SPECIFICATIONS FOR

Bid No. 2604

Construction of
New Continuation High School 2004-1

VOLUME II

Division 1 - 16

Technical Specifications

DVBE and LCP Compliance Required

KERN HIGH SCHOOL DISTRICT
Donald E. Carter, Ed. D., Superintendent

SECTION 00005 - CERTIFICATIONS AND SEALS

PROJECT:

NEW CONTINUATION HIGH SCHOOL 2004-1
3700 BELLE TERRANCE
BAKERSFIELD, CALIFORNIA 93307
PROJECT NO. 08-0801
DSA Application No. 03-112813 File No. 15-H3

ARCHITECT'S CERTIFICATION:

I hereby certify that Divisions 0 through 14 of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Architect under the laws of the State of California.
Architect's Name: Renfro and Cuningham, Inc.
2200 Truxtun Avenue
Bakersfield, California 93301
Telephone: (661) 327-7075
Facsimile: (661) 327-1822

LICENSED ARCHITECT KENNETH L. SVENDSEN No. C-15251 3-31-11 RENEWAL DATE STATE OF CALIFORNIA

Architect's Signature: Kenneth Svendsen, AIA
Date: December 4, 2009 Registration No. C15251

CIVIL ENGINEER'S CERTIFICATION:

I hereby certify that Sections of this Specification relating to civil engineering were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.
Engineer's Name: McIntosh and Associates.
2001 Wheelan Court
Bakersfield, California 93309
Telephone: (661) 834-4814
Facsimile: (661) 834-0972

REGISTERED PROFESSIONAL ENGINEER ROGER A. McINTOSH No. 33322 Exp. 6-30-10 CIVIL STATE OF CALIFORNIA

Engineer's Signature: Roger McIntosh, P.E.
Date: December 4, 2009 Registration No. 33322

STRUCTURAL ENGINEER'S CERTIFICATION:

I hereby certify that Sections of this Specification relating to structural engineering were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.
Engineer's Name: Minner Stinnet Koo and Agbayani Engineering.
1716 Oak Street, Suite 21
Bakersfield, California 93301-3040
Telephone: (661) 324-9724
Facsimile: (661) 324-3416

REGISTERED PROFESSIONAL ENGINEER WARREN A. MINNER No. 863 Exp. 12-31-10 STRUCTURAL STATE OF CALIFORNIA

Engineer's Signature: Warren A. Minner, P.E.
Date: December 4, 2009 Registration No. 863

MECHANICAL ENGINEER'S CERTIFICATION:

I hereby certify that Division 15 of this Specification was prepared by me or under my direct supervision and that I am a duly Licensed **Professional** Engineer under the laws of the State of California.
Engineer's Name: Mechanical Design Concepts.
5500 Ming Avenue, Suite 251
Bakersfield, California 93309
Telephone: (661) 397-2114
Facsimile: (661) 397-2116

Engineer's Signature: Mark J. Baskin, P.E.
Date: December 4, 2009 Registration No. M26578

ELECTRICAL ENGINEER'S CERTIFICATION:

I hereby certify that Division 16 and Section 11130 of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of California.
Engineer's Name: Waters Engineering
3200 South Fairway, Suite B
Visalia, California 93227
Telephone: (559) 733-9733
Facsimile: (559) 733-9755

Engineer's Signature: Vincent W. Waters, P.E.
Date: December 4, 2009 Registration No.E14975

LANDSCAPE ARCHITECT'S CERTIFICATION:

I hereby certify that landscape sections of this Specification were prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of California.
Engineer's Name: Sierra Designs, Inc.
113 North Church Street, Suite 310
Visalia, California 93291
Telephone: (559) 733-3690
Facsimile: (559) 733-3694

Engineer's Signature: Daniel M. Veyna, L.A..
Date: December 4, 2009 Registration No. 2409

END OF SECTION 00005

KERN HIGH SCHOOL DISTRICT

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SECTION 01110 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Description of Construction Delivered Under a Single Prime Contract.

1. Work Covered by the Contract Documents.
2. Contract Method.
3. Commencement of the Work.
4. Owner Furnished/ Contractor Installed Products.
5. Contractor’s Duties.
6. Overlapping & Conflicting Requirements.
7. Contractor’s Use of Site and Premises.
8. Owner Occupancy.

1.2 WORK COVERED BY THE CONTRACT DOCUMENTS

A. The Project shall consist of NEW CONSTRUCTION at the NEW CONTINUATION HIGH SCHOOL located at 3700 EAST BELLE TERRACE, BAKERSFIELD, CA 93307.

B. Work of the Contract shall consist of all General Construction; including Mechanical and Electrical Work.

C. Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, Addenda and modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual, including, but not necessarily limited to, printed material referenced by any of these.

D. It is recognized that Work of the Contract, is also unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions and other forces outside the Contract Documents.

1.3 CONTRACT METHOD

A. The Owner shall award a Stipulated Sum Single Prime Contract for the total Work of the Project.

1.4 COMMENCEMENT OF THE WORK

A. The Contractor shall neither commence the Work, nor allow any Subcontractor or Sub-subcontractor to commence the Work until:

1. The Contract has been fully executed; and the Owner has issued a Notice to Proceed.
2. The Owner has approved the Contractor's Performance Bond and Payment Bond.
3. The Owner has approved evidence of the Contractor's Liability Insurance, Owner's Protective Liability Insurance and any other required insurance to be purchased by the Contractor.

1.5 OWNER FURNISHED/CONTRACTOR INSTALLED PRODUCTS

A. Owner’s Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data and samples to Contractor.
2. Arrange and pay for product delivery to the site according to Contractor’s Construction Schedule.
3. Upon delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage, and replace damaged, defective or deficient products.
5. Arrange for manufacturer’s warranties, inspections and service.

B. Contractor’s Responsibilities:

1. Review Owner furnished shop drawings, product data and samples and return them to Architect noting discrepancies or anticipated problems in use of products.
2. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
3. Handle, store, protect, install and finish products.

4. Repair or replace items or products damaged after receipt.

1.6 CONTRACTOR'S DUTIES

A. The intent is for the Contractor to include all items necessary for the proper execution and completion of the Work. Work shall cover all portions of the Contract Documents, and all Work necessary to produce the intended results.

B. Work Included: Provide construction administration and supervision, labor, materials, articles, equipment, incidentals, items, tools, services, supplies, methods, operations, skills in such quantities as may be necessary to complete the project within the intent of the Contract Documents.

1.7 OVERLAPPING AND CONFLICTING REQUIREMENTS

A. Where compliance with two or more standards or requirements is indicated in the documents or where overlapping requirements establish different or conflicting levels of quantity or quality within the documents; the most stringent, (and generally the most expensive), requirement is intended, and will be enforced unless written approval is granted otherwise by the Architect.

B. Bidding Stage: Notify Architect in writing of overlapping and conflicting requirements for clarification by Addenda.

C. Construction Stage: Refer to Architect for resolution conflicting requirements and uncertainties as to which level of quality is more stringent, and receive written clarification from Architect before proceeding with questioned Work.

1.8 CONTRACTOR USE OF SITE & PREMISES

A. Limit use of site and premises to allow:

1. Owner occupancy.
2. Use of site and premises by public.
3. Construction operations and activities.

B. Confine the Work, including all construction operations and activities, within the "Construction Limits" indicated on the Drawings.

C. Emergency Building Exits During Construction: Maintain all required building exits necessary for fire and life safety conditions. Review enclosures for temporary exit corridor construction with the Architect and local fire and building officials to insure safety and compliance with all applicable codes.

D. Utility Outages and Shutdown: Contractor shall obtain written permission from the Owner at least forty-eight (48) hours in advance of any such occurrence. Provide and maintain proper shoring and bracing for existing underground utilities and sewers encountered during excavation work, protect them from collapse or movement, or other types of damage until such time as they are to be removed, incorporated into the new Work or can be properly backfilled upon completion of new Work.

E. Protect pavements, curbs, trees, landscaping and existing construction during the course of the Work, and repair or replace all parts of same which become damaged.

F. Failing to adequately clean vehicles or otherwise causing dirt or debris to be deposited on any public street or highway shall be the responsibility of the Contractor, and he shall be liable for all costs levied by public authorities having jurisdiction in connection with the cleaning thereof.

G. Assume full responsibility for the protection of and safekeeping of products and materials under his contract, stored on the site.

H. Provide and maintain access roads for delivery of all materials and services to the site.

I. Keep driveways and entrances serving the site clear and available to the Owner and the Owner's employees and agents at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

J. All employees shall be properly and completely clothed while working; minimum attire is long pants, T-shirt and sturdy work shoes. Sneakers and tank tops are not permitted. The use of "hard hats" which meet or exceed Federal Standards are

required to be worn at all times by every person who works or visits the site.

1.9 OWNER OCCUPANCY

A. **Partial Owner Occupancy**: The Owner reserves the right to occupy, and to place and install equipment in completed areas of the building, prior to Substantial Completion provided that such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. A Certificate of Substantial Completion will be executed for each specific portion of the Work to be occupied prior to Owner occupancy.

2. Contractor shall obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.

3. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

(Not Used)

END OF SECTION 01110

SECTION 01410 - REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and methods for testing and reporting on the pertinent characteristics.

C. Provide materials and workmanship which meet or exceed the specifically named code or standard.

D. Deliver to the Architect required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested by the Architect and will generally be required to be copies of the certified report of tests conducted by a testing agency acceptable for that purpose to the Architect.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications. Comply with laws, ordinances, and regulations of authorities having jurisdiction. Proof of compliance shall be signed approval by the respective authorities having jurisdiction.

1.3 RELATED SECTIONS

A. Refer to School District Documents as referenced in Table of Contents.

B. Section 01600 - Product Requirements: Requirements for material and product quality.

1.4 QUALITY ASSURANCE

A. Familiarity with Pertinent Codes and Standards: Verify that requirements of the specifically named codes and standards as well as requirements mandated by law, ordinance and authority. Verify that the items procured and installed in this Work meet or exceed the specified requirements.

B. Rejection or Non-Complying Items: The Architect reserves the right to reject items incorporated into the Work which fail to meet such minimum requirements.

1.5 REGULATORY REQUIREMENTS

A. Contractors shall conform to procedures applicable when discovering hazardous or contaminating materials as outlined in School District Documents.

B. Contractors shall conform to Americans with Disabilities Act (ADA) Requirements for Making Buildings and Facilities Accessible to and Usable by Physically Disabled People.

1.6 APPLICABLE CODES

A. Work of the Project shall conform to the following Codes, copies of which shall be maintained at the job site by the Contractor throughout the duration of the Work:

1. 2007 California State Building Code; Standards and Regulations.
2. 2007 California State Fire Code.
3. 2007 California State Mechanical Code
4. 2007 California State Plumbing Code.
5. 2007 California State Electrical Code.
6. 2007 California State Energy Code.
7. Title 19, Health Safety Code.
8. Life Safety Code, Latest Edition.
9. All other applicable codes and regulations attributable to fire and life safety conditions.
10. Local ordinances and regulations affecting Work of this project.

1.7 APPLICABLE REFERENCE STANDARDS

A. Standards referenced in the Specifications are usually referred to by the abbreviation of the organization's name and the designation of the document (e.g., ASTM A36). Documents in common use may be referred to by their own designation (e.g., the National Electrical Code is published by the National Fire Protection Association as NFPA-70 but is referred to as NEC and is part of a series of documents or standards referred to as the National Fire Code).

B. References are to the latest issue of the publication available on the date of issue of the Project Manual.

PART 2 - PRODUCTS

(not used)

PART 3 - EXECUTION
(not used)

END OF SECTION 01410

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. References; Including Lists of Reference Standards Cited in the Contract Documents, The Organizations Whose Standards are Cited, or Both.

1. Reference Standards.
2. Definitions.
3. Industry Standards.
4. Jurisdictional Agencies.

1.2 REFERENCE STANDARDS

A. Where a reference in the Contract Documents to a Federal Specification, American National Standards Institute Standard, American Society of Testing Materials Standard or other standard does not include the edition or date of the standard, the edition of the standard current as of the date of this Project Manual with amendments shall apply.

B. Where a reference in the Contract Documents to any industry, trade, organization, governing or legal standard does not include the edition or date of the standard, the edition, including amendments, current as of the date of the Project Manual shall apply.

C. Conform to reference standard by date of issue current as of the date of Contract Documents.

D. Obtain copies of reference standards when required by Contract Documents.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.3 DEFINITIONS

A. The Definitions of this Section shall apply throughout the Contract Documents.

B. **: (Colon)**: Means the same as "shall be.".

C. **Directed:** Terms such as "directed", "requested", "authorized", "selected", "required", and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. **Furnish:** The term "furnish" means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

E. **Herein**: The term "Herein" shall refer to the contents of the Construction Documents including, but not limited to, any or all of the parts of Specification sections, or the contents within any or all of the parts and sections of Conditions of the Contract (General and Supplementary Conditions) and Division One - General Requirements.

F. **Indicated:** The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help the reader locate the reference. There is no limitation on location.

G. **Install:** The term "install" describes operations at the Project site including the actual unloading, proper storage, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. **Installer:** An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

I. **Project Site**: Project site is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

J. **Provide:** The term provide means to furnish and install, complete and ready for the intended use.

K. **Regulations:** The term "regulations" includes laws, ordinances, statutes, and lawful orders issued

by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

L. **Trades:** Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

M. **Testing Agencies:** A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

N. **Workmanship:** The quality of work in manufacturing, assembly, fabrication and/or installation of a product or materials either in the factory, on the job site or at a separate location. Workmanship shall include installation or incorporation of the products or materials into the Work of the Project.

O. **Approved Equal:** Products approved by the Architect that, in the opinion of the Architect, are equivalent or better, in terms of appearance, composition, construction and/or performance, than the products or materials listed in the Project specifications, based on comparison of salient features of the listed product in the Project specifications. When a product is rejected, the Architect shall indicate specific features for which rejection was based. Submit all substitution requests under the provisions of Division One.

1.4 INDUSTRY STANDARDS

A. **Applicability of Standards:** Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. **Publication Dates:** Comply with the standards in effect as of the date of the Contract Documents.

C. **Conflicting Requirements:** Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Architect for a decision before proceeding.

D. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

E. **Copies of Standards:** Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

F. **Abbreviations and Names:** Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but not ensured, to be accurate and up to date as of the date of Contract Documents.

1.5 GOVERNMENT STANDARDS AND REGULATIONS

ADAAG	Americans with Disabilities Act (ADA) www.access-board.gov (800) 872-2253/ (202) 272-5434
CFR	Code of Federal Regulations www.access.gpo.gov/nara/cfr (888) 293-6498/ (202) 512-1530
FS	Federal Specification Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online (215) 697-6257 Available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm

(202) 619-8925
Available from National Institute of Building Sciences
www.nibs.org (202) 289-7800

MILSPEC Military Specification and Standards
www.astimage.daps.dla.mil/online
(215) 697-6257

1.6 ORGANIZATIONS LISTED BY NAME

AA Aluminum Association, Inc.
www.aluminum.org (202) 862-5100

AAADM American Association of Automatic Door Manufacturers
www.aaadm.com (216) 241-7333

AABC Associated Air Balance Council
www.aabchq.com (202) 737-0202

AAMA American Architectural Manufacturers Association
www.aamanet.org (847) 303-5664

AATCC American Association of Textile Chemists and Colorists (The)
www.aatcc.org (919) 549-8141

ACI American Concrete Institute/ACI International
www.aci-int.org (248) 848-3700

ACIL American Council of Independent Laboratories
www.acil.org (202) 887-5872

ACPA American Concrete Pipe Association
www.concrete-pipe.org
(214) 506-7216

ADC Air Diffusion Council
www.flexibleduct.org (312) 201-0101

ADSC International Association of Foundation Drilling
www.adsc-iafd.com (214) 681-5994

AEIC Association of Edison Illuminating Companies, Inc.
www.aeic.org (205) 257-2530

AGC Associated General Contractors of America (The)
www.agc.org (703) 548-3118

AHA American Hardboard Association
www.hardboard.org (847) 934-8800

AHAM Association of Home Appliance Manufacturers
www.aham.org (202) 872-5955

AI Asphalt Institute
www.asphaltinstitute.org
(859) 288-4960

AIA American Institute of Architects (The)
www.aia.org
(800) 242-3837/ (202) 626-7300

AISC American Institute of Steel Construction
www.aisc.org
(800) 644-2400/ (312) 670-2400

AISI American Iron and Steel Institute
www.steel.org (202) 452-7100

AITC American Institute of Timber Construction
www.aitc-glulam.org (303) 792-9559

ALCA Associated Landscape Contractors of America
www.alca.org
(800) 395-2522/ (703) 736-9666

ALI Associated Laboratories, Inc.
www.assoc-labs.com (214) 565-0593

ALSC American Lumber Standard Committee
(301) 972-1700

AMCA Air Movement and Control Association International, Inc.
www.amca.org (847) 394-0150

ANLA American Nursery & Landscape Association (Formerly: AAN - American Association of Nurserymen)
www.anla.org (202) 789-2900

ANSI American National Standards Institute
www.ansi.org (202) 293-8020

APA APA - The Engineered Wood Association
www.apawood.org (253) 565-6600

APA Architectural Precast Association
www.archprecast.org (941) 454-6989

ARI Air-Conditioning & Refrigeration Institute
www.ari.org (703) 524-8800

ARRA Asphalt Recycling and Reclaiming Association
www.arra.org (410) 267-0023

ASC Adhesive and Sealant Council
www.ascouncil.org (301) 986-9700

ASCA Architectural Spray Coaters Association
www.ascassoc.com (609) 848-6120

ASCE American Society of Civil Engineers
www.asce.org
(800) 548-2723/ (703) 295-6300

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
www.ashrae.org
(800) 527-4723/ (404) 636-8400

ASME ASME International (The American Society of Mechanical Engineers International)
www.asme.org
(800) 843-2763/ (212) 591-7722

ASSE American Society of Sanitary Engineering
www.asse-plumbing.org
(440) 835-3040

ASTM ASTM International (American Society for Testing and Materials International)
www.astm.org (610) 832-9585

AWCI AWCI International (Association of the Wall and Ceiling Industries International)
www.awci.org (703) 534-8300

AWI Architectural Woodwork Institute
www.awinet.org
(800) 449-8811/ (703) 733-0600

AWPA American Wood-Preservers' Association
www.awpa.com (817) 326-6300

AWS American Welding Society
www.aws.org
(800) 443-9353/ (305) 443-9353

BHMA Builders Hardware Manufacturers Association
www.buildershardware.com
(212) 297-2122

BIA Brick Industry Association
www.bia.org (703) 620-0010

BIFMA BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
www.bifma.com (616) 285-3963

CCFSS Center for Cold-Formed Steel Structures
www.umr.edu/~ccfss (573) 341-4471

CDA Copper Development Association Inc.
www.copper.org
(800) 232-3282/ (212) 251-7200

CEA Canadian Electricity Association
www.canelect.ca (613) 230-9263

CFFA Chemical Fabrics & Film Association, Inc.
www.chemicalfabricsandfilm.com
(216) 241-7333

CGSB Canadian General Standards Board
www.pwgsc.gc.ca/cgsb
(819) 956-0425

CIMA Cellulose Insulation Manufacturers Association
www.cellulose.org
(888) 881-2462/ (937) 222-2462

CISCA Ceilings & Interior Systems Construction Association
www.cisca.org (630) 584-1919

CISPI Cast Iron Soil Pipe Institute
www.cispi.org (423) 892-0137

CLFMI Chain Link Fence Manufacturers Institute
www.chainlinkinfo.org (301) 596-2583

CPPA Corrugated Polyethylene Pipe Association
www.cppa-info.org
(800) 510-2772/ (202) 462-9607

CRI Carpet & Rug Institute (The)
www.carpet-rug.com
(800) 882-8846/ (706) 278-3176

CRSI Concrete Reinforcing Steel Institute
www.crsi.org (847) 517-1200

CSA CSA International (Formerly: IAS - International Approval Services)
www.csa-international.org
(800) 463-6727/ (416) 747-4000

CSI Construction Specifications Institute (The)
www.csinet.org
(800) 689-2900/ (703) 684-0300

CSSB Cedar Shake & Shingle Bureau
www.cedarbureau.org (604) 820-7700

CTI Cooling Technology Institute (Formerly: Cooling Tower Institute)
www.cti.org (281) 583-4087

DASMA Door and Access Systems Manufacturers Association International
www.dasma.com (703) 241-7333

DHI Door and Hardware Institute
www.dhi.org (703) 222-2010

EIA Electronic Industries Alliance
www.eia.org (703) 907-7500

EIMA EIFS Industry Members Association
www.eifsfacts.com
(800) 294-3462/ (770) 968-7945

EJMA Expansion Joint Manufacturers Association, Inc.
www.ejma.org (914) 332-0040

FCI Fluid Controls Institute
www.fluidcontrolsinstitute.org
(216) 241-7333

FMG FM Global (Formerly: FM - Factory Mutual System)
www.fmglobal.com (401) 275-3000

GA Gypsum Association
www.gypsum.org (202) 289-5440

GANA Glass Association of North America (Formerly: FGMA - Flat Glass Marketing Association)
www.glasswebsite.com/gana
(785) 271-0208

HI Hydraulic Institute
www.pumps.org
(888) 786-7744/ (973) 267-9700

HI Hydronics Institute
www.gamanet.org (908) 464-8200

HPVA Hardwood Plywood & Veneer Association
www.hpva.org (703) 435-2900

HPW H. P. White Laboratory, Inc.
www.hpwhite.com (410) 838-6550

ICC International Code Council
www.intlcode.org (703) 931-4533

ICEA Insulated Cable Engineers Association, Inc.
www.icea.net (770) 830-0369

ICRI International Concrete Repair Institute, Inc.
www.icri.org (847) 827-0830

IEC International Electrotechnical Commission
www.iec.ch

IEEE Institute of Electrical and Electronics Engineers, Inc.
www.ieee.org (212) 419-7900

IESNA Illuminating Engineering Society of North America
www.iesna.org (212) 248-5000

IGCC Insulating Glass Certification Council
www.igcc.org (315) 646-2234

IGMA Insulating Glass Manufacturers Alliance
www.igmaonline.org (613) 233-1510

ILI Indiana Limestone Institute of America, Inc.
www.iliai.com (812) 275-4426

ISSFA International Solid Surface Fabricators Association
(702) 567-8150

I3A International Imaging Industry Association (Formerly: PIMA - Photographic & Imaging Manufacturers Association)
www.pima.net (914) 698-7603

ITS Intertek Testing Services
www.itsglobal.com
(800) 345-3851/ (607) 753-6711

KCMA Kitchen Cabinet Manufacturers Association
www.kcma.org (703) 264-1690

LMA Laminating Materials Association (Formerly: ALA - American Laminators Association)
www.lma.org (201) 664-2700

MBMA Metal Building Manufacturers Association
www.mbma.com (216) 241-7333

MFMA Maple Flooring Manufacturers Association
www.maplefloor.org (847) 480-9138

MFMA Metal Framing Manufacturers Association
www.metalframingmfg.org
(312) 644-6610

MHIA Material Handling Industry of America
www.mhia.org
(800) 345-1815/ (704) 676-1190

MIA Marble Institute of America
www.marble-institute.com
(614) 228-6194

MPI Master Painters Institute
www.paintinfo.com (888) 674-8937

MSS Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
www.mss-hq.com (703) 281-6613

NAA National Arborist Association
www.natlarb.com
(800) 733-2622/ (603) 673-3311

NAAMM National Association of Architectural Metal Manufacturers
www.naamm.org (312) 332-0405

NACE NACE International (National Association of Corrosion Engineers International)
www.nace.org (281) 228-6200

NAIMA North American Insulation Manufacturers Association
www.naima.org (703) 684-0084

NAMI National Accreditation and Management Institute, Inc.
(304) 258-5100

NBGQA National Building Granite Quarries Association, Inc.
www.nbgqa.com (800) 557-2848

NCCA National Coil Coating Association
www.coilcoating.org

NCMA National Concrete Masonry Association
www.ncma.org (703) 713-1900

NCPI National Clay Pipe Institute
www.ncpi.org (414) 248-9094

NCTA National Cable & Telecommunications Association
www.ncta.com (202) 775-3550

NEBB National Environmental Balancing Bureau
www.nebb.org (301) 977-3698

NECA National Electrical Contractors Association
www.necanet.org (301) 657-3110

NEII National Elevator Industry, Inc.
(201) 944-3211

NELMA Northeastern Lumber Manufacturers' Association
www.nelma.org (207) 829-6901

NEMA National Electrical Manufacturers Association
www.nema.org (703) 841-3200

NETA International Electrical Testing Association
www.netaworld.org (303) 697-8441

NFPA National Fire Protection Association
www.nfpa.org
(800) 344-3555/ (617) 770-3000

NFRC National Fenestration Rating Council
www.nfrc.org (301) 589-6372

NGA National Glass Association
www.glass.org (703) 442-4890

NHLA National Hardwood Lumber Association
www.natlhardwood.org
(800) 933-0318/(901) 377-1818

NIBS National Institute of Building Science
www.nibs.org (202) 289-7800

NLA National Lime Association
www.lime.org (703) 243-5463

NLGA National Lumber Grades Authority
www.nlga.org (604) 524-2393

NOFMA National Oak Flooring Manufacturers Association
www.nofma.org (901) 526-5016

NPCA National Paint and Coatings Association
www.paint.org (202) 462-6272

NPCA National Precast Concrete Association
www.precast.org (317) 571-9500

NRCA National Roofing Contractors Association
www.nrca.net
(800) 323-9545/ (847) 299-9070

NRMCA National Ready Mixed Concrete Association
www.nrmca.org
(888) 846-7622/ (301) 587-1400

NSF NSF International (National Sanitation Foundation International)
www.nsf.org
(800) 673-6275/ (734) 769-8010

NSPI National Spa and Pool Association
www.nspi.org (703) 838-0083

NSSGA National Stone, Sand & Gravel Association (Formerly: NSA - National Stone Association)
www.nssga.org
(800) 342-1415/ (703) 525-8788

NTMA National Terrazzo and Mosaic Association, Inc.
www.ntma.com
(800) 323-9736/ (703) 779-1022

NUCA National Utility Contractors Association
www.nuca.com (703) 358-9300

PCA Portland Cement Assoc.
www.portcement.org (847) 966-6200

PCI Precast/Prestressed Concrete Institute
www.pci.org (312) 786-0300

PDCA Painting and Decorating Contractors of America
www.pdca.com
(800) 332-7322/ (703) 359-0826

PDI Plumbing & Drainage Institute
www.pdionline.org
(800) 589-8956/ (508) 230-3516

PGI PVC Geomembrane Institute
www.pgi-tp.ce.uiuc.edu
(217) 333-3929

PTI Post Tensioning Institute
www.post-tensioning.org
(602) 870-7540

RCSC Research Council on Structural Connections
www.boltcouncil.org
(800) 644-2400/ (312) 670-2400

RFCI Resilient Floor Covering Institute
www.rfci.com

RIS Redwood Inspection Service

www.calredwood.org
(888) 225-7339/ (415) 382-0662

SAE SAE International
www.sae.org (724) 776-4841

SDI Steel Deck Institute
www.sdi.org (847) 462-1930

SDI Steel Door Institute
www.steeldoor.org (440) 899-0010

SEFA Scientific Equipment and Furniture Association
www.sefalabfurn.com (516) 294-5424

SGCC Safety Glazing Certification Council
www.sgcc.org (315) 646-2234

SJI Steel Joist Institute
www.steeljoist.org (843) 626-1995

SMA Screen Manufacturers Association
www.screenmfgassociation.org
(561) 533-0991

SMACNA Sheet Metal and Air Conditioning Contractors' National Association
www.smacna.org (703) 803-2980

SPFA Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD)
www.sprayfoam.org (800) 523-6154

SPIB Southern Pine Inspection Bureau (The)
www.spib.org (850) 434-2611

SPRI Single Ply Roofing Institute
www.spri.org (781) 444-0242

SSINA Specialty Steel Industry of North America www.ssina.com
(800) 982-0355/ (202) 342-8630

SSMA Steel Stud Manufacturers Association (Formerly: ML/SFA - Metal Lath/Steel Framing Association)
www.ssma.com (312) 456-5590

SSPC SSPC: The Society for Protective Coatings www.sspc.org
(877) 281-7772/ (412) 281-2331

SWI Steel Window Institute
www.steelwindows.com
(216) 241-7333

SWRI Sealant, Waterproofing, and Restoration Institute
www.swrionline.org (816) 472-7974

TCA Tile Council of America, Inc.
www.tileusa.com (864) 646-8453

TIA/EIA Telecommunications Industry Association/ Electronic Industries Alliance
www.tiaonline.org (703) 907-7700

TMS The Masonry Society
www.masonrysociety.org
(303) 939-9700

TPI Truss Plate Institute (608) 833-5900

TPI Turfgrass Producers International
www.turfgrasssod.org
(800) 405-8873/ (847) 705-9898

UL Underwriters Laboratories Inc.
www.ul.com
(800) 704-4050/ (847) 272-8800

UNI Uni-Bell PVC Pipe Association
www.uni-bell.org (972) 243-3902

USITT United States Institute for Theatre Technology, Inc.
www.culturenet.ca/usitt
(800) 938-7488/ (315) 463-6463

WASTEC Waste Equipment Technology Association www.wastec.org
(800) 424-2869/ (202) 244-4700

WCLIB West Coast Lumber Inspection Bureau
www.wclib.org
(800) 283-1486/ (503) 639-0651

WCSC Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Assoc.)
www.windowcoverings.org
(800) 506-4636/ (212) 661-4261

WDMA Window & Door Manufacturers Association
(Formerly: NWWDA - National Wood Window and Door Association)
www.wdma.com

(800) 223-2301/ (847) 299-5200

WH Intertek Testing services
Warnock Hersey Listing Services
www.itsqs.com (916) 678-7820

WIC Woodwork Institute of California
www.wicnet.org (916) 372-9943

WMMPA Wood Moulding & Millwork
Producers Association
www.wmmpa.com
(800) 550-7889/ (530) 661-9591

WWPA Western Wood Products Association
www.wwpa.org (503) 224-3930

1.7 JURISDICTIONAL AGENCIES

A. **Federal Government Agencies:** Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of the date of the Contract Documents.

CE Army Corps of Engineers
www.usace.army.mil

CPSC Consumer Product Safety
Commission
www.cpsc.gov
(800) 638-2772/ (301) 504-0990

EPA Environmental Protection Agency
www.epa.gov (202) 260-2090

GSA General Services Administration
www.gsa.gov (202) 708-5082

HUD Department of Housing and Urban
Development
www.hud.gov (202) 708-1112

NIST National Institute of Standards and
Technology
www.nist.gov (301) 975-6478

OSHA Occupational Safety & Health
Administration
www.osha.gov
(800) 321-6742 /(202) 693-1999

PART 2 - PRODUCTS

(not used)

PART 3 - EXECUTION

(not used)

END OF SECTION 01420

SECTION 01440 - EXISTING UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Existing Utilities:

1. Utility Location.
2. Notification of Utility.
3. Compensation.
4. Care and Responsibility.

1.2 UTILITY LOCATION

A. Prior to beginning any excavation, contact local utility companies for the location of existing underground services.

B.

1.3 NOTIFICATION OF UTILITY

A. Notify public utility companies and municipalities as to which of their properties (such as pole lines, conduits, gas pipes, water pipes, sewers, fiber optics lines, TV lines, cable lines, telephone lines and tile lines) must be removed or relocated to complete the Work of this Contract. This notice shall note the locations where the properties could be relocated. However, no warranty is made or implied that the utility owners will remove or relocate their properties prior to commencement of construction operations or in sufficient time or manner to prevent interference with the Contractor's operations.

B. Notify the Owner of proposed construction activities and request information on existing utilities that may be present on the site that are not shown on the plans and/or identified by public utility companies and municipalities.

C. Verify the amount of time required to give sufficient notice to the Owner of all known utilities. The Contractor shall give such notice before starting any operations affecting those properties. If during the course of operations, the Contractor discovers utility property whose existence was not known, Contractor shall immediately notify the Owner thereof and the Architect/Engineer.

D. Do not commence construction operations adjacent to utility property until arrangements satisfactory to the utility owner have been made for the protection of said property and continuation of service. Contractor shall assume responsibility and pay for cost for which the Owner may be liable.

E. Should any of the Contractor's equipment come in contact with or damage utility property in any way, even though there may be no apparent evidence of breakage or harm, promptly notify the proper authorities and cooperate with them in determining damage and restoring interrupted services as may be needed. Where contact is made with a utility, operations shall be suspended immediately, and the area vacated, until it has been determined by the utility owner that it is safe to resume operations.

F. The Contractor shall locate all private utilities (such as electric lines, irrigation, conduits, fiber optic lines, cable lines, telephone lines, water pipes, sewers and tile lines). The Contractor will be required to confirm all utilities which must be removed or relocated to complete the work. No additional compensation will be paid to the Contractor for utilities shown on the drawings or which otherwise may have been anticipated prior to the construction. The Contractor may request, [through the Construction Manager,] the assistance of Owner personal in locating existing private lines.

1.4 COMPENSATION

A. It is understood and agreed that the Bidder has considered in his bid the relative locations of existing utilities, as shown on the Plans and that no additional compensation will be allowed for any delays, inconveniences or damages sustained due to interference which may result from those utilities or the operations of moving them.

B. If the Contractor is required to perform any special work or use special construction methods in prosecuting work adjacent to underground utility property whose existence was not indicated in the Contract, equitable compensation will be made for the additional costs incurred.

C. The Contractor shall contact the Owner and Architect/Engineer prior to performing the special work or special construction methods. Any special work or special construction methods performed without the approval by the Owner shall not be compensated.

1.5 CARE AND RESPONSIBILITY

A. Employ special equipment or construction methods (including hand labor, if necessary) to accomplish the work as planned adjacent to utility properties without damage thereto. At no time shall the Contractor interfere with any persons engaged in protecting or moving utility property or in the operation of the utility.

B. The Contractor shall assume full responsibility for reimbursing the utility owners for any damages caused to utility properties whose existence and approximate locations were made known to him before the damage was done. Nothing in this Section shall make the Contractor liable for damage to utility property located below the ground surface, in the absence of negligence, if the owner of the utility, after reasonable notice from the Contractor, fails to advise the Contractor of its location and approximate depth below the ground surface.

PART 2 PRODUCTS

(not used)

PART 3 EXECUTION

(not used)

END OF SECTION

SECTION 01450 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Quality Control; Includes Procedures to Measure and Report the Quality and Performance of Construction.

1. Quality Assurance and Control of Installation.
2. Field Samples.
3. Mock-Up Requirements.

1.2 RELATED REQUIREMENTS

A. Division One-Refer to documents provided by School District.

B. Section 01770 - Closeout Procedures.

C. Individual Specification Sections - Inspection and testing required and standards for testing.

1.3 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification for Architect before proceeding.

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.4 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions and workmanship to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as a minimum quality for the Work, except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.5 FIELD SAMPLES

A. Install field samples at the site as required by individual specifications Sections for review by the Architect.

B. Acceptable samples represent a quality level for the Work.

C. Where field sample is specified in individual Sections to be removed, clear area after field sample has been accepted by Architect.

1.6 MOCK-UP REQUIREMENTS

A. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work unless indicated otherwise in the relevant specification section:

1. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals and finishes in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Where mock-up is specified in individual Sections to be removed, clear area after mock-up has been accepted by Architect.

B. Tests will be performed under provisions identified in the relevant specification section.

PART 2 - PRODUCTS
(not used)

PART 3 - EXECUTION
(not used)

END OF SECTION 01450

SECTION 01460 - TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Administrative and Procedural Requirements for Quality Control Testing and Inspection Services.

C. Conventional Testing and Inspection Services.

D. Special Structural Testing and Inspection.

E. Testing Laboratory Services.

1. Selection and Payment.
2. Laboratory Responsibilities.
3. Laboratory Reports.
4. Limits on Testing Laboratory Authority.
5. Contractor's Responsibilities.

F. Conventional Inspections and Testing.

1. Testing Schedule Requirements.
2. Schedule of Conventional Inspections and Testing.

G. Special Structural Testing and Inspection.

1. Special Structural Testing and Inspection Schedule.

1.2 RELATED SECTIONS

A. Division One-Refer to documents provided by School district.

B. Individual Specification Sections: Inspection and testing required and standards for testing.

1.3 REFERENCES

A. ASTM C1077-00 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.

B. ASTM C1093-95 - Standard Practice for the Accreditation of Testing Agencies for Unit Masonry.

C. ASTM D3740-01 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.

D. ASTM E329-00b - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

E. ASTM E543-99 - Standard Practice for Evaluating Agencies that Perform Nondestructive Testing.

F. ASTM E548-94e1 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence.

1.4 QUALITY ASSURANCE

A. Testing and inspection shall comply with the requirements of the 2007 California Building Code..

B. Testing and inspection shall comply with requirements of ASTM E329 and ASTM D3740.

C. Testing Laboratory: Must be authorized to operate in the State in which project is located, and must maintain a full time registered Engineer on staff to review services.

D. Testing and inspection services are intended to assist in determining probable compliance of the Work with requirements specified. These services do not relieve the Contractor of responsibility for compliance with the requirements of the Contract Documents.

E. If inspection of fabricators work is required, the Architect may require testing and inspection of the work at the plant, before shipment. The Architect reserves the right to reject materials not complying with the Contract Documents.

F. Work shall be checked as it progresses, but failure to detect any defective work or materials shall in no way prevent later rejection if defective work or materials are discovered, nor shall it obligate Architect to accept such work.

1.5 DEFINITIONS

A. **Testing**: Evaluation of systems, primarily requiring physical manipulation and analysis of materials in accordance with approved standards.

B. **Inspection**: Evaluation of systems, primarily requiring observation and judgment.

C. **Conventional Testing and Inspection**: Work herein described as those items not specifically required by the 2007 California Building Code, but are considered essential to the proper performance of the building systems.

D. **Special Structural Testing and Inspection**: Work herein described include items required by the 2007 California Building Code, and other items which in the professional judgment of the Structural Engineer are critical to the integrity of the building structure.

1.6 TESTING LABORATORY SERVICES

A. Selection and Payment:

1. Owner shall employ and pay for services of an Independent Testing Laboratory to perform specified inspection and testing.
2. Employment of testing laboratory shall in no way relieve the Contractor of his obligation to perform work in accordance with requirements of Contract Documents.
3. The Owner shall submit, prior to start of Work, Independent Testing Laboratory name, address, telephone number and names of full time registered Engineer and responsible officer.

B. Laboratory Responsibilities:

1. Take field specimens and samples for testing according to provisions of paragraph 3.2 of this section and as otherwise indicated in the Contract Documents.
2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
3. Perform specified inspection, sampling and testing of Products in accordance with specified standards.
4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
5. Promptly notify Architect and Contractor in writing of observed irregularities or non-conformance of Work or Products.
6. Perform additional inspections and tests required by Architect.
7. Attend pre-construction conferences and progress meetings.

C. Laboratory Reports:

1. Testing agency and/or special inspectors shall submit a report in accordance with the Special Structural Testing and Inspection Schedule and shall conduct and interpret tests and inspections and state in each report whether; (1) test specimens and observations comply with Contract Documents, and specifically state any deviations, (2) record types and locations of defects found in Work, and (3) record Work required and performed, to correct deficiencies.
2. Reports for conventional testing and inspection shall be submitted in a timely manner to the Architect, Structural Engineer, and Contractor.
3. After each inspection and test, promptly submit copies of laboratory report as follows:
   a. Date issued.
   b. Project title and number.
   c. Name of inspector.
   d. Date and time of sampling or inspection.
   e. Identification of product and Specifications Section.
   f. Location in the Project.
   g. Type of inspection or test.
   h. Date of test.
   i. Results of tests.
   j. Conformance with Contract Documents.
4. When requested by Architect, provide interpretation of test results.

D. Limits on Testing Laboratory Authority:

1. Laboratory may not release, revoke, alter or enlarge on requirements of Contract Documents.
2. Laboratory may not approve or accept any portion of the Work.
3. Laboratory may not assume any duties of Contractor.
4. Laboratory has no authority to stop the Work.

E. Contractor's Responsibilities:

1. Schedule of Tests and Inspections: Coordinate scheduling of required testing with testing laboratory and prepare a schedule of tests, inspections, and similar quality-control services according to provisions of Part 3 of this section and as otherwise indicated in the Contract Documents.
2. Coordinate Work such that all specified testing and inspections are accomplished.
3. Deliver as needed by the Testing Laboratory, materials and construction related documents necessary for the Testing Laboratory to complete testing.

4. Cooperate with laboratory personnel, and provide access to the Work and to manufacturer's facilities.
5. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
6. Notify Architect and laboratory 24 hours prior to expected time for operations requiring inspection and testing services.
7. Upon completion of testing, sample taking, or inspection, the Contractor shall repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed surfaces, as judged solely by the Architect.
8. Protect work exposed by or for testing and/or inspection and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing and/or inspection.

1.7 CONVENTIONAL TESTING AND INSPECTION:

A. Provide conventional inspection and testing as required by the 2007 California Building Code, and as scheduled below.

B. Independent Testing Agency shall indicate compliance or non-compliance with Contract Documents.

C. Submit a final signed report stating whether the Work was, to the best of their knowledge, in conformance with the approved plans, specifications and the applicable workmanship provisions of the code.

D. Contractor shall cooperate with independent firm; furnish samples of materials, design mixes, equipment, tools, storage and assistance as requested.

E. Schedule of Conventional Inspections and Tests:

1. Schedule of Tests: Contractor shall prepare a Testing Schedule in tabular form and include the following:
   a. Specification Section number and title.
   b. Identification of test designation and type.
   c. Test frequency required.
   d. Estimated total number of tests by type required.
   e. Estimated time schedule or time span for tests.
   f. Entity responsible for performing tests if other than Owner's Testing Agent.
2. Submit Testing Schedule under provisions of Division One.
3. Submit Testing Schedule to Architect for review and general acceptance. Owner reserves the right to withhold Contractor payments until Testing Schedule is reviewed by the Architect.
4. Schedule of Conventional Inspections and Tests, includes, but is not limited to:
   a. Section 02200 - Earthwork.
   b. Section 02310 - Site Grading.
   c. Section 02320 - Trench Excavation and Backfill for Utilities.
   d. Section 03100 - Concrete Forms and Accessories.
   e. Section 03200 - Concrete Reinforcement.
   f. Section 03300 - Cast-in-Place Concrete.
   g. Section 04200 - Unit Masonry Systems.
   h. Section 05120 - Structural Steel.
   i. Section 05310 - Steel Deck.
   j. Section 05400 - Cold Formed Metal Framing.
   k. Section 05500 - Metal Fabrications.
   l. Section 07540 - Thermoplastic Membrane Roofing

1.8 SPECIAL STRUCTURAL TESTING AND INSPECTION:

A. The parties involved shall complete and sign the Special Structural Testing and Inspection Schedule attached to this Section. The completed schedule is an element of the Construction Documents and after permit issuance, becomes part of the building department approved plans and specifications. The completed schedule shall include the following:

1. A specific listing of the items requiring testing and inspection.
2. The associated specification section and article which defines the applicable standards by which to judge conformance with the approved

plans and specifications in accordance with the 2007 California State Building Code. The specification section should also include the degree or basis of testing and inspection; i.e., intermittent/will-call, or full time/continuous.

3. The frequency of reporting; i.e., intermittent, weekly, monthly, per floor, etc.

4. The parties responsible for performing the testing and inspection work.

5. The required acknowledgements by each designated party.

B. In addition to the testing and inspections required by IBC Section 109 Owner shall employ and pay for one or more special inspectors who shall provide inspections during construction on the types of work listed under (IBC Section 1704).

C. Exception: The Building Official may waive the requirements for the employment of a special inspector if the construction is of a minor nature.

D. Schedule of Special Inspections (IBC 1704):

1. Concrete.

2. Bolts Installed in Concrete.

3. Reinforcing Steel.

4. High-Strength Bolting.

PART 2 - PRODUCTS

(not used)

PART 3 - EXECUTION

3.1 COORDINATION WITH TESTING LABORATORY AND INSPECTORS

A. Inspectors and representatives of the testing laboratory firm shall have access to the Work. Contractor shall provide facilities for such access in order that the testing, inspection and the obtaining of samples may be done properly.

B. Coordination: Contractor shall coordinate and cooperate with Testing Agency the sequence of activities necessary to accommodate required testing and inspection with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

C. Deliver material specimens to the Owner's testing lab, which must by terms of the Contract be tested prior to inclusion in the Project, at least forty-five (45) days prior to scheduled delivery to the job site.

D. Materials shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.

3.2 TAKING SPECIMENS

A. Field specimens and samples for testing, unless otherwise provided in these Contract Documents, shall be selected and taken by the testing laboratory or Inspector and not the Contractor. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory.

3.3 SCHEDULES FOR TESTING

A. Establishing Schedule of Tests and Inspections:

1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.

2. Provide required time within the construction schedule.

3. Revising Schedule: When changes of construction schedule are necessary during construction, coordinate such changes of schedule with the testing laboratory as required.

4. Numbers of Testing: Determine with the Testing Laboratory the total number of each type of test required in accordance with specification. Monitor progress of testing to ensure that proper number and types of testing required are being accomplished. Provide copies of schedules documenting types and numbers of tests required with corresponding information showing types and numbers of actual tests conducted monthly after commencement of testing and within five (5) days of completion of testing under each section of the Work.

5. Submit Testing and Inspection schedule, prior to commencement of the Work, to the Owner, Architect/Engineer, testing agencies, and other parties whose Work may be affected by the Testing and Inspection Schedule.

B. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedules, but is prevented from testing or taking specimens due to incompleteness of the work, extra charges for testing attributable to the delay may be back-charged to the Contractor and will be deducted by the Owner from the Contract Sum.

END OF SECTION 01460

TEST AND INSPECTION REQUIREMENTS

TITLE 24, PART 2 (2007 CBC) – VOLUME 2	
	CBC Section
Chapter 17-Structural Tests and Inspections	
Inspection: Wood Diaphragms and Shear Panels	1707A.3
Chapter 18A-Foundations and Retaining Walls	
Inspection: Pier Foundations	1704A.9
Chapter 19A-Concrete	
Materials: Portland Cement	1704A.4.1; 1916A.1
Concrete Aggregates	1704A.4.1; 1903A.3
Reinforcing Bars	1704A.4.1; 1916A.2
Quality: Proportions of Concrete	1905A.2; 1905A.3; 1905A.4
Strength Tests of Concrete	1905A.1.1; 1905A.6
Inspection: Job Site	1905A.7
Batch Plant	1704A.4.3
Waiver of Batch Plant	1704A.4.4
Reinforcing Bar Welding	1903A.4; 1704A.4.2
Post-Installed Anchors in Concrete	1916A.8
Chapter 21A-Masonry	
Materials: Masonry Units	2103A.1
Portland Cement, Lime	2103A
Mortar and Grout Aggregates	2103A.8; 2103A.12; 2103A.12.3
Reinforcing Bars	2103A.13.1
Quality: Portland Cement Tests	1916A.1
Mortar and Grout Tests	2105A.5
Masonry Prism Tests	2105A.2.2.2
Masonry Core Tests	2105A.4
Masonry Unit Tests	2105A.2.2.1
Reinforcing Bar Tests	1916A.2
Inspection: Reinforced Masonry	1704A.5
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Chapter 22A-Steel	
Materials: Structural Steel	2205A.1
Cold Formed Steel	2209A.1
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Quality: Tests of Structural and Cold Formed Steel	2212A.1
Tests of High Strength Bolts, Nuts, Washers	2212A.2

Tests of End Welded Studs	2212A.3
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Welding	1704A.3.1
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Chapter 23-Wood	
Materials: Lumber and Plywood	2303.1

END OF LIST

SECTION 01505 - CONSTRUCTION WASTE MANAGEMENT (CA)

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Construction Waste Management.

1. Requirements.
2. Waste Prevention and Management Goals.
3. Reuse and Salvage.
4. New Construction Waste Recycling.
5. Disposal.

1.2 RELATED SECTIONS

A. Section 01740 – Cleaning.

1.3 SUBMITTALS

A. Submittals under provisions of Division One.

B. Submit to the Architect, prior to the first submittal for payment, his complete outline of methods and means, cost for reuse, salvage and recycling work for the entire project.

C. Submit to the Architect, prior to the first submittal for payment, his schedule of values for his Application for Payment.

D. Submit to the Architect, the names of the companies that will provide New Construction Waste Recycling Services, Area Materials Hauler, and the Area Reuse/Salvage Organizations.

1.4 REQUIREMENTS

A. Provide for construction waste management through new construction waste recycling and disposal.

B. Within thirty (30) days after start of project, or prior to any waste removal, The Contractor shall submit to the Architect and Owner the methods and means, and cost for recycling work.

1.5 WASTE PREVENTION AND MANAGEMENT GOALS

A. The Owner desires that as many materials as possible from this project be recycled in order to minimize the impact of construction waste in landfills and to minimize the expenditure of energy and cost in fabricating new materials.

B. Waste/pollution prevention and management necessarily involves efforts in recycling, in addition to source reduction through packing materials reduction and materials handling, source reduction through design and installation methods, and hazardous materials handling and disposal. This Specification Section addresses recycling of new construction waste.

1.6 REUSE AND SALVAGE

A. The Contractor and Subcontractors are encouraged to reuse and salvage as many materials as possible. Reuse is a better waste management method than recycling because little or no reprocessing is necessary. Thus less pollution is created when items are reused in their original form.

B. Reuse Includes:

1. Returning reusable items such as wood pallets, packing materials or other unused products to the vendors.

1.7 NEW CONSTRUCTION WASTE RECYCLING

A. The Contractor shall provide space on-site for bins to accept mixed loads of construction waste. The Contractor must recycle at least three (3) of the following material types from every load, if the materials are present.

1. Dimensional wood and lumber.
2. Wood crates and pallets.
3. Concrete and Concrete Masonry Units.
4. Uncontaminated Corrugated Cardboard.
5. Metals, both scrap and steel.

1.8 POTENTIALLY RECYCLABLE MATERIALS

A. The Contractor is required to work with the Architect to potentially recycle the following materials, for which available methods and markets are variable.

1. Glass and glass products.
2. Plastics.
3. Polystyrene insulation.

1.9 DISPOSAL

A. The Contractor and Subcontractors are encouraged to dispose of materials in landfills only after all attempts have been exhausted to either reuse or recycle the materials. Try every means possible to rely on local resources and organizations for disposal, and discourage disposal of materials in landfill facilities which are environmentally unsound.

B. Markets for recycling and reuse are currently in a state of rapid development and change due to increasing interest in minimizing construction waste. The Contractor is encouraged to work with the Architect and the Owner to uncover potential venues for additional materials to be recycled and reused, as they become available.

C. Disposal materials and items include:

1. Paper.
2. Vinyl tile and base.
3. Acoustical tile.
4. Drywall.
5. Roofing shingles.
6. PVC pipe.
7. Rotten wood.
8. Glued wood products.
9. Batt insulation.
10. Ordinary trash.
11. Tree and yard waste.

D. The following materials are to be disposed of only if recycling efforts fail:

1. Carpet and carpet pad.
2. Glass and glass products.
3. Plastics.
4. Polystyrene insulation.

PART 2 - PRODUCTS

2.1 RECYCLERS FOR NEW CONSTRUCTION WASTE

A. Provide new construction waste recycling services from one of the local multi-materials haulers and processors, transfer stations and materials recovery facilities that accept mixed loads of construction waste and sort out three (3) or more materials for recycling.

PART 3 - EXECUTION

(not used)

END OF SECTION 01505

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Basic Product Requirements.

C. Product Options.

D. Product Substitution Procedures.

E. Owner Furnished Products.

F. Product Transportation & Handling Requirements.

G. Product Storage & Protection Requirements.

H. Repair/Replacement of Damaged Work.

1.2 RELATED SECTIONS

A. Division One documents as provided by School District.

1.3 GENERAL

A. Material and Equipment Incorporated into the Work:

1. Conform to applicable specification and standards.

2. Comply with size, make, type, and quality specified.

B. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accordance with the best engineering and shop practices.

2. Manufacture like parts of duplicate units to standard sizes and gauges for interchangeability.

3. Two or more items of the same kind shall be identical and by the same manufacturer.

C. Supplementary materials not specifically described in each Section, but required for a complete and proper installation of the Work, shall be new, first quality of their respective kinds, and subject to review and acceptance by the Architect.

1.4 DEFINITIONS

A. **Products:** are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms material, equipment, system and terms of similar intent.

1. **Named Products:** are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. **New Products:** Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

B. **Materials:** are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed or installed to form a part of the Work.

C. **Equipment:** is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

D. **Substitutions:** Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor during the bidding period or after award of the Contract are considered requests for "substitutions". The following are not considered substitutions:

1. Revisions to Contract Documents requested by the Owner or Architect.

2. Specified options of products and construction methods included in Contract Documents.

3. The Contractor's determination to comply with governing regulations and orders issued by governing authorities.

1.5 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of materials and Work.

B. Source Limitations: Provide products of the same kind, from a single source, to the fullest extent possible.

C. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or where required for observation after installation, on an accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.

b. Model and serial numbers.

c. Capacity.

d. Speed.

e. Ratings.

E. Prior to requesting final testing, adjusting and balancing, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested testing, adjusting and balancing.

1.6 BASIC PRODUCT REQUIREMENTS

A. Products: Shall be "new products" unless stated otherwise in the Contract Documents. Products do not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components from the same manufacturer, for similar components.

1.7 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers With a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.8 PRODUCT SUBSTITUTION PROCEDURES

A. Substitution Procedures During Bidding:

1. The aesthetics of the proposed product substitutions exposed to view in the completed Work shall be a "salient feature" of the Architects review. Therefore, the Architect reserves the right to reject products that, in the opinion of the Architect, do not meet the Project aesthetic requirements.

2. Substitutions may be considered when allowed under the Contract Documents or when a product becomes unavailable through no fault of the Contractor.

3. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

4. A substitution request constitutes a representation that the Contractor:

a. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

b. Will provide the same warranty for the Substitution as for the specified product.

c. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

d. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without prior written approval from the Architect, or when acceptance will require revision to the Contract Documents.
6. Substitution Submittal Procedure:
   a. All substitutions shall be submitted on a completed School District approved form.
   b. Submit three (3) copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
   c. Substitution requests shall include the name of the materials or equipment for which it is being substituted and a complete description of the proposed substitution.
   d. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
      1) Samples: If requested by the Architect, submit samples as indicated in the specification section or in a manner as directed by the Architect.
   e. Provide additional information when directed by the Architect and as required by the Contract Documents.
   f. The Architect will notify Contractor, in writing, of decision to accept or reject request.
7. The burden of proof of the merits of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
8. Testing of a proposed substitute material to assure compliance with the Specifications may be required by the Architect at the Contractor's expense. When so directed, submit samples for acceptance.
9. Equipment, material and articles installed or used without required acceptance shall be at the risk of subsequent rejection.
10. Failure to place orders for specified equipment or material sufficiently in advance of the scheduled installation date will not be considered a valid reason upon which the Contractor may base his request for substitutions or for deviations from the Drawings and Specifications.
11. Products listed "No Substitutions Allowed" will not be considered for substitution by the Architect.

B. Substitution Procedures During Construction:
   1. Substitution procedures during construction shall be the same as during bidding except that substitutions shall only be allowed when a product becomes unavailable through no fault of the Contractor.

1.9 OWNER-FURNISHED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data and samples to the Contractor.
   2. Arrange and pay for product delivery to the site.
   3. Upon delivery to the site, inspect products jointly with the Contractor.
   4. Submit claims for transportation damage, and replace damaged, defective or deficient products.
   5. Arrange for manufacturer's warranties, inspections and service.

B. Contractor's Responsibilities:
   1. Review Owner furnished shop drawings, product data and samples.
   2. Receive and unload products at site; inspect for completeness or damage, jointly with Owner.
   3. Handle, store, protect, install and finish products.
   4. Repair or replace items or products damaged after receipt.

1.10 PRODUCT TRANSPORTATION AND HANDLING REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's written instructions.

B. Before making a shipment of materials to the Project site, Contractor shall ascertain that the project site is in a condition to receive the shipment.
   1. If materials are delivered to the Project site and the site is not in condition to receive the materials, the materials shall be removed from the site and properly stored offsite at the expense of the Contractor or his Subcontractor.

C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

E. Arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.

F. Coordinate deliveries to avoid conflict with work and conditions at site, taking into consideration:

1. Work of the Contractor or Owner.
2. Limitations of Storage Space
3. Availability of equipment and personnel for handling products.
4. Owner's use of premises.

G. Deliver products in undamaged condition in original containers or packaging, and with identifying labels intact and legible.

H. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts, and to facilitate assembly.

I. Immediately on delivery, inspect shipment to ensure:

1. Product complies with requirements of Contract Documents and reviewed submittals.
2. Quantities are correct.
3. Containers and packages are intact and labels are legible.
4. Products are undamaged and properly protected.

J. The Architect reserves the right to observe delivered materials, to review the accompanying bills of lading, and to reject the following:

1. Materials not identifiable as accepted products of the accepted manufacturer.
2. Materials exhibiting shelf-lives in excess of those stipulated by the manufacturer.
3. Materials not bearing the appropriate label of Underwriters Laboratories (UL), where applicable.
4. Materials in opened or excessively damaged containers.
5. Damaged or defective products.
6. Materials exhibiting evidence of moisture, organic matter, or other adulterants.

K. In the event of damage or rejection by the Architect for stipulated cause, immediately make repairs and replacements necessary to the acceptance of the Architect and at no additional cost to the Owner.

1.11 PRODUCT STORAGE AND PROTECTION REQUIREMENTS

A. Store and protect products in accordance with manufacturer's written instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place on sloped supports, above ground.

C. Provide off-site storage and protection when site does not permit on-site storage or protection. Provide Architect with complete inventory of all off-site stored items, and provide certificate of insurance for all stored items.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.12 REPAIR/REPLACEMENT OF DAMAGED PRODUCTS

A. Protection of products shall not relieve the Contractor of his responsibility to repair or replace any products damaged by the elements or by any subsequent construction operation.

B. The decision on whether a damaged product is to be repaired or replaced is based on the requirement that ALL products shall meet the requirements specified for the Work as covered in the applicable sections of the Contract Documents; i.e., if a damaged product cannot be repaired so that it matches new, undamaged, products, then it must be replaced.

C. In REFINISHING repaired or replaced products, refinish entire surfaces, as necessary to provide an even finish to match adjacent finishes:

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

B. Standard Products: Provide standard products of types that have been produced and used successfully in similar situations on other projects and fully comply with all requirements of the Contract Documents.

C. Visual Selection: Where specified product requirements include the phrase “as selected from manufacturer’s standard colors, patterns, textures“ or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

D. Allowances: Refer to individual Specification Sections and “Allowances” provisions for control product selection, and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer’s instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Basic Requirements for Determining Conditions and Preparing to Install, Erect or Apply Products.

1. Layout of the Work.
2. Field Engineering.
3. Cutting and Patching.
4. Protection of Installed Work.

1.2 RELATED SECTIONS

A. Refer to Division One as provided by School District.

B. Section 01740 - Cleaning.

C. Individual Specification Sections: Specific requirements for contract closeout, product warranties and project maintenance data.

1.3 QUALITY ASSURANCE

A. In preparing data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the extent needed for communicating the essential data.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Cutting and Patching Proposal: Submit a proposal describing procedures that will be performed. Include the following information: The extent of the work, changes to existing construction, products to be used, dates work will be performed, and utilities that will be affected.

C. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

D. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALIFICATIONS

A. For field engineering or survey work employ a Land Surveyor or Professional Engineer of the discipline required for specific service on project legally qualified to practice in California], and acceptable to the Architect.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. If specified materials are no longer available, submit substitution proposal to the Architect for approval. Propose materials similar to existing and that match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems, points of connection of utility services and other construction affecting the Work.

3.2 LAYOUT OF THE WORK

A. All layout of the Work will be provided by the Contractor as a part of the Work.

B. The Contractor shall be responsible for the accuracy with respect to layout of its Work. Immediately report any perceived discrepancies or errors in the Contract Documents, or the Work to

the Architect. Make adjustments in accordance with instructions given by the Architect.

C. Verify locations of survey control points prior to starting work.

D. Locate and protect survey control and reference points.

E. Utilize recognized engineering survey practices.

3.3 FIELD ENGINEERING

A. Survey Reference Points:

1. Existing basic horizontal and vertical control points for the Project are those designated on the Drawings.

2. Locate and protect control points prior to starting site work, and preserve permanent reference points during construction. Identify and protect survey monuments on the site discovered during construction, which are not referenced on the project Drawings. Tie out such monuments and notify Architect prior to allowing them to be disturbed.

3. Replace permanent boundary markers disturbed during construction with new permanent monuments and file the required Record of Survey or Corner Record in accordance with applicable State and County laws, at no addition cost to the Owner.

B. Maintain a complete, accurate log of control and survey work as it progresses. Submit one (1) copy to the Architect on a weekly basis, with proper identification, including copies of all cut sheets and field notes.

C. Prior to the first Application for Payment, submit name and address of Licensed Surveyor or Civil Engineer to Architect, including changes as they may occur. Obtain approval of any changes from the Architect.

D. Upon request of the Architect, submit:

1. Data demonstrating qualifications of persons proposed to be engaged for field engineering services.

2. Documentation to verify accuracy of the field engineering Work.

3. Certification, signed by the Contractor's retained field engineer, certifying in writing that elevations and locations of improvements are in conformance or non-conformance with requirements of the Contract Documents.

E. Project Record Drawings further requirements:

1. At the appropriate times during the Project, Licensed Surveyor or Civil Engineer shall deliver to the Contractor's Record Documents Recorder current, "as-built" data of the work, for inclusion into the Project Record Documents. Clearly indicate differences between original drawings and completed work within specified tolerances.

2. Show as-built locations by coordinates of utilities on-site with top of pipe elevations at major grade and alignment changes.

3. Clearly locate final locations of plumbing and electrical lines which are only shown on the drawings in a diagrammatic way.

4. Completed as-built transparencies shall be signed and certified as correct by the licensed Land Surveyor or Civil Engineer.

5. Furnish any required Engineering Survey information for all utility easements for any required document recording.

3.4 CUTTING AND PATCHING

A. Structural Work Requirements: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect’s opinion, reduce the building’s aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

D. Each trade will be responsible for cutting and patching required for their portion of the Work.

E. Submit written request to Architect a minimum of forty-eight (48) hours in advance of cutting or alteration which affects:

1. Structural integrity of any element of the Project.

2. Integrity of weather-exposed or moisture-resistant elements.

3. Efficiency, maintenance or safety of any operational element.
4. Visual qualities of sight-exposed elements.
5. Work of Owner or separate contractor.

F. Execute cutting, fitting and patching, including excavation and backfill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install ill-timed Work.
3. Remove and replace defective and non-conforming Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

G. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

H. After uncovering, inspect conditions affecting performance of Work.

I. Beginning of cutting and patching means acceptance of existing conditions affecting performance of the Work.

J. Provide supports to assure structural integrity of surroundings; and devices and methods to protect other portions of Project from damage.

K. Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

L. Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

M. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not allowed without prior written approval.

N. Restore work with new products in accordance with requirements of Contract Documents.

O. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

P. At penetrations through fire-rated walls, ceilings or floor construction, completely seal voids with fire-rated materials, full thickness of the construction element.

3.5 PROTECTION OF INSTALLED WORK

A. Protect installed work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs and other surfaces from traffic, dirt, wear, damage or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

3.6 REPAIR/REPLACEMENT OF DAMAGED WORK

A. Protection of finished work shall not relieve the Contractor of his responsibility to repair or replace any work damaged by the elements or by any subsequent construction operation.

B. Repair or remove and replace defective and damaged Work.

C. Comply with requirements for cutting and patching.

D. The decision on whether damaged work is to be repaired or replaced is to be based on the requirement that ALL finished work shall meet the requirements specified for the Work as covered in the applicable sections of the Contract Documents; i.e., if damaged work cannot be repaired so that it matches new, undamaged, work, then it must be replaced.

E. In REFINISHING repaired or replaced work, refinish entire surfaces, as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces - refinish to nearest intersection.
2. For an assembly - refinish entire unit.

END OF SECTION 01700

SECTION 01740 - CLEANING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Cleaning for Single Prime contracts

1. Quality Assurance.
2. Daily Clean-Up.
3. Progress Cleaning.
4. Final Cleaning.
5. Cleaning During Owner's Occupancy.

C. Related Work Described Elsewhere: In addition to standards specified herein, comply with requirements for cleaning up as described in other sections of these Specifications.

1.2 RELATED SECTIONS

A. Division One-Refer to documents provided by School District.

B. Section 01505 - Construction Waste Management:

C. Individual Specification Sections: Specific requirements for cleaning and adjusting.

1.3 QUALITY ASSURANCE

A. Inspection: Contractor shall conduct daily inspections, and more often if necessary, to verify that requirements of cleanliness are being met.

B. Codes and Standards: In addition to the requirements specified herein, Contractor shall comply with pertinent requirements of authorities having jurisdiction.

C. Contractor shall use only a professional cleaning company experienced in commercial cleaning for final cleaning.

1.4 PAYMENT WITHHELD

A. The Architect reserves the right to withhold certification of payment requests for failure on the part of the Contractor to regularly clean the Project in conformance with the Requirements of this Section.

PART 2 - PRODUCTS

2.1 TRASH CONTAINERS

A. Contractor shall provide a trash container service to remove rubbish from the site at no cost to the Subcontractors. The locations of the trash containers will be determined by the Contractor.

B. Subcontractors shall be responsible for depositing their rubbish in the containers. It shall be the responsibility of Subcontractors generating bulky materials (e.i.; crates, cartons, ductwork, etc.) to break these materials down to minimum volume before depositing them in the trash containers. Segregate materials in accordance with the requirements of the trash container service. In the event that any Subcontractor fails to segregate their materials in accordance with those requirements, then the additional cost of the non-segregated containers will be back-charged to that Subcontractor.

C. Disposal of waste materials not permitted in trash containers, such as tires, paints, etc., shall be performed by the Subcontractor responsible for that waste and shall be done in accordance with the applicable laws and regulations of the regulatory agency having jurisdiction.

D. The burning of refuse on the site shall not be permitted.

E. Protruding nails or screws in boards, planks, timbers, etc. shall be removed, hammered in or bent over flush.

2.2 CLEANING UP

A. All trades, even the so called “clean trades”, contribute to the accumulation of debris through the use of drinking cups, lunch wrappers, dirt or mud tracked into the Work site etc. Therefore, all trades will be required to participate in the clean-up procedures.

2.3 CLEANING MATERIALS & EQUIPMENT

A. Contractor shall provide required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.4 COMPATIBILITY

A. Contractor shall use cleaning materials and equipment which are compatible with the surfaces being cleaned, as recommended by the manufacturer of the material to be cleaned.

PART 3 - EXECUTION

3.1 DAILY CLEANUP

A. General: Clean work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

3.2 PROGRESS CLEANING

A. General:

1. Subcontractors shall retain stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
2. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this work.
3. Weekly, and more often if necessary, remove scrap, debris and waste material from the job site.
4. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site:

1. Inspect the site daily, and more often if necessary, and pick up all scrap, debris and waste material. Remove items to the place designated for their storage. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris from the site. Store flammable waste in sealed metal containers until removed from the site.
2. Inspect storage arrangement of materials stored at site weekly, and more often if necessary. Re-stack, tidy or otherwise service arrangement to meet the requirements specified above.
3. Maintain the site in a neat and orderly condition.

C. Structures:

1. Subcontractors shall inspect the structures and pickup weekly, and more often if necessary, scrap, debris and waste material. Remove items to the place designated for their storage.
2. Sweep interior spaces clean weekly, and more often if necessary.
   a. "Clean", for the purpose of this subparagraph, means free from dust and other material capable of being removed by use of reasonable effort and a handheld broom, i.e., "broom clean".
3. As required preparatory to installation of succeeding materials, Subcontractors shall clean the structures of pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily, and more often if necessary, and while work is being performed in the space in which finish materials have been installed.
   a. "Clean", for the purpose of this subparagraph, means free from foreign material which, in the opinion of the Architect, may be injurious to the finish floor material, i.e., "vacuum clean".

3.3 FINAL CLEANING

A. Final cleaning of the project, site and structure, shall be the responsibility of the Contractor.

B. Definition: Except as otherwise specifically provided, "clean", for the purpose of the Article, means the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials, i.e., "scrub and polish clean".

C. General: Remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste prior to completion of Work. Conduct final progress cleaning as described above.

D. Site: Water and broom clean paved areas on the site and public paved areas directly adjacent to the site, unless otherwise directed by the Architect. Remove resultant debris.

E. Structures:

1. Exterior: Visually inspect exterior surfaces and remove traces of soil, waste material, smudges, and other foreign matter in areas affected by the Work of this Contract. Remove traces of splashed material from adjacent surfaces. Hose down the exterior of the structure if necessary to achieve a uniform degree of exterior cleanliness. In the event of stubborn stains not removable with water, the Architect may require other cleaning at no additional cost to the Owner.
2. Interior: Visually inspect interior surfaces and remove traces of soil, waste material, smudges, and other foreign matter in areas affected by the Work of this Contract. Remove traces of splashed materials from adjacent surfaces. Remove paint drippings, spots, stains, and dirt from finished surfaces. Use only the cleaning materials and equipment instructed by the manufacturer of the surface material.
3. Glass: Clean glass inside and outside.
4. Polished Surfaces: On surfaces requiring the routine application of buffed polish, apply the polish recommended by the manufacturer of the material being polished. Glossy surfaces shall be cleaned and shined as intended by the manufacturer.
5. Carpet: Use only dry-chemical method for cleaning carpeting. Steam cleaning or water based cleaning shall not be used on carpeting. Use only dry-chemical materials and methods fully approved by the carpet manufacturer, as instructed in the manufacturer's published literature.

F. Timing: Schedule final cleaning as accepted by the Architect to enable the Owner to accept a completely clean project.

3.4 CLEANING DURING OWNER'S OCCUPANCY

A. Should the Owner occupy the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be the responsibility of the Owner.

END OF SECTION 01740

SECTION 01750 - STARTING AND ADJUSTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to this Section.

B. Initial Checkout and Start-Up Procedures, and Initial Adjusting to ensure Safe Operation During Acceptance Testing and Commissioning.

1. Start-Up Procedures.
2. Initial Adjusting.
3. Final Adjusting.

1.2 RELATED SECTIONS

A. Division One-Refer to documents provided by School District.

B. Division 15000 - Mechanical: Sections related to start-up and adjusting of systems.

1.3 START-UP PROCEDURES

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify in writing the Architect and Owner a minimum of seven (7) days prior to start-up of each item of equipment or system.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence or other conditions which may cause damage or malfunction.

D. Verify that tests, meter readings and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up procedures under supervision of responsible Contractor's personnel in accordance with manufacturer's instructions.

G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report to the Architect/Engineer in accordance with the relevant Section that equipment or system has been properly installed and is functioning correctly.

1.4 INITIAL ADJUSTING

A. Perform initial adjusting of all equipment and systems prior to the date of start-up.

1. Verify with Division 15 - Mechanical, for all items requiring adjustment.

B. Adjust all movable parts of equipment and systems to insure smooth and unhindered operation.

1.5 FINAL ADJUSTING

A. Perform final adjusting of all equipment and systems prior to the date of Substantial Completion.

1. Verify with Division 15 - Mechanical, for all items requiring adjustment.

B. Adjust all movable parts of equipment and systems to insure smooth and unhindered operation.

PART 2 - PRODUCTS

(not used)

PART 3 - EXECUTION

(not used)

END OF SECTION 01750

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Earthwork Operations:

1. Site Clearing and Grubbing.
2. Site Preparation, Protection and Special Precautions.
3. Stripping Operations and Stockpiling of Soils to be Re-Used.
4. Importing Approved Soils for Fill.
5. Excavation and Removal (Off-Site) of Soils Not to be Re-Used.
6. Excavation for Pavements; Including Roadways, Parking Areas, Athletic Play Surfaces and Walkways.
7. Excavation for Building Foundations.
8. Building and Site Backfilling and Soil Compaction Operations.
9. Rough Grading; Including Cutting, Filling, Compaction Operations, Preparing of Sub-Grade to Receive Pavements.
10. Construction Under Building Floor Slabs.
11. Relocation of Existing Soils On-Site for Specific Uses; Including Topsoil, Structural Fill Under Parking Lots, Roads and Building Areas.

C. Soil Corrections:

1. Due to known site areas of unsuitable soil conditions, soils correction work is required. Refer to the Soil Exploration Report and compacted fill as outlined in this Section.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services: Testing laboratory services.

B. Division One - Construction Facilities and Temporary Controls: Dewatering excavations, erosion control and silt fences, and water control.

C. Section 02320 - Trench Excavation and Backfill for Utilities.

D. Section 02310 - Site Grading: Finish grading operations for all site work.

E. Section 02530 - Sanitary Sewage: Excavation and backfilling associated with sanitary sewage systems.

F. Section 02630 - Storm Drainage: Excavation and backfilling associated with storm sewage systems.

G. Section 02740 - Asphalt Concrete Paving: Stabilized aggregate base beneath asphalt pavements.

H. Section 02750 - Exterior Concrete Work: Stabilized granular base beneath concrete work.

I. Section 02830 - Fences and Gates: Excavation associated with chain link fencing and related concrete maintenance strip.

J. Division 15000 - Mechanical: Sanitary sewer, water, storm sewer and gas piping from five (5) feet outside exterior building line to within building system.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Samples: Submit ten (10) lb. Sample of each type of fill to Independent Testing Laboratory, in air-tight containers.

C. Test Reports: Submit Independent Testing Laboratory reports which pertain to testing services performed at the site under provisions of Division One

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work and disposal of debris in accordance with applicable requirements of governing authorities having jurisdiction.

B. All excavations and trenches shall comply with the requirements of O.S.H.A. 29 CFR, Part 1926, Sub-Part P, “Excavations”.

1.5 SITE CONDITIONS

A. Existing Utilities: Locate and mark all existing utilities which are on site where work is to be performed.

B. Bench Marks and Monuments: Maintain benchmarks and monuments existing on site.

C. Protection of Existing Property to Remain: Protect existing plants, equipment and structures, which are in area where Work will be performed and which are to remain. Repair or replace existing property, which is to remain that is damaged by the work, to Architect's satisfaction and at no cost to the Owner.

D. Provide dust and noise control. Prepare Erosion and Sediment Control Plan including measures to address dust and noise control to be approved prior to commencing work.

PART 2 PRODUCTS

2.1 MATERIALS

A. Sub-Grade Material under Buildings, Parking Lots and Driveways: Granular material having less than 50% passing the No. 40 sieve and less than 12% passing the No. 200 sieve.

1. Soils with the ASTM classification symbols "SP", "SW", "SP-SM" and "SW-SM" may meet this criteria.

B. Sand Cushion beneath Building Floor Slabs and Exterior Concrete Work: Granular soil containing less than 5% passing 200 sieve and no more than 40% passing the 40 sieve.

C. Sub-Soil: Existing or imported, free of gravel larger than three (3) inch size, and debris.

D. Topsoil: Specified under provisions of Section 02310 – Site Grading.

E. Coarse Granular Fill: The predominant size is material that will pass a No. 10 sieve and be retained on a No. 200 sieve. The material will not form a ribbon. H.R.B. classification, A-1b or A-3, Group Index 0. Material shall be verified and approved by the Independent Testing Agency.

F. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; and graded in accordance with ASTM C136, to the following:

1. Minimum Size: 1/4 inch.
2. Maximum Size: 5/8 inch.

2.2 ACQUISITION OF MATERIALS

A. Insufficient Materials: Provide necessary material from off-site, as approved by Architect and Geotechnical Engineer to complete the Work. The cost of these materials shall be considered incidental to the Contract.

2.3 DISPOSITION OF MATERIALS

A. Surplus Earth: Unless designated elsewhere for use or disposal on Owner's property, surplus earth becomes the property of the Contractor and shall be removed from the Owner's site. The cost of disposal off-site shall be considered incidental to the Contract.

2.4 MATERIAL BALANCE

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work under this Section, including the cost of importing approved fill or exporting excess materials.

2.5 SPORTS FIELD SPECIAL SOIL MIXTURE

A. Root Zone Mix: Minimum twelve (12) inch depth, after settling and compaction, of either sand and soil, or sand and peat. A sand/soil mixture is preferred, but if suitable soil is not readily available, a sand/peat mixture is acceptable.

B. Mixture Components:

1. Sand: For either sand/soil or sand/peat mixture, sand shall meet the following criteria:

a. Fineness modulus value between 1.7 and 2.5.

b. Uniformity coefficient less than four (4).

c. Particles < 0.1 mm in diameter less than 3% by weight.

d. Particles > 2.0 mm in diameter less than 3% by weight.

e. Particles between 0.25 and 1.0 mm in diameter > 60% by weight.

2. Soil: For sand/soil root zone mixture, the soil used shall meet the following specifications:

a. Topsoil originating from within eighteen (18) inches of the soil surface.

b. Free of herbicide residues that would affect turf grass growth.

c. Ratio of silt plus very fine sand particle content (0.002 mm to 0.1 mm diameters) to clay particle content: less than 2.5.

d. Particles greater than 2.0 mm in diameter: less than 8% of the soil by weight.

3. Peat: For sand/peat root zone mixture, the peat used shall meet the following specifications:

a. Free of residue that will not pass a screen with 5 cm openings.

b. Percent loss by ignition in a muffle furnace shall be greater than 75%.

C. Mixing Specifications:

1. Sand/Soil Mixture:

a. Mix sand and soil at a moisture content that preserves the natural structure in the soil and prevents excessive balling up of the soil with resultant non-uniform mixture.

b. Estimate mixture ratio from soil tests prior to mixing such that a final mix will consist of 92% by weight sand. This estimated mixing ratio may be modified after the initial mixing run if the sand content of the resulting mixture is below 91% or above 94% sand on a weight basis or if the mixture is judged by the Independent Testing Agency (Division One) to be excessively compactable or too high in water retention characteristics.

c. Mix the initial sand and soil in the proper ratio by a front-end loader or similar equipment, then put through a mixer-shredder or similar machine, such that a uniform mixture results. The mixture shall be checked periodically by the Independent Testing Agency (Division One), who shall have the prerogative of modifying the mixture ratio or procedure, or rejecting any amount of mixture deemed unsatisfactorily mixed, non-uniform, or otherwise unacceptable.

2. Sand/Peat Mixture:

a. Mix the sand and peat at a moisture content that results in the uniform mix of sand and peat that prevents excessive separation of smaller particles, or peat.

b. Initial Mixing Volume Ratio: Four (4) parts sand to one (1) part peat. The mixing ratio may be modified after the initial mixing run if the resulting mixture is judged by the Independent Testing Agency (Division One) to be compactable or too high in water retention characteristics.

c. Mix the initial sand and peat in the proper ratio by a front-end loader or similar equipment, such that a uniform mixture results. The mixture shall be checked periodically by the Independent Testing Agency (Division One), who shall have the prerogative of modifying the mixing ratio or procedure, or rejecting any amount of mixture deemed unsatisfactorily mixed, non-uniform, or otherwise unacceptable.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Perform clearing and grubbing as required to construct the proposed planned improvements within the construction limits of the Project.

B. Cutting and removing trees, shrubs, bushes, windfalls, and other vegetation. Cut brush within six (6) inches of the ground surface. Remove, as directed, any low hanging, unsound, or unsightly branches on the trees and shrubs designated to remain.

C. Remove and dispose of stumps, roots and other remains. Remove stumps completely. Except in areas to be excavated, backfill depressions resulting from the grubbing operations with suitable material. Compacted to the specified requirements.

D. Remove timber, stumps, roots and other debris or by-products resulting from the clearing and grubbing operations. Remove from the site. If any wood is run through a chipping machine, the wood chips shall be recovered and disposed of off site.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum. Verify that survey benchmark and intended elevations for the Work are as indicated on the Drawings.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations. Protect above and below grade utilities, which are to remain.

3.3 PROTECTION

A. Protect utilities that remain, from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect benchmarks, existing structures, fences, sidewalks, paving, curbs and other items indicated on the Drawings to remain.

3.4 SPECIAL PRECAUTIONS

A. Dewatering:

1. Prevent surface water and subsurface (ground) water from flowing into excavations and from flooding the site and surrounding area.
2. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
3. Convey water removed from excavations and rainwater to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
4. The cost of dewatering are considered incidental to the Contract.

B. Stability of Excavations:

1. Sidewalls of all excavations shall comply with the most current O.S.H.A. regulations and applicable local building codes and ordinances. Shore and brace where adequate sloping is not feasible because of space restrictions or stability of material being excavated.
2. Maintain slopes of excavations in safe condition until completion of backfilling.

C. Cold Weather Protection:

1. Protect excavation bottoms and bearing surfaces against freezing when atmospheric temperature is less than 35 degrees F (2 degrees C).

3.5 EXCAVATIONS

A. Excavate and remove all soil with organic content within areas of the proposed building (including future additions) and all paving areas. Remove any soft soils which are unsuitable for loads as directed by the Geotechnical Engineer. No proposed concrete slabs or similar loads shall bear on soil with questionable bearing capacity.

B. Oversize excavations at least three (3) feet (plus one (1) foot horizontally from face of building for each one (1) foot or excavation below finish floor grade.

C. Excavate to the lines, grades and slopes as indicated on the Drawings.

D. Provide temporary drainage where construction interferes with existing drainage.

3.6 EARTHWORK REQUIREMENTS

A. Earthwork Procedures for Paved Roadways, Walkways and Parking Areas:

1. In cut areas scarify and compact to a point twelve (12) inches below the grading plane for pavements.
2. Prior to placing fill materials, proof roll sub-grade using a loaded truck or similar equipment to detect soft or loose zones where additional excavation depths may be required.
3. All unsuitable material shall be excavated and removed from pavement areas as directed by the Geotechnical Engineer.
4. Only fill passing DTSC Standards will be allowed.
5. In fill areas, fill material shall be placed and compacted per Section 5.4 “Placing, Spreading and Compacting Fill Materials,” of Appendix A or the Geotechnical investigation.
6. Compaction in proposed pavement areas should be a minimum of the maximum density as obtained by ASTM D1557, and should extend to a minimum of two (2) feet beyond the outside edges of pavement. The top 8” of Subgrade shall be compacted to 95% minimum.
7. For roadways and parking areas, refer to Section 02740 for stabilized aggregate base and asphalt pavement.

B. Building Floor Slabs:

1. Remove surface topsoil from building pad areas. Excavate earth per requirements in the Geotechnical investigation.
2. The exposed sub-grade soils shall be test rolled or surface compacted. Remove unsuitable soils as directed by the Geotechnical Engineer. Replace with approved fill.

3.7 BACKFILLING PROCEDURES

A. Employ a placement method that does not disturb or damage foundation perimeter drainage, foundation dampproofing and protective cover.

B. Slope grade away from building minimum two (2) inches in ten (10) feet, unless noted otherwise.

3.8 SITE GRADING

A. Rough Grading: Spread subsoil to an elevation four (4) inches below finish grade. Rough grading includes spreading the material on-site smoothly

and evenly with a dozer or equal equipment, leaving it similar to back-dragging with a dozer.

B. Finish Grading: Specified under provisions of Section 02310 – Site Grading.

C. Compaction: Compact subsoil and topsoil as necessary to prevent settlement without inhibiting vertical drainage and subsequent turf establishment. If over compaction occurs, Contractor may be required to scarify soil and reblade. Depth of topsoil shall be measured after compaction.

3.9 COMPACTED FILL

A. Prior to the placement of fill, the Geotechnical Engineer shall inspect and approve the bottom or bearing surface of each excavation.

B. Before placing fill on a slope greater than 5 horizontally to 1 vertically (5:1), the Contractor shall, at his option: (a) flatten the existing slope to the extent that it will not be steeper than 5:1; or (b) construct steps in the slope, with the back surface being as nearly vertical as practicable and with the horizontal cuts being made as close together as the slope permits, but with no step being less than ten (10) feet wide.

C. Do not place fill on frozen ground. Suspend filling operations when the temperature is such as to permit the layer under placement to freeze.

D. Deposit approved fill in uniform layers not exceeding eight (8) inches (loose) thickness. Compact each layer with approved methods and equipment.

E. The fill material, when being compacted, shall contain the moisture content necessary for the required compaction as designated by the Geotechnical Engineer. Clay soil shall be moisture conditioned to within 2% of optimum moisture content. The moisture shall be uniform throughout each layer.

F. Scarify, remove, recompact or otherwise rectify all soft or yielding areas resulting from construction operations, rain or other sources at no additional cost to the Owner.

3.10 COMPACTION DENSITY REQUIREMENTS

A. Compaction of all fill and backfill shall meet or exceed the requirements listed in the Geotechnical investigation.

B. Tests falling below the specified density shall be cause for rejection of lift and will require further compacting or removal and recompacting at Contractor's expense until the specification requirements are met. Each lift shall be approved before commencing with the next succeeding lift.

3.11 ROUGH GRADING

A. The grades shown on the drawings are proposed finish grades. The Contractor shall grade to prescribed sub-grade elevations except landscaped areas which shall be graded to finish grade with approved topsoil.

B. The Contractor shall be solely responsible for determining quantities of fill and waste materials to be handled, and for amount of grading to be done in order to completely perform all work indicated on the Drawings. Cost of importing fill and/or exporting excess materials from the site shall be considered incidental to the Contract.

C. Provide surfaces free of debris and building materials. Complete rough grading by blading to reasonably smooth contours with neat, uniform transitions and slopes. Remove stones over two (2) inches diameter, branches and other vegetation. Ease new grades into surrounding existing grades without awkward or abrupt transitions.

D. Finish all surfaces to such contour that they will not impound surface water.

1. Rough grade tolerances are as follows:

   a. Unpaved areas outside buildings: Not more than 0.10' (30 mm) above or below finish grade elevations shown on the drawings.

   b. Building and paved areas: Surfaces shall not vary by more than plus or minus 0.10' below the subgrade elevations referenced to herein.

E. Protect newly graded areas from traffic and erosion. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

F. Hold downs for rough grading are as follows:

1. Lawn Areas: Six (6) inches.

2. Landscape Areas: Refer to Section 02480.

3. Building Pad: Ten (10) inches.

4. Exterior Sidewalks, Bituminous Walkways and Pavements: Indicated on the Drawings.

3.12 SUB-GRADE TREATMENT

A. Compact and shape the subgrade for its entirety as may be necessary to produce, at the time base is

placed, the specified density and stability in the top twelve (12) inches of the subgrade and the grades indicated on the Drawings.

B. Compact subgrade with approved equipment to a minimum of 90% of the maximum density obtainable by ASTM D1557.

C. Bring all building areas and areas to be paved to within 0.05 feet of subgrade elevations and cross sections.

D. The required subgrade stability shall be such that during placement of the base, rutting and displacement does not occur. Maximum yield: One (1) inch (measured from the top of the constructed subgrade to the bottom of the rut).

E. Test roll all proposed pavement subgrades in accordance with 2007 California State Building Code immediately prior to placement of aggregate base course.

F. If test rolling shows any area to be unstable, the Contractor shall, at his expense, scarify the area and aerate or add moisture to the soil as necessary, and recompact the soil to the extent it will be stable when retested by rolling.

G. **ALL PROPOSED BUILDING AND PAVEMENT AREAS SHALL BE TEST ROLLED IN THE PRESENCE OF THE GEOTECHNICAL ENGINEER.**

3.13 MANHOLE AND CATCH BASIN CASTING ADJUSTMENTS

A. All manhole and catch basin castings shall adjust to a height of between 1/2 inch to one (1) inch below the final bituminous course. This allowable tolerance shall be uniform around the periphery of each casting. All castings which do not meet the between 1/2 inch to one (1) inch tolerance shall be removed and readjusted at the Contractor's expense.

B. Set any required concrete adjusting ring firmly in a full bed of mortar. When adjustment rings are required for final adjustment and leveling, use only concrete or metal. Set all castings on a full mortar bed.

C. Temporarily fasten a template of 3/4 inch plywood to the top of each casting during the placing and rolling of the final bituminous course to insure the specified tolerances are met.

D. All casting adjustments are considered incidental to the Contract.

3.14 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by 2007 California State Building Code, but are considered essential to the proper performance of the building systems.

C. Verify that footing bearing surfaces comply with frost depth requirements and report variances in a timely manner.

D. Classification of materials used and encountered during construction will be performed in accordance with ASTM D2488 and D2487.

E. Compaction testing will be performed in accordance with ASTM D698.

F. Observe all subgrades and excavation bases below footings and slabs before further construction is performed.

G. Document presence of ground water within excavations. Verify cut and fill slopes as specified in the Contract Documents.

H. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

I. Frequency of Tests:

1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect.

2. Make compaction tests of subgrade at maximum horizontal intervals of 50 feet in each direction, or as directed by Architect.

3. Make compaction tests of in place backfill materials at a maximum vertical interval of one 1' - 0" foot, and maximum horizontal intervals of 50 feet in each direction, or as directed by Architect.

J. Proof roll compacted fill surfaces under slabs-on-grade.

END OF SECTION

SECTION 02210 - Grading and Soil Preparation for Sports Fields

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. All labor, materials, tools, the transportation and performance of all the work required as indicated on the Drawings and Specifications and reasonably incidental to the following.

1. Furnish all laser guided grading equipment.
2. Soil tests
3. Tilling, discing, gypsum application, soil amendments
4. Planter & Tree Well Soils
5. Finish Grading
6. 95 % Completion
7. Touch up Finish Grading
8. Grading and Compaction Certification.
9. Clean up.
10. Guarantee.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division O and Division 1 Specification Sections, apply to work of this Section.

A. Related Work: : Examine all Sections of the Specifications and Drawings for work related to this Section – including but not limited to:
    1. Earthwork Section 02200.
    2. Irrigation System-Section 02810.
    3. Planting-Section 02480.
    4. Refer to Bid Package _____-Dust Control.
    5. Refer to General and Specific Conditions
    6. Refer to Schedule of Work & Timelines

1.03 QUALITY CONTROL

A. Contractor is to be fully informed regarding the management and control of fugitive dust and shall comply with all current San Joaquin Valley Air Pollution Control District “Visible Dust Emissions” (VDE) requirements and any other requirements related to dust, soil, water emissions/control. Additionally protect Storage Piles and Bulk Materials as required to comply with VDE requirements. Review the Site Dust Emissions Plan with the Construction Manager and/or District Representive prior to commencing grading operations.

B. Contractor shall be an experienced and licensed grading – land leveling contractor with a minimum of **5 years** experience in site preparation; grading with laser guided, monitored and/or controlled equipment. Contractor shall directly own, rent or lease sufficient equipment of sufficient size to properly laser level, disk, and fine laser level the site to the required lines, limits, grades and tolerances.

C. Verification of Job Conditions: CONTRACTOR shall verify actual conditions and report any discrepancies between the plans and actual conditions immediately to the Construction Manager, IOR and Architect, refraining from doing any work in said areas until given approval to do so. It is the responsibility of the CONTRACTOR to coordinate his work with other trades and be familiar with the locations of drain lines, utility lines, other subsurface improvements that could affect the grading work and adjacent or bisecting hardscape and/or structures.

D. Grades and Staking: Grades and lines shall be established by others. Contractor shall confirm same to his/her satisfaction prior to commencement. Contractor shall inform the Construction Manager of the minimum / maximum number of points required to accurately perform grading operations. Contractor shall inform the Construction Manager of preferred staking locations and offsets. Should the Contractor perform offsets, he/she shall be responsible for same. Contractor shall request restaking from the Construction Manager should stakes, markers, temporary bench marks etc. be lost due to vandalism.

E. Obstruction To Operations: If foundations, abandoned infrastructure or utilities, rock, plaster, concrete or other debris, electrical cables, conduits, concrete pipes, active utility lines, soil stockpiles (not intended be utilized or used for items covered under this section), construction materials or equipment of other trades are encountered and cause conflict with grading and soil preparation operations, immediately notify the Construction Manager, IOR, District and Architect to arrange relocation, cleanup work: including the need for re-grading or tilling if stockpiling or compaction occurs after landscape grading operations have occured.

F. Use of Pesticide: Chlorinated hydrocarbons (DDT, Chlordane, Lindane, etc...) or organic phosphates (Parathion, etc...) shall not be used in this work. The use of any restricted material is prohibited. Comply with all state laws and regulations regarding the reporting of the application of pesticides and herbicides.

G. Work Notice: Notify the IOR and Landscape Architect at least 10 working days prior to start of grading operations. The CONTRACTOR must give 10 working days prior notice to the IOR and Landscape Architect when materials or work are ready to be reviewed and/or inspected. The District and Landscape Architect are not responsible for delays if the CONTRACTOR fails to give advance notice for inspection.

H. The Construction Manager shall maintain continuous power and water supply to all facilities that are directly or indirectly affected by this construction, unless other arrangements are made with the DISTRICT for temporary shut-offs.

I. The CONTRACTOR shall protect the public health, safety and welfare during all phases of the work.

1.04 SUBMITTALS

A. Material Submittals: Provide the Landscape ARCHITECT with 2 representative samples of the following for review and approval: (2 Quart samples unless otherwise noted.)
   1. Gypsum – with Manufactures Cut Sheet
   2. Muratic Acid – Hydra-Hum DG with Manufactures Cut Sheet
   3. Virgin Fir Bark Humus – with recent (within 90 days) composition analysis sheet
   4. Soil Sulfur – with Manufactures Cut Sheet
   5. Mycorrhizal Innoculants 2 – 2oz. samples – with Manufactures Cut Sheets

B. Materials Receipts: The CONTRACTOR shall submit materials and delivery receipts to the IOR for later review by the Landscape Architect.
   1. Submit delivery receipts weekly and prior to each payment request during the time period in which the material is recieved.
   2. The project name, material and quantity shall be indicated on all receipts.
   3. Receipts shall be legible, in chronological order, punched and bound with in a binder with the Project Name promently marked on the spine, front and back covers.
   4. A summary cover sheet shall be provided with each submittal indicating previous shipments versus new.

5. The contractor shall provide a weekly subtotal of all materials delivered on the cover sheet(s). These quantities shall be reviewed, math confirmed and signed off by the IOR on a weekly basis.

C. Schedule: Provide a grading and amendment installation schedule, for review by the Landscape Architect within 30 days after the Master Contract is Awarded or the first contract for any work on site is awarded (whichever comes first).

D. Soils Tests:
1. Multiple are required. Assit the Landscape Architect with the acquisition of 2 or more soils test from multiple locations on the sports field areas (6 maximum). 2 additional tests are required at the topsoil harvest site for planter and tree well backfill site.
2. The Landscape Architect shall submit the samples to a testing laboratory of their choice for soils analysis and recommendations for horticultural planting. Analysis and recommendations shall be delivered to the Landscape Architect.
3. The contractor shall include the price of the soils tests in his/her bid/price. For bidding purposes assume $ 100 direct cost per sample.

1.05 DELIVERY SOURCE AND HANDLING

A. Delivery: Deliver amendments, and fertilizer materials in original unopened containers, showing weight, analysis and name of manufacturers. Provide the IOR with shipping tickets for each delivery the same day as the delivery.
B. Bulk Material: For Bulk materials the Contractor shall daily provide legible weight and/or shipping tickets for each load of material to the IOR on the date of delivery.
C. Storage: Store materials in a dry, safe and secure location to prevent deterioration, vandalism or theft.

1.06 QUALITY ASSURANCE

A. Reviews: The CONTRACTOR shall specifically request **10 working days in advance** the following reviews prior to progressing with the work;
1. Pre-Grading Review: Contractor shall request an on site review with the Landscape Architect and District to review the site, staking, work areas and limits of work.
2. Rough Grade and 1st Discing Operation: Review after rough grade and application of Gypsum and other amendments the day Discing is to begin.
3. Review of 1st Discing – the day discing is to be completed to confirm proper depth and blending of amendments.
4. Prior to 2nd Discing: Review application of all amendments placed on site prior to 2nd discing.
5. Amendment Incorporation – Review that suffienct depth and mixing of soil with amendments has occurred the day discing is to completed.
6. Finished Grade & Grade Certification after all incorporation and grading operations have been completed.

B. Review Requirements:
1. No site review by the Landscape Architect or DISTRICT'S representative shall commence without all items noted in previous site review reports being completed or remedied, unless compliance has been waived by the Landscape Architect or DISTRICT in advance.
2. Failure to accomplish punch list items or prepare adequately for required/desired reviews and/or inspections shall make the CONTRACTOR responsible for reimbursing the DISTRICT for the Landscape Architect at the Landscape Architects current per hour billing rates including transportation costs.

3. No further reviews shall be scheduled until this charge has been paid or deducted by change order from the contract amount. Delays due to CONTRACTORS non compliance shall not be considered for contract time extensions.

C. Contractor Representative(s) for Reviews:
   1. The CONTRACTOR shall provide the construction superintendent and foreman in charge of the project for all standard required meetings, all payment request meetings and all special meetings deemed necessary by the Landscape Architect or DISTRICT'S representative.
   2. The superintendent shall be capable of informing the Landscape Architect and DISTRICT'S representative of all pertinent information regarding the project, including schedules and deliveries, and shall have the authority to make binding decisions regarding the work in progress.
   3. All meetings are to be in English.
   4. The CONTRACTOR shall provide an interpreter, at the CONTRACTOR'S expense, to translate for his non-English or poor English speaking representatives.

D. Application of Soil Amendments: Soil amendments shall be applied to planting areas during normal business hours at specified rates and inspected, approved, and **certified** by Kern High School IOR prior to covering or tilling in.

E. Final Completion: Final completion shall occur at the completion of all check list items have been completed, reviewed and the project is 100% complete.

F. Grading Tolerances: Rough grade shall be + .1 to .2 feet (plus one to two tenths of a foot). Over cutting is not allowed. Final Fine grade shall be **+ .05 feet (plus or minus .5 tenths of a foot)**

G. Sports Field Grading Certification:
   1. Sports Field rough and fine grading shall be completed per earthwork specifications section 02200 & 02210.
   2. Sports Field rough and fine grades shall be certified by a licensed surveyor, provided by the Construction Manager, for the Contractor.
   3. Initiation of work indicates acceptance of the rough and fine grading by the Contractor.
   4. At the completion of irrigation trench backfill and compaction, and prior to sod, stolon or seed planting the grades shall be re-certified by a licensed surveyor for the Landscape Contractor. The fine grades must be per the Grading Plan.
   5. Should adjustments to the fine grade be required they shall be performed by the grading contractor that generated the fine grade originally.

PART 2 - PRODUCTS

2.01 SOIL AMENDMENTS

A. Materials, Product, Amendments & Sources:
   1. The materials, products and amendments have been specficly selected for this project. For the Contractors convience materials/product suppliers have been prelocated for the Contractors convience. The contractor may provide identical, equal or better products from other sources.
   2. The burden of proof of identical, equal or better status shall be the Contractors responsibility. The Contractor shall provide the following items in an organized submittal format to the Architect for the Landscape Architects review:
      a. Supplier Name, Address, Responsible Contact Persons name, Contact information (address, phone number(s) and e-mail address).

b. Cut Sheet for the Chemical Anayisis for the originally specified material and the requested substitution material. Clearly highlight on these sheets the items that are identical, equal or better. Additionally highlight any additional or deleted items that the requested material contains
c. Provide a summary written description of the similarities and/or differences between the materials. Differences shall be extremely minor or an improvement over the specified material to be considered.
d. If suffiecient information is not provided in a timely and clear manor, the requested source and/or material may be rejected without further cause. The Contractor shall have 1 opportunity to resubmit. If this submittal is also not timely or clear the source and/or material shall be rejected. No further submittals will be considered.
e. The Landscape Architect shall be the sole entity to determine identical, equal or better status.
f. The Landscape Architect may conduct independent review of the source and/or material and may require additional information from the Contractor and/or source. Failure or untimely delivery of the requested information from the Contractor or supplier source shall be grounds for rejection without recourse.
g. Should the Source or material be rejected by the Landscape Architect – the Contractor shall be required to provide the originally specified material from the originally specified source.

B. Amendments, Organics & Fertilizers

1. Virgin Fir Bark Humus (Humus)
   a. Shall be 100% Virgin Bark predominately generated from Western Fir. Small amounts of Western Pine bark are allowable.
   b. 0" – ¼" in size
   c. Allowable Ph Range: 4.5 – 6
   d. Allowable desolved salts _____
   e. 95% + organic material by dry weight
   f. Human, horse, cow, chicken or other waste specificly prohibited.
   g. Recycled material specificly prohibited
   h. Available from:
      Sequoia Horticultural Products
      Contact: Gary W. _____

2. Ultra Fine Grind Gysum (Gypsum)
   a. Shall be 98% Ultra Fine Grind Gysum in bulk form or Prilled 100% Calcium Plus Ultra Fine Grind Gypsum. (Contractors Choice)
   b. Available from:
      Superior Soil Supplements
      10367 Houston Ave.
      Hanford, Ca. 93230
      Contact: _____ 559 584-7695
3. Hydro Hume DG – Greens Grade (Humic)
   a. Shall be Humic derived from ---- as provide by _____
   b. Available from:
      Superior Soil Supplements
      10367 Houston Ave.
      Hanford, Ca. 93230
      Contact: _____ 559 584-7695

4. Mycorrhizal Innoculants (Mycorrhiza)
   a. Endo Granular — 1 lb/1000 sq.ft (44 lbs./acre)
   b. Available from:
      BioBurst 'n Grow
      956 South 500 West
      Vernal, Utah 84078
      1 (888) 208-9706

4. Soil Sulfur — 20 lbs/1000 sq. ft. (870 lbs/acre)
5. Slow Release Nitrogen — _____
6. Micronutrients — _____

C. Application Rates by Phase

1. Applied Prior to 1st Discing – All Areas (18" Depth Tilling)
   a. Gypsum — 250 lbs/1000 sq. ft. (5.5 tons/acre)
   b. Soil Sulfur — 20 lbs/1000 sq. ft. (870 lbs/acre)
   c. Mycorrhizal Innoculants — 1 lb/1000 sq.ft. (44 lbs./acre)
   d. Humic — 5 lbs./ 1000 sq.ft (220 lbs./acre)
2. Applied Prior to 2nd Discing (6" Depth Tilling)
   a. Football Stadium Field - Humus — 9 cu.yds./1000 sq.ft (3" Layer)
   b. Sulfate of Ammonia: Stadium — 5 lbs. /1000 sq. ft. (220 lbs./acre)
   c. Gypsum — 100 lbs/1000 sq. ft. (2.2 tons/acre)
   d. Humic — 5 lbs/ 1000 sq. ft. (220 lbs./acre)
   e. Mycorrhiza — 1 lb/1000 sq.ft (44 lbs./acre)
3. Backfill for Planters & Tree Wells
   a. Humus — 1/4 by volume of total backfill
   b. Gypsum — 250 lbs/1000 sq. ft. of exposed pit surface area
   c. Gypsum — 2.5 lbs/100 sq. ft. per 2 verticle feet of volume of backfill. (ie: a 10' x 10' x 4' deep planter requires 5 lbs. of Gypsum blended into the topsoil backfill)
   d. Hyrdo Hume – Greens Grade — ¼ lb per cubic yard of backfill (ie: a 10' x 10' x 4' deep planter Requires 3.7 lbs)
   e. Mycorrhizal Innoculants — 1 lb. per cubic yard by volume of backfill.
      Endo/Ecto Granular
      From BioBurst 'n Grow
      (different than product use for turf areas)

2.02 TOPSOIL USED TO BACKFILL EXCAVATED PLANTERS & TREE WELLS

A. Topsoil for backfill of excavated raised planters and tree wells
   1. Shall be on site topsoil.
      a. Topsoil shall be generated from on site and shall be harvested at a location as directed by the District Representative. The harvest site shall be selected within 60 days of contract award and shall be approved by the Landscape Architect prior to harvest.
      b. Soil shall be harvested from within the top 18" of native soil. Soil harvested below 18" of depth of native grade shall not be used.
      c. A minimum of 60 days prior to harvest the contractor shall assist the Landscape Architect in the acquisition of 2 soils samples from the harvest site which shall be

sent to a Soils Lab selected by the Landscape Architect. The Contractor shall pay for the soils test.

d. The Landscape Architect shall direct any modifications to the soils amendements described in this section based on the soils test. The Landscape Architect will make the final determination as to the final amendment mix required for backfill.
e. Topsoil shall be free of debris and contaminates.

PART 3 - EXECUTION

3.01 ROUGH GRADE, SOIL PREPARATION, FINE GRADE & CERTIFICATION

A. Finish Grades: Coordinate soil preparation work with the requirements for finish grading.

B. Weed, Debris, Clod, and Rock Removal: All areas to be planted shall be cleared of all weeds and debris prior to soil preparation and finish grading. Nutgrass, purple or white nutsedge and Bermuda grass shall be chemically killed (Round Up or approved equal) prior to grading. Dispose of weeds and debris legally off-site. At Finish Grade Remove all clods or rocks over 1 inch in diameter.

C. Contaminated Soil: Do not perform any soil preparation work in areas where soil is contaminated with soil sterilants, oils or oil by products, pesticides or herbicides, cement, plaster, paint, thinners or other construction substances. Notify Construction Manager CONTRACTOR'S Construction Manager and Architect to arrange for clean up. The Construction Manager shall be responsible for removal of these materials and contaminated soil. Contaminated soils shall be removed to a depth of 6" below the lowest discernable depth of contamination (determined by soils tests) or 18 inches, which ever is greater. Contaminated soil shall be legally disposed of. Construction Manager shall be responsible for soils tests and the import and placement of suitable fill soils.

D. Rough Grade: Contractor shall cut and fill site to within + .1 to .2 feet (plus one to two tenths of a foot) of finished grade. **Do not over cut site**. Cutting and filling may be accomplished with paddlewheels, scrapers, loaders and transfers as needed. Contractor shall confirm that the soil contains sufficient moisture to allow grading operations to occur smoothly. Apply water as needed via water truck or other means as needed to provide sufficient moisture to work the soil and minimize dust during grading operations. **Dust shall not be allowed to drift onto adjacent properties.**

E. Gypsum, Soil Sulfur, Humic & Microrizza Application: Prilled Gypsum and Soil sulfur shall be applied to planting areas during normal business hours at specified rates and inspected, approved, and certified by Kern High School IOR prior to tilling in. Gypsum and soil sulfur application shall be accomplished immediately before discing, within 24 – 48 hrs of discing. Prevent high grind water soluble gypsum dust or soil sulfur from drifting onto adjacent properties.

F. Preferred application methods. Prilled Gypsum may be applied dry via a Variable Rate Precission Belt Spreader (to minimize dust) or 98% Ultra Fine Grind Gypsum may be applied as a water slurry via an agitating tank – contractors option. Optional means of Gypsum and Soil Sulfur application shall be any other traditional method that the contractor choses, as long as the materials are spread in a manor that does not allow dust (fugitive fines) to escape the immediate vicinity. **Contractor shall use whatever means necessary to prevent drift of gypsum & sulfur dust from the immediate site of application**.

G. First Discing - Rough Grade Cultivation: Cultivate site immediately after gypsum and sulfur application. As used in this specification section Rough Grade Cultivation shall mean to disc and till the soil to a minimum depth of **18 inches**. Discing shall produce a uniform mix of native soil and amendments into a loose, friable soil to a depth of 18 inches. Continue discing in multiple cross directions until the soil has reached a blended, loose friable condition and amendments are uniformily distributed through out the full depth and cross section. 3 discing passes minimum to be reviewed and approved by the Landscape Architect – additional passes shall be required until a well blended friable condition is achieved. Maximum clod size shall not exceed 1" in diameter. Utilize disc blades 36" + in diameter. Utilize equipment large enough to drag a weighted disc set sufficient to penetrate 18" minimum. Confirm that the soil has sufficient moisture content to blend well and minimize dust. Apply water as needed via water truck or other means as needed to provide sufficient moisture to work the soil and minimize dust during discing operations. **Dust shall not be allowed to drift onto adjacent properties.**

H. Application of Amendments, Humus, Fertilizers and Endo Micrrohizae: After the site the first discing has sufficiently blended the Gypsum & Soil sulfur, evenly apply the balance of the amendments, humus, fertilizers and Michrozia innoculant. For bidding purposes assume the materials and quantities identified above in the "Materials" section of this specification. Humus, Prill Gypsum, Sulfur, hydro hume and microziahia application shall be accomplished immediately before the second discing, within 24 – 48 hrs. Prevent dust from drifting onto adjacent properties.

I. Preferred application methods. Prilled Gypsum may be applied dry via a Variable Rate Precission Belt Spreader (to minimize dust) or 98% Ultra Fine Grind Gypsum may be applied as a water slurry via an agitating tank – contractors option. Optional means of Gypsum and Soil Sulfur application shall be any other traditional method that the contractor choses, as long as the materials are spread in a manor that does not allow dust (fugitive fines) to escape the immediate vicinity. **Contractor shall use whatever means necessary to prevent drift of gypsum & sulfur dust from the immediate site of application**.

J. Second Discing - Cultivation: Immediately after the humus, amendments and fertilizers have been applied to the site Cultivation shall occur. As used in this specification section, Final Cultivation shall mean to disc and till the soil to a minimum depth of **8 inches**. Discing shall produce a uniform mix of soil and amendments into a loose, friable soil to a depth of 8 inches. Continue discing in multiple cross directions until the soil has reached a blended, loose friable condition. Maximum clod size shall not exceed 1/2" in diameter. Utilize disc blades 24" in diameter. Utilize equipment large enough to drag a weighted disc set sufficient to penetrate 8" minimum. Confirm that the soil has sufficient moisture content to blend well and minimize dust. Apply water as needed via water truck or other means as needed to provide sufficient moisture to work the soil and minimize dust during discing operations. **Dust shall not be allowed to drift onto adjacent properties.**

K. Fine Grade – Laser Grading: Contractor shall fine grade the site to the grades, lines, levels per the grading plan. Contractor shall cut and fill site to within ± .05 feet (plus or minus .5 (1/2) tenth of a foot). Cutting and filling may only be accomplished with laser controlled ight weight Gannon Box scraper and/or road grader with a minimum 12' blade. Loaders and transfers may be used as needed to transport excess soil or trim edges. Contractor shall confirm that the soil contains the minimum amount of moisture necessary to allow grading operations to occur smoothly. Apply water as needed via water truck or other means as needed to minimize dust during grading operations. **Dust shall not be allowed to drift onto adjacent properties.**

Equipment operators shall be sufficiently experienced and skilled to accomplish the work within the required tolerances. Make minimal yet sufficient passes to provide a smooth uniform surface which drains to and from the control points established by the surveyor. The grades shall smoothly feather into existing adjacent site grades to remain. Grading operations shall continue until the site is compacted from a minimum of 75% to a maximum of 85%. Contractor shall take care to not over compact the site or 'bridge" compact the top layer of soil. If over compaction occurs the Contractor will be required to till and regrade and float the site to the correct compaction tolerances.

Perform Compaction testing per Specification section 01400 to confirm compaction. If the site is over compacted that the contractor shall re till the site as necessary and regrade to provide the proper grade and compaction.

L. Certification of Final Grade: The Contractor shall have the final grade certified by a licensed survey that the final grade is within the tolerances specified in this section and to the lines, grades and limits indicated on the civil engineers plans. Architect shall observe the final grades for conformance to the design intent communicated on the drawings and give final approval.

3.02 BLENDING OF PLANTER & TREE WELL SOIL

A. The Contractor shall harvest planter and tree well backfill soil at the site directed by the district and approved by the Landscape Architect.
B. In an approved location, pre blend the soil with the required amendments. Blend and mixing may be accomplished via loader/tractor or tubble mixer (contractors option).
C. In case of accidental fluid emission (ie: oil, fuel, hydrolic fluids) from the mixing loader/tractor, all affect soil and amendments shall be legally removed and disposed of off site.
D. Provide sufficient water during the blending/mixing operation to reduce dust emissions. Pre & Post stockpiles of soil and amendments shall be protected from potential dust emission.
E. Blending shall continue until the entire volume is thouroughly mixed and amendments are evenly distributed.
F. Document and certify that the proper amendments are used by volume of soil for each batch. Each batch and documentation shall be review and approved by the IOR prior to use.

3.03 COMPLETION

A. Completion of all areas included in the Contract shall be substantially clean and free of debris and weeds. All grades have been certified by a liscened surveryor for the Contractor and approved by the Landscape Architect and District

END OF SECTION

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SECTION 02310 - SITE GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Cut, Fill, Excavate, Backfill, Compact and Grade the Site as Necessary to Bring the Roads, Drives, Building Sites, Paved Areas and Open Areas to the Lines and Grades Indicated on the Drawings.

C. The Work Includes, But is Not Necessarily Limited to:

1. Building Site Preparation, Protection and Special Precautions.
2. Stripping Operations and Stockpiling of Soils to be Re-Used.
3. Importing Approved Soils for Fill.
4. Excavation and Removal (Off-Site) of Soils Not to be Re-Used.
5. Roadway, Parking Areas, Drive and Walk Subgrade Preparation.
6. Excavation for Pavements; Including Roadways, Parking Areas, Athletic Play Surfaces and Walkways.
7. Dressing of Graded Areas, Shoulders and Ditches.
8. Building and Site Backfilling and Soil Compaction Operations.
9. Rough Grading; Including Cutting, Filling, Compaction Operations, Preparing of Sub-Grade to Receive Pavements.
10. Construction Under Building Floor Slabs.
11. Relocation of Existing Soils On-Site for Specific Uses; Including Topsoil, Structural Fill Under Parking Lots, Roads and Building Areas.
12. Imported Special Soil Mixture for Fields.
13. Excavation and Compacted Fill Around Concrete Piers for Exterior Basketball Posts, and Chain Link Fence Posts.

D. Soil Corrections:

1. Due to some known site areas of unsuitable soil conditions, there may be some soils correction work required. Refer to the Soil Exploration Report and compacted fill as outlined in this Section.

E. Classification: All excavation is unclassified and excavation of every description, regardless of material encountered within the grading limits of the project, shall be performed to the lines and grades indicated on the Drawings.

1.2 RELATED SECTIONS

A. Division One - Existing Utilities.

B. Division One - Testing and Inspection Services.

C. Section 02320 - Trench Excavation and Backfilling for Utilities.

D. Section 02370 - Erosion and Sediment Control.

E. Section 02530 - Sanitary Sewerage: Excavation and backfilling associated with sanitary sewage systems.

F. Section 02630 - Storm Drainage: Excavation and backfilling associated with storm sewage systems.

G. Section 02750 - Exterior Concrete Pavement: Stabilized granular base beneath concrete work.

H. Section 02830 - Fences and Gates: Excavation associated with chain link fencing and related concrete maintenance strip.

I. Division 15 - Mechanical: Sanitary sewer, water, storm sewer and gas piping from five (5) feet outside exterior building line to within building system.

1.3 DEFINITIONS

A. Open Areas: Open areas are those areas that do not include building sites, paved areas, street right-of-ways and parking areas.

B. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

C. Optimum Moisture: Percentage of water in a specific material at maximum density.

D. Rock Excavation: Excavation of any hard natural substance, which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specially designed for use in cutting or breaking rock, but exclusive of trench excavating machinery. To be considered as rock excavation, the material shall be continuous; individual boulders or rocks in soil will not be considered rock excavation.

E. Muck: Materials unsuitable for foundation because of organic content, saturation to the extent that it is somewhat fluid and must be removed by dragline, dredge or other special equipment, are designated as muck. No extra payment will be made for muck removal.

F. Unsuitable Material: Unsuitable material is defined as earth material unsatisfactory for its intended use and as classified by the soils technician. In addition to organic matter, sod, muck, roots and rubbish, highly plastic clay soils of the CH and MH descriptions, and organic soils of the OL and OH descriptions, as defined in the Unified Soil Classification System shall be considered as unsuitable material.

G. Suitable Material: Where the term suitable material is used in specification sections pertaining to earthwork, it means earth or materials designated as being suitable for their intended use by soils technicians or the Engineer. Suitable material shall be designated as meeting the requirements of the Unified Soil Classification System types SW, GW, GC, SC, SM, ML, CL or as designated in these specifications.

H. Select Material: Select material is defined as granular material to be used where indicated on the Drawings, or where specified herein consisting of soils conforming to the Unified Soil Classification System types SW, SM, GW or GM or as otherwise approved by the Geotechnical Engineer as select fill. Select material shall contain no stones or rubble larger than one and one-half (1-1/2) inch in diameter.

I. Crushed Stone (Gravel): No. 57 aggregate or equal conforming to ASTM C33.

J. Excavation: Excavation is defined as unclassified excavation of every description regardless of materials encountered.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work and disposal of debris in accordance with applicable requirements of governing authorities having jurisdiction.

B. All excavations and trenches shall comply with the requirements of O.S.H.A. 29 CFR, Part 1926, Sub-Part B, “Excavations and Trenches”.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

D. A testing laboratory retained by the Owner will make such tests and inspections as are specified herein. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts of fill material and shall keep the laboratory informed of his progress. The cost of the initial tests shall be paid for by the Owner. Subsequent tests required as a result of improper compaction shall be paid for by the Contractor.

E. All fill materials (subsoil, topsoil, planting soil and gravel) shall come from sources free of chemical contaminants. This includes sources contaminated by chemicals and the chemical run-off from industrial areas. Also, the insecticides and herbicides used in farming, nurseries, etc. Use materials from the existing site whenever possible.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

B. Samples: Submit ten (10) lb. sample of each type of fill to Independent Testing Laboratory, in air-tight containers.

C. Test Reports: Submit Independent Testing Laboratory reports which pertain to testing services performed at the site under provisions of Section 01460.

1.6 SITE CONDITIONS

A. Protection of Persons: Owner activities will continue in and about the site during construction. Install barricade fencing (snow fence), as necessary, to provide a safe environment between construction work and student/pedestrian circulation.

B. Existing Utilities: Locate and mark all existing utilities, which are on site where work is to be performed.

C. Bench Marks and Monuments: Maintain benchmarks and monuments existing on site.

D. Protection of Existing Property to Remain: Protect existing plants, equipment and structures which are in Work area and which are to remain. Repair or replace existing property, which is to remain that is damaged by the work, to Architect's satisfaction and at no cost to the Owner.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Soil materials use as fill, backfill, subgrade for structures or pavements, embankments, or site grading shall consist of suitable material as found available on site, provided that all grasses, weeds and other deleterious debris are first removed.

1. Provide suitable material free from organic matter and deleterious substances, containing no rocks or lumps over two (2) inches (51 mm).

2. Do not permit rocks having a dimension greater than one (1) inch (25 mm) in the upper six (6) inches (152 mm) of fill or embankment.

B. Should the quantity of suitable on-site material be insufficient to complete the Work, suitable borrow material as approved by the Geotechnical Engineer shall be provided by the Contractor at no additional expense to the Owner.

C. Select materials may be provided from on-site, if acceptable material as approved by the Geotechnical Engineer is available on site. Otherwise approved select material shall be provided by the Contractor from an off-site source.

2.2 SUBGRADE FILL

A. Sub-grade material under building, parking lots and driveways: Granular material with less than 50% passing the No. 40 sieve and less than 12% passing the No. 200 sieve.

1. Soils with the ASTM classification symbols “SP”, “SW”, “SP-SM” and “SW-SM” may meet this criteria.

2.3 TOPSOIL

A. Topsoil: Dark brown to black sandy material, if available, stripped from the site. If stripped topsoil is not suitable or sufficient material is not available on site, provide topsoil from an approved off-site source.

B. Use topsoil consisting of material removed from the top three (3) to six (6) inches of soils.

C. Use topsoil containing no stones, roots or large clods of soil.

D. Stockpile topsoil separate from other excavated material.

2.4 SAND CUSHION

A. Sand cushion beneath building floor slabs and exterior concrete work: Granular soil containing less than 5% passing 200 sieve and no more than 40% passing the 40 sieve.

2.5 COARSE GRANULAR FILL

A. Coarse Granular Fill: The predominant size is material that will pass a No. 10 sieve and be retained on a No. 200 sieve. The material will not form a ribbon. H.R.B. classification, A-1b or A-3, Group Index 0. Material shall be verified and approved by the Independent Testing Agency (01460).

2.6 PEA GRAVEL

A. Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; and graded in accordance with ASTM C136, to the following:

1. Minimum Size: 1/4 inch.

2. Maximum Size: 5/8 inch.

2.7 WEED KILLER

A. Provide a dry, free flowing, dust free chemical compound, soluble in water, capable of inhibiting growth of vegetation and approved for use on this Work by governmental agencies having jurisdiction.

2.8 SILT FENCE

A. Provide silt fence structure specifically designed to control sediment run-off.

B. Erect fabric fence to a height of approximately two feet six inches (2’-6”) with an additional six (6) inch of fabric available for toe-in.

C. Support fabric on posts spaced approximately seven feet six inches (7'-6") on centers.

D. Use "Envirofence 100X" Sediment Control System as manufactured by Mirafi, Inc., or approved equivalent by the Architect/Engineer.

2.9 EQUIPMENT

A. Use equipment adequate in size, capacity and numbers to accomplish the Work in a timely manner without undue waste or damage of materials.

2.10 ACQUISITION OF MATERIALS

A. Insufficient Materials: Provide necessary material from off-site, as approved by Architect and Geotechnical Engineer to complete the Work. The cost of these materials shall be considered incidental to the Contract.

2.11 DISPOSITION OF MATERIALS

A. Surplus Earth: Unless designated elsewhere for use or disposal on Owner's property, surplus earth becomes the property of the Contractor and shall be removed from the Owner's site. The cost of disposal off-site shall be considered incidental to the Contract.

2.12 MATERIAL BALANCE

A. The Contractor is responsible for determining the quantities of material necessary for completing the Work under this Section, including the cost of importing approved fill or exporting excess materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum. Verify that survey benchmark and intended elevations for the Work are as indicated on the Drawings.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations. Protect above and below grade utilities which are to remain.

C. Clearing and Grubbing: Clear and grub areas to be graded prior to commencement of the grading operations.

D. Where so directed by the Architect, protect and leave standing designated desirable trees.

E. Complete any demolition and/or removal Work as may be required prior to grading operations.

F. Dispose of all clearing, grubbing and demolition debris and other deleterious material off the project site. Vegetation, roots, brush, rubbish, stumps, etc. may be burned on-site only where permitted by local authorities and regulations, and approved by the Geotechnical Engineer.

G. Topsoil:

1. Transport and deposit topsoil in storage piles convenient to areas that are to receive topsoil or in other locations as indicated on the Drawings or approved by the Geotechnical Engineer.

2. Deposit topsoil in areas that are already graded and will not be disturbed by on-going construction.

3. Dispose of unsuitable or unusable stripped material off-site or as otherwise directed by the Geotechnical Engineer.

H. Sampling and Preliminary Testing:

1. Prior to beginning the grading operations, the Contractor shall submit to the Engineer his proposed sequence of excavation operations.

2. Based upon the sequence of excavation, samples of the fill materials will be obtained as excavation proceeds and tested for grain size permeability and moisture density relationship using the Standard Proctor Method (ASTM D698, Method A).

3. Allow sufficient time for completion of laboratory tests before any fill operations begin, using the soils being tested.

3.3 SPECIAL PRECAUTIONS

A. Dewatering:

1. Prevent surface water and subsurface (ground) water from flowing into excavations and from flooding the site and surrounding area.

2. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

3. Convey water removed from excavations and rain water to collecting or run-off areas. Establish and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.

4. The cost of dewatering shall be considered incidental to the Contract.

B. Stability of Excavations:

1. Sidewalls of all excavations shall comply with the most current O.S.H.A. regulations and applicable local building codes and ordinances. Shore and brace where adequate sloping is not feasible because of space restrictions or stability of material being excavated.

2. Maintain slopes of excavations in safe condition until completion of backfilling.

C. Cold Weather Protection:

1. Protect excavation bottoms and bearing surfaces against freezing when atmospheric temperature is less than 35 degrees F.

3.4 FINISH ELEVATIONS AND LINES

A. Construct areas outside of building or structure lines true to grades shown.

1. Where no grade is indicated, shape finish surface to drain away from buildings or structures, as approved by the Geotechnical Engineer.

B. Degree of finish shall be that ordinarily obtainable from bladegrader, supplemented with hand raking and finishing.

C. Finish surfaces to within 0.10 feet above or below the established grade or approved cross section.

3.5 GENERAL PROCEDURES

A. Existing Utilities:

1. General requirements for Existing Utilities are under provisions of Division One.

2. Unless shown to be removed, locate and protect active utility lines indicated on the Drawings, or otherwise made known to the Contractor prior to excavating.

3. If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the Engineer and secure his written instructions.

4. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

B. Protection of Persons and Property:

1. Barricade open holes and depressions occurring as part of this Work, and post warning lights on property adjacent to or with public access.

2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, washout and other hazards created by operations under this Section.

C. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

D. Maintain access to adjacent areas at all times.

E. Erosion Control:

1. Upon completion of clearing and prior to beginning grading operations, erect silt fence structures where indicated on the Drawings.

2. Erect posts securely and toe-in fabric to prevent escape of silt under the fence.

3. Silt fence to be maintained in good condition throughout the entire construction period.

4. Remove silt fence only when directed by the Engineer.

F. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

3.6 EXCAVATING (CUTS)

A. Perform excavating of every type of material encountered within the limits of the Work to the lines, grades and elevations indicated and specified herein.

B. Suitable Excavated Materials:

1. Use all suitable materials removed from the excavation, as far as practicable, in the formation of the embankments, subgrades, shoulders, building sites and other places as directed.
2. Unless otherwise indicated on the Drawings, or approved by the Engineer, surplus suitable material shall be removed from the site and disposed of by the Contractor.

C. Unsuitable Excavated Material: Remove from the site and dispose of all unsuitable material, unless otherwise approved by the Engineer.

D. Rock Excavation:

1. Immediately notify the Engineer upon encountering rock or similar material which cannot be removed or excavated by conventional earth moving or ripping equipment.
2. Do not use explosives without written permission from the Engineer.
3. When explosives are permitted, use only experienced powder men or persons who are licensed or otherwise authorized to use explosives. Store, handle and use explosives in strict accordance with all regulatory bodies and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc.
4. The Contractor shall be solely responsible for any damage resulting from the use of explosives.
5. The Contractor is responsible for securing all permits required in performing this Work.

E. Unauthorized Excavation:

1. Excavation of material to depths below the grades indicated on the Drawings, unless so directed in writing by the Engineer, will be deemed unauthorized excavation.
2. Unauthorized over-excavation shall be backfilled and compacted without any additional expense to the Owner.

F. Authorized Over-Excavation:

1. In the event that it is necessary to remove unsuitable material to a depth greater than that shown on the Drawings, or otherwise specified, the Contractor shall remove, replace and compact such material with suitable materials as directed by the Geotechnical Engineer at no additional expense to the Owner.

3.7 FILLING AND BACKFILLING

A. Use fills formed of suitable material placed in layers of not more than eight (8) inches in depth measured loose and rolled and/or vibrated with suitable equipment until compacted.

B. Do not place rock that will not pass through a six (6) inch diameter ring within the top twelve (12) inches of the surface of the completed fill or rock that will not pass through a three (3) inch diameter ring within the top six (6) inches of the completed fill.

C. Do not use broken concrete or asphalt pavement in fills.

D. Selection of Borrow Material:

1. Material in excess of that available on the site shall be suitable material furnished by the Contractor from private sources selected by the Contractor. The material shall be approved by the Geotechnical Engineer before use. All expenses involved in securing, developing, transporting and placing the material shall be borne by the Contractor.

E. Placing and Compacting:

1. Place backfill and fill materials in layers not more than six (6) inches in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for the area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.
6. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

F. Moisture Control:

1. Do not use soil material that is either too dry or too wet to achieve proper compaction.
2. Where subgrade or layer of soil material is too dry to achieve proper compaction, uniformly apply water to surface of soil material such that free water does not appear on the surface during or subsequent to compacting operations.
3. Remove and replace, or scarify and air dry, soil material that is too wet to permit compacting to the specified density.
4. Soil material that has been removed because it is too wet to permit compacting may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory value as determined by moisture-density relation tests approved by the Geotechnical Engineer.

G. Compaction Requirements:

1. Compaction requirements per Geotechnical investigation.

3.8 FINISH GRADING

A. General:

1. Uniformly grade the areas within limits of grading under this Section, including adjacent transition areas.
2. Smooth the finish surfaces within specified tolerance.
3. Grade with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately eight feet zero inches (8'-0"), unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Grading Adjacent to Structures: Grade areas adjacent to buildings to achieve drainage away from the structures and to prevent ponding.

C. Ditches, Gutters and Swales:

1. Cut accurately to the cross sections, grades and elevations shown.
2. Maintain excavations free from detrimental quantities of leaves, sticks, trash and other debris until completion of the Work.
3. Dispose of excavated materials as specified herein; do not in any case deposit materials within three feet zero inches (3'-0") of the edge of a ditch.

3.9 MANHOLE AND CATCH BASIN CASTING ADJUSTMENTS

A. All manhole and catch basin castings shall adjust to a height of between one-half (1/2) inch to one (1) inch below the final bituminous course. This allowable tolerance shall be uniform around the periphery of each casting. All castings which do not meet the between one-half (1/2) inch to one (1) inch tolerance shall be removed and readjusted at the Contractor's expense.

B. Any required concrete adjusting ring shall be set firmly in a full bed of mortar. When adjustment rings are required for final adjustment and leveling, only concrete or metal shall be used. All castings shall be set on a full mortar bed.

C. A template of three-fourths (3/4) inch (19 mm) plywood shall be temporarily fastened to the top of each casting during the placing and rolling of the final bituminous course to insure the specified tolerances are met.

D. All casting adjustments shall be considered incidental to the Contract.

3.10 FINISH GRADING TOLERANCES

A. All surfaces shall be finished to such contour that they will not impound surface water.

1. Finish grade tolerances are as follows:
   a. Unpaved Areas Outside Building: Not more than one-tenth (0.10) of a foot above or below the finish grade elevations indicated on the Drawings.
   b. Building and Paved Areas: Surfaces shall not vary more than five-hundredths (0.05) of a foot above or below the finish grade elevations indicated on the Drawings.

3.11 FIELD QUALITY CONTROL

A. Field-testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Section 01460.

B. Conventional testing and inspection services herein describe those items not specifically required by 2007 California Building Code, but are considered essential to the proper performance of the building systems.

C. Secure the Geotechnical Engineer's inspection and written approval of subgrades and fill layers before subsequent construction is permitted thereon.

D. Verify that footing bearing surfaces comply with frost depth requirements and report variances in a timely manner.

E. Classification of materials used and encountered during construction will be performed in accordance with ASTM D2488 and D2487.

F. Compaction testing will be performed in accordance with ASTM D698.

G. Observe all subgrades and excavation bases below footings and slabs before further construction is performed.

H. Document presence of ground water within excavations. Verify cut and fill slopes as specified in the Contract Documents.

I. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

J. Frequency of Field Density Tests:

1. Footing Subgrade: For each strata of soil on which footings will be placed, conduct at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested strata, when acceptable to Architect/Engineer.

2. At areas to receive paving, at least one (1) field density test for every five thousand (5,000) square feet of subgrade area, but not less than three (3) tests.

3. In each compacted fill layer, one (1) field density test for every five thousand (5,000) square feet of overlaying paved area, but not less than three (3) tests.

4. In fill beneath structures, one (1) field density test for every two thousand five hundred 2,500 square feet in each layer.

5. Other tests as deemed necessary by the Geotechnical Engineer.

K. If, in the Geotechnical Engineer's opinion based on reports of the testing laboratory, subgrade or fills, which have been placed are below specified density, provide additional compacting and testing until specified requirements are met.

1. Additional testing will be provided by the Owner's selected testing laboratory and all costs for the additional testing will be borne by the Contractor.

L. Proofrolling:

1. Proofroll subgrade for areas to receive paving, structures on fill or impervious lining material.

a. Make not less than three (3) passes of a twenty-five (25) to fifty (50) Ton (23 to 45 ton) rubber tired roller over the full area.

b. Remove unstable, soft or otherwise unsuitable materials revealed by the proofrolling and replace with satisfactory materials, compacted as specified herein.

3.12 PLACING TOPSOIL

A. Upon completion of site grading and other related site work, topsoil shall be uniformly spread over the graded or improved areas. Topsoil shall be evenly distributed to conform to final grade elevations shown on the Drawings.

B. Place, level and lightly compact topsoil to a depth of not less than three (3) inches.

C. Maintain topsoil free of roots, rocks, debris, clods of soil and any other objectionable material, which might hinder subsequent grassing or mowing operations.

D. Any surplus materials shall be disposed of in approved areas on the site.

3.13 MAINTENANCE

A. Protection of Newly Graded Areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds.

2. Repair and re-establish grades in settled, eroded and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations, or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

END OF SECTION 02310

SECTION 02320 - TRENCH EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Trench Excavation, Backfilling and Compaction as Indicated on the Drawings, Specified Herein; and as Needed for Installation of Underground Utilities Associated With the Work.

C. Special Pipe Foundations, Pipe Bedding and Trench Work; Done in Accordance With O.S.H.A. Regulations.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02200 - Earthwork: Rough grading and contouring of site.

C. Section 02310 - Site Grading: Finish grading materials and procedures.

D. Section 02480 - Planting: Landscape beds above trenches.

E. Section 02510 - Water Distribution: Water lines laid in trenches.

F. Section 02530 - Sanitary Sewerage: Sanitary lines laid in trenches.

G. Section 02630 - Storm Drainage: Storm sewer lines laid in trenches.

H. Section 02740 - Asphalt Concrete Paving: Asphalt concrete paving adjacent to trenches.

I. Section 02750 - Exterior Concrete Pavement: Exterior concrete work adjacent to trenches.

J. Section 02810 - Irrigation Systems: Landscape irrigation lines laid in trenches.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Samples: Submit 10 lb. Sample of each type of fill to Independent Testing Laboratory, in air-tight containers.

C. Test Reports: Submit Independent Testing Laboratory reports which pertain to testing services performed at the site under provisions of Section 01460.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work and disposal of debris in accordance with applicable requirements of governing authorities having jurisdiction.

B. All excavations and trenches shall comply with the requirements of O.S.H.A. 29 CFR, Part 1926, Sub-Part P, “Excavations and Trenches”.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

D. Use equipment adequate in size, capacity, and numbers to accomplish the Work in a timely manner.

1.5 SITE CONDITIONS

A. Existing Utilities:

1. There now exists in the construction areas, waterworks, storm drainage, sanitary sewers, street paving, gas mains and other utilities.

2. Approximate location of certain underground lines and structures are shown on the Plans for information only, and other underground lines or structures are not shown. Refer to Section 01440 - Existing Utilities, for further information regarding this condition.

3. Locate these and other possible unknown utility lines using electronic pipe finder, or other approved means.

4. Locate, excavate and expose all existing underground lines in advance of trenching operations.

5. The Contractor will be held responsible for the workmanlike repair of any damage done to any of these existing utilities in the execution of his Work under this Section.

6. The Contractor shall familiarize himself with the existing conditions and be prepared to adequately care for and safeguard himself and the Owner from damage.

B. Protection of Persons: Owner activities will continue in and about the site during construction. Install barricade fencing (snow fence), as necessary, to provide a safe environment between construction work and student/pedestrian circulation.

C. Bench Marks and Monuments: Maintain benchmarks and monuments existing on site.

D. Protection of Existing Property to Remain: Protect existing equipment and structures, which are in area where work will be performed and which are to remain. Repair or replace existing property, which is to remain that is damaged by the work, to Architect's satisfaction and at no cost to the Owner.

E. Protecting Trees, Shrubbery and Lawns:

1. Refer to Division One - Temporary Facilities and Control: Tree and Plant Protection.

2. Trees, plants and shrubbery in developed areas and along the trench line: Do not disturb unless absolutely necessary, and subject to the approval of the Architect/Engineer.

a. Any such trees, plants and shrubbery necessary to be removed shall be heeled in and replanted.

3. Where trenches cross private property through established lawns, cut, remove, stack and maintain sod in suitable condition until replacement is approved by the Architect/Engineer.

a. Topsoil underlying lawn areas: Remove and keep separate from general excavated materials.

F. Clearing:

1. Perform all clearing necessary for installation of the complete Work.

2. Clearing work consists of removing all trees, stumps, roots, brush and debris in the right-of-way obtained for the Work.

3. All timber of merchantable size shall remain the property of the Owner and shall be trimmed and cut in such lengths as directed and stacked along the edge of the right-of-way.

4. All other material, including trimmings from above, shall be completely disposed of off-site in a satisfactory manner.

G. Removing and Re-Setting Fences:

1. Where existing fences must be removed to permit construction of utilities:

a. Remove such fences, and as the Work progresses, reset the fences in their original location and condition.

b. Provide temporary fencing or other safeguards as required to prevent stock and cattle from wandering to other lands.

H. Restoration of Disturbed Areas:

1. Restore all areas disturbed by, during or as a result of construction activities to their existing or better condition.

2. Do not interpret this as requiring replacement of trees, and undergrowth in undeveloped sections of the right-of-way.

I. Minimizing Silting and Bank Erosion During Construction:

1. During construction, protective measures shall be taken and maintained to minimize silting and bank erosion of creeks and rivers adjacent to the Work being performed during construction.

2. Sack breakers are to be used on steep slopes along creek banks and fill slopes to prevent washing of ditch. Sack breakers are to be placed at the direction of the Engineer.

J. Blasting:

1. Store all explosives in a secure manner, complying with all laws, ordinances and regulations.

PART 2 - PRODUCTS

2.1 EXCAVATED MATERIALS

A. Perform all excavations of every description and of whatever substances encountered to depths indicated on the Drawings or specified.

B. Pile materials for backfilling in an orderly manner at safe distance from banks or trenches to avoid overloading and to prevent slides or cave-ins.

C. Remove and deposit unsuitable or excess materials as directed by the Engineer.

2.2 GRANULAR MATERIALS

A. Granular materials furnished for foundation, bedding, encasement, backfill, or other purposes as may be specified shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone, or slag, that shall be so

graded as to meet the gradation requirements specified herein for each particular use.

2.3 GRANULAR MATERIAL GRADATION CLASSIFICATIONS

A. Granular materials furnished for use in foundation, bedding, encasement, or backfill construction shall conform to the following requirements:

Percent Passing Sieve Size	MATERIALS USE DESIGNATION		
	Foundation	Bedding	Backfill
1 inch	100	100	100
3/4 inch	85-100	90-100	
3/8 inch	30-60	50-90	
# 4	0-10	35-80	35-100
# 10		20-65	20-100
# 40		0-50	0-50
#200		0-15	50

NOTE: Granular foundation, bedding and encasement material provided for plastic pipe and fittings shall meet the requirements of ASTM 2321, Class I, II or III materials or the requirements provided above if the Engineer authorizes such substitution.

2.4 GRANULAR MATERIAL DESIGNATIONS

A. Granular materials provided for Foundation, Bedding, Encasement, or Backfill use as required by the Plans, Specifications and Special Provisions, either as part of the pipe item work unit or as a separate Contract Item, shall be classified as to use in accordance with the following:

MATERIAL USE DESIGNATION	ZONE DESIGNATION
Granular Foundation	Placed below the bottom of pipe grade as replacement for unsuitable or unstable soils, to achieve better foundation support.
Granular Bedding	Placed below the pipe midpoint, prior to pipe installation, to facilitate proper shaping and to achieve uniform pipe support.
Granular Backfill	Placed below the surface base course, if any, as the second stage of backfill, to minimize trench settlement and provide support for surface improvements.

B. In each case above, unless otherwise indicated, the lower limits of any particular zone shall be the top surface of the next lower course as constructed. The upper limits of each zone are established to define variable needs for material gradation and compaction or void content, taking into consideration the sequence of construction and other conditions. The material use and zone designations described above shall only serve to fulfill the objectives and shall not be construed to restrict the use of any particular material in other zones where the gradation requirements are met.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 TRENCH EXCAVATION

A. Work shall be done by open trench excavation except jacked or augured pipe designated on the plans or as directed by the Architect/Engineer.

B. Topsoil shall be stripped from the trench and stockpiled to be used over all disturbed areas to be seeded or sodded. Stripping, stockpiling and re-spreading topsoil will be considered incidental to the project, and provided under provisions of Section 02310.

C. Trench excavation shall be dug to the alignment and depth shown on the plans and only 100 feet in advance of the pipe laying. The trench shall be braced and drained so that workmen may work safely and efficiently therein.

D. Trench water shall be drained from the trench into natural drainage channels or storm sewers and shall be considered incidental to construction. Draining trench water into sanitary sewers will not be permitted.

E. Braced and sheeted trenches shall be put in place and maintained as may be required to support the

side of the excavation and to prevent any movement which may in any way endanger personnel or injure or delay the work or endanger adjacent buildings or other structures. Where sheeting and bracing are used, the trench width shall be increased accordingly. Trench sheeting shall remain in place until pipe has been laid, tested for defects and repaired if necessary, and the earth around it compacted to a depth of one (1) foot over the top of the pipe. It shall be the Contractor's responsibility for compliance therein.

F. Excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks, driveways and drainage. Gutters shall be kept clear or other satisfactory provisions made for street drainage.

G. Width of trench may vary with, and depend upon, the depth of trench and the nature of the excavated material encountered; but in any case, shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of un-sheeted trench for pipe less than ten (10) inches shall be eighteen (18) inches and for pipe ten (10) inches or larger, at least two (2) feet greater than the diameter of the pipe, except by consent of the Engineer. The maximum clear width of the trench at the top of the pipe shall not be more than two (2) feet greater than the outside diameter of the pipe.

H. Unless otherwise specified on the plans, all pipe will be placed in a flat bottom trench with tamped backfill. The sides of the trench shall slope back to provide a stable slope for the particular type of soil in the trench.

I. If the trench is excavated to greater width than authorized, the Engineer may direct the Contractor to provide a higher class of bedding, a higher strength pipe or both, than that required by the Contract, without additional compensation therefore, as the Engineer may deem necessary to satisfy the design requirements.

J. Faulty grade of the trench below grade lines shall be corrected with approved material, thoroughly compacted without additional compensation to the Contractor.

K. Solid rock excavations shall include such rocks as are not decomposed, weathered or shattered and which will require blasting, barring, wedging or use of air tools for removal. Under this classification shall be included the removal of any concrete or masonry structure (except concrete pavement, curb pavement, curb and gutter and sidewalk) that cannot be removed by the standard trenching equipment. The removal of individual boulders shall be defined as solid rock excavations sheer the size of boulders shall be defined as solid rock excavation where the size of boulders exceeds two (2) cubic yards.

L. Loose rock excavation shall include all stratified rock, sandstone, cemented gravel, shale and boulders not otherwise defined as solid rock, regardless of how removed.

M. Blasting for excavation will not proceed until the Contractor has notified the Engineer of the necessity to do so. This notification shall in no matter relieve the Contractor of the hazards and liability contingent on blasting operations. The Engineer will fix the hours of blasting. The Contractor at his expense shall repair any damage caused by the blasting. The Contractor's method of procedure relative to blasting shall conform to the local and State laws and municipal ordinances.

N. When excavation is encountered that is unsuitable for backfill, it shall be removed as directed by the Geotechnical Engineer.

3.3 PREPARATION OF SOIL DURING PIPE LAYING

A. At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate. No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper.

B. If trench bottom conditions are encountered which appear to require stabilization, the Engineer shall be informed. The trench conditions shall be examined by the Engineer to determine the nature of such instability, employing the services of a testing laboratory if necessary. If it is determined that the trench bottom cannot support the pipe, a further depth and/or width shall be excavated and refilled to the pipe foundation grade with granular foundation material ad thoroughly compacted.

C. If the examination by the Engineer reveals that the afore described conditions are caused by the Contractor's manipulation of the soils in the presence of excessive moisture or lack of proper dewatering, the Contractor shall take such steps as are necessary to stabilize the trench bottom including the use of pipe support material and improved dewatering methods. In such case, the

cost of measure necessary shall be borne by the Contractor.

D. When the bottom of the trench consists of material suitable to properly support the pipe the following methods of bedding shall apply:

1. Granular bedding material will be placed below the midpoint of the pipe, prior to the pipe installation, to facilitate proper shaping and achieve uniform pipe support, using hand compaction methods.

2. Granular backfill material at pipe zone shall be free from rock, boulders or other unsuitable substances and shall be deposited into the trench simultaneously on both sides of pipe for the full width of the trench in six-inch lifts thoroughly compacted to a minimum elevation of one foot above the top of the pipe. Compaction shall be accomplished by mechanical tamping.

3. The granular backfill material shall be placed to the top of the trench of street subgrade elevation in level, successive layers, having a thickness of not greater than twelve (12) inches. Each successive layer shall be thoroughly compacted as specified prior to the placement or additional layers. If the specified compaction is not being attained utilizing the equipment and materials available, the thickness of the layers shall be reduced. The addition of water to the backfill materials should be limited to achieving satisfactory moisture content for compaction control, if necessary. Compaction of the backfill should be attained using vibratory, non-vibratory, or mechanical rammer-type compactors. The type of compactor is dependent on the type of backfill material used. Precautionary measures should be taken to assure that the compaction equipment will not damage the underlying pipe.

4. Backfilling shall not take place at any time unless approved compaction equipment is available at the site.

E. Ledge rock, boulders and large stones shall be removed to provide a clearance of at least six (6) inches below outside barrel of the pipe, or fittings, and to clear width of six (6) inches on each side of the pipe and appurtenances for pipe sixteen (16) inches or less in diameter; for pipes larger than sixteen (16) inches, a clearance of nine (9) inches below and clear width of nine (9) inches on each side of inside diameter of pipe shall be provided. Adequate clearance for properly jointing pipe laid in rock trenches shall be provided at bell holes.

F. Excavations below subgrade in rock or in boulders shall be refilled to subgrade with material approved by the Engineer or his representative and thoroughly compacted.

G. Where trench excavation is encountered which is unsuitable for backfill, such material shall be replaced with granular backfill to be supplied by the Contractor at the direction of the Engineer.

H. Where pipes are of sufficient size to create an excess of backfill material, the excess shall be hauled offsite. Hauling and grading of the excess backfill will be considered incidental to the project.

I. Any deficiency in the quantity of material for backfilling the trenches or for filling depressions caused by settlement shall be supplied by the Contractor with no extra compensation allowed. Any settlement, which occurs within one year after final acceptance, shall be refilled and the subject area completely restored to the satisfaction of the Owner, by the Contractor with labor and material supplied at the Contractor's expense. Obtain Engineer’s approve of all material prior to use.

J. Backfill in trenches in areas to be paved shall be placed to an elevation that will permit the placement of base material and surfacing material.

3.4 FIELD QUALITY CONTROL

A. Field testing and inspection: Performed by qualified parties as specified herein and in accordance with the provisions of Section 01460.

B. Conventional testing and inspection services herein describe those items not specifically required by 2007 California State Building Code, but are considered essential to the proper performance of the building systems.

C. Classification of materials used and encountered during construction shall be in accordance with ASTM D2488 and ASTM D2487.

D. Compaction testing: In accordance with ASTM D698.

E. Document presence of ground water within excavations. Verify cut and fill slopes as specified in the Contract Documents.

F. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

G. Frequency of Tests:

1. Compaction tests of subgrade: Make at maximum horizontal intervals of 50 feet in each direction, or as directed by Architect.
2. Compaction tests of in place backfill materials: Make at a maximum vertical interval of 1' - 0", and maximum horizontal intervals of 50 feet in each direction, or as directed by Architect.

H. Proofroll compacted fill surfaces within trenches.

END OF SECTION 02320

SECTION 02325 - CONTROLLED DENSITY FILL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Controlled Density Fill (Flowable Fill) at All Locations Indicated on the Drawings, as Specified Herein, and as Required For a Complete and Proper Installation.

1.2 RELATED SECTIONS

A. Section 02310 - Site Grading.

B. Section 02320 - Trench Excavation and Backfill for Utilities.

C. Section 03300 - Cast-in-Place Concrete.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Within fifteen (15) calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

2. Concrete mix design, prepared by the manufacturer of the controlled density fill, showing compliance with the specified properties.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Comply with all provisions of the controlled density fill manufacturer's recommendations.

1.5 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Comply with the applicable sections of the California Department of Toxic Waste Substances Control.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide a slurry of the specified Portland cement, fly ash, sand and water.

1. Use Portland cement complying with ASTM C150, Type I or II.

2. Use fly ash approved by the manufacturer of the flowable fill.

B. Additives:

1. Admixtures for entrained air may be used if specifically recommended by the manufacturer.

2. Do not use calcium chloride.

C. Water:

1. Use potable water, free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the concrete.

D. Sand:

1. Use find aggregate conforming to ASTM C33-82.

E. Design the mix to obtain a compressive strength of more than 80 psi at twenty-eight (28) days with an ultimate strength not to exceed 200 psi.

F. Slump:

1. Seven (7) to ten (10) inches.

2. Provide lower slump fill around pipelines to a point above the top of the pipe to prevent floating.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Place in forms or cast against earth.

B. Weather Conditions:

1. Avoid freezing before initial set of the concrete.
2. Do not place at temperatures of less than 40 degrees F, nor when freezing conditions are expected in less than twenty four (24) hours.

C. Remove any form materials prior to earth backfilling.

D. Protect the flowable fill mass and do not permit fill of any kind to be placed thereon until the concrete has attained a compressive strength of at least 30 psi.

3.3 CLEANING

A. Completely remove all traces of concrete from surfaces on which it was not scheduled to be placed.

END OF SECTION 02325

SECTION 02330 - PLAY FIELD CONSTRUCTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Play Field Construction; Including Free-Draining Granular Material Under Field, Imported Special Soil Mixture, and Coarse Granular Fill at Drain Tile Areas.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02310 - Site Grading.

C. Section 02320 - Trench Excavation and Backfill for Utilities.

D. Section 02480 - Planting.

E. Section 02630 - Storm Drainage.

F. Division 15000 – Mechanical.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate location and complete layout of underground construction, field connections, and drainage plane.

C. Samples: Submit ten (10) lb. sample of each type of fill to Independent Testing Laboratory, in air-tight containers.

D. Test Reports: Submit Independent Testing Laboratory reports which pertain to testing and inspection services performed at the site under provisions of Division One.

1.4 QUALITY ASSURANCE

A. Codes and Standards: Perform excavation work and disposal of debris in accordance with applicable requirements of governing authorities having jurisdiction.

B. All excavations and trenches shall comply with the requirements of O.S.H.A. 29 CFR, Part 1926, Sub-Part B, “Excavations and Trenches”.

1.5 SITE CONDITIONS

A. Protection of Persons: Owner activities will continue in and about the site during construction. Install barricade fencing (snow fence), as necessary, to provide a safe environment between construction work and student/pedestrian circulation.

B. Existing Utilities: Locate and mark all existing utilities, which are on site where work is to be performed. Refer to Division One - Existing Utilities.

C. Bench Marks and Monuments: Maintain bench marks and monuments existing on site.

D. Protection of Existing Property to Remain: Protect existing plants, equipment and structures which are in area where Work will be performed and which are to remain. Repair or replace existing property, which is to remain that is damaged by the Work, to Architect’s satisfaction and at no cost to the Owner.

PART 2 - PRODUCTS

2.1 PLAY FIELD SPECIAL SOIL MIXTURE

A. Root Zone Mix: Consists of a minimum twelve (12) inch depth, after settling and compaction, of either sand and soil, or sand and peat. A sand/soil mixture is preferred, but if suitable soil is not readily available, a sand/peat mixture is acceptable.

B. Mixture Components:

1. Sand: The sand used in the mixture, whether sand/soil or sand/peat, shall meet the following criteria:

   a. Fineness modulus value between 1.7 and 2.5.

   b. Uniformity coefficient less than four (4).

   c. Particles < 0.1 mm in diameter less than 3% by weight.

   d. Particles > 2.0 mm in diameter less than 3% by weight.

   e. Particles between 0.25 and 1.0 mm in diameter > 60% by weight.

2. Soil: If the root zone mixture consists of sand and soil, the soil used in the mixture shall meet the following specifications:

a. Topsoil originating from within eighteen (18) inches of the soil surface.

b. Free of herbicide residues that would affect turfgrass growth.

c. Ratio of silt plus very fine sand particle content (0.002 mm to 0.1 mm diameters) to clay particle content shall be less than 2.5.

d. Particles greater than 2.0 mm in diameter shall be less than 8% of the soil by weight.

3. Peat: If the root zone mixture consists of sand and peat, the peat used in the mixture shall meet the following specifications:

a. Free of residue that will not pass a screen with 5 cm openings.

b. Percent loss by ignition in a muffle furnace shall be greater than 75%.

C. Mixing Specifications:

1. Sand/Soil Mixture:

a. Mixed at a moisture content that preserves the natural structure in the soil and prevents excessive balling up of the soil with resultant non-uniform mixture.

b. Mixture Ratio: Estimated from soil tests prior to mixing such that a final mix will consist of 92% by weight sand. This estimated mixing ratio may be modified after the initial mixing run if the sand content of the resulting mixture is below 91% or above 94% sand on a weight basis or if the mixture is judged by the Independent Testing Agency to be excessively compactable or too high in water retention characteristics.

c. Mix sand and soil in the proper ratio, initially by a front-end loader or similar equipment, then put through a mixer-shredder or similar machine, such that a uniform mixture results. The mixture shall be checked periodically by the Independent Testing Agency, who shall have the prerogative of modifying the mixture ratio or procedure, or rejecting any amount of mixture deemed unsatisfactorily mixed, non-uniform, or otherwise unacceptable.

2. Sand/Peat Mixture:

a. Mix at a moisture content that results in the uniform mix of sand and peat that prevents excessive separation of smaller particles, or peat.

b. Initial Mixing Volume Ratio: Four (4) parts sand to one (1) part peat. This mixing ratio may be modified after the initial mixing run if the resulting mixture is judged by the Independent Testing Agency to be compactable or too high in water retention characteristics.

c. Mix sand and peat in the proper ratio, initially by a front-end loader, or similar machine, such that a uniform mixture results. The mixture shall be checked periodically by the Independent Testing Agency, who shall have the prerogative of modifying the mixing ratio or procedure, or rejecting any amount of mixture deemed unsatisfactorily mixed, non-uniform, or otherwise unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum. Verify that survey benchmark and intended elevations for the Work are as indicated on the Drawings.

B. Identify known underground, above ground, and aerial utilities. Stake and flag locations. Protect above and below grade utilities, which are to remain.

3.3 SITE GRADING

A. Rough Grading: Spread subsoil to an elevation four (4) inches below finish grade. Rough grading shall include spreading the material on-site smoothly and evenly with a dozer or equal equipment, leaving it similar to back-dragging with a dozer.

B. Finish Grading: Specified under provisions of Section 02310.

C. Compaction: Compact subsoil and topsoil as necessary to prevent settlement without inhibiting vertical drainage and subsequent turf establishment. If over compaction occurs, Contractor may be required to scarify soil and reblade. Measure depth of topsoil after compaction.

3.4 ROUGH GRADING

A. The grades shown on the drawings are proposed finish grades. Grade to prescribed subgrade elevations except landscaped areas which shall be graded to finish grade with approved topsoil.

B. The Contractor shall be solely responsible for determining quantities of fill and waste materials to be handled, and for amount of grading to be done in order to completely perform all work indicated on the Drawings. Cost of importing fill and/or exporting excess materials from the site shall be considered incidental to the Contract.

C. Provide surfaces free of debris and building materials. Complete rough grading by blading to reasonably smooth contours with neat, uniform transitions and slopes. Remove stones over two (2) inches diameter, branches and other vegetation. Ease new grades into surrounding existing grades without awkward or abrupt transitions.

D. Finish all surfaces to such contour that they will not impound surface water.

1. Rough grade tolerances are as follows:

a. Unpaved areas outside buildings: Not more than 0.20” (10 mm) above or below finish grade elevations shown on the drawings.

E. Protect newly graded areas from traffic and erosion. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

F. Hold Downs for Rough Grading:

1. Lawn Areas: Six (6) inches.

3.5 FIELD QUALITY CONTROL

A. Perform field testing and inspection by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Classify materials used and encountered during construction in accordance with ASTM D2488 and D2487.

C. Perform compaction testing in accordance with ASTM D698.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

E. Frequency of Tests:

1. Subgrade Compaction Tests: Make compaction tests of subgrade at maximum horizontal intervals of fifty (50) feet in each direction, or as directed by the Architect/Engineer.

2. Compaction Tests of In-place Backfill Materials: Make tests at a maximum vertical interval of twelve (12) inches, and maximum horizontal intervals of fifty (50) feet in each direction, or as directed by the Architect/Engineer.

END OF SECTION 02330

SECTION 02360 - VEGETATION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Vegetation Control; Including Soil Treatment Materials to Resist Invasion of Adjoining Structure by Pests and Growth of Vegetation.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork: Backfill materials and operations.

B. Section 04200 - Unit Masonry Systems: Unit masonry foundation walls.

C. Section 05500 - Metal Fabrications: Metal termite foundation shield.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Indicate each toxicant to be used, composition by percentage, dilution schedule, intended application rate.

C. Certification: Indicate that products used comply with U.S. Environmental Protection Agency (EPA) regulations.

D. Manufacturer's installation instructions; including precaution requirements for field applicator.

1.4 QUALITY ASSURANCE

A. Contractor shall employ and pay for a professional Pest Control Operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

B. Use only products that bear a Federal Registration number of the EPA, and are approved by local authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Do not apply vegetation control solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils, or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division One.

B. Accurately record moisture content of soil before application, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

1.7 MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Maintenance Data: Indicate re-treatment schedule recommended by vegetation control manufacturer.

1.8 QUALIFICATIONS

A. Applicator: Company specializing in performing the Work of this Section with minimum five (5) years documented experience, and licensed by the State of California.

