COLLEGE OF SAN MATEO
BUILDING 34 RENOVATION

SAN MATEO, CALIFORNIA

PROJECT MANUAL

February 4, 2011

Pankow
SPECIAL PROJECTS
2101 Webster Street, Suite 1500
Oakland, CA 94612
Phone (510) 379-1461
Fax (510) 893-8950

NOLL & TAM *ARCHITECTS*
729 Heinz Avenue, Suite 7
Berkeley, CA 94710
Phone (510) 649-8295
Fax (510) 649-3008

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SEALS PAGE

Architect:
NOLL & TAM ARCHITECTS
729 Heinz Avenue, Suite 7
Berkeley, CA 94710

Structural Engineer:

Mechanical Engineers:

Electrical Engineer:

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DIVISION 02

EXISTING CONDITIONS

SECTION 02 41 13 - SELECTIVE SITE DEMOLITION

1. Section Includes: Selective demolition of site elements.

2. Applicable Codes and Standards
   a. State of California Title 24 (2007) Part 2: California Building Code Chapter 33.
   b. San Mateo County and City of San Mateo Standards.

3. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective site demolition Work similar to that indicated for this Project.

4. Site Demolition
   a. Remove minor structures, existing paving, below-grade piping, conduit, and utilities in the Project area as indicated on the Drawings.
   b. Promptly repair adjacent construction or surfaces soiled or damaged by selective site demolition. Repair demolition performed in excess of that required. Return structures and surfaces to remain to conditions existing prior to commencement of demolition work.
   c. Do not interrupt existing utilities serving occupied spaces or adjacent property except when authorized in writing by authorities having jurisdiction. Locate, stub off, and disconnect utility services that are not to remain.
   d. When unanticipated mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of conflict. Submit report to the District in written, accurate detail. Pending receipt of directive from the Architect, rearrange selective site demolition schedule as necessary to continue overall job progress without delay.

5. Excavation and Backfill
   a. Prior to digging, review with the District the location of any services in the area. Review all plans and schedules that the utilities and phone company have for burying the services.
   b. Provide trenching and backfilling for underground conduit to depths required by agencies having authority, mark location and depth on plans for future reference by the District.
   c. Minimize disruption to site by excavating only what is required to facilitate work. Stockpile material to be reused where directed by the District. Dispose of any material off site that is not required for reuse.
   d. Ensure that substrate for footings is undisturbed and free of any chemical or organic material which would affect bearing and stability.

SECTION 02 41 16 - SELECTIVE STRUCTURE DEMOLITION

1. Section Includes: Demolition of selected portions of the existing building, including cutting and patching and repairs.

2. Applicable Codes and Standards
   a. State of California Title 24 (2007) Part 2: California Building Code Chapter 33.
   b. San Mateo County and City of San Mateo Standards.

3. Definitions
   a. Demolish: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the District's property.

b. Remove: Remove in good condition for re-use or storage at the District's discretion, unless otherwise noted.
c. Remove and Salvage: Items indicated to be removed and salvaged remain the District's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to the District's designated storage area.
d. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
e. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

4. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective building demolition Work similar to that indicated for this Project.

5. Regulatory Requirements
   a. Comply with governing EPA notification regulations before starting selective demolition. Call (800) 822-1974. Comply with hauling and disposal regulations of authorities having jurisdiction.
   b. State and local code requirements shall control disposal of debris which shall be at off site location.

6. Hazardous Materials: The Contractor shall notify the District in the event that they uncover conditions suspected of having asbestos and/or lead containing components. The handling of such materials will comply with all the appropriate regulations.

7. Building Demolition
   a. General
      1) Protect existing work that is to remain from damage.
      2) Provide dust protection as directed in the form of polyethylene draped and taped to all openings.
      3) Do not remove any wall, roof, or floor without ensuring adequate structural stability of what is to remain. Provide the necessary bracing and shoring required.
      4) Remove carefully and stockpile in a protected and conditioned location all material salvaged for reuse.
      5) Use repair materials identical to existing materials.
         a) Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
         b) Use materials whose installed performance equals or surpasses that of existing materials.
   b. Existing Broadloom Carpet at Hallways: Remove as indicated. Seal concrete floor as specified in Section 03 35 00.

8. Cutting and Patching
   a. General
      1) Where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
      2) To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
      3) Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

4) Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
5) Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

b. Existing Broadloom Carpet: Protect in place. Cut and patch carpet around new partitions.

END OF DIVISION 02

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DIVISON 03 11 13

CONCRETE

SECTION - CONCRETE FORMING AND ACCESSORIES

1. DESCRIPTION:

   a. Work Included: Furnish, install and remove forms for cast-in-place concrete including shoring and form supports.

   b. Related Work Specified Elsewhere:

      1. Formwork for concrete work beyond the building lines: See Sidewalks and Driveways.
      2. Excavating, filling and backfilling: See Earthwork.
      3. Forms and casting beds for architectural precast concrete: See Concrete, Architectural Precast.
      4. Patching and filling of form tie holes: See Concrete Finishes.

2. REFERENCES, CODES AND STANDARDS: The following references, codes and standards are hereby made a part of this Section and formwork shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

   a. "Recommended Practice for Concrete Formwork", ACI Latest Edition.

   b. California Building Code, 2007 Edition.

3. SUBMITTALS: Comply with requirements of Shop Drawings, Product Data and Sample Section.

   a. Shop drawings shall include finished elevations and dimensions of all formed surfaces including finish floor elevations.

   b. Contractor shall check architectural, structural and mechanical drawings to determine size and location of all depressions, openings, chases.

4. ALLOWABLE TOLERANCES: Design, construct, set, and maintain the formwork so as to insure complete work within the suggested tolerance limits specified in ACI 347, Section 3.3.1. See Concrete Finishes Section for traffic surface tolerances of slabs.

PART 2 - PRODUCTS

5. MATERIALS:

   a. Earth Forms: Unless otherwise indicated or required by the Structural Drawings, concrete for footings may be placed directly against vertical excavated surfaces provided the material will stand without caving and provided that minimum reinforcing steel clearances indicated on Drawings are maintained and suitable provisions are taken to prevent raveling of top edges or sloughing of loose material from walls of excavation. Sides of excavation shall be made with a neat cut and the width made as detailed on Drawings.

Concrete which is exposed to view on exterior shall be formed to a minimum depth of 6" below finished grade.

b. Wood Forms:

1. Exposed Concrete Not Otherwise Noted or Specified: APA Plyform, Grade B-B, Class I or II (as per strength and tolerance requirements), Exterior, each piece grade marked, no mill oiling permitted.
2. Chamfer Strips, Reveals, and Score Marks: Clear Douglas fir or pine, selected straight, milled on all faces -or- extruded polyvinylchloride specially produced for concrete work, Vinylex Corp., Preco Industries, Vulcan Metal Products, or equivalent. Material usage shall be consistent for each application.
3. Unexposed Concrete Not Otherwise Specified: Of sufficient design and strength to hold concrete properly in place and alignment.
4. Framing: At Contractor option subject to meeting necessary strengths and surface tolerances.

c. Metal Forms: Specification to be issued as an addendum.

d. Form Release Agents:

1. Exposed Concrete Including Surfaces to Receive Paint: Chemically active type producting water insoluble soaps. Form release agents shall be delivered in manufacturer's sealed and trademarked containers and shall be guaranteed to provide clean, stain-free concrete release and not to interfere with future applied coatings and finishes. Release agents shall contain no petroleum solvents such as creosote, paraffin, waxes or diesel oil.
2. Concealed Concrete: Contractor option.

e. Form Sealer (Wood Forms): Burke "Form Sealer", or equivalent, and of a type which will not interfere with bond of applied finishes.

f. Form Ties: Metal, spreader type, removable to 1" from concrete face. Ties for exposed concrete shall be of same type throughout project. Wire ties and wood spreaders will not be allowed except that such devices may be permitted for footings, shallow foundations and similar other totally concealed below grade surfaces upon specific approval of Architect. Wood spreaders shall not remain in concrete.

g. Cold Joints (Slabs on Grade): Standard 24 ga. galvanized steel, keyed profile, sized to suit slab thickness.

h. Vinyl Tape (Sandblasted Concrete Form Joints): Pressure sensitive vinyl tape, not thicker than 3 mils, type recommended for sealing forms.

PART 3 - EXECUTION

6. PREPARATION:

a. Vertical and Horizontal Controls: Establish and maintain necessary benchmarks, lines, or controls throughout construction.

b. Secure information and provide for openings, sleeves, chases, pipes, recesses, nailers, anchors, ties, inserts, and similar embedded items. Coordinate with concrete work for requirements governing embedment and sleeving of pipes and conduit.

7. CONSTRUCTION:

a. Formwork: - General: Construct wood forms of sound material, straight and rigid, thoroughly braced, mortar tight, and of such strength that the pressure of concrete and the movement of men and equipment will not displace them. Visible waves in exposed concrete surfaces after stripping of forms may result in rejection of that portion of the concrete. The design and engineering of formwork shall be the complete responsibility of the Contractor.

b. Plywood Forms for Exposed Concrete:

1. Plywood panels shall be clean, smooth, uniform in size, and free from damaged edges or faces (including holes other than those required for form ties). Use full size (4' x 8' or larger) panels wherever possible. Make plywood panel pattern regular and symmetrical, joints plumb or level, horizontal joints continuous. Block plywood edges which do not occur at bearing points in order to eliminate joint offsets.

2. Construct forms for sandblasted concrete with butted joints. Joints shall be taped carefully applied to completely eliminate wrinkles, ripples, bubbles, fishmouths and other surface defects which would telegraph onto face of concrete. Tape shall be aligned and centered on the joint. The degree of sandblasting to be done in finishing shall be sufficient to completely remove all traces of the impression in the concrete left by the tape. Construct and externally brace forms so that no form ties or other devices penetrate sandblasted surfaces.

c. Framing and Bracing: Framing, bracing and supporting members shall be of ample size and strength to safely carry, without excessive deflection (exceeding allowable tolerances), all dead and live loads to which formwork may be subjected, and shall be spaced sufficiently close to prevent any apparent bulging or sagging of forms.

d. Form Ties: Form ties shall be of sufficient strength and used in sufficient quantities to prevent spreading of the forms. Ties for exposed concrete surfaces shall be arranged symmetrically and shall be aligned both vertically and horizontally (do not stagger). Form ties are not permitted through sandblasted surfaces.

e. Forms for exposed concrete shall be constructed full height and width between indicated construction joints or emphasized joints in concrete surface and shall not be broken for pour or construction joints within these areas.

f. Construct forms no higher than 12" above the top of a pour or construction joint.

g. Construction Joints: Construction joints shall be in accordance with requirements of Concrete, Cast-In-Place Section. Confine construction or pour joints to rustication strip locations where they occur; where rusticated joints do not occur in a surface, provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide straight line at joints. Prior to subsequent pour, remove strip and tighten forms. Construction joints shall have no "overlapping" or offsetting of concrete surfaces and shall, as closely as possible, present the same appearance as butted plywood joints. Joints in a continuous line shall be straight and true.

h. Cleanouts: Provide cleanouts along bottom of walls and columns or elsewhere as required to permit thorough cleaning of loose dirt, debris and waste material. Cleanout shall not be apparent on exposed concrete surfaces and no openings in the forms for cleanouts shall be made on surfaces to be sandblasted.

i. Chamfered Corners: In general, chamfer all corners for exposed concrete unless otherwise noted. Obtain chamfers by placing 3/4" x 3/4" nonstaining moldings in forms. Pieces shall be in longest lengths possible, joints mitered.

j. Score Lines: Where "score", emphasized or rustication lines are indicated on vertical surface, obtain such lines by accurate placement of moldings in forms. Pieces shall be in longest lengths practical with joints mitered.

k. Arrange forms to allow proper erection sequence and to permit form removal without damage to concrete.

l. Form Sealer: Wood forms for exposed concrete shall be sealed on contact faces and edges using specified form sealer in strict accordance with manufacturer's directions.

m. Form Release Agent: Thoroughly clean forms and coat with release agent prior to initial use and before each reuse. Apply release agent in strict accordance with manufacturer's directions and coverage recommendations avoiding starved areas or excessive applications. Apply release agents before reinforcing steel is placed.

n. Reuse of Forms: Do not reuse any form which cannot be reconditioned to "like new" condition. Control reuse of forms for exposed surfaces to provide surface of uniform color and texture without sharp demarcation between adjacent surfaces.

o. Waterproofing Conditions: Concrete surfaces to receive waterproofing materials shall be formed to provide a relatively smooth surface free of sharp corners, projections, and offsets at form joints. Depressions and voids shall permit satisfactory patching as specified under Concrete Finishes Section. Form ties shall not penetrate or damage applied waterproofing.

p. Bases and Foundations: Whenever concrete bases or foundations are to be provided for equipment furnished by other trades, dimensions shall be verified for the equipment furnished before concrete is placed.

q. Prior to placement of concrete, remove dirt, debris, and foreign material from forms. Leave no wood in concrete except nailers.

8. REMOVAL OF FORMS:

a. The removal of forms shall be carried out in such manner as to ensure the complete safety of the structure. Supports shall not be removed until members have sufficient strength to safely support their own weight and superimposed loading with proper factor of safety.

b. Forms for exposed concrete surfaces shall be removed in such a manner as to preclude damage to finish. Pinch bars and similar tools shall not be used for prying against exposed surfaces. Stripping shall commence at top edge or vertical corner where the use of wooden wedges is possible. Wedging shall be done gradually and shall be accompanied by light tapping on panels to loosen them. When free at one end, gradually loosen remaining area without jerking.

c. Removal of Forms: After concrete is placed, the following minimum times shall elapse before the removal of forms:

1. Vertical Forms (Walls, Columns, Beam Sides): 24 hours.
2. Side Forms (Footings, Slabs on Grade): 24 hours.

d. Upon removal of forms, bolts, wires, clamps, rods, etc., not necessary to the work, shall be removed to a minimum of 1 inch from the surface. The Contractor shall so conduct his operations as to eliminate any danger of rust stains from form tie materials or other unprotected ferrous materials embedded in or adjacent to exposed concrete.

END OF DIVISON 03 11 13

DIVISON 03 21 00

CONCRETE

SECTION - CONCRETE REINFORCING

1. DESCRIPTION:

   a. Work Included: Furnish and install reinforcement for cast-in-place concrete.

   b. Related Work Specified Elsewhere:

      1. Reinforcement for concrete work: See Sidewalks and Driveways.

2. REFERENCES, CODES AND STANDARDS: The following references, codes and standards are hereby made a part of this Section and reinforcement shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

   a. "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI 315, latest edition.

   b. "Building Code Requirement for Reinforced Concrete", ACI 318-05.

   c. "Manual of Standard Practice" published by CRSI, latest edition.

   d. California Building Code, 2007 Edition.

3. SOURCE QUALITY CONTROL: Refer to Quality Control Section for general requirement governing testing and inspection. Where certified mill test reports (required hereinafter under "Submittals") are not furnished, conform to the following.

   a. Reinforcing bars shall be tested in tension and bending as per ASTM A-615. Testing shall be done by the Owner's testing agency. Furnish one copy of test reports to Architect, Structural Engineer, Owner and Contractor.

   b. Samples will be taken by the testing agency from bundles as delivered from the mill. Where bundles are identified by heat number and a mill analysis accompanies the report, one tensile and one bending test specimen will be taken from each 10 tons or fraction thereof, of each size and kind of bar. Where positive identification of heat numbers cannot be made or where random samples are taken, one series of tests shall be made from each 2-1/2 tons or fraction thereof, of each size and kind of bar.

   c. The costs of tests, sampling and handling of reinforcing steel shall be paid by the Owner by deducting from moneys due the Contractor.

   d. Include material required to provide samples for testing.

   e. The following is subject to Special Inspection as per California Building Code, Sec. 1704. Costs therefore will be paid by the Owner. No inspection is required for slabs-on-grade 5" thick or thinner.

1. Placement of reinforcing steel as required by Sec. 1704.4.

4. SUBMITTALS: Comply with requirements of Shop Drawings, Product Data, and Sample Sections.

   a. Shop Drawings:

      1. Fully detailed shop drawings, including bending schedules and bending diagrams, shall be submitted to the Architect for review. Shop drawings shall show placing detail and size location of reinforcing steel.

      2. Shop drawings shall be of such detail and completeness that fabrication and placement at the site can be accomplished without the use of project or contract drawings for reference.

      3. Contractor shall check architectural, structural, mechanical and electrical project or contract drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeves, and any other items which are required to be cast in concrete, and shall make necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

      4. Reinforcing Steel shall not be fabricated or placed before the shop drawings have been reviewed by the Architect and returned to the Contractor. Review of shop drawings by the Architect will not relieve the Contractor of responsibility for errors or for failure in accuracy and complete placing of the work.

   b. Mill Test Reports: Certified mill test reports (tensile and bending) for each heat and melt of steel shall be submitted to the Architect before delivery of any material to the job site. See requirements above under "Source Quality Control".

5. DELIVERY AND STORAGE: Deliver reinforcing to site properly bundled and tagged, and store so as to prevent excessive rusting or fouling with grease or any coating that will interfere with bond. Segregate so as to maintain identification after bundles are broken. Do not use damaged, reworked, or deteriorated material.

PART 2 - PRODUCTS

1. MATERIALS:

   a. Reinforcing Bars:

      1. New, free of loose rust.

      2. Billet Steel Bars: ASTM A615-86, Grade 40 for #3 bars and smaller, Grade 60 for #4 bars and larger.

      3. Low Alloy Steel Bars: ASTM A706 required for all reinforcing in shear walls and reinforcing bars to be welded.

   b. Welded Wire Fabric: Welded wire fabric shall be new, rectangular mesh, welded steel wire fabric, conforming with ASTM A185. Gage or diameter of wire and center-to-center spacing of wire shall be as indicated on the Drawings.

   c. Tie Wire: #16 minimum, black and annealed.

d. Accessories: Metal or plastic spacers, supports, ties, etc., as required for spacing, assembling, and supporting reinforcing in place. Legs of accessories to be of type that will rest on forms without embedding into forms. Galvanize metal items where exposed to moisture or use approved other non-corrosive, non-staining supports. Use plastic or plastic coated accessories for supporting reinforcing where concrete soffits are exposed.

2. FABRICATION:

a. Comply with details on Drawings.

b. Where specific details are not shown or noted, do detailing and fabrication in conformance with or superior to requirements contained in the References, Codes and Standards Article.

c. Clean bars of loose rust, loose mill scale and any substance that may decrease bond. Bend bars accurately to details on reviewed shop drawings. Unless otherwise permitted by the Structural Engineer, bar shall be bent cold.

d. Shop fabricate reinforcement.

PART 3 - EXECUTION

1. PLACING:

a. General: Reinforcing steel shall be placed in accordance with the Drawings and reviewed shop drawings and the applicable requirements of the References, Codes and Standards Articles. Install reinforcement accurately and secure against movement, particularly under the weight of workmen and the placement of concrete. Reinforcing partially embedded in concrete shall not be field bent except as shown on the Drawings or permitted by the Structural Engineer.

b. Reinforcement Supports:

1. Reinforcement shall be accurately located in the forms and held in place by means of supports adequate to prevent displacement and to maintain reinforcement at proper distance from form face. Supports and their placement shall comply with CRSI "Placing Reinforcing Bars". The use of wood supports and spacers inside the forms is not permitted except as noted in Concrete Forms Section.

2. Support reinforcement for on-grade slabs by wiring to precast concrete blocks spaced 3'-0" o.c. (maximum) both ways staggered. Size blocks so that reinforcing is maintained at the distance from face of concrete shown on the drawings.

c. Obstructions: Wherever conduits, piping, inserts, sleeves, etc., interfere with placing of reinforcing, reinforcing shall be maintained at the distance from face of concrete shown on the drawings.

d. Tying: Reinforcing shall be rigidly and securely tied with steel tie wire at splices and at crossing points and intersections in the position shown. Tie wires, after cutting, shall be bent in such a manner that concrete placement will not force the wire ends to surface of exposed concrete.

e. Spacing: Where Drawings do not show the spacing of the reinforcing, the minimum clear spacing shall conform to California Building Code Sec. 1907.6.

f. Splicing: Make splices only at those locations shown on the Drawings or as approved by the Structural Engineer. Where Drawings do not show minimum laps, comply with requirements of ACI 318 Section 12.14. Stagger splices in adjacent bars wherever possible.

g. Dowels: Dowels shall be tied securely in place before concrete is deposited. In the event there are no bars in position to which dowels may be tied, No. 3 bars (minimum) shall be added to provide proper support and anchorage.

h. Welding: Not permitted.

2. CLEANING:

a. Reinforcement, at time of placing concrete, shall be free of any coating that would impair bond.

3. PROTECTIVE CONCRETE COVER:

a. Except where indicated otherwise on the Drawings, the minimum concrete coverage for steel reinforcement shall be as specified in the California Building Code, Chapter 19, under Sec. 1907.7 "Concrete Protection for Reinforcement."

4. PLACEMENT TOLERANCES:

a. Where placement tolerances are not indicated on the Drawings, applicable requirements of ACI 301 shall apply. Bars may be shifted as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are shifted more than one diameter, or enough to exceed specified tolerances, the resulting arrangement of bars shall be subject to the Architect's acceptance.

5. NOTIFICATION AND INSPECTION:

a. The Contractor shall notify the Architect at least 72 hours ahead of each concrete pour, and no concrete shall be deposited until reinforcing steel has been installed, and has been observed by the Architect.

6. CORRECTION BEFORE CONCRETE PLACEMENT:

a. Capable steel workers shall be kept on the job during the placing of concrete, and they shall properly reset any reinforcement displaced by runways, workers, or other causes. Reinforcement shall not be bent after being partially embedded in hardened concrete.

7. DEFECTIVE WORK:

a. The following reinforcing steel work will be considered defective and will be ordered by the Architect to be removed and replaced by the contractor:

1. Bars with kinks or bends not indicated on Drawings.

2. Bars injured due to bending or straightening.
3. Bars heated for bending or straightening.
4. Reinforcement not placed in accordance with the Drawings and Specifications.
5. Reinforcement with corrosion or coatings which may impair bond with concrete.

END OF DIVISION 03 21 00

DIVISION 03 31 00

CONCRETE

SECTION - CAST-IN-PLACE CONCRETE

1. DESCRIPTION:

   a. Work included: Furnish and install cast-in-place concrete required for the project as shown on the Drawings and specified herein. This Section also includes:

      1. Concrete for work specified in Mechanical and Electrical Divisions unless specifically included therein.
      2. Grouting of structural steel setting (if required).
      3. Grouting of bases and equipment not specified under other Sections.
      4. Concrete fill for metal stairs and pipe guards (bollards).
      5. Coordination with other trades with regard to requirements for special bases, sleeves, chases, inserts, finishes or provisions of any nature.
      6. Curing of formed concrete surfaces.
      7. Installation of anchor bolts, hangers, anchors, plates, inserts and miscellaneous metal or other materials embedded in concrete and which are furnished by other trades.

   b. Related Work Specified Elsewhere:

      1. Concrete work beyond the building lines: See Sidewalks and Driveways.
      2. Aggregate base for slabs on grade: See Earthwork.
      3. Concrete Forms (including erection, stripping and removal).
      4. Concrete Reinforcement.
      5. Finish for concrete surfaces including patching and curing of concrete (except curing of formed concrete): See Concrete Finishes.

2. REFERENCES, CODES AND STANDARDS: The following references, codes and standards are hereby made a part of this Section and concrete work shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings. Nothing contained herein shall be construed as permitting work that is contrary to code requirements.

   a. "Building Code Requirements for Reinforced Concrete", ACI 318-05.

   b. California Building Code, 2007 Edition, Chapter 19.

3. SOURCE QUALITY CONTROL: Refer to quality Control Section for general requirements governing testing and inspection.

   a. Cement and Aggregates: Furnish to the Architect the following data:

      1. Mill certificates from cement manufacturer certifying that cement meets Specifications and is suitable for purpose intended.
      2. Proof of aggregate's compatibility with cement to be used and certification that aggregates meet Specifications. Owner reserves the right to have his testing

agency perform any additional tests on cement and aggregates which may be deemed advisable.

4. ENVIRONMENTAL CONDITIONS:

   a. Cold Weather Requirements: Comply with ACI 306R, "Cold Weather Concreting".

   b. Hot Weather Requirements: Comply with ACI 305, "Hot Weather Concreting".

PART 2 - PRODUCTS

1. MATERIALS:

   a. Cement: ASTM C 150, Type II. Cement shall be of same brand, type and source throughout Project.

   b. Aggregates:

      1. Concrete for Slabs On Grade: ASTM C 33 from sources with proven history of successful use. Source shall be constant unless 10 days prior notice is given for approval after recheck of mix design.

         a. Fine Aggregate: Sechelt or Orcas sands.

         b. Coarse Aggregate: Granite Rock Co., Kaiser Limestone or Kaiser Clayton, Sechelt or Orcas aggregates.

         c. Other aggregates may be submitted for use provided the concrete mix meets the following shrinkage criteria: .040% drying shrinkage (max.), as tested per Structural Engineers Association of California recommendation, May 1989.

      2. All Other Concrete: ASTM C 33 from sources with proven history of successful use. Source shall be constant unless 10 days prior notice is given for approval after recheck of mix design.

         a. Fine Aggregate: Natural sand with sand equivalent of not less than 75 when tested per Test Method Calif. 217-E. Radum sand, or approved equal.

         b. Coarse Aggregate: Fine grain, sound crushed stone, natural gravel or granite with cleanness value not less than 75 when tested as per Test Method Calif. 227. Granite Rock Co., Kaiser Limestone or Kaiser Clayton.

   c. Water: Clean and potable, free from impurities detrimental to concrete.

   d. Admixtures: The use of admixtures shall be confined to those admixtures listed below. Admixtures containing chlorides are not permitted. Admixtures shall be batched in strict accordance with manufacturer's recommendations.

      1. Chemical Admixtures:

         a. Water Reducing Admixture: W.R. Grace Co. "WRDA-79", Master Builders "Pozzolith 200N" or Sika Chemical Corp. "Plastocrete 161". Admixture shall conform to ASTM C 494, Type A and shall not contain more chloride ions than are present in the municipal drinking water.

         b. High-Range Water Reducing Admixture: W.R. Grace Co. "WRDA-19" or approved equal. Admixture shall conform to ASTM C494 Type F and

shall not contain more chloride ions than are present in the municipal drinking water.

c. Air Entraining Agent: Air-entraining admixture conforming with ASTM C260 may be introduced into the mix. Air-entrainment shall not exceed 4 percent. Submit manufacturer's data to Architect for review.

d. Flyash: Pozzolanic admixtures, conforming with ASTM C618, Class F, with weight loss on ignition limited to 3%, may be utilized in mix designs where indicated on structural drawings. Maximum cement replacement shall be 15% by weight, unless otherwise noted on drawings.

2. Certification: Written conformance to above requirements and the chloride ion content of the admixture shall be submitted by the admixture manufacturer prior to review of mix designs by the Architect.

e. Expansion Joint Fillers: ASTM D 994, asphaltic compound strips, 1/2" thick unless otherwise noted, precut to proper size.

f. Non-Shrink Grout (Non-Metallic): Euclid Chemical Co. "Euco N-S", L&M "Crystex", Upco "Upcon", U.S. Grout Corp. "Five Star", Master Builders "Masterflow 713", or approved equal, nonmetallic, nonstaining, premixed grout having a compressive strength at 28 days of not less than 6800 psi, non-shrink at all flow levels. Grout shall conform to ASTM C1107.

g. Curing Compounds (Formed Concrete): Conform to requirements of Concrete Finishes Section (for Clear Curing and Sealing Compound).

2. MIXES:

a. Mix Designs:

1. Mix designs for concrete shall be Contractor-designed at his expense. Designs shall be prepared by a qualified agency approved by the Architect and Structural Engineer. Four (4) copies of mix designs shall be submitted for Architect's review at least 30 days prior to placing any concrete and shall indicate completely, brands, types and quantities of admixtures included. If concrete is to be placed by pumping, recommendations of ACI Committee 304 shall be followed.

2. Mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318. Submit mix designs for each class of concrete for review.

b. Structural Drawings indicate minimum compressive strengths, slumps, maximum size aggregates and minimum cement contents.

PART 3 - EXECUTION

1. MIXING: Concrete shall be ready mixed as per ASTM C 94a. Equipment shall be adequate for the purpose and kept in good mechanical condition at all times.

a. The rate of delivery, haul time, mixing time and hopper capacity shall be such that mixed concrete delivered shall be placed in the forms within 90 minutes or 300 revolutions of the drum from the time of introduction of cement and water to the mixer. Any interruption in placing in excess of 90 minutes or 300 revolutions will be cause for shutdown of the work for the day and the wasting of any remaining mixed concrete in hoppers or mixers. In case such interruption occurs, the Contractor shall provide construction joints where and as directed and cut concrete back to such line, cleaning forms and reinforcing as herein

specified. Delivery tickets shall show departure time from plants. Revolution counters shall be set at "0" and shall commence to operate when drum revolution begins after introduction of ingredients into the mixer.

b. No water shall be added to the mix after the initial introduction of mixing water for the batch except when, on arrival at the job site, the slump of the concrete is less than that specified. In this case, and only under the direction of the Special Inspector and with not more than one application per load, additional water may be added from the truck system to bring the slump within required limits. The drum or blades shall then be turned an additional 30 revolutions or more until mix is uniform.

c. Mixers shall be equipped with an automatic device for recording number of revolutions of drum or blades prior to completion of mixing operation.

d. Concrete shall be kept continuously agitated until discharged into the hopper at the job site.

e. Contractor shall note that the appearance of unpainted exposed concrete surfaces depends upon uniform color and texture within any one area and between adjacent areas and he shall exercise strict batching and mixing controls to achieve this end.

2. PLACING:

a. Absorbent forms shall be thoroughly wetted before concrete is placed. Aggregate base for slabs on grade shall be moist but not saturated when concrete is placed.

b. Placing of concrete shall be done immediately after mixing. No concrete shall be placed or used after it has begun to set and no retempering will be allowed. The method used in placing shall be such that concrete is conveyed to place and deposited without separation of the ingredients. No concrete shall be placed with a free unconfined fall in excess of six (6) feet. Concrete shall not be allowed to cascade through reinforcing steel in such manner as to promote segregation. Do not support runways on reinforcing steel.

c. Splash or accumulations of hardened or partially hardened concrete shall be removed. Contact faces of forms for exposed concrete shall be protected from splash during placing of adjacent concrete. Concrete containing piping shall be placed in a manner that will prevent damage to pipes.

d. Deposit concrete in approximate horizontal layers not exceeding 18" in thickness, unless otherwise authorized. Placing of concrete shall be carried on in a continuous operation without interruption until placing of course, section, panel or monolith is completed.

e. Distribution of concrete shall be even and continuous and no placement joints shall show. Before a placement is started, make certain that adequate equipment, men, and concrete will be available to place in cycles which will permit proper and thorough integration of each layer of concrete. Upon stopping of a placement, the top surface shall be on a level. Points of deposit in walls shall be so spaced that it will not be necessary for concrete to flow laterally more than 24 inches.

f. No concrete shall be placed for any element until reinforcing for same is fastened in place nor until forms are complete. No concrete shall be placed before work that is to be embedded has been set. Notify other crafts so they may deliver anchor, inserts, etc., or other work to be embedded in ample time and also notify them when their assistance in setting is required. Reinforcing or other materials that have been set in place shall not be disturbed.

g. No pipes except electrical conduits 1-1/4" and less in diameter shall be embedded in structural concrete. Before placing concrete, such pipes and large conduits shall be sleeved providing 1/4" clearance (min.) all around. Sleeves for plumbing and mechanical pipes shall be placed so as not to impair strength of concrete or interfere with reinforcing bar placement. Multiple sleeve openings shall be placed no closer than three times diameter of the larger sleeve. Reinforcing clearances to sleeves shall conform to clearances specified for concrete surfaces. Sleeves and inserts will be provided and set under other Sections of the work.

h. Remove debris, mud and water from places to receive concrete.

i. Concrete splash and/or grout shall be removed from surfaces that will receive painter's finish.

j. Place no concrete in water unless written permission has been obtained from Structural Engineer.

k. Notify Owner's Representative, Architect and Structural Engineer 48 hours minimum prior to placing of any concrete.

3. VIBRATION AND CONSOLIDATION:

a. Concrete shall be thoroughly consolidated by means of internal mechanical vibrators. Such consolidation shall be produced as will be obtained by placing the vibrator directly in concrete at 18" - 30" intervals for a period of approximately 5 to 15 seconds and withdrawing slowly or as directed, depending on the consistency of concrete. One vibrator will be required for each location where simultaneous placing takes place, to ensure thorough vibrating of all sections. Provide sufficient spare vibrators on the job so as to have them readily available in case any vibrator in use should suddenly cease to function properly. Where spare vibrators are employed, provide additional spares. Provide smaller diameter vibrators for areas with congested reinforcing steel. Under no condition shall vibrator be placed against reinforcing steel or attached to forms. Use no vibrators to transport material.

b. Vibrator shall be of the flexible immersion type having a frequency of not less than 8,000 rpm. Use and type of vibrator shall conform to ACI 309, "Recommended Practice for Consolidation of Concrete".

c. Spading will not be permitted on exposed concrete surfaces.

d. Voids and rock pockets shall be eliminated. Voids and rock pockets in exposed concrete may subject that portion to rejection.

4. CONSTRUCTION JOINTS:

a. Placement of construction joints and the manner in which they are provided for shall be only as approved by Owner's Representative or as shown on the Drawings. Construction joints shall be few as possible and will not be permitted simply to save forms. Submit shop drawings of construction joints showing proposed locations and details. Submit to Architect prior to forming or placing concrete.

5. CURING: See Section 03 35 00, Paragraph 3.01.

6. EQUIPMENT BASES: Verify sizes and shapes required by items specified elsewhere. Concrete bases for special equipment shall be installed in strict accordance with Drawing details and the specifications and recommendations of the equipment manufacturer.

7. EXPANSION JOINT FILLERS: Place filler material so that top of surfaces is level and aligned uniformly 1/4" below adjacent concrete surface.

8. GROUTING:

   a. The setting of steel base plates is specified under Structural Steel Section. The grouting of the steel base plates shall be performed as hereinafter specified and as a part of this Section.

   b. Grout used for the grouting of base plates shall be non-metallic, non-shrink grout mixed and applied in strict accordance with manufacturer's directions.

   c. Grouting of bases shall be carefully done so as not to leave any voids between the base plates and the concrete.

9. FIELD QUALITY CONTROL: Refer to Quality Control Section for general requirements governing testing and inspection.

   a. Tests and inspections shall be performed by qualified individuals, engineering companies or testing laboratories who shall perform those special inspections required by Sec. 1701.4 of the California Building Code, those tests and inspections specified below and such other tests and inspections as the Architect or Owner may require to establish the acceptability of the work.

   b. Testing and inspection services shall be retained by the Owner at his expense except that when tests or inspections reveal failure of materials to meet contract requirements, costs for subsequent tests and inspections will be deducted from the Contract Price. Excessive inspection time required by Contractor's failure to provide sufficient workmen or to properly pursue the progress of the work shall likewise be deducted from the Contract Price.

   c. Furnish material and handling for test cylinders and any other samples which testing agency requires for analysis of concrete work.

   d. Compression Tests; unless noted otherwise:

      1. Mild Reinforced Concrete: 4 compression test cylinders will be taken for each placement of 150 cu. yd. or fraction thereof of each class of concrete placed each day. Make, cure and store test cylinders as per ASTM C 31. One cylinder will be tested at 7 days for information; two at 28 days for acceptance; and one retained as a spare.

   e. Slump Test: Slump tests will be performed as per ASTM C 143 (slump cone) 360-63 at time of taking test cylinders. Tests shall be taken at the truck.

   f. Testing agencies shall select and prepare samples taken at job site.

END OF DIVISION 03 31 00

DIVISION 03

CONCRETE

SECTION 03 35 00 - CONCRETE FINISHING

1. Section Includes: Concrete finishes.

2. Performance Requirements
   a. Provide smooth concrete surfaces at exposed cast-in-place concrete, utilizing steel, fiberglass, or plastic coated forms or any other kind of material that will impart no pattern to concrete.
   b. In accordance with CBC 1124B.1 and ASTM C1028, accessible routes of travel shall have slip resistance of minimum 0.6 coefficient of friction.

3. Concrete Formwork, Reinforcing, and Cast-In-Place Concrete: As specified on the Structural Drawings.

4. Curing Compound: ASTM C309, and shall conform with all applicable air pollution regulations.

5. Sealer: As manufactured by L. M. Scofield, “Cementone Clear Sealer”, or equal.

6. Monolithic Slab Finishes
   a. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or as otherwise indicated.
      1) After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 5/16-inch in 10 feet when tested with a 10 feet straightedge or to tolerance of F(F) not less than 20 (floor flatness) and F(L) not less than 15 (floor levelness) measured according to ASTM E1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
   b. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, thin set ceramic or paver, paint or another thin film finish coating system.
      1) After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 3/16-inch in 10 feet when tested with a 10 feet straightedge or to tolerances of not less than F(F) 30 (floor flatness) and F(L) not less than 20 (floor levelness) measured according to ASTM E1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
      2) At accessible routes of travel, finished surface shall provide slip resistance of minimum 0.6 coefficient of friction in accordance with ASTM C1028.

7. Sealer Application
   a. Apply sealer exactly in accordance with manufacturer’s written instructions, using manufacturer’s recommended equipment and method.
   b. Apply the number of coats recommended by manufacturer.

8. Concrete Surface Repairs
   a. Intent of this Specification is to require forms, mixtures of concrete and workmanship so that concrete surfaces will require no patching, except for plugging of tie holes.
   b. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to the Architect.
   c. Mix dry-pack mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.
      1) Cut out honeycombs, rock pockets, voids over 1/4-inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.
      2) For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
   d. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of the Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.
      1) Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.
   e. Perform structural repairs in accordance with the Structural Drawings.
   f. Repair methods not specified above may be used, subject to acceptance of the District.

END OF DIVISION 03

DIVISION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included: Provisions of structural steel. Work Includes, but is not necessarily limited to following:

1. All structural steel framing and all other steel as shown on the drawings and herein specified.
2. Anchor bolts, bearing plates, and leveling plates and/or shim plates.
3. Furnishing of all anchor bolts and templates for structural steel items and responsibility for their correct locations.
4. Furnishing and installing all shear stud connectors except on flanges of beams.

1.02 INCORPORATED DOCUMENTS:

A. Requirements of General Conditions, Supplementary Conditions, and Division Number 1 apply to all work in this section.

B. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this section where cited by abbreviations noted below.

1. American Society for Testing and Materials (ASTM).
2. American institute of Steel Construction (AISC).
   a. “Steel Construction Manual, 13th Edition”, AISC 325-05.
   b. “Specification for Structural Steel for Buildings”, AISC 360-05.
   c. "Code of Standard Practice for Steel Buildings and Bridges", AISC 303.05.
   d. “Seismic Provisions for Structural Steel Buildings, Including Supplement No. 1”, AISC 341-05.
   e. “Prequalified Connections for Special and Intermediate Moment Frames for Seismic Applications”, AISC 358-05.
3. Research Council on Structural connections (RCSC): “Specifications for Structural Joints Using ASTM A325 or A490 Bolts” (2000).
4. American Welding Society's (AWS):
   a. Structural Welding Code (AWS D1.1-2006).
   b. Seismic Supplement (AWS D1.8-2005).
5. American National Standards Institute's "Plain Washer" (ANSI B18.22.1 - 1967 (R1975) and Beveled Washers (ANSI 18.23.11 - 1967 (R1975).
6. Steel Structures Painting Council's "Painting Manual" (SSPC).
7. California Building Code, 2007 Edition.

1.03 QUALITY ASSURANCE:

A. Steel Fabricator's Qualifications: Fabricator shall have had not less than five years experience in fabrication of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed projects of this size.

B. Steel Erector's Qualifications: Erector shall have had not less than five years experience in erection of structural steel and be able to furnish evidence of his ability, facilities, proficiency of his personnel and completed project of this size.

C. Welding Qualifications: Welding procedures, welders, welding operations and tackers shall be qualified in accordance with AWS Building Code. All welders shall be pre-qualified.

1. Welders who have not performed welding for period of three or more months shall be requalified.
2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
3. The Contractor shall pay costs of welding procedure qualifications, welder performance qualification, welding operator performance qualifications, and tack welder performance qualifications.
4. Contractor shall pay all costs to remove and replace all welding performed by any welder not qualified per AWS D1.1 at the time of welding, or performed using a welding procedure that was not qualified per AWS D1.1 at the time of welding, or performed using a welding procedure that was not submitted and reviewed prior to welding.

D. Allowable Tolerances:

1. Straightness of Structural Members: Conform to ASTM A6.
2. Erection Tolerances: Conform to additional requirements of AISC, Section M4.

E. Owner's Testing Agency: Test and inspections will be performed by the Owner's Testing Agency. The cost of testing and inspection of structural steel shall be paid for by the Owner except as follows.

1. It is assumed that all fabrication will take place in one shop location only. All additional inspection costs resulting from fabrication at more than one shop location will be back-charged to the Contractor.
2. In case of controversy about tensile properties and bend test, costs of retest of plain materials shall be at the expense of the Contractor.

1.04 SUBMITTALS:

A. Shop Drawings:

1. Show shop and erection details, including cuts, copes, connections, holes, threaded fasteners and bolts in accordance with AISC standards. Show welds in accordance with AWS welding symbols.
2. For braced frames, show each gusset plate connection separately. Include all gusset plate dimensions, location of brace end, and angle of brace to horizontal.

C. Erection Procedure: Submit descriptive data to illustrate structural steel erection procedure, including location of equipment, sequence of erection and temporary staging and bracing. Procedure must be approved by Owner prior to erection.

D. Welding:
   1. Welder Qualifications: Submit certification of performance qualification for each welder, welding operator, and tack welder prior to performing any welding.
   2. Welding Procedures: Submit written welding procedure specifications (WPS's) conforming with AWS D1.1 for review prior to performing any welding. Identify where each WPS will be used. The WPS variables shall be within the parameters established by the filler-metal manufacturer. Filler-metal manufacturer and manufacturer's electrode identification shall be considered essential variables and shall be included on each WPS. Include electrode manufacturer's data sheet with each WPS showing recommended ranges.

   3. Welding Procedure Qualification Records: Where WPS's are not pre-qualified by AWS D1.1 submit procedure qualification records with WPS's.

E. Manufacturer's Proofs of Compliance for Materials:
   1. Certification that materials meet requirements specified. All steel shall be identified by the mill using the appropriate ASTM designation. Manufacturer's mill analyses and test reports shall be submitted. Enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability.
   2. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified.

F. Samples: Provide as requested by the Owner's Testing Agency.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Unload materials carefully; do not set onto ground.

B. Store structural steel members, whether on or off site, above ground on platforms, skids or other support; store other materials in weathertight, dry place until time of use.

1.06 JOB CONDITIONS

A. Provide the Owner's Testing Agency with free access to places whether on or off the job site where materials are stored or fabricated, to places where equipment is stored or serviced, and to job site during time of laying out, erection or job-site fabrications.

B. Sequencing, Scheduling:
   1. Notify the Owner in sufficient time prior to shop or field fabrication or erection to permit testing and inspection without delaying work.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel Wide Flange Shapes: ASTM A992

B. Other Steel Shapes, Bars and Plates: ASTM A36 or ASTM A572 (grade 50) as indicated on drawings.

C. Steel Tubing:
   1. Rectangular and Square: ASTM A500 Grade B.
   2. Circular: ASTM A500 Grade C.

D. Steel Pipe: (12-inch nominal diameter or less): ASTM A53 Grade B

E. Standard Threaded Fasteners: ASTM A36 or ASTM A307 as indicated on drawings.
   1. Plain Washers: ANSI B 27.2.
   2. Beveled Washers: ANSI B 27.4.

F. High Strength Bolts: ASTM A325-SC Class A with threads excluded from shear plane, or ASTM A325-X with threads excluded from shear plane as indicated on drawings.

G. Nuts for High Strength Bolts: ASTM A563

H. Washers for High Strength Bolts: ASTM F436 or ASTM F959

J. Anchor Bolts: ASTM F1554, Grade 55 unless otherwise indicated on drawings.

K. Filler Metals for Welding:
   1. SMAW Process: AWS A5.1 or A5.5, E70XX Low Hydrogen Type.
   2. FCAW Process: AWS A5.20 or A5.29, E7XT-X.
   3. Demand Critical Welds noted as “DC” on structural drawings: Welding shall use a filler metal that has a minimum Charpy V-notch toughness of 20 ft-lbs at minus 20 degrees Fahrenheit as determined by AWS classification or manufacturer certification and 40 ft-lbs at 70 degrees Fahrenheit as determined by Appendix X of AISC 341-05.

L. Shear Studs: "Nelson" shear connectors. Conform to ASTM A-108.

M. Modified Alkyd Rust-Inhibitive Primer: FS TT-P-86h. Same as Sherwin Williams “B50RV6227” or approved equal.

2.02 FABRICATION

A. General Requirements:
   1. Fabricate structural steel in accordance with AISC, and requirements of regulatory agencies.
   2. Fabricate and preassemble work in shop to greatest extent possible.
   3. Do shearing, flame cutting and chipping carefully and accurately.
   4. Coordinate as required for attachment of other work to structural steel.
   5. Conform to "Structural Steel" notes on drawings.

B. Connections:
   1. Connections shall be bolted or welded as indicated.
   2. Shop connections not otherwise shown shall be welded.
   3. Eccentric connections are not permitted unless shown in detail on approved shop drawings.

C. Bolted Connections:
   1. Punch or drill holes 1/16-inch larger than bolt size.
   2. Do not drift to match unfair holes; where enlarging is required, ream unfair holes, but only up to next larger bolt size, and use larger bolts. Where unfairness

exceeds maximum, weld hole in base material solid and drill hole of proper size. Misaligned holes will subject members to rejection. Use of gas cutting torch is not permitted.

3. Bolting: See Part 3, Execution, Section 3.3 D.

D. Welded Construction:

1. Weld in accordance with AWS D1.1, and AISC Specification. A copy of the applicable WPS shall be reviewed by the Welder or Welding Operator and Special Inspector prior to welding.
2. Minimum preheat and interpass temperature shall be per AWS D1.1 Table 3.2.
3. In general, welding procedures should be prequalified by AWS D1.1. Where welding procedures do not meet the AWS D1.1 requirements for prequalification (base metal / filler metal combination do not comply with Table 3.1, General WPS requirements of Table 3.7 are not met, weld details are not within tolerances of Figures 2.1, 2.5, and 3.4 through 3.11, or Table 3.6, etc.) the welding procedure shall be qualified by test per AWS D1.1 Section 4 prior to performing any project welding. All costs associated qualifying the welding procedure (including inspection and testing) shall be the responsibility of the contractor.
4. Demand Critical Welds noted as “DC” on structural drawings: All welding shall be performed and inspected in accordance with AISC 341-05, Appendix W.
5. Grind exposed welds reasonably smooth.
6. Field Welding Equipment: Field welding equipment shall be adequate type, voltage and amperage to make proper welds.
7. The ability of each welder to produce sound welds of all types required by the work shall be established by welder qualification satisfactory to the enforcement agency.

E. Column Bases: Mill and attach to columns.

F. Column Splices and Splices in Compression Members: Mill contact ends to assure full bearing.

G. Bearing Plates: Provide for attached installation resting on footings, piers and walls.

2.03 FINISHES

A. Shop Painting of Steel Surfaces:

1. Remove loose mill scale and rust, grease, dirt and other foreign matter.
2. Treat with rust remover and neutralizer in strict accordance with manufacturer's instructions.
3. Apply one coat of primer except where steel will be encased in concrete, where steel will be fireproofed, or within two-inches of welds to be made after painting.

2.04 SOURCE QUALITY CONTROL

A. The Owner's Testing Agency shall perform the following tests and special inspections per California Building Code Section 1704.3:

1. Review certificates of compliance. Where certification is questionable test material to verify compliance.
2. Inspect welding equipment and welder's qualifications.
3. Visually inspect shop and field welding as noted on the drawings per AWS D1.1. Inspector shall verify fit-up prior to welding and verify that the appropriate reviewed WPS is followed.
4. Perform nondestructive testing of welds as noted on the drawings per AWS D1.1.

5. Inspect and approve shear connectors and high strength bolts.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine foundations to support construction and verify the following:
   1. Correct location and elevation of bearings and anchor bolts.
   2. Absence of other conditions that will adversely affect erection of steel.

B. Do not begin erection before unsatisfactory conditions have been corrected, and Erector is fully satisfied of correctness.

3.02 PREPARATION

A. Supervise setting of anchor bolts and other embedded items required for erection of structural steel. Be responsible for correct bearing of steel and correct location of anchor bolts. Furnish all necessary shim plates, etc, for levelness.

3.03 ERECTION

A. General Requirements:
   1. Erect structural steel in accordance with AISC.
   2. Insure steel is plumb, level and in accurate alignment before making final connections.
   3. Where erection requires performing work of fabrication on site, conform to applicable standards of Fabrication Article.
   4. Field corrections of major members will not be permitted without the Engineer's prior approval
   5. Conform to "Structural Steel" notes.

B. Column Bases and Bearing Plates:
   1. Attached Column Bases and Bearing Plates: Align with wedges or shims.
   2. Loose Column Bases and Bearing Plates: Where too heavy to be placed without derrick or crane, set, wedge and shim.
   3. Grouting: Grout in accordance with requirements of Concrete, Cast-In-Place Section. (Not included in this section.)

C. Field Assembly:
   1. Clean bearing surfaces and surface to be in permanent contact before assembling members.
   2. Accurately assemble frames to lines and elevations indicated, within erection tolerances noted.
   3. Insure assembly is plumb, level and aligned before final connecting.
   4. Do not fasten splices of compression members before abutting surfaces have been brought completely into contact.

D. Bolting:
   1. As erection progresses, bolt up work to take care of all dead loads, construction live loads, lateral and wind forces and erection stresses.