1.9 WARRANTY

A. Provide five (5) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work, including coverage for damage and repairs to building and building contents caused by termites. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Type One: Under paving, sidewalks, curbs, gutters, etc.:
   a. Oust XP by Dupont Company
   b. Monobar-Chlorate
2. Type Two: Under paving, sidewalks, curbs, gutter within 5 feet of landscape areas:
   a. Treflan TR-10 by Dow

B. Substitutions: Under provisions of Division One.

C. Other solutions may be used as recommended by Applicator, if approved for intended application by local authorities having jurisdiction. Use only soil treatment solutions that are not harmful to plants and wildlife.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that soil surfaces are unfrozen, sufficiently dry to absorb soil sterilant (weed killer), and ready to receive treatment.

C. Verify final grading is complete.

3.2 SURFACE PREPARATION

A. Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake and level soil to be treated, except previously compacted areas under slabs and foundations.

B. Toxicants may be applied before placing compacted fill under slabs, if recommended by toxicant manufacturer.

3.3 APPLICATION

A. Apply chemical in accordance with manufacturer's instructions.

B. Apply to areas receiving paving sidewalks curbs and gutter prior to their installation.

1. Type One to be applied to compacted aggregate base course or compacted Subgrade course where no aggregate base is used.

2. Type Two to be applied to bottom of apparatus yards, jump pits and sand areas immediately prior to installation of protective surface.

C. Re-treat disturbed treated soil with same material as original treatment.

D. Apply in sufficient amount to guarantee one year sterilization of weeds.

3.4 PROTECTION

A. Protect finished Work under provisions of Division One.

B. Do not permit soil grading over treated work.

C. Take precaution to protect adjoining property and areas designated for planting.

D. Any improper application of weed killer on areas designated for planting will necessitate complete removal of all soil and replacement to a depth of 4 feet not at expense of the Owner..

END OF SECTION 02360

SECTION 02370 - EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Provide Protection of the Environment During the Construction of This Project to Reduce Soil Erosion and Siltation to the Lowest Reasonably Achievable Level.

C. Erosion and Sediment Control; as Indicated on the Drawings, Specified Herein; Including, But Not Limited to, Construction of Permanent Erosion Checks and Controls, Sodding, Silt Traps, Barriers, Earthen Berms, Diversion Ditches, Slope and Water Course Protection, and the Placement of Hay Bales.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork.

B. Section 02310 - Site Grading.

C. Section 02320 - Trench Excavation and Backfill for Utilities.

D. Section 02840 - Planting.

1.3 GENERAL

A. Exercise every reasonable precaution, throughout the life of the project, to prevent the eroding of soil and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground or roadway surfaces, or other property. Erosion control practices to be used for this project are indicated on the Drawings.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's product data for silt fence materials; including fabrics and posts.

C. Shop Drawings: Indicate complete silt fence and erosion control layout, dimensions, and termination details.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - SILT FENCES

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Mirafi, Inc. - "EnviroFence".
2. Terra Tex SC - "EconoFence".
3. Webtec, Inc. - "Z-Fence".

B. Substitutions: Under provisions of Section 01600.

C. Silt Fence Standards (minimum):

1. Grab Tensile Strength - 120 lb.
2. Trapezoid Tear Strength - 60 lb.
3. Mullen Burst Strength - 275 lb.
4. Water Permeability Coefficient (K) - 20gal/min/ft^2
5. U.V. Stability (500 hrs.) - 70%
6. Grab Tensile Elongation - 10%
7. Fabric Height - 3'-0"

2.2 MATERIALS

A. Provide silt fences as specified, and located where indicated on the Drawings. Anchor silt fences in accordance with manufacturer's instructions.

B. Filter cloth for silt fences: Pervious sheet of synthetic polymer filaments non-woven from continuous fibers and as the type indicated on the Drawings.

2.3 EROSION CONTROL BLANKETS

A. Blankets are machine produced mats of curled wood excelsior of 80% six (6) inch or longer fiber lengths. Consistent thickness with the fiber evenly distributed over the entire area of the blanket. The topside of each blanket is covered with an extruded plastic mesh. The blanket is smolder-resistant without the use of chemical additives. Provide "Curlex" Blankets as manufactured by American Excelsior Company or approved equal by the Architect.

1. Provide erosion blankets at slopes and berms, ditches, and other "hard to hold" problem areas.

PART 3 - EXECUTION

3.1 GENERAL

A. Construct and maintain all erosion control measures until the Substantial Completion of the project, or as directed by the Engineer.

3.2 EROSION CONTROL

A. Install sediment filters at catch basins within the construction zone. Sediment filters shall remain in place until turf and pavement surfaces are established. Contact Engineer prior to removal.

B. Repair or replace any erosion control devices, which have been disrupted during operations as required by local regulation. This work and material shall be considered incidental to the contract and no additional compensation shall be made therefore.

C. Install siltation fence and leave in place until turf has been established. Contact engineer prior to removal.

D. Schedule and conduct operations so as to minimize erosion of soils and to prevent silting and muddying of streams, irrigation systems and impoundments (lakes, reservoirs, etc.). Construction of drainage facilities, turf establishment items and other contract work, which will contribute to the control of erosion and sedimentation shall be carried out concurrently with earthwork operations or as soon thereafter as practicable.

E. Where erosion is likely to be a problem and where potentials for water pollution exist, the contractor shall prepare and submit to the engineer for acceptance, his proposed schedules for accomplishment of the effected work, including any temporary measures proposed. No work shall be started in the affected areas until the applicable erosion control schedules and proposed methods of operation have been accepted by the Engineer.

F. The Engineer shall have authority to limit the surface area of erodible soil that can be exposed to possible erosion at any time, without having the permanent erosion control features completed and operative.

G. While operations are in progress and prior to suspension of grading operations for longer than 60 days, areas of bare soil exposed to erosion possibility shall be shaped to permit storm runoff with minimum erosion. Temporary berms, dikes, slope drains or sedimentation basins will be required where possibilities for water pollution exist and the permanent erosion controls are not completely operative.

H. Erosion control devices shall remain in place until other means of permanent control such as turf establishment and paving has taken place.

I. Application of wood fiber blanket: Where slopes are greater than 5 feet horizontal to 1 foot vertical, apply wood fiber blanket (regular type) per CBC and CALTRAN.

J. Restoration:

1. Control of drainage and erosion shall include restoration work, as the engineer considers necessary in preventing siltation of public waters. Restoration shall include cleanup, shaping, replacement of topsoil and establishment of vegetative cover on all disturbed areas where water pollution potentials have been increased due to the Contractor's operations.

K. Compensation:

1. All expenses incurred in complying with the provisions hereof and effectively preventing pollution of public waters shall be borne by the contractor with no direct compensation being made therefore.

L. Installation of Silt Fence:

1. Dig or scrape a minimum 6-inch by 6-inch trench where fence is to be installed or ensure sufficient fill material is available.

2. Unroll fence by section along trench or predetermined path. Position posts on downstream side of fence.

3. Drive posts into undisturbed soil until 6 inches of fabric is in trench or laying on ground.

4. Place fill material in trench or on fabric flap and tamp.

5. In areas where water build-up other than sheet flow is expected or experienced, provide additional metal or wooden posts between fence posts for increased support.

M. Maintenance:

1. When siltation fence and/or sediment filters have sedimentation built-up to one-third height, the contractor is to remove the build-up. The soils are either to be taken off the site or to a location on the site where it can be used (contact soils engineer prior to placement). The relocation and clean-up of sediments is incidental to the contract.

3.3 EROSION CONTROL BLANKET - INSTALLATION

A. Properly prepare, fertilize and seed areas to be covered before blanket is applied. When the blanket is unrolled, netting should be on top and fibers in contact with the soil over the entire area.

B. In ditches, apply blankets in the direction the water flows, butting them at the ends and sides and then stapling.

C. On slopes, apply blankets either horizontally or vertically to slope, butt ends and sides and then staple.

D. Use wire staples, 0.091 inch in diameter or greater, "U" shaped with legs six (6) inch in length and a one (1) inch crown. Size and gauge of staples used will vary with soil conditions. Drive staples vertically into the ground. Use four (4) staples across at the start of each roll. For slope installation, continue to staple along the length of the roll at six (6) feet intervals. For ditch liner, staple along the length of the roll at four (4) feet intervals. Another row of staples in the center of each blanket should be alternately spaced between each side of either slope or ditch. Use a common row of staples on adjoining blankets.

3.4 CONSTRUCTION ENTRANCE

A. Construct a gravel area or pad at points where vehicles enter and leave the construction site.

B. Clear the entrance and exit area of all vegetation, roots, and other objectionable material and properly grade and place gravel to the grade and dimensions shown on the plans.

C. Construct drainage channels to carry water to a sediment trap or other suitable outlet.

D. Use geotextile fabrics to improve stability of the foundation in locations subject to seepage or high water table.

E. Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site by periodic top dressing with two (2) inch stone.

F. After each rainfall, inspect any structure used to trap sediment and clean it out as necessary.

G. Immediately remove objectionable materials spilled, washed, or tracked onto public roadways.

3.5 TEMPORARY GRASSING

A. Provide a temporary cover for erosion control on disturbed areas that will remain unstabilized for a period of more than thirty (30) days in accordance with Section 02480.

B. This practice applies to cleared areas, diversions, dams, temporary sediment basins, temporary road banks, and topsoil stockpiles where vegetation is needed for less than one (1) year.

C. Provide grassing on slope 5% or greater within fourteen (14) days of disturbance.

1. Comply with Section 02480.

3.6 CURB INLET PROTECTION

A. Construct temporary sediment barriers around storm drain curb inlets using block and gravel as indicated on the Drawings.

B. Inspect structure after each rainfall and repair as required.

C. Remove sediment when trap reaches one-half (1/2) capacity.

D. Remove structure when protected areas have been stabilized.

3.7 TEMPORARY SEDIMENT TRAPS

A. Utilize temporary sediment traps at the bottom of all disturbed slopes where run-off is parallel to the utility trench and draining into an existing ditch or stream, and where slopes are five percent (5%) or greater along the trench.

B. Provide at intervals of seventy five (75) feet.

3.8 REMOVAL

A. Remove temporary structures after protected areas have been stabilized.

END OF SECTION 02370

SECTION 02480 - PLANTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. All labor, materials, tools, transportation and performance of all the work required as indicated on the Drawings and Specifications and reasonably incidental to:

1. Furnish all plant material.
2. Soil tests
3. Herbicide application and weed eradication
4. Tilling, soil amendments placement & incorporation (except sports fields)
5. Over excavation of tree wells and soil backfill – including Parking Lot Islands
6. Over excavation of soil under raised planters
7. Over excavation of soil in planters adjacent to buildings and structures.
8. Fill dirt at planters and tree wells Finish grading. (except sports fields)
9. Finished grade certification
10. Leaching
11. Delivery, storage and maintenance of plant material prior to planting
12. Deep Root Barriers Installation
13. Plant Selection
14. Planting and fertilizing trees, shrubs and ground covers.
15. Staking trees and arbor guards.
16. Decomposed Granite / Rock Dust
17. Sod Delivery & Installation
18. Pre & Post Emergant weed control placement
19. Mulch placement.
20. Interim Maintainance & weed control until Subtantial Completion
21. Substantial Completion
22. Establishment & Maintenance Period.
23. 100 % Completion
24. Guarantee.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division O and Division 1 Specification Sections, apply to work of this Section.

A. Related Work: Examine all Section of the Specification and Drawing for work related to this Section
    1. Refer to a Division 7 section for waterproofing at raised planters.
    2. Refer to a Division 2 section for Soil Preparation
    3. Refer to a Division 2 section for Irrigation
    4. Refer to a Division 2– Section 02330 for Baseball Diamond Infield Material & Installation
    5. Refer to Earthwork specification in another Division 2 section.
    6. Refer to Planting specification in another Division 2 section.
    7. Refer to Section 01460 Testing and Inspection Serivces.
    8. Refer to Bid Package 1812 Volume 1 – Green Sheets Item 29 – Dust Control

1.03 QUALITY CONTROL

A. Contractor is to be fully informed regarding the management and control of fugitive dust and shall comply with all current San Joaquin Valley Air Pollution Control District "Visible Dust Emissions" (VDE) requirements and any other requirements related to dust, soil, water emissions/control. Additionally protect Storage Piles and Bulk Materials as required to comply with VDE requirements. Review the Site Dust Emissions Plan with the Construction Manager and/or District Representive prior to commencing grading operations.

B. Verification of Job Conditions: CONTRACTOR shall verify actual conditions and report any discrepancies between the plans and actual conditions immediately to the ARCHITECT. Refraining from doing any work in said areas until given approval to do so. It is the responsibility of the CONTRACTOR to coordinate his work with other trades and be familiar with the locations of drain lines, utility lines, and other subsurface improvements that could affect the planting work.

C. Obstruction To Planting Operations:
   1. If rock, plaster, concrete, trash or other construction debris is encountered in the area which the CONTRACTOR is working, notify the Construction Manager to arrange clean up by others.
   2. If electrical cables, conduits or other utility lines are encountered and cause conflict with planting operations, notify the Construction Manager and ARCHITECT to arrange utility relocation or notify the Landscape Architect for direction on the adjustment of plant locations.
   3. If washout areas or equipment emissions by other CONTRACTORs (ie: paint, thinners, concrete slurry, cleaning fluids, oils, fuel, hydrolic fluids, etc) are encountered, Notify the Construction Manager and ARCHITECT verbally and in writing. No planting is to occur until the area has been cleaned and contaminated soil remove and disposed of by others and new clean fill soil has been imported, placed, compacted and approved for planting by the ARCHITECT and/or DISTRICT.
   4. If soil grades are not within the .10' tolerance for rough grade, notify the Construction Manager and IOR to arrange final grading by others prior to commencing work.
   5. If Construction materials or equipement of other trades is encountered in the area which the Contractor is to work, notify the Construction Manager and IOR to arrange for removal prior to commencing work.

D. Use of Pesticide: Chlorinated hydrocarbons, (DDT, Chlordane, Lindane, etc...) or organic phosphates (Parathion, etc...) shall not be used in this work. The use of any restricted material is prohibited. Comply with all state laws and regulations regarding the reporting of the application of pesticides and herbicides.

E. Work Notice: Notify ARCHITECT at least 10 working days prior to start of each phase of soil preparation and planting construction. The ARCHITECT and DISTRICT are not responsible for delays if the CONTRACTOR fails to give advance notice for review.

F. The Construction Manager shall maintain continuous power and water supply to all facilities that are directly or indirectly affected by this construction, unless other arrangements are made with the DISTRICT for temporary shut-offs. The CONTRACTOR shall be responsible to co-ordinate and inform the Construction Manager a minimum of 3 days in advance of any anticipated power or water supply shut offs that he/she intends to perform as a function of his/her work.

G. The CONTRACTOR shall protect the public health, safety and welfare during all phases of the work.

1.04 SUBMITTALS

A. Material & Verification Submittals: Provide the Landscape ARCHITECT with 2 representative samples of the following for review and approval: (2 Quart samples unless otherwise noted.) All samples shall be forwarded with the Manufactures Cut Sheet showing the properties of the specified material. Each sample shall be labeled with the project name and sample delivery date.
   1. 100 % Prill Gypsum or 98% Ultra Fine Grind Gypsum (325 mesh)
   2. Muratic Acid – Hydra-Hum DG
   3. Virgin Fir Humus
   4. Bark Topdress Material
   5. Plaster Sand (for irrigation trench settlement and turf low area filling)
   6. Microrhizae – 2 oz. samples
   7. Root Barrier Material
   8. Gravel
   9. Decomposed Gravel / Rock Dust (Tan)
   10. Grass Seed – small sample with certificate of origin and PLS (pure live seed) count
   11. Plant Material Photos & Source Log
   12. Pest Control Advisor & Pest Control Applicator License & Contact Information
   13. Maintenance Fertilizers – Application Rates, Volumes & Copy of Contract with the supplier.

B. Materials Receipts: The CONTRACTOR shall submit materials and delivery receipts to the Inspector of Record (IOR). IOR shall collect delivery receipts on a daily basis as material is delivered. Submit a summary of all deliveries with each payment request which will be confirmed by the IOR. The project name, material and quantity shall be indicated on all receipts. Receipts shall be legible, in chronological order, punched and bound in a binder with a prong paper fastener or better. A summary cover sheet shall be provided with each submittal indicating previous shipments versus new.

C. Upon completion of the Work of this Section, submit manuals compiled in accordance with Section 01700 of these Specifications, indicating botanical and common names of all plant material installed and maintenance instructions and procedures.

D. Provide a complete landscape and turf installation schedule, with a site diagram, for review by the Landscape ARCHITECT within 30 days after contract award.

E. Soils Tests: Multiple are required. Assit the Landscape Architect with the acquisition of 2 soils test from multiple locations on the project site. The Landscape Architect shall submit the samples to a testing laboratory of their choice for soils analysis and recommendations for horticultural planting. Analysis and recommendations shall be delivered to the Landscape ARCHITECT. Samples shall be taken at each of the following Phases:
   1. Streetscape & Quad Planting
      a) Pre Fine Grade
      b) Post Soil Amendment Incorportaion
      c) Post Fine Grade – Pre Planting
      d) 20 days after plant installation
      e) 30 days prior to end of Maintenance Period.

   2. Planter & Tree Well Backfill
      a) Pre Soil Harvest

b) Post Soil Amendment Incorportaion & Blending – Pior to use.

F. Post Planting Amendments: Upon approval of the Landscape ARCHITECT, the recommendations provided by the soils lab, along with any additions or modifications recommended by the Landscape ARCHITECT shall be used by the CONTRACTOR for acquiring and applying soil amendments for post-planting maintenance. Post Planting Amendment application shall be performed within 5 business days after the post planting amendments are provided to the Landscape ARCHITECT and forwarded to the Contractor; or as scheduled and directed by the Landscape ARCHITECT. The Landscape ARCHITECT may require consultation with the CONTRACTORs' Pest Advisor prior to making final recommendations. The CONTRACTOR shall provide verification as noted in this and other sections of materials, quantities and dates of application.

G. Plant Material Photos: The CONTRACTOR shall provide the ARCHITECT with photos of all trees 15 gallon and larger **within 20 days** of the award of contract. Photos shall be accompanied with plant specifications; nursery of origin, (including specific block and yard site), box size, height, canopy spread and trunk diameter. Photos shall be digital and may be e-mailed directly to the Landscape ARCHITECT or printed and mailed within the allocated time frame. Photos shall be of medium to high digital quality and shall clearly show a typical tree for each species. If photo quality is poor or individual trees can not be identified (photographed in a block where the individual tree can not be decerned or clearly seen as an individual), the Landscape ARCHITECT, at his/her discretion, may require **additional photos** be taken and delivered. These additional photos shall be provided **within 5 working days. Photos shall include the date that the photo was taken, nursery of origin & location of yard/site in which trees are located and specs.**

H. Plant Material Sources: The CONTRACTOR shall provide the Landscape ARCHITECT, **within 20 days** of the award of contract to the Construction Manager, the source(s) of all plant material. Provide the Landscape ARCHITECT with the Nursery name, address, phone number, e-mail and full name of the nursery contact. If multiple sources are required, the CONTRACTOR shall provide a organized list that shall include which specific plant quantities by species are to be provided by each supplier. The CONTRACTOR shall provide the Landscape ARCHITECT with documentation from the nursery indicating that the plant materials have been secured by the CONTRACTOR, and set aside for this specific project. Trees 24" box size and larger shall be individually tagged in the nursery as sold and set aside for this specific project. The CONTRACTOR shall provide nursery documentation that shall provide plant material specifications which include:
   1) Trees; current box or container size, trunk caliper, trunk height, overall height and head diameter
   2) Shrubs; current container size, overall height and width.
   3) For sod; planting date and anticipated age at harvest and anticipated field locations
   4) Specific address and directions to each and every yard, field and block location within the nursery where the plants may be inspected.

I. State of California Agricultural Inspection Tags: The CONTRACTOR shall provide the IOR, for later review by the Landscape ARCHITECT, with legible and chronologically ordered copies of all plant material inspections. Both at the source nursery and point of delivery. The tags shall be specific to itemized delivery sheets verifying that the plant material has been inspected by the County Ag inspector at the point of origin and delivery site and are free from all restricted pests and pathogens including but not limited to: Mediterranean fruit fly, glassy wing sharpshooter, sudden oak decline and fire ants.

J. Pest Control Advisor & Pest Control Applicator:

Within 20 days of the award of Contract the CONTRACTOR shall provide the Landscape ARCHITECT and DISTRICT with:

1. Pest Control Applicator: The name and copy of the license of the individual who will be the responsible Pest Control Applicator for the CONTRACTOR. This individual will be required to have an active license in good standing and the CONTRACTOR shall provide documentation that the individual is current with his/her State required CED units. This person will be required to personally supervise the mixing, application and clean up of all herbicides, pesticides, fungicides and fertilizers utilized on this site.

2. Pest Control Advisor: The name, resume and a copy of the license and provide documentation that the individual is current with his/her State required CED units of the Pest Control Advisor intended to make recommendations for turf weed control and incidental pest control related specifically to plant material. The Pest Control Advisor shall have current and ongoing experience with turf grass and ornamental plant material – Strictly Agriculture related Pest Control Advisors shall not be deamed qualified, with the exception of Advisors who specialize in Turf Grass and Plant Material Production as Agricultural crops.. The Landscape ARCHITECT and DISTRICT reserve the right to reject the Pest Control Advisor with or without cause and require a substitute.

1.05 DELIVERY SOURCE AND HANDLING

Deliver seed, amendments, herbicides, pesticides and fertilizer materials in original unopened containers, showing weight, analysis and name of manufacturers. Store in a dry, safe and secure location to prevent deterioration, vandalism or theft. **See 1.04A regarding delivery tags.**

1.06 QUALITY ASSURANCE

A. Inspections: The Landscape ARCHITECT and/or DISTRICT shall retain the right to inspect the plant material at any time within normal business days and hours prior to delivery to the site at the source nursery(s).

1. If requested by the Landscape ARCHITECT, the CONTRACTOR shall co-ordinate 1 or more on nursery site review(s) by the Landscape ARCHITECT and/or DISTRICT with a knowledgeable representative of the nursery.

2. The Landscape ARCHITECT may reject any plant material for any of the following, but not limited to, reasons: a) poor plant health, b) insect, wind or sun damage, c) weeds in containers, d) undersized/aged for container size, e) oversized/aged/root bound for container size, f) poorly formed structure which varies from individual species standards, g) scared or damaged trunks, h) deforming and/or poor pruning techniques i) weeds or pests in sod j) indication of prior water or insect stress.

3. Rejected Plant Material: If the Landscape ARCHITECT rejects any plant material, it is the CONTRACTORS responsibility to find suitable replacement material. Either at the same nursery or another. The CONTRACTOR shall provide the Landscape ARCHITECT with all the same submittal information required above **within 5 working days** of being notified by the Landscape ARCHITECT that material has been rejected. Replacement material shall be provided at no additional cost to the DISTRICT.

4. Tagged Material: The ARCHITECT retains the right **to remove and relocate tags** to different individual trees or blocks of shrubs within the same or similar blocks of saleable trees or shrubs of the same container size within the same nursery. This shall include the

right to tag trees and shrubs in different blocks and or locations owned by the same nursery. **The CONTRACTOR shall provide the trees and shrubs tagged by the Landscape ARCHITECT at no additional cost to the DISTRICT.**

B. Reviews: The CONTRACTOR shall specifically request **10 working days in advance** the following reviews prior to progressing with the work;

1. Plant material delivery: The contract shall allow **5% of the quantity of plants** for removal from their containers for review by the Landscape ARCHITECT, the CONTRACTOR shall provide sufficient labor to remove and replant reviewed plants. Suspected non-conforming plant material may be reviewed by a plant and/or pest specialist chosen by the Landscape ARCHITECT. Costs for plant and/or pest specialist conformance review shall be paid by the CONTRACTOR if any material is found in non-conformance. Should materials pass conformance review, plant specialist fees shall be paid by the DISTRICT. **Rejected material shall be replaced within 7 days and shall not be cause for contract time extensions.**

2. Plant material layout: Plant material locations shall be marked or plants located per plans prior to plant pit excavation for review and approval. If plant material is spotted on site in advance of planting the CONTRACTOR shall make provisions to adequately water the plants in their spotted position. Plants that are stress due to lack of water during spotting operations shall not be plant and shall be replaced as noted in this section. All material planted prior to review may be subject to rejection by the Landscape ARCHITECT and require relocation at no additional cost to the DISTRICT.

3. No site review by the Landscape ARCHITECT and/or DISTRICT'S representative shall commence without all items noted in previous site review reports being completed or remedied (unless compliance has been waived by the Landscape ARCHITECT or DISTRICT in advance). Failure to accomplish punch list items or prepare adequately for desired inspections shall make the CONTRACTOR responsible for reimbursing the DISTRICT for the Landscape ARCHITECT at his/her current billing rates per hour including transportation costs. No further inspections shall be scheduled until this charge has been paid or deducted by change order from the contract amount. No time extension on the contract will be allowed for these delays caused by the CONTRACTOR.

4. The CONTRACTOR shall provide their in house construction superintendent and foreman in charge of the project for all standard required meetings, all payment request meetings and all special meetings deemed necessary by the Landscape ARCHITECT or DISTRICT'S representative. The superintendent shall be capable of:
   a) Informing the Landscape ARCHITECT and DISTRICT'S representative of all pertinent information regarding the project, including schedules and deliveries,
   b) Shall have the authority to make binding decisions regarding the work in progress.
   c) Be able to read English sufficient to understand plans and specifications.
   d) All meetings are to be in English. The CONTRACTOR shall provide an interpreter, at the CONTRACTOR'S expense, to translate for his non-English or poor English speaking representatives.

5. Soil amendments shall be applied to planting areas during normal business hours at specified rates and inspected, approved, and **certified** by Kern High School **Inspector of Record (IOR) prior** to covering or tilling in. **Notify the Landscape ARCHITECT, IOR and Project Manager 10 days in advance.**

D. Establishment Period / Substantial Completion / Maintenance Period:

1. The Establishment Period shall be the period of time that the CONTRACTOR is activily working on the site and shall be maintaining any grading, irrigation and/or planting work

which he/she has performed. This shall include the maintenance of the irrigation system, turf, sod, trees and plants that have been installed.

2. Substantial Completion shall be when the CONTRACTOR has **completed approximately 98% + of work <u>in all specification sections</u>. The Landscape Architect will recommend substantial completion when less than 15 working days of work remain.**

3. **Maintenance Period - The CONTRACTOR shall continue working towards 100% completion, and all work required for 100% completion shall occur within 15 working days of receiving Substantial Completion approval. (See Non Performance, Penelties & Witholds section regarding revocation of Substantial completion approval)**

E Final Completion: Final completion shall occur at the completion of the Maintenance Period, after all check list items have been completed, reviewed and the project is 100% complete.

F Planting Area and Turf Grading Certification: Rough grading shall be completed per earthwork specifications section 02200 Earthwork. Rough grades shall be certified by the Surveryor, supplied by the Construction Manager, prior to landscape work being performed. **Initiation of work indicates acceptance of the rough grading by the Landscape CONTRACTOR**. At the completion of landscaping soil amendments, the rough grades shall be certified by Landscape CONTRACTOR. The rough grades must be per the Grading Plan.

G Sports Field Grading Certification: Sports Field rough and fine grading shall be completed per earthwork specifications section 02210 Grading and Soil Preparation for Sports Fields section . Sports Field rough and fine grades shall be certified by a licensed surveyor, supplied by the Construction Manager. Initiation of work indicates acceptance of the rough and fine grading by the Landscape CONTRACTOR. At the completion of irrigation trench backfill and compaction, and prior to seed planting or sod installation the grades shall be re-certified by a licensed surveyor for the Landscape CONTRACTOR. The fine grades must be per the Grading Plan and approved by the DISTRICT.

H. Maintenance Reviews: The CONTRACTOR shall request Maintenance reviews by the Landscape ARCHITECT and DISTRICT

1. For Turf the first shall be after **20 days after seeding or 10 days after sod installation** of turf areas.

2. Every 30 days there after.

3. Or on an as needed basis as determined by the Landscape ARCHITECT, ARCHITECT, DISTRICT, IOR, or Construction Manager.

4. The CONTRACTOR shall have the site in a relatively weed free condition prior to each site review. If significant weed germination or intrusion and/or other pests are noted by the Landscape ARCHITECT and/or DISTRICT they may require the CONTRACTOR to retain the services of the previously approved Licensed Pest Control Advisor to make immediate recommendations for the method and means of removal and destruction of weeds and/or pests. The Pest Control Advisor shall provide the Landscape ARCHITECT, DISTRICT and CONTRACTOR with written recommendations for treatment **within 48 hrs**. The CONTRACTOR shall fully implement the recommendations within the immediate following 72 hrs. **A maximum of 5 working days** shall pass from time of notice by the Landscape ARCHITECT and/or DISTRICT and complete correction/completion/remedy of the treatment and/or removal of weed or

pest intrusion. **SEE PENELTIES AND WITHHOLD SECTION RESULTING FROM THE CONTRACTOR FAILURE TO PERFORM .**

1.07 NON PERFORMANCE PENELTIES & WITHOLDS

A. **Failure to Provided Specified Representatives:** The CONTRACTOR shall be responsible for reimbursing the DISTRICT for the Landscape ARCHITECTs time, travel and materials (at their current billing rate on the date of the CONTRACTORs Failure) should the CONTRACTOR fail to provide the required Supervisor authorized to make binding decisions and the foreman responsible for the work at the required and/or scheduled Reviews or Meetings. Additionally, the CONTRACTOR shall reimburse the DISTRICT for the expense of the Landscape ARCHITECT should the CONTRACTOR fail to provide an interpreter for his/her non or poor English speaking Representatives. The DISTRICT shall deduct the Landscape ARCHITECTs expenses from the next payment request. The CONTRACTOR shall not be reimbursed these expenses.

B. **Failure to Provide Timely Submittals at Required Intervals:** Should the CONTRACTOR Fail to provide required submittals within the required time frame the DISTRICT shall withhold 5% of the net receivable due the CONTRACTOR on the next payment request submitted by the CONTRACTOR. An additional 5% shall be withheld from the net receivable for each subsequent payment period until the required submittals are received. The withholds shall be in addition to the required retention. **Withholds shall be released at the next payment application, after complete submittals have been received by the ARCHITECT .** Should the CONTRACTOR fail to provide required submittals the CONTRACTOR is subject to termination and all other remedies listed in the General Conditions.

C. **Failure to Achieve 100% Completion within 15 days after 95% Completion:** The CONTRACTOR is required to continue working until the project is 100% complete. After 95% completion approval has been achieved the CONTRACTOR shall have 15 working days to reach 100% completion. If the CONTRACTOR fails to complete the final 5% of work (unless otherwise waived in writing by the DISTRICT) the 95% completion approval and commencement of the maintenance/establishment period shall be revoked. **The CONTRACTORs maintenance/establishment period shall than begin only after 100% completion has been achieved.** Should this extend the project time beyond the liquidated damages deadline the CONTRACTOR shall be responsible for Liquidated Damages per the General Conditions.

D. **Failure to Apply Pre-Emigrants, Post-Emigrants or other means of Weed Control to Maintain Weed Free Planter Beds:** The CONTRACTOR is required to maintain the site in a relatively weed free condition on a weekly basis. Should the CONTRACTOR fail to maintain the Planter Beds in a relatively weed free status and/or completely follow the recommendations of the Pest Control Advisor on a weekly basis, the DISTRICT shall withhold 25% or $10,000.00 (whichever is greater) of the net receivable due the CONTRACTOR on any outstanding monies due. An additional 5% or $2,500.00 (whichever is greater) shall be withheld from the net receivable for each subsequent payment period until the required weeding or pest management treatment has been achieved. The withholds shall be in addition to the required retention. **Withholds shall be released at the next payment application**, **after successful and approved weed control**. Withholds for Planters and Turf are independent of each other and may be enforced concurrently and simultaneously. Should the CONTRACTOR fail to provide the required work the CONTRACTOR is subject to termination and all other remedies listed in the General Conditions.

E. **Failure to Provide Constant and Timely Weed Control in Turf:** The CONTRACTOR is required to maintain the site in a relatively weed free condition on a weekly basis. Should the

CONTRACTOR fail to maintain the Turf Plantings in a relatively weed free status and/or completely follow the recommendations of the Pest Control Advisor on a weekly basis, the DISTRICT shall withhold 25% or $10,000.00 (whichever is greater) of the net receivable due the CONTRACTOR on any outstanding monies due. An additional 5% or $2,500.00 (whichever is greater) shall be withheld from the net receivable for each subsequent payment period until the required weeding or pest management treatment has been achieved. The withholds shall be in addition to the required retention. Withholds shall be paid at the end of the project with the final retention. Withholds for Planters and Turf are independent of each other and may be enforced concurrently and simultaneously. Should the CONTRACTOR fail to provide the required work the CONTRACTOR is subject to termination and all other remedies listed in the General Conditions.

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

A. Grade: Quality and size shall conform to the American Standard for Nursery Stock, No. 1 grade. **Plant material shall be provided by nursery(s) liscened to produce and/or sell plant material in the State of California.**

B. Unacceptable Material: All plant material overgrown and root bound, too recently canned with insufficient roots, or damaged root balls, diseased, unhealthy, **having noxious weeds in the container**, or badly shaped are considered unacceptable and shall be removed from the site.

C. Inspection and Substitutions: Plants shall be the varieties and sizes shown on the plan. At least one plant of every 10 (10%) of each variety delivered shall be identified with nursery tag, **from the originating nursery** showing complete botanical name, common name clearly stating the species and cultivar. In the case of similar looking species (ie: Raphiolepis 'Ballarina' vs. Raphiolepis 'Springtime') the plants shall have a minimum of 25% identified with a nursery tag or shall be delivered on a separate delivery and kept separated in the on site holding area. Tags shall remain on the plants until the after Substantial Completion is approved. A maximum of **30 days after the award of contract** to the CONTRACTOR and **at minimum of at least 365 days (1 year) prior** to commencement of planting, the CONTRACTOR shall, in writing, inform the Landscape ARCHITECT of all requested plant material substitutions. Local unavailability shall not be an acceptable cause for substitution. Approval or disapproval shall be at the sole discretion of the Landscape ARCHITECT. The Landscape ARCHITECT shall **retain the right to** inspect and approve or reject plant material prior to installation.

D. Plant Acclimatization: All plants shall be nursery grown under climatic conditions similar to this project site in Kern County. **Plants grown within 50 miles of the California coast shall require specific verification and approval by the Landscape Architect prior to delivery between the months of June and September.**

E. Delivery, Care and Storage of Plants: CONTRACTOR shall adequately protect all plants delivered to the site including but not limited to:

1. Damage from sun, frost, wind, **and reflected light and heat from paving & building walls** before planting.

2. CONTRACTOR shall provide care similar to that in which the plants were grown under, including, but not limited to:
   a) **Daily watering including weekends and holidays**.

b) **Daily Watering shall thoroughly soak the root balls.**
c) Lack of proper watering causing dehydration stress, indicated by withered, burned or white salt rimmed leaves or shriveled bark and stems; shall be cause for rejection of plant material on site, even if previously inspected, approved, delivered, spotted and/or planted.
d) Rejected plant material shall be replaced within 7 days at no additional cost to the DISTRICT and shall not be cause for contract time extensions.

3. Plants shall not be stored on concrete or asphalt surfaces when the temperature is expected to exceed 75 degrees.

4. Plants shall not be stored within 50 feet of south or west facing walls when temperatures exceed 75 degrees.

5. During spring, summer and fall, plants shall be watered immediately, **within 1 hour** of delivery.

2.02 SOIL AMENDMENTS

A. Fertilizers, Amendments & Innoculants:
1. Site Planting Plant Pit Backfill (Except Raised Planters & Tree Wells)
a) Add slow release fertilizer tablets – 21 grams – Osmocote 180 day formula or approved equal.

1 GAL.	1	24" BOX	8
5 GAL.	3	36" BOX	12
15 GAL.	5	48" BOX	16

b) Add Muratic Acid (65%) granular – Evenly blended into backfill at the following rates:

1 Gal.	¼ cup	24” Box	1 cup
5 Gal.	½ cup	36” Box	2 cups
15 Gal.	¾ cup	48” Box	3 cups

Hydra-Hume DG – available from
Superior Soil Supplements
10367 Houston Ave.
Hanford, Ca. 93230
559 584-7695

c) Mycorrhizal Inoculants — Sprayed onto rootball & backfill soil per

Endo/Ecto Soluble – available from
BioBurst ‘n Grow
956 South 500 West
Vernal, Utah 84078
1 (888) 208-9706

Manufactures recommendations
1 lb. per 200 gal. of water – 200 gals will apply to 400 - 1 gal. plants or 200 200 - 5 gal.; or 100 – 15 gal. ; or 50 - 24” Boxes; or 30 – 36” Boxes or 20 - 48” Boxes

2. Amendments to incorporate during tilling for all turf and planting areas.

a. Soil Sulfer:	25 lbs./1000 sq. ft. (174 lbs./acre)
b. Potassium Sulfate:	9 lbs./1000 sq. ft. (392 lbs./acre)
c. Zinc Sulfate (35%):	.6 lbs./1000 sq. ft. (25 lbs./acre)
d. Ferric Sulfate (25%):	.6 lbs./1000 sq. ft. (25 lbs./acre)
e. 98% Ultra Fine Grind Gypsum: or Prilled 100% Gypsum	250 lbs./1000 sq. ft. (5.5 tons/acre)
f. Muratic Acid (65%) Grandular Hydra-Hume DG – available from	4 lbs./1000 sq. ft. (200 lbs/acre)

Superior Soil Supplements
10367 Houston Ave.
Hanford, Ca. 93230
559 584-7695

g. Mycorrhizal Inoculants .5 lbs/1000 sq.ft (20 lbs./acre)
Endo/Ecto Granular – available from
BioBurst 'n Grow
956 South 500 West
Vernal, Utah 84078 1 (888) 208-9706

3. Pre-Planting – Turf: Just prior to planting, hydrostolen application, seeding or Sodding the following are to be to be uniformly applied as a top dress on finished grade (intended to make contact at root emergance) immediately prior to hydrostolen, seed or sod application/installation.
   a. Mycorrhizal Inoculants .25 lbs/1000 sq.ft (10 lbs./acre)
   Endo/Ecto Granular – available from
   BioBurst 'n Grow
   956 South 500 West
   Vernal, Utah 84078
   1 (888) 208-9706

   b. Muratic Acid (65%) Grandular 4 lbs./1000 sq. ft. (200 lbs/acre)
   Hydra-Hume DG – available from
   Superior Soil Supplements
   10367 Houston Ave.
   Hanford, Ca. 93230
   559 584-7695

   c. Iron Sulfate 10 lbs./ acre

4. Pre-Planting Trees – Planting Pit Preparation: After excavation of the tree planting pit (specified elsewhere in this section) evenly spread the following amendments on the bottom of the plant pit. The contractor shall calibrate the quantiy of full shovels will be required to apply the proper volume to each pit. Rootballs may rest directly on the material.
   a. 100% Prilled or 98% Ultra Fine Gypsum 3 lbs. per 15 gal. Tree
   5 lbs per 24" Box Tree
   7 lbs. per 30" - 36" Box Tree
   15 lbs. per 42" – 48" Box Tree

5. Pre-Planting Raised Planters & Tree Wells – Pre Soil Backfill Preparation: After over excavation of the planters and/or tree wells and before placement of blended backfill material (specified elsewhere in this section) evenly spread the following amendments on the bottom of the excavated areas. The contractor shall calibrate the quantiy of full shovels will be required to apply the proper volume to each pit.
   a. For Tree Wells
   100% Prilled or 98% Ultra Fine Gypsum 3 lbs. per 15 gal. Tree
   5 lbs per 24" Box Tree
   7 lbs. per 30" - 36" Box Tree
   15 lbs. per 42" – 48" Box Tree
   b. For Planters
   100% Prilled or 98% Ultra Fine Gypsum 250 lbs./ 1000 sq.ft
   (25 lbs./ 100 sq.ft.)

6. Post-planting for all turf areas. Applied during Maintenance period 30 days after Planting or germination. Other fertilizers may be required based on soils report and Landscape ARCHITECTS recommendations.
    a. Sulfate of Ammonia: 2 lbs./1000 sq. ft. (100 lbs./acre)
    b. Muratic Acid (70%) Grandular 2 lbs./1000 sq. ft.(100 lbs./acre)
    Hydra Hume DG. – Greens Grade
    c. 100% Prilled or 98% Ultra Fine Gypsum 50 lbs./1000 sq. ft. (1.2 tons/acre)

7. Post-planting for all trees:
    a. 14-7-14 granular fertilizer: Evenly spread over rootball area.
    b. Muratic Acid (70%) Grandular
    Hydra Hume DG. – Greens Grade ¼ cup per 15 gal. Tree
    ½ cup per 24" Box Tree
    ¾ cup per 36" Box Tree
    1 cup per 48" Box Tree

8. Post-planting for all shrub planting and ground cover areas: Other fertilizers may be required based on soils report and Landscape ARCHITECTS recommendations.
    a. 12-12-6 granular fertilizer: 10lbs./1000 sq. ft.
    b. Muratic Acid (70%) Grandular 2 lbs./1000 sq. ft. (100 lbs./acre)

B. Organic Amendments:

1. Ground cover areas: humus to be tilled in at 3 cubic yards/1000 sq.ft. (1 inch layer).

2.03 TURF SEED – Not Used

2.04 TURF HYDRO STOLEN – Not Used

2.05 TURF SOD – MAIN CAMPUS (within Fire Lane & select parking lot planters)

A. Pre Purchased Sod: - Not Used

B GN – 1 or CT-3 Propagated Hybrid Bermuda grass sod shall be delivered and installed within 24 hours of harvest anytime of the year, unless approval is given for a specific preservation technique. Sod not installed within this period shall be inspected and approved by the Landscape ARCHITECT and/or IOR or his representative prior to its installation to determine viability and suitability for installation.

C. Sod strength shall be such that the sod rolls or slabs may be handled, lifted and moved without substantial breaking or tearing. **Sod grown with synthetic netting is specifically prohibited.**

D. Substitution shall not be permitted.

E. The sod shall be freshly harvested grown from high quality propagated material on Methyl Bromide fumigated soil (or approved equal) with appropriate State and Federal regulatory agency approved pesticides and herbicides for control of diseases, insects, and weeds. Sod shall meet or exceed the standards of the " State of California Regulations for Nursery Inspection ". Sod shall be weed and fungus free at delivery.

G. Weekly Fertilizer & Amendments to be Injected via the Irrigation System during Establishment & Maintenance Period:

1. 8-8-8	½ ton per acre during anticipated 4 month period
2. Zinc	60 gals. Per acre during anticipated 4 month period
3. Humic Acid	50 gals. Per acre during anticipated 4 month period

Available from: Britz Fertilizer
Bakersfield, Ca.
661 343-1121

2.06 MISCELLANEOUS MATERIALS

A. Herbicides:

1. Pre-Emergent: Shall be Ron Star or approved equal and shall be applied per manufacturer's recommendations. Conform to all national, state, county, city and DISTRICT application and reporting requirements.

2. Post-Emergent – Shrub Beds: Shall be Roundup or approved equal and shall be applied per manufacturer's recommendations. Conform to all national, state, county city reporting and application requirements.

3. Post-Emergent – Turf: Shall be as recommended by a licensed Pest Control Advisor on an as needed basis when directed by the Landscape ARCHITECT and/or DISTRICT.

B. Deep Root Planters: 24" Vespro Root Guide & Barrier – Extruded Polyethylene Panels
Availabe Vespro (800) 554-0914 www.veproinc.com

C. VIT Twist Brace per detail.

D. Arbor tree guards per detail, for all trees in turf areas.

E. Mulch top dressing: Gorrilla Hair shredded cedar bark, ¾ inches – 3 - 4 ± inches in size, uniform color, clean and free of impurities.

F. Gravel ¾" – 1" free of weeds and debris (used to backfill over excavated plant pits)

G. Decomposed Granite or Rock Dust – Tan Color – For Mulch Top Dress in selected Tree Wells in Student Parking Lot.

2.07 PLANTER & TREE WELL SOIL

Harvest and Blending of Planter & Tree Well Soil:

A. The Contractor shall harvest planter and tree well backfill soil at the site directed by the district and approved by the Landscape Architect.

B. In an approved location, pre blend the soil with the required amendments. Blend and mixing may be accomplished via loader/tractor or tubble mixer (contractors option).

C. In case of accidental fluid emission (ie: oil, fuel, hydrolic fluids) from the mixing loader/tractor, all affect soil and amendments shall be legally removed and disposed of off site.

D. Provide sufficient water during the blending/mixing operation to reduce dust emissions. Pre & Post stockpiles of soil and amendments shall be protected from potential dust emission.

E. Blending shall continue until the entire volume is thouroughly mixed and amendments are evenly distributed.

F. Document and certify that the proper amendments are used by volume of soil for each batch. Each batch and documentation shall be review and approved by the IOR prior to use.

2.08 IMPORT SAND

A. Plaster Sand: To be used to sand low spots or minimal trench settlement in turf and sod Plantings. Sand shall be weed and dirt free. Provide representative submittal sample for approval prior to purchase and delivery per 1.04 Submittals Requirements.

B. River Sand / Fill Sand: Shall be used for palm tree plant pit backfill. Sand shall be debris free. Provide representative submittal sample for approval prior to purchase and delivery per 1.04 Submittal Requirements.

PART 3 - EXECUTION

3.01 COMBINATION OF MATERIALS

A. Mixing Soil Amendments: All soil amendment materials for plant pit backfill shall be thoroughly mixed prior to backfilling. Methods of backfill mixing shall be approved by the Landscape ARCHITECT prior to planting. Mixing in hole shall not be allowed. See 2.07 above for instruction for blending harvested topsoil.

B. Mixing Herbicides & Pesticides: All Herbicides and Pesticides shall be mixed in strict accordance with State of California standards and shall be performed by individual(s) trained in the safe and legal handling of these materials. All on site mixing shall be performed under the supervision and direction of a Licensed Pest Applicator or Pest Advisor.

C. Mixing of Mycorrhizal: Inoculants may be mixed with water per manufacture recommendations for spray application to plant roots during planting operations.

3.02 ROUGH GRADE (Except Sports Fields)

A. Rough Grade: Shall be arranged by the Construction Manager. Grading Contractor shall cut and fill site to within + .1 to .2 feet (plus one to two tenths of a foot) of finished grade. **Do not over cut site**. Cutting and filling may be accomplished with paddlewheels, scrapers, loaders and transfers as needed. Contractor shall confirm that the soil contains sufficient moisture to allow grading operations to occur smoothly. Apply water as needed via water truck or other means as needed to provide sufficient moisture to work the soil and minimize dust during grading operations. **Dust shall not be allowed to drift onto adjacent properties.**

B. Grades shall conform to lines and elevations set by the Surveryor, provided by the Construction Manager. The Surveyor shall certify that the grades and lines provided by the Grading Contractor conform to the intent of the plans and specifications and are within the allowed tolerances.

C. Acceptance of Rough Grade: : The CONTRACTOR shall verify that grades are within 0.1 foot of finished grades before performing, soil preparation, irrigation, planting and finished grading. The Landscape Contractor shall review the rough grades prior to commencing any work. Commencment of work by the Landscape Contractor shall indicate acceptance of the

grades and work conditions. (See 1.03 Quality Control Paragraphs B. Verification of Job Conditions: & C. Obstruction To Planting Operations: above.)

3.03 SOIL PREPARATION (Except Sports Fields)

A. Weeds: All areas to be planted shall be cleared of all weeds and debris prior to soil preparation and finish grading. Common Bermuda Grass, Johnson Grass, Nutgrass and purple or white nutsedge shall be chemically killed with post emergent herbicides (Round Up or approved equal) prior to planting. Clear and dispose of weeds and debris legally off-site.

B. Construction Debris Removal: It is not the intent of this Landscape Planting Specification to include Construction Debris Removal. Construction debris removal is the responsibility of others, with the exception of debris generated directly by the Landscape Contractor during the course of work within his/her contract. **See 1.03 Quality Control – C. Obstructions to Planting Operations above.**

C. Contaminated Soil: Do not perform any soil preparation work in areas where soil is contaminated with cement, plaster, paint, thinners or other construction substances. Notify CONTRACTOR'S Superintendent and ARCHITECT to arrange for clean up. The Construction Manager shall be responsible for removal of these materials and contaminated soil. Contaminated soils shall be removed to a depth of 6" below the lowest discernable depth of contamination or 18 inches, which ever is greater.

D. Gypsum, Soil Sulfur, Humus, Fertilizer and Amendments Application: Prilled Gypsum (or 98% Ultra fine grind), Soil sulfur and other amendments, noted above in the Materials Section shall be applied to turf & shrub planting areas during normal business hours at specified rates and inspected, approved, and certified by Kern High School IOR prior to tilling in. Application shall be accomplished immediately before discing, within 24 – 48 hrs of discing and tilling. Prevent amendment dust from drifting onto adjacent properties.

E. Cultivation – Turf & Shrub Planting Areas: Prior to Cultivation review with the Landscape ARCHITECT any~~d~~ anticipated modification to tilling depths in specific locations due to utilities or other obstructions. Cultivation as used in this specification section shall mean to rip and till the soil to **a minimum of 12 inches deep** after ~~prior to~~ applying soil amendments. Ripping and tilling shall produce a uniform, well mixed, loose, friable planting soil to a depth of a minimum of 12 inches. This should be done in all at-grade planting areas and to within 2 feet of buildings utilizing equipment capable of producing the required results. In remaining areas, use a rear tine tiller or hand till. Remove and dispose of debris, rocks or clods which will not break. Confirm that the soil has sufficient moisture content to blend well and minimize dust. Apply water as needed via water truck or other means as needed to provide sufficient moisture to work the soil and minimize dust during discing operations. **Dust shall not be allowed to drift onto adjacent properties.**

B. Planters and Tree Wells Surrounded by Paving (including parking lot Planters and Tree Wells and Administration Building Front Entry Planter):

1. CONTRACTOR shall excavate to a **depth of 3 to 5 feet, as necessary to break through the layer of 95% ± compaction** below surrounding finished grade (ground level). The Contractor shall excavate through the compaction layer to loose friable native soil. Confirm with the IOR on each Planter and Tree Well that the compaction layer has been penetrated. Document the planters and tree wells that have passed inspection on a site plan which is permenantly stored at the Construction Mangers trailer, the CONTRACTOR shall have the IOR intial and date the planters and pits which have been approved.

2. Scarify the soil side walls of the excavated pit. Loosen all side walls to eliminate lateral compaction which may occur during excavation.

3. After excavation, apply, the above specified, gypsum to the bottom of each excavated pit. Dash excavation side walls with gypsum as well.

4. Leaching: After application of gypsum to the sides and floor of the excavation, fill the excavation with a minimum of 24" (2') of water. Allow the water to naturally drain through the soil. If water does not drain out in 48 hours, CONTRACTOR shall auger a 4 inch by 3 foot hole in bottom of each tree well as well as each affected planter at the rate of 1 hole per in the approximate center of each 10' x 10' (100 sq. ft.) or portion thereof of planter area. Fill the augered hole with blended backfill soil. After augering and filling, Retest sample holes selected by the Landscape ARCHITECT by filling with 12" of water. If water does not drain within an 24 hour period, immediately notify the Landscape ARCHITECT. Do not plant until the Landscape ARCHITECT has made recommendations for modifications.

5. Backfill: After leaching, use blended and amended backfill per this section. Place the amended backfill mixture in layers not exceeding 8 inch uncompacted thickness. Compact each layer by thorough saturation with water to minimize future settlement. Recompaction shall not exceed 85%.

3.04 FINISH GRADING (Except Sports Fields)

A. Work by Others: Grades shall be established under work of other Sections to within 0.1 foot of required finish grades. See Civil Engineer Plans and related specification sections.

B. Verify Existing Grades**: The CONTRACTOR shall verify that grades are within 0.1 foot of finished grades before performing irrigation, soil preparation, planting and finished grading.** Positive drainage to catch basins and away from buildings shall be confirmed. The Landscape CONTRACTOR shall not fine grade or plant any landscape areas that does not meet this specification and shall bring these areas to the attention of the Construct Manager, IOR and ARCHITECT. The Construction Manager shall be responsible for correcting rough grades of any planted areas that are not within 0.1 foot of finished grades or that do not provide positive drainage away from buildings and walkways towards drains or those that have not been accepted by the ARCHITECT as an exception to this requirement.

C. Contractor shall perform fine grading of turf areas immediately prior to seeding/planting. Fine grading of shrub planting areas shall be completed after trees and shrubs have been planted. Spread excess plant pit excavated soils as needed on site to provide a uniform finished grade. Remove excess soil and dispose of on site as needed to complete site grading.

D. Clod and Rock Removal: Remove all clods or rocks over 1 inch in diameter during fine grading operations.

E. Conformance To Site Grading Plan: Finish grades shall conform to the site grading plan. The finish grades of all lawn areas shall be 1-1/2 inch below sidewalk or curb grades and 2 inches below sidewalk or curb grades at shrub areas after soil preparation. All planting areas shall have positive drainage away from buildings for a minimum distance of 5 feet, and at a minimum grade of 2 percent.

F. Finish Grading Approval: The Construction Manager shall confirm that the grades are per the Civil Engineers plans, drawings and specifications prior to commencement of landscape work. ARCHITECT and Landscape Architect shall observe the final grades for conformance

to the design intent communicated on the drawings and give approval prior to any soil preparation and planting operations. Grades shall be uniform and smooth.

C. Raised Planters: Finish grades of raised planters after backfilling shall be 4 inches below top surface of planter wall.

I. Root Barriers: Install Deep Root Planters along walkways, curbs and walls where trees are closer than 8 feet to walkways, curbs and walls. (See Detail) Install per manufacturer's recommendations.

3.05 TREE AND SHRUB PLANTING

A. General: Do not plant site until irrigation system is fully operative from the irrigation controllers with permanent power and approved by the Landscape ARCHITECT (unless otherwised approved in writing).

B. Leaching: After application of soil amendments and installation of the irrigation system and prior to planting the Contractor shall leach all areas to be planted. Utilizing the irrigation system the Contractor shall apply the equivilant of 3 acre feet of water over the entire site. The soil shall be wetted to a minimum depth of 3'. The contractor shall adjust the irrigation system to apply water through a series of multiple start and stop times. The water shall be applied in a continuous manner, via multiple cycles, such a continuous column of water moves through the soil profile. The Contractor shall closely monitor the irrigation system to insure that water runoff does not occur by matching the irrigation application rates to the soil water infiltration rate. Leaching may occur in phases or by irrigation zones as they are completed. Maintain a record drawing of the areas leached and dates completed. This record shall be stored in the General Contractors trailer at all times and confirmed and intialed by the IOR as each area is completed.

C. Location: Locate trees and shrubs in the field as shown on the plans. The Landscape ARCHITECT reserves the right to approve, **revise and/or modify** the locations of trees and shrubs prior to planting unless waived in writing. Any alterations to locations shown on the plan, **made by the CONTRACTOR**, must be approved by the Landscape ARCHITECT. Do not plant trees over water or sewer mains.

D. Planting Holes: Excavate holes of with vertical sides, per the planting details. Holes shall be per details and not over dug. Scarify sides of hole. Apply gypsum to tree planting pits as noted above. CONTRACTOR shall test to determine if water will drain out in an 8 hour period. If water does not drain out in that time, CONTRACTOR shall auger a 4 inch by 3 foot hole in bottom of the planting hole and fill with native soil. Retest sample holes selected by the Landscape ARCHITECT after augering by filling with water. If water does not drain within an 8 hour period immediately notify the Landscape ARCHITECT. Do not plant until the Landscape ARCHITECT has made recommendations for modifications.

E. Impervious Soils: Where impervious soils are encountered in excavating planting holes, notify the Landscape ARCHITECT at once before continuing work. Do not plant until authorized in writing by the ARCHITECT.

F. Placement, Planting Backfill and Staking of Plants:

1. Cans and boxes shall be removed carefully to avoid damaging the root ball.

2. Plant holes shall be per details and not over-excavated. Holes shall be dug to the height of the root ball in its container, less 1 inches to 4 inches. (Allow for rootball settlement & compression when planting) Over-excavated holes shall be cleared of all loose soil and backfilled with clean ¾ - 1 inch diameter gravel as necessary to raise the elevation of the plant to the correct grade. One (1) inch of backfill top soil shall be placed on top of the gravel such that the elevation of the plant is 1-1/2 inches above finished grade (minimum) and 3 inches maximum.

3. Set shrubs and trees upright in the center of holes so that the top of root ball is 1" to 1 ½" (one & one half inches) higher than anticipated finished grade.

4. Backfill with native topsoil mixed with amendments noted above in the Materials Section above.

5. Backfill shall feather over the top of the root ball. (Do not leave exposed roots) A maximum of ½" of backfill soil shall cover the top of the rootball and be in contact with the primary plant trunk(s). If more than ½" of soil is in contact with the trunk(s) above the original soil/air interface it shall be removed immediately.

6. If the plant settles such that the stem is covered by greater than ½" the plant shall be removed, the plant pit reexcavated removing all backfill until undisturbed native soil is encountered, gravel shall be placed in the bottom of the pit on native soil to raise the bottom of the plant pit to the required elevation. If the plant has not been damaged by removal it may be replanted correctly. If the plant has been damage it is to be removed from the job site within 24 hours, and a exact variety of equal size and quality replacement shall be correctly planted within 15 working days by the CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

7. Plants with severe circling or crossing roots shall be rejected. Plants with slightly circling roots shall have the roots teased and/or cut and spread prior to planting. Review technique with Landscape ARCHITECT and I.O.R. prior to planting. Plants that have been planted and later found to have circling roots that have not been correctly cut and spread shall be removed and replaced by the **CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER. Replacement shall occur within 15 working days of discovery/notification.**

8. **Stake trees per details, the same day as planted** and prior to leaving site at completion of that days work. **Trees that are unstaked overnight will be tagged for removal and shall be replaced immediately.** Remove nursery stake and tape within 48 hours of the permant stake installation.

9. Prune plants only as directed by the Landscape ARCHITECT to correct damage or awkward forms. Do not remove lower branches on trees unless specificly approved by the Landscape Architect.

10. **DO NOT PLANT IN DRY SOIL.** All areas to be planted shall be pre watered to a depth 1' (one foot) below the largest rootball to be planted. Pre water the site, via the irrigation system, and plant into moist soil, after allowing the site to dry sufficiently to allow for planting operations to proceed with out compacting soil. Backfill soil premixed with required amendments specified above shall be moist. **BACKFILLING WITH DRY SOIL IS SPECIFICLY PROHIBITED**. Sufficient watering needs to have occurred such that the soil is moist at least 1' below and 18 inches in all horizontal directions from root balls.. Immediately apply water and flood plant pit during backfill operations. Planting and watering shall occur simultaneously. **If the IOR, Landscape Archtiect, Architect**

or District, Constuction Manager observe the planting in dry soil or with dry backfill or without simultaneously watering the CONTRACTOR SHALL BE REQUIRED TO IMMEDIATELY STOP PLANTING OPERATIONS UNTIL THE SITUATION IS CORRECTED. Plants that are determined to have been planted in dry conditions shall be tagged and documented by the IOR – any stress noted prior to final acceptance shall be cause to require the plants to be removed and replaced within 15 working days of notification at NO ADDITIONAL EXPENSE TO THE OWNER.

11. Large Tree Planting: For large box trees, 24" or larger, the situation may occur where the upper layers of soil are sufficiently moist BUT the lower levels are not. In this situation the contractor shall excavate the plant pit and amend with gypsum as noted above. Then the CONTRACTOR shall prewater the plant pit with sufficient water to drive moisture a minimum of 18" in all directions. Allow the water to drain prior to planting.

12. Water thoroughly after planting, multiple times the first day and multiple times during week if surrounding soil is dry. Insure that all voids have been filled and add backfill soil, **within 24 hours**, as needed to raise the level of soil settlement inside the planting hole.

13. Fine Grade after all plant pit voids have been filled. Fine Grades shall match the lines and grades established by the Surveyor and shall maintain positive drainage away from buildings and to drainage structures which was achieved and certified at Rough Grade.

3.06 HERBICIDE & MULCH APPLICATION

A. Herbicide Application:
   1. Shrub & Ground Cover Areas:
      a. **Apply Pre-emergent after planting of trees and shrubs and after trees and shrubs have been thoroughly watered in**. All soil settlement around plant holes shall have been filled and water jeted to eliminate translocation of pre-emergent via water into plant pits. Plants shall have received a minimum of 3 water soakings to eliminate all voids at plant pits. Fine grade shall be completed prior to application of pre-emergants. Plants that experience stunting from improper application shall be replaced immediately by the CONTRACTOR at no additional cost to the Owner.

      b. Take extreme care not to apply pre-emergent over top of moist foliage or into the crowns of strap leaf plants or any plant where the pre-emergent clings, gathers or is trapped by foliage or branches. Plants that experience foliage burn from application of pre-emergent to the foliage shall be replaced immediately by the CONTRACTOR at no additional cost to the OWNER.

      c. Backfill soil contaminated with herbicide shall be tested and treated with activated charcoal and other remedies recommended in the soils analysis (including removal and replacement with clean topsoil). Removed soil shall be legally disposed of off-site and replaced at no additional cost to OWNER. The CONTRACTOR SHALL PAY FOR ALL TESTING AND Lanscape Architects time to resolve soil contamination.

   2. Pre-Emergent Reapplications: The CONTRACTOR shall reapply pre-emergants to any areas that have been disturbed due to repair or renovation work or due to manual weeding. Pre emergent shall be applied immediately (within 24 Hours) of the completion of repair, renovation or weeding operations. If it is anticipated that a repair will require more than 1 week of exposure, the site shall be pre-emerged after the work is

completed, however the area of work shall be kept weed free via hand or mechanical removal – no weeds shall be allowed to mature and go to seed.

3. Post-Emergent Herbicide Application – Shrub Beds:
   a. DISTRICT and State Approved Contact Post-Emergent Herbicides shall be applied in a safe manor. The application of these Herbicides shall be performed by a trained individual under the direct and immediate supervision of a California Licensed Pest Applicator or Pest Advisor. Dead or dying weeds shall be manually removed within 7days of herbicide application.

   b. Nut sedge, Nutgrass, Bermuda Grass and Johnson grass shall be aggressively sprayed 3 x's weekly until completely dead.

B. Wood Mulch:

1. In planters, apply specified mulch (See 2.06.E), 2 inches deep, evenly spread over the entire area of shrub and planter areas.]

2. Mulch Top dress shall not be applied until after a minimum of 3 ~~2~~ soaking waterings of plants has occurred and the elimination of all voids at plant pits.

3. Fine grade around plants shall be completed and pre-emergant application prior to application of mulch.

4. Clean all walks and surfaces immediately after mulch has been applied.

5. Test the Irrigation system in all areas receiving mulch to insure that Irrigation heads are popping up above the mulch and nozzles have not be clogged by mulch particles.

6. Employ practices and methods necessary to reduce the emission of dust.

C. Rock Dus / DG:
1. Rock Dust shall be Tan in color and shall be placed in a 3" thick layer after wetting and tamping. Rock Dust shall be flush within adjacent paving.

2. Rock Dust shall be installed after planting and trees have had a minimum of 3 soaking waterings and the pre-emergant has been spread over the entire surface area intended to receive

3. After the Rock Dust has been placed and wet tamped apply a second coat of Pre-Emergant on the top surface.

3.07 SEED or HYDRO STOLON TURF

A. The ground surfaces shall be inspected by the Landscape ARCHITECT and DISTRICT prior to installation of the seed or stolons to determine suitability of grading and soil preparation for planting. The CONTRACTOR shall obtain such approval prior to seed or stolon installation.

B. Planting Surface: Cultivate and finish grade soil to establish a smooth, uniform, debris free surface prior to planting. Soil must be moist to a depth of 12 inches prior to planting. Do not apply seed or stolons until ground surface has been inspected and approved by the Landscape ARCHITECT. Immediately prior to applying seeds or stolons apply specificed Hydro Hume and Michrozal Innoculant. With prior approval and review the Michrozal Innoculant may be applied with the hydro seed or stolens.

C. Schedule: Seeding shall be timed to occur between April 15, 2010 or earlier if specifically directed by the District and September 2010. Application of sports field shall occur as soon as possible after grading and irrigation work is complete. A firm construction time line will be provided by the Construction Manager. The CONTRACTOR shall be required to perform the work based on the Construction Managers schedule.

D. Hydro Application: The application of material via a hydro seed machine.

1. Planting shall be by hydro seeding or hydro stolon.
2. Application of Fertilizers and Amendments noted for hydro seeding shall be applied.
3. Application of Fertilizers and Amendments noted for sod shall be applied vis Hydro application.

E. Equipment and Application: Hydraulic equipment used for the application for slurry shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend and homogeneously mix the seed/fiber or stolens in a slurry. Distribution lines shall be large enough to prevent stoppage and to provide even distribution of the slurry over the ground. The pump shall be capable of exerting sufficient pressure for proper coverage. The slurry tank shall be mounted on a traveling unit which will place the slurry tank and spray nozzles within sufficient proximity of the areas to be planted so as to provide uniform distribution without waste and shall be thoroughly clean and free of seed and/or stolon species that are not specified. The Specified Fertilizer and Amendments noted above shall be added to the mixture; followed by wood cellulose fiber. The wood cellulose fiber shall only be added to the mixture after the seed or stolons and fertilizers and amendments and when the tank is at least one-third filled with water. All the wood cellulose fiber shall be added by the time the tank is two-thirds to three-fourths full. Spraying shall commence when the tank is full. Care shall be taken that the equipment does not crack, break or damage existing and newly placed concrete paving, or leave depressions in the finished grade.

F. Mixing:
1. For lawns that are hyrdoseeded or hydrostolonized prepare slurry by mixing fiber, fertilizer, inoculants, seed or stolons and water in proportions specified on the plans or herein. The IOR must be present to inspect the amounts of materials being mixed and applied and shall reject any materials or work not conforming to the specifications. Mixing time of materials shall **not exceed 45 minutes** from the time the seed or stolons contact the water until the entire batch is discharged onto the earth.
2. For lawns that are to be sodded, apply the above noted fertilizers and amendments by mixing with water in suffiecient quantities to evenly apply to areas to receive sod. The IOR must be present to inspect the amounts of materials being mixed and applied and shall reject any materials or work not conforming to the specifications.

G. An organic tackifier is to be used per manufactures recommendations to reduce/eliminate seed/fiber/stolens from becoming airborne or releasing dust fines. Utilize sufficient tackifier to accommodate seasonal winds that are historically present at the time of hydroseeding.

H. Maintenance Until Maintenance/Establishment Period Begins and Until Final Acceptance:

1. Begin watering cycle within 3 hours of seed or stolon application and maintain in moist, but not saturated, condition. Apply water regularly, multiple start/stop times during the first 3 weeks to keep the site continuously moist, but not saturated. Water as needed (including multiple daily applications) to maintain adequate surface soil moisture for proper germination and rooting. Avoid excess run off.

1. Maintain lawn areas, including watering, spot weeding, mowing, sanding low and grading high spots, applications of herbicides, fungicides, insecticides, rodent control and reseeding until a full, uniform strand of grass free of weeds, undesirable grass species, disease and insects is achieved and accepted by the Landscape ARCHITECT, ARCHITECT and the DISTRICT to begin Establishment Period. CONTRACTOR shall notify the IOR and Construction Manager as well (if actively working on the site) the Plant Supervisor at the school site or the Maintenance and Operations Grounds Department for approval to apply pesticides.

2. Turf Mowing for Hydro Seeded Areas: An aggressive mowing regime shall be appled to all Hydroseeded areas. The intent is that the turf is to be mowed multiple times per week to encourage horizontal growth and rooting.

    a. The first mowing shall be when the grass reaches approximately 1 ½" ± in height And shall remove approximately 1/3 of the growth. Lowering the turf height to approximately 1" tall
    b. The second mowing shall be approximately 1 week later and shall again remove approximately 1/3 of the growth. Lowering the turf height to approximately ½" – 1/3" tall.
    c. The third mowing shall be approximately 5 days after the second mowing and shall remove any new growth over ½" tall.
    d. Subsequent mowings during moderate weather 70 degrees – 80 degrees shall be 2 times per week. During hotter weather 80 degrees plus the grass shall be mowed 3 times per week. Grass shall be maintened at a height of ½" – ¾" tall. A maximum of 1/3 of the total grass height shall be removed in any one (1) mowing. The grass shall not be allowed to reach ¾" – 1" tall.
    e. Confirm mowing schedule with the Landscape Architect.

4. The CONTRACTOR shall retain the services of a Licensed Pest Advisor, to be approved by the Landscape ARCHITECT, to recommend weed control measures for all seeded turf areas during he Maintenance Period.

5. Maintenance work includes all mowing, watering, weeding, sanding and regrading of depressions or high spots, re-seeding/stolonization, mulching, cultivating, spraying, rodent control and trimming necessary to bring the turf areas to healthy growing conditions, and any additional work needed to keep the areas neat, edged and attractive.

6. Any day the CONTRACTOR fails to adequately water, mow, replace unsuitable plants, weed, provide timely rodent control and other work determined to be necessary by the Landscape ARCHITECT, ARCHITECT, IOR or DISTRICT and/or sufficient maintenance is not provided, that time period shall **NOT** be credited as part of the Establishment Period.

7. Constant diligence shall be maintained to prevent the start of disease, insects, and/or rodent infestations and proper preventative or control measures shall be taken by the CONTRACTOR.

8. Fertilizer Injection during Establishment & Maintenance Period:
   Fertilize turf as noted above and thereafter, and every week during the months of May through October, until turf receives Final Acceptance by DISTRICT.
    a. The Contractor shall have installed a liquid fertilizer injection system provided by Britz Fertilizer Inc.

b. The Contractor shall provide a temporary 1" hose bib above ground connection immediately behind (down stream) from the master/sensor valve assembly. The connection for fertilizer injection shall be at this location.
c. The Contractor shall provide and/or make available 110 - 120 v. electrical power at the booster pump location for the temporary injection system.
d. The Contractor shall work with Britz Fertilizer Inc. to calibrate the fertilizer injection to match the run time for the irrigation system. The Contractor shall notify Britz Fertilizer inc. a minimum of 48 hours prior to changing the irrigation run time so that the fertilizer injection system may be recalibrated to match the new irrigation run time.
e. The Contractor shall be trained to operate the fertilizer injection system.
f. The Contractor shall turn the fertilizer injection system on 1 time per week starting after the 2nd mowing of any grass that has been installed. The fertilizer injection system shall operate through 1 entire watering cycle for the entire site (for any areas which have been planted) including any multiple start stop irrigation cycles intended to water the site within a single 24 hour day.
g. Fertilizer injection shall continue on a weekly basis until and including the week of Final Acceptance and the project is delivered to the Kern County High School District.
h. All Fertilizer Injection System materials and equipment shall be removed from the site just prior to anticipated dated of final acceptance.

9. 45 days after installation, CONTRACTOR shall assist the Landscape ARCHITECT obtain, in seeded areas, a soils sample, which the Landscape ARCHITECT shall send to a soils lab for analysis and recommendations for horticultural plant fertilizing. After being reviewed, approved or modified by the Landscape ARCHITECT, CONTRACTOR shall apply recommended amendments to all seed or stolon applied areas.

10. Any erosion, slippage or settlement of soil, caused by watering, shall be repaired immediately (within 5 working days of damage occurring) by the CONTRACTOR at his expense.

11 All walks, curbs, drainage structures and gutters shall be kept clear of debris, mud, dust, and standing water by sweeping, mopping, or hosing down as required to maintain cleanliness throughout.

12. If needed, to restrict traffic, pedestrian or vehicular, from crossing the newly planted turf areas, the CONTRACTOR shall provide a temporary barrier string line with color flags, or colored tape between new turf area and other existing areas until turf is established and is ready for use. Erect protective barrier around turf using 2 x ½ inch stakes 24 inches high and 15 feet apart with 2 strands of heavy twine and occasional white ribbon (or other approved method) for visibility. Verify locations with ARCHITECT.

13. Damage caused by other trades or vandalism shall be immediately documented and reported to the the IOR and Construction Manager. Immediately provide the Construction Manger with a estimate of the hours for labor, equipment and materials to repair the damage. The Construction Manager shall log and note the estimate. Repair minor damage (damage which will not affect drainage or Substantial Completion) within 5 – 10 working days. Major Damage (damage which immediately adversely affects drainage, plant material survival, and other improvements) shall be repaired within 1 – 3 working days. Provide the Construction Manager with a detailed list of hours for labor, equipment and materials used by the end of business every Friday for the work performed during each week to repair the damage.

14. Mow grass at multiple intervals weekly, or as required to maintain at a maximum height of 3/4 ". First mowing shall occur when grass is 1 inche high. Do not cut more than 1/3 of

grass blade at any one mowing. Neatly trim all turf edges and hand clip where necessary along walks and curbing. Immediately remove all clippings after mowing and trimming. CONTRACTOR shall be responsible for mowing until final acceptance.

15. Mowing Depressions**:** Do not mow turf when soil is saturated or wet. Turf areas shall be sufficiently firm, such that mowing equipment does not cause wheel depressions. If wheel depressions do occur the CONTRACTOR shall be responsible for sanding all depressions with clean, weed free, sand within 24hrs.

I. Acceptance of Seeded or Stolonized Turf: A proper stand of turf is defined as a minimum of 100 grass plants per square foot and where no gaps larger than 4 inches in diameter occur anywhere in the turf area. Turf shall be free of weeds, pests and disease and shall be in a healthy growing condition.

3.08 SODDING TURF

A. The ground surfaces shall be inspected by the Landscape ARCHITECT and DISTRICT prior to installation of the sod to determine suitability of grading and soil preparation for planting. The CONTRACTOR shall obtain such approval prior to sod installation. Soil shall not be dry during placement. Pre water the site sufficiently that the soil is moist to a depth of 12" minimum.

B. Lay sod as soon as possible after delivery to prevent deterioration. All sod must be installed within 8 - 10 hours of delivery to the site. Do not use any equipment that will leave depressions in the final grade greater than ¼" – 1/2'". If depressions occur during the delivery of sod they are to be repaired immediately with native soil or plaster sand as directed by the Landscape ARCHITECT or I.O.R. or their representative. No equipment shall be placed on the final grade that exceeds 2000 lbs.

C. Prior to laying sod top dress with recommended Hydo Hume and Michrozal innoculant at the rates specified in the Materials section above. Lay sod closely knit together with no open joints visible and pieces not overlapped. Lay smooth and flush with adjoining paving, curbing, or other sod strips.

D. Immediately water sodded areas during and after installation. A maximum of 1000 square feet shall be laid before surface water is applied. The CONTRACTOR shall provide sufficient hoses, nozzles and manpower prior to installation to continuously apply water to the surface of the sod by hose feed from the irrigation system, water truck or whatever means necessary until sufficient sod has been laid to allow the irrigation system to water each area. Sod shall not be allowed to dry our during installation. Graying or dusty color appearance of the grass blades will indicated that the grass plants are stressing and the sod shall be immediately watered. Should the IOR, District Representative, Construction Manager or Landscape Architect note that the sod is drying they shall have the authority to direct the CONTRACTOR to stop the sod laying operation until the situation has been remedied. The CONTRACTOR shall not receive any additional compenstation nor any time extension for delays, loss of material, or increased costs of any kind.

E. After sod has been laid and during the surface moisture application, roll sodded areas to insure a good bond between sod and soil and to remove minor depressions and irregularities. Insure rolling equipment weight to be approximately 150 lbs and of standard commercial width.

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F. After all the Sod has been applied and cleanup performed; immediately water the sod, in multiple sets, in sufficient amounts to saturate sod and upper 6 inches of soil.

G. Maintain sodded areas immediately after placement until 95 % completion is reached as determined by the Landscape ARCHITECT and the DISTRICT. This constitutes firm attachment to the soil by the sod and a vigorous growing condition.

H. Turf Mowing: An aggressive mowing regime shall be appled to all Turf areas. The intent is that the turf is to be mowed multiple times per week to encourage deep root growth and development.

f. The first mowing shall be when the sod reaches approximately 1" ± in height And shall remove approximately 1/3 of the growth. Lowering the turf height to approximately 3/4" tall
g. The second mowing shall be approximately 1 week later and shall again remove approximately 1/3 of the growth. Lowering the turf height to approximately ½" – 1/3" tall.
h. The third mowing shall be approximately 5 days after the second mowing and shall remove any new growth over ½" tall.
i. Subsequent mowings during moderate weather 70 degrees – 80 degrees shall be a minimum of 3 times per week. During hotter weather 80 degrees plus the grass shall be mowed a minimum of 5 times per week. Grass shall be maintened at a height of ½" – ¾" tall. A maximum of 1/3 of the total grass height shall be removed in any one (1) mowing. The grass shall not be allowed to reach ¾" – 1" tall.
j. Confirm mowing schedule with the Landscape Architect.

I. Water when required and in sufficient quantities to prevent grass and underlying soil from drying out. However monitor irrigation such that over watering does not occur. Irrigation zones shall be individually timed and sequenced to insure evan and adequate water application.

J. Roll when required to remove depressions or irregularities. Rolling shall be by use of a push, walk behind water filled roller. The roller shall not be filled beyond 50%. If this is insufficient to remove depressions or irregularities the voids shall be sanded and high points trimmed.

K. Control growth of weeds. When using herbicides, apply in accordance with manufacturer's recommendations. Remedy damage resulting from negligent or improper use of herbicides.

L. Immediately repair or replace any areas which show deterioration or bare spots. Bare spots shall be resodded within 5 days of appearance.

M. Protect sodded areas. If needed, to restrict traffic, pedestrian or vehicular, from crossing the newly planted turf areas, the CONTRACTOR shall provide a temporary barrier string line with color flags, or colored tape between new turf area and other existing areas until turf is established and is ready for use. Erect protective barrier around turf using 2 x ½ inch stakes 24 inches high and 15 feet apart with 2 strands of heavy twine and occasional white ribbon (or other approved method) for visibility. Verify locations with ARCHITECT.

N. Damage caused by other trades or vandalism shall be immediately documented and reported to the the IOR and Construction Manager. Immediately provide the Construction Manger with a estimate of the hours for labor, equipment and materials to repair the damage. The Construction Manager shall log and note the estimate. Repair minor damage (damage which will not affect drainage or Substantial Completion) within 5 – 10 working days. Major Damage (damage which immediately adversely affects drainage, plant material survival, and other

improvements) shall be repaired within 1 – 3 working days. Provide the Construction Manager with a detailed list of hours for labor, equipment and materials used by the end of business every Friday for the work performed during each week to repair the damage.

O. Fertilizer Injection during Establishment & Maintenance Period:

a. The Contractor shall have installed a liquid fertilizer injection system provided by Britz Fertilizer Inc.

b. The Contractor shall provide a temporary 1" hose bib above ground connection immediately behind (down stream) from the master/sensor valve assembly. The connection for fertilizer injection shall be at this location.

c. The Contractor shall provide and/or make available 110 - 120 v. electrical power at the booster pump location for the temporary injection system.

d. The Contractor shall work with Britz Fertilizer Inc. to calibrate the fertilizer injection to match the run time for the irrigation system. The Contractor shall notify Britz Fertilizer inc. a minimum of 48 hours prior to changing the irrigation run time so that the fertilizer injection system may be recalibrated to match the new irrigation run time.

e. The Contractor shall be trained to operate the fertilizer injection system.

f. The Contractor shall turn the fertilizer injection system on 1 time per week starting after the 2nd mowing of any grass that has been installed. The fertilizer injection system shall operate through 1 entire watering cycle for the entire site (for any areas which have been planted) including any multiple start stop irrigation cycles intended to water the site within a single 24 hour day.

g. Fertilizer injection shall continue on a weekly basis until and including the week of Final Acceptance and the project is delivered to the Kern County High School District.

h. All Fertilizer Injection System materials and equipment shall be removed from the site just prior to anticipated dated of final acceptance.

i. At 45 days after installation, CONTRACTOR shall assist the Landscape ARCHITECT obtain a soils analysis, which the Landscape ARCHITECT will send to a soils lab for recommendations for horticultural plant fertilizing. After review and approval and/or modification by the Landscape ARCHITECT, the CONTRACTOR shall apply recommended amendments to all sodded areas.

P. **Before the 20th day after installation, all depressions, high spots and gaps shall be removed or filled**. Gaps and low spots shall be sanded to make surface uniform and consistent. All high spots shall be removed and the surface repaired to be uniform with adjacent sodded areas.

Q. Inspection to determine acceptability of sodded lawns will be made by the Landscape ARCHITECT and the DISTRICT, upon the CONTRACTOR'S request. Provide notification at least 10 working days prior to requested inspection date. Any areas found to be deficient shall be corrected and the maintenance period shall be extended until the entire sodded turf areas are acceptable.

3.09 SUBSTANTIAL COMPLETION AND MAINTENANCE/ESTABLISHMENT PERIOD

a. Substantial Completion and Completion of Establishment Period:

2. During the Establishment Period the Contractor shall maintain all work he/she has performed until all sections and all areas of the work have been completed. All areas included in the Contract shall be substantially clean and free of debris and weeds. All plant materials shall be alive, healthy, and free of infestations. All grade related issues shall have been completed. All irrigation systems shall be fully operational including but not limited to the irrigation heads, valves and nozzles, Maxicom System, Contollers, and Booster Pumps.

3. The CONTRACTOR shall request a Pre-Substantial Review – it is recommended that there be less than 1 months (3 weeks) worth of work remaining before requesting this review. This review will be performed by the Landscape Architect and IOR (other District, Contruction Manager and Architect representatives may be present). A punch list shall be provided and the CONTRACTOR shall complete all items on the punch list prior to requesting a formal Substantial Completion Review.

4. After completion of the Pre-Substantial punch list items the CONTRACTOR shall request a formal Substantial Completion Review. The Review shall be attended by the Landscape Architect, IOR, Construction Manager, Architect and District representatives. A punch list shall be generated and if it is determined that the remaining punch list items can be completed in less than 15 working days – the Landscape Architect will recommend that Substantial Completion be awarded. If it is determined that the CONTRACTOR has been negligent in completing the original punch list items and more than 15 working days remain – then the CONTRACTOR may be penalized as noted in the Penalties and Withholds Section above.

5. If Substantial Completion is Awarded than the CONTRACTOR shall have 15 working days to complete all punch list items and achieve 100% completion. See Penalties and Withholds Section regarding failure to complete all items within the 15 working day period. DISTRICT Maintenance and Operations personnel will inspect all planting areas and will recommend approval or denial of CONTRACTOR'S Work.

6. If all punch list items are completed than the Landscape Architect will recommend that the project is 100% complete and that Establishment Period end and the Maintenance Period begin.

B. Commencement of Maintenance Period: The Maintenance Period shall begin after all work has been satisfactorily completed and granted final completion notice by the DISTRICT. The Maintenance Period shall be 90 days.

C. Responsibility of CONTRACTOR: During the Maintenance Period, the CONTRACTOR shall maintain all planting areas in a weed free condition, performing pest control, pruning, fertilizing and replacement of dead or unhealthy plants as necessary to establish a healthy, vigorous and attractive planting. **SEE PENELTY AND WITHOLDING SECTION SHOULD THE CONTRACTOR FAIL TO PERFORM THIS ITEM.**

D. At the end of the 90 day Maintenance Period, the ARCHITECT, Landscape ARCHITECT, and DISTRICT shall inspect the site to determine if the site is acceptable. Site must be weed free. If the site is not acceptable the CONTRACTOR will be notified, in writing, of the deficiencies and shall immediately correct those items. Then a new inspection will be arranged. The Maintenance Period will continue for as long as it takes to get an acceptable stand of grass, trees and shrubs to be certified by the ARCHITECT, Landscape ARCHITECT, and DISTRICT. Further inspections shall be at the CONTRACTOR'S cost.

E. Final Acceptance: At the completion of the 90 day maintenance period the site will be inspected. After successfully completing the Maintenace Period the Landscape Architect will recommend Final Acceptance.

F. Replacement of dead plants: All plants and ground covers that may die or become severly stressed during the Maintenance Period shall be replanted immediately. Waiting to replant until the end of the Maintenance Period is not acceptable and shall be cause to extend the Maintenance Period an equal number of days as the delay in replanting, plus 7 days.

G. Replacement of Vandalized or Stolen Plants during the Maintenance Period: CONTRACTOR shall verify with the I.O.R. on a daily basis all plants that have been installed. It shall be the CONTRACTORs responsibility to have the IOR initial and verify on an As Built field copy plan areas that have been installed. Once plants have been installed and verified by the IOR, plants that are stolen or vandalized shall be immediately brought to the attention of the IOR, Construction Manager and ARCHITECT. The CONTRACTOR shall provide a change order request for review and approval by the ARCHITECT and DISTRICT to replace vandalized or stolen plants. Do not remove damaged plants until reviewed and documented by the IOR and removal is approved by the ARCHITECT and DISTRICT.

3.10 CLEAN UP

A. Removal of Debris: Remove all cans, surplus material and other debris from the site daily. Flush or sweep all paved areas of soil, leaves or other material. Neatly rake and dress all planting areas immediately after planting on a daily basis.

B. Dust Removal: Rinse foliage of plant materials as often as needed to remove dust generated by work.

C. Temporary Fertilizer Injection System Removal:
1. The temporary Fertilizer Injection System shall remain active through the entire establishment and maintenance period and shall be remove no more than 4 days prior to the anticipated Final Acceptance.
2. The final application of fertilizer shall occur no more than 4 days prior to Final Acceptance.
3. If Final Acceptance is delayed for any reason prior to the this 4th day the system shall remain installed and active.
4. After removal of the temporary Fertilizer Injection System the site shall be returned to its final state, including but not limited to: sanding of any depressions or wheel ruts caused by the equipment or its removal and modification of the irrigation sytem to cover the temporary site.

3.11 GUARANTEE

A. All shrubs and ground cover shall be guaranteed by the CONTRACTOR as to species, variety and cultivar, growth and health for a period of 1 year after Final Acceptance. Vandalism and damage by others shall be excluded and are not the responsibility of the CONTRACTOR.

B. Plant Material Found not to be true to species, variety or cultivar: If it is found that the Contractor substituted plant material without written change order approval the CONTRACTOR shall be required to remove and replace the subject plants **AT NO ADDITIONAL COST TO THE OWNER.** Further the Contractor shall provide an extended Warrenty/Guarantee for an additional 2 years for that plant material.

C. All trees shall be guaranteed by the CONTRACTOR to live and grow in an acceptable upright position for a period of 12 months after Final Acceptance, except that the trees, in 15 gallon cans or larger, shall be guaranteed by the CONTRACTOR to live and grow in an acceptable upright position for a period of 2 years after Final Acceptance.

D. The CONTRACTOR, **within 14 days** of written notification by the DISTRICT, shall remove and replace all guaranteed plant materials which for any reason fail to meet the requirements of the guarantee. All plant material replaced shall be guaranteed for the original period, starting from the date of replacement. If the CONTRACTOR fails to remove and replace these plants, the DISTRICT shall contract the work and charge all associated costs to the CONTRACTOR.

END OF SECTION
5-19-09 **dan@sierradesignsla.com**

SECTION 02510 - WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Water Distribution System for Domestic Consumption and Fire Fighting as Indicated on The Drawings, Herein Specified, and Required for a Complete and Proper Installation.

1. Pipe and Fittings.
2. Hydrants.
3. Valves and Boxes.
4. Insulation and Gaskets.
5. Electrical Bonding of Joints.
6. Installation of Granular Materials
7. Plastic Film Wrap.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork: Site excavation and material for backfilling.

B. Section 02310 - Site Grading: Finish grading materials and procedures.

C. Section 02320 - Trench Excavation and Backfill for Utilities.

D. Section 02480 - Planting: Ground cover, and sod and seeding operations.

1.3 QUALITY ASSURANCE

A. Construction of water main and building service pipelines utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of potable water. Relocation or adjustment of existing facilities as may be indicated on the Drawings.

B. Removal of existing facilities, trench excavation and backfill, and restoration is included in Section 02320.

C. All references to CALTRAN Specifications shall mean the latest published edition of the California Department of Transportation standards for construction, as modified by any CALTRAN Specification edition published prior to the date of advertisement for bids. All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc.

D. All references to Cast Iron material shall be construed to include both Gray Iron and Ductile Iron products, except where one or the other is specified. All references to "structure" shall include any man-made object that is not otherwise exempted by special terminology or definition.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's data for product characteristics, valves, fittings, insulation jointing materials, and all other materials required for a complete installation.

C. Installation: Submit manufacturer's installation instructions and recommendations.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver new packaged materials, well marked and identified, clean, dry and protected against dampness, freezing and damage.

C. Storage of PVC Materials:

1. Store in unit packages as received from manufacturer until just prior to use.
2. Stack units in such manner as to prevent deformation to pipe barrel and bells.
3. Protect from direct sunlight by covering with opaque material if storage period will exceed six (6) weeks.

D. Avoid severe impact blows, gouging or cutting by metal surfaces or rocks.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of water distribution system and other construction to which water distribution system must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials required for this work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in these specifications. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans and Specifications.

B. Manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Engineer may require advance approval of material suppliers, product design, or other unspecified details as he deems desirable for maintaining adopted standards.

2.2 PIPE AND FITTINGS

A. Water Main Pipe and Fittings:

1. The pipe and fittings furnished shall be of the Ductile Iron type as specified in the pipe table below.

PIPE TABLE

Pipe Description	Class or Type	Specification	Joint
Cement Lined Ductile Iron Pipe w/ Tar Coated Exterior	Class 52	ASA A21.51 ASA A21.4	Mechanical or Push-on
Cement Lined Cast Iron Fittings	Class 250	ASA A21.10 ASA A21.4	Mechanical

2.3 VALVES AND BOXES

A. Gate Valves:

1. Gate valves shall be manufactured and furnished in accordance with an approved pattern and shall conform to all applicable requirements of AWWA C500 and be designed for 150 PSI working pressure, together with such supplementary requirements as may be covered in the Plans and Special Conditions or the provisions hereof. Unless otherwise specified, the gate valves furnished shall comply with the following supplementary requirements.

a. The gate valves shall be two-faced, double disc type, with parallel seats and a two (2) inch, operating nut opening counterclockwise.

b. The gate valves twelve (12) inches or smaller in size shall be furnished with O-Ring stem seals.

c. All gate valves sixteen (16) inches or larger in size shall be of the double square bottom type arranged for operation in the horizontal position and shall be equipped with bypass valves.

d. All gate valves twelve (12) inches or larger in size shall be of the non-rising type equipped with approved barrel type rugged gate position indicators.

e. All gears on gate valves shall be cut tooth steel gears, housed in heavy cast iron extended type grease cases of approved design.

f. All gate valves shall have mechanical joint ends.

g. An open indicating arrow, the manufacture's name, pressure rating and year of manufacture shall be cast on the body of all valves.

h. Upon request, three certified copies of the performance tests complying with Section 25 of AWWA C500 shall be submitted to the Engineer.

B. Valve Boxes:

1. All valves smaller than twelve (12) inches in diameter are to be provided with vertical valve boxes.

2. Valve boxes shall be cast iron, buffalo-type adjustable. Valve boxes shall be provided for 7' x 6" of cover, except where greater depths are indicated on the profiles of the plans.

3. Valve boxes shall be at least three (3) pieces with sufficient adjustment to provide at least six (6) inches of adjustment above and below grade. Adjustments for depths greater than six (6) inches shall be incidental and no payment made therefore.

C. Insulation:

1. Insulation shall be equal to Dow Chemical Company STYROFOAM HI brand plastic foam.

D. Gaskets:

1. Rubber gaskets for mechanical joint and push-on joint shall conform to ASA A21.11 and shall be designed and manufactured to exact dimensions to assure a liquid tight joint.

E. Electrical Bonding of Joints:

1. Each joint on cast iron pipe, valves, hydrants or fittings, whether "push-on" or mechanical joint type shall be electrically bonded with an external copper jumper capable of carrying 500 amps. of current for an extended period of time to provide integral electric thawing capabilities.

2. These copper jumpers can be either shop or field applied in accordance with these specifications. For field applied copper jumpers, either the "Burndy-Thermoweld" as supplied by Burndy Corporation, Norwalk, Connecticut, of "Cadweld" by Erico Products Company, Cleveland, Ohio will be permitted.

3. submit the method proposed to be used for approval by the Engineer prior to construction.

4. The copper jumper shall be a minimum 1/16" x 1/2" side flat strip or equal cross section round copper wire in the annealed condition conforming to ASTM Specification B152-58 Type DHP.

5. The copper jumpers shall be welded to the pipe and fittings by the metallic-arc welding process, if shop applied or by the exothermic welding process if field applied.

6. The copper jumper can be applied as a single strip welded at each end across the joint or by multiple strips with bolted connections in the middle. Silicon bronze bolts and nuts shall be used on all bolted connections.

7. All welded connections shall be made on a clean metal surface which has been ground to remove coating and oxide. The area at the connection, including the weld, shall be refinished with its original coating or other suitable protective coatings specified.

8. The assembled copper jumper across the joints shall be so installed that expansion, contraction, or relative pipe movement incidental to normal service will not damage the connection to such an extent that electrical resistance will vary across the joint.

9. The completed water main system shall be tested for electrical conductivity according to these specifications.

F. Granular Materials:

1. Granular materials furnished for foundation, bedding, backfill, or other purposes as may be specified shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone, or slag, that shall be so graded as to meet the gradation requirements specified in Section 02320.

2.4 HYDRANTS

A. Hydrants shall be approved by the City of Bakersfield Fire Department.

PART 3 - EXECUTION

3.1 INSPECTION AND RESPONSIBILITY OF MATERIALS

A. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. Notify the Engineer of all material found that has cracks, flaws or other defects. The Engineer shall inspect the damaged material and have the right to reject any materials he finds unsatisfactory. Promptly remove all rejected material from the site.

B. Pipe and other accessories shall, unless otherwise directed by the Engineer, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor. They shall at all times be handled with care to avoid damage.

C. The Contractor shall be responsible for all material furnished by him and shall replace at his own expense all such material that is found to be defective in manufacture or that has become damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work.

D. The Contractor's responsibility for material furnished by the Owner shall begin at the point of delivery by the manufacturer, or Owner, and upon acceptance of the material by the Contractor. Examine all material furnished by the Owner a the time and place of delivery, and shall reject all defective material.

E. Any material furnished by the Owner that becomes damaged after acceptance by the Contractor, shall be replaced by the Contractor at his own expense.

F. The Contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work until it has been incorporated in the completed project.

3.2 REMOVALS, TRENCH EXCAVATION AND BACKFILL AND RESTORATION

A. Removal of existing facilities, trench excavation and backfill and restoration shall be in accordance with the provisions of Section 02320.

3.3 WATER MAIN PIPE LAYING OPERATIONS

A. The primary line and grade shall be performed by a registered Land Surveyor employed by the Contractor. No deviation from the required line or grade will be allowed except with the consent of the Engineer.

B. Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper placement and joining of the pipe and fittings at the prescribed grade and alignment without unnecessary hindrance. Ever reasonable precaution shall be taken to prevent foreign materials from entering the pipe while it is being placed in the line. The water main materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped or dumped into the trench.

C. Before being lowered into laying position, the Contractor shall make a thorough visual inspection of each pipe section and appurtenant units to detect damage, foreign matter needing removal or unsound conditions that may need corrective action or be the cause for rejection. Inspection procedure shall be as approved by the Engineer, with special methods being required as he deems necessary to check out suspected defects more definitely. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection and prompt removal from the site.

D. Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

E. At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes hall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate. No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper. Unless otherwise permitted by the Engineer, bell and spigot pipe shall be laid with the bell end facing upgrade and the laying shall start at the downgrade end and proceed upgrade.

F. When placement or handling precautions prove inadequate, in the Engineer's opinion, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit.

G. As each length of bell and spigot pipe is placed in laying position, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be securely in place with approved backfill material, which shall be thoroughly compacted around the pipe. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is effected. All valve stems and hydrant barrels shall be plumb.

H. All openings along the line of the water main shall be securely closed, as directed, and at the suspension of work at any time, suitable stoppers shall be placed to prevent earth or any substances from entering water main. If water is present in the trench, the seals shall remain in place until the trench is pumped completely dry.

I. All water line installations shall comply with the Standards for Domestic Water Systems, City of Bakersfield, latest revisions.

J. In certain locations where the water main is in direct conflict with storm or sanitary sewer, the water main shall be constructed under the sewer. Where is necessary to use vertical bends to avoid sewer mains, no extra compensation will be made for this construction.

K. Water mains crossing storm sewers or sanitary sewers shall be laid to provide a separation of at least eighteen (18) inches between the bottom of the water main and the top of the sewer. When

local conditions prevent a vertical separation as described, the following construction shall be used:

1. Sewers passing over or under water mains shall be constructed of materials equal to water main standards of construction.

2. Water main passing under sewers shall, in addition, be protected by providing:

   a. A vertical separation of at least eighteen (18) inches between the bottom of the sewer and the top of the water main;

   b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the water mains;

   c. The length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

L. Water mains shall be laid at least ten (10) feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible. When local conditions prevent a horizontal separation of ten (10) feet a water main may be laid closer to a storm or sanitary sewer provided that:

   1. The bottom of the water main is at least eighteen (18) inches above the top of the sewer;

   2. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

M. No valve or other control on the existing system shall be operated for any purpose by the Contractor without approval by the City.

N. Give the City at least one day notice when it is necessary to take a water main out of service. Disruption of service shall be during the time of day when the least inconvenience will be caused to the customer.

O. Where pipe cannot be placed by open trench excavation, the method for placing shall be approved by the Engineer.

3.4 TAPPING INTO THE WATERMAIN

A. Wet Tapping a Lateral to a Main:

   1. When tapping a lateral water main or service to an existing water main, the Contractor shall make connection to the existing water main while the existing water main is under pressure (i.e., wet tap) using a AWWA approved drilling machine, tapping sleeve and tapping valve. A connection to an existing water main by methods other than a wet tap can be done only with approval of the Engineer or if specifically shown on the plan. The Contractor shall verify the size of the existing water main prior to ordering the fittings for the connection.

B. Setting Valves, Valve Boxes, Fittings and Curb Stops and Boxes

   1. Gate valves and pipefittings shall be set and jointed in new pipe in the manner heretofore specified for cleaning, laying and jointing pipe.

   2. Valve boxes shall be firmly supported, and maintained centered and plumb over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or such other level as may be directed. All geared valves and such other valves as may be designated shall be set in valve manholes with the wrench nuts readily accessible for operation through the manhole openings. Manholes shall be constructed in a manner that will permit minor valve repairs and to afford protection to the pipe from impact where it passes through the manhole walls.

C. Plastic Film Wrap:

   1. An approved plastic film wrap for protection of ductile iron pipe shall be provided at all locations. The wrap shall be the “tube” type having 8-mil thickness. A two (2) inch wide polyethylene adhesive tape shall be used to secure the tube of film to the pipe. The unit bid price per lineal foot shall include the cost of furnishing and installing the plastic wrap and shall be compensation in full regardless of the size of the pip to be protected.

D. Joint Restraint:

   1. Retainer glands shall be used for joint restraint on all bends having a deflection of 22 1/2 degrees or greater, tees, crosses, plugs, valves at the end of a line, all hydrant valves, and all hydrants. Retrained joints cast onto the pipe by the manufacturer (lok-Tyton, Fastite, etc.), will be considered as being equivalent to the use of retainer glands. If retainer glands are not available, thrust blocking may be used with approval of the City.

2. The use of zinc coated tie rods suitably attached by half-circle clamps may be utilized with the Engineer's permission.

3. Where valves are located on dead ends, the valves may be tied or lugged across the valves with tie rods.

4. Plugged tees and crosses in a straight run do not require restraint. For restrained joints, the number of feet of tied pipe required shall be in accordance with the "Table of Restrained or Tied Pipe Required on Each Side of the Bend" at the end of this section.

E. Jointing of Pipe

1. Before laying the pipes, the outside of the spigot and the inside of the bell shall be wire brushed and wiped clean and dry. Pipe ends shall be kept clean until joints are made.

2. All jointing of mechanical joint pipe and push-on pipe shall be in accordance with the requirements of the A.W.W.A. Standard C600.

3. Ductile iron pipe shall be cut only by sawing, milling or torch cutting in accordance with the manufacturer's recommendations, provided the cut joint is properly ground.

F. Insulation

1. The insulation shall be placed between the storm sewer or storm sewer structure and the water main. The insulation shall be placed in two layers, each layer one-(1) inch thick, with the joints in the upper layer offset 1/2 board width from the lower layer. The insulation shall be held in place to prevent movement during backfill by 1/4 inch diameter six (6) inch long wood dowels driven through each corner of the insulation boards into the soil below. The insulation shall extend a minimum of four (4) feet (1220 mm) from the centerline of the water main, and a minimum of six (6) feet (1830 mm)) beyond the edge of the storm sewer or structure along the centerline of the water main or service. The actual depth, thickness, width and length to be insulated Will be determined in the field by the Engineer or his representative or as noted in the plans.

3.5 METHODS OF TESTING AND DISINFECTION

The Contractor shall perform all testing and disinfecting in the Engineer's presence.

A. Hydrostatic Pressure Test:

1. Before a new water main can be filled for testing, or flushing, a **"24" hour notice** must be given to the Local Water Department. A permit may be issued for this purpose when Water Department personnel are not available for valve operation, but only after a **"24" hour notice** has been given.

2. If it becomes necessary to interrupt water service because of new utility construction, sufficient notice must be give to the Local Water Department]so that written notice may be given to the affected customers "24" hours prior to interruption of service. When notified, the Local Water Department will take the responsibility for customer notification.

3. If a Contractor, acting on his own, operates a fire hydrant or water main valve without a valid permit in his possession, the Local Water Department and the Public Safety Department will seek the maximum allowable penalty because of the potential for jeopardizing the public's safety and health.

4. After the pipe has been laid including fittings, services, valves and hydrants, and the line has been backfilled in accordance with these Specifications, all newly laid pipe, or any valved section thereof including building services unless otherwise directed by the Engineer, shall be subjected to a hydrostatic pressure test.

5. Each valved section of pipe shall be slowly filled with water. The specified test pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, gauges and all necessary apparatus shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made if necessary at points of highest elevation and afterward tightly plugged.

6. The test pressure shall be brought to 150 psi. Thereafter, the test shall be considered satisfactory if without additional water, the pressure remains constant for a period of two (2) hours at any specified pressure between 125 psi and 150 psi.

7. Any cracked or defective pipes, fittings, valves or hydrants discovered n consequence of the pressure test shall be removed and replaced by the Contractor and the test shall be repeated until satisfactory tot he Engineer.

B. Electrical Conductivity Test:

1. After the hydrostatic test has been completed, a conductivity test shall be conducted in accordance with the following specification:

   a. The system (pipeline and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic pressure test. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by the Engineer.

   b. Direct current of 350 amperes, +10%, shall be passed through the pipe line for five (5) minutes. Current flow through the pipe shall be measured continuously on a suitable ammeter and shall be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the five (5) minute test period.

   c. Insufficient current or intermittent current or arcing, indicated by large fluctuation of the ammeter needle, shall be evidence of defective electrical contact in the pipeline. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

2. Sources of D.C. current for these tests may be motor generators, batteries, arc welding machines, etc.; D.C. arc welding machines will probably be the usual source. These machines are available in adequate capacity for these tests and are equipped with controls for regulating the current output.

3. Cables from the power source to the section of the system under test should be of sufficient size to carry the test current without overheating or excessive voltage drop. Usable sizes will probably be in the range of 2/0 to 4/0 A.W.G.

4. Connections for the test shall be made at hydrants. The hydrants shall be in the open position with the caps on during the test. The cable shall be clamped to the top operating nut. Note: After the test, the hydrant shall be shut off and a cap loosened to allow hydrant drainage. Tighten cap after drainage.

5. A hook-on type D.C. ammeter placed on one of the cables leading to the hydrant is a convenient method of measuring current.

6. In using arc welding machines, the current control should be set at a minimum before starting. After starting the machine, advance the control until the current indicated on the ammeter is at the desired test valve. Caution: In case of open circuits at joints or connection, the voltage across the defective joint or connection will be in the order of 50 - 100 volts.

C. Disinfection of Water Mains:

1. General: All pipelines installed shall be disinfected with a strong chlorine solution. Disinfecting may be done concurrently with pressure and leakage testing or after pressure and leakage testing at the option of the Contractor. Each section line that is repaired shall be disinfected after such repairs are made. All necessary disinfection equipment and materials shall be provided by the Contractor.

2. Flushing: The pipeline shall be flushed at a velocity of at least 2.5 feet per second immediately prior to disinfection. A 24-hour notice is required to the City Water Department for pipeline flushing.

3. Disinfectants: Disinfection shall be performed using either chlorine gas or calcium hypochlorite solution. Chlorine gas shall conform to AWWA B301 and shall be handled under pressure as an aqueous solution. Calcium hypochlorite shall conform to AWWA B300 and shall be granules with 70 percent available chlorine.

4. Feeding: Chlorine gas shall be used only as a solution. Introduction of chlorine gas into the pipeline directly will not be permitted. When chlorine is used, a chlorinator and booster pump with injector shall be provided.

5. Calcium hypochlorite shall be made into a solution and pumped into the pipeline with a suitable chemical feed pump

6. Application: Pipelines shall be disinfected by either the continuous feed method or the slug method.

7. In using the continuous feed method, chlorine feed shall be proportional to the rate of flow into the pipe so that the entering water contains at least 50 mg/1 of available chlorine. Chlorine application shall be continuous until the entire pipeline is filled with the chlorine solution. The treated water shall be retained in the pipeline

for at least 24 hours and the chlorine residual at the end of the period shall be at least 25 mg/1.

8. In suing the slug method, chlorine shall be fed at a rate that will produce at least 300 mg/1 in the water entering the pipeline and a sufficient quantity of water shall be chlorinated so that all parts of the pipeline will be exposed to chlorine concentration of 300 mg/1 for at least three (3) hours.

9. During disinfection all valves and hydrants shall be operated to insure that all appurtenances are disinfected.

D. Bacteriological Tests:

1. The chlorine solution shall be flushed out of the line and samples shall be collected and tested for bacteriological quality after the line has set for a minimum of 24 hours. The samples shall be collected by the City Water Department personnel and the cost of these test paid for by the City. A "**24"-hour notice** is required to the City Water Department for pipeline flushing.

2. Repeat Testing: If initial disinfection fails to produce satisfactory bacteriological samples, the disinfection shall be repeated until satisfactory bacteriological samples are obtained. Costs for additional disinfection shall be borne by the Contractor.

3. Inspection: The above operation shall be supervised by a qualified Inspector furnished by the Consultant. If a qualified Inspector cannot be supplied, the City shall furnish an Inspector. The City shall have at least a **"24" hour notice** for said inspection.

(Table follows next page)

* *

TABLE OF RESTRAINED OR TIED PIPE REQUIRED ON EACH SIDE OF THE BEND

Note: (1) Table based on sand excavation, for silt, increase 50%
(2) If polyethylene wrapping is used, increase value by 100%
NR = Not Recommended

	4' Cover (1220 mm)				6' Cover (1630 mm)				8' Cover (2440 mm)			
	Bend Sizes by Degrees				Bend Sizes by Degrees				Bend Sizes by Degrees			
Pipe Size	22.5	45	67.5	90	22.5	45	67.5	90	22.5	45	67.5	90
3"	NR	NR	NR	NR	1'	3'	4'	8'	1'	2'	3'	4'
4"	NR	NR	NR	NR	2'	4'	5'	13'	1'	3'	4'	5'
6"	NR	NR	NR	NR	3'	6'	8'	9'	2'	4'	5'	6'
8"	NR	NR	NR	NR	4'	7'	9'	11'	3'	5'	7'	9'
12"	NR	NR	NR	NR	6'	10'	14'	17'	5'	8'	10'	12'
16"	NR	NR	NR	NR	7'	13'	18'	21'	6'	10'	14'	17'
20"	12'	22'	30'	37'	9'	15'	22'	27'	7'	12'	17'	20'
24"	14'	25'	37'	43'	10'	18'	26'	30'	NR	NR	NR	NR
30"	17'	30'	45'	52'	12'	21'	30'	37'	NR	NR	NR	NR
36"	19'	35'	50'	61'	14'	25'	35'	43'	NR	NR	NR	NR

The table was determined from the following formula printed in the 1975 fall issue of "Cast Iron Pipe News" published by the Cast Iron Research Association.

$$L \text{ (restrained length)} = \frac{SfKPA}{KFs + DPp}$$

Sf = Safety factor (1.25)
P = Max. Pressure (150 p.s.e.)
A = Pipe Cross- section area (in. sq.)
Fs = Conduit frictional resistance neglecting bell resistance (p.l.f.)
D = Conduit outside diameter (ft.)
Pp = Passive soil pressure (p.s.f.)
$K = 4 \tan \frac{\text{friction angle}}{2}$

* *

END OF SECTION 02510

SECTION 02515 - WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Water Service Connections; Including Meters, Meter Boxes, and Other Appurtenances as Indicated on The Drawings, Specified Herein, and Required for a Complete and Proper Installation.

1. Service Connections Include Connection to The Distribution Main, Service Line Between Main and The Meter, Meter with Box, and Service Stops.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork: Site Preparation.

B. Section 02320 – Trench Excavation and Backfill for Utilities.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. All Materials in this Section are to be manufactured in the United States.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of water service connections and other construction to which water service connections must fit before installation. Coordinate installation schedule with construction progress to avoid delay of the Work.

1.7 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 SERVICE PIPE

A. Use materials for the various sizes of service as follows:

B. Services one (1) inch in diameter and smaller:

1. Provide Type K, soft copper complying with ASTM B88, Table 4; or

2. High molecular weight polyethylene pipe complying with ASTM D1248, Type III, and Commercial Standard 255 for flexible pipe with SDR 7.

a. Pipe shall be stamped with National Sanitation Foundation approval for use with portable water at 18 inch intervals.

C. Services 1 1/2 inch in diameter and larger:

1. Provide standard weight, hot-dip galvanized steel pipe complying with ASTM A53, ends threaded and coupling on one (1) end.

2.2 BRASS MATERIALS

A. Provide materials complying with AWWA Standard C800, unless otherwise indicated or specified.

B. Corporation stops: Furnish with AWWA Standard Corp. Stop Thread on inlet side, with outlet connection suitable for use with the type service pipe being installed.

C. Service stops: Provide water works ground key type, oval flow way, tee handle, without drain.

1. Quarter Turn between "open-close" positions, controlled by integral check lugs.

2. Inlet connection to match service pipe, outlet end to match meter spud.

D. Goosenecks: Form from Type K copper tubing complying with ASTM B88, to a minimum length of 18 inches.

2.3 METER BOXES

A. General:

1. Provide cast iron or pre-cast concrete boxes per jurisdictional agency requirements.

2.4 METERS

A. Provide sizes as shown on the Drawings.

2.5 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 GENERAL

A. Install service lines from the distribution main to the property lines at each lot, or at each location indicated or directed by the Engineer.

B. Depth of service connection shall be no less than the top of main connected to and shall be at least twelve (12) inches deep at the meter box.

C. Install insulating couplings between ferrous and non-ferrous pipe, fittings, etc. of such shape to effectively prevent metal-to-metal contact between the dissimilar metals.

3.3 EXCAVATION AND BACKFILLING

A. Comply with pertinent provisions of Section 02200, except as otherwise specified herein.

B. Under paved areas install service lines by jetting, unless otherwise directed by the Engineer.

3.4 INSTALLATION - SERVICE LINES

A. Provide gooseneck between distribution main and steel pipe services.

B. Install flexible service lines in one continuous piece from main to service stop.

C. Connections to mains, three (3) inch and smaller:

1. Provide tees or tapped couplings in new mains.

2. Use approved tapping saddle on existing mains.

3. Provide corporation stop on mains larger than two (2) inches.

D. Connections to cast iron on ductile iron mains:

1. Drill and tap pipe barrel and install corporation stop therein.

E. Connections to PVC mains, four (4) inch and larger:

1. Provide factory tapped coupling sleeves in new mains, located within 3 1/2 inches of designated service location.

2. Use approved tapping saddle on existing mains.

3. Provide corporation stop at all connections.

F. Terminate each service line with service stop and/or meter, as indicated on the Drawings.

3.5 INSTALLATION - METER BOXES AND METERS

A. Install boxes level in both directions and with top flush with finished grades.

B. Do not let weight of box rest on the service line.

C. Make installation in such manner that meter may be removed at any time without disturbing box setting.

3.6 FLUSHING

A. Flush each service line thoroughly after installation to clear of sand, dirt, or other construction debris.

B. When meters are to be installed accomplish flushing prior to meter installation.

END OF SECTION 02515

SECTION 02525 - FIRE HYDRANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Fire Hydrants; as Indicated on The Drawings, Specified Herein, and Complete With All Fittings and Connections.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork: Site Preparation.

B. Section 02320 – Trench Excavation and Backfill for Utilities.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Provide product data.

C. Shop Drawings: Provide Shop Drawings showing all locations and connections, including sizes and requirements for anchoring.

D. Installation Instructions: Provide manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. All fire hydrants shall be those approved by the City of Bakersfield Fire Department.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

1.6 COORDINATION

A. Coordinate connection and installation of all hydrants with plumbing and earthwork.

1.7 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All fire hydrants shall comply with AWWA Specification C-502. All fire hydrants shall be approved by the City of Bakersfield Fire Department .

B. The hose connection and pumper connection shall be located on the same plane with the hose connection 180 degrees from each other, with the pumper connection 90 degrees from either hose connection. The hose and pumper connections shall be located on the hydrant a minimum of eighteen (18) inches from the ground line to the center of the pumper and hose caps.

C. Flow loss of hydrant shall not exceed 1.6 psi at 500 GPM through two (2) simultaneous 2-1/2 inch hose nozzles. Flow loss shall not exceed 4.4 psi at 1000 GPM through one (1) 4-1/2 inch pumper nozzle.

D. Hydrants shall be provided with either a ferrous metal or a non-ferrous metal rain shield.

E. Hydrant shoe shall be bronzed bushed as to allow a bronze to bronze connection between the valve seat ring and the bushing for ease of removing the seat ring for repair. The bushing will not be subject to ground contact.

F. Concrete: Provide concrete specified in Section 03300.

G. Crushed stone or washed pit gravel.

H. Bar Reinforcement: Type specified in Section 03200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION REQUIREMENTS

A. Install hydrants as indicated on the Drawings, with thrust block backings and in strict accordance with manufacturer's recommendations.

B. Test hydrants in conjunction with entire water system.

C. Place crushed stone or gravel at the base of the hydrant as detailed on the Drawings to provide drainage, incidental to the hydrant.

D. Depth of bury shall be the same as that specified for the pipe.

E. After installation, clean and paint fire hydrant one (1) coat of enamel, color as selected by the Architect/Engineer.

END OF SECTION 02525

SECTION 02530 - SANITARY SEWERAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of This Section.

B. Site Sanitary Sewerage Construction to Building and Municipal Sanitary Drains; Drainage Piping Including Fittings, Accessories and Bedding.

C. Structures for Access to Underground Piping.

D. Connection of Building Sanitary Drainage System to Municipal Sewers.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services: Testing laboratory services.

B. Section 02200 – Earthwork: Clearing, grubbing and rough grading of subsoil for sewer system piping.

C. Section 02310 - Site Grading: Site grading materials and procedures.

D. Section 02320 – Trench excavation and Backfill for Utilities: Excavation, backfilling and compacting over piping, granular pipe covering up to subgrade elevation, underside of fill under paving and slab.

E. Section 02480 – Planting.

F. Section 02630 - Storm Drainage.

1.3 DEFINITIONS

A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Provide data indicating pipe, pipe accessories, and all other accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.

1.5 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Division One.

B. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 REGULATORY REQUIREMENTS

A. Conform to all applicable codes for materials and installation of the Work of this Section.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of sanitary sewage systems with other construction to which sewage systems must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.8 COORDINATION

A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

1.9 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials required for this Work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in the Contract.

B. Work consists of the construction of pipe sewers utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of sewage wastes or storm water. This includes construction of manhole and catch basin structures and other related items as specified.

2.2 SEWER PIPE MATERIALS

A. Pipe furnished for main sewer and service line installations shall be of the type, kind, size and class indicated for each particular line segment as indicated on the Drawings. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be subject to approval by the Architect.

B. The pipe and fittings provided shall be of the Ductile Iron type as specified below:

1. Cement Lined Ductile Iron Pipe: Class 52, ASA A21.51 and mechanical or push-on joint.
2. Pipe with Tar-Coated Exterior: ASA A21.4, mechanical or push-on joint.
3. Fittings will be the same class, size and type as the pipe the fittings are being attached to.

C. Joints shall conform to the requirements of ASTM C425-58T, Type I or III for vitrified clay pipe. Joints shall conform to the requirements of ASTM D1869 for PVC pipe.

D. Plastic Pipe: ASTM D3033, Type PSP, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of [____inches], bell and spigot style solvent sealed joint end.

OR

E. Plastic Pipe: ASTM D2729, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of [____inches], bell and spigot style solvent sealed joint end.

OR

F. Plastic Pipe: ASTM D3034, Type PSM, Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of [____inches], bell and spigot style solvent sealed joint end.

OR

G. Plastic Pipe: ASTM D1785, Schedule [40] [80] [120], Poly (Vinyl Chloride) (PVC) material; inside nominal diameter of [____inches], bell and spigot style solvent sealed joint end.

OR

H. Polyvinyl Chloride (PVC) Pipe (Sanitary): Pipe shall conform to ASTM D3034 (SDR-35), and shall be used to a depth not to exceed twenty (20) feet. Sewer pipes with a depth greater than twenty (20) feet shall be SDR-26 PVC and with a depth greater than thirty (30) feet shall be ductile iron pipe.

1. Joints shall be either solvent cement or elastomeric gasket joints. Gasket joints must be approved by the Architect/Engineer on the basis of data furnished by the manufacturer.
2. An approved water stop gasket shall be used on the sewer main where it enters and exits a manhole. The gasket shall be placed near the center of the manhole wall.

2.3 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tees, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewer Service" in large letters.

2.4 MANHOLES

A. Precast concrete riser sections and appurtenant units (grade rings, rope and base slabs, special sections, etc.) used in the construction of manhole and catch basin structures shall conform with the requirements of ASTM C-478, subject to the following supplementary provisions:

1. The precast sections and appurtenant units shall conform to all requirements as shown on the detailed drawings.
2. Air-entrained concrete shall be used in the production of all units. Air content shall be maintained within the range of 5 to 7 percent.
3. A Certificate of Compliance shall be furnished with each shipment of precast manhole and catch basin sections stating that the materials furnished have been tested and are in compliance with the specification requirements.
4. Lift holes will not be permitted in precast manholes.

B. Unless otherwise specified or approved, manholes shall be constructed with precast concrete base section and the barrel riser sections, cone section and top adjusting rings shall all be of precast concrete. The precast concrete base section shall be supplied with pre-formed inserts and flexible watertight sleeve connections. All units shall be properly fitted and sealed to form a completely watertight structure. Barrel and cone height shall be such as to permit placement of at least three and not more than six standard two-inch precast concrete adjusting rings immediately below the

casting assembly which shall be set in a mortar bed. Each adjusting ring shall also be set in mortar.

C. Unless otherwise specified or approved, manholes shall have an inside barrel diameter at the bottom of 48 inches minimum and the inside diameter at the top of the cone section and of all adjusting rings shall be of the same size and shape as the casting frame. Casting assemblies shall be as specified in the Plans.

D. The precast concrete base section shall be placed on firmly compacted foundation material which shall be trimmed to proper elevation. All riser section joints of the tongue and groove design shall be sealed with rubber gaskets.

E. Wherever special designs so require or permit, and as otherwise may be approved by the Engineer, a precast concrete base may be used or the structure may be constructed with solid sewer brick or block units or with cast-in-place concrete. Any combination of cast-in-place concrete and brick or block mortar construction will be allowed and may be required where it is impossible to complete the construction with standard precast manhole sections.

F. All annular wall space surrounding the in place pipes shall be completely filled with mortar or concrete, and the inside bottom of each manhole and catch basin shall be shaped with fresh concrete to form free flow through invert troughs as directed.

2.5 MANHOLE CASTINGS

A. Manhole castings shall be Neenah R-1733, or approved equivalent by the Architect/Engineer, and have the words “SANITARY SEWER” printed on the lid.

2.6 BEDDING MATERIALS

A. Bedding: Granular materials shall be provided for foundation backfill, bedding and other purposes in accordance with Section 02320.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that trench cut and excavation base are ready to receive work and excavations, dimensions, and elevations are as indicated on the Drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 02320 for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding six (6) inches compacted depth, compact to 95 percent.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings and accessories in accordance with manufacturer's instructions. Seal joints watertight.

B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

C. Install bedding at sides and over top of pipe to minimum compacted thickness of twelve (12) inches; and compacted to 95% Standard Proctor Density.

D. Refer to Section 02320 for trenching requirements. Do not displace or damage pipe when compacting.

E. Connect to the two (2) existing building sanitary sewers, and provide eight (8) inch line to new location at building as indicated on the Drawings.

F. Install trace wire continuous buried six (6) inches below finish grade, above pipe line; and coordinate with Section 02320.

3.5 CONNECTION TO EXISTING MANHOLE

A. Make connection at same location as existing four (4) inch line and provide for watertight seal.

B. Remove curb and pavement as indicated on the Drawings. Upon completion of sanitary Work, the curb and street are to be replaced in kind to the existing section.

C. Contractor shall be responsible for providing traffic control and signage as required to perform this Work.

3.6 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as indicated.

D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division One.

B. Request inspection prior to and immediately after placing bedding.

C. Compaction testing will be performed in accordance with ASTM D698.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.8 PROTECTION

A. Protect finished installation under provisions of Division One.

B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 02530

SECTION 02535 - SANITARY SEWER MANHOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Sanitary Sewer Manholes; as Indicated on The Drawings, Specified Herein, and Complete With All Fittings and Accessories.

C. Connections at Existing Manholes.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork: Site Preparation.

B. Section 02320 – Trench Excavation and Backfill for Utilities.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

1.4 QUALITY ASSURANCE

A. Provide products meeting requirements of the City of Bakersfield and authorities having jurisdiction.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

1.6 COORDINATION

A. Coordinate placement of sanitary sewer manholes with City of Bakersfield and adjacent work.

1.7 WARRANTY

A. Provide written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Precast concrete base sections, risers, cone sections, flat slab tops, and adjusting rings shall conform to ASTM C478.

B. Riser joints shall be the rubber gasket type in accordance with ASTM C433, and shall be installed in accordance with the manufacturer's recommendations. Joint material shall be Kent Seal No. 2, or approved equivalent by the Engineer.

C. Manhole frame and cover sets shall conform to ASTM A48, Class 30. The bearing surfaces of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking. Frames and covers shall be painted or dipped in commercial quality asphaltic paint. Cover shall read "SEWER". Frame shall provide a (minimum) inside dimension of twenty-four (24) inches. There shall be no holes or perforations in the manhole covers.

D. Manhole Steps: Twelve (12) inches wide, 3/8 inch steel reinforcing rod encapsulated in a copolymer polypropylene plastic, integrally cast with precast riser and cone sections. The minimum tread width shall be twelve (12) inches.

E. Concrete (Other than Precast) shall conform to the requirements of concrete specified under provisions of Section 03300.

F. Reinforcement: Grade 40 or 60 billet steel conforming to ASTM A615.

G. Select Backfill Material: Sand, with less than 10% passing the No. 10 mesh sleeve.

H. Entry Pipe Rubber Gasket: Flexible water-tight rubber gasket cast permanently in place in the manhole opening for the entry pipe so that wedge will be installed from INSIDE of manhole. Rubber material shall conform to the requirements of Paragraphs 3 and 4, ASTM C443. Gaskets shall be similar to Press Wedge II, as manufactured by Press Seal Gasket, Fort Wayne, Indiana; A-LOK Manhole Pipe Connector, as manufactured by A-LOK Corporation, Trenton, New Jersey; Kor-N-Seal, as manufactured by NPC Systems; or approved equivalent by the Engineer.

I. Interior concrete surfaces shall be prepared, coated, and cured as necessary for the application of a coal tar epoxy lining in each concrete manhole section, at the concrete pipe manufacturer's plant.

1. Before coating work is begun, Contractor shall submit to Engineer the proposed coating supplier's complete materials, data sheets, and application specifications specifically prepared for the particular application.

J. The material used for the lining shall be a two component coal tar epoxy complying with the requirements specified herein, and approved by the Engineer. Material shall be Induralls Ruff Stuff 2100, Amercoat No. 78, Koppers 300-M, or approved equivalent by the Engineer, used with approved epoxy structural paste adhesives, primers and thinners. Each batch of lining material shall be tested at the manufacturer's plant, and certified by the supplier to meet the U.S. Corps of Engineers Specification C-200.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CONSTRUCTION REQUIREMENTS

A. Excavation for manholes shall conform to the same requirements as adjoining sewers to which they are connected.

B. Precast concrete manhole base sections shall be set, true and plumb, on a prepared, firm subgrade, free of water. When directed by Engineer. Contractor shall excavate an additional twelve (12) inches, and place a twelve (12) inch thick compacted foundation in accordance with the project Documents.

C. Reinforcement shall conform accurately to the dimensions and details indicated on the Drawings. Before being placed in any concrete work, it shall be cleaned thoroughly of all rust, mill scale, mortar, oil, dirt, or coating of any character which would be likely to destroy, reduce, or impair its proper bonding with the concrete.

D. Concrete shall conform accurately to the dimensions and details indicated on the Drawings. Concrete shall not be permitted to fall more than six (6) feet without the use of pipes at least six (6) inches in diameter. Concrete shall be thoroughly consolidated in a manner that will encase the reinforcement and inserts, fill the forms, and produce a surface or even texture free of rock pockets and excessive voids.

E. Form invert channels smooth and shape to semi-circular bottom conforming to the inside of the adjacent sewer section. Inverts shall extend up to the spring line of the pipe. Changes in direction of the sewer and entering branches shall have a true curve of as large a radius as the size of the manhole will permit.

F. The method of joining precast concrete riser and cone sections shall be such that the ends are fully entered and the inner surfaces are reasonably flush and even. The finished manhole shall be free of visible evidence of leakage. No more than two (2) adjusting rings shall be allowed per manhole.

G. Lifting holes in manhole risers shall **not** be allowed.

H. Manhole steps shall be in a straight alignment so as to form a continuous ladder with a maximum distance of sixteen (16) inches between steps.

I. Manhole frame casting shall be set on full mortar beds on top of concrete cone section, to line and grade, and in such a manner that subsequent adjustments will not be necessary.

J. Backfill may proceed as soon as manholes have developed sufficient strength to resist backfilling loads and forces. Backfill for manholes shall be in the same manner as the adjoining sewers to which they are connected.

K. Contractor shall restore construction area to original conditions and shape to encourage drainage.

L. In any sewer manhole where the vertical distance from the invert of the incoming sewer and the manhole invert exceeds two (2) feet, a drop connection shall be provided for the incoming sewer. Drop manholes shall be constructed with an outside drop connection. Due to the unequal earth pressures in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete.

3.3 MANHOLE TESTING

A. Vacuum test shall be made and observed by Engineer's designated representative on each manhole.

B. Vacuum Test Procedure:

1. Contractor shall supply a vacuum testing system to test sewer manholes and pipe. The testing shall be done immediately after assembly of the manhole and before backfilling. A sixty (60) inch-pound torque wrench shall be used to tighten the external clamps that secure the test cover to the top of the manhole. All lift holes shall be plugged with a non-shrinking mortar. Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe to prevent the piping from being drawn into the manhole. A vacuum of f10 inches Hg (5.86 psi) shall be drawn and the vacuum pump shut off. The test shall pass if the vacuum remains as 10 inches Hg or drops to nine (9) inches Hg (5.28 psi) in a time greater than thirty (30) seconds.

2. If the manhole fails the initial test, Contractor shall locate the leak and make proper repairs, then retest at no additional expense to the Owner.

3.4 CONNECTIONS AT EXISTING MANHOLES

A. The connection of new pipelines to existing manholes shall be accomplished by carefully breaking a circular hole in the existing manhole. A flexible pipe connection gasket shall then be grouted at the appropriate elevation using non-shrink grout.

END OF SECTION 02535

SECTION 02630 - STORM DRAINAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Site Storm Drainage Construction to Buildings and Municipal Storm Drainage; Including All Pipes, Fittings, Attachments and Connections Needed for a Complete and Proper Installation.

C. Storm Drainage Piping for Surface, or a Combination of Surface and Subsurface Water.

D. Catch Basins, Grates and Frames.

E. Structures for Access to Underground Pipe.

F. Protection of Completed System Against Infiltration During Subsequent Construction Activities.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02310 - Site Grading: Finish grading materials and procedures.

C. Section 02320 - Trench Excavation and Backfill for Utilities: Excavation, backfilling and compacting trenches for utilities.

D. Section 02630 – Storm Drainage: Foundation drain tile connected to storm drainage system.

E. Section 02480 – Planting: Sodding and seeding operations.

1.3 QUALITY ASSURANCE

A. Storm drainage to conform with state and local requirements for storm drainage.

1.4 SITE CONDITIONS

A. Monuments: Maintain benchmarks, monuments, and other reference points. If disturbed or destroyed, have replaced or relocated by a registered land surveyor at the Contractor's expense.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

1.7 PROTECTION OF OTHER UTILITIES

A. Location:

1. Approximate location of certain known underground lines is shown.
2. Existing small lines not shown.
3. Locate small and other possible utility lines using electronic pipe finder, or other approved method.
4. Excavate and expose existing underground utilities ahead of trenching operations.

B. Repair or replace any damaged utility line or structure at no additional cost to Owner.

1.8 CONFLICTING UTILITIES

A. Remove and/or relay conflicting utilities, when so directed by the Engineer, at the expense of the Owner.

B. When alterations to existing utilities are shown to avoid conflicts, make alterations at no cost to Owner.

1.9 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no additional expense to the Owner.

PART 2 - PRODUCTS

2.1 PIPE AND MATERIALS

A. General:

1. Materials required for this Work shall be new materials conforming to requirements of the referenced specification for the class, kind, type, size, grade and other details indicated on the Drawings.

2. Wherever connection of dissimilar materials or design is required, the method of joining and any special fittings employed shall be subject to approval by the Architect/Engineer.

B. Reinforced Concrete Pipe (RCP): Pipe shall meet the requirements of ASTM C76 for Class III, Wall B. Sizes shall be as indicated on the Drawings. Provide pipe with joints designed for flexible watertight gaskets.

1. Gaskets: O-Ring rubber complying with ASTM C443; or preformed plastic gaskets complying with AASHTO Designation M-198 for Type B, Flexible Plastic Gasket.

C. PVC Pipe: PVC pipe and fittings shall conform to the requirements of ASTM D3034, Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings, SDR 35. The pipe shall be joined with a bell and spigot type of elastomeric gasket joint. The spigot end shall be marked so that the installer and the observer can determine when the pipe is properly fitted.

D. Ductile Iron Pipe (DIP): Pipe for storm sewage system shall be Class 52, cement lined DIP with tar coated exterior with mechanical or push-on joints.

E. Coarse Filter Aggregate: Materials shall conform to CALTRANS.

F. Concrete: Concrete shall be minimum 4,000 psi air-entrained concrete, meeting requirements of ACI 301.

G. Reinforced Concrete Surge Basin: Basin shall be as indicated on the Drawings.

H. Reinforced Concrete Sewer Pipe (RCP) and End Sections (Storm):

1. Reinforced concrete sewer pipe and end sections shall conform to CALTRANS and shall have rubber gasket joints CALTRANS. The Class of pipe shall be as indicated on the Drawings.

2. End sections shall be provided with a galvanized trash guard in accordance with Detail Drawings which shall be incidental to the cost of the end sections. End sections shall be tied back a minimum of three (3) pipe joints with approved pipe ties.

3. The Drawings indicate various lengths of storm sewer. These dimensions are from end to end of pipe, and include special sections.

2.2 DRAINAGE STRUCTURES

A. Use precast concrete or built in place masonry units.

B. Precast drop inlets, catch basins, curb inlets, etc., shall be as manufactured by Christy Concrete Products, Inc. or equal units by others.

C. Built in place structures:

1. Use concrete brick complying with ASTM C55 for Grade N, Type II.

2. Use Portland cement mortar: 1 part cement (ASTM C150, Type I) to 3 parts clean, sharp sand.

D. Provide gray iron castings, complying with ASTM A48, Class 30 iron.

1. Patterns and weights shall be as indicated on the Contract Drawings.

2.3 MANHOLES

A. Use Precast Concrete Manholes:

1. Provide reinforced precast concrete ring and eccentric cone sections complying with ASTM C478 and the following.

2. Use Portland cement complying with ASTM C150, Type II.

3. Cast ladder rungs into the units.

4. Provide tongue and groove or o-ring rubber gasketed joints.

5. Use vulcanized butyl rubber sealant with tongue and groove joints.

6. Provide flat slab tops where manhole depth is less than 4’0”.

B. Steps:

1. Use aluminum or plastic steps.

2. Provide steps having non-skid top surfaces, safety stops at each end, minimum width of 10” and not less than 5” projection from wall.

3. Aluminum steps shall support 1000 pound load at center with no deformation, coat embedded ends with bituminous paint.

4. Provide polypropylene plastic reinforced with 3/8” diameter steel rod, M.S.A. Industries, Inc. Model PS-K, or equal.

C. Frames and Covers:

1. Provide gray iron castings, complying with ASTM A48, Class 30 iron.
2. Machine all bearing surfaces.
3. Provide frames weighing not less than 120 lbs. or more than 250 lbs.with inside opening of 24".
4. Provide circular cover with two "pick" holes and weighing not less than 120 lbs. or more than 200 lbs.
5. Covers to have the words "STORM SEWER" cast in the metal.
6. Coat frames and covers with two shop coats of bituminous paint.
7. Provide watertight covers, where indicated, conforming to above requirements and with frame tapped for four bolts, countersunk in cover.

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 LAYING OUT WORK

A. Provide all materials, labor, instruments, etc. required to lay out Work.

B. Prepare "cut sheets" under direct supervision of the Engineer.

C. Notebooks will be provided by the Engineer and shall be returned to the Engineer upon completion of Work.

D. Exercise proper precaution to verify figures on the drawings prior to laying out Work. Contractor will be held responsible for any errors therein that otherwise might have been avoided.

E. Promptly inform Engineer of errors or discrepancies found, in order that proper corrections may be made.

3.3 INSTALLATION OF STORM DRAINAGE

A. Trenching, Backfilling and Compacting:

1. Trenching and backfilling shall be constructed in accordance with Section 02320 - Trench Excavation and Backfill for Utilities.

B. Installing Piping and Appurtenances:

1. Provide and use the proper implements, tools, and facilities for the safe and convenient prosecution of the Work.
2. Unload and distribute materials at site carefully to prevent materials from being damaged, minimize handling, and not hamper construction activities. In no case shall materials be thrown or dumped from truck.
3. Lower pipe into trench carefully to prevent damage to pipe and protective coatings and linings. Under no circumstances shall pipe be dumped into trench.

C. Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges and projections, and any other imperfections so detected shall be corrected by cleaning, trimming or repair as required.

D. Pipe shall be laid using grade boards, furnished and set by the Contractor according to the established grade stakes. No pipe shall be laid unless there is a minimum of four (4) grade boards set to check the proper grade and alignment ahead. Provide and use a suitable grade rod to insure the proper grade of the pipe. Grade boards shall be no more than twenty-five (25) feet apart. Laser equipment may be used in lieu of grade boards and strings to set pipe grade and alignment.

E. At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate. Bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start at the downgrade end and proceed upgrade.

F. As each length of bell and spigot pipe is placed inlaying position, the spigot end shall be centered in the bell and the pipe forced hole and brought to correct line and grade. The pipe shall be secured in place with approved backfill material, which shall be thoroughly compacted around the pipe. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is affected.

G. When existing utility structures or branch connections leading to main sewers or to main drains, present obstructions to the grade and alignment of the pipe, they shall be permanently supported, removed, relocated or reconstructed.

H. When water main, water services and sewer services, whether lowered or existing, are in danger of freezing due to proximity of storm sewers, catch basin leads, or storm sewer structures, the Architect may direct the placement of insulation between the storm sewer and the water main or service pipe.

I. Openings along the line of the storm sewer shall be securely closed, and at the suspension of Work at any time, suitable stoppers shall be placed to prevent earth or any substance from entering the storm sewer. If water is present in the trench, the seals shall remain in place until the trench is completely dry.

3.4 MANHOLE AND PRECAST STRUCTURES

A. Set bases level so that walls will be plumb.

B. Apply joint sealer, or ring gasket to wall section(s), set firmly in place to assure watertight joints.

C. Form manhole invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened. Smooth the floor of the manhole outside the channels and slope toward the channels at not less than 1" per foot not more than 2" per foot.

1. Shape the invert channels to be smooth and semicircular, conforming to the inside of the adjacent sewer section.

2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.

3. Make changes in size and grade of channels smoothly and evenly.

4. Slope invert uniformly from invert of inlet to invert of outlet.

3.5 SUB-SURFACE DRAIN

A. Sub-surface drain construction shall be performed in accordance with the provisions of CALTRANS, except as modified below:

1. The pipe shall be installed at the locations indicated on the Drawings, or as determined at the time of the construction operations to drain the sand sub-base.

2. The pipe shall conform to the following specifications; Thermoplastic Pipe - CALTRANS.

3. The pipe may be furnished with either bell or spigot joints, or with sleeve couplings on the straight pipe. All joints in the perforated pipe shall be left unsealed.

4. To prevent infiltration of soil and aggregate into the pipe, the perforated pipe (regardless of type) shall be wrapped with strong, porous, rotproof polymeric fiber filter cloth, the openings in which will be compatible with the gradation of the backfill material.

5. The filter fabric shall have a minimum weight of 4.0 ounces per square yard, a minimum water permeability of 10 cm/sec., shall retain particles larger than 210 microns (No. 70 sieve) and shall have a minimum grab tensile strength of 105 lb. (ASTM D1682). Torn or punctured fabric shall not be accepted and in no case shall the fabric be exposed to heat or direct sunlight to the extent that its strength or toughness are diminished.

6. The over-wrapping and securing of the filter cloth to the pipe shall be done in a manner approved by the Independent Testing Inspector. Spiral wrapping of the filter cloth on the pipe will not be permitted.

3.6 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under the provisions of Division One.

B. General:

1. All pipe will be visually inspected.

2. All visible leaks shall be repaired.

3. Broken or cracked pipe, mislaid pipe and other defects shall be corrected.

4. All repairs, relaying of sewers, etc. required to bring the sewers to specified status shall be made at no additional cost to the Owner.

C. Inspection:

1. Request inspection prior to and immediately after placing aggregate cover over pipe.
2. Compaction testing will be performed in accordance with ASTM D698.
3. Clean and prepare for inspection each block or section of sewer upon completion, or at such other time as the Engineer may direct.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.7 ADJUSTING AND CLEANING

A. Correcting Deficiencies: Correct imperfections and irregularities in work at no expense to Owner.

B. Cleaning Drains: Drains shall be free of silt, debris, and other obstructions at time of final acceptance.

C. Cleaning Site: Remove excess earth, excess construction materials, construction equipment, and construction debris which is related to this work from site at completion of work.

3.8 PROTECTION

A. General Requirements: Protect storm drainage system from damage and construction operations until date of Substantial Completion.

END OF SECTION 02630

SECTION 02740 - ASPHALT CONCRETE PAVING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Asphalt Concrete Paving Above Base Course; as Indicated on The Drawings, Specified Herein, and Complete With All Accessories.

C. Aggregate Base Course.

D. Bituminous Seal Coat.

E. Asphalt Concrete Paving; Binder Course and Wearing Course.

1. Parking Lot Pavement.
2. Bus and Driveway Pavement.
3. Walkway Pavement.
4. Athletic Play Surfaces.

F. Paint Stripping and Logos.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02200 - Earthwork: Preparation of site for base and compacted sub-base.

C. Section 02310 - Site Grading. Finish grading materials and operations.

D. Section 02750 - Exterior Concrete Pavement: Exterior concrete work adjacent to paving.

E. Section 02480 –Planting: Landscaping and sodding adjacent to paving.

1.3 QUALITY REQUIREMENTS

A. General: In addition to other specified conditions, comply with the following minimum requirements:

1. Test-in-place asphalt concrete courses for compliance with requirements for density, thickness and surface smoothness.
2. Provide final surfaces of uniform texture, conforming to required grades and cross-sections.
3. Take not less than six (6) inch diameter pavement specimens for each completed course, from locations as directed by Architect. There will be a total of four (4) test specimens for each course. These specimens shall be obtained by core drilling.
4. Repair holes from test specimens as specified for patching defective work.

B. Density: Minimum acceptable density of in-place course material is 100% of the recorded laboratory specimen density.

C. Thickness: In-place compacted thicknesses will not be acceptable if exceeding following allowable variation from thickness specified herein.

1. Base Course: 1/4 inch, +/-.
2. Surface Course: 1/4 inch, +/-.

D. Surface Smoothness:

1. Test finished surface of each asphalt concrete course for smoothness, using a ten (10) foot straight edge applied parallel to and at right angles in centerline of paved areas.
2. Check surfaced areas at intervals as directed by Geotechnical Engineer.
3. Surfaces will not be acceptable if exceeding the following:
   a. Base Course: 1/4 inch in 10 feet.
   b. Surface Course: 3/16 inch in 10 feet.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Samples: Submit ten (10) lb. sample of aggregate base course material to independent testing laboratory.

C. Samples: Submit samples of asphalt concrete paving materials and asphalt mix design to independent testing laboratory.

D. Certificates: Contractor and Asphalt Concrete Producer shall jointly provide certificates certifying that materials comply with specification requirements.

1.5 SITE CONDITIONS

A. Weather Limitations:

1. Apply bituminous tack coat only when the ambient temperature is at least 50 degrees F, and when the temperature has not been below 35 degrees F for twelve (12) hours immediately prior to application.
2. Do not apply materials when the base surface is wet or contains an excess of moisture which would prevent uniform distribution and the required penetration.
3. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees F, when the underlying base is dry, and when weather is not rainy.
4. Refer to "Minimum Placement Temperature Chart" prepared by the National Asphalt Pavement Association for Minimum Bituminous Placement Temperatures.
5. Paving shall not take place when, in the opinion of the testing laboratory, the weather or surface conditions are considered unfavorable.

B. Grade Control: Establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

C. Traffic Control:

1. Maintain vehicular and pedestrian traffic during paving operations as required for other construction activities.
2. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety, and to cause the least interruption of work.

1.6 MATERIAL REQUIREMENTS

A. Mix Criteria:

1. Provide mix formulas for each required asphalt-aggregate mixture.
2. Establish a single percentage of aggregate passing each required sieve size, a single percentage of asphalt cement to be added to aggregate, and a single temperature at which asphalt concrete is to be produced.
3. Comply with the mix requirements of the California Department of Transportation (CALTRANS) standards.
4. Maintain material quantities within allowable tolerances of the governing standards.

B. The sub-grade shall be tested and approved by the Testing Laboratory immediately prior to placement of the base course.

C. Contractor will be responsible for all drainage of the finish surface. Any "bird baths" will be considered unacceptable and shall be remedied by the Contractor at his expense to the satisfaction of the Architect.

1.7 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE MATERIALS

A. Aggregate Base: Aggregate shall meet the requirements of CALTRANS. Comply with CALTRANS Standard Specifications, Section 26 for Class II base.

2.2 SOIL STERILANT

A. Per Section 02360 – Vegetation Control.

2.3 TACK COAT

A. Tack coat shall be emulsified asphalt conforming to AASHTO M208 ASTM D2397 CSS-1 or CSS-1h. Dilute one part water to one part emulsified asphalt.

2.4 ASPHALTIC CONCRETE

A. Hot-mix type B asphaltic concrete, uniformly graded aggregate to 1/2” maximum, medium grading, per State of California CALTRANS Standard Specifications Section 39, using AR-4000 asphalt.

2.5 FOG SEAL

A. Emulsified asphalt conforming to AASHTO M208 ASTM D2397 CSS-1 or CSS-1h.

2.6 PATCHING CAULK

A. Overcutting and joints of asphaltic concrete shall be filled with BASF/Sonneborn NP-1 Self-Leveling Caulk.

2.7 SOURCE QUALITY CONTROL

A. Provide mix design for asphalt under provisions of Division One.

B. Submit proposed aggregate base and mix design of each class of mix for review and approval prior to commencement of work.

C. Test samples in accordance with AI MS-2.

2.8 ACCEPTABLE MANUFACTURERS - ASPHALT MARKING PAINT

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. J.E. Bauer Company - "Traffic Paint".
2. Tnemec - "Traffic Paint".
3. Glidden-Durkee - "Romark Traffic".
4. PPG - "Traffic & Zone Marking Paint".

B. Substitutions: Under provisions of Section 01600.

2.9 PAVEMENT MARKING PAINT

A. Provide paint stripping and handicap logos as indicated on the Drawings.

B. Provide paint specifically formulated for use as exterior pavement marking paint in traffic areas, and in the colors selected by the Architect from manufacturer's standard color range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify gradients and elevations of subgrade are correct.

C. Beginning of installation means acceptance of subgrade conditions.

3.2 SEAL COAT PRE-SWEEPING

A. Both sweeping prior to the application of seal coat bituminous materials and post application sweeping shall be done by the Contractor. The sweeping shall be performed beginning one (1) week after application and shall be completed no later than two (2) weeks after application. Proper disposal of the swept rock will be the responsibility of the Contractor.

3.3 AGGREGATE BASE PLACEMENT

A. Spread aggregate base over prepared base to a total compacted thickness of nine (9) inches.

B. Place aggregate base in maximum three (3) inch layers and roller compact.

C. Level and contour surfaces to elevations and gradients indicated on the Drawings.

D. Compact placed aggregate materials to achieve compaction to 100 percent of its maximum dry density in accordance with ASTM D698.

E. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

F. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

G. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.4 SURFACE PREPARATION

A. Proof roll all prepared subgrades using a heavy, rubber-tired roller. (Amount of allowable yielding shall be one (1) inch maximum). ***THE PROOF ROLLING MUST BE OBSERVED BY THE TESTING LABORATORY INSPECTOR.***

1. Check for unstable areas, and areas requiring additional compaction.

B. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. Remove loose and foreign material from compacted sub-base surfaces immediately before paving application. Do not disturb sub-base material.

D. Tack Coat:

1. Apply to contact surfaces of previously constructed Portland Cement concrete surfaces and similar surfaces.

2. Apply at rate of 0.05 to 0.15 gallons per sq. yd. of surface.
3. Apply tack coat by brush to contact surfaces of concrete curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
4. Allow surfaces to dry until material is at condition of tackiness and ready to receive pavement.

3.5 PLACING THE MIX - DOUBLE COURSE

A. Place asphalt concrete mixture on prepared surfaces, spread and strike-off using paving machine.

B. Inaccessible and small areas may be placed by hand.

C. Place each course at thickness so that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated.

D. Pavement Placing:

1. Unless otherwise directed, begin placing binder course at high side of section on one-way slope.
2. After first strip has been placed and rolled, place succeeding strips.
3. Complete binder courses for a section before placing wearing courses.
4. Place mixture in continuous operation as practicable.
5. Place tack coat before placing wear course.
6. Base course shall be swept as required before placing wear course.

E. Hand Placed:

1. Spread, tamp and finish mixture using hand tools in areas where machine spreading is not possible, as acceptable to Geotechnical Engineer.
2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.

F. Joints:

1. Gradually make joints between old and new pavements, or between successive day's work, to ensure a continuous bond between adjoining work.
2. Construct joints to have same texture, density and smoothness as adjacent sections of asphalt concrete course.
3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
4. Offset transverse joints in succeeding courses not less than five (5) feet.
5. Cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
6. Offset longitudinal joints in succeeding courses no less than six (6) inches.
7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, cut back unsatisfactory section to expose as even, vertical surface for full course thickness.

3.6 SEAL COAT ROLLING OPERATIONS

A. Initial rolling shall follow immediately behind the spreading of cover aggregate, with the initial coverage being completed within five minutes after spreading the aggregate. The surface rolling shall be continued until five complete coverages over the full width have been obtained. All rolling operations on an area shall be completed within 30 minutes after spreading the cover aggregate on that area.

B. All rolling shall be performed with approved, self-propelled, smooth tread, pneumatic-tired rollers. A minimum of two rollers shall be used for rolling operations. The rollers shall not be operated at speeds exceeding five miles per hour. Rolling shall begin at the outer edge of the aggregate cover and proceed in a longitudinal direction, working towards the center of the alley.

C. The completed surface shall present a uniform appearance. The surface shall be lightly broomed or otherwise maintained as necessary during the rolling operations to achieve uniform appearance.

3.7 COMPACTING THE MIX

A. Provide sufficient number of rollers to obtain the required pavement density of 100% of the recorded laboratory specimen density.

B. Begin rolling operation as soon after placing mix when the mixture will bear weight of roller without excessive displacement.

C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.

D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

E. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.

F. Do not roll centers of section first under any circumstances.

G. Breakdown Rolling:

1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
2. Operate rollers as close as possible to paver without causing pavement displacement.
3. Check crown, grade and smoothness after breakdown rolling.
4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.

H. Second Rolling:

1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
2. Continue second rolling until mixture has been thoroughly compacted.

I. Finish Rolling:

1. A pneumatic tired roller shall be used for finish rolling.
2. Perform finish rolling while mixture is still warm enough for removal of roller marks.
3. Continue rolling until roller marks are eliminated and course has attained specified density.

J. Patching:

1. Remove and replace defective areas.
2. Cut-out and fill with fresh, hot asphalt concrete.
3. Compact by rolling to specified surface density and smoothness.
4. Remove deficient areas for full depth of course.
5. Cut sides perpendicular and parallel to direction of traffic with edges vertical.
6. Apply tack coat to exposed surfaces before placing new asphalt concrete mixture.

3.8 MANHOLE AND GATE VALVE PROTECTION

A. Cover manholes, catch basins and gate valves lying within the surface to be sealed so as to prohibit the bituminous material from being placed thereon.

B. Clean the surface of these structures following the application of the cover aggregate.

3.9 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/4 inch.

3.10 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by CBC, but are considered essential to the proper performance of the building systems.

C. Aggregate base compaction testing will be performed in accordance with ASTM D698.

D. Frequency of Tests: Provide minimum of four (4) compaction tests at locations as directed by the Architect.

E. Flood Test:

1. After completion, flood the entire asphalt concrete paved areas with water by use of a tank truck or hoses.
2. If a depression is found where water ponds to a depth of more than 1/8 inch in six (6) feet, fill areas or otherwise correct to provide proper drainage.
3. Feather and smooth the edges of fill so that the joint between fill and original surface is invisible.

F. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional cost to Owner.

G. Take asphalt mixture samples and perform tests in accordance with AI MS-2.

3.11 CLEANING

A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the Architect.

B. When marking paint is thoroughly dry, visually inspect the entire application, and:

1. Touch-up paint as required to provide clean, straight lines and surfaces throughout.

2. Using a permanently opaque paint identical in color to the surface on which the paint was applied, block out and eliminate all traces of splashed, tracked and/or spilled pavement marking paint from the background surfaces.

3.12 PROTECTION

A. Contractor shall be required to protect all adjacent concrete surfaces from chipping and damage during the asphalt paving placement.

B. Protect all concrete surfaces from staining or discoloration during placement of asphalt materials or vehicle trucking during construction.

C. Immediately after placement of asphaltic paving, provide traffic cones, barricades and other devices needed to protect pavement and marking paint from mechanical injury for minimum of seven (7) days.

END OF SECTION 02740

SECTION 02750 - EXTERIOR CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Exterior Concrete Pavement Systems Above Base Course; as Indicated on The Drawings, Specified Herein, and Complete With All Accessories.

C. Aggregate Base Course; at Curb and Gutter Areas Adjacent to Asphalt and Concrete Paving Areas.

D. Granular Base Under All Other Exterior Concrete Work: Specified Under Provisions of Section 03300.

E. Exterior Concrete Work:

1. Sidewalks.
2. Aprons and Driveway Slabs.
3. Straight Curbs.
4. Curb and Gutter.
5. D.A. Swale Curbs.
6. Accessible Ramps.
7. ADA Detectable Warning Surfaces (Truncated Domes).
8. Poured Seatwall/Bench.
9. Concrete Piers at Volleyball Sleeves, Light Fixture Poles, Flagpoles and Basketball Post Sleeves.
10. Slabs for Transformer Pads and Setting Beds for Site or Plaza Finishes.

F. Provide Sealant and Joint Backing From Materials Specified Under Section 07910.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02200 - Earthwork: Preparation of site for base, excavation, backfilling and compaction.

C. Section 02310 - Site Grading: Grading materials and operations.

D. Section 02740 - Asphalt Concrete Paving: Asphalt concrete paving adjacent to concrete.

E. Section 02480 - Planting: Sodding and planting adjacent to concrete work.

F. Section 07910 - Joint Sealers: Sealant and joint backing for control and expansion joints.

1.3 PERFORMANCE REQUIREMENTS

A. The complete exterior concrete Work shall give the appearance of uniformity in surface contour and texture, and shall be accurately constructed to line and grade. The required joints shall show neat workmanship.

B. Provide concrete curbing in accordance with CALTRAN requirements, unless otherwise specified or indicated on the Drawings.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate all exterior concrete types and locations, dimensions, termination details, control and expansion joints.

C. Product Data: Provide product information showing that detectable warning truncated domes meet DSA and CBC requirements. Show dome size, spacing and layout.

D. Product Data: Provide manufacturer's data on joint filler and curing compounds.

E. Concrete Design Mix: Submit substantiating data for concrete mix design to the Architect and Independent Testing Agency not less than two (2) weeks prior to concrete placement. Data for mix shall, as a minimum, include the following:

1. Mix identification designation.
2. Statement of intended use for mix.
3. Mix proportions, including all admixtures.
4. Manufacturer's data and/or certification verifying conformance of all mix materials, including admixtures with specific requirements.
5. Wet and dry aggregate unit weight.
6. Entrained air content.
7. Design slump.
8. Required average strength qualification data per ACI 301: 3.9.1 and 3.9.2.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not place exterior concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301 and ACI 318.

B. Acquire cement and aggregate from same source for all Work.

C. Quality Control:

1. Do not commence placement of concrete until mix design has been reviewed and approved by the Architect, and until copies are at the job-site, the batch plant, and the building inspection department.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of exterior concrete work and other construction to which concrete work must fit, by accurate field measurements before installation; show recorded measurements on final shop drawings. Coordinate installation schedule with construction progress to avoid delay of Work.

1.8 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 BASE MATERIALS

A. Stabilized Aggregate Base: 100 percent crushed quarry rock meeting requirements of CALTRAN.

1. Provide under concrete curb and gutter and all concrete pavement areas indicated on the Drawings.

B. Fine Aggregate: Natural river or bank sand; washed free of silt, clay, loam, friable or soluble materials; and graded in accordance with ANSI/ASTM C136.

C. Provide granular cushion material under all other exterior concrete work as specified under provisions of Section 02300.

2.2 FORM MATERIALS

A. Form materials as given in Table 4.2 of ACI 347. Do not use aluminum materials in contact with concrete. Concrete form materials must be used in a manner to provide the surface finish specified.

B. Form Coating Material: Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.

C. Pre-Formed Expansion Joint Filler: Comply with requirements under provision of Section 03300.

2.3 REINFORCEMENT

A. Reinforcing Steel: Deformed steel bars, ASTM A185, Grade 60, sizes as indicated on the Drawings.

B. Welded Wire Mesh: ASTM A185; welded plain cold drawn steel wire fabric; type in flat sheets, and 6 x 6 10/10 WWF, unless noted otherwise in the Contract Documents.

C. Steel Dowels: ASTM A615; 60 ksi yield grade, plain steel bars, cut bars true to length with ends square and free of burrs.

1. Dowels: #4 bars, unfinished, unless noted otherwise.

2.4 CONCRETE MATERIALS

A. Typical Exterior Concrete Materials: Minimum 4,000 psi (30 Mpa) compressive strength (28 days), 3/4 inch (19 mm) maximum course aggregate (ASTM C33), Type 1 Portland cement, air entrainment as required (ASTM C260), 0.45 maximum water/cementitious materials ratio, 1-3 inches (25-76 mm) slump, 5.75 sacks minimum cement content (sacks/CY), and 6% +/- 1% air content.

B. Curbing Concrete:

1. Hand Placed Form Curbing:

2. Extrusion Machine Placement of Concrete:

3. In production of curbing concrete, add an air-entraining agent to the mix in the amount necessary to produce concrete having an air content within the ranges of 4.5 to 6.5 percent. Make every effort to maintain this air content within a range of 5 to 6 percent.

C. Air-Entraining Mixture:

D. Poured Concrete Bench Mix: Cemstone #4574 Mix or equal. Six and one-half (6-1/2) bag mix with LaFarge cement. Use super plasticizer as necessary to provide flowable concrete mix.

2.5 ACCESSORIES

A. Cure & Hardener: Water based, white pigmented curing compound containing white pigments and resins in suspension. Formulated to retain a minimum of 95% moisture in freshly poured concrete, VOC compliant, and meets ASTM C309, Type 2, Class A & B.

B. Acceptable Manufacturers:

1. Dayton-Superior - Day-Chem White Pigmented Cure (J-10-W).
2. W. R. Meadows - 1200-White.
3. L&M Chemicals - L&M Cure R-2.
4. Substitutions under provisions of Division One.

C. Membrane Curing Compound: Type 2, white pigmented.

D. Concrete Treating Oil:

E. Sealant and Joint Backing: Types specified under provisions of Section 07910.

F. Stair Safety Treads: Abrasive cast safety stair treads, Type 101 with wing type anchors for poured concrete treads; Wooster Products, Inc., or approved equal by the Architect.

G. Truncated Domes: Provide and install modular truncated domes, yellow in color meeting Federal Color No 33538, and conforming to requirements of CBC and DSA. Wausau Tiles, or approved equal.

2.6 QUALITY CONTROL

A. Provide concrete mix design under provisions of Division One.

B. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

C. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.

D. Test samples in accordance with ACI 301.

2.7 EXPOSED AGGREGATE CONCRETE

A. Exterior aggregate concrete, horizontal casting, at all areas indicated on the Drawings.

B. Concrete Materials: Type specified above in Article 2.4. Provide pigment types resistant to lime and other alkali. Inorganic, pigment content less than 10% of the weight of the cement, and color as selected by the Architect.

C. Aggregate: Granite, smooth, “Glacial” mix, clean and washed, natural colors, from single source and of same color for entire project.

1. Type 1: Maximum size aggregate 3/8 inch.
2. Type 2: Maximum size aggregate 1/2 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify compacted granular base is acceptable and ready to support paving and imposed loads.

C. Verify gradients and elevations of base are correct.

3.2 BASE PLACEMENT

A. Spread aggregate base, at curb and gutter sections and all other areas indicated on the Drawings, over prepared base to a total compacted thickness as indicated on the Drawings.

B. Place aggregate or granular base in maximum three (3) inch layers and roller compact.

C. Level and contour surfaces to elevations and gradients indicated on the Drawings.

D. Compact placed aggregate materials to achieve compaction to 100 percent of its maximum dry density in accordance with ASTM D698.

E. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.3 TYPICAL BASE PLACEMENT

A. Spread granular cushion over prepared base to a total compacted thickness as indicated on the Drawings.

B. Place granular cushion base in maximum three (3) inch layers and roller compact.

C. Level and contour surfaces to elevations and gradients indicated on the Drawings.

D. Compact placed aggregate materials to achieve compaction to 100 percent of its maximum dry density in accordance with ASTM D698.

E. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.4 PREPARATION

A. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.

B. Contractor shall notify Architect and Independent Inspection Agency a minimum of twenty-four (24) hours prior to commencement of concreting operations.

C. Base Preparation: The base shall be well drained and compacted with an approved vibrator compactor to a firm, uniform bearing surface, conforming to the planned section and established grade. Granular materials shall be thoroughly wet down so as to be in a moist condition immediately prior to placement of concrete.

3.5 FORMING

A. Place and secure forms to correct location, dimension and profiles.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

D. Install forms to allow continuous progress of Work and so that forms can remain in place at least twenty-four (24) hours after concrete placement.

3.6 REINFORCEMENT

A. Place reinforcement as indicated on Structural Drawings.

B. Interrupt reinforcement at contraction and expansion joints.

C. Place dowels and reinforcement to achieve pavement and curb alignment as detailed on the Drawings.

D. Provide doweled joints 24 inches o.c. at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.

3.7 PLACING CONCRETE

A. Place concrete in accordance with ACI 301, and comply with requirements for mixing and placing concrete as herein specified.

B. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

C. Install safety stair nosing to be cast into all exterior poured concrete stair treads.

D. Place concrete continuously between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

E. Place concrete to pattern indicated on Drawings, or as directed by the Architect.

F. Place concrete by methods that prevent segregation of the mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement and side forms.

G. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

H. Concrete Seatwall/Bench:

1. Place concrete directly from truck chute to maintain even aggregate distribution with concrete mix.
2. Place reinforcements as shown in details.

I. Exterior Concrete Piers:

1. Fence and Gate Posts (02820): Twelve (12) inches diameter, thirty six (36) inches deep.
2. Basketball Posts: As detailed.
3. Light Fixture Poles (Division 16): Verify sizes required with Electrical Contractor, reinforce with 4-#4 bars.
4. Flagpole (10350): Verify size required with flagpole manufacturer.

3.8 JOINTS

A. Expansion Joints: Joints shall be filled with 1/2 inch thick preformed joint filler material, and shall be installed in the following locations:

1. At the beginning and end of all curved sections.
2. Where all new concrete surrounds, adjoins or abuts any existing fixed objects, such as fire hydrants, valve boxes, manholes, light poles, flag poles, curbs, walks or other rigid structures.
3. At 100 foot maximum spacing.

B. Contraction Joints: Curbing shall be provided with contraction joints at 8'-0" on centers, or as indicated on the Drawings.

C. General: All joints shall be vertical and straight. Transverse joints shall be placed at right angles to the longitudinal axis of the Work. Joints shall align with similar joints in adjoining work where practical.

D. All joint work shall coordinate precisely with grids, modules and radials as prescribed on the Drawings.

E. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

3.9 CONCRETE FINISHING

A. After striking off and consolidating concrete, smooth surfaces by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating and before final finishing, check the concrete with a 10 foot steel straight edge to ensure there is no variation greater than 3/16 inches from the straight edge.

C. Work edges of slabs, gutters, back top edge of curbs, and formed joints with an edging tool, and round to 1/2 inch radius, unless otherwise indicated. Eliminate tool marks on concrete surfaces.

D. After completion of floating and when excess moisture or surface sheen has disappeared, complete troweling and finish surfaces as follows:

1. Sidewalks: Light broom, radius edges to one (1) inch, and trowel joint edges.
2. Median Barrier: Light broom, radius to one (1) inch, and trowel joint edges.
3. Curbs and Gutters: Light broom.
4. Straight Curbs: Light broom, radius edges to one (1) inch, and trowel joint edges.
5. Inclined Ramps: Light broom perpendicular to slope.
6. Truncated Domes: Install per manufacturer's installation instructions in accordance with applicable industry and government standards.

3.10 CONCRETE CURING

A. Compound Application:

1. Apply a membrane curing compound to the exposed surface of the concrete within one (1) hour of finishing the concrete.
2. If forms are removed in less than seventy-two (72) hours after placing the concrete, apply the curing compound immediately to the exposed surfaces.
3. Apply the curing compound by an approved airless spraying machine at the approximate rate of one (1) gallon of compound to 150 square feet of surface curing area.
4. In all cases, the Contractor is responsible for the protection of the concrete from frost during the cure period.
5. Concrete placement will be shut down by the Architect if the operations are not being carried out according to these specifications.

3.11 FIELD QUALITY CONTROL

A. Perform field testing and inspection by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by 2007 California State Building Code but are considered essential to the proper performance of the building systems.

C. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301 and Section 03300.

D. Three (3) concrete test cylinders will be taken for every 75 or less cubic yards of each class of concrete placed each day.

E. One (1) additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.

F. One (1) slump test will be taken for each set of test cylinders taken.

G. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Protect concrete from footprints until surface has hardened.

END OF SECTION 02750

SECTION 02810- Underground Irrigation System

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. All labor, materials, tools and the transportation and performance of all the work required as indicated on the Drawings and Specifications and reasonably incidental to:

1. Connections to water meter supply (meter installed by others).

2. Training and certification of crews for installation of solvent weld glue joints and thrust blocks.

3. Service Line, gate valve and connections from water meter to backflow device including the backflow prevention devices and all connections to Booster Pump Assembly.

4. Booster pumps with all its sensors, valves, electrical connections, separate blader tank, overflow drainage sump and misc.

5. Sleeves, Irrigation mains, laterals, gate valves, Pressure Regulating (Reducing) valves with gauges, couplings and valve boxes.

6. Central control system, automatic controllers, rain sensors, wiring, grounding, cable, communication line, district personnel training, support plan, connection to Kern HS District existing central control system and remote handheld devices.

7. Electric control valves, valve boxes, wiring, and I.D. tagging – valves and boxes.

8. Master Valve, flow sensor and related plumbing and electrical connections

9. Sprinkler bodies, nozzles and swing joints.

10. Quick coupler valves, swing joints and pressure regulators where called for.

11. Air relief valves.

12. Flushing, coverage performance and leaching.

13. All related trenching and backfilling.

14. Temporary Booster Pump with necessary connections if needed for the duration of the establishment period.

1.02 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division O and Division 1 Specification Sections, apply to work of this Section.

A. Related Work:
   1. Refer to a Division 7 section for waterproofing at raised planters.
   2. Refer to a Division 2 section for Soil Preparation

3. Refer to a Division 2 section for Planting & Sod

1.03 QUALITY CONTROL

A Examine all sections of Specifications and Drawings for Work related to this Section.

B Install irrigation system in accordance with all applicable codes and regulations. Installer shall have had considerable experience and demonstrate ability in the installation of irrigation systems of specified type(s) in a neat, orderly, and responsible manner in accordance with recognized standards of workmanship.

C Crew Training for Solvent Weld PVC & Thrust Block Installation:

1. **The CONTRACTOR SHALL BE REQUIRED TO PROVIDE CREW MEMBERS THAT WILL INSTALL PVC PIPE FOR MANDITORY TRAINING & CERTIFICATION**.
2. **Contractor shall schedule training a maximum of 30 days and a minimum of 5 days prior to the installation of any pipe on the site.**
3. Solvent weld PVC training shall be performed by the PVC Glue Manufacture, IPS Weldon Representative (Eagle Sales 800 648-4646).
4. The CONTRACTOR shall provide the full name of each person who will be working on the irrigation project.
5. All CONTRACTOR owners, supervisors, foreman, crew leaders and laborers who will be supervising or working on the irrigation system are required to attend the training, and will be required to demonstrate above average competence in the performance of installing sound glue joints for all sizes of PVC pipe 1" to 4". Certification will be issued by the PVC Glue Manufacture, IPS Weldon Representative.
6. Attendance for Certification shall mean that the individuals shall be present for the entire training – start to finish without interruption. Cell phone & text message conversations will not be permitted during the Training. Leaving the training for any purpose shall void certification for that individual.
7. CONTRACTOR employees who are certified will have their photographs taken by the contractor and contractor shall laminate the photo to each individuals certification card. A color copy of each card shall be provided to the IOR a minimum of 5 days prior to the commencement of work on the irrigation systems.
8. CONTRACTOR employees shall wear their identification cards in a very visible location on the exterior of their clothing at all times while on site while any irrigation is taking place anywhere on the site.
9. CONTRACTOR employees who have not passed certification are specifically prohibited from supervising, directing or working on the irrigation system on site. With the exception of trenching and backfill as stand alone operations. If any pipe or irrigation head installation is in progress, non certified employees will not be allowed to work adjacent to the irrigation system regardless of task.
10. The IOR, Architect, Landscape Architect, Construction Manager or their representatives shall be entitled to check the photo identification card of any CONTRACTOR employee at any time during irrigation installation or repair.
11. If a CONTRACTOR employee loses or forgets their identification card – they may not work on the system until the ID card is located or replaced.
12. If it is discovered that a non certified employee worked on the irrigation system the IOR shall determine and estimate how much work was performed with the uncertified worker and that entire section shall be removed, discarded and replaced – regardless of size, other irrigation improvements attached or

backfilled. Such removal, legal disposal and replacement shall be at no additional cost to the owner and shall not be cause for time extension or any other compensation. The IOR's determination of work to be removed and replaced shall be final.

13. If it is determined that the ID cards are switched between or to other employees, or if ID cards are forged the CONTRACTOR shall be penalized as noted below in section titled "Non Performance Penalties and Withholds".
14. Similar Training shall be performed by the IOR related to proper Thrust Block construction and Installation. Certification by the IOR shall be identified on each employee ID Card. Requirements and Enforcement shall be the same as that for irrigation installation.
15. The CONTRACTOR shall provide all materials necessary for the training. Co-ordinate specific parts and tools in the quantities required by the trainers: IPS Weldon Rep and IOR. This shall include but not be limited to: Pipe of all sizes, fittings and valves of each type anticipated to be installed; specified glue and primer; as well as trenches cut to typical depths and layouts: straight, 90's, 45's vertical direction changes and valve box block outs. Tools shall include, but not be limited to: trencher, shovels, PVC and hacksaws, carpet knives and any other implement normally used to cut, trim, clean and install PVC pipe. Materials for Thrust Block training shall be provided as well, including but not limited to: Concrete and steel tie downs per specified standards and thrust block forms from the specified manufacture.
16. Training shall occur on the site at a location directed by the IOR. Finalized and approved samples shall be left on site as models until the end of the project. Samples shall be disposed of on written direction of the IOR. The training work area shall be cleaned within 48 hours and samples not to be kept as models shall be legally disposed of and the site returned to its original condition.
17. A 2nd training may be requested by the CONTRACTOR to certified additional employees. The CONTRACTOR shall be responsible for all items and materials listed above, for the second training.
18. If a 3rd or more training sessions are required the CONTRACTOR shall forfeit $1,000.00 for every additional requested; or required training that is provided.
19. The District, at its discretion, may require additional staff be trained by the CONTRACTOR if it is determined that the CONTRACTOR is not providing sufficient trained staff to complete the project in a timely manner. Monetary forfeiture will be enforced after the 2nd training session, regardless of cause.

D. Contractor shall check static pressure and electrical supply at the irrigation point of connection to the water supply before beginning work and notify Architect in writing of the water pressure & electric phase and voltage available a minimum of 20 days prior to Installation of the irrigation system. The Contractor shall not order the Final Booster Pump until the static water pressure & electrical phase and voltage delivered to the site is confirmed and the CONTRACTOR is authorized to proceed with the purchase and installation of the Booster Pump assembly.

E. Contractor shall provide the Landscape Architect with a proposed work schedule – based on days of work – within 30 working days of the award of the master contract to the general contractor.

F. Contractor shall notify the Architect and the Inspector a minimum of 7 working days in advance when each work phase is ready to be inspected.

G. Contractor shall provide his/her Construction superintendent and Forman in charge of

the project for all standard meetings and reviews identified in the specifications and all other meetings deemed necessary by the Architect, Landscape Architect or DISTRICT'S representative. Installation lead men/women shall not fulfill this requirement. The Contractors superintendent shall be capable of informing the Architect, Landscape Architect and/or Districts representative of all pertinent information regarding the project, including but not limited to schedules and deliveries, and shall have the authority to make binding decisions regarding the work in progress.

H. All meetings, including training, shall be conducted in English. The Contractor shall provide an interpreter, at the Contractors expense, to translate for his/her non-English or poor English speaking representative(s). Any district representative with review authority may require the use of an interpreter, including but not limited to: Architect, Landscape architect, IOR or District Representative.

I. Contractor shall adequately prepare for each required meeting, review/inspection or additional meetings required by the Architect or District. Additionally the Contractor shall not request reviews or inspections prior to completing all items noted on all prior reviews/inspections. No site review by the Architect, Landscape Architect or Districts representative shall commence prior to all other items noted in previous site review meetings and reports being completed or remedied.

J. Contractors Failure to: Complete or remedy items noted in prior meetings and/or reports or; prepare adequately for required or directed reviews and /or inspections; provide the Construction Superintendent and Foreman at appointed times and dates; or provide English speaking representatives or interpreter(s); Shall make the Contractor responsible to the District for reimbursement of the Architects, Landscape Architects and IOR's direct time, travel time, materials and expenses. Reimbursement shall be at the Architects/Landscape Architects/IOR's current billing rate as of the date of Contractors failure to perform the above noted item(s) plus a 15% District processing fee. No further reviews and/or inspections shall occur until the Contractor has reimbursed the District by either direct payment or deduction by change order from the contract amount. See below for "Non Performance Penalties and Withholds".

K. Contractor shall continuously maintain a working copy "As Built" plan plus an attached log noting the dates of entries/modifications and the full name of the person making the entries. The Plan shall be located in the office trailer of the Construction Manager. The CONTRACTOR shall update the "As Built" on the minimum of a weekly basis which shall be confirmed and initialed by the IOR. No payment requests shall be honored without a completed log of weekly IOR sign offs.

L. Contractor shall provide 3 clean sets of "As-Built" plans for the irrigation system prior to final acceptance of work. In addition, copies shall be reduced to half size, laminated with vinyl film, and placed in each of the controller boxes, one copy mounted by the central computer and one copy shall be provided to the Owner.

M. The Contractor shall maintain continuous power and water supply to all facilities that are directly or indirectly affected by this construction, unless other arrangements are made with the Owner for temporary shut-offs.

N. The Contractor shall protect the public health, safety and welfare during all phases of the work.

O. Contractor's price shall include an amount to install fifteen (10) additional sprinkler heads of each type and three (2) additional valves of each type and size from that

quantity shown on the drawings at no additional cost to the Owner. (ie: 2 2" PESB Valves plus 2 – 2" PESB – PRS-D valves; plus the same for 1 ½", 1" and 3/4 " valves, etc.). Locations, if needed, shall be determined by the Landscape Architect. All unused additional sprinklers and valves not used from this quantity shall be delivered to the Owner as spares. These spares shall be delivered, neatly packaged in their original boxes, to the Construction Managers trailer and received by the IOR in writing prior to the substantial completion review. Substantial Completion Review shall not occur until these additional parts are supplied.

P. Unused Parts: Specifically related to Valves and Irrigation Heads. Should site modifications or layout adjustments or site reviews determine that some Irrigation Valves or heads are not needed for the completion of the project; these unused parts shall be provided to the Construction Managers trailer and received by the IOR in writing prior to the substantial completion review. Substantial Completion Review shall not occur until these additional parts are supplied.

Q. Nozzle changes to accommodate existing conditions, layout modifications or site adjustments shall be provided at no additional cost to the Owner. All spare nozzle trees shall be provided to the owner in a clean organized fashion at no additional cost to the Owner.

R. Maxicom Installation Certifications: The Contractor shall be Maxicom certified for installation prior to commencement of Irrigation Installation. Provide the Landscape Architect with proof of Certification within 30 days of after award of the master contract. Delay in signing the Landscape Contractors contract shall not qualify. The Contractor shall confirm that the individual certified to install Maxicom remains employed by the Contractor within 20 days prior to start of construction. The individual that holds the Maxicom certification shall personally and directly supervise and or install all Maxicom wiring, components and connections. If the Contractor can not provide proof of Certification they will be required to take a Certification Class from the local Maxicom Supplier (Dennis Banducci – Kern Turf Supply – 661-664-5200) at the direction and location required by the Landscape Architect a minimum of 30 days prior to any irrigation work, including sleeve installation, being performed.

1.04 GUARANTEE

A. Contractor shall provide a one year guarantee from the date of Final Acceptance of the Work.

B. Any soil, pipes, valves, heads, planting, structures or paving which has settled as a direct result of irrigation trench settlement shall be reinstalled to the proper level at no cost to the Owner. Completely restore all damaged planting, paving, and/or other improvements. See below for "Non Performance Penalties and Withholds"

C. The Guarantee period for the entire site shall not begin until the Central Control system is totally operational and connected to the Kern HS District Central Control System.

1.05 INSTRUCTION, TRAINING & SUPPORT PLAN

A. Provide instruction to the Owner's maintenance personnel in the operation and maintenance of the system. All warranties, product data and manuals shall be bound together with half size reduced site irrigation plans showing zones in 9" by 12" black 3

ring binders.

B. Contractor Bid and Price shall include training for up to two (2) District maintenance personnel in the programming and operation of the Maxicom Central Computer Controller System. Two (2) of the District maintenance staff are to be certified to level 1 to be provided locally by Kern Turf Supply. One (1) District maintenance staff member is to be certified to level 2 at the Rainbird Corporation Training Facility in Tucson, Arizona.

C. Contractors Bid and Price shall include a 3 year Maxicom Global Support Plan (GSPC – Kern Continuation H.S. – 3 Year) from Kern Turf Supply. The Maxicom Global Support Plan shall be in place at the time of Maxicom Supplier Site Sign Off. All remaining time under the 3 year plan shall be transferred with the Maxicom Global Support Plan ownership to the district when the district accepts the project as final.

D. Contractor is to provide for one year 4 – 1/2 day sessions on site technical support and continuing training after the date of final acceptance by the District at no additional cost to the District.

PART 2 - PRODUCTS

2.01 MATERIALS

All materials shall be as indicated on the plan, irrigation schedule and as specified herein

A. Backflow Protection Device and Bladder Tank:
   1. Bladder Tank shall be Wessell NLA-200 53 gallon ASME Expansion Tank. Tank shall be pre-charged to 65 psi (70% of Normal System Pressure). Install per Cal Water requirements and details between the water meter and Booster Pump.
   2. Backflow Protection Device: Febco 825 Y – 2” Reduced Pressure Backflow Preventer for Toxic Service. With Febco Model 758 “Y” strainer – 6”, reducing bushings, unions, line size risers, chain & lock (provide 4 keys to locks w/ spare equipment prior to Substantial Completion Review), concrete pad and thrust blocks per manufactures recommendations.
   3. The entire backflow device shall be enclosed with a custom fabricated “Polar Blanket” that provides insulation from freezing temperatures.

B. Piping, Fittings and Thrust Blocks:
   1 All non-pressure lines shall be IPS Class 200 PVC with solvent weld joints and fittings, sizes as shown on the Irrigation Legend and plans.
   2 All Service Pressure Lines from the meter to the backflow device shall be 3” IPS Class 315 PVC pipe with bell ends for solvent welds (glued).
   3 All Pressure Mainlines 3” - 2” shall be IPS Class 315 PVC with solvent weld joints and fittings.
   4 All Pressure Mainlines 1 ½” – 1” shall be IPS Schedule 40 PVC with solvent weld joints and fittings.
   5 All pipes shall be IPS PVC manufactured by PW Pipe, JM Pipe, Diamond or Centainteed Pipe or approved equal.
   6 PVC pipe fittings shall be schedule 40, ASTM 2260.
   7 PVC pipe fittings at valve connections and swing joints shall be Schedule 40.
   8 Galvanized pipe and fittings shall be ASTM A120.
   9 Piping for Control System sensor shall be black iron, ASTM A120.
   10 All Fittings that connect to Pressure Mainline to the Bladder Tank, Reduced Pressure Backflow Device, Booster Pump, Flow Sensor, and Isolation Gate Valves shall be Leemco ductile iron flanged fittings that connect to Class &

Schedule Rated IPS PVC.

11 All Fittings that connect PVC to Isolation Valves (gate valves) Master Valves and other Iron, Bronze or Brass Flanged fittings shall be Schedule 80 PVC Flanged Fittings.

12 Thrust Block shall be made by utilizing forms as needed to keep valve manifolds clear and clean for service access.

13 Thrust Block forms shall be for soils with bearing strength 1000 lbs/sf or greater.

14 Thrust Blocks sizes and dimensions shall be based on charts for 2000 lb/ft² Soil Bearing Capacity at 150 psi.

15 Concrete for Thrust Blocks shall be a min. of 6 sac mix, mixed and at the consistency (stiffness) recommended by in the plumbing specification section.

C. Gate Valves: Nibco Irrigation IPS Resilient Seat Gate Valve, epoxy coated, with non rising stem, sq. Wrench nut top, with flanged fittings – Model Number F-619-RWSON. All Gate Valves are to be line size. Each valve shall have its own rectangle valve box. Provide the district with 2 Keys prior to substantial completion review.

D. Controller Wires: Shall be solid copper conductors, 600 volt AC, Type UF-AWG, UL approved for direct burial. Common wire to be # 10 size; station wires to be # 121size, minimum.

E. Maxicom Control System Communication Cable: Shall be PE 89 communication cable (19 gauge six twisted pairs) to connect the CCU-28 to the field satellites. Install in 2" conduit rigid metal conduit between controllers. Install per Manufactures recommendations and specifications.

F. Flow Sensor: Rainbird Model FS400P – 2" Flow Sensor with 2 with reducing couplings and 5' mainline sections both upstream and downstream from the Flow Sensor. Contractor is to connect PE 89 communication cable to the irrigation booster pump flow sensor output board. Communication cable shall be placed in electrical conduit. Utilize AEF 9516-2 SP flow wire for flow sensor connection to the flow transmitter – to be placed in electrical conduit. Contractor is to install conduit into pump control panel for communication cable as required by Maxicom Manufacturers recommendations and specifications for a complete installation.

G. Install Maxi Surge Pipe MSP-1 at each controller to protect equipment from electrical surges. - See Detail.

H. Tracer Wire: All water pressure lines to be installed with #12 tracer wire except where control wires are located adjacent to pressure lines.

I. Utility Marker Tape: Any control wires that do not follow irrigation pipes shall be 24 inches deep and marked with continuous utility marking tape located 6 inches below finish grade.

J. Solvent Cements & Primers: As manufactured by IPS Corporation and shall conform to ASTM D- 2466 and NSF approved and be of the proper body (viscosity) for the size of pipe, fittings and valves being installed as recommended by manufacturer. All Solvent Cements & Primers shall be Low VOC. The contractor and installation crew shall be familiar with and follow recommended set times based on weather and the specific solvent cements and primers being utilized.

1. Pressure line assembly of pipe (mainlines) is specifically prohibited at temperatures below 40º or above 100º. Installation of larger than 4" schedule 80 PVC is specifically prohibited during wet conditions.
2. The contractor shall contact the Solvent Cement & Primer manufactures rep.

for specific training and for specific product and application recommendations and shall proceed at his/her own risk for the installation of lateral line systems when temperatures are very wet, below 40º or above 100º or any other unusual conditions.

3. During normal weather conditions - Dry & 60º - 100º Use Low VOC P-68 or P-70 Purple Primer. Primer shall be used for all solvent weld joints.
4. During wet, foggy, damp and/or colder conditions 40º - 60º use only P-70 Purple Primer. Primer shall be used for all solvent weld joints.
5. During normal weather conditions – Dry & 60º - 100º Use 2704 Grey, 2721 Blue, or 2737 Turf & Ag Low VOC Solvent Cements.
6. For Class 200 & 315 & Schedule 40 pipe up to 6" or Schedule 80 PVC 4" or smaller, during wet, foggy, damp and/or colder weather 40º - 60º Use 2725 Wet 'R Dry Aqua Blue Low VOC or 2737 Turf & Ag or Low VOC Solvant Cements.

K. Controllers – Non Maxicom Set Up: See Irrigation Legend for required stations.
   1. For a Non Maxicom installation use Rain Bird ESP-MC Series Field Satellite Controllers,
   2. Enclose each controller in a Kern Turf Safe Weather & Vandal Resistant Stainless Steel Enclosure # SB-22ss.
   3. Contractor shall include in his price
      a) 2 Remote Control Technologies TRC Commander Hand Held Programmable Irrigation Controls Model # 01035
      b) 1 receiver card in each controller Model # 01060.
      c) A Cobra Antenna # 01947 including wiring from each receiver card to the antenna with high quality Coax cable and fittings per the manufactures recommendations. All exposed Coax cable shall be installed in rigid electrical conduit. The antenna shall be securely fixed to the top of a tennis court fence directly behind the controllers.

L. Controllers – Maxicom Set Up: See Irrigation Legend for required stations. All the items listed in Controllers – Non Maxicom Set Up (above): Except modified for Maxicom use plus the following:
   1. For a Maxicom Installation use Rainbird Maxicom Interface Board M7200 on each controller.

   2. Controller Assemblies Shall be:
      Controller I.D #.
      a) _____
      b) _____

M. Control Valves: Rain Bird Remote Control Valves PESB Series, See Irrigation Legend. Use PRS-Dial pressure regulating valves where shown on plans. See Irrigation Legend.

N. Irrigation Heads: Rain Bird - See Plans, Legends & Details

O. Swing Joints:
   1. For Irrigation Heads
      a) ½" KBI Standard Series
      b) ¾" – 1" Rain Bird TSJ Series – Length as needed
   2. For Quick Couplers
      a) Low / Regulated Pressure Areas – 1" Rainbird TSJ Series
      b) High Pressure Areas – 1" TSJ – PRS Series

P. Pressure Reducers: Not Used.

Q. Valve boxes: Applied Engineering Products Valve Boxes. Provide District with 6 Hex Bolt opening tools prior to Substantial Completion Review.
   a. Irrigation Valves, Large Pressure Regulators & Flow Sensor: Series 1015 1G2G 12“ High Standard Rectangle with Solid Cover (lid) w/ Stainless Steel pentagon bolt and socket. Utilize 1015 6” Extension Bodies where necessary to eliminate soil intrusion into valve boxes. Use 1 box per valve. As shown on drawing.
   b. Master Valve & Gate Valves: Series 1320 1G2G 12” High Jumbo Rectangle with Solid “T” Cover (lid) w/ Stainless Steel pentagon bolt and socket. Utilize 6” High Jumbo Extension Bodies to full depth to provide clean access to valve. Use 1 box per valve.
   c. Quick Couplers & Small Pressure Regulators: Series 610 6” Heavy Duty Round with Solid “T” twist on cover.
   d. Valve Box Lids shall be hot stamped (branded) with the controller ID and Valve ID.

R. Central Control System: The Central Control System shall be the MAXICOM² Central Computer Control System with Flo-Watch and Flo-Manager software features (located in the Facility managers office – Building 1700) as manufactured by Rain Bird Sprinkler Mfg. Corp. The system shall incorporate a 28 Channel Cluster Control Unit (located with Irrigation Controllers) The CCU shall have its own Kern Turf Safe Weather and Vandal Resistant Enclosure # SB-22SS. The Contractor is to add this site to the Districts existing Maxicom Central Computer Control System located at the Districts Maintenance Facility. Communication is to be via dedicated telephone line between the Central Control System (in office) and the Cluster Control Unit located at the site of the Controllers. Contractor is responsible to establish communication between central computer and the new school site and for all data gathering and input and programming required for a complete installation.

S. Temporary Booster Pump: The Contractor shall provide a temporary booster pump during the leaching, establishment period of the turf and landscaping.

   1. It is anticipated that permanent electrical power will not be available during some or all of the leaching, establishment period for a portion of the landscape. Especially the sports turf.
   2. The contractor shall install the temporary booster pump at the location of the future permanent pump, or other location with prior approval of the IOR and Landscape Architect.
   3. The Contractor shall utilize the booster pump to pressurize the irrigation mainlines for the sports fields during construction and immediately after water is provided at the POC – Point of Connection.
   4. The temporary booster pump shall be sufficient in size to boost the pressure so that a minimum of 1 large turf irrigation station can operate and provide full pressure at the irrigation heads. Approximate 65 – 70 gpm delivered to the valve at 500 psi delivered to the irrigation head/rotor.
   5. The Contractor may choose the means, methods and type of power provided to operate the booster pump. The pump and power supply must meet all local, state and federal codes and shall be secured sufficiently to protect it from the public – protecting the public health, safety and welfare.
   6. The Contractor shall operate the pump as and when necessary to properly operate the irrigation system to establish and maintain the landscape during

installation, establishment and maintenance until such time as proper power is provided for the permanent Irrigation Booster Pump.

T. Irrigation Booster Pump: Contractor is to supply and install a factory assembled and tested Rain Bird BP Series VFD Multi-Pump Booster System complete with enclosure. The system shall include all components necessary to function as a complete and operational pumping system with variable frequency drive (vfd) primary pressure regulation with electronic butterfly valve (ebv) backup pressure regulation. And Low Flow Bypass System. The entire system shall be completely flow and pressure tested prior to delivery
   a. Model # PMH 91124450
   b. The pump station is 7.5 HP to be rated for __ gpm - 120 gpm with a 0 - 80 psi pressure boost range.
   c. Electrical Requirements: 3 Phase x 460 4 wire wye / /30 Ampere Disconnect.
   d. Enclosure: Marine grade Aluminum: VIT #PE-60AL (60"l x 38"w x 39"H) w/ Exhaust Fan #OPT-FAN
   e. Basic Features: 4.4 gallon Diaphragm bladder tank (150 psi rating); PMU 2000; emergency Operation Switch; Lightning Protection; Pupm RUN Light; Fault Pilot Light
   f. Additional Features: Enclosure fan; GFI 120 V Side Outlet; Discharge Spool Piece Accommodation – 4" Spool; Pressure Relief Valve – 2" Watts Valve threaded.
   7. Pump station is to have a graphical touch screen with friendly user features including digital flow and pressure display, cumulative and re-settable gallons pumped indicators, elapsed run time display per pump, pump running status indication, full alarm status display with auto time stamping and user adjustable operation parameters.
   8. Pump station is to have flow sensor output board (pulse encoder & output decoder) with formatted signal compatible with the Maxicom Central Computer Controller System. Contractor is to provide and install conduit as required to connect Maxicom communication cable to pump station flow sensor output board supplied as part of the irrigation booster pump station.
   9. Pump station is to be capable of shutting down or starting based upon signals received through the Maxicom Central Computer Controller System.
   10. Pump station is to have an auxiliary power zone to include three (3) 120 volt, 15 amp circuit breakers.

U. Rain Sensor – Automatic Shut Off: Rain Guard Shut Off Device Model #WCF by Hunter Industries. To be built directly into Maxicom CCU Enclosure.

V. If non Maxicom System – Mount to top of Controller A Enclosure, and install per manufactures recommendations to automatically shut off irrigation system during rain events.

W. Valve Tags: Shall be by T. Christy Enterprises Standard size Identification tags, which shall be Irrigation Yellow color with the Controller Letter and Valve numbers hot stamped in Black (ie: A – 1 for Controller A – Valve # 1; B-10 for Controller B – Valve 10, C-38 for Controller C – Valve # 38 and so on). ID tags shall be installed prior to the Substantial Completion Review and Maxicom set up and review.

PART 3 - EXECUTION

3.01 GENERAL

All installation shall be per plan, details, manufactures recommendations and specifications

and as specified herein. All grading shall be completed and or accommodated before trenching commences. Contractor shall examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work or bring to attention of Construction Manager, IOR and Architect. **Do not proceed until unsatisfactory conditions are corrected.**

3.02 IRRIGATION BOOSTER PUMPS

A. Temporary Booster Pump: Install as and when needed to provide sufficient boost to pressurize the irrigation system during construction of the irrigation system and to provide sufficient pressure during leaching, planting, establishment and maintenance prior to the installation of permanent electrical power and permanent booster pump. Install in a safe manor. It is the Contractors option as to the power source for the temporary booster pump (ie: generator fueled by gas, diesel, etc.) The Contractor shall include in his/her price sufficient funds to operate the temporary booster pump for a minimum of 6 months.

B. Permanent Booster Pump: Rain Bird shall supply a binder complete with instructions and details for installation. Contact Kern Turf Supply for a sample 661 – 978-5935 (Josh Banducci). Install pump at location designated and as detailed on Plans and per Rain Bird specifications and instructions. Secure to concrete pad per manufacturer's recommendations and ground per manufacturer's recommendation. Pump assembly shall be completely installed, connected to power supply and to irrigation controllers as part of this work. All materials and workmanship shall be warranted for a period of one year from Final Acceptance. Booster Pump Start up shall be supervised by Rain Bird and certified that the pump systems are operating properly and within parameters.

3.03 CENTRAL CONTROL SYSTEM

A. Available from Rain Bird Sprinkler Mfg. Corporation via Kern Turf Supply 661-664-5200. Central Control System shall be installed by Certified Maxicom Technician supplied by Kern Turf Supply.

B. The Districts existing MAXICOM System shall be programmed by a certified MAXICOM programmer supplied by Kern Turf Supply after instillation of all wiring and components by the Contractor.

C. Install Cluster Control Unit (CCU) to work with existing District Maxicom computer station. Install primary electrical and surge protections. Install computer data path and satellite data path. Test and confirm that it operates system properly. CCU shall be installed in its own Kern Turf Safe Weather and Vandal Resistant Enclosure #SB-22SS.

D. Conduit sweeps into Building _____ shall be provided by others, for phone/communication line. Contractor shall provide conduit from the Controller location to Building _____ for the communication line. The communication line shall be installed by others. Contractor shall connect the communication wire to the Central Control Unit at the Controller location. The Maxicom technician shall make the connection to the Central Control System at Building _____.

E. Utilize PE 89 communication cable to connect the CCU-28 to the field satellites. It shall be installed in a Electric metal conduit of proper size (2" minimum conduit size) required for the number of cables to be placed in it, utilize electrical sweeps with at all changes in directions.

F. Install Maxi Surge Pipe MSP-1 at each controller to protect equipment.

G. Dedicate Station # 24 on each controller for Quick Coupler Scheduling on the Maxicom system.

H. Maxicom² Field Information For Data Base Input: The contractor shall fill out and complete the entire data sheet to be provided by Kern Turf Supply prior to the Maxicom² System Technician making the connections to the CCU and Central Control System. The Contractor shall contact Kern Turf Supply 661-664-5200 for instructions prior to irrigation start up. The following is a sample which shall be completed for all controllers and valves by the Contractor.

KERN TURF SUPPLY, INC.

MAXICOM2

FIELD INFORMATION FOR DATA BASE INPUT

CHANNEL #_____ DEVICE TYPE_____

COMMUNICATION TYPE_____(2-WIRE OR LINK)

Flow sensor(s) on Link satellite: Gal/pulse A_____B_____

Station Number & Description	Landscape coefficient	Precipitation rate	Flow rate (GPM per valve)	Cycle time Maximum minutes	Soak time Minimum minutes	Flo-Watch Zone (F#) 1-40	Flo-Mng. Zone-(FM#)+ capacity and POC
1							
Through							
40							

3.04 TRENCHING AND PIPING

A. Piping Under Paving: All mains, laterals and wires required under AC paving or Concrete Fire Lane or Drive Approach Paving shall be in PVC sleeves. If soil is expansive or rocky, Contractor shall set sleeves on a 6 inch deep sandy base. All sleeves to be installed prior to paving. Sleeves shall be a minimum of 2 times larger than pipes and wires being sleeved. Minimum sleeve size is 2". Pipes and wires are to be installed in separate sleeves. See Details.

B. Pipe Location: All irrigation lines shall have 12 inches of horizontal clearance from lines of other trades, unless previously approved on site by the inspector. All pipelines shown parallel on the drawing may be installed in a common trench. When placed in a common trench irrigation lines shall maintain the minimum cover required. Where shown parallel or adjacent to planted areas versus pavement, they shall be installed in planted area.

C. Changes in Pipe Direction and Elevation: All changes in depth of pipe or pipe direction

shall be accomplished using 45 degree fittings.

D. Trench Depth: Pressure line minimum depth/cover to be 24 inches. Under paving pressure line shall be 24 inches minimum in depth under the bottom of the base material. Lateral line minimum depth/cover shall be 18 inches. Under paving lateral line minimum depth shall be 24 inches.

E. Joints:

1. All supervisors, foreman and laborers who review or install PVC Solvent Weld joints shall be certified by the IPS Weldon PVC Glue Manufacture. (See Quality Control Section – above)
2. All pipe to be cut square.
3. Remove all burrs.
4. Remove all soil, grease, and moisture to form clean dry surface.
5. Apply primer per manufacturer's printed specifications to all piping.
6. Apply cement with correct applicator and quantity per the manufacturer's specifications for various pipe sizes. Insert and maintain pressure per manufactures recommendations.
7. Allow for minimum manufacturer's specifications for various pipe sizes.
8. Allow for minimum manufacturer set before moving pipe.
9. Allow for minimum manufacturer's cure time before application of water pressure.

E Dissimilar Materials: Provide dielectric fittings between dissimilar materials.

F Threaded Fittings: Teflon tape or non locking Teflon plumbers dope shall be used on all threaded fittings. Wrap threads no more than twice with Teflon tape. Screw fittings to prevent leaks; however do not over-tighten fittings such that either the female or male fittings crack. Immediately repair or replace all fittings that leak on discovery.

G Mark capped ends of pressure lines with a concrete stake 18 inches long, set directly in front of the end of the pipe. Top of stake to be one inch above grade. Note location of concrete stake by a minimum of 2 dimensions from known fixed objects on Record Drawings (As Builds).

H Thrust Blocks:

1. Contractor shall install thrust blocks on mains at all changes in direction, changes in grade, and other points as recommended by the manufacturer or as directed by the IOR or Landscape Architect.
2. Cast in place concrete blocks shall be based on charts for 2000 lb/ft based on 150 psi. to protect the pipe from all thrust damage. Thrust Blocks shall have a minimum of 24” of soil cover.
3. Irrigation control wires shall be kept clear of the thrust blocks and shall not be imbedded into the concrete of the thrust blocks, wires shall have a minimum of 6” of cover between them and the thrust blocks or be run on the opposite side of the pipe from the thrust block.
4. Thrust Blocks for Isolation Gate Valves and other vertical or inline connections, including Ductile Iron Flanges shall be tied down utilizing rebar rods; properly installed and placed to eliminate wear from vibration.

3.05 CONTROLLERS

A. Install satellite controllers in location indicated on plans in a fenced enclosure adjacent

to the gym as shown on drawings. Install primary electrical and surge protection. Install communication wire from controllers to CCU at Building _____.

B. Control Wire Placement: Wires shall be placed below irrigation mains wherever practical and taped to main at 50 foot intervals. Install wire prior to irrigation lines to insure coverage. Where wires do not parallel pipes, they shall be buried a minimum of 24 inches, taped at 50 foot intervals, marked with utility tape, and should run along walks or building edges wherever practical. Control wires under roads, walks, walls, or any other paving shall be in Schedule 40 PVC sleeves, 24 inches deep.

C. Single Wires: All controller-to-valve runs shall be single, individual wires, one for each valve.

D. All wire splices shall be with 3M DBY/DBR wire connectors or approved equal. Any wires that receive a splice shall be reviewed by the IOR for proper installation be tested for conductivity prior to backfill.

E. Connection to Valves: Connect control wires to valves using 3M DBY/DBR wire connectors or approved equal. Wire should be installed so that a loop encircles the valve. Provide 24 inches of slack at each valve; turn in trenching, and for each 100 feet of straight runs.

F. Valve Identification: Attach an identification tag with the valve & Controller Station numbers shown on plans prior to substantial completion review.

G. Valve Sequence: Connect control wires to controller in sequential order according to valve / station numbers as shown on plans. The

3.06 VALVES & VALVE BOXES

A. Install valves per details. A maximum of 1 valve per valve box.

B. Valves shall be located in shrub areas when ever possible.

C. No valves or valve boxes shall be installed within, or immediately adjacent to the play area of the baseball, softball, soccer or football fields. Confirm with the Landscape Architect all valve locations in all sports areas prior to trenching and installation. It shall be the Contractors responsibility to accurately layout all sports areas prior to installation of the irrigation system. The Contractor shall relocate all valves placed within or immediately adjacent to sports fields as directed by the Landscape Architect and at no additional cost to the owner.

D. Valve boxes shall be installed per details with valve extensions as needed to keep the boxes clear of soil and debris with bricks at corners and clean gravel underneath valves.

E. Valve boxes shall be placed flush with finished grade and square to the nearest adjacent walkway, curb, fence or buildings.

F. Settlement of valve boxes and or soil immediately adjacent shall be corrected prior to planting and within 1 week after detection during the establishment and warranty period.

3.07 HEADS

Install irrigation heads with nozzles as specified in the irrigation schedule. Make as many nozzle size changes per head as needed to provide adequate and even coverage and to accommodate unforeseen site changes or conditions. Nozzle changes shall be made at no additional cost to the Owner. Set heads flush with finish grade and 1-1/2 inch from pavement edges.

3.07 QUICK COUPLING VALVES

Install in valve boxes with the top flush with finish grade, 8 inches from pavement and heads. Furnish 5 valve keys with inverted hose bibs and 5 swivel hose ells to the IOR along with the required spare irrigation parts prior to Substantial Completion Review. Install per details. Provide with Pressure regulating valve when shown on plans.

3.08 TESTING AND INSPECTION

A. Contractor shall specifically request the following Landscape Architect reviews ten business days prior to completion and progressing with additional work. Requested visits in less than this time or return visits required due to lack of Contractor performance shall be at the Contractor's cost.

1. Pre-construction: An initial pre-construction meeting shall be initiated by the Contractor and shall be held on-site. The Contractor, Project Foreman, Architect, Landscape Architect and Owner's Representative and Inspector shall be present.

2. Lay out and flagging of entire system with verification of limits and grades of work.

3. Point of connection installation including surge tank, Reduced Pressure Backflow Preventer.

4. Booster pumps installation.

5. Main line and valve installation and pressure test.

6. Coverage adjustments of all heads, valve box review and operation of system including Maxicom Control System from both the CCU and Hand Held Irrigation Control Units and flow sensor.

B. General: The Contractor shall not allow nor cause any of this work to be covered or enclosed until it has been inspected and approved by the IOR and Landscape Architect. Should any of this work be enclosed or covered before such inspection or test, it shall be uncovered at the Contractors own expense. After the uncovered work has been inspected, tested and approved, the Contractor shall make all repairs with like materials necessary to restore all the work and that of other Contractors to its original condition. This shall include point of connection, main line and valve installations.

C. Repairs: The use of caulking or cement to repair leaks is prohibited. Leaking joints shall be cut out, replaced and retested. Tapping Saddles are prohibited, unless specifically authorized in writing, on an individual and one on one occasion, by the IOR or Landscape Architect. Regardless of authorization the installation of a tapping saddle shall be at the Contractors risk.

D. Pressure Test: After installation of the pressure lines, valves and prior to backfilling

and installation of lateral lines, the system shall be thoroughly flushed under pressure to remove dirt, scale or other material from the lines. Provision shall be made to bleed the lines of air. The pressure lines shall then be tested at 100 psi for 4 hours with couplings exposed and pipe sections center loaded. Contractor shall install a calibrated pressure gauge indicating a maximum pressure of 3 times the required test pressure in a quick coupler valve. After pressurizing the system, the backflow device shall be closed. No pressure loss shall occur in the pressure lines for a 4 hour period. Should any pressure loss occur or leaks develop, the system shall be re-tested following repair. The pressure test must be made in the presence of the IOR and Landscape Architect.

E. The Reduced Pressure Backflow Preventer shall be inspected, tested and certified by a Certified Technician prior to Substantial Completion.

3.09 HEAD LAYOUT AND OPERATION

A. Layout: Adjust layout as necessary to meet job conditions and to coordinate installation with work under other Sections. Adjustments to head locations to achieve full and uniform coverage of the areas intended to be watered, with minimum over-spray of walks and roadways, including nozzle changes, shall be made at no additional cost to the Owner. No overspray shall be allowed onto buildings.

B. Head Coverage: After sprinkler heads are installed, the system shall be inspected for adequacy and even and complete distribution of water. Any defects discovered shall be immediately repaired. Including but not limited to the installation of additional irrigation heads from the above mentioned allowance and credit for heads determined to not be needed on other zones.

C. Operation: No planting shall occur until the irrigation system, central control system and automatic controllers are fully operative and have been inspected by the IOR and the central control system is certified by Rain Bird and approved by the Landscape Architect.

3.10 BUBBLERS

A. Circuit: All bubblers shall operate from valves used exclusively for bubblers.

B. Location: Bubblers shall be located on the uphill side of trees. Bubbles shall be installed in deep root watering tubes per specifications and details.

3.11 BACKFILLING

A. Compaction: After the work has been inspected and approved, backfill all trenches with fine earth materials, no gravel or rocks, and **compact to 85 per cent compaction for all planting areas. Compaction under paving shall be 95 per cent or greater below all paving or per engineers requirements for plumbing backfill – whichever is greater.** All trenches shall be left flush with adjoining grade in a firm unyielding condition. Back fill per pipe manufactures recommendations.
B. Fill and compact from the setting bed to the spring line either manually or by flooding. Take specific precautions to not “Float” the pipe. After compaction to the spring line the remainder of the trench may be backfilled and compacted in lifts. Backfill shall be done in such a manor as to eliminate all voids. Water flooding is allowed as a method of compaction. Avoid “Bridging” during backfill and compaction.
C. If “Floating” occurs at any time for any reason the contractor shall immediately take

what ever measures necessary to rebury the pipe to the correct alignment, depth and cover requirements. Any floated pipe shall be inspected and approved by the IOR prior to backfill.

D. If Bridging occurs during the backfilling process the contractor shall take whatever means necessary to immediately correct the non conforming sections.
E. Any trench depressions shall be backfilled and areas affected replanted with sod to match turf type or ground cover species originally planted during the 1 year guarantee period.

3.12 LEACHING

Immediately after a discernable section of irrigation is completed (ie: a specific sports field such as the varsity baseball diamond, or Central quad turf area, or Streetscape planting area) that area shall be irrigated to promote leaching. See Specification sections 2210 Grading & Soil Preparation and 2480 Planting for required soil amendments that are to be applied prior to leaching. The Contactor shall apply water via the newly installed irrigation system.

A. Water Application for Leaching: Apply sufficient water to wet (leach) the soil to the depth of 3.5' (three and one half feet). Multiple sets (start times per area) may be required to apply sufficient water without causing runoff. The leaching process shall continuously apply water such that a unbroken continuous column of water is moving downward through the soil profile to the minimum depth.
B. The Contractor shall provide sufficient supervision to insure that water is not allowed to puddle, pool or run off the immediate area. Provide all State required erosion control measures. Should water run off the site, provide all required silt fencing, straw wattles or whatever means necessary to trap sediment prior to leaving the immediate site. Trap run off and pump back onto site. Do not allow water to exit the site.
C. Inform the IOR and Construction Manager a minimum of 5 days in advance of the intent to begin the leaching process on each specific area. Care shall be taken to that runoff does not affect the construction activities of other trades immediately adjacent to the area being leached.
D. The cost of water will be paid for by the District. With the exception of uncontrolled runoff. If uncontrolled runoff occurs the District and Architect will estimate the amount of wasted water and the Contractor shall be responsible for reimbursing the District for the waste.

3.13 CLEAN UP

Remove all excess materials and other debris from the site. Sweep all paved areas of soil, leaves and other material. The site shall be cleared and clean of debris on a weekly basis minimum. Debris shall be disposed of in a legal manor. Spare and unused material shall be stored in a neat and organized fashion, such that spot reviews of material stockpiles can be conducted by the IOR, Architect, Landscape Architect or District Representative.

END OF SECTION
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SECTION 02830 - FENCES AND GATES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Site Fences and Gates as Indicated on the Drawings, Specified Herein, for Protective, Security, Decorative, Recreational, and Right-of-Way Purposes.

C. Types of Fences and Gates:

1. Exterior Galvanized Steel Chain Link Fence; Framework, Fabric, Swing Gates, Hardware and Accessories.

a. Excavation for Post Bases and Concrete Piers for Posts.

b. PVC Slats Around Sump Area.

D. Exterior Chain Link Backstops.

E. Exterior Ornamental Fences With Fence Framework and Accessories; Swing and Pivoting Gates.

F. Custom Steel Swing and Center Pivoting Gates.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork: Excavation and backfilling for concrete piers for posts.

B. Section 02310 - Site Grading.

C. Section 02480 – Planting.

D. Section 02740 - Asphalt Concrete Paving.

E. Section 02750 - Exterior Concrete Work.

1.3 SYSTEM DESCRIPTION

A. Fence Height:

1. Chain Link Fence: 8’-0” high.

2. Ornamental Fence: 7’-0” high.

B. Line Post Spacing: At intervals not exceeding 6 feet.

C. Gate Sizes: Width as indicated on Drawings by height of fence.

D. Line, Corner, Gate and Terminal Post Footing Depth Below Finish Grade: ASTM F567, four (4) feet.

E. Refer to Drawings for locations.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:

a. Wind Speed: 80 mph.

b. Fence Height: 8-10 feet.

c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.

d. Wind Exposure Category: C.

2. Determine minimum post size, group, and section according to ASTM F1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain fences and gates as complete units; including necessary erection accessories, fittings, and fasteners from a single source or manufacturer.

1.6 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

C. Product Data: Provide manufacturer’s data on fabric, posts, accessories, fittings and hardware.

D. Samples: Submit two samples of fence fabric illustrating construction and finish.

E. Manufacturer's Installation Instructions: Indicate installation requirements and post foundation anchor bolt templates.

F. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of fences and gates and other construction to which fences and gates must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CHAIN LINK FENCES

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Boundary Fence & Railing System- "Patrician".
2. Anchor Fence, Inc.
3. Century Fence Company.
4. Crown Fence & Wire Company.
5. Simmerling Fence Company.

B. Substitutions: Under provisions of Division One.

2.2 CHAIN LINK MATERIALS

A. Chain Link Fence & Gate Types:

1. Galvanized steel chain link fences and gates, heights shall be eight (8) feet and gate locations as indicated on the Drawings.

B. Framework: Galvanized Steel Pipe; ASTM F1083, Group IC round steel pipe with minimum yield strength of 50,000 psi. Galvanized per ASTM F1043, Type B and the ability to resist 1,000 hours of exposure to salt spray with a maximum of 5% red rust when tested in accordance with ASTM B117. All coatings to be applied inside and out after welding.

1. Fence: Fused bonded vinyl coating, 7 to 12 mils thickness conforming to ASTM F668, Class 2B. Color as selected by the Architect from manufacturer's full color range.

C. Pipe: Straight, true to section and conform to the following weights:

PIPE SIZE (O.D.)	WEIGHT LBS/FT
1-5/8" (41 mm)	1.84
2" (51 mm)	2.28
2-1/2" (63 mm)	3.12
3" (76 mm)	4.64
3-1/2" (89 mm)	5.71
4" (102 mm)	6.56
6-5/8" (168 mm)	-----

D. Fabric: Aluminized fabric per ASTM A491, coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. Fabric, nine (9) gauge (3.796 mm) woven in a two (2) inch (51 mm) diamond mesh. Top selvage, twisted and barbed. Bottom selvage, knuckled.

2.3 SWING GATES

A. General:

1. Fabricate gate perimeter frames of tubular members.
2. Provide additional horizontal and vertical member to assure proper operation of the gate, and for attachment of fabric, hardware and accessories.
3. Space frame members maximum six (6) feet apart.
4. Fabricate gate frames from pipe 1.90 inches O.D. weighing 2.72 lb. per linear foot.
5. Gate sizes and locations as indicated on the Drawings.

B. Fabrication:

1. Assemble gate frames by welding, with special malleable or pressed steel fittings and rivets for rigid connections.
2. Fabric to match fence fabric.
3. Install fabric with stretcher bars at vertical edges as a minimum.
4. Attach stretchers at gate frame maximum fifteen (15) inches on centers.
5. Attach hardware with rivets or by other means that will provide security against removal and breakage.
6. Provide diagonal cross bracing consisting of 3/8 inch diameter adjustable length truss rods on gates where required to provide frame rigidity without sag or twist.

C. Gate Hardware (Provide for each gate):

1. Hinges:

a. Pressed or forged steel, or malleable iron, to suit gate size; non-lift off type, offset to permit 180 degree opening.

b. Provide 1-1/2 pair of hinges for each leaf over six (6) feet in nominal height.

2. Latches:

   a. Provide forked type or plunger bar type to permit operation from either side of the gate.

   b. Provide padlock eye as integral part of latch.

   c. All gates shall be lockable in open position. Provide galvanized steel post with tab anchor tab for securing chain and padlock in open position.

3. Keeper: Provide keeper for vehicle gates, which automatically engages the gate leaf and holds it in the open position until manually released. Provide lockable master lock at each leaf keyed to school.

4. Double Gates:

   a. Provide gate stops for double gates consisting of mushroom or flush plate, with anchors.

   b. Set in concrete to engage the center drop rod or plunger bar.

   c. Provide locking device and padlock eyes as an integral part of the latch, requiring one (1) padlock for locking both gate leaves.

5. All gate hardware, hot-dipped galvanized.

6. See district standards for leaf widths.

D. Concrete Mow Curbs: Provide continuous concrete mow curb 18" wide x 6" deep at bottom of chain link fence where no other paving is called for under fencing and where any planter or grass areas are shown for easier maintenance, 1" above finish grade minimum.

2.4 CONCRETE FOR POSTS

A. Concrete for Posts: ASTM C94, Minimum 4000 psi compressive strength (28 days), Type 1 Portland cement, maximum 3/4 inch aggregate, 6.0 Sacks/cy cement ratio, and slump between 1 - 3 inches.

B. Fine and Coarse Aggregate: ASTM C33.

C. Water: Clear and potable, not detrimental to concrete.

D. Footing: 10" diameter x 2' deep.

2.5 CHAIN LINK COMPONENTS

A. General: Boundary Fence and Railing System, Inc., "Patrician" or equal.

B. End, Corner Line Posts: 4" x 4" x 3/16" steel Maximum spacing= 10' o.c. unless noted otherwise.

C. Hold Open Fence Posts: 4" x 4" x 3/16" steel x 4' high.

D. Top and Bottom Rails: 2" x 4" x 14 gauge steel channel.

E. Fittings, conforming to ASTM F626 and as follows:

1. Post Caps: Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Provide cone type caps for terminal posts and loop type for line posts.

2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cup-shaped to receive rail and brace ends.

3. Top Rail Sleeves: Tubular steel, minimum 0.051 inch thickness by seven (7) inches long, expansion type.

4. Tension Bars: Steel strip, 5/8 inches) wide by 3/16 inches thick.

5. Tension Bands: Pressed steel, minimum 14 gauge thickness by 3/4 inches wide.

6. Brace Bands: Pressed steel, minimum 12 gauge thickness by 3/4 inches wide.

7. Truss Rods: Steel rod, 3/8 inch diameter merchant quality with turnbuckle.

8. Tension Wire: Marcelled seven (7) gauge steel wire per ASTM A824, Type II, Class 1 (Galvanized) or Type I (Aluminum).

9. Tie Wires: Aluminum, nine (9) gauge, alloy 1100-H4 or equal.

10. Hog Rings: Steel wire, eleven (11) gauge, per ASTM A824, Type II, Class 1 (Galvanized).

11. Anti-Climb Pickets: Provide arched anti-climb pickets with 3' of building overhang. Space at 3" o.c. and approximately 1'-3' long.

2.6 CHAIN LINK ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings; steel.

C. Privacy Slats: PVC, UV-light stabilized, flame resistant, 4 ply, not less than 0.023 inch thick; attached to not less than 0.0475-inch-diameter, twisted galvanized wire; hedge-type lattice; sized to fit mesh specified for direction indicated.

1. Color: As selected by the Architect from Manufacturer's Full color selection.

2.7 GATE AND FRAME MATERIAL

A. Swing gates, post, railings, fittings and attachments as indicated on the Drawings. Finish: Hot-dipped galvanized steel conforming to the requirements of ASTM A123.

1. Main posts spacing and swing gates heights shall be as indicated on the Drawings.

B. Gate Hardware:

1. Hinges: Heavy gauge continuous hinges, plain steel, no hole construction, prime painted for field finishing; Stanley "NH314", 3" x 72"; or approved equal.

a. Continuously weld hinges to both the steel tube frame and the gate frame.

2.8 ACCEPTABLE MANUFACTURERS - ORNAMENTAL FENCES

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Ameristar Fence Products, Inc. - "Montage II ATF Welded Ornamental Steel, Majestic Design."

B. Substitutions: Under provisions of Division One.

2.9 CUSTOM STEEL GATES

A. Provide custom steel gates as detailed on Drawings.

2.10 ORNAMENTAL MATERIALS

A. General: Steel material for fence panels and post shall conform to ASTM A653 with minimum yield strength of 45, 000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/sq.ft., G90.

B. Pickets, rails and posts to be precut to specified lengths; rails to be pre-punched to accept pickets.

C. Pickets to be 1" square x 14 gauge tubing.

D. Rails to be steel channel, 1.75" x 1.75" x .0105"

E. Concrete: Type specified in Section 03300.

2.11 ORNAMENTAL ASSEMBLY

A. Assemble Pickets to Rails: Insert into pre-punched holes in rails and align to standard spacing. Pickets and rails to be joined at each picket-to-rail intersection by welding for a completely rigid assembly.

B. Attach rails posts with rail brackets using nuts and bolts per manufacturer's requirements.

2.12 ORNAMENTAL FINISH

A. Galvanize all steel members inside and outside to assure maximum corrosion resistance.

B. "Power Wash" all fence components using four stage pretreatment process to ensure complete adhesion of the finish coat.

Stage 1: Rinse metal in warm water so that surface is water break free.
Stage 2: Give metal an zinc phosphate pretreatment at 130 mg, to ensure adhesion.
Stage 3: Rinse metal thoroughly in a dionized water rinse to remove chemicals.
Stage 4: Give metal a baked, chromated seal, to assure the best surface for painting.

C. Finish: Coating to meet the following performance requirements:

1. Adhesion: ASTM D3359-Method B, 90% minimum area.

2. Corrosion Resistance: ASTM B117, D714 and D1654-Resistance over 1,500 hours.

3. Impact Resistance: ASTM D2794 over 60 inch lb using forward impact 0.625" ball.

4. Weathering: ASTM D822, D2244, and D523 over 1,000 hours; failure is 60% loss of gloss or color variance more than 3-delta E color units.

5. Color: As selected by the Architect from manufacturer's standard color selection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CHAIN LINK INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with manufacturer's instructions and in conformance with ASTM F567.

B. Fence Heights: Heights as indicated on the Drawings, and specified herein.

C. Set intermediate, terminal, gate and line posts plumb in concrete footings with top of footing two (2) inches above finish grade. Slope top of concrete for water runoff.

D. Brace gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

E. Top rail installed through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts.

F. Stretch bottom tension wire between terminal posts six (6) inches above grade and fasten to outside of line posts with tie wires.

G. Stretch fabric taut with bottom selvage two (2) inches (51 mm) above finish grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum fifteen (15) inch intervals. Tie to line posts and top rails with tie wires spaced at maximum twelve (12) inches on posts and twenty-four (24) inches on rails. Attach to bottom tension wire with top rings at maximum 24 inch intervals.

H. Gates: Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete.

I. Do not attach swing gate to building wall; provide gate posts.

J. Install gate with fabric to match fence. Install three hinges per leaf, latch, catches, and retainer and locking clamp.

K. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

L. Fasteners: Install nuts for fittings, bands and hardware bolts on inside of fence.

M. Anti-Climb Pickets: Install per Drawings.

3.3 ORNAMENTAL INSTALLATION

A. Install all ornamental picket fencing in accordance with manufacturer's instructions.

B. Set line posts plumb, in concrete piers with top of pier 2 inches above finish grade and 36 inches deep. Slope top of concrete for water runoff.

C. Attach all brackets to posts.

D. Install all posts (using rail to assure spacing).

E. Assemble all sections, and insert section rails into brackets.

F. Using pilot hole in bracket drill end holes in rail.

G. Install rivet into bracket and rails.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: One (1) inch.

3.5 CLEANING

A. Clean all exposed surfaces and remove wrappers and debris from the site.

END OF SECTION 02820

SECTION 02840 - WALK, ROAD, AND PARKING APPURTENANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Site Walk, Road, and Parking Appurtenances as Indicated on The Drawings, Specified Herein, and Complete With All Accessories and Attachments.

C. Site Items Included:

1. Parking Wheelstops.

1.2 RELATED SECTIONS

A. Section 02740 - Asphalt Concrete Pavement: Asphalt concrete play areas.

B. Section 02750 - Exterior Concrete Pavement: Concrete walks, curbs and gutters adjacent to play areas.

C. Division 16 - Lighting: Exterior roadway and site lighting.

1.3 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PARKING WHEELSTOPS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Plan-It Company, Inc.

2. Saf-T-Park Company, Inc.

B. Substitutions: Under provisions of Division One.

2.2 PARKING WHEELSTOP MATERIALS

A. Provide precast concrete wheel stops, minimum 4000 psi compressive strength (28 days), fully reinforced, minimum 8 feet wide and 6 inches high, complete with suitable anchorage devices as required for positive and permanent attachment to the parking surface.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PARKING WHEELSTOP INSTALLATION

A. Carefully coordinate the arrangement of wheel stops with the layout of parking stalls and traffic aisles, providing proper angle to engage wheels and proper location to prevent over-travel of vehicles.

B. Fix the precast wheelstops into final position by means of anchorage devices approved in advance by the Architect.

C. Upon completion of the installation, visually inspect each wheelstop and verify that it is in perfect condition and properly set.

D. Promptly remove units which are cracked, chipped, spalled or otherwise damaged and replace with new units meeting the specified requirements.

3.3 CLEANING

A. Dispose of excess materials and debris from the jobsite.

B. Prior to Substantial Completion, clean all exposed surfaces in accordance with manufacturer's instructions.

END OF SECTION 02840

SECTION 02890 - TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Traffic Signage; as Indicated on The Drawings, Specified Herein, Including Related Accessories and Attachments.

1.2 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's data on product characteristics, accessories, hardware and finishes.

C. Shop Drawings: Indicate complete layout, dimensions, spacing of components, anchorage and schedule of components.

D. Samples: Submit samples of product colors including finish and texture.

E. Installation Instructions: Submit manufacturer's installation instructions.

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver and store products to site in accordance with manufacturer's instructions.

C. Protect products from weather and construction operations.

1.4 FIELD MEASUREMENTS

A. Verify actual locations of traffic signage and other construction to which traffic signage must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.5 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - TRAFFIC SIGNAGE

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Champion America, Inc.
2. EMED Company, Inc.
3. Seton Identification Products.

B. Substitutions: Under provisions of Division One.

2.2 TRAFFIC SIGNAGE MATERIALS

A. Exterior Parking and Traffic Control Signage: 1/16" galvanized steel with porcelain enamel graphics and letters. Secure with masonry screws where applicable..

B. Exterior Signage Posts: Tubular sign posts, 2-3/8 inch O. D., schedule 40 galvanized steel, set in concrete. Minimum footing size: 10" diameter x 24" deep, set post or sleeve from bottom of footing.

C. Set post in 2-1/2" nominal sleeve when signage is in walk or paved areas. Sleeve to protrude above top of concrete 1" and have 5/16" diameter galvanized tamper resistance hex bolts through pipe and sleeve. Sleeve to be embedded in concrete to 3" from bottom of footing.

D. Exterior Signage Schedule:

1. STOP - Octagonal shape, single line message, 24 x 24 inches, 0.080 inches thick, "Red" background with "White" message; provide two (2) thus.
2. YIELD -
3. HANDICAP PARKING TOWING ENFORCED - Rectangular shape, double line message, 18 x 24 inches, 0,063 inches thick, "Blue" background and "White" message; provide six (6) thus.

4. NO PARKING LOADING ZONE - Rectangular shape, double line message, 12 x 18 inches, 0.063 inches thick, “White” background and “Red” message; provide two (2) thus.
5. VISITOR PARKING - Rectangular shape, double line message, 12 x 18 inches, 0.063 inches thick, “Blue” background with “White” message; provide six (6) thus.
6. NO PARKING DROP OFF ONLY - Rectangular shape, double line message, 12 x 18 inches, 0.063 inches thick, “White” background with “Red” message; provide two (2) thus.
7. NO PARKING BUSES ONLY - Rectangular shape, double line message, 12 x 18 inches, 0.063 inches thick, “White” background with “Red” message; provide two (2) thus.

2.3 FABRICATION

A. Units shall be assembled by the manufacturer so as to minimize on-site assembly.

B. Ensure that all welds are provided behind finished surfaces and transmit no distortion or discoloration to the finished side.

C. All other joints, miters and connections shall be tight and free of noticeable fractures.

D. Direct Ground Burial Posts:

1. Posts shall be fabricated a minimum thirty six (36) inches longer than the height indicated for the sign to allow for embedding into concrete piers (minimum ten (10) inch diameter).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 TRAFFIC SIGNAGE INSTALLATION

A. Install site traffic signage in accordance with manufacturer’s instructions.

B. Install traffic signage at all locations indicated on the Drawings under the direction of the Architect.

C. Traffic signage shall be installed to the proper height in accordance with CALTRANS Standard Specifications.

3.3 CLEANING

A. Dispose of excess materials and debris from the job-site.

B. Prior to Substantial Completion, clean all exposed surfaces in accordance with manufacturer’s instructions.

END OF SECTION 02890

SECTION 03100 - CONCRETE FORMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Permanent and Temporary Concrete Forms and Accessories for Cast-In-Place Concrete; Including All Shoring, Bracing and Anchorage, Materials and Equipment.

1. Openings for Other Work, Formwork Accessories and Formwork Removal.

1.2 PRODUCT INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 03300 - Cast-In-Place Concrete: Furnishing concrete accessories for placement by this Section.

B. Division 15 - Mechanical: Supply of mechanical items for placement by this Section.

C. Division 16 - Electrical: Supply of electrical items for placement by this Section.

1.3 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02320 - Excavation and Backfill for Utilities: Excavation and backfilling for footings and utilities.

C. Section 02750 - Exterior Concrete Pavement: Formwork for exterior concrete work.

D. Section 03200 - Concrete Reinforcement.

E. Section 03300 - Cast-in-Place Concrete.

F. Division 15 - Mechanical: Mechanical items.

G. Division 16 - Electrical: Electrical items.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate general construction of forms including jointing, special form joints and reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.

1. Architect's review is for general architectural applications and design features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

C. Product Data: Submit manufacturer's product data for specified products.

D. Submit two (2) copies, to the Architect, of the MSDS requirements for all materials used in this section under provisions of Division One.

1.5 DESIGN REQUIREMENTS

A. Work of this Section includes design and construction of formwork, shoring and bracing. Design formwork to comply with the minimum requirements of ACI 347, Chapter 2. Resultant concrete shall conform to required shape, line and dimension.

1.6 QUALITY ASSURANCE

A. Conform to ACI 301 and ACI 347 for design, fabrication, erection and removal of formwork.

B. Plywood: Conform to Tables for form design in APA Form V-345, including strength.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Upon delivery to the site, place materials in areas protected from weather.

C. Store materials above ground on framework or blocking and cover with protective waterproof covering providing adequate air circulation and ventilation.

1.8 COORDINATION

A. Coordinate this Section with other Sections of work which require attachment of components to formwork.

B. Notify all responsible parties of schedules of concrete pours so as to allow adequate time for installation and coordination of their work.

C. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, adjust reinforcement and formwork to achieve proper cover prior to placement of concrete.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Concrete Formwork: Use materials that comply with ACI 347, Table 4.2. Wood, metal or other approved material that will not adversely affect the surface of concrete, and will provide or facilitate obtaining specified surface finish.

1. Wood forms for unexposed concrete surfaces shall be constructed of sufficient size and thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces, and so constructed as to be readily removable

2. Forms for exposed concrete surfaces shall be 5/8" minimum Douglas fir, Plyform or Softwood Plywood, PS 1-83, APA Plywood, B-B or HDO. Exterior sanded. All formwork to be new, mill oiled, and edge sealed, bearing legible inspection trademark.

3. Forms for unexposed concrete surfaces to be Douglas Fir 2" x 4" minimum per WCLIB Rules No. 16, Construction or No. 2 or better, surfaced 1 side and 2 edges minimum for tight fit; dimensions as required to support loads.

4. Metal forms shall be clean, unpainted and in good condition. Forms shall at all times be straight to provide members of the widths and depths required. **Do not use aluminum materials in contact with concrete.**

B. Column Forms:

1. Square or Rectangular Columns: Minimum two (2) inch thick Douglas Fir planks or joists, surfaced one (1) side and two (2) edges, or use metal forms.

2. Construct column forms with tight joints securely clamped together with steel clamps. Smooth seamless finish with no rib marks.

3. Circular Columns: "Sonnotube" Smooth Fibre Form Coated, or approved equivalent by the Architect/Engineer.

C. Studs and Wales: Sound, straight, Douglas Fir, not less that 2 x 4 in size.

2.2 FORMWORK ACCESSORIES

A. Form ties and accessories for exposed concrete surfaces shall be of such design that upon removal of forms, metal shall be greater than one (1) inch from surface where surface is to be visible in unfinished or finished space.

1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.

2. Locate ties not more than six (6) inches below horizontal pour lines. Tighten after concrete has set and before the next pour is made.

3. For exposed concrete surfaces, provide form ties of removable type with she-bolts equipped with permanent plugs and a system approved by the Architect/Engineer for fixing the plugs in place.

B. Form Release Agent: Product specifically manufactured for the type of form material used to prevent adhesion of concrete to form material, VOC compliant, staining of concrete or injury to exposed concrete surfaces or the specified finish. Provide form release which will be compatible with finish material applied to the concrete.

C. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Establish a "Bench Mark" in an accessible location and use as a reference point for various construction levels.

B. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

C. Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage. Securely brace and shore forms to prevent displacement and to safely support

construction loads. Provide access openings for cleaning and inspecting forms and reinforcing prior to depositing concrete. Keep wood forms wet as necessary to prevent shrinkage.

D. Layout the run of partitions and establish location of openings so that other trades may properly locate their work.

E. Install pipe sleeves furnished by other Sections.

3.3 ERECTION - FORMWORK

A. Provide forms for all concrete work, including footings. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301 and ACI 347.

B. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

C. Align joints and make watertight. Keep form joints to a minimum.

D. Provide temporary openings at the bottom of cast-in-place concrete walls, columns and elsewhere as required to facilitate cleaning, drainage and inspection.

E. Obtain approval from Architect/Engineer before framing openings in structural members which are not indicated on Drawings.

F. Unless shown otherwise, form chamfer strips on external corners of columns and walls with 3/4 x 3/4 inch strips, accurately formed and surfaced to produce uniformly straight lines and tight edges. Extend terminal edges to required limit, and miter the chamfer strips at changes in direction.

G. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

H. Build in anchors, inserts, bolts and other devices indicated or required for the various portions of the Work. Build in sleeves, thimbles, and other items furnished or set in place by other trades. Accurately position and support these items. Fill voids with a readily removable material to prevent entry of concrete into voids.

I. Locate control joints as indicated on the Drawings, maximum spacing of control joints shall be (15'-0") on center U.N.O., and where required as approved by the Architect/Engineer.

J. Forms For Exposed Concrete:

1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.

2. Provide sharp, clean corners at intersecting planes, without visible edges or off-sets. Back joints with extra studs or girts to maintain true, square intersections.

3. Use extra studs, wales and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.

4. Assemble forms so they may be readily removed without damage to exposed concrete surfaces. Form molding shapes, recesses and projections with smooth finish materials, and install forms with sealed joints to prevent displacement. Fill joints with specified joint filler. Finish flush and smooth.

3.4 FORM TIES

A. Form ties shall be employed in such places, and at such intervals, as to securely hold the forms in position during the placing of concrete, and to withstand the weight and pressure of the wet concrete.

B. Ties of a type intended to be entirely removed shall be coated with a release agent to safeguard against damaging the concrete during such removal. **The use of wire ties will not be permitted.**

3.5 WOOD STRIPS, BLOCKING & MOLDING

A. Place in the forms wood strips, blocking, moldings, nailers, etc., as required to produce the finished profiles and surfaces indicated on the Drawings, and to provide nailing for wood members or other features required to be attached to concrete surfaces in such manner. Coat wood strips, blocking and moldings with release agent.

3.6 CHAMFERS

A. All exposed external angles of concrete members shall have 3/4 inch chamfer strips placed in the forms to relieve the angles.

3.7 APPLICATION FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.8 INSERTS, EMBEDDED PARTS AND OPENINGS

A. Provide formed openings where required for items to be embedded in or passing through concrete work.

B. Locate and set in place items which will be cast directly into concrete.

C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses, chases, sleeves, bolts, anchors, and other inserts.

D. Position dovetail anchor slots for brick veneer masonry anchors to spacing and intervals specified in Section 04200.

E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.9 SHORES AND SUPPORTS

A. Comply with ACI-347 for shoring and reshoring.

B. Extend shoring as follows:

1. Shore floor directly under floor being placed, so that loads from construction above will transfer directly to these shores.

2. Space out shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing is provided.

3. Extend shores beyond minimum if required to ensure the proper distribution of loads throughout the structure.

C. Remove shores and reshores in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support the Work without excessive stress or deflection.

1. Keep reshores in place a minimum of fifteen (15) days after placing upper tier, and longer if required, until the concrete has attained its required twenty eight (28) day strength and heavy loads due to construction operations have been removed.

3.10 CONSTRUCTION JOINT

A. Except as otherwise specifically indicated on the Drawings, each concrete member shall be considered as a single unit of operation, and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, the same shall be located at or near the midpoints of spans.

B. Additional construction joints shall not be made under any circumstances without prior evaluation and approval of the Architect/Engineer. Provide appropriate keys and dowels in all construction joints, whether horizontal or vertical.

3.11 JOINT TREATMENT

A. Provide gaskets, plugs, tape or caulk joints at all gaps and apertures in exposed concrete forms to positively prevent leakage. Form joints shall only be allowed where indicated on the Drawings. Where possible, locate joints behind rustication. Apply joint treatment within twenty four (24) hours of scheduled pour.

3.12 FORM CLEANING

A. Clean and remove foreign matter within forms as erection proceeds.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete

construction proceed within heat enclosure. Use compressed air or other means to remove foreign matter.

3.13 INSERTS AND ACCESSORIES

A. Make provisions for required installation of accessories; such as waterstops, hangers, sleeves, bolts, anchor slots and inserts cast in concrete.

B. Obtain templates or instructions from accessory manufacturer's for installation of items.

C. Place expansion joint fillers where detailed and indicated on the Drawings.

3.14 WATERSTOPS

A. Provide continuous waterstop in all joints below grade, and at all other locations indicated on the Drawings. Position waterstop accurately and support against displacement. Splice sections watertight in accordance with manufacturer's instructions.

3.15 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 347, Section 3.

B. Set and maintain forms so that finished concrete dimensions conform to the tolerances of ACI 347, Section 3.3.1.

3.16 FORM FINISHES

A. Unexposed Concrete Form Finish: Provide concealed concrete finishes with a rough form finish as defined in ACI 301, Article 5.3.3.

B. Exposed Concrete Form Finish: Provide concrete surfaces exposed to view in the finished work or surfaces to receive finishes of any type (paint, textured paint, etc.) with a rubbed finish as defined in ACI 301, Article 5.3.3. and as directed by Architect.

3.17 FORM REMOVAL

A. General: Formwork not supporting concrete, such as sides of beams, walls, columns and similar parts of the Work, may be removed after cumulatively curing at not less than 50 degrees F for twenty four (24) hours after placing concrete, providing concrete is sufficiently hard to not be damaged by form removal operation, and provided that curing and protection operation are maintained.

B. Do not remove forms from concrete until it has acquired sufficient strength to support its own weight and any superimposed loads and the concrete has hardened sufficiently to resist damage from removal operations.

C. Forms shall remain in place for the following periods of time. These periods represent cumulative number of days or hours, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 degrees F:

1. Columns, Walls, and Vertical Forms: 2 days.
2. Slabs: 7 days.
3. Vertical Shores Under Joists, Beams, and Girders: 14 days.
4. No forms to be removed less than 24 hours after placement.

D. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

E. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

3.18 FIELD QUALITY CONTROL

A. Field inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by California State Building Code, but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the California State Building Code, and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. Verify layout of all work and check general building lines and levels established. Coordinate layout and measurements, and if discrepancies arise, report them to the Architect.

E. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

END OF SECTION 03100

SECTION 03200 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Reinforcing Steel, Welded Wire Fabric and Accessories for Cast-In-Place Concrete.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02750 - Exterior Concrete Pavement: Exterior concrete work requiring reinforcing.

C. Section 03100 - Concrete Formwork: Formwork for cast-in-place concrete.

D. Section 03300 - Cast-in-Place Concrete: Concrete work requiring reinforcing.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate complete bending diagrams, bar sizes, spacing, locations, splices and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices. Also, provide details as necessary to show final position of reinforcement in elements.

1. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies required for the fabrication and placement of concrete reinforcement.

C. Mill Test Reports: Certified copies, evidencing compliance with the requirements of these specifications, shall be delivered to the Architect/Engineer with all deliveries of reinforcing steel.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with CRSI 63, 65 and Manual of Standard Practice, ACI 301, ACI SP-66, ACI 315, ACI 318, ASTM A185.

B. Submit certified copies of mill test report of reinforcement materials analysis.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

D. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site. The Contractor is also responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his Work.

1.5 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

B. The Contractor is responsible for the fabrication processes, techniques of construction, coordination of his work with that of all other trades, and the satisfactory performance of his Work.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver reinforcement to the site bundled, tagged and marked. Indicate on tags the bar size, lengths and other information corresponding to markings shown on placement diagrams.

C. Store reinforcing steel bars, ties, wire fabric, etc., on the site in a manner that will permit access for proper inspection and identification. When storing reinforcing, on existing construction or forming avoid excessive concentrated loads by distributing reinforcing to insure that the load carrying capacity of the area is not exceeded.

1. Store in a manner to prevent excessive rusting and fouling with dirt, grease and other bond-breaking coatings.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of concrete reinforcing and other construction to which reinforcing must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel:

1. #3 and larger: ASTM A615, Grade 60, unless noted otherwise.
2. Welded Rebar: ASTM A706, Grade 60.
3. Spiral Rebar: ASTM A82, cold drawn bars.
4. All reinforcing steel to be tested and results reported prior to use in any concrete and masonry work

B. Welded Wire Fabric: ASTM A185; new, domestic manufacturer, plain type in flat sheets; sizes as indicated on the Drawings.

2.2 ACCESSORY MATERIALS

A. Steel Tie Wire: ASTM A82; minimum 16 gauge, annealed type, black.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.. Use wire bar type supports complying with CRSI specifications where supported on form material and use grooved concrete block spacers where supported by earth.

C. Weather-Exposed Concrete Surfaces: Plastic coated or stainless steel type so finished concrete surfaces will not be stained by rust; size and shape as required.

2.3 DETAILING

A. Detail reinforcing steel in accordance with ACI 315 and ACI 318. Comply with CRSI MSP-1 for the number, type and spacing of supports and other accessories, except reinforcing, including temperature steel, shall be supported and tied.

2.4 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI Manual of Standard Practice, ACI SP-66, ACI 301 and ASTM A185.

B. Weld reinforcement in accordance with AWS D1.4. Measure bend diameters on the inside of the bar.

C. Splicing will not be permitted without the approval of the Structural Engineer.

D. No splices allowed in the vertical reinforcing steel of concrete columns.

E. Shop fabricate reinforcing steel to size, shape and dimensions.

F. Bend bars cold. Do not use any method of fabrication which would be injurious to the material

G. Clean bars free from mill scale, excessive rust and other coatings which would reduce or destroy the bond with concrete.

H. Fabricate reinforcement to comply with the maximum tolerances indicated in ACI 301, Section 3.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Clean all reinforcement before placing. Remove oil, mill scale, pitting, mud, loose rust, strong alkali or organic matter. Remove all excessive rust with wire brush or by sandblasting.

3.3 PLACEMENT

A. Place reinforcing in accordance with the maximum tolerances indicated in ACI 301 Section 3.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Properly position reinforcing steel. Wire reinforcing steel together at intersections and to supports to prevent displacement during concrete placing.

E. Place temperature steel or mesh for slabs on grade at one-and-one-half (1-1/2) inches clear of top of slab, U.N.O.

F. Reinforcing steel for slabs on grade and wire mesh may be supported on precast concrete blocks. Slab on grade reinforcing and mesh must be supported. DO NOT lift reinforcing mesh during placement of concrete.

G. Provide minimum concrete cover for reinforcing steel indicated in ACI 318, Article 7.7.l unless otherwise indicated on the Drawings.

H. Splice reinforcing where indicated on Drawings. See Structural Drawings for splice lengths.

I. Lap wire mesh in slabs on grade and topping slabs so that full, uncut squares of mesh of both sheets lap each other at least one (1) time or six (6) inches, whichever is greater.

J. Secure reinforcing bars in place before concrete is poured. Do not bend bars embedded in hardened or partially hardened concrete.

K. Bend tie wires away from the concrete surface.

L. Unless noted otherwise, bend bars cold. Field bending of reinforcing will not be permitted except as specifically indicated on the Drawings or with Engineers written approval. Do not straighten or rebend reinforcing bars without specific approval. Torch cutting at the site will be acceptable only for minor correction of shop fabricated bars and for fabrication of slab reinforcing.

3.4 WELDING

A. No welding of reinforcing steel will be permitted, unless specifically indicated on the Structural Drawings.

B. If required, welding of reinforcing steel shall conform to AWS D1.4.

3.5 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by the California State Building Code, but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the California State Building Code, and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. Observe and inspect reinforcement in all cast-in-place concrete, including slabs on grade.

1. Verify reinforcing bar grade, and that bars are free of dirt, excessive rust and damage.
2. Verify reinforcing bars are adequately tied, chaired and supported to prevent displacement during concrete pour.
3. Verify proper clear distances between bars and to surfaces of concrete.
4. Verify reinforcing bar size and placement.
5. Verify bar laps for proper length and stagger, and bar bends for minimum diameter, slope and length.
6. Verify that mechanical splices are placed in accordance with the Contract Documents.

E. The Contractor must give the independent inspection firm providing the reinforcing observation services a minimum of twenty four (24) hours notice before placement of concrete so the field observation of the reinforcing may be performed.

END OF SECTION 03200

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. This Section includes all labor, materials, transportation, protection, apparatus, tools, equipment, incidentals and things necessary to complete in all respects, all cast-in-place concrete indicated on the Drawings or specified herein, including where applicable the following items:

1. Cast-in-Place Concrete Footings, Building Framing Members, Floors and Supported Slabs.
2. Control, Expansion and Contraction Joint Devices Associated with Concrete Work; Including the Installation of Joint Sealant.
3. All plain and reinforced concrete Work, concrete fill, and concrete finishing required in connection with concrete Work including all concrete stoops and aprons, and grouting of steel bearing plates and column base plates.
4. Concrete finishing; special concrete finishes, concrete curing, color hardener, color sealer, clear sealer, color-conditioned concrete and stained concrete.
5. Other Work identified with concrete Work and herein specified or called for on the Drawings, including cooperation with other trades in the setting and placing of all items required to be incorporated in the concrete Work. Include setting of all anchor bolts, inserts, setting plates, concrete anchor systems, and miscellaneous steel items and miscellaneous metal items embedded in concrete work furnished under other trades.
6. Existing Approved Test Data: Concrete mixing shall be Method B in accordance with CBC Section 1905A.3.1.1.
7. Contractor's testing laboratory shall provide mix designs for strengths required indicating acceptance by DSA.
8. Mix Designs shall be stamped and signed by a California licensed Civil Engineer.
9. All concrete pads and curbs for Plumbing, Mechanical, Fire Protection or Electrical equipment shall be furnished and paid for by the General Contractor. The Plumbing, Mechanical, Fire Protection or Electrical Contractors (whichever trade is involved) shall be responsible for the exact number, size, configuration and location of all such concrete pads or curbs for the particular trade, and shall furnish to the General Contractor all necessary appurtenances, Drawings, and templates showing actual requirements, including size, type and location of all anchoring devices.

C. Concrete Design Mix Schedule at End of This Section.

D. Exposed concrete shall have a special hand rubbed finish.

E. Poured concrete stairways with safety stair nosing.

1.2 PRODUCT FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03100 - Concrete Forms and Accessories: Placement of joint device anchors in formwork.

1.3 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02750 - Exterior Concrete Pavement: Exterior concrete walks, curbs, medians, curbs and gutters.

C. Section 03100 - Concrete Forms and Accessories: Formwork and accessories.

D. Section 03200 Concrete Reinforcement.

E. Section 07910 - Joint Sealants: Sealant and joint backing materials.

F. Division 15 - Mechanical: Mechanical items for casting into concrete.

G. Division 16 - Electrical: Electrical items for casting into concrete.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's data for concrete materials, accessories and items, including reinforcement and forming accessories, admixtures, patching compounds, joint systems, curing compounds, dry-shake finish materials, and others as requested by the Architect/Engineer.

1. Include Material Safety Data Sheets (MSDS).

C. Concrete Mix Design of Laboratory Designed Mix:

1. The mix design shall be approved prior to use, 3000 psi minimum unless noted otherwise.
2. Relative amounts of ingredients shall be determined by a testing laboratory and be stamped and signed by a California licensed Civil Engineer.
3. Contractor to pay costs of concrete mix designs.
4. Concrete mix shall be in accordance with CBC Section 1905A.3.
5. Water to cement ratio shall be less than 0.55 maximum by weight for interior slabs on grade and for concrete in contact with soil.

1.5 PRE-CONSTRUCTION MEETING

1. Prior to installation, Contractor, Architect, Inspector, District Representative and Installer shall review concrete work. Contractor to record proceedings and furnish copy to all parties attending. Review coordination requirements and other topics including:
   a. Contract Requirements.
   b. Mix identification designation.
   c. Statement of intended use for mix.
   d. Mix proportions, including all admixtures.
   e. Manufacturer's data and/or certification verifying conformance of all mix materials, including admixtures with specific requirements.
   f. Design slump.
   g. Control joints.
   h. Depressed slabs.
   i. Required submittals.
   j. Construction schedule and related work.
   k. Weather conditions.
   l. Mock-Ups.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division One.

B. Accurately record actual locations of embedded utilities and components which are concealed from view.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI 318, and CBC Chapter 19A..

B. Acquire cement and aggregate from same source for all Work.

C. Conform to ACI 305R concrete during hot weather.

D. Conform to ACI 306R concrete during cold weather.

E. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

F. Quality Control:

1. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect/Engineer, and until copies are at the job site, the batch plant, and the DSA.

G. Provide to the Architect two (2) copies of Material Safety Data Sheets (MSDS) for all concrete materials and accessories provided for this project.

1.8 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Hauling Time: Discharge all concrete transported in a truck mixer, agitator, or other transportation device not later than 1-1/2 hours, or 300 revolutions of the drum after the mixing water has been added, whichever is earliest.

C. Addition of Water On-Site: The addition of water to the mix after leaving the batch facility shall be within the guidelines of ACI 304R

1.10 JOB CONDITIONS

A. Hot Weather Concrete:

1. Comply with ACI 301 and ACI 305.

2. Provide retarding type admixture conforming to ASTM C494/C494M, Type A or D in accordance with manufacturer's recommendations.

3. Maximum concrete temperature shall not exceed 95 degrees F at time of placement.

B. Cold Weather Concrete:

1. Comply with ACI 301 and ACI 306R.

2. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions or low temperatures.

3. When ambient temperature at the site is below 40 degrees F, or is expected to fall to that temperature within ensuing twenty four (24) hour period, heat water and/or aggregate prior to adding to mix so that temperature of concrete will be between 55 and 85 degrees F at time of placement.

4. Maintain temperature of deposited concrete between 50 and 70 degrees F for minimum of seven (7) days after placing.

C. Combustion heaters shall not be used during the first forty-eight (48) hours without precautions to prevent exposure of concrete and workmen to exhaust gases containing carbon dioxide and/or carbon monoxide.

D. Admixtures intended to accelerate hardening of concrete or produce higher than normal strength at early periods will not be permitted, unless approved by the Architect/Engineer. The use of calcium chloride is specifically prohibited.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: Provide a standard brand of Portland cement complying with ASTM C150, Type V or Type II - low alkali. Do not change the brand of cement during progress of the Work except as approved in writing by the Architect/Engineer.

B. Fly Ash: ASTM C618, Class F, subject to the approval of the Architect/Engineer.

C. Coarse Aggregates: ASTM C33, Clean, hard, fine grained, sound crushed rock or washed gravel, free of substances that may be deleterious to the concrete.

D. Fine Aggregate: ASTM C33, washed natural sand having strong, hard, durable particles, and containing not more than 2% by weight of deleterious matter such as clay, lumps, mica, shale or schist. Pea gravel not allowed.

E. Water: Clean, potable, and free of deleterious amounts of acid, alkali, salt and organic materials.

F. Admixtures:

1. Water Reducing: ASTM C494/C494M, Type A.

G. Prohibited Products: Calcium chloride or admixtures containing more than 0.05 percent chloride ions or thiocyanates are not permitted.

2.2 ACCESSORIES

A. Vapor Barrier: Meets or exceeds Class A requirements of ASTM E1745; PVC membrane minimum ten (10) mils thick, fungi-resistant, tear resistant, type recommended for below grade application, and joints sealed with adhesive backed PVC tape.

B. Non-Shrink Grout: ASTM C1107, Grade C; non-shrink, non-corrosive, non-metallic compound consisting of non-staining natural aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 3,000 PSI in three (3) days and 5000 PSI in twenty-eight (28) days.

1. Acceptable Manufacturers:

a. Dayton-Superior - 1107 Advantage Grout.

b. W. R. Meadows - CG-86.

c. EUCLID - NS Grout.

d. Five Star Products – Five Star Grout.

e. MasterBuilders – Masterflow 713 Grout.

2. Substitutions: Under provisions of Section 01600.

C. Bonding Agent: Non-re-emulsifiable acrylic latex emulsion, high solids emulsion, non-oxidizing and ultra-violet stable, VOC compliant; meets ASTM C1059, Type 2.

1. Acceptable Manufacturers:

a. Dayton-Superior - Day-Chem Ad Bond (J-40).

b. W. R. Meadows - Intralok 1059.

c. L&M Chemicals - Everbond.

2. Substitutions: Under provisions of Section 01600.

D. Curing Compound: ASTM C-309, Type 1, Class A & B; non-yellowing, V.O.C. compliant, water based liquid membrane forming curing and sealing compound.

1. Acceptable Manufacturers (Exterior):

a. BASF-"Sonneborn Kure-N-Harden.

b. Dayton-Superior - Safe Cure & Seal (J-18).

c. W. R. Meadows - Intex/VOCOMP-20.

d. EUCLID - Diamond Clear VOX.

2. Acceptable Manufacturers (Interior):

a. Creteseal-CS2000

3. Substitutions: Under provisions of Section 01600.

E. Concrete Floor Sealer: Clear, water based, acrylic floor sealer, V.O.C. compliant; "Diamond Clear VOX" as manufactured by The Euclid Chemical Company, or approved equal.

F. Safety Stair Nosing: Provide nosing for every tread, recess for tile, nosing shall be 3-1/2 inch (89 mm) wide, 1/4 inch (6 mm) thick, 1/4 inch (6 mm) nose underside; WOOSTER Products, Inc. Type 431 (for tile), Type 101 (for poured Concrete), or approved equal.

2.3 CONCRETE ANCHORS

A. Concrete Anchor Systems: Hilti, Inc., ITW Ramset/Red Head, The Rawlplug Company, or approved equal. All concrete anchor systems must be prior approved by the Architect/Engineer for type, size, location and finish.

2.4 FILLER MATERIALS

A. Asphalt Expansion Joint: ASTM D994; Asphalt impregnated expansion joint filler, 3/8 inch thickness waterproof, flexible, permanent and self-sealing. W.R Meadows - Sealtight or approved equivalent by the Architect.

B. Joint Filler: ASTM D3405, high performance, polymer modified asphalt emulsion horizontal joint and crack sealant. W.R. Meadows "Safe-seal" 3405 or approved equivalent by the Architect.

C. Sealant and Primer: Type as specified in Section 07910.

2.5 CONCRETE MIX

A. Mix concrete in accordance with ACI 304 and deliver concrete in accordance with ASTM C94.

B. Provide concrete meeting ACI 301, and the criteria listed in the "Concrete Mix Design Schedule" located at the end of this Section.

C. Use accelerating admixtures in cold weather only, when approved in writing by the Structural Engineer. Use of admixtures will not relax cold weather placing requirements.

D. Use set retarding admixtures during hot weather only, when approved in writing by the Structural Engineer.

2.6 STANDARD MOISTURE BARRIER PROTECTION

A. At Administration, Gym and Cafeteria: 5" concrete over 2" vibraplated rock dust over vapor barrier over 2" sandfill over 4" of 1" crushed rock over compacted grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify requirements for concrete cover over reinforcement.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 304 and ACI 301.

B. Notify Architect/Engineer and independent inspection firm minimum twenty-four (24) hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, formed joint fillers and joint devices are not disturbed during concrete placement.

D. Install reinforced vapor retarder over top of granular sand fill below interior slabs-on-grade. Lap joints minimum six (6) inches and seal watertight by taping edges and ends.

E. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum six (6) inches and seal watertight.

F. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.

G. Separate slabs on grade from vertical surfaces with 3/8 inch thick joint filler.

H. Extend joint filler from bottom of slab to within 1/4 inch of finished slab surface. Conform to Section 07910 for finish joint sealer requirements.

I. Install joint devices in accordance with manufacturer's instructions.

J. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.

K. Install joint device anchors. Maintain correct position to allow joint cover flush with floor and wall finish.

L. Install joint covers in one piece length, when adjacent construction activity is complete.

M. Apply sealant in joint devices in accordance with Section 07910.

N. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

O. Place concrete continuously between predetermined expansion, control, and construction joints.

P. Do not interrupt successive placement; do not permit cold joints to occur.

Q. Place floor slabs in pattern indicated.

R. Saw cut joints within two (2) hours after final concrete finishing as shown on Drawings.

S. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 feet.

T. Vibrate all formed concrete. The Contractor is required to have a minimum of two functioning concrete vibrators on-site during all concreting operations.

U. Provide thickened concrete slabs below masonry partitions where indicated on Drawings.

3.4 INSERTS, ANCHORS AND EMBEDDED ITEMS

A. Power Driven Concrete Fasteners:

1. In addition to their use where the pins are loaded in shear, power driven concrete fasteners may be used in tension for support of light loads, such as acoustical ceilings, duct work, conduits, pipes and similar items where such loads are limited to less than 75 lb.

2. Testing:

   a. Secure pre-qualification of operator, tool and fastener by the project inspector, who shall observe testing of the first ten fastener installations.

   b. Apply a test "pull-out" load of not less than twice the design load or 150 lb. (68 kg), whichever is the greater, to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin.

   c. Thereafter, secure random tests by the project inspector of approximately one in ten pins; except that when the design load exceeds 75 lb., test one-half of the pins.

   d. Should failure occur on any pin tested, test all installations under observation of the project inspector, and replace all non-qualifying pins at no additional cost to the Owner.

3. Where "Red Head" or similar types of concrete anchor bolts are used for significant gravity loads or seismic anchorage, test in the presence of the project inspector:

   a. Proof test 50% of the bolts (alternate bolts in any group arrangement) to twice the allowable load.

   b. If there are any failures, also test the immediately adjacent bolts.

4. Where hanger rods, bolts, wire or similar items are used to suspend construction items, place in the concrete as required and/or indicated on the Drawings.
5. Where suspended ceilings with metal carrying systems are called for on the Drawings:
   a. Provide hanger wires in the slab, as indicated on the Drawings or otherwise required, of sufficient length to extend twelve (12) inches below the line of the finish ceiling.
   b. Place the hanger wires in line to receive runner channels, beginning six (6) inches from the walls parallel to the runners.

B. Reglets and Rebates:
1. Form reglets and rebates as required to receive frames, flashing and other equipment.
2. Verify the dimensions and positions of required reglets and rebates with trades whose work is related to or contingent upon such dimensions and positions.
3. If concrete slabs on earth join a wall or other perpendicular concrete surface, form a reglet in the wall to receive and carry the horizontal concrete work.
   a. Provide reglet full thickness of the slab and 3/4 inches deep, unless otherwise indicated on the Drawings.
   b. Exterior walks need not be provided for in this way except where so detailed on the Drawings.

C. Embedded Piping and Rough Hardware:
1. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeves, box, bolt, anchor, insert or other rough hardware.
2. Provide every facility for setting all required items accurately in the forms.
3. Contractor shall be responsible for changes in position of such items after they have been set.
4. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts, strap anchors for frames, and other rough hardware required for the Work, and which are shown or required to be embedded in the concrete.
5. Conduit and Sleeves:
   a. Locate so as to not reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 3-1/2 (89 mm) inch thickness.
   b. In supported concrete slabs, do not bury conduit having an outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.
   c. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.
   d. In placing conduits at slabs on earth, place below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least three (3) inches of concrete around the conduit on all sides.

D. Where openings in floors and walls are required by the various trades, but are not detailed on the Drawings, reinforce as directed by the Architect/Engineer.

3.5 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

B. Place required dividers, edge strips, reinforcing and other items to be cast in.

C. Apply bonding agent to substrate in accordance with manufacturer's instructions.

D. Place concrete floor toppings to required lines and levels. Place topping in checkerboard panels, dimension not to exceed twenty (20) feet.

E. Screed toppings level, maintaining surface flatness of maximum 1/8 inch in ten (10) feet.

3.6 PATCHING TIE HOLES

A. Patch tie holes in accordance with ACI 301 - Article 9.3.

B. (Exposed Tie Holes) Tie holes left by withdrawal of rods or holes left by removal of ends of ties shall be filled solid with mortar after first being thoroughly wetted. Fill holes with a small tool that will permit packing the hole with mortar. Formed hole shall have a one (1) inch deep exposed recess after patching.

3.7 CONCRETE FINISHING

A. Provide finish for formed concrete surfaces to be left exposed.

B. Finish concrete floor surfaces in accordance with ACI 301.

C. Wood float surfaces which will receive quarry tile, ceramic tile and terrazzo with full bed setting system.

D. Steel trowel surfaces which will receive carpeting, resilient flooring, thin set quarry tile and thin set ceramic tile.

E. Steel trowel surfaces which are scheduled to be exposed.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on Drawings.

G. Exposed concrete shall have hand rubbed finish in accordance with ACI 301 - Article 10.3.

3.8 SPECIAL PROCEDURES TO REDUCE MOISTURE VAPOR EMISSIONS FROM CONCRETE SLABS

A. Moisture vapor emissions are major cause of failure of finish flooring materials. Low permeability flooring such as sheet vinyl, solid vinyl, VCT, vinyl-backed carpet and elastomeric flooring systems are affected by such moisture vapor migration from concrete slabs.

B. Contractor is hereby notified that concrete construction practices which must be controlled are as follows:

1. Be certain that water/cement ratio is not so high that it does not provide for proper hydration and precipitation.

2. Moisture barrier assembly must be protected from precipitation.

3. Do not use floating practices which seal the surface of the concrete and prevent proper evaporation of water.

4. Do not use curing practices and admixtures that prevent proper hydration by “rushing” the process.

3.9 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure concrete floor surfaces with specified curing compound applied in accordance with manufacturer’s written instructions.

D. Curing compounds may adversely affect the installation of certain flooring materials, therefore, verify with the flooring sections in the Project Manual and with the flooring manufacturer’s whether Curing compounds can be used in the concrete floor installation prior to installation of curing compound. Do not install curing compound on floors where it may adversely affect the installation of flooring material. Use water curing methods instead.

3.10 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by 2006 California State Building Code, but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the 2006 California State Building Code, and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. Submit proposed mix design of each class of concrete to inspection and testing firm and Architect/Engineer for review prior to commencement of Work.

E. Sample and test all cast-in-place concrete:

1. Prepare compression test specimens (ASTM C31), one set of four standard cylinders of concrete for each compressive strength test, mold and store cylinders for laboratory cured specimens.

2. Perform compressive strength tests (ASTM C39). One set of four cylinders for each day's pour between one and twenty five cubic yards. If a day's pour exceeds twenty five cubic yards, take one set of four cylinders for each additional fifty cubic yards, or fraction thereof. One specimen at seven days, two specimens at twenty eight days and one specimen retained in reserve for later testing if required.
3. Slump (ASTM C143); one test at point of discharge for each set of compression test specimens; additional tests when concrete consistency appears to have changed.
4. Test concrete temperature hourly when air temperature is 40 degree F and below, and when 80 degrees F and above; and each time a set of compression test specimens is made.

F. Perform Concrete Mix Verification:

1. Verify that mixer truck trip ticket conforms to approved mix design.
2. Verify that total water added to mix on site does not exceed that allowed by concrete mix design.
3. Verify that concrete quality is indicative of adequate mixing time, consistency and relevant time limits.

G. Inspect preparation and placement of all concrete, including slabs on grade.

1. Verify acceptable general conditions of concrete base prior to placement.
2. Verify that concrete conveyance and depositing avoids segregation and contamination.
3. Verify that concrete is properly consolidated, and reinforcement remains at proper locations.
4. Verify that concrete footings are constructed with tolerances conforming to the requirements of ACI 117.

H. Observe protection and curing methods for all concrete; including slabs on grade.

1. Verify that specified curing procedures are followed.
2. Verify that specified hot and cold weather procedures are followed.

I. Tolerances: Test all slabs with F-number finish tolerance in accordance with ACI 117-81 Tolerance Specifications by Use of the "Dipstick Floor Profiler." Take measurements within 24 hours after completion of final finishing and one month before any items are installed on it.

a. Cafeteria and Administration Corridors: F_f 50 and F_l 30, Class A – 1/8".
b. Depress slabs sufficiently to accommodate floor systems. Steel trowel finish. Grind high spots and fill in low spots with approved leveling compound.

J. Inspect all bolts installed in concrete.

1. Verify specified size, type, spacing, configuration, embedment and quality.
2. Verify proper concrete placement and consolidation around all bolts.

K. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

L. If any test indicates Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.11 PATCHING

A. Allow Architect/Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect upon discovery.

C. Patch imperfections as directed in accordance with ACI 301.

3.12 DEFECTIVE CONCRETE

A. Defective concrete shall be repaired in accordance with ACI 301 - Article 9.2.

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements. Concrete that has voids or honeycombs that have been cut, resurfaced, or filled. Concrete that has sawdust, shavings, wood or embedded debris, or does not conform fully to provisions of the Contract Documents.

C. Repair and Replacement:

1. Defective concrete may be cut out and repaired with gunite, or other approved methods, when and as directed by the Architect/Engineer.

2. Where defective concrete is found after removal of the forms, cut out the defective concrete, if necessary, and make the surfaces match adjacent surfaces.

3. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.

D. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express written direction of Architect/Engineer for each individual area.

(See next page for Concrete Mix Schedule.)

CONCRETE MIX DESIGN SCHEDULE

	CLASS I	CLASS II	CLASS III	CLASS IV	CLASS V
COMPRESSIVE STRENGTH (28 DAY)	3000 PSI	NA	NA	NA	NA
COARSE AGGREGATE - ASTM C33	1" OR 3/4"MAX	NA	NA	NA	NA
FINE AGGREGATE – ASTM C33	SAND	NA	NA	NA	NA
PORTLAND CEMENT - ASTM C150	TYPE V OR TYPE II-LOW ALKALI	NA	NA	NA	NA
AIR-ENTRAINMENT (ASTM C260)	NA	NA	NA	NA	NA
WATER REDUCER - ASTM C494 (TYPE A)	REQUIRED	NA	NA	NA	NA
WATER/CEMENTIOUS MAT'LS RATIO	0.55 MAX	NA	NA	NA	NA
MAXIMUM SLUMP	4”	NA	NA	NA	NA
MIN. CEMENT AND FLY ASH CONTENT (SACKS/CY)	6.0 SACKS	NA	NA	NA	NA
AIR CONTENT	NA	NA	NA	NA	NA

SCHEDULE	Footings, Caissons, Grade Beams and Piers and Walls, Slabs-on-Grade	NA	NA	NA	NA

END OF SECTION

SECTION 04200 - UNIT MASONRY SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Mortar and Grout for Unit Masonry Systems.

C. Unit Masonry Systems; as Indicated on the Drawings, Specified Herein; Including All Related Reinforcements, Anchorage and Accessories.

D. Concrete Unit Masonry Work Includes:

1. Single Wythe.

E. Graffiti Resistant Coating.

1.2 PRODUCT INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 05120 - Structural Steel: Placement of steel anchors.

B. Section 05500 - Metal Fabrications: Placement of loose steel lintels.

C. Section 07210 – Building Insulation: Cavity wall insulation.

D. Section 07620 - Sheet Metal Flashing and Trim: Placement of reglets for flashing.

1.3 RELATED SECTIONS

A. Section 01460 - Testing and Inspection Services.

B. Section 03200 - Concrete Reinforcement: Steel reinforcing for cores of unit masonry systems.

C. Section 03300 - Cast-in-Place Concrete: Concrete for cores of unit masonry systems.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate all expansion and control joint locations and conditions.

C. Product Date: Submit manufacturer's data for masonry unit characteristics fabricated steel reinforcement, mortar and grout design mix, and mortar and grout admixture limitations.

D. Submit two (2) copies, to the Architect, of the MSDS requirements for all materials used in this section under provisions of Division One.

E. Samples: Submit samples of each type of masonry unit specified to illustrate color, texture and extremes of color range.

F. Submit test reports on mortar indicating conformance to ASTM C270.

G. Submit test reports on grout indicating conformance to ASTM C476.

H. Test Reports:

1. Submit test reports on prism tests for moisture-cured concrete masonry units.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in Manufacturing the Work of this Section with minimum five (5) years documented experience.

B. Installer: Company specializing in performing the Work of this Section with minimum five (5) years documented experience.

1.6 QUALITY ASSURANCE

A. Codes: Comply with the California Building Code, current edition, and the applicable requirements of governing authorities and codes of the types of masonry construction shown, except where more stringent requirements are shown.

B. Coordination: Review installation procedures and coordinate with other work that must be integrated with masonry.

C. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.

D. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.

E. Fire-Rated Concrete Masonry Units: Note requirements indicated on the Drawings for wall and partition types with various hourly fire ratings. Provide written certification by UL, or an independent laboratory to the Architect that fire-

rated masonry materials have been manufactured in compliance with the governing codes in regard to face shell and aggregate for the ratings indicated. Units stamped with UL certification seal shall also be accompanied by certificates.

F. Construction joints installed in fire-resistive walls required to have protected openings shall be protected with an approved material designed to provide the same degree of fire-resistance as the wall in which it is installed when tested in accordance with the CBC.

G. Testing CMU Grout:

1. Grout mixes are specified in Article 2.4 and shall be tested by Independent Testing Laboratory (01460) in accordance with ASTM C476, for each type of grout specified.
2. Test mix designs prior to beginning construction of CMU walls.
3. The seven (7) day compressive strength test of the laboratory mix design must meet or exceed the specified twenty eight (28) day design compressive strength.
4. Prepare test specimens in accordance with ASTM C476 of this Section.

H. Testing CMU Mortar:

1. Mortar mixes as specified shall be tested by Independent Testing Laboratory (01460) in accordance with ASTM C270, for each type of mortar specified.
2. Test mix designs prior to beginning construction of CMU and brick masonry walls.
3. The seven (7) day compressive strength test of the laboratory mix design must meet or exceed the specified twenty eight (28) day design compressive strength.
4. Prepare mortar test cubes in accordance with ASTM C270 for laboratory tests.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect Products to site under provisions of Section 01600.

B. Accept delivery of materials only in unopened and undamaged containers; handle and store above and under weather-tight covers.

C. Accept concrete masonry units on site. Inspect for damage.

D. Store admixtures to prevent contamination or damage from excessive temperature changes. Stockpile aggregates to prevent contamination from foreign materials. Damaged or otherwise unsuitable materials, when so determined, shall be immediately removed from the site.

E. Store masonry units on pallets and keep covered to protect from moisture damage.

F. Maintain packaged materials clean, dry and protected against moisture, freezing and foreign matter.

G. In storage, segregate pallets of various fire-rated units from each other, and from other non-rated units; maintain clear indication of the rating of the stored units for easy identification and selection.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during and forty eight (48) hours after completion of masonry work.

B. Cold Weather Protection: When temperature of outside air is below 40 degrees F, pre-condition materials and finish work in accordance with "Recommended Practices for Cold Weather Masonry Construction" as published by the International Masonry Industry All-Weather Council.

C. Hot Weather Protection: Protect masonry construction from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F in shade with relative humidity less than 50%.

1.9 SEQUENCING

A. Do not apply uniform loading for at least twenty-four (24) hours after erecting masonry walls or columns.

B. Do not apply concentrated loads for at least three (3) days after erecting masonry walls or columns.

1.10 COORDINATION

A. Coordinate the masonry work with installation of window and door anchors, and all other related trades.

PART 2 - PRODUCTS

2.1 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I; natural gray color.

B. Masonry Mortar: ASTM C270.

C. Masonry Cement: Not permitted.

D. Mortar Aggregate: ASTM C144; standard masonry type; clean, dry protected against dampness, freezing and foreign matter.

E. Hydrated Lime: ASTM C207, Type S; containing no air entrainment.

F. Quicklime: ASTM C5; non-hydraulic type.

G. Grout Aggregate: ASTM C404; maximum size 3/8 inch.

H. Water: Clean and potable.

I. Prohibited Materials: Masonry cement and calcium chloride are not allowed. Fly ash, slag and pozzolans are not permitted.

2.2 MORTAR MIXES

A. Mortar for Walls and Partitions: ASTM C270, Type S using the Property Method.

B. Mortar for Interior Load Bearing Walls and Partitions: ASTM C270, Type S, per CBC Table 2103A.8(1).

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.

B. No admixtures are permitted.

C. If water is lost by evaporation, retemper only within one-and-a-half (1-1/2) hours of mixing.

D. Use mortar within one-and-a-half (1-1/2) hours after mixing.

2.4 GROUT MIXES

A. Core Fill Grout: Minimum 2000 psi compressive strength at twenty-eight (28) days; 6-8 inches slump; mixed in accordance with ASTM C476 Course grout and CBC Table 2103A.12.

2.5 GROUT MIXING

A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C476 Course grout.

B. Add Sika Grout Aid in accordance with manufacturer's instructions. Provide uniformity of mix.

2.6 CONCRETE MASONRY UNITS

A. Hollow Load Bearing Block Units: ASTM C90-99a, Grade N, Type I - Moisture Controlled; light weight or Manufacturer's certification that the concrete masonry units have cured at an ambient temperature above 40 degrees F for a minimum 28 days.

1. At time of deliver, the linear shrinkage of units shall not exceed 0.065%, per ASTM C90.

B. Masonry Units: Nominal modular size as indicated on the Drawings. Provide special units for 90 degree corners, bond beams, lintels, center score, and other items as noted.

C. **All concrete masonry units shall be either Autoclave or Carbon Dioxide manufactured with materials which conform to ASTM Cementitious and Aggregate Specifications.**

D. Reinforcing Steel: Types specified in Section 03200; unprotected finish.

2.7 ACCESSORIES

A. Joint Filler: ASTM D994; W.R. Meadows "Sealtight" asphalt expansion joint filler, 3/8 inch (10 mm) thick by maximum lengths, waterproof, flexible, permanent and self-sealing, or approved equivalent by the Architect.

B. Cleaning Solutions: General purpose cleaning agent, not harmful to masonry work or adjacent materials; "Sure-Klean No. 600, ProSoCo, Inc., or approved equivalent by the Architect.

C. Water-Repellent Sealer: BASF Enviroseal or approved equivalent by Architect.

2.8 GRAFFITI RESISTANT COATING

A. Provide a water based, odorless, biodegradable, non-hazardous, vapor permeable, VOC compliant, sacrificial (disposable) coating; listed products are approved from the following manufacturers:

1. Dayton Superior Corp. - "Graffiti Protector".
2. ProSoCo, Inc. - "Defacer Eraser SC-1".

3. Seal Krete, Inc. - "Graffiti Barrier".
4. Textured Coatings of America, Inc. - "Sacrificial Graffiti Gard".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify items provided by other Sections of work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

D. Beginning of installation means installer accepts existing conditions.

3.2 MORTAR AND GROUT INSTALLATION

A. Install mortar and grout in accordance with CBC Chapter 21A. Grout walls solid.

B. Work grout into masonry cores and cavities to eliminate voids.

C. Do not displace reinforcement while placing grout.

D. Remove excess mortar from grout spaces.

E. All mortar joints shall be mechanically tooled, concave joints, unless noted otherwise.

3.3 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other Sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until no longer required.

3.4 GENERAL ERECTION REQUIREMENTS

A. Provide all masonry construction aligned, plumb, and true in required layout, making straight level courses, unless otherwise indicated. Construct masonry to full thickness as shown with masonry units of sizes noted and specified, using whole units wherever possible. When required, cut masonry neatly by power-saw to obtain sharp edges without damage to the unit, as approved for providing required bond pattern and proper fit at all adjoining items. Build-in items furnished by other trades, and leave accurate openings necessary for subsequent installation of other work, in a manner to maintain required strength and appearance of masonry construction.

1. Fill solidly with mortar around conduit and sleeves passing through masonry work.
2. Build-in embedded items as shown on Drawings.
3. Provide threaded steel anchors where indicated on the Drawings to be built into masonry construction for attachment of work by other trades. Conform to requirements of ASTM A307, and include nuts with hardened washers where indicated on the Drawings. All anchors shall be hot-dipped galvanized where used in exterior exposed construction.
4. Grout steel frames in masonry walls solidly with mortar. Perform grouting without clogging holes, boxes, and spaces required for the proper installation, and operation of hardware.
5. Prevent grout, mortar and soil from staining the face of masonry to be left exposed or painted. Remove grout and mortar from these surfaces immediately.
6. Protect base of masonry walls from rain splashed mud and mortar splatters by means of coverings spread on ground or over wall surfaces.

3.5 COURSING

A. Establish lines, levels, and coursing indicated on the Drawings. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal eight (8) inches. Form concave mortar joints.

3.6 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.

D. Remove excess mortar as Work progresses.

E. Interlock intersections and external corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job-site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.7 BUILT-IN WORK

A. As work progresses, build in fabricated metal frames, anchor bolts, plates and other items furnished by other Sections.

B. Build in items plumb and level.

C. Bed anchors of metal frames in adjacent mortar joints. Fill frame voids solid with grout.

3.8 TOLERANCES

A. Maximum Variation From Alignment of Columns: Pilasters: 1/4 inch.

B. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.

C. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

D. Maximum Variation From Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

E. Maximum Variation From Level Coursing: 1/8 inch in 3 feet; 1/4 inch in 10 feet; and 1/2 inch in 30 feet.

F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

G. Maximum Variation From Cross Sectional Thickness of Walls: 1/4 inch.

3.9 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves, grounds and other penetrations. Coordinate with other Sections of work to provide correct size, shape, and location.

B. Obtain Architect written approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.10 CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, an completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealant.

C. Final Cleaning: after mortar is thoroughly set and cured, clean masonry as per methods recommended by SCPI and NCMA and as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels

2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposed. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

3.11 GRAFFITI RESISTANT COATING

A. Apply Graffiti Resistant Coating on masonry where indicated in accordance with manufacturer’s instructions.

B. Apply to height of 10’-0’.

3.12 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

B. Provide weather-tight protective cover over all masonry walls exposed to the elements during construction to keep moisture out of all cores and cavities.

C. Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

D. Install water repellent sealer to block per manufacturer’s instructions.

3.13 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Section 01460.

B. Conventional testing and inspection services herein describe those items not specifically required by CBC but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the CBC, and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. If any test indicates Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

E. Submit proposed mortar and grout mix designs to Architect/Engineer for review prior to commencement of Work.

F. Grout Tests:

1. Seven (7) day test and a twenty eight (28) day strength test will be required for every 30 or less cubic yards of each type of grout placed each day. A strength test shall be taken as the average of the strengths of two (2) 3" x 3" x 6" rectangular grout specimen made from the same sample of grout.

2. Prepare and test rectangular grout specimens in accordance with ASTM C1019-00$^{\varepsilon 1}$. One (1) slump test in accordance with ASTM C143-00 will be taken for each set of test specimens.

G. Strength level of grout will be considered satisfactory if the averages of all sets of three (3) consecutive twenty eight (28) day strength test results equal or exceed specified strength and no individual twenty eight (28) day strength test result is less than 2,000 psi.

H. Mortar Testing:

1. One (1) mortar test specimen shall be taken for each 5,000 square feet of masonry wall constructed and a minimum of one (1) set of mortar test specimens shall be taken for each day that masonry construction is accomplished. Test specimens shall be taken for seven (7) day test and twenty eight (28) day test.

2. Prepare and test mortar specimens in accordance with the CBC.

3. One (1) slump test in accordance with ASTM C143-00 will be taken for each set of test specimens.

I. Strength level of mortar will be considered satisfactory if no individual twenty eight (28) day mortar test specimen result is less than 1,800 psi Type S mortar.

J. The water-soluble alkali content of the cement used in the mortar shall be tested in accordance with ASTM C114-00, or suitable certification furnished by the manufacturer of the cement, to establish that total water-soluble alkali content does not exceed 0.1 percent of the alkali present.

K. Prism Tests: Perform on Type I - moisture cured concrete masonry units in accordance with ASTM C1388-97.

1. Tests shall be performed on two (2) sets of three (3) units each as directed by the Architect.

2. Tests shall be conducted by the Independent Testing Laboratory (See Division One).

L. Masonry Preparation and Placement:

1. Verify that masonry bearing surfaces are clean and free of debris.

2. Verify that masonry units are clean, sound and dry.

3. Inspect laying of masonry units for the following: nominal unit widths, stack or running bond, proper thickness and tooling of mortar joints, acceptable depth of furrowing of bed joints. Note temperature at time of inspection.

4. Inspect construction, expansion and contraction joints for location and continuity of reinforcement.

5. Verify that hot and cold weather procedures are followed.

6. Verify that wall cavities are protected against entry of moisture and precipitation.

M. Masonry Reinforcement:

1. Inspect placement and alignment of vertical bars and dowels for size, grade and spacing. Inspect length of lap splices, clearances between bars, clearances to masonry units and outside face of walls, and positioning of steel.

2. Inspect horizontal masonry reinforcement bars for size, length of lap splices, dowels,

clearances between bars, clearances to masonry units and outside face of walls, and alignment.

3. Inspect ties in masonry units for type, straightness, embedment, spacing and size.
4. Inspect the installation of masonry anchor bolts, inserts and dowels.

N. Masonry Grouting and Capping:

1. Verify that grout spaces are correctly sized and clean, cleanouts are closed after inspection and are in place before grouting.
2. Verify proper application of dry packing.
3. Verify proper grouting technique, including consolidation to approved height of grout space, reconsolidation and vibration.

END OF SECTION 04200

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One), and the Drawings Apply to the Work of This Section.

B. Structural Steel Framing Members and Support Members; as Indicated on the Drawings, Specified Herein; Including All Related Bracing, Bridging, Connections and Attachments.

1.2 PRODUCT FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03300 - Cast-In-Place Concrete: Anchor bolts and loose bearing and setting plates for casting into concrete.

B. Section 04200 - Unit Masonry Systems: Anchors for embedding into masonry.

1.3 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 03300 - Cast-in-Place Concrete: Grouting under base plates and setting anchor bolts.

C. Section 04200 - Unit Masonry Systems: Setting anchors in masonry.

D. Section 05310 - Steel Decking: Support framing for small openings in roof and floor deck.

E. Section 05500 - Metal Fabrications: Non-framing fabrications affecting structural steel work.

F. Section 09900 - Paints and Coatings: Touch-up and finish painting.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings based on current AISC Specifications:

1. Indicate profiles, sizes, weight of members, spacing, and locations of structural members, openings, attachments and fasteners.
2. Connections.
3. Cambers and loads.
4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
5. Provide setting drawings, templates and directions for the installation of the anchor bolts and other anchoring devices.

C. Mill Test Reports: Submit under provisions of Section 01460. Manufacturer's Certificates, indicating structural strength, destructive and non-destructive test analysis.

D. Welders' Certificates: Submit under provisions of Section 01460. Manufacturer's Certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

E. Design computations for connections not detailed on the Structural Drawings shall be designed and certified by a Professional Structural Engineer registered in the State of California.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

B. Perform Work in accordance with AISC - Specification for Architectural Exposed Structural Steel.

C. Perform all welding operations under provisions of AWS, D1.1 - "Structural Welding Code Steel".

D. Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation "Specification for Structural Joints Using ASTM A325 or A490 Bolts".

E. SSPC, Volume 2, Systems and Specifications, "Steel Structures Painting Manual".

1. Metal primers shall be chromate free and VOC compliant.

1.6 QUALIFICATIONS

A. Fabricator and Erector: Companies specializing in performing the Work of this Section with minimum five (5) years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver anchor bolts and other anchorage devices to be embedded in concrete or masonry construction to site in time for installation.

C. Store steel members above ground on platforms, skids or other acceptable supports. Protect steel from corrosion.

D. Store other materials in a watertight and dry place until ready for incorporation into the Work.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of structural steel and other construction to which the structural steel must fit by accurate field measurements before fabrication; show recorded measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are new, smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Wide Flange Sections: ASTM A992, unless noted otherwise on Drawings.

C. Structural Steel Shapes and Plates: ASTM A36.

D. Structural Steel Tubing: ASTM A500, Grade B.

E. Steel Pipe: ASTM A53, Grade B.

F. Bolts, Nuts, and Washers (Connecting Steel to Steel): ASTM A325-galvanized to ASTM A153.

G. Bolts, Nuts and Washers (Anchored in Concrete): ASTM F1554, unless noted otherwise.

H. Welding Materials: AWS D1.1, min 70 ksi; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC Paint 15, Type 1.

J. Touch-up Primer for Galvanized Surfaces: Zinc rich type.

K. Stud Shear Anchors: Equivalent to Nelson Application 420-A shear connector studs, manufactured by Nelson Stud Welding Company, or approved equivalent by the Architect/Engineer. The ferules shall be specifically designed for the weld-through technique.

L. Expansion Bolts ICBO Approved: Use one of the following or approved equivalent by the Structural Engineer:

1. Hilti.
2. Simpson Strong-Tie.
3. Substitutions: Under provisions of Division One.

2.2 MATERIAL TESTING

A. Identified Steel: Where steel, ordered from the mill, cut to lengths, is identified by heat or melt numbers, and is accompanied by mill analysis (chemical and physical properties) test reports, such material may be used without further local tests, provided an acceptable affidavit is given to confirm that materials conform with Contract requirements.

B. Unidentified Steel: Where materials are not identified, and when mill analysis and tests are not furnished or source is questionable, then one (1) tension and one (1) bend test shall be made for each ten (10) tons or fractional part thereof of each member of such materials proposed in the Work.

C. The cost of testing unidentified steel shall be borne as a part of Work of this Section.

2.3 FABRICATION

A. Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final Shop Drawings. Provide camber in structural members where indicated.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

C. Shop and field connections of columns, beams, girders, etc. shall be bolted using high strength bolts (bearing type with threads excluded from shear plane) or by welding, unless noted otherwise. Use 7/8 inch diameter bolts unless noted otherwise. All connections listed are to be double angle or double plate framed connections. The standard gauge of three (3) inches shall be used for detailing typical connections

D. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members

exposed in final structure free of markings, burrs, and other defects.

E. Connections: All connections are to be standard AISC connections unless otherwise noted. All tube column-beam/girder connections are to have welded through plates unless otherwise noted. Weld or bolt shop connections, as indicated.

F. Bolt field connections, except where welded connections or other connections are indicated.

G. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

H. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

I. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

J. Holes and Connections for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final Shop Drawings.

K. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

L. Structural fabricator shall furnish all beam bearing plates, frames, etc. around openings, unless noted otherwise.

M. Structural fabricator shall furnish all anchor plates and anchor assemblies shown to anchor the structural steel to cast-in-place concrete walls, beams, columns or slabs.

2.4 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-3.

B. Galvanizing-hot dip process: Conform to ASTM A123 and A153.

C. Touch-up Galvanizing: “Galvalloy, “ Metalloy Products, Inc., or equal.

D. Shop prime interior structural steel members to provide a smooth and even surface with a dry film thickness of 2.0 to 3.5 mils. Do not prime surfaces that will be fireproofed, field welded or in contact with concrete.

E. Block out at connections and omit shop paint. Do not prime surfaces that will be fireproofed, field welded or in contact with concrete.

F. Surface Preparation: After inspection and before shipping, clean all steel work to be painted.

G. Exterior Exposed Structural Steel: Commercial blast clean all surfaces to be exposed to conform to SSPC-SP6. Shop prime surfaces with Sherwin-Williams Kromik metal primer, or approved equivalent by the Architect. Dry film thickness shall be minimum 4.0 mils. Thickness shall be verified by an Independent Inspection Firm under provisions of Division One.

1. Finish coats shall be specified under provisions of Section 09900.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means erector accepts existing conditions.

3.2 ERECTION

A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

B. Anchor Bolts: Provide anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

C. Provide templates and other devices as necessary for presetting bolts and other anchors to accurate locations.

D. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

E. Slice members only where indicated and approved on Shop Drawings.

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

G. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

H. Stud Shear Connectors: Connectors shall be automatically welded in the field at the size and spacing indicated on the Drawings. The welds shall be made in accordance with the recommendations of the stud anchor manufacturer and in accordance with the applicable requirements of AWS Standards.

1. The top flanges of the beams receiving stud sear connectors shall be free of dirt, oil, rust, paint, water and any other substances that might interfere with the welding operations. Similarly, while being attached to the beams, the steel decking panels shall be free of dirt, oil, rust, paint, water and other detrimental substances and rest tightly upon the top flange of the beam.

I. Temporary Connections: As erection progresses, the Work shall be securely bolted up as necessary to maintain the steel in proper position while field bolting and welding is being done, and as necessary to take care of dead loads, winds and erection stresses.

J. Do not field cut or alter structural members without written approval of Architect/Engineer.

K. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

L. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect/Engineer. Finish gas-cut sections equal to a sheared appearance when permitted.

M. Immediately after erection, clean and prime field welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

N. After erection of the "Architecturally Exposed Structural Steel", field finish under provisions of Section 09900.

3.3 WELDING

A. Welding and Welded Joints: Detail and execute in accordance with the requirements of the American Welding Society (AWS) Standards and the Structural Welding Code, AWS D1.1, and as modified by the Drawings. In the event of conflict the Drawings take precedence. Perform structural welding by one of the following processes:

1. Shielded Metal Arc Welding Process.

2. Fluxed-Cored Process.

3.4 ANCHOR BOLTS

A. Furnish anchor bolts to the Project Site when and as required to maintain project schedule. All anchor bolts which are to be embedded in concrete or masonry for securing of structural steel in proper position.

B. Provide the necessary templates and drawings to Sections 03300 and 04200 for setting of such anchor bolts.

C. Setting of anchor bolts in hardened concrete, necessitated through error or oversight, and in existing concrete shall be as acceptable to the Architect/Engineer in suitable drilled holes solidly grouted in place, or embedded in an acceptable structural epoxy.

3.5 TOLERANCES

A. Material, fabrication and erection tolerances as indicated in the latest edition of the AISC Manual of Steel construction – Code of Standard Practice for Steel Buildings and Bridges as amended by this section.

3.6 CLEANING

A. After the erection and welding of steel, apply a field touch-up coat of paint on all welded connections and damaged areas using the same color and type of paint used on the shop coat as necessary. Also, remove clay, mud or other foreign materials from all members.

B. Upon completion of erection, promptly remove all tools, equipment and rubbish caused by, and resulting from, structural steel erection work, and perform such final cleaning service as may be necessary to leave job in an acceptable condition.

3.7 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One and as required by the DSA.

B. Conventional testing and inspection services herein describe those items not specifically required by

California State Building Code but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the California State Building Code and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. High Strength Bolting:

1. Visually inspect mating surfaces and bolt type for all slip-critical connections for general conformance with the Contract Documents prior to bolting.

2. Test bolt tightening in ten percent (10%) of all bolts. Test a minimum of two (2) bolts in each connection. Verify that all plies of connected elements have been brought into contact, at 100% of connections. Verify that all tips are removed from "twist-off" bolts.

3. Visually inspect to confirm all plies of connected elements have been brought into contact, at 100% of connections.

4. Test High Strength bolted connections per RCSC "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."

F. Welding (Field):

1. Visually inspect 100% of all fillet welds; for size, length and quality per AWS D1.1.

2. Test 25% of all partial penetration welds exceeding 5/16 inches, using Ultrasonic Testing per AWS D1.1, Section 6. Test 10% of all partial penetration welds less than 5/16 inches, using Magnetic Particle Testing per ASTM E109, performed on root pass and on finished weld.

3. Test 25% of all full penetration welds exceeding 5/16 inches, using Ultrasonic Testing per AWS D1.1, Section 6. Test 10% of all full penetration welds less than 5/16 inches, using Magnetic Particle Testing per ASTM E109, performing on root pass and on finished weld.

4. Stud Shear Connector Welds: Visually inspect 100% of installed studs for full 360 degree flash. Test all questionable studs, not showing full 360 degree flash by bending studs to 15 degrees from vertical, away from weld discontinuity, per AWS D1.1, Section 7. Randomly test all other studs by bending to 15 degrees fro vertical as noted:

   a. Studs welded through deck: 15%

   b. Studs welded to bare steel: 5%

5. Visually inspect 100% of all reinforcing bar welds as the welding in performed, per AWS D1.4. Verify that proper joint preparation is provided and proper electrodes are used and properly stored and dried.

6. Procedures and Preparation:

   a. Verify qualifications of all welders as AWS certified.

   b. Verify proposed welding procedures and materials.

   c. Verify adequate preparation of faying surfaces.

   d. Verify preheat and inter-pass temperatures of steel, proper technique and sequence of welding, and cleaning and number of passes are provided as required.

7. Mechanical Fasteners (Misc.):

   a. Visually inspect all fasteners for specified size, spacing, embedment and location.

END OF SECTION 05120

SECTION 05310 - STEEL DECKING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Steel Decking of Fluted, Ribbed and Cellular Configurations; Composite Decks of Metal and Acoustical or Thermal Insulation; as Indicated on the Drawings, Specified Herein; Including Related Anchors, Closures, Attachments and Accessories.

1. Steel Roof Decking.
2. Steel Floor Decking.

C. Formed Steel Angles and Bent Plates.

D. Framing for Openings Up To and Including Eighteen (18) inches.

E. Architecturally Exposed Steel Decking Shall be Classified as "Architecturally Exposed Structural Steel" (AESS) as Defined by AISC.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 05120 - Structural Steel: Structural framed openings larger than 18 inches.

C. Section 05500 - Metal Fabrications: Non-structural ferrous metal members and components.

D. Section 07540 – Thermoplastic Membrane Roofing: Roof system.

E. Section 07620 - Sheet Metal Flashing and Trim: Pre-finished metal copings and flashing.

F. Division 15 - Mechanical: Reinforcement pans with roof drain hub assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Design metal deck in accordance with SDI Design Manual for Roof and Floor Decks.

B. Calculate metal deck to structural working stress design and maximum vertical deck deflection of l/240.

C. Verify all deck fastening requirements with Structural Engineer for deck configurations not noted.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate deck type and profile, deck layout, dimensions, gauge, support locations, attachment methods, attachment patterns, projections, openings and reinforcement, closure panels and accessories. Indicate temporary shoring of decking where required.

1. Indicated locations on steel decking to receive Phosphatized/paint.

C. Product Data: Submit manufacturer’s relevant structural data including physical properties; gauge and yield strength of steel and finishes.

D. Manufacturer's Installation Instructions: Indicate specific installation sequence, and special instructions.

E. Welder's Certificates: Submit manufacturer's certificates under provision of Section 01460 that welders employed on the Work have met AWS verification within the previous 12 months.

F. Certification: Submit metal deck manufacturer’s calculations and supporting data, stating that each metal decking proposed for use complies with the Contract Documents and applicable code requirements. Obtain Architect’s review and approval prior to fabrication and installation of metal decking.

1.5 QUALITY ASSURANCE

A. Fabricator and Installer: Company specializing in performing the Work of this Section with minimum five (5) years documented experience, and member of the Steel Deck Institute (SDI).

B. Design deck layout, spans, fastening, joints and accessories under direct supervision of a Professional Structural Engineer experienced in Design of this Work and licensed in the State of California.

C. Welder’s Qualifications: Welders shall be properly certified for the type of Work involved in compliance with applicable code requirements and in accordance with requirements and procedures of AWS 1.3 and AWS 1.1.

D. Continuous inspection shall be made of all welding operations as performed by the Independent Testing Laboratory.

E. Requirements of Regulatory Agencies:

1. Fire Rating: Contractor shall be responsible for obtaining UL and Building Department approval of the decking, when used as part of the assembly indicated on the Drawings in which fire-resistive construction ratings are required.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver, store and protect metal deck in a manner to completely protect the deck from damage, including the painted surfaces. Cover deck and accessories in storage with a waterproof covering and store up off the ground.

C. Protect steel deck from corrosion, deformation, and other damage during delivery, storage and handling.

D. Cut original plastic wrap to encourage ventilation.

E. Separate sheets and store decking on dry wood sleepers; slope for positive drainage.

F. Do not use decking for storage or as working platform until units have been welded into position.

G. Exercise care not to damage the material or overload the decking during the construction period.

H. Stack decking on platforms or pallets and cover with weather tight ventilated covering. Elevate one end during storage to provide for positive drainage.

1.7 FIELD MEASUREMENTS

A. Verify actual location of steel decking and other construction to which steel decking must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - STEEL DECKING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. ASC Pacific, Inc.
2. B.H.P. Steel Building Products.
3. United Steel Deck, Inc.
4. Verco Manufacturing Company.
5. Vulcraft Steel Deck.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Sheet Steel: Deck and accessories shall be manufactured with ASTM A653, Structural Quality, Grade 33 or higher with oven cured, flexible primer paint. Galvanized to be ASTM A653, G60.

B. Bearing Plates or Angles: ASTM A36 steel, unfinished.

C. Welding Materials: AWS D1.3.

D. Touch-Up Primer for Galvanized Surfaces: Zinc rich type.

E. Hanging Devices: Provide piercing and non-piercing hanger tabs for light weight ceiling suspension loads.

2.3 TOLERANCES

A. Panel Lengths: Plus or minus 1/2 inch.

B. Thickness: Shall not be less than 95% of the design thickness.

C. Panel Cover Width: Minus 3/8 inch, plus 3/4 inch.

D. Panel Camber and/or Sweep: 1/4 inch in 10 foot length.

E. Panel End Out of Square: 1/8 inch per foot of panel width.

2.4 FABRICATION

A. Sheet Steel Roof Decking; minimum yield strength of 33 ksi, and configured as follows:

1.	Span Design:	Multiple
2.	Min. Metal Thickness:	18 gauge
3.	Nominal Height:	1-1/2 inch or 3 inch fluted to SDI profile
4.	Rib Type:	Intermediate
5.	Deck Profile:	Non-Cellular
6.	Formed Sheet Width:	Varies with Manufacturer
7.	Side Joints:	Lapped
8.	Finish:	Galvanized, unless noted otherwise

B. Sheet Steel Floor Decking; minimum yield strength of 33 ksi, and configured as follows:

1.	Span Design:	Multiple
2.	Min. Metal Thickness:	16 gauge
3.	Nominal Height:	1-1/2 inch fluted to SDI profile
4.	Deck Profile:	Non-Composite
5.	Formed Sheet Width:	Varies with Manufacturer
6.	Side Joints:	Lapped
7.	Finish:	Galvanized

C. Metal Closure Strips, Flat Plates at Change of Deck Direction, Wet Concrete Stops, Cover Plates, and Related Accessories: minimum 16 gauge thick galvanized sheet steel; of profile and size required.

D. Provide recessed roof sump pans of minimum 14 gauge thick galvanized sheet steel, flat bottom, sloped sides. Recessed 1-1/2 inches below roof deck surface, bearing flanges three (3) inches wide, seal watertight.

E. Fasteners: As indicated on Structural Drawings.

F. Weld Washers: Mild steel, un-coated, 3/4 inch outside diameter, 1/8 inch thick.

2.5 FINISH

A. Interior sheet steel decking and accessories shall be thoroughly cleaned and chemically treated for paint adhesion.

B. Finish: When indicated on the Finish Schedule, paint steel decking under provisions of Section 09900.

C. Exterior Exposed Structural Steel: Commercial blast clean all surfaces to be exposed to conform to SSPC-SP6. Shop prime surfaces with TNEMEC No. 161-1211, "TNEME-FASCURE" Primer, or approved equivalent by the Architect. Dry film thickness shall be minimum 4.0 mils. Thickness shall be verified by an Independent Inspection Firm under provisions of 01460.

1. Finish coats shall be specified under provisions of Section 09900.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 OPENINGS

A. Cut and reinforce units to provide openings which are located and dimensioned on the Structural Drawings. Provide closures where required for containment of subsequent concrete fill.

B. Provide openings, holes and sleeves through decking which are required for Work of other trades, and which are not indicated on Structural Drawings. Coordinate as to sizes, locations and reinforcements. Sleeves will be furnished by the various trades requiring them.

3.3 WELDING

A. Location, size and spacing of the welds shall conform to the recommendations of the Steel Deck Institute (SDI) and as shown on final Drawings. Comply with AWS D1.3 for procedures, appearance, quality of welds and methods used in correcting welding work.

3.4 ERECTION

A. Erect metal decking in accordance with SDI Design Manual for Roof and Floor Decks.

B. Do not place or store metal deck on steel joists or beams until they are permanently anchored and bridged. Avoid excessive concentrated loads during construction by distributing piles of deck in insure that the load carrying capacity of the framing is not exceeded.

C. Bear decking on steel supports with three (3) inch minimum bearing. Align and level.

D. Fasten metal deck to steel support members as indicated on Structural Drawings.

E. Weld steel deck to supports using minimum welds noted on typical deck welding details shown on the Structural Drawings in accordance with AWS D1.3.

F. Fasten male/female side laps as indicated on Structural Drawings.

G. Reinforce steel deck openings from 6 to 18 inches in size with steel members: Place members perpendicular to flutes; extend minimum two (2) flutes beyond each side of opening and attach to deck at each flute.

H. Install six (6) inch minimum wide sheet steel cover plates, of same thickness as decking, where deck changes direction. Attach at twelve (12) inches o. c. minimum.

I. Install sheet steel closures and angle flashing to close openings between deck and walls, columns, and openings.

J. Position roof sump pans with flange bearing on top surface of deck. Fusion weld at each deck flute.

K. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

L. Fasten accessories by welding or self-tapping stainless steel screws.

M. Weld metal deck at each rib at roof openings and secondary supporting members.

N. Welding washers shall be used on all deck units with metal thickness less than 0.028 inches thick. Welding washers shall be a minimum thickness of 0.0568 inches and have a nominal 3/8 inch diameter hole.

O. The completed metal deck shall be protected from construction loads in excess of 30 psf. All loads shall be moved across the deck on wood planking (or similar means) to distribute loads.

P. Where the metal deck installer injures or damages the steel below the deck while welding, it shall be his responsibility to repair the joist in an acceptable manner with the manufacturer.

3.5 ACCESSORIES

A. Provide perimeter closures and flashing at wall ends of all units, open ends and sides of panels and at columns.

B. Provide reinforcing angles or channels, where a deck is cut parallel to rib to make a tight fit along the cut.

C. Provide all flashing, metal closure pieces, transition pieces, reinforcement and accessories attached to the decks as may be required and as indicated on the Drawings to make decking complete and ready to receive concrete.

3.6 CLEANING

A. Upon completion or erection, promptly remove all tools, equipment and rubbish caused by or resulting from the roof deck erection work and perform such final cleaning service as may be necessary to leave job in acceptable condition.

3.7 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by California State Building Code but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the California State Building Code, and other items which in the professional judgment of the Structural Engineer of Record are critical to the integrity of the building structure.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Visually inspect 100% of welds for specified length and burn-through for 100% of puddle welds on metal deck designed as a structural element, per AWS D1.3, Section 6. Provide testing and inspection for field welds previously specified under provisions of Section 05120.

END OF SECTION 05310

SECTION 05400 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Cold Formed Structural Steel, Load Bearing Vertical Wall Framing and Bridging; as Indicated on the Drawings, Specified Herein; Including Related Attachments and Accessories.

1. Exterior wall framing.
2. Interior wall framing.

C. Cold Formed Structural Steel, Load Bearing Horizontal Framing and Bridging; as Indicated on the Drawings, Specified Herein; Including Related Attachments and Accessories.

1. Exterior soffit framing.
2. Interior Ceiling Framing.
3. Interior Floor/Platform Framing.

1.2 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 03300 - Cast-in-Place Concrete: Concrete substrate for metal framing.

C. Section 05120 - Structural Steel: Structural building framing.

D. Section 05310 - Steel Decking: Metal roof and floor decking.

E. Section 05500 - Metal Fabrications.

F. Section 06100 - Rough Carpentry: Treated wood blocking.

G. Section 07210 - Building Insulation: Insulation within framing members and vapor retarders.

H. Section 07910 - Joint Sealers: Sealant and joint backing.

I. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish.

J. Section 09255 - Exterior Sheathing Board: Exterior sheathing board.

1.3 PERFORMANCE REQUIREMENTS

A. Design system components in accordance with AISI reference; provide for movement of components due to thermal variations without damage, failure, or excessive stress on components.

B. Design exterior wall system for wind exposure "C" as outlined in the Calfiornia State Building Code, and to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

C. Design system to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

D. All structural properties shall be computed in accordance with AISI - Specifications for the Design of Cold-Formed Steel Structural Members.

E. Vertical Assemblies:

1. Withstand Loads as Follows:
   a. Positive Wind Pressure: 25 PSF.
   b. Negative Wind Pressure: 25 PSF.
2. Maximum Allowable Deflection:
   a. Gypsum Board: L/240th of span under total design loads.
   b. Exterior Insulation Finish System: L/240th of span under total design loads.
   c. Plaster or Stucco: L/360th of span under total design loads.

F. Horizontal Assemblies:

1. Withstand 55 PSF under total design loads.
2. Maximum Allowable Deflection: 1/240th of span under total design loads.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer’s descriptive literature for products specified in this Section.

C. Shop Drawings:

1. Indicate locations of cold formed framing assemblies.

2. Indicate sizes and spacing of framing components.
3. Indicate fastening methods between framing members and to adjacent products/materials.
4. Indicate bearings, anchors, and other products required for construction activities of this section; indicate products not supplied by manufacturer of products of this section.

D. Manufacturer's Instructions: Printed installation instructions for products specified in this section.

E. Design Data: Calculations for loading and stresses, bearing seal and signature of Structural Engineer registered in the State of California.

F. Provide design calculations for all exterior walls, canopies, and soffit systems. Design wind loads are indicated on the structural drawings.

G. Mill Certificates for each type structural framing member, indicating the following information:

1. Bare metal thickness of steel, measured to 1/1000 inch.
2. Yield strength of steel.
3. Tensile strength of steel.
4. Total elongation of steel in two (2) inch gauge length.
5. Chemical analysis of steel.
6. Thickness of galvanized coating, measured to 1/1000.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five (5) years documented experience.

B. Installer: Company specializing in performing the Work of this Section with minimum five (5) years documented experience.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of cold formed metal framing and other construction to which the framing must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - COLD FORMED METAL FRAMING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. California Expanded Metal Products Company.
2. Consolidated Fabricators Corporation.
3. United Metal Products, Inc.
4. Clark Western Framing Systems.
5. Dietrich Industries, Inc./Unimast

B. Substitutions: No Substitutions Allowed.

C. Supply all products specified in this Section from a single manufacturer.

2.2 FRAMING MATERIALS

A. Structural steel studs and components shall be "C" shaped sized and spaced as indicated on the Drawings.

B. Structural steel joists and components shall be "C" shaped sized and spaced as indicated on the Drawings.

C. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, bracing, and accessories as recommended by the manufacturer for application indicated, as needed to provide a complete metal framing system.

D. All structural members shall be designed in accordance with American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members", current edition.

E. All structural members shall be formed from corrosion-resistant steel, corresponding to the requirements of ASTM A653/A-653M, with a minimum yield strength of 40 ksi for SJ studs and Grade A, 33 ksi, for CR runners.

F. All structural members shall be coated conforming to ASTM A924/A-924M-94.

2.3 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

B. Plates, Gussets, Clips: Formed sheet steel, thickness determined for conditions encountered, manufacturer's standard shapes, same finish as framing members.

C. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, red oxide.

D. Metal slide clips for expansion.

2.4 FASTENERS

A. Self-drilling, Self-tapping Screws, Bolts, Nuts and Washers: ASTM A90/A90M-93, hot dip galvanized to G60.

B. Anchorage Devices: Power actuated, type recommended by manufacturer for specific installation.

C. Welding: In conformance with AWS D1.1 and AWS D1.3.

2.5 FINISHES

A. Studs: Galvanize to G60 coating class.

B. Tracks and Headers: Galvanize to G60 coating class.

C. Joists: Galvanize to G60 coating class.

D. Bracing, Furring, Bridging: Same finish as framing members.

E. Plates, Gussets, Clips: Same finish as framing members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that bearing surfaces and substrates are ready for construction activities of this Section.

C. Verify that concealed treated wood blocking (Section 06100) has been provided and is in the proper locations.

3.2 ERECTION OF STUDDING

A. Install components in accordance with manufacturer's instructions.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 16 inches o.c. Coordinate installation of sealant with floor and ceiling tracks.

C. Place studs at maximum 16 inches o.c.; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks in accordance with Drawings.

D. Construct corners using minimum three studs. Double stud wall openings, door and window jambs.

E. Erect load bearing studs one piece full length. Splicing of studs is not permitted.

F. Erect load bearing studs, brace, and reinforce to develop full strength, to achieve design requirements.

G. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

H. Install intermediate studs above and below openings to align with wall stud spacing.

I. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.

J. Attach steel blocking to studs for attachment of fixtures anchored to walls.

K. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

L. Touch-up field welds and damaged galvanized surfaces with primer.

M. Provide bridging (horizontal stiffeners) at 4'-0" o.c. maximum vertical spacing for all exterior and all load bearing metal stud walls.

3.3 ERECTION OF JOISTS

A. Install framing components in accordance with manufacturer's instructions.

B. Make provisions for erection stresses. Provide temporary alignment and bracing.

C. Place joists at maximum 16 inches o.c.; not more than 2 inches from abutting walls. Connect joists to supports in accordance with Drawings.

D. Set ceiling joists parallel and level, with lateral bracing and bridging.

E. Locate joist end bearing directly over load bearing studs or provide load distributing member to top of stud track.

F. Provide web stiffeners at reaction points.

G. Touch-up field welds and damaged galvanized surfaces with primer.

3.4 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Variation of any Member from Plane: 1/16 inch.

3.5 INSTALLATION

A. Field Welding: In accordance with AWS D1.3, and the following:

1. Stud-to-Track Connections: 1/16 inch fillet weld, full length of inside flange dimension, inside each flange of stud onto track web.

2. All Other Connections: Flat, plug, butt or seam, unless noted otherwise.

3. Minimum Steel Thickness for Welded Connections: 18 gauge.

B. Field Fastening: Use minimum two (2) self-tapping metal screws per connection, unless otherwise indicated.

C. Framing: Install components in accordance with manufacturer's instructions, shop drawings, and requirements of ASTM C1007.

1. Provide for erection stresses; provide temporary bracing as construction activities progress.

2. Erect load bearing components in single piece full length; splicing of load bearing components is prohibited.

3. Brace and reinforce load bearing assemblies as indicated or required for full design strength.

D. Vertical Framing:

1. Align top and bottom tracks; locate as indicated, and secure track to substrate in accordance with Drawings.

2. Coordinate installation of acoustic sealant specified in Section 07910 with installation of track.

3. Place studs at spacing indicated on shop drawings, maximum two (2) inches from abutting walls; construct corners using minimum three (3) studs.

4. Install double studs at jambs of openings for doors, cased openings, and windows; install intermediate studs above and below openings to align with wall stud spacing.

5. Seat studs in track square with track flange, with stud end maximum 1/16 inch from surface of track web.

6. Attach steel blocking for attachment of fixtures; install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

7. Placement of insulation between studs after erection is specified under provisions of Section 07210.

E. Horizontal Framing:

1. Place components at spacing indicated on the shop drawings; minimum two (2) inches from abutting walls.

2. Set components parallel and level, with lateral bracing and bridging.

3. Locate ends of load bearing components directly over support points.

4. Provide web stiffeners at locations indicated or required.

F. Touch up damaged coating surfaces; use specified primer.

G. Installation Tolerances:

1. Variation from Plumb: Maximum 1/8 inch in ten (10) feet.

2. Variation from Level: Maximum 1/8 inch in ten (10) feet.

3. Variation from True Plane: Maximum 1/8 inch in ten (10) feet.

4. Variation from True Position: Maximum 1/4 inch.

5. Variation of Member from Plane: Maximum 1/8 inch.

3.6 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein, and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by the California State Building Code but are considered essential to the proper performance of the building systems.

C. Special structural testing and inspection services herein described include items required by the California State Building Code and the DSA, and other items which in the professional judgement of the Structural Engineer of Record are critical to the integrity of the building structure.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

E. Visually inspect 100% of welds for specified length, size and continuity in accordance with AWS D1.3 for metal less than 1/8 inch thickness, for Work designed as a structural element. Provide testing and inspection for field welds previously specified under provisions of Section 05120.

END OF SECTION 05400

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Shop Fabricated Ferrous Metal Fabrications Manufactured to Conventional Details From Standard Metal Shapes and Plates; as Indicated on the Drawings, Specified Herein; Including All Related Fittings, Connections, Attachments and Accessories; Prime Painted and Galvanized.

C. Metal Fabrications (Supplied, but not inclusive):

1. Interior Ladder.
2. Exterior Roof Ladder (with Cage).
3. Exterior Pipe Bollards.
4. Angles, Channels and Plates Not Attached to Structural Framing.
5. Steel Lintels.
6. Steel Backing Plates.
7. Railings and Handrails.
8. Countertop Brackets.
9. Perimeter Closures.

D. Schedule of Items at End of This Section.

E. Architecturally Exposed Metal Fabrications Shall be Classified as “Architecturally Exposed Structural Steel” (AESS) as Defined by AISC.

1.2 PRODUCT FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.

B. Section 04200 - Unit Masonry System: Placement of metal fabrications in masonry.

1.3 RELATED SECTIONS

A. Section 01460 - Testing and Inspection Services.

B. Section 05120 - Structural Steel: Structural steel anchor bolts.

C. Section 05310 - Steel Decking: Bearing plates or angles for metal deck bearing, including anchorage.

D. Section 05400 - Cold Rolled Metal Framing.

E. Section 06100 - Rough Carpentry: Treated wood blocking.

F. Section 09900 - Paints and Coatings: Paint touch-up and finish.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate detailed fabrication and erection of each metal fabrication; Include profiles, sizes, plans, elevations, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.

C. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

D. Welder's Certificates: Submit under provisions of Section 01460. Manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

1.5 QUALITY ASSURANCE

A. Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of California.

B. Perform Work in accordance with AISC - Specifications for Architectural Exposed Structural Steel.

C. Perform all welding operations under provisions of AWS, D1.1 - "Structural Welding Code Steel".

D. Welders’ Certificates: Submit under provision of Section 01430, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.

E. SSPC, Volume 2, Systems and Specifications, "Steel Structures Painting Manual".

1. Metal primers shall be chromate free and VOC compliant.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver anchor bolts and other anchorage devices to be embedded in concrete or masonry construction to site in time for installation.

C. Store steel members above ground on platforms, skids or other acceptable supports. Protect steel from corrosion.

D. Store other materials in a watertight and dry place until ready for incorporation into the Work.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

1. Where field measurements cannot be made without delaying the work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METAL MATERIALS

A. Metal Surfaces, General: For metal fabrications exposed to view upon completion of the work, provide new materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variation in flatness exceeding those permitted by reference standards for stretcher-leveled sheet. All steel tubing and plate shall have sharp edging, unless shown otherwise.

B. Steel Sections: ASTM A36.

C. Steel Tubing: Cold-Formed, ASTM A500, Grade B.

D. Plates: ASTM A283.

E. Steel Pipe: ASTM A53-93a, Grade B.

1. Galvanized: Exterior locations, and other areas where indicated.

2. Interior Type F, standard weight (schedule 40), unless indicated otherwise.

F. Anchors-Inserts:

1. Threaded Type: ASTM A27; hot-dip galvanized in accordance with ASTM A153.

2. Slotted Type: ASTM A283; hot-dip galvanized in accordance with ASTM A153.

G. Fasteners: Zinc coated, galvanized for exterior use or when used in exterior walls, in accordance with ASTM A153-82. Select fasteners for the type, grade and class required for the installation of miscellaneous metal items.

1. Standard Bolts and Nuts: Regular hexagon type, ASTM A307-94, Grade A.

2. Lag Bolts: Square head type, FS FF-B-561.

3. Machine Screws: Cadmium plated steel, FS FF-S-92.

4. Wood Screws: Flat head carbon steel, FS FF-S-111.

5. Plain Washers: Round, general assembly grade carbon steel, FS FF-W-92.

6. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

7. Other Fastener Types: As required to suit application.

H. Welding Electrodes: Appropriate type for the metal to be welded; comply with AWS D1.1.

2.2 STAINLESS STEEL SHEET

A. Stainless Steel: ASTM Type 304, 16 gauge, number 4 finish, 180 grit, non-magnetic, 18% chrome, 8% nickel, corrosion resistant alloy steel; flat, first grade and free of buckles and surface imperfections.

2.3 GROUT AND ANCHORING CEMENT

A. Non-Shrink Metallic Grout: Premixed, factory-packaged, ferrous aggregate grout complying with CE CRD-C 621, specifically recommended by manufacturer for heavy duty loading applications of type specified in this section.

B. Non-Shrink Non-Metallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Interior Anchoring Cement: Premixed, factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Use for interior applications only.

D. Erosion-Resistant Anchoring Cement: Premixed, factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.4 FABRICATION - GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated on the Drawings, but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Fit and shop assemble in largest practical sections, for delivery to site.

C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

D. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication and installation of metal assemblies to prevent buckling, opening up of joints, and over-stressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and night time sky heat loss.

E. Welding:

1. Weld all shop connections and all field connections, unless noted or specified otherwise.

2. Weld corners and seams, continuously and in accordance with the requirements of the AWS Code.

3. Employ welders qualified in accordance with the requirements of the AWS Code.

F. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

G. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

H. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

I. Ease exposed edges to a radius of 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work,

J. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinate installation.

2.5 FINISHES

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Shop Primer for Ferrous Metals: Manufacturer's or fabricator's standard, fast-curing, lead-free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated, and for capability to provide a sound foundation for field applied topcoats despite prolonged exposure.

D. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint-20.

E. Exterior Exposed Ferrous Metal: Commercial blast clean all surfaces to be exposed to conform to SSPC-SP6. Shop prime surfaces with TNEMEC No. 161-1211, “TNEME-FASCURE” Primer, or approved equivalent by the Architect. Dry film thickness shall be minimum 4.0 mils. Thickness shall be verified by an Independent Inspection Firm under provisions of Section 01460.

1. Finish coats shall be specified under provisions of Section 09900.

2.6 ROUGH HARDWARE

A. Provide bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for

framing and supporting woodwork, and for anchoring and securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6.

B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports for applications indicated on the Drawings, or which are not a part of structural steel framework, as required to complete the work.

B. Fabricate units to sizes, shapes, and profiles indicated on the Drawings, and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connections. Cut, drill and tap units to receive hardware, hangers and similar items.

1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate sections.

C. Coordinate and furnish anchorage; setting drawings, diagrams, templates, instructions and directions for installation of anchorage, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.3 INSTALLATION - GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded due to shipping size limitations. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.