2. Unless otherwise noted, erection bolts used in welded construction may be either tightened securely and left in place or removed and the holes filled with plug welds.
3. High Strength Bolting:
   a. Shall be performed in accordance with "Specifications for Structural Joints using ASTM A-325 or A-490 Bolts" by Research Council on Structural Connections.
   b. Contact surfaces shall be free of oil, paint, lacquer or other coatings.
   c. Tighten all nuts using (1) properly calibrated wrenches, (2) by the "Turn-of-Nut" method, or (3) by the use of a Direct Tension Indicator. Minimum bolt tension as per AISC for each bolt size used. Check wrenches for accuracy of calibration at least once each day.
   d. When bolts have been completely tightened, mark with identifying symbol.

E. Temporary Bracing: Introduce wherever necessary to provide for all loads to which structure is subjected including erection equipment and its operation. Leave in place until no longer required for safety. Make proper provisions for construction loads, piles of materials, equipment, etc., carried by structural frame during erection. Contractor shall be solely responsible for frame during erection.

3.04 CLEANUP

A. After erection thoroughly clean surface of foreign or deleterious matter such as dirt, mud, oil or grease that would impair bonding of fireproofing or concrete.

3.05 FIELD QUALITY CONTROL

A. The Owner's Testing Agency will test and inspect in accordance with the AISC requirements and as required, and as follows:
   1. Bolting: High strength bolts, nuts, and washers shall be sampled and tested for conformance with the requirements of AISC 360 Section A3.3. Inspection of high-strength bolt installations shall be made in accordance with California Building Code Section 1704.3.3**,** by an inspector specially approved for that purpose by the enforcement agency. The inspector shall check the materials, equipment, details of construction and installation procedure. For slip-critical connections, check bolt tightness on not less than ten percent of bolts selected at random in each high strength bolt connection with a minimum of two bolts per connection. Connections that are not designated slip-critical need not be inspected for bolt tension other than to ensure that the plies of the connected elements have been brought into snug contact. Inspection procedure will be as described in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts" by the Research Council on Structural Connections.
   2. Welding Inspection: Visual inspection per AWS D1.1 by a qualified welding inspector approved by the enforcement agency is required for all welding performed in the shop and field, including installation of automatic end-welded shear stud connectors. Inspector shall be a person trained and thoroughly experienced in inspecting welding operations. The inspector's ability to distinguish between sound and unsound welding shall be reliably established. The minimum requirements for a qualified welding inspector shall be those for an AWS certified welding inspector (CWI), as defined in the provisions of the ANSI/AWS QC-1-96, Standard for AWS Certification of Welding Inspectors. The welding inspector shall check the material, equipment, details of construction and procedure, as well as the welds. The inspector shall use all means necessary to

determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics, or other aid to visual inspection which the inspector may deem necessary to be assured of the adequacy of the welding. The ability of each welder to produce sound welds of all types required by the work shall be established by welder qualification satisfactory to the enforcement agency. The welding inspector shall make a systematic record of all welds. This record shall include, in addition to other required records:

a. Identification marks of welders.
b. List of defective welds.
c. Manner or correction of defects.

3. Welding Tests: Test complete and partial joint penetration groove welded connections of column to column, column to girder, or beam to girder by ultrasonic testing. Test fillet welds by magnetic particle testing where indicated on the drawings.
   a. Ultrasonic testing and magnetic particle testing will be performed by a specially trained, qualified technician, who will operate the equipment, examine welds and maintain a record of welds examined, defects found and disposition of each defect. Defective welds shall be repaired and the cost of retesting of defective welds shall be borne by the Contractor.
   b. Initially, welds requiring ultrasonic testing will be tested at the rate of 100 percent in order to establish qualifications of each individual welder. After 40 welds have been completed by an individual welder, if rejectable defects occur in less than five percent of the welds tested, the frequency of testing of that welders work may be reduced to 25 percent. If the rate of rejectable defects increases to five percent or more, 100 percent testing will be reestablished until the rate is reduced to less than five percent. Percentage shall be calculated for each welder independently.
   c. When ultrasonic indications arising from the weld root can be interpreted as either a weld defect or the backing strip, the backing strip shall be removed at the expense of the Contractor, and if no root defect is visible, weld shall be retested. If no defect is indicated on this retest and no significant amount of the base and weld metal have been removed, the joint need no further repair or welding. If a defect is indicated, it shall be repaired by the Contractor at no expense to the Owner.
   d. Questionable root indications that prove not to be defects will not count against the welder to increase test rate.
   e. Ultrasonic instrumentation will be calibrated by technician to evaluate the quality of the welds in accordance with AWS D1.1, Appendix C.
   f. Other methods of inspection, for example, radiographic, magnetic particle, or dye penetrant, may be used on welds if deemed necessary by the inspection agency with the cooperation of the Contractor.
   g. When welds from web doubler plates or continuity plates occur in the k-area of rolled steel columns, the k-area adjacent to the welds shall be inspected after fabrication as required by the enforcement agency, using approved nondestructive method conforming to AWS D1.1. The k-area is defined in wide flange shapes to be the area of the web immediately adjacent to the flange, extending from the fillet to a point approximately 1-1/2 inches beyond the point of tangency between the fillet and the web.
4. Welded Studs: End welded studs shall be sampled, tested and inspected per the requirements of AWS D1.1.
5. Inspection and Test Reports: The inspector shall furnish the architect, structural engineer, and enforcement agency with a report stating that the work has been completed in every material respect in compliance with the approved plans and specifications. The welding inspector shall issue a report verifying that the

welding is proper and has been done in conformance with AWS D1.1 and the approved plans and specifications.

B. The Contractor shall:

1. Make no extra charge for any handling of steel required for complete four-sided inspections of members at Engineer's request. It is not anticipated that complete four-sided inspection of all members will be undertaken. Such inspection will be necessary in case of dispute or uncertainty regarding adherence to Drawings and Specifications.
2. Repair defective welds or flaws, lamellar tearing, and replace defective studs.
3. Pay for retesting of repaired defective welds flaws and studs.
4. Cooperate to the fullest extent to accommodate inspection agency personnel with the on site testing and inspection procedures.
5. Assume full responsibility and pay for all corrective work.

END OF SECTION

DIVISION 05

METALS

SECTION 05 45 00 - METAL SUPPORT ASSEMBLIES

1. Section Includes
   a. Metal studs and furring for support of gypsum board.
   b. Suspended framing system for interior suspended ceilings.
   c. Backing for interior items to be attached to gypsum board and metal studs.

2. Design Requirements
   a. Metal stud framing system for interior partitions and ceilings, with gypsum board specified in Section 09 29 00.
   b. Plumb, true, straight, and rigid framing for support of attached materials.
   c. Design system to accommodate construction tolerances, deflection of building structural members, support of attached materials, and clearances of intended openings in accordance with CBC. Partitions shall be designed for L/240 deflection.
   d. New suspended gypsum board ceilings shall not support materials or building components other than grilles, light fixtures, small electrical conduits, and small ducts. Such components shall be supported by supplemental framing which is supported by main runners. No vertical loads other than gypsum board dead load shall be applied to cross-furring.

3. Quality and Assurance: Perform work in accordance with GA 203 and ASTM C754, governing laws, building code requirements, manufacturer's printed recommendations and United States Gypsum company, "Good Design Practices" systems folder SA-923, 1994 Edition.

4. Acceptable Manufacturers
   a. Steel Framing and Furring: Gold Bond Building Products Div., National Gypsum Co.; Clark Steel Framing; Dietrich Industries, Inc., or equal.
   b. Grid Suspension Assemblies: Chicago Metallic Corp.; USG Interiors, Inc.; National Rolling Mills Co., or equal.

5. Steel Framing for Partitions
   a. Studs: C-shaped, ASTM C645, with galvanized coating ASTM A653, G-90; non-load bearing rolled steel, channel shaped, punched for utility access.
      1) Width: 1-5/8 inches, unless otherwise noted.
      2) Thickness: 20 gauge throughout, unless otherwise specified on the Drawings.
      3) Tracks: Match stud grade.
      4) Spacing: 16 inches on center throughout.
   b. Deflection Tracks: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A653 or ASTM A568. Thickness as indicated for studs and width to accommodate depth of studs.
   c. Furring and Bracing Members: Same material and finish as studs, thickness to suit purpose.
   d. Steel Rigid Furring Channels: ASTM C645, hat shaped, depth of 7/8-inch, and minimum thickness of base (uncoated) metal as follows.
      1) Thickness: 0.0179-inch, unless otherwise indicated.
      2) Protective Coating: ASTM A653, G 40 hot-dip galvanized coating.
   e. Z-Furring Members: Manufacturer's standard Z-shaped furring members with slotted or nonslotted web, fabricated from steel sheet complying with ASTM A653 or ASTM A568; with a minimum base metal (uncoated) thickness of 0.0179-inch, face flange of 1-1/4 inch, wall-attachment flange of 7/8-inch, and of depth required to fit insulation thickness indicated.

f. Fasteners: Galvanized, GA 203, self-drilling, self-tapping screws.
g. Metal Backing Plates: As indicated on the Drawings.
h. Anchorage Devices: Provide drilled in anchors.

6. Steel Framing for Suspended and Furred Ceilings
   a. General: Provide components of sizes indicated but not less than that required to comply with CBC and ASTM C754 for conditions indicated.
   b. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, as indicated on the Drawings.
   c. Channels: Cold-rolled steel, 0.0598-inch minimum thickness of base (uncoated) metal and 7/16-inch wide flanges, and as follows:
      1) Carrying Channels: 1-1/2 inches deep, 1.12 pound/foot minimum, hot rolled.
      2) Furring Channels: 7/8-inch deep, 26 gauge, galvanized hat sections at 24 inches maximum center to center.
      3) Finish: ASTM A653, G40 hot-dip galvanized coating for framing for exterior soffits.
   d. Steel Studs for Furring Channels: ASTM C645, with flange edges bent back 90 degrees and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:
      1) Thickness: 0.0179 inch, unless otherwise indicated.
      2) Depth: 1-5/8 inch, unless otherwise indicated.
      3) Protective Coating: ASTM A653, G40 hot-dip galvanized coating for framing for exterior soffits and ceiling suspension members in areas within 10 feet of exterior walls.
   e. Resilient Channels: As manufactured by Unimast, “RC Deluxe”; Cemco, “RC-1”; Dale/Incor, “RFC-1”, or equal.

7. Miscellaneous Materials
   a. Acoustical Sealant: As specified in Section 07 92 00.
   b. Galvanized Finish Touch-Up Coating: Liquid zinc compound that bonds electrochemically to iron, steel and aluminum, as manufactured by ZRC Chemical Products, “ZRC Cold Galvanizing Compound”, or equal.

8. Finishes for Galvanized Surfaces: Where galvanizing is removed by welding or other assembly procedures, clean area of any foreign matter by wire brushing and metal conditioner recommended by galvanized finish touch-up manufacturer. Apply galvanized touch-up coating by brush or spray with minimum coverage of 1.4 mils, dry film.

9. Examine areas to receive metal support framing systems.
   a. Verify installation of building components located in walls is complete.
   b. Verify backing plates are properly located for support of wall hung items.
   c. Beginning of installation means installer accepts existing conditions.

10. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
    a. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

11. Installing Steel Framing for Partitions
    a. Stud Partitions - Typical
       1) Align and secure top and bottom tracks. Place 2 beads of acoustic sealant between tracks and substrate.
       2) Fit tracks under and above openings; secure intermediate studs at spacing of wall studs.

3) Install studs vertically at spacing as indicated. Place 2 beads of acoustic sealant between studs and adjacent vertical surfaces.
4) Connect studs to tracks using fastener method.
5) Construct corners using minimum 3 studs.
6) Double studs vertically at wall openings, door and window jambs, and not more than 2 inches each side of openings, unless otherwise specified. Provide track and stud horizontally at wall, window head, and sill openings.
7) Brace stud framing system and make rigid.
8) Coordinate erection of studs with requirements of door and window frame supports and attachments.
9) Align stud web openings.
10) Coordinate installation of jamb anchors and metal backing plates with electrical and mechanical work to be placed in or behind stud framing.
11) Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

b. Backing in Stud Partitions or Furring - Typical
1) Securely weld or screw cut sections of unpunched stud to at least 3 stud supports, leaving flat surface of backing stud web to receive attachment of object to be secured to studs.
2) Verify that any pre-drilling of backing and attachment of spacers to prevent crushing of attached material is done prior to application of attached material.
3) If it is determined by the Architect that backing was not provided for any items as required, the Contractor shall remove the finish materials, install backing, and shall patch and refinish surface to match adjacent area and surface at no additional cost to the District.

c. Installation of Resilient Channels
1) Attach resilient channels perpendicular to framing and spaced as follows, unless otherwise required by Code:
a) Where Framing Is Spaced 24 Inches on Center: Attach resilient channels on 16 inch centers.
b) Where Framing Is Spaced 16 Inches on Center: Attach resilient channels on 24 inch centers.
2) Drive screws only through pre-punched holes in channels.
3) Attach resilient channels with mounting flanges facing in only one direction. Orient the gap between the channel and stud faces upward on walls.
4) Hold back ends of channels 1 to 3 inches from intersecting surfaces.
5) Splice channels only at joists and overlap ends.
6) Locate channels so that gypsum board will not be cantilevered more than 6 inches from vertical surfaces.
7) Resilient channel only to bear load of gypsum board, unless indicated otherwise.

d. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8-inch from plane of faces of adjacent framing. Shear off protruding pick tabs, etc. to provide a smooth and safe finished surface.

12. Installing Steel Framing for Suspended and Furred Ceilings
a. Suspend ceiling hangers from building structural members and as follows:
1) Hangers shall be saddle-tied around main runners to develop full strength of hangers.
2) Cross-furring shall be saddle-tied to main runners with 1 strand of No. 16 or 2 strands of No. 18 gauge tie wire.
3) Main runners shall be spliced by lapping and interlocking flanges 12 inches minimum and tying near each end with double loops of No. 16 gauge wire.
4) Cross-furring shall be spliced by lapping and interlocking the pieces 8 inches minimum and tying near each end with double loops of No. 16 gauge wire.

5) Fasten hanger wires with not less than 3 tight turns. Fasten bracing wires with 4 tight turns. Make all tight turns within a distance of 1-1/2 inches. Hanger or bracing wire anchors to the structure shall be installed in such a manner that the direction of the wire aligns as closely as possible with direction of the forces acting on the wire.
6) Wire turns made by machine where both strands have been deformed or bent in wrapping can waive the 1-1/2 inch requirement, but the number of turns shall be maintained, and be as tight as possible.
7) Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, and conduit. It is acceptable to attach lightweight items, such as single electrical conduit not exceeding 3/4-inch nominal diameter to hanger wires using connectors acceptable to authorities of jurisdiction.
8) When drilled-in concrete anchors are used in reinforced concrete for hanger wires, 1 out of 10 shall be field tested for 200 pounds of tension. When drilled-in concrete anchors are used for bracing wires, 1 out of 2 shall be field tested for 440 pounds in tension. Shot-in anchors in concrete are not permitted.
9) Provide trapeze or other supplementary support members at obstructions to main hanger spacing.
10) Provide additional hangers, struts or braces as required at all ceiling breaks, soffits, or discontinuous areas.
11) Hanger wires that are more than 1 in 6 out of plumb shall have counter-sloping wires.
12) Resilient Ceilings
    a) Select resilient hangers for proper loading, as required to achieve a minimum 0.20-inch static deflection.
    b) Incorporate cables with resilient hangers at diagonal bracing where cable is in tension.
    c) Ceiling hanger wires, support rods, and framing shall not contact ducts, pipes, equipment, or supports.
    d) Isolation hardware shall not be concealed until approval is obtained from the Architect.

b. Light Fixture Support
1) Recessed or drop-in light fixtures shall be supported directly by main runners or by supplemental framing which is supported by main runners.
2) Surface mounted fixtures shall be attached to main runner by positive clamping device made of material with a minimum of 14 gauge. Rotational spring catches do not comply.
3) Light fixtures, HVAC diffusers, speakers, etc., shall have minimum 2 wires at opposite ends for support if ceiling should fail during seismic fault.

c. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8-inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.

SECTION 05 50 00 - METAL FABRICATIONS

1. Section Includes
   a. Galvanized exterior pipe railings and guardrails.
   b. Miscellaneous channels, angles, and other shapes as required.
   c. Rough hardware.

2. Design Requirements
   a. Wind Load Requirements for Exterior Items: Design and size members to withstand dead and live loads caused by pressure and suction of wind in accordance with CBC, Chapter 16A, and ASCE 7-05.

b. Fabricate work to support normally imposed loads and in conformity with AISC requirements.
c. Provide for expansion and contraction.
d. Design exterior items to exclude water.

3. Welding Standards: Comply with applicable provisions of AWS D1.1 and AWS D1.3.
   a. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

4. General
   a. Metal Surfaces: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
   b. Provide steel with 25 percent minimum recycled steel content. In the case of comparable suppliers, preference shall be given to suppliers with highest recycled steel content in their product.

5. Steel and Iron
   a. Steel Plates, Shapes, and Bars: ASTM A36.
   b. Stainless Steel Shapes: ASTM A276.
   c. Cold-Formed Steel Tubing: ASTM A500. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A123.
   d. Steel Pipe: ASTM A53, Type S, Grade B, Schedule 40, unless otherwise indicated, or another weight required by structural loads.
   e. Concrete Inserts: Anchors of type indicated below, fabricated from corrosion resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.

6. Fasteners: Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
   a. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563, and, where indicated, flat washers.
   b. Machine Screws: ANSI B18.6.3.
   c. Plain Washers: Round, carbon steel, ANSI B18.22.1.
   d. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
   e. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency. Testing shall be to twice the indicated tension capacity for the specific approved application listed in a current ICBO report for the expansion/sleeve anchor.

7. Welding Materials: AWS D1.1, type required for materials being welded.

8. Coatings
   a. Coatings for Protection of Dissimilar Materials
      1) Dissimilar Metals: Bituminous type materials conforming with MIL Standard 889.
      2) Aluminum in Contact with Concrete, Metal, Wood, or other Absorptive Material.
   b. Shop Primer for Ferrous Metal: VOC compliant, fast-curing, lead and chromate free, universal modified alkyd primer with good resistance to corrosion, compatible with finish paint systems.

c. Galvanizing Repair Paint: High zinc dust content paint, with dry film containing not less than 94 percent zinc dust by weight, as manufactured by Sherwin Williams, "Zinc Clad I"; ZRC Chemical Products Co., "ZRC Cold Galvanizing Compound", or equal.
d. All items exposed to moisture or weather shall be hot dipped galvanized.

9. Nonshrink, Nonmetallic Grout
   a. Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
   b. Manufacturer: Five Star Products, Inc., "Five Star Grout"; Master Builders Technologies, Inc., "Masterflow 928 and 713", or equal.

10. Fabrication, General
    a. Form metal fabrications from materials of size, thickness, and shapes indicated 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. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
    c. Shear and punch metals cleanly and accurately. Remove burrs.
    d. Remove sharp or rough areas on exposed surfaces.
    e. Weld corners and seams continuously.
    f. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
    g. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
    h. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

11. Miscellaneous Framing and Supports
    a. Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
    b. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports.
    c. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection.
    d. Cut, drill, and tap units to receive hardware, hangers, and similar items.

12. Galvanize miscellaneous interior and exterior framing and supports.
    a. Galvanizing: Apply zinc coating by the hot-dip process complying with the following requirements:
       1) ASTM A153 for galvanizing iron and steel hardware.
       2) ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299-inch thick or thicker.

13. Coatings for Dissimilar Materials
    a. For Protection of Dissimilar Metals: Apply at least 2 coats of bituminous coating, having minimum total thickness of 5 mils.
    b. For Aluminum in Contact with Concrete, Metal, Wood or Other Absorptive Material: Apply at least 2 coats, having minimum total thickness of 3 mils.

14. 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 masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
    b. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installing 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. Fit exposed connections accurately together to form hairline joints. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
    d. Field Welding: Comply with the following requirements:
        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.
    e. Touchup Painting: Clean welds, bolted connections and abraded areas, and apply galvanizing repair paint to comply with ASTM A780.

15. Field Painting: As specified in Section 09 90 00.

END OF DIVISION 05

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DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 05 73 - WOOD TREATMENT

1. Section Includes: Fire retardant treatment.

2. Single-Source Responsibility for Fire Retardant Treated Wood: Obtain each type of fire retardant treated wood product from 1 source for both treatment and fire retardant formulation.

3. Fire Retardant Wood Treatment
   a. General: Where fire retardant treated wood is indicated, pressure impregnate lumber and plywood with fire retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated; identify “fire retardant treated wood” with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.
      1) Current Evaluation/Research Reports: Provide fire retardant treated wood for which a current model code evaluation/research report exists that is acceptable to authorities having jurisdiction and that evidences compliance of fire retardant treated wood for application indicated.
   b. Interior Type: For interior locations, use fire retardant chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation.
      1) No reduction takes place in bending strength, stiffness, and fastener holding capacities below values published by manufacturer of chemical formulation that are based on tests by a qualified independent testing laboratory of treated wood products identical to those indicated for this Project under elevated temperature and humidity conditions simulating installed conditions.
      2) No other form of degradation occurs due to acid hydrolysis or other causes related to manufacture and treatment.
      3) No corrosion of metal fasteners results from their contact with treated wood.
      4) No effect on the appearance or performance of field applied coatings or paint.
   c. Product: As manufactured by Hickson Corporation, “Dricon”; Hoover Treated Wood Products, “Pyro-Guard”; Osmose Wood Preserving Co, Inc., “Flameproof LHC-HTT”, or equal.

4. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

SECTION 06 10 00 - ROUGH CARPENTRY

1. Section Includes: Plywood panels for ITS spaces and Apparatus Storage.

2. Plywood: ACX, in thickness indicated.

3. Fasteners
   a. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   b. Power-Driven Fasteners: NES NER-272.
   c. Wood Screws: ANSI B18.6.1.
   d. Lag Bolts and Screws: ANSI B18.2.1.

e. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and where indicated, flat washers.

4. Fire Retardant Treatment: As specified in Section 06 05 73.

5. Prime and finish paint exposed lumber as specified in Section 09 90 00.

6. Installation, General
   a. Comply with applicable recommendations contained in APA E30, for types of construction panels and applications indicated.
   b. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.
   c. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
   d. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.

SECTION 06 20 00 - FINISH CARPENTRY

1. Section Includes: Interior standing and running wood trim.

2. Interior Wood Intended for Opaque Finish: Douglas Fir or Pine, clear.

3. Medium Density Fiberboard: ANSI A208.2, 3/4-inch thick, paint grade, with low VOC/ formaldehyde-free., as manufactured by Medite Corporation, Inc., “Medite II”, or equal.

4. Fasteners for Interior Finish Carpentry: Provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A153.

5. Finish Painting: As specified in Section 09 90 00.

6. Comply with requirements of specified inspection agencies and manufacturer’s recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas. Fabricate finish carpentry to dimensions, profiles, and details indicated.

7. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.

8. Install to tolerance of 1/8-inch in 96 inches for plumb and level. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails. Align new materials with existing adjacent.

9. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

END OF DIVISION 06

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 21 01 - BUILDING INSULATION

1. Section Includes: Thermal building insulation.

2. Thermal Insulation
   a. Wall Fiberglass Batt Insulation Where Indicated
      1) Unfaced, friction-fit, flexible batt or blanket of fiberglass, width to fit stud space, having thermal resistance rating of R-19 and conforming to ASTM C665, Type I, non-combustible when tested in accordance with ASTM E136 and having the following fire resistive requirements when tested in accordance with ASTM E84:
         a) Flame Spread: 10 or less.
         b) Smoke Developed: 10 or less.
      2) Manufacturer: Owens-Corning Fiberglas Corp., “Thermal Batt Insulation”; Johns Manville Corp., or equal.

3. Acoustical Insulation
   a. Type 1 - Wall Acoustical Batt Insulation Where Indicated
      1) Unfaced, friction-fit, flexible batt or blanket of fiberglass, depth and width to fit stud space, and conforming to ASTM C665, Type I, non-combustible when tested in accordance with ASTM E136 and having the following fire resistive requirements when tested in accordance with ASTM E84:
         a) Flame Spread: 10 or less.
         b) Smoke Developed: 10 or less.
      2) Manufacturer: Owens-Corning Fiberglas Corp., “Thermal Batt Insulation”; Johns Manville Corp., or equal.
   b. Type 2 - Ceiling Acoustical Batt Insulation Where Indicated
      1) Unfaced, friction-fit, flexible batt or blanket of fiberglass, conforming to ASTM C665, Type I, non-combustible when tested in accordance with ASTM E136 and having the following fire resistive requirements when tested in accordance with ASTM E84:
         a) Flame Spread: 10 or less.
         b) Smoke Developed: 10 or less.
      2) Manufacturer: Owens-Corning Fiberglas Corp., “Thermal Batt Insulation”; Johns Manville Corp., or equal.

4. Accessories
   a. Insulation Support: Galvanized springwire as required.
   b. Acoustical Pads for Junction Boxes
      1) Non-Fire Rated Conditions: As manufactured by Harry A. Lowry & Assoc., “Lowry’s Electrical Box Sealer”, or equal.
      2) Fire Rated Conditions: As manufactured by Nelson Fire Stop Pads, “Heavy-Duty/Nelson”; 3M Fire Protection Products, “MPP-4S Moldable Putty Pad”, or equal.

5. Examine substrates and conditions with installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

6. Installation
   a. General
      1) Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
      2) Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
      3) Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.
   b. Thermal Building Insulation
      1) Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations. If no specific method is indicated, use mechanical anchorage to provide permanent placement and support of units.
      2) Maintain required separations from electric fixtures and appliances.
   c. Acoustical Insulation
      1) Install 5-1/2-inch thick batt insulation above all suspended gypsum board ceilings.
      2) Install batt insulation to fill framing cavities and fasten to framing to prevent slipping at sound-rated construction.
      3) Install insulation batts around perimeter of piping and electrical boxes in sound-rated wall/ceiling cavities.
      4) Pack sound insulation batts around perimeter of piping and electrical boxes in wall/ceiling cavities where indicated.
   d. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

SECTION 07 26 00 - VAPOR RETARDERS

1. Section Includes: Vapor retarder at underslab. Tie in to existing underslab membrane.

2. Single-Source Responsibility for Vapor Retarder Products: Obtain vapor retarder from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

3. Vapor Retarder: 3 ply, minimum 20 mil thick, high-density polyethylene copolymer and nylon yarn laminate, with yarn suspended in a permanently flexible adhesive media. Material shall have a reinforced non-woven grid with a PPT tear strength of not less than 15 pounds, as determined by ASTM D2582. Provide in widest rolls practical to minimize joints, as manufactured by Stego Industries; Griffolyn (Reef Industries), or equal.

4. Tape for Vapor Retarder: Pressure sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.

5. Plastic Cement: FS SS-C-153C, Type I (Asphalt).

6. Installation: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place. Extend vapor retarder to cover miscellaneous voids in substrates.
   a. Seal overlapping joints in vapor retarders with tape per vapor retarder manufacturer's printed directions. Seal butt joints and fastener penetrations with tape of type recommended by vapor retarder manufacturer.

b. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape of type recommended by vapor retarder manufacturer to create an airtight seal between penetrating objects and vapor retarder.
c. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with tape or another layer of vapor retarder.

7. Protect installed vapor retarder from damage due to harmful weather exposures, physical abuse, and other causes.

SECTION 07 92 00 - JOINT SEALANTS

1. Section Includes: Building joint sealants and backing systems.

2. Performance Requirements: Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

3. Environmental Requirements
   a. Do not install solvent curing sealants in enclosed building spaces.
   b. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

4. Provide joint sealants and caulks compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   a. Type A - One Part Neutral Cure Silicone Sealant
      1) ASTM C920, non-sag, one part, low modulus, elastomeric sealant.
      2) Color: As selected by the Architect.
      3) Manufacturer: Dow-Corning, “790”; Tremco, “Spectrum 1”, or equal.
   b. Type B - Polyurethane Sealant, Two Component
      1) ASTM C920, Type M; Grade P; Class 25; Use T having minimum ASTM D2240 Shore A hardness of 30 plus or minus 5.
      2) Color: As selected by the Architect.
      3) Manufacturer: Sika Corp., “Sikaflex 2cSL”; Sonneborn Building Products Division, “Sonolastic SL2”, or equal.
   c. Type C - Silicone Sealant, Single Component
      1) FS TT-S-001543, mildew resistant, chemical curing, non-sagging, non-staining, non-bleeding.
      2) Color: As selected by the Architect.
      3) Manufacturer: Dow-Corning, “786”, or equal.
   d. Type D - One Part Acid Curing Silicone Sealant
      1) ASTM C920, One part glazing sealant.
      2) Color: As selected by the Architect.
      3) Manufacturer: Dow-Corning, “999-A”; Rhone-Poulenc, Inc., “Rhodorsil 3B”, or equal.
   e. Type E - Acrylic Emulsion Sealant
      1) ASTM C834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
      2) Color: As selected by the Architect.
      3) Manufacturer: Pecora Corp., “AC-20”; Tremco, Inc., “Tremco Acrylic Latex 834”, or equal.

f. Type F - Acoustical Sealant
   1) Elastic, non-hardening, polysulphide type, non-skinning, pumpable type sealant which shall remain permanently flexible, ASTM C919, for use in conjunction with gypsum board.
   2) Manufacturer: U.S. Gypsum, “Acoustical Sealant”; Tremco Manufacturing Co., “Tremco Acoustical Sealant”; Miracle Adhesives, “MS21”, or equal.

5. Accessories
   a. Primer: Non-staining type recommended by sealant manufacturer to suit application.
   b. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
   c. Joint Backing: ASTM D1056 round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width as recommended by manufacturer of sealant material.
   d. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

6. Preparation
   a. Clean and prime joints in accordance with manufacturer’s instructions.
   b. Remove loose materials and foreign matter which might impair adhesion of sealant.
   c. Verify that joint backing and release tapes are compatible with sealant.
   d. Perform preparation in accordance with ASTM C804 for solvent release and ASTM C790 for latex base sealants.
   e. Protect elements surrounding the work of this Section from damage or disfiguration.

7. Installation
   a. Install sealant in accordance with manufacturer’s instructions.
   b. Measure joint dimensions and size materials to achieve required width/depth ratios.
   c. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
   d. Install bond breaker where joint backing is not used.
   e. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
   f. Install sealant free of air pockets, foreign embedded matter ridges, and sags.
   g. Tool joints concave.
   h. Repair or replace defaced or disfigured finishes caused by work of this Section.
   i. Protect completed sealant and caulking installations until curing is complete.

END OF DIVISION 07

DIVISION 08

OPENINGS

SECTION 08 11 15 - STEEL DOORS AND FRAMES

1. Section Includes: Fire resistance rated and non-fire rated steel doors and frames.

2. Regulatory Requirements: Provide fire resistance rated door frame assemblies that comply with NFPA 80, are identical to door frame assemblies whose fire resistance characteristics have been determined in accordance with ASTM E2074 and which are labeled and listed by UL.

3. Materials
   a. Cold-Rolled Steel Sheet: ASTM A1008, Commercial Steel (CS), Type B; suitable for exposed applications.
   b. Hot-Rolled Steel Sheet: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
   c. Supports and Anchors: Fabricate of not less than 18 gauge sheet steel; galvanized where used with galvanized frames.
   d. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built in at exterior walls, hot-dip galvanize in compliance with ASTM A153, Class C or D as applicable.
   e. Flush Doors
      1) Provide metal doors of SDI grades and models specified below or as indicated on the Drawings or schedules:
         a) Interior: SDI-100 Grade III, Model 3, with 18 gauge face sheets.
         b) Provide fire resistance doors with fire ratings as indicated.
      2) Door Cores
         a) Core Stiffeners: Vertical steel stiffeners or steel channel grid.
         b) Core Filler: Sound deadening mineral composition, incombustible, moisture-resistant, chemically inert in accordance with reviewed manufacturer's recommendations.
         c) Fire Resistive: Labeled door core material shall conform to requirements of labeling authority.
   f. Frames
      1) Provide metal frames for doors of types as indicated. Conceal fastenings.
         a) Interior: Fabricate fully welded frames of minimum 18 gauge cold-rolled steel; knock-down construction acceptable where required at existing partitions.
         b) Provide fire resistance frames with fire ratings as indicated.
      2) Door Silencers: Drill stops to receive 3 silencers on strike jambs of single door frames and 2 silencers on heads of double door frames.
   g. Door Hardware: As specified in Section 08 71 00.

4. Installation
   a. General: Install steel doors, frames, and accessories in accordance with final shop drawings, manufacturer's data, and as herein specified.
   b. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated.
      1) Except for frames located at existing concrete, masonry, or drywall installations, place frames prior to construction of 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.
      2) Install fire resistance rated frames in accordance with NFPA 80.

c. Door Installation: Fit hollow metal doors accurately in frames, within clearances specified in SDI A250.8.
   1) Install fire resistance rated doors with clearances as specified in NFPA 80.

5. 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.

6. Final Adjustments: Check and readjust operating hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

SECTION 08 15 00 - PLASTIC DOORS

1. Section Includes: Exterior flush fiberglass reinforced plastic (FRP) door and aluminum door frame.

2. Regulatory Requirements: All FRP component parts, including the gelcoat finish, shall have a flame spread classification of 25 or less per ASTM E84 and shall be self extinguishing per ASTM D635 unless operating conditions dictate otherwise.

3. Acceptable Manufacturer: Special-Lite, Inc.; no known equal.

4. Doors
   a. Face Sheets
      1) Standard face sheets shall be manufactured using a corrosion resistant resin system with light stabilizing additives. Resin shall be reinforced with fiberglass, 40 percent by weight.
      2) Thickness: 0.070-inch to 0.125-inch. Total door thickness shall be 1-3/4 inches nominal.
      3) Finish: Smooth, seamless finish, with special gelcoat color as selected by the Architect.
   b. Internal Construction
      1) Typical Core: Polyurethane foam core.
      2) Stiles and Rails: 1-1/2 inch square pultruded fiberglass tubes. Polyester based resin filled with 1/4-inch chopped glass strands and aerosil shall be used for reinforcement and corner block. Bottom rail shall allow 1-1/4 inches of height alterability without loss of panel's integrity. No metal or wood lumber reinforcement shall be allowed.
   c. Hardware Preparation
      1) Reinforcement Blocking for Lockset, Surface Mounted Hardware, Thru-Bolted Hardware: Non-swelling polymer blocking.
      2) Doors shall be mortised and reinforced to allow application of hinges and locks in accordance with hardware schedule and manufacturer's templates. Hinges shall be attached by using stainless steel wood screws. Pilot holes shall be in strict accordance to manufacturer's recommendations.
   d. Glazing: Glass support structures shall ensure that glass area is weathersealed as not to permit moisture to enter the core of the door. Pultruded FRP tubes shall be used to fabricate window opening. Glazing shall allow for ready access for repair without affecting sealed integrity of the cutout in the door panel itself. Openings cut directly into the core material shall not be allowed. Refer to Section 08 80 00.
   e. Fasteners: Provide stainless steel fasteners as required for glazing opening and louvers.

5. Frames
   a. Size and Type: As indicated on the Drawings.
   b. Materials: Aluminum Alloy 6063-T5, 1/8-inch minimum wall thickness.

c. Applied Door Stops: 0.625-inch high, with screws and weatherstripping. Door stop shall incorporate pressure gasketing for weathering seal. Counterpunch fastener holes in door stop to preserve full metal thickness under fastener head.
d. Frame Members: Box type with 4 enclosed sides. Open-back framing is not acceptable.
e. Caulking: Caulk joints before assembling frame members.
f. Joints: Secure joints with fasteners. Provide hairline butt joint appearance.
g. Field Fabrication: Field fabrication of framing using stick material is not acceptable.
h. Applied Stops: Applied stops shall incorporate pressure gasketing for weathering seal. Reinforce with solid bar stock fill for frame hardware attachments.
i. Hardware: Premachine and reinforce frame members for hardware in accordance with manufacturer's standards and hardware schedule. Factory install hardware.
j. Anchors
    1) Anchors appropriate for wall conditions to anchor framing to wall materials.
    2) Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
    3) Secure head and sill members of transom, side lites, and similar conditions.

6. Fabrication
    a. Fabricate FRP door and frame systems as indicated. Frames shall be rigid, neat in appearance and free from defects. Field measurements shall be taken as required for coordination with adjoining work.
    b. Form exposed surfaces free from warp, wave and buckle, with all corners square, unless otherwise indicated. Set each member in proper alignment and relationship to other members with all surfaces straight and in a true plane.
    c. Reinforce members and joints with plates, tubes or angles for rigidity and strength.
    d. Doors and frames shall be mortised and reinforced for hardware in accordance with the hardware manufacturer's instructions and templates. The reinforcing shall be designed to receive hinges, locks, strikes, closures, etc.
    e. Mortar guard boxes shall be provided for hardware cutouts in frames.
    f. Furnish at least 3 metal anchors or polymer spacers in each jamb of frames up to 84 inches high and 1 additional anchor for each 24 inches in height above 84 inches, in shapes, sizes and spacing shown or required for anchorage into adjoining wall construction. Fabricate joint anchor of stainless steel.
    g. Terminate bottom of frames at the indicated finished floor level.
    h. Provide clearance for doors of 1/8-inch at jambs and heads; 1/4-inch clearance above threshold.

7. Examination: Installer shall examine the substrate and conditions under which fiberglass reinforced plastic work is to be installed and notify the General Contractor in writing of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

8. Installation
    a. General: Install FRP doors, aluminum frames, and accessories in accordance with final shop drawings and as herein specified. Installation to be similar to that of hollow metal doors and frames, and in accordance with FRP manufacturer's written instructions.
    b. Frame Installation: Place frames prior to construction of 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. Frame must not be drilled for brace supports as finish may be damaged.
    c. Door Installation: Fit FRP doors accurately in frames, within clearances as specified above.
    d. Maximum Diagonal Distortion: 1/8-inch measured with a straight edge, corner to corner. Maximum measurable plane is 4 feet-0 inches by 7 feet-0 inches.

e. At Substantial Completion, adjust all operable components to ensure proper installation and that they function smooth and freely.

9. Cleaning
   a. Remove dirt and excess sealant from exposed surfaces. Follow the manufacturer's recommended cleaning techniques and procedures for cleaning all surfaces. Use only cleaning products that will not scratch or damage the surfaces, and are recommended by the manufacturer.
   b. Remove debris from Project site.

SECTION 08 33 13 - COILING COUNTER DOORS

1. Section Includes: Overhead coiling counter door.

2. Manufacturer Qualifications: Furnish overhead coiling counter door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

3. Inserts and Anchorages: Furnish inserts and anchoring devices that must be set in concrete or built into masonry for installation of overhead coiling counter door unit. Provide setting drawings, templates, instructions, and directions for installing anchorage devices. Coordinate delivery with other work to avoid delay.

4. Acceptable Manufacturers: Cornell Iron Works, Inc., "Rolling Counter Door"; The Cookson Co., or equal.

5. Counter Door Materials and Construction
   a. Curtain
      1) Door Curtain: No. 1F, interlocked flat-faced slats, 1-1/2 inches high by 1/2-inch deep, 22 gauge ASTM A653, Commercial Quality, galvanized steel with extruded tubular aluminum bottom bar with continuous lift handle and vinyl astragal.
      2) Fabricate interlocking slat sections with high strength molded nylon endlocks riveted to ends of alternate slats.
      3) Slat Finish: Phosphate treatment followed by baked-on polyester powder coat; color as selected by the Architect from manufacturer's standard color range; minimum 2.5 mils cured film thickness; ASTM D3363 pencil hardness: H or better.
      4) Aluminum Bar (for Steel Slat with Powder Coating): Match slat powder coating.
   b. Guides
      1) Aluminum: Heavy duty extruded aluminum sections with snap-on cover to conceal fasteners. Provide polypropylene pile runners on both sides of curtain to eliminate metal to metal contact between guides and curtain.
      2) Finish (for Steel Slat with Powder Coating): Match slat powder coating.
   c. Counterbalance Shaft Assembly
      1) Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot of width.
      2) Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs. Provide wheel for applying and adjusting spring torque.
   d. Brackets: Fabricate from reinforced steel plate with bearings at rotating support points to support counterbalance shaft assembly and form end closures.
      1) Finish: Phosphate treatment followed by baked-on polyester powder coat; color as selected by the Architect from manufacturer's standard color range; minimum 2.5 mils cured film thickness; ASTM D3363 pencil hardness: H or better.

e. Hood: 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4-inch steel intermediate support brackets as required to prevent excessive sag.
   1) Finish: Phosphate treatment followed by baked-on polyester powder coat; color as selected by the Architect from manufacturer's standard color range; minimum 2.5 mils cured film thickness; ASTM D3363 pencil hardness: H or better.
f. Operation: Manual push-up.
g. Locking: Padlockable slide bolt on coil side of bottom bar at each jamb extending into slots in guides.

6. Examination
   a. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings.
   b. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates.
   c. Commencement of work by installer is acceptance of substrate.

7. Installation
   a. General: Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports.
   b. Follow manufacturer's installation instructions.
   c. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion.

8. Clean surfaces soiled by work as recommended by manufacturer. Remove surplus materials and debris from the site.

9. Demonstrate proper operation to District's Representative. Instruct District's Representative in maintenance procedures.

SECTION 08 36 13 - SECTIONAL DOORS

1. Section Includes: Electrically operated glazed aluminum sectional overhead door.

2. Acceptable Manufacturers: C.H.I. Overhead Doors, “3295 Aluminum Full-View Doors”; Raynor, or equal.

3. Door Section
   a. Construct door sections with extruded aluminum shapes, complying with ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, with wall thickness not less than 0.065-inch for door section 2 inches deep, with tongue and groove rail frame.
   b. Fabricate sections with stile and rail dimensions and profiles shown. Join stiles and rails by welding or with concealed, 1/4-inch minimum diameter, aluminum or nonmagnetic stainless steel through bolts, full height of door section. Form meeting rails to provide a weathertight seal joint. Provide reinforcement for hardware attachment.
      1) Dimensions: As indicated.
      2) End Stiles, Bottom Rail and Top Rail: 4 inch face width.
      3) Center Stiles and Intermediate Rails: 2 inch face width.
      4) Aluminum Finish: Custom color, as selected by the Architect.

4. Glazing: Provide 1/8-inch polycarbonate glazing in accordance with manufacturer's installation requirements. Set with silicone sealant and plastic glazing strips.

5. Exhaust Ports: Aluminum, with hinged cover.

6. Tracks, Supports and Accessories
   a. Tracks: Provide manufacturer's standard, galvanized steel track system, sized for door size and weight, and designed for clearances shown. Provide complete track assembly including brackets, bracing and reinforcing for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track at 2 inches on center for door-drop safety device. Slope tracks at proper angle from vertical, or otherwise design to ensure tight closure at jambs when door unit is closed. Weld or bolt to track supports.
   b. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members. Secure, reinforce and support tracks as required for size and weight of door to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
   c. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling tracks) with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.
   d. Weather Seals: Provide continuous rubber, neoprene, or flexible vinyl adjustable weatherstrip gasket at tops and compressible astragal on bottoms of overhead door.

7. Hardware
   a. General: Provide heavy-duty, rust-resistant hardware, with galvanized or cadmium-plated or stainless steel fasteners, to suit type of door.
   b. Hinges: Provide heavy steel hinges at each end stile and at each intermediate stile, per manufacturer's recommendations for size of door. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet in width, unless otherwise recommended by door manufacturer.
   c. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide case hardened steel roller tires to suit size of track (3 inch diameter for 3 inch track; 2 inch diameter for 2 inch track).
   d. Provide Schlage "IC Core" key switch for each door on interior only.

8. Counterbalancing Mechanism
   a. Torsion Spring: Operation by torsion spring counterbalance mechanism, consisting of adjustable tension, tempered steel torsion springs mounted on a cross header tube or steel shaft. Connect to door with galvanized aircraft-type lift cables. Provide springs calibrated for 10,000 cycles minimum.
   b. Provide cast aluminum or grey iron casting cable drums, grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide 1 additional midpoint bracket for shafts up to 16 feet long and 2 additional brackets at one-third points to support shafts over 16 feet long, unless closer spacing recommended by door manufacturer.
   c. Include a spring-loaded, steel or bronze cam mounted to bottom door roller assembly on each side, designed to automatically stop door if either cable breaks.
   d. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

9. Electric Door Operator
   a. General: Furnish electric door operator assembly of size and capacity recommended and provided by door manufacturer; complete with electric motor and factory prewired motor controls, gear reduction unit, solenoid-operated brake, clutch, and control devices. Provide unit with light that activates upon start-up of door and remains on 30 seconds after the door is fully raised or fully lowered.

b. Provide hand operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation. Include interlock device to automatically prevent motor from operating when emergency sprocket is engaged.
c. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
d. Door Operator Type
    1) Trolley or drawbar type, V-belt and roller chain and sprocket primary drive, and chain and sprocket secondary drive.
e. Electric Motors: Provide high starting torque, reversible, constant-duty, Class A insulated electric motors with overload protection, sized to move door in either direction, from any position, at not less than 2/3 foot per second or more than 1 foot per second.
    1) Coordinate wiring requirements and current characteristics of motors with building electrical system.
    2) Provide open-drip-proof type motor, and controller with NEMA Type 1 enclosure.
f. Automatic Reversing Control: Furnish door with automatic safety switch, extending full width of door bottom, and located within neoprene or rubber astragal mounted to bottom door rail. Contact with switch will immediately reverse downward door travel. Furnish manufacturer's standard take-up reel or self-coiling cable. Ensure no exposed wires.
    1) Provide electrically actuated automatic bottom bar.

10. Installation
    a. Do not begin installation until openings have been properly prepared. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
    b. Clean surfaces thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
    c. Install overhead doors and track in accordance with approved shop drawings and the manufacturer's printed instructions. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
    d. Anchor assembly to wall construction and building framing without distortion or stress. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
    e. Fit and align door assembly including hardware. Adjust door assembly to smooth operation and in full contact with weatherstripping.
    f. Clean doors, frames, and glass. Remove temporary labels and visible markings.
    g. Do not permit construction traffic through overhead door openings after adjustment and cleaning. Protect installed products until completion of project.
    h. Touch-up damaged coatings and finishes and repair minor damage before Substantial Completion.

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS

1. Section Includes: Aluminum storefronts and entrances.

2. Warranty: Submit a written warranty, executed by the manufacturer, agreeing to repair or replace units that fail in materials or workmanship within 2 years after the date of Final Completion. Failures include, but are not necessarily limited to.
    a. Structural failures including excessive deflection, excessive leakage or air infiltration.
    b. Faulty operation.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

3. Acceptable Manufacturers: Kawneer Company, Inc.; Vistawall, or equal.

4. Materials
   a. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with the requirements of standards indicated below.
      1) Sheet and Plate: ASTM B209.
      2) Extruded Bars, Rods, Shapes, and Tubes: ASTM B221.
   b. Steel Reinforcement: Complying with ASTM A36 for structural shapes, plates, and bars; ASTM A1008 for cold-rolled sheet and strip; or ASTM A1011 for hot-rolled sheet and strip.
   c. Glazing: Conform to CBC, Chapter 10, Egress Requirements and CBC 2406, Safety Glazing; as specified in Section 08 80 00.
   d. Glazing Gaskets: Manufacturer's standard pressure-glazing system of black, resilient glazing gaskets, setting blocks, and shims or spacers, fabricated from an elastomer of type and in hardness recommended by system and gasket manufacturer to comply with system performance requirements. Provide gasket assemblies that have corners sealed with sealant recommended by gasket manufacturer.
   e. Sealants and Joint Fillers for Joints at Perimeter of Storefront Systems: As specified in Section 07 92 00.
   f. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC Paint 12 requirements, except containing no asbestos, formulated for 30-mil thickness per coat.
   g. Brackets and Reinforcements: Provide manufacturer's standard brackets and reinforcements that are compatible with adjacent materials. Provide nonstaining, nonferrous shims for aligning system components.
   h. Fasteners and Accessories: Manufacturer's standard corrosion resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
      1) Reinforce members as required to retain fastener threads.
   i. Concrete Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.
   j. Concealed Flashing: Manufacturer's standard corrosion resistant, nonstaining, nonbleeding flashing, compatible with adjacent materials, and of type recommended by manufacturer.
   k. Hardware: Conform to CBC Chapter 11 requirements for operation and opening force.
      1) Exit Devices: As manufactured by Von Duprin, "99 Series". District Standard; no known equal.
      2) Hinges: Continuous; District Standard.
      3) Access Control System: Compatible with District standards at exterior entry doors. Doors with access control hardware to have Schlage, "Primus FP", 6-pin cylinders, in accordance with District and College of San Mateo Standards.
      4) Weatherstrip: All doors to meet California Energy Efficiency Standards of Residential and Non-Residential Buildings, Title 24, Part 6.

5. Fabrication
   a. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
      1) Fabricate components for screw-spline frame construction.
   b. Forming: Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
   c. Prepare components to receive concealed fasteners and anchor and connection devices. No "through-bolting" will be accepted.
   d. Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
   e. Glazing Channels: Provide minimum clearances for thickness and type of glass indicated according to GANA's "Glazing Manual".

f. Storefront: Fabricate framing in profiles as indicated on final Drawings for flush glazing (without projecting stops). Provide subframes and reinforcing of types indicated or, if not indicated, as required for a complete system. Factory assemble components to greatest extent possible. Disassemble components only as necessary for shipment and installation.

g. Entrances: Fabricate entrance framing in manufacturer's standards and required thickness for structural conditions. Reinforce as required to support imposed loads. Factory assemble entrance door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill, and tap for factory-installed hardware before finishing components.
   1) Exterior Entrance Doors: Provide compression weatherstripping at fixed stops. At other locations, provide sliding weatherstripping retained in adjustable strip mortised into door edge.
   2) Stile Width: Provide door stile width to accommodate District Standard entrance hardware and access control systems.

6. Aluminum Finish
   a. General: Comply with NAAMM's MFM for recommendations relative to finish applications and designations.
   b. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
   c. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
      1) Color: Dark bronze.

7. Examine areas with the installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of storefront system. Do not proceed with installation until unsatisfactory conditions are corrected.

8. Installation
   a. General: Comply with manufacturer's written instructions for protecting, handling, and installing storefront, entrance systems and breakforms. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.
   b. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete, protect against corrosion by painting contact surfaces with bituminous paint.
   c. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.
   d. Set continuous sill members and flashing in a full sealant bed to provide weathertight construction, unless otherwise indicated. Comply with requirements of Section 07 92 00.
   e. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.
   f. Install entrances plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.
      1) Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
   g. Protection of Dissimilar Metals: As specified in Section 05 50 00.
   h. Install glazing to comply with requirements of Section 08 80 00.
   i. Install perimeter sealant to comply with requirements of Section 07 92 00.

j. Erection Tolerances: Install storefront system to comply with the following maximum tolerances.
   1) Variation from Plane: Limit variation from plane or location shown to 1/8-inch in 12 feet; 1/4-inch over total length.
   2) Diagonal Measurements: Limit difference between diagonal measurements to 1/8-inch.

k. Remove excess sealant and glazing compounds, and dirt from surfaces.

SECTION 08 71 00 - DOOR HARDWARE

1. Section Includes: Items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed.

2. This Section includes the following, but is not necessarily limited to:
   a. Door Hardware, including electric hardware.
   b. Storefront and Entrance door hardware.
   c. Gate Hardware.
   d. Digital keypad access control devices.
   e. Hold-open closers with smoke detectors.
   f. Wall or floor-mounted electromagnetic hold-open devices.
   g. Power supplies for electric hardware.
   h. Low-energy door operators plus sensors and actuators.
   i. Thresholds, gasketing and weather-stripping.
   j. Door silencers or mutes.

3. Obtain each type of hardware (latch and lock sets, hinges, closers, exit devices, etc.) from a single manufacturer.

4. Qualifications
   a. Supplier: A recognized architectural door hardware supplier, with warehousing facilities in the project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this project and that employs an experienced architectural hardware consultant (AHC) who is available to the District, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
      1) Responsible for detailing, scheduling and ordering of finish hardware.
      2) Stock parts for products supplied and be capable of repairing and replacing hardware items found defective within warranty periods.
   b. Hardware Installer: Company specializing in the installation of commercial door hardware with five years documented experience.

5. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and tested by UL or Warnock Hersey for given type/size opening and degree of label. Provide proper latching hardware, door closers, approved-bearing hinges and seals whether listed in the Hardware Schedule or not.
   a. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors' UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware"), provide UL label on exit devices indicating "Fire Exit Hardware".

6. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.

7. Warranty: Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
   a. Locksets: 7 years.
   b. Closers: 10 years, except electronic closers shall be 2 years.
   c. Exit Devices: 3 years.
   d. All Other Hardware: 2 years.

8. MANUFACTURERS

	Item	Manufacturer	Acceptable Substitutes
a.	Hinges	Ives	Hager, Stanley, McKinney
b.	Locks, Latches and Cylinders	Schlage	None
c.	Exit Devices	Von Duprin	None
d.	Closers	LCN	None
e.	Push, Pulls, and Protection Plates	Ives	Trimco, BBW, Quality
f.	Flush Bolts	Ives	Trimco, BBW, Quality
g.	Dust Proof Strikes	Ives	Trimco, BBW, Quality
h.	Coordinators	Ives	Trimco, BBW, Quality
i.	Stops	Ives	Trimco, BBW, Quality
j.	Overhead Stops	Glynn-Johnson	None
k.	Thresholds	National Guard	Pemko, Zero
l.	Seals and Bottoms	National Guard	Pemko, Zero
m.	Continuous Hinge	Ives	Select

9. Hinges: Exterior out-swinging door butts shall be non-ferrous material and shall have stainless steel hinge pins. All doors to have non-rising pins.
   a. Hinges shall be sized in accordance with the following:
      1) Height:
         a) Doors up to 41 Inches Wide: 4-1/2 inches.
         b) Doors 42 Inches to 48 Inches Wide: 5 inches.
      2) Width: Sufficient to clear frame and trim when door swings 180 degrees.
      3) Number of Hinges: Furnish 3 hinges per leaf to 7 feet-5 inches in height. Add one for each additional 2 feet in height.
   b. Furnish non-removable pins (NRP) at all exterior out-swing doors and interior key lock doors with reverse bevels.
   c. Continuous Hinges are to be used at all FRP doors, exterior Aluminum Storefront doors, and all locations with heavy use as determined by the District.

10. Pivots: High strength forgings and castings with precision bearings for smooth operation. Positive locking vertical adjustment mechanism to allow installer to precisely position the door and balance the load.

11. Continuous Hinges: As manufactured by Ives, an Ingersoll-Rand Company. UL rated as required.

12. Heavy Duty Cylindrical Locks and Latches: Schlage "ND" Series as scheduled with "Sparta" design fastened with through-bolts and threaded chassis hubs. All locks to have I.C. cores.
   a. Locksets to comply with ANSI A156.2, Series 4000, Grade 1; tested to exceed 3,000,000 cycles. Locksets shall meet ANSI A117.1, Accessible Code.
   b. Chassis: One piece modular assembly and multi-functional allowing function interchange without disassembly of lockset.
   c. Spindle shall be deep-draw manufactured not stamped. Spindle and spring cage to be one-piece integrated assembly.
   d. Anti-rotation plate to be interlocking to the lock chassis. Lock design utilizing bit-tabs are not acceptable.
   e. Lever Trim: Accessible design, bi-directional, independent assemblies.

f. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.
g. Thru-bolts to secure anti-rotation plate without sheer line. Fully threaded thru-bolts are not acceptable.
h. Spring cage to have double compression springs. Manufacturers utilizing torsion springs are not acceptable.
i. Latchbolt to be steel with minimum 1/2-inch throw deadlatch on keyed and exterior functions; 3/4-inch throw anti-friction latchbolt on pairs of doors.
j. Strikes: ANSI curved lip,1-1/4 inches by 4-7/8 inches, with 1 inch deep dust box (K510-066). Lips shall be of sufficient length to clear trim and protect clothing.

13. Exit Devices: Von Duprin as scheduled.
a. Provide certificate by independent testing laboratory that device has completed over 1,000,000 cycles and can still meet ANSI/BHMA A156.3 - 2001 standards.
b. All internal parts shall be of cold-rolled steel with zinc dichromate coating.
c. Mechanism case shall have an average thickness of 0.140-inch.
d. Compression spring engineering.
e. Non-handed basic device design with center case interchangeable with all functions.
f. All devices shall have quiet return fluid dampeners.
g. All latchbolts shall be deadlocking with 3/4-inch throw and have a self-lubricating coating to reduce friction and wear.
h. Device shall bear UL label for fire and or panic as may be required.
i. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.
j. Lever Trim: “Breakaway” design, forged brass or bronze escutcheon with a minimum of 0.130 inch thickness, match lockset lever design.
k. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key.
l. Furnish glass bead kits for vision lites where required.
m. All exit devices to be sex-bolted to the doors.
n. Panic hardware shall comply with CBC Section 1008.1.9 and shall be mounted between 30 inches and 44 inches above the finished floor surface. The unlatching force shall not exceed 5 pounds applied in the direction of travel. Where doors are indicated to be fire rated, the opening force may be increased in order to achieve positive latching, but shall not exceed 15 pounds applied in the direction of travel.

14. Closers: LCN as scheduled. Place closers inside building, stairs, room, etc.
a. Door closer cylinders shall be of high strength cast iron construction with double heat treated pinion shaft to provide low wear operating capabilities of internal parts throughout the life of the installation. All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
b. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16-inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
c. All parallel arm closers shall incorporate one piece solid forged steel arms with bronze bushings. 1-9/16 inch steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for strength, durability, and aesthetics for versatility of trim accommodation, high strength and long life.
d. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
e. Closers shall be installed to permit doors to swing 180 degrees.

f. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees Fahrenheit to minus 30 degrees Fahrenheit without requiring seasonal adjustment of closer speed to properly close the door.
g. Provide the manufacturer's drop plates, brackets and spacers as required at narrow head rails and special frame conditions. No wood plates or spacers will be allowed.
h. Maximum effort to operate closers shall not exceed 5 pounds, such pull or push effort being applied at right angles to hinged doors. Compensating devices or automatic door operators may be utilized to meet the above standards. When fire doors are required, the maximum effort to operate the closer may be increased but shall not exceed 15 lbs. when specifically approved by fire marshal. All closers shall be adjusted to operate with the minimum amount of opening force and still close and latch the door. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. Door shall take at least 5 seconds to move from an open position of 70 degrees to a point of 3 inches from the latch jamb. Reference CBC Sections 1133B.2.5 and 1133B2.5.1.
i. Provide sex-bolted or through bolt mounting for all door closers.

15. Flush Bolts and Dust Proof Strikes: Automatic Flush Bolts shall be of the low operating force design. Utilize the top bolt only model for interior doors where applicable and as permitted by testing procedures.
    a. Manual flush bolts only permitted on storage or mechanical openings as scheduled.
    b. Provide dust proof strikes at openings using bottom bolts.

16. Door Stops
    a. Unless otherwise noted in Hardware Sets, provide floor type stops with appropriate fasteners.
    b. Do not install floor stops more than 4 inches from the face of the wall or partition (CBC Section 1133B.8.6).
    c. Overhead stops shall be made of stainless steel and non-plastic mechanisms and finished metal end caps. Field-changeable hold-open, friction and stop-only functions.

17. Protection Plates: Fabricate either kick, armor, or mop plates with four beveled edges. Provide kick plates 10 inches high and 2 inches LDW. Sizes of armor and mop plates shall be listed in the Hardware Schedule. Furnish with machine or wood screws of bronze or stainless to match other hardware.

18. Thresholds: As Scheduled and per details.
    a. Thresholds shall not exceed 1/2-inch in height, with a beveled surface of 1:2 maximum slope.
    b. Set thresholds in a full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection".
    c. Use 1/4-inch fasteners, red-head flat-head sleeve anchors (SS/FHSL).
    d. Thresholds shall comply with CBC Section 1133B.2.4.1.

19. Seals: Provide silicone gasket at all rated and exterior doors.
    a. Fire-rated Doors, Resilient Seals: UL10C Classified, Category "J" listed seals complying with NFPA 80 and NFPA 252 Standards. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements.
    b. Fire-Rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Category "G" furnish fire-labeled opening assembly complete and in full compliance with NFPA 252. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required.
    c. Smoke and Draft Control Doors: Provide Category "H" listed seals complying with NFPA 105 for use on "S" labeled Positive Pressure door assemblies.

20. Door Shoes and Door Top Caps: Provide door shoes at all exterior wood doors and top caps at all exterior out-swing doors. Top caps are to be provided by door manufacturer.

21. Silencers: Furnish silencers for interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where sound or light seals occur, or for fire-resistive rated door assemblies.

22. Keying
    a. This is an existing Schlage keying system. All permanent cores and/or cylinders are keyed by the District. Furnish all permanent Primus FP cores '0' Bitted and all permanent Classic F cores '1' Bitted. The District is to verify the Schlage Primus FP Level 3 and existing Classic F Keyway locations.
    b. Provide construction keying for doors requiring locking during construction; remove temporary cores immediately prior to District occupancy. Permanent cores and keys are to be shipped directly from the factory to the District.
    c. Keys: Supply keys and blanks as follows:
        1) Supply 2 each FP ('0' Bitted) or F ('1' Bitted) change keys per lock.
        2) Supply 2 Cut Construction Control keys and 2 Permanent Cut Control keys.

23. Finishes
    a. Generally to be satin chrome at interior US 26D (626 on brass and 652 on steel) unless otherwise noted.
    b. Furnish push plates, pull plates and kick or armor plates as scheduled.
    c. Door closers shall be powder-coated to match other hardware, unless otherwise noted.
    d. Aluminum items to be finished anodized aluminum except thresholds which can be furnished as standard mill finish.

24. Fasteners
    a. Screws for strikes, face plates and similar items shall be flat head, countersunk type, provide machine screws for metal and standard wood screws for wood.
    b. Screws for butt hinges shall be flathead, countersunk, full-thread type.
    c. Fastening of closer bases or closer shoes to doors shall be by means of sex bolts and spray painted to match closer finish.
    d. Provide expansion anchors for attaching hardware items to concrete or masonry.
    e. All exposed fasteners shall have a phillips head.
    f. Finish of exposed screws to match surface finish of hardware or other adjacent work.
    g. All Exit Devices and Lock Protectors shall be fastened to the door by the means of sex bolts or through bolts.

25. Hardware Locations: Conform to CCR, Title 24, Part 2, and ADAAG for positioning requirements for the disabled.

26. Field Quality Control: Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and it's installation have been furnished and installed in accordance with manufacturer's instructions and as specified herein.

27. Schedule
    a. The items listed in the following schedule shall conform to the requirements of the foregoing specifications.
    b. The Door Schedule on the Drawings indicates which hardware set is used with each door.

Manufacturers Abbreviations (Mfr.)

IVE	=	Ives	Hinges, Pivots, Bolts, Coordinators, Dust Proof Strikes, Push Pull & Kick Plates, Door Stops & Silencers

LCN	=	LCN	Door Closers
NGP	=	National Guard Products	Thresholds, Gasketing & Weather-stripping
SCH	=	Schlage Lock Company	Locks, Latches & Cylinders
VON	=	Von Duprin	Exit Devices

SPECWORKS # 108668-B7R54JQ2M

HW SET: 01 - NOT USED

HW SET: 02 EXTERIOR / EXISTING
DOOR NUMBER:
34-V01B
EACH TO HAVE:

1	EXISTING DOOR, FRAME AND HARDWARE TO REMAIN

HW SET: 03 INTERIOR / EXISTING
DOOR NUMBER:
34-130A 34-131A 34-132A 34-133A 34-133AA 34-151B
EACH TO HAVE:

1	EXISTING DOOR, FRAME AND HARDWARE TO REMAIN

HW SET: 04 INTERIOR PAIR / EXISTING
DOOR NUMBER:
34-105A 34-151A
EACH TO HAVE:

1	EXISTING DOOR, FRAME AND HARDWARE TO REMAIN

HW SET: 05 INTERIOR PAIR / MEDIA SERVICES, ITS R&D
DOOR NUMBER:
34-134A 34-135A
EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	ENTRANCE LOCK	ND53TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4041	689	LCN
2	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
1	EA	THRESHOLD	PER DETAIL	AL	
2	EA	SILENCER	SR64	GRY	IVE

COLLEGE OF SAN MATEO
BUILDING 34 RENOVATION
SAN MATEO, CALIFORNIA

HW SET: 06 EXTERIOR PAIR / FRP DOORS / PANIC HARDWARE
DOOR NUMBER:
34-H01A
EACH TO HAVE:

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	CD9947DT	626	VON
1	EA	PANIC HARDWARE	CD9947NL	626	VON
1	EA	RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 XQ11-948 (FOR CD)	626	SCH
2	EA	SURFACE CLOSER	4041EDA	689	LCN
2	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
2	EA	FLOOR STOP & HOLDER	FS43	626	IVE
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	SET	INTERLOCK SEALS	123NA X 124A	AL	NGP
2	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL	AL	

HW SET: 06A EXTERIOR PAIR / MAIL/RECEIVING
DOOR NUMBER:
34-120A
EACH TO HAVE:

2	EA	CONTINUOUS HINGE	112HD	628	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	CLASSROOM LOCK	ND94TD SPA	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	COORDINATOR	COR X FL X MB	628	IVE
1	EA	SURFACE CLOSER	4041 HCUSH	689	LCN
1	EA	SURFACE CLOSER	4041EDA	689	LCN
2	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
1	EA	FLOOR STOP & HOLDER	FS43	626	IVE
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	SET	INTERLOCK SEALS	123NA X 124A	AL	NGP
2	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL	AL	

HW SET: 07 - NOT USED

HW SET: 08 INTERIOR PAIR / HALL / PANIC HARDWARE
DOOR NUMBER:
34-140A
EACH TO HAVE:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	CD9947DT	626	VON
1	EA	PANIC HARDWARE	CD9947NL	626	VON
1	EA	RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
2	EA	MORTISE CYLINDER	20-771 XQ11-948 (FOR CD)	626	SCH
2	EA	SURFACE CLOSER	4041EDA	689	LCN

2	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
2	EA	FLOOR STOP & HOLDER	FS41	626	IVE
1	EA	THRESHOLD	PER DETAIL	AL	
2	EA	SILENCER	SR64	GRY	IVE

HW SET: 09 INTERIOR / ITS SHIPPING
DOOR NUMBER:
34-140B
EACH TO HAVE:

3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	PANIC HARDWARE	CD99NL	626	VON
1	EA	RIM CYLINDER	20-057T X ICX (CONST CORE)	626	SCH
1	EA	PERMANENT CORE	20-740 (PRIMUS)	626	SCH
1	EA	MORTISE CYLINDER	20-771 XQ11-948 (FOR CD)	626	SCH
1	EA	SURFACE CLOSER	4041EDA	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
1	EA	FLOOR STOP & HOLDER	FS41	626	IVE
1	EA	THRESHOLD	PER DETAIL	AL	
3	EA	SILENCER	SR64	GRY	IVE

HW SET: 10 INTERIOR PAIR / EXISTING / SECURE STORAGE
DOOR NUMBER:
34-140AA
EACH TO HAVE:

2	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
			BALANCE OF HARDWARE EXISTING		

HW SET: 11 EXTERIOR / FRP DOOR
DOOR NUMBER:
34-110A
EACH TO HAVE:

1	EA	CONTINUOUS HINGE	112HD	628	IVE
1	EA	CLASSROOM LOCK	ND94TD SPA	626	SCH
1	EA	CORE ONLY	23-030	626	SCH
1	EA	SURFACE CLOSER	4041 SCUSH	689	LCN
1	EA	ARMOR PLATE	8400 34" X 2" LDW	630	IVE
1	SET	WEATHER SEAL	SUPPLY WITH DOOR AND FRAME ASSEMBLY		
1	SET	INTERLOCK SEALS	123NA X 124A	AL	NGP
1	EA	DOOR SWEEP	200NA	CL	NGP
1	EA	THRESHOLD	PER DETAIL	AL	

HW SET: 12 EXTERIOR / ROLL-UP DOOR
DOOR NUMBER:
34-110B 34-110C
EACH TO HAVE:

1	EA	MORTISE CYLINDER	20-061 W/ F KYWY (FOR KEY SWITCH)	626	SCH
1	EA	KEY SWITCH	BY DOOR SUPPLIER		

NOTE: VERIFY THE MORTISE CYLINDER WILL WORK WITH THE KEY SWITCH.

HW SET: 12A METAL COILING DOOR
DOOR NUMBER:
34-140C
EACH TO HAVE:
1 SET HARDWARE BY DOOR SUPPLIER

SECTION 08 80 00 - GLAZING

1. Section Includes: Glass and glazing of windows, doors, and interior partitions and replacement of glazing in existing windows as indicated.

2. Design Requirements
   a. Provide glass and glazing that has been produced, fabricated, and installed to withstand movement without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glass and glazing materials, and other defects in the work.
   b. Glass Design: Glass thicknesses indicated on the Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
      1) Minimum glass thickness, nominally, of lites in exterior walls is 0.23-inches.
      2) Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following: 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E1300 based on type of glass.
   c. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
      1) Temperature Change (Range): 120 degrees Fahrenheit ambient; 180 degrees Fahrenheit material surfaces.
   d. Verify locations where safety glazing is required by CBC. Bring to the Architect's attention locations not noted as such in the Drawings. Do not proceed until directed by the Architect.
   e. Provide glazing to meet STC ratings indicated.

3. Product Data: Submit manufacturer's product data for each glass product and glazing material indicated.

4. Shop Drawings: Show locations of all glass types; show all typical glazing details.

5. Regulatory Requirements
   a. Glass and glazing shall meet requirements of CBC Chapter 24.
   b. Safety Requirements: Provide glass and glazing complying with ANSI Z97.1 and CBC Chapter 24 and testing requirements of CPSC 16 CFR Part 1201 for Category II materials.
   c. Fire Resistive Glazing Products: Products identical to those tested in accordance with ASTM E2074 for doors and ASTM E2010 for window assemblies; both labeled and listed by UL.

6. Acceptable Manufacturers: Ford Glass Division; PPG Industries, Inc., or equal.

7. Glass Types
   a. Type 1 - Float Glass: ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), thickness to match existing or as recommended by manufacturer to meet load requirements.
   b. Type 2 - Float Glass: ASTM C1048, Kind FT (fully tempered) Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), thickness to match existing or as recommended by manufacturer to meet load requirements.
   c. Type 3 - Float Glass: Low-E, coated, ASTM C1036, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), thickness to match existing or as recommended by manufacturer to meet load requirements.
      1) Product: PPG, “Solarban 60”, match existing tint.
   d. Type 4 - Float Glass: Tempered, Low-E, coated, ASTM C1048, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), thickness to match existing or as recommended by manufacturer to meet load requirements.
      1) Product: PPG, “Solarban 60”, match existing tint.
   e. Type 5 - Fire Rated Monolithic Ceramic Glazing Material: Proprietary product in the form of clear flat sheets of 3/16-inch nominal thickness weighing 2.5 lb/sq. ft., unpolished on both surfaces, and as follows:
      1) Fire-Protection Rating: As indicated for the fire window in which glazing material is installed and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
      2) Product: As manufactured by Nippon Electric Glass Co., Ltd., “Standard FireLite”, and distributed by Technical Glass Products.
   f. Type 6 - Obscure Glass: ASTM C1048, Kind FT (fully tempered) Type II (patterned glass, flat), Class 1 (translucent), Forms 3 (patterned), Quality q4 (glazing), Finish f1 (patterned one side, Pattern (as selected by the Architect), thickness to match existing or as recommended by manufacturer to meet load requirements.
8. Glazing Accessories
   a. Setting Blocks, Spacers and Edge Blocks: Neoprene, EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
   b. Sealant: One part non-acid curing silicone type, as manufactured by Dow Corning Corp., “795”; General Electric Corp., “Silpruf”; Tremco, Inc., “Spectrum 2”, or equal.
   c. Glazing Tape: Provide manufacturer’s standard solvent free butyl-polyisobutylene formulation with solids content of 100 percent; in extruded tape form; non-staining and non-migrating in contact with nonporous surfaces; packaged on rolls with release paper on 1 side; with or without continuous spacer rod as recommended by manufacturers of tape and glass for application indicated.
   d. Glazing Channels: Aluminum extrusions as indicated on the Drawings to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses with reasonable tolerances. Adjust as required by Project conditions during installation.
   e. Provide glazing materials and accessories as required to replace glass in existing aluminum sash as indicated.
      1) Remove glazing compound and deteriorated glazing materials and prepare existing sash to receive new glazing.
      2) Notify the Architect of any conditions which would interfere with installationof new glazing prior to prceding.

9. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including referenced glazing standards. Install setting blocks of proper size in sill rabbet, located 1/4 of glass width from each corner, but with edge nearest corner not closer than 6 inches from corner, unless otherwise required. Set blocks in thin course of sealant that is acceptable for heel bead use.

10. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where gaskets or glazing tapes with continuous spacer rods are 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.

11. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

12. Protect exterior glass from breakage immediately upon installation by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces. Remove and replace glass which is broken, chipped, cracked, abraded, or damaged in other ways during construction period, including natural causes, accidents, and vandalism. Wash glass on both faces not more than 4 days prior to date scheduled for inspection intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

END OF DIVISION 08

DIVISION 09

FINISHES

SECTION 09 29 00 - GYPSUM BOARD

1. Section Includes: Gypsum board, screw attached to metal framing and furring members, joint treatment, and accessories.

2. Product Data: Submit manufacturer's product data, including the following:
   a. Fire Resistance Data: Include required fire test results for gypsum board systems on partitions, ceilings and columns. Correlate with supporting steel framing details.
   b. Sound Transmission Data: Include certified evidence that installed gypsum board systems and materials meet required STC levels.

3. Acceptable Manufacturer: USG, or equal.

4. Materials
   a. General
      1) Gypsum Board Facing Paper: Manufactured from 100 percent recycled newsprint including post-consumer waste.
      2) Gypsum Board: Total gypsum board installed at site will be manufactured with at least 20 percent recycled gypsum, or "synthetic gypsum".
         a) Recommendation: Install maximum content recycled or synthetic gypsum possible.
   b. Gypsum Board: Fire rated board for fire resistance rated assemblies, ASTM C1396, Type X, tapered edges, 48 inches wide, 5/8-inch thick.
   c. Tile Backer Board: Silicone treated gypsum backer board, 48 inches wide, 1/2-inch thick, unless otherwise noted, as manufactured by Georgia Pacific, "Dens-Shield Tile Backer", or equal.
   d. Corner Beads and Casing Beads: ASTM C1047, sheet steel zinc coated by hot-dip process.
   e. Joint Treatment Materials: Products of one manufacturer conforming to ASTM C475, ASTM C840, and recommendations of manufacturer of both gypsum board and joint treatment materials for application indicated.
      1) Joint Tape: Paper reinforcing tape or glass fiber mesh as recommended by setting type joint compound manufacturer.
      2) Setting Type Joint Compound: Factory prepackaged, job mixed, chemical hardening powder products formulated for uses indicated or factory premixed product.

5. Gypsum Board Finish: Joints and interior angles tape embedded in joint compound and 3 separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. A thin skim coat of joint compound, or a material manufactured especially for this purpose, shall be applied to entire surface. Surface shall be smooth and free of tool marks and ridges.
   a. Typical: GA Level 4.
   b. Areas to Receive Semi-Gloss Paint: GA Level 5.

6. Installation
   a. Install and finish gypsum board to comply with ASTM C840 or GA 216. Apply in either vertical or horizontal direction with ends and edges falling on supports. In vertical applications, gypsum board shall be of length required to reach full height of vertical surfaces in one continuous piece. Position boards so that like edges abut, tapered edges against tapered edges, and field cut ends against field cut ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite

sides of partitions. Attach gypsum board to framing with screws, lengths and sizes as recommended by manufacturer and in accordance with CBC.

b. Install corner beads at vertical and horizontal external corners, and whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound. After accessories are installed, correct surface damage and defects.

c. Apply joint treatment at gypsum board joints; flanges of corner bead, edge trim and penetrations, fastener heads, and surface defects. Apply joint tape at joints between gypsum boards.

SECTION 09 90 00 - PAINTING AND COATING

1. Section Includes: Surface preparation, painting, and finishing of exposed designated exterior and interior items and surfaces.

2. Submittals
   a. Product Data: Submit manufacturer's technical product data information, stating the material composition and analysis and the Material Safety Data Sheet (MSDS) on all paint to be used.
   b. Samples: Following the selection of colors and glosses by the Architect, submit samples for the Architect's review.
      1) Provide 3 samples of each color and each gloss for each material on which the finish is specified to be applied.
      2) Make samples approximately 8 inches by 10 inches in size.
      3) If so directed by the Architect, provide field mock-ups during progress of the Work in the form of actual application of the materials on actual surfaces to be painted for approval by the Architect. Areas shall be 10 feet by 10 feet.
      4) Do not commence finish painting until samples are approved.

3. Exterior Paint Materials
   a. Refer to SMCCCD Design Standard Exterior Paint Guideline, Version 5.2010.04.09.
   b. Pursuant to Section 3400 of the Public Contract: Kelly-Moore Paints, Rustoleum Paints and Tnemec Paints are now in use on the particular public improvement described as San Mateo County Community College District. At each instance in these Specifications that a designated material, product, thing or service is designated by the brand names "Kelly-Moore" or "Rustoleum" or "Tnemec", "Kelly-Moore", "Rustoleum" or "Tnemec" are designated to support the existing painting systems that are in place at College of San Mateo. The Contractor will furnish and apply only "Kelly-Moore" and/or "Rustoleum" and/or "Tnemec" paints and coatings as required, and no substitutions shall be deemed to be "or equal" or allowed.
   c. SMCCCD has standardized on latex (water based) paints for the outdoor environment.
   d. SMCCCD has standardized on elastomeric wall coatings for its masonry buildings.
   e. Colors: Refer to Appendix B to the SMCCCD Exterior Paint Design Standard for the College of San Mateo Exterior Paints Color Palette at the end of this Section.

4. Interior Paint Materials
   a. Refer to SMCCCD Design Standard Interior Paint, Version 5.2009.11.17.
   b. Pursuant to Section 3400 of the Public Contract: Kelly-Moore Paints are now in use on the particular public improvement described as San Mateo County Community College District. At each instance in these Specifications that a designated material, product, thing or service is designated by the brand name "Kelly-Moore", "Kelly-Moore" is designated to support the existing painting systems that are in place at College of San Mateo. The Contractor will furnish and apply only "Kelly-Moore" paints and coatings as required, and no substitutions shall be deemed to be "or equal" or allowed.
   c. SMCCCD has standardized on latex (water based) paints for the indoor environment.

d. Colors: Refer to Appendix B to the SMCCCD Interior Paint Design Standard for the College of San Mateo Interior Paints Color Palette at the end of this Division.

5. SMCCCD Exterior Paint Application Guidelines
   a. For ease of initial and touch-up painting, mid-plane color changes are not allowed. Wall paint shall be applied across one wall plane, corner-to-corner, or at an architectural "breakpoint" such as a change in material or architectural trim.
   b. Door jambs shall be one color only, for ease of initial and touch-up painting and for the cleanest overall aesthetic.
   c. The majority of SMCCCD's buildings require masonry paint, because the exterior skins are concrete or plaster.
      1) For College of San Mateo, the standard masonry paint to be used is 1128 Kel-Seal 100% Acrylic Elastomeric Coating. This is a 100 percent acrylic, smooth elastomeric coating that features excellent weather resistance, waterproofing, durability, excellent film strength, elasticity, 300 percent elongation, bridging of hairline cracks for prevention of moisture penetration, chalk resistant properties and cleans up with water. This paint is designated for concrete, concrete block, stucco and masonry surfaces and is self-priming on cured concrete and stucco. This paint conforms to Green Seal Paints GS-11 Criteria.
      2) These elastomeric coatings are suitable for incidental use on adjacent metal and wood surfaces that should be painted the same color as the building field.
      3) Apply the same color semi-gloss paint on top of the final layer of elastomeric paint on lower exterior walls in circulation areas, as a cleanable, sacrificial wear layer.
      4) Paint door trim in the adjacent building wall color or in the bronzetone color listed in Appendix B to the SMCCCD Exterior Paint Design Standard for the College of San Mateo Exterior Paints Color Palette at the end of this Division.

6. SMCCCD Interior Paint Application Guidelines
   a. For ease of initial and touch-up painting, mid-plane color changes are not allowed. Wall paint shall be applied across one wall plane, corner-to-corner and floor-to-ceiling, or at an architectural "breakpoint" such as chair rail or other trim.
   b. Door jambs shall be one color only, for ease of initial and touch-up painting and for the cleanest overall aesthetic.
   c. In a renovation project with existing acoustic surface-mounted tiles that are aesthetically damaged, and if the project's budget cannot support tile replacement, the design professional should consider painting the tile with acoustic paint. Acoustic paint is designed for use on acoustic ceiling tile; the paint covers without impairing the tile's acoustic qualities. It can be applied with a roller, but a paint sprayer is more efficient and less likely to affect the sound-deadening properties of the tile.
   d. The standard finish applied to classrooms, corridors, and other non-wet areas is eggshell. All palette colors may be specified in eggshell (Bone White and all accent colors).
      1) For areas where the design professional is specifying the use of eggshell paint finishes, the design professional shall also specify a level 4 smooth drywall finish.
   e. The standard finish applied to custodial closets, mechanical/electrical/data rooms, restrooms, science labs and other wet areas is semi-gloss, in Bone White color only. (Accent colors are not to be specified in semi-gloss).
      1) For areas where the design professional is specifying the use of semi-gloss paint finishes, the design professional shall also specify a level 5 smooth drywall finish.

7. Surface Preparation, Painting and Finishing, General
   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. 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.
   b. Mix and prepare paint materials and perform preparation and cleaning procedures in strict accordance with the manufacturers' recommendations. Remove removable items

that are in place and are not scheduled to receive paint finish; or provide surface applied protection prior to surface preparation and painting operations. Following completion of painting in each space or area, reinstall the removed items.

c. Clean each surface to be painted prior to applying paint or surface treatment. Remove oil and grease with clean cloths and cleaning solvent of low toxicity and flash point in excess of 200 degrees Fahrenheit prior to start of mechanical cleaning. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.

d. Clean wood surfaces until free from dirt, oil, and other foreign substance. Smooth finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface. Unless specifically approved by the Architect, do not proceed with painting of wood surfaces until the moisture content of the wood is 12 percent or less as measured by a moisture meter approved by the Architect. Back prime concealed wood surfaces.

e. Thoroughly clean metal surfaces until free from dirt, oil and grease. On galvanized surfaces, use solvent for the initial cleaning, and then treat the surface thoroughly with the phosphoric acid etch. Remove etching solution completely before proceeding. Allow to dry thoroughly before application of paint.

f. Touch-up shop-applied prime coats which have been damaged, and touch-up bare areas prior to start of finish coats application. Slightly vary the color of succeeding coats. Do not apply additional coats until the completed coat has been inspected and approved. Only the inspected and approved coats of paint will be considered in determining the number of coats applied. Sand and dust between coats to remove defects visible to the unaided eye from a distance of 5 feet.

g. Allow sufficient drying time between coats, modifying the period as recommended by the material manufacturer to suit adverse weather conditions.

h. Brush out and work the brush coats onto the surface in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable. 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.

SECTION 09 97 25 - VAPOR EMISSION TREATMENT SYSTEMS

1. Section Includes: Vapor control barrier applied to new and existing interior areas scheduled to receive moisture sensitive floor coverings not limited to carpet, carpet tiles, and linoleum.
   a. Provide only at areas where moisture emission exceeds allowable limits.

2. Examine substrate conditions and finishes for compliance with requirements, including flatness.

3. Review temporary protection requirements for carpet during and after installation.

4. Acceptable Manufacturers: Floor Seal Technology, Inc.; Dupont Flooring Systems, or equal.

5. Materials
   a. Vapor/Alkalinity Barrier: 36 percent modified based resin based penetrating barrier, containing specifically formulated chemicals and resins to saturate slab surfaces seamless vapor/alkali barrier to protect floor coverings from damage.
   b. Materials containing water based solutions of sodium, potassium and lithium silicates do not meet performance levels specified in this Specification. Silicate based solutions are chemically reactive and do not meet the intent of ASTM C309. See ASTM documents for verification.

6. Site Verification of Conditions: Verify that sub-slab vapor retarder meets ASTM E1745 Class A; the concrete water-to-cement ratio maximum of 0.45; sub soil over vapor retarder is not rained on or saturated, and concrete is not poured during a day of rain.

7. Coordinate work with work specified under other Sections to ensure proper and adequate interface of work. Protect all adjacent surfaces from drips, spray, air pollution of surrounding environment, and other damage from work.

8. Concrete Substrates: Apply when concrete is not marred by walking workman. Freshly poured concrete shall be free of surface contaminates, rain and other sealing/curing materials.

9. Application
   a. Note: Application specified is based on Floor Seal Technology, Inc. system.
   b. Apply material in accordance with manufacturer's requirements and instructions.
   c. Apply material to produce a uniform, monolithic wearing surface.
   d. Coordinate application of components to provide optimum adhesion to substrate.
   e. Apply system coat(s) in thickness to achieve maximum performance.
   f. Barrier Application: Coverage rate for system shall be based on the surface texture and porosity of the substrates. Maximum cure time is 12 hours. Allow walking traffic in 4 hours.

10. Inspection
    a. Validation Testing: Perform post installation testing at 1 calcium chloride test per 1,000 square feet. Interior temperature and humidity to be similar during the District's occupancy.
    b. Reapply materials in areas above flooring manufacturer's limits, prior to floor covering installations at no additional charge to the District.

11. Protect installations during specified cure periods from any kind of traffic, topical water, and contaminants.

END OF DIVISION 09

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Appendix B to Exterior Paint Design Standard

College of San Mateo Exterior Paints Color Palette

Exterior Paint for All Buildings except Athletic Facilities @ Field Level						
color description	**color name**	**Kelly-Moore Control #**	**product**	**sheen**	**notes**	**Formula**
beige	Malibu Beige	KM# 216	1128-100 Kel-Seal Terpolymer	flat elastomeric	for building wall & colonnade ceilings (masonry surfaces)	Standard KM color
beige	Malibu Beige	KM# 216	1250-121 Acry-Shield	semi-gloss	Applied on top of elastomeric paint on lower exterior walls in circulation areas, for cleanable wear layer. Also for metal/wood surfaces adjacent to building wall & colonnade ceilings.	Standard KM color
white	Acoustic White	05-1200-1112	1240-121 Acry-Shield	flat	for roof overhangs	(C25)(L2)(Y34)
creamy white	Swiss Coffee	05-1201-1112	1128-100 Kel-Seal Terpolymer	flat elastomeric	for building columns & roof fascia (masonry surfaces); matches Parex stucco color " Marble White"	(C¼)(L¾)
creamy white	Swiss Coffee	KM# 23	1250-23 Acry-Shield	semi-gloss	for metal/wood adjacent to bldg columns & roof fascia	Standard KM color
light brownish beige	Glen Abbey	05-922-1112	1128-100 Kel-Seal Terpolymer	flat elastomeric	for lowest floor of building walls below a certain datum line (i.e., the pedestal of the building) (masonry surfaces)	(B25)(I 15)(C22)
light brownish beige	Glen Abbey	KM# 3957-2	1250-222 Acry-Shield	semi-gloss	to match Glen Abbey paint color on metal/wood surfaces	Standard KM color
dark brownish beige	Earthstone	KM# 3972-2	1128-220 Kel-Seal Terpolymer	flat elastomeric	matches Parex stucco color "Brushwood" (the medium stucco color on B10)	Standard KM color
wet concrete	Greyswood	KM# 3958-3	1128-330 Kel-Seal Terpolymer	flat elastomeric	matches Parex stucco color "Fair Field Stone" (the darkest stucco color on the lowest part of B10 and B5)	Standard KM color
gray green	Khaki Green	05-2090-1112	1128-220 Kel-Seal Terpolymer	flat elastomeric	accent color (masonry surfaces)	(BY44)(CY23)(I6½)(L16)
medium orange	Terra Cotta	05-2086-1112	1128-330 Kel-Seal Terpolymer	flat elastomeric	accent color (masonry surfaces)	(B2½)(C2Y2)(I 12½) (F12½)(T12)
golden yellow	Full Sun	KM# 168	1128-220 Kel-Seal Terpolymer	flat elastomeric	accent color (masonry surfaces)	Standard KM color
dark brown	Bronzetone	Rustoleum	5275402	semi-gloss	interior/exterior door trim, other metal surfaces as approved	Standard Rustoleum color
medium grey	46GR Sinker	Tnemec Company Inc.	StrataShield	satin	Applied on structural steel posts for rooftop screen at Building 5. V69F high build epoxoline topcoat also applied, in satin finish.	Standard Tenemec color

Exterior Paint for Athletic Facilities @ Field Level						
dark green	Essex Green	07-2318-1102	1250-149 Acry-Shield	semi-gloss	building color	(B3Y)(DY)(F4)(T8)
dark green	Essex Green	05-1888-1112	1245-149 Acry-Shield	low-sheen	building color	(B3Y)(DY)(F4)(T8)
medium gray	Metro Gray	KM# 75	1700-333 Kel-Guard	semi-gloss	door color	Standard KM color
gold	ME 660 Pharoah's Gold	Modern Masters Metallic Paint Collection™	n/a	Semi opaque	Gold lettering on Bulldog Softball, Bulldog Baseball, and Bulldog Aquatics signage on black iron gates	n/a

End of Appendix B of Exterior Paint Design Standard

Appendix B to Interior Paint Design Standard

College of San Mateo Interior Paints Color Palette

Interior Paint for All Buildings						
color description	**color name**	**Kelly-Moore Control #**	**product**	**sheen**	**notes**	**Formula**
white	Bone	KM# OW27	1685-121 Dura-Poxy+	semi-gloss	ubiquitous wall color	(C10)(L35)
white	Bone	KM# OW27	1686-121 Dura-Poxy+	eggshell	ubiquitous wall color	(C10)(L35)
light beige	Graystone	KM# 230	1686-222 Dura-Poxy+	eggshell	accent color	Standard KM color
medium beige	Charro	KM# 228	1686-333 Dura-Poxy+	eggshell	accent color	Standard KM color
medium purple	Wisteria	05-904-1112	1686-333 Dura-Poxy+	eggshell	accent color	(B44)(F12)
light purple	Purple Mountain	05-1673-1112	1686-333 Dura-Poxy+	eggshell	accent color	(B34)(F2)(M2)
light blue	Robin's Egg Blue	05-1708-1112	1686-222 Dura-Poxy+	eggshell	accent color	(B40)(C6)(D6)(E6)
diamond white	Diamond White	KM# OW224-1	1686-121 Dura-Poxy+	eggshell	accent color	Standard KM color
crisp white	Apple White	KM# OW206-1	1686-121 Dura-Poxy+	eggshell	accent color	Standard KM color
dusty orange	Ritzy	KM# HL4242-3	1686-333 Dura-Poxy+	eggshell	accent color	Standard KM color
dusty yellow	Creased Khaki	KM# 3533-2	1686-222 Dura-Poxy+	eggshell	accent color	Standard KM color

avocado green	Mossy Log	KM# 3413-2	1686-222 Dura-Poxy+	eggshell	accent color	Standard KM color
milk chocolate	Cameroon Bay	KM# 4199-3	1686-333 Dura-Poxy+	eggshell	accent color	Standard KM color
almost black	Dark Sky	09-0837-0312	1272-555 ColorMax	flat	Color used for visible interstitial spaces (e.g., above Building 5 wood slat ceiling) or where a very dark ceiling is desired (e.g., Building 5 San Mateo Fitness Center ceiling)	(E2Y10)(M3Y46) (L4Y44)(KX36)
dark brown	Vermeer's Fields	KM# AC251-5	1276-555 ColorMax	eggshell	accent color	Standard KM color
dark brown	Bronzetone	Rustoleum	5275402	semi-gloss	semi-gloss color to match architectural bronze mullions	Standard Rustoleum color
Additional Interior Paint for Athletic Facilities						
medium blue	Sea of Cortez	KM# 73	1685-333 Dura-Poxy+	semi-gloss	accent color	Standard KM color
dark blue	Bulldog Blue	Sierra Performance Epoxy Paint			accent color	National Blue Activator #208106
dark blue	Bulldog Blue	Rustoleum	5227	semi-gloss	interior/exterior door trim, other metal surfaces as approved	Standard Rustoleum color
gray	Bulldog Gray	Sierra Performance Epoxy Paint			accent floor color	Activator #208072

End of Appendix B of Interior Paint Design Standard

DIVISION 10

SPECIALTIES

SECTION 10 14 00 - SIGNAGE

1. Section Includes: Code required and identification signs as indicated.

2. Design Requirements
   a. Design signs as required by ADA and CBC and in compliance with applicable portions of the SMCCCD Design Standard Interior Building Informational Signage.
   b. Fabricator shall provide all necessary services, labor, materials, equipment, supervision, and products required to fabricate and install all items included in this Section.

3. Regulatory Requirements: Comply with CBC requirements for signage, to include Braille.

4. Submittals
   a. Product Data: Submit manufacturer's product data describing materials and signs.
   b. Shop Drawings
      1) Provide shop drawings showing construction details for approval before proceeding with fabrication. Include full size details of exposed edges, and any other details which would affect sign appearance.
      2) Fasteners: Detail methods of fastenings and provide exact specifications for all fasteners noted on shop drawings.
      3) Artwork: Submit full size patterns or prints of typical copy layouts and/or graphic elements to be applied on signs. Using layouts on the Drawings as a guide, optically enlarge and hand correct images before submitting to the Architect for approval before fabrication.
      4) Sign Location: Provide Graphic Schedule and location plans to identify and locate all signs. Item numbers listed in the Graphic Schedule shall be found on location plans and shall identify locations of specific sign items.
   c. Samples
      1) On 6-inch by 6-inch pieces of actual sign materials, submit to the Architect for review and approval, 3 samples of painted and graphic finishes, in each material, color, and finish, with texture to simulate actual conditions.
      2) Provide listing of the material and application for each coat of each finish sample.
      3) Be prepared to resubmit each sample as requested until required sheen, color, and texture are approved.
      4) Acrylic: Submit color and finish samples of plastics for approval before proceeding with fabrication. No substitution in color, thickness, finish, or plastics will be accepted without written approval of the Architect.
      5) Fasteners: Submit 1 sample of all fasteners and hardware for approval.
      6) Background Color: CSM Blue.
      7) Copy/Dictogram Color: 3M Scotchal Series 220, Premium Film White.
   d. Operation and Maintenance: Provide the District with proper cleaning instructions required for continued maintenance of signs.

5. Fabricator Qualifications: Fabricator shall have at least 5 years experience in the fabrication and installation of signage of scope and design similar to the required work.

6. Warranties
   a. Fabrication and installation of all items included in this Section shall be guaranteed for a period of 1 year from Final Acceptance by the District against defects in materials or workmanship.

b. All finishes shall be guaranteed for a period of 5 years from Final Acceptance by the District against fading, cracking, peeling, blistering, and other defects in materials or workmanship.
c. All vinyl sheet materials shall be warranted for a period of 5 years from Final Acceptance by the District for defects in materials or workmanship.
d. Warranties noted above shall include all required materials, labor, and associated costs to replace defective components.

7. Acceptable Manufacturers: Action Signs; Fabricators able to provide Scotch 3M3D sign systems.

8. Pursuant to Section 3400 of the Public Contract: 3M Scotchal materials are now in use on the particular public improvement described as San Mateo County Community College District. At each instance in these Specifications that a designated material, product, thing, or service is designated by the brand name 3M Scotchal, items are designated to support the existing signage system that is in place at College of San Mateo. The Contractor will furnish and apply only 3M Scotchal as required, and no substitutions shall be deemed to be "or equal" or allowed.

9. Materials: As specified in SMCCCD's Design Standard Interior Building Informational Signage, Version 2.2010.0922.

10. Fabrication
    a. Artwork: Fabricator shall provide signage as indicated and in accordance with District Standards.
    b. Braille is shown on the Drawings for position only. Fabricator is responsible for Contracted Grade 2 Braille translation to meet State of California requirements as needed.
        1) Contractor shall be responsible for the accurate translation of all applicable tactile copy to Contracted Grade 2 Braille. All Braille shall be produced in accordance with California Title 24 requirements. Dots shall be 1/10-inch on centers in each cell with 2/10-inch space between cells. Dots shall be raised a minimum of 1/40-inch above the background.
    c. Graphics: All text, arrows, and symbols shall be provided in the sizes, colors, typefaces, and spacing specified in the Drawings and as required by Code. All text shall be a true, clean, digitally or photomechanically accurate reproduction of the typeface(s) specified, with letter spacing and directional arrows.
        1) Font: Frutiger Book.
    d. Finishing
        1) All finishes to conform with ADA requirements for contrast, semi-gloss level, and reflectivity. Submit samples as required under "Submittals" article above.
        2) Provide uniform finish, color, and appearance in all instances.

11. Examination
    a. Examine all site conditions, structures, and substrates under which items in this Section are to be installed for suitability to receive the items.
        1) Advise Architect of any unsatisfactory conditions.
        2) Do not install signage until unsatisfactory conditions have been corrected.
    b. Dimensions shown on the Drawings are for reference only.
        1) Field verify all dimensions prior to fabrication and indicate these dimensions on the appropriate shop drawings.
        2) Provide templates and patterns for review and to other trades as required to ensure proper fit, alignment, and finish of all work.
    c. Sign Mounting Locations: All signs identifying permanent rooms and spaces shall be located in compliance with CBC 1117B.5.9. Center of sign shall be 5 feet-0 inches above finish floor. Sign to be located at latch side of door, or, if there is insufficient wall space, on the nearest wall, preferably to the right.

12. Installation
    a. General
        1) Install signage in neat and proper manner.
        2) Install sign items, including all components, in accordance with reviewed Graphic Schedule at locations shown.
        3) Install signs properly aligned, level and true to line and dimension.
    b. Install with reviewed manufacturer's adhesive or mechanical fasteners after application of finish painting at heights noted.
    c. Damage to the items installed and their surrounding surfaces shall be repaired to the satisfaction of the District, at no additional cost to the District.

13. Cleaning and Protection
    a. At completion of installation, clean all sign surfaces in accordance with manufacturer's instructions.
    b. Protect all signs from damage until acceptance by the Architect; repair or replace damaged units as required.
    c. Clean and/or repair all evidence of installation work or damage to adjacent surfaces prior to completion of work.
    d. Remove all protective materials and dispose of properly off site.

14. Contract Close-Out Items: Provide District with written instructions for proper cleaning of the signs. Note any solvents that should not be used.

SECTION 10 26 00 - WALL AND DOOR PROTECTION

1. Section Includes: Wall guards and corner guards.

2. Rigid Plastic Material: Extruded, textured, chemical and stain-resistant, high-impact, acrylic modified vinyl plastic, thickness as indicated. Comply with specified requirements of ASTM D256 for impact resistance and ASTM E84 for flame spread and smoke developed characteristics.
    a. Colors and Textures of Plastic Material: Provide extruded plastic material that matches selections made by the Architect from the manufacturer's full range of standard colors and textures.

3. Aluminum Extrusions: Provide alloy and temper recommended by the manufacturer for the type of use and finish indicated, but with not less than the strength and durability properties specified in ASTM B221 for 6063-T5.

4. Stainless Steel Sheet: Type 304, minimum 0.0500-inch thick (16 gauge), ASTM A240.
    a. Finish: Directional satin, No. 4.

5. Fasteners: Provide noncorrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened.

6. Wall Guards: Provide surface mounted, 0.04-inch thick rigid sheet vinyl assembly consisting of the following:
    a. Wainscot
        1) Dimensions: 3 feet by 8 feet sheet; height shall be typically 3 feet or flush below the window sill if lower.
        2) Color: Clam Shell.
        3) Product: As manufactured by InPro Corp., "Rigid Sheet Vinyl Material", or equal.
            a) Manufacturer's vinyl sealant in matching color shall be used at wainscot joints.

b. Chair Rail
   1) Dimensions: 3 inch width by 12 feet lengths; chair rail height to match window sill height.
   2) Chair rail ends shall have end caps.
   3) Color: Clam Shell.
   4) Product: As manufactured by InPro Corp., “Series 500”, or equal.
c. End Cap
   1) Dimensions: 3 inch width by 12 feet lengths.
   2) Color: Clam Shell.
   3) Product: As manufactured by InPro Corp., “Series 502”, or equal.