4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent and has the appearance of a weld free butt jointed connection at inside and outside corners, or the appearance of a continuous piece at straight butt joints.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout,

concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint or zinc chromate primer.

G. Obtain Architects written approval prior to site cutting or making adjustments not scheduled.

H. Install Strut System Components into final position true to line, level and plumb, in accordance with manufacturer's instructions.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.5 FIELD QUALITY CONTROL

A. Field testing and inspection shall be performed by qualified parties as specified herein and in accordance with the provisions of Division One.

B. Conventional testing and inspection services herein describe those items not specifically required by the California Building Code, but are considered essential to the proper performance of the building systems.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

D. Inspect and test special finish primer outlined above.

3.6 CLEANING

A. Cleaning and touch-up painting of field welds, bolted connections and abraded areas of the shop paint on miscellaneous metal is specified in Section 09900 - Painting and Coatings.

B. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

3.7 SCHEDULE

A. The Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

B. Interior Ladder: Steel, straight bar stock 3/8 inch by 3 inch continuous on both sides, height as indicated on the Drawings, 3/4 inch diameter bar rungs at 12 inches on center, let rungs into side bars and weld, provide all steel mounting brackets and attachments; prime paint finish.

C. Exterior Roof Ladder: Steel, galvanized to G90 requirements, straight bar stock 3/8 inch by 3 inch continuous on both sides and curved over the top to provide support, height and profile as indicated on the Drawings, 3/4 inch diameter bar rungs at 12 inches on center, let rungs into side bars and weld, complete with all mounting brackets and attachments; prime paint finish.

D. Bollards: Steel pipe seven (7) feet long, concrete filled, crowned cap, prime paint finish only the exposed top 3'-6".

E. Ledge and Shelf Angles, Channels and Plates Not Attached to Structural Framing: Steel for support of metal decking, joists, masonry and miscellaneous items; galvanized to G90 requirements, and prime paint finish.

F. Lintels: Steel as detailed; galvanized to G90 requirements, and prime paint finish.

G. Backing Plates: Steel plates in connection with studs and furring necessary for engaging and fastening of wall hung items shall be provided at locations indicated on the Drawings, or as necessary.

1. Backing plates shall be securely welded, heavier than 20 gauge; self-drilling screwed or bolted to 20 gauge and lighter steel stud supporting members in the required position; shop prime finished.

H. Railings and Handrails: Steel pipe as detailed; insure that runs of horizontal pipe on opposite sides of posts are in the same plane, both vertically and horizontally. Make joints flush with concealed seamless fittings. Accurately cut, miter, weld and grind smooth to flush surfaces. Make bends to preserve the contour of the pipe. Shop prime finish at interior rails, and hot-dip galvanize finish after fabrication for exterior rails.

1. Secured to Walls: Provide cast brackets of stock design providing 1-1/2 inch minimum clearance between railing and wall. Secure to wall with machine bolts and steel backer plate secured to metal studs. Attach to concrete and masonry with expansion shields and galvanized bolts.

2. Pipe Sleeves Set in Concrete: Fabricate pipe sleeves from minimum 16 gauge galvanized steel with welded, closed bottoms. Deliver pipe sleeves to Project Site for installation in concrete forms. Pipe standards set in metal sleeves wedged true and plumb and cemented in place with non-shrink grout. Finish surface

of grout smooth and flush with concrete surface.

I. Countertop Brackets: 3/8 x 2 inch bent steel support brackets as detailed, pre-drilled holes, profile as indicated on Drawings, prime paint finish.

J. All other miscellaneous metal fabrications supplied on a project of this type, and indicated on the Drawings.

END OF SECTION 05500

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Rough Carpentry; as Indicated on the Drawings, Specified Herein; Including But Not Limited To:

1. Treated Wood Blocking, Shims, Grounds, Nailers, Equipment Bases, Furring and Curbs.
2. Concealed Treated Wood Blocking for Support of Hardware, Toilet Compartments, Toilet Accessories, Base Cabinets, Grab Bars, Stair Railings, Cubicle Curtain Track, Folding Partitions, Window Treatment and Miscellaneous Equipment.
3. Concealed Sheet Metal Strap Backing for Support of Wall Cabinets.
4. Treated Plywood Backing Panels for Electrical and Telephone Equipment.
5. All Related Fasteners, Attachments and Adhesives.
6. All Related Preservative and Fire-Retardant Wood Treatments.

1.2 RELATED SECTIONS

A. Section 03100 - Concrete Formwork: Wood formwork.

B. Section 03300 - Cast-in-Place Concrete: Wood blocking anchored into concrete.

C. Section 04200 - Unit Masonry Systems: Wood blocking anchored into unit masonry.

D. Section 05310 - Steel Decking: Wood blocking fastened to metal decking.

E. Section 05500 - Metal Fabrications: Miscellaneous item requiring backing materials.

F. Section 06160 – Sheathing.

G. Section 06200 - Finish Carpentry: Miscellaneous items requiring concealed backing materials.

H. Section 06610 - Solid Polymer Fabrications: Miscellaneous items requiring backing materials.

I. Section 07540 – Thermoplastic Membrane (TPO) Roofing: Requirements for wood nailers and blocking.

J. Section 07620 - Sheet Metal Flashing and Trim: Requirements for wood nailers and blocking.

K. Section 10810 - Toilet Accessories: Miscellaneous items requiring backing materials.

L. Section 12325 - Plastic Laminate Casework: Casework items requiring backing materials, and core material for plastic laminate construction.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated materials.

1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
2. Water-Borne Treatment: Include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Fire-Retardant Treatment: Include certification by treating plant that treated materials comply with specified standard and other requirements.

1.4 QUALITY ASSURANCE

A. Rough Carpentry Lumber: Visible grade stamp, of agency certified by National Forest Products Association (NFPA).

B. Perform work in accordance with the following agencies:

1. Lumber Grading Agency: Certified by ALSC.
2. Plywood Grading Agency: Certified by APA.

C. In addition to other legal requirements, comply with the following:

1. Pressure Treated Wood: Treatment plant and preservative acceptable to governing building code.
2. Fire-Retardant Treated Wood: Testing agency UL label rating acceptable to governing building code.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect Products to site under provisions of Division One.

B. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the work. Protect items from weather while in transit.

C. Store indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

D. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

E. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.6 PROJECT CONDITIONS

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow attachment of other work.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of rough carpentry and other construction to which rough carpentry must fit, by accurate field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 LUMBER - GENERAL

A. Lumber Standards: Manufacture lumber to comply with "PS 20"; American Softwood Lumber Standard graded in accordance with established grading rules of inspection agencies certified by American Lumber Standards Committee (ALSC); maximum moisture content of 19 percent.

B. Grade Stamps: Factory mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing and mill.

C. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS-20, for moisture content specified for each use.

D. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 CONCEALED WOOD BLOCKING

A. Lumber: Standard light framing grade, Douglas Fir, #3 Southern Pine or #2 Western Hemlock, sound and thoroughly seasoned with maximum 19 percent moisture content at time roofing is installed.

1. Fire-Retardant Treated.

2.3 ROOF BLOCKING

A. Lumber: Standard light framing grade, Douglas Fir, #3 Southern Pine or #2 Western Hemlock, sound and thoroughly seasoned with maximum 19 percent moisture content at time roofing is installed.

1. Preservative Treated.
2. Fire treated where exposed to concealed spaces.

B. Plywood: APA Graded Plywood, Structural I, C-D grade, Exposure 1, exterior glued, untreated and thickness as indicated on the Drawings.

1. Fire treated where exposed to concealed spaces.

2.4 DIMENSION LUMBER

A. Light Framing: Provide “Stud” or “Standard” grade lumber for stud framing (2 - 4 inch thick, 2 - 6 inch wide, ten (10) feet and shorter) and “Standard” grade for other light framing (2 - 4 inch thick, 2 - 4 inch wide, and species, construction grade).

2.5 MISCELLANEOUS LUMBER

A. Provide wood for support or attachment of other work, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated on the Drawings, and worked into shapes shown.

B. Maximum 19 percent moisture content for lumber items not specified to receive wood preservative treatment.

C. Grade: Standard grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard Grade boards per WCLIB or WWPA rules or No. 3 boards per SIB rules.

D. All interior wood blocking and furring, including all 1x or 2x members shall be fire-retardant, treated wood with a maximum moisture content of 19 percent.

2.6 CONSTRUCTION PANELS

A. Plywood Backing Panels: Mounting electrical and telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D Plugged INT with exterior type moisture resistant glue, in thickness indicated on the Drawings, or, if not otherwise indicated, not less than 5/8 inches.

2.7 LUMBER SEASONING

A. Allow lumber to attain a state of equilibrium with the local atmosphere prior to incorporating into the Work.

B. If wood treatment specifications state the maximum percentage of moisture content at the time of treatment, comply with those requirements.

2.8 WOOD TREATMENT

A. Preservative Treatment: Where lumber or plywood is specified herein to be treated or is indicated on the Drawings as "Treated Wood" or "Treated Plywood", comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPA Quality Mark Requirements.

1. Pressure-Treated Above Ground Items: Provide with water-borne preservatives to comply with AWPA Standards C2 (Lumber) and C9 (Plywood). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent respectively. Treat indicated items and the following:

   a. Blocking, and similar members in connection with roofing, flashing, vapor barriers and waterproofing.

   b. Interior wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

   c. Wood framing members less than eighteen (18) inches above grade.

   d. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Above-Ground Items: Permanenet wood foundations: C22, any wood in contact with earth.

B. Fire Retardant Treatment:

1. The fire retardant chemical shall provide protection against termites and fungal decay and must be registered for use as a wood preservative by the U.S. Environmental Protection Agency (EPA).

2. All fire retardant wood must have a flame spread of less than 25 when tested in an extended 30 minute tunnel test in accordance with ASTM E84, NFPA 255 or UL 723.

3. All lumber must be kiln dried to a maximum moisture content of 19 percent after treatment. All plywood must be kiln dried to a maximum moisture content of 15 percent after treatment.

4. All fire retardant wood must comply with the requirements of AWPA Standard C-20 for lumber and C-27 for plywood.

5. Carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire retardant treated wood must exhibit corrosion rates less than one mil per year when tested in accordance with FS MIL-L-19140, Paragraph 4.6.5.2.

6. The fire retardant chemicals used to treat the lumber must be free of halogens, sulfates and ammonium phosphate.

7. Testing on the fire performance, strength and corrosive properties of the fire retardant treated wood shall be recognized by issuance of a National Evaluation Services Report.

8. Pressure-treat after fabrication to comply with UL “FR-S” fire hazard classification. Label each piece. Kiln dry after treatment to 15% moisture for plywood and 19% for lumber.

C. All interior dressed lumber shall be S4S, unless indicated otherwise. Interior studs, blocking, shim material and plywood shall be performance rated and give grade and species.

2.9 ACCESSORIES

A. Nails, Spikes and Staples: Galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations; size and type to suit applications. See nailing schedule in CBC, latest edition.

B. Bolts, Nuts, Washers, Lags, Pins and Screws: Medium carbon steel; sized to suit application, galvanized for exterior locations, high humidity locations, and treated wood; plain finish for other interior locations.

C. Fasteners: Electro-hot-dipped galvanized steel for exterior, high humidity, and treated wood locations; plain finish elsewhere; Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel. Provide from Ramset, Hilti or equal.

D. Clinch Anchors: Redhead, Hilti or equal.

E. Building Paper: 15 lb. asphalt felt type.

F. Concealed Metal Strap Backing: Minimum 18 gauge sheet metal by twelve (12) inches wide, continuous and fastened to metal studs for length indicated on the Drawings.

1. Behind all wall cabinets for support.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. Beginning of installation means acceptance of substrate conditions.

3.2 PREPARATION

A. Coordinate with all specification sections that might require concealed wood blocking for surface mounted materials or equipment.

B. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints, or optimum joint arrangement.

3.3 FRAMING, FURRING AND STRIPPING

A. Erect wood furring, stripping and nailing members true to lines and levels. Do not deviate from true alignment more than 1/4 inch.

B. Space members as indicated on Drawings.

C. Construct members of continuous pieces of longest possible lengths.

3.4 INSTALLATION - GENERAL

A. Workmanship: Perform all Work in accordance with the best Standards of Practice relating to the trade and carefully plan and lay out the Work as required on the Drawings. Properly accommodate the Work of other trades.

B. Treated wood shall not be installed in direct contact with light metal framing or light metal decking. Provide rosin paper or similar barrier material between treated wood and metal framing.

C. Provide treated wood curbs at all roof openings, unless noted as prefabricated curbs by equipment supplier. Form wood curbs corners by lapping side members alternately.

D. Place horizontal members laid flat, crown side up.

E. Provide fire retardant treated plywood (with exterior glue) at all electrical and telephone backing panels.

F. Securely attach carpentry work to substrates by anchoring and fastening as indicated and as required by recognized industry standards. Comply with all installation instructions as recommended by manufacturers for installation of their products.

G. Set carpentry work to required levels and lines, with members plumb and true to lines and cut and fitted.

H. Countersink nail heads on exposed carpentry work and fill holes.

I. Wood Grounds, Nailers, Blocking and Sleepers: Provide wherever indicated and where required for screeding or attachment of other work. Form to shapes as indicated and cut as required for true line and level of work to be attached. Coordinate locations with other work involved.

3.5 ROOF BLOCKING

A. Install in straight lines, level planes and at proper elevation.

B. Top surface of horizontal blocking is to match the surface elevation of the roof insulation.

C. Do not use warped wood members unless they can be adequately fastened to permanently hold them in their required alignment.

D. At vertical roof edge blocking, provide staggered joints for all layers and minimum twelve (12) inch laps.

3.6 SITE TREATMENT OF WOOD MATERIAL

A. Brush apply two (2) coats of preservative treatment for wood in contact with cementitious materials, roofing and related metal flashing.

B. Apply preservative treatment in accordance with manufacturer's instructions. Re-dry to 19 percent moisture content.

C. Treat all site-sawn ends. Allow preservative to cure prior to placing members.

3.7 FIRE RETARDANT SITE TREATMENT

A. Field Cuts:

1. Do not rip or mill fire retardant treated lumber. Only end cuts, drilling holes and joining cuts are permitted unless the material carries a ULI approved milling after treatment classification. All cuts on plywood are considered end cuts due to the nature of the product.

B. Application:

1. Fire retardant treated wood used in structural applications shall be graded or span-rated material that has been applied using the design adjustments provided in NER-303. A corrosion resistant fastener, such as hot-dipped galvanized nails or better, shall be used.

C. Fastening:

1. Nailing schedules and panel spacing shall be in accordance with the American Plywood Association's Design and Construction Guide for Residential and Commercial Uses (1993). The use of ply-clips is also required where specified by the APA. It should be noted that APA does not permit the use of staples for untreated plywood. Fire retardant treated plywood shall be nailed, and not stapled.

3.8 CONCEALED WOOD BLOCKING

A. Install concealed wood blocking within stud wall spaces at all locations indicated on the Drawings, and dimensions required by the various specification sections.

B. Install wood blocking structurally sound to carry all imposed loads.

3.9 CONCEALED METAL STRAP BACKING

A. Attach sheet metal strap backing directly to stud framing with minimum two (2) self-tapping screws per each stud behind all casework wall cabinets, and other locations indicated on the Drawings.

END OF SECTION 06100

SECTION 06160 - SHEATHING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Wood Panel Product Sheathing Made of Plywood and Other Wood-Based Construction Panels.

C. Sub-Flooring Made of Plywood and Other Wood-Based Construction Panels.

D. Underlayment Made of Plywood and Other Wood-Based Construction Panels.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Treated wood blocking, wood framing, wood studs, and shims.

B. Section 07210 - Building Insulation: Thermal insulation.

C. Section 09250 - Gypsum Board Systems: Interior metal wall framing and gypsum board finish.

D. Section 09255 - Exterior Sheathing Board: Exterior sheathing over metal stud wall framing.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Provide data on plywood.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

C. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

D. Fire-Resistive Rating: Where indicated on the Drawings, provide materials and construction which are identical to those assemblies whose fire resistance rating has been determined per ASTM E119 by a testing and inspecting organization acceptable to authorities having jurisdiction.

E. Wall and ceiling assemblies shall meet or exceed the fire resistance requirements outlined under provisions of the GA-600-94 Fire Resistance Design Manual.

F. Surface burning characteristics of finish materials must meet or exceed the flame/fuel/smoke requirements of ASTM E84.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One

B. Deliver all materials in manufacturer's unopened original packages showing manufacturers and product brand names.

C. Store products inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. Protect adhesives from freezing or overheating in accordance with manufacturers instructions.

E. Protect metal framing, metal studs and accessories from bending.

F. Handle gypsum boards to prevent damage to edges, ends and surfaces.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of sheathing and other construction to which sheathing must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Wood Structural Panels:

1. Plywood: Either DOC PS-1 or DOC PS-2, unless otherwise indicated.

2. Thickness: As needed to comply with requirements specified but not less than thickness indicated on the Drawings.

3. Comply with "Code Plus" provisions in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."

4. Factory mark panels according to indicated standard – Exterior Grade Structural I.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and suitable for the use and type of wood treated.

2. Kiln-dry material after treatment to a maximum moisture content of 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

B. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D5516, for plywood.

2. Use treatment that does not promote corrosion of metal fasteners.

3. Use Exterior type for exterior locations and where indicated.

2.4 MATERIALS

A. Miscellaneous Concealed Plywood: Exterior sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch, nominal.

B. Plywood Underlayment: DOC PS-1, Exterior A-C with fully sanded face, thickness as indicated but not less than 1/2 inch.

C. Particleboard Underlayment: ANSI A208.1, Grade PBU.

D. Hardboard Underlayment: AHA A135.4, Class 4 (Service), Surface S1S; with back side sanded.

E. Miscellaneous Exposed Plywood: DOC PS-1, A-D Interior, thickness as indicated but not less than 1/2 inch.

F. Telephone and Electrical Equipment Backing Panels: DOC PS-1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.5 ACCESSORIES

A. Building Paper: ASTM D226, 15 lb. asphalt felt.

B. Sheathing Tape: Sheathing Tape No. 8086 by 3M Contractor Products, or approved equivalent by the Architect. Acrylic adhesive with oriented polypropylene backing, Red color, total thickness 0.0027 inches (0.07 mm); tensile strength 22.5 lb./in., elongation of 125%:

1. Width: 1-7/8 inch width,.

2.6 FASTENERS

A. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of Work means acceptance of conditions.

3.2 INSTALLATION

A. Wood Structural Panels: Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.

B. Plywood Sheathing Installation:

1. Where plywood sheathing is used for diaphrams, nail plywood around the perimeter of each sheet with nail spacing as indicated on the Drawings. Provide blocking at all plywood edges not supported by studs or plates, unless noted otherwise.

2. Roof plywood: APA, 15/32 inch thick, minimum, 32/16 rated sheathing.

3. Wall plywood: APA, 7/16 inch thick, minimum, 24/0 rated sheathing. Face grain to be across supports for roof sheathing, and parallel to studs for wall sheathing.

C. Particleboard Underlayment: Comply with the National Particleboard Association's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.

D. Hardboard Underlayment: Comply with AHA's "Application Instructions for Basic Hardboard Products" and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.

E. Install either a shingled layer of building paper horizontally with six (6) inch edge and end laps; or housewrap applied per manufacturer’s instructions. Fasten building paper with corrosion-resistant staples or screws. Coordinate installation of building paper with masonry wall flashing to insure overlap of building paper on flashing material.

F. Sheathing Tape Installation:

1. Per Manufacturer’s recommendations.

END OF SECTION 06160

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Finish Carpentry Items, Other Than Shop Prefabricated Casework; as Indicated on the Drawings, Specified Herein; Including Related Hardware, Attachments and Accessories.

1. Wood Treatment, Including Fire Retardant and Preservative Treatment.

C. Finish Carpentry Items; Including, But Not Limited To:

1. Hardwood Base; to Receive Transparent Finish.
2. Plastic Laminate Open Shelving with Metal Standards and Brackets.

1.2 RELATED SECTIONS

A. Section 04200 - Unit Masonry Systems: Unit masonry substrate material.

B. Section 06100 - Rough Carpentry: Treated wood blocking, grounds and wood support framing.

C. Section 06610 - Solid Polymer Fabrications: Solid polymer fabrications for window stools or countertops.

D. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish.

E. Section 09900 – Paints and Coatings: Field painting and finishing of carpentry items.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate materials, component elevations and dimensions, component profiles, fastening methods, jointing details, accessories and finishes.

C. Product Data: Provide data on fire retardant treatment materials, wood preservative treatment materials and application instructions.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with AWI Premium Quality Standard Requirements.

B. Factory mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements it cannot be marked on a concealed surface.

C. Fire-Test-Response Characteristics: Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.

1.5 QUALIFICATIONS

A. Fabricator: Company specializing in fabricating the products specified in this Section with minimum five (5) years documented experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to California Building Code (CBC), latest edition, for fire retardant requirements for the following specific items:

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Do not deliver shop fabricated carpentry items until site conditions are adequate to receive the Work. Protect items from weather while in transit.

C. Store finished items indoors, in ventilated areas with a constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

D. Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

E. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of finish carpentry items and other construction to which carpentry items must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.9 COORDINATION

A. Coordinate the work with plumbing and electrical rough-in, installation of associated and adjacent components.

PART 2 - PRODUCTS

2.1 LUMBER MATERIALS

A. General: Nominal sizes as indicated, except as shown by detailed dimensions. Provide dressed, or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by Department of Commerce (DOC) PS-20 or to actual sizes and pattern as shown, unless otherwise indicated.

B. Moisture Content of Softwood Lumber: Provide kiln-dried lumber having a moisture content from time of manufacturer until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

C. Moisture Content of Hardwood Lumber: Provide kiln-dried lumber having a moisture content from time of manufacturer until time of installation within the ranges required in the referenced woodworking standard.

D. Lumber for Transparent Finish (Stained or Clear): Use pieces made of solid lumber stock.

E. Softwood Lumber: PS 20; Graded in accordance with AWI or WI Premium Standards; moisture content of 6 - 8 percent.

F. Hardwood Lumber: Graded in accordance with AWI or WI Premium Standards; Grade I for transparent finishes, Grade II for opaque finishes; moisture content of 6 - 8 percent; sizes and profiles as indicated on the Drawings, unless indicated otherwise below; and quality suitable for transparent finish under provisions of Section 09900, for the following items:

1. Hardwood Base: Solid hardwood lumber, four (4) and six (6) inches high, profiles as detailed on the Drawings, plain sliced Maple graded in accordance with AWI or WI Premium Standards, and field transparent finish under provisions of Section 09900.

2. Hardwood Edge at Hardwood Plywood Shelves and Paneling: Solid hardwood lumber, plain sliced Maple graded in accordance with AWI or WI Premium Standards, profile and sizes as indicated on the Drawings, and field transparent finish under provisions of Section 09900.

2.2 SHEET MATERIALS

A. Softwood Plywood: PS 1, Graded in accordance with AWI or WI Premium Standards; particleboard core.

B. Hardwood Plywood: HPVA, HP-1 Grade in accordance with AWI or WI Standards; particleboard core; type of adhesive recommended for application.

C. Hardboard: ANSI A135.4; Pressed wood fiber with resin binders, tempered grade, 1/4 inch thick, smooth one side.

D. Interior Grade, Medium Density Fiberboard: Wood based panel product, manufactured from softwood fibers, minimum 90 percent of which obtained from wood residuals, bonded under heat and pressure with formaldehyde free synthetic resin binders, meeting requirements of ANSI A208.2 Product Class MD, and having the following properties for sheet material thickness up to, and including, 3/4 inch (19 mm):

1. Acceptable Product: Medite Corporation; “MEDITE II”.

2. Density: Minimum 46 PCF.

3. Internal Bond Strength: Minimum 115 PSI.

4. Modulus of Rupture: Minimum 5,200 PSI.

5. Modulus of Elasticity: Minimum 520,000 PSI.

6. Hardness: Minimum 1,150 lb. (5115 N), Janka modified.

7. Screw-Holding Capacity: Force required to pull one (1) inch long No. 10 sheet metal screw from material:

   a. Face: Minimum 325 lbf (1445 N).

   b. Edge: Minimum 275 lbf (1223 N).

8. Moisture Content: Maximum six (6) percent.

9. Panel Thickness Tolerance: 0.005 inch, plus or minus.

E. Fire Retardant, Medium Density Fiberboard: Wood based panel product, manufactured from softwood fibers, minimum 90 percent of which obtained from wood residuals, saturated with fire retardant additives, then bonded under heat and pressure with formaldehyde free synthetic resin binders, meeting requirements of ANSI A208.2 Product Class MD, and having the following properties for sheet material thickness up to, and including, 3/4 inch:

1. Acceptable Product: Medite Corporation; "MEDITE-FR".
2. Density: Minimum 45 PCF.
3. Internal Bond Strength: Minimum 100 PSI.
4. Modulus of Rupture: Minimum 3,500 PSI.
5. Modulus of Elasticity: Minimum 375,000 PSI.
6. Hardness: Minimum 1,000 lb. (4400 N), Janka modified.
7. Screw-Holding Capacity: Force required to pull one (1) inch long No. 10 sheet metal screw from material:
   a. Face: Minimum 300 lbf (1334 N).
   b. Edge: Minimum 225 lbf (1000 N).
8. Moisture Content: Maximum six (6) percent.
9. Panel Thickness Tolerance: 0.005 inch, plus or minus.
10. Fire Resistance: Class 1 surface flame spread when tested in accordance with UL 723.

2.3 PLASTIC LAMINATE MATERIALS

A. Acceptable Manufacturers of Plastic Laminate:

1. Formica
2. Laminart
3. Nevamar
4. Pionite
5. Wilson Art
6. No Substitutions Allowed.

B. Plastic Laminate: NEMA LD-3; High pressure plastic laminate, 0.050 inch thickness, color, pattern and gloss as selected by the Architect from manufacturer's full color range.

C. Laminate Backing Sheet: NEMA LD-3, BK20 unfinished backing sheet, 0.020 inch thick.

1. Plastic Laminate Shelving with Metal Standards and Supports: Medium Density Fiberboard, 12 inches wide by 3/4 inch thick, by length indicated on the Drawings. All surfaces covered with plastic laminate finish. Provide heavy duty adjustable metal wall standards, flush design. Brackets designed for width of shelving, and include slots for ability to mechanically attach shelf to clips. Bracket load rating: 300 lb. minimum for each support without failure.

2.4 ADHESIVE

A. Adhesive: Non-solvent; type recommended by laminate manufacturer to suit application.

2.5 FASTENERS

A. Fasteners: Of size and type to suit application; Galvanized finish in concealed locations and Plain finish in exposed locations.

B. Concealed Joint Fasteners: Threaded steel.

2.6 ACCESSORIES

A. Lumber for Shimming, and Blocking: Softwood lumber.

B. Primer: Alkyd primer sealer type.

C. Wood Filler: Non-solvent base, tinted to match surface finish color.

2.7 WOOD TREATMENT PROCESSES

A. Fire Retardant (FR-S Type): Chemically treated and pressure impregnated; providing a maximum flame spread/smoke development rating of less than 25 in accordance with ASTM E84.

B. Wood Preservative by Pressure Treatment (PT Type): AWPA Treatment C2 (Lumber) or C9 (Plywood) using water borne preservative with 0.25 percent retainage.

C. Wood Repellent Preservative Treatment by Dipping Method: NWWDA I.S.4, with 0.25 percent retainage.

D. Wood Preservative (Surface Application): Clear type, manufacturer's standard to suit application.

2.8 SHOP TREATMENT OF WOOD MATERIALS

A. Shop pressure treatment to wood materials requiring preservatives to concealed wood blocking.

B. Provide UL approved identification on fire retardant treated material.

C. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.

2.9 FABRICATION

A. Fabricate to AWI Premium Quality Standards.

B. Shop assemble work for delivery to site, permitting passage through building openings.

C. Fit exposed sheet material edges with matching veneer edging. Use one piece for full length only.

D. Cap exposed plastic laminate finish edges with material of same finish and pattern.

E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

F. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.

G. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

2.10 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

D. Finish work to meet AWI Premium Quality standards.

2.11 FIELD FINISHING

A. Painting or transparent finishes shall be as specified in Section 09900.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

D. Beginning of installation means acceptance of substrate conditions.

3.2 PREPARATION

A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.

3.3 INSTALLATION

A. Install work in accordance with AWI Premium Quality Standards, in particular, comply with AWI section 1700 or WI Quality Standards for woodwork installation.

B. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned, or too small to fabricate work with minimum of joints or optimum joining arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

C. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8’-0” for plumb and level countertops; and with 1/16 inch maximum off-set in flush adjoining 1/8 inch maximum off-sets in revealed adjoining surfaces.

D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

E. Install components and trim with fasteners of type and size to suit application.

F. Avoid exposed nailing as far as possible; when necessary to nail, use blind nailing methods and set all nail heads.

G. Install running woodwork in single lengths whenever material is obtainable in required lengths; otherwise install in as long lengths as obtainable with joints between adjacent members staggered. Make joints only where solid fastening can be provided.

H. Cope molded Work at returns and interior angles. Miter at corners.

I. Kerf backs at wide flat members.

J. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

K. Except where pre-finished matching fasteners heads are required, use fine finishing nail for exposed nailing, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.4 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment in accordance with manufacturer's instructions.

B. Brush apply one (1) coat of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashing. Treat site-sawn cuts.

C. Allow preservative to dry prior to erecting members.

3.5 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.6 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

3.7 CLEANING

A. Clean and remove all temporary coverings and stickers from finish materials.

B. Clean and polish all glass materials and surfaces.

END OF SECTION

SECTION 06610 - SOLID POLYMER FABRICATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Solid Polymer Fabrications; AS Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments:

1. Interior Window Stools.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Bent steel brackets to support vanity tops.

B. Section 06100 - Rough Carpentry: Wood blocking and grounds.

C. Section 06200 – Finish Carpentry: Woodwork cabinets to receive solid polymer tops.

D. Section 07910 - Joint Sealers: Sealant and joint backing.

E. Section 09250 - Gypsum Board Systems: Interior metal stud wall framing and gypsum board finish.

F. Section 12325 - Plastic Laminate Faced Casework: Casework to receive solid polymer tops.

G. Division 15 - Mechanical: Plumbing sink connections.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate locations, dimensions, elevations, component sizes, fabrication details, attachment provisions, and coordination requirements with adjacent work.

C. Product Data: Submit manufacturer’s product description, fabrication information, and compliance with specified performance requirements.

D. Samples: Submit minimum size 6 x 6 inch samples illustrating surface color and finish. Approved samples will be retained as standard for work.

E. Installation Instructions: Submit manufacturer's installation instructions.

F. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and clean instructions under provisions of Division One.

G. Installer Certification: Product manufacturer must certify in writing that the installer is approved to apply the Work of this Section.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacturing of products specified in this section with minimum five (5) years documented experience.

B. Installer: Company certified by the manufacturer to install products specified in this section with minimum five (5) years documented experience, and certified in writing that installer is approved by the manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver no components to site until areas are ready for installation.

C. Handle materials with care to prevent damage to finish surfaces.

D. Provide protective coverings to prevent damage or staining to surfaces.

E. Store all components indoors in dry heated spaces.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of solid polymer fabrications and other construction to which solid polymer fabrications must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.7 COORDINATION

A. Coordinate the Work of this Section with all related work.

1.8 WARRANTY

A. Provide ten (10) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. DUPONT Company - CORIAN.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. Avonite, Inc.
2. Gibraltar, Inc.
3. Formica Corporation.
4. Nevamar - Fountainhead.
5. L G Hi-Macs.

C. Substitutions: No Substitutions Allowed.

2.2 MATERIALS

A. Homogeneous filled acrylic; not coated, laminated or of composite construction; conforming to ANSI Z124.3 & 6, Type Six, and FS WW-P-541E/GEN.

1. Material shall have minimum physical and performance properties specified below.
2. Superficial damage to a depth of 0.010 inches shall be repairable by sanding or polishing.

B. Interior Window Stools: 1/2 inch thick material, adhesive joined with inconspicuous seams; edge details as indicated on the Drawings, color as selected by the Architect.

2.3 PERFORMANCE CHARACTERISTICS

Properties	Requirements
Tensile Strength	6,000 psi (ASTM D638)
Flexural Strength	7,890 psi (ASTM D790)
Elongation	0.4% (ASTM D638)
Strain at Break	0.81% (ASTM D638)
Work to Break	2.48 in lb (ASTM D638)
Hardness	56 Barcol Impressor
Thermal	
Conductivity	7.0 Btu/hr/sq ft F
Color Stability	No Change - 200 hrs

2.4 ACCESSORIES

A. Joint Adhesive: Two-part, non-porous joints, with a chemical bond type as recommended by manufacturer.

B. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color matching or clear formulations.

2.5 FABRICATION

A. Factory fabricate components to sizes and shapes indicated on Drawings, and in accordance with manufacturer's instructions.

B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints and voids.

C. Cut and finish component edges with clean, sharp returns. Route radii and contours to templates. Reject defective and inaccurate work.

D. Thermoforming:

1. Construct matching molds of plywood sections to form component shapes.
2. Form pieces to shape prior to seaming or joining.
3. Cut pieces larger than finished dimensions. Sand edges. Remove nicks and scratches.
4. Heat entire component uniformly between 275 - 325 degrees F during forming.
5. Prevent blistering, whitening and cracking of materials during forming.

2.6 FINISH

A. Finish: All surfaces shall have uniform finish.

1. Matte: Standard finish with gloss rating of 5 - 20.
2. Semi-Gloss: Gloss rating of 25 - 50.
3. Polished: Gloss rating of 55 - 80.

B. Color: Selected by the Architect from manufacturer's full color range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install components plumb and level, in accordance with manufacturer’s instructions.

B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components clean when making joints.

C. Keep components and hands clean during installation. Remove adhesives, sealant and other stains.

D. Install window stools level, plumb and true in accordance with manufacturer's recommendations. Provide sealant at all perimeter joints.

3.3 CLEANING

A. Remove adhesives, sealant and other stains.

B. Replace stained components.

3.4 PROTECTION

A. Protect all surfaces from damage until Date of Substantial Completion.

B. Replace damaged work that cannot be repaired to Architect's satisfaction.

END OF SECTION 06610

SECTION 07110 - DAMPROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Cold Applied Asphalt Dampproofing; at Exterior Face of Concrete Foundation Walls, Over Top of Concrete Footing Surface; as Indicated on the Drawings, Specified Herein; Including All Related Accessories.

1. Provide Protective Board as specified.

1.2 PRODUCT INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 07210 - Building Insulation: Perimeter rigid insulation over foundation walls.

1.3 RELATED SECTIONS

A. Division One - Testing and Inspection Services.

B. Section 02200 - Earthwork: Excavation, backfill and compaction of foundation earthwork.

C. Section 03300 - Cast-In-Place Concrete: Concrete footing surfaces.

D. Section 04200 - Unit Masonry Systems: Unit masonry foundation wall surfaces.

E. Section 07210 - Building Insulation: Perimeter rigid insulation over foundation walls.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer’s data on properties of primer, bitumen and mastics.

C. Shop Drawings: Indicate plan showing complete location of all dampproof, and termination details.

D. Samples: Submit minimum six (6) x six (6) inch samples of the protection board.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Waterproofing Manual, Latest Edition.

B. Applicator: Company specializing in performing the Work of this Section with minimum five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle Products under provisions of Division One.

B. Store materials in a dry location.

C. Provide new materials in unopened containers with labels intact.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until membrane has cured.

1.8 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including coverage for dampproof failing to resist penetration of moisture, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – BELOW-GRADE WATERPROOFING MEMBRANE

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. W. R. Meadows – “Mel-Rol”.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. .56 mil polymeric waterproofing membrane on a heavy duty 4 mil cross-laminated polyethylene carrier film.

2.3 ACCEPTABLE MANUFACTURERS – PLANTER DAMPPROOFING

A. Subject to compliance with requirements, provide products from one following manufacturer:

1. W. R. Meadows – "Mel-Rol".

B. Substitutions: Under provisions of Division One.

2.4 MATERIALS

A. BASF – "Thoroseal Foundation Coating with Acryl Additive".

2.5 ACCESSORIES

A. Flexible Flashing: Type as recommended by manufacturer to suit application.

B. Protection Board: As specified in 07210.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproof system.

C. Verify items which penetrate surfaces to receive dampproof are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproof.

B. Clean and prepare surfaces to receive dampproof in accordance with manufacturer's instructions.

C. Do not apply dampproof to surfaces unacceptable to manufacturer or applicator.

D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 DAMPPROOFING APPLICATION

A. Prime surfaces in accordance with NRCA - Waterproofing Manual, Latest Edition.

B. Apply cold bitumen by **trowel**.

C. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F; finish blowing temperature not to be exceeded for four (4) hours.

D. Apply bitumen in two (2) coats, continuous and uniform, to a total minimum thickness of 1/8 inch.

E. Apply from two (2) inches below finish grade elevation down foundation wall and over top of footings.

F. Seal items projecting through dampproof surface with mastic. Seal watertight.

G. Install dampproof at the perimeter exterior face of foundation and cast-in-place concrete walls, and all other locations indicated on the Drawings.

H. Where applicable, install the perimeter insulation board (07210) over the dampproof areas.

I. Immediately after the waterproof application, and perimeter insulation, if required, install the protection board over the entire surface with butted joints over nominally cured membrane. Apply with mastic over dampproofing or insulation surfaces. Scribe and cut boards around projections and interruptions.

1. Neatly fit boards tight around pipe and other projections.

J. Do not begin backfilling operations until Architect has observed completed Work. Any waterproofing work covered by backfilling operations prior to Architect's observation shall be uncovered at Contractor's expense.

3.4 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

3.5 PROTECTION

A. Protect Work from damage until substantial completion.

END OF SECTION 07110

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Building Insulation; as Indicated on the Drawings, Specified Herein, Including Related Accessories and Attachments.

C. Insulation Types:

1. Rigid Board Insulation at Outside Face of Perimeter Foundation Walls
   a. Perimeter Board Insulation.
2. Insulation for Filling Perimeter Window and Door Shim Spaces.
3. Thermal Insulation at Exterior Structural Wall Stud Framing.
4. Sound Attenuation Insulation for Sound Control Within Interior Wall Partitions.
5. Safing Insulation.
6. Acoustical Insulation for Above Ceiling Spaces Where Partitions Do Not Extend to the Structure Above.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Concrete walls to receive rigid insulation.

B. Section 04200 - Unit Masonry Systems: Concrete masonry unit foundation walls to receive rigid insulation, and cells to receive granular fill insulation.

C. Section 05400 - Cold Formed Metal Framing: Exterior metal wall framing.

D. Section 07110 – Dampproofing: Rigid insulation over dampproofing.

E. Section 07910 – Joint Sealers.

F. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish. Installation of vapor barrier

G. Section 09255 - Exterior Sheathing Board: Exterior sheathing board.

H. Section 09510 - Suspended Acoustical Ceilings: Suspended ceilings to receive insulation for sound attenuation.

I. Division 15 - Mechanical: Kitchen grease duct of minimum 16 gauge hot dipped galvanized all welded steel duct.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's product literature and installation instructions for each type of insulation and vapor barrier material required.

C. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including r-values (aged values for plastic insulation), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

1.4 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly one (1) inch thick, measured by test method include in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F, between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E84.
2. Fire Resistance Ratings: ASTM E119.
3. Combustion Characteristics: ASTM E136.

C. Maximum Allowable Asbestos Content of Inorganic Insulation: Provide insulation composed of mineral fibers or mineral ores which contain less than 0.25% by weight of any type or mixture of types occurring naturally as impurities as determined by polarized

light microscopy test per Appendix A of 40 CFR 763.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver materials to the site in manufacturer's original packages, unopened, and correctly labeled.

C. General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

D. Protection for Plastic Insulation:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of work.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 COORDINATION

A. Coordinate the Work with all related sections for placement of insulation materials.

1.8 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - BUILDING INSULATION

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Certainteed Insulation Systems.
2. Dow Chemical Company.
3. DiversiFoam Products.
4. Fibrex, Inc.
5. Johns Manville Company

B. Substitutions: Under provisions of Division One.

2.2 INSULATION - RIGID BOARD

A. Perimeter Board Insulation: ASTM C578; Type IV, extruded polystyrene closed-cell insulation board, square edge, compressive strength minimum 25 psi, board size of 48 inches wide by two (2) inches thick, thermal resistance "R-5.0" per inch, and flame spread/smoke developed of 75/450 when tested in accordance with ASTM E84.

1. Provide a polystyrene compatible adhesive for below grade application.
2. Protect subgrade applications with installation of asphaltic protection board under Section 07110.
3. Secure thermal rigid insulation to back side of spandrel glass panels with adhesive as recommended by the glass manufacturer.

2.3 INSULATION - NON-FACED THERMAL

A. Thermal Insulation: ASTM C665, Type I and ASTM E136; non-faced glass fiber thermal insulation, friction fit, insulation thickness as indicated on the Drawings by width to fill stud space; and flame spread/smoke developed of 25/50 when tested in accordance with ASTM E84.

2.4 INSULATION - SOUND ATTENUATION

A. Sound Attenuation Insulation: ASTM C665, Type I and ASTM E136; non-faced glass fiber acoustical insulation, panel width to fit stud space by three (3) inch thickness, and flame spread/smoke developed of 25/50 when tested in accordance with ASTM E84.

2.5 INSULATION - SAFING

A. Safing Insulation: USG Thermafiber Mineral Fiber Safing insulation; non-combustible, non-asbestos, regular color, non-faced.

1. Provide galvanized steel safing clips, UL labeled.

2.6 INSULATION - ACOUSTICAL ABOVE CEILING

A. Acoustical Insulation: ASTM C665, Type 1; 3-1/2 inches thick, 48 inches wide by lengths required, minimum R-Value of 11.0, non-faced and fire hazard classification of 25/50 or less when tested in accordance with ASTM E84.

2.7 ACCESSORIES

A. Protection Board: Premolded, semirigid asphalt/fiber composition board, 1/4 inch thick, formed under heat and pressure, of standard sizes.

B. Adhesives: Type recommended by insulation manufacturer for specific application.

C. Insulation Fasteners: Impale clip of galvanized steel, to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation.

C. Verify substrate surface is flat, free offings and irregularities.

3.2 PREPARATION

A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

B. Clean substrates of substances harmful to insulation or vapor barriers, including removal of projections which might puncture vapor barriers.

3.3 INSTALLATION - GENERAL

A. Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation full thickness as shown over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

D. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

E. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to insulation manufacturer's written instructions.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (non-breathing insulation units by applying mastic or sealant on edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with mastic or sealant.

3.5 INSTALLATION OF VAPOR RETARDER

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.

B. Seal vertical joints in vapor retarder over forming by lapping not less than two (2) wall studs. Fasten vapor retarder to framing at top, end and bottom edges, at perimeter of wall openings and at lap joints; space fasteners sixteen (16) inches on center.

C. Seal overlapping joints in vapor retarder with adhesives per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer. Locate all joints over framing members or other solid substrates. Firmly attach vapor retarder to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.

D. Seal joints caused by pipes, conduits, electrical boxes and similar items perpetrating vapor retarder with cloth or aluminized tape of type recommended by vapor retarder manufacturer to create an air-tight seal between penetrating objects and vapor retarder.

E. Repair any tears or punctures in vapor retarder immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

3.6 PROTECTION

A. Protect installed insulation and vapor retarder from harmful weather exposures from possible physical abuses, where possible by non-delayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION 07210

SECTION 07450 - FIBER-REINFORCED CEMENTITIOUS PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Exterior Fiber-Reinforced Cementitious Panels, Trim and Soffits; Including All Related Flashings, Support Attachments and Accessories. All Cement Board products to be factory primed. Final coats of paint and touch-up in field.

C. Support Attachments to Structure.

D. Installation of Joint and Perimeter Sealant and Joint Backing.

1.2 RELATED SECTIONS

A. Section 05120 - Structural Steel: Structural steel building frame.

B. Section 05400 - Cold Formed Metal Framing: Stud wall framing system.

C. Section 07210 - Building Insulation: Insulation system for wall construction.

D. Section 07620 - Sheet Metal Flashing and Trim: Pre-finished metal flashings.

E. Section 07910 - Joint Sealers: Sealants and joint backing.

F. Section 09250 - Gypsum Board Systems: Gypsum sheathing substrate material and moisture barrier.

1.3 DESIGN REQUIREMENTS

A. Conform to California Building Code, current edition, and all federal and local codes.

B. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as measured in accordance with ANSI/ASTM E330.

C. Follow all manufacturer's requirements for installation including National Evaluation Report No. NER-405 for application information.

D. System to accommodate, without damage to system, components, or deterioration of seals, movement within system; movement between system and perimeter components, when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.

E. System to accommodate tolerances of building structural framing.

1.4 QUALITY ASSURANCE

A. Nichiha boards are fiber cement board products meeting the following performance standards:

1. Wet Flexural Strength: 1155.51.
2. Moisture Movement: Linear change of 0.098% or less.
3. Mean Coefficient of Linear Thermal Expansion: Average 3.18 x 10^-6 in./in.F.
4. Surface Burning/Smoke Developed: 0/0.
5. Wind Load: Positive-Average 148.03 psf; Negative, 120.29.
6. No Asbestos.
7. Water Tightness: No drops observed.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate dimensions and panel layout, spans, joints, construction details, methods of anchorage, method and sequence of installation.

C. Product Data: Provide manufacturer's data on assembled panel structural capabilities, sealants, and all accessory components.

D. Samples: Submit samples of panel finish illustrating color, sheen and texture.

E. Design Data: Indicate panel profile characteristics, dimensions and structural properties.

F. Manufacturer's Installation Instructions: Indicate special handling criteria, installation sequence and cleaning procedures.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.

B. Installer: Company specializing in performing the Work of this Section with minimum five (5) years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products under provisions of Division One.

B. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.

C. Stack pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials which may cause discoloration or staining.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of natural limestone composite panels and other construction to which natural limestone composite panels must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.9 COORDINATION

A. Coordinate the Work with placement of anchors and brackets.

1.10 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including coverage for degradation of panel finish, color fading caused by exposure to weather, water tightness and integrity of seals, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIBER REINFORCED CEMENTITIOUS PANELS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Nichiha Fiber Cement – Wall Panels and Soffit Panels “Nichisoffit.”
2. James Hardie – “Soffit Panels “Hardiesoffit.”.

B. Substitutions: No Substitutions Allowed.

2.2 CEMENTITIOUS PANEL

A. Non-asbestos fiber-cement siding to comply with ASTM C1185, Grade II, Type A; non-combustible when tested according to ASTM E136; flame spread index of 25 or less when tested according to ASTM E84; as indicated on Drawings:

1. Panel Type: Premium Smooth Fiber Cement Board Block Panels.
2. Profile Finish: Factory primed.
3. Seals: Factory sealed on all sides.
4. Sizes: Per Drawings
5. Exposed Coverage and Overlap: Per Drawings.

B. Soffit Panels: Non-asbestos fiber-cement soffit panels to comply with ASTM C1185, Grade II, Type A; non-combustible when tested according to ASTM E136; flame spread index of 25 or less when tested according to ASTM E84; as indicated in Drawings:

1. Panel Type: Non-Vented Smooth Fiber Cement Soffit Panels.
2. Finish: Factory primed.
3. Seals: Factory sealed on all sides.
4. Weight: 1.8 lbs/square foot.
5. Sizes: Per Drawings.

2.3 FINISH

A. All cement board products to be factory sealed and primed with manufacturer’s premium priming system.

B. Field touch-up primer on products cut in the field using manufacturer’s recommended primer. All exposed surfaces to receive finish paint to be primed.

C. Field finish under provisions or Section 09900.

2.4 FASTENERS

A. Use manufacturer’s recommended galvanized fasteners for application and code requirements. Refer to National Evaluation Report NER-405 for application requirements. All fasteners to be corrosion resistant.

B. Fasteners must penetrate metal studs a minimum of 1/2".

2.5 ACCESSORIES

A. Sealant: Use manufacturer's recommended sealant for application.

B. Building Paper: 15# asphalt saturated building felts conforming to ASTM D226 with vapor perm rate of 5 perms.

C. Starter Track.

D. Pre-Manufactured Corner Piece with 3" Returns.

E. Manufacturer clips for wall attachment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be pre-formed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Install siding over sheathing and building paper.

C. Verify that building framing members are ready to receive panel system.

D. Beginning of panel system installation means acceptance of substrate conditions.

3.2 INSTALLATION

A. Install panels, planks, soffit, trim and components in accordance with manufacturer's instructions.

B. Permanently fasten panel system with clips to structural supports; aligned, level, and plumb, within specified tolerances.

C. Provide for expansion and contraction of the system.

3.3 INSTALLATION-PANEL

A. Fasten through panel into building structure (studs). All edges to be supported by framing. Ensure appropriate blocking is in place.

B. Use fasteners and spacing as recommended by manufacturer for application.

C. Fasteners should be set back a minimum of 3/8 inches from edges of panels, 2 inches from corner of panels.

D. Fasteners shall be flush, do not overdrive. Protect overdriven fasteners from weather and compliment with a second fastener, properly installed.

E. Use a rain screen clip system as described by manufacturer's installation instructions.

F. Plan for panel layout to minimize construction waste.

G. Refer to Drawings for panel pattern.

H. Install starter track at each stud cove; verify first course of panels is level.

I. Use panel clips on top edge of panels; work to proceed from bottom of wall to top moving left to right along the row.

3.4 INSTALLATION-SOFFIT

A. Fasten through panel into building structure. All edges to be supported by framing. Ensure proper blocking is in place.

B. Use fasteners and spacing as recommended by manufacturer for application.

C. Fasteners should be set back a minimum of 3/8 inches from edges of panels, 2 inches from corner of panels.

D. Fasteners shall be flush, do not overdrive. Protect overdriven fasteners from weather and compliment with a second fastener, properly installed.

E. Joint Treatment: Butt panels centered on solid blocking.

3.5 TOLERANCES

A. Meet all tolerances required by the panel system manufacturer.

3.6 CLEANING

A. Remove site cuttings from finish surfaces.

END OF SECTION 07450

SECTION 07540 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Thermoplastic Membrane Roofing:

1. Thermoplastic Polyolefin Membrane (TPO) Mechanically Fastened Roofing Over New Sloped Plywood Roof Decks.

C. Preparation of Plywood Roof Deck Surfaces.

D. Vapor Retarder.

E. Roof Insulation.

F. Roof Walkway Membrane Pads.

1.2 RELATED SECTIONS

A. Division One - Testing Laboratory Services.

B. Section 06100 - Rough Carpentry: Wood nailers, curbs, and blocking and for wood-based, structural-use roof deck panels.

C. Section 06160 - Sheathing: Plywood Roof Deck Surface.

D. Section 07210 - Building Insulation: Insulation beneath the roof deck.

E. Section 07620 - Sheet Metal Flashing and Trim: Metal roof penetration flashings, flashings, copings and counter flashing.

F. Section 07910 - Joint Sealants.

G. Division 15 - Mechanical: Flashing collars, roof drains and prefabricated curb for mechanical equipment.

H. Division 15 - Plumbing Specialties for roof drains.

I. Division 16 - Electrical: Flashing collars.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7.

D. Provide a system that meets California State Building Code, Chapter15, and Table 15-A. Roof to be Class B minimum.

1.4 SUBMITTALS

A. Provide under provisions of Division One.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, base flashings and membrane terminations, insulation fastening patterns, tapered insulation, including slopes, and attachments to other Work.

D. Samples for Verification: For the following products:

1. 12-by-12-inch square of sheet roofing, of color specified, including T-shaped side and end lap seam.

2. Six insulation fasteners of each type, length, and finish.

3. Six roof cover fasteners of each type, length, and finish.

E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified above.

1. Submit evidence of meeting performance requirements.

G. Qualification Data: For Installer and manufacturer.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.

I. Maintenance Data: For roofing system to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for membrane roofing system identical to that used for this Project.

C. Source Limitations: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.

D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

1. Fire-Resistance Ratings: ASTM E119, for fire-resistance-rated roof assemblies of which roofing system is a part.

1.6 PRE-INSTALLATION CONFERENCE

A. Schedule and convene one (1) week prior to commencing Work of this Section.

B. Review preparation and installation procedures, and coordinating and scheduling required with related work.

C. Pre-installation Conference: Conduct conference at Project site. Comply with requirements in Division One. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.

3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.

5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

7. Review governing regulations and requirements for insurance and certificates if applicable.

8. Review temporary protection requirements for roofing system during and after installation.

9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture.

D. Do not store adhesive containers with open lids due to the loss of solvent which will occur from flash off.

E. Store all roll goods, cartons and drums of cements, primers and coatings on end.

F. Protection: Use all necessary means to protect the materials in this Section before, during and after installation, and to protect the Work and materials of all other trades.

G. Replacements: In the event of damage, immediately make all repairs and replacements as necessary for the approval of the Architect, at no additional cost to the Owner.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply roofing membrane during unsuitable weather when ambient temperature is below 40 degree F or above 90 degrees F.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

1.9 COORDINATION

A. Coordinate the Work with installation of associated counter-flashing installed by other sections as the Work of this Section proceeds.

1.10 WARRANTY

A. Provide ten (10) year written Total System Warranty from the Roofing Manufacturer under provisions of Division One.

1. Provide Wind Uplift Speed Coverage up to 55 mph

B. Warranty: All materials and workmanship provided are guaranteed against defects, including damage to Work resulting from failure to resist the penetration of moisture when exposed to non-catastrophic conditions, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - THERMOPLASTIC POLYOLEFIN ROOF MEMBRANE

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. GAF-ELK Materials Corporation- "TPO Roofing."
2. Carlisle SynTec Incorporated.
3. Firestone Building Products Company.
4. Johns Manville, Inc.
5. Sarnafil Inc.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS – FABRIC REINFORCED SHEET

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:

1. Thickness: 60 mils, nominal.
2. Exposed Face Color: White.
3. Physical Properties:
   a. Breaking Strength: 225 lbf; ASTM D751, grab method.
   b. Elongation at Break: 15 percent; ASTM D751.
   c. Tearing Strength: 55 lbf minimum; ASTM D751, Procedure B.
   d. Brittleness Point: Minus 22 deg F.
   e. Ozone Resistance: No cracks after sample, wrapped around a 3-inch- diameter mandrel, is exposed for 166 hours to a temperature of 104 deg F and an ozone level of 100 pphm; ASTM D1149.
   f. Resistance to Heat Aging: 90 percent minimum retention of breaking strength, elongation at break, and tearing strength after 166 hours at 240 deg F; ASTM D573.
   g. Water Absorption: Less than 4 percent mass change after 166 hours' immersion at 158 deg F; ASTM D471.
   h. Linear Dimension Change: Plus or minus 2 percent; ASTM D1204.

2.3 ACCESSORIES

A. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.

B. Bonding Adhesive: Manufacturer's standard water-based bonding adhesive for membrane, and solvent-based bonding adhesive for base flashings.

C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

D. Metal Termination Bars: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

E. Metal Battens: Manufacturer's standard aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, termination reglets, cover strips, and other accessories.

2.4 VAPOR RETARDER

A. Polyethylene Vapor Retarder: ASTM D4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.

1. Adhesive: Manufacturer's standard lap adhesive, FMG approved for vapor-retarder application.

2.5 ACCEPTABLE MANUFACTURERS - ROOF INSULATION - POLYISOCYANURATE

A. Subject to compliance with requirements, provide products from one of the following manufacturer's:

1. Carlisle SynTec Incorporated.
2. Firestone Building Products Company.
3. GAF Materials Corporation.
4. Johns Manville International, Inc.

B. Substitutions: Under provisions of Division One.

2.6 MATERIALS

A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, felt or glass-fiber mat facer on both major surfaces.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

B. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.

C. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick.

1. Product: Subject to compliance with requirements, provide "Dens-Deck" by Georgia-Pacific Corporation.

D. Securement System: Provide manufacturer's warrantied securement system.

2.8 ASPHALT MATERIALS

A. Roofing Asphalt: ASTM D312, Type III or IV.

B. Asphalt Primer: ASTM D41.

2.9 WALKWAYS

A. Rubber Roof Pavers: Interlocking, lightweight rubber units, 24 by 24 by 2-1/4 inches, 6 lb/sq. ft.; with grooved back for 4-way drainage, beveled and doweled; by Carlisle SynTec Incorporated; Interlocking Rubber Paver and as follows:

1. Color: Gray.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

1. Verify roof deck is supported and secure.
2. Verify roof deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped to drains, valleys, or leaves, and suitable for installation of roof system.
3. Verify roof deck surfaces are dry and free of snow or ice.
4. Verify roof openings, curbs, and penetrations through roof are solidly set, and reglets are in place.
5. Beginning of Work means acceptance of conditions.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSTALLATION - VAPOR-RETARDER

A. Loosely lay polyethylene-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches, respectively.

1. Seal side and end laps with adhesive.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.4 INSTALLATION - ROOF INSULATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.

1. Fasten to resist uplift pressure at corners, perimeter, and field of roof.

3.5 INSTALLATION - MECHANICALLY FASTENED ROOFING MEMBRANE

A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.

B. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Mechanically fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

D. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

E. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.

2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.

3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

F. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

G. Through-Membrane Attachment: Secure roofing membrane using fastening plates or metal battens and mechanically fasten roofing membrane to roof deck. Cover battens and fasteners with a continuous cover strip.

3.6 INSTALLATION - BASE FLASHING

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with sheet flashing.

D. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through securement system.

3.7 INSTALLATION - WALKWAY

A. Rubber Roof-Paver Walkways: Install rubber roof-paver walkways according to manufacturer's written instructions, loosely laid, in locations indicated.

3.8 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect or Owner 48 hours in advance of date and time of inspection.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07540

SECTION 07610 - CUSTOM SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Underlayment Flashing Membrane; Installed Over Plywood Roof Deck Surface.

C. Prefinished, Prefabricated Galvanized Steel Standing Seam Roof System With Continuous Integral Seams; Associated Integral Flashings, Fasteners, Clips, and Accessories.

1.2 RELATED SECTIONS

A. Division One - Testing Laboratory Services.

B. Section 05120 - Structural Steel: Roof framing construction.

C. Section 05300 - Steel Decking: Steel roof deck surfaces.

D. Section 05500 - Metal Fabrications: Non-structural steel fabrications.

E. Section 06100 - Rough Carpentry: Wood blocking and shims.

F. Section 06160 - Sheathing: Plywood roof decking.

G. Section 07210 - Building Insulation: Rigid roof insulation.

H. Section 07620 - Sheet Metal Flashing and Trim: Adjacent pre-finished flashings.

I. Section 07910 - Joint Sealers: Sealant and joint backing material used in conjunction with roofing.

J. Division 15 - Mechanical: Roof related mechanical items.

K. Division 16 - Electrical: Roof related electrical items.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate complete layout of the Work, design and erection drawings, material profiles and dimensions, jointing pattern, construction details, edge conditions, fastening methods, sealant placement, flashings, penetrations and special details.

C. Product Data: Submit manufacturer's specifications and data on metal characteristics, catalog cuts, finishes and sealants.

D. Performance Requirements: Submit structural design calculations and test reports certified by a registered Professional Structural Engineer licensed in the State of California.

1. Verify load carrying capacities of panel system, fasteners and expansion control calculations.

E. Samples: Submit samples illustrating metal roofing mounted on plywood backing to illustrate typical standing seam, anchor clips, fasteners, external corner, internal corner, closures, valley, ridge, junction to vertical dissimilar surface, material, and finish.

1. Submit samples illustrating metal finish colors.

F. Submit manufacturer's installation instructions.

G. Submit certified laboratory test reports showing that the specified system has been tested and conforms to applicable provisions specified herein.

H. Submit manufacturer's certification that the roofing assembly is listed in the UL Building Materials Directory with a Class 90 wind uplift rating, including relevant construction number. **Certified statements from the manufacturer are not acceptable in lieu of a UL 90 classification.**

1.4 QUALITY ASSURANCE

A. Manufacturer/Installer: Company specializing in the Work of this Section with a minimum of ten (10) years documented experience in architectural roofing and the specified panel system. The manufacturer shall have a permanent, stationary, indoor production facility.

B. Single Source Responsibility: Supply roof panels, clips, closures, flashings, and related accessories from a single manufacturer.

C. Mark Factory fabricated components shipping cartons with the manufacturer's name or trademark, and a UL-90 label where applicable.

1.5 PERFORMANCE REQUIREMENTS

A. Underwriter's Laboratories (UL) Wind Uplift Resistance Classification: Roof assembly shall be classified as UL-90 as defined by UL 580 specifications.

B. Structural-uniform uplift load capacity of the panel system shall be determined in accordance with the principles of ASTM E330 adapted to testing of formed sheet panels (Pleated Air Bag Test) as follows:

1. Construct roof test specimens to represent the main body of the roof, free from influence of perimeter conditions. The setup will be continuous over two or more supports and contain at least five panel widths of standing seam roofing.
2. No roof attachments are permitted at the side, other than the standard gable or rake conditions. For uplift tests, both end seals shall be flexible and in no way restrain the crosswise distortion of panels.
3. Roofing panels and accessories shall be production materials of the same type and thickness proposed for use on the project.
4. Longitudinal seals or plastic film shall not span any crevice or crack that may tend to separate under pressure.
5. The Factor of Safety of the test results shall be 1.65 for the panel, batten or clip ultimate loads with no increase for wind.
6. The Factor of Safety for fasteners shall be 2.5 in metal and 4.0 in masonry.
7. Design uplift capacity for conditions of gauge, span or loading other than those tested may be determined by interpolation of test results. Extrapolation of conditions outside the range of the tests is not acceptable.
8. Deflection shall be L/240 for positive loading.

C. The roof panels shall withstand a 250 lb (113.4 kg) concentrated load applied to a four square inch area at the center of the panel at mid span between supports with no panel deformation, rib buckling, or panel sidelap separation that will adversely affect the weather-tightness of the system.

D. Static Air Infiltration: Completed roof system shall have a maximum of 0.06 cfm/sq.ft. with 6.24 psf air pressure differential when tested under ASTM E283.

E. Water infiltration: No evidence of water penetration at an inward static air pressure differential of not less than 6.24 psf and not more than 12.00 psf when tested under ASTM E331 when tested at 20 psf pressure for 15 minutes.

F. Thermal Movement: Provide sheet metal roofing that allows for thermal movement resulting from a temperature change of 120 deg. F., ambient with no buckling, opening of joints, hole elongation, joint sealant failure, or other detrimental effects. Provide clips that resist rotation and shear stress as a result of movement.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Stack preformed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials which may cause discoloration or staining.

D. Store materials in a safe place, dry and above ground.

E. Trim with strippable film shall not be exposed to direct sunlight or extreme heat.

F. Protect all materials from damage by other trades.

1.7 COORDINATION

A. Coordinate with the work of all adjacent and related sections.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of custom sheet metal roofing with other construction to which metal roofing must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.9 WARRANTY

A. Provide ten (10) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including coverage for degradation of metal finish, water tightness and integrity of seals, after competition and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CUSTOM SHEET METAL ROOFING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. AEP - Span.
2. Berridge Manufacturing Company.
3. Ryerson Metals – "ColorKlad".
4. Merchant & Evans, Inc.
5. Modern Metals Systems Corporation.
6. Peterson Aluminum Corp. – "Pac-Clad"
7. Smith Steelite.
8. Copper Sales, Inc. – "Una-Clad"

B. Substitutions: Under Provisions of Division One.

2.2 DECK SUBSTRATE

A. Plywood roof deck substrate provided under provisions of Division One.

2.3 UNDERLAYMENT MEMBRANE

A. Waterproof Sheet Membrane: Forty (40) mils thick, composed of four (4) mils of non-skid polyethylene and thirty six (36) mils of rubberized asphalt. Tensile strength of minimum 250 psi, black color, elongation of minimum 300 %, and overlap ends six (6) inches and side edges three and one-half (3-1/2) inches; MIRADRI WIP as manufactured by Nicolon/Mirafi Group, or approved equivalent by the Architect.

2.4 MATERIALS

A. Prefinished Metal Panels: Fabricate metal panels from 22 gauge minimum thickness, G90 galvanized steel conforming to ASTM A653/A-653M-94, Grade A.

B. Concealed Clips:

1. Fasten standing seam roofing to framing members with minimum 16 gauge, G90 galvanized steel, ASTM A446, concealed fastening clips with gusseted base to increase strength.
2. Clips shall provide for unlimited, unimpeded panel movement confirmed by testing, certified by an independent Professional Engineer. The testing shall require 100,000 cycles with two (2) inch minimum panel movement in relation to the anchored clip.

C. Panning of panel ends is required at ridge, hip and headwall conditions when the slope is less than 3:12.

D. Finish:

1. Exterior Panels: Fluorofinish (Kynar 500-70%) shop coated consisting of 0.2 +/-0.05 mil primer on both sides with 0.8 +/-0.1 mil 70% Kynar 500 topcoat. Finish shall conform to all tests for adhesion, flexibility, and longevity as specified by Kynar 500 specifications. Color: As selected by Architect from the Manufacturer's full color range
2. Coating System Performance Requirements: Coating system shall conform to the following:
   a. **Weatherometer Test (ASTM D822, G152, G153):** Passes 5,000 hours - No chalking, color change or adhesion loss.
   b. **Specular Gloss (ASTM D523 at 60 degrees F):** Standard shall have a gloss of 30 +/-5.
   c. **Chalking Resistance (ASTM D4214):** Florida exposure; ten (10) years at 45 degrees F South. Maximum rating of 8.
   d. **Color Change (ASTM D2244):** Florida exposure; ten (10) years at 45 degrees F South. Maximum 5 units change.
   e. **Humidity Test (ASTM D2247):** 100% relative humidity at 95 degrees F. Passes 1,000 hours. No blisters.
   f. **Salt Spray (ASTM B117):** 5% salt fog at 95 degrees F. Passes 1,000 hours with less than 1/8 inch creepage from scribe. None or few #8 blisters in field.
   g. **Impact Resistance Test (ASTM D2794):** Impact in in./lbs. - 2,000 X metal thickness - no cracking or adhesion loss.
   h. **Abrasion Resistance Test Falling Sand (ASTM D968):** Liters to expose 5/32 inch of substrate - 50 liters.

E. Flashing and Trim: Same material, gauge, finish and color as the panels, unless otherwise indicated.

2.5 ACCESSORIES

A. Fasteners:

1. Screws: No. 14 diameter self-tapping type with 5/8 inch diameter combination steel and neoprene washers.
   a. Exposed Screws: 300 series stainless steel, color finished to match panel.
   b. Concealed Screws: Carbon steel or 300 series stainless steel.
2. Blind Rivets: Solid-threaded, sealed-stem type with a weathertight neoprene washer under the head. Exposed rivets, color finished to match panel.

B. Closures:
1. Precut profile closure shall be cut from cross-linked, closed cell polyethylene composition foam. Color is gray.
2. Protect and support all ridge and hip foam closures with a formed metal closure manufactured from the same material, color and finish as the roofing.
3. Factory-fabricated ridge closures and field cut hip closures.

C. Sealants: Under provisions of 07910. All must not contain oil, asbestos or asphalt.
1. Factory-Applied Sidelap Sealant: Non-drying, non-skinning, synthetic polymer-based, designed for metal-to-metal concealed joints; JS-773 by Tremco, or approved equivalent by the Architect.
2. Field-Applied Panel End Sealant: Extruded polymeric butyl tape, non-skinning and not easily displaced under compression; Webbed Mastic by Tremco, or approved equivalent by the Architect.
3. Exposed Sealant: Single component, skinning, polyurethane joint sealant, color to be coordinated with panel; Dymonic by Tremco, or approved equivalent by the Architect.

D. Thermal Barriers: Non-treated wood per manufacturer's recommendations.

E. Round Penetrations: Pre-molded EPDM boot with metal collar; Dektite by Buildex, or approved equivalent by the Architect.

F. Vapor Retarder: The vapor retarder shall have a permeance of 0.05 or less as determined by ASTM E96.

G. Slip - Sheeting: Red Rosin Paper at areas where roof system contacts weather treated wood blocking.

H. Roofing Felt: 30 lb. asphalt saturated roofing felt.

2.6 FABRICATION

A. Fasten standing seam metal roof and fascia panels to the framing members with concealed anchor clips designed to allow for thermal movement of the panels, except where specific fixed points are indicated on the Drawings.

B. No exposed fasteners, except to fasten flashings, at fixed points, or as indicated on the Drawings.

C. Individual panels shall be removable for replacement of damaged material without disturbing adjacent panels.

D. Fabricate panels in full length with no end laps. Any roll-forming of panels at the job-site must be performed with industrial type rolling mill having at least ten or more stands to gradually shape the sheet metal, maintaining flatness and strict tolerances.

E. The panel system shall be a symmetrical design, allowing panels to be installed in either direction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to eaves.

C. Verify deck is dry and free of snow or ice.

D. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.

E. Verify roofing termination and base flashings are in place, sealed, and secure.

F. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Contact between dissimilar metals shall receive a protective coating of asphaltic paint for the prevention of electrolytic action and corrosion.

B. Install underlayment membrane flashing over roofing deck in accordance with manufacturer's instructions.

C. Install red rosin paper slip-sheeting over underlayment membrane flashing at areas where roof system contacts weather treated wood blocking.

3.3 INSTALLATION

A. Install standing seam roofing system in accordance with manufacturer's instructions.

B. All attachments shall allow for thermal expansion and contraction of the roofing panels.

C. Install panels in one continuous length from ridge to eave.

D. Snap-on seams shall be one (1) inch in height and shall contain a factory applied extruded vinyl weather seal insert to prevent siphoning of moisture through the standing seam.

E. Seal the top and bottom of the metal closures with butyl tape (7/8 x 1/8 inch) sealant.

F. Concealed anchor clips shall be spaced as required to meet uplift load requirements (maximum of 24 inches on center).

G. Seam panels and battens together with electric powered seaming machine supplied by the manufacture to ensure side lap weathertightness.

H. Vapor Retarder: The joints, perimeter and all openings shall be sealed per the manufacturer's instructions to provide a continuous vapor retarder. Any breaks or tears shall be repaired before panels are installed.

3.4 CLEANING

A. Wipe down each area after erection is complete.

B. Wash metal clean with neutralizing solution, and rinse with water.

3.5 PROTECTION

A. Protect the finished roof from wet cement, plaster and painting operations. Provide walk boards in heavy traffic areas to prevent damage to panels.

B. To prevent rust staining, remove immediately from finished surfaces any fillings caused by drilling or cutting.

C. Replace damaged panels and other components of work which cannot be repaired by finish touch-up or similar minor repair.

END OF SECTION 07610

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Shop Formed Sheet Metal Flashing and Trim; Pre-Finished Zinc-Coated Steel Where Exposed to View, and Zinc-Coated Steel Where Not Exposed to View; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Roof Drain Sheet Metal Fabrications:
    a. Downspouts.
    b. Scuppers.
2. Low-Slope Roof Sheet Metal Fabrications:
    a. Roof Edge Flashing (Gravel Stop) and Fascia Caps.
    b. Copings.
    c. Base Flashing.
    d. Counterflashing and Flashing Receivers.
    e. Roof-Penetration Flashing.

C. Membrane Flashing.

1.2 RELATED SECTIONS

A. Section 03300 – Cast-in-Place Concrete: Installation of reglets.

B. Section 04200 - Unit Masonry Systems: Masonry through-wall flashing.

C. Section 06100 - Rough Carpentry: Treated wood blocking.

D. Section 07540 – Thermoplastic Membrane Roofing: Flashing and accessories.

E. Section 07610 – Sheet Metal Roofing: Roofing system, including flashing and accessories directly associated with roofing.

F. Section 07910 - Joint Sealers: Sealant in conjunction with metal reglets and counter flashing.

G. Division 15 - Mechanical: Roof curbs for mechanical equipment, and flashing sleeves and collars for mechanical items protruding through roofing membrane.

H. Division 16 - Electrical: Roof curbs for electrical equipment, and flashing sleeves and collars for electrical items protruding through roofing membrane.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer’s data for product characteristics, joint and fastening requirements, and factory finishing.

C. Shop Drawings: Indicate material profile, dimensions, jointing pattern, jointing details, fastening methods, flashing, termination, and installation details.

D. Submit manufacturer's installation instructions.

E. Warranty: Submit to the Architect the written warranties specified in this Section and under provisions of Division One.

1.4 QUALITY ASSURANCE

A. Fabricate and install all sheet metal work, including flashing and sheet metal items not particularly indicated on the Drawings, but required for finish work in accordance with the “Architectural Sheet Metal Manual” published by the Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA).

B. Conduct welding in accordance with standard practices outlined in American Welding Society Code for Welding in Building Construction. Complete all weld by an AWS certified welder. Submit certification, including date qualified, and the name of the firm and individual certifying the qualification tests.

C. Factory shall have capability to show conformance with National Coil Coating Association Technical Bulletins for factory color-coated metal.

1. Provide factory applied protection for finished color-coated metal by means of a strippable plastic film.

D. Roof sheet metal shall be resistant to corrosion.

E. Protect all metals in contact with dissimilar metals or materials from galvanic action.

F. Fabricator and Installer: Companies specializing in sheet metal flashing work with five (5) years documented experience.

1.5 PERFORMANCE REQUIREMENTS

A. Fabricate and install roof edge flashing and copings capable of resisting 85 MPH basic wind exposure, Category "C".

B. Thermal Movement: Provide sheet metal roofing that allows for thermal movement resulting from a temperature change of 120 deg. F., ambient with no buckling, opening of joints, hole elongation, joint sealant failure, or other detrimental effects. Provide clips that resist rotation and shear stress as a result of movement.

C. Water Penetration: Sheet metal flashing and trim shall not allow water into the building interior.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. All materials shall be delivered to the site in cartons with manufacturer's identification labels in tact, including storage recommendations.

C. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

D. Prevent contact with materials which may cause discoloration or staining.

E. Flammable materials shall be stored in conformance with applicable fire codes and regulations in a manner that will not create a potential fire hazard.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of sheet metal flashing and trim and other construction to which sheet metal flashing and trim must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 PROJECT CONDITIONS

A. Protection: Prevent damage to the new or existing roof, including protection from damage by ladders and other equipment. Potentially damaging materials, such as metal scraps, nails and screws, acid flux, and other debris shall not be permitted to come into contact with the roof surface.

B. Construction Schedule: Install sheet metal as soon as possible after roof work has been completed. Sheet metal work shall be fully completed by the given completion date.

1.9 COORDINATION

A. Coordinate the Work of this Section with interfacing and adjoining construction for proper sequencing of each installation. Ensure best possible weather resistance and durability of Work, and protection of materials and finishes.

1.10 WARRANTY

A. Provide five (5) year manufacturer's written warranty covering all sheet metal work specified herein under provisions of Division One.

B. Provide ten (10) year coil-coating supplier's written warranty for KYNAR 500 color coated metal finish covering color fading, chalking and film integrity under provisions of Division One.

C. Warranty: All materials and workmanship provided are guaranteed against defects, include coverage for degradation of metal finish, water tightness and integrity of seals, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PREFINISHED METAL

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Ryerson Metals – "Color-Klad"
2. Peterson Aluminum. – "Pac-Clad"
3. Metal-Era Roof Edge Systems.
4. Modern Metal Systems Corporation.
5. Firestone Building Products. – "Una-Clad"

B. Substitutions: Under provisions of Division One.

2.2 SHEET METAL MATERIALS

A. Sheet Metal Flashing and Trim (Not Exposed to View):

1. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A653/A653M, G90 hot-dip galvanized, minimum 24 gauge except as otherwise indicated.

B. Sheet Metal Flashing and Trim (Exposed to View From Grade Level or Upper Floors):

1. Pre-Finished Zinc-Coated Steel: Provide minimum 24 gauge, hot-dip galvanized steel, commercial quality A1 S1 G90 extra smooth, primed on both sides and finished on one (1) side with 70% KYNAR based fluorocarbon coating of minimum 0.70 mils total dry film thickness. Finish shall conform to all tests for adhesion, flexibility and longevity as specified by KYNAR 500 finish supplier.

   a. Color: Selected by the Architect from manufacturer's full color range.

   b. Strippable coating shall be liquid applied in the shop to the front side of the pre-finished metal to protect the finish during fabrication, shipment and field handling. This strippable coating shall be removed prior to installation.

C. Keeper Strips: Zinc coated steel, continuous strips, minimum 18 gauge thickness, G90 hot-dip galvanized per ASTM A653/A653M, slotted holes at maximum ten (10) inches on center and profiled as indicated on the Drawings.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Same material as flashing on which they are used, type and size indicated on the Drawings, or specified herein, unless noted otherwise. Fasteners exposed to the weather shall have neoprene washer under heads to ensure water-tightness. Match finish of exposed heads with material being fastened.

C. Pop Rivets: Closed end type, used for metal to metal connections where future disassembly is not required.

D. Bituminous Coating: SSPC - Paint 12, solvent type bituminous mastic (chromate free), free of sulfur, compounded for 15 mil dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant, for use at moving sheet metal joints.

F. Elastomeric Sealant: Generic type recommended by fabricator of sheet metal and fabricator of components being sealed; comply with ASTM C920.

G. Epoxy Seam Sealer: Two-part, non-corrosive, aluminum seam cementing compound, recommended by sheet metal fabricator for exterior/interior non-moving joints, including riveted joints.

H. Adhesive: Type recommended by sheet metal fabricator for waterproof/weather-resistant seaming and adhesive application.

I. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

J. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of Work, matching or compatible with material being installed, non-corrosive, size and gauge required to suit application.

K. Elastic Flashing Filler: Closed cell polyethylene or other soft closed cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

L. Roofing Cement: ASTM D2822, asphalt, compatible with material being installed.

M. Felt Underlayment: ASTM D226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

N. Paper Slip Sheet: Minimum 5 lb., red rosin building paper.

2.4 MEMBRANE FLASHING

A. Membrane Flashing: Fully self-adhering, self-healing, composite flexible flashing, total 40 mil membrane consisting of 36 mils of pliable, highly adhesive rubberized asphalt, completely and integrally bonded to a 4 mil, high density, cross-laminated polyethylene film; "Perm-A-Barrier" Wall Membrane by W. R. Grace, Inc., "Miradri TWF" by CCW; or approved equivalent by the Architect.

1. Flashing joints shall be lapped a minimum of four (4) inches, and cemented with a suitable product as recommended by the manufacturer.

2.5 FLEXIBLE FLASHING

A. Self-Adhering Sheet Flashing:

1. Flexible Flashing: Fully self-adhering, self-healing, composite flexible flashing, butyl rubber adhesive. "Flexwrap" and "Straight Wrap" by Tyvek, or approved equal.

B. Bituminous self-adhering flashing is not allowed. Self-adhering flashing shall be able to withstand sustained temperatures exceeding 200 degrees F.

2.6 FABRICATED UNITS

A. General Metal Fabrication: Shop fabricate work to the greatest extent possible. Comply with details indicated on the Drawings, and with applicable requirements of SMACNA - "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the Work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For tin edges to be seamed, form seams, and solder.

C. Expansion and Contraction:

1. Provide for thermal expansion and contraction, and building movement in completed Work, without over-stressing the material, breaking connections or producing wrinkles and distortion in finished surfaces. Make watertight and weather-resistive.

2. Where subject to thermal expansion and contraction, attach members with clips to permit movement without damage, or provide slotted or oversize holes with washers only, as acceptable by the Architect.

3. Make lock seam work flat and true to line, and sweat full of solder, except where installed to permit expansion and contraction.

    a. Flat lock seams, and lap seams where soldered, shall lap according to pitch, but in no case less than three (3) inches. Make seams in direction of flow.

D. Sealant Joints: Where movable, non-expansion type joints are indicated, or required for proper performance of the Work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.

E. Separations: Provide for separation of metal from non-compatible metal, or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer.

F. Solder: ASTM B32, 50 - 50 tin/lead solder with rosin flux.

1. Clean material and tin prior to soldering. Solder with heavy coppers of blunt design, properly tinned before use.

2. Solder slowly with well heated coppers; heat the seams thoroughly and completely fill with solder. Exposed soldering with finish surfaces shall be neatly made full flowing and smooth.

3. Wash acid flux with soda solution after soldering and remove soldering flux on exposed and painted surfaces.

G. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

H. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.7 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Downspouts: Fabricate rectangulardownspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

B. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.

C. Base Flashing.

D. Counterflashing and Flashing Receivers.

E. Roof-Penetration Flashing.

F. Roof-Drain Flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashing is in place, sealed, and secure.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Contact between dissimilar metals shall receive a protective coating of asphalt paint for the prevention of electrolytic action and corrosion.

B. Field measure site conditions prior to fabricating work.

C. Install starter and edge strips, and continuous keeper strips before starting installation.

D. Install flexible flashing membrane over top of fascia, coping areas, and other locations required in accordance with manufacturer's instructions.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks in conformance with SMACNA guidelines.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
2. Aluminum: Use aluminum or stainless-steel fasteners.
3. Copper: Use copper or stainless-steel fasteners.
4. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.

1. Do not solder prepainted, metallic-coated steel sheet.
2. Pretinning is not required for zinc-tin alloy-coated stainless steel.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

C. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces in accordance with specified Performance Requirements.

1. Interlock bottom edge of roof edge flashing with continuous cleats anchored to substrate at 16-inch on centers.

C. Copings: Anchor to resist uplift and outward forces in accordance with specified Performance Requirements.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch on centers.
2. Anchor interior leg of coping with screw fasteners and washers at 18-inch on centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Secure in a waterproof manner. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.

E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
2. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.6 INSTALLATION

A. Membrane: Cover parapet walls and treated nailers with roofing membrane. Follow membrane manufacturer’s recommendations

1. Install roofing membrane up and over the top of the wall and down outside face of wall, covering nailer completely. Allow 1/2 inch excess membrane below the nailer, trimming membrane if necessary.

2. Install Work with laps, joints, and seams which will be permanently weathertight and waterproof.
3. Install membrane flashing in accordance with manufacturer's installation instructions.

3.7 CLEANING

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

3.8 PROTECTION

A. Protection: Protect flashing and sheet metal work during construction to ensure that Work will be without damage or deterioration, other than natural weathering at time of Substantial Completion.

END OF SECTION 07620

SECTION 07840 - FIRESTOPPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Fire-Stopping Systems Used For Sealing All Penetrations Through Fire-Rated Assemblies or at Periphery of Fire-Rated Construction; Including Pipes, Ducts, Conduits, Cable Trays, Structural Members, Intersections Between Walls and Floors, and All Other Openings as Required by the California Building Code (CBC) and California Fire Code (CFC).

C. Fire-Stopping Sealant For All Construction Joints in Fire-Rated Walls and Partitions as Required by CBC and CFC, Current Editions.

D. Labeling Fire-Stop Penetrations.

1.2 RELATED SECTIONS

A. Section 01460 - Testing and Inspection Services.

B. Section 03300 - Cast-in-Place Concrete: Concrete floor openings requiring fire-stopping.

C. Section 05310 – Steel Deck: Steel deck requiring fire-stopping, and fire-stopping sealant at all construction joints in fire-rated walls.

D. Section 09250 - Gypsum Board Systems: Interior metal stud partitions and gypsum board requiring fire-stopping, and fire-stopping sealant at all construction joints in fire-rated partitions.

E. Division 15 - Mechanical: Mechanical work requiring fire-stopping.

F. Division 16 - Electrical: Electrical work requiring fire-stopping.

1.3 PERFORMANCE REQUIREMENTS

A. Fireproofing Materials: ASTM E119 and ASTM E814 to achieve a fire rating as noted on Drawings.

B. Surface Burning Characteristics: ASTM E84.

1. Flame Spread of less then 25.

2. Smoke Development Rating of less then 450.

C. Fire-Rated Construction Joints: California Building Code and California Fire Code.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate each condition and location requiring penetration seals, UL systems material, reinforcement, anchorage, fastenings, and methods of installation.

C. Submit a copy of UL illustration of each proposed system indicating manufacturer-approved modifications.

D. Product Data: Submit manufacturer’s data for all materials and prefabricated devices, providing descriptions sufficient for identification at Project Site. Provide data on product characteristics, performance and limitation criteria.

E. Manufacturer's Installation Instructions: Indicate preparation and installation procedures for each type of product.

F. Submit material safety data sheets (MSDS) for each fire-stop product.

G. Certification: Submit manufacturer’s letter of certification that the materials or combination of materials meet the requirements specified in ASTM E814 - Fire Tests of Through Penetration Fire-Stop Systems.

1. Provide directory listing number and number of each system to be used according to location types.

1.5 QUALITY ASSURANCE

A. Fire-stopping materials shall conform to Flame (F) and Temperature (T) ratings as required by the CBC and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests. The F rating must be a minimum of one (1) hour but not less than the fire resistance rating of the assembly being penetrated. T rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

B. Fire-stopping material shall be asbestos free, free of any PCB’s, and lead free.

C. Do not use any product containing solvents or that requires hazardous waste disposal.

D. Single Source Limitations: Obtain all fire-stopping systems for the Project through one source from a single manufacturer.

E. Contractor performing Fire-stopping shall be trained and certified or approved by the fire-stopping manufacturer. Contractor shall specialize in fire-stop application, and have experience in similar applications and projects. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.

F. Equipment used shall be in accordance with fire-stopping manufacturer's written installation instructions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products under provisions of Division One.

B. Deliver materials in the manufacturer's original, unopened containers or packages with manufacturer's name, product identification, lot numbers, UL labels, and mixing and installation instructions, as applicable.

C. Store materials in the original, unopened containers or packages, and under conditions recommended by the manufacturer.

D. All fire-stop materials shall be installed prior to expiration date of shelf life.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and for three (3) days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

1.8 SEQUENCING

A. Sequence work to permit fire-stopping materials to be installed after adjacent and surrounding work is complete.

1.9 PROTECTION

A. Where fire-stopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

1.10 WARRANTY

A. Provide five (5) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, include coverage for fire-stopping to remain free from cracking, checking, dusting, flaking, spalling, separation and blistering, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIRE-STOPPING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Hilti Corporation, Fire-Stopping Systems.
2. RectorSeal, Inc. - "BioFireshield" Fire-Stopping Systems.
3. 3M Fire Protection Products.
4. Grace Construction, Fire-Stopping Systems.
5. TREMCO Fire-Stopping Systems.

B. Substitutions: No Substitutions Allowed.

2.2 MATERIALS

A. Fire-stopping materials shall be asbestos-free and capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ASTM E814.

1. The rating of the fire-stops shall be in no case less than the rating of the time-rated floor, roof or wall assembly.

B. Fire-Stopping Systems: Material systems required for sealing fire-rated wall and floor penetrations greater than one (1) inch in size.

1. Seal tops of walls, including the space between the flutes of the metal roof deck.

C. Fire-Stopping Sealant: One-part elastomeric sealant formulated for use as part of a through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through rated walls and floors, TCA listed by UL.

1. Use at penetrations through floors and other fire-rated assemblies where voids are one (1) inch or less in size.

2. Use at construction joints at fire-rated walls and partitions at concrete masonry unit walls and gypsum board partitions.

D. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

E. Intumescent Fire-Stop Sealant: FS 611A; one part, acrylic sealant, virtually odorless, contains no volatile solvents, non-sag, gun grade, expands when exposed to heat and protects combustible penetrations for up to two (2) hours.

F. Provide all fire-stop mortars, caulks, sealant, putty, collars, mastic, wrap strips and other products as recommended by the Manufacturer necessary to complete the project in an approved manner.

2.3 ACCESSORIES

A. Dam Material: Mineral fiber matting permanent, or other type recommended by manufacturer.

1. Retainers: Clips to support mineral fiber matting.

B. Primer, Sealant and Solvent Cleaner: Types recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify with mechanical and electrical for all openings and penetrations required to be sealed.

C. Examine penetrations, all surfaces and openings to receive fire-stopping, with Installer present, for compliance with requirements for configurations, installation tolerances and other conditions affecting fire-stopping performance. Do not proceed with installation of fire-stopping until unsatisfactory conditions have been corrected.

3.2 CONDITIONS REQUIRING FIRE-STOP

A. General:

1. Provide fire-stopping for conditions specified whether or not fire-stopping is indicated, and, if indicated, whether such material is designated as insulation, safing, or otherwise.

2. Insulation types specified in other Sections shall not be installed in lieu of fire-stopping material specified herein.

B. Building Exterior Perimeters:

1. Where exterior facing construction is continuous past a structural floor, and a space would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide fire-stopping to equal the fire resistance of the floor assembly. Mineral wool by itself is not an acceptable fire-stop, neither is mineral wool used with beads of caulking applied along length of mineral wool/curtain wall or mineral wool/floor slab junctures. If mineral wool is part of fire-stop system, the mineral wool must be completely covered by appropriate thickness of UL listed Fire-Stop Sealant.

2. Fire-stopping shall be provided whether or not there are any clips, angles, plates or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall of composite type construction passes a perimeter structural member, such as a girder, beam, or strut, and the finish on the interior wall face does not continue up too close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and lower edge of the structural member, provide fire-stopping to continuously fill such open space.

C. Interior Walls and Partitions:

1. Where a wall or partition is continuous past a structural floor, such as a stairwell or vertical shaft, and a space would otherwise remain open between the wall face and perimeter edge of the adjoining structural floor, provide fire-stopping.
2. Provide fire-stopping whether or not there are any clips, angles, plates, or other members bridging or interconnecting the wall and floor systems, and whether or not such items are continuous.
3. Where the top edge of a fire-rated wall or partition abuts and is at right angles to fluted-type metal decking, the construction is such that would otherwise leave the flute spaces open, provide fire-stopping.

D. Penetrations:

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire-rated floor, wall or partition.
2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide fire-stopping to fill such spaces in accordance with ASTM E814 and UL 2079 for dynamic movement.
3. Where penetrations occur at fire-rated walls or partitions of solid type construction, provide fire-stopping to completely fill spaces around the penetration in accordance with ASTM E814.
4. Where penetrations occur at fire-rated walls or partitions of hollow type construction, provide fire-stopping to completely fill spaces around the penetration, on each side of the wall or partition, in accordance with ASTM E814.
5. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, fire-stop annular space - if any - between sleeve and wall of opening.

E. Provide fire-stopping to fill miscellaneous voids and openings in fire-rated construction in a manner essentially the same as specified herein before.

3.3 PREPARATION

A. Surface Cleaning of Fire-Stopping: Clean out joints and other areas of application immediately before installing fire-stopping to comply with recommendations of manufacturers and the following requirements:

1. Remove all foreign material from joint and opening substrates which could interfere with adhesion of fire-stopping, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion an compatibility by manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.
2. Clean porous joint and opening substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with fire-stopping. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.

3.4 PROTECTION OF ADJACENT SURFACES

A. Protect surfaces not scheduled for fire-stopping and equipment from damage by fall-out and dusting.

B. Close off and seal ductwork in areas where fire-stopping is being applied.

3.5 INSTALLATION

A. General:

1. Apply fire-stops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
2. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire related construction have been permanently installed prior to installation of fire-stops, schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of fire-stops.
3. Follow safety procedures recommended in the Material Safety Data Sheets (MSDS).

B. Procedures and Preparations:

1. Verify that substrates to receive fire-stopping are prepared in accordance with manufacturer's instructions and are free of materials which may prevent adequate adhesion.

2. Manufacturer's representative must make periodic visits to verify proper materials.

3. Certification: Manufacturer's representative must provide written report to the Architect that all materials have been installed in accordance with specification requirements.

C. Dam Construction:

1. Install dams when required to properly contain fire-stopping materials within openings and as required to achieve fire-resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming materials may be left as a permanent component of the fire-stop system.

D. Field Quality Control:

1. Field testing and inspection shall be performed by the applicable Code authorities.

2. Conventional testing and inspection services herein describe those items not specifically required by applicable code authorities, but are considered essential to the proper performance of the building systems.

3. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.6 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.

3. Through-penetration firestop system designation of applicable testing and inspecting agency.

4. Date of installation.

5. Through-penetration firestop system manufacturer's name.

6. Installer's name.

3.7 CLEANING

A. Clean off excess fire-stopping and fire-stopping smears as work progresses by methods and with cleaning materials approved by manufacturers of products in which fire-stopping occurs.

B. Leave finished work in neat, clean condition with no evidence of spill-over or damage to adjacent surfaces.

3.8 PROTECTION

A. Protect fire-stopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated fire-stopping immediately an reseal joints with new materials to produce fire-stopping installations with repaired areas indistinguishable from original work.

END OF SECTION

SECTION 07910 - JOINT SEALERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General,. Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Preparing Substrate Surfaces to Receive Sealant and Joint Backing Materials.

C. Exterior and Interior Joint Sealant and Gaskets; as Indicated on the Drawings, Specified Herein; Including Joint Backing Materials and Accessories.

D. Sealant Types:

1. Acrylic Latex Sealant.
2. Silicone Glazing Sealant.
3. Polyurethane Sealant.
4. Polyurethane Sealant (Horizontal).
5. Acoustical Sealant

E. Gasket Types:

1. Pre-Compressed Foam Sealant.

1.2 RELATED SECTIONS

A. Section 02750 - Exterior Concrete Pavement: Sealant used in conjunction with exterior concrete.

B. Section 03300 - Cast-In-Place Concrete: Sealant used in conjunction with concrete.

C. Section 04200 - Unit Masonry System: Sealant used in conjunction with unit masonry.

D. Section 07620 - Sheet Metal Flashing and Trim: Sealant used in conjunction with metal flashing for roofing.

E. Section 08110 - Steel Doors and Frames: Sealant used in conjunction with steel door frames.

F. Section 08210 – Wood Doors: Sealant used in conjunction with wood doors.

G. Section 08330 – Coiling Doors and Grilles: Sealant used in conjunction with coiling doors and grilles.

H. Section 08410 - Aluminum Entrances and Storefront: Sealant used in conjunction with aluminum door and window frames.

I. Section 08520 - Aluminum Windows: Sealant used in conjunction with aluminum window frames.

J. Section 08560 – Sliding Serving Window: Sealant used I conjunction with sliding service window.

K. Section 08810 - Glass and Glazing: Sealant used in conjunction with glazing.

L. Section 09310 - Ceramic and Porcelain Tile Finish: Sealant used in conjunction with ceramic tile finish.

M. Section 09220 – Portland Cement Plaster.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Provide manufacturer’s data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability for each joint sealer product required, including instructions for joint preparation and joint sealer application.

C. Samples for Initial Selection Purposes: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available, for each product exposed to view.

D. Samples for verification purposes of each type and color of joint sealer required. Install joint sealer samples in 1/2 inch wide joints formed between two (2) six (6) inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealers.

E. Qualification data complying with requirements specified in "Quality Assurance" article. Include list of completed projects with project name, addresses, names of Architects and Owners, plus other information specified.

F. Compatibility and Adhesion Test Reports: Where sealant will be applied between dissimilar materials, non-typical materials, under unusual conditions or under conditions not normally recommended by the sealant manufacturer, submit the following:

1. Certificates from manufacturers of joint sealers attesting that their products comply with specification requirements and are suitable for the use indicated.

2. Compatibility and Adhesion Test Reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealant.

3. Sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion to the intended substrates.

G. Product test reports for each type of joint sealers indicated, evidencing compliance with requirements specified.

1.4 QUALITY ASSURANCE

A. Joint sealers are required to establish and maintain waterproof continuous seals during the specified warranty period within recognized limitations of wear and aging indicated for each application.

B. Installer Qualifications: Installer who has successfully completed within the last five (5) years at least five (5) joint sealer applications similar in type and size to that of this Project.

C. Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

D. Product Testing: Provide comprehensive test data for each type of joint sealer based on tests conducted by a qualified independent testing laboratory on current product formulations within a twenty-four (24) month period preceding date of Contractor's submittal or test results to Architect.

1. Test elastomeric sealant for compliance with requirements specified by reference to ASTM C920. Include test results for hardness, stain resistance (per ASTM C-1248), adhesion and cohesion under cyclic movement (per ASTM C719), low-temperature flexibility, modulus of elasticity at 100 percent strain, effects of heat aging, and effects of accelerated weathering (ASTM C793).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver materials to site in original unopened containers of bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.

C. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

D. Damaged or otherwise unsuitable materials, when so ascertained, shall be immediately removed from the job site, and replaced at no additional cost to the Owner.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealers when ambient and substrate temperature conditions are outside the limits recommended by joint sealer manufacturers published recommendations or when joint substrates are wet due to rain, snow, frost, condensation or other causes except as provided below:

1. Installation of joint sealants in temperature conditions outside the limits of the Manufacturer’s published recommendations may occur only if the Installer provides a letter to the Architect from the Manufacturer authorizing installation under revised ambient and substrate temperature limits. The letter shall indicate the date the letter is effective, the specific accepted revised ambient and substrate temperature conditions, and certification that the sealant warranty will remain in effect if installation is performed within the revised limits.

B. Joint Width Conditions: Do not proceed with installation of joint sealers where joint widths are less than allowed by joint sealer manufacturer for application indicated.

C. Joint substrate Conditions: Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.7 WARRANTY

A. Provide manufacturer's written warranty under provisions of Division One

B. Warranty: All materials and workmanship provided are guaranteed against defects, include coverage for installed sealant and accessories which fail to achieve air tight seal, and water tight seal exhibit loss of adhesion or cohesion, or do not cure, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

1. Provide one (1) year warranty for Acrylic Latex.
2. Provide twenty (20) year warranty for Silicone Sealant and Adhesive.
3. Provide five (5) year warranty for Polyurethane Sealant.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - JOINT SEALANT

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Dow Corning Silicone Sealant.
2. BASF-SONNEBORN Building Products.
3. GE Silicones.
4. TREMCO Sealant Systems.
5. TREMCO - VULKEM.

B. Substitutions: Under provisions of Division One.

2.2 JOINT SEALANT

A. **Acrylic Latex Sealant:** ASTM C834-86, non-sag, gun-grade, single component acrylic latex sealing compound, mildew-resistant. Color as selected by Architect from standard colors. Use for sealing interior joints that are to receive paint and not subject to movement.

1. BASF/SONNEBORN - SONOLASTIC SONOLAC.
2. TREMCO - TREMFLEX 834.
3. Substitutions: Under provisions of Division One.

B. **Silicone Structural Glazing Adhesive**: ASTM C920, Type S, Grade NS, Class 25, FS TT-S-001543A, Class A; single component, neutral-cure, medium modules, elastomeric silicone structural adhesive. Color selected by Architect from standard colors. Use for silicone structural and non-structural glazing of glass, metal and plastics, also for weatherproofing applications as recommended by the Manufacturer.

1. DOW CORNING 995.
2. TREMCO - SPECTREM 2.
3. Substitutions: Under provisions of Division One.

C. **Polyurethane Sealant:** ASTM C920, Type M, Grade NS, Class 25; non-sag, gun-grade, low modules, chemical curing, non-staining, two-component polyurethane sealant with movement capability of +/- 50 percent. Color as selected by Architect from standard colors. Use for exterior joints exposed to view where normal movement is anticipated; such as masonry control joints, window and door perimeters, louvers, relief angles, slip joints, copings, joints in wall sheathing, etc.

1. BASF - SONOLASTIC NP 2.
2. TREMCO – DyMeric 240/240FC.
3. Substitutions: Under provisions of Division One.

D. **Polyurethane Sealant (Horizontal, Except for Vehicle Traffic Areas):** ASTM C920, Type M, Grade P, Class 25; two-component, non-sag, self leveling pourable moisture curing polyurethane sealant with movement capability of +/- 25 percent. Color as selected by Architect from standard colors. Use for horizontal surface joints; such as concrete floor and paving joints, slab/wall junctions, etc.

1. BASF - SONOLASTIC SL 2.
2. TREMCO - THC-900 (for joint slopes of 5% or less).
3. TREMCO - THC-901 (for joint slopes greater than 5%).
4. TREMCO – Vulkem 245/255.
5. Substitutions: Under provisions of Division One.

2.3 ACOUSTICAL SEALANT

A. **Flexible Synthetic Rubber Sealant:** Non-skinning, non-hardening, non-staining, permanently flexible sealant designed specifically for sealing drywall partitions to limit the transmission of sound. To be used in concealed areas only.

1. TREMCO ACOUSTICAL SEALANT.
2. PECORA - AC-20. FTR.
3. SHEETROCK Acoustical Sealant – U.S. Gypsum Comp.
4. PECORA - BA-98 (for concealed joints only).
5. Substitutions: Under provisions of Section 01600.

2.4 ACCEPTABLE MANUFACTURERS - JOINT GASKETS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. EMSEAL Joint Systems.
2. ILLBRUCK - “WILLSEAL”.
3. SANDELL - “POLYSEAL”.

B. Substitutions: Under provisions of Division One.

2.5 JOINT GASKET

A. **Pre-Compressed Foam Gasket:** Open cell foamed polyurethane strips saturated with polybutylene waterproofing material. Adhesive used to adhere sealing gaskets to surfaces approved by manufacturer’s of sealing gaskets. Use at exterior or interior joints one (1) inch and wider in concrete or masonry.

1. EM-SEAL - GREYFLEX.
2. ILLBRUCK - WILLSEAL Tape Type 150.
3. SANDELL - POLYSEAL.
4. Substitutions: Under provisions of Division One.

2.6 ACCESSORIES

A. Joint Cleaner: Non-corrosive and non-staining type, as recommended by sealant manufacturer; compatible with joint forming materials.

B. Primer: Non-staining type. For all Sealants, prime surfaces according to Manufacturer’s recommendations for substrate and sealant application.

C. Joint Backer Rod: Designed for use with cold applied joint sealant passing ASTM C1253-93. Provide backer rod of size required for joint design

1. Type C: Closed cell polyethylene rod, where off gassing is acceptable.
2. Type O: Open cell material where no off gassing is allowed. Not suitable for horizontal surfaces.
3. Type B: Bicellular material with surface skin.

D. Joint Filler: ASTM D1056; round, closed cell polyethylene joint filler designed for use with cold applied joint sealant. Provide joint filler of size required for joint design.

E. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joints sealers, with Installer present for compliance with requirements for joint configurations, installation tolerances and other conditions affecting joint sealer performance. Correct conditions detrimental to timely and proper completion of the Work.. Do not proceed width installation of joint sealers until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prior to installation, for all sealants, verify with Sealant Manufacturer that sealant is compatible with each substrate where sealant is to be applied.

B. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealers to comply with recommendations of joints sealer manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealers; oil; grease; waterproofing; water repellents; water; surface dirt and frost.

2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrates, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particle remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces or ceramic tile and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

C. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

D. Masking tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

E. Back-Up Material:

1. Verify compatibility of back-up material with sealant before installation.

2. Use back-up material 25 percent wider than width of joint to provide substantial resistance to displacement.

F. Release Agent: Apply release agent or bond breaker strip to joint to be sealed on top of back-up material to prevent adhesion of sealant to back-up material per manufacturer’s recommendations.

G. Prior to beginning installation of sealant, Installer shall identify all weeps and drainage ways in areas where sealant is to be applied. Installer shall be responsible to ensure that weeps and drainage ways remain open after completion of installation of sealants.

3.3 INSTALLATION

A. General: Comply with joint sealer manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C1193-91 for use of joint sealant as applicable to materials, applications and conditions indicated.

C. Solvent-Release-Curing Sealant Installation Standard: Comply with requirements of ASTM C804 for use of solvent-release-curing sealant.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint-fillers of type indicated to provide support of sealant during application and at position required to produce the cross-sectional shapes and depths of installed sealant relative to joint widths which allow optimum sealant movement capability

a. Do not leave gaps between ends of joint-fillers.

b. Do not stretch, twist, puncture or tear joint fillers.

c. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

2. Install bond breaker tape between sealant and joint fillers, compression seals or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.

E. Installation of Sealant: Install sealant by proven techniques that result in sealant directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

F. Tooling of Non-Sag Sealant: Immediately after sealant application and prior to time skinning or curing begins, tool sealant to form smooth, uniform beads of concave configuration, to eliminate air pockets and to ensure contact an adhesion of sealant with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents which discolor sealant or adjacent surfaces or are not approved by sealant manufacturer.

1. Provide appropriate concave joint configuration as indicated in ASTM C1193-91, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealer immediately and reseal joints with new materials to produce joint sealer instructions with repaired areas indistinguishable from original work.

END OF SECTION 07910

SECTION 07950 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Manufactured Interior Expansion Joint Cover Assemblies; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Flush Cover Assemblies.
    a. Thin-Line Floor Expansion Joint Covers.
    b. Twin-Line Floor Expansion Joint Covers.
2. Seismic Flush Cover Assemblies.
    a. Floors.
    b. Walls and Ceilings.
3. Seismic Model SSR Assemblies.
4. Extruded Aluminum Cover Assemblies.

C. Manufactured Exterior Expansion Joint Cover Assemblies, as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Vertical Exterior Wall Seals.
2. Roof Covers.

1.2 RELATED SECTIONS

A. Section 01460 - Testing and Inspection Services.

B. Section 03300 - Cast-in-Place Concrete: Expansion and contraction joints in concrete joints and junction of concrete slab-on-grade and perimeter walls.

C. Section 05500 - Metal Fabrications.

D. Section 07620 - Sheet Metal Flashing and Trim:

E. Section 07910 - Joint Sealers: Expansion and control joint finishing utilizing a sealant and bond breaker.

F. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish expansion devices.

G. Section 09510 - Suspended Acoustical Ceilings: Suspended acoustical ceilings requiring expansion joints.

1.3 QUALITY ASSURANCE

A. Materials and work shall conform to the latest edition of reference specifications, specified herein, and to the California Building Code.

B. Fire Performance Characteristics: Where indicated on the Drawings, provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per UL 2079, including hose stream test at full-rated period by UL.

1. Fire Rating: Not less than the rating of adjacent construction.

C. Loading Characteristics: Standard floor coverings should be designed to withstand a maximum point load of 500 lb. without damage or permanent deformation. Single Source Responsibility: Obtain expansion joint cover assemblies from one source from a single manufacturer.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate full extent of expansion joint cover assemblies; including details indicating profiles of each type of joint. Splice joints between sections, joinery with other types, special end conditions, anchorage, fasteners, and relationship to adjoining work and finishes.

C. Product Data: Provide manufacturer's latest published literature for materials specified, joint assembly profiles, profile dimensions, anchorage devices, and available colors and finish.

D. Samples: Submit samples of materials specified herein, which shall include the following:

1. Sample of each type of metal finish indicated on metal of same thickness and alloy to be used in the Work.
2. Sample of each type of flexible seal to be used in the Work.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes; provide templates for cast-in or placed frames or anchors; required tolerances for item placement.

F. Warranty: Submit copy of manufacturer's full limited warranty specifically documented for this project.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products at the site under provisions of Division One.

B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical.

C. Exercise proper care in handling of all Work so as not to injure the finished surface, and take precautions to protect the Work from damage after it is in place.

D. Store materials under cover in a dry and clean location off the ground. Remove materials which are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials at no additional cost to the Owner.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of expansion joints and other construction to which expansion joints must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings.

B. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.7 COORDINATION

A. Coordinate the Work of this Section with all related trades and adjacent materials.

1.8 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided shall be guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - EXPANSION JOINTS ASSEMBLIES

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. C/S Expansion Joint Covers.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. Architectural Art Mfgr., Inc.
2. Balco/Metalines, Inc.
3. D&B/NYSTROM Expansion Joint Covers.
4. InPro "Jointmaster".

C. Substitutions: No Substitutions Allowed.

2.2 MATERIALS

A. Structural Steel Shapes: ASTM A36.

B. Steel Plates: ASTM A283, Grade C.

C. Rolled Steel Floor Plates: ASTM A786.

D. Aluminum: ASTM B221, alloy 6063-T5 for extrusions; ASTM B209, alloy 6061-T6, sheet and plate.

1. Protect aluminum surfaces in contact with cementitious materials with zinc chromate primer or chromate conversion coating.

E. Bronze: ASTM B455, alloy C38500 for extrusions; alloy C28000, Muntz Metal for plates.

F. Brass: UNS alloy C26000 for half hard sheet and coil.

G. Stainless Steel: ASTM A167, Type 304 with 2B finish, unless indicated otherwise, for plates, sheet and strips.

H. Extruded Pre-Formed Seals: Single or multi-layered rubber extrusions as classified under ASTM D2000, designed with or without continuous, longitudinal, internal baffles and formed to fit compatible frames, in color indicated, or it not indicated, as selected by Architect from manufacturer's standard colors.

I. Elastomeric Sealant: Manufacturer's standard elastomeric sealant complying with ASTM C920, Use T, factory formed and bonded to metal frames or anchor members; in color indicated, as selected by Architect from manufacturer's standard colors.

1. Joints up to two (2) inches wide - withstand plus or minus 35 percent movement of the joint width without failure.

J. Exterior Seals: Typically two single layered flexible extrusions, one interior PVC and one exterior thermoplastic rubber, as classified under ASTM D2000, retained in a set of compatible frames, in color indicated, or, if not indicated, as

selected by Architect from manufacturer's standard colors.

K. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installation.

2.3 FABRICATION

A. Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated on the Drawings. Select units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and structural movement. Furnish units in longest practicable lengths to minimize number of end joints. Provide hairline mitered corners where joint changes directions or abuts other materials. Include closure materials and transition pieces, tee-joints, corner, curbs, cross connections, and other accessories as required to provide continuous joint cover assemblies.

B. Flush Cover Assemblies:

1. Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating cover plate of design indicated on the Drawings. Furnish colorable, thermoplastic frame seal free from grooves or ridges with rigid edges for positive attachment to frame and center plate. Seals to have flexible core with shore hardness of 65A. Seals to be replaceable without removal of center plate and to be in one of four standard colors, unless otherwise specified. All aluminum in contact with concrete to have zinc chromate finish, and exposed aluminum to be mill finish.

C. Seismic Flush Cover Assemblies:

1. Provide continuous extruded aluminum frame assemblies of suitable profile to receive free floating center plate of design indicated on the Drawings. Center plate to be held in place and kept centered throughout movement cycle by spring loaded stainless steel turnbar spaced sixteen (16) inches on center maximum. Assembly to be sealed with dual durometer, colorable thermoplastic seals with rigid edges for positive attachment to frame and center plate. Free from grooves or ridges, seals to have flexible core of shore hardness 65A to allow maximum movement of +/- two (2) inches without gaps occurring between seal and cover assembly. Center plate to include concealed lifting device to allow full seismic movement without damage to cover. Seals to disengage under seismic conditions only. All aluminum in contact with concrete to have zinc chromate finish.

D. Seismic Model SSR Assemblies:

1. Provide continuous extruded aluminum frame assemblies of profile indicated on the Drawings to receive free-floating center plate. Center plate to be held in place and kept centered throughout movement cycle by spring loaded stainless steel turnbars spaced sixteen (16) inches on center maximum. Center plate to be recessed 1-5/8 inches to receive finish floor material. Seismic covers to allow +/- 1/2 inch of seasonal movement and frames allowing the center plate to raise during seismic movement. All aluminum in contact with concrete to have zinc chromate primer.

E. Extruded Aluminum Cover Assemblies:

1. Provide continuous extruded aluminum frame assemblies of suitable profile to receive free-floating cover plate of design indicated on the Drawings. Furnish depth and configuration to suit type of construction with no exposed fasteners. All aluminum in contact with concrete to have zinc chromate finish, exposed aluminum to be finished as noted free of gaskets and filler assemblies to be capable of +/- 50% expansion and contraction without loss of cover. Seismic covers of four (4) inch and wider to be retained by stainless steel turnbars 24 inches on center. Floor covers must withstand 500 lb. point load without damage or permanent deformation. Provide continuous flexible waterstop where detailed.

F. Vertical Exterior Seals:

1. Extruded thermoplastic rubber primary seals retained in extruded aluminum side frames complete with independent continuous PVC back seal. Side frames mounted on butyl caulk tape with appropriate anchors eighteen (18) inches on center. The installation to include factory, heat welded transitions where applicable to ensure a watertight system. Color of primary seal to be one of four standard colors or custom color selected by Architect.

G. Elastomeric Flexible Roof Covers:

1. Continuous neoprene sheet bellows complete with foam support membrane and continuous galvanized attachment flanges, mechanically fastened to curb member 24" o.c. Cover to be one-piece unit with optional back seal. All

transitions and end caps to be factory fabricated with butt joints sealed with site applied flexible splice covers. All as C/S Elastomeric Roof Covers as manufactured by Conspec Systems, Inc.

a. Flexible Bellows Roof Covers Assembly: Roof-to-roof and roof-to-wall neoprene bellows. Color black. As Model BRJ/BRJW

H. Roof Covers:

1. Metal - Provide continuous extruded aluminum base frame sections fastened to roof curb at twenty-four (24) inches on center with aluminum cover formed from minimum 0.078 inch thick aluminum sheet. Frames sealed with continuous extruded PVC gasket and seated on continuous neoprene waterstop. Frames to incorporate adjustable angle flange folded on site to cover edge of roof membrane. All transition and end caps to be factory fabricated to ensure maximum weather tightness, all butt joints to be sealed with aluminum splice cover bedded in sealant and fastened on one side only.

2. Extruded EPDM seals in profile to suit application complete with extruded aluminum frames where indicated. Seals to be supplied in maximum practical lengths with factory formed miters to ensure a watertight system.

I. Metal Finishes:

1. Comply with NAAM “Metal Finishes Manual” for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory after products are fabricated. Protect finishes on exposed surfaces with protective covering before shipment.

2. Aluminum Finishes:

a. Clear Anodized Finish - AA-C22A41; medium matte etched finish with 0.7 mil minimum thick anodic coating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that joint preparation and affected dimensions are acceptable.

C. Verify tolerances, and correct any improper conditions.

3.2 PREPARATION

A. Provide all templates as required to related trades for location of all supports and anchorage items.

3.3 INSTALLATION

A. In addition to requirements specified herein, comply with manufacturer's instructions and recommendations for all phases of Work; including preparation of substrate, applying materials, and protection of installed units.

B. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction; including threaded fasteners with drill-in fasteners for masonry and concrete where anchoring members are not embedded. Provide fasteners of metal, type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

C. Perform all cutting, drilling and fitting required for installation of expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.

D. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

E. Set floor covers at elevations to be flush with adjacent finished floor materials. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.

F. Locate wall, ceiling, roof and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with all required accessories.

G. Locate anchors at interval recommended by manufacturer, but not less than three (3) inches from each end, and not more than twenty-four (24) inches on center.

H. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. Cut and fit ends to produce joints that will

accommodate thermal expansion and contraction of metal to avoid buckling of frames.

I. Adhere flexible filler materials, if any, to frames with adhesive or pressure sensitive tape as recommended by manufacturer.

1. Installation of Extruded Preformed Seals - Install seals to comply with manufacturer's instructions and with minimum number of end joints.

2. For straight sections provide preformed seals in continuous lengths.

3. Vulcanize or heat-seal all field splice joints using manufacturer's recommended procedure.

4. Apply manufacture's approved adhesive, epoxy or lubricant adhesive to both frame interfaces prior to installing preformed seal.

5. Seal transitions in accordance with manufacturer's instructions.

J. *Installation of Elastomeric Sealant Joint Assemblies*:

1. Seal all end joints within continuous runs and joints at transitions in accordance with manufacturer's directions to provide a watertight installation.

2. Install exterior flexible seal in standard lengths.

3. Seal transitions and butt joints in accordance with manufacturer's instructions.

K. Installation of Seismic Seals:

1. Install secondary seals in continuous lengths; vulcanize all field splice joints in secondary seal material to provide watertight joints using manufacturer's recommended procedures.

2. Install primary flexible seals in standard lengths.

3. Seal transitions and butt joints in accordance with manufacturer's instructions.

4. Install transition and end joints to provide continuous fire resistance and in accordance with manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

A. Field inspection will be performed under provisions of Section 01460.

B. Provide inspection of expansion joint installation process, and certify in writing to the Architect that the system has been installed in accordance to Contract Documents.

3.5 CLEANING AND PROTECTION

A. Do not remove strippable protective material until finish work in adjacent areas is complete. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

B. Do not permit construction traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Steel Doors and Frames; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Exterior and Interior, Non-Rated and Rated, Seamless Standard Steel Doors.

2. Exterior and Interior, Non-Rated, Pressed Standard Steel Frames, Welded Unit Type for Doors, Transoms, Sidelights, Mullions, and Other Openings.

3. Interior, Non-Rated, Borrowed Light Pressed Standard Steel Frames, Welded Unit Type.

C. Installation of Steel Door and Frame Glazing, and Door Hardware.

D. Provide Factory Primed Steel Doors and Frames to be Field Paint Finished.

1.2 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Door Hardware: Finish hardware templates and hardware for installation by this Section.

B. Section 08810 - Glass and Glazing: Glass and glazing for installation by this Section.

1.3 RELATED SECTIONS

A. Section 04200 - Unit Masonry Systems: Grouting of steel door frames.

B. Section 06100 - Rough Carpentry: Wood framing, partitions, blocking and shims.

C. Section 07910 - Joint Sealers: Sealant and joint backing at steel frames.

D. Section 08210 - Wood Doors: Flush wood doors in steel frames.

E. Section 08710 - Finish Hardware: Finish hardware and templates.

F. Section 08810 - Glass and Glazing: Glazing in steel doors and frames.

G. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish.

H. Section 09900 - Paints and Coatings: Field painting of steel doors and frames.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's technical product data substantiating that products comply with requirements; including, but not limited to, details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles and finishes.

C. Shop Drawings: Indicate fabrication and installation of steel doors and frames; including details of each door and frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints at connections. Show all anchorage and accessory items.

1. Provide schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

2. Indicate coordination of glazing frames and stops with glass and glazing requirements.

D. Label Construction Certification: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, submit manufacturer's certification for that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Obtain all steel doors and frames from a single source manufacturer.

1.5 QUALITY ASSURANCE

A. Provide doors and frames complying with Steel Door Institute "Recommended

Specifications: Standard Steel Doors and Frames" (ANSI/SDI-100) and as herein specified.

B. Labeling of Doors: Provide labels on non-hinged side of door to allow for rating inspections when applicable hardware group calls for a continuous hinge.

C. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated or required, provide fire-rated door and frame assemblies that comply with UL 10C.

D. Fire-Rated Door and Frame Assemblies: Require assemblies and components to comply with positive pressure and S-Label requirements.

E. Oversize Fire-Rated Door Assemblies: For door assemblies required to be fire-rated and exceeding sizes of tested assemblies, provide certificate or label from an approved independent testing and inspection agency, indication that door and frame assembly conforms to the requirements of design, materials and construction as established by individual listings for tested assemblies.

F. Temperature Rise Rating: At stair well enclosures, provide doors that have Temperature Rise Rating of 450 degrees F maximum in 30 minutes of fire exposure.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Deliver hollow metal work carton or crated to provide protection during transit and job storage. Provide additional sealed plastic wrapping for factory finished doors.

C. Inspect hollow metal work upon delivery from damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.

D. Store doors and frames at building site under cover. Place units on minimum four (4) inch high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4 inch spaces between stacked doors to promote air circulation.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of steel doors and frames with and other construction to which steel doors and frames must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 COORDINATION

A. Coordinate the Work of this Section with door and frame opening construction, including door hardware installation.

1.9 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects; including delamination of veneer, warping beyond specified tolerances, defective materials and telegraphing core construction, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - STEEL DOORS AND FRAMES

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. The CECO Corporation.
2. Security Metal Products, Culver City.

B. Substitutions: No Substitutions Allowed.

2.2 STEEL DOORS

A. General:

1. Provide types and sizes indicated on the Door Schedule, full seam welded construction with no visible seams on the faces or edges.
2. Provide steel doors rigid and neat in appearance, no buckles or warpage. All

forming bends, straight with a minimum radius for the gauge of metal used.

3. Continuously seam welded the full height of the door vertical edge seams formed by the face sheets. Edges ground, filled and sanded smooth to provide a seamless edge surface.

4. Top and bottom edges of all steel doors, closed with a continuous recessed steel channel not less than 14 gauge, extending the full width of the door and spot welded to both faces. Provide exterior steel doors with an additional flush closing channel at their top edge and, where required for attachment of weather-stripping, a flush closure also at their bottom edge.

5. Door Thickness: Minimum 1-3/4 inches thick with a beveled lock edge 1/8 inch in two (2) inches. Provide doors mortised and reinforced for field application of hinges and locks in accordance with the approved hardware schedule and templates as furnished by the hardware supplier. Provide all surface mounted hardware with appropriate internal reinforcement plates for field drilling and tapping by the installation contractor.

6. After fabrication, chemically treat steel doors to insure maximum paint adhesion and paint with a rust-inhibitive primer in accordance with ANSI A224.1-87 procedures, oven dried and fully cured before packaging and shipment.

7. Provide steel doors of the following types:

   a. Grade II – Heavy Duty.

   b. Grade III - Extra Heavy Duty.

   c. Model 1 - Full Flush Design.

   d. Model 2 - Seamless Design.

   e. Core Design E - Mineral Fiber (Rated).

   f. Core Design F - Vertical Steel Stiffeners.

B. Exterior Doors: ANSI/SDI-100; Grade III, Model 2; minimum 16 gauge face sheets, 1-3/4 inches thick; galvanized steel with full flush construction having an A60 zinc coating conforming to ASTM specification A526. Seamless composite construction with Core Design F. Face sheets, stiffened by continuous vertical formed steel sections between door faces. Provide stiffeners not less than 22 gauge, spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches on center. Sound deaden and insulate spaces between stiffeners the full height of the door with expanding polyurethane foam-in-place insulation. Reinforce doors for all hardware. If required, provide door glazing under provisions of Section 08810.

C. Interior Doors (Non-Rated): ANSI/SDI-100, Grade II, Model 2; minimum 16 gauge face sheets, 1-3/4 inches thick; cold rolled steel with full flush construction conforming to ASTM specification A366. Seamless composite construction with Core Design F. Stiffen face sheets by continuous vertical formed steel sections between door faces with stiffeners not less than 22 gauge, spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches on center. Sound deaden spaces between stiffeners. Reinforce doors for all hardware. If required, provide door glazing under provisions of Section 08810.

D. Interior Doors (Fire-Rated): ANSI/SDI-100, Level II, Model 2; minimum 18 gauge face sheets, 1-3/4 inches thick; cold rolled steel with full flush construction conforming to ASTM A1008.

1. Seamless composite construction.

2. Core Design E, with stiffeners not less than 22 gauge, maximum six (6) inches spacing, spot-welds maximum five (5) inches on center.

3. Sound deaden and insulate spaces between stiffeners full height of the door with fire-resistive mineral wool.

4. If required, provide door glazing under provisions of Section 08810 with fire-rated glazing stops and UL label as indicated in the Door Schedule.

2.3 STEEL FRAMES

A. General:

1. All steel frames shall be of jamb depth, profile and size as indicated on the Door Schedule.

   a. Typical: 5-3/4 inch by two (2) inch.

2. All steel frames shall be rigid and neat in appearance, no buckle or warpage. All

forming bends shall be straight and of a minimum radius for the gauge of metal used.

3. Frame corners shall be saw mitered, fully back welded and ground smooth. Frames shall be double rabbet face profile as indicated on the Drawings, unless noted otherwise. **NO KNOCKDOWN FRAMES ALLOWED**.

4. Minimum depth of stops shall be 5/8 inch.

5. Frames for multiple or special openings shall have mullion and/or rail members which are closed shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

6. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully template mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface mounted hardware is to be applied, frames shall have reinforcing plates only; all drilling and tapping shall be done in the field by the hardware installer.

7. Floor anchors shall be of 14 gauge securely welded inside each jamb, with two (2) holes provided at each jamb for floor anchorage.

8. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs only to serve as a brace during shipping and handling.

9. After fabrication frames shall then be chemically treated to insure maximum paint adhesion and shall be painted with a rust-inhibitive primer in accordance with ANSI A224.1-87 procedures which shall be oven dried and fully cured before packaging and shipment.

10. All frames to have high frequency hinge reinforcement on all hinges.

11. All frames with continuous hinges to have twelve (12) gauge reinforcing full height of frame.

B. Exterior Frames: ANSI/SDI-100; minimum 14 gauge thick material, pressed steel frames, capped and butted stops with face corners mitered, welded and ground smooth; hot-dipped galvanized having an A60 zinc coating conforming to ASTM specification A653. Reinforce for all hardware; sound deaden spaces inside frames. If required, provide glass and glazing in accordance with Section 08810 with manufacturer's standard glazing stops.

C. Interior Frames (Non-Rated): ANSI/SDI-100; 14 gauge thick material, cold-rolled steel frames, capped and butted stops with face corners mitered, welded and ground smooth. Reinforce for all hardware; sound deaden spaces inside frames. If required, provide glass and glazing in accordance with Section 08810 with manufacturer's standard glazing stops.

2.4 HARDWARE REINFORCEMENT

A. Reinforce steel doors and frames adequately for all hardware; as a minimum provide the following reinforcing:

1. Cover Boxes: Provide for hardware cut-outs.

2. Lock Strike Reinforcement: 12 gauge by template requirements.

3. Hinge and Pivot Reinforcement (Each Location): Minimum 7 gauge, 1-5/8 inch x 10 inches long welded to frame.

4. Lock Edge Reinforcement, Flush Bolts, Concealed Holders, Concealed or Surface Mounted Closer: Minimum 12 gauge x 14 inches long x full frame width welded to frames.

5. Other Surface Mounted Hardware: 16 gauge.

6. Angle Floor Clips: 16 gauge welded to frames or shipped loose, and each drilled for two (2) 3/8 inch anchors.

B. Galvanized steel doors and frames shall have galvanized hardware reinforcements.

2.5 FRAME ANCHORS

A. Provide steel frames for installation in masonry walls with adjustable jamb anchors of type recommended by frame manufacturer. Anchors: not less than 16 gauge steel or 0.156 inch diameter steel wire. Stirrup straps: not less than 2 x 10 inch in size, corrugated and/or perforated. Provide anchors on each jamb as follows:

1. Frames up to 7’-6” height: Three (3) anchors.
2. Frames 7’-6” to 8’-0” height: Four (4) anchors.
3. Frames over 8’-0” height: One (1) anchor for each two (2) feet or fraction thereof in height.

B. Provide steel frames for installation in stud partitions with steel anchors of suitable design, not less than 18 gauge thickness, securely welded inside each jamb as follows:

1. Frames up to 7’-6” height: Four (4) anchors.
2. Frames 7’-6” to 8’-0” height: Five (5) anchors.
3. Frames over 8’-0” height: Five (5) anchors plus one (1) additional anchor for each two (2) feet or fraction thereof over 8’-0”.

C. Provide steel frames to be anchored to previously placed concrete, unit masonry or structural steel with anchors of suitable design as shown on approved shop drawings.

D. Steel frames for installation in masonry wall openings more than 4’-0” in width shall have an angle or channel stiffener factory welded into the head of the frame. Stiffeners: not less than 12 gauge steel and not longer than the opening width. Do not use stiffeners as lintels or load bearing members.

E. Dust cover boxes (mortar guards) of not less than 26 gauge steel, provided at all hardware mortises on frames to be set in masonry or plaster partitions.

2.6 ACCESSORIES

A. Provide removable steel spreaders attached to the bottom of three-sided frames.

B. Mark frame number on the jamb of each frame in butt recess for identification at the job site.

C. Glazing Frames: Anemostat “LoPro-IS Vision Frames for Glazing,” or approved equal.

D. Non-Rated Glazing Stops and Moldings: Rolled steel channel shape, minimum 18 gauge, prepared for counter sink style tamper proof screws.

E. Frames Silencers: Resilient rubber, fitted into factory drilled hole.

F. Mortar Guards: Provide minimum 26 gauge steel mortar guards or mortar boxes at back of hardware cut-outs where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.7 FABRICATION

A. Fabricate steel door and frame units rigid, neat in appearance and free from defects, warping or buckling. Wherever practicable, fit and assemble units in manufacturer's plant. Provide stiffeners where indicated.

1. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at project site.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from cold-rolled steel.

D. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of minimum 16-gauge inverted steel channels.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips heads for exposed screws and bolts.

F. Finish Hardware Preparation: Prepare doors and frames to receive mortised and concealed finish hardware in accordance with final Finish Hardware Schedule, with templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 series specifications for door and frame preparation for hardware.

1. For concealed overhead door closer, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.
2. For magnetic locks provided under Division 16, prepare doors and frames with templates provided by magnetic lock supplier.

G. Reinforce door and frames to receive surface-applied hardware. Drilling and tapping for

surface-applied finish hardware may be done at project site.

H. Locate finish hardware as indicated on final shop drawings or, if not indicated, in accordance with "Recommended Locations for Builder's Hardware:" by the Door and Hardware Institute.

I. Shop Painting:

1. Clean, treat, and paint exposed surfaces of steel doors and frame units, including galvanized surfaces.

2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.

3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive finish paint.

4. Exterior Doors: Hot-dipped galvanized in the 0.6 ounce coating class (G60), to conform to ASTM A653.

J. Field Painting: Touch-up and finish painting under provisions of Section 09900.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that all hardware reinforcing conforms with templates furnished by Section 08710.

3.2 INSTALLATION

A. General: Install standard steel doors and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.

B. Door Installation:

1. Fit steel doors accurately in frames, within clearances specified in ANSI/SDI-100.

C. Install steel doors with uniform margin at jambs and heads. Upon complete erection, verify all items are in perfect operating condition with all doors swinging free and not rattling when closed.

D. Placing Frames: Comply with provisions of SDI-105, “Recommended Erection Instructions for Steel Frames", unless otherwise indicated.

1. Grout all frames 2’-0” above finish floor in stud walls.

2. Grout frames solid in masonry walls.

3. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction at enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged.

4. In masonry construction, located three (3) wall anchors per jamb at hinge and strike levels and grout solid full height.

5. At in-place concrete or masonry construction, set frames and secure to adjacent construction with machine screws and masonry anchorage devices.

6. In metal stud partitions, install at least three (3) wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

7. Grout all frames to 2’-0” AFF with approved non-shrink material

E. Hardware Installation: Refer to Section 08710 for hardware installation requirements.

3.3 ERECTION TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.4 CLEANING AND ADJUSTING

A. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged

areas of prime coat and apply touch-up of compatible air-drying primer.

B. Final Adjustments: Check and readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

END OF SECTION 08110

SECTION 08210 - WOOD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Wood Doors; as Indicated on the Drawings and Door Schedule, Specified Herein; Including Related Accessories and Attachments.

1. Interior Non-Rated Flush Wood Doors.
2. Interior Rated Flush Wood Doors.

C. Installation of Door Glazing, Louvers and Hardware.

D. Factory Finished Doors.

1.2 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Door Hardware: Finish hardware templates and products to be installed by this Section.

B. Section 08810 - Glass and Glazing: Glass products to be installed by this Section.

1.3 RELATED SECTIONS

A. Section 08110 - Steel Doors and Frames: Steel door frames.

B. Section 08710 - Door Hardware: Hardware templates and products for flush wood doors.

C. Section 08810 - Glass and Glazing: Door glass.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Door Manufacturer’s Literature: Certificate of compliance with NWWDA I.S.I-86.

C. Shop Drawings: Submit schedules and elevations indicating door opening criteria, sizes, types, construction, swing, label, clearance, special beveling, special blocking for hardware, identify cut-outs for glazing and applicable hardware locations.

D. Product Data: Indicate manufacturer’s door core materials and construction; veneer species, type and characteristics; factory machining criteria and factory finishing criteria.

E. Samples: Submit 12 x 12 inch samples of door veneer; illustrating wood species, grain and color.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Submit manufacturer's written certification that all labeled wood fire-rated doors have been machined under licensed inspection.

H. Test Reports: Submit Laboratory test reports of NWWDA TM-5 Split Resistance, NWWDA TM-7 Cycle/Slam Test, NWWDA TM-8 Hinge Loading Resistance and NWWDA TM-10 Screw Holding Capacity.

1.5 QUALITY ASSURANCE

A. Quality Standards; Comply with the following standards:

1. NWWDA Quality Standard: I.S.1 - "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
2. AWI Quality Standards: "Architectural Woodwork Institute" (AWI), including Section 1300 - Architectural Flush Doors for grade of doors, core construction, finish and other requirements exceeding those of NWWDA quality standards.

B. NWWDA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S.1 Premium Grade Series.

C. Labeling of Doors: Provide labels on non-hinged side of door to allow for rating inspections when applicable hardware group calls for a continuous hinige.

D. Manufacturer: Obtain all wood doors from a single source manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division One.

B. No wood doors shall be delivered to the site until weatherproof storage space is available.

C. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish,

Install, and Maintain Wood Doors", as well as with manufacturer's instructions.

D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in wet or damp areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week. Break seal on-site to permit ventilation.

E. Identify each wood door with individual opening numbers which correlate with designation system used on shop drawings for wood doors, frames and hardware, using temporary, removable or concealed markings.

1.7 PROJECT CONDITIONS

A. Environment: Do not deliver or install wood doors until conditions for temperature and relative humidity have been stabilized, and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:

1. Referenced AWI Quality Standard, including Section 100-S-11; "Relative Humidity and Moisture Content".

1.8 FIELD MEASUREMENTS

A. Verify actual locations of wood doors and other construction to which wood doors must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication of products without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.9 COORDINATION

A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.10 WARRANTY

A. Provide manufacturer’s written warranty, including replacement, re-finishing and re-hanging, under provisions of Division One to the following terms:

1. Life of Original Installation: Interior Solid Core Wood Doors.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

C. Contractor’s Responsibilities: Replace or refinish flush wood doors where Contractor’s work contributed to rejection or to voiding of the manufacturer’s warranty.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. EGGERS Industries, Inc.
2. Graham Manufacturing Corporation.
3. Marshfield Door Systems (was Weyerhaeuser).

B. Substitutions: Under provisions of Division One.

2.2 DOOR TYPES

A. Flush Interior Wood Doors (Non-Rated): Premium grade 5-ply Architectural doors, 1-3/4 inches thick; solid core construction of Particleboard DPC-1 (32 lb./cu ft); stiles and rails securely bonded to core; factory transparent finish under provisions of Section 09900; and 1/4 inch thick glass lights as scheduled.

B. Flush Interior Wood Doors (Fire-Rated): Premium grade 5-ply Architectural doors, 1-3/4 inches thick; solid fire-rated core construction; wood veneer faces, solid edge band securely bonded to core; fire-rated label 45 minute attached to door; factory transparent finish under provisions of Section 099000; and 1/4 inch thick glass lights as scheduled.

2.3 FLUSH DOOR FACING

A. Veneer Facing (Flush Interior Doors): WI Premium Grade “A” Quality species wood, Natural White Birch, book matched; face veneer balance to

be center balanced match; color to be chosen by Architect.

B. Face veneers Thickness: Minimum 1/50 inch thick prior to field sanding.

C. Face veneers shall comply with matching requirements of AWI 1300-G-13.

2.4 CROSS BANDS

A. Cross bands: Minimum of 1/16 inch thick engineered fiber with no voids or defects, extending full width of doors with grain at right angles to face veneer. Laminate cross bands to core using Type I glue.

B. No exposed cross bands on ends of door.

2.5 NON-RATED AND 20 MINUTE DOORS

A. Labeled 20-minute doors: Tested in conformance with UL 10C and UBC 7-2 conducted by Underwriter Laboratories (UL), Warnock-Hersey, or by other recognized independent testing agencies.

1. Where required Intumescent seal to be concealed at visible door edges with same species veneer

2. Labeling of Doors: Provide labels on non-hinged side of door to allow rating inspections.

B. Particleboard Core: ANSI A208 1-LD-2 Particleboard. Vertical and horizontal edges must be securely bonded to the core, and then abrasively sanded as a unit before veneering. No visible joints will be permitted.

1. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

C. Vertical edges (Stiles):

1. 1-3/8 inch minimum structural composite lumber backer or inner plies

2. Veneered to match species of visible surface.

3. Minimum test rating of 525 lb. per the NWWDA TM-5 Split Resistance, 930 lb. per the NWWDA TM-8 Hinge Loading Resistance, and 1000 lb. per the NWWDA TM-10 Screw Holding Capacity test reports.

4. Fire treated stiles, edges to match face veneer, at 20-minute doors.

D. Horizontal Edges (Rails):

1. Top and bottom edges: 5 inch minimum hardwood or structural composite lumber.

2. 5-inch midrail blocking, in doors indicated to have exit devices.

2.6 LABELED FIRE DOORS (45, 60 AND 90 MINUTE)

A. Labeled fire doors: Tested in conformance with UL 10C and UBC 7-2 conducted by Underwriter's Laboratories (UL), Warnock-Hersey, or by other recognized independent testing agencies.

1. Intumescent seal to be concealed at visible door edges with same species veneer

B. Cores: Door manufacturer's standard non-combustible mineral core.

1. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.

C. Reinforcement: Provide vertical edges, top and bottom rails per the manufacturer standard fire door approvals.

1. Vertical edge veneer: To match species of visible surface.

2. Hinge edge: Laminated on all fire doors to accommodate full mortise hinges and to provide additional screw holding power when hinge is installed, unless specified otherwise.

D. The vertical edges on labeled doors will require a minimum test rating as follows:

WHI TEST	45 and 60 MINUTES	90 MINUTES
WDMA TM-5 Split Resistance	1400 lb.	1075 lb.
WDMA TM-7 Cycle/Slam	200,000 min.	200,000 min.
WDMA TM-8 Hinge Loading Resistance	740 lb.	660 lb.
WDMA TM-10 Screw-Holding Capacity	1300 lb.	775 lb.

2.7 ADHESIVE

A. Interior Doors: AWI 1300-S-6; Type 1 - Waterproof.

2.8 ACCESSORIES

A. Glazing Frames: Anemostat "LoPro-IS Vision Frames for Glazing," or approved equal.

B. Glazing Stops (Non-Rated): Manufacturer's standard flush wood molding glazing stops; prepared for flush finish nails and adhesive.

C. Louvers: Factory supplied, inverted "Y" type of 18 gauge steel with factory prime finish, rated to match fire-rating on door, sizes as indicted on Door Schedule, and transparent finish under provisions of Section 09900. Fire-rated louvers to be Air Louvers, Inc. #1900A or equal.

2.9 FABRICATION

A. Fabricate non-rated doors in accordance with AWI Premium Quality Standard requirements.

B. Fabricate fire-rated doors in accordance with WI Premium Quality Standard and to UL-10C requirements. Attach fire-rating label to door.

C. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

D. Refer to Section 08710 - Finish Hardware; for complete door hardware templates and products.

E. Refer to Section 08810 - Glazing; for complete glass and glazing requirements.

F. All cutouts for vision panels must be minimum of six (6) inches from the edge of the door and/or other cutouts for louvers, locks, closer or other hardware.

G. Use a ten (10) inch margin between the edge of the door and the edge of any cutout near the lock area.

H. Provide solid wood blocking at vertical stiles, and top and bottom edges of all doors, fire rated and non-rated, per Article 2.5.A which would otherwise require through bolting for attachment of closer and locksets. **Wood doors are to have no through bolting.**

2.10 WOOD DOOR FINISHING

A. Factory Transparent Finishing:

1. Factory finish doors in accordance with WI Finish System Standards.
2. Use only high-grade finishing material, and follow the manufacturer's instructions. Do not intermix materials from different suppliers.
3. Apply seal coat to both faces and four edges; allow for thorough drying. Sand lightly with 120 to 180 grit sandpaper. This seal coat will allow uniform staining of the veneers when stained or when filler stain is required.
4. Factory Finish to meet or exceed performance standards of TR-6, Catalyzed Polyurethane.
5. Apply one or two coat(s) of stain or filler stain as required. Allow to dry thoroughly.
6. Clean surfaces of all dust and dirt.
7. Apply two coats of topcoat; allow to dry and sand between coats.
8. Apply finish to both faces and four edges of doors.
9. Color to be selected by Architect from manufacturers standard finish colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install non-rated doors in accordance with AWI Premium Quality Standard requirements.

B. Install fire-rated doors in accordance with AWI Premium Quality Standards, and to NFPA 80 requirements.

C. Trim non-rated door width by cutting equally on both jamb edges.

D. Trim fire-rated door width from lock edge only, to a maximum of 3/16 inch.

E. Trim door height by cutting bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, in accordance with fire rating requirements.

F. Pilot drill screw and bolt holes.

G. Machine cut for hardware. Core for handsets and cylinders.

H. Coordinate installation of doors with installation of standard steel frames specified in Section 08110, and hardware specified in Section 08710.

I. Coordinate installation of glass and glazing as specified in Section 08810.

J. Hardware Installation: Refer to Section 08710 for hardware installation requirements.

3.3 INSTALLATION TOLERANCES

A. Conform to AWI requirements for fit and clearance tolerances.

B. Conform to AWI 1300 requirements for maximum diagonal distortion.

C. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taught string, edge to edge, over an imaginary 36 x 84 inch surface area.

3.4 CLEANING AND ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Operation: Re-hang or replace wood doors which do not swing or operate freely.

C. Finished Doors: Refinish or replace wood doors damaged during installation.

3.5 PROTECTION

A. Protect wood doors as recommended by door manufacturer to assure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08210

SECTION 08260 - SLIDING GLASS DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Exterior Prefinished Thermally Broken Extruded Aluminum Sliding Glass Doors and Frames; Including Operating Hardware, Track, Stacking Bays, Threshold, and All Accessories and Attachments.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08810 - Glazing: Clear tempered safety glass units.

1.3 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Rough wood perimeter blocking.

B. Section 07210 - Building Insulation: Perimeter vapor and air seal between sliding door frame and adjacent construction.

C. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

D. Section 08410 - Aluminum Entrances and Storefronts.

E. Section 08710 - Door Hardware: Cylinder locks.

F. Section 08810 - Glazing: Glass type and installation.

1.4 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of sliding door as calculated in accordance with the California Building Code and as measured in accordance with ANSI/ASTM E330.

B. Limit member deflection to flexure limit of glass; with full recovery of glazing materials.

C. System to accommodate deflection of lintel without damage to components, deterioration of seals, or movement between door frame and perimeter framing.

D. Ensure continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.

E. Drain water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system, to the exterior by a weep drainage network.

F. Thermal Movement: Design sections to permit thermal expansion and contraction of components as compared to perimeter opening construction.

G. Limit air infiltration through assembly to 0.06 cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf psf as measured in accordance with ANSI/ASTM E283.

H. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 2.86 lbf/sq ft.

I. Forced Entry Resistance: ASTM F842 Type B, Grade 30.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, affected related work, installation requirements, and stacking arrangement.

C. Product Data: Provide manufacturer’s component dimensions, fastener types, glass type, internal drainage details, performance criteria tests and certificates, and cuts of hardware and accessories,.

D. Samples: Submit samples, illustrating typical sliding door panel corner construction, door frame corner construction, frame, threshold profile, and finishes.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with the following:

1. Fabricate door assembly in accordance with ANSI/AAMA 101.

2. Fabricate insulated glass units in accordance with FGMA Glazing Manual.

1.7 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in commercial fabrication of sliding doors with five (5) years minimum experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond to substrate when exposed to sunlight or weather.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and twenty four (24) hours after installation of sealants.

1.10 FIELD MEASUREMENTS

A. Verify actual locations of sliding glass doors and other construction to which sliding glass doors must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.11 WARRANTY

A. Provide five year written manufacturer's warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including coverage for insulated glass units from seal failure, interpane dusting or misting, replacement of same, ans coverage for degradation of color finish; after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Nana Wall Systems – "HSW50 Double Leaf Framed Sliding Door System."

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Extruded Aluminum: ANSI/ASTM B221, 6063-T5 alloy, thermally broken.

2.3 GLASS

A. Glass and Glazing Materials: Specified in Section 08810. All glass to comply with ANSI Z97.1 and CPSC 16FR 1201.

2.4 ACCESSORIES

A. Anchors: Corrosion resistant steel.

B. Bituminous Paint: Fibered asphaltic type.

C. Sealant and Backing Materials: As specified in Section 07910.

2.5 HARDWARE

A. Pull Handles: Manufacturer's standard type.

B. Threshold: Extruded aluminum thermally broken.

C. Sliding Panel Bottom Rollers: Stainless steel, adjustable from interior.

D. Limit Stops: Resilient rubber.

E. Cylinder Locks: Specified in Section 08710.

2.6 COMPONENTS

A. Unit Frame:

1. See Drawings.

2. Construction: Extruded aluminum with screw lock corner construction.

B. Fixed and Sliding Frame:

1. See Drawings.

2. Construction: Extruded aluminum with screw lock corner construction.

3. Weatherstripping: Manufacturer's standard.

C. Threshold: Extruded aluminum; sloped for positive wash; fit under frame to 1/2 inch beyond wall face; one piece full width of opening.

2.7 FABRICATION

A. Size and fabricate door assembly to allow for tolerances of rough framed openings, clearances, shim spacing and shims around perimeter of assemblies.

B. Ensure joints and connections are flush, hairline, and waterproof.

C. Form sills and stools in one piece. Slope sills for wash.

D. Accurately and rigidly fit joints and corners. Match and align cladding joints for continuity of line and design.

E. Match components to ensure continuity of line.

F. Provide drainage to exterior for moisture entering joints and glazing spaces and condensation occurring within frame construction.

G. Install glass in fixed and sliding units in accordance with manufacturer's standard method.

2.8 FINISHES

A. Exterior and Interior Surfaces: Finish Anodized to color as selected by Architect.

B. Threshold: Mill finish.

C. Pull Handles: Baked enamel, color as selected by Architect.

D. Locks: As shown in Section 08710.

E. Apply coat of bituminous paint on concealed aluminum surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that openings are ready to receive work and opening dimensions and clearances are as indicated on the Drawings.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit in conjunction with air and vapor seal.

3.3 INSTALLATION

A. Install sliding glass door unit assembly in accordance with manufacturer's instructions.

B. Attach frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Use anchorage devices to securely fasten sliding door assembly to wall construction without distortion or imposed stresses.

D. Coordinate installation of thermal insulation at shim spaces at frame perimeter as specified in Section 07210.

E. Place threshold in bed of butyl sealant.

F. Install perimeter sealant to method required to achieve performance criteria and in accordance with Section 07910.

G. Install glass in fixed and sliding units in accordance with manufacturer's standard method.

3.4 ERECTION TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation from Plumb: 1/16 inch.

C. Maximum Variation from Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 foot straight edge.

3.5 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Remove labels and visible markings.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.6 PROTECTION

A. Do not permit continuing construction activities near unprotected finish surfaces.

END OF SECTION 08260

SECTION 08330 - COILING DOORS AND GRILLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Coiling Doors and Grilles; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Exterior, Electrically Operated, Non-Rated Overhead Coiling Steel Doors; Factory Primed.

1.2 RELATED WORK

A. Section 05120 - Structural Steel: Support framing for door openings.

B. Section 05400 - Cold Formed Metal Framing: Structural metal wall framing.

C. Section 06100 - Rough Carpentry: Wood blocking and shims.

D. Section 08710 - Door Hardware: Cylinders for locks.

E. Section 09250 - Gypsum Board Systems: Interior metal framing and gypsum board finish.

F. Section 09900 - Paints and Coatings: Field finishing.

G. Division 16 - Electrical: Conduit, boxes, wiring, disconnect switches and all necessary fittings and connections to complete the installation of the electrically operated coiling doors.

1.3 REFERENCES

A. ASTM A525 - General Requirements for Steel Sheet, Zinc - coated (Galvanized) by the Hot-Dip Process.

B. ASTM B209 - Aluminum and Aluminum Alloy Sheet and Plate.

C. ASTM B221 - Aluminum Alloy Extruded Bar, Rod Wire, Shape and Tube.

D. AAMA 607.1 - Specifications and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.

E. ANSI/NFPA 70 - National Electrical Code.

1.4 EXTERIOR DOOR SYSTEM DESCRIPTION

A. Exterior electrically operated insulated doors with overhead counter balance devices. Coiling doors shall be designed to withstand a minimum of twenty (20) lb. per square foot wind load. Wind-locks shall be provided as required for wind load protection.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate pertinent dimensioning, general construction, component connections and details, electrical requirements and connections, anchorage methods, hardware location, and installation details.

C. Product Data: Provide manufacturer’s data for door specifications, door and frame finish.

D. Submit manufacturer's installation instructions.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit manufacturer's operation and maintenance data under provisions of Division One.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of coiling doors and other construction to which coiling doors must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 WARRANTY

A. Provide two (2) year manufacturer’s written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - OVERHEAD COILING DOORS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Overhead Door Corporation.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. The COOKSON Company.

2. Atlas Door Corporation.

3. Pacific Door Company.

C. Substitutions: No Substitutions Allowed.

2.2 EXTERIOR INSULATED ROLLING DOOR

A. General: Overhead Exterior Coiling Steel Door, face-mounted on finished opening with complete operating assemblies.

B. Curtain: Lateral movement of slats to be contained by means of cast-iron and fastened with two (2) zinc-plated steel rivets. Wind-locks shall be provided as required by door size or special wind load requirements. Bottom bar shall be two (2) steel angles, minimum 1-1/2" x 1-1/2" x 1/8". Single contact type bottom weather-stripping extended into guides. Provide dual durometer low temperature vinyl extrusion snaps to middle guide angle to provide effective seal at jambs. Provide a reinforced neoprene sheet attached to the hood and extending its full length, resting on the curtain to minimize air infiltration. Doors shall include galvanized bottom bar.

C. Flat Slats: The curtain shall consist of interlocking contour flat slats not less than 20 gauge commercial quality hot-dipped galvanized (G90) steel per ASTM A525 and A526 with a two (2) coat baked-on primed paint. Slats shall have a 3/4 inch thick, expanded polystyrene core included with the entire length of each slat. Interior surface shall be covered with a primed paint, 20 gauge hot-dipped galvanized steel. The door shall be provided with bottom astragal vinyl jamb seal and hood baffle as a standard.

D. Guides: All guide assemblies shall be fabricated from three (3) structural steel angles with minimum 1/4 inch thickness. Wall mounted angle shall be continuous type, minimum 3" x 3" x 1/4" .Guide angles shall be minimum 3" x 3" x 1/4" and fitted with two (2) removable bell-mouth curtain stops each.

E. Brackets: Mounting bracket plates shall be made from a minimum 1/4 inch steel plate and attached to the wall angle of the guide assembly with 1/2 inch diameter Class 5 case hardened bolts. The drive side brackets shall be fitted with sealed ball bearing.

F. Barrel: The barrel shall be made from a minimum 4-1/2 inch O. D. x 0.120 inch wall structural steel pipe. Deflection of pipe under full load shall not exceed 0.03 inch per foot of span.

G. Counter Balance: The curtain shall be counter-balanced by means of oil tempered, helical torsion springs, grease-packed and mounted on a single continuous steel torsion shaft. Springs shall be compression spring design to facilitate any counter-balance maintenance.

H. Hood: The hood shall be 24 gauge primed painted, hot-dipped galvanized steel with rolled edges.

I. Hood Baffle: Hood shall incorporate a flame baffle (UL listed) activated by fusible links.

J. Automatic Closure: Closure shall be initiated by melting a 165 degree fusible link. Operation mechanism will be disengaged during automatic closing of the door and a rate of descent controlled by a governor.

K. Operation: Operators shall be jack-shaft type, UL listed.

1. Motor: Provide 1/2 HP, 115 volt, single phase, permanent split capacitor motor with built-in automatic reset overload protection.

2. Reduction: Furnish V-belt drive from motor to full ball bearing power train with additional reduction by chain and sprockets. All power train shafts shall be minimum 3/4 inch diameter.

3. Roller Chain Drive: Door shaft shall be driven by roller chain to provide door travel of six (6) inches to twelve (12) inches per second.

4. Adjustable Friction Clutch: Provided to protect door and operator if door movement is obstructed.

5. Limit Switches: Provide positive chain drive screw type limit switch, enclosed in electrical control box. Limit switches will remain in time when emergency chain hoist is used and door is operating manually.

6. Control Wiring: Control voltage shall be 24 volt. Solid state circuitry with built-in safety edge to reverse capability, external radio control hook-up and maximum run timer shut-off feature.

7. Electrical Enclosure: All electrical components shall be NEMA 1 enclosures.

8. Magnetic Brake: Furnish magnetic solenoid brake for positive stop.

L. Finish: All non-plated components of the door shall receive one (1) coat of rust-inhibitive primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that all electrical control stations and connections are properly sized.

C. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install coiling doors and grilles in accordance with manufacturer's instructions.

B. Fit, align and adjust door assemblies level and plumb; provide smooth operation.

C. Coordinate with electrical for locations of control stations, and connection to individual motors.

D. Verify that all motors have UL listings.

E. Doors and all exposed components shall be field painted under provisions of Section 09900.

3.3 CLEANING AND ADJUSTING

A. Provide final cleaning for the door and all components.

B. Adjust the door for proper operation.

END OF SECTION 08330

SECTION 08410 - ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Exterior Prefinished Aluminum Entrance Doors and Storefront With Thermally Broken Frames; Including Attachments and Accessories.

C. Installation of Vision and Spandrel Glass Panels.

D. Installation of Entrance Door and Frame Hardware Furnished by Section 08710.

1.2 PRODUCT INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08710 - Finish Hardware: All entrance door and frame hardware items and templates, except as noted otherwise.

B. Section 08810 - Glazing: Aluminum frame, door and window glass.

1.3 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and shims.

B. Section 07210 - Building Insulation: Vapor seal and batt insulation for shim spaces.

C. Section 07910 - Joint Sealers: System perimeter sealant and back-up materials.

D. Section 08710 - Finish Hardware: Finish hardware items and templates.

E. Section 08810 - Glazing: Glass and glazing methods.

1.4 SYSTEM DESCRIPTION

A. Aluminum entrances and storefront system; includes tubular aluminum sections thermally broken except door jambs at exterior with supplementary internal support framing as required, shop fabricated, factory prefinished, vision and spandrel glass, extruded break metal, related flashings, and anchorage and attachment devices. Interior aluminum doors and frames shall not be thermally broken.

1. Front glazed.

1.5 PERFORMANCE REQUIREMENTS - FRAMES

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with California Building Code, Exposure "C", and as measured in accordance with ASTM E330.

B. Limit mullion deflection to flexure limit of glass; with full recovery of glazing materials.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

2. Seismic Loads: As indicated on Drawings.

D. Uniform Load: Apply a static air design load of 25 psf in the positive and negative direction in accordance with ASTM E330. There shall be no deflection in excess of L/175 of the span of any framing member. At a structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

E. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

H. Thermal Transmittance (U-value): When tested to AAMA Specification 1503, the thermal transmittance (U-value) shall not be more than:

1. Glass to Exterior – 0.47 (low-e) or 0.61 (clear).

2. Glass to Center – 0.44 (low-e) or 0.61 (clear).

3. Glass to Interior – 0.41 (low-e) or 0.56 (clear).

I. Condensation Resistance (CRF): When tested to AAMA Specification 1503, the condensation resistance factor shall not be less than:

1. Glass to Exterior – 70_{frame} and 69_{glass} (low-e) or 69_{frame} and 58_{glass} (clear).
2. Glass to Center – 62_{frame} and 68_{glass} (low-e) or 60_{frame} and 58_{glass} (clear).
3. Glass to Interior – 56_{frame} and 67_{glass} (low-e) or 54_{frame} and 58_{glass} (clear).

J. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heal bead of glazing compound.

K. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental affect to system components.

L. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network, and provide for pressure equalization of these spaces.

1.6 PERFORMANCE REQUIREMENTS - SWING DOORS

A. Structural: Resistance to corner racking tested by the Dual Moment Load Test as follows:

1. Test section consisting of a standard top door corner assembly. 24 inches long side rail section and 12 inches long top rail section.
2. Anchor "top rail" positively to test bench so that corner protrudes three (3) inches beyond bench edge.
3. Anchor a lever arm positively to "side rail" at a point 19 inches from inside edge of "top rail". Attach weight support pad at a point 19 inches from inner edge of "side rail".
4. Test section shall withstand a load of 245 pounds on the lever arm before reaching the point of failure, which is considered a rotation of the lever arm in excess of 45 degrees.

B. Air infiltration: Tested in accordance with ASTM E283, at a pressure differential of 1.57 psf. A single 3'-0" x 7'-0" entrance door and frame shall not exceed 0.50 cfm per linear foot of perimeter crack. A pair of 6'-0" x 7'-0" entrance doors and frame shall not exceed 1.0 cfm per linear foot of perimeter crack.

C. Manufacturer shall provide written certification to the Architect that all performance requirements noted above have been tested and approved by an independent agency. If this certification cannot be produced, then the manufacturer shall have the doors and frame tested at no additional cost to the Owner.

1.7 SUBMITTALS

A. Submit under provisions of Division One. Window details, structural calculations and specifications must be submitted to the Division of State Architect for deferred approval prior to installation.

B. Shop Drawings: Indicate system elevations and dimensions, profiles of door members, thicknesses of metal for doors and frames, sizes and types of fasteners, methods of glazing, framed opening requirement and tolerances, mullion details, affected related Work and expansion and contraction joint location and details.

C. Product Data: Provide component specifications and characteristics; describe components within assembly, anchorage and fasteners, glass and glazing, door hardware reinforcing, and internal drainage details.

D. Samples: Submit samples illustrating prefinished aluminum surface, glass, and glazing materials.

E. Submit manufacturer's installation instructions.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with AAMA SFM-1 and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specifications Manual.

B. Storefront shall conform to all applicable building codes and with authorities having jurisdiction.

C. Provide the Architect with current (within past 12 months) test reports from a AAMA certified and accredited independent laboratory certifying the performance requirements as specified in 1.06.

D. Test reports shall be accompanied by the manufacturer's letter of certification stating that the tested windows meet or exceed the referenced criteria for the appropriate ANSI/AAMA 101-88 window type.

1.9 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing and installing aluminum glazing

systems as specified in this Section with minimum ten (10) years documented experience.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Handle work of this section in accordance with AAMA - Curtain Wall Manual #10.

C. Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.12 FIELD MEASUREMENTS

A. Verify actual locations of aluminum entrances and storefront and other construction to which entrances and storefronts must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.13 COORDINATION

A. Coordinate the Work of this Section with installation of firestopping, air and vapor barrier and all other related components or materials.

1.14 WARRANTY

A. Provide five (5) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. KAWNEER Corporation –

   a. Trifab VG 451-T Framing System,

   b. #500 Entrance Doors,

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. Arcadia – "AG451T."

2. VISTAWALL Architectural Products, Inc. – "Series 3000 Thermal Multipane Flush Glaze.".

C. Substitutions: No Substitutions Allowed.

2.2 MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper.

B. Sheet Aluminum: ASTM B209; 6063 alloy, T5 temper.

C. Steel Sections: ASTM A36; shaped to suit mullion sections.

D. Fasteners: Stainless steel.

E. Shop and Touch-Up Primer for Steel Components: SSPC 15, Type 1, red oxide.

F. Perimeter Anchors: Stainless steel or zinc plated steel.

G. Glazing Gaskets: Elastomeric or neoprene.

2.3 DOOR AND FRAME COMPONENTS

A. KAWNEER 451-T Framing: Thermally broken system allows frame to be installed from unitized assemblies. Framing system provides for flush glazing on all sides with no projecting stops. Provide entrance-framing members compatible with glass framing in appearance. Provide positive barrier weathering with all single acting entrance frames. Manufacturer's standard thermal barrier and elastomeric glazing gaskets.

1. Front glazed.

2. Frame Dimensions: 2 inch nominal face dimension of vertical and horizontal framing members with 4-1/2 inches overall depth.

B. Reinforced Mullion: Shape and location as required by manufacturer; with internal reinforcement of shaped steel structural section.

C. Swing Entrance Doors: Factory pre-finished extruded aluminum, minimum 0.125 inches thick extrusions. Door dimensions: 1-3/4 inches depth, eight (8) inch wide top rail, five (5) inch wide

vertical stiles, ten (10) inch wide bottom rail. Minimum 0.050 inch thick glazing moldings, hook-in type glazing stops with EPDM glazing gaskets.

1. KAWNEER #500 or approved equal.

D. Break Metal, Sills and Flashings: Factory pre-finished extruded aluminum, minimum 0.125 inches thick, finished to match mullion sections where exposed.

E. Door Hardware furnished under Section 08710 and installed by this section, including hardware templates for all aluminum entrance doors and frames except as noted otherwise.

2.4 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08810, and to sizes as indicated on the Drawings.

2.5 SEALANT MATERIALS

A. Frame Perimeter Sealant and Backing Materials: As specified in Section 07910.

B. Window and Frame System Sealant: Manufacturer's recommended types to suit application.

2.6 FABRICATION

A. Fabricate components with minimum clearance and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Design fasteners and attachments to be concealed from view.

E. Reinforce interior rails as required by manufacturer to meet specification requirements.

F. Prepare components for internal reinforcement for door hardware and door operator hardware.

G. Reinforce framing members as required to meet specified performance requirements.

H. Miters cut thermally broken extrusions at top corners, assemble with two heavy duty serrated aluminum keys per corner and fasten with a minimum of three stainless steel screws.

I. Precision machine frame sills and fit to the jambs and fasten with a minimum of three (3) stainless steel screws per corner.

J. Design weep system to allow drainage of all water from all cavities in sill clear through from inside to outside.

K. Construct horizontal sash members of tubular extrusions; thermally break all sash members using poured and de-bridged polyurethane, self-adhering to adjacent aluminum surfaces.

L. Thermal Break: Minimum, 9/32 inch thermal separation between the exterior and interior metal surfaces.

M. Sash Corners: Milled and properly fit to assure complete sealing.

N. Fasten horizontal sash members to vertical members using a minimum of two stainless steel screws at each corner, and non-corrosive corner blocks to prevent thermal bridging as sash corners.

2.7 FINISHES

A. Provide exposed aluminum framing members free of scratches and other serious blemishes. Pre-treat members per paint manufacturer's requirements.

B. Exposed Aluminum Surfaces Finish: Architectural Class I, Color Anodized Coating, minimum 0.70 mils thickness, conforming to AA-M12C22A42/A44.

C. Concealed Steel Items: Primed with iron oxide paint.

D. Apply one (1) coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

E. Provide liquid applied, strippable coating in the shop to all pre-finished surfaces to protect finishes during fabrication, shipping and field handling.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify dimensions, tolerances and method of attachment with other work.

C. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

A. Install aluminum door and framing system in accordance with manufacturer's written instructions and AAMA - Metal Curtain Wall, Window, Store Front and Entrance - Guide Specification Manual.

B. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action by complying with requirements specified under "Dissimilar Materials" in Appendix of ANSI/AAMA 320.9.

C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

D. Provide alignment attachments and shims to permanently fasten system to building structure.

E. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, and aligning with adjacent work.

F. Provide thermal isolation where components penetrate or disrupt building insulation.

G. Install sill flashings.

H. Coordinate attachment and seal of perimeter air and vapor barrier materials.

I. Pack insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

J. Install flashings.

K. Set thresholds in bed of mastic and secure.

L. Install hardware using templates provided. Refer to Section 08710 for installation requirements.

M. Install glass in accordance with Section 08810 and in a manner to meet performance criteria.

N. Install perimeter sealant and backing materials in accordance with Section 07910.

3.3 TOLERANCES

A. Maximum Variation From Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING AND CLEANING

A. Adjust operating hardware for smooth operation, positive latching and continuous contact of perimeter weather-stripping with frames.

B. Remove strippable coating from pre-finished aluminum surfaces prior to installation.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by method acceptable to sealant manufacturer.

3.5 PROTECTION

A. Protect finished Work from damage.

END OF SECTION 08410

SECTION 08520 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Prefinished Extruded Aluminum Thermally Broken Windows with Fixed Sash and Operating Sash; and Shop Glazed Insulated Glass Units; Including All Attachments, Accessories, Operating Hardware and Insect Screens.

1. Glazing: Types indicated on the Drawings, and specified in Section 08810.

C. Extruded Aluminum Light Shelf System; Including Channels, Seam Clips, Support Beams, End Caps and Covers, and Fascia Cap, Attachments and Accessories.

D. Sunshade System, Including Outriggers, Louvers, Fascia, Attachments and Accessories.

E. Installation of Joint Sealant at Perimeter Joints Provided Under Provisions of Section 07910.

1.2 PRODUCTS INSTALLED, BUT NOT PROVIDED UNDER THIS SECTION

A. Section 07910 - Joint Sealers: Sealant and joint backing materials provided to this Section for installation.

1.3 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Steel lintels.

B. Section 06100 - Rough Carpentry: Wood perimeter shims.

C. Section 06610 – Solid Polymer Fabrications: Solid surface window stools for the new windows.

D. Section 07210 - Building Insulation: Batt insulation at window shim spaces.

E. Section 07910 - Joint Sealers: Perimeter sealant and back-up materials and installation criteria.

F. Section 08810 - Glass and Glazing: Glass and glazing.

1.4 SYSTEM DESCRIPTION

A. Windows: Extruded aluminum Architectural windows, including tubular aluminum sections thermally broken with supplementary internal support framing as required, factory fabricated, factory prefinished, factory glazed, vision glass, related flashings, extruded break and panning metal, anchorage and attachment devices, and window units conforming to the following configurations:

1. Fixed Glazed Units.
2. Horizontal Sliding Glazed Units.
3. Projected Units.

B. Frame Depth: All windows, not less than 4” and not more than 4-1/2”.

C. Window classification (Grade):

1. Provide aluminum window units meeting or exceeding the testing performance rating as established by Voluntary Guide Specifications for Aluminum Architectural Windows; AAMA/NWWDA 101 I.S.2-97 for AW-60.

D. Glazing: Window Manufacturer shall provide factory installed and warranted glass and glazing types as indicated on the Drawings, and specified in Section 08810.

E. Insect Screens: Provide for all operable windows.

F. Light Shelf System: Provide light shelves which integrate into window system and are wall to wall with the Sunshade System where indicated on Drawings.

1.5 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with the Exposure "C" of the California Building Code, current edition, and as measured in accordance with ASTM E330.

B. Standards: Except as otherwise indicated, requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in ANSI/AAMA 101-97 and applicable general recommendations published by AAMA and AA.

C. Performance: Except as otherwise indicated, comply with air infiltration tests, water resistance tests and applicable load tests specified in ANSI/AAMA 101-97 for type and classification of window units required in each case.

D. Testing: Where manufacturer's standard window units comply with requirements and have been

tested in accordance with specified tests, provide certification by manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized testing agency approved in advance by the Architect and provide certified test results.

1. Test reports: No more than two years (2) old.
2. No "Downsize" testing allowed.

E. Specific Performance Requirements – Fixed and Projected Windows: Windows shall conform to specified ANSI/AAMA standards and the following, whichever are the more stringent:

1. Air Infiltration Test: Test in accordance with ASTM E283 with the sash in a closed and locked position.
   a. Air infiltration shall not exceed 0.10 cubic feet per minute per foot of crack length for operable units and 0.06 cfm/sq.ft. for fixed units when tested at 6.24 psf pressure differential.
2. Water Resistance Test: With the window ventilators closed and locked, test unit in accordance with ASTM E547 and E331 at static air pressure difference of minimum 10.00 psf, apply five gallons of water per square foot of window area to the exterior face of the unit for a period of 15 minutes. No leakage shall occur.
3. Structural Test Performance Requirements: Test unit in accordance with ASTM E330 with the primary set of the sash in the closed and locked position, and the secondary set of the sash in the full open position. Test at a static air pressure difference of 60 psf. with high pressure applied first on one side of the unit and then on the other side.
   a. Uniform Load Structural Test:
      1) Test static air pressure difference at 1.5 times the design wind class.
      2) Test Results: No glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanisms, nor any other damage that would cause the window to be inoperable. Permanent deformation of any window, sash or ventilator member shall not exceed 0.2% of its span.
   b. Uniform Load Deflection Test:
      1) No deflection in excess of L/175 of any unsupported span (meeting rails, mullions, frames, etc.) of test unit, at both positive and negative pressure
4. Condensation Resistance Factor: Test in accordance with AAMA 1503 standards.
   a. Thermal performance shall have a condensation resistance factor of not less than 56 (glass) and 63 (frame).
5. Thermal Transmission (Conductive U-Value): Test in accordance with AAMA 1503 using same test unit size and configuration as used for the Condensation Resistance Factor test.
   a. Conductive thermal transmission (U-Value) shall not be more than 0.56 BTU/Hr/SF/0 degrees F.
6. Life Cycle Testing: Test in accordance with AAMA 910-93 and as required for AW window rating.
   a. Sash Operation: Adjusted to operate in either direction with a force not exceeding 45 pounds (200 N) after sash is in motion.

1.6 SUBMITTALS

A. Submit under provisions of Division One. Detail, structural calculations and specification must be submitted for deferred approval to Division of State Architect for approval prior to installation.

B. Shop Drawings: Indicate opening elevations and dimensions, configurations, fastening types, methods of glazing, framed opening requirements and tolerances, mullion details, flashing and drainage details, thermal break details, window system operators, weatherstripping details, expansion provisions, affected related work; installation requirements; and termination details.

C. Product Data: Provide window component specifications and characteristics, fabrication methods, anchorage and fasteners, glass and glazing specifications, and internal drainage details.

D. Samples: Submit samples illustrating window frame section, screen and frame, prefinished aluminum surfaces and glazing materials.

1. Submit samples of operating hardware.

E. Certification: Where manufacturer's standard window units comply with specified requirements and have been tested, provide certification by window manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized independent testing

laboratory or agency and provide certified test to the Architect.

F. Manufacturer's products failing to meet certification, design and/or testing requirements will constitute grounds for bid or product rejection.

1.7 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing and installing commercial and institutional aluminum windows with minimum ten (10) years documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Protect pre-finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

C. Handle work of this Section in accordance with AAMA Curtain Wall Manual #10.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.10 FIELD MEASUREMENTS

A. Verify actual locations of aluminum windows and other construction to which windows must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.11 WINDOW FIELD TESTING

A. On-Site Tests - Installed Operable Windows:

1. Conduct On-site tests for air and water infiltration as specified in This Section by a Certified Testing Laboratory under provisions of Division One. Architect shall select at random a minimum of three (3) operable window units at the job site to be tested.

2. Repaired or replaced any window failing to meet the performance requirements specified herein until unit complies with all performance requirements, without any additional costs to the Owner.

3. Window Supplier shall pay for all tests and retests.

4. Independent Testing Agency as approved by the Architect.

5. If any one test fails, one additional test shall be made above and beyond the original specified quantity of tests.

1.12 COORDINATION

A. Coordinate the Work of this Section with air and vapor barrier and all other related trades.

1.13 WARRANTY

A. Provide Lifetime manufacturer's written warranty under provisions of Division One.

B. Warranty: The window manufacturer/installer shall guarantee their work against material and workmanship defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - ALUMINUM WINDOWS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Kawneer – "451-T."

2. Arcadia – "T200 Series F-HC70."

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Aluminum Extrusions: 6063-T5 or T6 aluminum alloy complying with ASTM B221, and with not less than 0.125 inch wall thickness. Alloy and temper recommended by window manufacturer for strength, corrosion resistance and application of required finish.

B. Fasteners: Aluminum, stainless steel or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.

1. Do not use exposed fasteners on exterior, except where unavoidable for application of hardware. Match finish of adjoining metal.

2. Provide non-magnetic stainless steel Phillips flat-head machine screws for exposed fasteners, where required, or special tamper-proof fasteners.

3. Locate all fasteners so as not to disturb the thermal break construction of window units.

C. Anchors, Clips and Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate units of aluminum, non-magnetic stainless steel or hot-dip zinc coated steel or iron complying with ASTM A123.

D. Window Glazing: Factory glazed with minimum one inch insulated glass per Section 08810. Minimum air space in insulated glass, 1/2 inch. Set glass on two 1/4 inch thick, 1 inch wide, 3 inches long neoprene setting blocks and against a minimum 1/8 inch thick glazing tape, bedded in a sealant compatible to the edge sealant on the insulated glass. Glass held in place by extruded aluminum glazing stops containing a minimum of 1/8 inch thick neoprene gaskets. Provide a perimeter bead of silicone at the exterior, sealing glass to glazing leg. Glazing leg and beads; 3/4 inch minimum in height. Glass shall have nominal 1/4 inch edge clearance from metal frame.

E. Weatherstripping: Provide woven pile weatherstripping of polypropylene or nylon pile and resin-impregnated backing fabric, and mylar fin, complying with AAMA 701. Provide double weatherstripping at sills using silicone coated woven pile with mylar side fins and a neoprene seal.

F. Sealant: Provide elastomeric type as recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Provide product complying with AAMA Specification #800.

2.3 FABRICATION AND ACCESSORIES

A. General: Provide manufacturer's standard fabrication and accessories that comply with specified standards, except to extent more specific or more stringent requirements are indicated. Include complete system for assembly of components and anchorage of window units and prepare complete pre-glazing at factory of approved manufacturer.

B. Window Members: Manufactured Aluminum, all window members. Secondary members, such as friction tabs, shoes, weatherstripping guides, etc. shall be of aluminum or a material compatible with aluminum.

1. Mainframe and Sash Members: Nominal wall thickness of not less than 0.125 inches, either integral or applied. Frame sill member: nominal thickness of not less than 0.125 inches.

2. The Master Frame Depth: Not less than 4 inches and not more than 4-1/2 inches in depth.

C. Thermal Break: Provide a continuous uninterrupted thermal break around the entire perimeter of the frame and all sashes using manufactures standard construction that meets specified performance requirements. No bridging by any metal conductors at any point.

D. Motorized Actuator System: Clearline, Inc. “24 VDC Motorized Actuator System” tied to HVAC controls with switch located in HVAC closet. To include actuator, 3-position switch, power supply and window attachments.

1. Case of cast alloy, powder-coated finish. Chain is double sprocket stainless steel and adjustable

2. Coordinate electrical requirements with electrical.

3. Install per manufacturer’s written instructions and in locations noted in Drawings.

E. Hardware: Aluminum, stainless steel or other non-corrosive material compatible with aluminum.

1. Stainless steel, 4 bar hinge, dual arm roto operator. Cam action lock at each jamb with keeper.

2. Cadmium or zinc-plated steel where used shall be in accordance with ASTM Specification B633 and B766.

F. Construction:

1. Assembly: Assemble windows in a secure and workmanlike manner to perform as specified.

2. Mainframe Joints: Butt type, coped and joined neatly and secured by means of screws anchored in integral ports. Seal the main frame at the sill on the outside with a narrow joints sealant meeting AAMA #800 specification for narrow joint sealants.

3. Sash: All sash construction screwed together to facilitate easy repaired. Top and bottom sash meeting rails shall interlock in the closed position. The meeting rail interlock shall consist of two separate and distinct metal interlocks containing a fin-seal as an integral part of both metal interlocks.

G. Mullions - Other Structural Members: When mullion units occur, whether they are jointed by

integral mullions, independent mullions or by a combination of frame members, the resulting members must be capable of withstanding the load outlined under the Uniform Load Deflection Test requirements, as specified, without deflecting more than 1/175th of its span.

1. Construct independent or integral mullions with a thermal break, as specified, when used to join windows. Evidence of compliance shall be by mathematical calculations.

H. Balances: Provide balances of appropriate size and capacity to hold both top and bottom sash stationary in an open position, block and tackle type, easily accessible and replaceable in the field without the use of special tools.

I. Sash: Joined at the corners with screws in integral screw ports, easily removed from the frame for either cleaning or repair. Re-glazing easily accomplished without the aid of special tools.

J. Glazing: All units, factory glazed as indicated above. Test and certify all insulated glass units and apply the respective IGCC-CBA level certification number on the glass spacer.

K. Weather Protection:

1. Provide means of drainage for water and condensation that may accumulate in window unit.

2. Weatherstripping: As indicated above.

L. Screens: Provide screens on operating vents as indicated on the Drawings.

1. Screen frames: Extruded aluminum with corners mitered and crimped with corner gussets.

2. Screening Fabric: 18 x 16 aluminum mesh retained in screen frames with vinyl splines that permit easy replacement. Provide a minimum of four spring loaded plungers from the inside to hold screens firmly in Place.

M. Aluminum Sills and two-piece thermally broken head starters: Precision machine and fit the Frame Sill to the jambs and fasten with a minimum of three stainless steel screws per corner. Frame sill shall have a minimum slope of 15 percent for proper drainage. Provide aluminum sill sections with a minimum nominal wall thickness of 0.125 inches; include all cleats and fasteners.

N. Panning and Break Metal: Provide with a minimum nominal wall thickness of 0.125 inches; include all cleats, fasteners and accessories as recommended by the manufacturer for proper installation.

2.4 CASING COVER SYSTEM

A. Exterior Casing Covers: Extruded aluminum 6063-T5, minimum nominal 0.080 inch wall thickness. Casing covers of less than 2 inches in depth from the window frame may be of 0.062 inch wall thickness. One-piece aluminum section design to lock around the entire window frame for a weather tight connection, allow for unrestricted expansion and contraction of casing cover members and window frames.

1. Secure casing cover sections at the corners with stainless steel screws in integral screw ports with the joints back sealed using manufacturer's recommended sealant.

2. **Exposed screws, fasteners or pop rivets are not acceptable on the exterior of the casing cover system.**

B. Exterior Mullion Covers: Extruded aluminum shape to provide rigidity, wall thickness not less than 0.062 inches thick, nominal. Seal mullions against the casing covers by means of a continuous bulbous vinyl weather-strip that interlocks within the mullion cover.

C. Interior Trim, Closures and Angles: Extruded shapes as detailed, not less than 0.062 inch nominal wall thickness.

1. Provide snap trim in required lengths and attached with clips spaced no more than 18 inches on center. No exposed screws allowed on interior trim.

2.5 FINISHES

A. General: Comply with the NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.

B. Preparation: Provide cleaning, degreasing and chromate conversion coating as standard substrate preparation.

C. Exposed Aluminum Surfaces Finish: Architectural Class I, Color Anodic Coating, minimum 0.7 mils thickness, and conforming to AA-M12C22A42/A44.

1. Color selected by the Architect from manufacturer's full color range.

D. Provide a liquid applied, strippable coating in the shop to all prefinished surfaces to protect the finish during fabrication, shipping and field handling.

E. Apply coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

2.6 ACCEPTABLE MANUFACTURERS – LIGHT SHELF AND SUNSHADE SYSTEM

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Kawneer – "InLighten System with 1600 Sunshade."

B. Substitutions: Under provisions of Division One.

2.7 COMPONENTS

A. Light Shelf: Include all parts necessary to make fully functioning light shelf, including but not limited to anchor channel, support channel, support beam, cover support, end cap, and fascia cap and all fasteners with rout and return groove.

B. Sunshade System: Straight-square outrigger, planar louvers, and rectangular fascias with a 2-3/4" exterior vertical cover to hide bolts.

C. Finish: To match window frame system.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Do not leave any openings uncovered at end of working day, during wind-driven precipitation or during excessively cold weather.

B. Remove existing work carefully, avoid damage to existing work to remain.

C. Perform all other operations as necessary to prepare openings for proper installation and operation of new units.

3.3 DISPOSAL

A. Existing windows and other temporary materials removed from site become the property of the Contractor who shall promptly remove same and legally dispose of at no additional cost to the Owner.

B. Comply with all applicable laws, rules, regulations and codes.

3.4 INSTALLATION

A. Install window frames, glass and glazing and hardware in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align windows plumb, level and true to line, without warp or rack of frames or sash. Maintain dimensional tolerances, aligning with adjacent work. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.

D. Set sill members and other members in bed of compound to provide weather tight construction. Seal units following installation as required to provide weather tight system.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air and vapor barrier materials.

G. Install operating hardware.

H. Install perimeter sealant, backing materials, and installation criteria in accordance with Section 07910.

3.5 INSTALLATION – LIGHT SHELF AND SUNSHADES

A. Install per manufacturer's written installation instructions.

B. Integrate light shelves and sunshades into window framing and glazing systems to provide a weathertight total system.

3.6 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.7 ADJUSTING AND CLEANING

A. Adjust operating sash and hardware to provide tight fit at contact points and at weatherstripping, for smooth operation and weather tight closure.

B. Remove strippable coating.

C. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protection coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and moving parts.

D. Clean glass promptly after installation of windows. Remove glazing and sealant compounds, dirt and other substances.

3.8 PROTECTION

A. Initiate all protection and other precautions required to prevent damage or deterioration to windows prior to time of acceptance.

END OF SECTION 08520

SECTION 08560 - SLIDING SERVING WINDOWS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Aluminum Sliding Serving Pass Windows; Including Glazing and Frame.

C. Attachments and Operating Hardware.

D. Glass and Glazing.

1.2 RELATED SECTIONS

A. Section 05400 – Cold-Formed Metal Framing: Metal studs. -

B. Section 07910 - Joint Sealers: Frame perimeter sealant and joint backing.

C. Section 09250 - Gypsum Board Systems: Interior opening to receive window.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit data on window unit criteria, glass and glazing, frame finish, hardware and all attachment devices.

C. Shop Drawings: Indicate dimensions, location, and operation.

D. Samples: Submit two samples illustrating frame finish and color, and glass.

E. Installation Instructions: Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Window unit shall remain in wooden crate until time for installation.

C. Protect pre-finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.5 FIELD MEASUREMENTS

A. Verify actual locations of sliding serving windows and other construction to which sliding serving windows must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.6 COORDINATION

A. Coordinate the work with installation of adjacent components.

1.7 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Ready Access, Inc.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Frames and Glass Channels: Extruded aluminum sections, type 6063-T5.

B. Provide all miscellaneous sections including sills, break metal closures, anchorage clips, angles and other accessories required for a complete installation.

C. Screens: 16 x 16 mesh aluminum wire secured to extruded aluminum frames with reusable vinyl spline. Screens firmly held in place by a minimum of four spring-loaded plungers from the inside. Screen must be manual opening and self-closing to comply with local health department regulations.

D. Glass: Insulating glass panels per manufacturer's recommendations.

E. Weatherstripping: Weather strip sash at head, jamb, sill and meeting rails using manufacturer's

standard materials. **Vinyl weather stripping will not be accepted.**

F. Hardware: Type recommended by manufacturer for complete installation, including a lock. Provide stop to limit pass-thru net opening size to 216 square inches to comply with local health department regulations.

2.3 FINISH

A. Exposed Aluminum Surfaces: Anodized clear aluminum finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

A. Install window frames, glass and glazing, and hardware in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances, aligning with adjacent work.

D. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Install operating hardware.

F. Install perimeter sealant, exterior and interior, backing materials, and installation criteria in accordance with Section 07910.

3.3 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inches every 3 feet non-cumulative or 0.5 inches per 100 feet, whichever is less.

3.4 CLEANING

A. Clean work under provisions of Division One.

B. Remove protective material from pre-finished aluminum surfaces.

C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08625 - TUBULAR SKYLIGHTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Tubular Skylights Consisting of Skylight Dome, Reflective Tube, and Diffuser Assembly; Including Accessories and Attachments.

C. Flashing Base for Dome Support and Top of Tube.

D. Manufactured Metal Curb for Metal Curb Installation.

1.2 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Fabricated steel framed opening.

B. Section 06100 - Rough Carpentry: Treated wood curbs and blocking.

C. Section 07540 – Thermoplastic Membrane Roofing: Roofing system.

D. Section 07620 - Sheet Metal Flashing and Trim: Prefinished counter flashing.

1.3 PERFORMANCE REQUIREMENTS

A. Tubular skylight to be roof-mounted with self-flashing curb, reflective tube and ceiling level diffuser assembly transferring light to interior spaces, complying with ICC-16.

B. Skylight manufacturer is responsible for configuration and fabrication of the skylight system.

C. System to accommodate, without damage to system or components, or deterioration of perimeter seal; movement with system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate detailed plans, profiles and configurations, dimensions, glazing materials, fastening methods, sealants, anchors, and types of formed flashings and closures.

C. Product Data: Submit manufacturer’s product data, use limitations and recommendations for the entire system, characteristics of light admitted, and insulation value of unit.

D. Samples: Submit a verification sample of acrylic plastic glazing material in specified color.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Manufacturer/Installer: Company specializing in manufacturing and installing the products specified in this Section with minimum five (5) years documented experience.

B. Materials: For each type of materials required for the Work of this Section, provide primary materials which are the products of one (1) manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver materials and products to the site in clearly labeled packages and containers.

C. Store and handle materials and products at the site in strict compliance with manufacturer’s instructions and recommendations.

D. Protect materials and products at the site from damage due to sunlight, weather, excessive temperatures and construction operations.

E. Sequence deliveries to avoid delays, but minimize on-site storage.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of tubular skylights and other construction to which the skylights must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 COORDINATION

A. Coordinate the work with the installation of roofing system.

B. Coordinate this section with dimensions, tolerances, and method of attachment with other adjacent work.

1.9 WARRANTY

A. Provide manufacturer's written warranty under provisions of Division One.

B. Skylight Warranty: State that all materials and workmanship, including coverage for weather and water tightness of skylight assembly and seal with roofing system, provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

1. Warranty Period: Skylight: Ten (10) years from date of Project Substantial Completion.

C. Finish Warranty: State that all materials and workmanship, including finish peeling, chipping, chalking, fading, abnormal aging or deterioration, and failure to perform as required, provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - TUBULER SKYLIGHTS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Solatube – "Model 330 DS-C."

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Solatube Daylight Device Roof Dome Assembly:

1. Glazing: 0.080 inch minimum thickness polycarbonate classified as CC1 material.

2. Raybender: Prismatic pattern molded into dome to capture low angle sunlight.

3. Light Interception Transfer Device: Aluminum sheet, thickness 0.015 inch with Spectralight Infinity. Position in dome to capture low angle sunlight.

4. Flashing Base: One piece, seamless, leak-proof flashing functioning as base support of dome and top of tube.

5. No-Pitch Flashing: 4" and 6" high.

6. Dome Ring: 0.090 inch high impact PVC to prevent thermal bridging; weather-sealed.

7. Reflective Extension Tube: Aluminum sheet, 0.015 inch thick with specular reflective finish on exposed surface; specular reflectance 99 percent for visible spectrum. Tube diameter about 14".

8. Reflective 30 and 90 Degree Adjustble Tube: 0.018 inch thick for 90 degree tube and 0.015 inch for 30 degree tube.

9. Ceiliing Ring: Injection molded high impact ABS, 0.085 inches thick.

10. Dress Ring: Injection molded high impact ABS; 0.0100 inches thick.

B. Dual Glazed Diffuser Assembly:

1. Upper Glazing: Acrylic plastic CC2, 0.040 inch thick.

2. Lower Glazing: As recommended by manufacturer.

C. Accessories:

1. Roof Counter-Flashing.

2. Fasteners: Non-magnetic stainless steel or other non-corrosive metal as recommended by the manufacturer. Match finish of exposed fasteners with finish of material being fastened.

D. Elastomeric Sealant: Generic type recommended by skylight unit manufacturer, compatible with joint surfaces.

2.3 FABRICATION

A. Fabricate skylight free of visual distortion and defects.

B. Fabricate for a weather tight assembly.

C. Apply bituminous paint on aluminum surfaces of units in contact with cementitious materials or dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Contact between aluminum and dissimilar metals shall receive a protective coating of asphaltic paint for the prevention of electrolytic action and corrosion.

3.3 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation or roof deck and other substrates to receive skylight units, and roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are to be installed in contact width noncompatible metal or corrosive substances, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

3.4 CLEANING

A. Cleaning under provisions of Division One.

B. Clean exposed metal and plastic surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

C. Clean and polish tubular skylight units, inside and out, not more than five (5) days prior to date of Substantial Completion.

3.5 PROTECTION

A. Protection of finished work under provision of Division One.

END OF SECTION

SECTION 08710

FINISH HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Door Hardware.
2. Storefront and entrance door hardware.
3. Padlocks.
4. Key cabinets.

B. Related Sections:

1. Section 06200 - Finish Carpentry: Finish Hardware Installation
2. Section 07910 - Joint Sealers – exterior thresholds
3. Section 08110 - Steel Doors and Frames
4. Section 08210 - Wood Doors
5. Section 08410 – Aluminum Entrances and Storefronts

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Cabinets, including open wall shelving and locks.
3. Signs, except where scheduled.
4. Toilet accessories, including grab bars.
5. Rough hardware.
6. Sliding aluminum doors, except cylinders where detailed.
7. Access doors and panels, except cylinders where detailed.
8. Corner Guards.

1.2 REFERENCES:

Use date of standard in effect as of Bid date.

A. American National Standards Institute – ANSI 156.18 – Materials and Finishes.

B. ICC/ANSI A117.1 - 1998 – Specifications for making buildings and facilities usable by physically handicapped people.

C. ADA – Americans with Disabilities Act of 1990

D. BHMA – Builders Hardware Manufacturers Association

E. DHI – Door and Hardware Institute

F. UL – Underwriters Laboratories

1. UL 305 – Panic Hardware

G. WHI – Warnock Hersey Incorporated

H. State of California Building Code

I. Local applicable codes

J. SDI – Steel Door Institute

K. WI – Woodwork Institute

L. AWI – Architectural Woodwork Institute

M. NAAMM – National Association of Architectural Metal Manufacturers

1.3 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Division 1. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into “Hardware Sets” with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.
2. Use BHMA Finish codes per ANSI A156.18.
3. Name, part number and manufacturer of each item.
4. Fastenings and other pertinent information.
5. Location of hardware set coordinated with floor plans and door schedule.
6. Explanation of abbreviations, symbols, and codes contained in schedule.
7. Mounting locations for hardware.
8. Door and frame sizes, materials and degrees of swing.
9. List of manufacturers used and their nearest representative with address and phone number.
10. Catalog cuts.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

C. Deviations: Highlight, encircle or otherwise identify deviations from “Schedule of Finish Hardware” on submittal with notations clearly designating those portions as deviating from this section.

D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

E. Substitutions per General Conditions. Include product data and indicate benefit to the Project. Furnish operating samples on request.

F. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.

a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.

B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.

C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

D. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / UBC Standard 7-2 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.

E. Note: scheduled resilient seals may exceed selected door manufacturer’s requirements.

F. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers’ instructions.

1.5 DELIVERY, STORAGE AND HANDLING:

A. Delivery: coordinate delivery to appropriate locations (shop or field).

1. Permanent keys and cores: secured delivery direct to Owner's representative.

B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.6 PROJECT CONDITIONS AND COORDINATION:

A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.

B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:

1. Location of embedded and attached items to concrete.

2. Location of wall-mounted hardware, including wall stops.

3. Location of finish floor materials and floor-mounted hardware.

4. Locations for conduit and raceways as needed for electrical, electronic and electro-pneumatic hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.

5. Manufacturer templates to door and frame fabricators.

C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.7 WARRANTY:

A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:

1.	Locksets:	Three years
2.	Extra Heavy Duty Cylindrical Lock:	Seven Years
3.	Exit Devices:	Three years
4.	Closers:	Ten years
5.	Other Hardware	Two years

1.8 COMMISSIONING:

A. Conduct these tests prior to request for certificate of substantial completion:

1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

1.9 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 30" to 44" above the finished floor, per California Building Code, Section 1133B.2.5.1.

B. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.

C. Adjust door closer sweep periods so that from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door, per California Building Code Section 1133B.2.5.1

D. All hardware to meet California Building Code Sections 1133B.2.1, 1133B.2.5.1 and 1008.1.8.

E. Thresholds: Comply with California Building Code Section 1133B.2.4.1.

F. Floor stops: Do not locate in path of travel. Locate no more than 4" from walls, per DSA Policy #99-08 (Access).

PART 2 PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers and their abbreviations used in this schedule:

IVE	H. B. Ives
GLY	Glynn-Johnson Hardware
LCN	LCN Closers
NGP	National Guard Products
SCH	Schlage Lock Company
VON	Von Duprin

2.2 HINGING METHODS:

A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.

C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing.

1. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins and security studs.

2. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.

D. Continuous Hinges:

1. Geared-type aluminum.

a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.

2.3 LOCKSETS and LATCHSETS:

A. Mortise Locksets and Latchsets: as scheduled.

1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.
3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
    a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
4. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
5. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.
6. Scheduled Lock Series and Design: Schlage L series, 06A design.
7. Certifications:
    a) ANSI A156.13, 1994, Grade 1 Operational, Grade 1 Security.
    b) ANSI/ASTM F476-84 Grade 31 UL Listed.

B. Extra Heavy Duty Cylindrical Locks and Latches: as scheduled.
1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
2. Locking Spindle: stainless steel, integrated spring and spindle design.
3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
4. Latchbolt: solid steel.
5. Backset: 2-3/4" typically, more or less as needed to accommodate frame, door or other hardware.
6. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.
7. Electric operation: Manufacturer-installed continuous duty solenoid.
8. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
9. Lock Series and Design: Schlage D series, "Rhodes" design.
10. Certifications:

a) ANSI A156.2, 1994, Series 4000, Grade 1.

b) UL listed for A label and lesser class single doors up to 4ft x 8ft.

2.4 EXIT DEVICES / PANIC HARDWARE

A. General features:

1. Independent lab-tested 1,000,000 cycles.
2. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
3. 0.75-inch throw deadlocking latchbolts.
4. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
5. No exposed screws to show through glass doors.
6. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
7. Releasable in normal operation with 15-lb. maximum operating force per UBC Standard 10-4, and with 32 lb. maximum pressure under 250-lb. load to the door.
8. Exterior doors scheduled with XP-series devices: Static load force resistance of at least 2000 pounds.
9. Flush end cap design as opposed to typical "bottle-cap" design end cap.
10. Comply with CBC Section 1003.3.1.9.

B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130” thickness, compression spring drive, match lockset lever design.
3. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.

2.5 CLOSERS

A. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.

2. ISO 2000 certified. Units stamped with date-of-manufacture code.

3. Independent lab-tested 10,000,000 cycles.

4. Non-sized and adjustable. Place closers inside building, stairs and rooms.

5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.

6. Advanced Variable Backcheck (AVB): where scheduled, these units commence backcheck at approximately 45 degrees.

7. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 1133B.2.5, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.

8. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.

9. Extra-duty arms (EDA) at exterior doors scheduled with parallel arm units. EDA arms: rigid main and forearm, reinforced elbow.

10. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.

11. Exterior doors: seasonal adjustments not required for temperatiures form 120 degrees F to -30 degrees F, furnish checking fluid data on request.

12. Non-flaming fluid, will not fuel door or floor covering fires.

13. Pressure Relief Valves (PRV) not permitted.

2.6 OTHER HARDWARE

A. Automatic Flush Bolts: Low operating force design.

B. Overhead Stops: Non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

C. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.

D. Door Stops: Provide stops to protect walls, casework or other hardware.

1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.

2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90deg stop / 95deg deadstop. Note degree of opening in submittal.

E. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.

1. Proposed substitutions: submit for approval.

2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.

3. Non-corroding fasteners at in-swinging exterior doors.

F. Thresholds: As scheduled and per details. Comply with CBC Section 1133B.2.4.1. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).

2. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.

3. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.

G. Through-bolts: Do not use. Coordinate with wood doors; ensure provision of proper blocking to support wood screws for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to support machine screws for mounting panic hardware and door closers.

H. Silencers: Interior hollow metal frames, 3 for single doors, 4 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.7 FINISH:

A. Generally BHMA 626 Satin Chromium.

1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.

B. Door closers: factory powder coated to match other hardware, unless otherwise noted.

C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

2.8 KEYING REQUIREMENTS:

A. Key System: Schlage Everest restricted “D” keyway, interchangeable core throughout. Utility patent protection to extend at least until 2014. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner to determine system keyway(s), keybow styles, structure, degree of physical security and degree of geographic exclusivity. Furnish Owner’s written approval of the system.

1. New master key system.

2. Construction keying: furnish temporary keyed-alike cores. Remove at substantial completion and install permanent cylinders/cores in Owner’s presence. Demonstrate that construction key no longer operates.

3. Temporary cylinders/cores remain supplier’s property.

4. Furnish 10 construction keys.

5. Furnish 2 construction control keys.

6. Key Cylinders: furnish 6-pin solid brass construction.

B. Cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.

C. Permanent keys: use secured shipment direct from point of origination to Owner.

1. For estimate: 3 keys per change combination, 5 master keys per group, 5 grand-master keys, 3 control keys.

2. For estimate: VKC stamping plus “Do Not Duplicate”.

D. Bitting List: use secured shipment direct from point of origination to Owner at completion.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

A. Can read and understand manufacturers' templates, suppliers hardware schedule and printed installation instructions. Can readily distinguish drywall screws from manufacturers furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

3.2 PREPARATION:

A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.

B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.

1. Notify Architect of code conflicts before ordering material.

2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 30 inches to 44 inches above the finished floor, per CBC Section 1133B.2.5.1.

3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.

C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

3.3 INSTALLATION

A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.

1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.

2. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.

3. Replace fasteners damaged by power-driven tools.

B. Locate floor stops no more that 4 inches from walls and not within paths of travel. See paragraph 2.2 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.

C. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.

D. Drill pilot holes for fasteners in wood doors and/or frames.

E. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4. ADJUSTING

A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.

1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.

2. Adjust doors to fully latch with no more than 1 pound of pressure.

3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.

4. Adjust door closers per 1.9 this section.

B. Inspection: Use hardware supplier's consultant or consultant's agent. Include supplier's report with closeout documents.

C. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:

1. Re-adjust hardware.

2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.

3. Identify items that have deteriorated or failed.

4. Submit written report identifying problems

3.5 DEMONSTRATION:

A. Demonstrate mechanical hardware and electrical, electronic and pneumatic hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING:

A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.

B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

A. See door schedule in drawings for hardware set assignments.

B. Miscellaneous Material:

20 ea.	Padlock	KS43F3200	452	Schlage
20 ea.	Core	23-030	606	Schlage
30 ea.	Core	23-030	626	Schlage
1 ea.	Key Cabinet	DAWC150-S		Telkee

HW SET: 01

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	CD98DT X 990DT	626	VON
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (MULLION)	626	SCH
4	EA	CORE ONLY	23-030	626	SCH
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	MOUNTING PLATE	4110-18	689	LCN
2	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	DOOR SWEEP	601A	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

PERIMETER SEALS BY DOOR MANUFACTURER

HW SET: 02

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP W/RISER	FS436 435 438 437 AS REQU'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 02A

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP W/RISER	FS436 435 438 437 AS REQU'D	626	IVE
1	EA	SURFACE CLOSER	4011	689	LCN
1	SET	SMOKE SEAL	5050 HEAD & JAMBS	-	NGP

HW SET: 03

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY SET	ND40S RHO	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 04

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOME STOP W/RISER	FS436 435 438 437 AS REQU'D	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 05

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 06

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	PUSH PLATE	8200 8" X 16"	630	IVE
1	EA	PULL PLATE	8302-6 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 07

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM LOCK	L9077T 06A X L/OST X L283-150	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 08

3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	L9080T 06A X L/OST X L283-150	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	OVERHEAD HOLDER	700H-J	626	GLY
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE HOLDER

HW SET: 09

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	OFFICE LOCK	ND91TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 10

1	EA	CORE ONLY	23-030	626	SCH
1	EA		IC CYLINDER AS REQUIRED BALANCE OF HARDWARE BY DOOR MANUFACTURER	626	SCH

HW SET: 11

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 12

6	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	ASTRAGAL	570, 572, 574 AS REQU'D	630	NGP
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	SURFACE CLOSER	4011T BUMPER	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 13

3	EA	HINGE	3CB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	SET	SMOKE SEAL	5050 HEAD & JAMBS	-	NGP

HW SET: 14

6	EA	HINGE	3CB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	STOREROOM LOCK	L9080T 06A X L/OST X L283-150	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	COORDINATOR	COR7G	626	IVE
1			ASTRAGAL BY DOOR MANUF.		
2	EA	OVERHEAD HOLDER	700H-J	626	GLY
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	HEAD SEAL	5050		NGP
2	EA	JAMB SEALS	700ES	AL	NGP
2	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

HW SET: 15

3	EA	HINGE	3CB1HW 5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 16

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM LOCK	L9077T 06A X L/OST X L283-150	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	SURFACE CLOSER	4111 HEDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 17

3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	ENTRANCE LOCK	ND92TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4011T BUMPER	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 18

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM LOCK	L463T XB11-720	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	PUSH PLATE	8200 8" X 16" CFC	630	IVE
1	EA	PULL PLATE	8302-6 4" X 16" CFC	630	IVE
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
1	SET	JAMB SEALS	700ES HEAD AND JAMBS	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

HW SET: 19

3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	L9080T 06A X L/OST X L283-150	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900LLP	630	IVE
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	SET	JAMB SEALS	700ES HEAD AND JAMBS	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

HW SET: 20

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	CD98DT X 990DT	626	VON
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (MULLION)	626	SCH
4	EA	CORE ONLY	23-030	626	SCH
1	SET	MEETING STILE SEAL	140PA	AL	NGP
1	EA	OVERHEAD STOP	100S	630	GLY
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
2	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSERS

HW SET: 21

6	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	ND94TD RHO	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
1	EA	ASTRAGAL	570, 572, 574 AS REQU'D	630	NGP
2	EA	SURFACE CLOSER	4011	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 22

3	EA	HINGE	3CB1 4.5 X 4.5	652	IVE
1	EA	INDICATOR LOCK	L9486L 06A L/OST L583-375 & L583-363	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	IC MTSE CYL L CAM	30-138 ICX	626	SCH
1	EA	DOOR PULL	VR900LLP (CUT FOR INDICATOR)	630	IVE
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	KICK PLATE	8400 4" X 1" LDW	630	IVE
1	EA	WALL STOP	WS401CCV	626	IVE
1	SET	JAMB SEALS	700ES HEAD AND JAMBS	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

HW SET: 23

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM LOCK	L9077T 06A X L/OST X L283-150	626	SCH
2	EA	CORE ONLY	23-030	626	SCH
1	EA	DOOR PULL	VR900	630	IVE
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 24

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
1	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	OVERHEAD STOP	100S	630	GLY
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
1	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

HW SET: 25

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	MULLION	KR4954 X 2-154	689	VON
1	EA	PANIC HARDWARE	CD98DT X 990DT	626	VON
1	EA	PANIC HARDWARE	CD98NL X 990NL	626	VON
1	EA	RIM CYLINDER	20-057-ICX	626	SCH
2	EA	MORTISE CYLINDER	20-061 XQ11-948 (DOGGING)	626	SCH
1	EA	MORTISE CYLINDER	20-061-ICX (MULLION)	626	SCH
4	EA	CORE ONLY	23-030	626	SCH
1	SET	MEETING STILE SEAL	140PA	AL	NGP
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	SECURITY FLOOR STOP	FS18S	BLK	IVE
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP
2	EA	DOOR SWEEP	200NA	AL	NGP
1	EA	THRESHOLD	613 MSA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSERS

HW SET: 26

3	EA	HINGE	3CB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND72TD RHO X XN12-003	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4111 HEDA	689	LCN
2	EA	JAMB SEALS	700ES	AL	NGP
1	SET	HEAD SEAL	700SA	AL	NGP

INSTALL HEAD SEAL BEFORE CLOSER

END OF SECTION

SECTION 08810 - GLASS AND GLAZING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Glass and Glazing; as Indicated on the Drawings, Specified Herein; for Steel Doors and Frames, Wood Doors, Aluminum Entrances and Storefront, Aluminum Windows, and Sliding Serving Windows.

1. Flat Glass Types:

a. GL.02 - Safety (Tempered) Glass.

b. GL.06 – Fire-Rated Glass.

2. Sealed Insulating Glass Types:

a. GL.10 - Insulated Glass Units.

b. GL.11 - Insulated Safety Glass Units.

c. GL.11A - Insulated Colored Safety Glass Units.

d. GL.12 - Insulated Low E Glass Units.

e. GL.13 - Insulated Low E Safety Glass Units.

C. Sealant for Glass and Glazing Shall Be a Part of This Section.

D. Mirrors.

1.2 RELATED SECTIONS

A. Section 07910 - Joint Sealers: Sealant and back-up material.

B. Section 08110 - Steel Doors and Frames: Glazed doors and frames.

C. Section 08210 - Wood Doors: Glazed doors.

D. Section 08410 - Aluminum Entrances and Storefront: Glazed doors and frames.

E. Section 08520 - Aluminum Windows: Glazed windows.

F. Section 08560 – Sliding Serving Windows: Glazed windows.

1.3 PERFORMANCE REQUIREMENTS

A. Glass and glazing materials of this Section shall provide continuity of building enclosure vapor and air barrier:

1. In conjunction with materials described in Section 07910.

2. To utilize the inner pane of multiple pane sealed units for the continuity of the air and vapor seal.

3. Maintain continuous air and vapor barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.

B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with the California Building Code, Exposure “C”.

C. Limit glass deflection to flexure limit of glass with full recovery of glazing materials, whichever is less.

D. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement, wind loading and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealant or gaskets to remain watertight and airtight, deterioration of glass and glazing materials, and other defects in the Work.

1. Normal Thermal Movement shall be defined as that resulting from an ambient temperature range of 120 degrees F and from a consequent temperature range within glass and glass framing members of 180 degrees F.

2. Deterioration of Insulating Glass shall be defined as failure of hermetic seal due to other causes than breakage which results in intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating, if any, resulting from seal failure, and any other visual evidence of seal failure or performance.

3. Deterioration of Laminated Glass shall be defined as the development of manufacturing defects including edge separation or delamination which materially obstructs vision through glass.

4. Deterioration of Coated Glass shall be defined as the development of manufacturing defects including peeling, cracking or other indications

of deterioration in metallic coating due to normal conditions of use.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit minimum twelve (12) inch square samples of each type of glass indicated (including assembled insulating glass types) illustrating color and finish.

E. Samples: Submit minimum twelve (12) inch long bead of glazing sealant and/or gasket, illustrating color as selected.

F. Manufacturer's Installation Instructions: Indicate special precautions required.

G. Certification: Submit certificates from respective manufacturers attesting that glass and glazing materials provided for project comply with requirements.

1. Separate Certification will not be required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to the Architect.

H. Compatibility and Adhesion Test Report: Submit written statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealant and interpreting test results relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. During storage and handling of glass products, provide cushions at edges to prevent impact damage.

C. Protect glass and glazing materials to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.6 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

B. Glazing Standards: Comply with recommendations of Glass Association of North America (GANA) "Glazing Manual" and "Sealant Manual", except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this Section or other referenced standards.

C. Safety Glazing Standard: Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

D. Fire-Resistance Rated Wire Glass: Provide wire glass products that are identical to those tested per ASTM E163 (UL 9) and are labeled and listed by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

E. Fire-rated glas is to comply with NFPA 80.

F. Insulating Glass Certification Program: Provide insulating glass units permanently marked, either on spacers or at least one component pane of units with appropriate certification label of inspecting and testing organization indicated below:

1. Insulating Glass Certification Council (IGCC), or Associated Laboratories, Inc. (ALI).

G. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing or glazing materials when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of glazing and other construction to which glazing must fit, by accurate field measurements before fabrication; show recorded measurements on final submittal. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.9 COORDINATION

A. Coordinate the Work with glazing frames, wall openings, and perimeter air and vapor seal to adjacent Work.

1.10 WARRANTY

A. Provide ten (10) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects; including coverage for sealed glass units from seal failure, inter-pane dusting or misting, and replacement of same, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS OR FABRICATORS - GLASS AND GLAZING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Ford Glass Division.
2. Guardian Industries.
3. Nippon.
4. Oldcastle Glass.
5. Pilkington.
6. PPG Architectural Glass.
7. Saint-Gobain.

B. Substitutions: Under provisions of Division One.

2.2 FLAT GLASS MATERIALS

A. **Safety Glass (GL.02)**: ASTM C1048, Kind FT fully tempered Condition A non-coated, Type 1 transparent flat, quality q3 glazing select; conforming to ANSI Z97.1; and minimum 1/4 inch thick.

B. **Fire-Rated Glass (GL.06):** Minimum 3/16 inches thick, premium surface polished, UL fire-rated for 45 minute (3325 sq in max); safety-rated to meet impact requirements of ANSI Z97.1 and 16 CFR 1201 (Cat. I);

1. "Premium Firelite Plus" as manufactured by Nippon Electric Glass Company, "Pyroswiss or Keralite" as manufactured by Vetrotech Saint Gobain, or approved equivalent.

2.3 SEALED INSULATING GLASS MATERIALS

A. General:

1. Provide pre-assembled units consisting of organically sealed panes of glass enclosing a hermetically sealed dehydrated air space and complying with ASTM E774 for performance classification indicated as well as with other requirements specified for glass characteristics, air space, sealing system, sealant, spacer material, corner design and desiccant.
2. Provide heat-treated panes of kind and at locations indicated on the Drawings, or if not indicated, provide heat-strengthened panes where recommended by glass manufacturer for application indicated, and tempered where indicated, or where safety glass is designated or required.
3. Performance characteristics designated or coated insulating glass are nominal values based on manufacturer's published performance values for units with 1/4 inch panes of glass and 1/2 inch thick air space.
4. U-values indicated are expressed in the number of Btu's per hour/per sq. ft./per degree F difference.
5. Sealing System: Dual Seal; primary sealant = polyisobutylene, secondary sealant = silicone.
6. Spacer Material: Aluminum.
7. Desiccant: Low Nitrogen Absorbing.
8. Corner Construction: Bent/Soldered.

B. **Insulated Glass Units (GL.10):** Performance Classification per ASTM E774, Class CBA; thickness of each pane 1/4 inch, air space thickness 1/2 inch, overall unit thickness one (1) inch; exterior pane Clear float glass, annealed; interior pane Clear float glass, annealed:

1. The Unit Shall Have:
   a. Visible Light Transmittance of 79%
   b. Shading Coefficient of 0.83
   c. Winter U-Value of 0.48 BTU/hr./sq. ft.
   d. Summer U-Value of 0.55 BTU/hr./sq. ft.

C. **Insulated Safety Glass Units (GL.11):** Performance Classification per ASTM E774, Class CBA; thickness of each pane 1/4 inch, air space thickness 1/2 inch, overall unit thickness one (1) inch; exterior pane clear safety glass, fully tempered; interior pane clear safety glass, fully tempered:

1. The Unit Shall Have:
   a. Visible Light Transmittance of 79%
   b. Shading Coefficient of 0.83
   c. Winter U-Value of 0.48 BTU/hr./sq. ft.
   d. Summer U-Value of 0.55 BTU/hr./sq. ft.

D. **Insulated Safety Colored Glass Units (GL.11A):** Performance Classification per ASTM E774, Class CBA; thickness of each pane 1/4 inch, air space thickness 1/2 inch, overall unit thickness one (1) inch; exterior pane clear safety glass, fully tempered; interior pane clear safety glass with colored film, fully tempered:

1. The Unit Shall Have:
   a. Visible Light Transmittance of 79%
   b. Shading Coefficient of 0.83
   c. Winter U-Value of 0.48 BTU/hr./sq. ft.
   d. Summer U-Value of 0.55 BTU/hr./sq. ft.

E. **Insulated Low E Glass Units (GL.12**): Performance Classification per ASTM E774, Class CBA; thickness of each pane 1/4 inch, air space thickness 1/2 inch, overall unit thickness one (1) inch; exterior pane annealed Clear float glass with "VIRACON VE-2M Low Emissivity coating on #2 surface, or equivalent product approved by the Architect; interior pane Clear float glass, annealed:

1. The Unit Shall Have:
   a. Visible Light Transmittance of 70%
   b. Shading Coefficient of 0.44
   c. Winter U-Value of 0.29 BTU/hr./sq. ft.
   d. Summer U-Value of 0.26 BTU/hr./sq. ft.

F. **Insulated Low E Safety Glass Units (GL.13):** Performance Classification per ASTM E774, ASTM C1048, ANSI Z97.1 and/or CPSC 16 CFR 1201: Class CBA; thickness of each pane 1/4 inch, air space thickness 1/2 inch, overall unit thickness one (1) inch; exterior pane fully tempered Clear float glass with VIRACON VE-2M Low Emissivity coating on #2 surface, or approved equivalent by the Architect; interior pane Clear float glass, fully tempered:

1. The Unit Shall Have:
   a. Visible Light Transmittance of 70%
   b. Shading Coefficient of 0.44
   c. Winter U-Value of 0.29 BTU/hr./sq. ft.
   d. Summer U-Value of 0.26 BTU/hr./sq. ft.

2.4 MIRRORS

A. No. 1 quality, minimum 1/4 inch thick float glass mirror, beveled edges, guaranteed for ten (10) years against silver spoilage; sizes and locations as indicated on Drawings.

1. Backing: Shatter-proof mirror backing tape, ASTM D1709, ANSI Z97.1; applied full width of mirror without gaps.
2. Mounting: Full length mechanically fastened J-tracks, top and bottom, and adhesive.

2.5 ELASTOMERIC GLAZING SEALANT AND GLAZING TAPES

A. General: Provide products of type indicated and complying with the following requirements:

1. Compatibility: Select glazing sealant and tapes of proven compatibility with other materials with which they will come into contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
2. Suitability: Comply with recommendations of sealant and glass manufacturers for selection of glazing sealant and tapes which have performance characteristics suitable for applications indicated and conditions at time of installation.

3. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C920 requirements, including those for type, grade, class and uses.

4. Colors: Provide color of exposed sealant indicated, or if not otherwise indicated, as selected by the Architect from manufacturer's standard colors.

B. One-Part Non-Acid Curing Silicone Glazing Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and as applicable to uses indicated, and O; and complying with the following requirements for modulus and additional joint movement capability.

1. Medium Modulus: Tensile strength of not less than 45 nor more than 75 psi at 100 percent elongation when tested per ASTM D412 after 14 days at 77 degrees F and 50 percent relative humidity.

2. Additional Capability: When tested per ASTM C719 for adhesion and cohesion under maximum cyclic movement, to withstand the maximum 40 percent increase and decrease of joint width, as measured at time of application, and remain in compliance with other requirements of ASTM C920.

C. Preformed Butyl-Polyisobutylene Glazing Tape: Provide manufacturer's standard solvent-free butyl-polyisobutylene formulation with a solids content of 100 percent; complying with AAMA A-804.1; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with a release paper on one side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.

2.6 GLAZING ACCESSORIES

A. Compatibility: Provide materials with proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Extruded Type II silicone rubber, ASTM D2240, Type A, 80-90 Shore A Durometer hardness, length of 0.1 inch for each square foot of glazing or minimum four (4) inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area; color black.

D. Spacer Shims: Silicone, 50 - 60 Shore A Durometer hardness, minimum three (3) inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

E. Edge Blocks: Silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that openings for glazing are correctly sized and within tolerance.

C. Clean glazing channels, stops and rabbets to receive the glazing materials, making free from obstructions and deleterious substances which might impair the Work.

1. Remove protective coatings which might fail in adhesion or interfere with bond of sealant.

2. Comply with manufacturer's instructions for final wiping of surfaces immediately prior to application of primer and glazing compounds or tapes.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces to receive glazing compounds in accordance with manufacturer's recommendations.

3.3 GLAZING - GENERAL

A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealant, gaskets and other glazing materials, including those of referenced glazing standards.

B. Protect glass from edge damage during handling and installation; use a foiling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not

raise or drift glass with a pry bar. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealant.

3.4 GLAZING

A. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than six (6) inches from corner unless otherwise required. Set blocks in this course of sealant which is acceptable for heel bead use.

B. Provide spacers inside and out, of correct size and spacing to preserve required face clearances except where gaskets or glazing tapes with continuous spacer rods used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.

D. Provide compressible filler rods or equivalent back-up material, as recommended by sealant and glass manufacturers.

E. Force sealant into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Tool exposed surface of sealant to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

3.5 MANUFACTURER'S FIELD SERVICES

A. Glass and glazing product manufacturers to provide field surveillance of the installation of their products under provisions of Division One.

B. Monitor and report installation procedures, unacceptable conditions and all other field problems encountered.

3.6 MIRRORS

A. Install mirrors in accordance with manufacturer's instructions.

3.7 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean glass.

3.8 PROTECTION

A. Protect glass from breakage after installation by promptly installing streamers or ribbons, suitably attached to the framing and held free from glass. Do not apply warning markings, streamers, ribbons or other items directly to the glass, except as specifically directed in writing by the Architect.

END OF SECTION 08810

SECTION 08950 - FOUNDATION VENTILATION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Fiberglass Reinforced Polyester Polymer Concrete Passive Air Ventilation Systems. (Vents and Access Panels)

C. All Accessories and Attachments Required for a Complete Functional Ventilation System, Including But Not Limited to, End Plates, Spacers and Washers and Grating Cover.

1.2 RELATED SECTIONS

A. Section 02315 – Excavation and Backfill for Structures: Compacted earth to hold vents in place.

B. Section 03300 - Cast-in-Place Concrete: Concrete wall surfaces.

C. Section 07910 - Joint Sealers: Perimeter frame sealant and joint backing.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacture of foundation vent with minimum five (5) years documented experience.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate layout and location of all foundation vents, elevations, dimensions and tolerances, grating and end covers and any required attachments and accessories.

C. Product Data: Provide manufacturer's data on foundation vents describing design characteristics, maximum recommended air velocity, free area, materials, and finishes.

D. Submit manufacturer's installation instructions.

1.5 FIELD MEASUREMENTS

A. Verify actual locations of foundation vents and other construction to which vents must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.6 COORDINATION

A. Coordinate the Work with installation of foundation and backfilling.

1.7 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – FOUNDATION VENTS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. PolyVent by Hubbell Lenoir City Division, 800-346-3061.

B. Substitutions: Under provisions of Division One.

2.2 PRODUCTS

A. Foundation Vents: Fiberglass reinforced polyester polymer concrete vents, chemically resistant, providing free air openings. Provide with mounting spacers and washers and end plates. Provide appropriate number of sections to meet specified cross-flow ventilation requirements.

B. Grating Cover: Galvanized steel grating cover able to withstand 400 lb. concentrated load. Openings to be small enough not to allow rodents to enter vents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that prepared openings are ready to receive work and opening dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install ventilation systems and components in accordance with manufacturer's instructions.

B. Secure ventilation systems in openings level with finished floors. Attach directly to “C” channel or wooden perimeter structural floor by lag bolts and manufacturer supplied spacers and washers.

C. Add gratings with hold-down device installed so vents remain in place during backfill and paving.

D. Install perimeter sealant and backing rod in accordance with Section 07910 if required.

3.3 CLEANING

A. Clean all exposed surfaces as per recommendations by the manufacturer.

B. Remove all packaging and debris from the site.

END OF SECTION

SECTION 09220 - PORTLAND CEMENT PLASTER

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Metal Furring and Lathing Over New Metal Studs Substrate.

C. Exterior Portland Cement Plaster; Acrylic Surface Finish; Installed Over New Metal Stud Substrate; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Wall Systems.

1.2 RELATED SECTIONS

A. Section 05400 - Cold Formed Metal Framing: Structural metal studding and framing behind plaster base.

B. Section 07910 - Joint Sealers: Sealant and joint backing used at joints.

C. Section 09250 - Gypsum Board Systems.

D. Section 09255 - Exterior Sheathing Boards.

E. Section 09900 - Paints and Coatings: Applied surface finish.

F. Division 16 - Electrical: Lighting fixtures.

G. (Stucco) Manual.

1.3 SYSTEM DESCRIPTION

A. Fabricate vertical elements to limit finish surface to L/120 deflection under lateral point load of 100 lb.

B. Fabricate horizontal elements to limit finish surface to 1/360 deflection under superimposed dead load and wind uplift loads.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Provide data on plaster materials, characteristics and limitations of products specified.

C. Submit mix designs for base and finish coats, stating proportions proposed for each mix.

D. Plaster Applicator Qualifications: Submit complete qualifications as outlined below.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C926 and PCA Plaster (Stucco) Manual.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements, and the methods needed for proper performance of the Work of this Section.

1.6 QUALIFICATIONS

A. Plaster Applicator: Company with persons specializing in performing the Work of this Section with minimum five (5) years documented experience, and certified in writing by the materials manufacturer.

1.7 MOCK-UP

A. Provide mock-up of exterior wall Portland Cement plaster system with accessories under provisions of Division One

B. Mock-Up: At an area on the site where approved by the Architect, provide a mock-up Portland Cement plaster panel.

1. Mock-up shall be 4'-0" x 4'-0".

2. Provide one (1) panel for each Portland Cement plaster finish used on the Work.

3. Revise as necessary to secure the Architect's approval.

4. The mock-ups may not be part of the Work.

C. The mock-up panels, when approved by the Architect, will be used as datum points for comparison with the remainder of the Portland Cement plaster installation for the purpose of acceptance or rejection.

D. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the Work of this Section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not apply plaster when substrate or ambient air temperature is less than 50 degrees F nor more than 80 degrees F.

B. Maintain minimum ambient temperature of 50 degrees F during installation of plaster and until cured.

1.9 WARRANTY

A. Provide one (1) year written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced by the Contractor at his expense.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – METAL LATH MATERIALS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. National Gypsum - Gold Bond Building Products.
2. United States Gypsum Company (USG) – Junior Diamond
3. Western Metal Lath.

B. Substitutions: Under provisions of Division One.

2.2 FURRING AND LATHING

A. Building Paper: ASTM D226, non-perforated, 15 lb. felt asphalt saturated.

B. Metal Lath: ASTM C847, self-furring, expanded galvanized steel lath, minimum 3.4 lb. per square yard.

C. Cold Rolled Steel Channels: Two (2) inch furring, minimum 2.26 lb., and 3/4 inch , minimum 0.30 lb.

D. Wire: Minimum nine (9) gauge.

E. Wire Mesh Reinforcement: 1-1/2 x 1-1/2 inch galvanized steel 24 gauge wire, woven mesh, self-furring type.

F. Casing Bead: Formed sheet steel; minimum 26 gauge thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with square edges.

G. Corner Bead: Formed sheet steel; minimum 26 gauge thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with bull-nose edge.

H. Base Screed: Formed sheet steel; minimum 26 gauge thick; depth governed by plaster thickness; maximum possible lengths; expanded metal flanges, with bevel edge.

I. Corner Mesh: Formed steel, minimum 26 gauge thick; expanded flanges shaped to permit complete embedding in plaster; minimum 2 inches (51 mm) wide; rust inhibitive prime paint finish.

J. Control and Expansion Joint Accessories: Formed steel, minimum 26 gauge thick; accordion profile, 2 inch expanded metal flanges each side; rust inhibitive prime paint finish.

K. Anchorage Methods: Nails, staples, or other approved metal supports, of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

L. Polyethylene Sheet: Clear, minimum 8 mil thick.

2.3 PLASTER MATERIALS

A. Portland Cement:

1. Comply with ASTM C150, Type I or II.
2. When specifically approved in advance by the Architect, other cements such as masonry cement, plastic cement, and gun cement may be used in the proportions shown in the approved mix designs.

B. Lime: Provide special finishing hydrated lime complying with ASTM C206, Type S, or provide normal finishing hydrated lime complying with ASTM C6, Type N with maximum unhydrated oxide content of 8% by weight, according to the proportions shown in the approved mix designs.

C. Aggregates: Comply with ASTM C144.

1. Gradation:

a. For Base Coat; provide gradation within the following criteria:

SIEVE	MAX. PERCENT RETAINED	MIN. PERCENT RETAINED
No. 4	----------	0
No. 8	0	10
No. 16	10	40
No. 30	30	65
No. 50	70	90
No. 100	95	100

b. For Finish Coat; provide same gradation as for base coat; except with all aggregate passing the No. 8 sieve.

D. Water: Clean, fresh, potable and free of mineral or organic matter which can affect Portland Cement plaster.

E. Fiber Additive: Provide pure manila fiber or animal hair, specially processed and packaged for use with plaster, from 1/2 to 2 inches long, and free from grease, oil, dirt and other impurities.

F. Coloring Agent: Provide alkali resistant, sun fast, mineral oxide producing colors approved in advance by the Architect.

G. Bonding Agents: Provide material producing a permanent bond not affected by freezing, heat, acid, alkali or dampness, producing no discoloration to finished plaster surfaces, and complying with ASTM C631.

H. Acrylic Admix: Provide material as recommended by the manufacturer to suit the application.

I. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.4 MIXES

A. General Procedures:

1. Proportion and measure the materials for each batch of plaster (stucco) accurately, and in accordance with ASTM C926.
2. Prepare batches in quantity for complete use within a maximum of one (1) hour after mixing.
3. Do no retemper or use partially set plaster, except plaster which has stiffened only from evaporation.
4. Do not use frozen, caked or lumpy material, but remove such material from the job site immediately.
5. Use only sand which is moist and loose.
6. Withhold about 10 percent of the required water until the mixing cycle in nearly completed, then add water as needed to achieve the required consistency.
7. Do not mix by hand, unless specifically so approved by the Architect.

B. Mechanical Mixing:

1. Mix each batch separately.
2. Clean the mixer thoroughly between batches, removing set or hardened materials prior to loading new materials.
3. Continue operation of mixer while adding materials.

C. First Coat - “Scratch Coat”:

1. One (1) cubic foot Portland Cement.
2. One (1) cubic foot Masonry Cement.
3. Four (4) cubic foot silica sand.
4. One (1) lb. or more of 1/2 inch glass fibers.

D. Second Coat - “Brown Coat”:

1. One (1) cubic foot Portland Cement.
2. One (1) cubic foot Masonry Cement.
3. Five (5) to six (6) cubic foot of silica sand.
4. One (1) lb. or more of 1/2 inch glass fibers.

E. Finish Coat:

F. 100% acrylic elastomeric finish with factory blend aggregate and color as manufacturer by Dryvit, Sto, Senergy, Thoro, Parex, or approved equivalent by the Architect, and applied strictly according to manufacturer’s instructions.All mixing water shall be three (3) parts water and one (1) part acrylic admix to reduce shrinking and cracking, and eliminate the need for moist curing of plaster.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until satisfactory conditions are corrected.

B. Verify that grounds have been set in a manner to achieve the required plaster thickness.

C. Masonry: Verify joints are cut flush and surface is ready to receive work of this Section. Verify no bituminous or water repellent coatings exist on masonry surface.

D. Concrete: Verify surfaces are flat, honeycomb is filled flush, and surface is ready to receive work of this Section. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to plaster.

E. Beginning of installation means acceptance of existing substrate conditions.

3.2 PREPARATION

A. Uniformly dampen absorptive bases by use of a fine fog spray of clean water to reduce excessive suction.

B. Clean concrete surfaces of foreign matter. Clean surfaces using acid solutions, solvents, or detergents. Wash surfaces with clean water.

C. Roughen smooth concrete surfaces and apply bonding agent. Apply in accordance with manufacturer's instructions.

D. Protect adjacent surfaces near the Work of this Section from damage or disfiguration.

3.3 INSTALLATION - LATHING MATERIALS

A. Install lath and furring in accordance with ANSI A42.3.

B. Apply one (1) ply of building paper over substrate; weather lap edges four (4) inches minimum, and fasten in place.

C. Apply self furring reinforcement with self furring ribs perpendicular to supports.

D. Lap ends minimum one (1) inch. Secure end laps with tie wire where they occur between supports.

E. Attach metal lath to metal supports using tie wire at maximum six (6) inches on center.

3.4 INSTALLATION - ACCESSORIES

A. Continuously reinforce internal angles with corner mesh, return metal lath three (3) inches from corner to form the angle reinforcement; fasten at perimeter edges only.

B. Place corner bead at external wall corners; fasten at outer edges of lath only.

C. Place strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

D. Place four (4) inch wide strips of metal lath centered over junctions of dissimilar backing materials. Secure rigidly in place.

E. Place casing beads at termination of plaster finish. Butt and align ends. Secure rigidly in place.

F. Coordinate work with installation of metal access panels. Refer to Section 08310.

G. Install frames plumb and level in opening. Secure rigidly in place.

H. Position to provide convenient access to concealed work requiring access.

3.5 CONTROL AND EXPANSION JOINTS

A. Locate control joints at intervals of not more than 100 square feet.

B. After initial set, scribe contraction joints in exterior work as indicated on reflected ceiling plan by cutting through 2/3 of the cement plaster depth, neatly, in straight lines.

C. Locate exterior and expansion joints as indicated on Drawings.

D. Establish control and expansion joints with specified joint device.

E. Coordinate joint placement with other related work.

3.6 PLASTER APPLICATION

A. General:

1. Schedule application of Portland Cement plaster to precede application of other finishes, and installation of other items, which could be damaged by accidents incidental to the plastering.

2. Apply Portland Cement plaster by machine or by hand.

3. Apply each coat continuously, interrupting only at control joints, at openings, or a junctions of plaster planes.

4. Where frames or other items provide a plaster ground, tool through the finish coat to produce a V-joint at the intersection of plaster and such items.

5. Produce the total plaster thickness indicated on the Drawings.

B. Base Coats:

1. Over Metal Base:

   a. Apply with sufficient material and force to cover the substrate and to form good keys, embedding and filling all spaces of the metal base.

   b. Score to receive the succeeding coat.

2. Over Solid Base:

   a. Apply with sufficient material and force to insure tight contact and complete coverage of substrate.

   b. Score to receive the succeeding coat.

3. Three Coat Installation:

a. Do not apply the second coat sooner than 48 hours after installation of the base coat.

b. Apply with sufficient material and force to cover the substrate and form a good bond.

c. Bring out to grounds, straighten to a true surface, and leave sufficient rough to ensure adequate bond of the finish coat.

4. Acrylic Finish:

a. Comply with manufacturer's instructions for mixing and application of acrylic finish.

b. Apply finish continuously and in one operation to the entire surface areas maintaining a "wet" edge so that completed finish is free of scaffold lines and other imperfections due to application methods.

c. Complete finish textures and colors shall be consistent with the approved mock-up panels.

3.7 CLEANING

A. Clean Work under provisions of Division One.

B. Remove protective materials and plaster materials from adjacent surfaces, and remove stains which would adversely affect finishes.

C. Upon completion of the other Work of this Section, inspect all Portland Cement plaster surfaces and correct conditions which do not meet specified requirements.

END OF SECTION 09220

SECTION 09250 - GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Interior, Non-Load Bearing, Metal Framing and Gypsum Board Systems; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

C. Interior Gypsum Board Types:

1. Non-Rated Gypsum Board.
2. Fiber-Reinforced Abuse-Resistant Gypsum Board.
3. Non-Rated Moisture Resistive Gypsum Board.
4. Gypsum Ceiling Board.
5. Coated Glass Mat Tile Backer Board.

D. Taped and Sanded Joint Treatment.

1.2 RELATED SECTIONS

A. Section 05400 - Cold Formed Metal Framing: Exterior structural steel wall framing to receive work of this Section.

B. Section 06100 - Rough Carpentry: Concealed wood blocking.

C. Section 07210 - Building Insulation: Thermal and sound insulation.

D. Section 08310 - Access Doors and Panels: Access panels in gypsum board.

E. Section 09255 - Exterior Sheathing Boards.

F. Section 09310 - Ceramic Tile: Moisture-resistant gypsum board substrate.

G. Section 09900 - Paints and Coatings: Surface finish.

1.3 SUBMITTALS

A. Submit under provisions of Division One. Pre-approval required by DSA prior to installation.

B. Shop Drawings: Indicate special details associated with acoustical seals, opening locations and details, and opening termination details.

C. Product Data: Provide manufacturer's data on metal framing, gypsum board systems and components, joint tape; and finish.

D. Provide manufacturers written installation instructions.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

C. Single Source Responsibility: Obtain each type of gypsum board and related joint treatment materials from a single manufacturer.

D. Wall and ceiling assemblies shall meet or exceed the fire resistance requirements outlined under provisions of the GA-600-00 Fire Resistance Design Manual.

E. Surface burning characteristics of finish materials must meet or exceed the flame/fuel/smoke requirements of ASTM E84.

1.5 SYSTEM DESCRIPTION

A. Non-load bearing steel stud partitions, 20 gauge minimum required, with deflections conforming to L/360 at 15 psf for veneer plaster walls, and L/240 at 5 psf typical.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver all materials in manufacturer's unopened original packages showing manufacturer's and product brand names.

C. Store products inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. Protect adhesives from freezing or overheating in accordance with manufacturers instructions.

E. Protect metal framing, metal studs and accessories from bending.

F. Handle gypsum boards to prevent damage to edges, ends and surfaces.

1.7 PROJECT CONDITIONS

A. General Environmental Requirements: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C840, and with gypsum board manufacturer's recommendations.

B. Minimum Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F. For adhesive attachment of gypsum board maintain not less than 50 degrees F for forty-eight (48) hours prior to application and continuously thereafter until drying is complete.

C. Ventilate building spaces to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

1.8 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - INTERIOR METAL FRAMING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Clark Western Steel Framing Systems.
2. California Expanded Metal Product Company.
3. Dietrich Industries, Inc./Unimast.
4. National Gypsum.

B. Substitutions: Under provisions of Division One.

2.2 ACCEPTABLE MANUFACTURERS - GYPSUM MATERIALS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. National Gypsum - Gold Bond Building Products.
2. Georgia-Pacific Corporation.
3. Armstrong World Industries.
4. United States Gypsum Company (USG).

B. Substitutions: Under provisions of Division One.

2.3 FRAMING MATERIALS

A. Studs and Tracks: ASTM C645; galvanized sheet steel, 20 gauge thick (0.0341 inches (minimum thickness galvanized), C shape studs with knurled faces; widths as indicated on Drawings.

B. Main Runner Channels: 1-1/2 inch cold rolled steel channel, 475 lb./linear foot with minimum base steel of 0.054 inches; galvanized.

C. Cross Furring Channels: 3/4 inch cold rolled steel channel, 300 lb./linear foot with minimum base steel of 0.054 inches; galvanized.

D. Rigid Furring Channels: 7/8 inch hat shaped channels, 20 gauge, 287 lb./linear foot with minimum base steel of 0.0179 inches; galvanized and complying with ASTM C645.

E. Furring Channels: 1-1/2 inch Z shaped channels, 236 lb./linear foot with minimum base steel of 0.0179 inches; galvanized and complying with ASTM C645.

2.4 GYPSUM BOARD MATERIALS

A. Standard Gypsum Board: ASTM C36; gypsum core wall panel surfaced with paper on front, back and long edges; 5/8 inch thickness, type X, maximum permissible lengths, ends square cut, tapered edges.

B. **(All Classrooms):** Fiber-Reinforced, Abuse-Resistant Gypsum Board: ASTM C1629; fiberglass reinforced gypsum core wall panel with additives to enhance fire resistance of the core and surfaced with heavy smooth finish paper on front, back and long edges; mold and mildew-resistant; purple; Type X, UL rated; 5/8 inch thickness, maximum possible length; ends square cut, tapered edges.

1. National Gypsum- Gold Bond - Hi Impact XP Gypsum Board.

2. Substitutions under provisions of Division One..

C. Moisture Resistant Gypsum Board: National Gypsum Gold Bond XP Moisture Resistant Gypsum Board with "Sporgard" additives to enhance the water resistance of the core and papaer; surfaced with moisture resisitant paper on the front, back and long edges; 5/8 inch thickness, maximum permissible lengths, ends square cut, tapered edges.

D. Gypsum Ceiling Board: ASTM C36; gypsum core ceiling panel with additives to enhance the sag resistance of the core, and surfaced with paper on the front, back and long edges; 1/2 inch thickness; maximum permissible lengths, ends square cut, tapered edges.

E. Tile Backer Board (for Ceramic and Porcelain Tile): ASTM C1178; coated glass mat backer board. Thickness: 5/8 inch: G-P Gypsum Corporation; Dens-Shield Tile Backer or approved equivalent.

F. Joint Treatment and Compound: Types recommended by manufacturer to suit applications.

2.5 ACCESSORIES

A. Acoustical Sealant: Non-hardening, non-drying, non-skinning, non-staining, non-bleeding, gunnable type as recommended by the manufacturer for use in conjunction with gypsum board.

B. Corner Beads: ASTM C1047; formed galvanized steel angle, minimum base steel 0.014 inch thick, sizes as required to suit substrate.

C. Casing Bead: ASTM C1047; formed galvanized steel trim, minimum base steel 0.014 inch thick, sizes as required to suit substrate.

D. Control Joints: ASTM C1047; extruded vinyl formed with V shaped slot covered with removable flexible vinyl strip.

E. Jointing System:

1. Provide a jointing system, including reinforcing tape and compound, designed as a system to be used together and as recommended for this use by the manufacturer of the gypsum board approved for use on this Work.

2. Jointing compound may be used for finishing if so recommended by its manufacturer.

F. Fastening Devices:

1. For fastening gypsum board in place on metal studs and metal channels, use flat-head screws, shouldered, specially designed for use with power-driven tools, not less than one (1) inch long, with self-tapping threads and self-drilling points.

2. For fastening gypsum board in place on wood, use 1-1/4 inch type W bugle-head screws, or use annular ring type nails complying with ASTM C514, and of the length required to suit substrate.

G. Hangers for Suspended and Furred Ceilings: Per ASTM C754.

H. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Examine substrates to which gypsum board construction attaches or abuts, pre-set hollow metal frames, cast-in anchors, and structural framing, for compliance with requirements for installation tolerances and other conditions affecting performance of gypsum board construction. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Beginning of installation means acceptance of substrate conditions.

3.2 PREPARATION

A. Ceiling Anchorage: Coordinate installation of ceiling suspension with installation of overhead structural systems to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling anchors in a manner that will develop their full strength and at spacing required to support ceiling.

1. Provide concrete inserts, steel deck devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

3.3 METAL FRAMING INSTALLATION - GENERAL

A. Install steel framing to comply with ASTM C754 and with ASTM C840 requirements that apply to framing installation.

B. Install supplementary framing, blocking and bracing at termination in the Work and for support of fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, and similar construction to comply with details indicated on the Drawings, and with recommendations of gypsum board manufacturer, or if none available, with "Gypsum Construction Handbook" published by United States Gypsum Company.

C. Isolate steel framing from building structure to prevent transfer of loading imposed by structural movement, at locations indicated below to comply with details indicated on Drawings:

1. Where edges of suspended ceilings abut building structure horizontally at ceiling perimeters or penetrations of structural elements.

2. Where partitions and wall framing abuts overhead structure.

3. Provide slip type joint as detailed to attain lateral support and avoid axial loading.

D. Provide rosen paper or similar material to prevent treated wood from being in direct contact with light metal framing or light metal decking. .

E. Do not bridge building expansion and control joints with steel framing or furring members; independently frame both sides of joints with framing or furring members.

3.4 METAL FRAMING INSTALLATION - WALLS AND PARTITIONS

A. Install runners (track) at floors, ceilings and structural walls and columns where gypsum board stud system abuts other construction.

1. Where studs are installed directly against exterior walls, install asphalt felt strips between studs and wall.

B. Metal Stud Spacing: Maximum 24 inches on center, unless noted otherwise.

C. Installation Tolerances: Install each steel framing and furring member so that fastening surface do not vary more than 1/8 inch from plane of faces of adjacent framing.

D. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

E. Terminate partition framing at suspended ceilings where indicated on the Drawings.

F. Install steel studs in sizes and spacing indicated on the Drawings, but not less than that required by referenced steel framing installation standards.

G. Install steel studs so that flanges point in the same direction and gypsum boards can be installed in the direction opposite to that of the flanges.

H. Frame door openings to comply with details indicated on the Drawings, with GA-216 and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

I. Frame openings other than door openings to comply with details indicated on the Drawings, or if none is indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

J. Blocking: Bolt or screw steel channels to metal studs. Install concealed wood blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, and all other related items that require backing for support under provisions of Section 06100.

1. Use non-resistive type vapor retarder where vapor retarder is covered with gypsum board.

3.5 METAL FRAMING INSTALLATION - SUSPENDED AND FURRED CEILINGS

A. Secure hangers to structural support by connecting directly to structure where possible, otherwise connect to cast-in concrete inserts or other anchorage devices or fasteners as indicated on the Drawings.

1. Do not attach hangers to metal deck tabs.

2. Do not attach hangers to metal roof deck

3. Do not attach hangers to underside of concrete slabs with power-actuated fasteners.

B. Install metal ceiling framing in accordance with ASTM C754, and space main runners at 4'-0" on center maximum.

C. Do not connect or suspend steel framing from ducts, pipes or conduit.

D. Keep hangers and braces two (2) inches clear of ducts, pipes or conduits.

E. Sway-brace suspended steel framing with hangers used for support.

3.6 APPLICATION AND FINISHING OF GYPSUM BOARD - GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum board to comply with ASTM C840.

B. Install sound attenuation insulation (07210) where indicated on the Drawings, prior to gypsum board unless readily installed after board has been installed.

C. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than twenty-four (24) inches in alternate courses of board.

D. Install ceiling boards across framing in the manner which minimizes the number of end-butt joints, and which will avoid end joints in the central area of each ceiling. Stagger end joints at least twenty-four (24) inches.

E. Install wall and partition boards vertically.

F. Install exposed gypsum board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

G. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that like edges abut, tapered edges against tapered edges and mill-cut or field-cut ends against mill-cut or field-cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.

H. Attach gypsum board to steel studs so that leading edge or end of each board is attached to open (unsupported) edge of stud flange first.

I. Attach gypsum board to supplementary framing and blocking provided for additional support at openings and cut-outs.

J. Form control joints and expansion joints at locations indicated on the Drawings, or as required, with space between edges of boards, prepared to receive trim accessories. Maximum distance between control joints shall be 30 linear feet.

K. Cover both faces of steel stud partition framing with gypsum board in concealed spaces (above ceilings, etc.), except in chase walls which are properly braced internally.

1. Except where concealed application is indicated, or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 square feet (0.74 m^2) area, and may be limited to not less than 75 percent of full coverage.

2. Fit gypsum board around ducts, pipes and conduits.

3. Where partitions intersect open concrete coffers, cut gypsum board to fit profile of coffers and allow 1/4 to 1/2 inch wide joint for sealant.

L. Isolate perimeter of non-load bearing drywall partitions at structural abutments. Provide 1/4 inch to 1/2 inch space and trim edge with "U" bead edge trim. Seal joints with acoustical sealant.

M. Where sound-rated drywall construction is indicated on the Drawings, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C919 and manufacturer's recommendations for location of edge trim, and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.

1. For double-layer partition systems, construction above acoustical plaster ceilings may be installed with base layer only.

N. Space fasteners in gypsum boards in accordance with referenced gypsum board application and finishing standard and manufacturer's recommendations.

3.7 APPLICATION OF CEMENT BOARD - GENERAL

A. Install interior cement board, and treat joints to comply with manufacturer's recommendations for type of application indicated on the Drawings.

3.8 METHODS OF GYPSUM DRYWALL APPLICATIONS

A. Single-Layer Application: Install gypsum board as follows:

1. On ceilings apply gypsum board prior to wall/partition board application to the greatest extent possible.

2. On walls/partitions apply gypsum board vertically (parallel to framing), unless otherwise indicated on Drawings, and provide sheet lengths which will minimize end joints.

B. Wall Tile Base: Where drywall is base for thin-set ceramic tile and similar rigid applied wall finishes, install tile backer board.

1. In "dry areas" install gypsum backing board finished to produce a flat surface.

C. Double-Layer Application:

1. On walls/partitions apply base layer and face layers vertically or horizontally (parallel) with joints of base layer over supports and face layer joints off-set a minimum of ten (10) inches with base layer joints.

a. For fire rated systems, install boards vertically or horizontally and as otherwise required by the approved UL rating.

2. On ceilings apply base layer prior to application of base layer on walls/partitions; apply face layers in same sequence. Off-set joints between layers a minimum of ten (10) inches. Apply base layers at right angles to supports, unless otherwise indicated.

D. Single-Layer Fastening Methods: Fasten gypsum board to supports with screws.

E. Double-Layer Fastening Methods: Fasten both base and face layers to supports with screws.

3.9 INSTALLATION OF TILE BACKER BOARD

A. Install per manufacturer’s installation instructions for floor underlayment over plywood substrate and according to TCNA Handbook for Tile Installation, F-113.

3.10 INSTALLATION OF ACCESSORIES

A. General: Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges to comply with manufacturer's recommendations.

B. Install metal corner beads at external corners.

C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed, and except where plastic trim is indicated on the Drawings. Provide type with face flange to receive joint compound except where "U" bead (semi-finishing type) is indicated.

D. Install control joints at locations indicated on the Drawings, or if not indicated, at spacing and locations required by referenced gypsum board application and finish standard, and approved by the Architect for visual effect.

3.11 JOINT TREATMENT

A. General:

1. Apply Joint treatment per ASTM C840 and Manufacturer’s written instructions.

2. Inspect areas to be joint treated, verifying that the gypsum board fits snugly against supporting framework.

3. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees F for 24 hours prior to commencing the treatment, and until joint and finishing compounds have dried.

4. Apply the joint treatment and finishing compound by machine or hand tool.

5. Apply additional coats of compound, as required, after previous coat has set but before it dries.

B. Embedding Compounds:

1. Apply to gypsum board joints and fastener heads in a thin uniform layer.

2. Spread the compound not less than three (3) inches (76 mm) wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then, spread a thin layer of compound over the tape.

3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than six (6) inches wide at joints, and feather edges.
4. Sandpaper between coats as required.
5. When thoroughly dry, sandpaper to eliminate ridges and high points.

C. Finishing Compounds:

1. After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads.
2. Feather the finishing compound to not less than twelve (12) inches wide.
3. When thoroughly dry, sandpaper to obtain a uniform smooth surface, taking care to not scuff the paper surface of the board.
4. Finish gypsum board in accordance with GA-214-90 to the following criteria:
   a. **Level 1**: Concealed areas only; such as attics, plenums above ceiling spaces, etc.
   b. **Level 3**: Areas to receive wall coverings, textured surfaces, etc.
   c. **Level 4**: All areas to receive paint finish.

3.12 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in ten (10) feet in any direction.

3.13 PROTECTION

A. Provide final protection and maintain conditions, which ensure gypsum board construction being without damage or deterioration at time of Substantial Completion.

3.14 CLEANING

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum board scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.

B. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scraps, debris and surplus materials of this Section.

END OF SECTION 09250

SECTION 09255 - EXTERIOR SHEATHING BOARD

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Exterior Sheathing Board; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Exterior Fiberglass Mat Faced Sheathing Board.

1.2 RELATED SECTIONS

A. Section 05400 - Cold Formed Metal Framing: Exterior metal wall and soffit framing.

B. Section 09250 - Gypsum Board Systems: Interior metal framing and gypsum board finish.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate special details associated with construction, opening locations and details, and opening termination details.

C. Product Data: Provide manufacturer’s data on sheathing board systems and fasteners.

D. Provide manufacturers written installation instructions.

1.4 QUALITY ASSURANCE

A. Applicator: Company specializing in performing the work of this section with minimum five (5) years documented experience.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

C. Single Source Responsibility: Obtain each type of gypsum sheathing and related joint treatment materials from a single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver all materials in manufacturer's unopened original packages showing manufacturers and product brand names.

C. Store products inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic and other causes. Neatly stack gypsum boards flat to prevent sagging.

D. Handle gypsum boards to prevent damage to edges, ends and surfaces.

1.6 PROJECT CONDITIONS

A. Environmental Requirements - General: Establish and maintain environmental conditions for application to comply with gypsum sheathing manufacturer's recommendations.

1.7 WARRANTY

A. Provide one (1) year manufacturer’s written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 FIBERGLASS MAT FACED EXTERIOR SHEATHING BOARD

A. Fiberglass Mat Faced Exterior Sheathing: ASTM C1177; silicone treated core surfaced with inorganic glass fiber mat on the front and back; UL fire rated, 5/8 inch thick, 4’-0” wide x maximum permissible length; square cut edges and ends.

1. Georgia Pacific Corporation, Dens-Glas Gold Firestop Type X.

2. United States Gypsum, Firecode Core USG Aqua Tough Gypsum Sheathing.

3. National Gypsum - e^2XP extended exposure sheathing.

4. GlasRoc Brand Sheathing by Certainteed.

5. Substitutions: No Substitutions Allowed.

2.2 FRAMING MATERIALS

A. Cold Formed Metal Framing: As specified in Section 05400.

2.3 ACCESSORIES

A. Fastening Devices: 1-1/4 inch minimum #6 Type S-12 bugle head, corrosion resistant screws with self tapping threads and self-drilling points.

B. Building Paper: ASTM D226, 15 lb. asphalt felt.

C. Joint System:

1. Joint Tape: Glass mesh tape as recommended by board manufacturer.

2. Joint Compound: Georgia Pacific, “Speed Set”, or approved equivalent by the Architect.

D. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which sheathing board attaches or abuts for compliance with requirements for installation tolerances and other conditions which would adversely affect the performance of gypsum sheathing. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Beginning of installation means acceptance of substrate conditions.

3.2 APPLICATION GYPSUM SHEATHING - GENERAL

A. Gypsum Sheathing Application: Install gypsum sheathing to comply with manufacturer’s printed installation instructions and applicable requirements of GA-253.

B. Attach gypsum sheathing to steel studs using corrosion resistant fasteners spaced 3/8” from ends and edges and located 8” o/c maximum. Install fasteners flush with surface of sheathing. Do not countersink.

C. Do not install damaged sheathing boards. Butt boards together for a light contact at edges and ends with not more than 1/16 inch open space between boards. Do not force into place.

D. Attach gypsum sheathing board to supplementary framing and blocking provided for additional support at openings and cut-outs.

3.3 METHODS OF GYPSUM SHEATHING APPLICATIONS

A. Single-Layer Application: Install gypsum sheathing as follows:

1. Apply gypsum sheathing horizontally (parallel to framing), unless otherwise indicated on Drawings, and provide sheet lengths which will minimize end joints.

2. Fasten gypsum sheathing to supports with screws.

3.4 TOLERANCES

A. Maximum Variation of Gypsum Sheathing Board Surface from True Flatness: 1/8 inch in ten (10) feet in any direction.

3.5 PROTECTION

A. Provide final protection and maintain conditions, which ensure gypsum sheathing construction being without damage or deterioration during construction.

3.6 CLEANING

A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum sheathing board scraps. At completion of each segment of installation, promptly pick up and remove from the working area all scraps, debris and surplus materials of this Section.

END OF SECTION 09255

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Interior Ceramic Tile Floor, Wall and Base Using the Mortar-Set and Thin-Set Application Method.

C. Related Mortar, Grout, Trim and Accessories.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Trowelling of floor slab for tile application.

B. Section 07910 - Joint Sealers: Sealant at control joints.

C. Section 09250 - Gypsum Board Systems: Interior metal stud wall framing and gypsum board finish.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit data indicating material specifications, characteristics, and instructions for using adhesives, grouts, mortars and additives.

C. Submit manufacturer's installation instructions.

D. Submit maintenance data, including recommendations for cleaning and stain removal methods, and cleaning materials under provisions of Division One.

E. Submit manufacturer's written certification that all ADAAG Requirements have been met for this project.

F. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

1.4 QUALITY ASSURANCE

A. Conform to Tile Council of America (TCNA) Handbook, current edition, for Ceramic Tile Installation.

B. Conform to "Americans with Disabilities Act Accessibility Guidelines" (ADAAG) criteria for the following:

1. Static Coefficient of Friction: Appendix to the ADAAG, in Section A4.5 defines slip-resistant as a static coefficient of friction of 0.6 for floor areas and 0.8 for ramps. ASTM C1028 (The Slip Meter), test procedures shall be used for both wet and dry readings, and all manufacturers shall certify that their products meet or exceed these requirements.

C. Single-Source Responsibility: Obtain each color, grade, finish, type composition and variety of ceramic tile from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work. Obtain ingredients for setting and grouting materials of a uniform quality from one manufacturer for each cementitious and admixture component and from one source or producer for each aggregate.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of products specified in this Section with minimum five (5) years documented experience.

B. Installer: Company specializing in applying the work of this Section with minimum five (5) years documented experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements of ANSI A137.1 for labeling sealed tile packages.

C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

D. Prevent damage or contamination to materials by water, foreign matter and other causes.

E. Handle ceramic tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units.

1.7 MAINTENANCE

A. Submit manufacturer’s complete maintenance data under provisions of Division One.

B. Provide two (2) copies of the manufacturer’s Maintenance Manual for the complete care of the ceramic tile units. Submit to the Owner, through the Architect, for review and approval.

1. Provide ceramic tile manufacturer's and supplier's name, address and telephone numbers. Include for each product; the product name, serial or model numbers and colors.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and manufacturer's written recommendations.

B. Vent temporary heaters to the exterior to prevent damage to tile work from carbon dioxide build-up.

C. Maintain temperatures at 50 degrees F or more in tiled areas during installation and seven (7) days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

1.9 FIELD MEASUREMENTS

A. Verify actual locations of tile finish and other construction to which tile finish must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.10 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - INTERIOR CERAMIC TILE

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. American Olean Tile Co., Inc.
2. Dal-Tile Corporation.
3. Summitville Tiles, Inc.
4. U.S. Ceramic Tile Company.
5. Wausau Tile.

B. Substitutions: Under provisions of Division One.

2.2 CERAMIC FLOOR TILE MATERIAL

A. Ceramic Floor Tile: ANSI/TCNA A137.1-1992; conforming to the following:

1. Moisture Absorption: 0 to 0.5 percent
2. Size: 2" x 2" inch x 1/4 inch thick
3. Edge: Cushioned
4. Surface Finish: Unglazed
5. Colors: Refer to Finish Schedule.

2.3 CERAMIC WALL TILE MATERIAL

A. Ceramic Wall Tile: ANSI/TCA A137.1-1992; conforming to the following:

1. Moisture Absorption: 0 to 0.5 percent
2. Size: 4.25 x .25 inch x 1/4 inch thick
3. Edge: Square
4. Surface Finish: Matte glazed
5. Colors: Refer to Finish Schedule.

2.4 CERAMIC BASE TILE MATERIAL

A. Ceramic Base Tile: ANSI/TCNA A137.1-1992; match wall tile for size, moisture absorption, surface finish, and color, conforming to the following:

1. Internal Corner: Coved.
2. External Corner: Coved.

2.5 ACCEPTABLE MANUFACTURERS - MEMBRANE, MORTAR, AND GROUT

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. DAP, Inc.
2. Hydroment from Bostik.
3. Laticrete International, Inc.
4. Mapei Corporation.
5. TEC by H.B. Fuller Company.
6. W.R. Bonsal Company.
7. C-Cure Corp.

B. Substitutions: Under provisions of Division One.

2.6 SETTING MATERIALS

A. Comply with pertinent recommendations contained in the Tile Council of North America, current Edition, "Handbook for Ceramic Tile Installation".

A. **(Student Restrooms)** Portland Cement Mortar:

1. Materials:
   a. Portland Cement complying with ASTM C150, Type I or II.
   b. Sand complying with ASTM C144.
   c. Galvanized steel diamond mesh weighing 3.4 lbs. per square yard.
   d. Hydrated lime complying with ASTM C206.
   e. Water clean and potable, free of foreign matter.
   f. Paper-backed metal lath complying with ASTM
2. Where used on floors, provide a job-mix of one (1) part Portland cement to six (6) parts sand.
3. Where used on walls, provide a job-mix of one (1) part Portland cement to five (5) parts sand, with 1/2 part lime, except where other proportions are approved in advance by the Architect.

B. **(Staff Restrooms)** Latex-Portland Cement Mortar (Thin Set):

1. Provide a commercially prepared prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added, for use as a bond coat for setting tile. Comply with ANSI A118.4
2. Comply with ANSI A118.1; except where specifically indicated on the Drawings, or approved in writing in advance by the Architect.
   a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

2.7 GROUT MATERIALS

A. Comply with pertinent recommendations contained in the Tile Council of North America, current Edition, "Handbook for Ceramic Tile Installation", in colors selected by the Architect from standard colors available from the approved manufacturers.

B. Latex-Portland Cement Grout:

1. Provide a commercially prepared mixture.
2. Secure the Architect's written approval of the proposed material prior to use.
3. Grout sealant to be liquefied silicone.

C. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.8 ACCESSORIES

A. Metal Edging and Transitions: Schluter Systems or equal approved by Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means installer accepts condition of existing surfaces.

3.2 PREPARATION

A. Protect surrounding work from damage or disfiguration.

B. Vacuum clean existing surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing surfaces to acceptable flatness tolerances.

3.3 INSTALLATION

A. General:

1. Comply with ANSI A108.1, ANSI A108.2 and the "Handbook for Ceramic Tile Installation" of the Tile Council of North America, current Edition, except as otherwise directed by the Architect.
2. Install adhesive, tile, and grout to TCNA Handbook for Ceramic Tile Installation, Handbook Number F-113, F-147 and W-243.
3. Maintain minimum temperature limits and installation practices recommended by materials manufacturers.

4. Do not install tile floors over membrane until the membrane has been tested and approved.

B. Except where otherwise indicated on the Drawings or directed by the Architect, provide thin-set organic adhesive application for walls and floors. Limits of Tile:

1. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruptions.

2. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment.

C. Joining Pattern:

1. Lay tile in grid pattern, unless otherwise indicated on the Drawings or directed by the Architect.

2. Align joints when adjoining tiles on floor, base, trim and walls are the same size.

3. Lay tile work, and center the tile fields both directions in each space or on each wall area.

4. Adjust to minimize tile cutting.

5. Provide uniform joint widths.

D. Provide expansion and control joints where shown on the Drawings, and where otherwise recommended by the "Handbook for Ceramic Tile Installation" of the TCNA, sealing in accordance with Section 07910 of these Specifications.

E. Sound tile after setting. Replace hollow sounding units.

F. Allow tile to set for a minimum of forty-eight (48) hours prior to grouting. Grout tile joints.

G. Apply sealant to junction of tile and dissimilar materials and at junction of dissimilar planes.

3.4 CLEANING

A. Clean work under provisions of Division One.

B. Upon completion of placing and grouting, clean the Work of this Section in accordance with recommendations of the manufacturers or the materials used.

C. Protect metal surfaces, cast iron and vitreous items from effects of acid cleaning.

D. Flush surfaces with clean water before and after cleaning.

E. Provide tile surfaces clean and free from cracked, broken, chipped, unbonded and otherwise defective units.

3.5 PROTECTION

A. Protection of finished work under provisions of Division One.

B. Provide required protection to tile surfaces to prevent damage and wear prior to acceptance of the Work at Substantial Completion.

END OF SECTION 09310

SECTION 09510 - SUSPENDED ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Non-Rated Acoustical Panel Assemblies; Suspended Exposed Metal Grid Ceiling Systems and Perimeter Trim.

1.2 RELATED SECTIONS

A. Section 05310 - Steel Decking: Roof support deck.

B. Section 09250 - Gypsum Board System: Interior metal framing and gypsum board systems.

C. Division 15 - Mechanical: Sprinkler heads in ceiling system, air outlets and inlets, and air diffusion devices in ceiling system.

D. Division 16 - Electrical: light fixtures and fire alarm components in ceiling system.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system.

C. Product Data: Provide data on metal grid system components and acoustical units.

D. Samples: Submit two (2) samples full size illustrating material and finish of acoustical units.

E. Samples: Submit two (2) samples each of suspension system main runner, cross runner and edge trim.

F. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.4 MAINTENANCE

A. Submit manufacturer’s complete maintenance data under provisions of Division One.

B. Provide two (2) copies of the manufacturer’s Maintenance Manual for the complete care of the acoustical tile ceilings and trim. Submit to the Owner, through the Architect, for review and approval.

1. Provide acoustical suspension system and acoustical panel manufacturer’s and supplier’s names, address and telephone numbers. Include for each product; the product name, serial or model number and colors.

1.5 QUALIFICATIONS

A. Suspended Grid Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five (5) years documented experience.

B. Acoustical Panel Manufacturer: Company specializing in manufacturing the Products specified in this Section with minimum five (5) years documented experience.

C. Installer: Company specializing in the installation of products specified in this Section with minimum five (5) years documented experience.

D. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

E. All materials to meet CISCA requirements for Seismic zones.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.7 SEQUENCING

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Install acoustical units after interior wet work is dry.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of suspended acoustical ceilings and other construction to which finish suspended acoustical ceilings must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.9 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM

A. Subject to conformance with requirements, provide products from one of the following manufacturers:

1. Chicago Metallic Corp.
2. USG Interiors, Inc. – "DONN".

B. Substitutions: Under Provisions of Division One.

C. Comply with DSA requirements for seismic systems, CBC 2501 of Title 24.

2.2 ACCEPTABLE MANUFACTURERS - ACOUSTIC UNITS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Armstrong World Industries.
2. Certainteed (was Celotex).
3. USG Interiors, Inc.
4. Conwed.
5. National Gypsum – Gold Bond Building Products.

B. Substitutions: Under provisions of Division One.

2.3 MATERIALS AND SYSTEMS

A. **GRID SYSTEM**

1. Exposed Grid Suspension System (Non-Rated): Chicago Metallic No. 200 Heavy Duty System; install grid in a 2 x 4 foot module or a 2 x 2 foot module according to Reflected Ceiling Plan; color "White". Grid system typical for all ceiling types.

B. CEILING TYPE 1

1. Lay-In Acoustical Boards: Armstrong "Cirrus Second Look III", No. 514, beveled tegular edge; NRC range of 0.65; CAC of 35; Class A per ASTM E1264, 24 x 48 x 3/4 inch units; light reflectance 0.85; color - "White".

C. CEILING TYPE 2

1. Lay-In Acoustical Boards: Armstrong "Fine Fissured," No. 1729; square edge; NRC of .55 per ASTM C423; CAC of 35; Class A per ASTM E1264; 24 x 48 x 5/8 inch panels; color "White.".

D. **CEILING TYPE 3**

1. Lay-In Acoustical Boards: Armstrong "Cermaguard Non-Perforated", No. 605, square edge; NRC N/A; CAC 40; Class A Fireguard; 24 x 48 x 5/8"; light reflectance 0.88; scrubbable, soil resistant; sag-resistant; color "White."

E. **CEILING TYPE 4**

1. Lay-In Acoustical Boards: Armstrong "School Zone Fine Fissured", No. 1714, square edge; NRC 0.70; CAC 40; Class A per ASTM E1264; 24 x 48 x 3/4"; light reflectance 0.85; sag-resistant and antimicrobial; color "White."

F. **CEILING TYPE 5**

1. **(STANDARD CLASSROOM PANELS):** Armstrong "Minatone Cortega", No. 747, square edge; NRC 0.55; CAC 40; Class A per ASTM E1264; 24 x 48 x 5/8"; sag-resistant; color "White."

2.4 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to approval of the Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - GRID SUSPENSION SYSTEM

A. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.

B. Install system capable of supporting imposed loads to a deflection of 1/360 maximum.

C. Install per seismic code requirements.

D. Locate system on room axis according to reflected plan.

E. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.

F. Provide hanger clips during steel deck erection. Provide additional hangers and inserts as required.

G. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

H. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

I. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

J. Do not eccentrically load system, or produce rotation of runners.

K. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.

L. Form expansion joints as detailed. Form to accommodate plus or minus 1inch movement. Maintain visual closure.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.

D. Install units after above ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp and dents.

F. Cut tile to fit irregular grid and perimeter edge trim. Double cut and field paint exposed edges of tegular units.

G. Where bullnose concrete block corners occur, provide preformed closers to match edge molding.

H. Install hold-down clips to retain panels tight to grid system within 20 feet of an exterior door.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 PROTECTION

A. Protection of finished work shall be under provisions of Division One.

END OF SECTION

SECTION 09650 - RESILIENT FLOORING AND BASE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Concrete Floor Preparation and Leveling for Resilient Flooring.

C. Resilient Flooring, as Indicated on the Drawings, Specified Herein; Including All Related Accessories and Adhesives.

D. Types of Resilient Flooring:

1. Resilient Bio-Based Tile Flooring.

E. Resilient Rubber Base.

F. Resilient Rubber Reducer Strips.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Floor substrate surface.

B. Section 09250 - Gypsum Board Systems: Wall materials to receive application of base.

C. Section 12325 - Plastic Laminate Casework: Resilient vinyl base at toe spaces.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer's data on specified products describing physical and performance characteristics; sizes, accessories, patterns and colors available. Include installation recommendations for each type of substrate required

C. Shop Drawings: Indicate layout showing seaming plan, coving details and terminations for bio-based tile flooring.

D. Samples: Submit two standard samples, illustrating color and pattern for each floor material for each color specified.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Submit manufacturer's written certification that all ADAAG Requirements have been met for this project.

1.4 MAINTENANCE DATA

A. Submit manufacturer's complete maintenance data under provisions of Division One.

B. Provide two (2) copies of the manufacturer's Maintenance Manual for the complete care of each type of resilient flooring and base. Submit to the Owner, through the Architect, for review and approval.

1. Provide resilient flooring and base manufacturer's and supplier's name, address and telephone numbers. Include for each product; the product name, serial or model number and colors.

1.5 QUALITY ASSURANCE

A. Manufacturer/Installer: Company specializing in the manufacture and installation of products specified in this Section with a minimum of five (5) years documented experience.

B. Conform to "Americans with Disabilities Act Accessibility Guidelines" (ADAAG) criteria for the following:

1. Static Coefficient of Friction: Appendix to the ADAAG, in Section A4.5 defines slip resistant as a static coefficient of friction of 0.6 for floor areas and 0.8 for ramps. ASTM C1028 (The Slip Meter), test procedures shall be used for both wet and dry readings, and all manufacturers shall certify that their products meet or exceed these requirements.

C. All primers, adhesives, sealers and wax shall be VOC compliant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division One.

B. Deliver and store materials in manufacturer's original unopened containers with brands, names and production lot numbers clearly marked thereon.

C. Areas where materials are to be stored should be maintained at 55 degrees F with a maximum relative humidity of 50 percent.

D. Protect roll materials from damage by storing on end.

E. Resilient floor coverings shall not be delivered or installed at the job site until all masonry, plastering, and other finish operations including painting have been completed.

1.7 PROJECT CONDITIONS

A. Store the resilient flooring materials, adhesives and accessories in areas where they are to be installed for a minimum of 48 hours prior to installation to achieve temperature stability.

B. Maintain temperature and humidity in areas to receive the resilient flooring with a balance HVAC system in permanent operating condition. Maintain conditions at 65 degrees F minimum to 80 degrees F maximum with the relative humidity not to exceed 75 percent for at least 72 hours prior to, during and after the installation.

C. Do not install resilient flooring over concrete slabs or topping until the latter has been cured and is sufficiently dry to achieve bond with adhesive as determined by manufacturer's recommended bond and moisture test.

D. The extended temperature range after the installation shall be from 50 degrees F minimum to 85 degrees F maximum to maintain manufacturer's product warranty.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of resilient flooring and base and other construction to which resilient flooring and base must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.9 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – RESILIENT TILE FLOORING

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Armstrong World Industries – “Migrations with Biostride BioBased Tile.”

B. Substitutions: Under provisions of Division One and the General Conditions.

2.2 MATERIALS

A. Bio-based tile having nominal thickness of 1/8”; size 12” x 12” tile, composed of polyester resin binder, fillers and pigments with colors and texture dispersed uniformly throughout thickness.

B. Color: To be selected by the Architect from manufacturer’s full color range.

C. Adhesive: VOC compliant, manufacturer’s type to suit application.

2.3 ACCEPTABLE MANUFATURERS - BASE MATERIALS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. ARMSTRONG World Industries.

B. Substitutions: No Substitutions.

2.4 MATERIALS

A. Rubber Base (RB): ASTM F-1861, Type TP, thermoplastic rubber; color-integrated wall base with matte finish; continuous, four (4) inches high; 1/8 inch thick; top set cove; pre-molded external corners.

B. Colors:

1. Refer to Finish Schedule.

C. Adhesive: VOC compliant, base manufacturer’s type to suit application.

2.5 ACCEPTABLE MANUFACTURERS - RESILIENT REDUCER STRIPS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Burke-Mercer.

B. Substitutions: Under provisions of Division One and the General Conditions.

2.6 MATERIALS

A. Transition Between Carpet and Resilient Flooring:

1. Mercer #150.

a. Color: Selected by the Architect.

2. Adhesive: VOC compliant, manufacturer's type to suit application.

B. Transition Between Carpet and Ceramic Tile:

1. Mercer #153.

a. Color: Selected by the Architect.

2. Adhesive: VOC compliant, manufacturer's type to suit application.

2.7 ACCESSORIES

A. Sub-Floor Filler: Armstrong S-180 premix latex underlayment; type recommended by adhesive material manufacturer to be compatible with adhesive, and VOC compliant.

B. Sealer and Wax: Types recommended by flooring manufacturer to suit application, and VOC compliant.

C. Cove Base Trim: A-604 HG or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Installer is required to inspect sub-floor surfaces to determine that they are satisfactory to receive resilient flooring. Sub-floors shall be clean, dry, free from dust, grease, wax, soap and other foreign materials. Concrete sub-floors shall be dry, cured and free from crazing, dusting, spalling and shall not be coated with any curing compound, hardener or sealer. Ensure that sub-floor is free from hydrostatic water pressure.

B. Installer shall perform bond and moisture tests on sub-floors to determine if they are sufficiently cured and dry. A moisture test must be performed by using the CM Moisture Meter or similar apparatus approved in advance by the Architect. Acceptable range is from 0 to 2.5 percent. Bond test(s) must also be performed in accordance with the moisture test. Refer to manufacturer's installation instructions for additional information.

C. Verify floor and lower wall surfaces are free of substances that may impair adhesion of new adhesive and finish materials.

3.2 PREPARATION

A. Prepare All Sub-Floors as Follows:

1. Leveling and Patching Compounds: In areas where such products are required, the underlayment must be compatible with the resilient floor covering. Where a floor has been previously installed, old flooring and adhesive shall be removed in accordance with EPA standards. Then install underlayment in accordance with manufacturer's instructions.

2. Remove existing coatings from sub-floor surfaces that would prevent new adhesive to bond, such as curing compounds, paints, oils, waxes, sealers or other materials.

B. Broom clean and vacuum surfaces to be covered, and inspect sub-floor. Do not use any sweeping compounds that contain oil.

3.3 INSTALLATION - GENERAL

A. Install resilient flooring, base, adhesives and compounds in accordance with manufacturer's written installation instructions.

B. Where movable partitions are indicated on the Drawings, install resilient flooring before partitions are erected.

C. Install resilient flooring and base using method indicated in strict compliance with manufacturer's printed instructions. Extend resilient flooring into toe spaces, door reveals, and into closets and similar openings.

D. Scribe, cut and fit resilient flooring to permanent fixtures, built-in furniture and cabinets, pipes, outlets and permanent columns, walls and partitions.

E. Maintain reference markers, holes or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other non-permanent marking devices.

F. Tightly cement resilient flooring to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

3.4 INSTALLATION - TILE FLOORING

A. Mix floor tile from containers to ensure shade variations are consistent.

B. Spread only enough adhesive to permit installation of materials before initial set.

C. Install floor tile with pattern grain alternating with adjacent units to produce basket weave pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Terminate tile flooring at centerline of door openings where adjacent floor finish is dissimilar.

E. Install edge strips at unprotected or exposed edges, and where flooring terminates.

F. Scribe tile flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.5 INSTALLATION - RESILIENT BASE

A. Install base and components in accordance with manufacturer's instructions.

B. Fit joints tight and vertical. Maintain minimum measurement of twenty four (24) inches between joints.

C. Miter internal corners. At external corners, use pre-molded units. At exposed ends, use pre-molded units.

D. Install base on solid backing. Bond tight to wall and floor surfaces.

E. Scribe and fit to door frames and other interruptions.

3.6 INSTALLATION - ACCESSORIES

A. Install all accessories in accordance with manufacturer's written instructions.

B. Install resilient edge strips tightly butted to flooring and secure with adhesive. Install edge strips at edges of flooring which would otherwise be exposed.

3.7 CLEANING

A. Perform the following cleaning operations immediately upon completion of resilient flooring:

1. Sweep and vacuum floor thoroughly.

2. Do not wash floor until time period recommended by resilient flooring manufacturer has elapsed to allow resilient flooring to become well sealed in adhesive. Wait a minimum of 72 hours after the seams have been heat welded for all resilient sheet flooring.

3. Scrub floor with mechanical scrubber being careful to remove black marks and excessive soil.

4. Remove any excess adhesive or other surface blemishes, using appropriate cleaner recommended by resilient flooring manufacturer.

B. Clean resilient flooring and base not more than 4 days prior to date of Substantial Completion Inspection in each area of the project. Clean resilient flooring and base by methods recommended by resilient flooring and base manufacturers.

3.8 PROTECTION

A. Protect resilient flooring and base against damage during construction period to comply with resilient flooring and base manufacturer's directions.

1. Protect resilient flooring against damage from rolling loads for initial period following installation by covering with plywood or hardboard. Use dollies to move stationary equipment or furnishings across floors. Do not move any heavy loads across the new floor areas for a minimum period of 72 hours.

2. Cover resilient flooring and base with undyed, untreated building paper until inspection for Substantial Completion.

END OF SECTION 09650

SECTION 09680 - CARPETING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. New Concrete Floor Leveling and Preparation to Receive Carpeting.

C. Commercial Carpeting Installed with the Glued Down Application Method.

1. Adhesives and Accessories.

D. Matching Roll Carpet.

1. Accessories.

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Division 15 - Mechanical: Plumbing floor cover plate with recess for carpet.

B. Division 16 - Electrical: Electrical and telephone floor cover plate with recess for carpet.

1.3 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Concrete floor substrate surface.

B. Section 09650 - Resilient Flooring and Base: Vinyl base at carpeting areas.

1.4 DEFINITIONS

A. Commercial Carpet: Carpet intended for use in commercial and public spaces, with construction, fire-ratings, static control and appearance appropriate for this use.

1.5 SUBMITTALS

A. Submittals under provisions of Division One.

B. Shop Drawings: Indicate carpeting layout and seaming diagrams, show carpet direction, method of joining seams and types of edge strips.

C. Product Data: Submit manufacturer's data on specified products describing physical and performance characteristics; durability, resistance to fading and flame resistance characteristics. Include installation recommendations for each type of substrate required.

D. Samples: Submit samples 12 x 12 inch in size illustrating color and pattern for each carpet material specified.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Submit warranties that carpet meets specifications for wear, edge ravel, zippering, texture retention, static protection, delamination color-fastness and environmental standard for Green Label certification and 100% recylclability.

G. Certification: Submit manufacturer's certification as outlined under Article 1.9 below.

1.6 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing specified carpet with minimum five (5) years documented experience.

B. Installer: Company specializing in installing carpet with minimum five (5) years documented experience.

1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

C. Single Source Responsibility: Provide materials produced by a single manufacturer for each carpet type.

D. Carpet material shall be off-gassed, off-site as much as possible.

1.7 TESTING

A. Certification: Submit manufacturer's certification stating that materials provided comply with specified requirements. Include supporting certified laboratory testing data indicating that materials meet specified test requirements.

1.8 REGULATORY REQUIREMENTS

A. Conform to California State Building Code, Title 24, and Title 19 for flame rating requirements of 25 or less in accordance with ASTM E84.

B. Conform to ASTM D2859 for surface flammability ignition test.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Store materials for three (3) days prior to installation in area of installation to achieve temperature stability.

B. Maintain minimum 70 degrees F ambient temperature three (3) days prior to, during and twenty four (24) hours after installation.

C. Carpet materials are not to contain 4PCH, PVC or SBR latex and will meet all EPA standards.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Deliver materials to the site in original factory wrappings and containers, clearly labeled and unopened with identification of manufacturer, brand name, quality or grade, fire hazard classification, and lot number.

C. Store materials in original undamaged packages and containers, inside well ventilated areas protected from weather, moisture, soiling, extreme temperatures and humidity.

D. Lay goods flat, blocked off ground to prevent sagging and warping. Maintain temperature in storage areas above 68 degrees F.

E. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements.

1.11 MAINTENANCE DATA

A. Submit manufacturer's complete maintenance data under provisions of Division One.

B. Maintenance Instructions: Submit manufacturer's printed instructions for maintenance of installed work, including methods and frequency recommended for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against materials and methods which may be detrimental to finishes and performance.

C. Replacement Materials: After completion of work, deliver not less than two percent (2%) of each type, color and pattern of carpeting, exclusive of material required to properly complete installation. Provide accessory components as required, and replacement materials from same production run as materials installed. Package replacement materials with protective coverings, identified with appropriate labels.

1.12 WARRANTY

A. Provide ten (10) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects, including carpet edge raveling, delamination and resiliency, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - CARPETING

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Mohawk Commercial Carpeting.

B. Substitutions: Under provisions of Division One.

2.2 CARPET MATERIALS

A. Carpet: "Mohawk Commercial Carpet" - "Broadloom Carpet; Antimicrobial, contains no arsenic or heavy metals, non-halogenated, and conforming to the following criteria:

1. Construction: Woven Interlock.
2. Surface Texture: Textured Loop
3. Gauge:
4. Stitches:
5. Pile Height:
6. Face Yarn: 100% Solution Dyed Nylon by DuPont
7. Yarn Face Weight: 26 oz/sq yd
8. Backing Materials: Duraloc MG Backing as standard.
9. Color: To be selected by Architect..

2.3 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by adhesive material manufacturer to suit application.

B. Carpet Base: See Resilient Flooring Specification for base. Plastic or Vinyl base not acceptable.

C. Installation Adhesive: Water-resistant, non-staining type as recommended by carpet manufacturer, compatible with carpet material, and which complies with flammability requirements for installed carpet.

D. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

E. Provide other materials, not specifically described, but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

2.4 EXTRA MATERIALS

A. Provide extra material 1.5% of uncut extra stock of each product, two cans of carpet glue and one quart of RTSB glue, new and unopened.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that surfaces are smooth and flat with maximum variation of 1/4 inch in 10 feet, and are ready to receive Work.

C. Verify concrete floors are dry to a maximum moisture content of seven (7) percent; and exhibit negative alkalinity, carbonization, or dusting.

D. Verify with adhesive manufacturer, ph requirements and underlayment or sealer requirements for concrete substrates.

E. Beginning of Work means acceptance of substrate conditions.

3.2 PREPARATION

A. Immediately prior to installation of the Work of this Section, thoroughly clean substrata and remove oil, grease, paint, varnish, hardeners, and other foreign matter which would adversely affect the bond of adhesive.

B. Make substrata level and free of irregularities. Assure one constant floor height after carpet is installed, filling low spots and grinding high spots as required.

C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

D. Apply, trowel and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.3 INSTALLATION

A. Comply with manufacturers' instructions and recommendations for carpet tile installation, and direction of carpet. Maintain uniformity of carpet direction and lay of pile.

B. Verify carpet match before cutting to ensure minimal variation between dye lots.

C. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true and unfrayed.

D. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

E. Join seams by hot adhesive tape method. Form seams straight, not overlapped or peaked, and free of gaps.

F. Lay carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance. Provide monolithic color, pattern, and texture match within any one area.

G. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.

H. Cut and fit carpet around interruptions.

I. Bind cut edges where not concealed by edge strips.

J. Fit carpet tight to intersection with vertical surfaces without gaps.

K. Where wall bases are scheduled, cut carpet tight to walls. Fit carpet tight to vertical interruptions, leaving no gaps.

L. Install carpet edge guard at the termination of carpet to dissimilar materials, secure guards to substrate.

3.4 CLEANING

A. Remove excess adhesive without damage from floor, base, and wall surfaces.

B. Remove and dispose of debris and unusable scraps from the site.

C. Vacuum carpet surfaces using commercial machine with face-beater elements. Remove spots and replace carpet where spots cannot be removed. Remove any protruding face yarn using sharp scissors.

3.5 PROTECTION

A. Provide a heavy non-staining paper or plastic walkway as required over carpeting in direction of traffic, maintaining intact until time of Substantial Completion.

END OF SECTION 09680

SECTION 09710 - ACOUSTICAL TREATMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Preparation of Substrate Conditions.

C. Acoustical Ceiling Treatment Over Metal Stud Substructure; Including Mounting Accessories and Hardware.

1. Rabbeted Edge Ceiling Panels.

D. Wood Trim.

1.2 RELATED SECTIONS

A. Section 09260 - Gypsum Board Systems: Interior metal ceiling framing.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate scaled elevations, dimensions and mounting hardware.

C. Product Data: Submit manufacturer's data on product characteristics, fire classifications, and installation details.

D. Samples: Submit Samples of wall coverings illustrating surface color and finish.

E. Installation Instructions: Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

A. Fire Performance Characteristics: Tested in accordance with ASTM E84

1. Flame spread: (25) or less

2. Smoke Developed: (450) or less

B. Panels shall meet the requirements of CBC 2007.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Store products in a dry place with no contact to either floors or walls.

C. Panels shall be protected against marring, soil or damage during storage and erection.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of acoustical treatment and other construction to which acoustical treatment must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials and workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Tectum, Inc.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Acoustical Ceiling Panels: Class "A" construction, 23-3/4" wide x 8'-0" long x 1-1/2" thick. Rabbeted 2 long sides, factory finish white. Panels to be direct attached to metal studs substructure without visible seams as indicated in the Drawings.

B. Fasteners: Manufacturer's standard to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Commencement of Work signifies acceptance of all conditions.

3.2 INSTALLATION

A. Panel locations and construction as indicated on the Drawings.

3.3 CLEANING

A. Clean all Work under provisions of Section 01710.

3.4 PROTECTION

A. Protection of finished work under provisions of Division One.

END OF SECTION

SECTION 09775 - FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Preparation of Substrate Surfaces.

C. Fiberglass Reinforced Wall Panels, as Indicated on the Drawings, Specified Herein; Including All Related Accessories and Attachments.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and grounds.

B. Section 09250 - Gypsum Board Systems: Metal stud wall framing and gypsum board substrate construction.

C. Division 15 - Mechanical: Equipment cut-outs and penetrations through finish panels.

D. Division 16 - Electrical: Equipment cut-outs and penetrations through finish panels.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years documented experience.

B. Applicator: Company specializing in the installation of products specified in this Section with minimum five (5) years documented experience.

C. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer’s data on product characteristics, fasteners and accessories.

C. Shop Drawings: Indicate wall elevations, dimensions, joint and termination details.

D. Samples: Submit line of samples illustrating color, texture and sheen.

E. Installation Instructions: Submit manufacturer's installation instructions.

F. Certification: Submit manufacturer’s written certification that the products and components specified and supplied meet or exceed all required test for the requirements of ASTM E84 and have the written approval of USDA.

1.5 MAINTENANCE

A. Submit manufacturer’s complete maintenance data under provisions of Division One.

1.6 REGULATORY REGUIREMENTS

A. Conform to applicable building code for smoke/flame rating requirements of less than 25 in accordance with ASTM E84.

B. Panels and components shall be USDA approved and certified.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Inspect products upon delivery to site, and replace all broken or damaged panels

C. Store products in a dry place free of moisture.

D. Store panels flat on supported surfaces free of warpage.

1.8 FIELD MEASUREMENTS

A. Verify actual locations of fiberglass wall panels and other construction to which fiberglass wall panels must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication and installation schedule with construction progress to avoid delay of Work.

1.9 WARRANTY

A. Provide two (2) year manufacturer’s written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIBERGLASS REINFORCED WALL PANELS (FRP)

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. KEMLITE Company - "Fire-X Glasbord".

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. BP Chemicals, Inc.
2. LASCO Panel Products.
3. Sequentia, Inc.

C. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Fiberglass Reinforced Wall Panels (FRP): Moisture resistant, impervious to not support mold or mildew, and will not rust or corrode.

B. Panels: 0.090 inches thick, weight of 0.7 lb./sq. ft., custom cut from bulk coils to heights appropriate for the spaces scheduled to receive FRP.

1. Width of panels shall be 4'-0".
2. Flame Spread Rating: UL Class A.
3. Smoke Developed: 200 max.
4. Water Absorption - 24 hours at 77 degrees F 0.4%.

C. Pattern: Pebble Embossed.

D. Color: White.

2.3 ACCESSORIES

A. Adhesives shall contain no volatile organic compounds (VOC), and shall be as recommended by the panel manufacturer to suit application.

B. Molding shall be manufacturer's standard, one piece, specifically designed to accommodate 0.090 inch thick panels. Provide division bars, cap moldings, inside and outside corner moldings, and other moldings required for a complete installation.

1. Color: Match panel finish.

C. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do no proceed until unsatisfactory conditions are corrected.

B. Verify that treated wood blocking is in place, and properly installed.

C. Verify that substrate is sound and ready to receive work of this section.

D. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Clean all substrate surfaces.

B. Ensure wall surfaces are smooth and flat.

C. Remove ridges and bumps. Fill low spots, cracks, holes, etc. with filler that is compatible with panel adhesive.

D. Float and trowel filler to smooth, flat, hard surface.

3.3 INSTALLATION

A. Install fiberglass reinforced wall panels and all components in accordance with manufacturer's instructions.

B. Layout symmetrically in rooms, with wall joints vertical. Verify wall layout pattern with Architect prior to start of installation.

C. Use the largest practical panel sizes; avoid splices and joints between corners.

D. Fit joints tight and vertical.

E. Install straight, level and plumb.

F. Scribe and fit panels tightly to frames, trim, etc.

G. Finish butt joints, wall juncture, wall/ceiling and wall/curb joints with the specified sealant, tooling to a smooth finish.

3.4 CLEANING

A. Clean panels to uniform, unblemished, unstained, and unmarked condition.

B. Replace all panels that are damaged in any way during installation.

END OF SECTION 09775

SECTION 09900 - PAINTS AND COATINGS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Surface Preparation and Field Application of Paints and Coatings; as indicated on the Drawings, Specified Herein; Including Surface Finish Schedule.

C. New Construction: Paint all new construction, including, but not limited to, exposed sprinkler piping, ductwork, conduit and miscellaneous mechanical and electrical equipment.

D. Architecturally Exposed Structural Steel and Metal Fabrications Shall be Classified as "Architecturally Exposed Structural Steel" (AESS) as Defined by AISC.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete: Field finish work.

B. Section 04200 - Unit Masonry Systems: Field finish Work.

C. Section 05120 - Structural Steel: Touch up primer.

D. Section 05310 - Steel Decking: Touch-up primer and field finishing steel roof deck.

E. Section 05500 - Metal Fabrications: Field finishing.

F. Section 05510 - Metal Stairs and Railings: Field finishing

G. Section 06200 - Finish Carpentry.

H. Section 08110 - Steel Doors and Frames: Field finishing.

I. Section 08210 - Wood Doors: Field finishing.

J. Section 09220 - Portland Cement Plaster: Field finishing.

K. Section 09250 - Gypsum Board System: Field finishing.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D16 apply to this Section.

B. Paint: As used herein, shall mean coating system materials, including primers, emulsions, epoxy, enamels, sealers, fillers and other applied materials whether used as primer, intermediate or finished coats.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing quality paint and finish products as specified in this Section with minimum five (5) years documented experience.

B. Applicator: Company specializing in commercial painting and finishing products as specified in this Section with minimum five (5) years documented experience.

1.5 QUALITY ASSURANCE

A. Conform to California Building Code, Latest Edition for flame rating requirements of less than 25 for finishes in accordance with ASTM E84.

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this Section.

C. Paint Coordination:

1. Provide finish coats which are compatible with the prime coats actually used.
2. Review other sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
3. Upon request by the Architect, provide information on the characteristics of the specific finish materials to assure that compatible prime coats are used.
4. Provide barrier coats over non-compatible primers, or remove the primer and re-prime as required.
5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime coatings supplied under other Sections.

D. When painting over the top of any existing paint, the painter shall be responsible for analyzing the existing paint for type and composition to determine the exact preparation and primer to be used with the new paint product specified.

1.6 SUBMITTALS

A. Submit under provisions of Division One.

B. Submittal Timing: Provide all product data and samples to the Architect no later than sixty (60) days before any operations of this Section will commence.

C. Product Data: Submit for each paint system specified, including block fillers and primers:

1. Provide the manufacturer's technical information, including label analysis and instructions for handling, storage, and application of each materials proposed for use.

2. Provide material safety data sheets to the Architect, Owner and Contractor.

3. List each material and cross-reference to specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

4. Certification by the manufacturer that products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC).

D. Samples:

1. Following the selection of colors and glosses by the Architect, and provide samples for the Architect's review and approval.

a. Provide two (2) samples of each color and each gloss for each material on which the finish is specified to be applied.

b. Except as otherwise directed by the Architect, provide sample size of 12 x 12 inches.

c. Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.

1) Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color and texture is achieved and approved by the Architect.

2) Provide a list of material and application for each coat of each sample. Label each sample as to location and application.

d. If so directed by the Architect, submit samples during the progress of the Work in the form of actual application of the approved materials on actual surfaces to be painted.

2. Revise and resubmit each Sample as requested by the Architect until the required gloss, color and texture is achieved. Such samples, when approved by the Architect, will become standards of color and finish for accepting or rejecting the Work of this Section.

3. Do not commence finish painting until approved samples are on file at the job site.

E. Submit manufacturer's application instructions.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

F. Provide lighting level of minimum 80 foot-candles measured mid-height of substrate surface.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Apply paint according to Manufacturer's recommendations. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures according to Manufacturer's recommendations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity exceeds Manufacturer's recommendations.

1.9 MAINTENANCE DATA

A. Provide manufacturer's complete maintenance data under provisions of Division One.

B. Upon completion of the Work of this Section, deliver to the Owner an extra stock equaling one percent (1%) , but not less than one unopened container of each type, color, and gloss of paint used in the Work, new unopened tightly sealed containers, and clearly labeling with contents and locations where used.

1.10 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

1.11 EXTRA MATERIALS

A. Provide extra materials under provisions of Division One.

B. Provide a one gallon container of each color and surface texture to Owner, or one percent of each material used, whichever is greater.

C. Label each container with color. texture, and room locations, in addition to the manufacturer's label.

D. Store in Owner's designated storage area.

PART 2 - PRODUCTS

PROPRIETARY NAMES USED ARE NOT TO IMPLY EXCLUSION OF EQUIVALENT PRODUCTS OR MANUFACTURERS.

2.1 ACCEPTABLE MANUFACTURERS - TYPE A (EXTERIOR) & C (INTERIOR) COATINGS

A. Subject to compliance with requirements, provide products from the following manufacturer as Scheduled at the End of this Section:

1. Benjamin Moore Company.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. Diamond Vogel Paints.
2. ICI Dulux Glidden.
3. ICI DuLux DeVoe.
4. ICI DuLux Sinclair (CA).
5. Pratt & Lambert Paints.
6. Pittsburgh Paint Company.
7. Sherwin-Williams Company.
8. Dunn-Edwards.
9. Sequoia Paint Company.

C. Substitutions: Under provisions of Division One.

2.2 ACCEPTABLE MANUFACTURERS - TYPE B COATINGS (LOW ODOR, LOW VOC PAINTS)

A. Subject to compliance with requirements, provide products from the following manufacturer as Scheduled at the End of this Section:

1. ICI Dulux Paint Stores - "Glidden Lifemaster 2000".
2. Benjamin Moore - "Pristine - Eco-Spec".
3. Diamond Vogel – "Health-Kote".

B. Substitutions: Under provisions of Division One.

2.3 ACCEPTABLE MANUFACTURERS - TYPE D (SPECIAL COATINGS)

A. Subject to compliance with requirements, provide products from the following manufacturer as Scheduled at the End of this Section:

1. TNEMEC Company, Inc.
2. Ameron.

B. Substitutions: Under provisions of Division One.

2.4 MATERIALS

A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

B. Material Quality: Provide the manufacturer's best quality trade sale paint materials of the various coating types specified. Paint material containers not displaying paint manufacturer's product identification will NOT be accepted.

C. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Provide the manufacturer's material data and certificates of performance for proposed substitutions.

D. Undercoats and Thinners:

1. Provide undercoat paint produced by the same manufacturer as the finish coat.

2. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits.

3. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

E. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.

1. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

F. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

G. It shall be understood that all coatings must conform to all Federal, State and Local Regulations, including VOC/VOS rules at the time of application.

2.5 FINISHES

A. Refer to Schedule at End of Section for Surface Finish Schedule.

2.6 APPLICATION EQUIPMENT

A. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect.

B. Prior to the use of application equipment, verify that the proposed equipment is actually compatible with the material to be applied, and that integrity of the finish wall will not be jeopardized by use of the proposed equipment.

2.7 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor and subject to the approval of the Architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Veneer Plaster and Gypsum Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Wood: 15 percent, measured in accordance with ASTM D2016.

4. Exterior Wood: 15 percent, measured in accordance with ASTM D2016.

F. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request by the Architect, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 MATERIALS PREPARATION

A. General:

1. Mix and prepare paint materials in strict accordance with the manufacturer's recommendations as approved by the Architect.
2. When materials are not in use, store in tightly covered container.
3. Maintain containers used in storage, mixing and application of paint in a clean condition, free from foreign materials and residue.

B. Stirring:

1. Stir materials before application, producing a mixture of uniform density.
2. Do not stir into the material any film which may form on the surface, but remove the film and, if necessary, strain the material before using.
3. Use only thinners approved by Paint Manufacturer and only within recommended limits.

3.3 SURFACE PREPARATION

A. Exterior and Interior Surfaces - New Construction and Previously Painted Surfaces:

1. Follow all recommended procedures outlined by the paint manufacturer for surface preparation of applicable specified surfaces and substrates.

B. Remove electrical plates, hardware, light fixture trim, escutcheons, fittings and other items installed but are not to be painted prior to preparing surfaces or finishing.

C. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects.

D. Seal with shellac and seal marks which may bleed through surface finishes.

E. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.

H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to cure and dry.

I. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing.

J. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

K. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.

L. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

M. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces to meet pH value requirements recommended by paint manufacturer.

N. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

O. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.

P. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

Q. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

R. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior caulking compound after prime coat has been applied.

S. Metal Doors Scheduled for Painting: Seal top and bottom edges with primer.

3.4 PROTECTION

A. Protect elements surrounding the work of this Section from damage or disfiguration.

B. Repair damage to other surfaces caused by work of this Section.

C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.

D. Remove empty paint containers from site.

3.5 PAINT APPLICATION

A. General:

1. Apply paint coatings in accordance with manufacturer's written instructions and recommendations. Use applicators and techniques best suited for substrate and type of materials being applied.

2. Touch-up shop applied prime coats which have been damaged, and touch-up bare areas prior to start of finish coats application.

3. Slightly vary the color of succeeding coats.

4. Do not apply additional coats until the completed coat has been inspected and approved by the Architect.

5. Only the inspected and approved coats of paint will be considered in determining the number of coats applied.

6. Sand and dust between coats to remove defects visible to the unaided eye from the distance of five feet.

7. On removable panels and hinged panels, paint the back sides to match the exposed sides.

B. Drying:

1. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.

2. Consider oil-base and oleo-resinous solvent type paint as dry for re-coating when the paint feels firm, does not deform or feel sticky under moderate pressure of the thumb, and when the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Brush Applications:

1. Brush out and work the brush coats onto the surface in an even film.

2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.

D. Spray Applications:

1. Except as specifically otherwise approved by the Architect in writing, confine spray application to metal framework and similar surfaces where hand brush work would be inferior.

2. Where spray application is used, apply each coat to provide the hiding equivalent of brush coats.

3. Do not double back with spray equipment to build up film thickness of two (2) coats in one pass.

E. For completed work, match the approved samples as to texture, color and coverage. Remove, refinish or repaint work not in compliance with the specified requirements.

F. Miscellaneous Surfaces and Procedures:

1. Exposed Mechanical Items:

a. Finish electric panels, access doors, conduits, pipes, ducts, grilles, registers, vents and items of similar nature to match adjacent wall and ceiling surfaces, or as directed by the Architect.

b. Paint visible duct surfaces behind vents, registers and grilles "Flat Black".

c. Wash metal with solvent, prime and apply two coats of alkyd enamel.

2. Exposed Pipe and Duct Insulation:

a. Apply one coat of latex paint on insulation which has been sized or primed under other Sections; apply two (2) coats on such surfaces when unprepared.

b. Match color of adjacent surfaces.

c. Remove band before painting, and replace after painting.

3. Hardware:

a. Paint prime coated hardware to match adjacent surfaces.

b. Paint metal portions of head seals, jamb seals, and astragal seals to match the color of the door frame unless otherwise directed by the Architect.

4. Wet Areas:

a. In toilet rooms and contiguous areas, add an approved fungicide to paints.

G. All exposed interior steel and concrete surfaces in areas of new construction shall be prepped, primed and finish painted.

3.6 CLEANING

A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.

B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.

C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

D. Upon completion of the job, the painting contractor shall remove all surplus materials, scaffolds, etc. that relate to his trade, from the premises. He shall clean all window glass free of excess paint and splatters, and remove paint that has been misplaced on other surfaces.

3.7 SCHEDULE - TYPE A; EXTERIOR COATINGS (BENJAMIN MOORE)

A. Wood - Flat Acrylic Latex Finish (Dry film thickness not less than 3.7 mils):

1. Primer: One (1) coat Moorcraft Super Spec Latex Exterior Primer No. 169.

2. Finish: Two (2) coats Moorcraft Super Spec Flat Latex House Paint No. 171.

B. Wood Trim - Flat Latex Finish (Dry film thickness not less than 3.7 mils):

1. Primer: One (1) coat Moorcraft Super Spec Latex Exterior Primer No. 169.

2. Finish: Two (2) coats Moorcraft Super Spec Flat Latex House Paint No. 171.

C. Plywood - Flat Acrylic Finish (Dry film thickness not less than 3.9 mils):

1. Primer: One (1) coat Moorcraft Super Spec Latex Exterior Primer No. 169.

2. Finish: Two (2) coats Moorcraft Super Spec 100% Acrylic Exterior Flat Finish No. 180.

D. Concrete Unit Masonry - Flat Acrylic Latex Finish (Dry film thickness not less than 2.4 mils, excluding block filler):

1. Block Filler: One (1) coat Supercraft Latex Block Filler No. 285.

2. Finish: Two (2) coats Moorcraft Super Spec Flat Latex House Paint No. 171.

E. Concrete, Stucco - Flat Acrylic Finish (Dry film thickness not less than 2.6 mils):

1. Primer: Not Required.

2. Finish: Two (2) coats Moorcraft Super Spec 100% Acrylic Exterior Flat Finish No. 180.

F. Ferrous Metal – Alkyd Semi-Gloss Finish (Total dry thickness not less than 3.8 mils):

1. Primer: One (1) coat Acrylic Metal Primer No. M04.

2. Finish: Two (2) coats Alkyd Semi-Gloss.

G. Zinc Coated Metal - Soft Gloss Finish (Dry film thickness not less than 4.2 mils):

1. Primer: One (1) coat Acrylic Metal Primer No. M-04.

2. Finish: Two (2) coats Moorcraft Super Spec Latex House & Trim Paint No. 170.

H. Aluminum - Soft Gloss Finish (Dry film thickness not less than 2.3 mils):

1. Primer: One (1) coat Acrylic Metal Primer No. M04.

2. Finish: Two (2) coats Moorcraft Super Spec Latex House & Trim Paint No. 170.

3.8 SCHEDULE - TYPE B; INTERIOR COATINGS (ICI DULUX GLIDDEN) (LOW ODOR, LOW VOC)

A. Plaster, Gypsum Board - Painted:

1. Primer: One (1) coat Lifemaster 2000 Interior Wall Primer #LM 9300 Series.

2. Finish: Two (2) coats Lifemaster 2000 Interior Eggshell Finish #LM 9300 Series.

3.9 SCHEDULE - TYPE C; INTERIOR COATINGS (BENJAMIN MOORE)

A. Woodwork and Hardboard - Semi-Gloss Latex Enamel (Total dry film thickness not less than 3.6 mils):

1. Primer: One (1) coat Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253.
2. Finish: Two (2) coats Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276.

B. Natural-Finish Woodwork - Rubbed Varnish Finish (Two finish coats over filler on open-grain wood. Wipe filler before applying acrylic polyurethane.):

1. Filler Coat: (Paste Wood Filler) Benwood Interior Wood Finishes Wood Grain Filler No. 238.
2. Finish Coats: Benwood 422 (high gloss) or 423 (low luster) Acrylic Polyurethane.

C. Concrete and Masonry (other than concrete masonry units) - Lusterless (Flat) Latex Finish (Two coats with a dry film thickness not less than 2.4 mils):

1. Block Filler: Moorcraft Super Craft Latex Block Filler No. 285.
2. Finish Coats: Two (2) coats Moorcraft Super Spec Latex Flat No. 275.

D. Concrete Masonry Units - Semi-Gloss Latex Enamel (Two finish coats over filled surface with total dry film thickness not less than 12.4 mils):

1. Block Filler: Moorcraft Super Craft Latex Block Filler No. 285.
2. Finish: Two (2) coats of Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276.

E. Gypsum Drywall - Latex Eggshell Finish (Two coats over primer with a dry film thickness not less than 3.8mils):

1. Primer: One (1) coat of Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253.
2. Finish: Two (2) coats of Moorcraft Super Spec Latex Eggshell Enamel No. 274.

F. Plaster - Latex Eggshell Finish: Two (2) coats over primer with dry film thickness not less than 3.8 mils.

1. Primer: Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer No. 253.
2. Finish: Two (2) coats of Moorcraft Super Spec Latex Eggshell No. 274.

G. Ferrous Metal – Alkyd Semi-Gloss: Two (2) finish coats over primer with total dry film thickness not less than 4.0 mils.

1. Primer: One (1) coat Acrylic Metal Primer No. M04.
2. Finish: Two (2) coats Alkyd Semi-Gloss.

H. Zinc-Coated Metal - Semi-Gloss Latex Enamel: Two (2) finish coats over primer with total dry film thickness not less than 4.4 mils.

1. Primer: One (1) coat Acrylic Metal Primer No. M-04.
2. Finish: Two (2) coats Moorcraft Super Spec Latex Semi-Gloss Enamel No. 276.

I. Concrete Floors - Floor Sealer

1. Finish: M78 Moisture Curried Urethane Sealer Finish with Anti-Slip Procedure (See Industrial Maintenance Coating Tab 14 IV Anti-Slip Procedure).

3.10 SCHEDULE - TYPE D; SPECIAL EXTERIOR COATINGS (TNEMEC)

A. Exterior Exposed Structural Steel:

1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning all exposed surfaces.
2. Primer: TNEMEC No. N69, “Hi-build Epoxoline II” Primer, or approved equal. Dry film thickness: minimum 2.0 to 5.0 mils.
3. Finish: TNEMEC Series 1074 “Endurashield II” or approved equal. Dry film thickness: minimum 2.0 to 5.0 mils. High Gloss or Semi-gloss finish as selected by the Architect.
4. Use only Manufacturer’s approved thinner.

B. Interior Exposed Structural and Miscellaneous Steel; Shop Primed – Painted (Moderate, Dry Exposures):

1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
2. Primer: TNEMEC #161-1211 TNEME-FASCURE Primer at 3.0 – 5.0 mils DFT.
3. Finish: Two (2) coats of TNEMEC Series 1074 ENDURA-SHIELD Aliphatic Acrylic Polyurethane Semi-Gloss/High-Build.

3.11 SCHEDULE – TYPE F; SHOP PRIMED ITEMS FOR SITE FINISHING

A. Metal Fabrications (Section 05500): Exposed surfaces of lintels, roof ladders, ships ladders, overhead door frames and all other ferrous metals.

B. Steel Doors and Frames (Section 08110): Exposed surfaces of steel doors and frames.

3.12 COLOR SCHEDULE

A. Architect shall provide Color Schedule after award of Contract, and paint manufacturer has been established.

END OF SECTION 09900

SECTION 10100 - VISUAL DISPLAY BOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Visual Display Systems; as Indicated on the Drawings, Specified Herein; Including All Related Trim, Accessories and Attachments.

1. Porcelain Enamel Marker Boards.
2. Sealed Composition Cork Tackboard Surfaces.

C. Prefinished Aluminum Frame Display Cases; Safety Glazed Sliding Doors, Accessories, Attachments and Hardware.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and grounds.

B. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish.

C. Division 16 - Electrical: Final electrical connections to lighting fixture and outlet in Display Cases.

1.3 SUBMITTALS

A. Submittals under provisions of Division One.

B. Shop Drawings: Indicate wall elevations, dimensions, joint locations, and special anchor details.

C. Product Data: Provide data on marker boards, tack boards, trim and accessories.

D. Samples: Submit samples illustrating materials and finish, color and texture of marker board, tack boards and trim.

E. Submit manufacturer's installation instructions.

1.4 MAINTENANCE DATA

A. Submit data under provisions of Division One.

B. Maintenance Data: Provide manufacturer's complete maintenance recommendations, including data on regular cleaning and stain removal.

1.5 QUALITY ASSURANCE

A. Conform to California Building Code, Title 24, for flame spread rating and smoke development for wall finish materials in accordance with ASTM E84.

1.6 QUALIFICATIONS

A. Manufacturer and Installer: Company specializing in manufacturing and installing the Products specified in this Section with minimum five (5) years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify actual locations of visual display systems and other construction to which visual display systems must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.8 WARRANTY

A. Provide manufacturer's written warranty under provisions of Section 01795.

B. Warranty on Porcelain Enamel Marker Boards: Provide written warranty from manufacturer that for lifetime of installation, surface finish under normal conditions of use shall not exhibit crazing, flaking, or fading. Warranty is limited to replacement of material only.

C. Warranty on Assembled Units: Provide five (5) year written warranty from supplier/installer providing labor and material coverage on any units found to have manufacturing or installation defects.

D. Warranty on Tack Board and Display Case Units: State that all materials and workmanship provided are guaranteed for five (5) years after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - COMPOSITION CORK TACK BOARDS

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. Nairn Cork.

B. Substitutions: Under provisions of Division One.

2.2 ACCEPTABLE MANUFACTURERS – MARKER BOARDS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Claridge Products & Equipment, Inc.

2. Polyvision.

3. Best-Rite Chalkboard Company

4. Newline Products.

B. Substitutions: Under provisions of Division One.

2.3 COMPOSITION TACKBOARD MATERIAL

A. Sealed Composition Cork Tackboards: Nairn Cork; Flame spread index of 65 maximum in accordance with ASTM E84, 1/4 inch thick material consisting of homogeneous colored, burlap-backed composition cork, not sanded, with a vinyl sealed, fully washable, stain resistant surface. Color as selected by the Architect from manufacturer's standard colors.

1. Core Material: Manufacturer's standard 1/4 inch thick gypsum board core. Laminate gypsum board core to cork using manufacturer's standard moisture resistant thermoplastic type adhesive.

2. Tackboard Height: 4'-0".

3. Tackboard Width: Indicated on the Drawings.

4. Distance From Floor: As indicated on the Drawings.

2.4 MARKER BOARD MATERIAL

A. Porcelain Enamel Marker Boards: Maximum four (4) feet height, minimum 28 gauge enameling steel with porcelain/ceramic finish fused to steel sheet at a temperature of 1500 degrees F. Finish shall be Type A acid resistant, no seams allowed, and color as selected by Architect from manufacturer's full color range.

1. Core Material: Units up to 16 x 4 feet shall be one single piece of 1/2 inch thick gypsum board core. Larger units requiring spline joints shall have 1/2 inch thick particleboard core.

2. Backing Sheet: 0.001 inch aluminum foil for gypsum board, and 0.015 inch aluminum sheet for particleboard.

3. Markerboard sizes, profiles and location from finished floor shall be as indicated on the Drawings.

2.5 TACK BOARD MATERIAL

A. Tackable Surfacing: Acoustical and tackable surface, 3/16 inch thick, consisting of vinyl fabric, mildew resistant, complying with FS CCC-W-408, Type II; colors shall be selected by Architect from full range, flame spread maximum 20 as per ASTM E84, surface factory pressure laminated to a 3/8 inch 16 lb. density mineral fiberboard, and surface compatible with fasteners. Koroseal "Harborweave" or equal

2.6 CORE MATERIALS

A. Particleboard: NPA A208.1, wood chips, set with waterproof resin binder, sanded faces.

B. Gypsum Board: ASTM C36, foil faced type.

2.7 FABRICATION - FRAME AND TRIM

A. Aluminum Frame: Extruded of slip-trim profile with concealed fasteners; map rail with cork insert over marker-board and tack-board surfaces.

B. Aluminum Chalk Rail: J-11 low profile with closed ends by Neal Slate, one piece full length of marker-board, and concealed fasteners.

2.8 FINISHES

A. Porcelain Enamel: Glass fiber enamel, baked to vitreous surfaces; Porcelain Enamel Institute, Type A, low gloss; White.

B. Aluminum Frame, Chalk Rail, and Accessories: Heavily anodized on all exposed surfaces with natural satin finish, "Clear".

C. Map Rail with Cork Insert (Tack-Strip): Neal Slate J-2, or approved equivalent by the Architect. Provide over all marker-boards and tack-board surfaces, and at all other locations indicated on the Drawings.

D. Magnetic Tacks: Provide full set of magnetic tacks for each marker-board.

2.9 ACCEPTABLE MANUFACTURERS - DISPLAY CASES

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. W.E. Neal Slate Company - Series #5500 Case Frame.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. Claridge Products & Equipment, Inc.
2. Polyvision Display Products.
3. Poblocki and Sons, Inc.

C. Substitutions: Under provisions of Division One.

2.10 CASE FRAME CONSTRUCTION

A. Framing: Members shall be 6063-T5 anodized aluminum extrusions with a dull-etched anodized finish AA C22-A31.

B. Frames shall be assembled by means of concealed aluminum angles, welds or gussets. If welding is used, there shall be no visible welds. No screws shall be visible when door is closed. Knocked down or unassembled cases will not be acceptable.

C. Case Frame Style: W.E. Neal Slate #5500 Series Door Case Frame, or approved equivalent by the Architect.

2.11 SLIDING GLASS DOORS

A. Sliding Glass Doors: Minimum 1/4 inch thick tempered safety glass doors with hardware and standard glass in-frame tumbler type lock. Cases shall be keyed alike. Exposed glass edges shall be polished.

B. Door Track: Zinc plated steel track with full ball bearing carriers for sliding glass doors; “Roll Ezy” No. 992Zc complete assembly as manufactured by Knape & Vogt Mfg. Co., or approved equivalent by the Architect.

2.12 GLASS SHELVES AND SHELF BRACKETS

A. Glass Shelves: Minimum 1/4 inch thick x 12 inches deep tempered safety glass shelves with all edges ground and polished.

B. Shelf Brackets and Standards: Special steel standards, one (1) inch adjustment, flush slotted, 3/4 x 1/2 inch high, Kape & Vogt No. 83ANO, anochrome finish. Maximum spacing of standards shall be 24 inches on center. Special steel brackets, one (1) inch adjustment, heavy duty lock nut bracket, Knape & Vogt No. 161ANO, anochrome finish, 12 inch size.

2.13 DISPLAY CASE BOX CONSTRUCTION

A. Box construction, including interior case back, sides, top and bottom shall be as indicated on the Drawings. Electrical light fixture, switch and outlet with connections by Electrical Contractor shall be as indicated on the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

C. Verify flat wall surface for frameless adhesive applied type.

3.2 INSTALLATION

A. Install marker boards and tack boards in accordance with manufacturer's instructions.

B. Establish bottom of perimeter frame at dimension indicated on Drawings above finished floor.

C. Install individual sections of map rail with cork insert as indicated on Drawings.

D. Secure units level and plumb.

E. Carefully cut holes in tackboards for thermostats, wall switches, and convenience outlets.

F. All marker boards and tack boards shall be attached with round-head wood screws at 24” on center through the perimeter frame to solid wood backing. This attachment is in addition to the manufacturer’s standard mounting system.

3.3 CLEANING

A. Clean work under provisions of Division One.

B. Clean marker board surfaces in accordance with manufacturer's instructions.

C. Cover marker boards and remove temporary protective cover at date of Substantial Completion.

3.4 PROTECTION

A. Protection of finished work shall be the responsibility of the Contractor until the date of Substantial Completion.

END OF SECTION

SECTION 10170 - SOLID PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Solid Plastic Toilet Compartments; Floor Mounted, Overhead Braced; as Indicated on the Drawings, Specified Herein; Including Accessories, Fittings and Attachments.

C. Solid Plastic Urinal Screens; Wall Mounted, Floor and Ceiling Braced.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Concealed wood framing and plates within walls for partition panel support.

B. Section 09250 - Gypsum Board Systems: Interior metal stud framing and gypsum board finish.

C. Section 09310 - Ceramic Tile Finish: Ceramic tile floor and wall finish materials.

D. Section 10810 - Toilet and Bath Accessories.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, and door swings.

C. Product Data: Provide manufacturer's data on panel and door construction, hardware, and accessories.

D. Samples: Submit samples of partition panels illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.4 REGULATORY REQUIREMENTS

A. Conform to ANSI A117.1 and ADA requirements for access for the disabled.

B. Comply with CBC and DSA current requirements.

1.5 FIELD MEASUREMENTS

A. Verify actual locations of solid plastic toilet compartments and other construction to which solid plastic toilet compartments must fit, by accurate field measurements before fabrication; show recorded field measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.6 COORDINATION

A. Coordinate the work with placement of concealed support framing and anchors in wall construction.

1.7 WARRANTY

A. Provide fifteen (15) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects, including breakage, corrosion and delamination, after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Scranton Products (Includes Santana/Comtec/Capitol). - Poly-Mar HD.
2. Columbia Partitions-Super HD-Polylife Series.
3. Sanymetal Products-solid polymer series.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Toilet Compartments: Floor mounted, overhead braced with non-corrosive doors, panels and pilasters.

B. Panels, Doors and Pilasters: Fabricated from High Density Polyethylene (HDPE) containing a minimum of 50% recycled material manufactured under high pressure forming a single component section which is waterproof, non-absorbent and has a self-lubricating surface. Provide protective plastic covering on all panels, doors and pilasters.

C. Aluminum Extrusions: 6463-T5 alloy.

2.3 CHARACTERISTICS

A. Dual component compression molded High Density Polyethylene (HDPE) of solid virgin resin materials in colors that extend throughout the surface; the panels, doors and pilasters shall have recycled material (HDPE) as the core material.

B. Doors, Panels and Pilasters: Minimum one (1) inch thick, all edges machined to a radius of 0.250 inch and all exposed surfaces to be free of saw marks.

2.4 FABRICATION

A. Fabricate partitions, pilasters and doors of single component construction of solid polymer resin in colors that extend from the surface throughout the entire thickness of the panels.

B. Doors: 55 inches high and mounted at 12 inches above finished floor.

C. Dividing Panels: 55 inches high and mounted at 12 inches above finished floor.

D. Pilasters: 82 inches high, overhead braced, mounted within a one piece stainless steel shoe with one-way theft-proof, stainless steel sex bolts.

E. Aluminum edging strips to be fastened to the bottom edge of all doors and panels using vandal proof stainless steel fasteners.

2.5 ACCESSORIES

A. Pilaster Shoes: Stainless steel shoes anchored to finished floor with plastic anchors and No. 14 x 1-1/2 inch stainless steel phillips head screws.

B. Wall Brackets: Bright-dipped anodized aluminum brackets. Provide brackets for all panels to pilasters, pilaster to wall and panel to wall connections. Thru-bolt wall brackets panels and pilasters with one-way sex bolts. Attach brackets to adjacent wall construction with No. 14 x 1-1/2 inch stainless steel phillips head screws anchored directly behind the vertical edge of panels and pilasters at 12 inch intervals along the full length of bracket and at each 12 inch interval alternately spaced between anchor connections.

C. Headrails: Heavy aluminum extrusion with mill finish in anti-grip configuration weighing not less than 1.188 lb. per lineal foot. Fasten headrail to tops of pilasters and headrail brackets by thru-bolting with one-way stainless steel sex bolts.

D. Headrail Brackets: 18 gauge stainless steel.

E. Hardware:

1. Hinges: Integral hinge system. Machine pilaster to accept door and hinge mechanism. Hinge mechanism consists of a two piece 1/2 inch diameter, four (4) inch long nylon pin with “Cam Action” and a 3/16 inch stainless steel pin inserted into lower portion of pilaster and door. A one piece 1/2 inch diameter, four (4) inch long nylon pin to be inserted into the top portion of the pilaster and door. Door closures to be factory set to accommodate all conditions and allow for a positive opening and closing action free of impediment.

2. Provide one (1) door pull at each side of door (U-shape), and sliding or flip latch above pull with each accessible door. Hinges to have self-closing action.