7. Corner Guards: Provide surface mounted, stainless steel assembly.
   a. Corner Radius: 1/8-inch.
   b. Dimensions: 3 inches by 3 inches by 8 feet.
   c. Provide corner guards at outside corner of gypsum board walls along typical corridors at height as indicated. Extend corner guards full height, unless otherwise indicated.
   d. Product: As manufactured by Construction Specialties, Inc., “Model CO-8-90”; Arden Architectural Specialties, Inc., “SS-CG Stainless Steel Corner Guards”, or equal.

8. Fabrication
   a. General: Fabricate wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thicknesses of components.
   b. Preassemble components in the shop to the greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
   c. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
   d. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for interconnection of members to other construction.
   e. Fabricate anchoring devices to be capable of withstanding imposed loads. Coordinate anchoring devices with the supporting structure.

9. Installation
   1. General: Install wall surface protection units plumb, level, and true to line without distortions.
      a) Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished work.
   2. Install aluminum retainers, mounting brackets, and other accessories in strict accordance with the manufacturer’s instructions.
      a) Where splices occur in horizontal runs of over 20 feet, splice aluminum retainer and plastic cover at different locations along the run.
   3. Immediately upon completion of installation, clean plastic covers and accessories using a standard ammonia based household cleaning agent.
   4. Remove excess adhesive using methods and materials recommended by manufacturer.

SECTION 10 44 00 - FIRE PROTECTION SPECIALTIES

1. Section Includes: Fire extinguishers and cabinets.

2. Product Data: Submit manufacturer’s product data for cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.

3. Acceptable Manufacturers: Larsen's Manufacturing Co., "Architectural Series"; J. L. Industries, or equal.

4. Materials
   a. Fire Extinguishers: Multipurpose under pressure, dry chemical type bearing UL rating of 4-A:60-B:C, 10 pounds nominal capacity, in enameled steel container.
   b. Fire Extinguisher Cabinets: Flush recessed, 1-piece steel construction with 18 gauge steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
      1) Provide reviewed manufacturer's stainless steel door handles.
      2) Door Style: Manufacturer's standard design, ADA compliant.
   c. Fire Rated Cabinets: UL listed with UL listing mark with fire resistance rating of wall where it is installed.
   d. Brackets: Provide brackets for fire extinguishers designed to prevent accidental dislodge of extinguisher, of sizes required for type and capacity of extinguisher required.
   e. Wall Mounted Signs
      1) Provide wall mounted metal signs at 80 inches above the finished floor to center of sign for each fire extinguisher in cabinet. Separate wall mounted sign shall be provided for all extinguishers located in cabinets regardless of cabinet signage available from the manufacturer.
      2) Sign Colors and Lettering: Double faced, flanged, aluminum, 12 inches high by 4 inches wide, fire extinguisher symbol, arrow and red with white letters, which reads "Fire Extinguisher". Wall mounted signs shall also be provided for other extinguishers in areas where the extinguisher may be obstructed from view during normal use of the facility. Provide permanent aluminum signs as appropriate for the application.

5. Installation
   a. Follow manufacturer's printed instructions for installation.
   b. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
   c. Fasten mounting brackets and cabinets to structure, square and plumb.

SECTION 10 57 00 - WARDROBE AND CLOSET SPECIALTIES

1. Section Includes: Heavy duty coat hook.

2. Product Data: Submit manufacturer's catalog cuts and data sheets, complete parts list and installation requirements for each accessory item specified.

3. Accessories shall be the product of a single manufacturer, unless otherwise specified.

4. Coordinate submission of installation instructions so that backing, blocking, framing, and formwork can be properly installed and work of other trades will not be delayed.

5. Acceptable Manufacturer: Glaro Products, or equal.

6. Coat Hook: Wall mounted, standard heavy duty, solid aluminum double hooks.
   a. Dimensions: 4 inches high by 1 inch wide by 3-1/2 inches deep.
   b. Finish: Satin aluminum.

7. Provide all hardware required to complete the coat hook installation as recommended by the manufacturer.

8. Install coat hooks in accordance with manufacturer's instructions.

END OF DIVISION 10

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13 44 00 - MODULAR MEZZANINES

1. Section Includes: Design, engineer, furnish and install modular mezzanine and stair to mezzanine

2. Design Requirements
   a. Structural Performance: Engineer, fabricate and install mezzanine systems to withstand structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each of the respective components of each metal fabrication in accordance with CBC.
   b. Design work to support normally imposed loads and in conformity with AISC requirements.
   c. Provide for expansion and contraction.
   d. Shop drawings and calculations for metal fabrications engineered under work of this Section shall be prepared under direct supervision of State of California licensed Structural Engineer and shall be so wet stamped and wet signed.

3. Shop Drawings
   a. Verify measurements at the building and take field dimensions for fitting and proper attachment to related work prior to producing shop drawings.
   b. Submit shop drawings for the fabrication and erection of assemblies of mezzanine metal work, which are not completely defined in the manufacturer's data. Included shall be plans, elevations, and details of sections and connections. Show accessories and anchorage items to be incorporated into the work.
   c. Include setting drawings and templates for location and installation of miscellaneous metal items and anchorage devices.

4. Certificates: Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

5. Quality Assurance
   a. Materials shall conform to the specifications and standards of the American Society for Testing and Materials (ASTM), latest edition.
   b. In addition to standards specified under products and execution, fabrication of structural steel shapes shall conform to latest specifications of the American institute of Steel Construction (AISC).
   c. Welding shall be in accordance with American Welding Society (AWS) Specifications and local rules and ordinances.
   d. Fabricated metal products shall conform to the latest edition specifications of the National Association of Architectural Metal Manufacturers (NAAMM).
   e. Use fabricator and installer firms with capacity and experience in successfully producing and installing metal mezzanines similar to this Project.
   f. Use qualified welding processes and welding operators per AWS D1.1 "Structural Welding Code - Steel". Certify recent and current welder qualifications.
   g. Use products and protect metals as required for corrosive coastal marine environment.

6. Field Measurements
   a. Check 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.

b. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1) Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

7. Materials
   a. Steel Plates, Shapes and Bars: ASTM A36.
   b. Stainless Steel Shapes: ASTM A276.
   c. Steel Plates to be Bent or Cold Formed: ASTM A283, Grade C.
   d. Steel Bars and Bar Size Shapes: ASTM A663, or ASTM A675.
   e. Steel Tubing: ASTM A500, Grade B.
   f. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.
   g. Cold Rolled Carbon Steel Sheets: ASTM A366.
   h. Galvanized Carbon Steel Sheets: ASTM A526, with ASTM A525, G90 zinc coating.
   i. Gray Iron Castings: ASTM A48, Class 30.
   j. Malleable Iron Castings: ASTM A47, grade as selected.
   k. Steel Pipe: ASTM A53, type as selected, Grade A, galvanized. Pipe to be minimum standard weight (Schedule 40), or higher as approved for in final design for particular application.
   l. Concrete Inserts: Threaded or wedge type, galvanized ferrous castings, malleable iron ASTM A47, or cast steel ASTM A 27. Provide bolts, washers, and shims as required, hot dip galvanized, ASTM A153.
   m. Isolator for Metals Causing Electrolytic Action: Asphalt bitumen emulsion.
   n. Expansive Grout: Hemite, "Por-Rok"; Master Builders Co., "Embeco", or equal. Use structural epoxy as required.
   o. Anchors, Bolts, and Fastenings
      1) Concrete Inserts: Anchors of type indicated below, fabricated from corrosion resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 5, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
         a) Threaded or wedge type; galvanized ferrous castings, either ASTM A47 malleable iron or ASTM A27 cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized in accordance with ASTM A153.
      2) Fasteners: Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
         a) Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A, with hex nuts, ASTM A563, and, where indicated, flat washers.
         b) Machine Screws: ANSI B18.6.3.
         c) Plain Washers: Round, carbon steel, ANSI B18.22.1.
         d) Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
         e) Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 5 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
         f) Material: Carbon steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
         g) Material: Group 1 alloy 304 or 316 stainless steel bolts and nuts complying with ASTM F593 and ASTM F594.
         h) Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.
   p. Welding Materials: AWS D1.1, type required for materials being welded.
   q. Coatings
      1) Coatings for Protection of Dissimilar Materials
      2) Dissimilar Metals: Bituminous type materials conforming with MIL Standard 889.

r. Shop Primer for Ferrous Metal: As specified in Section 09 90 00.
s. Galvanizing Repair Paint: High zinc dust content paint, with dry film containing not less than 94 percent zinc dust by weight, as manufactured by Parker Amchem, "Galvaprep SG"; Sherwin Williams, "Zinc Clad I", or equal, or in accordance with Section CP05080 or Section CP09950.

8. Mezzanine: Occupational Safety and Health Administration (OSHA), CBC and ADA compliant.
   a. Pre-engineered steel mezzanine.
   b. Capacity: 125 lb./sq. ft.
   c. Columns: Constructed of 5 inch by 5 inch by 10 gauge structural steel with 10 inch base plates that are pre-drilled to accept 3/4-inch lag bolts.
      1) Dimensions: As indicated.
      2) Clearance: 8 feet high.
   d. Provide required nuts and bolts.
   e. Decking: 18 gauge galvanized open steel planking.
   f. Finish: Manufacturer’s standard gray epoxy finish.
   g. Product: As manufactured by Global Industrial, “Model 251227a”, or equal.

9. Stair: OSHA compliant.
   a. Provide stair frame with 12 inch channel steel stringers with welded 1-1/2 inch by 1-1/2 inch tubular steel hand rails.
   b. Provide 36 inch wide galvanized steel stair treads.
   c. Height: 105 inches.
   d. Quantity of Steps: 12.
   e. Finish: Manufacturer’s standard gray powder coat finish.
   f. Product: As manufactured by Global Industrial, “Model 253725”, or equal.

10. Workmanship: Use materials of the composition, thickness and sizes required and approved by the Architect in the final design drawings. Minimally provide the required size and thickness to provide adequate strength and durability in the finished product for the intended use. Work to the dimensions accepted on shop drawings, using proven details of fabrication and support. Use the type of materials specified for the various components of work

11. Install anchors and other connecting members which occur in concrete in the concrete as the work progresses to avoid unnecessary cutting and drilling.

12. Provide templates and patterns. Supervise proper location and installation of built-in items. Provide holes and connections for the work of other trades and make necessary connections thereto.

13. As far as possible, work shall be shop fitted and assembled, ready for erection. Shop and field connections shall be riveted, welded or attached with screws, countersunk and finished flush where exposed.

14. Form exposed work true to line and level, with accurate angles, surfaces and straight, sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise approved. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the work.

15. Weld corners and seams continuously and in accordance with the recommendations of AWS. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

16. Form exposed connections with hairline joints which are flush and smooth, using concealed fasteners where ever possible. Where exposed fasteners are used, they shall be "Phillips", flathead and countersunk, screws or bolts.

17. Provide for anchorage of the type required, coordinated with the supporting structure. Fabricate and space anchoring devices to provide adequate support for the intended use.

18. Cut, reinforce, drill and tap miscellaneous metalwork items as required, to receive finish hardware or similar items of work.

19. Provide custom shapes to metal work as required to meet the conditions of the provisions of this agreement.

20. Installation: Install in accordance with reviewed shop drawings and manufacturer's installation instructions.

END OF DIVISION 13

DIVISION 22

PLUMBING

SECTION 22 00 00 – GENERAL PLUMBING REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. All work to be furnished and installed under this section shall include but not necessarily be limited to the following:

B. Connection to utilities at five (5) feet from the building. Coordinate with the Civil Engineering Plans and/or Division 2 work.

C. Connection of all natural gas, waste, vent, and water piping to all plumbing fixtures, drains and mechanical equipment.

1.2 WARRANTY

A. Provide one year (12 months) warranty under provisions of Division 1. The warranty shall include parts, labor, travel costs, and living expenses to repair or replace products or systems.

PART 2 - PRODUCTS

2.1 PIPING

A. Domestic Hot and Cold Water Pipe and Fittings (Above Grade):
   a. Pipe: ASTM B88, Type L, hard drawn copper water tube.

   b. Fittings: ANSI B16.22, wrought copper 95%-5% tin-antimony solder joints. Elkhart or equal. Victaulic or T-drill at the contractor's discretion.

B. Domestic Hot and Cold Water Pipe and Fittings (Below Grade):
   a. Pipe: ASTM B88, Type K, soft drawn copper water tube.

   b. Fittings: No joints below ground or in trap primer lines. For pipes below grade wrap with Scotch Wrap #51, 20 mil, with 20% overlap. Any required joints shall be made above grade with 95%-5% tin-antimony solder. Brazed joints will be allowed for isolated pipe joints required below grade, if soft copper tubing is not feasible.

C. Sanitary Sewer Pipe and Fittings (Above Grade):
   a. Pipe: ASTM A-74, ASTM A-888 cast iron, Cast Iron Soil Pipe Institute (CISPI) Standard 301, twice bituminous coated, "no-hub". Pipe showing rust or cracks in coating shall be removed and replaced. Manufacturer: AB&I, Tyler, Charlotte, or approved equal.

   b. Fittings: Above-Grade No-Hub Joints (Above 12 inches from grade): Manufactured by Anaco, Tyler, Clamp-All, Charlotte, MG Coupling or approved equal Mission. Shield with 2, 4 or 6 bands and neoprene gasket conforming to ASTM C-1540 standards. Anaco Husky Series SD2000, 304 AISI Stainless

steel shield with 80 inch pounds sealing torque. Tyler "No-Hub" or "Wide-Body", or Mission "No-Hub" or "Heavyweight" stainless steel shield with 60 inch pounds sealing torque. MG Coupling, ASTM A-48 cast iron housing clamps with circular neoprene gasket and stainless steel bolts and nuts.

c. Pipe: ASTM B306, DWV class, copper tube.
Fittings: ANSI B16.23 cast bronze or ANSI B16.29 wrought copper. Elkhart or equal.

D. Sanitary Sewer Pipe and Fittings (Below Grade):

a. Pipe: ASTM A-74, ASTM A-888 cast iron, Cast Iron Soil Pipe Institute (CISPI) Standard 301, twice bituminous coated, "no-hub". Pipe showing rust or cracks in coating shall be removed and replaced. Manufacturer: AB&I, Tyler, Charlotte, or approved equal.

b. Fittings:

1) Below-Grade No-Hub Joints (Below grade up to 12 inches above grade): Manufactured by Anaco, AB&I, MG Coupling, Tyler, Clamp-All, or approved equal by Mission. Conforming to ASTM C-1540 standards. Couplings shall have stainless steel shield with 4 or 6 bands and neoprene gasket, cast iron coupling with neoprene shield, or as listed below. Anaco Husky Series SD2000, 304 AISI stainless steel shield with 80 inch pounds sealing torque. Clamp-All 125 inch pound torque coupling, 304 AISI stainless steel shield with 125 inch pounds sealing torque (Clamp-All Hy-Torque 80 is <u>not</u> acceptable). MG Coupling, ASTM A-48 cast iron housing clamps with circular neoprene gasket and stainless steel bolts and nuts. American Brass & Iron Foundry "Best" cast iron coupling with neoprene compression gasket. Tyler "Wide-Body" or Mission "Heavyweight" stainless steel shield with 60 inch pounds sealing torque.

E. Vent Pipe and Fittings (Above Grade):

a. Pipe: ASTM A-74, ASTM A-888 cast iron, Cast Iron Soil Pipe Institute (CISPI) Standard 301, twice bituminous coated, "no-hub". Pipe showing rust or cracks in coating shall be removed and replaced. Manufacturer: AB&I, Tyler, Charlotte, or approved equal.

b. Fittings: Above-Grade No-Hub Joints (Above 12 inches from grade): Manufactured by Anaco, Tyler, Clamp-All, Charlotte, MG Coupling or approved equal Mission. Shield with 2, 4 or 6 bands and neoprene gasket conforming to ASTM C-1540 standards. Anaco Husky Series SD2000, 304 AISI stainless steel shield with 80 inch pounds sealing torque. Tyler "No-Hub" or "Wide-Body", or Mission "No-Hub" or "Heavyweight" stainless steel shield with 60 inch pounds sealing torque. MG Coupling, ASTM A-48 cast iron housing clamps with circular neoprene gasket and stainless steel bolts and nuts.

OR

c. Pipe: ASTM B306, DWV class, copper tube.
Fittings: ANSI B16.23 cast bronze or ANSI B16.29 wrought copper. Elkhart or equal.

F. Vent Pipe and Fittings (Below Grade):

a. Pipe: ASTM A-74, ASTM A-888 cast iron, Cast Iron Soil Pipe Institute (CISPI) Standard 301, twice bituminous coated, "no-hub". Pipe showing rust or cracks in coating shall be removed and replaced. Manufacturer: AB&I, Tyler, Charlotte, or approved equal.

b. Fittings: Below-Grade No-Hub Joints (Below grade up to 12 inches above grade): Manufactured by Anaco, AB&I, MG Coupling, Tyler, Clamp-All, or approved equal by Mission. Conforming to ASTM C-1540 standards. Couplings shall have stainless steel shield with 4 or 6 bands and neoprene gasket, cast iron coupling with neoprene shield, or as listed below. Anaco Husky Series SD2000, 304 AISI stainless steel shield with 80 inch pounds sealing torque. Clamp-All 125 inch pound torque coupling, 304 AISI stainless steel shield with 125 inch pounds sealing torque (Clamp-All Hy-Torque 80 is not acceptable). MG Coupling, ASTM A-48 cast iron housing clamps with circular neoprene gasket and stainless steel bolts and nuts. American Brass & Iron Foundry "Best" cast iron coupling with neoprene compression gasket. Tyler "Wide-Body" or Mission "Heavyweight" stainless steel shield with 60 inch pounds sealing torque.

2.2 VALVES

A. Gate Valves:
1. 3" and Smaller: Class 125, MSS SP-80, ASTM B62 cast bronze body, soldered ends, bronze bonnet, bronze wedge, rising stem, brass packing gland, non-asbestos packing and aluminum hand-wheel. Nibco S-113, Milwaukee #149 or equal.

B. Butterfly Valves:
1. 21/2” and Larger: MSS SP-67, cast iron body, stainless steel disc, stainless steel stem, EPDM seat, memory stop control, lever handle thru 5" size and worm gear operator for 6" and larger. Mount stem in horizontal position: Nibco LD-20003, Milwaukee #BVF-399 or equal.

C. Ball Valves:
1. 3" and Smaller: Cast brass body, soldered ends, brass ball, teflon seat, brass stem, steel handle, conventional port. Nibco 585-70, Milwaukee #BA-450 or equal.

D. Check Valves:
1. 2" and Smaller: Class 125, MSS SP-80, ASTM B62 and ASTM B16, cast bronze body, soldered ends, screwed cap, swing type, Teflon bronze disc. Nibco 413, Milwaukee #1509-T or equal.
2. 2-1/2" and Larger: Class 125, MSS SP-71, ASTM A126 class B cast iron body, bolted bonnet flanged ends, bolted cap, swing type, cast iron disc with bronze face rings. Nibco F-918, Milwaukee #2974M or equal.

2.3 PLUMBING FIXTURES

A. Provide fixtures and appurtenances as specified on the drawings. Manufacturer listed on drawings are for reference only. Substitute manufacturers must comply with all aspects of specified fixtures.

B. Acceptable manufacturers include:
1. P-traps, supplies and stops: Brass Craft, Dearborn, Eastman, McQuire, Sanitary Dash, or Teldyne Ansonia.
2. Drains: J.R. Smith, Jones Spec, Josam, Wade, or Zurn.

C. General: Provide complete fixture assembly, including all trim and appurtenances for proper operation and neat, finished appearance. Procure all rough-in data from manufacturer and rough-in and connect to fixtures as required.

D. All fixtures shall comply with federal, state and local codes for water flow requirements.

E. All designated handicap fixtures shall comply with handicap accessibility requirements of the American with Disabilities Act (ADA), and applicable state and local codes.

F. Trim
1. All exposed trim, including tubing, traps, and waste pieces, shall be polished chrome plated.
2. Provide separate control stops for each fixture, polished chrome plated.
3. Provide screwdriver stop and vacuum breaker with each flush valve assembly.
4. P-Traps: Chrome plated 17 gauge trap, adjustable, 1-1/2 inch inlet, 1-1/2 inch outlet, 1-1/2 inch by 1-1/2 inch for sinks except as noted. Provide tap for condensate drains where required.
5. Faucet Aerators: Omni laminar flow control device shall be installed at each faucet outlet, except where specifically noted otherwise on the plans or at gold plated faucets. Provide vandal resistant model in public restrooms.

2.4 CLEANOUTS

A. Manufacturer: Zurn, J.R.Smith, Josam, Wade, or equal. J.R.Smith models shown for reference style.

B. Cleanout Plugs: Bronze, countersunk head, gasket seal.

C. Cleanouts: Cast-iron body and frame, flange with flashing clamp, adjustable cast-iron collar with scored nickel bronze top with non-skid finish, caulk inside, Ty-seal or no-hub joints.
1. Finished Floor: Zurn 1400 Cast iron cleanout or equal.
2. Grade at Pedestrian Traffic Areas: Cast iron cleanout complete with serrated cut-off ferrule, coated cast-iron plug with lead seal, adjustable head and heavy duty loose set scoriated cover.
3. Grade at Vehicle Traffic Areas: Cast iron cleanout, double flange, scoriated cover.
4. Yard Areas: Cast iron cleanout, double flange, scoriated cover.
5. Cleanout Tee on Riser: Cast iron cleanout tee and countersunk plug.
6. Wall: Zurn 1468 Cast iron wall cleanout with plated bronze raised head plug, stainless steel round access cover plate and countersunk screw or equal.

2.5 ROOF FLASHING

A. Lead roof jack.

2.6 TRAP PRIMERS

A. Cast bronze construction with vacuum breaker and 1/2" sweat connections. All floor drains and floor sinks shall be trap primed unless otherwise stated on the drawings. Locate behind e 12 x 12 access door for each concealed trap primer. PPP Model P-1 of P-2, J.R.Smith #2699, Pacific Plumbing Products, or equal. Optional: Sloan F-72-A1 used in conjunction with water closet flush valve.

2.8 ATMOSPHERIC VACUUM BREAKERS

A. For cold water service to hose bibbs, turf irrigation systems, or laboratory sinks. Watts #288A or equal.

2.9 ACCESS PANELS

A. Elmdoor Product, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all items specified in this section of the Specification under the full purview of local and state governing agencies.

3.2 PERFORMANCE OF WORK

A. Coordinate with other trades as necessary to properly interface components of the plumbing system.

B. Follow manufacturer's directions and recommendations in all cases where the manufacturers of articles used on this Contract furnish directions covering points not shown on the drawings or covered in these Specifications.

C. In addition to cleanout locations required by the UPC cleanouts shall be required at the following locations:
1. Cleanouts shall be provided every 100 feet along sanitary and storm waste piping below grade unless otherwise specifically shown on the plans at closer increments.
2. Cleanouts shall be installed at the upper terminus of each piping branch or main.
3. Cleanouts shall be installed on every horizontal branch five feet or more in length from the main line.
4. Cleanouts shall be provided on every horizontal sink drain, regardless of length.

3.3 CLEANING

A. All fixtures, including those on which only connection is made, shall be cleaned. Fixtures shall be cleaned with only mild household detergents or cleaning powders and clear warm water. The Contractor shall be held responsible to see that fixture trim and fixtures are not damaged during cleaning by acids, industrial cleaners or strong solvents.

3.4 CAULKING, SEALING AND PACKING

A. All floor drains, roof drains, sidewalk hydrants shall be sealed with waterproof packing around the pipe inside sleeve.

DIVISION 23

HEATING, VENTILATING AND AIR CONDITIONING

PART 1. - GENERAL

A. Scope: Provide design for code required ventilation, heating and cooling system, drawings, labor, materials, equipment and services necessary and reasonably incidental for the modifications made to building 34.

Building 34 – A new specialty truck exhaust system will be provided for the fire truck apparatus room. The base bid included a manual, non-emergency system. An alternate price is provided for an automatic, emergency system, capable of connecting three fire trucks. Ventilation, cooling, and supplemental heat to be provided by a packaged air conditioning unit which serves the areas of concern as identified in the drawings. Existing gas heaters are to remain to provide additional heat. No new BMS controls have been included but an alternate price will be provided to have the packaged AC and two split systems controlled off the BMS. Supply fans to be controlled by either an occupancy sensor or wall switch provided by the electrician, individual thermostats will be provided and installed by ACCO.

Related equipment and material include: Supply & exhaust fans, pipe, duct, registers & relocated split system AC units.

B. Submittals: To be provided to the owner and general contractor for approval prior to install.

C. Codes: *2007 CMC and CBC,* local and applicable codes.

D. Coordinate work with General Contractor and Other Trades.

E. Design and Performance:

1. The proposed system is designed to provide tempered/conditioned air to only the IT support, shipping/receiving, tech area, media/telecom storage, and IT offices. It is not a requirement to provide tempered/conditioned air to the media services and secured storage areas.

2. MDF/IDF – Loads have never been provided for this room. It is assumed that the existing split system which is relocating from building 25 to building 34 is adequate.

3. Ventilation – Ventilation will be provided by supply fans and packaged units as indicated on the drawings. Existing operable louvers will be utilized for building pressure relief.

F. Noise and Vibration Control:

1. All new rotating equipment will have seismically-restrained vibration isolation.

G. Related Work Specified Elsewhere (Work to be Provided by Others):

1. All electrical wiring whether line (110 VAC and greater), or low (110 VAC and lower) conduit, wire, flex, starters (except on packaged AC units and chillers), disconnects, etc. A complete wiring diagram will be furnished by ACCO as are all thermostats, sub-bases, and temperature control devices. Low voltage wiring for temperature controls, all LAN cable wiring, and DDC control wiring will be performed by the BMS contractor.

2. Temperature control panels will be mounted/installed by the BMS contractor.

3. Roof penetrations, wall penetrations, x-rays and patching are by the GC.

4. Structural steel for equipment supports and pipe rack supports as required.

5. Cutting, patching, coring, painting, fire caulking/sealing, roofing, and framing of openings.

6. Architectural sheetmetal or exterior louvers of any kind.

7. Painting of exposed duct and pipe systems.

8. Access doors in finished walls, ceilings, etc.

9. Condensate drain piping, equipment drains, equipment floor drains, approved receptors, gas piping, make-up water, backflow preventers, pressure reducing valves/stations, and all final connections.

10. Demolition work (safeoff only).

11. Overtime labor.

12. Structural calculations.

PART 2. - PRODUCTS

A. Vibration Isolation:

1. Use M.W. Sausse or Mason West for specific application as shown on the drawings.

2. Isolation for major HVAC machinery will be 2" deflection.

3. Isolation for smaller equipment and piping systems will be 1.5" deflection springs.

4. All isolation will be engineered by a person licensed in the State of California. All isolation will be designed to meet the 1997 UBC Seismic Code.

B. Split System AC Units:

1. Existing unit relocated from building 25.

C. Fans:

1. Centrifugal Supply and Exhaust:

a. Greenheck, Thermo-X-Air*, capacity, arrangement, rotation and discharge as indicated on the drawings.* Centrifugal blower assembly housing constructed entirely of steel with backward incline curved wheel, statically and dynamically balanced, lock-seam or Perma-lock constructed housing, belt driven, polished steel keyed shaft, AISI rated. Bearings to be grease lubricated.

b. Fan shall be AMCA rated and UL listed.

c. Includes inlet screens, and seismic base isolation, as specified on drawings.

2. Circulation Fan:

    a. ACCO to use the existing circulation fans which will be relocated by Pankow.

3. Fire Truck Exhaust:

    a. As indicated on the drawings and submittals provided.

E. Diffusers, Registers and Grilles:

1. Air distribution equipment shall be Titus, furnished in factory finished white enamel.

2. Square Ceiling Diffusers: Steel construction, perforated face, of size and capacity indicated.

3. Return and Relief Air Grilles: Steel construction to match ceiling diffusers

4. Supply Wall Registers: Steel construction with opposed blade volume dampers. Blades shall be fixed with the vertical blades having 45-degree deflection.

5. Return and Exhaust Wall Registers: Steel construction with opposed blade volume damper. Blades shall be fixed with the vertical blades having 45-degree deflection.

F. Ducts and Sheet Metal Work:

1. Provide ducts, plenums, access doors, fresh air intakes and exhausts as indicated and required. All ductwork shall be constructed, erected in accordance with local regulations and procedures detailed in the ASHRAE Handbook for Fundamentals, or the applicable standards adopted by the Sheet Metal and Air conditioning Contractors National Association. Provide prefabricated spiral lockseam ducts and fittings and rectangular ducts of galvanized steel.

2. Final connections to ceiling diffuser boxes shall be made with flexible glass fiber duct. Connections of flexible duct to round ducts shall be made with 1/2-inch wide positive locking straps.

3. Flat duct surfaces shall be crimped diagonally regardless of size. Longitudinal joints in all duct sizes may be flat-lock joints. Transverse joints and intermediate bracing shall be constructed of galvanized sheet metal or galvanized structural angles in accordance with requirements of the SMACNA guide and public authorities having jurisdiction.

4. Transverse joints on all supply ducts shall be sealed with mastic for all medium pressure applications.

5. Longitudinal joints on low pressure supply ducts with internal static pressure below 0.75” w.g. shall be sealed with mastic or tape. Above 0.75” w.g. use medium pressure mastic only.

6. Lock joints shall be hammered to make them airtight. Inside of duct shall present a smooth surface to air flow.

7. Horizontal ductwork shall be supported with 1-inch, 18 gauge galvanized strap hangers in accordance with the requirements of SMACNA and public authorities having jurisdiction.

8. Plenums shall be made of 18 gauge galvanized sheet steel reinforced horizontally on a maximum of 48 inch centers by 1-1/2 x 1-1/4 x 1/8 inch galvanized angles and reinforced vertically by 1-1/2 inches standing seams.

9. Flexible connections for air ducts shall be 16 oz. airtight "Ventglass" noncombustible fabric with fire retardant neoprene coating on outside. Attach to ductwork by lock seam. Install not more than 6 inches long. Provide where required or indicated.

10. Seal joints on the main supply air ducts with UL classified sealant. Sealant shall be specifically designed to seal high velocity and medium-pressure ductwork.

G. Piping:

1. Heating hot water piping to be schedule 40 black steel with Victaulic connections 3-inches and above. Type L copper will be used 2.5-inches and below.

2. All piping to be attached to structure in accordance with ACCO design and fabrication standards.

H. Insulation:

1. All thermal insulation shall comply with the State of California Energy Conservation Standards. All outdoor piping shall be provided with aluminum jacketing. All supply air ducting shall be wrapped. Lining shall be as scheduled and indicated on the drawings.

2. Install pipe insulation after piping is installed, tested and approved, and is in clean, dry condition. Firmly butt insulation joints.

3. Unions: Insulate in same manner as fittings, flanges and valve bodies.

4. Chilled water pipe and fitting will be insulated to prevent sweating.

5. At each pipe hanger protect insulation with 4 inch long, 18 gauge galvanized metal shield.

6. Thermal Duct Insulation: Insulate all cold supply air ducts and plenums unless otherwise specified, with J-M Microlite fiberglass duct insulation, foil-faces, 1 lb. density, 1-1/2 inch thick insulation wrapped entirely around duct with joints lapped at lease 2 inches and secured with staple bonds. All joints to be taped and sealed. Insulation shall cover all surfaces including standing seams.

7. All insulation shall have a minimum thermal resistance of 4.0 exclusive of film resistance.

G. Packaged Gas/Electric AC Unit

1. This section includes the packaged AC unit serving building 34.

2. Submittals will include manufacturer’s technical data for each model indicated, including rated capacities of selected model; dimensions; required clearances; shipping, and operating weights; furnished specialties; accessories; and installation and startup instructions.

3. ACCO drawings will detail equipment layouts and indicate weights, required clearances, and approximate location and size of field connections.

4. Acceptable manufacturers include Trane or equal.

5. All equipment is factory assembled and tested; designed for slab installation; and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers.

6. Manufacturer's standard construction with corrosion-protection coating and exterior finish, removable panels or access doors with neoprene gaskets, minimum 1/2-inch- (13-mm-) thick

thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs.

7. Evaporator Fans: Forward Curved or Airfoil, centrifugal, belt driven with adjustable sheaves and lubricated motor bearings.

8. Supply/Return Fans: Forward curved or airfoil, centrifugal, belt driven with adjustable sheaves.

PART 3. - EXECUTION

A. Support and Installation of new Mechanical Equipment, Piping and Ductwork:

1. Provide General Contractor with locations, dimensions and weights of equipment, ductwork and piping to be supported by the roof and floor structural system immediately after award of contract.

2. Mount equipment such that satisfactory and adequate clearance to electrical and mechanical components is available for maintenance, service and installation.

3. The Subcontractor shall accept all responsibility for safety in the hoisting and installation of his materials and equipment and shall take all appropriate measures to safeguard employees and other persons at the site against injury.

4. Start-up: All equipment and systems start-up will be performed by ACCO with the exception of startup of existing equipment by the facilities group.

5. Testing and Balancing: Air balance of the new registers only will be performed by *ACCO* .

B. Submittals:

1. *Submit within thirty (30) calendar days after contract award the following:*

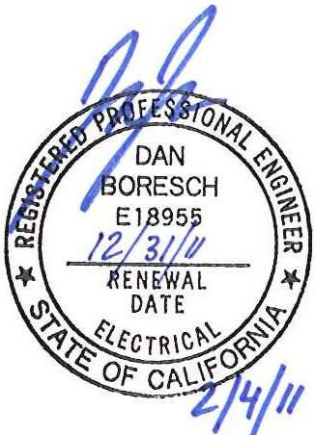
a. HVAC equipment, duct and piping layout.

b. Equipment brochures and electrical power requirements on all equipment.

C. Warranty:

1. Include warranty on all installed equipment, materials, and labor for one (1) year from date of start-up for beneficial use.

END OF DIVISION 23



ELECTRICAL INDEX

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

Building electrical systems for the College of San Mateo have been considered in accord with listed Codes.

A. Provide labor, material, equipment, tools, transportation, and services for the installation, connection, testing and completion of work described in the contract documents.

B. Code Compliance

1. International Building Code – 2006
2. National Electrical Code – 2005
3. California Electrical Code – 2007
4. California Energy Code – Title 24 – 2005
5. National Energy Code – ASHRAE 90.1 – 2004
6. NFPA 72 – National Fire Alarm Code – 2007
7. NFPA 101 – Life Safety Code – 2003
8. All other applicable Federal, State and Local laws and regulations

C. Work Included But Not Limited To:

1. Lighting fixtures, lamps, and seismic supports.
2. Wiring devices and plates.
3. Disconnect switches not furnished under other sections.
4. Repair damage to premises and work resulting from the installation of the electrical work.
5. Remove debris resulting from the installation of electrical work.
6. Final connections to equipment indicated on electrical plans and installed under other sections of specification or owner.
7. Fire Alarm System.
8. Emergency Lighting System.
9. Starters and disconnects for mechanical equipment furnished and installed by Electrical Contractor.

D. Related Work In Other Sections

1. Motor starters, relays, and equipment per Division 15.
2. Connection of electrical equipment furnished under other sections of these specifications as shown on the electrical plans.

E. Work excluded from this Contract

1. Fire protection for lighting fixtures.
2. Acoustic insulation at electrical device boxes.

F. Receptacles

1. Provide general purpose 15 and 20 ampere, 125/250 VAC receptacles that conform to NEMA WD-1 specifications. Specialty receptacles shall conform to NEMA WD-5 specifications as applicable.
2. Provide NEMA 5-20R, specification grade as noted herein, 20 amp, 125 VAC, 2 pole, 3 wire grounding type receptacles.
3. Receptacles shall be the standard conventional designer decora style device.

G. Wall Switches
   1. Product Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
   2. Body and Handle: Ivory or white plastic with toggle handle.
   3. Ratings:
      i. Voltage: 120-277 volts, AC.
      ii. Current: 20 amperes.

H. Power shall be provided to all miscellaneous pieces of mechanical equipment including, but not limited to the following

1. Heat pumps
2. AC units
3. HVAC control panels

I. Power shall be provided via a distribution board to all major pieces of mechanical equipment

END OF SECTION

DIVISION 26

ELECTRICAL

26 05 19 – LOW VOLTAGE ELECTRICAL CONDUCTORS AND CABLES

A. For power and lighting systems 600V or less:

1. Provide annealed copper for all wire, conductor, and cable.

2. Insulation type:
#12 to #1 AWG: THWN for wet or underground locations and THHN for dry locations #1/0 through #4/0 AWG: XHHW-2 #250MCM and larger: XHHW-2.

3. MC Cable, Cooper. Manufactured assembly of stranded copper conductors as specified above with flexible spiral wound, galvanized steel or aluminum armored MC cable construction.

4. Conduit Hangers – For individual conduit runs not directly fastened to the structure, use rod hangers manufactured by Caddy, Unistrut or Power-strut.

5. NonMetallic Raceway – Wiremold – Specification covers a surface nonmetallic raceway system used for branch circuit wiring or data network, voice, video and other low-voltage wiring. The nonmetallic raceway system shall consist of raceway, appropriate fittings and device boxes to complete installation per electrical drawings.

   a. Manufacturer – The surface nonmetallic raceway system specified herein for branch circuit wiring or data network, voice, video and other low-voltage wiring shall be the system as manufactured by wiremold/Legrand.

   b. Materials – The raceway and all system components must be UL listed and exhibit nonflammable self-extinguishing characteristics, tested to comparable specifications of UL94V-0.

      1. Raceway shall be a two-piece design with a base and a snap-on cover.

      2. A full compliment of fittings must be available including, but not limited to flat, internal, and external elbows, tees, cover clips, and end caps. The fittings shall have a matte texture, available in ivory, white, and fog white colors to match the cover.

      3. Device boxes shall be available for mounting standard devices and faceplates. A device box shall be available in single, two, and three gang configurations.

4. The raceway manufacturer will provide a complete line of connectivity outlets and modular inserts for UTP/STP, fiber optic coaxial and other cabling types with faceplates and bezels to facilitate mounting. A complete line of preprinted station and port identification labels, snap-in icon buttons, as well as write-on station identification labels shall be available.

9. Building wiring methods:

   a. 20 amp power and lighting branch circuits containing no more than eight (8) current carrying conductors (phases and neutrals).

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. Electrical Grounding

1. Permanently and effectively ground service raceways, service switch neutral, panelboards, raceways, motors, control equipment, signal system terminal cabinets and electrical equipment in accordance with the N.E.C. and local governing codes.

2. The National Electric Code (NEC) mandates certain grounding practices for electrical systems. These include systems for the electric utility, on-site power generation and distribution and other separately derived systems. This consists of copper ground wires and a few ground rods. A copper building main reference ground bus will be provided in the main electrical room. It will connect to the main switchboard, to the main incoming water lines (domestic and fire sprinkler), to a UFER grounding electrode, to driven ground rods, to building steel and to the neutral point of all local transformers. A copper ground bus sized at ¼" thick x 4" high x 24" long will be installed for the main electrical room, and a ¼" thick x 4" high x 28" long ground bus will be provided in the main telecommunications room (MPOE).

3. Equipment (Safety) Ground: The NEC requires all electrical equipment to be grounded and all metallic piping, structure or other equipment which may accidentally be energized and become a safety hazard, be bonded to the same electrical grounding system. The objective of these requirements is to provide safe operating conditions by reducing the difference of voltage potential between any two metal parts that are likely to be energized to as little as practicable. For this project, this will consist of copper ground wires in all feeders.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 33 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

A. Conduit and Raceways:

1. Electrical Metallic Tubing (EMT): Electro-galvanized steel.

2. Rigid Nonmetallic Conduit (RNC): Schedule 40 PVC, approved and labeled for use as non-metallic raceway for 90 degree Celsius conductors. Carlon, CertainTeed, or Kraloy.

3. Wireway: Code gauge steel, with knockouts and hinged cover. Corrosion resistant gray baked enamel finish.

4. Fittings and accessories shall be approved for the purpose and equal in all respects to the conduit or raceway. Die cast aluminum fittings are not allowed. Provide expansion conduit fittings at building expansion joints.

B. Installation for Conduit:

1. Install basic electrical material in accordance with manufacturer's written instructions, as shown on the drawings and as specified herein.

2. Conduit, general:

a. Minimum Conduit Size: Minimum conduit size shall be ½" for interior applications and ¾" for exterior and underground applications.

b. Conduit systems shall be mechanically and electrically continuous throughout. Install code size, insulated, copper, green grounding conductors in all conduit runs for branch circuits and feeders. This conductor is not shown on the Drawings.

c. Emergency power raceway system: Install entirely independent of other raceway systems, except where specifically allowed by NEC article 517.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 09 23 – LIGHTING CONTROL DEVICES

A. Standards: Provide general purposes 120/277 VAC switches that conform to NEMA WD-1 specifications.

B. Color: Device color shall be as selected by the Architect, unless otherwise noted.

C. The interfacing between the new lighting control system and the Building Management System (BMS) shall be provided by others.

D. Wall Switches:

1. Provide twenty ampere, 120/127 volt, specification grade, toggle handle style, fast make-slow break, quite type snap switch with silver cadmium alloy contacts, binding head terminal screws, back and side wired with totally enclosed case.

2. Single pole, single throw switches; Hubbell #1221 series, Pass & Seymour #20AC1 series, or Leviton #1221 series.

3. Double pole, single throw switches; Hubbell #1222 series, Pass & Seymour #20AC2 series, or Leviton #1222 series.

4. Three way switches; Hubbell #1224 series, Pass & Seymour #20AC4 series, or Leviton #1224 series.

5. Four way switches: Hubbell #1224 series, Pass & Seymour #20AC4 series, or Leviton #1224 series.

6. Occupancy Sensor: WattStopper or Equal

END OF SECTION

SECTION 26 22 00

DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 CONDITIONS & REQUIREMENTS:

A. Refer to the General Conditions, Supplementary General Conditions, and General Requirements.

1.2 DESCRIPTION:

A. Work included in this Section: Dry Type Transformers.

B. Related work included in other sections:

1. Common Work Results For Electrical: Section 26 05 00.

2. Grounding: Section 26 05 26.

1.3 SUBMITTALS:

A. Manufacturer's literature describing the product and dimensional drawings.

PART 2 - PRODUCT

2.1 GENERAL:

A. Equipment shall conform or exceed requirements of NEMA, ANSI Standard C89.2 for Dry Type Transformers for General Applications.

B. Acceptable products: Cutler-Hammer Type EPT, DT-3 line or equivalent Square D, Siemens, Acme, MGM, ITC, or General Electric.

2.2 ELECTRICAL RATINGS:

A. Primary windings voltage: 480 volts, 3-phase, delta; unless otherwise noted.
Secondary windings voltage: 208Y/120 volts, 3-phase; unless otherwise noted.
Frequency: 60Hz.
KVA rating: As shown on drawings.
Taps: 2.5% full capacity taps, 2 above and 4 below rated voltage.
Impedance: 5.75% nominal.
Windings: Aluminum
K-Factor: K1, unless otherwise noted on the drawings.

2.3 TEMPERATURE CLASSIFICATION:

A. Winding temperature rise shall be 150° C in accordance with UL specification UL 506, unless otherwise noted on drawings.

2.4 LOAD RATING:

A. Transformer shall be capable of operating at 100% of nameplate rating continuously while in an ambient temperature not exceeding 40° C.

B. Transformer shall meet the daily overload requirements of ANSI Standard C57.96.

2.5 VIBRATION ISOLATION:

A. Provide neoprene rubber pads to isolate core and coil assembly from transformer enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Anchor transformer securely with minimum of (4) anchor bolts. Bolts and washers shall be cadmium plated or galvanized steel. Strength of materials used to secure the transformer shall be sufficient to resist shear and uplift produced by a force equal to one-half of the equipment mass applied at it's center of gravity, but in no case, less than that required by the Uniform Building Code (UBC) for seismic zone 4 with an importance factor of 1.5.

B. Provide 1" thick high resiliency pads to isolate transformer from floor or platform. Korfund "Elasto Rib" or equivalent.

3.2 CONNECTIONS:

A. Provide suitable flexible connections and/or other vibration isolation to limit transmission of noise from the transformer via the distribution raceway system.

3.3 IDENTIFICATION:

A. Provide engraved plastic nameplate for each transformer.

3.4 TESTING

A. Transformers shall be field tested and commissioned prior to release to the owner in accordance with Section 16900- Startup, Commissioning and Testing.

B. Perform transformer inspections and tests listed in NETA ATS, Section 7.2.1.1.

C. Measure primary and secondary voltages and make appropriate tap adjustments where applicable.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 CONDITIONS & REQUIREMENTS:

A. Refer to the General Conditions, Supplementary General Conditions and General Requirements.

1.2 DESCRIPTION:

A. Work included in this Section: Panelboards.

B. Related work included in other Sections:

1. Common Work Results For Electrical: Section 26 05 00.

2. Grounding: Section 26 05 26.

1.3 SUBMITTALS:

A. Manufacturer's Literature describing the product and shop drawings.

B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

PART 2 - PRODUCTS

2.1 GENERAL:

A. Manufacturers: Cutler-Hammer Catalog numbers are used to identify type of equipment specified. Equivalent products by Square D, Siemens, IEM, or G.E are acceptable.

B. Branch Circuit Panels:

120/208 volt: Cutler-Hammer Pow-R-Line 1

277/480 volt: Cutler-Hammer Pow-R-Line 2

C. Distribution Panels:

Circuit Breaker Type: Cutler-Hammer Pow-R-Line 3 or 4 (CDP)

2.2 BRANCH CIRCUIT PANELBOARDS:

A. Cabinet: Construct cabinet with code gauge galvanized steel. Provide minimum 20" wide cabinets, with extra wiring space where incoming, feed-through, or parallel feeders are required.

B. Trim: Construct of cold-rolled steel. Door shall provide access to breaker handles and shall be completely flush with no visible bolts, screw-heads, or hinges. Provide with flush catch and lock. All panels shall be keyed alike. Provide door in door trim.

C. Panels located adjacent to each other shall have identically sized enclosures and trims.

D. Finish: Finish exposed parts with one coat of primer and one coat of light gray enamel suitable for over painting in field if desired.

E. Bus Bars:

1. Bus Bars shall be silver plated copper sized per UL standards based on maximum temperate rise. Attach circuit breakers to bus in such a way that circuits 1, 3, 5, or 2, 4, 6, or any 3 similarly numbered circuits form one three-phase, four-wire circuit.

2. Provide all hardware for future breakers, identified on drawings as SPACES, or for the full length of usable bus, whichever is longer.

3. Provide ground bus with full complement of terminals in addition to insulated neutral bus.

F. Circuit Breakers:

1. 120/208 Volt Branch Circuit Panelboards: Quick-make, quick-break, molded base bolt-on type designed for 120/208 volt, three phase, four wire service with minimum 10,000 amperes rms short circuit rating.

2. 277/480 Volt Branch Circuit Panelboards: Molded case bolt-on type designed for 277/480 volt, three phase, four wire service with minimum 14,000 amperes rms short circuit rating.

3. Provide multi-pole units with common trip elements.

4. Breakers shall have center-tripped position in addition of the ON and OFF positions.

5. Provide lockouts for all circuits that should not be inadvertently turned off.

G. Nameplates:

Provide screw-on (no adhesives) engraved rigid plastic laminate nameplates on the outside of each panel showing panel designation, voltage and phase. Nameplate shall be white face with black letters.

H. Circuit Directories:

Provide a metal-framed circuit directory welded to inside of inner door, with plastic protector.

2.3 DISTRIBUTION PANELBOARDS:

A. Dead-front, NEMA I enclosure, as indicated, designed for use on a three-phase, four wire, 120/208 or 277/480 volt system as required.

B. Construction: Code gauge galvanized steel box fully flanged for strength and rigidity. Provide separately hinged vertical access doors over lug and wiring spaces.

C. Finish: Finish all exposed parts with one coat rust inhibitor and two coats of light gray enamel.

D. Bus Bars: All bus bars shall be copper, unless prior approval has been obtained from the engineer to use aluminum. The bus bars shall be of sufficient cross-section to provide full rated current without exceeding a hot spot temperature rise of 65° C in a 40° C ambient based on UL tests. The bus bars shall also be rated to withstand mechanical forces exerted during short circuit conditions when directly connected to a power source having an available fault current as shown on the drawings. Provide a full capacity neutral, unless a reduced capacity neutral is specified on the drawings, wherever a neutral is indicated on the drawings.
The bus bars shall be factory pre-drilled to accept bus hardware for future field installation of 2 or 3 pole circuit breakers or fused switches in any combination, and shall run full length.

E. Provide a ground bus with sufficient terminal lugs for each distribution feeder indicated on the drawings.

F. Circuit Breaker Type: Thermal magnetic trip, molded case type breakers. Unless otherwise stated on the drawings, the minimum interrupting capacity shall be 22,000 amperes symmetrical for 208 volt breakers, and 18,000 amperes symmetrical for 480 volt breakers.

G. Nameplates: Provide screw-on (no adhesives) engraved rigid plastic laminate nameplates on the outside of each panel showing panel designation, voltage and phase. Nameplate shall be white face with black letters. Provide nameplate for each circuit protective device in distribution board identifying load served.

H. Nominal panel enclosure size shall be 90” high. Panels shall accept twin-mounted 400A frame breakers.

2.4 SHORT CIRCUIT RATINGS:

A. Where available short circuit current from the building service or a derived source exceeds the minimum circuit breaker interrupting capacity for branch and distribution panelboards as indicated in sections 2.2 and 2.3 above, provide main and branch/distribution breakers whose series rating exceeds the available fault current.