3. Fabricate door strike and keeper from heavy aluminum extrusion with clear anodized finish with wrap around flange surface mounted and thru-bolted to pilaster with one-way sex bolts. Strike: heavy duty six (6) inch plate.

4. Provide doors with one (1) coat hook/bumper of heavy chrome plated Zamack with rubber bumper.

5. Fabricate door latch housing from heavy aluminum extrusion with clear anodized finish, surface mounted and thru-bolted to door with one-way sex bolts. Slide bolt and button: heavy aluminum.

6. All hardware to meet or exceed CBC and DSA requirements.

2.6 URINAL SCREENS

A. Wall Mounted - Flange Supported: Heavy duty wall hung screen floor to ceiling support with integral flanges and continuous heavy anchor plate to support the panel.

B. Panels: Minimum one (1) inch thick, all edges machined to a radius of 0.250 inches and all exposed edges to be free of saw marks. Provide a continuous flanged edge formed for attachment to the wall. Continuous supporting wall bracket, fabricated of heavy steel, and is concealed by the panel flange when installed. Size: 18” x 42”

2.7 FINISHING

A. Doors, Panels and Pilasters Finish: Equal to Santana - "Plastic-Glaze 280"; color black with white specks..

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.

C. Attached panel brackets securely to walls using anchor devices.

D. Attach panels to brackets with tamper proof through bolts and nuts.

E. Anchor urinal screen panels to walls with fasteners as recommended by the manufacturer.

F. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.

G. Install accessories per manufacturer's instructions.

H. Field touch-up of scratches or damaged finish will not be permitted.

I. Replace damaged or scratched materials with new materials.

J. No evidence of drilling, cutting, or patching shall be visible in the finished work.

K. Clearance of vertical edges of doors shall be uniform top to bottom and shall not exceed 3/16 inch.

3.3 CLEANING

A. Cleaning work under provisions of Division One.

B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.

C. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging handicapped doors to closed position.

D. Clean all finished surfaces to be free of imperfections.

3.4 PROTECTION

A. Protect finished Work until the date of Substantial Completion.

END OF SECTION 10170

SECTION 10350 - FLAGPOLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Ground-Set Cone Tapered Aluminum Flagpoles With Lightning Protection System; Including All Related Accessories and Mounting Components.

C. Flag(s) Shall be Provided and Installed by Owner.

1.2 PRODUCT FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03300 - Cast-in-Place Concrete: Placement of anchor devices and foundation sleeve.

1.3 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Base and foundation construction, and vertical wall.

B. Section 07910 - Joint Sealers: Sealant and joint backing.

1.4 PERFORMANCE REQUIREMENTS

A. Flagpole With Flag Flying: Resistant without permanent deformation to 80 miles/hour wind velocity; non-resonant, safety design factor of 2.5.

1.5 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate detailed dimensions, base attachment details, anchor requirements, and imposed loads.

C. Product Data: Provide data on flagpole, accessories, and configurations.

1.6 QUALIFICATIONS

A. Design flagpole foundation under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State of California.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Spiral wrap flagpole with protective covering and pack in protective shipping tubes or containers.

C. Protect flagpole and accessories from damage or moisture.

1.8 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FLAGPOLES

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. American Flag Pole, Inc.
2. Baartol Company, Inc.
3. Concord Industries, Inc.
4. Elder Flag Manufacturing Co., Inc.
5. Michigan Flagpole Inc.

B. Substitutions: Under provisions of Division One.

2.2 POLE MATERIALS

A. Aluminum: ASTM B241, 6063 alloy, T6 temper, seamless extruded tubing, cone tapered.

2.3 POLE CONFIGURATION

A. Flagpole: Nominal exposed height thirty-five (35) feet, outside butt diameter seven (7) inches, outside top diameter four (4) inches, and nominal wall thickness 3/16 inches.

1. Flagpoles: Ground mounted type.
2. Flagpole Design: Cone tapered aluminum.
3. Mounting Brackets: Manufacturer's standard cast or fabricated aluminum in the design selected by the Architect. Include all necessary mounting plates, bolts, nuts and washers; finish to match the shaft.

2.4 COMPONENTS AND ACCESSORIES

A. Finial Ball: 14 gauge spun aluminum ball, gold anodized finish with flush seam, sized to match butt diameter of shaft.

B. Truck Assembly: Cast aluminum revolving, single pulley, for internal halyard poles, sized to fit pole top diameter.

C. Pulley and Eyebolt Assemblies: Deluxe, vertical mount pulley assemblies, including related caps and adaptors.

D. Cleats: Cast aluminum cleats, with stainless steel socket-head bolts, finish to match the shaft.

E. Halyards Cover: Aluminum plate, 1/8 inch thick, six (6) inch wide, height determined by the length of the halyard cover. Provide lock.

F. Cleat Box: Wall mounted onto a 20" high, 12" wide, 1/8" thick aluminum plate. Key operated with cylinder provided by Section 08710.

G. Internal Halyard: White nylon with wire core, equipped with two (2) chrome swivel-snaps to secure the flag.

2.5 MOUNTING COMPONENTS

A. Foundation Tube Sleeve: AASHTO M-36, corrugated 16 gauge steel, galvanized, depth as indicated on shop drawings, 3'-6" minimum.

B. Lighting Ground Rod: 3'-6" (long copper rod, 3/4 inch diameter.

C. Lightning Ground Cable: Copper No. 6 AWG, soft drawn.

2.6 FINISHES

A. Metal Surfaces in Contact With Concrete: Asphaltic paint.

B. Concealed Steel Surfaces: Galvanized to ASTM A123 1.25 oz/sq ft unfinished.

C. Aluminum: Anodized to clear finish, minimum seven (7) mils thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that concrete foundation is ready to receive work and dimensions are as indicated on shop drawings.

C. Beginning of installation means acceptance of existing conditions.

3.2 PREPARATION

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

B. Concrete base and corrugated sleeve shall be installed by Contractor under provisions of Section 03300.

3.3 INSTALLATION

A. Install flagpole and fittings in accordance with manufacturer's instructions.

B. Ground flagpole installation.

C. Install flagpoles straight, level and plumb.

3.4 TOLERANCES

A. Maximum Variation From Plumb: One (1) inch.

3.5 CLEANING AND ADJUSTING

A. Clean and adjust work under provisions of Section 01740.

B. Clean all finished surfaces and remove debris and wrappings from the site.

C. Adjust operating devices so that halyard function smoothly.

3.6 PROTECTION

A. Protection of finished work shall be under provisions of Division One.

B. Protect Work from damage until Substantial Completion.

END OF SECTION

SECTION 10400 - IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Identifying Devices; as Indicated on the Drawings, Specified Herein, Including Related Accessories and Attachments.

C. Exterior Signage: Building Identification Signage.

D. .Interior Signage:

1. Room Identification Signage.
2. Metal Toilet Room Signs.

1.2 RELATED SECTIONS

A. Section 04200 - Unit Masonry Systems: Unit masonry wall substrate.

B. Section 08110 – Steel Doors and Frames.

C. Section 09250 - Gypsum Board Systems: Interior metal stud wall framing and gypsum board finish.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Listing sign styles, lettering and locations, and overall dimensions of each metal sign. In clued sign schedules with door numbers where each sign is to be installed and whether installation is on the “push” or “pull” side.

C. Samples: Submit samples illustrating full size sign, of type, style and color specified including method of attachment.

D. Submit manufacturer's written installation instructions for each type of sign.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to site under provisions of Division One.

B. Package signs, labeled in name groups.

C. Store adhesive tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install plastic signs when ambient temperature is below 70 degrees F. Maintain this minimum during and after installation of signs.

1.6 REGULATORY REQUIREMENTS

A. All signs shall comply with all requirements of the Americans with Disabilities Act (ADA), CBC 1117B.5 and 1115.B.5, and Division of State Architect (DSA).

1.7 WARRANTY

A. Provide one (1) year manufacturer’s written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - METAL SIGNS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Vital Signs – (661) 325-1987.
2. Dixies Graphics – (615) 832-7000.
3. Advanced Corporation – (800) 328-9451.
4. Gemini 800 – (800) 538-8377
5. A.R.K. Ramos – (800) 725-7266.
6. Graphicline Sign Company – (909) 884-6276.

B. Substitutions: Under provisions of Division One.

2.2 METAL SIGN MATERIALS

A. Fabricate metal signs from zinc plate or magnesium plate as follows:

1. Zinc Plate:

Standard Thickness	Etch Depth
0.030	0.015
0.062	0.030
0.120	0.040
0.150	0.060

0.240	0.080

2. Magnesium Plate:

Standard Thickness	Etch Depth
0.030	0.015
0.062	0.030
0.120	0.040
0.150	0.060
0.240	0.080

B. Fasteners:

1. Adhesive: Silicone type, magnetic sheeting, hook and loop.
2. Mechanical: Flash welded copper blind studs, for concealed stud method fastening.

2.3 INTERIOR METAL SIGNS

A. Metal Room Identification Signs:

1. Material: Chemically etched zinc with raised copy and Braille, 0.125” thick.
2. Size: As required to accommodate copy. Minimum 1/16” less than the inside-to-inside dimension of frame for total reveal of 1/32” on all sides inside frame.
3. Background Color: As selected by Architect to contrast minimum 70% from copy color.
4. Copy Position: CC unless noted otherwise.
5. Raised Copy and Braille: Minimum raise of 1/32”. Copy to be 5/8” high.Helvetica medium uppercase unfinished satin zinc with grade 2 Braille, complying with CBC Section 1117B.5.6. Letters shall be integral part of plaque.
6. Frame: 1/16” thick aluminum natural satin finish with acrylic back plate mounted with adhesive inside frame. No hardboard backer.
7. Inner Piece: Black acrylic back plate with screw holes pre-drilled to countersink screw head.
8. Mounting Attachment: Fasten frame to wall with minimum four flush countersunk screws. Attach metal plaque in frame with minimum of two round head tamper-resistant fasteners.
9. Spacing Template: Normal.
10. Construction: No backer plates to allow plaque to fit flush to wall.

B. Metal Accessible Toilet Room Door Signage:

1. Material: Chemically etched zinc with raised copy and Braille, 0.125” thick. Raised border 1/4" wide.
2. Size: 12” circle for Women’s and UNISEX; 12” equilateral triangle for Men’s.
3. Background Color: As selected by Architect to contrast 70% from copy color.
4. Raised Graphics: Graphics and border to be unfinished satin zinc raised a minimum of 1/32”. Center graphics on plaque.
5. Mounting Attachment: Fasten sign to door with minimum of three round head tamper-resistant fasteners.
6. Mounting Location: Center on door 5’ from floor to center of sign.

C. Metal Accessible Toilet Room Side Signs:

1. Material: Chemically etched zinc with raised copy and Braille, 0.125” thick.
2. Size: 6” wide x 8” high; maximum of 1/16” less than the inside-to-inside dimension of frame for a total reveal equaling 1/32” on all sides inside frame.
3. Background Color: As selected by Architect to contrast 70% from copy color.
4. Raised Copy and Braille: To be raised a minimum of 1/32”. Copy to be 1” high Helvetica medium uppercase unfinished satin zinc accompanied with grade 2 Braille.
5. Copy Position: CC
6. Graphics: Unfinished satin zinc; center on plaque.
7. Frame: 1/16” thick natural satin aluminum finish with acrylic back plate mounted with adhesive inside the frame. No hardboard backer allowed.
8. Inner Piece: Black acrylic back plate with screw holes pre-drilled to countersink screw head.
9. Method of Attachment: Mechanically fasten frame to wall with four flat head screws and attach the metal plaque in the frame with a minimum of three round head tamper-resistant fasteners.
10. Mounting Location: Centered on door 5’ from floor to center of sign.

2.4 ACCEPTABLE MANUFACTURERS - CAST METAL LETTERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Architectural Signage Systems.
2. Gemini, Inc.
3. Leeds Architectural Letters, Inc.
4. Metal Arts; Div. of L & H Mfg., Inc.
5. OMC Industries, Inc.
6. Nelson-Harkins, Inc.

B. Substitutions: Under provisions of Division One.

2.5 CAST LETTER MATERIALS

A. Letter Styles:

1. Helvetica Medium.
2. Upper Case.
3. Letter Sizes: 16 inches high.

B. Materials and Finishes:

1. Satin Brite Aluminum.

C. Fastening Methods:

1. Attach all cast metal letters with aluminum tube spacers.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. All areas to receive signs shall be clean and free of dirt and foreign materials.

C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Install signs after doors are completely finished in locations indicated.

B. Center signs on doors, level.

C. Signs to be mechanically mounted with tamper-free screws, minimum 2 for small signs and four screws for large signs.

D. Install identification signs level and secure to substrate.

E. Provide level backing to full edge of surface when mounted on uneven surface. Grind uneven surface of block smooth at location to receive sign.

F. Install exterior cast metal letters with the specified fastening method, and in accordance with the manufacturer's instructions.

G. Use of double-sided tape is prohibited.

3.3 CLEANING

A. Clean work under provisions of Section 01740.

B. Clean and polish all finished surfaces..

3.4 SCHEDULE

A. Interior Metal Signs:
Contractor to develop schedule based on Architectural Floor Plan information. Signs to read "Custodial" in lieu of "Janitor's Closet."

B. Exterior Cast Metal Signs:

1. MESSAGE
NEW CONTINUATION HIGH SCHOOL

2. Room number and name per schedule.

END OF SECTION

SECTION 10520 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Fire Protection Specialties; as Indicated on the Drawings, Specified Herein; Including Related Accessories and Attachments.

1. Fire Extinguishers.
2. Non-Rated, Semi-Recessed Mounted Fire Extinguisher Cabinets.

C. Fire Department Key Retaining Box.

1.2 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements and locations.

C. Product Data: Provide manufacturer's data for extinguisher operational features, color and finish, and anchorage details.

D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.

1.3 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.4 REGULATORY REQUIREMENTS

A. Conform to the California Fire Code, latest edition, for requirements for fire extinguishers.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of fire protection specialties and other construction to which fire protection specialties must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

A. Provide one (1) year manufacturer's written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIRE EXTINGUISHERS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. Potter-Roemer.
2. AMEREX Fire Extinguishers.
3. J.L. Industries, Inc.
4. KIDDE Fire Extinguisher Company.
5. Larsen's Manufacturing Co.
6. SENTRY Fire Extinguishers.
7. NYSTROM Product Company.

B. Substitutions: Under provisions of Division One.

2.2 ACCEPTABLE MANUFACTURERS - FIRE EXTINGUISHER CABINETS

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. J.L. Industries, Inc.
2. Larsen's Manufacturing Co.
3. Modern Metal Products by Muckle.
4. NYSTROM Product Company.
5. POTTER-ROEMER - Div. Of Smith Industries.

B. Substitutions: Under provisions of Division One.

2.3 ACCEPTABLE MANUFACTURERS - FIRE DEPARTMENT KEY BOX

A. Subject to compliance with requirements, provide products from one of the following manufacturers:

1. KNOX Company.

B. Substitutions: Under provisions of Division One.

2.4 FIRE EXTINGUISHERS

A. Dry Chemical Type: UL 299; Heavy duty steel tank with pressure gauge; metal valve and siphon tube; corrosion and impact resistant epoxy finish; 5 lb. (UL 3-A:40-B:C) and 10 lb. (UL 4-A:60-B:C) capacities.

1. Provide fire extinguishers at all areas noted on Drawings, but as a minimum provide 5 lb. (2.3 kg) at all fire extinguisher cabinets; and 10 lb. (4.6 kg) elsewhere.

2. Provide fire extinguishers at all Janitor Closets, Classrooms, Science Classrooms, Art Rooms, Mechanical Rooms and Electrical Rooms, and all other locations indicated on the Drawings.

3. Provide Potter-Roemer 2A:1B:C:K, Class K at all kitchens.

2.5 NON-RATED FIRE EXTINGUISHER CABINETS

A. Potter-Roemer: Semi-recessed model No. 7322-BA-RR, baked-on prime coat exterior finish, white baked-on enamel interior finish. 1/8" thick acrylic view panel.

1. Provide at all areas indicated on the Drawings, and of proper size to accommodate specified fire extinguisher.

2.6 FIRE DEPARTMENT KEY BOX

A. Key Retaining Box:

1. Key box located as indicated on the Drawings, for Fire Department access to the building in case of emergency.

2. Recessed 7"W x 7"H (flange) x 3-1/4"D Knox-Box Series 3200 with hinged door as approved by the local Fire Department.

a. Tamper alarm option.

b. Color: Aluminum.

2.7 ACCESSORIES

A. Extinguisher Brackets: Formed steel, "White" enamel finish.

2.8 FABRICATION

A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

B. Pre-drill for anchors.

C. Hinge doors for 180 degree opening with continuous piano hinge. Provide roller type catch.

D. Weld, fill, and grind components smooth.

E. Glaze doors with resilient channel gasket glazing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION OF FIRE EXTINGUISHERS AND CABINETS

A. Install fire extinguishers, cabinets and accessories in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 48 inches from finished floor to inside top of cabinet. Secure rigidly in place.

C. Place extinguishers and accessories in cabinets or on wall brackets.

3.3 INSTALLATION KEY RETAINING BOX

A. Follow all Fire Department requirements for installation of key retaining box.

a. Contact: Local Fire Prevention Division.

3.4 CLEAN AND ADJUST

A. Clean all cabinet and glass surfaces.

B. Adjust cabinet doors to operate smoothly.

END OF SECTION 10520

SECTION 10810 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Commercial Toilet and Bath Accessories; as Indicated on the Drawings, Specified Herein; and Including Hardware and Attachments. Provide Items as Follows:

1. Handicap Grab Bars.
2. Framed Mirrors.
3. Toilet Paper Roll Dispensers.
4. Toilet Seat Cover Dispenser – Surface Mounted.
5. Napkin/Tampon Disposal – Wall or Partition Mounted.
6. Paper Towel Dispenser.
7. Electric Hair/Hand Dryers.
8. Mop/Broom Holders.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Concealed wood blocking and plates for support of accessories.

B. Section 08810 - Glass and Glazing: Unframed mirror glass.

C. Section 09310 - Ceramic Tile: Ceramic tile wall finish.

D. Section 09250 - Gypsum Board Systems: Metal stud wall framing and gypsum board substrate construction.

E. Division 16000 - Electrical: Connections to hand/hair dryers.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Submit shop drawings of all toilets accessories; including locations, mounting heights, method of fastening, and back-up requirements.

C. Product Data: Provide manufacturer's data on accessories describing size, finish, details of function, attachment methods.

D. Samples: Submit samples of each component, illustrating color and finish.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Schedule: Submit schedule listing all toilet accessory items, model numbers, finish, and cut sheets showing particular items.

1.4 REGULATORY REQUIREMENTS

A. Conform to ADA safety standards for access requirements for the disabled.

1.5 FIELD MEASUREMENTS

A. Verify actual locations of toilet accessories and other construction to which toilet accessories must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.6 COORDINATION

A. Coordinate the work with the placement of concealed wall reinforcement to receive anchor attachments.

1.7 WARRANTY

A. Provide two (2) year manufacturer's written warranty under provisions of Division One.

B. Warranty: State that all materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

1. Provide minimum ten (10) year manufacturer's written warranty for silver spoilage on all mirrors.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - TOILET ACCESSORIES

A. Subject to compliance with requirements, provide products from the following manufacturer:

1. BOBRICK Washroom Equipment, Inc.

B. Subject to compliance with requirements, other acceptable manufacturers offering equivalent products are:

1. American Specialties, Inc.
2. Bradley Corporation.
3. Gamco.

C. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Adhesive: Two component epoxy type, waterproof.

E. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.

F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

G. Grab Bars: Stainless steel satin finish with peen gripping surface.

2.3 FABRICATION

A. Weld and grind joints of fabricated components, smooth.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

2.4 KEYING

A. Supply ten (10) keys for each accessory to Owner.

B. Master key all accessories.

2.5 FINISHES

A. Galvanizing: ASTM A123 to 1.25 oz/sq yd. Galvanize ferrous metal and fastening devices.

B. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.

C. Chrome/Nickel Plating: ASTM B456, satin finish.

D. Stainless Steel: No. 4 satin luster finish.

E. Back paint components where contact is made with building finishes to prevent electrolysis.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install bath toilet accessories in accordance with manufacturers' instructions and ADA requirements.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.4 SCHEDULE (ITEMS ON SCHEDULE ARE BOBRICK)

To be provided and installed by Contractor:

ITEM	MODEL	FINISH
Grab Bars (1-1/2 Dia.)	B-6806.99 Peened Grip	Stainless Steel
Grab Bars (1-1/4 Dia.)	B-5806-36/ B-5806-42	Stainless Steel
Framed Mirrors	Series B-1556 2436	Stainless Steel
Toilet Paper Dispensers	B-4388	Stainless Steel
Toilet Paper Dispensers	B-4221	Stainless Steel
Napkin/Tampon Disposals (Wall) *Recessed*	B-353	Stainless Steel
Napkin/Tampon Disposals (Partition) *Double sided*	B-354	Stainless Steel
Napkin/Tampon Disposal *Surfaced Mounted*	B-270	Stainless Steel
Paper Towel Dispensers	B-262	Stainless Steel
Paper Towel Dispenser/ Disposal	B-3699	Stainless Steel
Toilet Seat Cover Dispenser	B-4221	Stainless Steel
Electric Hair/Hand Dryers, recessed per ADA requirements	Excel Dryer Xlerator	Stainless Steel-
Mop & Broom Holder	B-223-24”	Stainless Steel

To be provided by Owner and Installed by Contractor:

Soap Dispenser		Stainless Steel

END OF SECTION 10810

SECTION 11130 - SOUND AND AUXILIARY SYSTEMS

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

A. The general conditions, supplemental general conditions, and those requirements stated in section 16000 and relative to this specification, and those sections provided by the architect which have bearing on this system are part of this section as if fully repeated herein.

1.2 SCOPE

A. Furnish all labor, materials, apparatus, tools, equipment, transportation, temporary construction, and special and occasional services to make a complete working sound reinforcement system with auxiliary systems as shown on the contract drawings and described in this specification.

B. Also demonstrate by specified tests that all components and completed systems meet the specifications to the satisfaction of the engineer. Verify all conditions on the job site applicable to this work.

C. Coordinate work with the general and the electrical contractor, and the scheduled work of other trades, preserve harmony in the work environment with all trades providing services for this project.

D. Failure in coordination shall not be reason for additional payments due to omissions or errors in any work required to provide the specified functional system (s) whether specifically shown or not and called out in this specification or not.

E. Notify the architect and the engineer immediately in writing of any discrepancies in part numbers, technical differences, deficiencies, or any discrepancies before the bid. Failing to provide such notice, or not supplying items and quantities according to the intend of the specifications and drawing as interpreted by the engineer, or assumptions on the part of the contractor, is not claim for additional payment.

F. Work Included:

1. The installation of all sound system receptacles, mounting plates, including all systems cable and wire which is not to be installed by the electrical contractor.

2. All equipment and material according to the layout as indicated on the contract drawings and described in this specification.

3. Provide for twelve (8-4) hours of training at the owner s convenience. Training sessions shall be video taped and delivered to the owner.

4. This instruction shall be provided by a technician who is fully knowledgeable in, and technically capable of full operation and instruction of the use of the installed systems. All owner/operations and maintenance manuals shall be available for the training sessions.

5. The mounting, support and aiming for all loud speakers and other special devices shown. To be included is the approval stamp of a state licensed structural engineer prior to mounting of any loud speaker cluster or systems.

6. Cover plates and special outlet boxes and engraved name plates.

7. Survey radio frequencies with an R.F. scanner for the least intrusive frequencies for the wireless microphones and assistive listening systems provide test results with submittal for frequency selection for each system. Each room shall be provided with devices set to separate frequencies.

8. All required A.D.A. signage.

9. All documentation, manuals, drawings, details, schedules, notations, and installations by this contractor.

10. All acoustic isolation and insulation material.

11. All special rough in boxes or items which are proprietary to the sound and video industry.

G. Related work excluded and provided by others:

1. All conduits including device junction boxes, terminal cans and pulling lines installed, shown on the contract drawings and specified in this section shall be provided by the electrical contractor, unless specifically noted on the plan set to be

provided by the sound system contractor.

2. The conduit system shall be metallic in all cases except where the conduit enters the sound system equipment rack/racks. At this location metallic shall convert to pvc to enter the rack. Building structural metal, electrical ground or conduit from other systems shall not touch the sound system equipment racks.

3. The isolated grounding electrode and the isolated grounding electrode conductor and other equipment and materials for the isolated ground system shall be provided and installed by the electrical contractor, the sound system contractor is responsible for coordinating with the electrical contractor for proper installation of these requirements.

4. Wooden counters, cabinets, and fixtures.

5. Cooling for room where sound equipment racks mount.

6. Electrical power isolated by a transformer rated for the current drawn by the sound system (s).

7. Installation of sound contractor provided, sequencing, load center for sound system if shown on the drawings.

8. Conduit depth under ground shall be a minimum of 24 below grade.

1.3 SUBMITTALS

A. All submittals shall be in accordance with the requirements of the general conditions, at least nine bound copies shall be prepared and delivered in-total to the engineer for review including all required installation drawings, details, riser diagrams, and all other details which make up and are required for the submittal. Incomplete submittals will not be reviewed until the contractor has submitted all required data. The engineer and the architect are not responsible for contractor delays, nor the contractor incurring liquidated damages due to a non-responsive attitude.

B. Within ten calendar days from the receipt of the notice to proceed the contractor shall prepare for review a schedule which shall include, but not limited to the following;

C. Submission of shop drawings, samples, and layouts for all items described herein.

D. Each submittal booklet, along with all required data sheets, shall be provided with an index. The index shall list the following information for all components and equipment scheduled for installation to make a fully operational system.

E. The index shall list the quantity of each device or component, the manufacturer, the model number, the description, the system which will use the part, device, or component, the contractor shall also list the project name, the architects job number, who the contractor is subordinate with, that contractor s contact person and their telephone contact number.

F. Shop drawings will be provided in 1/8 in. scale minimum, at least nine copies, complete with one sepia set. Sheet sizes for all drawings shall be at least 24 x 36 in size, or in the size utilized to represent the work required on the bid documents. All submittal booklets, with drawings, shall be bound.

G. All drawings must be computer generated for all drawings, diagrams details, and symbols. Shop drawings shall contain; block system diagrams, installation drawings showing device locations on the building floor/ceiling plans, speaker (s) rigging, equipment rack risers, product data sheets, grounding detail, all required detail drawings in plan, elevation and section. All custom circuitry must be shown in point-to-point drawings.

H. Plate, panel, and jackbay layout showing engraving information with complete fabrication details, including the method of carrying through the shields.

I. Consoles, enclosures, supports, counters, cabinets and tables.

J. Locations of all equipment racks, consoles, with dimensions, wire routing A/C power outlets, terminal cabinets and terminal strip locations, and grounding details.

K. Loudspeaker locations, orientation, supports, isolation devices, insulation material, and rigging hardware, with substantiating information showing the weight safety factor.

L. Schematic drawings of all custom circuitry and/or equipment modifications, including pin-out information and component listings.

M. Original catalog data sheets on all equipment are to

be provided for review if for use on this project.

N. Samples and/or photographs as requested by the engineer.

O. Completion tests for the following tests:

1. Performance tests on all individual components and loud speakers as they are received from the manufacturer into the contractor s shop.

2. Performance tests on all sub-assemblies and complete assemblies, including all equipment racks relating to this project.

3. General performance testing of systems at the job site.

4. Final acceptance testing with the engineer at the job site.

P. Delivery and installation dates for wire and equipment.

Q. Submission dates for operation and maintenance manuals with aid-to-use charts.

R. Within thirty days of award of the contract, shop drawings shall be submitted for review on all items that require assembly by the contractor, including but not limited to all:

1. Wiring diagrams; complete detailed block wiring diagrams for all systems, including cable types, wiring connections at both the equipment and inside equipment racks complete with the grounding detail for the system(s).

2. Samples for submission on equipment as requested by the engineer include, but are not limited to; engravements, receptacles, and substitute equipment.

S. Layouts shall be submitted for approval as follows;

1. Equipment racks, jack fields, grounding diagram or as instructed by the engineer.

2. Color photographs as requested by the engineer.

T. Dates for all inspections. The contractor shall notify the engineer when it is appropriate for the engineer to visit the site for rough-in inspections. The rough-in inspections should be held when all underground conduit is installed but not yet covered, whether to be under soil or under concrete.

U. The contractor shall notify the engineer when it is appropriate to inspect all installed wire, wire cable numbers, and terminations at major terminal boxes.

V. The contractor shall notify the engineer when all in-facility testing has been completed with the office of the installing contractor.

W. The contractor shall notify the engineer when the project is ready for substantial completion inspection.

X. The contractor shall notify the engineer when the project is ready for a final inspection, all systems testing, and systems commissioning.

Y. The contractor shall notify the engineer when all instruction has been completed.

Z. All notices to the engineer shall be in writing and conveyed through the mail or via facsimile with verification on the part of the contractor s transmission has been received by the engineer.

1.4 QUALITY ASSURANCE

A. Unless otherwise stated, all electrical and electronic equipment shall be products of firms regularly engaged in the business for the manufacturer of electrical and electronic equipment. The equipment shall be the latest model or type offered which meets the applicable specification at the time of submittal. Discontinued or used items shall not be used in this project.

B. Quality of workmanship and fabrication of all equipment and components which are custom fabricated shall be comparable to the professional audio equipment as produced by specialized manufacturers of electronics apparatus and shall be verified by inspection. Only skilled craftsmen in this profession shall be utilized for fabrication and installation of this project.

C. Failure of the engineer, owner, architect or other representative of the owner to condemn any defective material or labor shall not release the contractor from the obligation to remove the replace, at once, the defective material or labor.

D. Standards as set forth by S.M.P.T.E., N.A.B., E.I.A., U.I., A.E.S., C.E.C., C.F.C., N.F.P.A., C.B.C., FC.C. and the requirements of A.D.A. will be enforced.

1.5 WARRANTIES

A. A two year warranty shall be provided in writing covering all components and systems, including materials and workmanship. This obligation does not include misused or abused equipment.

B. The contractor shall submit in writing; the period or warranty where the owner may call for service, and that response is provided within a normal 24 hour period, and that faulty components shall be replaced in the system (s) within two working days of the service call.

C. Said warrants and guarantees begin at the time of owner acceptance of the systems (s). The owner maintains the right to use the system(s), or any part of the system prior to acceptance without prejudice.

1.6 AIDS TO USE

A. Upon completion of installation, the contractor shall provide bound as-built drawings, record drawings, and manuals of operation, maintenance and programming literature, system geographical layout, and block diagrams shall be included.

B. During the installation, all cables and wires shall be labeled, the type, number, and location of all microphone, loudspeaker, and other receptacles shall be shown on the record drawings. Labels shall be permanent.

C. Prepare and provide on site, a graphic representation of the location of all input-output jacks. The graphic representation shall be in 1/8 scale, protected by plexiglass, framed, and mounted near the operational point of the sound system(s). (Adjacent to rack no.3).

D. All training sessions shall be video taped and presented to the owner at the time of completion of all training sessions.

1.7 SURVEILLANCE OF THE SYSTEM

A. The contractor shall for the first year of the system operation establish a maintenance program and coordinate the maintenance of the system.

B. Perform a complete system survey and critical electronic measurements on a semiannual basis, and submit the anticipated schedule to the architect and coordinate arrival dates and times with the owner. The second year of surveillance shall be accomplished in two visits.

1.8 SYSTEM DESCRIPTION

A. The sound reinforcement and auxiliary systems as indicated on the drawings and specified herein, shall provide voice and music reinforcement, recording as required, and as indicated on the contract drawings.

B. If the bidding contractor has any questions regarding the requirements of the system(s) shown, or the high level of technical requirements, the contractor shall contact the engineer in writing and present their questions or concerns.

C. Misunderstanding of the system(s), or assumptions made by the contractor, is not cause for extra charges by the contractor payable by the owner.

D. The system block diagrams as shown on the category drawings shows all receptacles, loudspeakers, wire requirements, controls, and process locations and quantities.

E. The maximum output of the system shall be equal to the maximum allowable continuous rms / program power of the speaker system within the listening environment.

F. Signal-to-noise ratio, clipping level, intermodulation, harmonic distortion shall not exceed the maximum amount of the worst electronic component of the system being installed within the signal chain, source to reproducer.

G. Acoustic distribution throughout the listening environment shall be at maximum of +/- 3 dB front to back and side to side within the listening environment.

H. Frequency response shall be as great as the least responsive electronic device in the system signal flow chain, source to reproducer.

1.9 CONTRACTOR QUALIFICATIONS

A. The work specified herein, and in each of the allied sections, shall be accomplished by a single contractor experienced in the design, fabrication, installation, check-out, and warranty contract management of systems such as those described in each section.

B. This contractor shall have complete responsibility for the system described herein and shall be the single point of contact for the architect, engineer and owner with respect to all work specified herein.

C. The bidder shall, prior to the bid, submit at least the following information to verify that the bidder has the necessary experience and qualifications to perform

the specified work;

D. A detailed brochure describing the firm s capabilities, the facilities, personnel, background, experience, and examples of similar installations. At least to (10) installations within the last two years is required relating to the relative size, technical requirements, and cost of this project.

E. Distribution agreements with manufacturers of equipment intended for use on this project. ie: the installing contractor will be the manufacturers authorized dealer/installation contractor of all major components.

F. Identify all subcontractors to be used in conjunction with this project.

G. Provide evidence that all licenses and approvals have been acquired.

H. Provide information on how and who will fulfill the requirements of the warranty.

I. This submittal must justify in the judgment of the engineer, the architect, and the owner, that the contractor has the capability to manage and install a project of this size and scope, and that the contractor is capable of the necessary business and technical arrangements for the installation and warranty period.

J. The contractor shall have on his staff a qualified project engineer. This person shall;

1. Be a university graduate engineer in electrical or electronic engineering or physics, or have at least five years of experience with similar electronic specialty systems or other acceptable educational experience presented for review by the engineer. (Required by other than pre-approved contractors).

2. Observe at all times a good working relationship with the architect and owner s representatives, and cooperate with the owner s technicians who will later operate this system, and with other trades on this project.

3. Provide all technical liaison between the contractor, the architect, general contractor, electrical contractor, the owner, and the engineer.

4. This shall include participation in meetings, inspections and in the preparation of all project documentation and in the required training, this person shall be responsible for supervising fabrication, installing, and at all times confirming intent of the specifications are being adhered to.

K. This contractor shall have fully staffed office within 100 miles of the site of construction unless a contractor has been pre-approved to participate in this project.

L. Fully staffed is defined as a contractor having a regular place of business, staffed by an installation department, a service department, and a sales department. The contractor shall list the quantity of personnel in each department.

1.10 ALTERNATIVE EQUIPMENT

A. Proposed alternatives for the approved equipment specified under this section shall conform with the special and general conditions of the architect s documents, the electrical engineer s requirements and those notations made within this technical specification. Contractors must submit 15 days prior to the bid date with the following information in triplicate (three copies) to the engineer to request substitute items for this project.

B. If the proposed substitute equipment cannot be shown to be equal to the specified item, the contractor shall supply equipment as specified. The bidding contractor maintains responsibility of proving equality for all items requesting to be substituted for those specified.

C. A complete list of the material the contractor wishes to substitute showing the proposed alternate equipment verses the specified equipment noting all manufacturers specifications.

D. In addition to the specification sheets, a brief explanation as to why the substitution is being requested, with complete drawings, showing the relationship of the proposed verses the specified equipment.

E. The substituting of equipment, which may increase costs for larger conduits, differences in architecture, or other requirements are the responsibility of the installing contractor.

F. Approval of a substitute item does not absolve the specialty contractor of these costs. If, in the opinion of the architect and the engineer the proposed substitute appears as an equal to the specified item, the submitting contractor will be notified.

G. The engineer, the owner, and the architect reserves the right to examine, and where necessary, have testing done by the same testing laboratory of the specified equipment, to insure that all substitute equipment is equal or better to that which was specified for this project.

H. The costs for all testing shall be borne solely by the providing contractor. If testing proves the substitute equipment is not an equal, the providing contractor shall, and without further delay, remove the questionable equipment and provide as specified.

I. The term equal for the purposes of this project may be determined by several methods, and therefore equality of equipment may be judged on more than just technical equality. The judgment may be based upon pricing, weight, color, physical size, the manufacturer and their reputation, past performance of the proposed substitute item or equipment, term of the warranty, probable service life of the product, current draw of the item, and at discretion of engineer.

J. No modification to the system shall be made for two years without the express knowledge and permission of the contractor and the engineer. Request for changes or and modifications shall be forwarded in writing with a brief description of and why the changes are being requested.

K. Failure to notify the engineer of any changes may result in the voiding of the warranty and any continued responsibility by the contractor to the project.

L. However, in refusing service by the installing contractor, the owner maintains the right to service, and repair, as required, for the system(s) without permission from the installing contractor without voiding any warranty, written or expressed, if the contractor proves to be non-responsive.

PART 2 - PRODUCTS

2.1 GENERAL

A. Insofar as is possible, the specification for all components is written as performance specification. In most all cases, there may be several manufacturers who can supply alternate components which meet the intent of this specification.

B. The contractor maintains the responsibility to prove equality with the item or items specified via pre-submission for approval of alternate equipment. It is not the responsibility of the engineer to prove equality.

C. The major manufacturers of equipment are noted to be or equal pursuant to the requirements of the specification and that of the architect.

2.2 GENERAL EQUIPMENT

A. The approved equipment names and numbers listed are items that will meet the intent and performance requirements of the systems depicted on the contract drawings with regards to performance and size.

B. If compliance with the specifications of any alternate component cannot be shown in the allotted time, the contractor shall supply the approved equipment listed. Cost increases created by this contractor shall be the responsibility of this contractor and not chargeable to the owner.

C. Microphone input connectors shall be Switchcraft D3F series in quantities as noted, riveted to the mounting plate. Stainless steel plates shall be used for all wall or ceiling locations unless otherwise noted.

D. Line output connectors shall be Switchcraft D3M series in quantities as noted, riveted to the mounting plate. Stainless steel plates shall be used for all wall or ceiling locations unless otherwise noted.

E. Auxiliary level input and output connectors shall be Swithcrarft 3501FR, 3511, 3512, 11, 12, 111, 112, series connectors mounted on stainless steel plates in quantities as noted. The shield / ground lug cannot contact the building conduit system.

F. Portable microphone and wired headset cordage connectors shall be Switchcraft A3M, A3F, A6M, or A6F series as is appropriate to the circuitry required.

G. Portable auxiliary cordage shall be Switchcraft series connectors to match plate mounted connectors.

H. Multi-pin connectors shall be Winchester, Amp, Cannon EP Series, or Whirlwind.

I. Control, low voltage connectors shall be Switchcraft D4, 5, 6, 7 M or F with mating A series connectors mounted on stainless steel plates in quantities noted.

J. Cordage, portable, shall be manufactured by Switchcraft, Conquest, Pro-Co, O.E.M.S, or others approved by samples submitted for approval.

K. Cable for permanent installation and inter-rack be manufactured by West Penn, Carol Columbia or Belden; stranded.

L. Jack fields/patch bays shall be manufactured by Switchcraft, Audio Accessories, Gentner, ADC, Whirlwind. Provide enough matching patch cords to complete all required input and output circuits.

M. Equipment cabinets shall be as manufactured by Atlas-Soundolier, Lowell, or Middle Atlantic in the series noted and complete with side panels, pedestals, spacers, trim, castors and all related accessories and blank panels to cover voids in the face of the rack, as noted.

N. All equipment racks shall receive a permanent, engraved label stating its usage and position in the system. Contractor labels or advertising type labels, service information labels shall not be placed on the face, sides, or rear of equipment cabinets. All labels of this type shall be placed on the inside of these cabinets only, facility identification labels shall be placed on every rack, or centrally located on a group of racks exterior.

O. All input, output, headset, speaker jack, monitor speaker jack, or auxiliary jack plate shall receive a permanent, engraved label giving its description and circuit number.

P. All electrical outlets associated with the sound system shall receive a permanent, engraved label, showing circuit number. If this outlet is exposed in common areas, the label should also say sound equipment only .

Q. Engravements shall be rowmark material, engraved in block gothic letters, sized to fit each piece of equipment. All labels to be black in color, or that color of the rack specified by the architect, engraved letters shall be white.

R. Battery back-up unit shall be APC, sized to provide 15 minutes of back-up power.

S. Transformers shall be microphone and line input, output, splitting matching, autoforming, and special purpose as supplied by the O.E.M., Jensen, Pro-Co., or Whirlwind, others by approval.

T. Line to voice coil shall be as supplied by Soundolier, Quam, Lowell or O.E.M.S.

U. Autoformer type volume controls shall be Soundolier, Mortronics, Lowell or as supplied by the O.E.M.S.

V. Precision controls shall be Shallco Attenuators, and Networks.

W. Terminal blocks shall be Cinch 140 and 150 series, Gentner Flexiblock, and Easyterm FB series, ADC Ultra-Patch, and Audio Accessories Krone Blocks.

X. Switches and indicators shall be Switchcraft PL series, Eaton/Cutler Hammer 200 and 250 series, Micro-Switch aml22 and 12 series, Dialight 21, 81, 95, and 101 series.

Y. Cable labels shall be Brady, Ideal, Electrovert, T&B, or equal.

Z. Shrink tubing shall be used to insulate drain wires and provide serving of cables at terminal blocks, and for connector reinforcement.

AA. Ty-raps shall be used to secure all cable bundles inside and outside equipment cabinets, terminal cabinets, and chases. Anchor with screw type bases.

BB. Power conditioner/UPS, free standing shall be APC, unless otherwise noted.

CC. Power conditioner/line voltage regulators, rack mounted shall be Furman Sound, Inc., AR and PL series, unless otherwise noted.

DD. Copper buss bar shall be Soundolier or Middle Atlantic.

EE. Custom rack mount kits, drawers, panels shall be Middle Atlantic Audio products.

FF. Power on-off sequencers shall be Atlas/Soundolier SACR-191 w/sSACS-1f or SACS-5F or Lyntec sequencing power distribution panels.

GG. Front/panel mounted equipment rack work lights shall be Furman, or Little-Lite.

HH. Work lights for interior of racks shall be Soundolier.

2.3 ELECTRONIC EQUIPMENT

A. Equipment racks shall be provided as noted on the project drawings, no substitutes shall be allowed for any equipment rack products. The equipment racks shall be manufactured by Middle Atlantic and shall be fitted with all shown vent panels and blank panels as noted on the drawings. For neatness of wiring harnesses, Middle Atlantic management and lacing products shall be used to organize all interior wire and cable necessary to make internal equipment

connections. Amplifier rack, if floor mounted, shall also be provided with a WRK-Z4 floor anchor kit. All interior electrical outlets shall also be manufactured by Middle Atlantic. All wire and cable shall be run in order to provide as much separation from different levels as possible.

B. Output protection / brute force filter network; all the Crest amplifiers connected to Atlas horns / drivers shall have a protection / brute force crossover filter attached to each output channel, and shall consist of a 1 watt 5% load resistor, a 250 volt non-polarized capacitor, and a screw type terminal block of sufficient size to accept speaker wire connection, and an Atlas AF-140 autotransformer. The contractor shall calculate to value of the resistor to present a 1 watt load to the transformer at 70.7 volts, and the capacitor value to knee at 300 hz, high pass. The transformers, resistors, and capacitor shall mount inside the rack, on rear rack rails, on Middle Atlantic access panels model no. AP-6 and spaced to coincide with the grouping of amplifiers. (the cheer amplifier and the restroom amplifier do not require the capacitor or auto transformer.)

C. Wire and cable: the sound contractor shall install all required wire and cable for this sound system. See the wire schedule on the project drawings. The drain wire of the speaker cable attaches to ground only, inside the equipment rack, and floats at the speaker end.

D. Automatic mixer shall feature phantom power on inputs, nominal gain reduction, automatic gate-on when input channel level exceeds average background. Acceptable: Altec 1678C / 1674C, Ivie 2502, or approved equal.

E. Mic/line mixer shall feature 8 microphone or line inputs each with a direct output, input 8 can be set to duck other inputs for voice over applications, line level outputs, tone controls ±8dB at 100hz and 10khz, two (2) tunable notch filters, output limiting with adjustable threshold, remote master level control VCA, LED indicators for signal present, peak, limiting and power on. Acceptable: Biamp Auto One, or approved equal.

F. Limiter, crossover, signal processor, shall feature a two (2) band crossover, L/R filters at 24dB/octave, adjustable crossover frequency, dual compressor/limiter, one in each output band following the crossover. Acceptable: Rane DC-24, or approved equal.

G. Monitor/Page 70 volt mixer-amplifier shall feature mic/line level inputs and provide a minimum of sixty (60) watts at seventy (70) volt output. Acceptable: Altec 1707 with 1781 modules, TOA A906 with B-01S modules, or approved equal.

H. Dual channel power amplifier for all areas shall feature 200 watts / channel at 8 ohms, 650 watts total into 8 ohms bridged, convection cooling (no fans). Acceptable: Biamp CPA 650, or approved equal.

I. Hearing assistance transmitter / receiver system: The assistive listening system shall be manufactured by Listen. The stationary transmitter shall be Listen LT-800-216, in a frequency band which has been surveyed to produce they least intrusive activity. The transmitter, with rack kit, shall have a 80dB signal to noise ratio, be provided with a remote located 216ghz ground plane antenna, and power supply. The transmitter shall have an on-off switch, multiple audio inputs, dual vu meter, mix level controls, equalization, adjustable power setting, lcd display, up/down channel selection, earphone jack, audio output jack, phono and xlr jacks, and be capable of transmitting up to 6,000 ft. The receivers shall be listen, LR-400 display receiver, in a channel to match the transmitter, powered by standard AA batteries, and an LA-164 ear speaker for each receiver. Provide receivers, headsets, batteries and charger for 4% of the seating. Each system shall occupy a different frequency.

J. Compact disc player (CD) shall feature professional CD player with cueing, skip forward and reverse, fast audible forward and reverse, mount in Ruslang overbridge. Acceptable: Studer A725, Tascam CD-301, or approved equal.

K. Cassette player with AM-FM tuner for cafeteria shall feature stereo cassette player with auto-reverse, AM-FM tuner, with rack mount. Acceptable Bogen CPT-1A or approved equal.

2.4 MICROPHONES, CABLES AND MISCELLANEOUS EQUIPMENT

A. Cardioid microphones shall feature dynamic microphone with cardioid directional pattern, 15' cable with XLR-3 connectors and hardware for stand mounting. Acceptable: Audio-Technica ATM-41a, EV DS-35, Shure 57, or approved equal. Provide six (6) units.

B. Paging microphone shall feature hand held microphone with push to talk switch, in which switch shorts microphone when off, dynamic element, balanced, low impedance. Acceptable: Shure 577 or

approved equal. Provide three (3).

C. Front/panel mounted equipment rack work lights shall be Furman, or Little-Lite.

D. Work lights for interior of racks shall be Soundolier.

E. Audio patchbays shall be prewired by manufacturer from jack panels to punch blocks. The punch blocks shall be capable of receiving at least four (4) cables per clip. The patch bays shall have 24 jacks per row, of two rows. All patch jacks shall be Not normalled unless shown on drawings to be different in requirement. Provide sufficient cords to complete every circuit plus 20 percent, all 36" length.

F. Speaker patch panel shall feature modular mounting of jacks as shown on the drawings with labels. Acceptable: Connectronics XB 16KV Frame with ADP/BK blank panels. Provide ten (10) patch cords matching connectors used.

G. Installed wire and cable: For loud speaker lines in conduit: 70V: #14 THHN, for low Z #10 THHN. For use in plenums, convey through conduit or use plenum rated cable in the same gauge as for conduit, meeting NEC 725, for mic/line use Belden 8761, or equal, Production Communications/; Trio #20 Belden 8772, for dc control lines use #20 for low current and #18 for high current. Cables are all Belden or as specifically noted.

H. Portable cables: Wireworks C10, C25 and C50 in the following quantities: 10' - 5 mic, 25' - 3 mic, 50' - 2 mic.

I. Receptacles as required. Use isolated ground receptacles for electrical outlets.

J. Line isolation and bridging transformers: 10K/10K or 15K/15K, use Altec 15335 or Sescom MI-98 or approved equal.

K. Line volume controls: Atlas Soundolier or Mortronics or approved equal.

2.5 SEISMIC REQUIREMENTS

A. All electrical and electronic equipment and associated components shall be braced or anchored to resist a horizontal force acting in any direction using the following criteria;

1. Fixed equipment on grade: 20% of operating weight. Fixed equipment on structure: 30% of operating weight. Emergency equipment on grade: 40% of operating weight. Emergency equipment on structure: 60% of the operating weight.

2. For flexibly mounted equipment, use 4 x the above values. Simultaneous vertical force shall be 1/3 x the horizontal force.

3. Where anchorage details are not shown on the drawings, the field installation shall be subject to the approval of the structural engineer, the architect, and the field representative of the office of the state architect.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

A. The following installation requirements shall govern the design, fabrication, and the installation of the system(s) specified herein. In all cases of any discrepancy between these overall system standards and the individual equipment item specifications, the latter shall govern.

B. The equipment specified shall be installed according to the standards of good human engineering practices and the conditions specified herein, and those requirements of the department of the state architect, all local codes, state codes, and all requirements of all regulatory agencies.

C. Workmanship on the installed systems shall be of professional quality, best commercial practices, and accomplished by persons experienced in the techniques and standards of the industry involved.

D. The specification with the contract drawings indicate the general design.

E. It is the intention of the specifications that the contractor will supply from his knowledge and background experiences for the necessary supporting details. In general, the drawings show dimensions. Any work called for on the drawings and not mentioned in this specification, or vice verse, shall be performed as though fully set forth on both.

F. In cases in differences, the decision of the engineer shall govern. Work not specifically detailed, marked, or specified, shall be construed to be the same as similar parts or areas that are detailed, marked, or specified.

G. Obtain all permits necessary for the execution of all work pertaining to the requirements of installation of this project.

H. Execute all work in accordance with the C.E.C., N.E.C., C.B.C., C.F.C, N.A.B., A.E.S., A.D.A., and all other state and local codes, ordinances, regulations and standards of the electronics industry. If a conflict exists between the contract documents and the codes and regulations, notify the engineer immediately in writing so that a clarification may be prepared.

3.2 CONDUIT SYSTEM

A. The contract drawings indicate the number, wire and location of the sound system receptacles, wire, and cable requirements, and the audio control and equipment room layouts, which are the responsibility of the sound contractor.

B. The conduit system shown on the contract drawings shall be provided and installed by the electrical contractor. However, the sound contractor shall verify that the conduits are adequate for the wiring and the functions specified. The contractor shall immediately notify the engineer in writing if differences are found prior to installation. If the contractor is remiss in this coordination, and discrepancies or deficiencies are discovered, the contractor shall at his expense install all required conduit as required for the proper function of the system.

C. Cable and wire for the same level or circuitry shall be in a single conduit. Therefore, low level, medium level, high level, D.C. control, A.C. power, shall not be intermixed, or combined into common conduits, but be provided with their own separate conduits.

D. Upon completion of installation of the conduit by the electrical contractor, this contractor shall notify the architect and the engineer in writing that all conduit paths, sizes, and requirements have been met, and that the engineer may inspect.

E. Underground conduit shall be a minimum of 24 below grade.

3.3 RACK LAYOUT AND ASSEMBLY

A. The equipment rack or racks shall be installed as indicated on the contract drawings.

B. The plan shall allow for an absolute minimum of 30 inches of clear space between the installed rack and walls or other equipment. All racks not provided with wheels shall be permanently bolted to the floor. Racks installed against walls or corners, shall be provided with wheels and shall be provided with approved removable seismic anchorage to allow for service, unless otherwise noted.

C. Wall mounting equipment cabinets shall be affixed to a 3/4" plywood backboard that has 2 1/2 times the surface area of the equipment cabinet.

D. The backboards shall be provided and installed by the general contractor. The backboard will be attached to the wall first. Fastening devices shall capture the backboard to the wall framing members. The fastening devices will be on 8 centers vertically, and all framing members. It is the responsibility of the sound system contractor to coordinate with all trades; the electrical contractor, the general contractor, and all other contractors directly responsible for work associated with the sound systems.

E. Traveling of cable within the equipment racks should maintain as much physical separation as possible between different levels to prevent interference and noise conditions.

F. Terminal strips shall be used at all points of entry and exit from all equipment racks, terminal cabinets, and audio control points. Maintain in all cases, sufficient service loops in cable.

3.4 SYSTEM GROUNDING

A. Definitions:

1. Electrical equipment ground. The electrical system equipment ground provided by the electrical contractor compliant with C.E.C. Article 250 for grounding all equipment casings, enclosures and racks per specifications section 16xxx.

2. Sound system signal ground. The audio system signal ground reference, isolated from the electrical system equipment ground.

B. Connect all equipment chassis to sound system signal ground by a single green #14 TW stranded wire unless each device is internally connected to ground via the AC receptacle.

1. Shields of shielded cables shall be grounded exclusively to the sound system signal ground at one end only, the low potential end of the run, unless otherwise noted.

2. There shall be no sound system signal ground current paths, unless otherwise

noted.

3. Sound system signal and electrical system grounds shall be isolated except at the local distribution panel or transformer ground.

4. Sound system ignal ground provisions shall realize less than 0.15 ohms to the primary ground connection.

5. All cnduit of the sound system shall be grounded exclusively to the building ground, then insulated at the entry to the equipment racks.

6. Do not buss speaker commons together and do not ground.

7. Isolate all conduits from sound system signal ground. Use insulated mounts for all panel connectors, conduit landings and rack support hardware.

3.5 SOUND SYSTEM SETTING CHARTS

A. Example. Provide one chart for every active and passive device which makes up the operational components of the system(s). See elsewhere for details and a sample form.

B. Provide a separate equalization graph of the unequalized house and each foldback/monitor area, using the test microphone and a house microphone. Do the same for the equalized house and all monitored areas. Provide detailed drawings on the orientation of each reproducer in all systems excluding portable monitor speakers. Show detailed coverage of all main re-producers, noting all down points for all main listening areas. A sample equalization record form is provided at the back of this specification.

C. All jack bays shall be labeled, logically, by level and each jack position shall receive a number. This documentation shall be shown on the as-built drawings. Every part, piece, and component that is attached into the face of all equipment racks shall receive a permanent, engraved label describing function, and unit number. ie: high amp. 1.

3.6 WIRING NOTES

A. The nationally recognized wiring color codes shall be observed at all times with cable numbering labels visible.

B. Three pin XLR connectors shall be wired with pin 1, circuit ground, pin 2 hot/high, and pin 3 as low/neutral. Pin 1 shall not be connected to the case ground lug/conduit ground.

C. T.R.S. Connectors shall be wired with tip to be high/left, ring to be wired low/right, and sleeve wired circuit ground.

D. All phone and phono (RCA) plugs/jacks shall be wired with tip hot.

E. All audio connectors shall be wired and mounted in such a manner as to prevent the circuit ground lug of the connector from coming into contact with conduit or conduit ground.

F. Circuits entering terminal blocks, shall enter from the left side. The lowest circuit number shall appear at the top and descend in numerical order. Shield, low, high shall be the conductor appearance. Circuits leaving terminal blocks, shall leave from the right side in the same order of the entry side. In all cases, the cable shall be straight layed, without dips or twists, with cable I.D.S. visible, and provided with ample service loops where required.

G. Standard conductor cable shall not be used with Seimen type terminal blocks unless specifically designated by and approved by the manufacturer.

H. All multi-pair, or multi-cable bundles entering or leaving a terminal can in open air shall be supported by woven wire cable supports if the fall distance is greater than five times the bundle or cable diameter.

I. All sound related terminal cans and equipment cabinets shall be provided with an appropriately sized backboard upon which all terminal blocks will mount. The backboard shall be a minimum of one-half inch thick, edges beveled, sanded, sealed, and painted flat black.

J. Cables of different signal levels/voltage potentials shall be provide metallic dividers to separate these different levels or potentials. Low levels to the left, and higher levels moving to the right.

K. Building metallic conduit or ground shall not come into contact with the system(s) equipment cabinets. Schedule 40 PVC shall be used to enter the equipment cabinets.

L. Cables carrying different signal levels/voltage potentials shall not be connected to the same/common terminal block.

M. Wire color or wire types shall not be changed in mid-

circuit, but be continuous from circuit beginning to end.

N. All circuits shall be brought out to terminal blocks for ease of servicing and identification.

O. All cables landing on termination blocks, jacks, and other terminus devices shall be served with shrink tubing. Shielded cables shall have drain wire of the shield served with shrink tubing and laid under the serving of the main cable to form a unitary package.

P. All cabling shall attach directly to its intended connector without the use of pigtails .

3.7 OPERATION AND MAINTENANCE MANUALS

A. Three sets of operation and maintenance manuals, in binders shall be delivered to the project engineer upon completion of installation containing the project as-built record drawings. Each manual shall contain data sheets and operating instructions for each piece of equipment, with all test data noted in detail.

B. All screw, nut and bolt connections shall be sealed with Loctite or Vibrarite. All connection points shall be supplied with area, flat, and locking washers as required per connection point. No connection shall bear upon itself without washers. All shackle and turn buckle connections shall be sealed and safety tied. No open throat hooks shall be used. All quick links shall be sealed and safety tied.

C. All cable shall be secured with stops and compression fittings applied with a nicopress, or secured properly with cable / rope clips of the cast variety. A minimum of three clips shall be used per end. All loops shall be fitted with thimbles. Compression fittings shall be verified for proper fit via an oval and stop sleeve gage.

D. In applications where speaker systems are shown to mount in an enclosure fabricated into the structure of the building, insulation material shall be used to help avoid unnecessary reflections inside the cavity or enclosure.

3.8 OVERALL SYSTEM PERFORMANCE

A. High quality laboratory instruments are essential for the verification and calibration of the overall sound system. Typical examples are listed; pulse generator/polarity detector: Sounder Electronics. Audio frequency oscillator: Loftech TS-1. pink noise source: Terrasonde Trinity Deluxe or greater, electronic volt meter: B&K 290. wide range oscilloscope: Tektronix 2236. sound level meter, third octave real time analyzer, audio analyzer, RT-60 meter: Terrasonde Trinity Deluxe or greater. or, system/acoustic analyzer: Crown Tef. electrical tester: Megohmeter.

B. Specific tests shall include, but not be limited to those listed below in order to verify that the system meets all design requirements.

C. All tests shall be fully recorded and a neat copy presented for review and included in the system manual.

D. The contractor shall pre-assemble and test as much of the system as possible in his own facility before delivery to the project.

E. Performance tests on individual components. Frequency response and performance of the system shall not be diminished below the performance of the most limiting component.

F. Perform in the contractors facility and verify that the manufacturers specifications are met. Measure the impedance and verify acoustical output and freedom from rattles and distortion for all loud speakers.

G. Verify the achievement of the specifications for each amplifier and other electronic component.

H. Performance test of the completed system.

I. Verify that all wiring is correctly and completely installed, verifying that there are no short circuits between conductors within any cable, and verify the integrity of each conductor of each cable. In addition the correct polarity of each connector shall be verified and the color code recorded and included in the project documentation.

J. Verify that the entire system performance is in accordance with the design requirements. Specific attention is directed to the following for each system; power amplifiers, transformers, mixers, preamplifiers, crossover networks, equalizers, effects electronics, and transducers.

K. Documentation of tests, measurements, and adjustments performed.

1. List of all personnel and certified test equipment used.

2. Impedance of all speaker lines.

3. Output impedance of all active sources connected to passive devices and the value of build-out, build-in, load and terminating resistors used.

4. The input impedance of all active devices used to terminate passive devices and the value of termination resistors used.

5. The variation of acoustic distribution throughout the seating area above and below a reference level at each 1/3 octave center frequency from 125 to 8000 hz. (This does not indicate that system response is other than full band width as determined by the most limiting component).

6. The recorded polarity and phase measurements of all main loud speakers.

7. The list of microphones polarity tested.

8. The recorded inspection results observed for hum, noise, parasitic oscillation, and if interference from the output of each power amplifier.

9. The unequalized house curve made with the measuring microphone.

10. The equalized house curve made with the measuring microphone.

11. The unequalized house curve made with the sound system microphone.

12. The equalized house curve made with the system microphone.

13. The proximity frequencies and attenuations.

14. All filter settings.

15. The factors; D_c, $\%AL_{cons}$, RASTI, STIPA, D_1, D_s, D_2, D_o, NAG, PAG, and EPR for the sound system and the space (if the system is provided other than as-specified).

16. Electrical measurement of the ground.

L. These tests, and any other that the contractor may wish to perform, shall have been performed and successfully achieved before inspection by the engineer is requested.

M. The engineer may request demonstration and repetition of certain of these tests or other critical tests if problems become apparent. If the specifications are found not to have been met, further inspection will be at the contractors expense.

N. Substantial completion, inspection:

1. Prior to the substantial completion inspection the contractor shall file a written notice with the architect, the general contractor, the electrical contactor, and the engineer stating that all tests and aids to use have been completed.

2. That all O&M manuals and other documents required have been submitted for approval. At this point, the project is ready for the substantial completion inspection.

3. After the substantial completion inspection has been completed, the engineer shall notify the architect in writing whether the system met the criteria set forth in the general conditions for substantial completion, along with a list of items for the contractor to correct, if required.

4. In the event that the systems are found not to be substantially complete, all of the engineers costs, including consulting fees, travel, and living expenses in connection with subsequent inspections or corrective work will be bornr solely by the installing contractor. This includes all new problems that arise during the course of the subsequent inspections.

5. The owner s right to use the equipment shall commence, without prejudice, once the system becomes operational, whether or not the system has been inspected and accepted.

O. The owner s use of the system does not eliminate any responsibility of the contractor to complete all work as specified within this specification.

P. Acceptance Inspection:

1. After the engineer has certified substantial completion of the systems, and the contractor has filed written notice with the general contractor that all the corrections have been completed, an acceptance inspection will be scheduled.

2. The engineer shall perform an acceptance inspection of the system and may request a

demonstration of any or all of the tests described above.

3. In the event that the corrections have not been completed to the satisfaction of the engineer or new problems arise at the time of the acceptance inspection, all of the engineers costs including consulting fees, travel and living expenses in connection with subsequent inspections for corrective work will be borne solely by the contractor.

Q. Acceptance:

1. After the inspections and tests have indicated that the entire sound system and auxiliary systems as specified herein and indicated on the contract drawings, are in total compliance with the same, the engineer shall submit to the architect a letter indicating said compliance.

2. Acceptance of the system shall be accomplished as described in the general conditions, or by the direction of the engineer.

3.9 WIRE PULLING TENSION

A. The table below lists the absolute maximum recommended pulling tensions for conductor sizes. For multiple conductor cables, multiply the appropriate value by the total number of conductors, these pulling tensions must be equally distributed among and along all of the conductors of a multi-conductor cable.

B. An anti-friction agent is required for all pulling operations. Select an anti-friction agent which is suitable for the cable jacket material of the specified cable and wire.

C. AllAll All conduitsAll conduits All conduits shallAll conduits shall All conduits shall beAll conduits shall be All conduits shall be priorprior prior toprior to prior to beginningprior to beginning prior to beginning wireprior to beginning wire prior to beginning w

D. Tensions:

24 AWG	4 lbs.
22 AWG	7 lbs.
20 AWG	12 lbs.
18 AWG	19 lbs.
16 AWG	30 lbs.
14 AWG	48 lbs.
12 AWG	77 lbs.

3.10 SOUND SYSTEM EQUIPMENT SETTING

CHARTS

A. Provide one chart for each type of device in the system, even if not specifically shown in the sample chart attached.

3.11 SOUND SYSTEM EQUALIZATION GRAPHS

A. Provide system equalization information for each sound system installed.

B. Contractor shall utilize the sample graph attached for each system.

END OF SECTION 11130

SOUND SYSTEM EQUIPMENT SETTING CHARTS

Amplifier

MAKE _____ MODEL _____ SYSTEM NO. _____
ELECTRICAL CIRCUIT NO. _____
POWERED AUDIO WATTS _____ MONO _____ STEREO _____
INPUT SETTING: CHANNEL A _____ CHANNEL B _____
OUTPUT: 4 8 16 25 70.7 VOLT CHANNEL A _____ CHANNEL B _____
IMPEDANCE: CHANNEL A _____ CHANNEL B _____ INPUT _____
RACK NO. _____ JOB NAME _____ JOB NO. _____

Equalizer

MAKE _____ MODEL _____ SYSTEM NO. _____
ELECTRICAL CIRCUIT NO. _____
INPUT SETTING _____ OUTPUT SETTING _____
INPUT IMPEDANCE _____ OUTPUT IMPEDANCE _____ RESOLUTION _____ NOTCH DEPTH _____
LOW FREQUENCY CUT _____ HIGH FREQUENCY CUT _____ SKIRT WIDTH _____
BUILD-OUT RESISTOR VALUES _____, _____
TERMINATING RESISTOR VALUES _____, _____
MANUALLY SET _____ DIGITAL/PROGRAMMER SET _____
CUSTOMER PROVIDED WITH PROGRAMMER? _____ CAN IBM PC BE USED? _____
RACK NO. _____ JOB NAME _____ JOB NO. _____

Electronic Cross-Over

MAKE _____ MODEL _____ SYSTEM NO. _____
ELECTRICAL CIRCUIT NO. _____
CROSS-OVER FREQUENCY _____, _____, _____, _____, POLARITY _____
WAYS 2 3 4
OUTPUT SETTINGS _____, _____, _____, _____
OUTPUT SETTINGS _____, _____, _____, _____
INPUT IMPEDANCE _____ OUTPUT IMPEDANCE _____
BUILD-OUT RESISTOR VALUES _____, _____
TERMINATING RESISTOR VALUES _____, _____
MONO _____ STEREO _____CHANNEL A SETTING _____ CHANNEL B SETTING _____
RACK NO. _____ JOB NAME _____ JOB NO. _____

Compressor/Limiter

MAKE _____ MODEL _____ SYSTEM NO. _____
ELECTRICAL CIRCUIT NO. _____
INPUT IMPEDANCE _____ OUTPUT IMPEDANCE _____ MONO _____ STEREO _____
CHANNEL A INPUT SETTING _____ CHANNEL B INPUT SETTING _____
CHANNEL A OUTPUT SETTING _____ CHANNEL B OUTPUT SETTING _____
EXPANDER-NOISE GATE PRESENT? _____ CHANNEL A SETTING _____ CHANNEL B SETTING _____
COMPRESSOR THRESHOLD SETTING: CHANNEL A SETTING _____ CHANNEL B SETTING _____
ATTACK TIME SETTING: CHANNEL A SETTING _____ CHANNEL B SETTING _____
RELEASE TIME SETTING: : CHANNEL A SETTING _____ CHANNEL B SETTING _____
COMPRESSION RATIO: CHANNEL A SETTING _____ CHANNEL B SETTING _____
BUILD-OUT RESISTOR VALUES _____, _____
TERMINATING RESISTOR VALUES _____, _____
RACK NO. _____ JOB NAME _____ JOB NO. _____

Automatic Mixer

MAKE _____ MODEL _____ SYSTEM NO. _____
ELECTRICAL CIRCUIT NO. _____
NUMBER OF MICROPHONE INPUTS _____ NUMBER OF LINE INPUTS _____
NUMBER OF OTHER INPUTS _____
INPUT IMPEDANCES _____
SOURCE IMPEDANCES _____
OUTPUT IMPEDANCE OF EACH CHANNEL _____
MAIN CHANNEL OUT IMPEDANCE _____ AUXILIARY CHANNEL OUTPUT IMPEDANCE _____
SETTING OF EACH INPUT _____
THRESHOLD OF EACH SETTING _____
INPUTS SET TO AUTO? _____ MANUAL? _____ SUB-MIXES? _____
BUILD-OUT RESISTOR VALUES _____, _____
TERMINATING RESISTOR VALUES _____, _____
RACK NO. _____ JOB NAME _____ JOB NO. _____

Note: provide information similar to the Automatic Mixer section for all manual mixers and consoles. Describe whether mono or stereo. If stereo, is the mixer used in stereo/dual channel configuration. Provide information on all inputs and outputs used.

SOUND SYSTEM EQUALIZATION GRAPH

Job Name: _____ Job Number: _____

Date: _____ System Number: _____

House Curve Information: Equalized?/Unequalized? System microphone?/test microphone?

Source: _____

Input level: _____

Frequency	Setting	Frequency
20	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	20
25	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	25
31.5	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	31.5
40	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	40
50	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	50
63	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	63
80	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	80
100	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	100
125	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	125
160	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	160
200	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	200
250	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	250
315	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	315
400	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	400
500	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	500
630	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	630
800	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	800
1k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	1k
1.25k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	1.25k
1.6k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	1.6k
2k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	2k
2.5k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	2.5k
3.15k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	3.15k
4k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	4k
5k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	5k
6.3k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	6.3k
8k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	8k
10k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	10k
16k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	16k
20k	-15 -14 -13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	20k

SECTION 11480 - RECREATIONAL EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Recreational Equipment, as Indicated on the Drawings, Specified Herein; Including All Related Accessories and Attachments.

1. Interior Manually Operated, Front Braced, Forward Fold, Overhead Supported Basketball Backstops; Complete With Tempered Safety Glass Backboards, Steel Goals, and Braided White Cotton Nets.

2. Interior Wall Mounted Stationary Basketball Backstops, as Indicated on the Drawings, Specified Herein; Including All Related Accessories and Attachments.

3. Exterior Stationary Basketball Backboards, Steel Pipe Post, Bracing, Net; Including All Related Accessories and Attachments.

4. Baseball Home Plate and Set of Three Bases.

1.2 RELATED SECTIONS

A. Section 02740 – Asphalt Concrete Paving: Concrete for sleeves at basketball poles.

B. Section 03300 - Cast-in-Place Concrete: Floor substrate for basketball.

C. Section 05310 - Steel Decking: Decking above Gymnasium.

D. Section 06100 - Rough Carpentry: Wood blocking and furring.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Product Data: Submit manufacturer’s equipment characteristics and specifications, operational features, maintenance information, color and finish.

C. Shop Drawings: Indicate plan location and vertical elevations; control stations, construction and anchorage details.

D. Submit manufacturer's installation instructions.

E. If additional structural members are required for support of the new equipment, the manufacturer shall provide structural calculations from a Professional Engineer registered in the State of California.

1.4 QUALITY ASSURANCE

A. Recreational equipment supplier shall provide complete design, materials and installation for all additional structural components necessary for the proper installation of the gymnasium equipment to the existing building structure and for the exterior equipment.

B. Recreational equipment specified and installed shall conform to the latest rules and regulations of the National Federation of State High School Association (NFSHSA).

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect to site products under provisions of Division One.

B. Pack individually in a manner to protect equipment and their finishes.

C. Protect adjacent or adjoining finished surfaces and work from damage during installation of Work of this Section.

1.6 FIELD MEASUREMENTS

A. Verify actual locations of recreational equipment and other construction to which recreational equipment must fit by accurate field measurements before installation. Coordinate installation schedule with construction progress to avoid delay of Work.

1.7 WARRANTY

A. Provide manufacturer’s standard written warranty under provisions of Division One.

B. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be repaired or replaced at no expense to the Owner.

1. Basketball Backstops - Manufacturer’s warranties for each individual item specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - RECREATIONAL EQUIPMENT

A. Subject to compliance with requirements, provide products from the following manufacturer

1. Jaypro.

B. Substitutions: Under provisions of Division One.

2.2 PADDING

1. Wall Padding: Provide treated 1 x 3 wood furring (06100) for wall surfaces indicated on the Drawings to provide mounting surface for backstops. Locate furring per shop drawings.

2.3 BASKETBALL EQUIPMENT

A. **Interior Manually Operated Wall Mounted Fold-Up Basketball Backstops** – Jaypro Model 1400 or approved equal.

1. Backstop and Framing: Wall mounted, wall-braced fold-up style with bank face extended from supporting wall. Pipe extension frames to be fabricated from 1.9" O.D. high strength galvanized pipe. Wall ends of frame hinge terminate in heavy steel plates for attachment to wall. Attachment of backstop to bank of hinge by special fabricated bracket.

2. Bracing: Brace horizontally using 1.90" O.D. perpendicular bars terminating in clamped fittings for maximum rigidity. Intersection of tension bars to be joined by hardened bolt.

3. Support: Safety chains of 1/4" aircraft cable #7000 to be independently attached to wall for support and stability of unit in playing position. Verify with manufacturer whether special fittings are required for chain attachment to walls.

4. Regulation Rectangular Backboard: Provide each backstop with rectangular backboard, 1/2 inch thick (72" x 42") tempered plate glass cushioned in unitized steel tubing frame with glare free aluminum perimeter. Standard white borders and target area fired permanently into the glass. Provide limited lifetime warranty against breakage.

   a. Backboard bolt-on safety padding installed according to manufacturer's specifications -. Provide pads with eight (8) year warranty.

5. Steel Goal - Provide at each backboard a high strength super goal fabricated from 5/8 inch diameter high strength cold drawn alloy steel. . Rim to be break-away type. Goal assembly capable of supporting up to an 800 lb. load on outer edge of the rim and under extreme dynamic loading shall flex downward up to 2-3/4 inches without permanent set or deformation. Finish goal in durable official orange powder coat finish. Provide a high quality braided white cotton net and plated mounting hardware.

   a. Rim shall attach directly to center strut of backstop. **Any goal relying on the backboard alone for support is not Acceptable**.

6. Manual Winch: Jaypro Model "TW-500M" or approved equal. Provide for use in folding up backstops when not in use.

7. Finish: Black powder coat entire unit.

B. **Interior Wall Mounted Stationary Backstops** – Jaypro Model 1300T or approved equal.

1. Backstop and Framing: Wall mounted and braced with bank face extends from 12" to 24" from supporting wall. Double "t" style extension frames fabricated from 1.90 O.D. high strength steel pipe. Wall ends of frame terminate in heavy steel plates for attachment to wall. Hardware to be included.

2. Support: Unit formed and welded by certified welders meeting requirements of AWS D1.1-Sheet Metal Welding Code and AWQ D1.1 Structural Steel Welding Code. Verify with manufacturer if special fittings are required for attachment to wall.

3. Bracing: None required due to rigid welded structure of frame.

4. Mounting: Wall pads of southern yellow pine with edges chamfered and finished with 2 coats of clear lacquer.

5. Finish: All metal parts to be painted with one coat of black semi-glass rust-inhibitive enamel.

6. Regulation Rectangular Backboard: Provide each backstop with rectangular backboard, 1/2 inch thick (72" x 42") tempered plate glass (fiberglass at crosscourt/white with orange markings) cushioned in unitized steel tubing frame with glare free aluminum perimeter. Standard white borders and target area fired permanently into the glass. Provide limited lifetime warranty against breakage.

   a. Backboard bolt-on safety padding installed according to manufacturer's specifications -. Provide pads with eight (8) year warranty.

7. Steel Goal - Provide at each backboard a high strength super goal fabricated from 5/8 inch diameter high strength cold drawn alloy steel. Rigidly brace rim by means of a 5/8 inch diameter cold drawn alloy steel round formed and welded in position. Goal assembly capable of supporting up to an 800 lb. load on outer edge of the rim and under extreme dynamic loading shall flex downward up to 2-3/4 inches without permanent set or deformation. Finish goal in durable official orange powder coat finish.

   a. Rim shall attach directly to center strut of backstop. **Any goal relying on the backboard alone for support is not Acceptable**.

8. Net: Provide a high quality braided white cotton net and plated mounting hardware.

C. **Exterior Basketball Equipment:**

1. Support Frame and Post: Single post with fixed offset, 4-1/2" O.D. schedule 40 steel pipe with single bent to 6' minimum extension. Single post support for back-to-back basketball goals. All exposed metal to be galvanized.

2. Bracing: Diagonal braces of 1-1/4" O.D. galvanized pipe for shock absorption.

3. Regulation Backboards: Rectangular 72" wide x 48" high reinforced A36, 1/4" mill flat steel plate, 12 gauge sheet with 1-1/2" flange return. Concealed bolting mechanism on backside of panels. Treat with phosphate prime coat and finish with two coats white enamel, eggshell.

4. Goal Rings: Double ring 5/8" steel rod welded to 1/2" steel rod approximately spaced to accommodate "S" hook supports for steel chain netting; double braced supports of 3/16" x 1-1/2" steel bars and 3/16" mounting plate. Finish to be baked enamel.

5. Nets: Chain-type, zinc-plated with "S" hooks.

2.4 BASEBALL EQUIPMENT

A. Jaypro Set of Three Throw Down Bases and Home Plate: Heavy duty molded rubber, waffle bottom. Jaypro part numbers BB-350 and HP-300 or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Beginning of installation means acceptance of existing substrate.

3.2 INSTALLATION

A. Install all gymnasium equipment in accordance with the manufacturer's instructions.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.3 ADJUSTING AND CLEANING

A. Adjust moving or operating parts to function smoothly and correctly.

B. Clean all items, including fittings and hardware.

END OF SECTION 11480

SECTION 12325 - PLASTIC LAMINATE CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conditions of the Contract (General, Supplementary and Other Conditions), the General Requirements (Sections of Division One) and the Drawings Apply to the Work of this Section.

B. Plastic Laminate Casework; as Indicated on the Drawings, Specified Herein; Including All Related Hardware, Overlay Doors and 3.0 mm PVC Edge Bands, Accessories and Attachments.

1. Plastic Laminate Countertops, Back-Splashes and End-Splashes.
2. Plastic Laminate Open Shelving.
3. Preparation for Installing Utilities.

1.2 RELATED WORK

A. Section 06100 - Rough Carpentry: Treated grounds and concealed wood blocking within partitions, and concealed strap backing for wall cabinets.

B. Section 09650 - Resilient Flooring: Base materials applied to toe base.

C. Section 08710 - Door Hardware: Cylinders for locks master keyed.

D. Division 15 - Mechanical: Sinks, faucets, fittings, traps, stops, tail pieces, vacuum breakers, trim, and other fixtures, runs and connections.

E. Division 16 - Electrical: Setting and installation of equipment and fixtures, and related utility connections.

1.3 SUBMITTALS

A. Submit under provisions of Division One.

B. Shop Drawings: Indicate component materials and dimensions, profiles and elevations, assembly methods, sink location cut-outs, joint details, fastening methods, finishes and hardware.

1. Submit sample warranty as outlined below.

C. Product Data: Submit manufacturer's data on product characteristics, cataloged accessories, and hardware items.

D. Samples: Submit samples of cabinet and countertop finishes; illustrating colors and texture.

1. Submit mock-up base cabinet as outlined below.

E. Installer Certification: Casework manufacturer must submit to the Architect, prior to the start of any work, a letter certifying that the proposed installer is qualified and approved to install their work.

F. Testing: Submit performance test data required and outlined below.

1.4 MOCK-UP

A. Successful bidder shall provide mock-up of full size base cabinet, complete with countertop and hardware under provisions of Division One.

B. Unit will be examined to ascertain quality and conformity to specified standards.

C. Mock-up unit may remain as part of the Work.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Provide casework, hardware and accessories manufactured by a single company.

B. Manufacturer's Qualifications: Company specializing in the manufacture of the products specified in this Section with a minimum of five (5) years documented experience.

C. Installer's Qualifications: Company specializing in the installation of the products specified in this Section with a minimum of five (5) years documented experience, and certified in writing by the manufacturer that the Installer is approved to install the manufacturer's products.

D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" Section 400 and 01600 except where higher standards are indicated.

E. Alternative materials and cabinet construction methods may be used only with prior Architect approval and with an extended warranty as indicated below. Alternative materials and cabinet construction methods shall meet or exceed specified performance requirements and shall other wise conform to specification requirements.

1.6 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Casework manufacturers shall submit certified product test data in accordance with ANSI A161.1-80, NEMA LD3-95, and general static load testing performed and certified by an independent testing agency, covering the following areas of product performance, with the following minimum results:

1. Base cabinet construction/racking test: 800 lb.
2. Cabinet front joint loading test: 425 lb.
3. Wall cabinet static load test: 1850 lb.
4. Drawer front joint loading test: 600 lb.
5. Drawer construction/static load test: 800 lb.
6. Cabinet adjustable shelf support device/static load test: 300 lb.
7. Particleboard screw holding power: 300 lb.

1.7 PRE-INSTALLATION CONFERENCE

A. Convene a pre-installation conference a minimum of one (1) week prior to commencing Work of this Section.

B. Require attendance of all trades that might require coordination with the cabinet installation, including mechanical and electrical.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, handle and protect products to the site under provisions of Division One.

B. Do not deliver shop fabricated casework until site conditions are adequate to receive the Work. Protect items from weather while in transit.

C. Store finished casework items indoors, in ventilated areas with a constant minimum temperature of 60 degrees F, and relative humidity between 25 to 55 percent.

D. Keep materials undercover and dry. Protect against exposure to weather and contact with damp or wet surfaces.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Division One.

B. Provide manufacturer's written instructions and recommendations regarding the complete maintenance of all casework finished surfaces and hardware.

C. Casework manufacturer shall provide a technically qualified representative to thoroughly instruct the Owner's personnel in correct procedures of operating and maintaining all equipment and materials installed under this Section.

1.10 FIELD MEASUREMENTS

A. Verify actual locations of casework and other construction to which casework must fit by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

1.11 COORDINATION

A. Coordinate the Work with mechanical and electrical rough-in work, and all related trades.

1.12 WARRANTY

A. Provide five (5) year manufacturer's written warranty under provisions of Division One.

B. Provide a ten (10) year manufacturer's written warranty under provisions of Division One for products using Architect approved alternative construction materials and methods.

C. Warranty: All materials and workmanship provided are guaranteed against defects after completion and final acceptance of the Work. Defects due to faulty materials or workmanship developed during the guarantee period shall be satisfactorily repaired or replaced at no expense to the Owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - PLASTIC LAMINATE CASEWORK

A. Subject to compliance with requirements, provide products from one of the following manufacturer's:

1. CALMAR Casework Company.
2. Case Systems, Inc.
3. Gray Wolf Companies, Inc.
4. LSI Corporation of America.
5. TMI Systems Design Corp.

B. Substitutions: Under provisions of Division One.

2.2 MATERIALS

A. Laminated Plastics/Finishes:

1. High Pressure Plastic Laminate: Minimum 0.028 inch thickness, in conformance with NEMA LD3-2000, VGS standards, for exterior cabinet surfaces.
2. Countertop High Pressure Plastic Laminate: Minimum 0.050 inch thickness, in conformance with NEMA LD3-2000, HGS and HGP standards, for countertops as indicated on the Drawings.
3. Plastic Laminate Balancing Sheet: High pressure cabinet liner, 0.020 inch thickness, in conformance with NEMA LD3-2000, CLS standards. Use for balancing exterior surface laminates.
4. Thermally Pressure Fused Laminate: Melamine resin impregnated, 110 gram PSM minimum, surface laminated to core under pressure, in conformance with NEMA LD3 -2000, VGS standards and NEMA LD3-2000, CLS standards. Concealed and interior surfaces except as otherwise indicated.
5. Non-surfaced coreboard not allowed.
6. Exterior Finish Color Selection: Colors selected by Architect from manufacturer's standard color range.
   a. Interior and Concealed Surface Color Selection: White.
7. Adhesive: Manufacturer's standard, water resistant adhesive, free of urea Formaldehyde and other health or environmentally hazardous ingredients. Methods requiring heat are not allowed; "contact" methods of laminating are not allowed.

B. High Performance Particle Board Core:

1. Minimum, 47 lb. density, balanced 3-ply construction with moisture content not to exceed 8%, conforming to ANSI A208.1-1999, Type M-3.
2. Particleboard cabinet components conforming to the following minimum core thickness prior to lamination:
   a. 1/2 inch: Concealed cabinet backs, drawer bottoms.
   b. 3/4 inch: Base and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, door/drawer, cabinet back rear hang-rails, exposed cabinet backs, dividers as detailed, and shelving as indicated below.
   c. One (1) inch: Wall cabinet tops and bottoms, shelving as indicated below.

C. Fiberboard Drawer Body Core:

1. Uniform, medium density conforming to ANSI A208.2, and shall meet the following minimum standards:

Screw holding, face:	325 lb.
Modulus of rupture:	4,000 PSI
Modulus of elasticity:	400,000 PSI
Internal bond:	120 PSI

2. Fiberboard components conforming to the following minimum for thickness prior to lamination:
   a. 1/2 inch: Drawer sides, sub-front and back. Drawer under-bottom stiffeners.
   b. 5/8 inch: Drawer sub-front.
   c. 3/4 inch: Framed glass doors.

D. Edging: 3 mm thick PVC, solid, high impact, purified, color-through, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives, automatically trimmed, inside/outside length-radius for uniform appearance, buffed and corner-radius.

E. Edging Locations:

1. Door/Drawer-Front Edge:
   a. 3.0 mm PVC edging; color as selected by Architect from manufacturer's standard colors.
2. Cabinet Body Edge, Including Door/Drawer Front Spacer Rail:
   a. Flat Edge PVC; color matched to door/drawer face.
3. Interior Body Component Edging, Interior Dividers, Drawer Body and Shelf:
   a. Flat Edge PVC; to match cabinet interior surface color.

2.3 HARDWARE

A. Hinges:

1. Heavy duty, five knuckle 2-3/4 inch (69.9 mm) institutional type hinge meeting ANSI/BHMA A156.9, Grade 1 requirements. Mill ground, hospital tip, tight pin feature with all edges eased. Full wrap around type hinge of tempered steel 0.095 inch thick. Each hinge shall have minimum nine (9) screws, #7, 5/8 inch FHMS to assure positive door attachment.

2. Provide one (1) pair per door to 48 inch height. One and one-half (1-1/2) pair over 48 inches in height. Hinges to accommodate 13/16 inch thick laminated door and allow 270 degree swing.

3. Finish: US-26D Satin Chrome.

B. Pulls: Wire pull design, four (4) inch projecting type. Finish to be Brushed Chrome.

C. Sliding Door Hardware:

1. Frame-less, 1/4 inch Glass, Sliding Doors: Double track rolling door assembly. LSI LH-370, or approved equal by the Architect.

2. Framed, 13/16 inch Thick Stile and Rail Sliding Doors: Top mounted track with dual roller hangers. Vertical adjustment for accurate alignment. LSI LH-372, or approved equal by the Architect.

D. Drawer Slides:

1. Standard Drawers: Self-closing design, epoxy powder coated slides to match drawer body color, with positive in-stop, out-stop and out-keeper to maintain drawer in 80% open position and complying with BHMA A156.9 Type B05091. Captive nylon rollers, front and rear. Minimum 100 lb. dynamic load rating at 50,000 cycles. Minimum 150 lb. static load rating. Provide adjuster cam to regulate body side sway.

2. File Drawers: Full extension, 3-part progressive opening slide, minimum 100 lb. dynamic load rating, zinc plated or epoxy coated at manufacturer's option.

3. Provide body mounted molded rails for hanging file system for legal or letter size as indicated on the Drawings. Cutting or machining of drawer body/face not allowed.

4. Paper Storage Drawers: Full extension, 3-part progressive opening slide, minimum 100 lb., zinc plated or epoxy coated at manufacturer's option.

E. Catches: Magnetic type in molded housing for base and wall cabinets. Provide two (2) 5 lb. catches at each tall cabinet door. Catch housing to be molded in putty color to match cabinet interior. ADA compliant opening resistance.

1. Roller catch for all mobile cabinets.

F. Adjustable Shelf Supports: Twin pin design with anti tip-up shelf restraints for both 3/4 inch and one (1) inch shelves. Design to include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip. Load rating: Minimum, 300 lb. for each support without failure. Flush cabinet interior sides without shelf system permanent projection.

G. Open Shelving, Adjustable Shelf Supports: Heavy-duty adjustable metal wall standards and brackets designed for both 3/4 inch and one (1) inch shelves. Design to include slots for ability to mechanically attach shelf to clip. Load rating: Minimum 300 lb. each support without failure.

H. Locks: Disc tumbler type, key alike and master keyed, dull chrome finish. Lock all new doors and drawers.

1. Hinged doors and drawers; National Lock No. M4-7054, or approved equal by the Architect.

2. Sliding doors, 13/16 inch thick; National Lock No. M4-0057, or approved equal by the Architect.

3. Sliding panel doors, 1/4 inch thick; National Lock No. C8741.26, or approved equal by the Architect.

I. Wardrobe Rod: Metal, 1-1/16 inch diameter with support flanges. Provide intermediate rod support if over 30 inches wide.

J. Coat Hooks: Single prong, wall mount, satin aluminum finish.

2.4 CONSTRUCTION REQUIREMENTS

A. Cabinet parts: Accurately machined and bored for premium grade quality joinery construction.

B. Sub-Base:

1. Cabinet Sub-base: Separate and continuous, exterior grade plywood with concealed fastening to cabinet bottom, ladder-type construction, leveled and floor mounted prior to cabinet body placement. Material to be exterior grade plywood. **No cabinet sides-to-floor allowed.**

C. Cabinet Top and Bottom:

1. Furnish solid sub-top for all base and tall cabinets.

2. Wall Cabinet and Library Stack Bottoms and Tops: One (1) inch thick.

3. Assembly devices to be concealed on bottom side of wall cabinets.

D. Cabinet Ends:

1. Holes drilled for adjustable shelves 1-1/4 inch on center.

E. Fixed and Adjustable Shelves:

1. Shelves in Door Cabinets: 3/4 inch thick for shelves up to twenty-seven (27) inches wide. One (1) inch thick shelving for shelves over twenty seven (27) inches.

2. Open Cabinets, Book Stack Shelves: One (1) inch thick.

3. Provide VGS high pressure decorative laminate on both sides of all shelving.

F. Cabinet Backs:

1. Fully dadoed into sides, top, and bottom, recessed 7/8 inch from cabinet rear, and back-shimmed. Provide 3/4 inch (19.1 mm) thick stiffeners glued and fastened to back/body. Fully seal back perimeter and stiffeners with hot melt adhesive.

a. Cabinet backs directly screwed to the edges of cabinet sides with screws spaced a maximum 4" o.c., may be accepted with a manufacturer's extended warranty, written certification the cabinets will meet specified performance requirements and Architect's prior approval.

2. Hang Rails: Glued to rear of cabinet back and mechanically fastened to cabinet sides. Provide minimum of two (2) at base, two (2) at wall, and three (3) at tall cabinets.

3. Exposed exterior backs to be high pressure plastic laminate balanced with high pressure cabinet liner.

G. Door and Drawer Fronts:

1. Laminated Door and Drawer Fronts: 13/16 inch thick for all hinged and sliding doors. Drawer fronts and hinged doors are to overlay the cabinet body. Maintain a maximum 1/8 inch reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.

2. Stile and Rail Doors: 13/16 inch thick with full 1/4 inch tempered plate glass. Available hinged or sliding. All exposed lite-opening edges to be trimmed and glazed with extruded vinyl glazing bead.

3. Frameless sliding glass doors to be 1/4 inch thick plate glass with ground and polished edges. Fitted with anodized aluminum shoes and nylon rollers.

H. Drawers:

1. Drawer Fronts: Applied to separate drawer body component sub-front.

2. Drawer Body: Multiple doweled joints and glued, squared and held under pressure to set.

3. Drawer Bottom: Bottom recessed, dadoed all four sides and underside of drawer sealed with hot melt adhesive.

a. Bottoms directly screwed to the bottom edges of the drawer box with screws spaced a minimum 4" o.c., may be accepted only with the use of drawer slides mounted to the drawer bottom, with a manufacturer's extended warranty, certification the cabinets will meet specified performance requirements and Architect's prior approval.

b. Reinforce drawer bottoms with 1/2 inch x 4 inch front-to-back intermediate under-body stiffeners, hot melt glued and fastened. One (1) at twenty four (24) inches, two (2) at thirty six (36) inches, and four (4) at forty eight (48) inches.

4. Paper storage drawers fitted with full width hood at back.

5. Drawer Slides: As specified above.

I. Cabinet Interior Spaces: Clear span interiors, no vertical dividers allowed, unless by specified architectural design.

1. Wall cabinets: Minimum clear inside depth of twelve (12) inches, unless detailed otherwise.

J. Vertical and Horizontal Dividers:

1. Natural hardboard, 1/4 inch thick, smooth both faces. Secure in cabinet with molded plastic clips.

2. Pressure fused laminate, 3/4 inch thickness. Secured in cabinet with molded plastic clips or dowels.

K. Door/Drawer Front Rail:

1. Provide minimum 3/4 inch x 6 inch x full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, close off reveal, and to locate for lock strikes.

L. Americans With Disabilities Act (ADA) Requirements: Comply with ADA requirements where specifically indicated on the Drawings.

1. Countertop Height: With or without cabinet below, not to exceed a height of thirty four (34) inches above finished floor (A.F.F.), at a surface depth of twenty four (24) inches.

2. Knee-Space Clearance: Minimum twenty seven (27) inches above finished floor (A.F.F.), and thirty (30) inches clear span width.

3. Twelve (12) inch Deep Shelving, Adjustable or Fixed: Not to exceed a range from nine (9) inches above finished floor (A.F.F.) to fifty four (54) inches above finished floor (A.F.F.).

4. Wardrobe Cabinets: To be furnished with rod/shelf adjustable to forty-eight (48) inches above finished floor (A.F.F.) at a maximum twenty one (21) inch shelf depth.

5. Sink Cabinet Clearances: In addition to above, upper knee-space frontal depth to be no less than eight (8) inches, and lower toe frontal depth to be no less than eleven (11) inches, at a point nine (9) inches above finished floor (A.F.F.), and as further described in Volume 56, Section 4.19.

M. Countertops: Furnish countertops with edge treatment and design profile as indicated on the Drawings. Countertops with sinks to have no-drip bullnose edge. Provide tops in as long as practical continuous lengths. Provide field glued splines at joints. No joints closer than twenty four (24) inches either side of sink cut-out. Radius corners at countertops.

N. Workmanship:

1. All cases shall be square, plumb and true.

2. Provide removable back panels and closure panels for plumbing access where indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that treated wood blocking is in place, and properly installed, including in metal stud partitions where cabinets are installed.

C. Verify adequacy of backing and support framing.

D. Beginning of installation means acceptance of existing conditions.

3.2 CASEWORK INSTALLATION

A. Install plastic laminate casework and accessories in accordance with manufacturer's recommendations and written instructions.

B. Cut toe base to length and assemble toe base frame.

C. Set cabinets on toe base frame and bolt continuous cabinets together with joints flush, tight and uniform, and with alignment of adjacent units within 1/16 inch (2 mm) tolerance.

D. Secure wall cabinets to solid supporting material, not to plaster, lath or gypsum board.

E. Set and secure casework in place rigid, plumb, and level.

F. Use fixture attachments in concealed locations for wall mounted components.

G. Use concealed joint fasteners to align and secure adjoining cabinet units and countertops.

H. Carefully scribe casework which abuts other building materials, leaving gaps of 1/32 inch maximum. Do not use additional overlay trim for this purpose.

I. Countersink anchorage devices at exposed locations. Conceal with solid plugs to match surrounding surface; finish flush with surrounding surfaces.

J. Resilient vinyl base: furnished and installed under Section 09650 over toe base.

K. Field drill two (2) inch diameter holes in computer countertops to receive cords. Provide one (1) hole and plug for each computer as directed by the Architect.

3.3 ADJUSTING AND CLEANING

A. Adjust moving or operating parts to function smoothly and correctly.

B. Clean casework, countertops, shelves, hardware, fittings and fixtures.

C. Repair or remove and replace defective work, as directed by the Architect upon completion of the installation.

3.4 PROTECTION

A. Provide all necessary protective measures to prevent exposure of casework and equipment to other construction activity.

END OF SECTION 12325

SECTION 15100 – GENERAL MECHANICAL REQUIREMENTS

1.1 GENERAL

A. The general provisions of the contract including General and Supplementary Conditions apply to the work specified in this Section. The provisions of this section shall apply to all sections of Division 15 of these specifications.

1.2 CODES AND STANDARDS

A. All work and materials shall conform with current rules and regulations of applicable codes. Nothing in these Drawings or Specifications is to be construed to permit work not conforming to these codes. Should the Drawings or Specifications call for material or methods of construction of a higher quality or standard than required by these codes, the Drawings and Specifications shall govern.

B. Applicable codes and standards shall include but are not necessarily limited to:

1. California Code Of Regulations:

a) Title 8, Industrial Relations

b) Title 17, Public Health

c) Title 19, Public Safety

d) Title 21, Public Works

e) Title 24, Energy Regulations

2. California Building Code.

3. California Mechanical Code

4. California Plumbing Code

5. Local Codes and Ordinances

6. American Gas Association (AGA)

7. Air Moving and Conditioning Association (AMCA)

8. American National Standards Institute (ANSI)

9. Air Conditioning and Refrigeration Institute (ARI)

10. American Society of Heating, Refrigerating, and Air Conditioning Engineers

11. American Society of Mechanical Engineers (ASME)

12. American Society for Testing and Materials (ASTM)

13. American Water Works Association (AWWA)

14. Cast Iron Soil Pipe Institute (CISPI)

15. National Electrical Code (NEC)

16. National Electrical Manufacturers Association (NEMA)

17. National Fire Protection Association (NFPA)

18. National Sanitation Foundation (NSF)

19. Occupational Safety and Health Act (OSHA)

20. Plumbing and Drainage Institute (PDI)

21. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

22. Underwriters' Laboratory (UL)

23. Requirements of local, state, and federal enforcing authorities codes and amendments to preceding codes shall be applicable to work performed under this specification.

24. Americans with Disabilities Act. Accessibility Guidelines for Buildings and Facilities. (ADAAG).

25. Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems as published by the sheet metal Industry fund of Los Angeles, California.

1.3 PERMITS AND FEES

A. The Contractor shall take out all permits and arrange for all tests in connection with his work as required. All charges are to be included in the work. Permits for equipment connected to a particular system are to be considered as part of the work included under each system. All charges or fees for service connections, meters, etc. shall be included in the work.

1.4 COORDINATION OF WORK

A. Before starting any work, thoroughly examine all existing and newly completed underlying and adjoining work and conditions upon which the installation of this work is in any way dependent for the workmanship required by the Contract Documents. Report to the Architect and Engineer in writing any and all conditions which might adversely affect this work and limit ability to perform the required workmanship.

B. Layout of materials, equipment and systems is generally diagrammatic unless specifically dimensioned. Some work may be shown offset for clarity. The actual locations of all materials, piping, ductwork, fixtures, equipment, supports, etc. shall be carefully planned prior to installation of any work in order to avoid all interference with each other, or with structural, electrical, architectural or other elements. Verify the proper voltage and phase of all equipment with the electrical plans. If discrepancies are discovered between drawing and specification requirements, the more stringent requirement shall apply. All conflicts shall be called to the attention of the Architect and the Engineer prior to the installation of any work or the ordering of any equipment. No work shall be prefabricated or installed prior to this coordination. No costs will be allowed to the Contractor for any prefabrication or installation performed prior to this coordination.

C. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Carefully investigate the mechanical, electrical, structural, architectural drawings and field conditions that could affect the work to be performed and arrange such work accordingly. Provide the required piping and ductwork offsets, fittings, and accessories to meet such conditions.

D. Spaces provided in the design of the building shall be utilized and the work shall be kept within walls or furring lines established on the drawings. Any discrepancy between Architectural or Mechanical drawings with respect to wall or furring locations and dimensions shall be brought to the Architect's attention for resolution before proceeding with installation.

E. Any work which is done as an addition, expansion, or remodel of and existing system shall be compatible with that system.

1.5 MANUFACTURER'S RECOMMENDATIONS

A. All material, equipment, devices, etc., shall be installed in accordance with the recommendations of the manufacturer of the particular item. The Contractor shall be responsible for all installations contrary to the manufacturer's recommendations. The Contractor shall make all necessary changes and revisions to achieve such compliance. Manufacturer's installation instructions shall be delivered to and maintained at the job site through the construction of the project.

1.6 GUARANTEE

A. Guarantee shall be in accordance with the General Conditions. These Specifications may extend the period of the guarantee for certain items. Where such extensions are called for, or where items are normally provided with guarantee periods in excess of that called for in the General Conditions, the certificate of guarantee shall be furnished to the Owner through the Engineer.

1.7 QUIETNESS

A. Piping, ductwork and equipment shall be arranged and supported so that vibration is a minimum and is not transmitted to the structure.

1.8 DAMAGES BY LEAKS

A. The Contractor shall be responsible for damages caused by leaks in the temporary or permanent piping systems prior to completion of work and during the period of the guarantee, and for damages caused by disconnected pipes or fittings, and the overflow of equipment prior to completion of the work.

1.9 EXAMINATION OF SITE

A. The Contractor shall examine the site, compare it with Plans and Specifications, and shall have satisfied himself as to the conditions under which the work is to be performed. No allowance shall subsequently be made in his behalf for any extra expense to which he may be put due to failure or neglect on his part to make such an examination.

1.10 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new unless otherwise noted. Materials and equipment of a given type shall be by the same manufacturer. Materials and equipment shall be free of dents, scratches, marks, shipping tags and all defacing features at time of project acceptance. Materials and equipment shall be covered or otherwise protected during construction as required to maintain the material and equipment in new factory condition until project acceptance.

1.11 SUBMITTALS

A. Refer to general conditions of the specifications.

1.12 OPENINGS, CUTTING AND PATCHING

A. The locations and dimensions for openings through walls, floors, ceilings, foundations, footings, etc. required to accomplish the work under this Specification Division shall be provided under this Division. Except as noted below, the actual openings and the required cutting and patching shall be provided by other Divisions. Coring through existing concrete or masonry walls, floors, ceilings, foundations, footings, etc., and saw cutting of concrete floors or asphaltic concrete required to accomplish the work under this Specification Division shall be provided under this Division. Patching of these surfaces shall be provided by other Divisions. Cutting or coring shall not impair the strength of the structure. Any damage resulting from this work shall be repaired at the Contractor's expense to the satisfaction of the Architect.

1.13 SCHEDULING OF WORK

A. All work shall be scheduled subject to the review of the Architect, Engineer and the Owner. No work shall interfere with the operation of the existing facilities on or adjacent to the site. The Contractor shall have at all times, as conditions permit, a sufficient force of workmen and quantity of materials to install the work contracted for as rapidly as possible consistent with good work, and shall cause no delay to other Contractors engaged upon this project or to the Owner.

1.14 DEMOLITION

A. Existing equipment, ducts, piping, valves, fittings, devices, etc., requiring removal shall be removed and delivered to the Owner at a location on the job site to be determined by the Owner. Those items determined by the Owner to be of no value shall become the property of the Contractor and shall be removed from the job site by the Contractor at the Contractor's expense.

B. Existing piping, ducts, and services, etc., requiring capping or plugging shall be capped or plugged below floors, behind walls, above ceilings or above roof unless otherwise noted.

1.15 EXCAVATION AND BACKFILLING

A. General: Barrel of pipe shall have uniform support on sand bed. Sand shall be free from clay or organic material, suitable for the purpose intended and shall be of such size that 90 percent to 100 percent will pass a No. 4 sieve and not more than 5 percent will pass a No. 200 sieve. Unless otherwise noted, minimum earth cover above top of pipe or tubing outside building walls shall be 24", not including base and paving in paved areas.

B. Excavation: Width of trenches at top of pipe shall be minimum of 16", plus the outside diameter of the pipe (22” minimum for Acid Waste piping). Provide all shoring required by site conditions. Where over excavation occurs, provide compacted sand backfill to pipe bottom. Where groundwater is encountered, remove to keep excavation dry, using well points and pumps as required.

C. Backfill:

1. 6" Below, Around, and to 12" Above Pipe: Material shall be sand. Place carefully around and on top of pipe, taking care not to disturb piping, consolidate with vibrator.

2. One Foot Above Pipe to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.

D. Compaction: Compact to density of 95% within building and under walkways, driveways, traffic areas, paved areas, etc. and to 90% elsewhere. Demonstrate proper compaction by testing at top, bottom and one-half of the trench depth. Perform these tests at three locations per 100' of trench.

1.16 CONTINUITY OF SERVICES

A. All existing services and systems shall be maintained except for short intervals when connections are to be made. The contractor shall be responsible for any interruptions of services and shall repair damage done to any existing service caused by the work.

B. If utilities not indicated on the drawings are uncovered during excavation, the Contractor shall notify the architect immediately for further instructions.

1.17 ELECTRICAL CONNECTIONS

A. Provide under Specification Division 15000 all required control conduit, wiring, controls and control panels as indicated on the drawings or as may be required for system operation.

B. No control device shall be mounted with rigid connections on vibration isolated mechanical equipment. No field furnished control device shall be mounted on any piece of equipment so that it interferes with physical access of air or water flow, or covers any portions of nameplates or access doors.

C. Starters.

1. Magnetic motor starters for all equipment shall be furnished under this Specification for installation under Specification Division 16000, except those shown to be in a motor control center on the Electrical Drawings and those located in factory assembled units.

2. Starters shall be of the appropriate horsepower and voltage, equipped with the proper NEMA enclosures for indoor and NEMA 3R enclosures for outdoor, with thermal overloads, necessary auxiliary contacts, and ambient compensated overloads, one in each leg.

3. A circuit breaker shall be mounted in a common enclosure unless the starter is not mounted within sight of the motor, in which case the disconnecting means shall be a separate device provided under Specification Division 16000, Electrical. Mounted in the starter cover shall be "hand-off-automatic" and "reset" control devices. Magnetic switches shall be of pivoted armature design. Starters shall have auxiliary contacts as required by the control system.

D. Motors.

1. Shall be selected for quiet operation, voltage, and rpm to match the project electrical characteristics. Motors shall be open, drip-proof, normal torque and weatherproofed where indicated or required. Motors shall be of the premium efficiency type.

E. Electrical Coordination

1. Prior to commencing construction arrange a conference with the electrical and mechanical trades as well as equipment suppliers and verify types, sizes, locations, voltage requirements, controls and diagrams of all equipment furnished by them. In writing, inform the Architect that all phases of coordination of this equipment have been covered and if there are any unusual conditions or problems they shall be enumerated at this time.

1.18 FLASHING

A. Whenever any part of the Mechanical System(s) must penetrate the roof or outside wall, the openings shall be flashed and counter-flashed absolutely water tight with minimum 22 gauge galvanized sheet metal, prime coated. Flashing aprons shall extend not less than eight inches (8") from the duct, pipe, or supporting member in all directions unless detailed otherwise. All penetrations shall be flashed following the procedures of the National Roofing Contractor's Association.

1.19 PAINTING

A. Paint all black iron supports, hangers, anchors, etc., and all uninsulated black iron pipe work installed in weather exposed locations with one coat of rust resisting primer.

1.20 ACCESS DOORS AND PANELS

A. Provide access doors as required where equipment, piping, valves, ductwork, etc. are not otherwise accessible. Access doors shall match the wall or ceiling finish and fire rating as indicated on the Architectural drawings. 16-gage steel frame and 14-gage steel door with paintable finish, except in ceramic tile, where door shall be 16-gage stainless steel with satin finish. Continuous hinge. Key and cylinder lock. Deliver doors to the General Contractor for installation. Milcor. Unless otherwise noted, the minimum sizes shall be as follows:

1 valve up to 1-1/2"	12" x 12"
1 valve up to 3"	16" x 16"
Fire damper, VAV box, coil	20" x 24"

1.21 SYSTEM IDENTIFICATION

A. Above Grade Piping: Provide markers on piping which is either exposed or concealed in accessible spaces. For piping systems, other than drain and vent lines, indicate the fluid conveyed or its abbreviation, either by pre-printed markers or stenciled marking, and include arrows to show direction of flow. Pre-printed markers shall be the type that wrap completely around the pipe, requiring no other means of fastening such as tape, adhesive, etc. Comply with ANSI A13.1 for colors. Locate markers at ends of lines, near major branches and other interruptions including equipment in the line, where lines pass through floors, walls or ceilings or otherwise pass into inaccessible spaces, and at 50' maximum intervals along exposed portions of lines. Marking of short branches and repetitive branches for equipment connections is not required.

B. Below Grade Piping: Bury a continuous, pre-printed, bright-colored, metallic ribbon marker capable of being located with a metal detector with each underground pipe. Locate directly over buried pipe, 6" to 8" below finished grade.

C. Equipment: All equipment shall be identified with a plastic laminated, engraved nameplate which bears the unit mark number as indicated on the drawings (e.g. AC-4). Provide 1/2" high lettering - white on black background. Nameplates shall be permanently secured to the exterior of the unit.

D. Valves: Provide brass valve tags with brass hooks or chains on all valves of each piping system, excluding check valves, valves within equipment, faucets, stops and shut-off valves at fixtures and other repetitive terminal units. Prepare and submit a tagged-valve schedule, listing each valve by tag number, location and piping service. Deliver to Owner through Architect.

1.22 PROTECTIVE COATING FOR UNDERGROUND PIPING

A. All ferrous pipe below grade (except cast iron) shall have a factory applied protective coating of extruded high density polyethylene, 35 to 70 mils total thickness, X-Tru-Coat, Scotchkote. All fittings and areas of damaged coating shall be covered with two layer double wrap of 10 mil polyvinyl tape to total thickness of 40 mils. Johns-Manville. Protective coating shall be extended 6" above surrounding grade.

1.23 CONCRETE ANCHORS

A. Steel bolt with expansion anchor requiring a drilled hole - powder driven anchors are not acceptable. Minimum concrete embedment shall be 4-1/2 diameters. Minimum spacing shall be 12 diameters center to center and 6 diameters center to edge of concrete. Maximum allowable stresses for tension and shear shall be 80% of the ICC test report values. Hilti, Wej-it.

1.24 EQUIPMENT ANCHORING

A. All equipment shall be securely anchored in accordance with CBC Section 1614A.1.13. All equipment mounted on concrete shall be secured with a concrete anchor as specified above at each mounting point.

1.25 SUPPORTS AND SEISMIC RESTRAINTS

A. All mechanical systems (equipment, ductwork, piping, etc.) shall be provided with supports and seismic restraints in accordance with Seismic Hazard Level 'A' of the "Seismic Restraint Manual: Guidelines for Mechanical Systems, Appendix B", third addition, dated 2008, as published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), Chantilly, Virginia, and in accordance with CBC Section 1614A.1.13.

1.26 CLEANING

A. Progressively and at completion of the job, the Contractor shall thoroughly clean all of his work, removing all debris, stain and marks resulting from his work. This includes but is not limited to building surfaces, piping, equipment and ductwork, inside and out. Surfaces shall be free of dirt, grease, labels, tags, tape, rust, and all foreign material.

1.27 DEFINITIONS

A. Provide. The term "provide" as used in these specifications or on the Drawing shall mean furnish and install.

B. Piping. The term "piping" as used in these Specifications or on the Drawings shall mean all pipe, fittings, nipples, valves, unions, hangers, and thermal insulation, etc., as may be required for a complete and functional system.

C. Ductwork. The terms "duct" or "ductwork" as used in these Specifications or on the drawings shall mean all ducts, fittings, joints, dampers, hangers, and thermal insulation, etc., and other devices as may be required to make a complete and functional system.

D. Wiring. The term "wiring" shall include the provision of all necessary products which are required for a complete installation and shall include products such as conduit, electrical boxes, connections, transformers, relays and switches.

1.28 PROJECT CLOSE-OUT

A. Record Drawings

1. Coordinate with section 01700 Contract Closeout

2. The Contractor shall obtain one set of blue line prints for the project, upon which a record of all construction changes shall be made. As the work progresses, the Contractor shall maintain a record of all deviations in the work from that indicated on the drawings. Final location of all underground work shall be recorded by depth from finished grade and by offset distance from permanent surface structures, i.e. building, curbs, walks. In addition, the water, gas, sewer, underfloor duct, etc. within the building shall be recorded by offset distances from building walls. The original drawings will be made available to the Contractor from which he shall have a set of reproducible drawings made. The Contractor shall then transfer the changes, notations, etc. from the marked-up prints to the reproducible drawings. The record drawings (marked-up prints and reproducibles) shall be submitted to the Engineer for review.

B. Operation and Maintenance Manual for Mechanical Systems

1. Coordinate with section 01700 Contract Closeout

2. Printed: Three copies of Operation and Maintenance Instructions and Wiring Diagrams for all equipment and parts list for all faucets, trim, valves, etc. shall be submitted to the Engineer. All instructions shall be clearly identified by marking them with the same designation as the equipment item to which they apply (e.g. AC-3). All Wiring Diagrams shall agree with reviewed Shop Drawings and indicate the exact field installation. All instructions shall be submitted at the same time and shall be bound in a suitable binder with tabs dividing each type of equipment (e.g. Pumps, Fans, Motors, etc.). Each binder shall be labeled indicating "Operating and Maintenance Instructions, Project Title, Contractor, Date" and shall have a Table of Contents listing all items included.

3. Verbal: The Contractor shall verbally instruct the Owner's maintenance staff in the operation and maintenance of all equipment and systems. The controls contractor shall present that portion of the instructions that apply to the control system. The Engineer's office shall be notified 48 hours prior to this meeting.

4. Acknowledgment: The Contractor shall prepare a letter indicating that all operation and maintenance instructions (printed and verbal) have been given to the Owner, to the Owner's satisfaction. This letter shall be acknowledged (signed) by the Owner and submitted to the Engineer.

END OF SECTION 15100.

SECTION 15400 – PLUMBING

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

A. The preceding General Mechanical Provisions shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Sanitary sewer system.
2. Domestic water system.
3. Drain system (including condensate drains).
4. All equipment as shown or noted on the drawings or as specified.
5. Demolition as indicated on drawings. Where demolition is called for, remove all equipment, piping, braces, housekeeping pads, supports and related items no longer required.
6. Painting of exposed black steel gas piping with 2 coats of rust inhibiting primer.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Sanitary Sewer:

1. Soil, Waste and Vent Piping (Non-Pressurized):

a. Inside Building and Within 5 Feet of Building Wall:

b. Coated standard weight cast iron pipe and fittings, CISPI Standard 301 and ASTM A-888. Joints shall be ABI "No-Hub" stainless steel band, mechanically assembled (no welds), conforming to ASTM C564.

c. Outside Building:

d. Extra strength vitrified clay, ASTM C700, ASTM C425.b. Johns-Manville ring-tite, or equivalent, polyvinylchloride (PVC) gravity pipe, where permitted by local codes, complying with ASTM 03034-SDR 35 with joints using flexible elastomeric seals meeting requirements of ASTM D-3212.

2. Cleanouts. Style shall be Zurn as follows (equivalent models of Smith are acceptable):

a. For vinyl tile use #ZN-1400-6

b. For carpeted areas use #ZN-1400-14

c. For terrazzo areas use #ZN-1400-10

d. For ceramic tile or finished concrete use #ZN-1420-2

e. Grade cleanouts (Non-Traffic areas) use #ZN-1400-25

f. Grade cleanouts (Traffic areas) use #ZN-146-15W/Z-1450-8

g. For wall cleanouts use #ZN-1460-8

3. Cleanout Box. Precast reinforced concrete. Cast iron lid marked for service.

B. Acid Waste Piping Shall comply with Section 5202, Chapter 52, of the Uniform Building Code, latest edition.

C. Acid resistant drain and vent lines shall be of polypropylene as manufactured by Orion. Pipe and fittings shall be made from flame retardant material in accordance with ASTM test method D 635 and rated SE-O in accordance with U.L. method 94.

D. Connections between polypropylene pipe and fittings shall be made by means of the L/E Mechanical Joint; connections containing metal components are prohibited. Use mechanical joint piping above grade and fused connections below grade.

E. Storm Drain (Including Rain Water Leader, RWL):

1. Piping:

a. Above and Below Grade: Shall be coated service weight cast iron "No-Hub" pipe and fittings CS 188. Joints shall be ABI "No-Hub" stainless steel bands, mechanically assembled (no welds).

b. Cast iron "No-Hub" pipe riveted stainless steel bands and neoprene gaskets are acceptable throughout system.

2. Catch Basins: Standard precast reinforced concrete. Cast iron grate, traffic duty where required. Manufacturer's model numbers are indicated on drawings to complete description. Brooks, Christy, Code Precast.

F. Perforated Drain Pipe: PVC perforated drain pipe with bell ends, ASTM D1784. Solvent weld fittings. Four rows of 0.25" holes on 3.25" centers longitudinally. Rows located at 35 degrees and 80 degrees from either side of bottom center. 35 SDR for 4"; 41 SDR for 6" and 8". Carlon.

G. Condensate Drains. Type “L” hard drawn copper tubing with wrought copper solder joint fittings. All changes in direction of condensate drain shall be accomplished with plugged tees. Drains shall be extended as indicated on drawings or to nearest acceptable fixture or vent if not indicated.

H. Water:

1. Cold Water Piping:

a. Inside Building, Within Five Feet of Building Walls, and All Above Grade:

1) Type "L" hard drawn copper tubing with wrought copper solder joint fittings, NIBCO, ANACONDA, or acceptable equivalent. Joints shall be made with 95.5 solder, such as Silavoy Streamline 122, Silvabrite 100 or acceptable "lead free" equivalent. Pipe to be reamed to full bore, de-burred, and joint area cleaned with a

Trisodiumphosphate solution prior to joining.

b. Outside Building - Below Grade:

2) Polyvinylchloride (PVC) pressure rated Schedule 40, ASTM D 2241, with rubber rings, ASTM D 1869. Piping shall be equivalent to Johns-Manville "Ring-Tite" and shall be installed in strict compliance with Manufacturer's Installation Guide. Where sizes shown are smaller than those available with “Ring-Tite” pipe, use schedule 80 PVC glued pipe and fittings. Piping option only where local codes allow its use.

3) Type "K" hard drawn. All else per copper specification above.

2. Hot Water Piping:

a. Inside Building - Above Slab: Same as Cold Water Piping.

3. Valves and Specialties:

a. Valves:

1) General: Manufacturer's model numbers are listed to complete description. Equivalent models of Crane, Grinnell, Nibco, or Stockham are acceptable. Use ball valves for 2" and smaller domestic hot and cold water, and gate valves for 2-1/2" and larger size. All valves to be threaded.

2) Gate Valve. 2-1/2" and Larger. Iron body, bronze mounted, Non-rising stem, Wedge disc, 200 psi WOG, Flanged or AWWA hub end as applicable. Stockham G-612. Underground valves shall have square operating nut. Provide one operating "T" handle for underground valves.

3) Check Valves. 2" and Smaller. All bronze swing check, regrinding. 200 psi WOG. Stockham B-319. 2-1/2" and Larger. Swing check, iron body, brass mounted seats, Class 125. Stockham G-931.

4) Ball Valve. Bronze body, cap, stem, disk and ball. Threaded connection. Lever handleTFE seat. O-ring seals. 600 psi WOG. Consolidated Brass “Apollo”, Grinnell.

5) Plug Valves. Lubricated plug cock. Cast iron or semi-steel body and plug. 200 PSI WOG. Flanged. Wrench handle. U.L. listed for gas distribution. Resun R-1430 Walworth 1700 F. Ball valves with U.L. listing for gas distribution and equivalent or higher pressure rating may be substituted for 2" and smaller plug valves. Apollo, Watts.

b. Instruments:

1) Thermometers. 9" liquid filled type with adjustable angle base, aluminum case. 2-1/2" insertion length stem. 3/4" NPT connection. 20-240F, 2F divisions. Provide separable thermometer well. Trerice, Weksler. Provide Brass thermometer well suitable for thermometer above. Provide 2" extension at insulated pipes.

2) Thermometer Well: Brass well. Suitable for thermometer above. Provide 2" extension at insulated pipes.

3) Pressure Gage: Phosphor bronze tube. Bronze bushed. 1% accuracy. Cast aluminum case. 3-1/2" white dial. Adjustable pointer. Operating pressure at midscale. 1/4" NPT brass socket. Provide brass porous core pressure snubber and gage cock. Trerice, Weksler, Winters.

4) Pressure Gauge. Phosphor bronze tube. Bronze bushed, 1% accuracy. Cast aluminum case. 3-1/2" white dial. Adjustable pointer. Operating pressure at mid-scale. 1/4" NPT brass socket. Provide brass porous core pressure snubber and gauge cock. Trerice, Walker.

5) Gauge Cock. Lever handle brass cock. 1/4" NPT connections.

6) Instrument Well: Suitable for temperature sensing element. Coordinate with supplier of temperature controls.

c. Backflow Preventers .

1) General: Backflow preventers shall be provided on building domestic water service as may be required by the local utility and shall also be provided in all branch lines serving any new or existing boiler, cooling tower, evap. condenser or other device requiring chemical water treatment.

2) Reduced Pressure Type: Two spring loaded "Y" pattern check valves, differential relief valve mechanism, inlet and outlet shut-off valves, and four test clocks. Approved by AWWA. Febco, Beeco, or equivalent.

3) Domestic Water Heater Expansion Tank: Provide expansion tank on cold water supply to any water heater if backflow prevention is required at site water connection. “Amtrol” ST series sized per manufacturer’s recommendations.

d. Miscellaneous Specialties:

1) Hose Bibbs. Arrowhead Brass, Zurn or Chicago.

2) Temperature and Pressure Relief Valve. ASME rated fully automatic, reseating combination temperature and pressure relief valve sized in accordance with energy input. Sensing element immersed within upper 6" of tank. “Watts” series 40 or 140 sized per BTU input.

3) Union. 2" and smaller - AAR malleable iron, bronze to iron ground seat. 30 psi. Size 2-1/2" and larger- #150 flanged

4) Dielectric Coupling: Insulating union or flange rated for 250 psig. EPCO.

5) Floor, Ceiling, and Wall Plates. Beaton and Cadwell No. 10, steel flange with locking device and polished chromium plated finish. Provide plates on any finished surface through which pipe passes.

6) Insulating Fitting. Epco dielectric unions with Epconite insulating gasket selected for applicable duty. Provide wherever pipes of different metals are joined.

7) Shock Absorber: Multiple bellows. All stainless steel construction. Designed and applied in accordance with PDI WH201. Amtrol, Smith, Wade, Zurn.

8) Air Chambers. Zurn Z-1700 "Shoktrol" complete with shut-off valve on branch to air chamber and screwdriver stop stainless steel access panel. Provide where noted on drawings and upstream at every quick-closing manual, solenoid or flush valve. Install per manufacturers instructions locating chamber between the last two fixtures on a 20' or shorter header, or use (2) chambers (calculated for the total fixture unit count) for headers over 20' in length with locations in the middle and between the last two fixtures on the header.

9) Gas Pressure Reducing Valve. Capacity and pressure ratings as indicated on drawings. Reliance Series 1800.

10) Flexible Connection: Corrugated bronze core covered with high tensile bronze tubular braid. 150 psi working pressure. 2" and smaller shall have screwed connections. 2-1/2" and larger shall have flanged connections. Flexonics, Keflex.

11) Water Pressure Reducing Valve: Iron body. Brass internal parts. Built-in strainer and check valve. Field adjustable range of 8-25 psi. 125 psi maximum working pressure. Bell and Gossett No. 12.

12) Strainers. Threaded strainers are to be of the gasketed capped cover extra heavy iron body type - Similar to Mueller Fig. #11. Provide gate valve and pipe nipple with 3/4" hose connection on each strainer for blow-off.

13) Balancing Cock: Calibrated all bronze balancing/shutoff cock. Integral pointer to indicate degree of valve opening. Taps for differential pressure gage, with check valves or shutoffs. 125 psi working pressure. Internal seals. Preformed insulation block. Armstrong, Bell and Gossett, Flo-set, Taco.

I. Drain Piping (including Condensate): Same as inside building cold water piping.

J. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller; steel clevis hanger for piping 5" and larger. Load and jam nuts. Size and maximum load per manufacturer's recommendation. Felt liner for copper piping. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.

b. Isolating Shield: Galvanized steel shell and reinforcing ribs. 1/4" non-conducting hair felt pad. Pipe hanger in accordance with paragraph above. Increase hanger size per manufacturer's recommendation. B-Line, Semco, Superstrut.

c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut.

2. Flashings. Vent flashing shall contain no lead, 16" sq. flange, length sufficient to be turned down 2" into vent. Oatey. Flashing for other piping through roof shall be prefabricated galvanized steel roof-jacks with 16" sq. flange. Provide storm collar and seal water tight with mastic. Provide 75 lb. base flashing sheet roofing for roof sump flashing in lieu of 24"x24" 4 lb. lead flashing.

3. Piping Protective Wrap:

a. All galvanized or black steel piping buried below grade shall be factory coated with

Scotchkote 101 Epoxy Resin as manufactured by 3M Company, or "X-tru-Coat" as manufactured by Pipe Line Service Corp. Field joints shall be wrapped by Scotchrap #50 or coated with Scotchkote 302 as recommended by manufacturer. In lieu of above, pipe may be machine-wrapped with Scotchrap #51. 50% lapped with joints per above.

b. Provide a continuous test of all pipe covering, including field joints, prior to backfilling. This test shall be made using a “Holiday Detector” as manufactured by Tinker and Rascor Co., or approved equal. Test at an electrical voltage of 10,000 volts D.C.. Any wrap holiday found shall be patched and retested. This test shall be done in the presence of the owner’s inspector.

4. Pipe Markers

a. One inch (1") high minimum, stenciled letters, located every 6'-0". Markers shall indicate piping service such as domestic cold water supply, etc., and shall have directional flow arrow at each location of stenciled letters. Decals pasted, glued, or adhered to piping or insulation are not acceptable unless decal wraps entirely around pipe or insulation such as Seton "Set mark", or equivalent. Decals shall be applied after painting of all piping systems is complete and after preliminary acceptance of piping system. Decals shall comply with ANSI and OSHA specifications with respect to marker size, color, and legend

5. Sleeves

a. Non-Rated Assemblies: Sleeves for pipe passing through concrete floors or walls shall be Schedule 40 galvanized steel pipe of size sufficient to permit the pipes to pass through with a minimum clearance of 1/2” between sleeve and pipe. Sleeves shall have square ends cut flush with surface and shall be caulked tight whether pipe is bare or insulated. Sleeves through floors shall extend 1" above finished floor surface.

b. Rated Assemblies. Bare Pipe. Same as for non-rated assemblies except that sleeves shall provide a clearance of 1" between sleeve and pipe. Clearance shall be packed for its entire length with a UL system 161 three hour classification such as a 3M FireDam 160 caulk at ends and mineral wool batt material stuffer in middle of penetration. Insulated Pipe. Insulation for pipe in sleeve shall consist of a 360 degree water-proofed calcium silicate insert sized to extend a minimum of 1" beyond each end of sleeve. Calcium silicate insert shall be of the same thickness of adjoining insulation. Clearance shall be packed for its entire length with a UL system 161 three hour classification such as a 3M FireDam 160 caulk at ends and mineral wool batt stuffer in middle of penetration.

6. Yard Boxes and Covers. One piece precast concrete with cast iron cover labeled "Sewer", "Gas", "Water", etc., as required. Provide traffic weight cover in traffic areas. Provide 6" minimum length "Thinwall" series 2000, 6" diameter pipe extension to valves installed deeper than boxes. Install in workman like manner. Multiple boxes located on same centerline parallel to building exterior wall. Provide 6" concrete apron in non-paved areas.

2.2 PIPING INSULATION MATERIALS

A. All insulation jackets and lapseal adhesives shall be tested as a composite product in accordance with UBC Standard No. 42-1 and shall have a flame spread of not more than 25 and a smoke developed rating of not more than 50.

B. All domestic hot water piping, fittings and accessories shall be insulated. All circulating piping shall be insulated. Cold water piping in ventilated attic shall be insulated.

C. Interior Piping, Fittings and Valves Shall be insulated with 1" thick Fiberglass ASJ/SSL U.L. rated pipe insulation through 1-1/4" diameter pipe, 1-1/2" thick for 1-1/2" diameter pipe and above. Fittings shall be hard molded plastic flush. Do not insulate flanges or valves unless water temperature exceeds 140°F or the piping is exposed to weather.

D. PVC Jacket (for pipe, fittings and valves): Pre-molded polyvinyl chloride (PVC) jackets, 0.020" thickness. Size to match application. Provide solvent weld adhesive and PVC vapor barrier pressure sealing tape by same manufacturer. Zeston.

E. Piping Exposed to Weather or View. All piping and fittings exposed to weather shall have, in addition to the above-described insulation, aluminum jacketing. 0.016" thickness for straight pipe. 0.024" thickness for fittings. Integral moisture barrier. Provide pre-fabricated aluminum strapping and seals by same manufacturer, “Childers" or equal. Secure in place with factory supplied straps. Install all joints to prevent water entry. All joints shall be sealed with outdoor mastic. Benjamin Foster 65-07 or equal.

F. For Miscellaneous fittings for which aluminum jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the insulation with stretchable glass fabric and at least two coats of outdoor mastic.

G. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather such as in equipment rooms shall be given an additional finish of PVC jackets.

H. Stretchable Glass Fabric: Reinforcing mesh. 10 X 20 continuous filament glass yarns per inch. Johns-Manville.

I. Vapor Barrier Coating: Childers CP-30LO.

J. Lagging Adhesive: Childers CP-50A.

K. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr-ft2-F or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

L. Hot Water Supply/Drain Piping and Handicap Fixtures. "Handi Lav-Guard" insulating kits by Truebro, Inc.. or “Trap Wrap” as manufactured by Brocar Industries. Pre-formed insulation and materials to cover hot water, cold water, and drain piping. Must conform to ADA article 4.19.4 and California article P1504B. Pressure sensitive expanded poly foam tape will not be accepted.

2.3 FIXTURES

A. General: Provide Rough-in for and install all plumbing fixtures. All trim not concealed shall be brass with polished chrome plate finish unless noted otherwise. Waste shall be chrome plated 17 gauge P-trap shall have clean-out and escutcheon at tailpiece. All fixtures shall be enameled cast iron. All enameled fixtures shall be acid resisting. Standard color is white.

B. Schedule: Refer to Plumbing Fixture Schedule on the drawings for list of fixtures and trim. Manufacturer's model numbers are listed to complete description. Equivalent cross- referenced manufacturers of china fixtures shall be American Standard, Eljer or Kohler. Equivalent cross-referenced manufacturers of cast iron fixtures shall be Kohler or Commercial Enameling. For drainage fixtures, equivalent cross-referenced models of Josam, Smith or Zurn are acceptable.

C. Stops and P-Traps: All fixtures shall be provided with stops and P-Traps as applicable. Wall mounted faucets, valves, etc. shall have integral stops or wall mounted stops.

1. Stops: All hot and cold water supplies shall be 1/2" I.P.S. inlet angle stops with stuffing box, loose key lock shield, and brass riser (3/8" for 2-1/2 gpm and less, otherwise 1/2"). McGuire, Speedway.

2. P-Traps: Semi-cast brass, ground joint. 17-gage. Clean-out plug. Unobstructed waterway. California Tubular, McGuire.

3. Exposed Pipe at Fixtures. Chrome plated red brass pipe, iron pipe size, with threaded cast bronze chromium plated couplings and fittings. Any pipe required to extend from finish wall into exposed view within Toilet Rooms shall be chrome plated. All penetrations through walls to fixtures shall be brass threaded nipples.

D. Water closets are floor mounted flush value and siphon jet action. Battery type electronic sensor flush valves "Zurn" at urinals and water closets.

E. All lavs shall be enameled cast iron, single drilled or 4" centers.

F. All drinking water faucet products shall be certified to NSF Standard 61 section 9 Drinking Water Components. The brass casting shall contain no more than two tenths of one percent lead by dry weight.

G. Other brass components which contact water within the faucet shall be from brass which contains no more than three percent lead by dry weight. All faucets exempt from NSF Standard 61 Section 9 shall meet the same lead content criteria.

H. Supplies. Standard threaded stop, straight pattern, loose key, chromium plated with stuffing box.

I. All exposed fixture supplies to lavatories, sink-sand water closets shall be Brass-Craft No-burst stainless steel braid flexible supplies. For lavatories & sinks use B1F16 and for tank-type water closets use 1T16.

2.4 EQUIPMENT

A. General Requirements:

1. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be considered minimum.

2. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.

3. Ratings:

a. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be approved by AGA.

b. Electrical: Electrical equipment shall be in accordance with NEMA standards and UL or ETL listed where applicable standards have been established.

4. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.

5. Electrical:

a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories and controls required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, and shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.

b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip-proof, NEMA B design on pumps, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction, unless otherwise noted. Design shall limit starting inrush current and running current to values shown on drawings. Motors from 1 horsepower to 5 horsepower shall be the standard high efficiency type, Magnetek E-Plus. Motors 7-1/2 horsepower and larger shall be the premium efficiency type, tested according to IEEE Standard 112, Method B. Magnetek E-Plus III. Motors exposed to weather shall be TEFC. Vertical motors with exposed fans shall have rain caps.

d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment. Vertical lines shall be installed to allow for building settlement without damage to piping. Pipe sizes indicated on the drawings are nominal sizes unless otherwise

noted. Provide secondary drain piping where required.

2. Joints:

   a. Threaded: Pipe shall be cut square and reamed to full size. Threads shall be in accordance with ANSI B2.1. Joint compound or tape suitable for conveyed fluid shall be applied to male thread only. Joints shall be made with three threads exposed.

   b. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100F. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.

   c. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

   d. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3. Fittings and Valves:

   a. Standard Fittings: All joints and changes in direction shall be made with standard fittings. Close nipples shall not be used.

   b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.

   c. Unions: A union shall be installed on the leaving side of each valve, at all sides of automatic valves, at equipment connections, and elsewhere as necessary for assembly or disassembly of piping.

   d. Valves: All valves shall be full line size. Provide shut-off valve for each building and each equipment connection. Provide shut-off valve at each point of connection to existing piping. At equipment connections, valves shall be full size of upstream piping, except that gas valves within 18" of the point of connection to the equipment may be the same size as the equipment connection.

   e. Valve Accessibility: All valves shall be located so that they are easily accessible. Valves located above ceilings shall be installed within 24" of the ceiling. For situations where this is not practical or where valves are greater than 10' above the floor, chain wheel operators shall be provided. Chain shall extend down to 7' above the floor. All such installations must have prior review by the Engineer.

4. Pipe Hangers and Supports

   a. General: Piping shall be seismically braced in compliance with the latest edition of the Guidelines For Seismic Restraints of Mechanical Systems as published by SMACNA, or an OSHPD Pre-Approval No. R-0010. Copies of the above manual and details shall be maintained at the project site until final acceptance. Hangers shall be placed to support piping without strain on joints or fittings. Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum).

Support pipe within 12" of all changes in direction. Support individual pipes with pipe hanger. Copper piping systems which protrude through a surface for connection to a fixture stop or other outlet shall be secured with a drop ell, Grinnell No. 9788; nipple through surface shall be threaded brass.

b. Hot and Cold Water Piping: All hot and cold water piping shall have isolating shield; no portion of this piping shall touch the structure without an isolating shield except at anchor points for fixture rough-in.

c. Steel pipe and Cast Iron Soil Pipe. 1/2" through 4" pipe. Provide B-line B3690 J-style hanger, with standard electro-plated finish.. 5" and larger pipe. B-line B3100 Clevis-Style pipe hanger with standard electro-plated finish.

d. Copper Tubing. Provide B-line B3690F felt-lined hanger for copper tubing with standard electro-plated finish.

e. Insulated Pipe & Tubing. Provide B-line B3380 thru B3384 360° calcium silicate shield. The hanger and shield shall be fitted to the outside of the pipe insulation.

f. Hanger Rod Sizing. Hanger rods shall be roll threaded mild steel with electro-galvanized finish and shall meet or exceed the following table:

Piping or Tubing Size	Hanger Rod Size
1/2" through 2"3/8"	3/8"
2-1/2" through 5"	1/2"
6" through 10"5/8"	5/8"

g. Hanger Spacing. Provide at least one hanger per branch and independently support all line-mounted equipment. Provide a hanger within 12" of elbow at riser or drop. Spacing of hangers along the run of the pipe shall not exceed the following table:

	Steel Pipe	Copper Tube	CI Pipe
1/2" through 3/4"	7'-0"	5'-0"	5'-0"
	7'-0"	6'-0"	5'-0"
1-1/2" through larger	10'-0"	10'-0"	5'-0"

Pipe or Tubing Size	Steel Pipe	Copper Tube	CI Pipe
1/2" through 3/4"	7'-0"	5'-0"	5'-0"
1" through 1-1/4"	7'-0"	6'-0"	5'-0"
1-1/2" through larger	10'-0"	10'-0"	5'-0"

h. Structure Attachments. Shall be engineered to support the intended design load and shall be sized for the hanger rod specified. For poured-in-place construction, install B-line B2500 Spot insert. After removing the concrete forms, install hanger rod in insert hanger rod in insert using channel nuts. For steel and concrete decking, install B- line B3019 insert through steel form prior to the pour. The anchor plate shall be fastened to the steel deck with machine screw. For attaching to steel channels, use B-line beam clamp threaded anchor hook.

i. Trapeze Hangers. Trapeze hangers shall be fabricated from galvanized channel. Stress on the installed channel shall not exceed 25,000 psi. Deflection on the installed channel shall not be greater than 1/240th of the span length. For load calculations, all piping to be assumed to be water-filled unless handling a heavier liquid. Hanger rods for trapeze hangers shall be limited to 9,000 psi stress based on the area at the root of the threads. Minimum hanger rod size shall be 3/8"

5. Miscellaneous:

a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller, otherwise 2" annular clearance. Piping through walls below grade shall be sealed with Link-Seal.

c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

d. Thermometer or Pressure Gage Tap: Provide tee for instrument well. Minimum size of pipe surrounding well shall be 1-1/2".

e. Concrete Thrust Blocks: Shall be constructed at all valves, tees, elbows, bends, crosses, reducers and dead ends in loose-joint pipe. Blocks shall cure a minimum of 7 days before pressure is applied. Concrete shall be 3000 psi mix.

f. Dielectric Couplings: Dielectric couplings shall be installed wherever piping of dissimilar metals are joined, except that bronze valves may be installed in ferrous piping without dielectric couplings.

g. Exposed Pipe at Fixtures: Piping extending from finished surfaces into a finished room shall be chrome plated brass.

B. Sanitary Sewer Piping:

1. General: Where inverts are not indicated, sanitary sewer piping shall be installed at 1/4" per foot pitch. Piping 4" and larger may be installed outside the building at 1/8" per foot pitch.

2. Cleanouts: Install cleanouts at ends of lines, at changes of direction greater than 90 degrees, and at not greater than 100 foot intervals. Locate interior cleanouts in accessible locations and bring flush to finished surface.

3. Vents: Vents shall terminate not less than 6" above the roof nor less than 12" from any vertical surface nor within 10' of any outside air intake. Install horizontal vent lines at 1/4" per foot pitch. Offset vents 2' minimum from gutters, parapets, ridges and roof flashing.

C. Storm Drain (Including Rain Water Leader, RWL): Similar to Sanitary Sewer. Piping with less than 24" of cover outside building walls shall be cast iron.

D. Water Piping: Connections to branches and risers shall be made from top of main. Supply header in fixture battery shall be full size to last fixture, reducing in size only on individual connections to each fixture in

battery. Minimum pipe size shall be 3/4", unless otherwise noted. Exposed fixture stops and flush valves shall be installed with brass nipples for copper piping and galvanized nipples for galvanized piping. Nipples are to extend from outside of wall to fitting at header or drop behind finish wall surfaces. Pipe nipples shall be same size as stop or flush valve. Provide shut off for each building and each connection to equipment. Provide water hammer arrestor with ball valve and screwdriver locked access panel where noted on drawings and upstream of quick-closing manual valves, solenoid valves and flush valves. Only equipment mounted on vibration isolators shall be connected with flexible connections. Underground hot water and cold water piping which run parallel to each other shall be installed a minimum of 3 feet apart.

E. Gas Piping: Installation shall comply with CPC and NFPA 54 (National Fuel Gas Code). Shall be pitched to drain to dirt legs at low points. No unions shall be installed except at connections to equipment. Provide shutoff and dirt leg at each equipment connection. Only equipment mounted on vibration isolators shall be connected with flexible connectors. Under floor piping shall be sleeved and vented. Plastic pipe and fittings shall be joined in accordance with manufacturer's recommendations. Metal to plastic transition fittings shall be installed at all transitions. Provide 14-gage insulated tracer wire secured to pipe at 10' intervals with nylon ties. Terminate tracer 6" above grade at both ends.

F. Drain Piping (Including Condensate): Install with constant pitch to receptacle, 1/4" per foot where possible, otherwise 1/8" per foot minimum. Provide TEE with clean-out plug at all changes of direction. Provide trap at each air handling unit to prevent air leakage. Only equipment mounted on vibration isolators shall be connected with flexible connection.

G. Acid Waste Piping: Shall be installed in accordance with manufacturer's recommendations.

H. PVC Piping: Shall be cut square and assembled prior to solvent weld. Apply primer per manufacturer's recommendations. Coat male joint fully with solvent, make joint before solvent dries and wipe exterior clean.

3.2 PIPING INSULATION INSTALLATION:

A. Domestic Hot Water:

1. General: All domestic hot water piping, fittings and accessories shall be insulated.

2. Pipe: Apply pre-molded fiberglass sections to pipe using integral pressure sealing lap adhesive in accordance with manufacturer's recommendations. Stagger longitudinal joints. Seal butt joints with factory supplied pressure sealing tape.

3. Fittings and Valves:

a. Wrap all fittings and valves with pre-cut fiberglass blanket to thickness matching adjoining insulation. Cover blanket with PVC jacket in accordance with manufacturer's recommendations. Solvent weld. Seal all joints with factory supplied pressure sealing vapor barrier tape with 1-1/2" (min.) overlap on both sides of joint. Insulate valves to stem. Do not insulate unions, flanges or valves unless water temperature exceeds 140ºF or the piping is exposed to weather.

b. For miscellaneous fittings and accessories for which PVC jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the fiberglass blanket with stretchable glass fabric, one coat of lagging adhesive and a final coat of vapor barrier coating. All exposed ends of insulation shall be adequately sealed.

4. Equipment: Storage tanks and other equipment through which there is normally circulation, shall be insulated with materials similar to those described in Paragraph 2.2. It shall be the Contractor's responsibility to provide adequate insulation and finish, weatherproofing for equipment exposed to

the weather, and a neat-appearing installation. Submit materials and method of installation to Engineer for review.

5. Piping Exposed to Weather:

   a. All piping and fittings exposed to weather shall have, in addition to the above-described insulation, an aluminum jacketing. Secure in place with factory supplied straps. Install all joints to prevent water entry. All joints shall be sealed with outdoor mastic.

   b. For miscellaneous fittings for which aluminum jackets are not available or where proximity of fittings precludes a neat-appearing installation, the Contractor may cover the insulation with stretchable glass fabric and at least two coats of outdoor mastic.

6. Additional Finish for Exposed Piping and Equipment: All piping and equipment exposed to view but protected from the weather shall be given an additional finish of PVC jackets.

B. Cold Water Piping-Freeze Protection: All cold water piping exposed to weather shall be wrapped with insulating tape, 50% overlap. Cover valves to stem. Apply at least two coats of protective finish.

C. Chilled Drinking Water: Insulate all chilled drinking water lines the same as indicated for domestic hot water lines except that a complete vapor barrier is required.

D. Piping Insulation Under Handicap Lavatories and Sinks: Hot and cold water piping, hot and cold water stops and drain piping under handicap lavatories and sinks shall be insulated with 3/16" thick molded closed cell vinyl. Installation shall be in accordance with manufacturer's instructions.

3.3 FIXTURE INSTALLATION

A. Fixture Height: Shall be as indicated on Architectural drawings.

B. Floor Drains or Floor Sinks: Shall be placed parallel to room surfaces, set level, flush with floor, and adjusted to proper height to drain. Cover openings during construction to keep all foreign matter out of drain line.

C. Wall Hung Fixtures: Shall be provided with proper backing and hanger plates secured to wall. Fixtures mounted on carriers shall bear against stop nuts, clear of wall surface. Caulk fixtures against walls with white G.E. "Sanitary 1700" silicone sealant. Caulking shall be smooth and flush with fixture surface (not concave).

D. Floor Mounted Fixtures: Shall be provided with proper support plates. Grout at the floor with waterproof ceramic tile grout.

E. Other Connections: Rough-in and connection for trim or fixtures supplied by others shall be included in this specification section.

3.4 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to insure that no work done under other specification sections shall in any way block, or otherwise hinder the equipment. All equipment shall be securely anchored in place.

B. Connections to Equipment: Where size changes are required for connections to equipment, they shall be made immediately adjacent to the equipment and, if possible, inside the equipment cabinet.

C. Pumps: Install pumps with a minimum of 8 diameters of straight pipe at the pump suction.

3.5 TESTS AND ADJUSTMENTS

A. General: Unless otherwise directed, tests shall be witnessed by a representative of the Engineer. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and entire work retested. Tests may be made in sections, however, all connections between sections previously tested and new section shall be included in the new test.

B. Gravity Systems:

1. Sanitary Sewer: All ends of the sanitary sewer system shall be capped and lines filled with water to the top of the highest vent, 10' above grade minimum. This test shall be made before any fixtures are installed. Test shall be maintained until all joints have been inspected, but not less than 2 hours.

2. Drains (Including Condensate): Similar to Sanitary Sewer.

3. Storm Drain: Similar to Sanitary Sewer.

4. Acid Waste: Similar to Sanitary Sewer.

C. Pressure Systems:

1. General: There shall be no drop in pressure during test except that due to ambient temperature changes. All components of system not rated for test pressure shall be isolated from system before test is made.

2. Domestic Hot and Cold Water Piping: Maintain 100 psig water pressure for 4 hours.

3. Backflow Preventer: All backflow preventers shall be tested according to manufacturer's recommendations and the USC Cross Connection Control and Hydraulic Research Manual (8th Edition). Testing shall be performed by an AWWA Certified Backflow Prevention Assembly Tester. Contractor shall certify in writing to the Engineer the date which backflow preventers were tested and by whom test was witnessed.

4. Sanitary Sewer Piping (Pressurized): Maintain 100 psig water pressure for 4 hours.

3.6 DISINFECTION

A. Disinfect all domestic water piping systems in accordance with AWWA Standard C651, "AWWA Standard for Disinfecting Water Mains", and in accordance with administrative authority. Disinfection process shall be performed by the contractor and witnessed by a representative of the Engineer. During procedure signs shall be posted at each water outlet stating, "Chlorination - Do Not Drink". After disinfection, contractor shall collect water samples for bacteriological analysis and sent to an independent lab. Certificate of Bacteriological Purity shall be obtained and delivered to the Owner through the Engineer.

END OF SECTION 15400

SECTION 15500 – FIRE SPRINKLER SYSTEM

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

A. The preceding General Mechanical Provisions shall form a part of this Section with the same force and effect as though repeated here.

1.2 SUBMITTALS

A. Architect of Record, Mechanical Engineer, & Fire Protection contractor (C-16) shall affix their seal, stamp, and sign all submittals, or provide documentation per DSA IR A-18.

B. Per NFPA 13 Figure 10.10.1: A copy of the completed and signed "Contractor's Materials & Test Certificate for Underground Piping" shall be included in the submittal.

1.3 GENERAL REQUIREMENTS:

A. Per NFPA 13 Section 10.10.2.2: all piping and attached appurtenances subjected to working pressures shall be hydrostatically tested at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure without loss for two hours. Test must be witnessed by the IOR.

B. Per NFPA 13 Section 6.2.9: Provide spare sprinkler head cabinet, sprinkler wrench, and no fewer than six spare sprinkler heads matching the types and temperature rating in each protected area for systems less than 300 sprinklers. (12 spare sprinklers for systems 300 to 1,000 sprinklers)

C. Per NFPA 13 Section 9.3.6.3: The end sprinkler on each line shall be restrained against excessive vertical and lateral movement.

D. Per CBC 903.4.2 and NFPA 13 Section 8.16.4.2.1 thru 8.16.4.2.3: The inspectors test valve location shall be installed in the most hydraulically remote system area. The pipe size shall be no less than one inch, with a smooth bore, corrosion resistant orifice, providing the equivalent flow of the smallest orifice of the sprinkler types installed within the system. The discharge shall be to the exterior of the building.

E. Per NFPA 25.5.3.3.6: The sprinkler flow switch shall be tested to confirm that when the Inspector's Test Valve is activated an alarm will sound no more than 90 seconds after the initial flow. Test must be witnessed by the IOR.

F. Per 2007 CBC 904.4.3: Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and transmission of alarms from automatic fire extinguishing systems. Test must be witnessed by the IOR.

G. Per NFPA 13 Section 8.16.2.4.7: Signage shall be provided as required, including "Riser Room Identification".

H. Per CBC Section 903.4.1: The main fire alarm panel valve monitoring and water flow alarm and trouble signals shall be distinctively different and shall be automatically transmitted to an approved central station monitoring company.

I. Per 2002 NFPA 13 Section 16.5: A permanent hydraulic calculations design data placard shall be attached to each riser.

J. Per 2002 NFPA 13 Section 6.9.1 and 2007 CBC 903.4.2: Flow switch shall be connected to a 10 inch outside alarm bell or other audible alarm device at each riser. Approved identification signs shall be provided on the

outside alarm bell "SPRINKLER FIRE ALARM – WHEN ALARM SOUNDS CALL 911 / FIRE DEPARTMENT".

K. Per Title 19 Article 906(a): A label of the self adhesive type shall be placed on the fire department connection or on the riser for fire sprinkler system and shall include the date of installation and/or date service was performed and license number of the person performing service work.

L. Per 2002 NFPA 13 Figure 16.1: Sprinkler contractor shall complete and sign Contractor's Material & Test Certificate for above ground piping. This form shall be given to the IOR who will forward to DSA for filing in project records.

1.4 SCOPE

A. General: Provide a complete hydraulically calculated automatic fire sprinkler system for the new buildings extending from the point of connection as indicated on the drawings to all areas of the buildings, including all necessary piping, devices, controls, labor, etc.

B. Design/Calculations: The sprinkler system shall be designed and sized (by hydraulic calculations or pipe schedules) in accordance with NFPA No. 13 and fire authority requirements. Calculations shall be included in submittals.

C. Preparation of Drawings and Material Data Sheets: Before starting work, complete shop drawings showing locations and sizes of all sprinkler heads, piping, valves, etc., shall be prepared. Shop drawings shall also include material data sheets giving manufacturer's name and catalog numbers, equipment descriptions giving dimensions, capacities, performance curves, and complete layouts. Exposed piping shall be specifically noted on shop drawings.

1.5 WORK SPECIFIED ELSEWHERE

A. Electrical wiring.

B. Fire alarm system.

1.4 DEFERRED APPROVAL SUBMITTAL REVIEW PROCESS

A. Submit shop drawings, calculations and material data sheets to Engineer for review.

B. Submit to DSA/ORS/FLS for approval.

C. Material or equipment shall not be ordered, nor work proceed until written review is processed by the Engineer and approved by DSA/ORS/FLS.

D. The following "Overhead Fire Sprinkler System General Notes" must appear on the title sheet of the Deferred Fire Sprinkler Submittals.

1. A copy of the original, previously approved DSA underground piping plans or other water supply components, such as Water Tanks, Fire Pumps, etc. for the project shall be included in all automatic fire sprinkler deferred submittal plan packages. All deviations from the previously approved plans shall be justified and submitted to DSA via the Change Order Process as applicable. Underground piping size is not the responsibility of DSA and the Architect of Record shall assume full liability for undersized piping should the final design of the fire sprinkler system require larger piping, additional water supply, fire pumps, or other equipment or items.

2. 2002 NFPA 13 8.15.3.1: The Designer shall indicate on the plans all piping subject to freezing (where water temperature cannot be maintained above 40 degrees Fahrenheit) and provide approved protection.

3. 2002 NFPA 13 Sec. 10.10.2.1.1: Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to overhead sprinkler piping. Where underground piping is flushed and not immediately connected to overhead piping, the riser shall be capped or otherwise protected to prevent debris, dirt, or animals from entering into the underground piping (Witnessed by the Project Inspector).

4. Provide "wet signed" water flow test data no more than 6 months old and indicate the locations and height elevations of the test and residual flow hydrants. Water flow test data must be provided by or witnessed by the local water purveyor, Utilities Company , or local fire department.

5. Architect of Record, Mechanical Engineer and Fire Protection Contractor (C-16) shall affix their seal, stamp and sign all submittals, or provide documentation per DSA IR A-18.

6. 2002 NFPA 13 Figure 10.10.1: A copy of completed and signed "Contractor's Materials and Test Certificate for Underground Piping" shall be included in the submittal.

7. 2002 NFPA 13 Section 10.10.2.2: All piping and attached appurtenances subjected to system working pressure shall be hydrostatically tested at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure without loss for 2 hours (Witnessed by Project Inspector).

8. 2002 NFPA 13 Sec. 6.2.9: Provide spare sprinkler head cabinet, sprinkler wrench, and no fewer than 6 spare sprinkler heads matching the types and temperature rating in each protected area for system s less than 300 sprinklers. (12 spare sprinkler heads for systems 300 to 1,000 sprinklers).

9. 2002 NFPA 13 Sec. 9.3.6.3: The end sprinkler on each line shall be restrained against excessive vertical and lateral movement.

10. 2007 CBC 903.4.2 and NFPA 13 8.16.4.2.1-8.16.4.2.3: The Inspector's Test Valve location shall be installed within the most hydraulically remote system area. The pipe size shall be no less than 1 inch, with a smooth bore, corrosion-resistant orifice, providing the equivalent flow of the smallest orifice of the sprinkler types installed within the system. The discharge shall be to the exterior of the building.

11. 2002 NFPA 25.5.3.3.6: The sprinkler flow switch shall be tested to confirm that when the Inspector's Test Valve is activated an alarm will sound no more than 90 seconds after initial flow (Witnessed by Project Inspector).

12. 2007 CBC 904.4.3: Connections to protected premises and supervising station fire alarm systems shall be tested to verify proper identification and transmission of alarms from automatic fire extinguishing systems (Witnessed by Project Inspector).

13. 2002 NFPA 13 Sec. 8.16.2.4.7: Signage shall be provided as required, including "Riser Room Identification."

14. 2007 CBC Sec. 903.4.1: the main fire alarm panel valve monitoring and water-flow alarm and trouble signals shall be distinctly different and shall be automatically transmitted to an approved central station monitoring company.

15. 2002 NFPA 13 Sec. 16.5: A permanent hydraulic calculations design data placard shall be attached to each riser.

16. 2002 NFPA 13 Sec. 6.9.1 and 2007 CBC 903.4.2: Flow switch shall be connected to a 10 inch outside alarm bell or other audible alarm device at each riser. Approved identification signs shall be provided on the outside alarm bell “SPRINKLER FIRE ALARM – WHEN ALARM SOUNDS CALL 911/FIRE DEPARTMENT.”

17. Title 19 Article 906(a): A label of the self-adhesive type shall be placed on the fire department connection or on the riser for fire sprinkler system and shall include the date of installation and/or date service was performed and license number of person performing service work.

18. 2002 NFPSA 13 Figure 16.1: Sprinkler contractor shall complete and sign Contractor’s Material and Test Certificate for the Aboveground Piping. This form shall be given to the Project Inspector who will forward to DSA for filing in project record.

PART 2 - PRODUCTS

2.1 STANDARDS

A. All materials shall be in accordance with NFPA No.13 "Standard for the Installation of Sprinkler Systems" and NFPA No. 14 "Standard for the Installation of Standpipe and Hose Systems". Underground mains shall be in accordance with NFPA No. 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances".

2.2 PIPING MATERIALS

A. General: The pressure rating of all piping, valves, flanges and other piping accessories shall be in accordance with code and fire authority requirements. Pressure ratings shall exceed the highest possible working pressure.

B. Piping:

1. Underground: Polyvinyl chloride, Class 150, DR 18, AWWA C900, with rubber ring joints, ASTM D1869. Cast or ductile iron fittings, AWWA C110 or C153, Class 150, with rubber ring joints, ASTM D1869.

2. Piping Protective Wrap. All steel piping (except stainless) buried below grade shall be factory coated with "Scotchkote" 101 epoxy resin as manufactured by 3-M Company, or "X-Tru-Coat" as Manufactured by Pipe-Line service Corp. Field joints shall be wrapped with "Scotchwrap" #50 or coated with "Scotchkote" 302. Provide a continuous test of all pipe covering, including field joints, prior to backfilling. This test shall be made using a “Holiday Detector” as manufactured by Tinker and Rascor Co., or approved equal. Test at an electrical voltage of 10,000 volts D.C.. Any wrap holiday found shall be patched and retested. This test shall be done in the presence of the owner’s inspector.

3. Above Grade:

a. Standpipes: Shall comply with NFPA No. 14 and fire authority.

b. From 5'-0" Outside Building (underground) to Inside Building +6" (or more) Above Floor at Riser.

c. “Ames” In-Building Riser constructed of one piece stainless steel pipe with grooved end above floor and socket end below grade. Install with 2” min. clearance through concrete

floor using PVC or sonatube sleeve. Install through or below footings per structural details. Length to be min. of 6 ft. Provide thrust blocks as required.

d. Inside Building From 6" Above Floor. 2" & smaller Pipe Size: Schedule 40 black steel ASTM A53 or A120. Joints shall be threaded malleable iron, ANSI B16.3, Class 125. 2-1/2" & Larger Pipe Size: Schedule 10 black steel pipe, ASTM A135. Joints shall be UL and FM approved mechanical couplings and shall not be welded. Couplings may be of the bolted rolled groove type or the mechanical locking push-on type. Groves for the rolled grooves type shall be rolled only. Pipe end preparations for the mechanical coupling shall be as follows.

e. Group components shall be of one manufacturer.

f. Utilized grooving tools shall be acceptable to fitting manufacturer and shall be limited to Victaulic, Ridge Tool Company, or Pace without substitution.

C. Valves

1. Control Valves for Sprinkler Systems. Solid wedge gate, rising stem, O.S.&Y., 175 psi w.p., U.L. Listed, provided with tamper switches.

2. Globe Valves. Bronze union bonnet, renewable composition disc, 175 psi w.p., U.L. Listed, provided with tamper switches.

3. Check Valves. 2" and Smaller: All bronze swing check. 175 psig WOG. U.L. Listed. 2-1/2" and Larger: Iron body, bronze mounted swing check. 175 psig WOG. U.L. Listed

4. Gate Valves. 2" and Smaller: All bronze, rising stem. 200 psi WOG. U.L. Listed, provided with tamper switches. 2-1/2" and Larger: Iron Body, bronze mounted, outside screw and yoke. 175 psi WOG. U.L. Listed. (U.L. Listed butterfly valves may be substituted for 4" and larger gate valves). Provide with tamper switch.

D. Standpipe Valves: Shall comply with NFPA No. 14 and fire authority.

E. Air Piping: All air piping for pre-action systems shall be copper tubing with brazed (1100°F) or flared joint connections.

2.3 SPRINKLER HEAD

A. Sprinkler Heads

1. Automatic spray sprinkler heads of suitable operating temperature shall be provided. Up-right, pendant, or flush type shall be provided, as required. In all areas with ceilings such as offices, work rooms, and corridors, classrooms etc., provide flush type heads. Heads installed in areas with finished ceilings shall have metal escutcheons with same finish as heads (Chrome Plated). All ceiling areas with concealed heads use off white in suspended ceiling. At exterior soffit locations with concealed heads match color of exterior plaster.

2. Provide side wall heads where indicated on the drawing or required by job condition. Escutcheons for side wall heads shall have finish to match color of wall.

3. Temperature ratings shall be in accordance with NFPA Pamphlet 13. Heads shall have chrome finish in areas with finished ceilings, standard finish in areas with exposed piping, lead coating on outdoor areas.

4. Heads installed lower than eight feet above the floor, Gymnasium, Activity rooms and Wrestling room shall have wire guards.

5. Provide extra heads (of each type installed) in accordance with code requirements.

2.3 TEST AND DRAIN CONNECTION

A. Install horizontal piping graded to low points and in a manner to make it possible to test and empty the entire system. Provide valves and piping of size as approved on accordance with NFPA Pamphlet 13.

2.4 ALARM VALVE ASSEMBLY

B. Standard wet type alarm valve assembly and water motor gong complete with retarding chamber and trim as required by the authority having jurisdiction. Provide flow switch for connection to alarm system. Provide tamper switch. UL listed.

2.5 ALARM VALVE ASSEMBLY

A. UL listed alarm valve assembly designed for a pre-action system. The assembly shall be single interlocked so that the valve does not open unless the detection system is activated. The assembly shall have the following features.

1. Air pressure switch to supervise the pressure in the piping system and signal the alarm system of a loss in air pressure.

2. Pipe mounted air compressor, 120 volt, l phase, ¾ horsepower.

3. Filter/dehydrator for air supply.

4. Pressure regulator to maintain air pressure in piping system.

5. Solenoid valve to allow main valve to open upon receipt of a signal from the detection system.

6. Miscellaneous gages, valves, tamper switch and control devices as detailed and as required by NFPA No.13 and the local fire authority.

7. OS & Y valve on the discharge side of the alarm valve.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Sprinkler Drawings are schematic and indicate generally the system and equipment to be used. Architectural and structural conditions or drawings and existing conditions shall govern the exact location for all piping and sprinkler heads. Lay-out and coordinate the sprinkler work with the work of other trades and confirm the locations of and install sleeves and hangers so that work of other trades is not impeded. Care shall be taken to secure best possible head room in location of sprinkler heads. Coordinate installation of sprinkler piping to avoid interference with adjacent air conditioning, plumbing, etc. Sprinkler piping must clear all overhead equipment.

B. All sprinkler heads shall be located on center-line of, corridor, light fixtures, air conditioning outlets ceiling panels as generally indicated and whenever possible to present a neat organized appearance.

C. Fire-caulk all piping penetrations of rated walls and floors per a U.L. approved caulking assembly.

3.2 PIPING INSTALLATION

A. General: Piping shall be concealed in walls, above the ceilings or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location shall be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. Depth of cover in traffic areas shall be 36 inches (minimum).

B. Standards: All piping shall be installed in accordance with NFPA No. 13 "Standard for the Installation of Sprinkler Systems". Underground mains shall be installed in accordance with NFPA No. 24 "Standard for the Installation of Private Fire Service Mains and Their Appurtenances". Standpipes shall be installed in accordance with NFPA No. 14 "Standard for the Installation of Standpipe and Hose Systems".

C. All piping shall be seismically braced and shall be done on compliance with NFPA 13, latest edition.

D. Drainage of System. All sprinkler pipe and fittings shall be installed so that the sprinkler system can be completed drained. Piped shall be pitched at 1/4" per foot.

E. Run in line with the building walls. Turns and bends shall be made with standard fittings.

F. Valve Supports. All piping carrying fire valves shall be securely fastened to the building structure and each valve to prevent movement of valves because of manual pressure to the valves.

G. On branch line piping, provide at least one hanger between every two sprinkler heads and a maximum of 12' apart. End Sprinklers more than thirty inches (30") from any hanger shall be supported by a hanger not less than 12" from the sprinkler head.

H. Miscellaneous:

1. Escutcheons: Provide chrome plated escutcheons where piping penetrates walls, ceilings or floors in finished areas. Chrome plated, brass. Crane, with set screw.

2. Pattern: Sprinklers shall be installed in a symmetrical pattern with lighting fixtures and with ceiling pattern. Heads located in lay-in ceilings shall be centered in panel.

3. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" annular clearance between sleeve and pipe for piping 3" and smaller and 2" annular clearance for piping 4" and larger. Piping through walls below grade shall be sealed with Link-Seal.

4. Non-Rated Assemblies. Sleeves for pipe passing through concrete floors or walls shall be schedule 40 galvanized steel pipe of size sufficient to permit the pipes to pass through with a minimum clearance of 1" between sleeves and pipe for pipe up to 3-1/2" and 2" clearance for pipe larger than 4". Sleeves shall have square ends cut flush with surface and shall be caulked tight. Sleeves through floors shall extend 1" above finished floor surface.

5. Rated Assemblies. Same as for non-rated assemblies except that sleeves shall be packed for its entire length with UL listed system three hour classification such as a 3M FireDam 160 caulk at ends and mineral wool batt material stuffer in middle of penetration.

6. Access: Provide access doors as required for all valves, devices, etc.

7. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe, or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

8. Concrete Thrust Blocks: Shall be constructed at all valves, tees, elbows, bends, crosses, reducers and dead ends in loose-joint pipe. Blocks shall cure a minimum of 7 days before pressure is applied. Concrete shall be 2500 psi mix.

9. Electrical Equipment: Piping shall not be run over electrical panels, motor control centers or switchboards.

3.4 IDENTIFICATION

A. All controls, piping, valves and equipment shall be labeled for function and service in accordance with NFPA No.13 and No.14.

3.5 TESTS AND ADJUSTMENTS

A. Unless otherwise directed, tests shall be witnessed by a representative of the Engineer and an inspector of the authority having jurisdiction. Contractor shall notify fire authority at least 48 hours prior to testing. At various stages and upon completion, the system must be tested in the presence of the enforcing agency. Work to be concealed shall not be enclosed until prescribed tests are made. Should any work be enclosed before such tests, the Contractor shall, at his expense, uncover, test and repair all work to original conditions. Leaks and defects shown by tests shall be repaired and the entire work retested. Test all systems in accordance with fire authority requirements and NFPA No.13, No. 14 and No.24. Test all pumps in accordance with NFPA No. 20.

3.6 ADDITIONAL TESTING AND DRAINING OF THE SYSTEM

A. In addition to the above described testing, the pre-action system shall also be given a one-time test to introduce water into the mains for the purpose of determining the length of time required for water to reach the most remote area. The Contractor shall completely drain the system after this test, including draining the drop nipples to pendent heads by removing those heads. The OS & Y valve on the discharge of the alarm valve assembly is to be closed for all subsequent tests of the trip mechanism. No water shall be introduced into the piping system downstream of this OS & Y valve after the initial test. Coordinate all testing with the fire authority. The system shall be air tested after this test.

3.7 CERTIFICATION

A. At completion of the project, a certificate of inspection from authority having jurisdiction indicating installation and testing in accordance with referenced standards shall be delivered to the Owner through the Engineer.

3.8 CLEANING

A. All cement, plaster, etc., shall be removed with an approved solvent. All foreign mater shall be thoroughly flushed from inside if pipes before fabrication.

3.9 TESTS

A. General: At various stages and upon completion the system shall be tested in the presence of a representative of the enforcing authority.

B. Tests Shall Include:

1. Flushing Test in accordance with NFPA 13, Paragraph 8-2.1.

2. Hydrostatic Test in accordance with NFPA 13. Paragraph 8-2.2.

3. System Operational Tests in accordance with NFPA 13, Paragraph 8-2.4.

3.10 CERTIFICATION

A. At the completion of the installation a certificate of inspection from the authority having jurisdiction indicating that the installation and testing is in accordance with reference standards, shall be delivered to the owner.

B. Along with the certificate of inspection furnish the owner with a copy of NFPA Pamphlet 13A, Care and Maintenance of Sprinkler Systems. Also provide a copy of Title 19, California Code of Regulations, Article 4, Maintenance and Service, Paragraphs 904.1 and 904.2.

END OF SECTION 15500

SECTION 15800 – HEATING, VENTILATING, & AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL MECHANICAL PROVISIONS

A. The preceding General Mechanical Provisions shall form a part of this Section with the same force and effect as though repeated here.

1.2 SCOPE

A. Included: Provide all labor, materials and services necessary for complete, lawful and operating systems as shown or noted on the drawings or as specified here. The work includes, but is not necessarily limited to, the following:

1. Air distribution system.

2. All equipment as shown or noted on the drawings or as specified.

3. System energy balance.

4. Acceptance testing as required to comply with title 24 energy code. If a HEERS rater is required to witness the test, the HERS rater shall be paid for under this specification section.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Refrigerant Piping:

1. Piping: Hard or soft drawn Type ACR copper, R410A pressure rated, dried and capped. Wrought copper fittings, silver alloy brazed, 1100F, Silfos. Size 3/8" and smaller shall be refrigerant tube, ASTM B280. Install in strict compliance with Daikin installation manuals including vacuum and pressure testing.

B. Miscellaneous Piping Items:

1. Pipe Support:

a. Pipe Hanger: Steel "J" hanger with side bolt for piping 4" and smaller. Load and jam nuts. Size and maximum load per manufacturer's recommendations. Hanger and rod shall have galvanized finish. B-Line, Grinnell, Unistrut.

b. Insulation Support: Armafix insulation pipe inserts.

c. Construction Channel: 12-gage, 1-5/8" x 1-5/8" galvanized steel channel. Single or multiple section. Self-locking nuts and fittings. B-Line, Grinnell, Unistrut. Green guard coated.

2. SLEEVES.

a. Non-Rated Assemblies: Sleeves for pipe passing through concrete floors or walls shall be

Schedule 40 galvanized steel pipe of size sufficient to permit pipes to pass through with a minimum clearance of ½" between sleeve and pipe. Sleeves shall have square ends cut flush with surface and shall be caulked tight whether pipe is bare or insulated. Sleeves through floors or roof shall extend 1" above finished floor surface.

b. Rated Assemblies: Same as for non-rated assemblies except that sleeves be fire caulked with a U.L. rated fire caulking assembly. Exact details of U.L. listed assembly shall be followed. Provide inspector of record and project engineer submittal showing U.L. listed fire caulking detail that the contractor intends to use for each condition.

3. Flashing: Flashing for piping through roof shall be prefabricated galvanized steel roof jacks with 16" square flange around pipe. Provide clamp-on storm collar and seal water tight with mastic. Maintain dielectric separation between copper and galvanized materials. For cold process built-up roof, material shall be 4 lb/ft^2 lead instead of galvanized steel.

2.2 PIPING INSULATION MATERIALS

A. General: All piping insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Aluminum Jacketing: Aluminum pipe and fitting jacketing, 0.016" thickness for straight pipe. 0.024" thickness for fittings. Integral moisture barrier. Stucco-Embossed finish. Provide pre-fabricated aluminum strapping and seals by same manufacturer. Childers.

C. Outdoor Mastic: Childers CP-21, Foster 65-05.

D. Insulating Tape: Ground virgin cork and synthetic elastomeric. Black, odorless, and non-toxic. K factor 0.43 Btu-in/hr- ft^2-ºF or less. Non-shrinking. For outdoor use, provide protective finish by same manufacturer. Halstead.

E. Foamed Plastic: Rubber based elastomeric preformed pipe insulation. Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft^2-ºF at a mean temperature of 70ºF. 1/2" thick. Provide adhesive by same manufacturer. Armstrong Armaflex.

2.3 DUCTWORK MATERIALS

A. General: All ductwork materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50. Shall comply with UMC Standard 6-2.

B. Metal Ductwork: Metal ductwork shall be galvanized sheet steel, lock forming quality, ASTM A-527, with gage and construction to match SMACNA Standard for pressure required (26 gage minimum). Interior ductwork shall be constructed with G60 or better galvanized steel. Exterior ductwork, or any ductwork exposed to high humidity environments (i.e. dishwasher exhaust) shall be G90 or better.

C. Ells. Rectangular ells of ninety degrees shall be mitered and fitted with AERO/DYNE, "HEP" or equivalent, adjustable turning vane of airfoil contour design. Side rails shall be installed so that vane at heel of elbow shall fit snugly without air passing on the back side. Spacing of vanes according to manufacturers recommendations.

D. Round Ducts, Galvanized: United McGill "Uni-Seal" spiral lockseam duct. For round ducts, 8" diameter or less, provide Noll or Young and company snap-lock galvanized steel with gage complying with Table 6-2 and hangers complying with Table 6-5, California Mechanical Code. Round elbows shall be United McGill pleated or welded gore for use with "Uni-Seal" or "Uni-Rib" ducts (5 piece ells) Non-welded gore elbows for use with snap lock ducts shall be taped at gore intersections

E. Support, access doors not part of ducts, bar or angle reinforcing damper rods and items made of uncoated mild steel shall be painted with two coats of two coats primer or provide galvanized equivalent

F. Duct Joints.

1. Ductwork located in unconditioned spaces shall be subject to leakage testing in accordance with 2005 CEC Building Energy Efficiency Standards, section 124.

2. Rectangular. All ducts shall utilize “Ductmate 25/35” factory fabricated duct joint connectors with #440 gasket tape. Flanged interior gaskets shall be Ductmate #440 or Butyl Rubber Gasket which meets Mil-C 18969B, Type II Class B, and TTS-S-001657 must also pass UL-723. The material must not contain any vehicle that will support fungal or bacterial growth. Formed on flanges shall not be accepted for any duct exceeding 42” in width or any duct subjected to greater than 2” W.G..

3. Round. All round ducts shall utilize male-female slip joints with minimum three (3) sheet metal screws. 0-20” ducts shall utilize sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with band of Versa Grip 181 sealant as required to meet UL-181 requirements. 24” – 72” ducts, use 3-piece, gasketed, flanged joints consisting of two internal flanges (with integral mastic sealant), and one external closure band. Ductmate Spiralmate or equal.

G. Sealing.

1. Versa grip 181 as described under round duct joints section of these specifications.

2. Exterior to Building - For joints exposed to weather, sealant shall be G.E. silicone.

3. Exposed Ducts. All joints shall use Hardcast Galva-Grip or equivalent. Joint shall be finished clean from outward appearance.

H. <u>Flexible Insulated Ducts.</u>

1. Flexible ductwork located in unconditioned spaces shall be required to have a minimum insulation value of R-8 and is subject to leakage testing in accordance with 2005 CEC Building Energy Efficiency Standards, section 124.

2. Shall be J.P. Lamborn Company Type AMF-07 or Thermoflex M-KE acoustical low pressure duct. Duct shall be listed and labeled UL-181 Air Duct; meet NFPA-HUD minimum standards and comply with UMC 6. Duct factory R-value 4.2 minimum.

3. Hangers shall consist of minimum 3" wide 28 gauge galvanized steel and shall be spaced a maximum of 36" on center. Flexible duct shall be installed in compliance with the manufacturer's latest installation instructions. No kinks or sharp bends allowed. Turning radius shall be a minimum of 1.5 times diameter of duct. A copy of which shall be at the site during and after installation. Provide a minimum of at least one hanger per duct section.

4. Connections to round ducts or collars shall be made with coating duct collar with versa grip 181 and securing collar with Hardcast 1402 B-FX 2” wide metal tape that meets UL-181 requirements. Seal outer jacket with galvanized or stainless steel worm clamps or "Panduit" adjustable clamps listed by UL-181B-C and tape with 1402 B-FX.

5. Unless indicated otherwise on the drawings, flexible duct shall be limited to the final 7 foot portion of the duct system connecting to the supply diffuser or return grille. Flex duct shall be limited to

factory cut pieces with factory applied end connections.

2.4 AIR TERMINALS AND DUCT FITTINGS

A. Grilles: (Grilles, Registers, Diffusers and Louvers)

1. Information on Drawings: Refer to Grille Schedule on the drawings for the list of grilles. Manufacturer's model numbers are listed to complete the description. Equivalent models of Carnes, Price, Titus or Tuttle and Bailey are acceptable. Manufacturer’s facilities must include a testing lab. Refer to the floor plans for neck size, CFM, air diffusion pattern and fire damper, if required.

2. Performance: Submit complete performance data (throw, pressure drop, noise level, etc.) for all grilles proposed, other than those scheduled. Testing shall be in accordance with ANSI/ASHRAE 70-1991. If, according to the certified data of the manufacturer of the proposed units, the sizes indicated on the drawings will not perform satisfactorily, the units shall be reselected by the Contractor for the proper diffusion, spread, pressure drop, throw and noise level.

3. Frame and Accessories: All supply, return, and exhaust grilles shall have an opposed blade volume control damper unless otherwise noted. All surface mounted grilles shall have a perimeter gasket and flanged edge. All grilles shall have frames suitable for mounting in the surfaces designated by the architectural drawings. Key or screwdriver operated, no slide bars.

4. Finish: All ceiling and wall grilles and all louvers shall have a paintable white finish unless otherwise noted. Interior components (everything behind the face plate) shall be flat black. Floor grilles shall have an anodized aluminum finish unless otherwise noted.

B. Branch Duct Volume Damper: Volume control damper (VCD) in rectangular ducts shall be as follows: Opposed blade, 6" maximum blade width, 16-gage blade, 48" maximum length, nylon or oil impregnated bronze bearings, 1/2" diameter pin shaft, 16-gage channel frame, actuating rod and linkage out of air stream. VCD in round duct shall be as follows: Damper blade full height of branch and 1" less than branch width. All branch dampers shall have regulator with stamped steel handle, spring loaded shaft nut, cast body and serrated self-locking die cast core. Secure a 12" length of brightly colored plastic ribbon to handle for ease of location. Where rectangular or round ductwork is insulated, slit insulation to allow handle to protrude. Ventlok 641 (with 607 end bearing for round ducts). Provide remote ceiling operator with chrome plated or painted cover where shown on drawings or where damper control is otherwise inaccessible.

C. Extractor: Curved blade turns in adjustable position rigid frame. Tuttle and Bailey Deflectrol.

D. Turning Vanes: Double wall, hollow metal, air foil shape. Spacing in accordance with manufacturer's recommendations. Aero Dyne HEP.

E. Flexible Connection: UL listed neoprene coated 30 ounce fiberglass cloth. 3" metal, 3" fabric, 3" metal. Ventglas, Dura-Dyne, Ductmate PROflex. Connectors with single fold seams will not be accepted.

F. Fire Dampers. Fire damper assembly shall bear the U.L. 555 Label and the California State Fire Marshall listing number. Provide duct access door to fire damper as required by job conditions in compliance with Title 24, California Mechanical Code, section 606. Fire dampers shall be installed in all rated walls and ceilings penetrated by ducts, grilles and diffusers. Fire damper shall have rating equivalent to construction. Dampers shall be installed in strict compliance with manufacturer's installation instructions.

G. Smoke/Fire Dampers. Damper Assembly shall bear the U.L. 555S Label and State Fire Marshall listing number. Provide access door to smoke damper as required by job conditions in compliance with Title 24, California Mechanical Code, section 606. Factory mounted in sleeve with factory mounted and wired duct

smoke detector. Means of disconnect shall be provided between detector and damper(s). Dampers shall meet most current standard for UL testing. UL555 and UL555S. Dampers shall be suitable for a dynamic system. See details on plans for leakage and velocity requirements. If not listed on plans, provide leakage class I and velocity level at 3,000 FPM.

H. Duct Access Door: Insulated double wall door. Full piano hinge. Cam latch. Pressure rating to match application. Air Balance.

I. Relief Vent: Factory fabricated, curb mounted gravity relief vent. Galvanized steel or aluminum. Throat area as indicated on drawings. Outlet area equal or greater than throat area. 1/2" birdscreen. Provide backdraft damper as specified elsewhere. Cook, Penn.

J. Back Draft Damper: Fabric blades. Aluminum or galvanized steel frame. Wire mesh stop. American Warming and Ventilating, Wonder Metal.

K. Duct Fire Caulking: All ductwork passing through rated assemblies that do not have a fire or fire/smoke damper shall be installed with a U.L. listed fire caulking assembly. Exact details of U.L. listed assembly shall be followed. Provide inspector of record and project engineer submittal showing U.L. listed fire caulking detail that the contractor intends to use for each condition. In lieu of fire caulking, at contractors option, provide fire damper installed in accordance with U.L. listing.

2.5 DUCTWORK INSULATION MATERIALS

A. General: All ductwork insulation materials shall have fire and smoke hazard ratings as tested under ASTM E-84 and UL 723 not exceeding a flame spread of 25 and smoke developed of 50.

B. Fiberglass Blanket: Thermal conductivity shall not exceed 0.27 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. 3/4 lb/ft^3, 1-1/2" installed thickness. Installed R-value of 4.2. Faced with glass reinforced foil laminated to Kraft paper. Certainteed, Knauf, Johns-Manville, Owens-Corning.

C. Fiberglass Board: Thermal conductivity shall not exceed 0.25 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. 3 lb/ft^3. 2” thick where installed outside the building insulation envelope; 1” thick where installed inside the building insulation envelope.

D. Acoustic Lining: Glass fiber. Thermal conductivity shall not exceed 0.24 Btu-in/hr-ft^2-ºF at a mean temperature of 75ºF. Coated to prevent fiber erosion up to 6000 ft/min. Noise reduction coefficient of 0.70 for 1” thickness; 0.85 for 2” thickness. 2” thick where installed outside the building insulation envelope; 1” thick where installed inside the building insulation envelope. Johns-Manville Permacote Linacoustic with Superseal anti-microbial edge treatment.

E. Bonding Adhesive: Childers CP-85.

2.6 EQUIPMENT

A. General Requirements:

1. Start-up: All equipment shall be started and tested in accordance with the manufacturer’s written instructions. Provide the inspector of record with factory start-up literature for each mechanical equipment item. Demonstrate to inspector that the start-up procedure has been completed. Start-up sheets shall be completed and submitted with O&M manuals. Start-up sheets shall be signed by the owner of the installing contractor, certifying that start-up has been completed per manufacturer’s written instructions.

2. Capacity: Capacities shall be in accordance with schedules shown on drawings. Capacities are to be

considered minimum.

3. Dimensions: Equipment must conform to space requirements and limitations as indicated on drawings and as required for operation and maintenance. Where Architectural screening is indicated, equipment shall not extend above or beyond screening. Equipment will not be accepted that does not readily conform to space conditions. Prepare and submit layout drawings for all proposed equipment (different than scheduled units) showing actual job conditions, required clearances for proper operation, maintenance, etc.

4. Ratings:

   a. Gas: Gas burning equipment shall be furnished with 100% safety gas shut-off, intermittent pilot ignition, and be approved by AGA, except that boilers shall be AGA approved or UL listed.

   b. Electrical: Electrical equipment shall be in accordance with NEMA Standards and UL or ETL listed where applicable standards have been established.

5. Piping: Each item or assembly of items shall be furnished completely piped for connection to services. Control valves and devices shall be provided. Equipment requiring domestic water for non-potable use shall be provided with backflow preventer acceptable for intended use by local governing authorities.

6. Electrical:

   a. General: Each item or assembly of items shall be furnished completely wired to individual terminal blocks for connection to single branch electrical circuit. All electrical accessories required by equipment shall be furnished. Provide terminal blocks for controls and interlocks not included in equipment package. Manual and magnetic starters shall have ambient compensating running overcurrent protection in all ungrounded conductors. Magnetic starters shall be manual reset, shall have H-O-A switches and auxiliary contacts. Controllers and other devices shall be in NEMA 1 or 3R enclosures as applicable.

   b. Wiring: Conductors, conduit, and wiring shall be in accordance with Electrical Specifications. Individual items within assembly shall be separately protected with dead front, fused disconnect, fuse block, or circuit breaker for each ungrounded conductor, all accessible on operating side of equipment. Switches, contacts and other devices shall be in ungrounded conductors.

   c. Motors: Shall be rated, constructed and applied in accordance with NEMA and ANSI Standards without using service factor. Single-phase motor shall be of type to suit application. Three-phase motors shall be open drip proof, NEMA B design on pumps and fans, NEMA C on reciprocating equipment, sealed ball bearing, three-phase induction unless otherwise noted. Motors from 1 horsepower to 5 horsepower shall be the standard high efficiency type, Magnetek E-Plus. Motors for use with VFD's and motors 7-1/2 horsepower and larger shall be the premium efficiency type, Class F insulation, tested according to IEEE Standard 112, Method B. Magnetek E-Plus III. Motors in a fan air stream shall be TEFC or TEAO. Vertical motors exposed to weather shall be ODP or TEFC and shall have rain caps. Horizontal motors exposed to weather shall be TEFC.

   d. Starters: Motor starters shall be furnished for all equipment except where starter is in a motor control center as designated on the electrical drawings. Deliver starter to Electrical Contractor for installation and wiring.

e. Control Voltage: Equipment connected to greater than 240 volts shall be provided with 120 volt control circuit from integral protected transformer if separate source is not indicated on plans. 240 volt control is acceptable if confined within control panel.

f. Submittals: Included in shop drawings shall be internal wiring diagrams and manufacturer's recommended external wiring.

7. Fan Selection:

a. Fan Curves: Performance curves shall be submitted for all units of 3000 CFM or greater. Operating point for forward curved fans shall be from point of maximum efficiency toward increased CFM limited by horsepower scheduled. Operating point for backward inclined fans shall be selected near point of maximum efficiency. Curves shall plot CFM verses static pressure with constant brake horsepower, RPM and efficiency lines.

b. Static Pressure: Unless otherwise noted, pressure scheduled as external static pressure (ESP) includes all ductwork and accessory losses external to the unit housing. Unless otherwise noted, pressure scheduled as total static pressure includes all ductwork, filter, coil, cabinet, damper and other accessory losses. Unless otherwise noted, pressure scheduled as duct static pressure includes all supply and return ductwork and accessory losses external to the unit housing and plenum (as applicable). The allowance for filter losses is 0.3" WC, unless otherwise noted. Submit itemized static pressure losses for all components.

8. Filters:

a. General: Tested and rated in accordance with ASHRAE Standard 52 - 92 and SFM 12-71-1, Part 12, Title 24, C.C.R. Furnish and install one complete change of all filters after air balance is completed and prior to acceptance.

b. Filter Media: 2" pleated media. MERV 8 rating..

9. Screens: All duct or louver openings to the outside shall be covered with 1/4", 16-gage, galvanized wire mesh screen.

10. Mixing Dampers: Opposed blade, 16-gage. Six-inch maximum blade width, 48" maximum length. Nylon or oil impregnated bronze bearings. One-half inch diameter pin shaft. 16-gage channel frame. One percent maximum leakage at 4" WC in accordance with AMCA 500 for outside air dampers. Actuating rod out of air stream. Arrow.

B. Heat Recovery Heat Pump

1. System Description

a. The variable capacity, heat recovery air conditioning system shall be a Daikin Variable Refrigerant Volume Series (simultaneous heat/cool model) split system. The system shall consist of multiple evaporators using PID control, and Daikin VRV® outdoor unit. The unit shall be a direct expansion (DX), air-cooled heat recovery air-conditioning system, variable speed driven compressor multi zone split system, using R410A refrigerant. The outdoor unit may connect an indoor evaporator capacity up to 130% to that of the outdoor condensing unit capacity. All indoor units are each capable of operating separately with individual temperature control.

b. The Daikin outdoor unit shall be interconnected to indoor unit models FXFQ, FXSQ,

FXMQ, FXDQ, FXLQ, FXNQ and FXAQ and shall range in capacity from 7,000 Btu/h to 48,000 Btu/h in accordance with Daikin's engineering data book detailing each available indoor unit. The indoor units shall be connected to the outdoor utilizing Daikin's REFNET specified piping joints and headers.

2. Quality Assurance

a. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

b. All wiring shall be in accordance with the National Electric Code (NEC).

c. The system will bear the Energy Star label.

d. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

e. The outdoor unit will be factory charged with R410A.

3. Delivery, Storage And Handling

a. Unit shall be stored and handled according to the manufacturer's recommendations.

4. Warranty

a. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at the discretion of Daikin US Corporation according to Daikin's Terms and Conditions.

5. Installation Requirements

a. The system must be installed by a Daikin factory trained contractor/dealer.

6. Performance

a. The operating range in cooling will be 23°F DB ~ 115°F DB. The operating range in heating will be 0°F DB – 64°F DB / -5°F WB – 60°F WB.

b.

c. The system shall be capable of refrigerant piping up to 575 equivalent feet, a total combined length of 1000 feet of piping between the condensing and fan coil units with 165 feet maximum vertical difference, without any oil traps or additional equipment. In case where the outdoor unit is located below the indoor unit, the vertical difference is a maximum of 133 feet.

C. Outdoor Unit

1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a Daikin scroll compressor, motors, fans, condenser coil, electronic expansion valve, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receivers and accumulators.

2. The outdoor unit can be wired and piped with outdoor unit access from left, right, rear or bottom.

3. The connection ratio of indoor units to outdoor unit will be 50% to 130%.

4. The sound pressure dB(A) at rated conditions shall be a value of 58 decibels at 3 feet from the front of the unit. The outdoor unit shall be capable of operating at further reduced noise during night time.

5. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.

6. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.

7. The following safety devices shall be included on the condensing unit; high pressure switch, control circuit fuses, crankcase heaters, fusible plug, high pressure switch, overload relay, inverter overload protector,

D. FXMQ Indoor Unit – Ceiling Concealed Ducted Unit

1. General: Daikin indoor unit FXMQ shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be a horizontal discharge air with horizontal return air configuration. Computerized PID control shall be used to maintain room temperature within 1°F. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with Daikin remote control BRC1C71 and BRC2A71. The indoor units sound pressure shall range from 41 dB(A) to 45 dB(A) at low speed measured 5 feet below the ducted unit.

2. The Daikin indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.

3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.

4. Both refrigerant lines shall be insulated from the outdoor unit.

5. The indoor units shall be equipped with a return air thermistor.

6. The cabinet shall be located into the ceiling and ducted to the supply and return openings.

7. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

8. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.

9. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz.

10. The air flow rate shall be available in high and low settings.

11. The fan motor shall be thermally protected.

12. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.

13. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.

14. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.

15. The refrigerant connections shall be flare connections and the condensate will be 1-1/4 inch outside diameter PVC.

16. A thermistor will be located on the liquid and gas line.:

17. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General:

1. Piping Layout: Piping shall be concealed in walls, above the ceilings, or below grade unless otherwise noted. Exposed piping shall run parallel to room surfaces; location to be approved by Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise, unless specifically allowed by structural drawings and/or specifications. Where such cutting is required, reinforcement shall be provided as specified or detailed. All piping shall be installed in a manner to ensure unrestricted flow, eliminate air pockets, prevent any unusual noise, and permit complete drainage of the system. All piping shall be installed to permit expansion and contraction without strain on piping or equipment.

   a. Welded or Brazed: Filler rod shall be of suitable or the same alloy as pipe. Brazing filler metal shall have a minimum melting point of 1100ºF. Welding or brazing shall be performed by a Certified Welder or Brazer as certified by an organization/institution that uses standards recognized by the American Welding Society (AWS) and meets the requirements of the ASME Boiler and Pressure Vessels Code, Section 9.

   b. Open Ends: Open ends of piping shall be capped during progress of work to preclude foreign matter.

2. Fittings and Valves:

   a. Standard Fittings: All joints and changes in direction shall be made with standard fittings.

   b. Reducers: Pipe size reduction shall be made with bell reducer fittings. Bushings shall not be used.

3. Pipe Support:

   a. General: Hangers shall be placed to support piping without strain on joints or fittings.

Maximum spacing between supports shall be as specified below. Actual spacing requirements will depend on structural system. Refer to drawings for additional requirements and attachment to structure. Side beam clamps shall be provided with retaining straps to secure the clamp to the opposite side of the beam. Vertical piping shall be supported with riser clamp at 20' on center (maximum). Support pipe within 12" of all changes in direction.

Pipe Size (In.)	Maximum Spacing Between Supports (Ft.)*		
	Copper	Steel	Plastic
1/2	6	6	4
3/4	6	8	4
1	6	8	4
1-1/4	6	8	4
1-1/2	6	10	4
2	10	10	4
2-1/2	10	10	4
3	10	10	4
4	10	10	4
6	10	10	4
8	10	10	4

*Based on straight lengths of pipe with couplings only. Provide additional supports for equipment, valves or other fittings. Plastic piping shall be supported per the manufacturer's recommendations. Seismic requirements may reduce maximum spacing.

b. Non-Insulated Piping: Support individual pipes with pipe hanger.

c. Refrigerant Piping: Support insulated refrigerant line with construction channel and sheet metal support saddle. 5' spacing. Use isolation shield for uninsulated pipe. When using pre-charged tubing, all changes of direction shall be made with bending tools producing neat uniform bends. Free hand bends will not be accepted.

4. Miscellaneous:

a. Escutcheons: Provide chrome plated metal escutcheons where piping penetrates walls, ceilings, or floors in finished areas.

b. Pipe Sleeves: All piping passing through concrete shall be provided with pipe sleeves. Allow 1" (nominal) clearance between sleeve and pipe or pipe insulation. Piping through walls below grade shall be sealed with Link-Seal.

c. Pipes Passing through Fire Rated Surfaces: Pipes passing through fire rated walls, floors, ceilings, partitions, etc. shall have the annular space surrounding the pipe or pipe insulation sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

B. Refrigerant Piping: Pipe shall be cut square. Joint surfaces shall be thoroughly cleaned, fitted and erected before brazing. After installation, evacuate and pressure test in accordance with Daikin written specifications. See installation manuals. Refrigerant piping below grade shall be run in 6" (min.) PVC conduit with long radius ells. Seal ends of conduit watertight.

3.2 PIPING INSULATION INSTALLATION

A. Refrigerant Piping: Cover suction (and liquid / hot gas lines where required by manufacturer) piping with foamed plastic insulation. Longitudinal and end seams shall be thoroughly cemented with adhesive in accordance with manufacturer's recommendations. Cover all fittings, unions, valves and connections. Piping exposed to weather shall be covered with aluminum jacketing, seal all joints with outdoor mastic.

B. All piping and fittings exposed to weather shall have, in addition to the above described insulation, an aluminum jacketing. Insulation at grooved pipe couplings shall be covered with aluminum flange fitting covers. Secure in place with factory supplied straps. Install all joints to prevent water entry. All joints shall be sealed with outdoor mastic.

3.3 DUCTWORK INSTALLATION

A. General:

1. Standards: Unless otherwise noted, all ductwork shall be constructed and installed in accordance with current SMACNA Standards. Ductwork shall be built to a pressure classification equal to or greater than the maximum operating pressure at that point in the ductwork. A copy of these standards shall be maintained at the job site at all times. Duct work and accessories shall be installed in a manner to prevent vibration and rattling.

2. Ductwork located in unconditioned spaces shall be required to have a minimum insulation value of R-8 and is subject to leakage testing in accordance with 2005 CEC Building Energy Efficiency Standards, section 124.

3. Access: Provide duct access doors as required to adjust equipment and dampers. Provide wall or ceiling access panels, or remote actuators as required where equipment and dampers are not otherwise accessible. Ventlok 666 concealed remote actuator with zinc finish on cover.

4. Flexible Connections: Connection of ductwork to any vibrating equipment shall be with 3" (min.) flexible connection. Install with ample slack and uniform gap. There shall be no metal to metal contact across flexible connection. Flexible connections exposed to weather shall have a protective sheet metal cover.

5. Flanges and Escutcheon: Where ductwork penetrates walls, ceilings, or floors, furnish and install flange or escutcheon of same material as duct.

6. Ductwork Passing through Fire Rated Surfaces: Ductwork passing through fire rated walls, floors, ceilings, partitions, etc. shall have the space surrounding the ductwork sealed with fire rated materials in accordance with the requirements of the fire authority having jurisdiction.

B. Low Velocity-Low Pressure (up to 2,000 ft/min and up to 2.0 in water):

1. Sheet Metal Ductwork:

a. Ells: Ells with less than standard radius and square ells shall be fitted with turning vanes.

b. Tees: Tees in supply ductwork shall be straight tap-in with extractor or 45 degree take-off as shown on drawings. Duct mounted supply grilles shall be installed with an extractor. Grilles or branches in supply ductwork shall be a minimum of 8 duct diameters downstream of tees.

c. Duct Joints / Duct Sealants: Rectangular Ducts: Ducts shall be joined with duct joint

connectors. Round Ducts: Ducts shall be joined with male-female slip joints and a minimum of three sheet metal screws. All joints and seams which are not exposed to weather shall be sealed airtight with fiber tape and liquid adhesive. Tape shall extend 3/4" on both sides of joints. All joints and seams exposed to weather shall be sealed air and water tight with G.E. "Silglaze II" silicone sealant. All joints on spiral wound metal ductwork not exposed to weather shall be sealed air tight with duct sealant.

d. Dampers: Install volume control damper and damper regulator in all branch ducts.

2. Flexible Glass Fiber Ductwork: The use of flexible duct is limited to the last 7 feet of each branch duct (i.e. one 7 foot section of flexible duct may be used to connect the grille to the sheet metal branch duct). No joints are permitted in this 7' length. Hangers shall be 4" wide metal straps spaced to prevent sagging, 42" spacing maximum. Insert 6" wide fiberglass pad between duct and hanging strap. Joints shall be installed with stainless steel or nylon draw bands, Duro Dyne Dyn-O-Tie. Minimum turn radius shall be in accordance with SMACNA Standards (turn radius of duct centerline not less than 1.5 times the duct diameter). Connections to round ducts or collars shall be made with coating duct collar with versa grip 181 and securing collar with Hardcast 1402 B-FX 2” wide metal tape that meets UL-181 requirements. Seal outer jacket with galvanized or stainless steel worm clamps or "Panduit" adjustable clamps listed by UL-181B-C and tape with 1402 B-FX.

3. Spiral Wound Metal Ductwork: At side duct grilles, the grille shall be cut directly into the spiral duct. Duct to duct joints shall be made with factory joint connectors and the spiral seam rotated so that the seam forms a continuous helical pattern across the joint.

4. Underground Ductwork: Install ducts with constant slope up to grilles. All ducts and fittings shall be anchored to prevent floating as slab is poured. Any duct or fitting which is not protected with a polyvinyl chloride coating shall be encased in 3" (min.) concrete.

3.4 AIR TERMINALS AND DUCT FITTINGS INSTALLATION

A. General: Unless otherwise noted, all air terminals and duct fittings shall be installed in accordance with current SMACNA Standards. Terminals and fittings shall be installed in a manner to prevent vibration and rattling. Metal surfaces exposed to view behind grilles and registers shall be painted flat black.

B. Fire and Combination Fire/Smoke Damper: Shall be installed in accordance with the manufacturer's recommendations. Provide access doors as required. Manufacturer's instructions shall be available to the inspecting authorities. Shall be tested according to State Fire Marshal requirements.

3.5 DUCTWORK INSULATION INSTALLATION

A. General: Insulate all sheet metal supply and return ductwork except as noted below. Insulation shall be continuous through walls and floors except at fire dampers. All ductwork used for supply and return located in exterior conditions or unconditioned spaces as defined in CCR title 24 shall be insulated to a thermal resistance of R8.0, minimum. All ductwork used for supply and return that is located in indirectly conditioned spaces as defined in CCR title 24 shall be insulated to a thermal resistance of R4.2.

B. Where Insulation Is Not Required: Do not insulate factory-insulated ducts or casings, acoustic lined ducts, underground ductwork, supply or return ductwork exposed to view in the space that it serves, or exhaust ductwork (except where lined for acoustical purposes). Exceptions to these rules may apply for condensation control of outside air or other ductwork. See plans for specific requirements.

C. Concealed Ductwork: Wrap concealed ductwork with fiberglass blanket lapped 6" minimum. Secure with staples 4" on centers maximum on straight runs and 3" maximum at elbows and fittings. Insulation on bottom of ducts wider than 36" shall also be secured with mechanical fasteners at 24" on center.

D. Acoustic Lining: Unless otherwise indicated, all supply and return ductwork in equipment rooms including outside air intakes, all ductwork exposed to weather and other ducts as indicated on drawings, shall have acoustic lining. Acoustic line all supply, return or exhaust duct connections to HVAC units or fans for a minimum of 10 lineal feet upstream and downstream of unit or fan, unless otherwise indicated on drawings. Do not acoustic line evaporative cooling ductwork or ductwork downstream of high efficiency filters. Where acoustic lining is installed, increase each sheet metal dimension to accommodate lining and maintain clear inside duct dimensions shown on drawings. Apply lining with bonding adhesive in accordance with manufacturer's recommendations and also secure with mechanical fasteners in accordance with SMACNA Standards. Provide with antimicrobial edge coating, Johns Manville Superseal Edge Treatment or Superseal HV. Coating edges with adhesive is not acceptable. All field cut edges must be coated prior to delivering duct to job site. Any lined duct left untreated that has been subjected to dirt and / or dust will be rejected, and will not be accepted for installation. Edges must be treated so that complete coverage is obtained, with no raw edges. Apply as directed by manufacturer’s literature.

E. Exposed Ductwork: All externally insulated ductwork which is exposed to view but protected from the weather shall be insulated with fiberglass board. Secure with mechanical fasteners at 12" on center. Reinforce all edges with corner angles and apply a finish coat of canvas or stretchable glass fabric and lagging adhesive.

F. Ductwork Exposed to Weather and Externally Insulated: Ductwork which is exposed to weather, but not internally insulated such as ductwork downstream of high efficiency filters or ductwork on combination evaporative cooled and heated air systems shall be externally insulated with fiberglass board. The fiberglass board shall then be protected with a galvanized sheet metal jacket per SMACNA standards.

3.6 EQUIPMENT INSTALLATION

A. General: It shall be the responsibility of the equipment installer to ensure that no work done under other specification sections shall in any way block or otherwise hinder the equipment. All equipment shall be securely anchored in place. All equipment shall be installed level.

3.7 SYSTEM ENERGY BALANCE

A. General: The contractor shall employ the services of an independent system balancing company registered by NEBB or AABC to test, adjust and balance, retest and record performance of the system to obtain design quantities as specified. The agency must prove that they have no affiliation with any equipment manufacturer, design engineer, installing contractor, or any other party which might lead to a conflict of interest, in order to provide an unbiased, third party system balance and report. The balancing contractors shall be limited to one of the following:

Air Control Balancing 2140 N. Winery, Suite 103, Fresno, Ca. 93703 (559) 454-8000
American Air Balance 4721 E. Hunter, Anaheim, Ca. 92807 (714) 693-3700
Los Angeles Air Balance 1848 W. 11th St., Unit #N, Upland, Ca. 91786 (909) 931-1114
RS Analysis 111 Natoma Street, Folsom, Ca. 95630 (916) 351-9842
National Air Balance 4171 Business Center Drive, Fremont, Ca. 94538 (510) 623-7000

B. Instruments: All instruments shall be accurately calibrated; calibration histories shall be available for examination. Application of instrumentation shall be in accordance with AABC or NEBB standards.

C. Submittals: Include in shop drawings copies of forms to be used for testing and balancing showing all data which is to be recorded. Three copies of completed balance report shall be submitted for review.

D. Procedure - General: Procedure shall be in accordance with Associated Air Balance Council's "National Standards for Field Measurements and Instrumentation - Total System Balance", Volume Two, No. 12173, or equivalent NEBB standards. System shall be in full, continuous operation during test. Balanced quantities

shall be plus 10%, minus 0% of design quantities. All nameplate data, manufacturer, model and serial numbers shall be recorded for each item tested.

E. The balancing contractor shall note in writing all discrepancies found that impede the precise balancing of the air and water systems. The written report shall be submitted to the IOR and the mechanical engineer prior to completing final balance.

F. Extended Warranty: The test and balance agency shall include an extended warranty of 90 days after completion of test and balance work, during which time the Engineer, at his discretion, may request a recheck or resetting of any item or items in test report. The agency shall provide technicians to assist the Engineer in making any tests he may require during this period of time.

G. Air Balance Procedure (For Each Air Handling System):

1. All air filters shall be clean when air balance is performed.

2. Provide a sketch of the equipment showing exactly where all pressure readings were taken.

3. Adjust blower RPM to design requirements.

4. Record motor full load amperes.

5. Make pitot tube traverse of main supply and return ducts and obtain design CFM at fans.

6. Record system static pressures, inlet and discharge.

7. Record filter quantity, size(s) and pressure drop across filter(s) at each filter bank.

8. Adjust system for design CFM recirculated air.

9. Adjust system for design CFM outside air.

10. Record entering air temperatures. (DB heating, DB and WB cooling.)

11. Record leaving air temperatures. (DB heating, DB and WB cooling.)

12. Adjust all main supply and return air ducts to design CFM.

13. Adjust all zones to design CFM, supply and return.

14. Adjust all diffusers, grilles and registers to plus 10%, minus 0% of design requirements.

15. Adjust CFM at all exhaust fans, make-up units, etc. (high and low speed, where applicable). Record applicable data from items 1 through 11 above.

16. Each grille, diffuser and register shall be identified as to location.

17. Verify proper diffusion pattern for all ceiling grilles and that all sidewall grilles are set for 5 degrees upward deflection unless otherwise noted. Make a notation of any that are not set properly.

18. Size, type and manufacturer of diffusers, grilles, registers and all tested items shall be identified and listed. Manufacturer's ratings shall be used to make required calculations on all items.

19. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test

resultant velocity, required CFM and test resultant CFM after adjustments.

20. In cooperation with the control manufacturer's representative, set adjustments of automatically operated dampers to operate as specified. Testing agency shall check all controls for proper calibrations and list all controls requiring adjustment by control installers.

21. All diffusers, grilles and registers shall be adjusted for required air patterns and to minimize drafts.

22. As a part of the work of this contract, THE AIR CONDITIONING CONTRACTOR shall make any changes in pulleys, belts and dampers or the addition of dampers required for correct balance as recommended by air balance agency, at no additional cost to Owner.

3.8 TEMPERATURE CONTROL SYSTEM

A. Scope: The control system includes control panels, control devices, line and low voltage wiring, conduit and related equipment as required for proper operation of all controlled systems.

B. Type of system: The control system shall be direct digital.

C. Contractor Qualifications: All controls shall be furnished and installed by a Contractor who is licensed, certified or contracted by the controls manufacturer for design, installation, start-up and service of their product. The Contractor must have factory supplied training and support. The Contractor must have sufficient personnel to respond to a trouble call at the site within two hours.

D. Submittals: Submittals shall include the following:

1. Contractor qualifications. Manufacturer licenses, contracts or certifications for the installer shall be submitted on manufacturer's letterhead.

2. Manufacturer's data for all devices.

3. Manufacturer's data for all software.

4. Diagrams showing control schematics. Diagrams shall include all sensors, terminal strips, panels and control devices. Locations of all devices shall be indicated.

5. Sequence of operation.

6. Site plan showing trench and pullbox locations.

E. Basis of Design and Substitutions: This specification is based on a Daikin system. Other manufacturers may be submitted for review. A conformance document must be submitted with a substitution. This document shall list the title of each paragraph of the specification with a notation of compliance, partial compliance with full explanation, or non compliance. If compliance is by a means or method other than what is specified, the functional equivalent proposed shall be described in detail.

F. System Components:

1. See control notes on plans.

G. Installation: All electrical work shall be in accordance with the National Electrical Code and the Electrical Specification Sections. All electric/electronic systems where concealed (example; wall drops, in crawl space) shall be hardwired in conduit. Wiring routed though attic and similar spaces may be routed without conduit but must be installed in a workman like manner and strapped to structure. Wiring shall be concealed in walls,

above the ceilings, or below grade unless otherwise noted. Exposed wiring shall run parallel to room surfaces; location shall be approved by the Engineer. No structural member shall be weakened by cutting, notching, boring or otherwise. Provide a 120 volt circuit for each device requiring external power. Dedicated circuits shall be provided where required. Any devices or wiring exposed to the weather shall be protected in weatherproof enclosures such as NEMA 3R and weatherproof conduit. Set, test and adjust the system for proper operation.

H. Programming: The Contractor shall be responsible for programming the system and shall coordinate the scheduling (on/off times) with the Owner.

I. Training: Prior to final acceptance, the Contractor shall provide operational training to the Owner's personnel. The training sessions shall include a complete demonstration of the system. Dates and times of the training sessions shall be coordinated through the Owner not less than one week prior to session. A total of 16 hours of instruction shall be provided - 8 hours initially, and 8 hours to be spread throughout the first year of operation. The Contractor shall maintain a log of training sessions including dates, times and names/titles of those attending. The Contractor shall submit a copy of this log on request.

J. Testing and Acceptance: The Contractor shall furnish a complete and operating system. The Contractor shall also verify, in the presence of the Owner, the system accuracy and proper function of each controlled device and sensor. The following items shall be successfully demonstrated prior to acceptance by the Owner:

1. All system outputs including controllers, relays, and other control devices shall be addressed and start/stop functions demonstrated.

2. All inputs shall be displayed and all event-initiated functions shall be demonstrated.

3. Demonstrate program integrity and power restore sequence during and after a power failure and restoration.

4. Deliver all As-Built drawings, wiring diagrams, equipment specifications, Operation and Maintenance Manuals and other documentation as required to describe the system.

5. Complete operator training in the use, programming, and operation of the system.

K. Operation and Maintenance Manuals: Furnish Operating and Maintenance Manuals for all components. These manuals shall contain full documentation which shall include, without being limited to, the following:

1. General description and specifications.
2. Installation and initial checkout procedures.
3. Principles and theory of operation.
4. Complete trouble-shooting procedures and diagrams.
5. Complete alignment and calibration procedures for all components.
6. Preventative maintenance requirements.
7. Detailed schematics and assembly drawings.
8. Complete recommended spare parts lists including unit prices.

END OF SECTION 15800

SECTION 16010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 SCOPE OF WORK

A. The work under this Division of the Specifications includes all labor, materials and appliances required to furnish and install the electrical work shown on the drawings and herein specified, and except as otherwise distinctly specified herein shall be complete and ready for use. Work shall include but not be limited to:

1. Complete underground distribution system with 480:208Y/120 volt 3 phase, 4 wire outdoor transformers and distribution switchboards.

2. Complete 480/277 and 120/208 volt, 3 phase, 4 wire lighting and power systems.

3. Complete integrated communications systems including, but not limited to telephone, public address and classroom passing signal system.

4. Complete multiplex fire alarm system.

5. Complete conduit, outlet boxes and modular jacks for the data (computer) system. Furnish and install category 6 cabling.

6. Complete intrusion alarm system.

7. Complete parking lot and walkway lighting system.

8. Conduits, vaults, trenching, etc. for power, telephone and cable television service.

9. All hangers, anchors, sleeves, chases and supports for fixtures, all electrical equipment and materials.

10. Access openings, panels, etc., in the building construction where required for the maintenance of, installation and/or removal of all equipment, or other items of the various electrical systems and equipment.

11. Demolition work as required to clear the way for the work of this project.

12. All excavation, backfill, concrete pads and bases required for electrical work.

13. Include payment of all required insurance, permits, fees and taxes. Any inspection Certificates required for the completion of all work included in this Contract shall be obtained and delivered to the Owner.

14. All utility companies service charges.

B. Work Not Included: The following work shall be done under the Mechanical Division of the Specifications:

1. Furnishing of all electrical or partially electrical devices related uniquely to the mechanical equipment and only as specifically indicated in the Mechanical Division of the Specifications.

2. Furnishing and installation of all motors.

3. Furnishing and installation of all equipment, such as solenoid valves which are to be installed in piping lines.

4. Furnishing and installation of all conduit and wiring for temperature controls and energy management systems.

1.3 NON-SPECIFIED EQUIPMENT OR MATERIALS

A. In the event equipment or materials are indicated on the drawings but not described as to type or quality, etc., either on the drawings or in the Specifications, the Contractor shall determine from the Architect, prior to submitting his bid what this descriptive information is and shall base his bid accordingly. Should he fail to do this, he shall furnish such equipment and material as later indicated to be the intent by the Architect without change in contract price.

1.4 SUBMITTALS AND SUBSTITUTIONS

A. Within 60 days after award of the General Contract, the Contractor shall submit a complete list of all materials he intends to use on the job. Where materials are specified by description and no manufacturers' names are mentioned in the specification, these materials need not be listed. Where one or more manufacturers' names

are mentioned in the specification for any material, he shall list the material or device along with the name of the manufacturer he intends to use and a note to the effect that the material will be as specified.

B. Should the Contractor desire to substitute for specified materials or equipment, he shall submit to the Architect a complete list of the requested substitutions within 60 days after the award of the General Contract. The request for substitution shall contain complete descriptive information as prepared by the manufacturer of the material or equipment being presented. Samples for evaluation shall also be submitted upon the Architect's request. If, in the Architect's opinion, the material or equipment as presented in this first submittal is in variance with the specified material or equipment, or if the information submitted is not sufficiently complete to allow proper evaluation, the substitution will be voided from consideration and the specified equipment and material shall be furnished.

1.4 SHOP DRAWINGS

A. Within 60 days after the award of the general contract, the Contractor shall submit to the Architect, for written review, shop drawings of all switchboards, panels, terminal cabinets, and all lighting fixtures which are not illustrated or listed in the manufacturer's catalogs. The Contractor shall check, correct and indicate approval of these shop drawings prior to submission to the Architect. The Contractor is responsible to provide all items covered by shop drawings in compliance with all requirements of the contract documents and thus ordering of this equipment is at his option. The intent of early submittal of shop drawings is to attempt to minimize possibilities of misunderstanding or misinterpretation. Unless otherwise specifically directed in the following specifications, the submittal of shop drawings by the Contractor to the Architect shall be as follows.

B. The Contractor shall submit to the architect eight (8) copies of each shop drawing, only after he has made his check of the drawing. All shop drawings received without the Contractor's note of approval will be subject to return without review. The drawings shall be numbered consecutively.

C. The Contractor shall, at his own expense, furnish all shop drawings, material samples and lists of materials and equipment he proposes to use, as required in these specifications and/or as called for by the Architect. These shop drawings, samples and lists shall be reviewed and returned to the Contractor within 21 days after receipt by the Architect.

D. In the event that certain shop drawings are rejected by the Architect, they will be so noted and returned to the Contractor for resubmittals. Resubmittals are to be made within 14 days.

E. If the shop drawings show variations from the contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that (if acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.

F. The Architect's review of shop drawings will be for general design and arrangement only, and shall not relieve the Contractor from responsibility for errors of any sort in shop drawings or schedules. The Contractor shall verify and be fully responsible for all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the shop drawings when reviewed.

G. Shop drawings for special lighting fixtures shall be completely detailed, and shall contain sufficient information to enable a workman to construct and install the fixture without further instruction.

1.6 REGULATIONS, CODES AND PERMITS

A. All work and materials shall be in full accordance with the latest rules of the National Board of Fire Underwriters, any state ordinances, Title 24, Part 3, California Code of Regulations, Electrical Regulations of the State Fire Marshal and with any prevailing rules and regulations pertaining to adequate protection and/or guarding of any moving parts or otherwise hazardous locations.

B. Nothing in these plans and specifications is to be construed as permitting work not conforming with these codes.

C. Should any changes be necessary in the drawings or specifications to make the work comply with these requirements, the Contractor shall notify the Architect at once and cease work on all parts of the contract which are affected.

D. The Contractor shall apply and pay for all permits required by any of the legally constituted public authorities for the installation or construction of the work included under this Division. The Contractor shall arrange and pay for any inspections or examinations so required and deliver certificates of all

such inspections to the Architect.

1.7 UTILITY COMPANY SERVICES

A. Contractor shall be responsible to contact the respective serving utility company planning office and coordinate all requirements for provision of power, telephone/communications and cable television services to the project per published and stated utility company requirements.

B. Drawings represent general installation and routing requirements for utility services only. Utility company engineered service drawings shall supercede any requirements shown on the drawings at no additional cost to the Owner.

1. Power and lighting service and metering facilities shall conform to the requirements of the serving utility. Contractor shall verify service location and requirements, and shall pay all costs levied by the serving utility for rendering electric service to the project without additional cost to the Owner. Service information will be furnished by the serving utility.

2. Upon receipt of notice that the Contract Award has been made, the contractor shall notify the New Business Department of the District Office of the serving power utility that he is the project contractor and will also furnish information as to the total lighting and power loads for the job. He shall furnish at the same time information as to the estimated completion date of job or the date when electric service will be desired.

3. All underground conduits with service voltage of 11 KV or greater, and where crossing public property, shall be encased with a 6 inch concrete envelope.

4. Grounding at the utility service transformer vault shall be executed in accordance with the requirements of the serving utility company.

5. Telephone/communication service shall be as required by the serving utility. The contractor shall verify location and requirements of service. The contractor shall obtain all permits and pay for all costs to public authorities when crossing public property without additional cost to Owner.

6. Upon receipt of notice that the Contract Award has been made, the contractor shall notify the serving utility of the estimated date when service will be desired. The Utility Company shall be notified fifteen days in advance of the date when underground service conduit is to be installed in order that they may inspect and accurately locate the conduit on their maps.

1.8 LOCATIONS

A. The drawings indicate diagrammatically the desired location or arrangement of conduit runs, outlets, equipment, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the work so as to secure the best possible installation in the available space and to overcome difficulties owing to space limitations or interference of structural conditions wherever encountered. It shall be the Contractor's responsibility to verify and coordinate the location of all outlets and lighting fixtures with the architectural, structural and mechanical drawings and with all shop drawings, including casework shop drawings. Refer to Section 01040 of these specifications.

B. Architectural elevations and reflected ceiling plans shall generally take precedence. However, in the event of large variations between architectural and electrical drawings the Architect shall be consulted for instructions. Unless specifically indicated otherwise, all lighting fixtures and/or fixture stems shall be placed symmetrically with respect to the ceiling tile pattern or other architectural ceiling and wall modules.

C. In the event changes in the indicated locations or arrangements are necessary due to developed conditions in the buildings' construction or rearrangement of furnishings or equipment, such changes shall be made by the Contractor without extra cost, providing the change is ordered before the conduit runs, etc., and/or work directly connected to same is installed, and no extra materials are required.

1.9 EXCAVATIONS

A. Do all excavating necessary for the proper installation of the electrical work whether or not indicated on the drawings or specified. When on the Owner's property, underground primary and secondary services and high voltage feeders shall be buried not less than 24" below finished grade; and other conduit runs containing circuits of 600 volts or less shall be not less than 24" below finish grade. Where conduit runs traverse public property, the depth below finish grade shall be as required by the legally constituted public authorities

having jurisdiction.

B. After the installation of work requiring excavations has been inspected and approved, all excavations shall be filled with clean earth and compacted in accordance with Section 02200 of these Specifications. All excavated earth which is not used for backfill shall be removed from the premises or otherwise disposed of as directed.

C. The Contractor shall pay all charges incident to the installation of conduits across public streets and alleys.

1.10 CUTTING AND PATCHING

A. The Contractor shall do all cutting and patching of the construction work, and of existing walks, pavements, and buildings which may be required for the proper installation of the electrical work. All patching shall be of the same materials, workmanship and finish as, and shall accurately match all surrounding work. All work shall be done under the Architect's instructions, and by the trade which did the original work. All lintels and other supports required, in the Architect's opinion, by reason of any cutting, shall be provided and installed by the Contractor as directed by the Architect. No cutting of any structural number is allowed unless fully detailed on an DSA approved drawing.

1.11 PROTECTION OF WORK

B. The Contractor shall protect all work, materials and equipment from damage from any cause whatever, and shall provide adequate and proper storage facilities during the progress of the work. He shall provide for the safety and good condition of all work until final acceptance of the work by the Owner, and replace all damaged or defective work, materials, and equipment before requesting final acceptance.

C. The Contractor shall be held responsible for the protection and correction of the work of all trades from smears, splashes, stains or damages that might occur in the process of the work.

1.12 CLEANING OF EQUIPMENT, MATERIALS AND PREMISES

A. The parts of the equipment shall be thoroughly cleaned of dirt, rust, cement, plaster, etc., and all cracks and corners scraped out clean. Surfaces to be painted shall be carefully cleaned of grease and oil spots and left smooth, clean and in proper condition to receive paint finish. Refer to General Conditions, Section 01500 and Section 01700.

A. The Contractor shall carefully examine the site and existing buildings, shall compare the drawings with the

1.13 RECORD DRAWINGS

A. At the beginning of the project, one blue-line print each applicable drawing, will be issued by the Architect's office for use in preparing record drawings.

B. Record drawings shall be recorded on the blue-line prints as the project progresses. Upon completion of the work and before final inspection, the Contractor shall submit the updated set to the Architect's office. When the marked up prints have been accepted by the Architect, the Contractor shall secure and pay for a complete set of reproducible transparent sepia mylar prints of the original contact drawings and transfer the accepted information to the sepia mylar set. Refer to Section 01700.

C. The actual size, location and elevation of all buried lines, boxes, monuments, vaults, stubouts and other provisions for future connections shall be referenced to the building lines or other clearly established base lines and to approved bench marks. All measurements shall be witnessed by the job Inspector who shall make his own record of the dimensions. Before the Inspector signs the record drawings, he shall check his own dimensions against those on the drawings. If any dimensions are omitted from the record drawings or are at variance with the Inspector's dimensions, the Contractor shall, at his own expense, do all excavation necessary to expose buried work and to establish the correct location and elevation. Measurements pertaining to the location of underground stub-outs, underground lines, boxes, vaults, etc. shall be referenced to permanent structures that will not be obscured with the passing of time, such as buried monuments.

1.14 TESTS

A. The Contractor shall make any and all tests necessary to satisfy the Owner and the Architect or his representative that he has carried out the true intent and meaning of the Contact Documents. Should the Contractor refuse or neglect to make the required tests, the Owner may make such tests and charge the expense thereof to the Contractor to be retained out of full final payment as provided in the "General Conditions" of the Contract.

B. Any work showing faults under test, and any work not in accordance with the Contact Documents, shall be made good by the Contractor at his own expense.

1.15 SITE INSPECTIONS

existing electrical installations, and shall thoroughly familiarize himself with all existing conditions within the scope of this work. By the act of submitting a bid, the Contractor will be deemed to have made such examination and to have accepted such conditions, and to have made allowance therefore in preparing his figure.

1.16 GUARANTEE

A. In addition to the guarantees required in the "General Conditions", all materials and equipment provided and installed under this Division of the Specifications shall be guaranteed by the Contractor for a period of one year from the date of acceptance of the work by the Owner. Should any trouble develop during this period due to defective materials or faulty workmanship, the Contractor shall furnish all necessary labor and materials to correct the trouble without any cost to the Owner.

1.17 COORDINATION OF HEATING, AIR CONDITIONING, PLUMBING AND OTHER MECHANICAL WORK:

A. The Mechanical Contractor shall furnish equipment such as motors, starters, thermostats, wiring diagrams, etc. However, the Electrical Contractor shall be responsible for furnishing and installing of all fused disconnect switches, conduits, wire, fittings, etc. for power connections.

B. Install all electrical equipment where it is not already installed as a part of a unit furnished by the Equipment Contractor. (See drawings of respective contractors).

C. The Electrical Contractor shall furnish fused disconnect switches for pumps, motors and air conditioning and handling units, if they are not furnished by others. Fuses shall be dual element, rating per equipment manufacturer=s recommendations. Disconnects shall comply with requirements for AMotor Disconnects@ as specified earlier in this section.

D. All disconnect switches (whether provided with unit or by contractor) shall have a circuit identification nameplate as specified under AMotor Disconnects@.

E. Thermal overload protection shall be furnished for all motors where such protection is not included as a part of another contract.

F. All motor outlets, disconnect switches= locations and control outlets shown on the plans are approximate only. Verify exact location of same with Equipment Contractor.

A. When not already covered under the Painting Section of the Specifications all electrical work exposed to view

G. All low and line voltage controls, including conduits, outlets, wiring and connections shall be furnished and installed by the Controls Contractor.

H. Furnish and install a weatherproof duplex receptacle with ground fault circuit interrupter protection within 25 ft. of all rooftop H.V.A.C. units.

I. Coordinate with general contractors, mechanical contractors and equipment suppliers before bid is submitted and again before rough-in is started to verify that all systems are complete and all components are provided including starters, disconnects, relays, solenoids, control conduit and wire, etc.

1.18 SAFETY

A. Contractor shall be solely and completely responsible for condition of the premises on which the work is performed and for safety of all persons and property on the site during performance of the contract. This requirements shall not be limited to normal working hours, but shall apply continuously.

B. Contractor shall conform with all governing safety regulations.

1.19 SEISMIC RESTRAINT

A. All electrical equipment shall have a means to prohibit excessive motion during an earthquake. Equipment which vibrates during normal operation shall have isolators with mechanical stops. All transformers and generators are considered to vibrate during operation.

B. All electrical equipment shall be braced or anchored to resist a horizontal force acting in any direction using the criteria set forth in C.B.C. Section 1632A and Table 16A-0.

C. Where anchorage details are not shown on the drawings the field installation shall be per S.M.A.C.N.A. Seismic Bracing Guidelines and subject to the approval of the Electrical Engineer and the Division of the State Architect field engineer.

D. Method of anchoring equipment and/or mechanical stops shall be certified by a Structural Engineer, registered in the State of California, as meeting these requirements. This certification shall be submitted by the Contractor to the Architect.

1.20 PAINTING

which is not prefinished or for which other finishing instructions are not given, shall be painted in accordance with the Painting Section of the Specifications to match surroundings. Work to be painted shall include conduit, hangers, outlet boxes, pull boxes, surface metal raceways and similar items.

1.21 CONCRETE WORK

A. The concrete work for the conduit envelopes shall be non-structural slab type with a mix of 1:2-1/2:3-1/2 by volume 7-1/2 gallons of water per sack of cement, and shall be furnished and installed under this Division of the Specifications.

B. All other concrete work in conjunction with the electrical work shall be furnished and installed under another Division of the Specifications unless specifically indicated otherwise hereinafter.

1.22 MISCELLANEOUS IRON WORK

A. All miscellaneous iron work required to complete and properly install the electrical work shall be furnished and installed under this Division of the Specifications. This shall include all supports, pull-in irons, etc.

1.23 GROUNDING

A. Regardless of whether or not grounding is specifically shown, noted or detailed on the drawings, the Contractor shall provide grounding to at least meet minimum requirements of the California Electrical Code (current edition). Additional grounding provisions shall be provided in compliance with Section 16450 of this Specification.

1.24 ROOF PENETRATIONS

A. Provide suitable roof jacks or pitch pockets wherever conduits penetrate the roof surface to accomplish complete waterproofing complying with the quality of the roof surface and meeting the highest standards of the roofing trade.

1.25 MATERIALS IN GENERAL

A. All materials, equipment, parts, etc., provided under this Specification shall be new, unless specifically noted to be reused or relocated.

B. All materials, equipment, parts, etc., provided under this Specification shall be in accordance with applicable portions of the current specifications and/or standards of the American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Institute of Electrical and Electronic Engineers (IEEE), National Electrical Manufacturers Association (NEMA), National Fire Protection Association (NFPA) including the California Electrical Code (CEC) which is ANSI/NFPA Standard 70, and Underwriters' Laboratories (UL).

C. All materials, equipment, parts, etc., provided under this Specification shall be Underwriters' Laboratories (UL) labeled unless specific approval is obtained from the Architect to substitute the approval of another recognized independent laboratory, suitable to the Architect and any public agencies having jurisdiction over the project.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 16010

SECTION 16110 - CONDUIT AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 APPROVAL AND MARKING

A. All raceways shall comply with the requirements of the Underwriter's Laboratories and shall be delivered to the site in standard lengths with each length bearing the manufacturer's trademark or stamp and the Underwriters' label of approval. All conduit subjected to rough usage while on the site before installation and not acceptable to the Architect shall be removed from the premises upon notice.

1.3 CONDUIT DEFINITION

A. Raceways other than conduit (in the general sense) such as wireways, cable tray, etc., shall only be used when, where and as allowed by the drawings and this Specification and in compliance with the California Electrical Code.

PART 2 - PRODUCT

2.1 CONDUIT AND FITTINGS

A. Rigid steel conduit shall be rigid hot dipped galvanized steel meeting UL-6 standards. Couplings and locknuts, etc., shall be hot dipped galvanized and be of the threaded type only.

B. Bushings for standard weight rigid steel conduit shall be nonmetallic for 1 inch and smaller. For conduits 1-1/4 inch and larger, insulated metallic bushings shall be used. Bushings shall be O.Z/Gedney, Type "B" or Type "BLG" grounding type where applicable.

C. Electrical metallic tubing shall be hot zinc coated meeting UL-797 standards. Couplings and insulated connectors shall be zinc electroplated steel compression type.

Manufacturer	Compression Connector	Compression Coupling	Set-Screw Connector	Set-Screw Coupling
Bridgeport	250-I Series	260 Series	230-I Series	240 Series
Steel City	TC-710 Series	TK-110 Series	TC-720 Series	TK-120 Series
Raco	2910 Series	2920 Series	2120 Series	2020 Series

D. Flexible metallic conduit shall be standard or intermediate weight hot dipped galvanized steel. Fittings shall be zinc electroplated malleable iron with insulated throat, squeeze connector type. Fittings which use a screw to bind against tubing will not be accepted. Flexible aluminum conduit is not acceptable under this specification.

E. Liquidtight flexible metallic conduit shall be UL listed, Type UA. See this Section under "Execution" for mandatory application of liquidtight flexible conduit. Fittings shall be zinc electroplated steel with insulated throat. Bridgeport SLTI Series or equal.

F. Polyvinyl-chloride (PVC) conduit shall be rigid heavyweight type, Schedule 40, U.L. 651 and 651A approved, complete with PVC fittings.

PART 3 - EXECUTION

3.1 GENERAL

A. Conduit systems shall be run continuous and with the minimum number of bends.

B. All joints in all conduits installed underground or exposed to the weather shall be made liquid and gas tight.

C. Changes in direction shall be made with conduit sweep elbows or long radius bends made on the job. Where 2 or more conduits are grouped in exposed locations, the sweeps shall be struck from the same center forming concentric arcs.

D. All joints in conduit shall be made with standard coupling. In making joints, conduits must be truly and accurately cut and threaded (where applicable) with straight cut and thread, smoothly reamed and squarely butted. All conduit shall be kept corked and dry during construction, using plastic caps or conduit pennies held in place with conduit bushings. Should dirt or moisture collect in any conduit, the Contractor shall swab them out to the satisfaction of the Architect.

E. All empty conduit shall be equipped with a nylon pull rope continuous from outlet to outlet.

F. All empty conduits, including conduit stubs, shall be capped and tagged at all exposed ends.

G. Where conduit passes from one type of construction to another, or where there is a possibility of dissimilar movements, or to compensate for thermal expansion and contraction, a suitable flexible or expansion device shall be installed.

H. All conduits containing conductors used for electrical systems shall be equipped with a properly sized ground wire.

3.2 UNDERGROUND CONDUIT INSTALLATION

A. Underground conduits shall be rigid, heavyweight (Schedule 40 or heavier) PVC.

B. Exception: Rigid standard weight galvanized steel conduit may be used, at the Contractor's option, in lieu of PVC in any underground run. If steel conduit is used in a run that contains PVC, for example, for the ells at the ends of the run, the steel conduit must be of the same size as the PVC, even if the PVC is larger than that shown on the drawings, for the Contractor's convenience. Steel conduits shall be wrapped with PVC tape or shall have factory applied PVC coating.

C. Conduits installed in underground trenches shall be securely fastened in place using interlocking type duct spacers so that absolutely no shifting will occur during placing of concrete encasement.

D. The minimum separation between conduits in a common trench or encasement shall be 4 inches.

E. Each underground conduit of the medium voltage power distribution system shall be completely encased in a concrete envelope with a minimum of 3 inches of concrete around each conduit, except that only 2 inches of concrete shall be required between adjacent conduits. At any point along the concrete encasement, top shall be not less than 24 inches below finished grade or paving.

F. Conduit stubs installed for future extensions shall be rigid steel for the last 5 feet of the conduit run. The conduit ends shall be terminated with couplings and pipe plugs. The closed end shall be double wrapped with 3M Scotchrap #50 for the last 12 inches. At medium voltage power distribution system stubs the concrete envelope shall leave 3 inches of the wrapped conduit exposed for future connection.

G. All underground conduit stubouts or group of stubouts in one location shall be furnished with a concrete monument, 6 inches X 6 inches X 15 inches deep buried flush with grade, over the capped ends or pull box in lieu of concrete monuments, a brass identification plate may be permanently attached to the building or concrete curb stating the exact distances and directions of the conduit stubout location.

H. The exact location of the monument or tag shall be shown on the "record" drawings.

I. The face of monuments shall be furnished with 3 inch square brass plates securely mounted and engraved with the number and size of conduits or pull box.

J. Where storm drains, sewer lines and other gravity lines are to be crossed by conduits, grade stakes shall be set for the gravity lines, elevations of conduits shall be set for the gravity lines and elevations of conduits shall be put at proper depth so that there will be no conflict with storm drains, sewer lines and other gravity lines. It shall be the responsibility of the Contractor to coordinate elevations of all conduits to miss all gravity lines. Where conduits are installed and not properly coordinated, it shall be the responsibility of the Contractor to remove and reconstruct the conduit runs as required, and all costs in connection with such removal and relocation shall be borne by the Contractor.

K. Exposed conduit stubbing up through floor slab into bottom of exposed panels, cabinets or equipment shall be lined up, properly spaced and shall be straight and plumb. Conduits shall be installed at sufficient depth below slab to eliminate any part of the bend above top of slab. All conduit stubups shall be wrapped with tape from a point 2 inches below the top of slab, to at least 3 inches above slab. Tape shall be removed after slab has been cured.

L. All telephone conduit runs shall be installed with long radius sweeps.

M. A segmented steel test mandrel of proper size shall be pulled through each non-metallic conduit 2 inches and larger. This test shall be made within 2 hours after concrete envelope has been poured. The job Inspector shall witness this test and shall so state in his report. A steel cable (3/8 of an inch diameter minimum) shall be fastened to both ends of the mandrel and mandrel shall be repulled through the conduit in the opposite direction.

N. All underground conduits outside of the building shall be buried to a depth of not less than 24" below finish grade. Utility services shall comply with utility company requirement.

3.4 ABOVEGROUND CONDUIT INSTALLATION

A. Rigid Steel Conduit (RSC):

1. Rigid steel conduit shall be used where

subject to mechanical injury, where installed in concrete, where used exposed on exterior work and where installed exposed on interior work below 8 feet or where suspended.

2. Only rigid steel conduit shall be used above grade for voltages over 600V.

B. Electrical Metallic Tubing (EMT):

1. Electrical metallic tubing may be used for all interior applications except where noted to be rigid steel or flexible steel conduit in these Specifications or as noted otherwise on the drawings. All EMT shall bear the UL label.

C. Flexible Steel Conduit:

1. Flexible steel conduit shall be used only where noted on the drawings, where required for connection to motors, etc., or with the approval of the Architect, where absolutely necessary due to structural conditions.

2. Plastic coated flexible metallic conduit (liquidtight), complete with proper fittings, shall be used in lieu of regular flexible conduit in all areas subject to moisture, dampness, rain; in excessively dusty or dirty areas; where subjected to constant personnel contact; for connections to all shop equipment; for connections to all shop equipment and where specifically called for on the drawings.

3. Flexible aluminum or flexible plastic conduit shall not be used.

D. Conduit shall be concealed, unless otherwise indicated. All conduit runs exposed to view, except those in attic spaces, shall be installed parallel, or at right angles to structural members, walls, or lines of the building.

E. Conduit shall be kept at least 6 inches from the covering on hot water and steam pipes, and 18 inches from the covering on flues and breechings. The open ends of all conduit shall be kept closed with approved conduit seals during the construction of the building. Use approved conduit unions where union joints are necessary. Running threads will not be permitted.

F. Conduit bends, other than factory ells, shall have radius of not less than 10 times the internal diameter of the conduit.

G. One inch and smaller conduits above metal lath ceilings or other non-accessible ceiling supported on channels shall be tied to the ceiling channels. 1-1/4 inch and larger conduits above such ceilings shall be suspended with pipe hangers or pipe racks or shall be secured to the superstructure with pipe straps. Conduits in metal lath or steel stud partitions shall be tied to the furring channels or the studs. In ceiling spaces and in partitions, the wires shall be spaced no more than 5 ft. apart and shall hold the conduit tight against the channels and studs at the point of tie. Tie wire shall be 16 gauge galvanized double annealed tie wire.

H. Conduits 3/4 inch and smaller above suspended modular ceilings such as the tee bar, duo flex and similar ceiling systems shall be supported with spring steel clips, manufactured for that specific purpose, from the ceiling suspension wires or from separate wires provided specifically for conduit suspension. Support and attachment shall reasonably restrict lateral movement as well as provide vertical support. Conduits and attachments shall be placed so as not to interfere with upward displacement of removable ceiling tile.

I. Outlet boxes above accessible suspended ceilings may be supported by devices manufactured for the purpose from the main ceiling members if they are placed so that they do not interfere with either the installation of recessed lighting fixtures or the removal of ceiling tile.

J. Conduit in ceiling spaces above ceilings constructed of wood and in wood stud walls shall be supported with factory made pipe straps or shall be suspended with pipe hangers or pipe racks. The pipe straps shall be attached to and shall hold the conduit tight at the point of support against the ceiling rafters and wall studs, or to 2 inches X 4 inches headers fitted between the joists or wall studs.

K. Conduit placed against concrete or masonry above ground shall be fastened to the concrete with pipe straps or one-screw conduit clamps attached to the concrete by means of expansion anchors and screws.

L. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket. Rods shall be 3/8 diameter for 2 inch conduit hangers and smaller and shall be 1/2 diameter for 2-1/2 conduit hangers and larger.

M. Pipe racks for groups of parallel conduits shall be

constructed of Unistrut (or similar material) of length as required, suspended on threaded rods and secured thereto with nut above and below the cross bar. All conduits shall rest on the cross bar and shall not be stacked one on top of the other. Conduits may be tiered on the same hanger provided that additional cross bars are installed.

N. Hanger straps, rods, or pipe supports under concrete shall be attached to inserts set at the time the concrete is poured. Under wood use bolts, lag bolts, or lag screws; under steel joists or trusses use beam clamps.

O. Conduits which are suspended on rods more than 2 feet long shall be seismically braced to prevent horizontal motion or swaying.

P. Factory made pipe straps shall be one-hole malleable iron or two-hole galvanized clamps.

Q. Conduit shall be supported at intervals not exceeding 10 feet and in all cases with a support not more than 3 feet from the outlet and at any point where it changes in direction. Perforated strap and plumber's tape shall not be used in the support of conduits.

R. `Power activated tools shall not be used for the mounting of electrical hardware.

END OF SECTION 16110

SECTION 16111 - WIREWAY, GUTTER AND SURFACE METAL RACEWAY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 RESTRICTIONS ON USE

A. Wireways, gutter and surface metal raceways shall be used only for exposed work as defined in the California Electrical Code.

PART 2 - PRODUCT

2.1 WIREWAY AND AUXILIARY GUTTER

A. Wireway and auxiliary gutter shall be steel enclosed, screw cover with combination 1/2 inch or 3/4 inch and 1 inch or 1-1/4 inch on the top and bottom sides. Knockouts are not required for the 8-inch X 8 inch and 12 inch X 12 inch gutters.

B. Couplings and hangers shall be designed to leave the screw cover removable.

C. Each run of wireway or auxiliary gutter shall be provided complete with all elbows, tees, offsets, cabinet connectors, couplings, hangers, rod hanger assemblies, end caps, and any other hardware, fittings and parts required for a complete and proper installation over the general route shown on the drawings.

D. Wireway and auxiliary gutter shall be available from the supplying manufacturer in 4 inch X 4 inch, 6 inch X 6 inch, 8-inch X 8 inch and 12 inch X 12 inch sizes. Sizes provided shall be as indicated on the drawings.

E. Wireway and auxiliary gutter shall be manufactured by B-Line, Milbank or equal.

2.2 SURFACE METALLIC RACEWAY

A. Pressed Steel:

1. Factory prepared, metallic raceway shall be used for all exposed interior wiring.

2. Each run shall include all outlet boxes, elbows, couplings, tees, offsets, covers and other fittings necessary for a complete and properly installed assembly.

B. All surface raceway shall be of the size recommended in the manufacturer's published data for the number and size of conductors contained in the raceway and shall be equal to the Wiremold Co. products.

C. Unless specifically indicated otherwise, all surface metallic raceways shall be Wiremold #V4000B/C/D Series with a center divider to separate power and data cabling. Provide entrance end fitting for feed from a flush outlet box with offset single gang raised ring mounted horizontally, one behind each section. When a separate section for data cabling is not required, Wiremold V700 series or V2400 series may be used as requirements of installation dictate. All available mounting holes are to be utilized.

D. Provide a two device mounting plate at each wiring device and data outlets shown to be mounted in the surface metallic divided raceway. Provide matching faceplates for respective wiring device and data outlets as required. Device mounting plate shall be Wiremold #V4049. Faceplates shall be Wiremold #5507 Series, #5507D for duplex receptacle and #AC-ARA/2A245-C5E for data outlets.

PART 3 - EXECUTION

3.1 WIREWAY AND AUXILIARY GUTTER

A. Wall mounted gutter shall be securely anchored with preset inserts or suitable backing.

B. Wireway suspended from the ceiling or roof structure shall be supported at intervals not exceeding 5 feet on center using 1/4 inch or 3/8 inch steel rod. Fittings for terminating the rod to the structure shall be specifically manufactured for type of surface or structure to which the attachment is made.

C. All suspended runs shall be suitably braced to prevent swaying.

3.2 SURFACE METAL RACEWAY

A. All surface metal raceway runs shall be parallel or at right angles to the basic lines of the building. Wherever practical runs shall be routed adjacent to moldings, corners or other surface features which will make the entire installation the least conspicuous.

END OF SECTION SECTION 16111

SECTION 16120 - CONDUCTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 LUGS

A. Furnish and install proper lugs in all panelboards, switchboards, gutters, etc., required to properly terminate each cable. The cutting of cable strands to fit into the lugs will not be permitted.

PART 2 - PRODUCT

2.1 COPPER, 600 VOLTS AND LESS

A. All conductors shall be delivered to the site in their original unbroken packages, plainly marked or tagged as follows:

1. Underwriters labels.
2. Size, type and insulation of wire.
3. Name of the manufacturing company and the trade name of the wire.
4. Month and year when manufactured which date shall not exceed 2 years prior to the date of delivery to the site.

B. All conductors shall be minimum of 98% conductivity, soft drawn copper.

C. All power wiring conductors shall be type THWN copper, unless otherwise noted. All conductors in underground feeders shall be type XHHW copper.

D. Control circuits for mechanical equipment in locations subject to abnormal temperatures on or under furnaces and heaters shall be C.E.C. listed 90 degrees C, 600 volt insulation conductors.

E. All circuit conductors installed within fluorescent fixture raceways shall be 600 volt Type XHHW , THHN or other C.E.C. listed 90 degrees C conductors approved for lighting fixture installation.

F. Minimum wire size shall be #12 AWG, unless specifically noted as #14 AWG.

G. All wire #14 AWG and larger conductors shall be stranded.

H. Connectors and terminal lugs shall be used for terminating stranded conductors #8 and larger shall be T & B, ILSCO, or equal, solderless connectors.

I. All branch circuit and fixture wiring joints, splices and taps for conductors #10 and smaller shall be made with UL approved connectors listed for 600 volts. Connector bodies shall consist of a cone shape expandable coil spring insert, insulated with Teflon or plastic shell. The connectors shall be the Wing Nut as manufactured by Ideal Industries, Scotchlok as manufactured by 3M or approved equal. All wet location splices and connections shall be waterproofed as described in a later paragraph.

J. Make all connections and splices necessary to properly install and complete with work, and all splices made with other than the insulated connectors as specified in a preceding paragraph shall be taped. All tape shall be 3M Scotch Super 33+ vinyl electrical tape. All connections and splices shall be electrically and mechanically perfect, and in strict accordance with all coed requirements.

K. All connections or splices located in a pull box or other space below grade or where moisture can collect shall be waterproofed. For #8 AWG and smaller wire, the recommended method is to use Scotchlok, or approved equal, connectors and to imbed the connectors within a Unipak of 3M Scotchcast epoxy type resin. For #6 AWG and larger wire use Hi-press hydraulically compressed connectors and an extra length of Thomas & Betts Shrink-kon HS-LR series heavy wall heat shrinkable tubing for each conductor. Any other method of waterproofing shall be submitted to the Architect for approval before use.

2.2 CABLES

A. A Cable shall be shielded twisted pair, two twisted pairs, 22 AWG, low capacitance, West Penn #373 or approved equal.

B. A1' Cable shall be shielded, twisted pair, two twisted pairs, 22 AWG, low capacitance, West Penn #AQC373 or approved equal.

C. B' Cable shall be shielded, twisted pair, 25 twisted pairs, 24 AWG, low capacitance, Superior Essex 04-097-21 or approved equal. Contractor shall verify each building cable requirements prior to bid.

D. B1 shall be shielded, twisted pair, 50 twisted pairs, 24 AWG, low capacitance, Superior Essex 04-100-21 or approved equal.

E. C Cable for computer work stations shall be per Section 16122 of this specification.

F. D Cable for intrusion alarm shall be per Section 16727 of this specification.

G. F Cable shall be overall shielded, single twisted pair, 18 AWG, 133 pf capacitance between one conductor and the other connected to the shield, maximum 6.5 ohms/1000 feet with 20 AWG stranded tinned copper drain wire, PVC jacket, West Penn #D975 or approved equal.

H. FO Cable shall be fiber optic data cabling system, including seven cell tube cable with one six fiber bundle installed to one cell of tube cable per Section 16121 of this specification.

I. F1' Cable shall be overall shielded, single twisted pair, 18 AWG, 68 pf capacitance between one conductor and the other connected to the shield, maximum 6.5 ohms/1000 feet with 20 AWG stranded tinned copper drain wire, 105 degree sunlight and moisture resistant PVC jacket, West Penn #AQC293 or approved equal.

J. K Cable shall be per Section 16727 of this specification.

K. K1' Cable shall be per Section 16727 of this specification.

L. MD Cable shall be per Section 16727 of this specification.

M. T Cable (inside buildings) shall be RG-6/U, cellular polyethylene dielectric, bare-copper braid shield with 95 percent minimum shielding factor, No. 18 AWG solid copper-covered-steel conductor, and PVC jacket, West Penn #Q841 or approved equal.

N. T1' Cable (site distribution) shall be RG-11/U, cellular polyethylene dielectric, bare-copper braid shield with 95 percent minimum shielding factor, No. 14 AWG solid bare-copper conductor, and PVC jacket, West Penn #821 or approved equal.

PART 3 - EXECUTION

3.1 COPPER, 600 VOLTS AND LESS

A. Connectors and terminal lugs shall be used for terminating stranded conductors.

B. All branch circuit and fixture wiring joints, splices and taps for conductors #10 and smaller shall be made with UL approved connectors listed for 600 volts.

C. Connector bodies shall consist of a cone shape expandable coil spring insert, insulated with Teflon or plastic shell.

D. Make all connections and splices necessary to properly install and complete the work, and all splices shall be taped. All tape shall be 3M Scotch Super 33 + vinyl electrical tape. All connections and splices shall be electrically and mechanically perfect, and in strict accordance with all code requirements.

E. Bolt type solderless connectors shall be tightened and then retightened after 24 to 48 hours before taping. Owner s Inspector shall be informed of this procedure during the waiting period and shall witness the act of retightening.

F. All debris and moisture shall be removed from the conduits, boxes and cabinets.

G. No oil, grease, or similar substances shall be used to facilitate the pulling in of conductors. Use a suitable wire pulling compound, 3M, Ideal or equal.

H. Wire in panel cabinets, pull boxes and wiring gutters shall be neatly grouped, taped together with 3M Scotch Super 33 + vinyl electrical tape, Thomas & Betts cable ties and fanned out to the terminals.

I. No splices shall be allowed in any concrete pull box, unless it is specifically called for on the drawings or with the specific written approval of the Architect. When splices are allowed, a Thomas & Betts Shrink-kon HS-LR series heavy wall heat shrink insulator over the splice shall be used.

J. See paragraphs under Panelboards as hereinafter specified for branch circuit wiring color code.

K. All control wiring shall be color coded and color continuity maintained throughout the system.

END OF SECTION 16120

SECTION 16121 - AIR BLOWN FIBER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 INSTRUCTIONS TO BIDDERS

A. BIDDER S PRESENTATION

1. Each Bidder, by submitting Bid, represents that:

2. Bidder has read and understands the Contract Documents and the bid is made in accordance therewith.

3. Has familiarization with the local conditions under which the work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.

4. Bidder agrees to comply with the requirements of the following paragraph. These requirements are absolute, and any Contractor who subsequently does not agree to comply with these requirements will automatically disqualify himself from bidding or receiving a portion of the contract.

5. Bidder agrees that:

a. Work on the project will begin immediately upon receipt of signed Contract or Notice to Proceed.

b. Contractor will participate as a team member in cooperation with the Owner.

c. The Contractor has bid a complete and operable system per the specifications and plans. All conduit, trenching, raceways, and power shall be supplied and installed by the Section 16000 Electrical Contractor.

B. Attached to the *BID PACKAGE*, the bidder shall list the names of all personnel who will be installing, programming, and training on this system and listing their appropriate certification on the system (Attachment # 1). *THIS INFORMATION MUST BE INCLUDED IN THE GENERAL CONTRACTOR S BID DOCUMENTATION*. All personnel shall have worked on at least ten (10) similar projects equal to or larger than this system in the last five (5) years.

C. The Installing Factory Authorized Contractor shall include in their bid at least seven (7) references of projects equal to or larger than this project including project name, address, phone number, contact person, and brief description of the project (Attachment #2). All references shall be within two hours driving time of this project and shall not include projects by anyone other than the Installing Factory Authorized Contractor, such as the Contractor s manufacturer. Failure to include reference material will disqualify the bidder and the next lowest qualified bidder shall be awarded the project at no additional cost to the Owner.

D. This contractor shall stock spare parts and maintain a staff of trained, certified technicians in an office no farther than 100 miles from the school site. Contractor must respond with 24 hours for repairs. Conduit and power shall be installed by a C10 licensed electrical contractor.

E. Where the word Provide is used, it shall be defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.3 SCOPE OF WORK

A. Furnishing of all labor, project management, materials, tools, equipment and sources necessary for the complete installation of the Air Blown Fiber as shown on the plans and as herein specified.

B. Provide cell tube cable and fiber optic cable between buildings. Provide all Fiber Termination Units, Tube Distribution Units, termination devices needed to complete a Data Distribution System able to run 1000Mbs shall be supplied and installed by the contractor. One Sumitomo or equal seven cell tube cable shall be installed from the MDF to each designated building in the electrical conduit. One Sumitomo or equal 6-strand fiber bundle shall be blown in from the MDF to each designated building. The six remaining cells shall be tested, filled with nitrogen, and capped for future use. Substitutions to Sumitomo shall be per General Provisions of

Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections.

C. Provide complete testing and documentation.

D. Provide complete project closeout documentation including 15-year warranty certificates, and record drawings.

E. It shall be the responsibility of each bidder to examine the site, plans and specifications carefully before submitting his bid, with particular attention to errors, omissions and conflicts between city ordinances, plans and specifications. Any such discrepancy discovered shall be brought to the attention of the Engineer and will be included in the Base Bid.

F. Provide for complete testing and documentation as shown in other parts of this specification.

G. Provide complete project closeout documentation including system performance warranty certificates as specified, record CAD drawings, and Owner and Operator s manuals.

1.4 QUALIFIED CONTRACTOR

A. A minimum of five years experience in the application of equipment is required. In the submittal process, manufacturer trained certificates on each installer who happens to work on this project. **Installers who have not received manufacturer s factory training as indicated by their factory training certificates shall not be authorized to install this system.** Prior to construction start-up the on-site inspector shall verify each installer has the appropriate training certificates on file at the job site before they can begin work.

1.5 SUBMITTALS

A. Submit product data sheets as outlined in the General Conditions, Division 1 and include a submittal for all components indicated in these specifications.

B. Provide complete brochure information on all components and accessory equipment. All information shall be clearly marked to indicate items provided.

C. PROVIDE: Where the word Provide is used, it shall be defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

1.6 15 YEAR WARRANTY

A. Manufacturer shall extend the fifteen (15) year warranty to the immediate end user customer of an authorized air blown fiber Designer/Installer Contractor for a specific cabling system for fifteen (15) years if the following conditions are met:

1. The cabling system must have been designed by or reviewed by an individual who has successfully completed the manufacturer s design course and who holds a current, valid registration number issued by the manufacturer. **The manufacturer s Designer/Installer Contractor must have completed this certification before the award of the bid.**

2. The cabling system must have been installed under the supervision of an individual who has successfully completed the manufacturer s authorized installation courses and who holds a current, valid registration number issued by manufacturer.

3. At least 75% of the installers who installed the cabling system must have successfully completed the manufacturer s authorized installation course and hold current, valid registration numbers issued by manufacturer.

4. The manufacturer s Designer/Installer Contractor must have installed the cabling system only using tube cable, fiber optic bundles, and connectors, authorized tube distribution units, and connecting hardware manufactured by approved manufacturer.

5. The manufacturer s Designer/Installer Contractor shall send to manufacturer completed AutoCAD drawings and completed test results to Sumitomo or approved substitution within 30 days after the project has been completed. If manufacturer finds errors or omissions, the manufacturer Designer/Installer Contractor shall make the appropriate changes to the system prior to manufacturer sending the fifteen (15) year warranty to the customer.

1.7 REGULATORY LISTING

A. UL Listing: All Material and equipment shall be listed, labeled, or certified by Underwriters

Laboratories, Inc. All power supplies and computers shall be UL listed. Provide UL listing cards for all components specified herein.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER.

A. Subject to compliance with requirements, provide the specified products of the listed manufacturer. Substitutions to the listed manufactured shall be per General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections.

2.2 SUMITOMO Future Flex

A. Products of an equal manufacturer when approved in writing prior conditions set forth in this contract per Article 28, General Conditions and the Public Contracts code (P.C.C. Section 3400).

2.3 TUBE CABLE

A. Tube Cable - The tube cable requires a dielectric exterior of 1/18 in diameter with seven empty interior cells, each cell is 6mm ID x 8mm OD, a laminated Aluminum Polyethylene (LAP) Sheath for additional water barrier is required between the exterior tube and the interior cells.

B. Tube Cable Installation The tube cable will be installed directly into a buried conduit, sized per drawings. No innerduct is required. Tube Distribution Units (TDU) will be utilized at all hub locations. An unjacketed tube cable may be used for interior installations between the Tube Distribution Unit (TDU) and the Fiber Termination Unit (FTU). Tube cable cells will be joined where necessary using 8mm tube couplings to form a continuous path. Bulkhead couplings are required where cells must be secured a hole in a box or cabinet. 6mm tube plugs are required for sealing unused cells.

TC07TOX	7 Cell Tube Cable (Outdoor/All-Dielectric)
TC01TGX	Cell Tube Cable (Indoor/Unjacketed Single Tube)
DE06MDU	Tube Distribution Unit
DEO8MC	Tube Couplers
DE06MP	Tube Plugs

C. Tube Cable Segments The tube cable segments are as follows:

1. See Air Blown Fiber Schematic for overview.

2.4 FIBER OPTIC CABLE

A. The fiber optic cable is a 6-strand multimode bundle. The fiber bundle must be constructed with an expanded foam polyethylene jacket, an inner nylon jacket for strength, on inner plastic ripcord and 6 multimode fibers, which must meet or exceed the specifications below.

Fiber Core	50+/-3 microns
Cladding Diameter	125+/-2 microns
Attenuation (db/Km at 850nm)	Max. 3.5 db/km
Bandwidth (MHz-Km at 850nm)	Min. 500 Km
Attenuation (db/Km at 1300nm)	Max. 1.5 db/Km
Bandwidth (MHz-Km at 1300nm)	Min. 500 MHz-Km
Core Non-Circularity	Less than 6%
Cladding Non-Circularity	Less than 2%
Concentricity Error	Less than 6%
Primary coating material	UV curable acrylate
Primary coating diameter	Nom. 250 Micron
FB06M5	6 Strand fiber 50/125 Microns, Multimode Fiber Bundle

B. Fiber Cable Installation and Testing The fiber optic bundle must be blown into an empty cell of the tube cable. The fiber bundle must be blown in using a non-toxic, non-flammable, dry gas (nitrogen). The fiber shall be terminated on AMP MTRJ-Style fiber connectors into AMP Fiber Termination Units. ***Fiber Optic Cable distance must not exceed 550 meters (1804 ft.)***. Each fiber strand must be tested with an OTDR. The testing criteria are 850 nm/sec in one direction. Printed test results will be provided for each strand tested.

C. Fiber Termination Units (Central) At the MDF location, an FTU providing 96 terminations will be utilized. The FTU must be equipped with six pack loaded coupler panels, and blank panels for termination of fiber strands as required. The dimensions of this unit must be 16 W x 16 L x 3 H. The unit must be rack mountable according to EIA specification. Fiber optic MTRJ-SC (AMP 1435356-X) patch cables must be provided as required.

1. X denotes length in meters. Length to be determined by owner.

D. Fiber Termination Unit (Remote) At the remote IDF location, an FTU providing 24 terminations will be utilized. Only six terminations shall be originally. The FTU must be equipped with six pack loaded coupler panels, and empty blank panels for termination of fiber strands as required. The

dimensions of this unit must be 16 W x 16 L x 3 H. The unit must rack be mountable according to EIA specifications. Fiber optic MTRJ-SC (AMP 1435356-X) patch cables must be provided as required.

1. X denotes length in meters. Length to be determined by owner.

E. Fiber Termination Unit Installation The FTU will be installed in the data cabinet conforming to EIA/TIA standards (See data cabinet section for details). Each fiber strand on each segment must be terminated in an FTU.

2.5 EQUIPMENT RACKS/DATA CABINETS

A. Equipment Racks (Central) Each Fiber Termination Unit (FTU) are required to be mounted on a 72 equipment rack in the MDF. The equipment rack is located in Building 1200. The equipment rack must provide (24) 110 AC outlets on a single strip. The racks must be secured to floor using proper anchors and lag bolts, and must be seismic braced using ladder runway. Three racks shall be supplied, one for data, one for video, and one for the intercom system. (See Rack Elevation Drawings for specifications and proper installation as required).

B. Data Cabinets (Remote) Each Fiber Termination Unit (FTU) to be mounted in a 48-inch data cabinet in all buildings. The cabinet will require a smoked glass, lockable front door, and no back panel. The cabinet must provide (12) 110 AC outlets on a single strip. The cabinet must be secured to the floor with quick release pins in a manner that allows the entire cabinet to slide away from the wall.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be per the manufacturer s printed instructions and in accordance with ANSI TIA/EIA-568-B.3 and ANSI TIA/EIA-568-B.3-1 standards.

3.2 TRAINING AND INSTRUCTION

A. The Contractor shall provide a minimum of four days of training for at least 20 employees of the Kern High School District. All costs of training will be at the sole expense of the Contractor. The training shall include the following elements:

1. A one-day session with hands-on training covering the use of the room equipment.

2. A two-day Train the Trainers session attended by a minimum of four, but not more than six, individuals selected by the Owner. All training must be conducted at the Kern High School District Starrh Center.

3. System documentation and training aids for this training supplied by the Contractor s trainer.

4. A final technical training session, which shall include hands-on training, accompanied by full system documentation and system as-constructed drawings.

B. The Contractor shall also provide the Owner with information and pricing on any training offered at the manufacturer s facility or designated training facility.

C. The Contractor shall provide 2 videos of all training to the District prior to final payment of retention.

3.3 DIAGRAMS, DRAWINGS, AND INSTRUCTIONAL MANUALS

A. Provide **26 bound instructional manuals in an 8-1/2 x 11 format** of the complete system shall be provided to the Owner.

B. Manuals shall include instructions, block and schematic diagrams, digital pictures of the front and back of each MDF and IDF rack, wiring diagrams, specification and technical data of the components, and as-constructed drawings of the completed system.

C. All drawings placed in the manuals shall be a minimum of 11 x 17 engineering format and shall include full engineering title blocks. One set of reproducible drawings shall be provided. A complete set of E size as-constructed engineering drawings shall be provided on a compact disk in an AUTOCAD compatible format.

D. Two separate manuals shall be provided, including a user operations manual and a systems engineering and maintenance manual. The maintenance manual shall contain copies of all final system configuration settings, wiring diagrams, inter-rack cabling, cable termination and labeling information, cross connect diagrams, jumper diagrams, recommended spares and parts list, service contact list, and local and manufacturer s support telephone numbers.

END OF SECTION 16121

ATTACHMENT #1

COMPANY QUALIFICATIONS FORM

BIDDER S NAME:

_____

_____

BIDDER S ADDRESS/TELEPHONE NUMBER:

_____

_____

Each person working on this project shall have prior experience on other like systems. For each person, please provide a narrative of the person s qualifications including education, factory training certification, 10 previous jobs worked on, and their position on this project. If additional room is needed, please attach additional sheets to this form. Supply AMP Netconnect Factory Training Certificates on each person who will be working on this project.

SYSTEM DESIGNER:

_____

_____

PROJECT MANAGER:

_____

_____

PROJECT FOREMAN:

_____

_____

LEAD TECHNICIAN:

_____

_____

ATTACHMENT #1 (CONTINUED)

FIELD TECHNICIANS/INSTALLERS:

_____

_____

_____

_____

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_____

_____

_____

_____

_____

REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER (RCCD):

_____

_____

_____

_____

IfIf additional room is needed, please attach additional information as If additional room is needed, please attach addi
Certificates for each Contractor employee who will be working on this project.

_____ _____

Authorized Signature Company Name

REFERENCE FORM

REFERENCE DATA SHEET

**VendorVendor shallVendor shall provide at least <u>seven</u> customer references who are presently using a system sim
beingbeing proposed for the Kern High School District. being proposed for the Kern High School District. Please i
forfor each installation. Vendor references shall not include any systemfor each installation. Vendor references sh
vendor or marketing locations.**

Customer Name:

_____

_____

Address:

_____

_____

_____

Contact Person(s):

_____

_____

Telephone/Fax Numbers:

_____

System Name/Model:

_____

_____

Date Installed:

_____

Features and Options:

_____

_____

_____

_____

_____

Please sign each reference form.

Authorized Signature

Company Name

SECTION 16122 - LOCAL AREA NETWORK SYSTEM - BUILDING

PART 1 - GENERAL INFORMATION

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 INSTRUCTIONS TO BIDDERS

A. BIDDER S PRESENTATION

1. Each Bidder, by submitting Bid, represents that:

2. Bidder has read and understands the Contract Documents and the bid is made in accordance therewith.

3. Has familiarization with the local conditions under which the work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.

4. Bidder agrees to comply with the requirements of the following paragraph. These requirements are absolute, and any Contractor who subsequently does not agree to comply with these requirements will automatically disqualify himself from bidding or receiving a portion of the contract.

5. Bidder agrees that:

   a. Work on the project will begin immediately upon receipt of signed Contract or Notice to Proceed.

   b. Contractor will participate as a team member in cooperation with the Owner.

   c. The Contractor has bid a complete and operable system per the specifications and plans. All conduit, trenching, raceways, and power shall be supplied and installed by the Section 16000 Electrical Contractor.

B. Attached to the *BID PACKAGE*, the bidder shall list the names of all personnel who will be installing, programming, and training on this system and listing their appropriate certification on the system (Attachment # 1). *THIS INFORMATION MUST BE INCLUDED IN THE GENERAL CONTRACTOR S BID DOCUMENTATION*. All personnel shall have worked on at least ten (10) similar projects equal to or larger than this system in the last five (5) years.

C. The Installing Factory Authorized Contractor shall include in their bid at least seven (7) references of projects equal to or larger than this project including project name, address, phone number, contact person, and brief description of the project (Attachment #2). All references shall be within two hours driving time of this project and shall not include projects by anyone other than the Installing Factory Authorized Contractor, such as the Contractor s manufacturer. Failure to include reference material will disqualify the bidder and the next lowest qualified bidder shall be awarded the project at no additional cost to the Owner.

D. All cabling system including copper cable, patch panels, workstation outlets and patch cords herein specified shall be provided by a single manufacturer, installed (wiring and equipment) by a C-7 Licensed Low-Voltage Communications Contractor who is the Factory Authorized Dealer for the specified equipment. This contractor shall stock spare parts and maintain a staff of trained, certified technicians in an office no farther than 100 miles from the school site. Conduit and power shall be installed by C-10 Electrical Contractor.

E. Where the word Provide is used, it shall be defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically noted.

F. The Integrated Systems Contractor (Factory Authorized Dealer) shall maintain on staff or provide the services of a Registered Communications Distribution Designer (RCDD). The RCDD shall have a minimum of five (5) years experience in infrastructure design. The RCDD shall review, approve, and stamp all infrastructure design documents to insure compliance with National Communications Standards and Practices as outlines by BICSI (Building Industry Consulting Service International), CEC (California Electrical Code), and any state and local requirements. The name, address, and telephone number of the RCDD assigned to this project must be included in the Contractor s documents and subsequent submittal package.

1.3 SCOPE OF WORK

A. Furnishing of all labor, project management, materials, tools, equipment and sources necessary for the complete installation of the Local Area Network System inside the building as shown on the plans and as herein specified.

A. It is the intent of these specifications and the accompanying plans that the Contractor furnish and install a system complete in every respect and ready to operate. All miscellaneous items and accessories required for such installation, whether or not each such item or accessory as shown on the plans or mentioned in these specifications, shall be furnished and installed. The architectural, structural, mechanical and electrical drawings and specifications are included in this division in that they establish requirements and limitations of work to be performed under this section.

B. It shall be the responsibility of each bidder to examine the site, plans and specifications carefully before submitting his bid, with particular attention to errors, omissions and conflicts between city ordinances, plans and specifications. Any such discrepancy discovered shall be brought to the attention of the Engineer and will be included in the Base Bid.

C. The Local Area Network System shall be a multi-tasking operating system and shall be directly compatible with Ethernet, Fast Ethernet, Switched Ethernet, Gigabit, Token ATM, and FDDI topologies. In general, the work shall consist of, but not be limited to:

1. Provide computer backbone consisting of fiber optic multi-conductor cable between buildings and Category 6 data cable inside the buildings for a networked computer system. Category 6 Patch Panels and all termination devices needed to complete a Data Distribution Cable System able to run at Gigabit Ethernet shall be supplied and installed by this contractor.

2. Provide for complete testing and documentation as shown in other parts of this specification.

3. Provide complete project closeout documentation including 25-year system performance warranty certificates, as-constructed CAD drawings, and Owner and Operator s manuals.

1.4 ALTERNATE SYSTEMS

A. All bids shall be based on the equipment as specified herein. The model numbers and product description are that of AMP Netconnect. No alternate systems shall be considered. Even though the District does not allow any deviation from this standard they will allow any Contractor who holds AMP Netconnect Factory Training Certificates for these systems to bid the project. The contractor must hold a current AMP ND&I certification at the time of bid. The current ND&I certificate must be included in the contractor s bid documents on the day of the bid.

1.5 SUBMITTALS

A. Submit cut sheets as outlined in the General Conditions and include a system riser diagram, all wire, devices and provide written confirmation from the factory that they are an authorized representative for the submitted product or prove they are using as a sub-contractor written confirmation they are using a factory authorized dealer. This document shall be included as part of the submittal data.

B. Provide complete brochure information on all components and accessory equipment. All information shall be clearly marked to indicate items provided.

1.6 QUALIFIED CONTRACTOR

A. All systems herein specified shall be provided by a single source, installed (equipment) by an Authorized Factory Distributor for the equipment, shall stock spare parts and maintain a staff of trained, certified technicians. A minimum of five years experience in the application of equipment is required. In the submittal process, AMP Netconnect factory trained certificates on each installer who happens to work on this project. Installers who have not received AMP Netconnect factory training as indicated by their factory training certificates shall not be authorized to install these systems. Prior to construction start-up, the on-site inspector shall verify each installer has the appropriate training certificates on file at the job site before they can begin work.

1.7 PROVIDE

A. Where the word Provide is used, it shall be defined as requiring the furnishing and installing of the item or facility indicated, complete in all respects and ready for operation unless otherwise specifically

noted.

1.8 GUARANTEE

A. This Contractor shall guarantee his work and equipment for a period of one year from date of acceptance of project by the Owner. Neither the final payment, nor any provisions in contract documents shall relieve this Contractor (or General Contractor) of the responsibility for faulty materials and/or workmanship for a period of one year. This contractor shall remedy any defects due thereto, and pay for any damage to work resulting therefrom. The Contractor shall guarantee they will extend the 25 year AMP Netconnect Warranty.

1.9 REGULATORY LISTING

A. All Material and equipment shall be listed, labeled, or certified by Underwriters Laboratories, Inc. All power supplies and computers shall be UL listed. Provide UL listing cards for all components specified herein.

PART 2 - MATERIALS

2.1 MANUFACTURER

A. The local area network equipment specified herein is that of AMP Netconnect and constitutes the quality of design and construction, operational characteristics, appearance standards, space requirements and field service staffing levels required to comply with the requirements of the specification. The Kern High School District installs AMP Netconnect systems at their schools and has standardized on these products. Because of network compatibility issues, wiring standards, twenty five (25) year warranties, and future cabling requirements, the Kern High School has determined there are no acceptable equals to AMP Netconnect.

2.2 LOCAL AREA NETWORK SYSTEM PRODUCTS AND PERFORMANCE CRITERIA

A. The instructional technology equipment specified herein shall provide the following system architecture:

1. Provide capability to interface to Ethernet, Fast Ethernet, and Gigabit Ethemet Local Area Networks.

2. Provide horizontal wiring with Category 6 data cable inside the buildings and all necessary termination points for the network computer system.

B. Copper Cabling

1. Copper Cable - Category 6, 4 pair, unshielded twisted pair (UTP) cable, is to be used for all copper wiring applications. Appropriate ratings must be used depending upon code requirements, e.g. (outdoor, plenum ...). All copper segments must be installed in strict compliance with the requirements specified in ANSI/TIA/EIA-568-B.1 through ANSI/TIA/EIA-568-B.2-1 The continuous (non spliced) length of any given segment must not exceed 90 meters or 290 feet. All copper segments must be tested to CAT 6 specification. Printed results of that testing must turned in to the on-site inspector. Any CAT 6 runs that fail testing shall be replaced and retested at no additional cost to the District. All runs made in attics, crawl spaces or other accessible area must be retained in such a manner as to prevent damaged to the cable segments. In-wall vertical transitions must be in conduit. Since a twenty five (25) year AMP System Warranty is part of this project, only AMP wire shall be used.

2. Copper Cable Termination at Patch Panel - All copper wire will terminate in Category 6 Patch Panels. A termination panel must provide a minimum of 24 RJ45 connections, fit in a standard 19 rack, and be accompanied by a cable organizer. At each building, patch panels shall be sized appropriately to handle a minimum of ninety-six connections, unless otherwise indicated. All exposed wire bundles must be concealed in a 4 x 5 Panduit® wall duct. Wire bundles extending from the wall to the data cabinet must be in plastic coil wrap and provide a minimum of three feet of slack. At the Main Distribution Frame (MDF) in Building 1200, CAT 6, copper patch cables, 6 feet in length must be provided for each termination in every other building on campus and at the Individual Distribution Frame (IDF) CAT 6 copper patch cables, 3 feet in length must be provided for each termination. Patch cables must be manufactured by AMP Netconnect.

3. Copper Cable Termination at Work Station - When possible, the specified copper station cables will be installed following pathways (conduits, raceways, etc.). All vertical or horizontal pathways exposed in the

classrooms must be concealed using surface mount WireMold®. Termination at workstation locations requires flush or surface mounted AMP Netconnect 110 Connect System faceplates populated with CAT 6 unshielded modular jacks. The modular jacks must be mounted in the WireMold® in such a manner as to provide clearance for additional cables in the same raceway.

4. CAT 6 copper patch cables, 15 feet in length must be provided for each workstation termination. All patch cables will be CAT 6 certified. All patch cables shall be manufactured by AMP Netconnect.

C. Copper Segment Definition - The copper segment connects workstations with the corresponding group switch. Each building or building group is serviced by a Central IDF (Intermediate Distribution Frame), The CAT 6, UTP cable between the work stations and the IDF is the copper segment. Locations for each workstation receptacle are provided in signals plans. The locations for computer receptacles are designated on the plans by a triangle with a C callout adjacent.

D. Wall Mounted Data Jacks:

1. Where shown on the plans, wall mounted modular data jacks shall be installed into a standard 4 11/16 square X 2 1/8 DP outlet box equipped with 1 1/2 DP box extension and a single gang ring. Boxes shall be mounted at +18 to center unless otherwise noted.

2. The Category 6 computer cabling shall be terminated onto Category 6 rated modular jacks similar to AMP Netconnect Model No. 1375055-6. Once the Category 6 cable has been terminated onto the jacks, any combination of modular jacks can be plugged in to match the device including but not limited to a computer, printer, or modem. Other parts included in the wall mounted jack are:

a. AMP #1FM-(6)ØE-AMP Single Gang Six Port Stainless Steel Faceplate.

b. AMP #1116412-1 Blank Inserts.

E. Patch Panels:

1. All Category 6 cable shall be terminated onto Patch Panels at the data equipment rack in each building.

2. Patch Panels shall be Category 6 with universal wiring (T568A or T568B) with 9mm or 12mm labels. Modular jacks shall be configured as 6-Port replaceable modules. Patch Panels shall mount in standard EIA 19 equipment racks. Patch Panels shall be as follows:

a. 24 Ports - AMP #1375014-1

b. 48 Ports - AMP #1375015-1

F. C Cable - Category 6 Cable:

1. Cable shall be Category 6, 4 pair UTP, 24 AWG Solid Conductors, with a Blue PVC jacket.

2. Each classroom shall have a CAT 6 cable pulled to each computer jack shown on the plans. CAT 6 cable shall be AMP #1499038-6.

3. The Category 6 cable shall be tested in accordance with Gigabit Ethernet TIA/EIA-568-B.2-1 standards. At the end of the project a written report shall be given to the owner indicating each computer jack has been tested. All testing shall be done in front of the owner or the owner s representative.

G. Patch Cables:

1. Patch Cables shall be an Category 6Assembly, 4 pair stranded, UTP, 24 AWG Conductors with color matched snag-less boots, universal wiring (T568A/T568B) and as follows:

AT MDF 6 Feet Blue Patch Cable, AMP #219886-6.

AT IDF 3 Feet Blue Patch Cable, AMP #219886-3.

AT WORK STATION 15 Feet Yellow Patch Cable, AMP #219890-1-5.

2. Contractor shall confirm color of Patch

Cable with owner prior to ordering.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All installations shall comply with the requirements of the California Electrical Code (CEC) for neatness and appearance. The Contractor shall comply with all local safety and installation codes and practices related to earthquake standards. The Contractor shall be familiar with all National Fire Protection Association (NFPA) Fire Stopping Codes and shall comply as required. All equipment shall be securely mounted in enclosures or special mounting devices made for the purpose. All switches, jacks, and receptacles shall be clearly, logically, and permanently marked.

B. Adequate ventilation for the equipment installed in equipment racks shall be provided to maintain manufacturer specified heat tolerances for the installed equipment. All equipment racks shall be properly grounded to meet CEC code requirements and to prevent electromagnetic or electrostatic interference. Without claim for extra payment, the Contractor shall make minor moves or changes in equipment locations to accommodate equipment of other trades or the architectural symmetry of the facility.

3.2 WIRING

A. The electrical contractor shall provide all conduit systems and shall mount all backboxes for the Building Local Area Network System wiring. Special boxes, as shown on the project drawings, shall be provided by the Contractor for installation by the electrical contractor. Electrical contractor shall supply all Panduit or Wiremold faceplates require to house the AMP data workstaton outlets.

3.3 LABELING

A. All horizontal and backbone subsystem cables shall be labeled at each end.

B. At the workstation end of the cable, the labels shall be installed within 3-6 inches of the associated voice/data jack and shall not be visible from the outside of the faceplate.

C. Contractor shall label all 48 position patch panels with pre-printed labels per AMP recommendations.

D. Patch panel labels shall be printed with the associated user data jack number.

E. Voice and data cables shall be arranged on the patch panels and/or connector blocks in numerical order according to the faceplate number scheme.

3.4 TESTING

A. Upon completion of the installation, the Contractor shall conduct a functional system test in the presence of the Owner and his representatives.

B. The Contractor shall prepare and submit a written test plan that will demonstrate the system s operation, critical component operation, and software feature set functionality.

C. A Contractor s punch list of problems shall be generated. The Contractor shall make all necessary modifications and/or adjustments of the punch list items.

D. Following corrections the Contractor shall repeat any system test necessary to satisfy the Owner of the system s compliance with the specifications.

3.5 TRAINING AND INSTRUCTION

A. The Contractor shall provide a minimum of four days of training to the Owner. The training shall include the following elements:

1. A one-day session with hands-on training covering the use of the room equipment.

2. A two-day Train the Trainers session attended by a minimum of four, but not more than six, individuals selected by the Owner.

3. System documentation and training aids for this training supplied by the Contractor s trainer.

4. A final technical training session, which shall include hands-on training, accompanied by full system documentation and system as-constructed drawings.

B. The Contractor shall also provide the Owner with information and pricing on any training offered at the manufacturer s facility or designated training facility.

3.6 DIAGRAMS, DRAWINGS, AND INSTRUCTIONAL MANUALS

A. Bound instructional manuals in an 8-1/2 x 11 format of the complete system shall be provided to the Owner.

B. Manuals shall include instructions, block and schematic diagrams, digital pictures of the front and back of each MDF and IDF rack, wiring diagrams, specification and technical data of the components, and as-constructed drawings of the completed system.

C. All drawings placed in the manuals shall be a minimum of 11 x 17 engineering format and shall include full engineering title blocks.

D. One set of reproducible drawings shall be provided. A complete set of E size as-constructed engineering drawings shall be provided on a compact disk in an AUTOCAD compatible format.

E. Two separate manuals shall be provided, including a user operations manual and a systems engineering and maintenance manual.

F. The maintenance manual shall contain copies of all final system configuration settings, wiring diagrams, inter-rack cabling, cable termination and labeling information, cross connect diagrams, jumper diagrams, recommended spares and parts list, service contact list, and local and manufacturer s support telephone numbers.

3.7 WARRANTY

A. AMP NETCONNECT 25 YEAR STRUCTURED CABLING SYSTEM WARRANTY: AMP Incorporated (AMP) will extend the AMP NETCONNECT OPEN CABLING SYSTEM WARRANTY to the immediate end user customer of an authorized AMPNETCONNECT Design and Installation Contractor (ND&I) for the cabling system for twenty five (25) years if the following conditions are met:

1. The cabling system must have been designed by or reviewed by an individual who has successfully completed the authorized AMP design course and who holds a current, valid registration number issued by AMP.

2. The cabling system must have been installed under the supervision of an individual who has successfully completed the authorized AMP installation courses and who holds a current, valid registration number issued by AMP.

3. At least 50% of the installers who installed the cabling system must have successfully completed the authorized AMP installation course and hold current, valid registration numbers issued by AMP.

4. The ND&I Contractor must have installed the cabling system only using cable, connectors and connecting hardware listed in the AMP NETCONNECT Warranted Parts Number List (AMP No. 1 14-44002) or parts specifically approved by AMP in writing on a case-by-case basis.

5. The cabling system must have been tested in accordance with a test plan prescribed by AMP by an individual who has successfully completed the authorized AMP testing courses and who holds a current, valid registration number issued by AMP.

6. The ND&I Contractor must submit the appropriate application form to the AMP Warranty Administrator within 30 days after installing and testing the cabling system. The application must include: (i) a list of the installers who installed and tested the cabling system signed by the installation supervisor; (ii) a bill of materials listing the part numbers, quantities and distribution of the components installed in the cabling system signed by the installation supervisor; (iii) a CAD-generated as-constructed drawing of the cabling system on a computer disk acceptable to AMP signed by the designer; (iv) test data in a form prescribed by AMP signed by the test technician.

B. Within a reasonable time period of receipt of the above documentation AMP will either register and issue the *System Warranty* or provide notice to the ND&I explaining the criteria that have not been met. If the ND&I correct the deficiency within a reasonable time from receipt of AMP s notice, then AMP will register and issue the System Warranty.

C. If AMP has registered a *System Warranty* for a cabling system, and moves, adds or changes are made to the cabling system, then AMP will continue to warrant the cabling system as modified provided that the ND&I meets all of the above criteria for the move, add, or change.

END OF SECTION 16122

ATTACHMENT #1

COMPANY QUALIFICATIONS FORM

BIDDER S NAME:

_____

_____

BIDDER S ADDRESS/TELEPHONE NUMBER:

_____

_____

Each person working on this project shall have prior experience on other like systems. For each person, please provide a narrative of the person s qualifications including education, factory training certification, 10 previous jobs worked on, and their position on this project. If additional room is needed, please attach additional sheets to this form. Supply AMP Netconnect Factory Training Certificates on each person who will be working on this project.

SYSTEM DESIGNER:

_____

_____

PROJECT MANAGER:

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PROJECT FOREMAN:

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LEAD TECHNICIAN:

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FIELD TECHNICIANS/INSTALLERS:

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REGISTERED COMMUNICATIONS DISTRIBUTION DESIGNER (RCCD):

_____

_____

_____

_____

If additional room is needed, please attach additional information as needed. Attach all AMP Factory Training Certificates for each Contractor employee who will be working on this project.

_____

_____ _____

Authorized Signature Company Name

REFERENCE FORM

REFERENCE DATA SHEET

Vendor shall provide at least seven customer references who are presently using a system similar to what is being proposed for the Kern High School District. Please indicate what features and options are being used for each installation. Vendor references shall not include any system working at manufacturer, distributor, vendor or marketing locations.

Customer Name:

_____

_____

Address:

_____

_____

_____

Contact Person(s):

_____

_____

Telephone/Fax Numbers:

_____

System Name/Model:

_____

_____

Date Installed:

_____

Features and Options:

_____

_____

_____

Please sign each reference form.

Authorized Signature

Company Name

SECTION 16130 - OUTLET, FLOOR AND PULL BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division O and Division 1 Specification Sections, apply to work of this Section.

PART 2 - PRODUCT

2.1 OUTLET BOXES

A. Outlet boxes shall be pressed steel knockout type and shall be hot dipped galvanized or sherardized.

B. All boxes shall be of proper code size for the number of wires or conduits passing through or terminating therein, but in no case shall any box be less than 4 inches square X 1½ inches deep.

C. Covers shall be of the types most suitable for the fixtures or devices used at the outlets, and shall finish flush with plaster or other finished surface.

D. Approved factory made knockout seals shall be used in all boxes where knockouts are not intact. Boxes in concrete shall be a type that will allow the placing of conduit without displacing the reinforcing bars.

E. Outlet boxes shall be Raco, Steel City, Bowers or approved equal.

2.2 FLOOR BOXES

A. Floor boxes shall be a fully adjustable concealed service floor box, 126 cubic inches of total capacity. Floor box shall have a polyamide service top with a 5/32 inch steel reinforced hinged floor plate. Floor plate shall be suitable for use in carpeted or tiled floors.

B. Box interior shall have barriers to permit use of both power and communications receptacles.

C. Boxes shall be Steel City Catalog No. 665/665-WT with Catalog No. 665-CST service top, color as selected by Architect.

D. Provide quantity and type of mounting device panels as required for devices indicated on drawings. Receptacle device panel shall be Steel City Catalog No. 665-RP. Blank device panel shall be Steel City Catalog No. 665-BP.

2.3 FLOOR BOXES (FOR DATA OUTLETS)

A. Floor boxes that contain data outlets in conjunction with duplex receptacles shall consist of a concrete form box and an access floor workstation module (4 or 5 gang).

B. Contractor shall field install all knockouts in concrete form box and provide flexible steel conduit from concrete form box to access floor workstation module for power conductors.

C. Contractor shall also provide ¼ - 20 threaded rod for leveling of box in four places.

D. Concrete form box shall be manufactured by Barthelmes Manufacturing Co., Inc., (716) 328-8140, reference part no. U135806.

E. Access floor workstation module shall be AMP #406376-X (4 gang) and #557601-X (5 gang).

F. Color of top shall be light almond, storm gray, black or NEMA gray as selected by Architect.

2.4 FLOOR BOXES (AT GYMNASIUM FLOOR)

A. Floor box shall be a recessed stage "Floor Pocket" type with cast iron cover, nonskid tread design and a self-closing hinged door with cord-clearance slots.

B. Housing shall be 16 gauge steel with removable interior barriers to separate low and line voltage compartments.

C. Box shall include mounting panels for multiple devices and mounting angles for mounting into "Flexible" Gymnasium floor. Refer to drawings for mounting details.

D. Verify exact location of floor boxes with Architect prior to rough-in.

2.5 FLUSH FLOOR COUPLINGS

A. 3/4 inch flush couplings shall be brass, complete with slotted brass plug and shall be equal to Hubbell #F-1340.

2.6 PULL BOXES

A. Pull boxes shall meet all code requirements as to size for conduits terminating therein and to thickness of metal used in fabrication or casting.

B. Fabricated sheet steel pull boxes shall be installed only in dry protected locations and shall be furnished with required knockouts and removable screw cover. Box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surroundings.

C. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with 2 coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.

D. Cast iron pull boxes shall be furnished with gasketed screw cover, drilled and tapped holes as required. Boxes shall be as manufactured by T&B, Alhambra Foundry Company, or Russell and Stoll. Where cast iron pull boxes are called for as being flush with finished grade, boxes shall have integral flange or trim.

PART 3 - EXECUTION

3.1 OUTLET BOXES

A. Outlet boxes shall be used as pull boxes wherever possible, and junction or pull boxes shall be installed only as required by the drawings or specifications, or as directed.

B. All outlet boxes that finish to an exposed brick or concrete block surface shall have 1 1/2 inch deep tile rings and shall be set to allow a brick or concrete block facing over the ring to frame the opening. Tile rings shall not be grouted into exposed brick or concrete block walls. Center outlet in a course of brick or concrete block. Standard plastering will not be accepted.

C. Unless otherwise specified or noted on the drawings, boxes for the various outlets shall be as follows:

1. For light fixtures use minimum of 4 inch square X 1½ inch deep outlet box, equipped with plaster ring and fixture supporting device as required by the unit installed.

2. For wall switch outlets, use 4 inch square X 1½ inch deep boxes with single or 2 gang plaster rings for one or two switches and solid gang boxes with gang plaster rings for more than 2 switches, unless noted otherwise on the drawings.

3. For convenience outlets, use 4 inch square X 1½ inch deep boxes with single gang plaster ring.

4. For telephone outlets, use 4 inch square X 2 1/8 inch deep outlet boxes with single gang plaster rings, unless otherwise noted.

5. For interior horns and fire alarm manual pull stations, use 4 inch square X 2 1/8 inch deep outlet box with single gang or 2 gang plaster ring, unless special back box is provided with device.

6. For emergency stop push button stations, use 4 inch square X 2 1/8 inch deep box with 2-gang plaster ring.

7. For range outlets, use 4-11/16 inch square by 2 1/8 inch deep boxes with 2-gang plaster rings.

8. For outlets not specified, use boxes and mounting heights as directed.

D. All outlet boxes shall be accurately placed and securely fastened to the structure independent of the conduit. Particular care shall be taken in locating outlet boxes in acoustic tile. The plaster ring shall be set flush with the finished surface of the ceiling wall. Hangers shall be used to support outlet boxes in all ceilings. Hangers for lighting fixture outlets shall have adjustable studs.

E. Crouse-Hinds "condulets" shall be used for all switch, receptacle and junction outlets where conduit is exposed.

F. Outlet boxes above accessible suspended ceilings may be supported by devices manufactured for the purpose from the main ceiling members if they are placed so that they do not interfere with either the installation of recessed lighting fixtures or the removal of ceiling tile.

G. All outlets shall be installed square and true, at the proper heights and shall be coordinated with the other trades to insure a proper installation.

H. Color coding of all outlet boxes:

1. Every concealed outlet box, junction box, sheet metal pull box, etc., shall be color coded with spray paint, inside and out, including a short section of the conduits terminating therein. The outside cover of

the box shall also be painted the same color. For surface exposed conduit and boxes on finished walls and/or ceilings only the inside of the box and blank cover plate need be painted. Avoid overspray on to finished surfaces.

2. This color code spray paint shall be applied soon after conduit and boxes are installed to assure paint being applied to clean surfaces. Note: Avoid overspray on to adjacent conduits or surfaces.

3. The outside of the blank covers shall have the system name painted thereon with black (or other color) permanent felt tipped marking pen. Example: FA, IC, 480V, 208V, etc.

4. The color code shall adhere strictly to the following schedule:

a.	120/208V	Black
b.	480/277V	Yellow
c.	Fire Alarm	Red
d.	CCTV	Dark Blue
e.	Intrusion Alarm	Light Blue
f.	Telephone	Green
g.	Data	White
h.	Sound	Orange
i.	Clock	Pink

3.2 FLOOR BOXES

A. Where carpeting occurs, floor boxes shall be complete with carpet flanges.

B. Floor boxes shall be set flush with finish floor and set on concrete pier to prevent movement during final pour of floor.

3.3 FLUSH FLOOR COUPLINGS

A. Flush floor couplings shall be adjusted to be flush with floor during pouring and finishing of floor.

3.4 FIRESTOPPING

A. All outlet boxes installed in rated walls (1 or 3 hour) shall not be closer than 24 inches measured horizontally.

B. All such outlet boxes shall also be wrapped with an approved firestopping pad(s). U.L. listed and certified pad(s) shall be IPC Type FSP1077 or equal by Hevi-Duty/Nelson.

C. Outlets or boxes greater than 16 inches square shall be enclosed in a rated enclosure equal to the rated wall in which installed.

END OF SECTION 16130

SECTION 16140 - WIRING DEVICES AND TELEPHONE/DATA OUTLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.2 IDENTIFICATION

A. The plates of wiring devices shall be identified with machine engraved inscriptions when indicated on the drawings or specified under "EXECUTION" herein. Engraved letters shall be at least 3/16 inches high and filled with suitable black (normal power) or red (emergency power) paint.

PART 2 - PRODUCT

2.01 RECEPTACLES

A. Duplex Receptacle:

1. Duplex receptacles shall be specification grade, ivory in color, grounding type, 125 volt, 20 ampere and shall have two current carrying contacts and one grounding contact which is internally connected to the frame. Outlet shall accommodate standard straight blade plug and shall be back and side wired.

2. Leviton #5362-I, Hubbell, Arrow-Hart, Pass and Seymour or approved equal.

B. Pilot Light:

1. Pilot lamp receptacle shall be long life type, complete with integral series resistor, 4 watt, 120 volt Candelabra base lamp as required and with rectangular red acrylic jewel. Where shown with manual motor starting switch, pilot light shall be installed in a separate box adjacent to the motor starting switch. Receptacle shall be Leviton #2152 and red jewel shall be #406R for use in single receptacle hole wallplate.

2. "Pilot Type" switches with an illuminated red handle will be acceptable. Leviton #1221-PLR for 120V and #1221-7PLR for 277V or approved equal.

C. Weatherproof Receptacle:

1. Weatherproof receptacle for concealed conduit and outlet shall consist of a G.F.C.I. duplex grounding type duplex receptacle with ground fault circuit interrupter as hereinafter specified mounted in a 4 inch square box with single gang plaster or tile ring depth, as required, and lockable cover. Provide a solid brass padlock, Master Lock #130KAD or equal at each cover. All locks shall be keyed alike. Cover shall be:

Manufacturer	Cover
Raco	#5028-0

D. Twist-Lock Receptacle:

1. Twist-lock receptacles shall be single reinforced nylon body of the amperage, voltage and the number of poles as indicated on the drawings. Each receptacle shall be of the grounding type with one pole grounded. Receptacles shall be for flush mounting in a 4 inch square (min.) box with single gang plaster ring and stainless steel wall plate. Each receptacle shall be furnished with a matching nylon and/or lexan plug at each outlet. Leviton catalog numbers are listed below. Only equal units by Hubbell, Arrow-Hart, Bryant, General Electric or P&S may also be used. Receptacles shall be as follows:

2-Pole 3 Wire Grounding

Amperage	Voltage	NEMA Style	Receptacle	Cap
15	125	L5-15R	#4710	#4720-C
15	250	L6-15R	#4560	#4570-C
20	125	L5-20R	#2310	#2311
20	250	L6-20R	#2320	#2321
20	480	L8-20R	#2340	#2341
30	125	L5-30R	#2610	#2611
30	250	L6-30R	#2620	#2621
30	480	L8-30R	#2640	#2641

3-Pole 4 Wire Grounding

Amperage	Voltage	NEMA Style	Receptacle	Cap
20	125/250	L14-20R	#2410	#2411
20	250	L15-20R	#2420	#2421
20	480	L16-20R	#2430	#2431

30	125/250	L14-30R	#2710	#2711
30	250	L15-30R	#2720	#2721
30	480	L16-30R	#2730	#2731

4-Pole 5 Wire Grounding

Amperage	Voltage	NEMA Style	Receptacle	Cap
20	120/208	L21-20R	#2510	#2511
20	277/480	L22-20R	#2510	#2521
30	120/208	L21-30R	#2810	#2811
30	277/480	L22-30R	#2820	#2821

E. Polarized Receptacle: Polarized receptacles shall be single reinforced nylon body of the amperage, voltage and the number of poles as indicated on the drawings. Each receptacle shall be of the grounding type with one pole ("U" ground) grounded. The voltage ratings of the receptacles shall be 250 volts, unless specifically indicated otherwise on the drawings. 15 and 20 ampere receptacles shall be for flush mounting in a 4 inch square (min.) box with single gang ring and stainless steel plate. 30, 50 and 60 ampere receptacles shall be for flush mounting in a 4-11/16 inch square by 2-1/8 inches deep box with 2-gang plaster ring and stainless steel plate. Each receptacle shall be furnished with a matching plug at each outlet. Leviton catalog numbers are listed below. Equal units by Hubbell, Arrow-Hart, Bryant, General Electric or P&S may also be used. Receptacles shall be as follows:

2-Pole 3 Wire Grounding

Amperage	Voltage	NEMA Style	Receptacle	Cap
15	250	6-15R	#5669-C	#5666-C
20	125	5-20R	#5359-C	#5366-C
20	250	6-20R	#5469-C	#5466-C
30	125	5-30R	#5371	#9530-P
30	250	6-30R	#5372	#9630-P
50	125	5-50R	#5373	#9550-P
50	250	6-50R	#5374	#9650-P

3-Pole 4 Wire Grounding

Amperage	Voltage	NEMA Style	Receptacle	Cap
30	125/250	14-30R	#9278	#9432-P
30	250	15-30R	#8430-A	#8432-P
50	125/250	14-50R	#9279	#9452-P
50	250	15-50R	#8450-A	#8452-P
60	125/250	14-60R	#9460-A	#9462-P
60	250	15-60R	#8460-A	#8462-P

F. Range Receptacle: Range receptacle shall be 3 pole, 50 ampere, 125/250 volt, polarized, single receptacle for flush mounting complete with matching angle plug and stainless steel wallplate. Receptacle shall be installed in a 4-11/16 inch square by 2-1/8 inches deep outlet box with 2-gang plaster ring. Receptacle shall conform to NEMA Configuration 10-50R. Receptacle and plug shall be one of the following:

Manufacturer	Receptacle	Plug
Leviton	#5206	#9450-P
Arrow-Hart	#7985N	#7952AN
Bryant	#9306	#3833
General Electric	#GE4152-3	#GE1052-9
Hubbell	#7962	#7977
P&S	#3890	#3861

G. Dryer Receptacle: Dryer receptacle shall be 3-pole, 30 ampere, 125/250 volt, polarized, single receptacle for flush mounting complete with matching plug and stainless steel wallplate. Receptacle shall be installed in a 4-11/16 inch square by 2-1/8 inches deep outlet box with 2-gang plaster ring. Receptacle and plug shall be one of the following:

Manufacturer	Receptacle	Plug
Leviton	#5207	#9332-P
Arrow-Hart	#9344N	#9352AN
Bryant	#9303	#9305
Hubbell	#9350	#9333
P&S	#3860	#3861
Leviton	#5055	#9332-P

H. G.F.C.I. Duplex Receptacle: Grounding type duplex receptacle with ground fault circuit interrupter shall conform to NEMA Configuration 5-20R. When leakage exceeds 5 m.a., the interrupter shall open the circuit at the receptacle within 1/30 of a second. Where feed-thru type is indicated on the drawings, the interrupter shall also protect all receptacles on the same circuit which are "downstream" (beyond the receptacle from the source). Interrupter shall only protect the receptacle indicated unless indicated on the drawings as feed-thru type. Receptacle shall be complete with test and reset buttons. Receptacle shall be installed in a 4 inch square by 2-1/8 inches deep box with single gang plaster ring complete with stainless steel plate at dry locations and with weatherproof hinged door cover where indicated as weatherproof (W.P.). Receptacle shall be ivory in color. Receptacle shall be as follows:

Manufacturer	Catalog Number
Leviton	#6899-1

Arrow-Hart	#GF5342I
General Electric	#GF5242-2
Hubbell	#GF5352I
P&S	#2091-S

I. Plug-In Strip (metallic): Shall be 2-wire single circuit or 3-wire two circuit as indicated on the drawings and have 20A grounding type single receptacles at 18 inches on center. Strip shall be complete with all necessary fittings, end caps, feed-in boxed, etc., to form a complete installation. Finish shall be ivory. Where two circuits are shown to a strip the receptacles shall be wired alternately on the two circuits. Wiremold Series #V20GB or V20GBA Series or equal.

J. Isolated Ground duplex receptacle with Transient Voltage Surge Suppression: Isolated Ground duplex receptacle with Transient Voltage surge suppression shall be a 20 amp, 3 level protection with LED status indicator light and meeting ANSI/IEEE C62.42-1980, Categories A & B and U.L. 1449. Minimum technical specifications shall be:

Transient Suppression Voltage (UL):	
Phase - Neutral	0.4 KV
Phase - Ground	0.4 KV
Neutral - Ground	0.8 KV
Clamping Voltage at 1ma	228 volts maximum
Energy Dissipation: (10/1000 microseconds)	70 joules
Peak Surge Current: (8/20 microseconds)	6500 amps
Approximate Response Time: (for 8/20 surge)	less than 5

K. Isolated ground TVSS receptacle shall be Leviton Catalog #5380-IG-O. Specifically approved receptacles meeting all requirements of this Specification, if available from the other manufacturers listed in this section for duplex receptacles, will also be allowed.

2.2 SWITCHES

A. Light switches shall be ivory, totally enclosed, toggle type with 120/277 volt, A.C. rating for full capacity of contacts for incandescent or fluorescent lamp loads. Switch ratings shall be 20 ampere only. Switches shall be back and side wired. Provide twenty (20) "Leviton" lock switch keys. Lock type switches manufactured by others listed below will be acceptable if compatible with the "Leviton" key.

Listed below are switches, only, which are approved:

1. Single Pole Switches

Manufacturer	Toggle Type	Lock Type
Leviton	#1221-2I	
Arrow-Hart	#1991-I	
Bryant	#4901-I	
Hubbell	#1221-I	#1221-L
P&S	#20AC1-I	
G.E.	#GE5951-2G	

2. Double Pole Switches

Manufacturer	Toggle Type	Lock Type
Leviton	#5352-2I	
Arrow-Hart	#1992-I	
Bryant	#4902-I	
Hubbell	#1222-I	#1224-L
P&S	#20AC2-I	
G.E.	#GE5952-2G	

3. Three-Way Switches

Manufacturer	Toggle Type	Lock Type
Leviton	#1223-2I	
Arrow-Hart	#1993-I	
Bryant	#4903-I	
Hubbell	#1223-I	#1223-L
P&S	#20AC3-I	
G.E.	#GE5953-2G	

4. Four-Way Switches

Manufacturer	Toggle Type	Lock Type
Leviton	#1224-2I	
Arrow-Hart	#1994-I	
Bryant	#4904-I	
Hubbell	#1224-I	#1224-L
P&S	#20AC4-I	
G.E.	#GE5954-2G	

5. Momentary Contact Switches

Manufacturer	3-Position Toggle Type	3-Position Lock Type
Leviton	#1257-I	
Arrow-Hart	#1995-I	
Bryant	#4921-I	
Hubbell	#1557-I	#1557-L
P&S	#1251-I	

6. Maintained Contact Switched (Double Throw, Center Off)

Manufacturer	Toggle Type 1-Pole	Toggle Type 2-Pole	Lock Type 1-Pole	Lock Type 2-Pole
Leviton	#1285-I	#1286-I		
Bryant	#4922-I	#4925-I		
G.E.	#GE5957-2			
Hubbell	#1385-I	#1386-I	#1385-L	#1386-L
P&S	#1225-I	#1226-I		

7. Door switch shall be Leviton #1865 or Arrow-Hart #4029. Mount box in door jam on hinge side of door. Switch shall be "on" when door is open.

8. Weatherproof switches shall be as specified above complete with weatherproof cover. Pass and Seymour #CA31-G or equal.

2.3 WALLPLATES

A. Wall Plates:

1. Plates shall be supplied for every local switch, receptacle, telephone outlet, wall speaker outlet, etc. All plates shall be furnished with engraved or etched designations under any one of the following conditions:

a. Light switches, three or more ganged together.

b. Lock switches.

c. Pilot switches.

d. Switches in locations from which the equipment or circuits controlled cannot be readily seen.

e. Manual motor starting switches.

f. Where so indicated on the drawings.

g. As required on all control circuit switches, such as heater controls, etc.

h. Where receptacles are other than standard duplex receptacles, to indicate voltage and phase.

i. All wall plates shall be .032 inch nominal stainless steel plates, unless specifically noted otherwise, be Leviton Type 302 stainless steel or equal.

2.4 NAMEPLATES

A. Provide black-on-white engraved nameplates for each switchboard, panel, terminal cabinet, control center, pull box, disconnect switch and magnetic motor starter to correspond with designations on the drawings. Nameplates shall be secured with screws, bolts or rivets, other means of attachment will not be accepted. "DYMO" type labels will not be accepted.

2.5 DATA OUTLETS (WALL MOUNTED)

A. Data outlets shall be mounted in a 4 11/16 inch square X 2 1/8 inches deep outlet box equipped with a 1 1/2 inch deep box extension and single-gang raised ring. Depth of raised ring shall be as required. Outlet shall consist of an 6 port stainless steel faceplate, a Category 6 modular jack and five "blank" inserts for future jacks. Assembly shall be suitable for unshielded twisted pair cable and consist of following:

1. One Category 6 modular jack - AMP #1375055-6

2. Five blank inserts - AMP #1116412-1

3. One stainless steel faceplate - AMP #1FM-(6)ØE-AMP

2.6 DATA OUTLETS (MOUNTED IN FLOOR BOXES)

A. Data outlets shall be Category 6 modular jacks. Jacks shall be suitable for unshielded twisted pair cable and as follows:

1. Two Category 6 modular jacks - AMP #1375055-6

2. One 4-port decorator mounting strap - AMP #1479504-1

3. Two blank insert - AMP #1116412-1

4. One rectangular faceplate - Steel City #665-GP

2.7 DATA OUTLETS (MOUNTED IN SURFACE METALLIC DIVIDED RACEWAYS)

A. Data outlets shall be a Category 6 modular jack, suitable for unshielded twisted pair cabling and as follows:

1. One Category 6 modular jack - AMP #1375055-6

2. One 4-port decorator mounting strap - AMP #1479504-1

3. Three blank inserts - AMP #1116412-1

4. One rectangular faceplate - Wiremold #5507R

2.8 DATA/VOICE OUTLETS

A. Data/Voice Outlets shall be mounted in a 4 11/16 inch square x 2 1/8 inch deep outlet box equipped with a 1 ½ inch deep box extension and single-gang raised ring. Depth of raised ring shall be as required. Outlet shall consist of a 6 Port stainless steel faceplate, one Category 6 modular data jack, one Category 3 modular voice jack and four blank inserts for future jacks. Assembly shall be suitable for unshielded twisted pair cables and as follows:

1. One stainless steel faceplate - AMP #1FM - (6)ØE-AMP

2. One Category 6 modular jack - AMP #1375055-6

3. One Category 3 modular jack - AMP #1375192-1

4. Four blank inserts - AMP #1116412-

B. Where subscript 2 is adjacent to Data/Voice symbol, provide two Category 6 modular jacks, two Category 3 modular jacks and two blank inserts.

PART 3 - INSTALLATION

3.1 GENERAL

A. All computer/data cabling within each building shall be Category 6 compliant.

A. All connections and splicing shall meet Category 6 compliance for Gigabit Ethernet data transmission. This means that all Category 6 cabling shall meet the minimum requirements as set forth in publications ANSI/TIA/EIA-568-B.1 through ANSI/TIA/EIA-568-B.2-1 published by Telecommunications Industry Association.

B. All terminations in wiring centers shall use a modular patching scheme. i.e. AMP Netconnect open wiring system, to facilitate easy connections and modifications.

C. Category 6 data cables must be terminated in accordance with TIA/EIA-568-A wiring practices.

3.2 TELEPHONE/DATA BACKBOARDS

A. Terminate all Category 3 cabling onto Type 66 punchdown blocks, quantity as necessary at each telephone/data backboard or Signal T.C. where applicable.

B. Punchdown blocks shall be Siemon #S66M1-50 with #589B stand-off bracket or equal.

C. Mount punchdown blocks onto the plywood backboard.

END OF SECTION 16140

SECTION 16142 - LOW VOLTAGE SWITCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 GENERAL REQUIREMENTS

A. Furnish and install a complete system of low voltage remote control switching to provide the general switching indicated symbolically on the drawings. System shall operate at 24 volts a.c. (or half-wave rectified d.c. at the Contractor's option).

PART 2 - PRODUCT

2.1 RELAYS

A. Relays shall be specification grade rated 20 amperes, 277 volts a.c., electrically operated, mechanically held with coils suitable for 24 volt a.c. or d.c. operation. Relays shall be designed to snap into a 1/2 inch knockout. Relays shall be General Electric #RR7 or Pass and Seymour #1070-B. Provide General Electric #RR8 if pilot light operation is required.

2.2 SWITCHES

A. Switches shall be momentary contact, single pole, double throw shall be General Electric #GE5935-2G or Pass and Seymour #1081. If pilot light is required, use General Electric #RS2-32-P. Key operated switches, if required, shall as specified, under toggle switches, for 3 position, momentary contact switches.

2.3 TRANSFORMER

A. Transformer shall be 75 volt-ampere, 120/24 volt a.c. high reactance (current limiting) type or fused secondary and installed in properly barriered compartment. Transformer shall be General Electric #RT1 or Pass and Seymour #1038.

2.4 RECTIFIER

A. Rectifier (if used) shall be solid state, half wave, silicon type rated 20 amperes, intermittent and 7.5 amperes continuous duty, at 30 volts a.c. General Electric #RA16, or Pass and Seymour #1037-H.

2.5 TERMINAL STRIPS

A. Terminal strips shall be furnished to terminate all line and low voltage conductors and shall be Marathon Special Products #100 series. Line voltage terminals shall be furnished with covers.

2.6 LOW VOLTAGE RELAY CABINET

A. Low voltage relay cabinets, when indicated on the drawings, shall be flush mounted, with hinged locking doors keyed to match the terminal cabinets and with the general construction specified for terminal cabinets. Cabinet width shall be 20 inches (minimum). The line and low voltage wiring shall be barriered, the barrier serving as the mounting plate for the relays. The barrier shall be isolated from the remainder of the cabinet to reduce noise but shall be flexibly bonded to the cabinet for ground continuity. Knockouts shall be provided in all usable barrier space for additional relays. Transformer and rectifier (if used) shall be properly mounted in the cabinet. All conductor terminations and connections shall be made up on terminal strips.

PART 3 - EXECUTION

3.1 RELAYS IN PANELBOARDS

A. When indicated to be mounted in panelboards, relays shall be mounted, along with all accessory equipment, in a compartment of the panelboard constructed as specified preceding for a separate low voltage relay cabinet, behind a separate door.

END OF SECTION 16142

SECTION 16143 - OCCUPANCY SENSOR LIGHT CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 GENERAL CHARACTERISTICS

A. All sensors shall be self-contained, ultrasonic motion detectors providing volumetric coverage without gaps within the detection area.

B. Sensors shall have a rugged solid-state design and be designed specifically for energy conservation.

C. Operating frequency shall be crystal controlled to within + 0.01 percent and all ultrasonic transducers must be protected from damage.

D. Sensors shall be available with different operating frequencies to allow individual control of adjacent areas.

E. User adjustable controls shall be provided for "sensitivity" and "time delay".

F. Coverage shall remain constant after sensitivity control has been set.

G. No reduction in coverage shall occur when air-conditioning is in operation.

H. Sensors shall be able to be wired in parallel to allow coverage of large areas.

I. Sensors shall be suitable for Class 2 wiring.

J. An easily visible indicator light shall be provided to verify that motion is being detected.

K. Sensors shall be designed, specifically, for the size and use of the area in which they will be used.

L. All ceiling mounted sensors shall have easily disconnectable connectors for easy installation.

M. Except when actually switching the load, system operation shall be silent.

N. Sensors shall cover volumetrically (no gaps) 90 percent to 100 percent of the area supervised.

PART 2 - PRODUCT

2.1 LIGHTING CONTROL SYSTEM DESCRIPTION:

A. The lighting control system shall consist of low voltage relay control panels with 64 programmable switch inputs and shall offer 48 control relays.

B. Each low voltage lighting control panel shall be microprocessor controlled with a touch screen interface display. The touch screen shall provide relay status information viewable through a protected windowed enclosure. All local programming shall be permissible through the self-prompting touch screen.

C. Programmable intelligence shall include Time-Of-Day control, 32 holiday dates, warn occupants of an impending off, timed inputs, preset control, auto daylight savings, astronomical clock w/offsets, local control, digital switches and network overrides.

D. Time Of Day Scheduling: 64 Time-Of-Day/holiday schedules for 365 day programming.

E. Holidays: 32 holiday dates.

F. Warn Off: Flash lights and provide an extra 1 second to 99 minutes of illumination.

G. Preset: Pre-programmed switch patterns.

H. Timed Inputs: Switch input timers 1-999 minutes.

I. Timed Overrides: Timed override from the touch screen 1-999 Overrides minutes, resumes to normal schedule.

J. Local Control: From integral touch screen & local switch.

K. Astronomical Clock: Longitude and latitude input with sunset-sunrise offsets to customize outdoor lighting.

L. Auto Daylight Savings Adjust: Automatically adjusts the clock at the appropriate dates, selectable.

M. Priorities: Establishes a hierarchy for inputs and network control commands.

N. Masking: Provides permission orientation to switch inputs and network commands thereby ensuring building lighting control integrity.

O. Soft-Linking: Group linking for rapid programming.

P. Gobal Linking: Each panel shall provide 64 addressable groups for network linking of control commands.

Q. Analog Inputs: Four analog inputs.

R. Lighting control unit shall be the ControlKeeper® TouchScreen manufactured by Cooper Controls, Inc., 6 Green Tree Drive, So. Burlington, VT 05403-6025.

2.2 CONTROL PANEL

A. The control panel shall be capable of self-determining what relay type is in each relay location. The relays may be designated in software as Normal, Inverted, Sentry or Phantom to allow various program options. The controller shall be capable of reporting whether the relays are overridden via software, override switches, or via on board hardware override. Relay status shall not only disclose commanded relay status but next scheduled state to occur.

B. Each control panel shall provide a Warn Off (flash the lights) to inform the occupants of an impending Off command. The Warn Off command shall provide an adjustable time duration of 1 second to 99 extra minutes. The occupants may exit the premises with adequate lighting or cancel the Warn Off by overriding the lighting zone. This option occurs with all Off commands except local overrides.

C. The controller shall permit lighting to be overridden On for after hours use or cleaning. The controller shall provide optional switch timer assignments or timed overrides. The override choices for various relays shall provide special event occurrences and the controller shall return to the programmed state after the override event. Also, the controller shall provide priority and masking choices to customize the functions of switch inputs, thereby enabling switches to function differently at different times of the day to meet special facility operational requirements. These overrides shall be digital, network, or hard-wired inputs.

D. Programming the controller shall be through the local integral touch screen. Descriptive information shall assist the user to employ the system without a programming manual.

E. Priorities and/or Masking shall be assigned to inputs, telephone override, and global commands to insure building integrity. Priorities enable or disable the inputs based on user actuation of overrides. Masks shall permit: On only, Off only and On & Off control for intelligent after hours utilization of the controlled facility based on Time-Of-Day scheduling in the controller.

F. The lighting control system may be fully programmed through PC programming software. Programming shall be permitted through a direct RS-232 connection, modem or TCP/IP.

G. The control system shall provide networking between lighting control panels. One network may support a maximum of 254 control panels. Panels shall permit data sharing for global control. All inputs (no limitation) are transferable over the network to create any switching pattern required. The maximum length of the lighting control network shall be 4000 feet. Repeaters are available to extend the network as needed. Networks that rely on a single time clock for system operation shall not be acceptable.

H. The lighting control system shall log all control events. The controller shall monitor all relay actuations, switch inputs and user intervention. Log reports shall be available for any duration of time the operator chooses through the integral touch screen or the Keeper Enterprise Software. Runtimes for each relay shall be available from the integral touch screen or the Keeper Enterprise Software.

I. (Optional) The lighting zones may be controlled through a graphical representation software package called VisionTouch®. The software permits up to 255 floors or site plans to be illustrated for intuitive control. The software provides real-time feedback to the operator of network control overrides and relay status.

J. (ptional) The lighting zones may be controlled through a graphical representation of four switches on multiple PC s that are connected to the building LAN. This software package for lighting control overrides is called VisionSwitch®. The software permits unlimited users connected to the building LAN to control their lighting zones. The software provides immediate feedback to the operator/user of network control overrides.

K. (Optional) The lighting control system shall permit LED annunciated digital switches. Each digital switch shall provide status feedback of any control relay in the entire lighting control network.

2.3 HARDWARE FEATURES

A. Diagnostic Aids: Each control panel shall incorporate diagnostic aids for confirmation of proper operation, or in case of failure these aids shall guide the individual in rapid troubleshooting of the system. The control panels shall employ both a backlit touch screen and LEDs to indicate:

1. POWER (LED)
2. SYSTEM OK (LED)
3. NETWORK COMMUNICATIONS (LED)
4. ON/OFF STATUS of EACH RELAY (LED & touch screen)
5. SYSTEM CLOCK and DATE (touch screen)
6. PROGRAMMING CONFIRMATION (touch screen)
7. CONTROL PANEL SUBNET NETWORK COMMUNICATIONS (TX & RX LEDs)

B. Control systems that do not provide visual self-help diagnostics shall not be acceptable.

C. Status Indication of Relays: The system shall provide visible status indication of all relays through the window of each control panel. The visual indication shall disclose On/Off status and relay number. Systems that do not provide relay status while the enclosure door is closed shall not be acceptable. Relay status shall also be visible via actual indication on the relay card. The serial standard relay cards shall provide visual status of the relay state and also the override state. The relay status LED shall also provide indication to the user if the relay is in a hand actuation condition. Each serial standard relay card shall permit manual overrides for each individual relay. The serial latched relay card shall provide relay status and permit hand actuation.

D. Operator Interface: The control panel programming interface resides in firmware in the control panel. The programming interface shall consist of a circuit board mounted touch screen capable of linking switch inputs to relay outputs and schedule assignments. Systems that utilize blocking diode technology for relay assignments shall not be acceptable. The integral touch screen shall provide access to the main programming features. The touch screen shall permit the user to manually command any or all relays individually. Each panel shall control its own loads from internal memory. A control system that relies on a central control computer/processor or external time clocks shall not be permitted.

E. Overrides: The controller shall provide timers for each override. Each override timer shall be capable of 0-999 minutes. Software shall enable or disable overrides based on Priorities, Masks or Time Of Day scheduling.

F. Digital Switch (DigitaTM): The lighting controller shall support digitally addressable LED annunciated switches. The maximum total number of digital switches that may exist on the lighting control network shall be 16,256. Each Subnet shall support 64 buttons. The digital switch network requires CAT 5 cable between switches. The digital switches shall control any relay group combination on the lighting control network. Data communications status feedback for system checkout and troubleshooting (transmit and receive LEDS) shall be visible on both the controller and interface. The digital switch configuration system shall permit custom labeling for multiple button switch locations. The digital switch configuration shall be DecoraTM form and function.

G. Dry Contact Inputs: The control system shall permit 32 dry contacts inputs for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Maintained contacts shall be supported as 2 wire (SPST) inputs. Inputs shall be dry contacts (24 VDC @ 12 ma. internally supplied to the inputs). The 24 VDC power supply is provided with an auto-resettable fuse. Should an inappropriate electrical connection be made the design will protect the board and switches until the fault is removed. Any switch input shall be software linked to any number of relays for override control. The control panel shall have dry contact inputs on the logic board. Control systems that utilize separate accessories to allow for dry contact switches shall not be acceptable. Control systems that do not supply both digital switches and analog switches from the same controller shall not be permitted.