PART 3 - EXECUTION

3.1 CLEARANCES:

A. Minimum code required clearances around panelboards must be maintained.

B. Securely brace to wall and floor for free standing sections.

3.2 MOUNTING HEIGHT:

A. Mount panelboards with center of top circuit breaker handle no higher than 6'-6" above finished floor. Mount flush mounted panelboards as indicated on architectural interior elevation drawings.

3.3 MOUNTING HARDWARE:

A. Provide all necessary blocking, channels and other hardware for securing panelboards to wall, column or other parts of building structure.

3.4 PANELBOARD OPERATIONAL CHECK:

A. Check cleanliness of all interiors and all parts. Remove any excess packing, shipping bolts, etc.

B. Inspect for physical damage and compare nameplate data with plans and specifications.

C. Tighten all points of connection with torque wrench to values recommended by the manufacturer.

D. Electrical Tests:

1. The panelboard shall be fully assembled, inspected and tested at the factory in accordance with ANSI, IEEE and NETA standards prior to shipment.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 51 00 –LIGHTING

1. General Requirements

   All lighting shall be designed to comply with or exceed Title 24 and follow the recommendations of the Illuminating Engineering Society (IES).
   - Comply with applicable ANSI standards pertaining to lamp materials, lamp ballasts and transformers, and luminaires.
   - Comply with applicable NEMA standards pertaining to lighting equipment.
   - Provide luminaires and lampholders which comply with UL standards and have been UL listed and labeled for location and use indicated.
   - Comply with CEC as applicable to installation and construction of luminaires.

2. Luminaires

   Luminaires shall meet code and be installed per electrical plans.

END OF SECTION

SECTION 27 00 00

TELECOMMUNICATIONS BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes general administrative and procedural requirements for Sections under Division 27, and is intended to supplement, not supersede, Division 1 requirements.

B. The requirements described herein include the following:

1. References
2. Definitions
3. Submittals
4. Quality Assurance
5. Delivery, Storage And Handling
6. Scheduling
7. Warranty
8. Project Management and Coordination Services.
9. Field quality control.
10. Project Closeout and Record Documents

C. Related Sections

1. Consult other Sections, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable installation.
2. General and Supplementary Conditions and general provisions of Contract apply to 27 XX XX series Sections.
3. Division 0 and Division 1 of the Project Manual apply to 27 XX XX series Sections.
4. Section 27 05 28 - Telecommunications Building Pathways
5. Section 27 11 00 - Telecommunications Rooms
6. Section 27 05 26 - Telecommunications Bonding
7. Section 27 15 13 - Telecommunications Horizontal Cabling
8. Section 27 13 10 - Telecommunications Backbone ISP Cabling
9. Section 27 13 14 - Telecommunications Backbone OSP Twisted Pair Cabling
10. Section 27 13 24 - Telecommunications Backbone OSP Fiber Optic Cabling
11. Section 27 08 00 – Telecommunications Testing

1.02 REFERENCES

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

B. Codes: Perform Work executed under this Section in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. United States Department Of Labor (DOL) Regulations (Standards - 29 CFR)
   a. Part 1910, "Occupational Safety and Health Standards"
2. National Fire Protection Agency (NFPA)
   a. NFPA 70, "National Electrical Code" (NEC).
   b. NFPA 75, "Protection Of Information Technology Equipment"
3. California Code of Regulations (CCR) Title 24, California Building Standards Code Part 2, Basic Building Regulations and Part 3, California Electrical Code (CEC).
4. Uniform Building Code (UBC).
5. Uniform Fire Code (UFC).
6. Uniform Mechanical Code (UMC).
7. National, State, Local and any other binding building and fire codes.
8. FCC Regulations:
   a. Part 15 – Radio Frequency Devices & Radiation Limits
   b. Part 68 – Connection of Terminal Equipment to the Telephone Network

C. Standards: Equipment and materials furnished under this Section shall conform to the following standards where applicable:

1. Underwriter's Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
   a. UL 444: Communications Cables
   b. UL 497: Protectors for Paired-Conductor Communication Circuits.
   c. UL 1651: Optical Fiber Cable
   d. UL 1690: Data-Processing Cable
   e. UL 1963: Communications-Circuit Accessories
   f. UL 2024A: Optical Fiber Cable Routing Assemblies.
2. ANSI/TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard.
   a. Part 1: General Requirements
   b. Part 2: Balanced Twisted-Pair Cabling Components
   c. Part 2, Addendum 1: Transmission Performance Specifications For 4-Pair 100 Ohm Category 6 Cabling
   d. Part 3: Optical Fiber Cabling Components Standard
3. ANSI/TIA/EIA-569-A Commercial Building Standard for Telecommunications Pathways and Spaces, including the following addenda:
   a. TIA/EIA-569-A-1 Surface Raceways
   b. TIA/EIA-569-A-2 Furniture Pathways and Spaces
   c. TIA/EIA-569-A-3 Access Floors
   d. TIA/EIA-569-A-4 Poke-Thru Fittings
   e. TIA/EIA-569-A-6 Multi-Tenant Pathways and Spaces
   f. TIA/EIA-569-A-7 Cable Trays and Wirelines
4. ANSI/TIA/EIA-598-B Optical Fiber Cable Color Coding.
5. ANSI/TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

6. ANSI/J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
7. ANSI/TIA/EIA-758 Customer-Owner Outside Plant Telecommunications Cabling Standard.
   a. TIA/EIA-758-1 Addendum No. 1
8. EIA testing standards.
9. Insulated Cable Engineers Association (ICEA):
   a. ANSI/ICEA S-80-576-2002 Category 1 & 2 Individually Unshielded Twisted Pair Indoor Cables for Use in Communications Wiring Systems
   b. ANSI/ICEA S-83-596-1994 Fiber Optic Premises Distribution Cable
   c. ANSI/ICEA S-87-640-1999 Fiber Optic Outside Plant Communications Cable
   d. ANSI/ICEA S-90-661-2002 Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems
   e. ICEA S-104-696-2001 Standard For Indoor-Outdoor Optical Cable
10. Building Industry Consulting Services International (BICSI):
   a. Telecommunications Distribution Methods Manual (TDMM)
   b. Customer-Owner Outside Plant Design Manual
   c. Wireless Design Reference Manual (WDRM)
   d. Network Design Reference Manual (NDRM)

D. Make a copy of each document readily available during the course of construction for reference by field personnel.

1.03 DEFINITIONS

A. The Definitions of Division 0 shall apply to the 27 XX XX sections.

B. In addition to those Definitions of Division 0, the following list of terms as used in this Section and Sections 27 XX XX shall be defined as follows:

1. "Connect": To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
2. "Cabling": A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].
3. "Identifier": A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.
4. "Engineer" and "Engineer Of Record": [TEECOM Design Group].

1.04 SYSTEM DESCRIPTION

A. In circumstances where the Specifications and Drawings conflict, the most stringent requirement shall apply. Generally, the Drawings shall govern quantity and the Specifications shall govern quality.

1.05 SUBMITTALS Submit required submittals in accordance with Section 01 25 00.

B. Obtain approval in writing by the Engineer for the Product Data submittals and for the Shop Drawings (as required) prior to release of order for products and equipment, and prior to installation.

C. Product Data Submittal Requirements

1. Quantity: Submit quantity of product data submittals as described in Section 01 25 00. In the absence of requirements given, submit nine product data submittals.

2. Format:
   a. Product data sheets shall be 8-1/2 x 11 inch pages or 11x17 for oversized information.
   b. Package each submittal with an outer cover. Examples include:
      1) 3-ring binder with front cover and spine having clear pockets for insertion of the submittal information.
      2) 3-hole report cover with transparent front cover.
   c. Clearly label each submittal on the outer cover with the following information:
      1) Project name and address.
      2) Submittal Title (e.g., "Product Data Submittal For Telecommunications Equipment Rooms").
      3) Project submittal number.
      4) Specification section number/s (e.g., "Section 27 11 00").
      5) Date and revision; date format: <month> <day>, <year> (e.g., "January 1, 2000")
      6) General Contractor / Prime Builder.
      7) Telecommunications Installer.
   d. Include index dividers for improved navigation through the submittal. Dividers shall match the Table Of Contents.

3. Content:
   a. Table Of Contents: Include a Table Of Contents at the beginning of submittal that lists materials by article and paragraph number (e.g., "2.02-A Equipment Racks").
   b. Cover Letter: Include a cover letter that states the scope of the submittal and states the submittal is in full compliance with the requirements of the Contract Documents, with a specific reference that the submittal complies with Section 01 25 00 procedures. The cover letter shall be signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.
   c. Product Information: Product Data submittal shall consist of manufacturer's technical data, product literature, "catalog cuts", data sheets, specifications, and block wiring diagrams (if necessary). Also include applicable Materials Safety Data Sheet (MSDS) for each item complying with OSHA's Hazard Communication Standard 29 CFR 1910.1200. This data shall clearly describe the product's characteristics, physical and dimensional information, electrical performance data, materials used in fabrication, material color & finish, and other relevant information such as test data, typical usage examples, independent test agency information, and storage requirements. Clearly indicate by arrows or brackets precisely what is being submitted on and those optional accessories, which are included and those which are excluded. At a minimum, include products listed in the specifications numbering 27 XX XX. Also include relevant products that will be installed, which are not listed in the specifications.
   d. Resubmittals: Resubmittals shall include a cover letter that lists the action taken and revisions made to each product submittal in response to Submittal Review Comments. Resubmittal packages will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

D. Shop Drawings Submittal Requirements

1. Quantity: Submit quantity of shop drawings as described in Section 01 25 00. In the absence of requirements given, submit six sets of shop drawings.
2. Media: Submit shop drawings on media as described in Section 01 25 00. In the absence of requirements given, submit shop drawings full size on bond or eco-bond.
3. Format:
   a. Prepare shop drawings using AutoCAD 2000 or later.
   b. Full size shall equal the Contract Documents.
   c. Use the project title block. Insert company information in title block.
   d. Text shall be 3/32" high, minimum, when plotted full size.

e. Device symbols shall match those used in the Contract Drawings.

f. Screen background information.

g. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.

h. Label each sheet in the shop drawings set with the Specification Section Number (e.g., "27 13 10").

i. Scaling:

1) Scale floor plans and reflected ceiling plans at 1/8"=1'-0".

2) Scale enlarged room plans at 1/4"=1'-0".

3) Scale wall elevations at 1/2"=1'-0".

4) Scale rack elevations at 1"=1'-0".

4. Content:

a. Submit detailed shop drawings if the proposed installation differs from the Contract Documents or the design intent.

b. Cover Letter: Accompany each shop drawing submittal with a cover letter stating that the shop drawings have been thoroughly reviewed by the Contractor and are in full compliance with the requirements of the Contract Documents. Cover letters shall include a drawing index, and shall be signed (and stamped, if applicable) by the person who prepared the submittal. Failure to comply with this requirement shall constitute grounds for rejection of submittal.

c. Drawings: Shop drawing submittals shall consist of floor plans, reflected ceiling plans, enlarged room plans, wall and rack elevations, installation details, and any other aspect of the system that differs from the Contract Documents or the design intent. Scales shall be the same as the Drawings (e.g., 1/4" = 1'-0" for enlarged room plans).

d. Resubmittals: Accompany resubmittals with a cover letter that lists the revisions made to each drawing in response to Submittal Review Comments. Resubmittals will not be reviewed unless accompanied by this cover letter. Failure to include this cover letter will constitute rejection of the resubmittal package.

E. As-Built Drawings Submittal Requirements

1. Quantity: Submit quantity of as-built drawings as described in Section 01 25 00. In the absence of requirements given, submit six sets of as-built drawings.

2. Media: Submit shop drawings on media as described in Section 01 25 00. In the absence of requirements given, submit shop drawings full size on bond or eco-bond.

3. Format:

a. Prepare as-built drawings using AutoCAD 2000 or later.

b. Use the same sheet size as the Contract Documents, and use the project title block.

c. Text: minimum of 3/32" high when plotted at full size.

d. Use symbols identical to the symbols shown on the Drawings.

e. Screen background information.

f. Plot system components (devices, cable routes, etc.) and text at a sufficient line weight to stand out against background information.

4. Content:

a. As-Built Drawings shall fully represent actual installed conditions and shall incorporate revisions made during the course of construction.

b. Floor plans shall show:

1) Locations and identifiers of outlets/devices.

2) Size, quantity, location, and routes of pathways (such as cable basket, conduits, cable hangers, and other cable support devices).

c. Enlarged room floor plans scaled at 1/2"=1'-0" showing exact placement of equipment cabinets/frames, rack bays, and other equipment. Enlarged room overhead plans scaled at 1/2"=1'-0"

showing exact placement of overhead cable support devices (e.g., cable basket, cable runway, conduit sleeves, etc.).

1) Applicable rooms: Telecommunications Room

d. Wall elevations scaled at 1"=1'-0" showing exact placement of termination hardware (e.g., termination/cross-connect blocks).

e. Installation details.

F. Operation and Maintenance (O & M) Manuals Submittal Requirements

1. Quantity: Submit quantity of O&M Manuals as described in Section 01 25 00. In the absence of requirements given, submit six product data submittals.

2. Format:

a. Package each O & M Manual in a white, 3-ring binder with front cover and spine having clear pockets for insertion of the project information.

b. Clearly label the cover of each O & M Manual with the following information:

1) Client name.

2) Project name and address.

3) Manual title (e.g., "Operation And Maintenance Manual for Telecommunications Cabling System").

4) Date; date format: <month> <day>, <year> (e.g., "January 1, 2000").

5) Telecommunications Installer and General Contractor names.

c. Include tabbed separators for improved navigation through the manual.

3. Content:

a. Include a Table Of Contents at the beginning that lists the contents.

b. 11"x17" prints of As-Built Drawings, as described above.

c. One CD-ROM of AutoCAD files of as-built drawings.

d. Manufacturer's original catalog information sheets for each component provided under applicable Section.

e. Warranty certificate from the manufacturer and the Contractor.

f. Manufacturer's instructions for system or component use.

g. Instructions for maintenance and warranty issues.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Five continuous years, minimum, design and manufacture of the materials and equipment specified herein.

2. Manufacturer(s) of all products and equipment specified herein shall demonstrate that they have a quality assurance program in place to assure that all of the specifications are met. The program shall include, as a minimum, provisions for:

a. Incoming inspection of raw materials

b. In-process inspection and final inspection of the cable product

c. Calibration procedures of all test equipment to be used in the qualifications of the product

d. Recall procedures in the event that out of calibration equipment is identified.

3. Conformance to certain government standards on quality assurance may be required for some applications within these specifications.

B. Contractor Qualifications

1. Current, active, and valid C7 or C10 California State Contractors License. Provide a copy of Contractors License in the bid submission.

2. Five, minimum, continuous years experience.
3. Five, minimum, completed projects similar to scope and cost. Provide a list of projects, including references, in the bid submission.
4. Technicians qualified for the work. Provide evidence in the bid submission of Technician qualifications. Evidence shall consist of manufacturer certifications, manufacturer training, industry training, relevant project experience, etc.
5. Also refer to additional requirements stated in Sections 27 05 26 through 27 13 24

C. Materials

1. Materials and equipment furnished shall be new, unused and without defects.
2. Furnish only specified products and equipment, or products and equipment that have been approved in writing.

D. Regulatory Requirements

1. Work and materials shall conform to the latest rules of National Board of Fire Underwriters wherever such standards have been established and shall conform to the regulations of the State Fire Marshal, OSHA and the codes of the governing local municipalities. Nothing in these specifications is to be construed to permit work not conforming to the most stringent of the applicable codes.
2. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.
3. When codes, standards, regulations, etc. allow work of lesser quality or extent than is specified under this series of Sections, nothing in said codes shall be construed or inferred authority for reducing the quality, requirements or extent of the Drawings and Specifications. The Contract Documents address the minimum requirements for construction.

E. Project Management And Coordination Services

1. Provide a project manager for the duration of the project to coordinate this Work with other trades. Coordination services, procedures and documentation responsibility shall include, but shall not be limited to the items listed in this section.
2. Review of Shop Drawings Prepared by Other Subcontractors:
   a. Obtain copies of shop drawings for equipment provided by others that require telecommunication service connections or interface with Division 26 work.
   b. Perform a thorough review of the shop drawings to confirm compliance with the service requirements contained in the Division 26 contract documents. Document any discrepancy or deviation as follows:
      1) Prepare memo summarizing the discrepancy.
      2) Provide a copy of the specific shop drawing, indicating via cloud, the discrepancy.
   c. Prepare and maintain a shop drawing review log indicating the following information:
      1) Shop drawing number and brief description of the system/material.
      2) Date of your review.
      3) Indication if follow-up coordination is required.

F. Drawings

1. Layout: Follow the general layout shown on the Drawings except where other work may conflict with the Drawings.
2. Accuracy: Drawings for the Work within this Division are essentially diagrammatic within the constraints of the symbology applied.

3. The Drawings do not fully represent the entire installation for the Telecommunications Cabling System. Drawings indicate the general route for the cables and the location of outlets.
4. Complete the details necessary for point-to-point design. This allows the Contractor to achieve desired results applying their own procedures and methods. Submit shop drawings for review prior to installation.

G. Role of the Engineer

1. During construction, the Engineer will work with the Contractor to provide interpretation and clarification of project contract documents, reply to (and 'process') relevant Requests for Information (RFIs), and act as an interface between the Contractor and the Owner.
2. The Owner has retained the Engineer's services to observe the Work for general compliance with the Contract Documents and to ensure that the installation meets the design intent of the system.
3. In summary, the Engineer will perform the following specific services during the construction phase:
   a. Review product submittals and shop drawings (as required) for general compliance with the contract drawings and specifications.
   b. Review changes as they arise, and confirm that the proposed solutions maintain the intended functionality of the system.
   c. Observe progress of the construction, and report observations back to the Owner.
   d. Review the testing procedures to confirm compliance with project requirements and industry-accepted practices.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery

1. Products shall not be delivered to the site until protected storage space is available.
2. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at jobsite.
3. Deliver materials in manufacturer's original, unopened, undamaged packaging and containers with identification labels (name of the manufacturer, product name and number, type, grade, UL classification, etc.) intact.
4. Replace equipment damaged during shipping at no cost to the Owner.

B. Storage and Protection

1. Store materials in clean, dry, ventilated space free from temperature and humidity conditions (as recommended by manufacturer) and protected from exposure to harmful weather conditions.
2. Comply with manufacturer's requirements for each product. Comply with recommended procedures, precautions or remedies as described in the Material Safety Data Sheets (MSDS) as applicable.
3. Maintain factory wrapping or provide a heavy canvas/plastic cover to protect units from dirt, water, construction debris, and traffic.
4. Storage outdoors covered by rainproof material is not acceptable.
5. Provide heat where required to prevent condensation or temperature related damage.

C. Handling

1. Handle in accordance with manufacturer's written instructions.
2. Damaged equipment shall not be installed.
3. Replace damaged equipment at no cost to the Owner.
4. Handle with care to prevent internal component damage, breakage, denting, and scoring.

1.08 SCHEDULING

A. Unless otherwise specified, the construction schedules of the Sections 27 XX XX may be combined.

B. Submit schedule within 30 days after Notice To Proceed.

1.09 WARRANTY

A. Service must be rendered within 4 hours of system failure notification. Note any deviation – exceptions or improvements – to this requirement at the time of bid.

B. Refer to Sections listed in 1.01, C for specific subsystem warranty period requirements.

C. Manufacturers of the major system components shall maintain a replacement parts department and provide testing equipment when needed. A complete parts department or stocking distributor shall be located close enough to the job site area to supply replacement parts within a 4-hour period.

D. Warrant installed hardware, under normal use and service, to be free from defects and faulty workmanship during the warranty period. Keep the system in operating condition at no additional material or labor costs to the Owner during the warranty period.

E. The manufacturers shall demonstrate that a quality assurance program is in place to assure that the specifications are met. The program shall include, as a minimum, provisions for:

1. Incoming inspection of raw materials
2. In-process inspection and final inspection of the product
3. Calibration procedures of test equipment to be used in the qualifications of the product
4. Recall procedures in the event that out of calibration equipment is identified.

F. Conformance to certain government standards on quality assurance may be required for some applications outlined in these specifications.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials used shall present no environmental or toxicological hazards as defined by current industry standards and shall comply with OSHA and EPA standards, other applicable federal, state, and local laws.

B. Product numbers listed in the 27 XX XX series sections are subject to change by the manufacturer without notification. In the event a product number is invalid or conflicts with the written description, notify the Owner in writing prior to ordering the material and performing any installation work. Provision and installation of the approved changed product will be at no additional cost to the Owner.

2.02 SUBSTITUTIONS

A. Requests for substitutions shall conform to the general requirements and procedure outlined in Division 1.

B. Where items are noted as "or equal", a product of equivalent function, design, construction, quality and performance will be considered. Include in the substitution request: catalog cuts, product information, and pertinent test data required to substantiate that the product is in fact equivalent to that specified. Only one substitution will be considered for each product specified.

C. Do not provide substitution material, processes or equipment without written authorization from the Engineer.

D. Substitutions shall be equivalent, in the opinion of the Engineer, to the specified product. The burden of proof of such shall rest with the Contractor. When the Engineer in writing accepts a substitution, it is with the understanding that the Contractor guaranteed the substituted product, component, article, or material to be

equivalent to the one specified and dimensioned to fit within the construction. Approved substitutions shall not relieve the Contractor of responsibilities for the proper execution of the work, or from any provisions of the Specifications.

E. Manufacturers' names and model numbers used in conjunction with materials, processes or equipment included in the Contract Documents are used to establish standards of quality, utility and appearance. Materials, processes or equipment that, in the opinion of the Owner, are equivalent in quality, utility and appearance will be approved as substitutions to that specified when "or equivalent" follows the manufacturers' names and model number(s).

F. Whenever any material, process or equipment is specified in accordance with a TIA/EIA specification, an ANSI specification, UL rating or other association standard, present an affidavit from the manufacturer certifying that the product complies with the particular standard specification. When requested by the Engineer, submit supporting test data to substantiate compliance at no additional cost.

G. Pay expenses, without additional charge to the Owner, in connection with substitution materials, processes and equipment, including the effect of substitution on self, subcontractor's or other Contractor's work.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Conditions: Verify conditions, provided under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. Pathways: Verify that pathways and supporting devices, provided under other sections, are properly and permanently installed, and that temporary supports, devices, etc., have been removed.

C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, "true tape" the conduits to verify cabling distances.

3.02 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman who is in charge of the Work and who is present at the job site at times Work is being performed. Supervise the work force executing the Work. Perform the installation within the restraints of the construction schedule.

B. Project Management: Coordinate and attend weekly status meetings to review the overall progress and issues to be resolved throughout the course of construction. Prepare and distribute meeting agenda prior to and meeting notes after meetings in a format acceptable to the General Contractor.

C. Scheduling: Prepare an overall construction schedule based on the results of the planning meetings with the General Contractor. Issue schedule to General Contractor for approval. Prepare and issue updated schedules whenever there are modifications.

D. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion, and inspection as required.

3.03 INSTALLATION

A. Conform to applicable federal, state and local codes, and telephone standards.

B. Coordinate the entire installation with the General Contractor, and their subcontractors, to meet the construction schedule. Include coordination meetings as required to fulfill this requirement.

C. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

D. Manufacturer's Instructions:

1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
2. Maintain jobsite file and comply with Material Safety Data Sheets (MSDS) for each product delivered to jobsite.

E. Adjusting:

1. Make changes and revisions to the system to optimize operation for final use.
2. Make changes to the system such that any defects in workmanship are corrected and cables and the associated termination hardware pass the minimum test requirements.

F. Protection:

1. Protect installed products and finish surfaces from damage during delivery and construction.
2. Provide protective coverings on adjacent surfaces for protection from dust and .

3.04 REPAIR/RESTORATION

A. Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement.

B. Punch List:

1. Inspect installed work in conjunction with the General Contractor and develop a punch list for items needing correction.
2. Provide punch list to Owner for review prior to performing punch walk with Owner.

C. Re-Installation:

1. Make changes to adjust the system to optimum operation for final use. Make changes to the system such that any defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.
2. Repair defects prior to system acceptance.

3.05 CLEANING

A. Clean daily. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.

B. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

C. Repair or replace damaged installed products.

D. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Legally dispose of debris.

3.06 DEMONSTRATION

A. On completion of the acceptance test, schedule a time convenient with the Owner or Owner’s Representative for instruction in the configuration, operation, and maintenance of the system.

3.07 CERTIFICATION

A. Provide to Owner or Owner’s Representative a written form of acceptance for signature. Corrections must be completed before Owner or Owner’s Representative and Engineer will give acceptance.

END OF SECTION

SECTION 27 05 28

TELECOMMUNICATIONS BUILDING PATHWAYS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Telecommunications building pathways.

B. Related Sections

1. Comply with the Related Sections paragraph of Section 27 05 28
2. Section 27 15 13 – Telecommunications Horizontal Cabling
3. Section 27 13 10 – Telecommunications Backbone ISP Cabling
4. Section 27 13 14 – Telecommunications Backbone OSP Twisted Pair Cabling
5. Section 27 13 24 – Telecommunications Backbone OSP Fiber Optic Cabling
6. Division 26 – Basic Materials and Methods, Conduit, Cable Tray, Boxes

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., list in Section 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ASTM A 510 Specifications for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
2. ASTM B 633 Specifications for Electrodepositing Coatings of Zinc on Iron and Steel, Sections SC2 and SC3.
3. ASTM A 653 Specifications for Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process
4. ASTM A 591 Specifications for Electrodepositing Coatings of Zinc on steel wire or sheets.
5. ASTM A 123 Specifications for Zinc (Hot Galvanized) Coatings on Iron and Steel.

1.03 DEFINITIONS

A. Definitions as described in Section 27 00 00 shall apply to this section.

B. "Cable Hanger": A metal, most often steel, cable support device shaped (section view) similar to the letter J; alternately, a fabric strap. The device is available in different sizes supporting different quantities of cables, and is also available with different attachment hardware to be supported by different methods (e.g., wire support, beam flange clip, etc.).

C. "J-Hook": Another name for cable hangers.

1.04 SYSTEM DESCRIPTION

A. Work Covered Under Other Sections

1. Conduit, pull boxes, device boxes.

B. Base Bid Work

1. The work under this section shall include the planning and coordination with General Contractor (and other trades) of telecommunications system building pathways, the furnishing of necessary materials, and the labor & associated services required to install pathways.

2. The Telecommunications Building Pathways consist of the following subsystems:
   a. ISP innerduct, from MDF to IDFs, as shown on Drawings
   b. Primary Pathways: Cable Basket, Cable Tray, Liner Ring Pathway, including supports
   c. Secondary Pathways: Cable Hangers, including supports
   d. Surface Raceway

1.05 SUBMITTALS

A. General: Conform to Submittal requirements as described in Section 27 00 00.

B. Quantity: Furnish quantities of each submittal as noted in Section 27 00 00.

C. Submittal Requirements at Start Of Construction:

1. Product Data Submittal

2. Shop Drawings Submittal: Consisting of proposed changes to pathway route plans.

D. Submittal Requirements at Close Out:

1. As-Built Drawings Submittal (can be combined with shop drawings of Section 27 15 13).

E. Substitutions

1. Requests for substitutions shall conform to the requirements and procedure in Section 27 00 00.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00.

B. NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to cable tray series of specifications.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. Comply with Warranty requirements of Section 27 00 00.

PART 2 - PRODUCTS

2.01 INSIDE PLANT INNERDUCT, PLENUM RATED

A. Application: Suitable for an indoor installation, typically within a riser system or backbone conduit, and within plenum spaces, such as above ceiling or within an access floor, for the support of telecommunications fiber optic cables.

B. Description: Designed and manufactured as a continuously extruded corrugated pipe.

C. Material: Fabricated from PVDF resin, or equivalent.

D. Manufacturers, or equal:

1. Carlon “Plenum Guard” series innerduct
2. Endot “Endocor/PL” series innerduct
3. Pyramid “Fire Flex Plenum Duct” series innerduct

2.02 CABLE HANGERS

A. Application: Suitable for indoor installation within ceiling space for the support of telecommunications cables.

B. Listings: UL 2043, for use in air handling spaces

C. Manufacturers (or variation per installation method), or equal:

1. B-Line #BCH12-W2; hanger for up to 16 cables
2. B-Line #BCH21-W2; hanger for up to 50 cables
3. B-Line #BCH32-W2; hanger for up to 80 cables
4. Erico #CAT12; hanger for up to 16 cables
5. Erico #CAT2; hanger for up to 50 cables
6. Erico #CAT32; hanger for up to 80 cables
7. Panduit #JMJH2-X20; hanger for up to 30 cables
8. Panduit #JMJH2W-X20; hanger for up to 30 cables, wall-mount type

2.03 DROP WIRE

A. Application: Suitable for indoor installation within ceiling space into structure above (e.g., slab and/or deck) for the support of telecommunications support devices.

B. Listings: UL 2043, for use in air handling spaces.

C. Assembly shall be equipped with ceiling clip, pre-mounted fastening pin, plastic washer, and pre-tied wire.

1. Fastening pin shall be 7/8”.
2. Wire shall be 12 gauge.

D. Manufacturer, or equal:

1. Hilti #CC27 X-AL-H22P8T xx ft PT; drop wire assembly, xx foot wire – where “xx” is the length

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

3.02 EXAMINATION

A. Examine areas to receive overhead hanger/support system prior to the start of work within this section. Notify the General Contractor of conditions that would adversely affect the installation or subsequent utilization of the system. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Installer is responsible for the integrity of the structures to which the system is attached, including their capability of safely accepting the loads imposed as evaluated by a qualified engineer

3.03 INSTALLATION

A. Innerduct

1. Provide innerduct for routing of fiber optic cables. The innerduct shall be continuous from originating room to destination room. Truncate the innerduct in either room prior to slack storage.

2. When routing through corridors, place innerduct in the cable tray / primary pathway / dedicated supports. When routing vertically through telecommunications rooms, support innerduct on vertical cable support (such as runway) and fasten using cable ties. When routing horizontally through telecommunications rooms, support innerduct on overhead cable support and fasten using cable ties. Install cable ties at 24-inch intervals.

3. Label innerducts at both ends. The label shall be visible to a technician standing at-ease.

B. Cable Hangers

1. Install hangers in accordance with recognized industry practices, to ensure that the installed system complies with requirements of the NEC, and applicable portions of NFPA 70B and NECA's "Standards of Installation" pertaining to general electrical installation practices.

2. Provide dedicated supports at sixty inches (60") separation, maximum, per a given route. Supports shall consist of #12 wire or ¼" threaded rod. Suspend wire or rod using components appropriate for the structure – e.g., powder-actuated clip fastener for wire, beam flange clip or angled flange clip for either wire or rod, or an embedded anchor for the threaded rod. Do not share support (wire/rod) with other trades. Do not support the hanger on ceiling grid support wires. Do not support the hanger from ductwork, piping, or other equipment hangers.

3. Install hangers six inches (6"), minimum, from light fixtures or other EMI source. Install hangers between six inches (6") and twelve inches (12") above ceiling grid.

END OF SECTION

SECTION 27 08 00

TELECOMMUNICATIONS TESTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Section Includes: Testing of Telecommunications Backbone and Horizontal Cabling subsystems.

B. Related Sections

1. Consult all other Sections and Divisions, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to completely test a complete and operable system.
2. Section 27 00 00 – Basic Telecommunications Requirements
3. Section 27 15 13 - Telecommunications Horizontal Cabling
4. Section 27 13 10 – Telecommunications Backbone ISP Cabling
5. Section 27 13 14 – Telecommunications Backbone OSP Twisted Pair Cabling
6. Section 27 13 24 – Telecommunications Backbone OSP Fiber Optic Cabling

C. Products Furnished and Installed Under Other Sections:

1. Telecommunications Cabling

1.02 REFERENCES

A. Comply with Section 27 00 00 References requirements.

B. Additional references to those listed in Section 27 00 00.

1. TIA/EIA-526-14 (“OFSTP-14”) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
2. TIA/EIA-455-171 Attenuation By Substitution Measurement – For Short-Length Multimode Graded-Index And Single-Mode Optical Fiber Cable Assemblies (a.k.a., FOTP-171)

1.03 DEFINITIONS

A. Refer to Definitions of Sections 27 00 00, 27 15 13, 27 13 10, 27 13 14, and 27 13 24.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. “Adapter” (associated with fiber connectivity): Shall mean a connecting device joining 2 fiber connectors, either like or unlike.
2. “Channel”: Shall mean a testing configuration which includes the Permanent Link and the line cord (at the workstation), the equipment cord, and, if a full crossconnection is implemented, a patch cord and the crossconnect termination/connecting apparatus.

3. "Connect": Shall mean install all required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
4. "Cord": Shall mean a length of cordage having connectors at each end. The term "Cord" shall be synonymous with the term "Jumper". The cord may be:
   a. Unshielded twisted pair
   b. Fiber (multimode or singlemode), jacketed & buffered
5. "Launch Cord": Shall mean the cord certified for use in fiber optic characterization testing, as described in this section.
6. "OTDR": Shall mean Optical Time Domain Reflectometer.
7. "Passive Link Segment": Shall mean the cable, connectors, couplings, and splices between two fiber optic termination units.
8. "Permanent Link": Shall mean the 'permanent' portion of the Horizontal cabling to each outlet with the test cords de-embedded from the measurements; this includes cable, consolidation point (if used), termination/connecting apparatus in the IDF and the connector at the outlet.
9. "System Cord": Shall mean the cord used in the operating electrical or optical circuit.
10. "Test Cord": Shall mean the cord certified for use in testing, as described in this section.

1.04 SYSTEM DESCRIPTION

A. Work Provided Under Other Sections

1. Refer to Section 27 15 13 for a more complete System Description.
2. Backbone Cabling
   a. The Backbone Cabling includes twisted pair and fiber cabling.
3. Horizontal Cabling
   a. The Horizontal Cabling, in general, consists of multiple 4-pair Category 6 UTP cables to each outlet. Refer to the Drawings for specific requirements.

B. Base Bid Work

1. Testing of a completed Telecommunications Cabling System, including:
   a. Procedures Submittals.
   b. Equipment Submittals.

2. Testing Requirements:
   a. Fiber optic passive link segment(s):

Table 270800-1.1: Tests For Fiber Optic Passive Link Segments

Subsystem	Type	Test	Direction	Wavelength
Backbone	Multimode	Characterization	Both	850nm and 1300nm
~~Backbone~~	~~Singlemode~~	~~Characterization~~	~~Both~~	~~1310nm and 1550nm~~
Backbone	Multimode	Passive Link Ins. Loss	One	850nm and 1300nm
~~Backbone~~	~~Singlemode~~	~~Passive Link Ins. Loss~~	~~One~~	~~1310nm and 1550nm~~

   b. Multipair/UTP cabling:

Table 270800-1.2: Tests For Multipair/UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	Riser	Wire map & length	-	-
Horizontal	CAT6	Category 6	Permanent Link	Per TIA/EIA-568-B.2-1

   c. Record Documents, including test reports.

1.05 SUBMITTALS

A. Refer to Submittals of to Section 27 00 00 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements:

1. Testing Procedures Submittal, describing step-by-step procedures used by the field technicians.
2. Product Submittal, including cut sheets of testing equipment to be used (note all software/firmware versions as applicable) and certificate of last calibration.
3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27 XX XX series Sections.

C. Submittal Requirements at Closeout:

1. Record Documents.

D. Submittal Description: Record Documents

1. Test Reports: Record documents submittal shall include test reports showing the following information:
   a. A title page which includes:
      1) Client Name
      2) Project Name
      3) Project Address
      4) General Contractor name / Telecommunications Installer name
      5) Date of Submittal
   b. Individual tabs which break down the test results by building, and then by telecommunications room.
   c. All Backbone Fiber Optic “Post Installation” Passive Link Attenuation test results (utilize the forms provided in Part 4 of this specification for documentation of test results if the tester used does not have data storage capabilities) and Fiber Optic OTDR test results.
   d. All Backbone UTP test results.

e. All Horizontal cable test results, per cable

2. Furnish all test results on CD-ROM in their native data format and an exported Microsoft Excel compatible format.
   a. Include all necessary software to allow viewing and printing of individual test results.
   b. CD shall be labeled with the project name, contractor name, and date of submission.

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. <expand the

1.07 WARRANTY

A. Warrant the validity of the test results. Under no circumstances shall any cable's test results be substituted for another's. If a single instance of falsification is confirmed, the Contractor shall be liable for a complete retest of the cabling system at no additional cost to the Owner. This includes the retaining the services of a neutral party to observe all retesting.

PART 2 - PRODUCTS

2.01 GENERAL

A. The manufacturer may change the product numbers listed in this Section at any time, as well as software and firmware versions. In the event this Section contains an invalid product number or conflicts with the written description, or specifies an out-of-date software and/or firmware version, notify the Engineer in writing prior to issuing submittals or field testing.

2.02 FIBER OPTIC LIGHT SOURCE

A. All connection interfaces shall be factory installed. No field-configurable adapters will be allowed at the light source.

B. Wavelengths output shall be continuous.

C. LED-based light source for multimode fiber testing shall have a:

1. Center wavelength of 850nm ± 30nm and 1300n ± 20nm.
2. Spectral width (FWHM) 30nm - 60nm at 850nm and 100nm - 140nm at 1300nm.
3. Minimum output power level of ≥14dBm.

D. VCSEL-based light source for multimode fiber testing shall have a:

1. Center wavelength of 850nm ± 30nm and 1300n ± 20nm.
2. Spectral width (FWHM) 30nm - 60nm at 850nm and 100nm - 140nm at 1300nm.
3. Minimum output power level of ≥14dBm.

E. The light sources may contain internal lenses, pigtails, and modal conditioners, provided they meet the launch conditions as described in "Post-Installation" Passive Link Attenuation Testing Procedures (ref. PART 3 - EXECUTION).

F. Equipment shall be factory-calibrated within 12 months of testing date.

G. Equipment:

1. Corning Cable Systems
   a. #OS-301 light source
   b. #OS-302 light source
   c. #OS-100D light source
2. Fluke Networks' DSP-4300 test set
   a. #DSP-4300; "CableAnalyzer" test kit, loaded with firmware version 3.0.4.
   b. #DSP-FTA420S; 'Multimode' fiber testing adapter, LED-based (850nm, 1300nm).
   c. #DSP-FTA440S; 'Gigabit' fiber testing adapter, VCSEL-based (multimode @ 850nm and singlemode @ 1310nm).
   d. LinkWare; "LinkWare" management software (latest version).
3. Laser Precision #5150 test set

2.03 FIBER OPTIC POWER METER

A. The power meter for both multimode and ~~singlemode~~ testing must be capable of measuring relative or absolute power, and must be independent of modal distributions.

B. All power meters used must be calibrated and traceable to the National Bureau of Standards.

C. All power meters used shall have the following performance:

1. Dynamic range of 0dBm to -40dBm, minimum.
2. Accuracy of ±0.2dB.

D. Equipment shall be factory-calibrated within 12 months of testing date.

E. Equipment:

1. Agilent Technologies' WireScope 350 test set
   a. #450-1070 Fiber SmartProbe testing adapter, multimode 850nm.
   b. #450-1080 Fiber SmartProbe testing adapter, multimode 1300nm.
   c. ScopeData management software (version 5.20).
2. Corning Cable Systems,
   a. #OTS-210 power meter, with data storage capacity.
   b. #OTS-310 power meter, with data storage capacity.
3. Laser Precision #5025 test set

2.04 FIBER OPTIC MANDREL

A. For jacketed (3.0 mm) fiber, mandrel diameter shall be 22 mm for 50/125 um fiber. For unjacketed buffered (0.9 mm) fiber, mandrel diameter shall be 25 mm for 50/125 um fiber.

B. Equipment: Fluke Networks

1. #NF-MANDREL-50; red mandrel for jacketed 50/125 um fiber

2.05 FIBER OPTIC OTDR

A. Multimode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
850nm	24dB	6.5mt	3.0mt	0.001dB	0.1mt
1300nm	27dB	7.0mt	3.0mt	0.001dB	0.1mt

B. Equipment, including main unit and source modules, shall be factory-calibrated within 12 months of testing date.

C. Equipment:

1. Agilent Technologies #8147, for multimode & singlemode systems
2. Corning Cable Systems,
   a. 2001HR, for multimode & singlemode systems
   b. 340 OTDR Plus Multitester II
   c. MiniOTDR+, for multimode & singlemode systems
3. Tektronix,
   a. TFP2A FiberMaster
   b. TFS3031 TekRanger2

2.06 FIBER OPTIC TEST CORDS

A. Multimode Fiber Optic Test Cord

1. The fiber of the multimode test cord(s) shall have the core diameter and numerical aperture nominally equal to that of the multimode fiber optic passive link.
2. The length of test cords used for insertion loss testing shall be between 1m and 5m.
3. The connectors of the test cords shall be compatible with the connector types of the light source and the power meter.
   a. The connector of the test cords shall be that which the light source accepts.
4. The connectors shall exhibit <= 0.5dB loss per connection @ both 850nm and 1300nm, as measured per FOTP-171 D2.

2.07 CATEGORY 6 HORIZONTAL CABLE TESTER

A. Equipment shall meet TIA/EIA-568B.2 Addendum 1 requirements for Level III accuracy.

B. Test Standards (minimum): TIA Category 6 (per TIA/EIA-568B.2 Addendum 1); ISO/IEC 11801 Class C and D; ISO/IEC 11801-2000 Class C and D, 1000Base-T, 100Base-TX; IEEE 802.3 10Base-T; ANSI TP-PMD; IEEE 802.5

C. Areas of Test Measurement (minimum): Wire Map; Length; Insertion Loss; Near End Crosstalk (NEXT) loss, at both master unit and remote unit; Power Sum NEXT (PSNEXT) loss, at both master unit and remote unit; Equal Level Far End Crosstalk (ELFEXT), at both master unit and remote unit; Power Sum ELFEXT, at both master unit and remote unit; Return Loss (RL), at both master unit and remote unit; Propagation Delay and Delay Skew; Attenuation-to-Crosstalk Ratio (ACR), at both master unit and remote unit; Power Sum ACR (PSACR), at both master unit and remote unit; Characteristic Impedance; DC Loop Resistance.

D. Equipment: Agilent Technologies

1. #N2600A-100; "WireScope 350" test kit (main unit, remote unit, CAT6 permanent link probe, CAT6 channel probe, accessories), loaded with firmware version 3.1.1.
2. "ScopeData Pro" reporting and documentation software latest version.

E. Equipment: Fluke Networks

1. #DTX-1200 or #DTX-1800; "DTX CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with latest version of firmware.
2. #DSP-4300; "CableAnalyzer" test kit (main unit, remote unit, CAT6 permanent link adapters, CAT6 channel adapters, accessories), loaded with firmware version 3.0.4.
3. "LinkWare" reporting and documentation software (version 1.1, or higher)

2.08 BACKBONE UTP CABLING TESTERS

A. Wire Map (continuity, opens, shorts, crossed pairs, split pairs) tester, or equal:

1. Siemon #MT-5000 test unit, with 25-pair adapter.

B. Length tester, or equal:

1. Harris #TS-90 test unit

PART 3 - EXECUTION

3.01 SCHEDULING

A. Prepare a schedule for testing activities based on the schedule developed in Sections 27 15 13, 27 13 10, 27 13 14, and 27 13 24. Update testing schedule when changes in the cabling construction schedule occur.

B. Schedule both the Engineer of Record and a representative of the test equipment manufacturer for a demonstration of testing methods. Execute a demonstration of testing methods with aforementioned parties prior to 'production' testing activities. Test reports and acceptance testing will not be accepted without proof of methods demonstration.

3.02 FIELD QUALITY CONTROL

A. Complete testing as delineated below prior to system acceptance.

B. Permanently record all test results and presented in a format acceptable to the Owner or Engineer before system acceptance.

C. Remove and replace with new, at no cost to the Owner, any cables or conductors (copper or glass) failing to meet the indicated standards. The Owner will not accept the installation until testing has indicated a 100% availability of all cables and conductors or the Owner has approved any deviation from this requirement.

D. Calibrate test sets and associated equipment per the manufacturers printed instructions at the beginning of each day's testing and after each battery charge. Fully charge the test sets prior to each day's testing to ensure proper operation.

3.03 "PRE-INSTALLATION" CONTINUITY TESTING PROCEDURES

A. Ensure fiber continuity of all fiber strands of all cables prior to installation.

B. Reports from “pre-installation” continuity testing are not required to be submitted at project close out.

3.04 BACKBONE FIBER OPTIC CHARACTERIZATION TESTING

A. Test fiber optic passive links per “Base Bid Requirements” in Part 1 of this Section.

B. Precautions

1. Adhere to the equipment manufacturer’s instructions during testing activities.
2. Prior to any testing activity or any measurements taken, complete the following activities:
   a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for however long it takes to bring the test equipment to reach room temp).
   b. Clean all launch cords and system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
3. Do not power off OTDR’s light source during testing activity.
4. Do not remove launch cord from the OTDR’s light source at any time (unless the testing is complete or the equipment is being put away for the evening, or during trouble shooting).
5. Do not bend the launch cord smaller than 20 times the cord diameter during testing activities (this may induce loss into the cord reducing the accuracy of the measurement).
6. Fully charge power source before each day’s testing activity, if applicable.

C. "Post-Installation" Characterization Testing Procedures

1. Equipment settings / measurement parameters:
   a. Index of Refraction: match cable-under-test fiber parameters; default settings as follows:

Multimode	Corning 50/125 Infinicor	1.483 @ 850nm	1.483 @ 1300nm
	SYSTIMAX 50/125	1.483 @ 850nm	1.478 @ 1300nm

   b. Pulse Width: multimode: 20ns; singlemode: 50 ns.

Multimode 50/125	4 ns for cable lengths up to 500 meters
	20 ns for cable lengths from 250 meters to 2,000 meters

   c. Backscatter:
      1) Multimode: -67dB @ 850nm, -74dB @ 1300nm;
   d. Event Threshold: 0.05dB for both multimode and ~~singlemode~~
   e. Reflection Threshold:
      1) Multimode: -45dB
   f. Fiber Break/End-Of-Fiber: 3dB for both multimode and singlemode
2. Waveform: The waveform shall be real-time/normal density.
3. Obtain measurements using a ‘launch’ cord connected to the test instrument and the cable-under-test.
   a. The fiber of the launch cord shall match the fiber of the cable-under-test in physical and performance parameters (such as type, core/cladding size, index of refraction, refractive profile). The fiber of the launch cord should match the fiber of the cable-under-test in manufacturer and product.

b. The length of the launch cord shall be between 25 meters and 100 meters.

4. Review the results of each test and bring to the attention of the Engineer all fibers that do not meet the manufacturer's allowed loss for splices and connectors, or fibers that do not meet the length of the overall cable length.

D. Record Documents:

1. Test reports shall match the cable and fiber IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is associated with the electronic and printed test record.
2. The units for distance measurements (i.e., the "X" axis of the graph) shown on the print of the test measurements shall be feet.
3. For the traces, the x- and y-axis scales of a given cabling link shall be identical. Preferably, all reports shall be printed with identical scales on both x- and y-axis.
4. The launch cord must be shown in the trace of the printed test report.
5. Measurements shall carry a precision through one significant decimal place (minimum).
6. Each test report shall contain the following information (not necessarily in this order):
   a. Project name,
   b. General Contractor name / Telecommunications Installer name
   c. Cable identifier, fiber number, and fiber type (e.g., "multimode")
   d. Measurement direction,
   e. Date measurement was obtained,
   f. Operator (name an company),
   g. Test equipment model and serial number(s),
   h. Set up parameters (minimum - pulse width, refractive index, event threshold.)
   i. Wavelength,
   j. OTDR trace,
   k. Length of fiber,
   l. Overall link loss.
7. For each passive cabling link, include either a schematic graphic or narrative accurately describing the test set up as a preface to the test reports. In other words, show the launch cord with length, expected events with distances, etc. This information will eliminate many questions the Engineer will have while reviewing the reports.

3.05 BACKBONE FIBER OPTIC PASSIVE LINK INSERTION LOSS TESTING

A. Test fiber optic passive links per "Base Bid Requirements" in Part 1 of this Section.

B. Launch Conditions:

1. For passive link insertion loss testing for multimode fibers, the modal launch condition from the light source shall be characterized as Category 1 per OFSTP-14.
2. For passive link insertion loss testing of singlemode fibers:
   a. Use the launch conditions, as described in FOTP-78.
   b. Employ a method to remove high-order propagating modes, as described in FOTP-77.

C. Test Methods:

1. The passive link insertion loss testing of multimode fibers shall be performed according to "Test Method B: One Jumper Reference", per OFSTP-14, for 'permanent' links, and shall be performed according to "Test Method C: Three Jumper Reference", per OFSTP-14, for 'channel' links.
2. The passive link insertion loss testing of singlemode fibers shall be performed according to "Test Method A.1: One Jumper Measurement", per OFSTP-7.

D. Precautions

1. Adhere to the equipment manufacturer's instructions during testing activities.
2. Prior to any testing activity or any measurements taken:
   a. Ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).
   b. Power on the light source and power meter for at least 5 minutes.
   c. Clean all test cords & system cords (if applicable) connectors and all adapters with a lint-free wipe and 90% (or higher) isopropyl alcohol.
3. Do not power off light source or the power meter during testing activity.
4. Do not remove Test Cord #1 from the light source at any time (unless the testing is complete or the equipment is being put away for the evening).
5. Do not bend the test cords smaller than 20 times the cord diameter (this may induce loss into the cord reducing the accuracy of the measurement).
6. Fully charge power sources before each day's testing activity.

E. Passive Link Insertion Loss Testing Procedures

1. Test Equipment Set Up
   a. Follow the test equipment manufacturer's initial adjustment and set up instructions.
   b. If the power meter has a Relative Power Measurement Mode, select this mode.
   c. If the meter can display power levels in dBm, select this unit of measurement to simplify subsequent calculations.
   d. Set the light source and power meter to the same wavelength.
2. Test Cord Performance Verification
   a. Connect Test Cord #1 between the light source and the power meter.
   b. The value displayed on the power meter is the reference power (P_{ref}) measurement. If the power meter has a relative power measurement mode, enter this reference power measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} onto the record documents for future reference.
   c. Disconnect Test Cord #1 from the power meter. Do not disconnect Test Cord #1 from the light source.
   d. Connect the 'open' end of Test Cord #1 to an adapter (of matching connector type). Connect one end of Test Cord #2 to the adapter and the other end of Test Cord #2 to the power meter.
   e. The value displayed on the power meter is the power measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the test cord #2 connection attenuation. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the connection attenuation:
      1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): Connection Attenuation (dB) = $\left| P_{sum} - P_{ref} \right|$
      2) If P_{sum} and P_{ref} are in watts: Connection Attenuation (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$.

3) The measured connection attenuation must be less than or equal to the value found in Table 3 (below).

f. Flip the ends of Test Cord #2 so that the end connected to the power meter is now connected to the adapter, and the end connected to the adapter is now connected to the power meter.

g. The meter reading is the reversed Power Measurement (P_{sum}). Perform the proper calculations if not using Relative Power Measurement Mode.

h. Verify that both connection attenuation measurements are less than or equal to the value found in the following table:

	ST or SC Cord	Mini-Connector Cord
Multimode (50/125)	0.50 dB Max	0.20 dB Max
~~Singlemode~~	~~0.55 dB Max~~	~~0.30 dB Max~~

i. If both measurements are found to be less than or equal to the values found in Table 1, test cord #1 is acceptable for testing purposes. Unacceptable attenuation measurements may be attributable to test cord # or test cord #2. Examine each cord with a portable microscope and clean, polish, or replace if necessary.

j. Repeat this test procedure from the beginning reversing the test cords in order to verify the performance of test cord #2.

3. Determine the Launch Category of the Light Source

a. The launch category of a light source can be determined by measuring its Coupled Power Ratio (CPR). The CPR is a measurement of the modal power distribution launched into a multimode fiber. A light source that launches a higher percentage of its power into the higher order modes of a multimode fiber produces a more over-filled condition and is classified as a lower Category than a light source that launches more of its power into just the lower order modes producing an under-filled condition. Under-filled conditions result in lower link attenuation, while over-filled conditions produce higher attenuation. Therefore, adjusting the acceptable link attenuation to compensate for a light source's launch characteristics increases the accuracy of the test procedure.

b. Provide two test cords, one multimode (Test Cord #1) and one singlemode (Test Cord #2). Both cords shall be directly terminated on connectors that are compatible with the light source and power meter.

1) The fiber of the multimode test cord shall have the core diameter and numerical aperture nominally equal to those of the permanent link.

c. Connect test cord #1 between the light source and the power meter. Avoid placing bends in the cord that are less than 4 inches in diameter.

d. The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} for future reference.

e. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.

f. Connect test cord #2 between the power meter and test cord #1, using an appropriate adapter between the test cords.

1) Test cord #2, the singlemode cord, shall include a high order mode filter. This can be accomplished by twice wrapping the cord around a 1.2" diameter (30-mm) mandrel.

g. The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the CPR. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the CPR:

1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): CPR (dB) = $\left| P_{sum} - P_{ref} \right|$

2) If P_{sum} and P_{ref} are in watts: CPR (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$

Coupled Power Ratio (CPR) in dB, for 50/125µm Fiber:

	Cat-1 Overfilled	**Cat-2**	**Cat-3**	**Cat-4**	**Cat-5 Underfilled**
850nm source	20 – 24	16 – 19.9	11 – 15.9	7 – 10.9	0 – 5.9
1300nm source	16 – 21	12 – 15.9	8 – 11.9	4 – 7.9	0 – 3.9

4. Multimode Insertion Loss Measurement
   a. After setting up the test equipment, verifying the performance of the test cords, and determining the light source's CPR, the insertion loss of the passive link segments can be measured.
   b. Connect test cord #1 between the light source and the power meter.
   c. The meter reading is the Reference Power Measurement (P_{ref}). If the power meter has a Relative Power Measurement Mode, enter the Reference Power Measurement (P_{ref}) value into the meter. If it does not, hand-write P_{ref} for future reference and to be included in the Record Documents.
   d. Disconnect test cord #1 from the power meter. Do not disconnect test cord #1 from the light source.
   e. Connect test cord #1 to the passive link segment 'input'.
   f. At the opposite end of the passive link segment, connect test cord #2 to the link segment 'input' and the power meter.
   g. The meter reading is the Power Measurement (P_{sum}). If the power meter is in Relative Power Measurement Mode, the meter reading represents the insertion loss. If the meter does not have a Relative Power Measurement Mode, perform the following calculation to determine the insertion loss:
      1) If P_{sum} and P_{ref} are in the same logarithmic units (dBm, dBu, etc): Link Segment Attenuation (dB) = $\left| P_{sum} - P_{ref} \right|$
      2) If P_{sum} and P_{ref} are in watts: Link Segment Attenuation (dB) = $\left| 10 \times \log_{10} [P_{sum}/P_{ref}] \right|$
   h. Record P_{sum} for inclusion into the Record Documents. Refer to Records (ref. PART 3: EXECUTION) for all of the information to record.

5. Acceptable Measurement Values
   a. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
   b. The general insertion loss equation for any link segment is as follows:
      1) Insertion loss = <cable loss> + <connection loss> + <splice loss> + <CPR adjustment>.
      2) Note: A connection is defined as the joint made by two mating fibers terminated with remateable connectors (e.g., ST, SC, etc).
   c. 50/125µm Multimode Insertion Loss Coefficients
      1) Cable Loss = Cable Length (km) x (3.0 dB/km @ 850-nm or 1.0B/km @ 1300-nm).
      2) Connection Loss (ST or SC Connectors) = (Connections x 0.4 dB) + 0.42 dB.
      3) Connection Loss (Other mini-connectors) = (Connections x 0.2 dB) + 0.24 dB
      4) Splice Loss = Splices x (0.05 dB for fusion or 0.10 dB for mechanical).
      5) CPR Adjustment = See following table:

	Cat-1	**Cat-2**	**Cat-3**	**Cat-4**	**Cat-5**
Links with ST or SC Connectors	+0.50	0.00	-0.25	-0.50	-0.75
Links with mini-connectors	+0.25	0.00	-0.10	-0.20	-0.30

6. All cable and fiber IDs of the test reports shall match the IDs as labeled in the field – i.e., the ID on the cable label/fiber port label shall be the same as what is entered into the stored test result in the power meter.

7. Measurements shall carry a precision through one significant decimal place (minimum).

8. Each test report shall contain the following information (not necessarily in this order):
   a. Project name and address,
   b. General Contractor name / Telecommunications Installer name.
   c. Operator's name(s),
   d. Date of measurement,
   e. Test equipment - manufacturer, model, and serial number,
   f. Cable identifier, fiber and fiber type,
   g. Measurement direction,
   h. Wavelength, and
   i. Measured loss values.

3.06 BACKBONE TWISTED PAIR CABLING TESTING REQUIREMENTS AND PROCEDURES

A. Testing Requirements

1. Test backbone multipair cabling per "Base Bid Requirements" in Part 1 of this Section.
2. The installation will be accepted when testing has indicated a 100% availability of all terminated pairs or the Owner has approved any deviation from this requirement.

B. Testing Procedures

1. Test wire map and continuity for all pairs.
2. Test length for 2% of pairs of each cable. None of the pairs tested for length shall be of the same 25-pair binder group.

C. Record Documents:

1. All cable and pair IDs of the test reports shall match the IDs as labeled in the field – i.e., the ID on the cable label/termination label shall be the same as what appears on the test reports.
2. Measurements shall carry a precision through no significant decimal place.
3. Each test report shall contain the following information (not necessarily in this order):
   a. Project name and address,
   b. General Contractor name / Telecommunications Installer name,
   c. Operator's name(s),
   d. Date of measurement,
   e. Test equipment - manufacturer, model, and serial number,
   f. Cable identifier and pair numbers,
   g. Overall test result, and
   h. Measured values of minimum requirements.

3.07 HORIZONTAL CATEGORY 6 TESTING PROCEDURES

A. Precautions

1. Adhere to the equipment manufacturer's instructions during all testing.
2. Prior to any testing activity or any measurements taken, ensure the test equipment is at room temperature – approximately 70 degrees F (e.g., if necessary, bring the test equipment in from outdoors and let it set for about 15 minutes or for however long it takes to bring the test equipment to reach room temp).

3. Fully charge power sources before each day's testing activity

B. Test Equipment Set Up

1. Set up the tester to perform a full Category 6 test, as a Permanent Link configuration.
2. If the tester has the capability, set the cable type as product specific setting. If not, set as generic Category 6.
3. Set the tester to save the full test results (all test points, graphs, etc.).
4. Save the test results with the associated cable link identifier to match that as specified in Section 27 15 13.
5. Calibrate the test set per the manufacturers instructions.

C. Acceptable Test Result Measurements

1. Links which report a Fail, Fail* or Pass* for any of the individual tests shall result in an overall link Fail. All individual test results must result in a Pass to achieve an overall Pass.
2. Any reconfiguration of link components required as a result of a test Fail, must be re-tested for conformance.
3. Any cabling links failing to meet the criteria described in this specification shall be removed and replaced, at no cost to the Owner, with cables that prove, in testing, to meet the minimum requirements.
4. Minimum measurement requirements:

Wire Map	All pairs of the cabling link shall be continuous and terminated correctly at both ends. No exceptions shall be accepted.
Length	The maximum acceptable electrical length measurements for any cabling link measured under a Permanent Link configuration shall be 94 meters, including test cords.
Insertion Loss	The acceptable insertion loss measurements for any Category 6 cabling link shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair Near End CrossTalk (NEXT) Loss	The acceptable worst pair-to-pair NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Power Sum NEXT Loss	The acceptable power sum PS-NEXT loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Worst Pair-to-Pair ELFEXT and FEXT Loss	The acceptable worst pair-to-pair ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Power Sum ELFEXT and FEXT Loss	The acceptable PS-ELFEXT and loss for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Return Loss	The acceptable return loss measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.
Propagation Delay and Delay Skew	The acceptable propagation delay and delay skew measurements for any Category 6 cable shall be no greater than that as listed in TIA/EIA-568B.2 Addendum 1.

D. Record Documents

1. For each Horizontal Category 6 test measurement, record the following information:
   a. Project name and address,
   b. General Contractor name / Telecommunications Installer name,
   c. Operator's name(s),
   d. Date of measurement,
   e. Ambient temperature,
   f. Test equipment - manufacturer, model, and serial number,
   g. Cable identifier,
   h. Overall test result, and
   i. Measured values of minimum requirements.

END OF SECTION

SECTION 27 11 00

TELECOMMUNICATIONS ROOMS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Build out of telecommunications rooms and spaces.

B. Products Specified, Furnished, and Installed Under Another Section:

1. Electrical service (120V and 208V circuits and devices)
2. Conduit, device boxes, and sleeves

C. Products Furnished and Installed by the Owner:

1. Network switches, UPS systems, power strips, and telephone handsets

D. Related Divisions

1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Consult other Divisions, determine the extent and character of related work, and properly coordinate work specified herein with that specified elsewhere to produce a complete and operable system.
3. General and Supplementary Conditions.
4. Drawings, general provisions of the Agreement, and Division 1 apply to this Section.

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

B. In additional to those codes, standards, etc., list in 27 00 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ANSI/EIA-310-D-1992 Racks, Panels And Associated Equipment

1.03 DEFINITIONS

A. Refer to the Definitions requirements of Section 27 00 00.

1.04 SYSTEM DESCRIPTION

A. Telecommunications Rooms house the following functions:

1. Data backbone crossconnect field (fiber terminations)
2. Voice backbone crossconnect field (UTP terminations)
3. Data system equipment (distributed switch)
4. Horizontal termination field – both voice and data – of cabling served from this room (refer to floor plans for area served)
5. Interconnection between the data system equipment and the horizontal termination field

B. Base Bid Work

1. Telecommunications Room build out includes the following work:
   a. Preconstruction Submittals
   b. Rack bays (equipment racks, vertical management sections, anchoring, and bracing).
   c. Cable, wire and patch cord management.
   d. Overhead cable support.
   e. Seismic bracing.
   f. Identification tags and labeling.
   g. Record Documents.
   h. Warranty.

1.05 SUBMITTALS

A. Refer to Submittals of Section 27 00 00 for procedural, quantity, and format requirements.

B. Pre-Construction Submittal Requirement: Submit the following prior to the start of construction.

1. Product Data Submittal: Submit product data on products listed in this section and products not listed in this section to be installed related to this section.
2. Sample Submittal: Submit sample of equipment rack label.
3. Schedule Submittal: Submit proposed schedule of work (this schedule may be combined with the schedule developed for the 27 XX XX series Sections).
4. Shop Drawings Submittal: Consisting of proposed changes to room plans.

C. Submittal Requirements at Closeout:

1. As-Built Drawings.
2. O & M Manuals.

1.06 QUALITY ASSURANCE

A. Refer to Quality Assurance requirements of Section 27 00 00.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Refer to Product Delivery, Storage and Handling requirements of section 27 00 00.

1.08 WARRANTY

A. Refer to Warranty requirements of section 27 00 00.

PART 2 - PRODUCTS

2.01 EQUIPMENT RACK, FLOOR-STANDING

A. Application: Suitable for the support of cable termination devices, management devices, common communications equipment, and other similar equipment, installed onto floor.

B. Material: High strength, lightweight 6061-T6 aluminum, extrusion construction.

C. Channel:

1. Size: The mounting channels shall be 3” deep by 1.265” wide with a 0.17” thick web.

2. Flange: The mounting channels shall have front and back mounting flanges ("double sided"). The flanges shall be 0.25" thick, and shall have mounting holes front and back.

3. Mounting Holes: The hole pattern shall be industry standard spaced at 5/8" - 5/8" - 1/2", compatible with ANSI/EIA-310-D (1992) standard. The mounting holes shall be pre-threaded as #12-24 rolled threading.

D. Assembled Rack: The rack shall come complete with base angles (3.5" high by 6" deep by .375" thick) and top angles (1.5" high by 1.5" deep by .375" thick). The assembled rack shall be 8'-0" high (overall) by 19" mounting width (20.25" wide overall), and shall contain 51 EIA mounting spaces.

E. Include required accessories, such as floor installation kit, etc. for a complete installation.

F. Manufacturer, or equal: CPI

1. #46353-715, 8'-0"H x 19" equipment rack, black.

2.02 VERTICAL MANAGEMENT SECTION, FOR FLOOR-STANDING RACK

A. Application: Suitable for cable routing (back) & cord slack storage (front) vertically from the bottom of the rack to the top. The vertical management sections shall be double sided (i.e., the management section shall have covered cable guides on the front and flip-retainers on the rear).

B. Size & Capacity: 8'-0" high by 6" wide, with 5-1/3" deep cable storage capacity in back and 6" cord storage capacity in front.

C. Mounting: The vertical management section shall have matching bolt holes for attachment to the rack.

D. Color: black (guides and cover).

E. Manufacturer, or equal: CPI

1. #30162-715, vertical mngt section, 8'-0"H x 6"W, double sided.

2.03 HORIZONTAL MANAGEMENT PANEL

A. Application: Suitable for installation into equipment rack for cord routing (front). The horizontal management panel shall match (and fully integrate with) the vertical management sections.

B. Size & Capacity: 1U high, with hinged/removable cover and pass through capacity. Management panel shall be double sided.

C. Color: black.

D. Manufacturer, or equal: CPI

1. #30529-719; horizontal cable manager, 1U, double sided.

2.04 CABLE RUNWAY

A. Cable Runway Straight Sections

1. Application: Suitable for the support & management of communications cables, either overhead or mounted vertically on a wall. Also overhead equipment racks bracing.

2. Material (both stringer and rung): Steel tube, rectangular, 1-1/2" by 3/8" by 0.65" wall thickness.

3. Rungs: 12" on center, welded to stringer.

4. Size: length: 9' 11-1/2" (cut–to–fit); width: refer to Drawings.

5. Manufacturer, or equal: CPI
   a. #10250-709, 9" wide universal cable runway, black.
   b. #10250-712, 12"wide universal cable runway, black.
   c. #10250-718, 18"wide universal cable runway, black.
   d. #10250-724, 24"wide universal cable runway, black.

B. Cable Runway Sweep Fittings

1. Material (both stringer and rung): Steel tube, rectangular, 1-1/2" by 3/8" by 0.65" wall thickness.
2. Manufacturer, or equal: CPI
   a. #10822-712, horizontal sweep fitting for 12" wide cable runway, black.
   b. #10723-712, vertical outside sweep fitting for 12" wide cable runway, black.
   c. #10724-712, vertical inside sweep fitting for 12" wide cable runway, black.

C. Cable Runway Installation Accessories

1. Refer to Drawings for additional information and instances for installation.
2. Manufacturer, or equal: CPI
   a. #11301-001, butt splice kit.
   b. #11313-001, 45-degree butt splice kit.
   c. #11314-001, 90-degree butt splice kit.
   d. #11302-001, junction splice ("T") kit.
   e. #10608-001, vertical wall bracket kit.
   f. #10642-001, end caps.
   g. #11421-712, wall angle support kit for 12" wide cable runway, black.
   h. #11312-712, triangle support kit for 9" and 12" wide cable runway, black.
   i. #11770-712, end closing kit for 12" wide cable runway, black.
   j. #10595-712, rack-to-runway attachment kit, for 9" or 12" wide runway, black.

2.05 LABEL PLATES, FOR EQUIPMENT RACKS

A. Application: Label plate shall be suitable to affix onto top angle of equipment rack.

B. Label plate shall be 'engrave-able' stock melamine plastic laminate substrate.

1. Size (minimum): 1/2 inch high by 6 inches long by 1/16-inch thick.
2. Color: Black.

C. Lettering shall be engraved, shall be 1/8" high, and shall be white.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the General Execution requirements of Section 27 00 00.

3.02 INSTALLATION

A. Rack Bays

1. Equipment Racks, Floor-Standing
   a. Provide parts and accessories required to complete each rack.
   b. Anchor racks to the floor using methods (concrete anchors) approved by both structural engineer and DSA. Brace racks overhead to cable runway where shown on the Drawings.
2. Vertical Management Sections
   a. Provide vertical management sections as shown on Drawings. If not shown, default shall be one vertical management section between each rack and at either end of the bay.
   b. Bolt vertical management sections to the equipment racks at the points designed by the manufacturer and per the manufacturer's installation instructions.
   c. Install support devices (e.g., brackets, threaded rod with strut, etc.) per the manufacturer's instructions and fastened to the wall or ceiling using appropriate fasteners.
3. Tolerances:
   a. Equipment Rack, Floor-Standing: Field verify dimensions to establish proper clearances as follows:
      1) Front: 40" clearance from channel's front mounting flange.
      2) Back: 57" clearance from channel's back mounting flange.
   b. Equipment Rack, Wall-Mounted: Field verify dimensions to establish proper clearances as follows:
      1) Front: 40" clearance from channel's front mounting flange.
      2) Side: 10" between racks and between rack and wall.
      3) Bottom: 24" clearance from floor to bottom of rack.
   c. Provide the correct amount of space between each rack for proper installation (according to manufacturer's written instructions) of the vertical management sections.
4. Accessories
   a. Furnish one bag of 50 mounting screws per equipment rack.

B. Overhead Cable Support

1. Provide overhead cable support as shown on the Drawings for use to support cables and store cable slack within telecommunications rooms between the exit sleeves/distribution conduits and the rack bay.
2. Provide parts required to complete the installation (e.g., trapeze, junction nuts, etc.).

C. Vertical Cable Support

1. Provide vertical cable support at the locations as shown on the Drawings for use to support cables routing vertically from conduits/sleeves to the overhead cable support.
2. Provide parts required to complete the installation (e.g., vertical mounting brackets, bolts, etc.).
3. If cable runway is used, install the runway such that the rungs are facing outward (the greater distance from the rung to the stringer edge is facing inward). If cable basket is used, install the basket with spacers such that the mesh is spaced 1/2" from the wall.

3.03 LABELING

A. General Requirements: Labeling and identifier assignment shall conform to TIA/EIA-606-A Administration Standard and as approved by Owner before installation.

B. Equipment Rack Label Requirements: Provide one label plate per rack. Permanently affix label plate and position the label plate centered on the rack's front top angle.

C. Identifier Assignment

1. Equipment Racks
   a. Prefix: "RACK"
   b. First field: the telecommunications room identity; for example: "TDB".
   c. Second field: the rack number; for example: "01".
   d. Example; "RACK TDB–01"

END OF SECTION

SECTION 27 13 10

TELECOMMUNICATIONS BACKBONE ISP CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Backbone ISP (indoor) twisted pair cabling and fiber optic cabling.

B. Related Sections

1. Comply with the Related Sections paragraph of Section 27 00 00 Telecommunications Basic Requirements.
2. 27 05 28 Telecommunications Building Pathways.
3. 27 08 00 Telecommunications Testing.

1.02 REFERENCES

A. Comply with Section 27 00 00 References requirements.

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. "CMP": Communications Media Plenum [NEC plenum rating]
2. "CMR": Communications Media Riser [NEC riser/non-plenum rating]
3. "ISP": Inside Plant [cabling]
4. "MM": Multimode [fiber type]
5. "PIC": Plastic Insulated Conductor
6. "OFNP": Optical Fiber Non-conductive Plenum, plenum rating
7. "OFNR": Optical Fiber Non-conductive Riser, non-plenum riser rating
8. "OFN": Optical Fiber Non-conductive, general purpose indoor rating
9. "PE": Polyethylene
10. "PVC": Polyvinyl Chloride
11. "SM": Singlemode [fiber type]

1.04 SYSTEM DESCRIPTION

A. Refer to Section 27 00 00 for description of the project and building.

B. Work Provided Under Other Sections

1. Telecommunications Pathways (Cable Basket, Conduits, Riser Sleeves, etc.). Refer to the Drawings for size/capacity and route information.
2. Buildout of the telecommunications rooms (e.g., backboards, overhead and vertical cable runway, etc.). Refer to the Drawings for buildout information.

C. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications backbone twisted pair and fiber optic cabling system installation described in these specifications.
2. Consider backbone cabling shown on the Drawings as base bid work, unless otherwise noted. This includes terminations at both ends, unless otherwise noted.
3. In general, the base bid work includes:
   a. Preconstruction Submittals.
   b. Backbone ISP (riser) twisted pair (copper) cables and terminations.
   c. Backbone ISP fiber optic cables and terminations.
   d. Cable management.
   e. Crossconnects.
   f. Cable identification tags and system labeling.
   g. Record Documents.
   h. Warranty.

1.05 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements of Section 27 00 00.

B. Preconstruction Submittal Requirements:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications, and specifications.
2. Labeling Submittal, consisting of proposed labeling scheme for backbone cables and backbone terminations.
3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 27 XX XX series Sections.
4. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.

C. Submittal Requirements at Closeout:

1. As-Built Drawings.
2. Crossconnection records/cut sheets.
3. O & M Manuals.

1.06 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 00 00

B. Contractor Qualifications:

1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Contractor shall be manufacturer certified to install the proposed and submitted cabling system and to provide an extended warranty. Provide satisfactory evidence of certification in the form of a current letter or certificate from the manufacturer as part of the bid submission.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Comply with Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. Telecommunications cabling system, as specified in this section, shall carry a 15 year (minimum) extended system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of the twisted pair cabling system to the specific category per ANSI/TIA/EIA-568-B performance criteria for backbone cabling.

PART 2 - PRODUCTS

2.01 SHIELDED TWISTED PAIR CABLES – NON-PLENUM

A. Application:

1. Cable shall be suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in cable tray, conduit, & hangers).
2. Each and every cable run shall be a continuous single cable, homogenous in nature. Splices are not permitted anywhere.
3. Cable shall be twisted pair PIC type cable, air core, with an "ALVYN" sheath. Cable shall be compatible with Bell System type "ARMM".

B. Conductors:

1. Conductors shall be 24 AWG annealed solid copper.
2. Conductors shall be fully insulated. Insulation shall consist of an inner layer of expanded polyolefin, covered with an outer layer (skin) of solid PVC.
3. Conductors shall be twisted into pairs. Twisted pairs are stranded into 25-pair bundles and into units (and super units, if required by pair count).
4. Color Coding: Twisted pairs and units (supper units, if necessary) shall be individually color coded to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230).

C. Core & Sheath:

1. Cable core (twisted pairs) shall have a tape applied longitudinally (wrapped around it's entirety). Tape Material: non-hydroscopic polypropylene film, or equivalent.
2. Sheath Type: "ALVYN". Sheath shall consist of an inner shield and an outer jacket.
   a. Shield: Aluminum, 0.008", corrugated tape applied longitudinally, with an overlap.
   b. Jacket: Flame-retardant PVC, adhesively bonded to shield.
3. Cable shall be NEC rated as CMR, and UL listed as such.

D. Performance:

1. Electrical performance of the twisted pairs and overall cable shall comply with TIA/EIA-568-B Part 2 requirements for Category 3 UTP cabling.

E. Manufacturers:

1. General Cable Air Core Cables "Foam Skin ALVYN Riser Cable" series cables.
2. SYSTIMAX ARMM series cables.

2.02 FIBER OPTIC CABLES – NON-PLENUM

A. Application:

1. Cable shall be suitable for indoor installation, between floors in vertical riser system, under access flooring, and through overhead ceiling space (in cable tray, conduit, & hangers).
2. Cable shall exhibit stable performance in a building environment. The optical transmission performance of the fiber shall not be significantly affected by environmental fluctuations, installation, or aging.
3. Materials used in the cable shall not emit hydrogen in quantities that will increase attenuation.

B. 50/125 μm Multimode fiber strands shall meet or exceed the following geometry criteria:

1. Core diameter = 50 μm, ±3.0 μm.
2. Cladding diameter = 125 μm, ±1.0 μm.
3. Core/Cladding Concentricity = ≤ 3 μm.
4. Minimum Tensile Strength = 100,000 psi.

C. 50/125 μm Multimode fiber strands shall meet or exceed the following performance criteria:

1. Attenuation = 3.5 dB/km at 850 nm and 1.5 dB/km at 1300 nm wavelengths, maximum.
2. Overfilled Bandwidth = 500 MHz•km at 850 nm and 500 MHz•km at 1300 nm wavelengths, minimum.
3. Laser Bandwidth = 2,000 MHz•km at 850 nm and 500 MHz•km at 1300 nm wavelengths, minimum.

D. Buffering:

1. Each fiber shall be completely covered with a "primary coating" (acrylate material). This shall constitute the "fiber strand".
2. Each fiber strand shall be fully covered with a flame retardant thermoplastic material (material = PVC, or equivalent thermoplastic). This shall constitute the "buffered strand" (tight buffer type), and shall have a diameter of 0.9 mm.
3. Buffered Strands: Buffered strands shall be individually color coded to meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA S-87-640-1992).

E. Cable Sheath:

1. Strength Element: The cable shall have an internal strength element such as aramid yarn (e.g., Kevlar).
2. Tensile Strength: The cable shall have a 150-lb, minimum, rated load.
3. Outer Jacket: The cable shall have a seamless outer jacket (material = PVC, or equivalent) applied to and completely covering the internal components (fiber strands, strength element, other).
4. Flame Rating: The cable shall be NEC (Article 770) rated as OFNR, and UL listed as such.

F. Manufacturer: Corning "MIC" series cables, or equal.

2.03 TERMINATION EQUIPMENT

A. Twisted Pair Cabling Patch Panel

1. Refer to Section 27 15 13 for product requirements.

B. Fiber Optic Patch Panels

1. Passive fiber optic physical equipment and apparatus used in interconnecting and cross-connecting fiber optic cables shall possess a minimum fire resistant rating of UL94V-1.
2. The equipment, apparatus, and material for fiber optic equipment an apparatus shall conform to existing OSHA Health and Safety Laws. The equipment and apparatus shall have provision for the application of safety labels such as laser identification or warning labels as required by system considerations.
3. Fiber optic patch panel shall be a fully assembled rack-mounted fiber optic enclosed housing for protecting, storing and organizing the termination of the fiber cable and all fiber strands at each end of the cable. The patch panel shall include an integrated patching facility.
4. "Fully assembled" shall include all required installation & mounting components, and include accessories such as connector panels, coupling adapters, etc. for a complete installation.
5. The fiber patch panel must:
   a. Provide means of strain relief and support of the specified cables.
   b. Contain slack storage facilities for fiber slack.
   c. Provide patch cord management.
6. Manufacturer: Uniprise (by CommScope)
   a. #RFE-FXG-EMT/1U; 1U fiber shelf, accepts 4 adapter plates
   b. #MFA-SC06-AQ; adapter plate – 6 simplex SC multimode adapters, aqua

2.04 FIBER OPTIC CONNECTORS

A. Multimode Fiber Optic Connectors – SC Type

1. Materials:
   a. Ferrule: ceramic (zirconia or alumina) with pre-radiused finish/face.
   b. Connector housing: plastic.
2. Connector shall have an integral strain relief feature, including a bend limiting rear boot.
3. Connectors shall be aqua.
4. Connectors shall be installable via either epoxy or anaerobic method.
5. Manufacturer: Corning Cable Systems, or equal.
   a. #95-050-48-BP; SC connector, multimode 50/125.

2.05 LABELS

A. Labels for Backbone ISP Cables

1. General: Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer. Labels shall be adhesive backed and have a self-laminating feature.
2. Printable Area: 2" x 0.5", minimum.
3. Color: White.

4. Manufacturer: Panduit, or equal.
   a. #LJSL7-Y3-1; laser/ink jet labels for cable diameters 0.16”-0.32”, white
   b. #LJSL8-Y3-1; laser/ink jet labels for cable diameters 0.31”-0.69”, white
   c. #LJSL19-Y3-1; laser/ink jet labels for cable diameters 0.31”-1.42”, white

PART 3 - EXECUTION

3.01 GENERAL

A. Comply General Execution requirements of Section 27 00 00.

3.02 EXAMINATION

A. Pathways: Prior to installation, verify pathways (cable trays, conduits, etc.) exist and are ‘ready’ to accept backbone cables.

B. Telecommunications Rooms: Prior to installation, verify equipment rooms are ‘ready’ to accept the backbone cables and terminations.

3.03 PREPARATION

A. The Contractor is solely responsible to verify that twisted pair cables and fiber optic cables are fully operational – both cable sheath and conductors (twisted pair and optical) – prior to installation.

B. Documentation of pre-installation testing is not a close out requirement, and shall be the responsibility of the Contractor.

3.04 INSTALLATION – TWISTED PAIR CABLING

A. Backbone Cables

1. General
   a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
2. Placement
   a. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
   b. Maintain pulling tension within manufacturer's limits.
   c. Protect cable during installation. Replace cable if damaged during installation.
   d. Place cables with no kinks, twists, or impact damage to the sheath.
   e. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
3. Routing
   a. Maximum cable length from the termination within the Entrance Facility to the termination in Telecommunications Room shall be 500 meters.
   b. Install cables within designated pathways.
   c. When routing horizontally within telecommunications rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the wall mounted vertical cable runway and support every 24 inches on center using cable ties.
   d. Place and suspend cables in a manner to protect them from physical interference or damage.
   e. Route cables a minimum of 6" away from power sources to reduce interference from EMI.

f. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. Place the slack in the overhead cable support.

4. Termination
   a. Properly strain relieve cables at termination points per manufacturer's instructions.
   b. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.
   c. Perform post-installation testing as described in the Telecommunication Testing specification.

B. Termination Apparatus
1. Provide accessories required for a complete installation.
2. Terminate twisted pair backbone cables to modular patch panels, terminating one pair to positions 4 and 5.
3. Install the patch panels as shown on the drawing. If not is shown, install patch panels at the top of the rack.

3.05 INSTALLATION – FIBER OPTIC CABLING

A. Backbone Cable
1. General
   a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
   b. Protect fibers during installation & termination. Fibers damaged beyond repair during installation or termination shall result in replacement of the affected cable at no additional cost.
   c. Place cables within innerduct the entire route.
2. Placement
   a. Bend Radius: Maintain a minimum bend radius of 20 times the cable diameter during installation, and a minimum bend radius of 10 times the cable diameter after installation.
   b. Pulling: Maintain pulling tension within manufacturer's limits.
   c. Protection: Place and suspend cables in a manner to protect them from physical interference or damage. Replace cable if damaged during installation.
   d. Place cables with no kinks, twists, or impact damage to the sheath.
   e. Do not use cable-pulling compounds for indoor installations.
   f. Provide 30 feet (minimum) sheathed cable slack loop at each end of the run within the Telecommunications Rooms; place the slack in the overhead cable support.
   g. Place a pull rope along with cables where run in conduit and spare capacity still exists in the conduit. Tie off ends of the pull rope.
3. Routing
   a. Maximum cable length from the termination within the Entrance Facility to the termination in Telecommunications Room shall be 500 meters.
   b. Route cables in innerduct between points of termination throughout entire length (except at the fiber take up reel).
   c. Install cables within designated pathways.
   d. Neatly dress and organize cables using designated cable routing facilities, and fasten to support devices via tie wraps or Velcro-type straps.
   e. When routing horizontally within telecom rooms, utilize the overhead cable support. When routing vertically within telecommunications rooms, utilize the wall mounted vertical cable runway and

properly fasten. "Properly fasten" shall consist of cable ties in a 'crossed' configuration per cable or cable bundle (up to three cables or innerducts) every 24 inches on center.

f. Place and suspend cables in a manner to protect them from physical interference or damage.

g. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. Store slack in slack storage ring mounted on the wall.

4. Termination

a. Properly strain relieve cables at termination points (at/within the fiber optic termination panels) per manufacturer's instructions.

b. Terminate/connectorize fiber strands at both ends using the specified fiber optic connectors appropriate for the mode type of the fiber. Perform terminations in accordance with manufacturer's instructions.

c. Provide required accessories and consumables for the complete termination of fiber strands.

d. Provide 3 feet of tight buffered fiber (unsheathed) slack at each end of the run within the patch panel/termination enclosure. Properly store fiber slack in rear of patch panel into the 'routing rings', per manufacturer's instructions.

B. Fiber Optic Cable Termination Panel

1. Provide the termination panel in designated equipment rack; locate per drawings (if not shown, locate at the top).

2. Provide accessories required for proper installation of each termination panel, including connector panels and adapters.

3.06 LABELING

A. General Requirements

1. Labeling and identifier assignment shall conform to the TIA/EIA-606 Administration Standard and as approved by Owner's Representative before installation. Label colors shall conform to the TIA/EIA-606 Administration Standard.

2. Provide permanent and machine-generated labels; hand written labels will not be accepted.

B. Label Formats

1. Cable Labels

a. Text Attributes: Black, 1/8" high, minimum, or #12 font size.

b. Provide labels on both ends of cables. Install labels no more than 4" from the edge of the cable jacket. Fully wrap label around the cable jacket. Install labels such that they are visible by a technician from a normal stance.

2. Termination Apparatus Labels

a. Use labels included in the product packaging. Request approval by the Engineer for substitutions.

b. Provide white label respective field type, per TIA/EIA-606.

c. Text Attributes: Black, 3/32" high, minimum, or #10 font size.

C. Identifier Assignment

1. General: Separate label fields of the identifier with a hyphen.

2. Backbone ISP Twisted Pair Cables

a. First field shall identify the originating termination room identifier as shown on the plans; for example, "B01-TDA".

b. Second field shall identify the ending termination room identifier as shown on the plans; for example, "B01-TDB".

c. Third field of the identifier shall be the campus pair count range; for example, "0401-0600"

d. Example: "B01-TDA–B01-TDB–0401-0600"

3. Termination Positions at the Patch Panels

a. Each port shall be labeled with the pair count of the campus infrastructure.

4. Backbone ISP Fiber Optic Cables

a. First field shall identify the originating termination room identifier as shown on the plans; for example, "B01-TDA".

b. Second field shall identify the ending termination room identifier as shown on the plans; for example, "B01-TDB".

c. Third field shall identify the type and number of strands; for example, "Mxxx" where "M" stands for multimode or "S" for singlemode and xxx stands for the ending fiber strand sequential count.

d. Example: "B01-TDA– B01-TDB–M025-M036"

5. Termination Positions at the Termination Panels

a. First field of the identifier shall be the destination room; for example "TO B01-TDB".

b. Second field of the identifier shall be the strand count range; for example, "M025-M036"

c. Identifier Example: "TO B01-TDB M025-M048".

3.07 FINAL INSPECTION

A. Inspect installed products and work in conjunction with the District or District's Representative. Develop a punchlist for items needing correction.

B. Issue punchlist to Engineer for review prior to performing punchlist with the Engineer.

C. Repair defects prior to system acceptance.

D. Inspect installed products and work in conjunction with the Engineer for sign off.

END OF SECTION

SECTION 27 15 13

TELECOMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Horizontal Cabling (subsystem of Telecommunications Cabling Infrastructure).

B. Related Sections

1. Comply with the Related Sections paragraph of Section 27 00 00.
2. Section 27 05 28 - Telecommunications Building Pathways

C. Products Furnished and Installed Under Another Section:

1. Conduits, sleeves, and other pathway systems for building distribution.
2. Conduit stubs and device (back) boxes for devices/outlets.
3. Surface raceway – base, cover, and device plates.

1.02 REFERENCES

A. Comply with the References requirements of Section 27 00 00.

1.03 DEFINITIONS

A. Refer to Section 27 00 00 for Definitions.

B. In addition, the following list of terms as used in this specification shall be defined as follows:

1. "CAT6": Category 6 [UTP]
2. "Channel": End to end transmission path; e.g., the entire portion of the horizontal cabling to each outlet consisting of the Permanent Link, line cord (at the workstation), patch cord, and, if a full cross-connection is implemented, the cross-connect termination/connecting apparatus and equipment cord.
3. "CMP": Communications Media Plenum, plenum rating; synonymous with "MPP"
4. "CMR": Communications Media Riser, riser rating; synonymous with "MPR"
5. "FEP": Fluorinated Ethylene Propylene
6. "Permanent Link": Test configuration for a horizontal cabling link excluding test cords, connections at the ends of the test cords, patch cords, equipment cords, line cords; e.g., the 'permanent' portion of the horizontal cabling to each outlet consisting of cable, consolidation point (if used), termination/connecting apparatus in the Telecommunications Room and the connector at the outlet.
7. "PVC": PolyVinyl Chloride
8. "UTP": Unshielded Twisted Pair

1.04 SYSTEM DESCRIPTION

A. Base Bid Work

1. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation required to make a complete working telecommunications Horizontal Cabling System installation described in these specifications.
2. Consider horizontal cabling as shown on Drawings to be base bid work, unless otherwise noted.

B. In general, the base bid work includes:

1. Preconstruction Submittals.
2. Horizontal cables, terminations, and outlets.
3. Cable management.
4. Cable identification tags and system labeling.
5. Record Documents.
6. Warranty.

1.05 SUBMITTALS

A. Comply with the Submittals article of Section 27 00 00 for procedural, quantity, and format requirements.

B. Preconstruction Submittal Requirements:

1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
2. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.
3. Typical Outlet Sample, including faceplate, faceplate label, connectors/jacks, port labels, cables (about 12" sample), and cable label.

C. Closeout Submittal Requirements:

1. As-Built Drawings.
2. Cross-connection records/cut sheets.
3. O & M Manuals.

1.06 QUALITY ASSURANCE

A. Comply with the Quality Assurance requirements of Section 27 00 00.

B. Contractor Qualifications

1. In addition to the Contractor Qualifications requirements of Section 27 00 00, the Telecommunications Installer shall be a Panduit Certified Installer (PCI), certified by Panduit Corporation, and shall be capable of providing an extended warranty in the CertificationPlus system warranty program.
2. Provide evidence in the bid submission of certification in the PCI program. Evidence shall consist of a "Certification Of Participation" issued by Panduit Corp listing the Telecommunications Installer's company name.

1.07 DELIVERY, STORAGE AND HANDLING

A. Comply with the Delivery, Storage and Handling requirements of Section 27 00 00.

1.08 WARRANTY

A. The telecommunications horizontal cabling system, as specified in this section, shall receive a CertificationPlus system warranty. This extended warranty shall cover parts and labor for the duration of the extended warranty. This extended warranty shall also cover electrical performance of cabling system to the specific category per ANSI/TIA/EIA-568-B performance criteria for Permanent Link.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

A. Comply with the Substitutions requirements of Section 27 00 00.

2.02 HORIZONTAL CABLE

A. Application: Suitable for indoor installation.

B. Conductors:

1. Insulated Conductors: 23 AWG solid-copper fully-insulated with a flame retardant thermoplastic material (material = PVC, or equivalent).
2. Twisted Pairs: Two insulated conductors twisted to form a pair (twisted pair), and individually color-coded to industry standards (ANSI/ICEA Publication S-80-576-1994, and EIA-230).

C. Cable Sheath:

1. The cable shall be unshielded.
2. Outer jacket shall be seamless (material = LS-PVC, or similar) applied to and completely covering the internal components (four twisted pairs).
3. Cable sheath shall be round.

D. Electrical Performance: Meet or exceed TIA/EIA-568-B.2-1 and ISO/IEC 11801 requirements for CAT6 UTP cabling.

E. Packaging: Cable shall come as 1,000 foot put-ups packaged in a box.

F. Manufacturer: Panduit, or equal by Berk-Tek, General Cable, SYSTIMAX, CommScope, or Belden

1. #PUP6004BU-U, “TX6000” CAT6 UTP CMP, Blue
2. #PUP6004GY-U, “TX6000” CAT6 UTP CMP, Gray

2.03 PATCH PANEL

A. Application: Patch panel shall be suitable for installation within a telecommunication room for the termination of the CAT6 UTP 4-Pair Cable (specified herein), and shall be horizontally oriented for a rack-mounted configuration.

B. Patch panel shall have discrete ports, fully compatible with the connectors / modular jacks – refer to this section for connectors.

C. Patch panels shall be capable of supporting, organizing, labeling and patching/crossconnecting between the horizontal termination field and the equipment and/or the equipment termination field.

D. Manufacturer: Panduit

1. #CPPL24M6BL; 24-port discrete patch panel – less connectors/modular jacks

2.04 WORKSTATION OUTLETS

A. Faceplate for Flush Mount Outlets

1. Refer to outlet schedule in the Drawings for port quantity per outlet type.
2. Faceplate shall include required accessories, such as icons, blank inserts, and labels. Faceplate shall be by the same manufacturer as the connectors.
3. Faceplate shall be "Executive" series, "IE" color.
4. Manufacturer: Panduit
   a. #CFPE2IE; Mini-Com line Executive series faceplate, 2-port
   b. #CFPE4IE; Mini-Com line Executive series faceplate, 4-port

B. Faceplate for Wall Phone Outlets

1. Faceplate for wall phone outlets shall come equipped with 1 modular jack and two mounting studs.
2. Manufacturer: Panduit
   a. #KWP6PY; Faceplate for wall phone, with modular jack.

C. Faceplate for Open Office Furniture Outlets

1. Application: Faceplate shall be compatible with the baseplate and beltway of the selected open office furniture, and shall "snap" into the furniture opening.
2. Faceplate shall have 4 ports.
3. Manufacturer (example – confirm open office system): Panduit
   a. #CFFPL4BL; snap-on faceplate for open office furniture, 4-port

D. Adapters for Raceway Mount Outlets

1. Application: Adapter / module insert shall be compatible with the surface raceway opening designated for telecom use. Refer to the Outlet Schedule of the Drawings for additional information. Refer to the electrical drawings for raceway information.
2. Manufacturer: Panduit #CH02MEI-X; module insert for raceway
3. Color shall match electrical device and/or coverplate.

2.05 CONNECTORS / MODULAR JACKS

A. Connectors shall be 8-position 8-conductor modular type, shall be CAT6 rated, and shall be intended for the termination of 4-pair UTP cables. Connectors shall be by the same manufacturer as the faceplates.

B. Connectors shall be T568B wired.

C. Manufacturer: Panduit

1. #CJ688TGOR; Mini-Com TX6 Plus Jack Module, Orange

2.06 COURTESY/CAMPUS PHONE

A. Indoor, wall-mount type: Allen Tel #GB306V

2.07 WIRELESS LAN ACCESS POINT ENCLOSURE

A. Indoor ceiling-mount type: Oberon #1055

B. Indoor wall-mount type: Oberon #1023-00

2.08 LABELS

A. Labels shall be machine printable with a laser printer, ink jet printer, thermal transfer printer, or hand-held printer.

B. Horizontal Cable Labels

1. Labels shall be adhesive backed and have a self-laminating feature.
2. Labels shall wrap around the cable's jacket.
3. Printable Area: size: 2" x 0.5", minimum; color: white.
4. Manufacturer, or equal: Panduit.
   a. #LJSL7-Y3-1; laser/ink jet labels for cable diameters 0.16"-0.32", white

C. Outlet Faceplate and Port Labels

1. Labels shall be adhesive backed.
2. Port labels shall fit above the port without overlap to the next port or to the port itself.
3. Manufacturer, or equal: Panduit.
   a. #C125X030FJJ; "Equipment Room Identifier" label, for laser printer
   b. #C061X030FJJ; "Unique Cable Number" label, for laser printer

D. Modular Patch Panels

1. Labels shall be adhesive backed.
2. Labels shall fit above the port without overlap to the next port or to the port itself.
3. Printable Area: size: 0.61" x 0.33", minimum; color: white.
4. Manufacturer, or equal: Panduit.
   a. #CPPLF-5; laser labels for modular patch panels, white

E. 110 Termination Block Labels

1. Color: Blue for horizontal termination field.
2. Manufacturer, or equal: Panduit
   a. #DSL110-BU; label inserts, blue

2.09 MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties

1. Width: .75".
2. Color: Velcro cable ties shall be the same color as the cable to which it is being applied.

3. Manufacturer, or equal: Panduit
   a. #HLS-15R-0 Black, 15’ roll, cut to length.

PART 3 - EXECUTION

3.01 GENERAL

A. Comply with the Execution requirements of Section 27 00 00.

B. Install products, components, accessories, hardware, etc, according to the manufacturer’s instructions.

3.02 EXAMINATION

A. Pathways: Prior to installation, verify pathways are complete and ready for cables.

B. Equipment Rooms: Prior to installation, verify equipment rooms are complete and ready for cables.

3.03 INSTALLATION

A. Horizontal Cable

1. General
   a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
   b. Maintain maximum cable length of 90 meters from the termination in the Telecommunications Room to the termination at the outlet.
   c. A cable bundle shall contain no more than 24 individual cables.
2. Color:
   a. Provide Blue cables for data links.
   b. Provide Gray cables for voice-only links.
3. Installation
   a. Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
   b. Maintain pulling tension within manufacturer's limits.
   c. Protect cable during installation. Replace cable if damaged during installation.
   d. Place cables with no kinks, twists, or impact damage to the sheath.
   e. Place and suspend cables in a manner to protect them from physical interference or damage.
4. Routing
   a. When routing horizontally within Telecommunications Room, utilize the overhead cable support. When routing vertically within Telecommunications Room, fasten the cable bundles using approved cable ties to the wall-mounted vertical cable support every 24 inches on center.
   b. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
   c. When routing cables in areas without primary horizontal pathways, install cables onto secondary pathways or approved support devices, such as cable hangers.
   d. Route cables at 90-degree angles, allowing for bending radius along corridors for ease of access. Do not route through an adjacent space if a corridor borders at least one wall of the room.
   e. Provide a 10 feet (minimum) sheathed cable slack loop at each end of the run. In the Telecommunications Room, place the slack in the overhead cable support. At the workstation, place cable in ceiling space before the device conduit stub supported from a cable hanger.

f. Provide six inches (minimum) of sheathed cable slack behind each workstation outlet faceplate. The slack cable shall be coiled inside the device box, the surface raceway, or within the wall, in accordance with the cabling manufacturer's installation standards.

g. At the equipment bay in the Telecommunications Room where floor-standing racks are used, divide horizontal cables equally between both sides of an equipment rack such that a cable does not travel past the midpoint of the rack prior to termination. At the equipment bay in the Telecommunications Room where wall-mounted racks are used, route the horizontal cables down the hinged side of the equipment rack.

5. Termination

a. Properly (per manufacturer's instructions and TIA/EIA-568-B standard installation practices) strain relieve cables at termination points.

b. Terminate pairs on the specified connecting hardware. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.

B. Patch Panels and Horizontal Management Panels

1. Provide discrete patch panels in a quantity to allow termination of data cables served from respective IDF.

2. Install the discrete patch panels and horizontal management panels in the configuration as shown on the Drawings. Install panels level.

C. Outlet Faceplates

1. Install faceplates plumb, square, and at the same level as adjacent device faceplates.

2. Patch gaps around faceplates so that faceplate covers the entire opening.

3. For surface raceway, color shall match electrical device and/or coverplate.

D. Outlet Modular Connectors

1. Terminate pairs on the specified modular connector. Perform terminations in accordance with manufacturer's instructions and TIA/EIA-568-B standard installation practices.

2. Replace terminations and connectors not passing the required media test.

E. Courtesy/ Campus Telephone

1. Provide backing plate.

2. Install phone unit to height noted in Drawings and per manufacturer's instructions, and in compliance with codes.

3. Obtain extension number from ITS.

4. Provide permanent label on phone unit that displays the telephone's extension.

F. Wireless LAN Access Point Enclosures

1. Refer to Drawings for enclosure cabling service and installation requirements.

3.04 LABELING

A. General Requirements

1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by Owner's Representative before installation.

2. Labels shall be permanent with machine-generated text; hand-written labels will not be accepted.

B. Label Formats

1. Horizontal Cable Labels
   a. Text Attributes:
      1) Black,
      2) 1/8" high, minimum, or #12 font size.
      3) Font: Verdana preferred, or SansSerif or Arial acceptable.
   b. Install labels on both ends of cables no more than 4" from the edge of the cable jacket. Install labels such that they are visible by a technician from a normal stance.
2. Modular Patch Panel Labels
   a. Use modular patch panel labels included in the product packaging. (Approval by the Owner shall be required for other labels.)
   b. Use a label color for the respective field type, per TIA/EIA-606.
   c. Text Attributes: Black, 3/32" high, minimum, or #10 font size.
3. Outlet Labels
   a. Text Attributes: Black, 1/8" high, minimum, or #12 font size.
   b. Provide an "Equipment Room Identifier" label at the top of the faceplate with the serving telecommunication room's identifier (refer to 27 11 00 for telecommunication room identifier assignment).
   c. Provide a "Unique Cable Number" label above each port with the link's unique cable number.