H. Lighted Switch Outputs (LSO): The controller shall provide an output for pilot light wall switch annunciation of dry contact inputs. A fourth connection point on the controller board shall provide power to illuminate pilot light switches. This option shall confirm relay operation. When a relay is in the ON position the pilot light switch shall be illuminated. The pilot light outputs shall be software selectable to offer either incandescent, LED illumination or locator.

I. Photocell Control: The controller shall accept either dry contact or analog ambient light sensors. The controller shall provide power for the sensor thereby

eliminating any external power supply. Sensors shall provide for outdoor, indoor or skylight applications and issue a command to the controller once the threshold is reached. The sensor shall provide either software or user adjustable dead band control.

J. Network Overrides: The controller shall accept network commands issued from other inputs or controllers on the network. The controller shall provide this feature without the need to add extra equipment to the controller. Network overrides can be issued from the Telephone Interface Module (TIM), Modbus® Gateway, DMXGateway, Photocells, Motion Sensors, Digital or Dry Contact Switches, or other controllers. Lighting systems that need to add extra equipment to receive network overrides are not acceptable.

K. Service Override & Priority Override: The control panel shall provide a three position master-service override for the control unit. The service override shall not be accessible from the exterior. Systems that provide a service override on the exterior of the controller shall not be acceptable.

L. The master service override provides a single three-position switch with the option of All Off, Auto, and All On, respectively. This master switch shall operate all of the relays in the controller. This switch shall override and supersede all commands from the logic board when the switch is in the All On or All Off position. The master switch shall function to override all the relays should the logic board programming differ from the space function. The system shall report all master service overrides to the controller and shall be accessible via network query. Systems that cannot determine when the service override is in use shall not be acceptable. The system shall remember the last command to the individual relays. Upon returning the master override switch to the Auto position, the relays shall return to the most recent command state. This will occur even if the last command happened during the master override condition.

M. Additionally, the system shall provide external priority override for the entire panel. Through an externally maintained contact the override card shall place the panel in a priority state. This external contact will supersede any other programmed state and will command all the relays ON or OFF depending on operational choice. This priority state will continue until the external contact is removed. Once the external override is removed the control panel will return the relays to the appropriate programmed state.

N. Serial Standard Relay Card (sSRC-NO): The system shall utilize normally open control relays, which are rated to 20 amps at 120/277 VAC. The relays shall be magnetically held and are provided in groups of four relays per card. Each relay card shall permit individual override and LED confirmation of relay state. The relays shall be rated for 10 million mechanical operations. The wire terminations shall be able to accept 10 AWG. A limited 10-year warranty shall be provided on the individual relay cards. Systems that do not offer a limited 10-year warranty on all installations are not acceptable.

O. Serial Standard Relay Card (sSRC-NC): The system shall utilize normally closed control relays, which are rated to 20 amps at 120/277 VAC. The relays shall be magnetically held and are provided in groups of four relays per card. Each relay card shall permit individual override and LED confirmation of relay state. The relays shall be rated for 10 million mechanical operations. The wire terminations shall be able to accept 10 AWG. A limited 10-year warranty shall be provided on the individual relay cards. Systems that do not offer a limited 10-year warranty on all installations are not acceptable.

P. Serial Two Pole Relay Card (sTPRC-NO/NC): The controller shall provide an option for two pole relay control. The Two Pole Relay Card shall offer the feature of controlling two pole voltages such as 208, 240, and 480VAC in a Normally Open or Normally Closed configuration. This relay card shall also provide visual indication of relay status. The wire terminations shall be able to accept 6 AWG wire. Two pole modules require two relay locations for a maximum of two - two pole relays per card. All Two Pole Relay Module components shall be warranted for 10 years. Systems that do not offer a limited 10-year warranty on all installations are not acceptable.

Q. Serial Latching Relay Card (sLRC): The controller shall provide an option to provide latching relays that are rated to 20 amps at 347 VAC. The relay shall provide an integral switch for both manual hand operation and visual indication of relay status. The relays shall be rated for 10 million mechanical operations. The wire terminations shall be able to accept 6 AWG wire. A limited 10-year warranty shall be provided on the individual relays. Systems that do not offer a limited 10-year warranty on all installations are not acceptable.

R. High Voltage Barriers: The controller shall provide as an option the ability to provide a barrier for either

voltage separation or emergency circuit separation. The barrier shall be painted red to denote the difference. Systems that do not provide voltage separation are not acceptable.

S. RS-232 port: The controller shall provide an RJ-12 connection for RS-232 communications. Programming shall be permitted through either a local connection or remotely through a modem. The Keeper Enterprise software accessory includes a six wire communication cable to connect to the controller. Systems that do not include an on-board RS-232 port for communications are not acceptable.

T. RS-485 Network: The controller shall be able to communicate to other controllers on a daisy chain twisted pair of wires. The RS-485 network shall support 254 controllers with a maximum distance of 4000 feet. Each controller shall be optically isolated. The networked controllers shall provide optical isolation between controller power supplies for true electrical isolation (communication grounds are 100% isolated). Cooper LCCP, Cooper LCCNP or Belden #9841 cable shall be approved for network wiring.

U. Modular Design: The control system shall employ all modular connectors to avoid repeat wiring in case of component failure. The system CPU board shall be mounted on quick release hinge pins that shall permit an entire change out of the controller in less than 1 minute. All connections for the dry contact inputs shall incorporate modular connectors. The relay board shall be modular and designed for rapid field replacement or upgrading. Systems that do not employ modular connectors shall not be acceptable.

V. Memory Back-up: The system shall utilize a memory back-up device that is system integrated and shall be non-serviceable. The data in Flash Memory shall be protected against power interruptions for the life of the product. The power interrupt protection circuit shall be entirely maintenance-free.

W. Multi-tapped Transformer: The control panel shall incorporate the use of a multi-tapped transformer. The panel shall not require specification of voltage for each control location. The voltages of 120 & 277 VAC shall be available with each control panel.

X. Lockable Enclosure: Each control panel shall be enclosed in a lockable NEMA class 1 enclosure. The enclosure shall be manufactured out of 1/16 steel and shall provide pre-punched knockouts for efficient installation.

Y. Enclosure: The low voltage controller shall exist in three sizes of relay enclosures. The enclosure maximum sizes shall be either 16, 32 or 48 relays per cabinet. The 16-size will employ four relay cards and the 32-size will utilize 8 relay cards and the 48-size relay cabinet shall communicate to 12 relay cards. Relays shall be provided in groups of four relays per card.

Z. Keeper Enterprise Software: The PC based interface software accessory shall provide access to lighting control system files within a Microsoft® Windows® environment. The Keeper Enterprise software shall support Windows® 2000, Windows® XP and above. The optional software package shall allow individual and network panel programming to be executed locally, via direct connection or remotely through a TCP/IP connection or modem. The central programming software shall permit the user to modify the control panel programming or configuration in an OFF-LINE mode. This software package shall store all programmed data and archive for future use. Systems using third party software are not acceptable. Systems that are not capable of creating program backups are not acceptable. The following features shall be standard in the PC based software:

1. Real Time Relay Status Monitoring
2. Alpha-Numeric Descriptors
3. Communications: Direct, Network, TCP/IP and Modem
4. Network Status Indication
5. Global Software Modifications
6. Manual Relay Commands
7. Remote Pattern Commands
8. Preset Options
9. User Management Password protection, and privilege modification for multi-user security
10. Logging of Controller Actions (switch inputs, TIM commands, & relay actuations)
11. Remote Commander (entire network global commands from one screen)
12. File Maintenance:
    a. Archive Programs
    b. Data Base Restoration

c. Uploading and Downloading of Programs
d. Snap Shots indication of changes and flawless panel restoration.

AA. Software package shall permit the PC to be utilized for other functions (i.e. word processing, database, & etc..) besides lighting control. Systems that require an on-line dedicated computer for control system operation shall not be acceptable.

BB. System Management Software Accessories require the Ethernet Interface Module (EIM) accessory, connection to the building LAN and Windows® 2000, Windows® XP or above operating system.

CC. VisionTouch®: The lighting zones may be controlled through a graphical representation software package called VisionTouch®. The software permits up to 255 floors or site plans to be illustrated for intuitive control. The software provides real-time feedback to the operator of network control overrides. The software shall be accessible through an Ethernet network permitting more than one location control access to the site. The software shall accept AutoCAD® drawing files to reduce programming set up of the control software. VisionTouch® requires the Ethernet Interface Module.

DD. VisionSwitch®: A lighting control tool which, when integrated on a computer desktop, shall employ Ethernet communications and shall control up to four load-groups per computer desktop. Each load-group shall span several panels and relays. VisionSwitch® requires the Ethernet Interface Module.

2.4 NETWORK HARDWARE ACCESSORIES

A. The ControlKeeper® TouchScreen has several hardware accessories that may be utilized to enhance your lighting control application. Select from the network hardware accessories which accessories will be utilized for your application.

B. ControlKeeper® 4A (CK 4A): The CK 4A shall provide additional flexibility by providing four 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4A shall optionally provide four 0-10VDC outputs to control dimming ballasts. The CK 4A controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4A provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide four 3-wire or eight 2-wire dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide four analog inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 4A. Networks that rely on a single time clock for system operation shall not be acceptable.

C. ControlKeeper® 4 (CK 4): The CK 4 shall provide additional flexibility by providing four normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 4 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 4 provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide 4 dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 4. Systems that utilize the master slave topology shall not be acceptable.

D. ControlKeeper® 2 (CK 2): The CK 2 shall provide additional flexibility by providing two normally open or normally closed 20 amp @ 277 VAC rated relays that are addressable and fully programmable from the network. The relay wire terminations shall be able to accept 10 AWG. The CK 2 controllers although accessible through the network shall be fully stand-alone in their control capability. The CK 2 provides full status indication of CPU status, network communication, power, and HOA overrides. The controller shall provide 2 dry contact inputs that may be configured as maintained or momentary inputs. The controller shall provide up to 64 digital buttons for overrides. The controller shall provide 64 additional global commands for network control and shall reside in the CK 2. Systems that utilize the master slave topology shall not be acceptable.

E. Ethernet Interface Module (EIM) Internet Connection Specifications: The control system accessory provides easy access to control panels over a TCP/IP connection by converting sent information into RS-232 communication capable information. This unit operates on standard 110VAC. Manufacturer shall provide proper cabling from controller to Ethernet Interface Modules. RJ-45 connections are the responsibilities of others. This specification will outline the respective responsibilities of Cooper Controls and of the customer when a TCP/IP

connection is used for communication to the Cooper Controls network.

F. VPN hardware device accessory: An optional VPN hardware device may be added to your lighting control network and building LAN to ensure security of your building LAN and lighting control network.

G. The control system shall provide intelligent software for the Telephone Interface Module (TIM) option. The optional TIM unit shall allow modem communications and touch-tone overrides from any touch-tone phone. The control system shall be multi-tasking and permit up to one TIM for each control panel.

H. Override Operation: Touch-tone interface shall permit the control panel to command pre-assigned control points On\Off. All user interfaces shall be through the twelve touch-tone keys on the telephone. All entries into the override system shall be prompted by a digitized voice. Systems not employing voice guided override instruction are not acceptable.

I. The TIM shall provide individual control passwords. Each password shall allow a preset group designation (number of relays) and the duration of the telephone override. TIM shall also provide a password to prevent entry into the override control system.

J. Modem: The control system shall be capable of modem communications. Each control panel shall provide a serial communications port for external telecommunications. The modem shall utilize the Hayes compatibility standard and enable modem access as defined by the Bell 21 2A and CCITT V.22 protocol standards. The system shall be a multi-tasking system and permit more than one modem in operation at a time communicating on the network. Communication speed shall be a minimum of 14,400 baud.

K. Interoperability: The controller shall provide accessories that allow for interoperability to other building automation technologies. Select the appropriate interoperability accessory that will be utilized for your application.

L. Automation Interface Module: The ControlKeeper® network shall permit data protocol translation through an Automation Interface Module. The Automation Interface Module permits systems that utilize the Modbus®, N2, BACnet or LonWorks communication protocols to operate individual relays or relay groups and to read the status of the coils (status read).

M. DMX Gateway: The ControlKeeper® network shall permit data protocol translation through a DMX Gateway. The DMX Gateway permits DMX communication to operate individual relays, and relay groups. The ControlKeeper® shall respond efficiently to the requested DMX commands. The DMX Gateway shall provide data messaging structure to rapidly increase data throughput by employing relay groups directly from the DMX Gateway.

2.5 DIMMING SENSORS

A. Sensors shall automatically dim indoor fluorescent lighting in response to the availability of natural daylight. The sensor shall control the ballast to dim to 20% to 10% of fluorescent lighting output.

B. The dimming rate of the sensor shall be selectable at either three or eight seconds.

C. The illuminance maintained on the task shall be adjustable at the sensor head, outside the sensor-viewing angle. The sensor head adjustment shall set the maximum output of the controlled ballast.

D. The Sensor shall automatically control the lamp output to compensate for lamp lumen depreciation.

E. The Sensor shall have a range between 0 and 500 foot-candles (FC), and shall be adjustable between 7 and 140 FC. The accuracy shall be +/-1% at 70 FC.

F. The Sensor shall be a Class 2, low voltage, ambient light sensor designed to interface directly via 1 8-guage wire with the Advance Mark VII, Universal Lighting Tech. Super Dim 10 or Lutron Eco-1 0 TVE Electronic Dimming Ballast.

G. One Sensor shall control up to 80 Advance Mark VII Ballasts.

H. The Sensor shall have a flat Fresnel lens with a 60-degree cone of response.

I. The Sensor shall have a low-profile, shadow-free appearance.

J. The penetration of the sensor wire through the ceiling shall be no greater than 3/8 diameter. The sensor shall mount to the ceiling surface with adhesive tape.

K. Sensor housing shall be flame retardant and meet UL 94 HB standards.

L. The Sensor shall be applicable for task tuning lighting zones to ANSI recommended illumination levels.

M. The Sensor shall be housed in Cycolac TTM for UV stabilization.

N. The Dimming Sensor shall be Greengate Model DLC-PD-DIM.

2.6 PHOTODIODES

A. Daylight Sensors shall activate the electrical load when natural light has decreased below a level determined to be sufficient, and deactivate it when natural light reaches a level determined to be sufficient.

B. Daylight Sensors shall be a Class 2, low voltage, ambient light sensor designed to interface directly with the analog input of the Greengate Daylight Controller and Greengate System. Refer to controller and panel specifications.

C. The sensor shall supply an analog signal to the EMS system proportional to the light measured. The sensor output shall provide for zero or offset based signal.

D. The sensitivity adjustment shall be at the sensor body, and outside of the sensor s viewing angle.

E. The sensor housing shall be constructed from GE Cycolac (R) ABS, shall be flame retardant and meet UL 94HB standards.

F. Output minimum voltage selection of zero or offset.

G. Indoor sensor with 60 degree clear Fresnel Lens. Adhesive mounting to ceiling, facing down. Sensor range: 0-100FC.

H. Outdoor sensor with flat clear lens. 1/2 IPT connection for horizontal mounting. Weatherproof housing. Sensor range: 0-250FC.

I. Atrium sensor with opaque dome lens filters 33% of light level in upper atrium. 1/2 IPT connection for horizontal mounting. Sensor range: 0-1 000FC.

J. Skylight sensor with dark dome lens filters 90% of light level in skylight. 1/2 IPT connection to for upward vertical mounting. Sensor range: 0-2000FC.

K. Sensor matched to human eye response range.

L. The Indoor Sensor shall be Greengate Model DLC-PD-IN.

M. The Outdoor Sensors shall be Greengate DLC-PD-OT.

N. The Atrium Sensor shall be Greengate Model DLC-PD-AT.

O. The Skylight Sensor shall be Greengate Model DLC-PD-SK

2.7 CEILING MOUNTED OCCUPANCY SENSORS

A. Sensor shall be available with a two-way or one-way coverage pattern.

B. Sensor shall activate the electrical load upon entry into the controlled area and deactivate it after the area is vacated.

C. Sensor shall be able to detect the moderate types of motion (i.e., picking up a telephone, raising a hand in class) of people seated anywhere in classrooms, offices and conference rooms.

D. Sensor shall self-adjust sensitivity and time delay in real-time using MicrosetTM technology to optimize performance.

E. Sensor shall maintain a constant level of sensitivity to motion regardless of changes in environmental conditions including airflow.

F. Sensor shall utilize Airflow Tolerant TechnologyTM to resist false activation in high airflow environments.

G. Sensor shall utilize passive infrared sensing technology to activate lights.

H. Sensor shall maintain lighting in one of two selectable modes: (1) either (passive infrared or ultrasonic technology); (2) both (passive infrared and ultrasonic technology).

I. One-way sensor shall cover areas from 300 to 700 square feet in rooms without partitions.

J. Two-way sensor shall cover areas from 700 to 2,000 square feet in rooms without partitions.

K. Sensor shall contain timing circuitry to provide adjustable time to lights off delay of 15 seconds (for installer checkout) to 30 minutes. Sensor shall automatically self-adjust to a 10-minute delay, 5 minutes after lights turn-off automatically, when left in installer mode.

L. Sensor coverage patterns shall have been verified using the NEMA WD7 Guide and robotic method.

M. Sensor shall incorporate separate, concurrent time delays for ultrasonic and infrared detectors.

N. Sensor shall provide a ten-second grace period that allows lights to be turned on by motion anywhere in a room after they are turned off due to inactivity.

O. Sensor shall have the capacity to be wired to a momentary pushbutton switch for manual on and off control. Pressing and holding the push button shall allow the occupant to cycle between loads when each control lead is connected to separate switchpacks.

P. Sensor shall be fully self-resetting in Automatic mode; lights turned off manually via the pushbutton switch shall stay-off while the room remains occupied. After the room is vacated and the time delay and grace period have elapsed, lights shall turn on automatically upon re-entry. The BAS relay shall remain active as long as occupancy is detected.

Q. Sensor shall have the capacity, in conjunction with up to 4 other sensors, to be powered by one switchpack.

R. Sensor shall provide a Building Automation System (BAS) interface via (1) a built-in isolated Form C relay output, (2) an open collector output or, (3) a direct BAS connection.

S. Sensor shall incorporate an Energy Saver Mode that ensures only one load activates initially. (In the Energy Saver Mode, if both loads are on when the sensor times out and automatically switches off the lights, the sensor will reactivate the primary load only. If only the primary or secondary load is on when the sensor times out and automatically switches off the lights, the sensor will reactivate the load that was on at shut off. If the lights are shut off manually, the sensor will activate the primary load only.) The Energy Saver Mode shall be selected by a DIP-switch under the sensor cover.

T. Sensor shall be capable of eliminating unnecessary lights on following power-on sweeps. Power Sweep Mode shall be selected by a DIP switch under the sensor cover.

U. Sensor shall provide a Bi-Color LED to indicate which technology detects motion.

V. Sensor shall provide a manual override switch which closes the BAS relay and allows the lighting load to be turned on without tools in the event of Sensor malfunction.

W. Sensor electronics shall be replaceable, in the event of failure, without disturbing hard-wiring or sensor mounting.

X. Sensor housing shall comply with UL 94V0 and shall be equipped with a protective grill to shield the detectors from damage. Sensor housing cover shall snap fit for easy removal. No screws or tools required.

Y. Sensor shall surface mount to ceiling tiles through a single 3/4-inch hole with provided hardware and without accessory fittings.

Z. Sensor shall be UL Listed.

AA. Sensor shall be suitable for Class 2 wiring.

BB. Sensor shall have Teflon-insulated pigtails and be approved for use in plenum ceilings per CEC 725.2(b).

CC. Sensor shall be designed for parallel wiring to allow coverage of large areas.

DD. Sensor shall be capable of operating on 10-30 VDC as supplied by Greengate Switchpacks or Greengate System. Refer to Switchpack and System specifications.

EE. Sensor shall provide sufficient switching capability to activate up to ten Switchpacks.

FF. Sensor shall perform within the FDA s guidelines for ultrasonic devices.

GG. MicrosetTM One-way Dual Technology Sensor shall be Greengate Model OMC-DT-0701 -R.

HH. MicrosetTM Two-way Dual Technology Sensor shall be Greengate Model OMC-DT-2000-R.

2.8 WALL MOUNTED SENSORS

A. The Wall Switch shall mount into a designer-style wallplate.

B. The Wall Switch shall turn off lights automatically after a room is vacated and a time delay elapses.

C. The Wall Switch shall be capable of sustaining light by detecting minor movements (i.e., picking up a telephone receiver) of a person located anywhere in the room within the coverage area.

D. The Wall Switch shall cover up to 450 square feet in rooms without partitions.

E. Sensor coverage patterns shall have been verified

using the NEMA WD7 Guide and robotic method.

F. The Wall Switch shall allow for the control of a second circuit without an adjacent toggle.

G. The Wall Switch shall incorporate a touchplate, which can be pressed to turn the lights off in either the automatic or manual mode. Tapping the touchplate shall allow the occupant to turn the lights on or off. Pressing and holding the touchplate shall allow the occupant to select the light level by cycling through the selection of the primary load, the secondary load only, or both loads.

H. When lights are shut off automatically by the sensor, the wall switch shall activate lights in the same state they were in when they were shut off.

I. Lights shall be activated manually upon entering a room for maximum energy savings or automatically for maximum convenience. A concealed switch shall be provided to enable selection of either option. (Patent pending) When set in the automatic mode, lights turned off manually shall stay off while the room Remains occupied. After the room is vacated and the pre-set time delay and grace period have elapsed, the lights shall come back on automatically upon re-entry.

J. The Wall Switch shall incorporate an Energy Saver Mode that ensures that the Wall Switch initially activates one load only. (In the Energy Saver Mode, if both loads are on when the sensor times out and automatically switches off the lights, the switch will reactivate the primary load only. If the only the primary or secondary load is on when the sensor times out and automatically switches off the lights, the switch will reactivate the load that was on at shut off. If the lights are shut off manually, the switch will activate the primary load only.) The Energy Saver Mode shall be selected by a DIP-switch under the touchplate.

K. The Wall Switch shall provide a time to lights off delay that is adjustable through a concealed control. The Time Delay shall be adjustable between 15 seconds (for installer testing) and 30 minutes.

L. The Wall Switch shall screen out false activation from corridor traffic by reducing sensitivity to motion after the time delay and grace period has elapsed.

M. The Wall Switch shall include a self-adjusting feature that shall maintain optimum performance by automatically and immediately self-adjusting sensitivity and time delay in response to occupant behavior.

N. In Manual On mode the Wall Switch shall provide a grace period of approximately ten seconds that allows lights to be turned on by motion anywhere in a room after they are turned off due to inactivity. Any motion detected by the Wall Switch within that grace period shall automatically turn the lights on, thus eliminating the need to manually reactivate the lights.

O. The Wall Switch shall incorporate a built-in feature that shall prevent false activation during building automation system power-on sweeps.

P. The Wall Switch shall maintain a constant level of sensitivity to motion regardless of changes in environmental conditions, including airflow.

Q. The Wall Switch shall provide a concealed dip switch that will force lights on in the event of product malfunction.

R. All adjustable controls shall be concealed and operable without special tools or removal of the Wall Switch from the wall.

S. The Wall Switch housing shall comply with UL 94V0 and shall be equipped with a tamper-resistant lens to shield detectors from damage.

T. The Wall Switch shall control up to 6.7 Amps (approximately 800 Watts) for 120 Volt systems and 4.3 Amps (approximately 1200 Watts) for 277 Volt systems for each relay. The Wall Switch shall have no minimum load requirement.

U. The Wall Switch shall be compatible with magnetic and electronic ballasts and shall conduct no current through the load when off.

V. The Wall Switch shall be immune to Electromagnetic Interference (EMI), Radio Frequency Interference (RFI) and voltage drops or surges.

W. The Wall Switch shall be UL Listed for both 120 and 277 Volt circuits.

X. The Wall Switch shall be Greengate Model OSW-P-0451 -DMV.

2.9 SWITCHPACKS

A. Switchpack shall supply 15 VDC to operate up to five (5) sensors.

B. Switchpack shall be operable from either 120 or 277 VAC circuits.

C. Relay contacts shall have ratings of:

1.	15 Amps:	120 VAC Tungsten
2.	20 Amps:	120 VAC Ballast
3.	20 Amps:	277 VAC Ballast
4.	1 HP:	120 VAC
5.	2 HP:	250 VAC

D. Switchpack shall have an isolated (dry) Form A contact closure capable of switching up to 15 Amps Incandescent (Tungsten) or up to 20 Amps fluorescent (Ballast).

E. Switchpack shall be capable of being mounted externally to any standard junction box or internally to standard electrical boxes with a single locknut which is provided.

F. Switchpack housing shall comply with UL 94V0.

G. Switchpack shall be UL Listed Class 2.

H. Switchpack shall be plenum rated.

I. Switchpack shall have Teflon control leads.

J. Heavy Duty Switchpack shall be used to control electronic, magnetic and hybrid ballasts.

K. Heavy Duty Switchpack shall utilize zero crossing circuitry to maximize relay life.

L. Heavy Duty Switchpack shall be used to control high inrush electronic ballasts.

M. Heavy Duty Switchpack shall be Greengate Model SP20-MV and shall be compatible with Greengate Sensors.

2.10 STATION SWITCHES

A. Local area control switches shall be fully programmable, with LED relay status indicators, Digital Switch (DigitaTM).

B. Each switch location shall be comprised of up to five (5) buttons that shall be capable of controlling up to 99,999 relay groups.

C. The digital switch configuration shall be DecoraTM form and function, engraved appropriately for location installed.

PART 3 - EXECUTION

3.1 MANUFACTURER'S RESPONSIBILITY

A. The manufacture or his authorized representative shall review the drawings at time of bidding for appropriateness of the indicated equipment and the adequacy of coverage. Should any deficiencies be noted they shall immediately be brought to the attention of the Architect.

B. The manufacture or his authorized representative shall check the completed installation and provide a letter stating that all elements of the system are properly installed, adjusted and operating properly.

3.2 ADEQUACY OF COVERAGE

A. If an alternate manufacturers are proposed under the terms of this specification and if the equipment parameters require additional equipment and wiring to provide equal adequacy of coverage and total specifications compliance to the system as shown and specified, revised drawings shall be submitted showing required changes. The cost of any such equipment an wiring changes, including conduit and outlet costs shall be borne by the Contractor.

3.3 RACEWAY REQUIREMENT

A. All conductors for this system shall be in conduit or other approved metal raceway. Open wiring, including Teflon insulated conductors, will not be accepted.

END OF SECTION 16143

SECTION 16155 - MOTOR STARTERS, CONTACTOR AND CONTROL RELAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

PART 2 - PRODUCT AND EXECUTION

2.1 INDIVIDUAL MAGNETIC MOTOR STARTERS

A. Magnetic motor starters shall be A.C. line voltage, across-the-line units in NEMA Type 1 enclosures are indicated. All starters located outside of a building whether or not indicated to be w.p. (weatherproof) and all starters noted w.p. shall be furnished in NEMA Type 3R weatherproof enclosures. Starters shall be horsepower rated for the motor controlled and shall be equipped with properly sized thermal overload unit. Every pole shall be equipped with a thermal overload unit.

B. Verify the exact motor current and voltage characteristics with the Contractor supplying the motor before installation of a starter. Each starter shall be equipped with 480/120 volt control power transformer, "hand-off-auto" switch or stop-start push button as required and each unit shall have an engraved nameplate securely fastened to the front cover indicating the device controlled.

C. All magnetic starters shall have a minimum of one auxiliary contact. Additional auxiliary contacts shall be provided as required to comply with the requirements of the wiring diagrams on the electrical and mechanical drawings and the description of function, if any, in the Mechanical Division of the Specifications.

D. The following types of magnetic motor starters are approved:

Manufacturer	Type
Arrow-Hart	Bul. AH32
Cutler Hammer	Type AN16
General Electric	CR306 Series
Square D	Class 8536

2.2 COMBINATION MAGNETIC STARTERS

A. Combination magnetic starters shall be a fusible disconnect switch and an across-the-line magnetic starter installed in a single NEMA Type 1 enclosure. NEMA 3R enclosure shall be used under the same circumstances as specified previously for magnetic motor starters.

B. Horsepower rating, overload setting and auxiliary devices for the magnetic starter portion shall all be as specified in the preceding paragraph for individual magnetic starters, including overload elements for every pole.

C. Combination magnetic starters shall also be used where both disconnect devices and magnetic starters are used at the same location regardless of whether the symbols indicate a combination device, unless specific notation, unusual operation or space condition cause variation.

D. Fusible disconnect shall meet requirements specified in Section 16170.

E. Magnetic starters shall be as specified in subsection 2.1.

2.3 MANUAL MOTOR STARTERS

A. Manual motor starters shall be flush or surface mounting with number of poles and size of thermal overload units as required for the motor being controlled. Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4 inch square outlet box or the larger type requiring a special box and cover designed to accept the particular unit. Unless otherwise noted on the drawings, all manual starters for single phase motors, 1 h.p. and smaller, shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p., and all three phase motors up to 5 h.p. shall be the heavy duty type. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet.

B. The following starters are approved:

Manufacturer	Single Phase 1 H.P. and Below	Others
Cutler-Hammer	Type MS	Type B100
General Electric	CR101	CF 1062
Square D	Class 2510, Type F	Class 2510, Type M

2.4 CONTACTORS (LIGHTING)

A. Contactors for control of lighting shall be 600 volt, A.C., mechanically held units, open type for panel mounting with number of poles, continuous ampere rating and with coil voltage as indicated on the drawings and shall be manually operable from the face of the unit.

B. Contactors shall be mounted in panelboards in barriered section under separate hinged lockable doors or in contactor cabinets as called for on the drawings. Contactors shall be installed on sound absorbing rubber mounts.

C. Acceptable contactors are the following:

Manufacturer	Catalog Number
ASCO	917
General Electric	CR360
Square D	Class 8903
Cutler-Hammer	Type A202

2.5 CONTACTORS (FOR CONTROL OF RECEPTACLES)

A. Contactors for control of receptacles shall be rated at 600V AC, mechanically held units, open type for panel mounting with number of poles and continuous ampere rating and with coil voltage as indicated on the drawings and shall be manually operable from the face of the unit.

B. Contactor cabinet shall be flush type of size as shown on the drawings with hinged lockable door keyed same as panelboards. Construction of cabinet shall be similar to terminal cabinets. Inside of box shall be sprayed with acoustic material.

C. Each contactor or relay mounted in the contactor cabinet shall be barriered in its own compartment. Provide an individual barriered compartment for each future contactor.

2.6 INDIVIDUAL CONTROL RELAYS

A. Individual control relays shall have convertible contacts rated a minimum of 10 amperes, 600 volts, regardless of usage voltage. Coil voltage, number and type of contacts shall be verified and supplied to suit the specific usage as shown in the wiring diagrams and/or schedules on the electrical and mechanical drawings. Furnish in the NEMA Type I enclosure unless indicated otherwise.

B. The following relays are approved:

Manufacturer	Type
Cutler-Hammer	Type AR
General Electric	CR120B
Square D	Class 8501, Type X

END OF SECTION 16155

SECTION 16160 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 GENERAL FEATURES

A. Panelboards shall be flush or surface mounted as indicated with bolt-on sub-breakers as shown on panel schedules, hinged trim (door in door), hinged lockable doors, circuit directory holders, engraved nameplates and proper bussing. Where indicated on the drawings, panelboards shall be furnished with a main breaker, subfeed breakers and/or lugs, contactors, time switches, relays, etc.

PART 2 - PRODUCT

2.1 STEEL GAUGE AND FINISH

A. All panelboards shall be finished with one coat of zinc chromate and coat of primer sealer after a thorough cleaning where exposed to public view (e.g., corridors, offices, etc.) and baked gray enamel in electrical, janitor and storage rooms. Primer coated panelboards shall be painted to match surroundings after installation. Panelboards shall be fabricated of sheet steel of the following minimum gauges: Door and trim shall be 12 gauge; enclosure shall be code gauge steel.

2.2 KEYING

A. All panelboards shall be furnished with a flush lock and keys. All locks shall be keyed alike to accept one "master" key. Door handles which extend beyond face of panel with integral locks will not be accepted for flush mounted panels but will be allowed on surface mounted panels.

2.3 CIRCUIT BREAKER WIRE TEMPERATURE RATING

A. All circuit breakers shall be U.L. labeled as suitable for use with 60 degrees/75 degrees C rated conductors.

2.4 CIRCUIT BREAKER FEATURES AND AUXILIARIES

A. Where 2 or 3 pole breakers occur in the panels, they shall have a common trip. Single pole breakers with tie-bar between handles will not be accepted.

B. Where indicated on the drawings, branch circuit breakers shall be furnished with lockout clips, mounted in the "ON" position. The breakers shall be able to trip automatically with lockout clips in place.

2.5 CIRCUIT BREAKER ARRANGEMENT

A. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the drawings. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs which can readily be changed from front of panel will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.

2.6 PANELBOARD AND CIRCUIT BREAKER IDENTIFICATION

A. In addition to the engraved nameplate hereinbefore specified, panelboard manufacturer shall stencil the panel number or letter on inside of panel door to correspond with panel designation on drawings.

B. Provide a white nameplate with 1/2" high red letters inside each 480/277 volt panel fastened to face of dead front plate, to read "WARNING 480 VOLTS."

2.7 BUSSING

A. Bussing shall be tin plated aluminum.

B. Each panelboard shall be equipped with a ground bar secured to the interior of the enclosure of sufficient size for the panel being used and shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

C. Where indicated on drawings, provide an additional isolated ground bar, insulated from panel enclosure for "ISOLATED GROUND RECEPTACLES" and an engraved nameplate indicating this.

2.8 ANCILLARY EQUIPMENT

A. Where contactors, relays and/or time switches are installed in the panelboards, they shall be installed in separate barriered sections located at the top of the panelboards under a separate lockable door in front trim which shall be keyed the same as the circuit breaker section.

B. At surface mounted panelboards, a factory supplied conduit enclosing shroud with solid back will be allowed between bottom of panel enclosure and finish floor.

2.9 GUTTER SPACE

A. Minimum gutter space where feeder enters panel shall be 6 inch high. In all panels where double lugs are required or where feeder cable size exceeds bus size, minimum gutter space shall be 12 inch high at the end where feeder enters.

2.10 DIRECTORY FRAME

A. Only welded-on metallic circuit directory frame with a clear plastic shield will be acceptable.

2.11 DIMENSIONS

A. Unless specifically noted otherwise, all panelboards shall be 20 inches wide and nominally 5-3/4 inches deep.

2.12 SHORT CIRCUIT CAPACITY AND SERIES RATING

A. All panelboards shall have bus bracing and circuit breaker fault interrupting capability to withstand and interrupt the available rms symmetrical fault currents indicated on the drawings. In no case, however, shall this capability be less than for 10,000 amperes at 208/240 volts and 14,000 amperes at 480 volts.

B. When so indicated on the drawings or when not indicated but required to comply with paragraph "A" preceding the panelboard main breaker (or the feeder breaker ahead of the panel if so indicated) and the branch circuit breakers shall be U.L. approved and tested "SERIES RATED". The shop drawing submittal shall document this rating and its suitability based on the available fault currents shown or specified.

C. When series rating is being applied to panelboards with main breakers (or feeder breakers if applicable) greater than 250 amperes, the branch circuit breakers shall be rated 22,000 amperes interrupting capacity, minimum or higher if required to coordinate under the series rating and for the available fault current indicated or greater where indicated on drawings.

2.13 MANUFACTURER

A. Lighting and appliance panelboards for 120/208 volt, three phase, 4 wire S/N, shall be as hereinafter specified and be suitable for non-linear loads (200% rated neutral) when indicated on the drawings. Circuit breakers in the panelboards shall have a minimum interrupting capacity of 10,000 amperes.

Square D----------Type NQOD

Cutler-Hammer----------Type PRL1

General Electric----------Type AQ

B. Distribution panelboards for 120/208 volt, three phase, 4 wire shall be as hereinafter specified and be suitable for non-linear loads (200% rated neutral) when indicated on the drawings. Circuit breakers in the panelboards shall have a minimum interrupting capacity of 10,000 amperes.

Square D----------Type I-Line

Cutler-Hammer----------Type PRL3

General Electric----------Spectra Series

C. Lighting panelboards for 480/277 volt, three phase, 4 wire shall be as hereinafter specified and be suitable for non-linear loads (200% rated neutral) when indicated on the drawings. Circuit breakers in the panelboards shall have a minimum interrupting capacity of 14,000 amperes.

Square D----------Type NF

Cutler-Hammer----------Type PRL2

General Electric----------Type AE

D. Distribution panelboards for 480/277 volt, three phase, 4 wire shall be as hereinafter specified. Circuit breakers in the panelboards shall have a minimum interrupting capacity of 14,000 amperes.

Square D----------Type I-Line

Cutler-Hammer----------Type PRL4B

General Electric----------Spectra Series

PART 3 - EXECUTION

3.1 COLOR CODING

A. Wiring for branch circuits shall be color coded and shall be so noted on the directory in panels. The 480/277 volt wiring shall be color coded differently

from the 120/208 volt wiring. The same color coding system shall be used throughout the entire job. Color coding shall be as follows:

208Y/120 Volt	480Y/277 Volt
Phase A, black	Phase A, brown
Phase B, red	Phase B, orange
Phase C, blue	Phase C, yellow
Neutral, white	Neutral, white
Switch legs, purple	Switch legs, other appropriate color

3.2 CIRCUIT DIRECTORY

A. Each panel shall have a neatly typewritten circuit directory with the name and number of the room, area or the equipment served by each circuit breaker which shall correspond with the final circuit arrangement, including all addenda and change orders. Where rooms are provided with room numbers and/or nameplates, these same numbers and names shall be used in lieu of those shown on the drawings. Spaces in directories for spare circuit breakers shall be neatly marked "Spare" in pencil. The directory shall also indicate the panel designation, voltage and phase at the top. Each directory shall be mounted in the index cardholder behind a clear plastic shield.

END OF SECTION 16160

SECTION 16170 - MISCELLANEOUS POWER EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

PART 2 - PRODUCT

2.1 DISCONNECT SWITCHES

A. Disconnect switches shall be a heavy duty safety switch, 250 volt or 600 volt A.C., as required, quick make, quick break, horsepower rated, fusible or non-fusible where indicated with number of poles and amperage as indicated on the drawings.

B. Switches shall be NEMA Type 1 for indoor applications. Where enclosure is outdoors or indicated W.P. (weatherproof) switches shall be in raintight NEMA Type 3R enclosure.

C. Disconnect switches shall be complete with padlockable door and door interlock that prevents the door from being opened unless the operating handle is in the "off" position.

D. Fuses shall be Bussman "LPN-PK or LPS-RK" or approved equal, dual element, time delay, current-limiting type, size per manufacturer's recommendation.

2.2 INDIVIDUAL CIRCUIT BREAKERS

A. Individual circuit breakers shall be installed in NEMA 1 enclosure for indoor applications of size and number of poles as shown on the drawings. Where enclosure is outdoors or indicated W.P. (weatherproof) on the drawings, circuit breakers shall be in a raintight NEMA Type 3R enclosure.

B. Breaker shall be 240 or 480 volt, as required, 25,000 AIC, symmetrical for 480 volts, and 22,000 AIC symmetrical for 240 volts.

C. Circuit breakers shall be manufactured by Cutler-Hammer, General Electric and Square D.

D. All circuit breakers shall be U.L. labeled as suitable for use with 60 degree/75 degree C or 75 degree C rated conductors.

2.3 TERMINAL CABINETS

A. Terminal cabinets shall be fabricated on sheet steel for flush or surface mounting of size indicated on the drawings and shall be complete with hinged lockable door (except public telephone terminal cabinets, these shall be with non-lockable latches), index card holders and the number of terminals as indicated on the drawings or as specified hereinafter.

B. Cabinets shall be constructed and finished identical to panelboards. 1/2 inch plywood backing shall be furnished with locks keyed the same as the panelboards.

C. Terminal cabinets shall be manufactured by the same manufacturer as the panelboards.

2.4 TIME SWITCH

A. Time switch shall be electronic, microprocessor based two circuit (photocell on photocell off and photocell on time switch off) momentary contact, to operate mechanically held contactors or solid state relays, Tork #DGLC(120V). Mount relays in a "contactor cabinet" per Section 16155.

2.5 PHOTOELECTRIC CONTROL (PHOTOCELL)

A. Photocell shall be flush, outlet box mounting, weatherproof, stainless steel plate, rated for 1000 watt load at 120 volts, Tork Catalog No. 3010.

B. Photocell shall be outdoor, weatherproof, in surface, cast box. Contact ratings, 2000 watt load at 120 or 208/277 volts. Operating level adjustable from 2 foot-candles to 50 foot-candles. Control shall be Tork Catalog No. 2101 (120 volt) or 2104 (208/277 volt). Take note that this photocell has an integral 1/2 inch threaded (male) connector at one end of the cast box and this is its only method of mounting.

2.6 POWER CORD REELS

A. Power cord reels in shops/kitchen shall be Daniel Woodhead, Catalog No. 9383/9521, outlet box mounting, with 30 ft. of 3/C #12 gauge type "SOW-A" cord and cord stop.

B. Provide an outlet box with wire mesh strain relief and two NEMA 5-20R duplex receptacles inside and mounted at the end of the cord. Daniel Woodhead #3210 outlet box and #5636M strain relief.

2.7 SCIENCE ROOM VARIABLE VOLTAGE UNITS

A. Variable voltage units shall be permanent, recessed into the end of the laboratory cabinets. They shall function from 120 volt a.c. supply and shall be thermal-magnetic circuit breaker protected.

B. Output Specifications:

Variable Voltage DC	0-18 Volts
Output voltage	0-18 volts dc
Output current	10 amperes dc (maximum)
Ripple	Less than 10 percent RMS
Load Regulation	2 Volts, no load to full load
Isolation	Floating-line and chassis isolated from grounds
Overload protection	Thermal-magnetic circuit breaker

Variable Voltage DC	0-36 Volts
Output voltage	0-36 volts dc
Output current	5 Amperes dc (maximum)
Ripple	Less than 3 percent RMS
Load regulation	4.5 volts, no load to full load
Isolation	Floating, isolated from line and chassis ground
Overload protection	Thermal magnetic circuit breaker

High Voltage AC	
Output voltage	120 volt ac
Output current	10 Amperes
Overload protection	Thermal-magnetic circuit breaker

Variable Voltage AC	0-45 Volts
Output voltage	0-120 volts ac
Output voltage	3.5 Ampere (maximum)
Overload protection	Thermal-magnetic circuit breaker

Variable Voltage AC	0-45 volts ac
Output voltage	0-45 volts ac
Output current	5.0 Amperes (maximum)
Overload protection	Thermal-magnetic circuit breaker
Isolation	Floating, isolated from line and chassis ground

Variable Voltage AC	0-22.5 Volts
Output voltage	0-22.5 Volts ac
Output current	10.0 Amperes (maximum)
Overload protection	Thermal-magnetic circuit breaker
Isolation	Floating, isolated from line and chassis ground

C. Nominal cutout dimensions - 12-1/8 inches wide x 5-1/8 inches in length.

D. Nominal face plate dimensions - 13-1/4 inches wide x 5-1/2 inches in length, depth - 9 inches.

E. Variable voltage units shall be "LAB-VOLT", Catalog No. 74 or equal.

LAB-VOLT SYSTEMS
P.O. BOX 686
FARMINGDALE, NJ 07727
PHONE NO. 1-800-223-1057

END OF SECTION 16170

SECTION 16400 - SERVICE AND DISTRIBUTION EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 SUBMITTALS

A. This contractor shall submit for approval 7 portfolios with full description of medium voltage switchgear, pad mounted distribution transformers, distribution switchboards and dry type transformers.

1.3 UTILITY COMPANY REQUIREMENTS

A. Comply with all serving utility companies requirements prior to any work.

PART 2 - PRODUCTS

2.1 MAIN SWITCHBOARD:

A. General Construction:

1. Furnish and install where indicated a dead front type, completely metal enclosed, self-supporting structure independent of wall supports. Voltage rating shall be as indicated on the drawings. It shall consist of the required number of vertical sections bolted together to form one rigid switchboard. The sides and rear shall be covered with removable screw-on plates. All edges of front cover panels shall be formed.
2. Equipment shall comply with the latest applicable standards of NEMA PB2 and UL 891. Where switchboards are used as service entrance equipment, they shall comply with all NEC and UL requirements for service entrance and a UL service entrance label shall be provided.
3. Switchboard shall be manufactured by Square 'D', General Electric Corporation or approved equal.

B. Bussing:

1. All bus bars shall be either tin-plated aluminum or copper with bolted connections at joints. The bus bars shall be of sufficient size to limit the temperature rise to 65 degree C rise based on UL tests, and rated to withstand mechanical forces exerted during short circuit conditions when directly connected to a power source having an available fault current of 50,000 amperes symmetrical at rated voltages. Provide full capacity neutral where a neutral is indicated on the drawings.
2. Bussing shall be complete for each phase and neutral required, with all connecting hardware throughout the full length and height of each section of the switchboard.
3. A ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. An incoming ground lug shall be furnished.
4. All hardware used on conductors shall be high-tensile strength and plated. All terminals shall be of the anti-turn solderless type suitable for copper or aluminum cable of sizes indicated for 75 degree C cable.

C. Utility Metering/CT Section:

1. Where indicated on the drawings, furnish a separate barriered Utility Metering Compartment complete with hinged sealable door. Bus work shall include provisions for mounting utility company current transformers and potential transformers or potential taps as required by utility company. Provide Service Entrance Label and provide necessary applicable service entrance features per NEC and local code requirements. Comply with serving utility company requirements.

D. Underground Pull/Auxiliary Section

1. Shall comply with serving utility company requirements. Verify for minimum size requirements.

E. Nameplates:

1. Engraved nameplates shall be

furnished for all mains and feeder circuits with designation and circuit number as indicated on the drawings. Furnish Master Nameplate giving voltage, ampere rating, short circuit rating, manufacturer's name, general order number and item number.

2. Nameplates shall consist of white letters and shall be minimum 3/4" high on black micarta tabs affixed to switchboard trim adjacent to device.

F. Ground Fault Protection:

1. Ground fault protection at the main switchboard shall be a complete system and shall include a ground sensor with integral test wiring, solid state relay to operate the shunt trip circuit protective device and monitor panel.
2. The ground sensor shall consist of a current sensor enclosing all phase and neutral conductors of the circuit to be monitored, with appropriate relaying equipment to provide the desired ground current sensitivity and time-current response characteristics.
3. The relay shall have continuously adjustable current pickup setting of 100-1200 amps and continuously adjustable time delay setting from instantaneously to one second.
4. The monitor panel shall indicate relay operation and provide means for testing the system with or without interruption of service and must not permit the ground fault system from being left in an inactive state.
5. The ground fault system shall be set as indicated on drawings. It shall be tested after installation and a written report stating results of test shall be sent to the Office of the Architect, Owner and Engineer stating the results of test. Test shall be made by an acceptable qualified independent testing agency in accordance with NEC 230-95 requirement. All cost of this requirement shall be paid by the Contractor.
6. The ground fault protection system and the main switchboard shall be of same manufacturer.

G. Enclosures:

1. Enclosures shall be of NEMA 3R outdoor construction as shown on the drawings.

H. Finish:

1. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchboard shall be ANSI 61 and use the manufacturer's standard process.

2.2 OVERCURRENT DEVICES:

A. Main protective device shall be circuit breaker with interrupting rating, frame and trip ratings as shown on the drawings with G.F.I.

B. Feeder protective devices as shown shall be molded case circuit breakers providing complete circuit overcurrent protection by having inverse time and instantaneous tripping characteristics, and where applicable, be current limiting.

C. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-made, quick-break over-center switching mechanism that is mechanically trip free. Automatic tripping of the breaker shall be clearly indicated by handle position. Contacts shall be non-welding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes.

D. Circuit breaker interrupting capacities shall be as indicated on the drawings or as specified hereinafter. Where applicable, circuit breakers shall be listed for series application.

E. All circuit breakers in main switchboard shall have short circuit current interrupting capacity exceeding the maximum available at service transformer. Contractor shall be responsible for obtaining fault current information from serving power company prior to fabrication of main switchboard. Submit letter of verification of available fault current with Main Switchboard submittals. The main switchboard shall have

an integrated short circuit current interrupting rating of minimum of 42,000A symmetrical, or greater if so indicated on drawings.

F. Standard two and three pole circuit breakers shall be UL listed as HACR type breakers for use with heating, ventilating and air conditioning equipment.

G. All circuit breakers located in separate enclosures, whether Nema 1 or Nema 3R rated, shall include a handle padlock attachment.

H. All circuit breakers, 100 amps or more, shall be tested by an independent testing firm in accordance with NETA specifications and a report submitted to the architect. The Contractor shall pay for the cost of this requirement. Any circuit breaker that does not pass the test shall be replaced.

2.3 DISTRIBUTION SWITCHBOARDS (480/277V RATED, 400 AMPERES OR GREATER)

A. Furnish and install where indicated a dead front type, completely metal enclosed, self-supporting structure independent of wall supports. Voltage rating shall be as indicated on the drawings. It shall consist of the required number of vertical sections bolted together to form one rigid switchboard. The sides and rear shall be covered with removable screw-on plates. All edges of front cover panels shall be formed.

B. Equipment shall comply with the latest edition of NEMA STANDARD PB2 & U.L. 891. Where switchboards are used as service entrance equipment, they shall comply with all C.E.C. and UL requirements for service entrance and a UL service entrance label shall be provided.

C. Small wiring, necessary fuse blocks and terminal blocks within the switchboard shall be furnished as required. All groups of control wires leaving the switchboard shall be provided with terminal blocks with suitable numbering strips.

D. Switchboard shall be provided with adequate lifting means and shall be capable of being rolled or moved into installation position.

2.2 BUSSING

A. All bus bars shall be silver-plated copper with bolted connections at joints. The bus bars shall be of sufficient size to limit the temperature rise to 65 degree C rise based on UL tests, and rated to withstand mechanical forces exerted during short circuit conditions when directly connected to a power source having an available fault current of 65,000 amperes symmetrical at rated voltages. Provide full capacity neutral where a neutral is indicated on the drawings.

B. A ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchboard. An incoming ground lug shall be furnished. Other ground lugs for feeder circuits shall also be supplied as shown in the schedules on the drawings.

C. All hardware used on conductors shall be high-tensile strength and plated. All terminals shall be of the anti-turn solderless type suitable for CU or AL cable of sizes indicated for 75 degree C cable.

2.4 SWITCHBOARDS

A. Front Accessible Panel Mounted Feeder Devices:

1. All sections of the switchboard shall be 30 inches deep except service sections containing large ampacity main disconnects which may be deeper as indicated. All sections of the switchboard shall align so that the back of the complete structure may be placed flush against a wall.

2. Construction shall allow maintenance of incoming line terminations, main device connections and all main bus bolted connections to be performed without rear access. The feeder or branch devices shall be removable from the front and shall be panel mounted with the necessary device line and load connections front accessible. Provide lugs on all devices for cable sizes shown on drawings.

3. Front and Rear Accessible Panel Mounted Feeder Devices:

a. All vertical sections shall align front and rear with uniform depth as shown on the drawings.

b. Switchboard shall be constructed for placement away from walls with required C.E.C. clearances.

c. All internal devices, except the main disconnect, shall be removable from the front and shall

be panel mounted with the necessary line and load connections front accessible from the rear.

B. Rear Accessible with Individually Mounted Feeder Devices:

1. The vertical sections shall align front and rear with depths shown on the drawings. Mains and Feeders devices shall be individually mounted with line and load bus connections. Devices shall be front removable and load connections rear accessible.

2. Insulated rigid bus connections shall extend from load sides of individually mounted overcurrent feeder devices into rear compartment where outgoing cable connections may be made without reaching into or near the main horizontal or vertical busses.

C. Distribution sections shall be sectionalized to provide a front device section, an intermediate bus section and a rear feeder cable section.

D. There shall be a solid full height vertical barrier of glass polyester between the device compartment and the bus compartment. A full height vertical barrier of glass polyester between the device compartment and the bus compartment. A full height vertical insulating barrier shall be provided to segregate the bus section from the rear cable section.

2.5 CUSTOMER METERING

A. Where indicated on the drawings, provide a customer metering compartment with front hinged door and include the following:

1. Cutler-Hammer IQ 200 monitor or an approved equal. Provide and install appropriately sized current transformers.

2.6 GROUND FAULT SYSTEMS

A. Ground Fault Systems shall be provided where shown on the drawing.

B. The Ground fault System shall be integral to the main circuit breaker.

C. The ground fault pick-up shall be adjustable from 100 to 1200 ampere and the time delay adjustable from .1 to .5 seconds.

2.7 NAMEPLATES

A. Engraved nameplates shall be furnished for all mains and feeder circuits with designation and circuit number as indicated on the drawings.

B. Furnish Master Nameplate giving voltage, ampere rating, short circuit rating, manufacturer's name, general order number and item number.

2.8 FINISH

A. All exterior and interior steel surfaces of the switchboard shall be properly cleaned and provided with a rust-inhibiting phosphatized coating.

B. Color and finish of the switchboard shall be ANSI 61 and use the manufacturer's standard process.

2.9 CONTROL POWER TRANSFORMERS

A. Control power transformers with primary and secondary protection shall be provided as indicated on the drawings or where required to operate ground fault systems, adequately sized for required burdens.

2.10 TESTING

A. The Cutler-Hammer IQ 200 or the approved equal shall have all metering and protection functions tested and the settings specified by the Coordination Study.

B. Ground Fault System:

1. The Ground Fault System shall be tested by primary injection per manufacturer's procedures.

C. All circuit breakers rated 100 amps and larger shall be tested by primary injection per manufacturer's procedures.

D. All bolted electrical connections shall be torque tested to the manufacturer's recommended values.

E. All testing to be performed by an independent electrical testing agency specializing in electrical equipment testing. Agency shall be NICET or NETA certified.

F. A detailed test report shall be submitted to the engineer for approval prior to energization.

2.11 COORDINATION STUDY

A. The equipment manufacturer shall perform a Coordination Study and specify settings for the

following equipment.

1. Main and feeder low voltage circuit breakers

B. All equipment shall be set to the settings specified in the Coordination Study prior to testing.

2.12 DRY TYPE DISTRIBUTION TRANSFORMERS:

1. Transformer shall be K-4 rated per ANSI/IEEE C57.110-1986 with UL recognized Class 220 insulation system. Maximum temperature rise shall be 115 degrees C., in a maximum ambient of 40 degrees C., with rated nameplate load connected to the secondary side, at rated voltage.

2. Transformer shall be built in accordance with the latest revised IEEE, ANSI and NEMA standards. The core shall be constructed with low hysteresis and eddy current losses. The core flux density shall be well below the saturation point to prevent core overheating caused by harmonic voltage distortion. Transformer shall be of a single, common core type construction. Transformers utilizing more than one core, or Scott-T connections shall not be acceptable.

3. The maximum temperature of the top of the enclosure shall not exceed 50 degrees C. above 40 degrees C., ambient.

4. Designs shall incorporate built-in vibration dampening systems.

5. Terminal compartment shall be located to insure termination of cable leads in temperature levels not to exceed 60 degrees C., and to provide for side or bottom entrance of conduit. Enclosures shall be weatherproof and rodent proof, and UL recognized for outdoor use. The exterior coating color shall be ANSI 49. Ventilation openings shall be louvered type. Screening will not be acceptable.

6. The transformer secondary neutral terminal shall be sized for 200% of the secondary phase current, and be furnished with lugs as required to accommodate parallel neutral conductors.

7. Transformer shall be furnished with 2 taps above and below rated voltage, each 2 ½%.

8. Acceptable manufacturers shall be Square "D", Westinghouse or approved equal.

PART 3 - EXECUTION

3.1 SITE CONDITIONS AND COORDINATION

A. Contact local serving utility companies for service arrangements. Joint trenching requirements before the start of any work. Obtain from utility company final engineered drawing showing all service requirements. Report any discrepancies with that of electrical drawing and report them to architect.

B. Coordinate with plumbing site drawing for location of all underground service piping. Adjust routing as required for site electrical runs to avoid any conflict. Joint trench not permitted with gas, water, sewer lines.

C. The Contractor shall visit the site of the proposed work and familiarize himself with all the site conditions. No subsequent allowances will be made because of negligence in complying with the above, or alleged inability to understand the requirements.

D. The general location and arrangement of underground conduits, pull boxes, etc., are shown on the drawings and all installations shall be made in accordance. Information on the drawings relative to existing service is approximate only. Minor deviations required to conform to actual locations shall be made without additional cost to Owner. The contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and he shall assume full responsibility for the proper locations of each portion thereof.

E. The working drawings are generally diagrammatic and the locations indicated may be approximate only. They do not show every bend, or elbow required for installation. The contractor, therefore, shall install all equipment, boxes, conduit runs as required for a complete underground service and distribution system. Adhere to the location indicated as near as possible.

3.2 CONDUIT SYSTEMS

A. Conduit system shall be installed for all wiring. Conduit shall be run continuous and with the minimum number of bends.

B. PVC 40 or rigid steel factory wrapped with PVC tape shall be used for underground runs. All 21 kV

primary underground conduits, on load side of main switchboard, shall be encased in 3 inches concrete envelope (red). Provide detectable warning tape 12 inches above the top of concrete envelope.

C. All conduit shall be delivered to the site of construction in their original bundles. Each length of conduit shall bear the label of the National Board of Fire Underwriters. All conduit subjected to rough usage while on the job before installation and not acceptable to the Architect shall be removed from the premises upon notice.

D. The joints in all conduits installed under concrete slabs on the ground, or underground, or exposed to the weather, shall be made liquid and gas-tight. All underground conduit outside of the buildings shall be buried to a depth of not less than 24" below finish grade. Utility services shall comply with utility company requirements. Two or more power or telecommunications conduit runs installed in a common trench shall be separated by at least four inches (4"). Two or more power and telecommunications conduit runs installed in a common trench shall be separated by at least twelve (12"). Electrical conduit runs installed in a common trench with other utility lines shall be separated from such lines by at least twelve inches (12").

E. Changes in direction shall be made with conduit sweep elbows or long radius bends made on the job. Where 2 or more conduits are grouped in exposed locations, the sweeps shall be struck from the same center forming concentric arcs.

F. All joints in conduit shall be made with standard coupling. In making joints, conduits must be truly and accurately cut and threaded (where applicable) with straight cut and thread, smoothly reamed and squarely butted. All conduit shall be kept corked and dry during construction, using plastic caps or conduit pennies held in place with conduit bushings. Should dirt or moisture collect in any conduit, the Contractor shall swab them out to the satisfaction of the Architect.

G. All conduits where they enter panel enclosures, pull boxes, or outlet boxes shall be secured in place by insulated throat connectors with locknut. Bushing shall be plastic where conductors are #4 or larger.

H. All empty conduit shall be equipped with nylon pull rope continuous from outlet to outlet or end to end.

I. Flexible connections in outdoor and damp locations shall be flexible liquid-tight metal conduit or non-corrosive seamless metallic tubing with water-tight connections.

J. Expansion joints for conduit shall be provided where required to compensate for thermal expansion and contraction.

K. Each primary single duct shall be completely encased in concrete with a minimum of 3 inches of concrete around each duct except that only 2 inches of concrete are required between adjacent ducts. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. At any point the top of concrete encasements shall be not less than 24 inches below finished grade or paving. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not further apart than 4 feet on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 6 inches vertically.

3.3 CONDUCTORS

A. All wiring shall be provided with identified neutrals.

B. No wire shall be installed until all work of other contractors that might cause injury to the said wire has been completed. Care shall be used to pull wires to insure that no damage occurs to the insulation. Powdered soapstones or wire ease shall be used for pulling in wires.

C. No splices shall be permitted in primary or 480V feeders, unless approved by engineer.

3.4 GROUNDING

A. The conduit system, supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded by means of approved ground clamps, in accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.

B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc., where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge, THWN wire with ground clamps.

C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.

D. At each building the interior hot and cold water and gas piping shall be bonded to the building service equipment per C.E.C. #250.104.

E. Do not use underground gas piping as a grounding electrode.

F. Pull a green ground wire in all power conduits, both metallic and non metallic.

G. Where there is more than one building supplied from a common service, provide a grounding electrode at each building per C.E.C. #250.32.

3.5 UTILITY COMPANY CHARGES

A. All utility company charges related to the new services will be paid by the Contractor (including street lighting charges if any).

B. Monthly charges for temporary construction power energy usage shall be paid by the General Contractor.

3.6 GUARANTEE AND TESTS

A. Equipment of all kinds installed by this Contractor shall be tested to determine whether it fulfills the requirements of these specifications.

B. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and made the connections for the tests.

C. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.

D. Should any piece of apparatus or any material or work fail in any of these tests, it shall be immediately removed and be replaced by perfect material by this Contractor at his expense and the portion of the work replaced be again tested by the Contractor.

E. The entire installation shall be free from short circuits and improper grounds.

1. Test shall be made in the presence of the Architect or his representative.

2. Panels and circuits shall be tested for grounds and shorts with mains disconnected from the feeder, branches connected, lamps removed or omitted from the sockets and all wall switches closed.

3. Each individual circuit shall be tested at the panel with the equipment connected for proper operation.

4. Ground tests shall meet the requirements of the California Electrical Code.

F. Upon completion of the work, a final inspection of the Architect and other interested authorities shall be conducted.

G. This Contractor shall guarantee to repair or replace at his expense any material or equipment that develops defects or is determined not to be in conformance with the plans and specifications, during a period of one year after work is accepted by the Owner.

H. The grounding electrode system at the main electrical service equipment shall be tested by an independent testing agency in accordance with the three point fall of potential method as specified in IEEE standard 81-1983. Maximum ground resistance shall be 25 ohms

I. A copy of the test reports shall be submitted to the Architect of record.

3.7 PROTECTIVE COORDINATION STUDY

A. The contractor shall prepare and submit the ground fault protective coordination study within 30 calendar days following the approval of the medium voltage switchgear distribution switchboard drawings.

3.8 SWITCHGEAR INSTALLATION

A. Main Switchboard, Distribution Panelboards and Transformers shall be mounted on concrete pads.

B. Units shall be carefully installed so as not to scratch finishes. After installation, finished surfaces shall be inspected and scratches touched up with a finish furnished by the manufacturer especially for this purpose.

C. Concrete pads shall be constructed as indicated. Tops of concrete pads shall be level and shall project above finished grade and sloped to drain. Conduits for primary, secondary, and grounding conductors shall be set in place prior to pouring of concrete pads.

END OF SECTION 16400

SECTION 16415 - PRECAST PULL BOXES AND VAULTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 CONCRETE STRENGTH

A. All concrete for precast pull boxes and slabs shall have 28 day compressive strength of at least 3000 psi.

1.3 TRAFFIC LOADING

A. Regardless of whether or not it is specifically called out in the "PRODUCT" description, all pull boxes in areas where vehicles could conceivably drive over the boxes shall be reinforced for traffic loading and shall have traffic covers.

PART 2 - PRODUCT

2.1 PRE-CAST CONCRETE PULL BOXES

A. Pre-cast concrete pull boxes shall be sized as called for on the drawings.

B. Pull boxes shall be complete with checkered plate steel cover, reinforced for traffic loading. Each cover shall be with designation as indicated on the drawings or as directed by the Architect, cast into or bead welded to the cover.

C. Pull boxes shall be ordered complete with openings for conduit as required and with pulling eyes as required for the proper pulling of all conductors.

D. The pre-cast concrete pull boxes shall be manufactured by Christy, Utility Vault, Brooks or approved equal.

E. Pre-cast, weatherproof, underground concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products, Vault, Brooks or equal. All boxes shall have lids marked POWER , SIGNAL , FIBER OPTIC , DANGER HIGH VOLTAGE , etc., per drawings and be traffic rated per Caltrans drawing ES-8 minimum where pull box occurs in vehicular traffic areas.

2.2 PRE-CAST CONCRETE VAULTS

A. Pre-cast concrete vaults shall be of the size indicated on the drawings.

B. Vaults shall be complete with non-slip galvanized steel frame and cover assembly, reinforced for incidental traffic loading. Grade rings shall be installed, as required, to bring top of cover to required elevation.

C. Vaults shall be ordered complete with openings for conduit as required and with pulling eyes as required for the proper pulling of all conductors. Vaults shall also have provisions for future conduit entry on all walls without conduit entering at this time.

D. Cable racks shall be installed as hereinafter specified to maintain all conductors at a relatively dry location in the vaults. Racks shall be installed vertically on each of four walls of the power vaults at 2 feet to 2 feet 8 inches (max.) centers. The racks shall extend from 4 inches below roof to 4 inches above floor except where duct entrances occur. At these locations the racks shall be to 4 inches from these entrances.

E. Floors of the vaults shall have at least 2 - 1 inch diameter knockouts located 6 inches from opposite walls. Install the number of 3/4 inch diameter by 10 foot long copperweld ground rods as required in each vaults to conform to the requirements hereinbefore specified under "Grounding". Openings around ground rods shall be sealed.

F. Pulling eyes shall be installed in each vaults as specified hereinafter under "Pulling Eyes".

G. Vault shall be equipped with 12 inch diameter by 2 inch deep sump with removable steel grate.

H. Covers for vaults shall have the word "ELECTRIC" - "HIGH VOLTAGE" and covers for signal manholes shall have the work "TELEPHONE" cast into or bead welded onto the top.

I. Vaults shall be 4 W X 6 -6 L X 3 D as manufactured by:

UTILITY VAULT	BROOKS
#2060920 & #4878-06 (-12 or -18)	#500 Series

J. Covers and extensions shall be Utility Vault #4878, Brooks #PB4878/500E or equal.

2.3 VAULTS CABLE RACKS

A. The cable racks required for racking the cables within the concrete vaults shall be fastened to walls of the vaults by means of galvanized bolts to pre-set inserts.

B. The cable racks shall consist of a vertical non-metallic channel, length as required, with adjustable horizontal non-metallic supports.

C. Cable racks shall be manufactured by Underground Devices, Inc. Model #CR36 Stanchion each equipped with two #RA14 Arms.

2.4 PULLING EYES

A. Pulling eyes shall be installed in the concrete vaults and pull boxes as required by this contractor for the proper pulling of all conductors.

PART 3 - EXECUTION

3.1 PRE-CAST VAULTS INSTALLATION

A. Unit shall be set level on 12 inch deep compacted crushed rock base extending beyond each side of the box.

B. All joints shall be sealed as directed by the manufacturer with sealing compound, Utility Vault, "Quikseal", or approved equal.

3.2 PRECAST PULL BOX INSTALLATION

A. Install pull boxes in compliance with the details on the drawings.

B. Note requirement for 12 inch (minimum) crushed rock base and concrete slab surrounding and flush with the top of the pull box. Concrete slab shall extend 6 inches, minimum, from the pull box in all directions, including when in ac paved areas.

C. Set approximately 2 inches above grade in planters and 1 inch above paving, sloping the paving to meet the slab, to minimize water intrusion.

END OF SECTION 16415

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

PART 2 - PRODUCT AND EXECUTION

2.1 CODES

A. Grounding shall be executed in accordance with all applicable codes and regulations both of the State of California and local authorities having jurisdiction.

2.2 SINGLE POINT OF GROUNDING FOR EACH VOLTAGE SYSTEM

A. The entire grounding system for that portion of the system operating at service voltage shall be at one point and that point shall be the ground bus of the main bus (unless local code authorities direct to the contrary).

B. Where transformers establish additional voltage systems to the service voltage, the neutral (if applicable) and the equipment ground for the additional systems shall be connected to a new single grounding point, as close to the transformers as possible, for each such additional system.

2.3 GROUNDING SYSTEM

A. All conductors shall be copper for the grounding system.

B. The grounding system shall consist of all 3 basic grounding techniques listed following:

1. A separate ground wire, either bare or insulated, shall be connected to the cold water piping system and run directly to the ground bus in the main switchboard without a break in the conductor and without any intermediate termination point in route.

   a. The size of this ground wire shall be determined by the largest service feeder conductor (or equivalent for parallel conductors) as listed hereinafter in Table "G".

2. A driven ground rod or system of driven ground rods, properly interconnected and connected to the switchboard ground bus with a minimum of #2/0 copper to give a maximum resistance of 25 ohms.

   a. This 25 ohm reading shall be witnessed by the Owners, Inspector and record made of such test.

   b. This resistance test shall be made before connecting the system of ground rods to the main switchboard ground bus and before attaching the UFER ground thereto.

   c. Minimum separation between the above individual rods shall not be less than that required by all applicable codes and regulations.

   d. Each ground rod shall be installed in a precast concrete ground rod box, without bottom and with lift out concrete cover with the word "Ground" cast therein. The ground rod and the cable connections shall be accessible therein for testing or replacement.

3. A UFER ground shall be installed and connected to the ground rod or rods and also be connected to the main ground bus within the main switchboard.

   a. A UFER ground shall consist of a minimum of 25 ft. of #2/0 AWG bare copper cable embedded in concrete (feeder encasement, footing, floor slab, etc.) so that all portions of the cable are between 2 inches and 4 inches from the earth.

   b. This copper cable shall be continued to the ground rods or main ground bus with an additional length of the same cable without being cut or spliced.

C. A ground wire shall be installed in all feeder conduit runs regardless whether metallic or non-metallic conduit is used. This ground wire shall be sized in accordance with Table "G" herein.

D. A ground wire shall be installed in all conduit runs where flexible conduit is used. This ground wire

shall be sized in accordance with paragraph "C" herein.

E. For branch circuit wiring, a green insulated, copper ground wire sized in accordance with the following table shall be installed. Where a ground conductor is installed, the conduit size shall be increased to conform to Table E1 of Title 24, Basic Electrical Regulations.

Branch Circuit Protection	Ground Wire Size
15 Ampere	#14
20 Ampere	#12
30 to 50 Ampere	#10
70 to 100 Ampere	# 8
125 to 200 Ampere	# 6

2.4 NEUTRAL AND EQUIPMENT GROUNDS

A. The neutral of all transformers, and the equipment grounds for all equipment within the distribution system shall be connected to the grounding system described preceding.

2.5 GROUND CONNECTION TO OUTLET BOXES

A. Ground conductors for branch circuit wiring shall be attached at each outlet to the back of the box using drilled and tapped holes and washer head screws, 6-32 or larger.

2.6 GROUND BUS

A. Each panelboard, switchboard, pull box or any other enclosure in which several ground wires are terminated shall be equipped with a ground bus secured to the interior of the enclosure.

B. The bus shall be equal to the phase bus size and shall have a separate lug for each ground conductor.

C. No more than one conductor shall be installed per lug.

TABLE "G"

Largest Feeder Conductor in Feeder Run (or Equivalent Parallel Conductor Size)	Ground Wire Size
2 or smaller	8
1 or 1/0	6
2/0 or 3/0	4
4/0 thru 350 MCM	2
500 MCM	1/0
750 MCM	2/0

NOTE: Where insulated conductors are used and green insulation is not available, white insulation shall be used, identified at each end and at all pull and junction boxes or equipment, with a minimum of 2 inches wide band of green plastic tape.

END OF SECTION 16450

SECTION 16500 - LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 specification Sections, apply to work of this Section.

1.2 FIXTURES IN GENERAL

A. Lighting fixtures shall have all parts and fittings necessary to completely and properly install the fixture. All fixtures shall be completely wired with conductors meeting applicable Underwriters' Laboratories requirements. All fixtures shall be equipped with lamps of size and type specified.

B. All fixtures shall be complete with accessories, end caps, plaster frames, yokes, hangers, etc., which are required for the specific installations and physical conditions encountered in this project.

C. The catalog numbers included in the description of the various types of lighting fixtures shall be basically considered to establish the type or class of the fixture with a particular manufacturer only. The fixture length, number of lamps, component material, accessories and all other features required to fulfill the total description of the fixture based on all drawing and specification information shall be complied with regardless of whether or not the catalog number specifically includes these features. If any conflict exists between the catalog number and the description, the Contractor shall either resolve the conflict with the Architect prior to submittal of his bid or furnish the fixture to meet the intent as later interpreted by the Architect without change in contract price.

1.3 PENDANT MOUNTED FIXTURES

A. All pendant stem mounting fixtures shall be supplied with swivel hanger and canopy assemblies providing 45 degree swiveling at top in any direction from plumb and meeting all other requirements of the Division of the State Architect and Table 23-P, Part 2, Title 24, California Code of Regulations. Swivel and canopy assemblies shall also have approved hinged connection at bottom which shall be able to withstand at least 100 percent seismic longitudinal load without any permanent distortion or damage of metal.

B. All swivel and canopy assemblies shall be suitable for the type of conduit mounting (surface or concealed) or the type of ceiling construction employed.

C. For pendant fluorescent fixtures, individual fixtures shall be suspended on two swivel assemblies. Continuous rows shall be suspended on one more hanger assembly than the number of fixtures.

D. Each pendant mounted lighting fixture shall be equipped with a safety cable or wire inside of each stem securely attached to the building structure at the top and to the fixture body at the bottom. The installed safety cable or wire shall be capable of supporting at least 4 times the fixture weight and shall be so tested, and the fixture shall be able to swing the full 45 degrees with this cable or wire installed. The Inspector shall verify this test and shall so state in his report.

1.4 SURFACE MOUNTED FIXTURES

A. All surface mounted fluorescent fixtures shall be suitable for mounting on low density material.

1.5 RECESSED MOUNTED FIXTURES

A. All fixtures mounted in plastered ceilings shall be equipped with plaster frame.

B. Recessed incandescent fixtures must have Underwriters' Laboratories labeling for through wiring.

C. Recessed incandescent fixtures shall have Underwriters' Laboratories approved thermal protection (TP).

D. Recessed fluorescent fixtures mounted in gypsum board ceilings shall be equipped with a flanged mounting trim and swing gate hangars.

E. Contractor shall verify that all lighting fixtures, housings, ceiling trims and frames are compatible with, and will physically fit within, the ceiling system they are intended to be installed to prior to ordering fixtures.

1.6 CONTINUOUS ROW FLUORESCENT FIXTURES

A. Fixture catalog numbers called out hereinafter are for individual units. Where 2 or more units are combined for continuous row installation, the Contractor shall furnish and install the necessary accessories for the indicated requirements.

1.7 DIFFUSERS

A. Unless noted otherwise, all lighting fixture diffusers shall be manufactured from virgin acrylic.

B. All flat diffusers shall be clear acrylic with male conical prisms aligned parallel and perpendicular to the length and width of the diffuser, (pattern #19). Lens shall be as manufactured by KSH or approved equal. Nominal 2 foot x 4 foot or smaller lenses shall have a minimum overall thickness of 0.187 inch. Data sheet shall be included in the submittal.

C. The contractor shall provide the Owner with the following additional diffusers for each type of light fixture: 5 percent additional for all indoor fixture types and 10 percent additional for all outdoor fixture types. This shall be included and indicated in the submittal.

PART 2 - PRODUCT

2.1 LAMPS

A. Lamps shall be new, for the wattage indicated and the voltage to which applied and shall be manufactured by Osram Sylvania, General Electric or Phillips. Each fixture shall be supplied with the proper lamps.

B. Incandescent:

1. General purpose incandescent lamps shall be inside frosted, medium base for 200 watts and smaller and mogul base for 300 watts and larger.

2. Reflector lamps shall be halogen type, PAR-38 with flood beam pattern unless otherwise specified. Osram Sylvania Capsylite / SPL , G.E. Halogen-IR or equal.

C. Fluorescent:

1. All fluorescent fixtures shall use 48 inches, rapid-start lamps unless specifically indicated otherwise.

2. 48 inch fluorescent lamps shall be medium bi-pin rapid start, 32 watt, Super T8, C.R.I. of at least 80, color temperature of 4100K, 3150 initial lumens. Osram Sylvania Octron 700 Series , G.E. "Trimline T8" or Phillips "TL70".

3. 36 inch fluorescent lamps shall be medium bi-pin rapid start, 25 watt, T8, C.R.I. of at least 75, color temperature of 4100K, 2125 initial lumens. Osram Sylvania Octron 700 Series , G.E. "Trimline T8" or Phillips "TL70".

4. 24 inch fluorescent lamps shall be medium bi-pin rapid start, 17 watt, T8, C.R.I. of at least 75, color temperature of 4100K, 1325 initial lumens. Osram Sylvania Octron 700 Series , G.E. "Trimline T8" or Phillips "TL70".

5. Nominal 48 inch T5 lamps shall be minature bi-pin Prostart, 54 watt, C.R.I. of 82, color temperature of 4100K, 5000 initial lumens. Osram Sylvania Pentron HO .

6. Compact fluorescent lamps shall be 32 watt or 42 watt (as listed in fixture schedule and drawings), T4, 4-Pin type for electronic ballasts with a C.R.I. of at least 82, color temperature of 4100K and initial lumens of 2400 and 3200, respectively. Osram Sylvania Dulux T/E/IN , G.E. Triple Biax or Philips PL-T/Alto .

7. High lumen compact fluorescent lamps shall be 40, 50 and 55 watt (as listed in fixture schedule and drawings), T5, 4-Pin type for electronic ballasts with a C.R.I. of at least 82, color temperature of 4100K and initial lumens of 3150, 4000 and 4800, respectively. Osram Sylvania Dulux L , G.E. High Lumen Biax or Philips PL-L .

D. Metal Halide:

1. Metal halide lamps shall be phosphor-coated, wattage as listed in fixture schedule and drawings. Lamps shall be for base up, base down or for burning positions other than vertical base up or base down as specifically required for each fixture. The exact lamp shall be used for each condition.

2.2 BALLASTS

A. General: The ballasts described following shall be used in all fixtures regardless of whether or not the catalog number defines the described ballast, unless specifically indicated otherwise.

B. Fluorescent: Important. All ballasts for all fluorescent fixtures, though not called out specifically for each fixture type, shall be electronic, as specified following:

1. Electronic: Ballast shall be integrated circuit, fully solid state type, U.L. listed and labeled and fully self protected. Ballast shall be suitable for lamps as required and listed in fixture schedule.

2. Electromagnetic interference shall meet or better the F.C.C. requirements governing electromagnetic and radio frequency interference.

3. High voltage surge protection shall be within the guidelines of ANSI/IEEE C62.41, Category A.

4. Ballast noise level shall be below audible under typical "quiet" ambient conditions such as sound stages.

5. Crest factor shall not exceed 1.5.

6. Ballast factor for 4' fluorescent lamps shall be between .74 and .77.

7. Ballasts shall have less than 20% THD and also meet P.G.E.'s latest requirements for total harmonic distortion, power factor and ballast factor.

8. Ballasts shall be manufactured by Osram Sylvania, Advance, G.E./Magnetek or equal.

9. Ballasts for T5 high output fluorescent lamps shall be Osram Sylvania Quicktronic PHO Prostart electronic ballast with a 1.00 ballast factor and Quicksense dynamic end-of-lamp-life sensing technology. Ballast shall be covered by a lamp and ballast system warranty of two (2) and five (5) years respectively.

C. Metal Halide: Unless otherwise noted, all ballasts for metal halide lamps shall be high power factor, constant wattage, autotransformer and shall be of a type approved by the lamp manufacturer of the particular lamp controlled.

D. Ballast Voltage: Ballasted fixtures for this project shall operate at 277 volt, unless otherwise noted.

2.3 FLUORESCENT EMERGENCY BATTERY PACKS

A. BATTERY PACKS FOR T8 LAMPS:

1. Emergency lighting shall be provided by using a standard fluorescent fixture equipped with an integral fluorescent emergency battery pack.

2. The EM pack shall consist of a high temperature, maintenance free nickel cadmium battery, charger board and an electronic circuit enclosed in a painted steel case.

3. A long life LED charge/indicator light and test switch shall be included.

4. The fluorescent EM pack shall operate one 20w - 75w (2 -8) or two 20w - 40w (2 -4) T8 - T12 fluorescent lamps. The EM pack shall provide reduced illumination for a minimum of 90 minutes in the emergency mode with a total initial output of 1400 lumens.

5. The unit shall have 4 watts of input power and a battery capacity of 24 watt hours.

6. The EM pack must meet or exceed all C.E.C. and Life Safety Code Emergency Lighting Requirements and shall be U.L. Listed for installation either inside the wireway or on top of the fixture.

7. All product shall be made in the U.S.A. and warranted for a full five (5) years from the date of purchase.

B. BATTERY PACKS FOR T5 LAMPS:

1. Emergency lighting shall be provided by using a standard fluorescent fixture equipped with an integral low-profile emergency ballast. This emergency ballast shall delay AC ballast operation for five seconds to prevent false-tripping of AC ballast end-of-life shutdown circuits (using a patent-pending circuit), and consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one galvanized or powder coated steel case.

2. A solid-state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided.

3. The emergency ballast shall be capable of operating one T54HO fluorescent lamp at 700 lumens initial emergency light output in the emergency mode for a minimum of 90

minutes.

4. The unit shall have 3.2 Watts of input power, a 13.2 Watt-hour battery capacity, and comply with emergency standards set forth by the current C.E.C. The emergency ballast shall be UL Listed for installation inside, on top of, or remote from the fixture, warranted for a full five (5) years from date of purchase, and made in the U.S.A.

C. BATTERY PACKS FOR T4 LAMPS:

1. Emergency lighting shall be provided by using a standard fluorescent fixture equipped with an emergency ballast. This emergency ballast shall consist of a high-temperature, maintenance-free nickel-cadmium battery, charger and electronic circuitry contained in one 12 x 2 3/8 x 1 ½ red metal case with 2 lengths of flexible conduit at each end.

2. A test/monitor plate with a solid-state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided.

3. The emergency ballast shall be capable of operating one 42W fluorescent lamp at 650 lumens initial light output in the emergency mode for a minimum of 90 minutes.

4. The emergency ballast shall have 3.5 Watts of input power, a 19.2 Watt-hour battery capacity, and comply with emergency standards set forth by the current C.E.C.

5. The emergency ballast shall be UL Listed for installation on top of or remote from the fixture, warranted for a full two years from date of purchase, and made in the U.S.A.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless specifically indicated otherwise, all lighting fixtures and /or fixture stems shall be placed symmetrically with respect to the ceiling tile pattern or other architectural ceiling and wall modules.

B. All fixtures of one type shall be of one manufacturer and of identical finish and appearance.

3.2 PENDANT FIXTURES

A. All pendant mounted lighting fixtures shall be securely fastened to the building structure by means of fixture studs or special mounting bracket. These devices shall be attached by means of machine screws and nuts through the construction or by 4 wood screws which shall penetrate the wood by at least one inch.

B. Where wood blocking or backing for fixture support is installed, it shall be securely anchored to the building structure in a manner approved by the Architect. This approval must be obtained before any fixtures are hung.

C. The installed hanger shall be capable of supporting at least 4 times the fixture weight and shall be so tested.

D. The Inspector shall verify this test and shall so state in his report.

E. Fixtures shall have special stem length to give the mounting height indicated on the drawings or as hereinafter specified. Stem shall be one piece without coupling and shall be finished the same color as the canopy unless noted otherwise. The contractor shall check all locknuts and set screws to rigidly secure the socket to the stem and the stem to the outlet box.

F. Individual fixtures shall be suspended on 2 swivel assemblies, and continuous rows shall be suspended on one more hanger assembly than the number of fixtures.

G. All swivel and canopy assemblies shall be suitable for the type of conduit mounting (surface or concealed) or the type of ceiling construction employed.

H. It shall be the contractor's responsibility that where obstructions such as walls, columns, exposed piping, ducts, etc., occur which prevent pendant mounted lighting fixtures from swinging the full 45 degrees, each individual fixture or row of fixtures at these locations be rigidly braced so that there is no horizontal movement. Bracing shall be securely attached directly to the building structure and shall be designed to withstand at least 100 percent horizontal seismic design load without permanent distortion or damage of metal. Bracing shall be done in a manner acceptable to both the Architect and the Division of the State Architect.

3.3 SURFACE FIXTURES

A. Toggle bolts or similar devices shall never be used to support surface mounted fixtures from the ceilings. Fixtures shall be screwed or bolted, as appropriate, to the main ceiling structure (if a fixed ceiling), the roof

structure or to suitable members bridging between main fixed ceiling or roof structural members.

3.4 RECESSED FIXTURES

A. Recessed fixtures for feed-through wiring shall have plaster frame or mounting frame and attached junction box. Lamp enclosure, reflectors and finish wiring shall not be installed until plastering is completed.

B. Finish trim shall not be installed until finish painting of the adjacent surface is completed.

C. The contractor shall verify the ceiling condition for each recessed fixture before placing final order for fixtures. Recessed fixtures shall be complete with the proper type mounting accessories required for the ceiling condition in which the fixture is mounted.

3.5 FIXTURES IN OR ON DEMOUNTABLE (TEE, ETC.) SUSPENDED CEILINGS

A. Where either surface or recessed fixtures are shown to mount on or lay in a suspended "tee" ceiling, the "tees" (or other ceiling members) shall be supported at each of the four corners of each 2 ft. by 4 ft. fixture (or smaller) by #12 ga. (minimum) hanger wires. The contractor, under this Division of the Specification, shall be responsible for the provision of any extra hanger wires necessary to meet this requirement.

B. 8 ft. long fixtures or continuous rows shall be supported on 4 ft. centers along the length.

C. Where fixture spacing of surface mounted fixtures places the edges in coincidence with the "tees", specifically approved scissors type devices which cannot be accidentally removed from the "tees" shall be used.

D. Where fixture edges do not coincide with the tees, 1-1/2 inch channel or "Unistrut", with welded or bolted studs, bridging the main ceiling channels, shall be provided.

E. Hanger wires shall still be attached at each of the 4 corners of each fixture as described preceding. Two additional #12 ga. hanger wires shall be installed directly from the structure above to each fixture housing which shall be slightly loose for recessed fixtures to be able to seat in the "tee" system.

F. Where pendant fixtures are shown to be mounted from a suspended "tee bar" ceiling or any related form of suspended ceiling, the fixtures shall be supported, using specifically approved devices, directly from the building structure in addition to the safety wire or cable hereinbefore specified. They shall not, to any extent, depend on the ceiling system for support even though the fixture hangers may be located at the ceiling members.

G. Where fixtures are located between ceiling members the hangers shall be attached to bridging channels, 1-1/2 inches minimum, provided under this section, across main ceiling channels. Even in this case, however, the actual support of the hanger shall be by wire or rod to the building structure. Any additional hanging wires or rods required for the support of fixture hangers shall be the responsibility of the Contractor under this Division of the Specification.

END OF SECTION 16500

SECTION 16721 - FIRE ALARM AND DETECTION SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification includes the furnishing, installation, connection and testing of Notifier microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated fire alarm system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), remote reporting equipment, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of 2007 NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

C. The fire alarm equipment manufacturer shall be Notifier, an ISO 9001 certified company and meet the requirements of EN29001, BS5750: Part 1: ANSI/ASQC Q91-1987.

D. The system and its components shall be State Fire Marshal approved and listed per 2007 California Building Code, 907.2.3 and conform to 2007 California Electrical Code and 2007 California Fire Code, Chapter 45.

E. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

1.2 SCOPE OF WORK

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.

3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.

4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.

5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

C. Basic System Functional Operation: When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the system display shall flash.

2. A local piezo electric signal in the control panel shall sound.

3. The 80-character LCD display on the local FACP node and on the network displays shall indicate all information associated with the fire alarm condition, including the type of alarm point, and its location within the protected premises. This information shall also be forwarded, displayed, and recorded on the existing Notifier network equipment located at Maintenance and Operations, 3701 E. Belle Terrace, Bakersfield.

4. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.

5. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

6. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

1.3 SUBMITTALS

A. Seven copies of all submittals shall be submitted to the Engineer for review.

B. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.

C. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show annunciator layout, configurations, and terminations.

D. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manual listing the manufacturer's name(s) including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

E. Software Modifications:

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.

2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices,

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

F. Certifications:

1. Together with the shop drawing submittal, submit a certification from Notifier indicating that the proposed provider of the equipment, supervisor of the installation, and the proposed performer of contract maintenance, is an authorized representative of Notifier. Include names and addresses in the certification.

1.4 GUARANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5 POST CONTRACT MAINTENANCE

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

C. Maintenance and testing shall be on a semiannual basis or as required by the local AHJ. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:

1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, water flow switches and all accessories of the fire alarm system.

2. Each circuit in the fire alarm system shall be tested semiannually.

3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

1.6 POST CONTRACT EXPANSIONS

A. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

B. As part of the submittal include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).

C. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FACP hardware would be required, include the material and labor necessary to install this hardware.

D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.

E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

1.7 APPLICABLE STANDARDS AND SPECIFICATIONS

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

B. National Fire Protection Association (NFPA) - USA:

No. 12 CO2 Extinguishing Systems (low and high)

No. 12B Halon 1211 Extinguishing Systems

No. 13 Sprinkler Systems

A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

No. 13A Halon 1301 Extinguishing Systems

No. 15 Water Spray Systems

No. 16 Foam/Water Deluge and Spray Systems

No. 17 Dry Chemical Extinguishing Systems

No. 17A Wet Chemical Extinguishing Systems Clean Agent Extinguishing Systems

No. 72 National Fire Alarm Code

No. 101 Life Safety Code

C. Underwriters Laboratories Inc. (UL) - USA:

No. 268 Smoke Detectors for Fire Protective Signaling Systems

No. 864 Control Units for Fire Protective Signaling Systems

No. 268A Smoke Detectors for Duct Applications

No. 521 Heat Detectors for Fire Protective Signaling Systems

No. 464 Audible Signaling Appliances

No. 38 Manually Actuated Signaling Boxes

No. 346 Waterflow Indicators for Fire Protective Signaling Systems

No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems

No. 1971 Visual Notification Appliances

D. Local and State Building Codes.

E. All requirements of the Authority Having Jurisdiction (AHJ).

F. The Video Display Terminal (VDT) shall comply with Swedish magnetic emission and X-radiation guidelines MPR 1990:10.

1.8 APPROVALS

UL Underwriters Laboratories Inc

ULC Underwriters Laboratories Canada

B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

C. The system shall be listed by the national agencies as suitable for extinguishing release applications. The system shall support release of high and low pressure CO2.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2 CONDUIT AND WIRE

A. Conduit:

1. Conduit materials shall be provided per section 16110, this specification and shall be in accordance with The California Electrical Code (CEC), local and state requirements.

2. All wiring shall be installed in conduit or raceway unless specifically noted otherwise on the project drawings. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per CEC Article 760-26.

4. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.

6. Conduit shall be 3/4 inch minimum.

B. Wire:

1. All fire alarm system wiring materials shall be provided per section 16120, this specification.

2. Wiring shall be in accordance with local, state and national codes (e.g., CEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as shown on the project drawings.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in CEC Article 760 (e.g., FPLR).

5. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. In certain applications, the systems shall support up to a 1,000 ft. loop of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.

6. All field wiring shall be completely supervised.

7. The Fire Alarm Control panel shall be capable of T-Tapping Class B (NFPA Style 4) Signaling Line Circuits (SLC's). Systems which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-Taps etc., are not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets

1. All boxes and cabinets shall be UL listed for their use and purpose.

2. Provide flat mount terminal blocks mounted on plywood backing inside terminal cabinets for conductor termination. Provide quantity of terminal blocks for each system as required. Terminal blocks shall be Kulka standard 600-600A series as manufactured by Marathon Special Products. Refer to section 16100 for terminal cabinet requirements.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.3 MAIN FIRE ALARM CONTROL PANEL

A. Main FACP shall be a NOTIFIER Model NFS-640 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

B. Operator Control

1. Acknowledge Switch:

a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.

b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo-sounders.

2. Alarm Silence Switch:

a. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards.

b. The FACP software shall include silence inhibit and auto-silence timers.

3. Alarm Activate (Drill) Switch:

a. The Alarm Activate switch shall activate all notification appliance circuits.

b. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch:

a. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

5. Lamp Test:

a. The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

C. System Capacity and General Operation

1. The control panel shall provide, or be capable of expansion to 636 intelligent/addressable devices.

2. The control panel shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style Y) or

Class A (NFPA Style Z) programmable Notification Appliance Circuits.

3. The control panel shall support up to 8 additional output modules (signal, speaker, telephone, or relay), each with 8 circuits for an additional 64 circuits. These circuits shall be either Class A (NFPA Style Z) or Class B (NFPA Style Y) per the project drawings.

4. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.

5. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.

6. The system shall allow the programming of any input to activate any output or group of outputs. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.

a. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming.

D. The FACP shall provide the following features:

1. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.

2. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.

3. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.

4. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Prealarm, selected by detector, to indicate impending alarms to maintenance personnel.

5. The ability to display or print system reports.

6. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.

7. PAS presignal, meeting NFPA 72 3-8.3 requirements.

8. Rapid manual station reporting (under 3 seconds) and shall meet NFPA 72 Chapter 1 requirements for activation of notification circuits within 10 seconds of initiating device activation.

9. Periodic detector test, conducted automatically by the software.

10. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.

11. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.

12. Walk test, with a check for two detectors set to same address.

13. Control-by-time for non-fire operations, with holiday schedules.

14. Day/night automatic adjustment of detector sensitivity.

15. Device blink control for sleeping areas.

E. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Panel notification circuits (NAC 1,2,3 and 4) shall also support Two-Stage operation, Canadian Dual Stage (3

minutes) and Canadian Dual Stage (5 minutes). Two stage operation shall allow 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. Canadian Dual stage is the same as Two-Stage except will only switch to second stage by activation of Drill Switch 3 or 5 minute timer. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse."

F. Network Communication

1. The network architecture shall be based on a Local Area Network (LAN), a firmware package that utilizes a peer-to-peer, inherently regenerative communication format and protocol. The protocol shall be based on ARCNET or equivalent. The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master-slave relationships at the network level to facilitate network communications. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations. Each node/panel shall communicate on the network at a baud rate of not less than 312 KBPS (kilo bits per second). A node may be an intelligent Fire Alarm Control Panel (FACP), Network Control Station PC (NCS) or Network Control Annunciator (NCA). The network shall be capable of expansion to at least 103 nodes.

2. Each network node address shall be capable of storing Event equations. The event equations shall be used to activate outputs on one network node from inputs on other network nodes.

3. The network shall be capable of communicating via fiber optic medium.

4. A network repeater shall be available for fiber optics that increases the wire distance in 10 dB increments. A mix (hybrid) fiber/wire network repeater shall also be supported. Systems that have distance limitations, and have no available means to regenerate signals are not suitable substitutes.

5. Fiber Optic Network Communication: The network shall support fiber optics with the following specifications:

   a. Size =62.5 micrometers / 125 micrometers

   b. Type=Multimode, Dual fiber, Plenum rated

   c. Distance=maximum 10 dB total attenuation between network nodes

   d. Connector type=ST

G. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, Flash memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

4. A special program check function shall be provided to detect common operator errors.

5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download, and have the ability to upgrade the manufacturers (FLASH) system

code changes. This program shall also have a verification utility, which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.

H. System Display

1. The system shall support the following display mode options:

a. The CPU with no display option shall allow the fire alarm control panel to function as a data-gathering panel when the panel is connected to a network with a Network Control Station (NCS) or Network Control Annunciator (NCA). In this application, the NCS or NCA shall provide all of the necessary controls and indicators to be used by the system operator. Programming of the CPU may be accomplished from the NCS or by use of a laptop PC with the software programming utility connected directly to the CPU.

b. 80 character display option. The display shall include an 80-character backlit alphanumeric Liquid Crystal Display (LCD) and a full PC style QWERTY keypad.

c. 640-character display option. The design of the CPU shall provide for a configuration with the 640 Character display mounted on the front of the CPU in place of the standard 80-character display.

2. The display shall provide all the controls and indicators used by the system operator:

a. The 80-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.

b. The 640-character display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.

3. The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

4. The display shall also provide Light-Emitting Diodes.

a. The 80-character display shall provide 8 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, and ALARM SILENCED.

b. The 640-character display shall provide 10 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER & NETWORK COMMUNICATION, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY EVENT, SYSTEM TROUBLE, ALARM SILENCED, DISABLED POINTS, OTHER EVENTS, CPU FAILURE.

c. The 80-character display keypad shall be an easy to use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

d. The 640-character display shall use 10 "soft" keys for screen navigation or to accomplish dedicated programming functions. Full programming access shall require use of a laptop and the proper programming utility.

5. The system shall support the display of battery charging current and voltage on the 80-character LCD display.

I. Network Control Annunciator:

1. A network control annunciator shall be provided to display all system intelligent points. The NCA shall be capable of displaying all information for all 200,000 possible points on the network. Network display devices, which are only capable of displaying a subset of network points, shall not be suitable substitutes.

2. The NCA shall include a minimum of 640 characters, backlit by a long life, solid state LCD display. It shall also include a full QWERTY style keypad with tactile feel. Additionally, the network display shall include ten soft-keys for screen navigation and the ability to scroll events by type. i.e. Fire Alarm, Supervisory Alarm, Trouble, etc.

3. The network control annunciator shall have the ability to display up to eight events in order of priority and time of occurrence. Counters shall be provided to indicate the total number of events by type.

4. The NCA shall mount in any of the network node fire alarm control panels. Optionally, the network display may mount in a backbox designed for this use. The network shall support a minimum of 103 network control annunciators (not to exceed total node capacity) and shall connect to the network over either a wire or fiber interface.

5. The network control annunciator shall have an event history buffer capable of storing a minimum of 1000 events in non-volatile memory. Additionally, the NCA shall have a fire alarm history buffer capable of storing a minimum of 200 events in non-volatile memory. Systems that do not protect fire alarm events from being overwritten by other events are not suitable substitutes.

6. The NCA shall include two optically isolated, 9600 baud, industry standard EIA-232 ports for UL864 listed printers and CRT's. These peripheral devices shall print or display network activity.

7. The network control annunciator shall include control switches for system wide control of Acknowledge, Signal Silence, System Reset, Drill, and local Lamp Test. A mechanical means by which the controls switches are "locked out", such as a key, shall be available.

8. The NCA shall include long life LEDs to display Power, Fire Alarm, Pre-Alarm, Security Alarm, System Trouble, Supervisory, Signals Silenced, Disabled Points, Other (non-fire) Events, and CPU Failure.

9. The network control annunciator shall include a Master password and up to nine User passwords. Each password shall be up to eight alpha-numeric characters in length. The Master password shall be authorized to access the programming and alter status menus. Each User password may have different levels of authorization assigned by the Master password.

10. The NCA shall allow editing of labels for all points within the network; control on/off of outputs; enable/disable of all network points; alter detector sensitivity; clear detector verification counters for any analog addressable detector within the network; clear any history log within the network; change the Time/Date settings; initiate a Walk Test.

11. The network control annunciator shall support an optional WindowsTM based program utility. This utility shall allow the user create an NCA database, upload/download an NCA database, and download an upgrade to the NCA executive. To ensure program validity, this utility shall check stored databases for errors. A compare function shall be included to identify differences between databases.

12. For time keeping purposes the NCA shall include a time of day clock.

13. Each NCA shall support up to 32 additional 80 character remote display annunciators for displaying network activity. These "Terminal Mode" displays will mimic the activity appearing on the corresponding NCA.

J. Network Control Station:

1. The NCS shall utilize a Microsoft(tm) operating system. Each Network Control Station shall be capable of graphically annunciating and controlling all network activity. Network display devices that are only capable of displaying a subset of network

points shall not be suitable substitutes.

2. The NCS shall be an IBM (or compatible) personal computer with the following minimum requirements: Intel Pentium II(tm)-processor, operating at a minimum of 400 Mhz, 128Mbytes of RAM, 8 Mbytes Video RAM, 1.44 Mbyte floppy drive, 3.2 Gbyte hard disk, mouse, 32X CD-ROM, 3PCI / 1 ISA expansion slots, internal 3.2 Gbyte tape drive, sound card, 200 watt power supply, and SVGA graphics with a screen resolution of 1024 x 768. The network control station shall include a 19-inch monitor.

3. The NCS shall be capable of storing over 100,000 network events in a history file. Events shall be stored on hard disk and shall be capable of back-up storage to a tape drive. The history buffer allows the operator to view events in a chronological order. A filter shall be available for displaying chronological events by operator, date, time, fire alarms, troubles (including security, supervisory and system/device), disabled points/zones, system programming, operator response and operator log in/log out. The ability to print NCS history files shall also be available.

4. The NCS shall use a Windows(tm) dialog box technology to address, interrogate, control, and/or modify intelligent points on each fire alarm node. This shall include, and not be limited to: Activating outputs, enabling or disabling points, adding or removing intelligent points, viewing intelligent detector sensitivity levels and modifying point information (custom messages, detector type, verification, day/night selection etc.)

5. The NCS shall include the ability to display system information in a graphical (floor plan) form. Each view, created using standard Windows bitmap files, shall include icons created for intelligent devices. These icons shall blink and change to the appropriate programmed icon when an event occurs. When the device has been acknowledged, the icon shall become steady. Once the point has returned to normal, the normal icon is displayed. In addition to the graphical representation of the device, the user shall be able to link pictures, documents and sound files to the device. The NCS shall also provide the ability to auto-vector to the floor plan (screen) of the device that is active. By selecting a device in the graphic presentation, the operator of the NCS shall have the ability to log onto the corresponding node and interrogate the associated intelligent point.

6. The NCS shall have the ability to provide the following information through a Windows(tm) pull down menu: An Event Counter that contains the number of new and total events on the network. The information that is displayed shall consist of Fire Alarms, Pre-Alarms, Security Alarms, Supervisory Alarms, and Troubles. A Detailed Event window that contains all Off-Normal events, both unacknowledged and acknowledged that are present in the system. It shall contain two views, Fire events and Non-fire events that shall be user selectable. A Current Event window that shall contain all network and local events as well as system messages with a maximum of 1,000 events displayed. A Disabled Device window that shall contain all disabled devices in the system.

7. The NCS shall have the option, from a Windows pull down menu, to connect to a third party paging service that allows the NCS to automatically send text-based messages regarding system status to a typical text pager.

8. The NCS shall include help screens, available to aid the user without leaving the selected application screen.

9. The NCS shall be UL-Listed for fire protection (UL864) and burglary (UL1076).

10. The NCS shall meet FCC regulations (Part 15, subpart J) regardless of its connection means to the network.

11. The NCS shall have a flexible way of assigning operator passwords. There shall be an unlimited number of possible operators, each with specific levels of control. Each operator shall have his/her own password. Operator password and control selection shall be available to a high level "administrator" who shall have complete control over levels of control. If no action has taken place on the NCS after 10 minutes, the current operator shall be logged out and require a new log-in.

12. The NCS shall include an industry-standard EIA-232 port for a UL864 listed printer.

13. The NCS shall be a table top hardware configuration.

K. Signaling Line Circuits (SLC):

1. Each FACP shall support up to two SLCs. Each SLC interface shall provide power to and communicate with up to 159 intelligent detectors (ionization, photoelectric or thermal) and 159 intelligent modules (monitor or control) for a loop capacity of 318 devices. The addition of the optional second loop shall double the device capacity, supporting a total of 636 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.

2. CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

L. Serial Interfaces:

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals.

2. One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

3. One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers that are not UL-Listed are not considered acceptable substitutes.

4. One EIA-232 interface shall be used to connect a UL-listed CRT terminal. This interface shall include special protocol methods that allow off-site monitoring of the

7. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.

8. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

FACP over standard dial-up phone lines. This ancillary capability shall allow remote readout of all status information, including analog values, and shall not interfere with or degrade FACP operations when used. It shall allow remote FACP Acknowledge, Reset, or Signal Silence in this mode. It shall also allow adjustment of detector sensitivity and readout of the history file.

5. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.

6. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

M. Notification Appliance Circuit (NAC) Module:

1. The Notification Appliance Circuit module shall provide four fully supervised Class A or B (NFPA Style Z or Y) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.

2. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.

3. The module shall not affect other module circuits in any way during a short circuit condition.

4. The module shall provide eight green ON/OFF LEDs and eight yellow trouble LEDs.

5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.

6. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor.

N. Control Relay Module:

1. The control relay module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.

2. Each relay circuit shall be capable of being activated (change in state) by any initiating

device or from any combination of initiating devices.

3. The relay module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs (indicates disabled status of the relay).

4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.

5. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.

6. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wire.

O. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.

3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be site configured for either right or left hand hinging.

P. Power Supply:

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.

2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0 amp hour batteries.

2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.

3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 55 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.

4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:

a. Ground Fault LED

b. AC Power Fail LED

c. NAC on LED (4)

5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.

6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 55 AH.

7. All circuits shall be power-limited, per UL864 requirements.

Q. Auxiliary Field Power Supply - Addressable:

1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.

3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.

4. The addressable power supply shall provide built-in synchronization for certain

Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.

5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.

6. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.

7. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.

8. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.

9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.

10. The addressable power supply mounts in either the FACP backbox or it's own dedicated surface mounted backbox with cover.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

3. The FCPS shall include an attractive surface mount backbox.

11. Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.

12. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of and end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.

13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.

14. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.

15. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.

16. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

R. Field Charging Power Supply (FCPS): The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.

4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.

5. The FCPS include power limited circuitry, per 1995 UL standards.

S. Specific System Operations:

1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.

2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

4. Point Read: The system shall be able to display or print the following point status diagnostic functions:

a. Device status

b. Device type

c. Custom device label

d. View analog detector values

e. Device zone assignments

f. All program parameters

5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.

7. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

9. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.

10. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:

a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.

b. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.

c. All devices tested in walk test shall be recorded in the history buffer.

11. Waterflow Operation: An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel

display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

12. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.

13. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

14. Non-Alarm Input Operation: Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.

15. Combo Zone: A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

2.4 SYSTEM COMPONENTS

A. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.

2. Electronic sounders shall be field programmable without the use of special tools, at a sound level of at least 90 dBA measured at 10 feet from the device.

3. Shall be flush or surface mounted as shown on plans.

B. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:

1. The maximum pulse duration shall be 2/10 of one second.

2. Strobe intensity shall meet the requirements of UL 1971.

3. The flash rate shall meet the requirements of UL 1971.

C. Waterflow Indicator:

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.

2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

3. All waterflow switches shall come from a single manufacturer and series.

4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.

5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

D. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.

3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.

4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.

5. The switch housing shall be finished in red baked enamel.

6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

7. Valve supervisory switches shall be provided and connected under this section and installed

by mechanical contractor.

a. This unit shall provide for each zone: alarm indications, using a red alarm an yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo-electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.

b. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

E. Alphanumeric LCD Type Annunciator:

1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.

2. The LCD annunciator shall display all alarm and trouble conditions in the system.

3. An audible indication of alarm shall be integral to the alphanumeric display.

4. The display shall be UL listed for fire alarm application.

5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.

6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the

4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.

5. Communication shall include vital system status such as:

a. Independent Zone (Alarm, trouble, non-alarm, supervisory)

main control panel.

7. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset, which shall be protected from unauthorized use by a keyswitch or password.

8. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

F. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

G. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.

2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.

3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.

b. Independent Addressable Device Status

c. AC (Mains) Power Loss

d. Low Battery and Earth Fault

e. System Off Normal

f. 12 and 24 Hour Test Signal

g. Abnormal Test Signal (per UL requirements)

h. EIA-485 Communications Failure

i. Phone Line Failure

6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

H. Field Wiring Terminal Blocks: For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

I. Printer : The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.

1. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.

J. Video Display Terminal: The Video Display Terminal shall provide a visual display and an audible alert of all changes in status of the system and shall annotate such displays with the current time-of-day and date.

1. The Video Display Terminal shall be enclosed in a cabinet suitable for placement on a desktop or table.

2. A detachable keyboard shall be provided that may be used for programming, testing, and control of the system. Individual keys shall be provided on the keyboard for the ACKNOWLEDGE, RESET, LAMP TEST, SYSTEM TEST, and SIGNAL SILENCE functions of the control panel.

3. The video display terminal shall include a count of all alarms and troubles in the system, as well as a count of all alarms and trouble requiring acknowledgment. These counts shall be continuously displayed during all FACP operations.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General:

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.

2. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.

12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

13. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.

B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Laser Photo Smoke Detector shall be a spot type detector that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.

1. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.

2. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.

3. The laser detector shall not require expensive conduit, special fittings or PVC pipe.

4. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.

5. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.

6. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.

E. Intelligent Ionization Smoke Detector shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

F. Intelligent Multi Criteria Acclimating Detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine it's environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.

1. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).

2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

G. Intelligent Thermal Detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

H. Intelligent Duct Smoke Detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

1. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

I. Hostile-Area Smoke Detector shall be designed to provide early warning smoke detection in environments where traditional smoke detectors are not practical.

1. The detector shall have a filter system to remove particles down to 25 microns.

2. This filter system shall remove unwanted airborne particles and water mist. This shall allow the detector to operate in environments where traditional smoke detectors would have nuisance alarms.

3. The filter system shall consist of 2 filters one of which is field replaceable.

4. The filter system shall have an intake fan to draw air and smoke through the filters into the sensing chamber.

5. The filter system shall be supervised so that if the filter is clogged or the fan fails the control panel reports trouble.

6. The filter system shall be powered from 24 VDC separate from the SLC communications.

7. The detector shall utilize a photoelectric sensing chamber.

2. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

J. Addressable Dry Contact Monitor Module shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.

1. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

K. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or

alarm initiating devices (any N.O. dry contact device).

2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

L. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances.

2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation.

3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.

4. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

M. Addressable Relay Module:

1. Addressable Relay Modules shall be available for HVAC control and other building functions.

2. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive.

3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

N. Isolator Module:

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

3. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

4. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.5 BATTERIES

A. Shall be 12 volt, Gel-Cell type (two required).

B. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the equipment manufacturer.

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

D. Manual pull stations shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

3.2 TEST

A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

B. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

C. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

D. Verify activation of all flow switches.

E. Open initiating device circuits and verify that the trouble signal actuates.

F. Open and short signaling line circuits and verify that the trouble signal actuates.

G. Open and short Notification Appliance Circuits and verify that trouble signal actuates.

H. Ground all circuits and verify response of trouble signals.

I. Check presence and audibility of tone at all alarm notification devices.

J. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

K. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

L. When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

A. At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.4 INSTRUCTION

A. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

B. The Contractor and/or the Systems Manufacturer's representatives shall provide a typewritten "Sequence of Operation" to the owner.

C. Factory training shall be provided to (5) five of the owner=s selected personnel. A one week session on all aspects of the Fire Alarm system shall be conducted at a location acceptable to Kern High School District. Manufacturer shall send one of owner=s selected personnel to main facility for training. It shall be the responsibility of the manufacturer to pay for air fare and hotel accommodations as required.

END OF SECTION 16721

SECTION 16727 - INTRUSION ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.2 BASIC FUNCTION

A. The first basic intent of the intrusion alarm system is to detect unauthorized entry into any covered building on the campus and identify, immediately, the specific point of entry to a 24-hour central supervisory office.

B. Points of entry to be monitored will be all outside doors and all roof hatches.

C. Selected areas of high risk shall have motion detector coverage to supplement the door entry protection.

D. The second basic intent is to minimize response to false alarm. Alarm pads placed in all protected buildings and appropriate time delay features are included to work towards this end.

E. The third basic intent is to provide a flexible, readily expandable system which is fully electrically supervised.

1.3 ALTERNATE DESIGN

A. The system presented on the drawings is based on a Digital Monitoring Products #DMP XR500 digital control communicator system supervised by Tel-Tec Inc.

1.4 SCOPE

A. The work described by this part includes the furnishing of all materials, equipment, supplies, and labor and the performing of all operations necessary for the installation of a complete and operating system.

B. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the contractor. The balance of the system, including the furnishing and installation of cable, furnishing and installation of equipment, making all connections, etc., shall be installed by the Intrusion Alarm Contractor, and the entire responsibility of the system, its operation, function, testing and maintenance for 1 year after final acceptance of the project by the Owner, shall be the responsibility of the Intrusion Alarm Contractor.

C. The Intrusion Alarm Contractor shall furnish and install all equipment, cables, devices as specified for the proper integration of the system so that the system shall perform the function listed herein in compliance with all the specified requirements.

1.5 BIDDER QUALIFICATIONS

A. To qualify as a bidder, the Intrusion Alarm Contractor shall hold a valid State of California C-61 or C-10 license, shall have completed at least 10 projects of equal scope within a 50 mile radius of this project, shall have been in business of furnishing and installing intrusion alarm systems of this type for at least 5 years, and capable of being bonded to assure the Owner of performance and satisfactory service during the guarantee period.

B. The Intrusion Alarm Contractor shall be an authorized representative and factory distributor of the equipment. The Intrusion Alarm Contractor shall provide a letter with submittals from the manufacturer of all major equipment stating that he is the representative and that the manufacturer will have a service representative assigned to this area for at least 5 years.

C. The Contractor shall furnish a letter from the manufacturer of the equipment, which certifies that the equipment has been installed according to factory intended practices and that the system is operating satisfactorily. The Contractor shall also furnish a written unconditional guarantee, guaranteeing all parts and labor for a period of 1 year after final acceptance of the project by the Owner.

1.6 SUBMITTALS

A. Within 60 days after the date of award of the contract, the Contractor shall submit to the architect for review 8 copies of complete submittals.

B. The submittals shall consist of 5 major sections with each section separated with insertable index tabs. The first section shall be the "index" which shall include the project title and address, name of the firm submitting the proposal and name of the architect. Each page in the submittal shall be numbered chronologically and shall be summarized in the index.

C. The second section shall include a copy of the Intrusion Alarm Contractor's valid C-61 California

State Contractor's License, letters of factory authorization and guaranteed service and list of projects of equal scope. The third section shall contain the comparative specification listing, including a complete listing of the characteristics of the equipment to be furnished. The fourth section shall contain an original factory data sheet for every piece of equipment in the specifications. The fifth section shall contain a wiring destination schedule for each circuit leaving each piece of equipment.

D. The contractor shall provide 2 copies of an "Operating and Servicing Manual" for the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: instructions necessary for the proper operation and servicing of the system; complete record set installation drawings of the system; a wiring destination schedule for each circuit leaving for each piece of equipment. The manual shall be submitted directly to the Owner with a letter of transmittal. A copy of this letter shall be forwarded to the Architect.

PART 2 - PRODUCT

2.1 GENERAL

A. The specified equipment for the alarm systems is that of the Digital Monitoring Products Security Systems, unless otherwise noted.

B. All mechanical, electrical and general information set forth on the respective data sheets for each specified item shall be considered as part of these specifications and binding herein.

C. Any proposed equal item offered shall be substantiated fully to prove equality. The Architect reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by an independent testing laboratory to prove equality. The decision of the Architect regarding equality of proposed equal items will be final.

2.2 SYSTEM FUNCTION

A. The actuation of any alarm initiating device in the system shall cause the alarm panel to go into alarm mode, locking in the call.

B. The alarm shall then be digitally transmitted to the alarm pad. It shall annunciate, by building and door number on the alpha-numeric display at the control communicator and be passed through automatically, by modem, to the central supervisory station off site.

C. The system shall include 2 telephone line interfaces with full line seizure on each.

2.3 CONTROL COMMUNICATOR (CENTRAL PROCESSOR)

A. Computer based communicator utilizing Serial 3 SDLC format supporting 16 - character user, zone and area names to increase the central station s response time with the following characteristics:

1. Four independent partitions
2. 32 individual reporting areas
3. Up to 574 fully programmable zones
4. Up to 574 graphic annunciator outputs
5. Up to 502 programmable form C relays
6. 10,000 user codes with 99 profiles
7. Pager Direct alphanumeric and numeric paging
8. Supports Easy Entry access control keypads
9. 7-day temporary user codes
10. One ambush code for each partition
11. Built-in programming from any keypad
12. Program from your laptop with a 462N Interface Card
13. Cross zoning between any zones in a partition
14. One or more Common areas in each partition
15. Permanent, Temporary, and up to 100 Output schedules
16. Individual zone programming for instant, delay, priority, fire, fire verification, fire retard, panic, presignal, fast response, cross zoning, and fire supervisory
17. Hardwire, 900 MHz, and 300 MHz wireless zone capability
18. Swinger bypass option on all zones
19. Up to 234 two-wire smoke detector zones

20. Area, All/Perimeter, or Home/Sleep/Away arming

21. Eight supervised keypad addresses with 32 zones

22. 4-wire keypad and zone expander connections

23. 200-event history display from keypad

24. Alternate reporting to 2 SCS-1 Receivers

25. AA Multiplex, digital dialer, or data network reporting to UL listed DMP SCS-1 Security Receiver

26. Secure-Com Cellular with Cell-Miser

27. Contact ID and Modem lle reporting to non-DMP receivers

28. Up to 60-second alarm transmission delay

29. 1.5 Amps bell output

30. 1.5 Amps smoke and auxiliary output

31. Inherent power limited circuits

32. Automatic or deferred test reports

2.4 PASSIVE MOTION DETECTORS

A. Passive infra red detector with 62 Detector Zones, 360 degree coverage 70 ft X 35 ft diameter.

B. Pattern shall be aimable by 15 degrees in either direction. The design shall be tripolar to reduce false alarms. Sensitivity shall be dip switch settable for high and low sensitivity.

C. Device shall be outlet box mounting and shall be Ademco 1895 Ceiling Mounted PIR.

2.5 ALARM PAD

A. Alarm pads shall be semi-flush, outlet box mounting, push button type with Arm, Monitor and Clear commands in addition.

B. Keypad shall be Digital Monitoring Products #DMP 690.

2.6 DOOR CONTACTS

A. Flush, concealed type, suitable for wood or steel doors and sash, wide break distance, magnetic, reed type switch rated 100 volts DC, 500 MA, 10,000,000 cycles (minimum).

B. Door contacts shall be Sentrol #1078 series.

2.7 CABLES

A. D Cable - From each door switch and or pair of door switches, 1 pair #22 gauge PVC insulated and PVC jacketed. Belden #8740 or equal.

B. K' Cable - To each alarm pad, one 4 conductor #18 gauge, PVC insulated and PVC jacketed. Belden #8489.

C. K1' Cable - From alarm panel in each building back to Building 100, one 7 conductor #18 gauge, PVC insulated and PVC jacketed. Belden #8467.

D. MD Cable - To each motion detector, 4 conductor #22 gauge, polyethylene insulated and PVC jacketed. Belden #9794, loop connected.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount control communicator inside a 30 H x 18 W x 6 DP telephone terminal cabinet with hinged lockable door, flush or surface mounted as shown on the drawings.

B. Cabinet shall be a B-Line #30186TCF/3018TCF(Flush) or #30186TCS/3018TCS (Surface) with #3018WB ¾ thick plywood backboard. Mount similar to Details #9 and #10/EG.07.

3.2 WIRING

A. All wiring shall be of the type and size recommended by the equipment supplier, and as approved by the authority having jurisdiction. Wire color coding shall remain the same throughout the system.

B. No wiring other than that directly associated with the intrusion alarm functions (NO 110 VAC), shall be permitted in intrusion alarm conduits.

C. All wiring shall be tested for opens, shorts or grounds prior to the connection of any devices.

D. All intrusion alarm junction boxes shall be clearly marked for easy identification.

E. Wire nut splices shall not be permitted.

3.3 END OF LINE DEVICES

A. End of the line devices shall be installed only in the control cabinet or with other equipment where the loop being supervised originates, never in remote outlets. Wiring shall be provided accordingly.

3.4 TESTING

A. Upon completion of the installation, the Contractor shall test each and every detection, initiating, and control device for proper operation.

B. A factory authorized trained representative of the manufacturer shall supervise final testing of the system.

C. A certificate report shall be submitted to the Owner, or his representative, indicating proper operation, compliance, date of testing and the Contractor's signature.

D. On completion of the acceptance tests, the Owner or his representative shall be instructed in the operation and testing of the system. A minimum of 8 hours training shall be provided.

3.5 RECORD DRAWINGS

A. Record drawings: The Contractor shall prepare "Record" drawings that indicate the final location of all devices, conduit routing and wiring methods.

B. One copy of "Record" drawings shall be forwarded to the Architect and one copy shall be located at the intrusion alarm control panel.

3.6 WARRANTY

A. All equipment and systems shall be warranted by the Contractor for a period of one year following acceptance.

3.7 MANUFACTURER'S RESPONSIBILITY

A. It is mandatory, under this section of the specification, that the intrusion alarm equipment manufacturer or his authorized representative, install and connect, supervise the installation and connection, or at the minimum, inspect and test the entire system after completion.

B. A letter from the manufacturer or his authorized representative certifying that this inspection and testing has been done and that the complete system is in full and proper operation and in compliance with this specification and the manufacturer's recommendations, shall be submitted before the project will be accepted.

3.8 CENTRAL STATION

A. The intrusion alarm equipment manufacturer's authorized representative shall have available in the Bakersfield area a 24 hour, 7 day per week central station service to receive and respond to alarms from the school intrusion alarm system.

3.9 SERVICE

A. The intrusion alarm equipment manufacturer's representative shall have a 24 hour (maximum) response capability to service calls.

END OF SECTION 16727

SECTION 16760 - INTEGRATED COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and General Provisions of Contract, including General and Supplementary conditions and Division 0 and Division 1 Specification Sections, apply to work of this Section.

1.2 GENERAL

A. All bids shall be based on the equipment as specified herein. The catalog numbers and model designations are that of the Class Connection and NEC. The System is designed to connect to the district wide Class Connection XPE Network and to integrate to the existing NEC System. Any other system must be approved by the specifying authority prior to bid.

B. Bidders wishing to submit alternate equipment shall submit to the specifying authority, at least 10 days prior to bid opening, the equipment proposed to provide a precise functional equivalent system to meet specifications. Bidder shall provide adequate information prior to bid date such as specification sheets, working drawings, shop drawings, and a demonstration of the system. Bidder shall provide a by comparison between the specified system and the alternate system. Any alternate system must be able to provide 100% of the specified functions. It shall be the Bidders responsibility to provide enough information so the specifying authority can assure the Owner that the alternate system or the specified system. The bidder shall also provide the FCC registration number of the proposed system. Alternate supplier-contractor must also provide a list to include six installations of the identical system proposed which have been in operation for a period of two years including school name, school address, contact person, and telephone number. Requests for pre-approval that do not include all of the above information will be sent back without comment.

C. Final approval of the alternate system shall be determined at the time of job completion. Failure to provide the "precise functional equivalent" shall result in the removal of the alternate system at the contractor's expense.

1.3 SCOPE OF WORK

A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete and operating Integrated Communications System consisting of Telephone (Telephone System provided by owner), Intercommunication and Public Address System.

B. Telephone service with public utilities shall be arranged by the owner, in conjunction with the equipment supplier.

C. The contractor shall provide all equipment, labor, and material necessary for a complete and satisfactory operation systems per plans and specifications. Systems shall be installed and wired in conduit provided by others.

D. The intent of this specification is to maximize communications between the classroom and administrative areas while enhancing school safety and reducing maintenance and operational cost.

E. Under this specification, the system shall provide a complete Communication System for the Administrative, Classroom, Cafeteria, Library, and Recreational areas.

F. The Communication System shall provide distribution of intercom, overhead paging, emergency paging, class change time tones, and emergency tones and program material and on board emergency messaging.

1.4 SUBMITTALS

A. A complete set of manufacturer's Specification Sheets shall be submitted on all items including cable types.

B. Submit outline drawing of system control cabinet showing relative position of all major components.

C. Submit FCC registration number on separate documentation with the ringer equivalency of the proposed integrated telephone system. This documentation is mandatory, all submittals without FCC registration information will automatically be rejected.

D. Submit wiring diagrams showing typical connections for all equipment.

E. Submit a certificate of completion of installation and service training from the system manufacturer.

1.5 SERVICE AND MAINTENANCE

A. The contractor shall provide a one year warranty of the installed system against defects in material

and workmanship. All labor and materials shall be provided at no expense to the owner during normal working hours. The warranty period shall begin on the date of acceptance by the owner/engineer.

B. The contractor shall, at the owner's request, make available a service contract offering continuing factory authorized service of this system after the initial warranty period.

C. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

1.6 QUALITY ASSURANCE

A. All items of equipment shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections. Existing cable shall be used.

B. The contractor shall be an established communications and electronics contractor that has had, and currently maintains, a locally run and operated business for at least five years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.

C. The contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the system. The contractor shall maintain at his facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

D. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the contractor's submittal.

E. The communication system supplied shall be listed by Underwriter's Laboratories under UL Standard 1459. A copy of the UL listing card for the proposed system shall be included with the contractor's submittal.

1.7 CONTRACTOR QUALIFICATIONS

A. The bidder shall submit at least the following information to verify that the bidder has the necessary experience and qualifications to perform the specified work:

1. A detailed brochure describing the firm s capabilities, present agreements with specified manufacturer s that they are authorized to install the specified equipment.

2. Certify that all work shall be performed by an experienced audio systems engineering contractor having at least 10 years direct experience with the components, devices and equipment specified herein and of similar scope.

3. Certify that the contractor shall have been a factory authorized engineering contractor for all products specified herein for at least the last 5 years at the time of the bid.

4. Certify that the contractor shall maintain a staff of qualified technicians able to respond to service requests. At least one staff technician shall have a minimum of 5 years experience servicing the products specified herein at the component level.

5. Certify that the contractor shall be a licensed California contractor holding a C-7 class license.

6. Certify that the contractor shall be involved solely with the engineering and installation of audio, video and control systems consistent with the scope of work described herein and as shown on the drawings. Electrical contractors specializing in the installation of power systems, lighting and associated conduits, wiring, fixtures and accessories or C-7 contractors who cannot show they have installed at least 15 projects similar to this one shall not be acceptable for this work.

7. Certify that the contractor shall have on staff a registered communications designer (RCDD) who shall approve and stamp the final drawings and supervise the installation of the systems.

8. Certify that the contractor maintains on staff the services of C-EST trained technicians. At least 50% of all installers and technicians who work on this project must have a C-EST. Copies of each certificate shall be included.

9. Certify that the contractor shall have on staff, an experienced engineer with at least 5 years direct experience with the scope of the system design and shall possess a degree in Electrical Engineering with direct experience in system work at the construction level. In lieu of a formal degree, the engineer must have experience on at least 5 projects of similar scope where a licensed Electrical Engineer has been required.

10. And certify that all installation technicians have at least 3 years direct experience with systems installations of similar scope.

1.8 WIRING

A. System wiring and equipment installation shall be in accordance with good engineering practices as established by the EIA and the NEC. Wiring shall meet all state and local electrical codes. All wiring shall test free from all grounds and shorts.

B. All wiring shall be listed for the intended purpose. The intercom shall use CAT 3 (three) or 5 (five) UTP U.L. listed cable. All classrooms shall be homerun.

C. All interior wiring shall be in accordance with new construction guidelines suggested by the Manufacturer; including the speaker and the call-in switch and/or telephone handset.

1.9 PROTECTION

A. The contractor shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.

B. The contractor shall note in his system drawings, the type and location of these protection devices as well as all wiring information.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The intercom system equipment model numbers specified herein are that of the CLASS CONNECTION XPE and NEC.

B. The intent is to establish a standard of quality, function and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.

C. The functions and features specified are vital to the operation of this facility; therefore, inclusion in the list of acceptable manufacturers does not release the contractor from strict compliance with the requirements of this specification.

D. The intercom system shall be a Class Connection System and the PBX shall be a NEC NEAX 2000, or pre-approved equal. All equals must be pre-approved in addendum form at least ten (10) days prior to bid. Equals shall not be allowed after the bid.

E. Unless otherwise noted in this specification, classroom telephones and administrative telephones shall be connected to the NEC System. The Class Connection XPE and NEAX 2000 systems shall be interconnected to provide seamless integration between the two systems.

F. The system shall be a Class Connection XPE System, or pre-approved equal. All equals must be pre-approved in addendum form at least ten (10) days prior to bid. Equals shall not be allowed after the bid.

2.2 VOICE COMMUNICATION AND SOUND SYSTEM

A. The Communication System shall provide at least the following functions and features:

1. Direct dialed, hands-free, two-way communication from all administrative telephones to any location equipped with a talkback speaker.

2. Automatic gain control on intercom speech to assure constant talkback speech level.

3. Microprocessor based system capable of handling up to 720 points (seven hundred twenty). A point is defined as a call-in switch or a speaker output.

4. System shall be modular in design and capable of expanding in increments of 48 points allowing for budget flexibility and expandability.

5. System shall interface with any telephone system, thus allowing the school(s) to upgrade or replace their telephone system without suffering a requirement to replace, or lose any feature of, their internal communications (intercom) system. Any system that limits system features based

upon any selected telephone system, and/or is proprietary to one or only a few telephone systems shall not be acceptable.

6. Automatically sound a tone or play a pre-page WAV file over any loudspeaker connected for two-way communication to alert the classroom teacher that this two-way call has been established. This is intended to prevent unauthorized monitoring. The privacy tone must repeat every 15 (fifteen) seconds.

7. Distribution of emergency announcement(s) from any authorized telephone to all areas furnished with a loudspeaker. Emergency announcements shall have the highest system priority.

8. Distribution of general announcements from any administrative telephone, staff telephone, or classroom telephone. The system shall be capable of providing all-call, group call, multiple group call, or dial-on-the-fly page groups.

9. Classroom speakers shall be software assignable to any or all of 72 (seventy-two) audio groups.

10. Provide the ability to define and archive unlimited time tone schedules with up to 255 events per schedule. Each scheduled event shall be capable of controlling any one of 6 (six) internal tones; user selected custom audio/voice phrases, audio from any of 3 auxiliary sources or up to 40 relays for building control. Each scheduled audio event shall be distributable to up to 72 audio groups. The system shall feature the ability to automatically initiate up to 8 schedules per day, based upon the day of the week or calendar dates up to one year in advance. Up to 8 daily schedules shall operate simultaneously. Schedule administration, modification and creation functions must be available through administration PC software. Systems that do not allow the school to manage their own schedules with PC software do not offer calendar based scheduling up to one year in advance or require separate page and time groups shall not be acceptable.

11. Provide 1, 2, 3 or 4 digits numbering plan, thus allowing the classroom speaker and the classroom telephone to be the same architectural number.

12. Provide facilities for up to 7 (seven) call-in priority levels. Each classroom call button shall be assignable to any one or two of these priority levels. The call button priority levels shall have the capacity to change state on a time of day basis. The priority levels shall be as follows:

    a. Normal

    b. Security

    c. Normal/Emergency

    d. Urgent/Emergency

    e. Overhead Ring

    f. Emergency Only

    g. Ignore

13. Call button priority levels shall determine call queue placement. Emergency calls will be answered first; urgent calls second and normal calls last.

14. System shall be capable of placing intercoms call on hold in order to perform other administrative functions.

15. Any classroom/area loudspeaker must have the flexibility to be programmed as a testing room. A testing room shall be excluded from receiving general announcements, class change tones, group announcements and program material. The testing room must receive emergency tones and announcements. A dial code must be provided that will access these testing rooms at the same time, allowing for an announcement to the testing rooms for applications such as standardized testing. The testing rooms may be reactivated to normal operation at any time by the administration staff as needed. Testing rooms shall automatically be reset to normal operation before start of class the next day.

16. Programmable features shall be stored in non-volatile memory and shall not be lost due to power failures.

17. Classroom initiated intercom calls must be able to be assigned to ring at specific

administrative ports. These administrative ports shall have the flexibility to be forwarded to other administrative ports should a call go unanswered or should the assigned administrative port be busy.

18. Facilities to annunciate incoming intercom calls at multiple administrative phones simultaneously. Calls may be answered from any of the administrative telephones by simply lifting handset, dialing the room number or pressing a button on telephone. Once answered, the call will automatically be cancelled for other administrative phones.

19. System functionality must include the capability to manually distribute up to 5 (five) alert emergency tones via pushbuttons, contact closure, or dial up tones from any administrative telephone. These tones shall be customizable with respect to cadence, type and duration. Dial up tones must only be accessible by authorized users.

20. The system must provide a minimum of 4 (four) ports to be connected to the telephone system from the intercom system. These 4 (four) intercom lines shall provide built-in Enhanced Caller Line Identification which will visually announce the name of the teacher or location, the architectural classroom number, and the status of the call-in level; thus allowing interfacing to any telephone system. Systems that require integration to a specific telephone system or systems in order to offer this feature, or any system feature, shall not be acceptable.

21. The system shall have the ability to control all system relays. Relays shall be controlled through the administrative software, DTMF controlled, automatically cycle at a programmed time of day, follow time schedule events, follow time group events, follow security calls, and follow emergency and ADA calls. All relays must be software programmable with the flexibility to change as required.

22. The system shall provide at least three simultaneously operating, non-restrictive program distribution channels. The audio program material shall be controlled and distributed with administration PC software allowing simple and easy changes. Systems that require manual operated switch-banks or cumbersome DTMF telephone codes for distribution shall not be acceptable.

23. The Communication System shall feature the capability to operate a system of cameras such that visual and audible communication may be seamlessly synchronized. The resulting system of cameras and intercom (visual intercom) shall feature a capacity of at least 192 camera locations and 4 administrative monitors. The system shall provide functionality such that each monitor can display a full motion visual broadcast of the area corresponding to any active intercom path. The camera system shall feature a PC based setup utility and shall use standard UTP infrastructure. Systems that do not offer the capability to seamlessly integrate with a camera system as described above shall not be acceptable.

24. The Communication System shall feature voice call progress. When 2 or more system users attempt to announce into the same area, the unsuccessful user shall be notified via a voice message. When a user s announcement attempt is overridden by a higher priority announcement, the overridden user shall be notified via a voice message.

25. The system shall have the ability to store WAV files directly onto the CPU and shall not be lost due to power outage.

26. The WAV files shall be activated via the Administration Software, Telephone and/or Telephone system, and/or pushbuttons.

27. The WAV files shall be programmable as to what level of priority they can be broadcast. They shall be programmable as to override any class change tones, normal all call, music, and intercom in the event of an emergency.

28. The WAV files shall also have the ability to be broadcast into any one or all of the 72 audio groups as well to any zone within the system.

29. The WAV files shall be have the ability to be broadcast via a schedule for any day of the week or time of the day. They shall also have the ability to be

broadcast for any duration of time and repeat number of plays with the ability to select how long the duration is between each repeated broadcast.

30. The WAV files shall be able to be broadcast via a pushbutton. When this pushbutton is activated it shall be programmable to select which WAV file is broadcast, the priority level, where it is broadcast, and how many times it shall play.

31. The WAV files shall also have the ability to be a part of the class change tones within the system. These files shall be able to replace any tone within the class change schedules as to offer the flexibility of customizable tones and or phrases in this class change mode.

32. The WAV files shall be programmable as to replace the hands-free alert tone, repeated alert tone, or the all call alert tones.

33. The system shall be compatible with a NEAX 2000 IPS PBX and be able to use standard touch tone phones from the PBX to make zone and all-call announcements. Use standard DTMF phone to communicate to any intercom station and provide two-way communication to a loudspeaker.

34. Provide simultaneous communications paths which include two intercom channels; Intercom between two ACC s or between an ACC and any standard dial telephone from the NEC NEAX 2000 PBX, Intercom between an ACC or telephone from the NEC NEAX 2000 PBX and any remote system, Page announcements to any remote stations or group of stations from an ACC or telephone from the NEC NEAX 2000 PBX.

2.3 INTERCOM CONTROL UNIT

A. Shall be capable of expanding to 720 (seven hundred twenty) points. A point is defined as a call-in switch or speaker output.

B. Provide pre-alert tone to classroom for intercom calls and general announcements.

C. Ability to program and control the built-in master clock with unlimited events and unlimited time schedules with multiple audio groups.

D. Ability to produce user defined tone signals for time tones or emergency tones.

E. Ability to select the tone on an all-call basis from any, or selected, administrative telephones.

F. Provide an RS-232 and Ethernet, which will give ability to monitor operations and functions of the systems.

G. Provide off-site programming and diagnostics of the system. It shall also be capable of determining basic circuit faults.

H. The system shall be capable of simultaneous conversations between administrative ports.

I. The system shall have a Windows® based PC administration programming tool which allows the administrative personnel to easily manage Audio Sources, Class Change schedules, paging groups, time updates, holiday schedules and day/night mode operation from their desktop PC. It shall also have the ability to activate on board WAV files on a schedule and/or immediately in the event of an emergency at the highest priority override level. Systems that require propriety consoles, special LCD displays or solely utilize DTMF for changes to perform these functions shall not be acceptable.

J. System shall provide calendar based scheduling up to one year in advance.

K. The system shall be programmable via Ethernet or direct COM port cable connection.

L. System shall be capable of utilizing 25-volt type speakers. Systems that require re-tapping existing classroom 25-volt speakers shall not be acceptable.

M. System speakers shall be capable of utilizing traditional 25 volt type wiring.

N. Provide 8 (eight) unrestricted audio paths for communication between administrative phones, program material, time tone distribution, and paging.

O. Provide 6 (six) software programmable pushbutton inputs that can be used to activate tones, emergency tones, time tones, schedules, set system time, force a holiday schedule, door entry, etc.

P. Provide 8 (eight) software programmable output contact closures which can be activated manually to turn on cameras, unlock doors, emergency

lockdown, etc., or automatically via Master Time Control Center.

Q. Provide voice-synthesized call-in, which allows the administrative telephones to hear the incoming intercom call s room number over the handset.

R. Provide call confirmation tone at speaker when an intercom call is placed. This verifies that the call has been placed in queue. If the call is upgraded to an emergency, a second confirmation tone shall be activated.

S. Automatically announce the architectural room number over any one, group, or all speakers if an emergency call-in goes unanswered. Systems that do not announce emergency call-ins shall not be acceptable.

T. Provide Emergency Override On Board Voice Messaging via the following methods:

1. Any authorized PC on the school s LAN/WAN
2. Any authorized telephone
3. Any pushbutton

2.4 TELEPHONE SYSTEM

A. The PBX shall consist of a NEAX 2000 IPS, classroom telephones, administrative telephones, and all associated material, hardware, wiring, and options described herein to provide a complete working system which shall meet the specified requirements.

B. The system shall provide communications between IP Dterms and also provide CCIS network connections with other NEAX 2000 IPS and NEAX 2400 Systems, TDM switching fro communication between legacy stations and trunks. Connections between IP Dterms/CCIS-over-IP and legacy stations/trunks are made via IP Pads, which convert packet-based voice/data to TDM-based voice/data and vice versa. The PBX PIMS and equipment shall be house din a relay rack.

C. The NEAX 2000 IPS shall provide for the following:

1. CCIS networking via IP network
2. 5 digit dialing plan (Contractor will coordinate with the owner for numbering plan)
3. ACR routing for long distance calls
4. Attendant Console
5. Digital Line Cards (see plans for number fo ports needed)
6. Analog Line Cards (see plans for number for ports needed)
7. 30 minutes fo battery backup
8. Programming via PC

D. Network Integration: The NEAX 2000 IPS shall provide IP CCIS (Common Channel Inter-Office Signaling), point-to-multipoint IP CCIS (via IP trunk card) to the existing KHSD CCIS network. The integration shall provide for 100% feature transparency. The NEAX 2000 IPS shall provide peer to peer IP CCIS capability while maintaining the full feature set available with the TDM switched CCIS. All equipment and programming needed to integrate the NEAX 2000 IPS into the existing KHSD CCIS network shall be provided.

E. Configuration and Programming: All configuration and programming shall be coordinated with the owner (KHSD). Programming shall include, but not be limited to, the following:

1. Trunk configuration
2. Feature codes (see table below)
3. Digital station key assignments
4. Classroom station call restrictions
5. ACR routing
6. Interface to the Class Connection XPE System
7. Night ring assignments
8. DID assignments
9. PRI provisioning to allow for dedicating incoming calls, outgoing calls, and DID service

Feature	Set Code	Cancel Code
Forward All	*2	#22
Busy/No Answer	*3	#33
Call Pickup	*7	
Automatic Call back	*5	

F. Programming Software: Upon completion of the project a programming cable and registered copy

of MatWorX Software will be provided to the owner.

2.5 ADMINISTRATIVE TELEPHONE (ATEL)

A. The ATEL shall be desk mounted and contain a matching telephone handset with retractable coiled cord and conductive rubber button switches, with clearly designated tough points. One ATEL shall be included with the system which shall be located at the Main Intercom Rack. The housing shall be constructed of high impact flame retardant beige plastic. Dimensions shall be 9-1/2 (23.75 cm) wide by 4-1/2 (11.25 cm) high and 8-3/4 (21.9 cm) deep. Dimensions include handset. Weight (4) lb. Terminations; RJ-45 Modular telephone type jack. Features shall include:

1. Conductive rubber moisture sealed buttons
2. Large easy-to-read 16 character alpha/numeric LCD display
3. Menu driven display for ease-of-operation
4. Handset or Push-to-Talk intercom with a push-to-talk switch for manual audio direction.
5. Alpha/numeric 3, 4, or 5 digit dialing
6. Distinctive electronic ring signals
7. Twelve button keypad
8. SPKR Phone, Talk, Volume Up/down (ringer volume), Emergency, Tone, Page, Program, Menu, and eight programmable, special function keys.
9. User-programmable function keys
10. Telephone-type modular connector
11. Sensitive loudspeaker
12. Built-in condenser microphone
13. Queuing
14. Data communications; Local Operating Network (LON®), RS-485
15. Telephone-style handset with dynamic receiver and electric transmitter
16. Flash button (Hold button)

2.6 STANDARD TELEPHONE (STEL)

A. It shall be possible to program each classroom independently of any other and to assign functions, facilities and attributes to any individual or all telephones collectively. The programming capabilities are flexible and build in capabilities to automatically or manually allow STELS to assume various levels of access.

B. STELS shall be standard utility grade telephones with built-in network and electronic ringer. All STEL s shall be equipped as standard telephones, which are not proprietary in nature and are not unique to the supplier of the communications system. Telephones shall be equipped with a modular type connector and shall include a method allowing the phones to be locked in place. The STEL shall include the following facilities and capabilities:

C. Telephone shall function as a standard DTMF telephone allowing station to station calls. Station to Station dialing shall allow any STEL to call any other ATEL, STEL, or speaker station in the system.

1. Message Waiting Light
2. Emergency Call-In Button
3. The ability to initiate, and participate in three-party conference calls.
4. The ability to transfer a call to another ATEL, CTEL, or STEL.
5. The ability to place calls on Hold.
6. The STEL can Auto Answer a classroom call-in automatically by lifting the handset thus going off-hook .
7. The STEL shall have capabilities to dial alpha/numeric dial numbers.
8. The ability to initiate Emergency All Call Pages or Normal All Call Pages.
9. The ability to initiate Emergency Zone Pages or Normal Zone Pages, inclusive of certain zones or rooms.
10. The ability to initiate an Emergency Zone Pages or Normal Zone Pages, excluding certain zones or rooms.

11. The ability to initiate an automatic Emergency Zone Page or Normal Zone Page when the telephone is off-hook. This announcement may be configured for any combination of loudspeaker zones.

12. The ability to distribute tone signals (up to 26 different tones) to All Loudspeaker Zones simultaneously, to include only certain Loudspeaker Zones, or to exclude certain rooms from receiving the tone signals.

13. The ability to distribute tone signals (up to 26 different tones) to all rooms simultaneously, to include only certain rooms in the distribution, or to exclude certain rooms from receiving the tone signals.

14. The length or duration of the tone signal distributed may be controlled by the user.

15. The ability to distribute program material (music, etc.) from programmed sources, to all Zones simultaneously, to include only certain Zones or to exclude certain Zones.

16. The ability to distribute program material (music, etc.) from programmed sources, to all Rooms simultaneously, to include only certain Rooms or to exclude certain Rooms.

17. At the conclusion of program distribution, the STEL may cancel the program distribution or switch to another program channel.

18. Either the classroom loudspeaker or the telephone may be called as determined by the calling party. The following are additional parameters that may be incorporated:

19. Calls placed to the room loudspeaker may be transferred automatically to the handset. Picking up the handset will transfer the conversation. If desired, an alternate transfer method may be initiated using a dial code to transfer the conversation from the loudspeaker to the handset. If desired, an alternate transfer method may be initiated using a dial code to transfer the conversation from the loudspeaker to the handset.

20. If desired, the staff member may re-establish the conversation over the loudspeaker.

21. If the classroom staff member is on the telephone, and the room speaker is called, the system will automatically deliver the call to the room s loudspeaker. The staff member may reply hands-free without disconnecting or interrupting the telephone conversation.

22. The preceding allows two separate simultaneous voice paths into each room.

23. The STEL may be programmed to initiate a Duress Emergency Call-in. If the handset is left off-hook for a pre-programmed time interval or the Emergency Call-In button which is on the STEL is pushed, the system will automatically place an Emergency Priority call-in.

24. The STEL may be programmed to initiate an immediate Direct Call-in. on behalf of its associated speaker station, to preprogrammed location(s) according to a user pre-determined priority level status. Used in this manner, the telephone may be used to generate a call-in instead of the call button.

25. A temporary exclusion map may be created which excludes specified loudspeakers from receiving all types of audio events except for Emergency Page and Intercom.

26. This exclusion may be manually canceled, or may automatically be canceled at the change of day. All rooms temporarily excluded, if not manually canceled, will be automatically canceled for the start of the next day.

27. Rooms may be removed from the map at the user s discretion, without affecting the balance of the pre-programmed rooms.

28. All rooms, which are part of the exclusion map, may be manually canceled at the discretion of the user.

2.7 TELEPHONE CONTROLLED INTERCOM SYSTEM

A. The Integrated System shall consist of and provide the selected, appropriate features and functions as required from the following:

1. Multi-processor design with LON® communications system
2. System configuration by PC terminal using programming and diagnostics package
3. Built-in Master Clock
4. Programmed music distribution
5. Automatic Daylight Savings Time (or the ability to disable) and Leap Year corrections
6. Simultaneous Telephone, Intercom, Program and Page Distribution in a transparent fashion

2.8 PBX AND PBS INTERFACE

A. Compatible with standard 2500 DTMF phone instruments with electronic ringer with and without Call Notification

B. Rack mounted central equipment cabinet

2.9 PC ATTENDANT

A. The system shall provide the capability for the system to include a GUI application (a PC Attendant), allowing the attendant full control of the system. Any activity may be initiated, edited, viewed or cancelled via the PC attendant. The system shall provide simplified operation utilizing point and click technique so the user may initiate activities quickly and easily.

B. The system shall provide the following:

1. A standard Windows® appearance for Menus, Icons, Status Bar, and all other visual applications.
2. Support capabilities for conventional point and click technique.
3. Capability to associate with any telephone.
4. The ability to initiate, edit, view or cancel any activity via mouse or keypad.
5. The ability to view system status of all Call-ins, Intercom Activity, Telephone Activity and other displayed system parameters. All information provided to the attendant shall appear in conventional Windows® screens.

C. The ability to provide and display additional room information, such as:

1. Room names
2. Teacher names
3. Zone Names
4. Logging system events
5. The Main viewing window shall contain all pertinent and current data without switching screens.
6. All screens shall be resizable
7. All buttons shall be images of standard pushbuttons
8. One list view control window displaying Call-ins to the associated attendant telephone and one text box control display will be provided.
9. Current Attendant activity will be displayed when busy.
10. User programmable function keys and pre-defined dial keys are provided.

D. The columns and fields shall be user definable from the following selection:

1. Priority
2. Room Number
3. Room Name
4. First Name
5. Last Name
6. Time and Date
7. Call-ins may be sorted by any column in ascending or descending order.
8. Calls may be answered using the mouse or keypad.
9. Attendant may communicate with called or calling rooms utilizing the associated telephone.
10. When making pages, tone distribution, program material distribution, intercom etc. selection of the appropriate key

allows a pop up window to appear from which the selections may be made.

11. Page Key is utilized to initiate paging to pre-selected or selected zones or rooms. The attendant may save frequently used destination zones and assign these to speed dial keys on the keyboard.

12. The Tone Key and Program Key allow the operator to distribute tones and program material in the same manner.

13. The intercom key is used to initiate intercom to a room or group of rooms.

14. The call key is used to initiate a call to a telephone. As with other similar functions, a pop up window appears from which a selection of the desired telephone may be made.

15. A redial key is provided allowing the last function to be automatically redialed

16. A hold key is provided to place a current call on hold. o A transfer key shall be used to transfer the current call to another extension. When this key is used a pop-up window shall appear with a phone list.

17. A conference key is used to set up a 3-party conference call.

18. The answer key is used to answer an incoming call from another telephone or call-in from a speaker station. When this key is activated the selected call or call-in will be answered and the display Test Box will show the call station s room number.

19. The system shall provide multiple function keys.

20. User definable speed dial keys shall be used to initiate specific activities

21. Each key shall provide an associated text box that shall display the function defined for that key.

22. All functions selected may be saved and reused at a future time utilizing the speed dial keys.

23. The function is initiated by clicking on the associated speed dial key.

24. All functions, data and settings are user programmable, and may be edited, changed and saved for future use at any time.

25. The PC attendant will not be supplied in this proposal but shall be supplied at a later date when additional funds are available. The system must be sized appropriately though to handle this capability in this proposal so that the Owner only has to supply this card and software at a later date without having to size-up the card cage.

2.10 INPUT OUTPUT CONTROL

A. The system shall be capable of providing input and output control of external devices and signals, using internal circuitry within the system.

B. The system shall not require a PC or external memory to perform control of the external devices.

C. Each plug in card shall enable the system to support (48) separate input or (48) separate outputs. Modules may be stacked to increase capacity as desired.

D. Programming of these inputs and outputs is via the RAPID software package. Each of the (48) inputs and outputs may be individually configured.

E. The Input Contact Card, (ICC) shall support dry contact output signaling. Input contacts may be isolated or ground referenced.

F. The Output Contact Card (OCC) shall interface with external equipment such as CCTV Video Camera Controllers, system status indicators, digital message units graphic control panels and a variety and other similarly controlled devices that utilized dry normally open contacts.

G. Each ICC input port is capable of initiating different system actions including OCC port activation. Each input port provides an optional enable/disable period, programmable by hour, minute, and day-of-week.

H. OCC port action is available in different modes including:

1. Normal

2. Pulse

3. Cycle

4. Toggle

5. The output port shall support any or all of the following:

   a. Any system timed event

   b. Any system activity

   c. Any speaker station port, by specific action types

   d. Any telephone port by specific action types

   e. Any ICC (Input Contact Card) port

   f. Each input and output shall be supported on an individual pair of twisted wire.

   g. External terminations of ICC and OCC are via customer provided punch blocks utilizing connections to the appropriate card via supplied 15 foot connecting cables with appropriate plug in connectors.

2.11 PBX/KSU INTERFACE

A. The PBX/KSU Interface shall be provided through a Trunk Interface Card. (TIC)

B. Each TIC shall support 2, 4, or 8 trunks with a maximum capacity of 32 trunks per system.

C. Each trunk shall be programmable as either incoming, or outgoing, or both.

D. For incoming trunks, system shall be able to direct calls to a user- defined attendant telephone or provide dial tone.

E. For outgoing trunks, system shall provide access to the trunk by dialing 8 , 9 , or both. If digit 9 is used to access an outgoing trunk, the system shall be able to automatically dial a second 9 .

F. Each trunk shall be loop start. The interface connection to a PBX/KSU shall be made from the TIC to a PBX/KSU extension to allow any system telephone to have access to all the extension functionality of the PBX/KSU.

G. The system must be 911E compatible.

H. The interface connection from the PBX/KSU shall be made from the PBX/KSU trunk to an extension.

I. This shall allow PBX/KSU telephones to have access to system extension features.

J. This shall allow call-ins to be made from speaker stations to the PBX/KSU attendant console.

K. Providing two (2) consoles or telephones at the attendant position shall be considered in direct conflict with the intent of this specification and therefore shall be deemed not acceptable.

L. The system shall have complete interconnect capabilities to the local telephone company central office lines. To accomplish this, the system must be registered with the FCC and have a registered ringer equivalence number.

2.12 RESTRICTIONS

A. Software updates to the programming shall be accomplished via a computer using software provided by the PBX manufacturer. The PBX shall be configured as to allow programming and diagnostics from a remote location.

2.13 INTERCOM AND PBX INTEGRATION

A. All equipment and programming necessary for integration between the Class Connection XPE and NEC shall be provided. The interface shall provide the following functions:

   1. Restrict use to a select set of telephones

   2. Receive and place calls to the ACC s

   3. Emergency Page to all speakers

   4. Distribute civil emergency tones to all stations

   5. Distribute selectable tone to all stations

   6. Activate custodial call tone to all speakers

   7. Answer intercom calls

   8. Direct dial of a remote speaker station

   9. Normal and emergency all call and zone paging to any one zone or a combination of two or more zones

10. Access via feature code or DTERM key assignment

2.14 AUXILIARY EQUIPMENT

A. Loudspeakers shall be an 8" diameter, Quam #8C10PAX/UB. Ceiling-mounted backboxes shall be Four jay #PB8/PE8/PR8, unless shown otherwise. Grilles shall be Four jay #RE8W.

B. Outside Loudspeakers on the exterior of buildings shall be Four jay #41 6TF with integral transformer, weatherproof flush mounted backbox, tamper and vandalproof hardware.

C. The Attendant Console shall be a NEC model SN716 Desk Console located per specifications provided on the plan drawings.

D. Administrative Telephones listed on the plan drawings shall be NEC Dterm Series I digital electronic multifunction terminals and shall provide the service of conventional key telephones over 1- pair wiring.

E. Classroom Telephones listed on the plan drawings shall be Cortelco Model #2500-13 or Cortelco Model # 2554-13 analog telephones and shall provide the service of conventional telephones over 1-pair wiring. Desktop or wall mount configuration shall be provided on the plan drawings.

F. All outlets at +48 shall have wall telephones and all outlets at +18 shall have desk telephones.

G. Site Cabling and termination facilities shall be as follows:

50-Pair:
Aircore/SealPic 24awg Cat3 NO Gel PIC
01-100-40

25-Pair:
Aircore/SealPic 24awg Cat3 NO Gel PIC
01-097-40

66 Punch Block 50PR
S66M1 50

66 Block Stand Off
S89B

66 Punch Block 25PR
CONNECTORIZED S66M2-5W

H. Horizontal Cabling:

Shielded/Unshielded Cable 6 Conductor 22 Gauge AQC369

I. Attendant Console, administrative telephones and classroom handsets are existing, no new required.

PART 3 - EXECUTION

3.1 GENERAL

A. Maintain a competent supervisor and supporting technical personnel during the entire installation. Change of supervision during the project is not acceptable without prior approval from the Owner.

B. Furnish and install all materials, devices, components, and equipment required for complete, operational systems.

C. Perform the Work of this specification in accordance with acknowledged Professional and Industry standards and practices.

D. Interpret any errors or conflicts discovered in the Drawings or specifications so as to accomplish the intent of the Drawings and specifications, and furnish and install all items necessary to complete the interpretation of these Specifications Documents to the satisfaction of the Owner without additional expense to the Owner. In all cases where a device or part of equipment is referred to in these specifications in singular number, each such reference shall apply to as many such devices or parts as are required to complete the installation.

3.2 INSTALLATION

A. The conduit, outlets, terminal cabinets, etc., which form a part of the rough-in work shall be furnished and installed complete by the Electrical Contractor.

B. The balance of the system, including installation of the communication equipment, making all connections, etc., shall be performed by the manufacturer's authorized representative, and the entire responsibility of the system, its operation, function, testing and complete maintenance for one (1) year after final acceptance by the Owner, shall be the responsibility of this subcontractor.

C. All communication connections throughout the system shall be crimped by means of AMP lugs in all junction boxes. At telephone backboards and in terminal cabinets, all wiring shall be

neatly laced, EZ code marked at both ends and terminated on Siemons S66M1 -50-C punch blocks or approved equal, quantity as required.

3.3 TESTING

A. At the completion of the project, provide all testing required to satisfy the Architect that the general performance criteria of paragraph 2.1 herein has been met.

B. Submit written test reports, graphs and plans attesting to the compliance to this criteria.

3.4 OPERATIONS, MAINTENANCE INFORMATION AND TRAINING

A. Upon completion of work, the electronics contractor shall submit all record drawings, including system single line block diagrams and wiring diagrams, etc.

B. The Electronics Contractor shall also provide a complete set of manufacturer's specification sheets on all major items of equipment, including operating instruction, where relevant.

C. Additionally, the Electronics Contractor shall dedicate no less than 16 working hours, upon completion of system to thoroughly familiarize owner's representative and staff with all aspects of the system operation.

3.5 WARRANTY

A. In addition to the warranties required under General conditions and under Section 16010 of this Division, provide the warranty described following:

B. All equipment provided under this specification shall be warranted to be free from defects in materials and workmanship for a period of 12 months from the notice of completion.

C. The Electronics Contractor shall maintain, regular service facilities and provide a qualified technician familiar with the work of this specification at the site, within 8 hours of receipt of a notice of malfunction from the Owner. The Electronics Contractor shall provide the Owner with the number of a telephone attended 24 hours a day and 7 days a week, to be called in the event of a malfunction. As part of this warranty, the sound contractor shall provide, at no expense to the Owner, and at the Owner's request, all material, devices, equipment, and personnel necessary and shall endeavor to provide alternate facilities, services, and system for the duration of repairs to any defective work of this section.

D. All repairs and service under warranty shall be at the jobsite unless in violation of manufacturer's warranty, wherein contractor shall provide substitute equipment for the duration of repairs. Transportation of substitute or test equipment and personnel to and from the jobsite shall be at no expense to the owner.

E. All repair and service work under warranty work, except emergency repairs can be performed during regular working hours of regular working days. Emergency repairs shall be made when a system or component malfunctions during use, and shall be performed on an immediate basis. All work shall be performed by personnel in the employ of contractor, having specific experience in the work of this specification and shall not be subcontracted or assigned to another company for service, unless Owner has approved such assignment in writing, in which event contractor shall nevertheless be responsible to the Owner for such work.

END OF SECTION 16760