C. Identifier Assignment

1. Horizontal Cables / Cabling Link
   a. Assign each cable a unique number, in ascending order beginning with the number 1.
2. Outlet Ports
   a. The outlet ports shall be identical to the unique cable number.
3. Modular Patch Panel Ports
   a. The modular patch panel ports shall be identical to the unique cable number.

3.05 FINAL INSPECTION

A. Inspect installed products and work in conjunction with the Owner. Develop a punchlist for items needing correction.

B. Issue punchlist to the Owner for review prior to performing punchlist walk.

C. Repair defects prior to system acceptance.

D. Inspect installed products and work in conjunction with the Owner for sign off.

END OF SECTION

28 31 00

FIRE DETECTION AND ALARM SYSTEM

PART 1-GENERAL REQUIREMENTS

1.01 SCOPE

1. This Section describes a Protected Premises Fire Detection system for the following San Mateo County Community College District sites: Caňada College, College of San Mateo and Skyline College. Modifications to the existing fire alarm system shall provide evacuation alarm tone signaling using horns to sound the alarm signals and ADA-compliant strobe notification devices for visual notification. The system shall be intelligent device addressable, analog detecting, low voltage and modular, with digital communication techniques, in full compliance with all applicable codes and standards. The system provided shall tie to the existing Fire Alarm Control Panel (FACP) and provide the required field devices as indicated on the Approved drawings.

   The features and capacities described in this specification are a requirement for this project and shall be furnished by the successful contractor. The District has determined that the Siemens MXL system, supplied and installed by Siemens Building Technologies, Hayward, CA (contact Kelly Rogers: 510-783-6000), is the District standard, no equal. The system as described in this specification and as shown on the drawings shall be installed, programmed, tested, and delivered to the owner in fully operational condition. The system shall include all required hardware, software, raceways and interconnecting wiring to accomplish the requirements of this specification and the contract drawings, whether or not specifically itemized herein. The system shall consist of, but not be limited to, the following, as indicated on the drawings:

   a. Fire Alarm Control Panel (FACP) - Existing
   b. Addressable Manual Fire Alarm Pull Stations
   c. Addressable Analog Smoke Detectors
   d. Audible and Visual Notification Appliances

2. Non-addressable alarm initiating, supervisory and status monitored devices shall be integrated into the fire alarm system, as applicable, via an addressable intelligent interface module, as indicated on the drawings and only as applicable to the particular project:

   a. Sprinkler Water Flow Alarm (alarm initiating)
   b. Sprinkler Valve Tamper Switch (supervisory)
   c. PIV, OS&Y

3. Audible/visual notification appliances and communicating devices to be controlled by the FACP:

   a. Strobe Lights
   b. Combination Horn/Strobes

4. Existing system is connected to the existing campus MXL network system such that all status changes are transmitted to the Main Campus FACP.

5. Although this project will not be submitted to DSA, DSA and local requirements shall be adhered to with regard to submitting specifications, wiring diagrams, shop drawings and plans. Responsibility for furnishing the quantities of copies in digital format and/or hard copy, as directed by contract requirements, shall be included as part of the work of this section.

1.02 RELATED SECTIONS, RELATED WORK AND EXISTING CONDITIONS

A. RELATED SECTIONS

1. Section 21 00 00 Basic Fire Protection
2. Section 01 32 19 Submittal Procedures
3. Division 01 General Requirements

B. RELATED WORK

1. The contractor shall coordinate work described within this section with all related trades and shall relay all necessary coordination information to the System Supplier in a timely manner such that proper coordination shall take place. Work and/or equipment provided in other sections and related to the fire alarm system shall include, but not be limited to:
    a. Mechanical Coordination: Sprinkler water flow alarm and valve tamper switches to be provided and installed by the fire protection sprinkler contractor, if a part of this project. See Division 22. They shall be wired and connected to the fire alarm system monitor modules by the contractor. N/A
    b. Mechanical Coordination: Duct Smoke Detectors shall be provided and wired under this Section and installed under the mechanical section as shown on the fire alarm system drawings. N/A
    c. Coordinate with all other trade contractors for the mounting of and/or interfacing with any and all other fire alarm system related devices.

C. EXISTING CONDITIONS

1. This project consists of modifying the existing fire alarm system within the existing building. The contractor shall visit the site to determine and verify all existing conditions. Existing conditions that would, in the contractor's opinion, prohibit or greatly delay construction progress shall be brought to the Architect and Engineer's attention in writing in a timely manner.
2. No additional compensation shall be permitted for variations due to accessible field conditions that would affect the installation of the fire alarm system.

1.03 REFERENCES - APPLICABLE LISTINGS, CODES, STANDARDS, DOCUMENTS

A. STANDARDS AND CODES

1. All equipment shall be installed and comply with the current adopted provisions of the following codes and standards.
2. All equipment shall be Underwriters' Laboratories (UL), Inc. listed for its intended use. At a minimum, the following standards shall apply:

    a. UL 268 and 268A - Smoke Detectors for Fire Protective Signaling Systems
    b. UL 346 – Water-Flow Indicators for Fire Protective Signaling Systems.
    c. UL 464 - Audible Signaling Appliances.
    d. UL 864 - Control Units for Fire Protective Signaling Systems.
    e. UL 1481 - Power Supplies for Fire Protective Signaling Systems.
    f. UL 1971 - Signaling Devices for the Hearing-Impaired.

3. National Fire Protection Association (NFPA) standards:

    a. NFPA No. 13 - 1999 Edition - Sprinkler Alarm and Supervision.
    b. NFPA No. 70 National Electrical Code.
    c. NFPA No. 72 National Fire Alarm Code.
    d. NFPA No. 90A Installation of Air Conditioning & Ventilating Systems.
    e. NFPA No. 101 Life Safety Code.

4. All raceways and wiring shall be installed in compliance with NFPA Standard 70 (National Electrical Code - Article 760) with applicable California amendments. Codes shall be implicitly followed, in particular, with regard to material type and quality, circuitry extensions from and connections to outlet and junction boxes, panel boards and similar appurtenances.

5. The fire alarm system and its installation shall comply with all applicable requirements of the Americans with Disabilities Act of 1992.

6. The fire alarm system and its installation shall comply with DSA and all other local codes and authorities having jurisdiction, including but not limited to, San Mateo County Community College District's engineering design standards and guidelines.

1.05 SYSTEM DESCRIPTION

1. The system shall operate as an integrated, multiplexed, protected premises fire alarm control system tied into the existing campus network system.

2. Changes in the status of monitored points shall be detected by the microprocessor based fire alarm control panel and shall report any change in status to the Main Campus Fire Alarm System utilizing peer-to-peer networking protocol.

3. Sensor "dirty" and "excessively dirty" trouble conditions shall report automatically.

4. Devices shall be listed by UL for sensitivity testing by means of the portable programmer/tester or by readout from the control panel. Each addressable device address shall be set electronically, devices requiring dipswitch settings, rotary switch settings, staples or jumper settings are not acceptable.

5. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the fail safe degrade mode.

6. System shall individually identify each addressable initiating device and other addressable monitor functions using multiplexing interfacing techniques.

7. System shall be capable of operating each alarm notification appliance, and other control functions, using multiplexing techniques.

8. Life safety alarm function programs shall perform automatically upon system alarm actuation. In addition, control points may be operated manually at any time by the attendant through appropriate keyboard commands. The FACP shall also provide integral programmable function control switches to allow personnel to manually operate specific pre-programmed control output functions, as required.

1.06 QUALITY ASSURANCE

1. It is the intent of these specifications to provide a complete fire alarm system that complies in all respects with the requirements of all applicable codes and standards. Equipment, materials, software, installation practices, etc. that do not meet these requirements or do not meet the performance standards herein specified shall not be acceptable.

2. The equipment furnished under this specification shall be that of the specified manufacturer, no equal. All information herein is intended to establish minimum standards of performance, quality and construction, and is based upon the Siemens MXL addressable analog equipment designed and manufactured by Siemens Building Technologies, Inc. Catalog and model numbers are specified

herein and indicate the materials as well as the operating features required. It is not the intent of these specifications to eliminate competitive installation proposals, only to standardize the District's Fire Life Safety Systems.

3. Before commencing work the fire protection contractor shall submit data showing that contractor has successfully installed fire alarm systems of the same scope, type and design as specified. The contractor shall also include the names and locations of at least three installations where such systems have performed satisfactorily for the preceding 18 months.

    a. The contractor shall submit copies of all required Licenses and Bonds as required by the State.
    b. The system supplier shall employ on staff a minimum of one NICET level 4 personnel or a professional engineer, registered in the State of California.
    c. Installing contractors unable to comply with the provisions of 1.06 shall present proof of engaging the services of a subcontractor qualified to furnish the required services.

4. Provide the services of a representative or technician from Siemens Building Technologies. The representative or technician is to be certified and experienced in the installation and operation of the type of system specified. The representative shall be licensed in the State, if required by law. The fire alarm contractor shall supervise installation (duct detector locations are to be determined by the mechanical contractor). The system supplier shall provide all software programming, software documentation, system adjustments, preliminary testing, final testing and certification of the system. The fire alarm supplier shall also be required to provide a 4 hour operational instruction to the owner's personnel.

5. All fire alarm system equipment furnished under this specification shall be UL listed, under the appropriate category, as the product of a single manufacturer. All control equipment shall be listed under UL as a single control unit. The manufacturer shall have been engaged in the production of this type of equipment for at least ten (10) years and have a fully equipped service organization capable of responding within 48 hours from the initial contact for warranty or regular service work. Emergency and/or off hours calls shall be responded to within 4 hours of initial contact, seven days a week.

6. Prior to bid submittal, per Document 00 11 19 Instructions to Bidders, contractor shall state what, if any, specific points of the proposed system's operation or the equipment's quality differ in any way from this specification by submission of a complete technical proposal to include supporting literature and drawings. Only those departures from these specifications, submitted in writing per the requirements of Document 00 11 19 Instructions to Bidders, shall be considered by the engineer. Failure to submit all departures from these specifications in compliance with Document 00 11 19 Instructions to Bidders, and to receive approval for such departures, shall be cause for summary rejection of any submittal documents where unapproved departures are discovered.

7. Should conflicts arise between project drawings and/or these specifications, regarding design, quantities of devices or circuits, the higher standard and/or quantity and/or cost shall be considered correct.

8. It is the contractor's responsibility to submit acceptable equipment for review by the engineer. The contractor shall bear all liability for damages arising from his failure to submit equipment that meets these specifications, including, but not limited to, any penalties for failure to meet construction deadline.

9. Final determination of compliance with these specifications shall rest with the Engineer of Record, who, at its discretion, may require proof of performance at the cost of the contractor. Required proof may include, but shall not be limited to, expense paid visits by representatives of the owner and engineer to sites where identical equipment is installed and providing beneficial use.

1.07 SUBMITTAL REQUIREMENTS

Prior to the start of work, the contractor shall provide a complete and comprehensive submittal for review by the engineer. These are to describe the proposed system and its equipment. Failure to provide a complete submittal shall be grounds for summary rejection of any incomplete submittal documentation. District reserves the right to deduct monies from payments due Contractor to cover District and Architect/Engineer's additional costs of review beyond the second submission. The complete submittal shall include, but not be limited to, all of the following material:

1. Power Calculations

    a. Battery capacity calculations shall be a minimum of 125% of the calculated requirement.
    b. Supervisory power requirements for all equipment.
    c. Alarm power requirements for all equipment.
    d. Power supply rating justification showing power requirements for each of the system power supplies. Power supplies shall be sized to furnish the total connected load in a worst case condition plus 25% spare capacity.
    e. Voltage-drop calculations for wiring runs demonstrating worst-case condition.

2. Complete manufacturers catalog data including supervisory power usage, alarm power usage, physical dimensions, finish and mounting requirements.

3. Complete drawings covering the following shall be submitted by the contractor for the proposed system. Floor plans in the current AutoCAD version showing the locations of all equipment and raceways, conductor counts with type and size.

4. A complete proposed system database including a description of all logic strings, control by event programming and point identification labels on a unique CD-ROM and in a formatted printed form, as required for off site editing, shall be submitted for evaluation by the owner.

    a. The program shall include all required interactive control functions between the local network systems and the methods for implementing these actions.

5. Provide the address, telephone number, and contact person(s) of the manufacturer's local service facility for normal and off-hour warranty issues.

6. Provide a fire alarm system function matrix. Matrix shall illustrate alarm output events in association with initiating devices input events. Matrix shall represent a summary of the installed system alarm, supervisory and trouble functions. (See Appendix-A NFPA-72 for minimum matrix requirements - A-7-5.2.2 (9) 1999).

7. For each system control and/or power panel, provide panel ampere loading during both normal and alarm modes, with time calculations to substantiate compliance with battery back-up power requirements (battery Ampere-Hour capacity), described elsewhere in these specifications.

8. For each system control panel, provide written schedule of active and spare addresses provided on each addressable circuit to substantiate compliance with circuit usage/spare requirements, described elsewhere in these specifications.

9. For each system control panel and system transponder notification appliance circuit, provide proof of spare capability in amperes available for future use, if needed.

10. Provide manufacture's printed product data, catalog pages and descriptions of any special installation requirements and/or procedures. Drawings depicting any special physical installation requirements shall show physical plans, elevations, all dimensions, conduit entry, minimum access clearances and any other details required.

11. Provide shop drawings as follows:

    a. Drawing or catalog page showing actual dimensions of the existing FACP.

b. Drawing(s) or catalog page(s) showing actual dimensions of any additional system control panels and/or battery cabinets.
c. Drawing or catalog page showing actual dimensions of the Remote Annunciator. N/A
d. Single line riser diagram showing, all equipment, all connections and number and size of all conductors and conduits.
e. Provide samples of various items when so requested by the Architect/Engineer.

PART 2 - SYSTEM OPERATION

2.01 BASIC SYSTEM EQUIPMENT, CIRCUITING, ADDRESSING AND OPERATING CAPABILITIES

A. GENERAL

1. The existing FACP communicates via an RS-485 Carrier Sense, Multiple Access, Collision Detect protocol, also known as CSMA/CD or an ETHERNET type topology.

2. The existing FACP provides NFPA 72, Style 4 (Class B) analog signaling line circuits. Each loop card shall communicate with and receive alarms from up to 120 points, consisting of a maximum of sixty intelligent analog alarm initiating and sixty intelligent controllable output devices. Circuits shall be configured with loop isolators and wired in a manner that prevents a catastrophic wiring event on a floor from affecting the performance of other floors.

3. System power supplies, including necessary Booster Power Supplies, transformers rectifiers, regulators, filters and surge protection required for system operation, with the capacity to power the system in a worst case condition with all devices in alarm and all local indicating appliances active without exceeding the listed ratings. Provide adequate notification appliance Booster Power Supplies so as to allow for a minimum of 20% spare capacity on each NAC.

    a. System primary power: Primary power for the FACP and the secondary power battery chargers shall be obtained from a dedicated emergency power circuit. Circuit breakers shall be fitted with a suitable guard, requiring removal of a screw to open, and used only for fire alarm. Each circuit used for fire alarm purposes shall be permanently labeled for function.
    b. Secondary power supply: Provide sealed gelled electrolyte batteries as the secondary power supply for all fire alarm functions. The battery supply shall be calculated to operate loads in a supervisory mode for twenty-four (24) hours no primary power applied and after that time, operate in alarm mode for five (5) minutes. Batteries shall be sized at 125% of the calculated size to compensate for deterioration and aging during the battery life cycle. Battery calculations shall be submitted to justify the battery size.

4. The system 16 bit core processor shall incorporate an internal operating system to process incoming alarm signals and issue output commands required as a result of the alarm reception, by system programming or by manual commands. All system processors shall be supervised by individual watchdog circuitry furnishing automatic restart after loss of activity. Systems with single watchdog circuits for all processors shall not be acceptable unless supplied with a "hot" standby CPU. Digital communication capabilities required for the control panel to communicate with remote annunciators, input/output drivers and displays shall be provided.

5. Manual Addressable Pull Stations (Siemens MSI-10B) shall be the single action type, unless specifically noted otherwise by these specifications or on project drawings, and listed by Underwriters' Laboratories, Inc. The intelligent manual fire station shall operate on any addressable detection circuit. It shall be red in color. Manual fire stations shall be individually annunciated on the control panel. Mounting height shall be 48" inches to the manual station actuation handle from the finished floor.

6. Intelligent/analog smoke detectors (Siemens FP-11) shall be photoelectric and listed by Underwriters' Laboratories, Inc. The detector shall contain a long life light emitting diode (LED) as its light source, and photo diode as a light receiver. An automatic gain control circuit shall be compensating for detector

aging and dirt accumulation. The smoke detector shall be a plug-in twist/lock unit that allows for easy connection to its mounting base. Each smoke detector, when activated, shall have a flashing tri-color LED alarm indicator that shall indicate red for alarm, yellow for trouble and green for normal operational mode. Application Specific Detection environmental settings shall be programmed as directed by the engineer. System programming shall provide multiple output functions from a single initiating multi-criteria smoke detector. This capability shall mean a separate alarm event output for smoke alarm and a separate alarm output function for thermal alarm from a single analog initiating address device. Systems not capable of providing this design requirement shall provide alternate programmable logic accomplishing design performance, acceptable to the Engineer of Record.

a. It shall be possible to adjust and/or electronically measure the sensitivity of each individual intelligent analog smoke sensor from the control panel. Relative sensitivity or manual test methods, which check the smoke sensor at the maximum allowable obscuration, will not be considered as being equivalent.

b. Smoke detectors shall alarm at their programmed sensitivity settings and shall not revert to a common default setting when their operating system segment is in the fail safe degrade mode.

7. Horns (Wheelock AH Series) shall be installed as shown on the drawings in accordance with the requirements of the UL 1971 standard and NFPA 72. Provide UL listed weatherproof units and their required back boxes where shown on the drawings.

8. Horn Strobes (Wheelock Z-Series) shall be installed as shown on the drawings in accordance with the requirements of the UL 1971 standard and NFPA 72. Provide UL listed weatherproof units and their required back boxes where shown on the drawings. See Strobe requirements below.

9. Strobes (Wheelock Z-Series) shall be installed as shown on the drawings in accordance with the requirements of the UL 1971 standard and NFPA 72. Where multiple visual notification appliances can be seen from any location, circuitry shall be incorporated for the synchronization of flash rate. Strobes shall be of the latest compatible Siemens appliances. See DSA approved drawings for device quantities and locations. Provide UL listed weatherproof units and their required back boxes where shown on the drawings.

   a. Strobes shall produce a flash rate of one (1) flash per second minimum over the listed input voltage (20VDC - 31VDC) range.
   b. Strobes shall incorporate a Xenon flashtube enclosed in a rugged Lexan lens or equivalent with solid state circuitry.
   c. Strobe intensity shall be rated per UL 1971 for 15/75, 30/75, 60/75, 75 or 110 Candela. Dual listing strobes of 15/75 intensity for UL 1971/near-axis requirements shall be used where acceptable.
   d. Strobes shall be available for semi-flush or surface mounting and in conjunction with audible appliances as required.

10. Software and firmware control:

    a. All software and firmware provided with a fire alarm system shall be listed for use with the fire alarm control unit.
    b. A record of installed software and firmware version numbers shall be maintained at the location of the fire alarm control unit.
    c. All software and firmware shall be protected from unauthorized changes through the use of "access levels."

B. SYSTEM ALARM OPERATION

1. Activation of any addressable manual fire pull box, area smoke detector, heat detector or waterflow switch shall result in, at a minimum, the following functions and indications:

a. Activate "ALARM" status change at the local FACP and annunciate on its LCD display, indicating device address, device type, device location, time and date.
b. Indicate "ALARM" status change at the respective building Remote Annunciator indicating device address, device type, device location, time and date
c. Activate General "ALARM" status change at the Off-Site Monitoring Station, through the Campus Network System.
d. Activate emergency evacuation audible and visual notification appliances within the associated building(s).
e. Annunciate "ALARM" status change at the On-site Main Campus Fire Alarm Control Panel location.
f. Record event in the non-volatile system historical log.
g. Record event system status change on the Main Campus Printer.

C. SYSTEM SUPERVISORY FUNCTIONS

1. Activation of any Supervisory circuit, (i.e.; duct detector, supervised fire sprinkler valve closure, fire suppression system air pressure abnormal, low temperature, fire pump trouble, emergency fuel tank level alarm, as applicable to this project), shall cause the following actions and indications:

    a. Activate "SUPERVISORY" status change at the FACP and annunciate on its LCD display, indicating device address, device type, device location, time and date
    b. Indicate "SUPERVISORY" status change at the respective building Remote Annunciator indicating device address, device type, device location, time and date
    c. Activate General "SUPERVISORY" status change at the Off-Site Monitoring Station, through the Campus Network System.
    d. Annunciate "SUPERVISORY" status change at the On-site Main Campus Fire Alarm Control Panel location.
    e. Record event in the non-volatile system historical log.
    f. Record event system status change on the Main Campus Printer location.

D. SYSTEM TROUBLE FUNCTIONS

1. Receipt of a system trouble alarm, shall cause the following actions and indications:

    a. Activate "TROUBLE" status change at the FACP and annunciate on its LCD display, indicating device address, device type, device location, time and date
    b. Indicate "TROUBLE" status change at the respective building Remote Annunciator indicating device address, device type, device location, time and date.
    c. Activate General "TROUBLE" status change at the Off-Site Monitoring Station, through the Campus Network System.
    d. Annunciate "TROUBLE" status change at the On-site Main Campus Fire Alarm Control Panel location.
    e. Record event in the non-volatile system historical log.
    f. Record event system status change on the Main Campus Printer location.

2. The fire alarm system wiring shall be electrically supervised to automatically detect and report trouble conditions to the FACP.

3. System addressable devices shall be supervised for placement and normal operation. Removal of an addressable device or the failure of its internal electronic circuitry shall initiate a system trouble condition.

4. The FACP shall initiate a system trouble condition when the following occurs:

    a. Primary 120/220 VAC power loss.

b. Battery disconnect.
c. Battery low voltage.

5. Operating an Off-Site Station agency alarm disconnect switch or any manual control commands that alter the system from its normal programmed standby configuration shall initiate a trouble condition.

6. Trouble conditions shall automatically activate an audible signal and flash the general system trouble LED indicator at the FACP. Pressing the trouble acknowledge key on the FACP shall silence the audible signal and continuously light the LED indicator, until the trouble condition is repaired. Subsequent trouble conditions shall re-sound the audible signal and again flash the LED. Each trouble condition must be individually acknowledged.

7. Removal of or failure of internal electronic circuitry of any addressable device shall initiate a system trouble condition.

E. INSTALLATION SHOP/AS-BUILT DRAWINGS

1. Show general layout of complete system including equipment arrangement. It shall be the responsibility of the fire alarm installing contractor to verify dimensions and ensure compatibility of all system interfaces. Shop drawings shall be maintained at the job site and shall be updated on an as needed basis. During the project life cycle, the Architect/Engineer may require updated drawings as reference during scheduled project meetings.

   a. Identify on the drawings, conduit and conductor sizes and types with number of conductors in each conduit. Provide each conduit and device with a unique identification. For addressable alarm initiation devices, the system identifier shall be the system address for that device. Signals shall be sequentially numbered with the address of the associated control module.

2. As-built drawings shall indicate point to point wiring diagrams of interconnecting wiring within all system control panels and termination enclosures showing wiring between modules and connecting field device terminals. All field numbering and/or labeling shall be reflected on As-built drawings.

3. Provide mounting details of FACP, remote transponder control panels (if any), system terminal enclosures and other boxes to building structure, showing fastener type, sizes, material and embedded depth.

F. CONDUIT, BOXES, ENCLOSURES AND WIRING DEVICES

1. All system wiring shall be in conduit and shall comply with all applicable article of the current California-amended NEC edition.

2. Boxes shall be installed plumb and firmly in position.

3. Extension rings with blank covers shall be installed on junction boxes where required.

4. Junction boxes served by concealed conduit shall be flush mounted.

5. Upon initial installation, all wiring outlets, junction, pull and outlet boxes shall have dust covers. Dust covers shall not be removed until wiring installation when permanent dust covers or devices are installed.

6. All junction boxes shall be painted fire department red and be affixed with a decal or silk-screened label “Fire Alarm System.”

7. Wet or damp locations shall require a NEMA rated enclosure suitable for the environment in which an addressable field device or module are to be installed. (i.e. monitoring of sprinkler water flow, tamper switches and OS&Y valves)

8. Electrical conduits shall enter only at the side or the bottom of control cabinets, unless designed and approved for entry on the top.

9. All conduits shall be grounded to a water main by approved ground clamps with a conductor equal in size to the largest conductor used in the system; but in no case shall the ground conductor be smaller than no. 10 AWG.

10. All openings in fire rated walls, floors or ceilings where conduits, cables or wiring trays pass through shall be fire stopped with an approved fireproofing material rated to meet or exceed the rating of the assembly penetrated.

G. CONDUCTORS

1. Each conductor shall be identified as shown on the drawings at each with wire markers at terminal points. Attach permanent wire markers within 2 inches of the wire termination. Marker legends shall be visible.

2. All wiring shall be supplied and installed in compliance with the requirements of the National Electric Code, NFPA 70, Article 760, and that of the manufacturer-wiring guides.

3. Wiring for analog loop circuits, conventional detection circuits, speaker circuits and telephone circuits shall based on the fire alarm manufactures wiring guidelines, but shall not be smaller than #16 AWG.

4. Notification Device Circuits: Minimum wire size shall be 12 AWG for horn and strobe circuits.

5. Splices shall be made with UL listed mechanical connectors to assure reliable service.

6. Crimp-on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors.

7. Wire nuts or other solderless splicing devices shall not be used.

8. A consistent color code for fire alarm system conductors throughout the installation shall be provided. The installation contractor shall submit for approval prior to installation of wire, a proposed color code for system conductors to allow rapid identification of circuit types.

9. All nominal voltage branch circuit power feeds (120/220 VAC) shall be identified “labeled” at both ends of the circuit to indicate its source and purpose. Each FACP and control panels shall have a dedicated branch circuit with shunt trip disconnect, labeled as such.

10. Wiring within system control panels shall be arranged and routed to allow accessibility to equipment for adjustment and maintenance and to isolate nominal voltage wiring from system low voltage wiring.

H. DEVICE DESCRIPTORS

Descriptors at SMCCCD MXL panels shall be developed following this standard SMCCCD protocol. No exceptions are allowed.

1. Address, Device, Equipment ID (if needed), Building Number, Floor Number, Description

2. Devices shall be identified by an abbreviation or code from the following table below.

Initiating Devices			**Communication Devices**	
Smoke Detector	SD		Fireman's Phone	FP
Heat Detector	HD		Fireman's Jack	FJ
Duct Detector	DD			

Beam Detector	BD		**Panels**	
Air Sampling	AS		Fire Alarm Control Panel	FACP
Monitoring Device (By Name)	MSC		Printer	PRT
Pull Station	PS		Annunciator	ANN
Tamper Switch	TS		Video Display Terminal	VDT
Water Flow	WF		Voice Evac Panel	EVAC
Fire Smoke Damper	FSD		Fan Control Panel	FAN
			Network Control Center	NCC
Notification Devices			Aux Power Supply	PWR
Audible	AUD		Dialer	DIAL
Visual	VIS		Foreign System Interface	FSI
Audible/Visual	AV			
Voice Evac Speaker	SPKR			

3. If the device is monitoring or controlling a piece of equipment, then that equipment's ID shall immediately follow the Device. (e.g., TRI HV-5A).

4. If the description is to contain a single compass point, it should be spelled out (e.g., North). If the description uses multiple compass points such as North East it should be abbreviated (e.g., N.E.).

5. If the description contains a room number, then state the building number followed by a dash and then the three digit room number. (e.g., 2-105)

6. Examples:
   a. 02:002-007 PS B2 F1 RM 2-105
   b. 02:001-047 SD B1 F3 MECH RM
   c. 02:004-034 DD B7 F3 N.E. CORRIDOR
   d. 02:004-059 TRI HV-5A B7 F1 MCC

PART 3 - TESTING AND ACCEPTANCE

3.01 FIELD QUALITY CONTROL

A. CERTIFICATE OF COMPLIANCE

1. Complete and submit to the project engineer in accordance with NFPA 72, paragraph 1.7.2.

B. FIELD - TESTING GENERAL

1. Each addressable analog smoke detector shall be individually field tested prior to installing the device at its designated location to ensure reliability after shipment and storage conditions. A dated log indicating correct address, type of device, sensitivity and initials of the technician performing the test - using test equipment specifically designed for that purpose - shall be prepared and kept for final acceptance documentation. After testing, the detection devices and base shall be labeled with the system address, date and initials of installing technician. Labeling shall not be visible after installation is complete.

2. Wiring runs shall be tested for continuity, short circuits and grounds before system is energized. Resistance (Megger), current and voltage readings shall be made as work progresses.

   a. A systematic record shall be maintained of all readings using schedules or charts of tests and measurements. Areas shall be provided on the logging form for readings, dates and witnesses.
   b. The acceptance inspector shall be notified before the start of any required tests. All items found at variance with the drawings or this specification during testing or inspection by the acceptance inspector shall be corrected.
   c. Test reports shall be delivered to the acceptance inspector as completed.

3. All test equipment, instruments, tools and labor required to conduct the system tests shall be made available by the installing contractor. The following equipment shall be a minimum for conducting the tests:

    a. Ladders and scaffolds as required to access all installed equipment.
    b. Multimeter for reading voltage, current and resistance.
    c. Intelligent device programmer-tester.
    d. Laptop computer with programming software for any required program revisions.
    e. Two way radios, flashlights, smoke generation devices and supplies.
    f. An approved device for measuring air flow through air duct smoke detector sampling assemblies.
    g. Decibel meter.
    h. Testing documentation.

4. In addition to the testing specified to be performed by the installing contractor, the installation shall be subject to test by the acceptance inspector.

C. FINAL ACCEPTANCE TESTING

1. A written "Acceptance Test Procedure" (ATP) for testing the fire alarm system components and installation will be prepared by the Engineer in accordance with NFPA 72 and this specification. The contractor shall be responsible for the performance of the ATP, demonstrating the function of the system and verifying the correct operation of all system components, circuits and programming.

2. The acceptance inspector shall use the system record drawings in combination with the documents specified under sections (2.01-G and 3.01-C.) during the testing procedure to verify operation as programmed. In conducting the ATP, the acceptance inspector shall request demonstration of any or all input and output functions. The items tested shall include but not be limited to the following:

    a. System wiring shall be tested to demonstrate correct system response and correct subsequent system operation in the event of:
        1. Open, shorted and grounded intelligent analog signaling line circuit.
        2. Open, shorted and grounded conventional initiating device circuits.
        3. Intelligent device removal.
        4. Primary power or battery disconnected.
        5. Incorrect device address.
    b. System evacuation alarm indicating appliances shall be demonstrated as follows:
        1. All alarm notification appliances actuate as programmed.
        2. Audibility and visibility at required levels.
    c. System indications shall be demonstrated as follows:
        1. Correct message display for each alarm input, at the control panel alphanumeric LCD display.
    d. System on-site and/or off-site reporting functions shall be demonstrated as follows:
        1. Correct alarm custom message display, address, device type, date and time transmitted for each alarm input.
        2. Correct trouble custom message display, address, device type, date and time transmitted for each alarm input.
        3. Trouble signals received for disconnect.
    e. Secondary power capabilities shall be demonstrated as follows:
        1. System primary power shall be disconnected for a period of time as specified herein. At the end of that period, an alarm condition shall be created and the system shall perform as specified for a period as specified.
        2. System primary power shall be restored for forty-eight hours and system-charging current shall be normal trickle charge for a fully charged battery bank.
        3. System battery voltages and charging currents shall be checked at the fire alarm control panel using the test codes and displayed on the LCD display.

5. In the event of system failure to perform as specified and programmed during the ATP procedure, at the discretion of the acceptance inspector, the test shall be terminated.

    a. The installing contractor shall retest the system, correcting all deficiencies and providing test documentation to the acceptance inspector.
    b. In the event that software changes are required during the ATP, the system manufacturer to compare the edited program with the original shall furnish a utility program. This utility shall yield a printed list of the changes and all system functions, inputs and outputs effected by the changes. The items listed by this program shall be the minimum acceptable to be retested before calling for resumption of the ATP. The printed list and the printer log of the retesting shall be submitted before scheduling of the ATP.
    c. The acceptance inspector may elect to require the complete ATP to be performed again if, in his opinion, modifications to the system hardware or software warrant complete retesting.

D. DOCUMENTATION

1. System documentation shall be furnished to the owner and shall include but not be limited to the following:

    a. System record drawings and wiring details including 3 sets of as-builts as well as as-builts on a CD-ROM in the current version of AutoCAD.
    b. System operation, installation and maintenance manuals.
    c. Written documentation for all logic modules as programmed for system operation with a matrix showing interaction of all input signals with output commands.
    d. System program "hard copy" showing system functions, controls and labeling of equipment and devices.
    e. All specified documentation as required under sections (2.01.E. and 3.01.C.).

E. CLEANING

1. Contractor shall thoroughly clean all areas in which it works at the end of each work day and upon completion of installation.

F. WARRANTY/SERVICES

2. The contractor shall warrant the entire system against system hardware and electrical defects including programming software defects for a period of one year. This period shall begin upon Substantial Completion of the project by the Architect of Record/Engineer of Record, but not prior to certification of final acceptance testing of the system. Contractor shall provide to owner a letter stating the start-date and end-date of warranty period. In addition, the contractor shall also provide an updated list of name(s) and phone number(s) for normal and off-hours contacts necessary to respond to warranty issues. Response to warranty notification shall require a reply within 24 hours of initial contact.

G. TRAINING

1. The fire alarm contractor shall furnish training as follows for a minimum of four employees of the system user:

    a. Training in the receipt, handling and acknowledgment of alarms.
    b. Training on system operation including manual control of output functions from the FACP.
    c. The total training requirement shall be a minimum of 4 hours, but shall be sufficient to cover all items specified.

---- END OF SECTION -----

- SECTION 31 0000 -

EARTHWORK AND GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to on-site earthwork. Any work within the public right-of-way shall be constructed to the standards of the City of San Mateo, and the State of California Department of Transportation. Earthwork includes, but is not limited to, the following:

1. Grading.
2. Material.
3. Excavation.
4. Filling and backfilling.
5. Soil Sterilant.
6. Termiticide.

B. Provide labor, material and equipment and services necessary to complete the excavations, recompaction and finish grading as specified and indicated on Plans.

1. Obtain permit from local authorities.
2. Provide surveying for grading operations.
3. Provide shoring design.
4. Provide dewatering operations.
5. Provide Site grading, cut, fill and finish.
6. Provide excavation and backfill for filling construction, including trenches within building lines.

7. Preparation for subgrade for building slabs, walks, pavements, and landscaping.
8. Provide distribution of stockpiled topsoil.
9. Provide sub-base course for walks and pavements.
10. Provide sand and gravel for capillary break/moisture barrier under building slabs.
11. Provide sub-surface drainage backfill for walls and trenches.
12. Provide Engineered fills for building slabs and foundations.

C. The work includes removal and legal disposal off the site of debris, rubbish and other materials resulting from clearing and grubbing operations.

D. Work specified in Related Sections:
1. Section 31 1000 – Site Preparation.
2. Section 31 2333 – Trenching, Backfilling, and Compacting.

1.3 DEFINITIONS

A. Engineered Fill:
1. Soil or soil-rock material approved by Project Manager and transported to the site by the Contractor in order to raise grades or to backfill excavations.
2. The District's Testing Agency will make sufficient tests and/or observations for the purpose of issuing a written statement that specification requirement.

B. On-site Material: Soil or earth material obtained from required on-site excavation.

C. Excavation: Consists of the removal of material encountered to subgrade elevations and the re-use or disposal of materials removed.

D. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.

E. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.

F. Base Course: The layer placed between the sub-base and surface pavement in a paving system.

G. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

H. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below top soil, rock base course, or drainage fill.

1.4 SYSTEM DESCRIPTION

A. Requirements:
1. Grades and elevations are to be established with reference to bench marks referenced on Plans.

2. Maintain Engineering markers such as monuments, bench marks and location stakes. If disturbed or destroyed, replace.

B. Criteria:
1. The character of the material to be excavated or used for subgrade is not necessarily as indicated.
2. Ground water elevations indicated are those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
3. Blasting will not be permitted.
4. Remove material in an approved manner.

C. Shoring Design: Where shoring is required by State Law or determined by the Contractor to be necessary, provide proposed excavation shoring method for review prior to commencement of excavation requiring shoring. Include the following information:
1. Basic design assumptions.
2. Design Calculations.
3. Describe materials or shoring system to be used.
4. Indicate whether or not any components will remain after filling or backfilling.
5. The shop plans for the proposed shoring system.
6. Coordinate with the Construction Documents and identify any proposed modifications or deviations.
7. Certification of the above by a registered professional civil or structural Project Manager licensed by the State of California.

D. Dewatering Plan: Based upon site surface and subsurface conditions, including available geotechnical and hydrological data, provide a system to perform the following:
1. Lower the ground water level two feet below the bottom of excavation.
2. Relieve the hydrostatic pressure below the subgrade to prevent uplift.
3. Prevent surface drainage from accumulating within work area.
4. Legally discharge and dispose of excess water.
5. Submit description of basic components of proposed dewatering system and its planned method of operation.

E. Safety:
1. The College of San Mateo campus has a history of serpentine rock. The Contractor shall take all necessary precautions to eliminate the exposure of workers, students, staff and the public to asbestos fibers, including but not limited to: dust control measures and measures included in Section 93106 and Section 93105 of California Code of Regulations, Title 17.

1.5 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures.

B. Product Data: Manufacturer's literature and data, including, where applicable, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:

1. Imported materials.
2. Class II aggregate base (CDT Section 26).
3. Storm Water Pollution Prevention / Erosion Control Plans.
4. Permit/Notice of Intent (N.O.I.), for discharge of storm run-off from the construction site.

C. Test Reports: Submit following reports for import material directly to Project Manager from the Contractor's testing services:
1. Test reports on borrow material.
2. Density test reports.
3. One optimum moisture-maximum density curve for each type of soil encountered.
4. Report of actual unconfined compressive strength and/or results of bearing test of each strata tested.
5. At least one laboratory optimum moisture - maximum dry density curve for each type of soil encountered.

D. Submit description of dewatering methods proposed for use.

E. Submit description of vibratory compactors proposed for use when requesting placement of backfill and fill materials in layers greater than 6 inches thick.

F. Samples:
1. 20-lb. Samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
2. 12-by-12 inch sample of filter fabric.

1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) "Standard Specifications."
2. Comply with State of California Code of Regulations (CCR).
3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).
4. San Mateo Department of Public Works, Standards and Specifications and Plans.

B. Soil Testing:
1. District will engage a geotechnical testing agency, to include testing soil materials proposed for use in the work and for quality control testing during excavation and fill operations.
2. Test results will be distributed in compliance with Section 01 4523 – Testing and Inspection.

C. Codes and Standards:
1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
2. Storm Water Pollution Prevention and Monitoring Plan to be prepared by others.
3. Statewide General Permit to Discharge Storm Water associated with construction activity.

D. Comply with the latest editions of the following Standards and Regulations:
   1. American Society for Testing and Materials (ASTM):
      a. C33: Concrete Aggregates.
      b. C125: Standard Terminology Relating to Concrete and Concrete Aggregates.
      c. C136: Sieve Analysis of Fine and Coarse Aggregates.
      d. C566: Total Evaporable Moisture Content of Aggregate by Drying.
      e. D421: Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
      f. D422: Particle Size Analysis of Soil.
      g. D854: Specific Gravity of Soils.
      h. D1556: Density of Soil by the Sand Cone Method.
      i. D1557: Laboratory Compaction Characteristics of Soil Using Modified Effort
      j. D2216: Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
      k. D2487: Classification of Soils for Engineering Purposes.
      l. D2922: Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
      m. D2937: Density of Soil in Place by Drive Cylinder Method.
      n. D3017: Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
      o. D4318: Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   2. California Code of Regulations, Title 24, Part 2 - Basic Building Regulations, Chapter 24 - Excavations, Foundations, and Retaining Walls.
   3. California Department of Transportation (CDT) Standard Specifications:
      a. Section 17:
      b. Section 18:
      c. Section 19: Earthwork.
   4. CAL/OSHA, Title 8.
   5. Other authorities having jurisdiction

E. Geotechnical Engineering Services:
   1. Geotechnical Engineer will observe grading observations during preparation offsite, excavation, and compaction of fill materials.
   2. Make visits to site to familiarize himself generally with progress and quality of work.
   3. Make field observations and tests to enable him to form opinions regarding adequacy of site preparation, acceptability of fill materials and extent to which earthwork construction and relative compaction comply with specifications requirements.
   4. Examine conditions exposed in foundation excavations.

F. Site Information:
   1. Soil borings and other exploratory operations may be made by Contractor at no cost to District. Submit proposed boring locations for review prior to performing the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect materials of this section before, during and after installation; objects designated to be retained; and the installed work of other trades.

B. In the event of damage to any of these items, immediately make repairs or replacements necessary to the acceptance of the Project Manager and at no additional cost to the District.

C. Comply with provisions of Section 01 5100 – Temporary Facilities and Controls where necessary to control dust and noise on and near the work caused by operations during performance of the Work.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:
   1. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water.
   2. Provide adequate temporary drainage to prevent erosion.
   3. After interruption, reestablish compaction specified in last layer before resuming work.
   4. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to District.
   5. Protect existing streams, ditches and storm drain inlets from water-borne soil by means of straw bale dikes, filter fiber dams, or other methods as approved by the Project Manager.

B. Barricade open excavations and post with warning lights.
   1. Comply with requirements of Section 01 5100 – Temporary Facilities and Controls.
   2. Operate warning lights as recommended by authorities having jurisdiction.
   3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout and other hazards.

C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

D. At Contractor's option, a working pad of granular material may be laid to protect footing and floor subgrade soils from disruption by traffic during wet conditions.

E. Transport all excess soils materials by legally approved methods to disposal areas.
   1. Coordinate with the Project Manager.
   2. Sufficient topsoil and fill material shall be retained from the site to complete project requirements.
   3. Any additional topsoil and fill requirements shall be the responsibility of the Contractor.

F. Use of explosives will not be permitted.

G. Dust Control Requirements: At all times during earthwork operations and until final completion and acceptance of the earthwork, the Contractor shall prevent the formation of an airborne dust

and dirt nuisance from interfering with the surrounding normal operations. The Contractor shall effectively stabilize the site of work in such a manner that it will confine dust particles to the immediate surface of the work and to obtain a minimum of 40 percent emissions reduction by applying a dust palliative. The dust palliative shall be non-petroleum based. Water alone is not considered to be a dust palliative. The dust palliative shall be applied at the rate and method in conformance with Section 18, "Dust Palliative," of the CDT Standard Specifications and as recommended and/or specified by the manufacturer. Contractor shall assume liability for all claims related to dust and dirt nuisances.

1.9 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work. If utilities are to remain in place, provide adequate means of protection during construction operations.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during construction activities, consult utility Project Manager immediately for directions.
   1. Cooperate with the District and public and private utility companies in keeping their respective services and facilities in operation.
   2. Repair damaged utilities to the satisfaction of the utility District.

C. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by Project Manager and then only after acceptable temporary utility services have been provided.

1.10 SEQUENCING AND SCHEDULING

A. The sequence of operations shall be reviewed by the Project Manager prior to commencement of any work.

B. Coordinate operations with relocation of existing utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Fill material will be subject to approval of the Geotechnical Engineer.
   2. For approval of imported fill material, notify the Project Manager at least 7 days in advance of intention to import material, designated proposed borrow area, and permit the Geotechnical Engineer to sample as necessary from borrow area for purpose of making acceptance tests to prove quality of material.
   3. The Geotechnical Engineer's report on acceptability shall be final and binding.
   4. During grading operations, soil types other than those analyzed in the geotechnical report for the project, may be encountered.
   5. Consult the Geotechnical Engineer to determine the suitability of these soils.
   6. Recycled concrete to meet the gradation and quality of Class II Aggregate Base as specified in Section 26-1.02A of the Caltrans Standard Specifications, 2006

B. Engineered Fill Material: Soil excavated from site or imported conforming to requirements for fill material.

1. Imported materials should have a plasticity index not less than 5 nor greater than 15, as determined by ASTM D4318; and expansion index not exceeding 20, as determined by UBC Specification 29-2; and a particle size not exceeding 3 inches as determined by ASTM D422.

C. Topsoil: Friable clay loam surface soil found in a depth of not less than 10 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2 inches in diameter, and without weeds, roots and other objectionable material.

1. Use topsoil for top 2 feet of fill against exterior walls, except at paving, sidewalks, and slabs.
2. Topsoil may also be used beyond the area within 5 feet of building, except under paving and sidewalks.
3. Confirm suitability of stockpiled materials.

D. Sand: Clean, well-graded fine to coarse sand with not more than 2 percent passing the #200 sieve based on wet sieve analysis.

1. Provide 2-inch layer under building slabs on grade.
2. Provide layer at least two feet wide (thick) against embedded walls.
3. Provide at other locations indicated.
4. Where coarse sand is required, provide sand no finer than No. 40 sieve.

E. Graded Rock Base:

1. Bedding for utility piping: Washed, uniformly graded mineral aggregate ASTM D448 with percentage composition of dry weight conforming with following limits:
   a. Passing 1-inch Sieve: 100 percent.
   b. Passing 3/4-inch Sieve: 90-100 percent.
   c. Passing No. 4 Sieve: 0-10 percent.
2. Base at Slab-on-Grade: As specified in the geotechnical report for this project.
3. Absorption of water to saturated-surface dry condition shall not exceed 3 percent of oven-dry weight of a sample.

F. Backfill material for use behind retaining walls shall be a granular material consisting of sand, broken rock, or a mixture of sand and gravel containing no size larger than 2 ½ inches and not more than 15 percent passing the No. 200 sieve.

G. Imported Fill Requirements: Imported fill, where required, shall be non expansive granular soil, free of organic matter and deleterious substances. Imported fill material shall conform to the following requirements:

1. Grading:

U. S. Sieve Size	Percentage Passing Sieve
2 ½ inch	100
No. 8	25-45
No. 200	0-10

2. Be thoroughly compactable without excessive voids.
3. Meet the following plasticity requirements:

a. Maximum Plasticity Index of 12, as determined by ASTM D4318.
b. Maximum Liquid Limit of 35, as determined by ASTM D4318.

H. Imported Fill for Planting Areas: Imported fill for use in planting areas shall be sandy loam weed free soil. Submit analysis from certified Soil and Plant Lab. Coordinate with Architect and Landscape Engineer.

I. Recycled Fill for Pavement and Trench Backfill Areas: Recycled concrete for use as aggregate base in pavement areas and in trench initial backfill areas shall meet the gradation and quality of Class II Aggregate Base as specified in Section 26-1.02A of the Caltrans Standard Specifications, 2006. Recycled concrete shall not be used in areas where landscape planting is proposed.

J. Pea Gravel: 3/8 inch to ½ inch washed, uncrushed gravel. Use at drainage pipe and at other locations indicated.

K. Filter Fabric: Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test method in parentheses.
1. Grab Tensile Strength (ASTM D4632): 100 lb.
2. Apparent Opening Size (ASTM D4751): #100 U.S. Standard sieve.
3. Permeability (ASTM D4491): 150 gallons per minute per square foot.

L. Drainage Pipe:
1. Perforated corrugated plastic drainage tubing meeting ASTM F405, with continuous integral nylon filter screen.
2. Acceptable Manufacturers and Products: Advanced Drainage Systems “DrainGuard,” Hancor “Agri-Flow.”
3. Provide couplings, elbows and other fittings as recommended by pipe manufacturer.

M. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to commencement of earthwork, become thoroughly familiar with site conditions.

B. In the event discrepancies are found, immediately notify the Project Manager in writing, indicating the nature and extent of differing conditions.

C. No earthwork shall be performed without physical presence or acceptance of the Geotechnical Engineer.

D. The Geotechnical Engineer’s acceptance is required by these specifications; notify the Project Manager at least 48 hours prior to commencing any phase of earthwork.
1. No phase of work shall proceed until prior phase has been accepted by the Geotechnical Engineer.

2. Work shall not be covered up or continued until acceptance of the Geotechnical Engineer shall give written notice of conformance with the specifications upon completion of grading.

E. Compacting:
1. Compact by power tamping, rolling or combinations thereof as accepted by the Geotechnical Engineer.
   a. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
   b. Scarify and recompact any layer not attaining compaction until required density is obtained.
2. Compaction by flooding, ponding or jetting will not be permitted, unless specifically accepted by the Geotechnical Engineer.

F. Hazardous Materials
1. If any materials are encountered that may be hazardous (as defined in Section 25117 of the California Health and Safety Code), inform the Project Manager verbally within 24 hours and in writing within 2 business days. Upon discovery, material is to remain undisturbed until investigation by Project Manager is complete. The removal and disposal of hazardous materials, if discovered, is not part of the scope of work of this Division for this project.

3.2 SITE PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities which are to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. Set up tree protection measures prior to commencing grading or demolition operations.

B. Clearing and Grubbing:
1. Remove from area of designated project earthwork all improvements and obstructions, including designated concrete curbs or slabs, asphaltic concrete, all tree and shrub roots, any buried utility and irrigation lines, and other matter determined by the Geotechnical Engineer to be deleterious.
   a. In all new planting areas, remove existing base material.
   b. Use only hand methods for grubbing inside the drip line of trees indicated to be left standing.
2. Retain on the site all trees and shrubs, unless otherwise indicated on the plans as existing trees to be removed.
3. Remove or fill existing basements left from removed structures as appropriate to areas. Compact in accordance with requirements of these specifications.
4. Removed material shall become property of the Contractor and shall be removed from site, unless otherwise indicated on the plans or specified herein.
5. Holes resulting from removal of underground obstructions that extend below finish grades shall be cleared and backfilled with Engineered fill.
6. Existing Trees to remain:
   a. Verify the locations of existing trees to be preserved.

b. Replace existing trees to remain that are damaged during construction at no additional cost to the District and provide replacement specimens of same species per coordination with the Project Manager.

c. Carefully make clean cuts at roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction. Paint cuts over ½ inch in size with tree pruning compound.

7. Contact District Arborist 48 hours prior to cutting any trees

C. Topsoil:

1. Strip topsoil to whatever depths encountered in manner to prevent intermingling with the underlying subsoil or other objectionable material.
2. Remove heavy growths of grass from areas before stripping. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to the main root system.
3. Stockpile topsoil in storage piles to freely drain surface water.
4. Cover storage piles if required to prevent windblown dust.

3.3 EXISTING UTILITIES

A. Protect existing utilities that are to remain in operation as specified.

B. Demolish and completely remove from the site existing underground utilities indicated and/or required to be removed in order to complete the work. See Section 31 1000 – Site Preparation.

C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at contractor's risk.

D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.

1. Use hand or light equipment for excavating immediately adjacent to or for excavations exposing a utility or buried structure.
2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
3. Preserve and irrigate removed sections of existing turf for salvage and/or replacement and restoration.
4. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
5. Report damage of utility line or subsurface structures immediately to Project Manager

3.4 PREPARATION OF SUBGRADE

A. Expansive soils are anticipated to basement depth.

1. Review the necessity for overexcavation of expansive soils.

B. Scarify exterior flatwork and pavement subgrade to a depth of at least 8 inches and work until uniform and free from large clods.

1. Bring expansive subgrades to 2 to 5 percentage points above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density, in accordance with ASTM D1557.
2. Bring nonexpansive subgrades to or slightly above the optimum moisture content and compact to 90 percent of the maximum laboratory dry density in accordance with ASTM D1557.
3. Increase compaction of the upper 12 - 18 inches of pavement subgrades to 95 percent of the maximum laboratory dry density per ASTM D1557 for nonexpansive subgrades.

3.5 DEWATERING

A. Do not allow water from surface drainage or underground sources to accumulate in excavations, unfinished fills, or other low areas.

B. Provide and maintain ample means and devices to remove water promptly and dispose properly of water entering excavations or other parts of the work to prevent softening of exposed surfaces.

C. Dewater by methods which will ensure dry excavation and preservation of finish lines and grades of excavation bottoms.

D. Prior to excavating below ground water level, place dewatering system in operation.
   1. Lower the ground water level a minimum of 2 feet below the bottom of the excavation.
   2. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation to prevent uplift.
   3. Use screens and gravel packs as necessary to prevent removal of fines from the soil.

E. Operate the dewatering system continuously, 24 hours a day, 7 days a week until construction work below existing ground water lever is completed.
   1. Measure and record the performance of the dewatering system.
      a. Perform at the same time each day.
      b. Use piezometers and observation wells.
   2. After placement of initial slabs and backfill, the ground water level may be allowed to rise.
   3. At no time allow ground water to rise higher than 1 foot below the prevailing level of excavation or backfill.
   4. Have a back-up pump and system available for immediate use.

F. Dispose of water away from the work in suitable manner without damage to adjacent property or menace to public health.

G. Do not drain water into work being built or under construction without prior acceptance of the Project Manager.

H. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

3.6 SITE EXCAVATION

A. General

1. All supports, shoring, and sheet piling required for the sides of excavations or for protection of adjacent existing improvements shall be provided and maintained by the Contractor. The adequacy of such systems shall be the complete responsibility of the Contractor.
2. Earth and rock, regardless of character and subsurface conditions, shall be excavated to depths shown on plans and to the neat dimensions of the footings wherever practicable, to permit pouring of footings and grade beams without use of side forms, except at slab perimeters.
3. Large rocks, pieces of concrete or other obstructions, if encountered during the excavation/scarifying operations, shall be removed and disposed of by the Contractor off the site in a legal manner.
4. Where footing excavation is too deep, backfill shall be concrete. Where footings are overdug laterally, side forms shall be employed for backfill with rock fill or concrete backfill shall be used (Contractor's option).
5. Where forming is required, only that excavation necessary to permit placing and removal of forms shall be done.
6. Bottoms of all footings and foundations trenches shall be subject to testing by the Geotechnical Engineer. Corrective measures as directed by the Project Manager shall be executed promptly.

B. Excavate subgrade as required to allow for finish grades shown on plans, as required for structural fill or otherwise required for proper completion of the work.

C. Remove and replace subgrade materials designated by Geotechnical Engineer as unsuitable.

3.7 FILL AND COMPACTING

A. See Section 31 2333 – Trenching, Backfilling, and Compacting for fill and compacting requirements.

3.8 MOISTURE CONTROL

A. Do not place, spread or roll fill material during unfavorable weather conditions or when fill material is excessively wet.

B. Do not resume operations until moisture content and fill density are satisfactory to the Geotechnical Engineer.

C. Provide berms or channels to prevent surface water from flooding excavations. Promptly remove water collecting in depressions.

D. Where soil has been softened or eroded by flooding or by placement during unfavorable weather, remove damaged areas and recompact as described for fill and compaction.

1. Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material.
2. Prevent free water appearing on surface during or subsequent to compaction operation.

3. Remove and replace, or scarify and air dry, soil material too wet to permit compaction to specified density.
4. Soil material removed because it is too wet to permit compaction 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.

3.9 GRADING

A. General: Uniformly grade areas of work including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
   1. All areas covered by the project, including excavated and filled areas and adjacent transition areas, shall be uniformly graded so that finished surfaces are at the elevations established by the plans. Planter areas to receive future topsoil shall be graded below finished grade to allow for such material.
   2. Finished surfaces and surfaces to receive paving and aggregate base shall be smooth, compacted, and free from irregular surface drainage.
   3. Ditches, gutters, and swales shall be finished to permit proper surface drainage.
   4. All surface areas, except paved and sloped embankments exceeding 8:1, shall be hydroseeded.

B. Grading Tolerances:
   1. Excavations shall not exceed 0.10-foot variation from dimensions and elevations shown or noted, unless otherwise approved by Project Manager.
   2. Fill and backfill shall be placed with tolerance of plus or minus 0.10 foot if placed in layers.
   3. Grading shall be done within plus or minus 0.10 foot typically; areas under slabs, walks or pavements shall be graded within tolerance of 0 to 0.10 foot.
   4. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10 foot above or below required subgrade elevations.
   5. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
   6. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.

C. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal of Excess Excavated Material: Excess material shall be removed by the Contractor off the site in a legal manner.

B. Testing Agency Services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform field in-place density tests according to ASTM D1556 (sand cone method), ASTM D2167 (Rubber Balloon Method), or ASTM D2937 (Drive Cylinder Method), as applicable.
   a. Field in-place density tests may also be performed by the nuclear method according to ASTM D2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D1556. With each density calibration check, check the calibration curves furnished with the moisture gauges according to ASTM D3017.
   b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gauges at beginning of work on each different type of material encountered, and at intervals as directed by the Project Manager.
2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verifications and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Project Manager.
3. Paved and Building Slab Areas; At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 square feet or less of paved area or building slab, but in no case fewer than three tests.
4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
5. Trench Backfill: In each compacted initial and final backfill layer, perform at least one filed in-place density test for each 150 feet or less of trench, but not fewer than two tests.

C. Number and location of test shall be at option of the Geotechnical Engineer.

D. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

E. After grading is completed and the testing agency has completed observation of the work, permit no further excavation or filling, except as approved by Project Manager.

3.11 PROTECTION

A. Protect newly graded areas from traffic and erosion. Install erosion control mat and straw wattles as directed by the Project Manager. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.12 CLEAN-UP

A. Comply with requirements of Section 01 7400 - Cleaning.

- END OF SECTION -

- SECTION 31 1000 -

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to site preparation, unless otherwise noted. This section applies to:

1. Surface and subsurface demolition.
2. Backfilling of excavations and depressions.
3. Coordination, demolition and/or relocation of existing utilities.
4. Prior to start of demolition of facilities, shut-off, disconnect, cut, and cap where required, underground utility services to facilities.
5. Removal of A.C. pavement driveway and concrete pavement, concrete pads, and A.C. curbing.
6. Removal of vegetation and trees as specified herein.

B. Contractor shall provide labor, material and equipment required for demolishing, cutting, removing and disposing of existing construction as designated and shown on the Plans for the following as required, unless otherwise noted.

C. Related Sections:

1. Section 31 0000- Earthwork and Grading.
2. Section 31 2333- Trenching, Backfilling, and Compacting.

1.3 SUBMITTALS

A. Comply with requirements of Section 01 3219 – Submittal Procedures.

B. Submit all permits and certificates required for the project, for record purposes.

C. Demolition schedule and proposed methods and operations.

D. Permits and notices authorizing demolition.

E. Letter or certificates of severance of utilities services from the affected agencies or utilities.

F. Proposed haul route(s) from the demolition worksite to an authorized disposal site.

G. Permit for transport and disposal of debris.

H. Make arrangements of disposing of waste and excess materials at a legally licensed landfill/disposal facility outside worksite and pay cost thereof.

I. Photograph existing conditions of existing structure surfaces, equipments, and adjacent improvements that might be misconstrued as damage related to removal operations. File photographs with Project Manager prior to start of work.

J. Submit Proposed dust control measures.

K. Submit Proposed noise control measures.

L. Work Schedule: Submit a proposed schedule of work items to be performed, and a description of how the work is to be accomplished, for the Project Manager's review.

M. Report of inspections conducted with the Project Manager before and after performing work.

1.4 QUALITY ASSURANCE

A. Comply with the following Standards: American National Standards Institute, Inc. "American National Standard Safety Requirements for Demolition" (ANSI A10.6 and A10.8).

B. Regulatory Agencies:
   1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, "Construction Safety Order."
   2. Comply with applicable local and state agencies having jurisdiction.
   3. Comply with governing EPA notification regulations.

C. Secure all required Permits or Certificates for demolition or discontinuance of utilities, prior to beginning the work.

1.5 PROJECT CONDITIONS

A. Disposition of Existing Improvements:

1. All materials indicated to be removed shall become the property of the Contractor; dispose of these outside the project site.
   a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the Site.
   b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from the construction site by the Contractor.
2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor's employees and no others.

B. Salvage and Reuse:
1. Where units or items of existing work are designated to be removed and reused in the new work or are to become salvage, remove such units or items carefully.
   a. Use tools and methods that will not damage such units or items.
   b. Protect underlying or adjoining work from damage.
   c. Salvaged items shall be cleaned by the Contractor.

C. Protection:
1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District's employees, finishes, improvements to remain and adjoining property from damage, all in accordance with applicable regulations.
2. Wet down areas affected by this work as required preventing dust and dirt from rising.

D. Scheduling:
1. Coordinate with the District in scheduling noisy or dirty work.
2. Schedule work at the District's convenience to cause minimal interference with the District's normal operations.
3. Jackhammering shall be coordinated with the District and College to minimize disturbance of classes.

E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
1. Do not close or obstruct public thoroughfares without first obtaining the required permit or permission of the responsible jurisdiction.
2. Where closing of a vehicular or pedestrian traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas affected by work of this Section and verify following:

1. Disconnection of utilities as required.
2. That utilities serving occupied portions of buildings on and off the site will not be disturbed or that temporary utility services have been provided.
3. Removal by the District of the District's personal property, movable furniture and equipment items not designated for relocation.

B. Where existing conditions conflict with representations of the Construction Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

3.2 PREPARATION

A. Verify that the area to be demolished or removed has been vacated, or adequate space made available to perform the work.

B. Arrange for, and verify termination of utility services to include removing meters and capping of lines.

C. Lay out cutting work at Job Site and coordinate with related work for which cutting is required.

3.3 DEMOLITION

A. If confirmed or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Project Manager.

B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.

C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.
1. Remove all materials not designated as salvage, in their entirety.
2. Remove building foundations in their entirety, unless otherwise indicated on the plans.

D. Fill voids in the land left by the removal of existing structures as follows:
1. In accordance with the requirements of Section 31 0000 – Earthwork and Grading. Grade finished remaining surface to the contours shown, or if not shown, to match the existing natural contours.

E. Lower, or remove, heavy structural framing members by hoist or crane.

F. Concrete and Masonry:
1. Demolish concrete and masonry in sections, less than 3 feet in any direction.
2. Method of cutting shall be limited to saw cutting and torch.

3.4 CUTTING

A. Make new openings neat.

B. Do not cut or alter structural members and any utilities including appurtenances unless indicated to do so in the Construction Documents, or written approval is received from the Project Manager.

C. Take care not to damage reinforcing or structural steel scheduled to remain in place.

D. Concrete: Cut new openings in concrete by coring and saw cutting. Saw run-bys will not be permitted.

3.5 PREPARATION FOR NEW FINISH WORK

A. Where demolished surfaces are scheduled to receive new finishes, Contractor shall restore such substrate to a condition ready to receive the scheduled new finishes, including grinding or leveling.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning of demolished materials off District's property in a legal manner.

3.7 FIELD QUALITY CONTROL

A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

- END OF SECTION -

- SECTION 31 2333 -

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:
   1. A geotechnical report is available and is titled "Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California" prepared by TRC, dated June 8, 2007.
   2. A supplemental geotechnical report is available and is titled "Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California" prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. Provide labor, material, equipment, and services necessary to complete the backfilling and compacting as necessary for this project. Section includes, but is not limited to:
   1. Select Backfill Material.
   2. Aggregate Base.
   3. Detectable Tape.
   4. Trench Excavation.
   5. Pipe Bedding.
   6. Trench Backfill.
   7. Trench Surfacing.

B. Work specified in Related Sections:
   1. Section 31 0000 – Earthwork and Grading
   2. Section 31 1000 – Site Preparation
   3. Section 33 4000 – Storm Drainage

1.3 DEFINITIONS

A. Engineered Fill:
   1. Soil or soil-rock material approved by the Project Manager and transported to the site by the Contractor in order to raise grades or to backfill excavations.

2. Contractor shall provide sufficient tests, and a written statement that all materials brought onto the project site comply with specification requirements.

B. Excavation: Consists of the removal of material encountered to subgrade elevations.

C. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below base.

D. Base: The layer placed between the subgrade and surface pavement in a paving system.

E. Relative Compaction: In-place dry density of soil expressed as percentage of maximum dry density of same materials, as determined by laboratory test procedure American Society for Testing and Materials (ASTM) D1557.

1.4 SYSTEM DESCRIPTION

A. Requirements:
1. Comply with the recommendations of the Geotechnical Engineer.
2. Protect existing trees to remain. No grading is permitted under the drip line of protected trees.
3. Excavations for appurtenant structures, such as, but not limited to, manholes, transition structures, junction structure, vaults, valve boxes, catch basins, thrust blocks, and boring pits, shall be deemed to be in the category of trench excavation.
4. Unless otherwise indicated in the Plans, all excavation for pipelines shall be open cut.

1.5 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures.

B. Test Reports: Submit the following report for import material directly to the Project Manager from the Contractor's testing services:
1. Compaction test reports for aggregate base.

C. Submit description of compactors proposed for use when requesting placement of base material.

1.6 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
1. Comply with State of California Business and Transportation Agency, Department of Transportation (Caltrans) latest edition of "Standard Specifications." (CSS).
2. Comply with State of California Code of Regulations (CCR).
3. Comply with State of California Construction Safety Orders, Latest Edition (CAL/OSHA).

B. Soil Testing:
1. District to engage a geotechnical testing agency, to include compaction testing and for quality control testing during fill operations.

2. Test results will be submitted to the Project Manager.

C. Codes and Standards:
1. Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
2. California Department of Transportation (CDT):
a. Section 19: Earthwork.
b. Standard Test Methods: No. 202.
3. American Society for Testing and Materials (ASTM):
a. D1556: Density of Soil by the Sand Cone Method.
b. D1557: Moisture Density Relations of Soils and Soil-Aggregate Mixtures.

1.7 DELIVERY, STORAGE AND HANDLING

A. Protect materials before, during and after installation.

B. Comply with provisions of Section 01 5100 – Temporary Facilities and Controls where necessary to control dust and noise on and near the work caused by operations during construction activities.

1.8 PROJECT CONDITIONS

A. Environmental Requirements:
1. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.
2. Protect existing streams, ditches and storm drain inlets during work on this project.

B. Barricade open excavations and post with warning lights.
1. Comply with requirements of Section 01 5100 – Temporary Facilities and Controls.
2. Operate warning lights and barricades as required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities immediately adjacent to excavations, from damages caused by settlement, lateral movement, undermining, washout, and other hazards.

C. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations, or other areas prepared for project.

D. Transport all excess soils materials by legally approved methods to disposal areas.
1. Coordinate with the Project Manager.
2. Any additional fill requirements shall be the responsibility of the Contractor.

1.9 EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work. For utilities that are to remain in place, provide adequate means of protection during excavation operations.
1. Locating of existing underground utilities shall include but not be limited to pot-holing prior to the start of construction.

B. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Project Manager, Facilities, and/or utility agency immediately for directions.
   1. Cooperate with the Project Manager and public and private utility companies in keeping their respective services and facilities in operation.
   2. Repair damaged utilities to the satisfaction of the agency with jurisdiction.

C. Do not interrupt existing utilities serving facilities occupied and used by the District or others, except when permitted in writing by the Project Manager and then only after acceptable temporary utility services have been provided.

1.10 SEQUENCING AND SCHEDULING

A. The sequence of operations shall be reviewed by the Project Manager prior to commencement of any work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:
   1. Import materials will be subject to approval of the Geotechnical Engineer.
   2. For approval of imported fill material, notify the Project Manager at least 7 days in advance of intention to import material.

B. Select backfill material shall be gravel, free of clay or organic matter and shall conform to the following gradation:

Sieve Size	Percentage Passing
1 inch	100
¾ inch	90 – 100
No. 4	35 – 60
No. 200	2 - 9

C. For gas pipe and fuel piping select backfill shall be clean, graded building sand conforming to the following gradation:

Sieve Size	Percentage Passing
No. 4	100
No. 200	0 - 5

D. Water: Clean and free from deleterious amounts of acids, alkalis, salts and organic matter.

2.2 BURIED WARNING AND IDENTIFICATION TAPE

A. Polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 75 mm 3 inch minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil.

1. Warning Tape Color Codes.
    a. Red: Electric.
    b. Yellow: Gas, Oil; Dangerous Materials.
    c. Orange: Telephone and Other Communications.
    d. Blue: Water Systems.
    e. Green: Sewer Systems.
    f. White: Steam Systems.
    g. Gray: Compressed Air.
2. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.003 inch. Tape shall have a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.
3. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.004 inch. Tape shall have a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 920 mm 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.3 DETECTION WIRE FOR NON-METALLIC PIPING

A. Detection wire shall be insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to commencement of work, become thoroughly familiar with site conditions.

B. In the event discrepancies are found, immediately notify the Project Manager in writing, indicating the nature and extent of differing conditions.

C. Backfill excavations as promptly as work permits.

D. Do not place Engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Project Manager.

E. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

F. In excavations, use satisfactory excavated or borrow material.

G. Under grassed areas, use satisfactory excavated or borrow material.

3.2 COMPACTING

A. Compact by power tamping, rolling or combinations thereof.
   1. Where impractical to use rollers in close proximity to walls, stairs, etc., compact by mechanical tamping.
   2. Scarify and recompact any layer not attaining compaction until required density is obtained.

3.3 SITE PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, which are to remain, from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect existing storm drainage system from silt and debris resulting from construction activities. If contamination occurs, remove contamination at no cost to the District.

3.4 EXISTING UTILITIES

A. Identity the location of existing utilities.
   1. Prior to trenching, the Contractor shall excavate at locations specifically indicated on the Plans, if any, and where new lines cross other utilities of uncertain depth and determine the elevation of the utility in question to ensure that the new line will clear the potential obstruction.
   2. The Contractor shall contact Underground Service Alert (USA) at 1-800-227-2600 for assistance in locating existing utilities.
   3. If, after the excavation, a crossing utility does present an obstruction, then the line and grade of the new line will be adjusted as directed by the Project Manager to clear the utility.

B. Protect all existing utilities to remain in operation.

C. Movement of construction machinery and equipment over existing pipes and utilities during construction shall be at Contractor's risk.

D. Excavation made with power-driven equipment is not permitted within 2 feet of any known utility or subsurface structure.
   1. Use hand or light equipment for excavating immediately adjacent to known utilities or for excavations exposing a utility or buried structure.

2. Start hand or light equipment excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
3. Support uncovered lines or other existing work affected by excavation until approval for backfill is obtained.
4. Report damage of utility line or subsurface structures immediately to the Project Manager.

E. Backfill trenches resulting from utility removal in lifts of 8 inches maximum.

3.5 TRENCH EXCAVATION

A. General
1. Excavation shall include removal of all water and materials that interfere with construction. The Contractor shall remove any water which may be encountered in the trench by pumping or other methods during the pipe laying, bedding and backfill operations. Material shall be sufficiently dry to permit approved jointing.
2. Excavation shall include the construction and maintenance of bridges required for vehicular and pedestrian traffic, support for adjoining utilities.
3. The Contractor shall be responsible to safely direct vehicular and pedestrian traffic through or around his/her work area at all times.
4. The Contractor shall relocate, reconstruct, replace or repair, at his/her own expense, all improvements which are in the line of construction or which may be damaged, removed, disrupted or otherwise disturbed by the Contractor.

B. Existing Paving and Concrete:
1. Existing pavement over trench shall be sawcut, removed, and hauled away from the job. Existing pavement shall be neatly sawcut along the limits of excavations.
2. Existing concrete over the trench shall be sawcut to a full depth in straight lines either parallel to the curb or a right angles to the alignment of the sidewalk.
3. Boards or other suitable material shall be placed under equipment outrigging to prevent damage to paved surfaces.

C. Trench Width:
1. The maximum allowable trench widths at the top of the pipe shall be as follows:

Pipe Type	Trench Width (Maximum)
Copper	Outside diameter of barrel plus 18 inches
Plastic	"
Vitrified Clay	"
Ductile-Iron	"
Reinforced Concrete	"

a. The maximum trench width shall be inclusive of all shoring.
b. If the maximum trench width is exceeded, the State's representative may direct the Contractor to encase or cradle the pipe in concrete at no additional charge.

2. For pipes 3 inch diameter and larger, the free working space on each side of the pipe barrel shall not be less than 6 inches.

D. Open Trench:

1. The maximum length of open trench shall be 300 feet or the distance necessary to accommodate the amount of pipe installed in a single day, whichever is greater. No trench shall be left open at the end of the day.
2. Provisions for trench crossings and free access shall be made at all street crossings, driveways, water gate valves, and fire hydrants.

E. Excavation Bracing:

1. The excavation shall be supported and excavation operations shall be conducted in accordance with the California Industrial Accident Commission and CAL/OSHA.
2. The Contractor shall, at his/her own expense, furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of all excavations (whether above or below the pipe grade), and to prevent any movement which could in any way diminish the required trench section or otherwise injure or delay the work. The sheeting and bracing shall be withdrawn in a manner such as to prevent any earth movement that might overload the pipe.

F. Excavated Material:

1. All excavated material not required for backfill shall be immediately removed and properly disposed of in a legal manner by the Contractor.
2. Material excavated in streets and roadways shall be laid alongside the trench no closer than 2 feet from the trench edge and kept trimmed to minimize inconvenience to public traffic.
3. Provisions shall be made whereby all storm and wastewater can flow uninterrupted in gutters or drainage channels.

3.6 PIPE BEDDING

A. Bedding Excavation: The trench shall be excavated below the grade of the pipe bottom to the following minimum depths:

Pipe Type	Depth
Copper	6 inch
Reinforced Concrete	6 inch
Plastic: 2 inch diameter and smaller	6 inch
Plastic: over 2 inch diameter	6 inch
Ductile Iron	6 inch

1. Stabilization of Trench Bottom: When the trench bottom is unstable due to wet or spongy foundation, trench bottom shall be stabilized with gravel or crushed rock. The State's inspector will determine the suitability of the trench bottom and the amount of gravel or crushed rock needed to stabilize a soft foundation. Soft material shall be removed and replaced with gravel or crushed rock as necessary.
2. Placement of Bedding Material: The trench bottom shall be cleaned to remove all loose native material prior to placing select backfill material. Sufficient select backfill material shall be placed in trench and tamped to bring trench bottom up to grade of the bottom of pipe. The relative compaction of tamped material shall be not less than 90 percent. It is

the intention of these requirements to provide uniform bearing under the full length of pipe to a minimum width of 60 percent of the external diameter.

3.7 TRENCH BACKFILL

A. Initial Backfill:

1. Prior to trench backfill, the condition of the trench and laying of pipe must be inspected and approved by the Inspector of Record.
2. Select backfill material shall be used for initial backfill. After the pipe has been properly laid and inspected, select backfill material shall be placed on both sides of the pipe and compacted to final depth as follows:

Pipe Type	Depth
Copper	12 inches above top of pipe
Plastic: less than 3 inches diameter	12 inches above top of pipe
Plastic: 3 inches diameter and larger	12 inches above top of pipe
Ductile Iron	12 inches above top of pipe
Reinforced Concrete	12 inches above top of pipe

3. Compaction: Initial backfill compaction shall be by mechanical means. The initial backfill material shall be hand tamped in layers not exceeding 4 inches in uncompacted depth and shall be brought up uniformly on both sides of the pipe to avoid bending or distortional stress. After hand tamping, the relative compaction of the initial backfill material shall be not less than 90 percent.
4. Pipe Detection: In trenches containing pressurized plastic pipes, tracer wire shall be placed directly above the pipe and shall be connected to all valves, existing exposed tracer wires, and other appurtenances as appropriate.

B. Subsequent Backfill:

1. Above the level of initial backfill, the trench shall be backfilled with non-expansive native material from trench excavation or with imported select backfill material (Contractor's option). Subsequent backfill shall be free of vegetable matter, stones or lumps exceeding 3 inches in greatest dimension, and other unsatisfactory material. The Inspector of Record shall approve the backfill material prior to placement.
2. Subsequent backfill compaction shall be by mechanical means with backfill material placed in layers not exceeding 8 inches in loose depth. Each layer shall be thoroughly compacted before succeeding layers are placed. The use of machine tampers, except manually held types, shall not be permitted.
3. Subsequent backfill shall be compacted to a relative compaction of not less than 90 percent except the relative compaction shall not be less than 95 percent within 2-1/2 feet of finished permanent surface grade or 1-1/2 feet below the finished subgrade, whichever is greater.

C. Jetting and Ponding:

1. Jetting of trench backfill is not permitted.

D. Compaction Testing:

1. Compaction testing shall be in accordance with California Test Method ASTM D1556 or D1557.

3.8 TRENCH SURFACING

A. Unpaved Areas:
   1. In unimproved areas, the trench surface shall be restored to its original condition. No mounds of earth shall be left along the trench. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
   2. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

B. Temporary Surfacing:
   1. Temporary surfacing shall be a minimum of 2 inches of cutback asphalt on 10 inches of Class 2 aggregate base and shall be placed at all trench locations subject to vehicular or pedestrian traffic.
   2. Temporary surfacing shall be laid within one day after backfilling (except where the Contractor elects to place permanent surfacing within this time period).
   3. Before the trenching area is opened for traffic, all excess dirt, rock, and debris shall be removed, the street surface shall be swept clean and the pavement shall be washed down with a water truck and pressure nozzle.
   4. Temporary surfacing shall be maintained to prevent the occurrence of mudholes and prevent the surface from settling below 1 inch or rising more than 1 inch from the existing pavement grade.

3.9 FILL AND COMPACTING

A. General Requirements:
   1. Backfill excavations as promptly as work permits.
   2. Do not place Engineered fill or backfill until rubbish and deleterious materials have been removed and areas have been approved by the Project Manager.
   3. Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
   4. In excavations, use satisfactory excavated or borrow material.
   5. Under grassed areas, use satisfactory excavated or borrow material.

B. After subgrade compaction has been approved by the Geotechnical Engineer , spread the Engineered fill materials in 6 to 8 inch loose lifts and uniformly mixed during the spreading operation.
   1. Bring non-expansive fill materials to or slightly above the optimum moisture content and compacted to at least 85 percent of the maximum laboratory dry density, pert ASTM D1557.
   2. Bring non-expansive aggregate fill materials to or slightly above the optimum moisture content and compacted to at least 95 percent of the maximum laboratory dry density, pert ASTM D1557.
   3. Do not compact the top 12 inches of soil in the planting areas.

4. Fill sections greater than 5 feet in depth shall be compacted to at least 95 percent.

C. Repeat compaction procedure until proper grade is attained.

D. Rocks generated during site earthwork may be used in fill when conforming to material specifications.

3.10 MOISTURE CONTROL

A. Do not resume operations until moisture content and fill density are satisfactory to the Inspector.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Testing Services: Allow testing agency to test each backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

B. When testing agency reports that backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.12 PROTECTION

A. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operation or adverse weather, scarify surface, reshape, compact to required density and provide other corrective work, including retesting, prior to further construction.

3.13 CLEAN-UP

A. Remove all debris, equipment, tools and materials upon completion prior to final inspections to the satisfactions of the Project Manager.

B. In unpaved areas without landscaping, cover with straw erosion control blanket. Follow manufacturer's recommendations for installation. Provide and place straw wattles or biodegradable fiber logs across the slope at the midpoint and along the downhill edge of site. No soil is to be left uncovered at the completion of construction.

- END OF SECTION -

- SECTION 32 1000 -

DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. Provide labor, material, and equipment required for demolishing, cutting, removing and disposing of existing construction as designated or required to provide for new work.

B. Coordinate all work with capping or sealing of existing utilities.

C. Related Sections:

1. Section 31 0000 – Earthwork and Grading.
2. Section 31 1000 – Site Preparation.
3. Section 31 2333 – Trenching, Backfilling, and Compacting.

1.3 SUBMITTALS

A. Comply with requirements of the Section 01 3219 – Submittal Procedures.

1.4 QUALITY ASSURANCE

A. Comply with the following Standards: American National Standards Institute, Inc. “American National Standard Safety Requirements for Demolition” (ANSI A10.6 and A10.8).

B. Regulatory Agencies:

1. Comply with rules and regulations of State of California, California Code of Regulations, Title 8, Industrial Relations, Chapter 4, Subchapter 4, “Construction Safety Order.”
2. Comply with applicable local and state agencies having jurisdiction.
3. Comply with governing EPA notification regulations.
4. Comply with applicable state and local regulations regarding dust and noise mitigation during construction.

C. Secure all required Permits or Certificates for demolition prior to beginning the work.

1.5 PROJECT CONDITIONS

A. District assumes no responsibility for actual condition of the site to be altered.
1. Conditions existing at time of inspection for bidding purpose will be maintained by District as far as practical.

B. Disposal of Existing Improvements:
1. Unless otherwise indicated, all demolition waste shall become the property of the Contractor, except materials to be recycled. Dispose of demolished material outside the project site.
a. Do not dispose of removed materials to the general public by sale, gift or in any other manner at the project site.
b. These provisions shall not be construed as limiting or prohibiting sale or disposal of such materials at the Site to duly licensed Contractors or material suppliers, provided materials are removed from construction site by the Contractor.
2. All removal of debris from the site, including removal of inventory to site of storage, is part of this Contract and shall be done by Contractor’s employees and no others.

C. Protection:
1. Erect and maintain temporary bracing, shoring, lights, barricades, except construction barricades for subsequent new construction, warning signs, and guards necessary to protect public, the District’s employees, adjacent improvements to remain, and adjoining property from damage, all in accordance with applicable regulations.
2. Wet down areas affected by this work as required to prevent dust and dirt from rising.

D. Scheduling:
1. Coordinate with the Project Manager in scheduling noisy or dirty work.
2. The Project Manager will supply a schedule of days on which no construction will be allowed.
3. Contractor shall take College schedule into consideration during construction.
4. Coordinate and schedule temporary water shut-downs and temporary water service with the Project Manager, District Facilities, and the Fire Department.

E. Traffic Circulations: Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
1. Minimize obstruction to public thoroughfares by first obtaining the required approval or permission of the responsible jurisdiction.

2. Coordinate all closures of on-campus roads, driveways, sidewalks and pedestrian pathways with the District.
3. Where closing of a vehicular traffic circulation route is necessary, provide adequate directional signs to minimize the potential for confusion. Provide access at all times for emergency vehicles.

F. Safety:
1. The College of San Mateo campus has a history of serpentine rock. The Contractor shall take all necessary precautions to eliminate the exposure of workers, students, staff, and the public to asbestos fibers, including but not limited to: dust control measures and measures included in Sections 93106 and 93105 of California Code of Regulations, Title 17.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Where existing conditions conflict with representations of the Construction Documents, notify the Project Manager and obtain clarifications. Do not perform work affecting the conflicting conditions until clarification of the conflict is received.

3.2 PREPARATION

A. Verify that the area to be demolished or removed has been vacated, and adequate space has been made available to perform the work.

B. Lay out saw cutting and coordinate with related work for which saw cutting is required.

C. Contractor shall coordinate and arrange the shut down of utilities serving the site with Facilities, the Fire Department, and the Project Manager.

D. Maintain continuous service to the campus fire loop and fire hydrants. If any interruption of service is necessary, notify the District a minimum of 72 hours in advance and cooperate fully with the District in managing the temporary interruption.

3.3 DEMOLITION

A. If known or suspected hazardous materials are encountered during operations, stop operations immediately and notify the Project Manager.

B. Perform work in accordance with ANSI A10.6-1969 unless otherwise noted.

C. Provide noise and dust abatement as required to prevent contamination of adjacent areas.

D. Remove all materials, including the concrete utility trench, not designated to be recycled or salvaged, in their entirety.

E. If unknown items such as human remains are encountered during operations, stop operations immediately and notify the Project Manager.

F. Stockpile salvaged items at a location on campus, determined by the Project Manager.

G. Stockpile recycled concrete and asphalt concrete in areas designated and approved by the District.

H. Construction activities shall be limited to the hours of 7:00 am and 7:00 pm Monday through Friday. Noise-generating construction activities shall be limited to the hours of 8:00 am and 5:00 pm. Work on Saturdays shall require special approval of the District. No construction activity shall be permitted on Sundays or State and Federal Holidays.

3.4 DEMOLITION AND REMOVAL OF PAVEMENT

A. Sawcut pavement at edge of demolition area.

B. Remove any base material, gravel, and/or or any other non-native soil deemed unsuitable per Geotechnical recommendations.

3.5 SAW CUTTING

A. Make new openings neat.

B. Take care not to damage existing concrete or asphalt concrete pavement designated to remain in place.

3.6 UTILITY REMOVAL

A. Utility removal to include, but is not limited to:
   1. Storm Drain
   2. Sanitary Sewer
   3. Fire Water/Water Service
   4. Communication
   5. Electrical
   6. Gas
   7. Irrigation
   8. Hot Water Service

B. Where utility removal is shown on the plans or required for construction, excavate to expose existing utility, demolish and remove the section of pipe or conduit. Cap section of pipe or conduit to remain. Mark end of utility with 12” piece of #4 rebar.

C. The contractor shall be responsible for locating and removing all existing utilities, not designated as to remain, within the work area whether or not shown on the plans.

D. Included in demolition are any appurtenances, including but not limited to valves, valve boxes, and irrigation system components.

E. Backfill trench in accordance with requirements of Section 31 2333 – Trenching, Backfilling, and Compacting.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Promptly dispose of demolished materials not indicated to be recycled. Do not allow demolished materials to accumulate on-site.

B. Burning of demolished materials is prohibited.

3.8 FIELD QUALITY CONTROL

A. The Project Manager will accompany the Contractor before and after performance of work to observe physical condition of existing structures or improvements involved.

- END OF SECTION -

- SECTION 32 1233 -

PAVING AND SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:
   1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
   2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. Section Includes (but is not necessarily limited to):
   1. Asphalt Concrete Paving.
   2. Concrete Paving.
   3. Liquid Asphalt and Asphalt Emulsion.
   4. Aggregate Base.

B. Related work furnished under other sections but conforming to the provisions of this section:
   1. Subgrade preparation.
   2. Aggregate Base installation.

C. Related Sections:
   1. Section 31 1000 – Site Preparation.
   2. Section 32 1000 – Demolition.
   3. Section 32 1313 – Pedestrian Concrete Paving.
   4. SMCCCD Design Standards.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. A615: Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

2. C150: Portland Cement.
3. D1557: Moisture Unit Weight Relations of Soils and Aggregate Mixtures Using a 10 lb (4.5 kg) Rammer and 18 in. (457 mm) Drop.
4. D1682: Breaking Loads and Elongation of Textile Fabrics.

B. California Code of Regulations (CCR): Title 24, Chapter 2-71, Site development Requirements for Handicapped Accessibility.

C. California Department of Transportation (C.D.T.):
1. Standard Specifications:
   a. Section 26 Aggregate Bases.
   b. Section 37 Bituminous Seals.
   c. Section 39 Asphalt Concrete.
   d. Section 51 Concrete Structures.
   e. Section 52 Reinforcement.
   f. Section 73 Concrete Curbs and Sidewalks.
   g. Section 90 Portland Cement Concrete.
   h. Section 92 Asphalts.
   i. Section 93 Liquid Asphalts.
   j. Section 94 Asphaltic Emulsions.
2. Traffic Manual.
3. Highway Design.

D. Institute of Transportation Engineers: Transportation and Traffic Engineering Handbook.

1.4 SUBMITTALS

A. Requirements: Refer to Section 01 3219 – Submittal Procedures.

B. Asphalt Concrete Paving:
1. Provide two copies of material certificates signed by the material producer and the Contractor, certifying that each material item complies with or exceeds specified requirements.
2. The Contractor shall furnish a certified weight or load slip for each load of material used in the construction of the asphalt concrete pavement.

C. Concrete Paving: The Contractor shall furnish mill test reports on the cement, reinforcement bars, and aggregates, showing compliance with the respective specifications. The Testing Engineer may make concrete test cylinders and slump tests as deemed necessary to determine compliance with the Specifications.

D. Liquid Asphalt: The Contractor shall furnish product data and manufacturer specifications.

E. Pavement Reinforcement: The Contractor shall furnish product data and manufacturer specifications.

F. Tack Coat: The Contractor shall furnish product data and manufacturer specifications.

1.5 PROJECT CONDITIONS

A. Liquid Asphalt and Asphalt Emulsion:
   1. Prime coat, seal coat, and paint binder shall be applied only when the ambient temperature is above 50° Fahrenheit and when temperature has not been below 35° Fahrenheit for 12 hours immediately prior to application.
   2. Prime coat, fog coat, seal coat, and paint binder shall not be applied when base or surfaces are wet or contain excess moisture.

B. Asphalt Concrete Paving: Asphalt concrete surfaces shall be constructed only when ambient temperature is above 50° Fahrenheit and when base is dry.

1.6 GENERAL DESIGN CRITERIA

A. Services Areas: Approach ramps, driveways, and paved work areas in excess of 4 percent slope shall be provided with a rough texture for non-skid surface.

B. Walks and Paths: Concrete exterior slabs (walks, terraces, etc.) shall have a pitch of at least 2 percent, unless otherwise shown on plan.

C. Pavement Markings: All traffic control striping and pavement markings shall conform to the standards illustrated in the C.D.T. Standard Plans Book issued July 1992, General Road Work Section.

PART 2 - PRODUCTS

2.1 PAVING MATERIALS

A. Aggregate Base: Aggregate base shall conform to Caltrans Class 2 (R value 78 min) aggregate base, 3/4" maximum size, as specified in Section 26 of the C.D.T. Standard Specifications.

B. Asphalt Concrete Paving:
   1. Paving asphalt to be mixed with aggregate shall be steam-refined asphalt, AR-4000, conforming to Section 92 of the C.D.T. Standard Specifications.
   2. Mineral aggregate shall be Type B mineral aggregate as specified in Section 39 of the C.D.T. Standard Specifications.
   3. Maximum aggregate size shall be as follows:

A.C. Thickness	Max. Ag.
a. ¾" - 1½	1/2"
b. 2 & 2½"	1/2"
c. 3" & 4"	3/4"

   4. Liquid asphalt for prime coat shall be Grade SC-70 in conformance with Section 93 of the C.D.T. Standard Specifications.

5. Asphaltic emulsion for paint binder, fog coat, and seal coat shall be emulsified asphalt, Type SS-1h, conforming to Section 94 of the C.D.T. Standard Specifications.

C. Portland Cement Concrete:
1. Concrete shall be Class A concrete conforming to Section 90 of the C.D.T. Standard Specifications.
2. Cement shall be Type II cement conforming to ASTM C150 as modified by Section 90 of the C.D.T. Standard Specifications.
3. Aggregate shall be 3/4-inch maximum size conforming to Section 90 of the C.D.T. Standard Specifications.
4. Water shall be potable and free of organic matter and injurious amounts of oil, acid, alkali, or other deleterious substances.
5. Reinforcing bars shall be deformed and shall conform to ASTM A615.
6. Filled joints, unless noted otherwise on the Drawings, shall be 1/4-inch thick, the full depth of the concrete section and conforming to Section 51 of the C.D.T. Standard Specifications.
7. Joint filler shall conform to Section 51 of the C.D.T. Standard Specifications for pre-molded expansion joint filler and expanded polystyrene joint filler.
8. No admixtures will be allowed without prior approval of the Project Manager.

D. Pavement Reinforcement Fabric: Pavement reinforcement fabric shall meet Caltrans Section 88-1.02, BP Petromat or approved equivalent.

E. Crack Sealant:
1. Crack sealant shall be rubberized hot-pour type and shall meet ASTM D 3405, Husky 1611 or approved equivalent.
2. Blotting Agent shall be one of: Screened sand, cement, or fly ash.

F. Tack coat: Tack coat shall meet Caltrans Section 39-4.02.

PART 3 - EXECUTION

3.1 PREPARATION

A. Subgrade and Aggregate Base:
1. Prepare a subgrade and over excavation paragraph reference 3.4 of Section 31 0000 – Earthwork and Grading.
2. Aggregate base shall be compacted to 95 percent ASTM D1557. Sections 26-1.04B and 26-1.05 of the C.D.T. Standard Specifications shall apply.
3. Soil sterilant shall be applied to prepared subgrade or after installation of rock or aggregate base uniformly at the rate recommended by the manufacturer.

B. Crack Sealing:
1. Before sealing, cracks shall be cleared of dirt, dust, and all other deleterious materials to a depth of 1/4-inch to 1/2-inch.

2. Cracks 1/8-inch in width and greater shall be sealed.
3. Application of crack sealer shall be in accordance with the manufacturer's recommendations unless otherwise directed.

3.2 ASPHALT CONCRETE PAVING

A. General:

1. Asphalt concrete shall be proportioned, mixed, placed, spread, and compacted in conformance with Section 39 of the C.D.T. Standard Specifications.
2. Before placing asphalt concrete on untreated base, a liquid asphalt prime coat shall be applied to the base course in conformance with Section 39 of the C.D.T. Standard Specifications. Prime coat shall be applied at the rate of 0.25 gallons per square yard.
3. Before placing asphalt concrete, an asphalt emulsion tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, construction joints, and all existing pavement to be surfaced, in conformance with Section 39 of the C.D.T. Standard Specifications.
4. Spreading and compacting asphalt concrete shall be performed in accordance with Section 39 of the C.D.T. Standard Specifications.
5. Fog seal shall be applied to all finished surfaces of asphalt concrete pavement at a rate of 0.05 gallons per square yard, in accordance with Section 37 of the C.D.T. Standard Specifications.
6. After fog seal has been applied, ample time shall be allowed for drying before traffic is allowed on the pavement or paint striping is applied.

3.3 CONCRETE CONSTRUCTION

A. General:

1. All concrete shall be mixed in accordance with applicable provisions of Section 90 of the C.D.T. Standards Specifications.
2. Construction of concrete substructures shall conform to applicable provisions of Section 51 of the C.D.T. Standard Specifications. Unless noted otherwise in the Specifications, all exposed surfaces of structure shall have Class 1 surface finish or finished to match existing adjacent paving.
3. No pigment shall be used in curing compounds for construction of concrete curbs, gutters, and structures.
4. All work shall be subject to field inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.
5. Expansion joints on curbs and gutters shall be placed 20 feet on centers, adjacent to structures, and at all returns, and shall be filled with joint filler. Control joints shall be formed 10 feet on centers. The score shall 1-inch deep minimum.
6. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than 6 feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.4 FIELD QUALITY CONTROL

A. Asphalt Concrete Paving:

1. The specified thickness of the finished pavement shall be the minimum acceptable.
2. Conforms shall form a smooth, pond-free transition between existing and new pavement.
3. Depressions in paving between high spots are not to exceed 1/8-inch when measured below a 10 feet long straight edged placed anywhere on surface in any direction.
4. The finished asphalt pavement shall have positive drainage without ponding.

3.5 CLEANUP

A. General:

1. Surplus material remaining upon completion of paving operations shall become the property of the Contractor, to be removed from the work site and disposed of in a lawful manner.
2. Surfaces shall be left in a clean, neat, and workmanlike condition, and all construction waste, rubbish, and debris shall be removed from the work site and disposed of in a lawful manner.

- END OF SECTION -

- SECTION 32 1313 -

PEDESTRIAN CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Pedestrian concrete walkways, including integral color and special finishes.
   2. Concrete aprons, curbs and gutters.

1.3 RELATED SECTIONS

A. Section 31 0000 "Earthwork and Grading" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

B. Section 32 1233 “Paving and Surfacing” for AC paving, vehicular concrete paving, liquid asphalt and asphalt emulsion, and aggregate base.

1.4 DEFINITIONS & STANDARDS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

B. ASTM C494 - Standard specifications for chemical admixtures for concrete

C. ASTM C979 - Standard specifications for pigments for integrally colored concrete

D. ASTM C3 09 - Liquid membrane forming compounds for curing concrete

E. ACI 302 JR - Guide for concrete floor and slab construction

F. ACT 305 R - Hot weather concreting

G. ACT 306 R - Cold weather concreting

H. ACT 3 18 - Building code requirements for reinforced concrete

I. NRMCA - CJP5 - Plastic shrinkage cracking

1.5 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.
   1. Submit manufacturer's tech-data sheets and certificates of compliance to applicable ASTM requirements.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Design Mixes shall be stamped by a licensed engineer in the State of California.

C. Samples:
   1. Manufacturer's color chip for colored concrete colors.

D. Qualification Data: For testing agency.

E. Material Test Reports: From a qualified testing agency provided by the Owner indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.
   3. Admixtures.
   4. Curing compounds.
   5. Applied finish materials.
   6. Joint fillers.

G. Mock-up: Contractor shall provide an on-site 5 foot by 5 foot mock-up of each concrete finish and color with respective score/sawcut and expansion joints for approval by the Architect.
   1. Upon request, the Architect may require modifications to be made to the mock-ups. The revised mock-ups shall be provided at no additional cost to owner. Once mock-ups have approved by the Architect, contractor shall retain approved mock-ups during construction as standard for judging completed work.
      a. Paving Module: Construct a mock-up of one special paving module, including banding, 12'-0" x 12'-0". Construct a mock-up of curved radial paving, approximately 180 sq.ft.
   2. Walls: Construct at least 6 linear feet of straight or curved special finished concrete site wall, including detailed reveal and skateboard deterrents as detailed on Drawings.
   3. Location: Construct mock-ups on site where directed. Approved mock-ups shall not become part of the final installation. Mock-ups will be used to establish acceptable quality, color and texture; remove and repeat until results satisfactory to the Architect are

achieved. Maintain exact record of variables associated with each mock-up to facilitate the matching of approved mock-ups in actual construction

H. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Installer Qualifications: Submit applicators/contractors resume of successful projects utilizing specified Architectural concrete color system with a minimum requirement of 3 years related experience.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Pre-installation Conference: Conduct conference at Project site to comply with all civil specifications.
   1. Before submitting design mixtures, review concrete pavement mixture designs and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete producer.
      d. Concrete pavement subcontractor.
   2. Identify mockup cast-in-place locations, and verify types and quantity of mockups during the pre-installation meeting.
      a. Mock-ups to be reviewed by Architect 7 to 14 days after the concrete pour.
      b. Notify Architect a minimum of 72 hours prior to the contractor’s request for review of field mock-ups.

1.7 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Epoxy-Coated Welded Wire Fabric: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Plain Steel Wire: ASTM A 82, as drawn.

F. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs, similar to “Speed Dowel” assembly manufactured by Greenstreak, Inc. St. Louis, MI (800) 325-9504.

G. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:
   1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

A. Concrete material shall comply with ASTM C94, Ready-Mixed Concrete, and the State of California Standard Specifications, Section 90, except as herein specified.

B. Fine and Coarse Aggregates: ASTM C33, 3/4-inch maximum size; clean, crushed permanent limestone aggregate free of materials which may cause staining; use Olympia natural sand for fine aggregate.

C. Water: Clean, free from injurious amounts of oil, alkali, organic matter, or other deleterious material, and not detrimental to concrete per ASTM C 94/C 94M.

D. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type II, or IV, gray [white].
      a. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

E. Air-Entraining Admixture: ASTM C 260.

F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
   1. Products:
      a. Burke by Edeco; BurkeFilm.
      b. ChemMasters; Spray-Film.
      c. Dayton Superior Corporation; Sure Film.
      d. Euclid Chemical Company (The); Eucobar.
      e. Kaufman Products, Inc.; Vapor Aid.
      f. Lambert Corporation; Lambco Skin.
      g. L&M Construction Chemicals, Inc.; E-Con.
      h. Meadows, W. R., Inc.; Sealtight Evapre.
      i. Nox-Crete Products Group, Kinsman Corporation; Monofilm.
      j. Sika Corporation, Inc.; SikaFilm.

D. Concrete Finish Retarder: Spray applied, film forming, water based top surface retarder, calibrated for specific sized aggregate and finish requirements.
   1. Materials Basis of Design: The design is based on “Top Cast #3 Finish” manufactured by Grace Construction Products, 800-354-5414.

E. Curing and Sealing Materials-Colored Concrete:

1. Manufactures:
   a. Materials Basis-of-Design Product: The design is based on L.M. Scofield Company, Los Angeles, CA, tel: (800) 800-9900, www.scofield.com.
   b. Subject to compliance with requirements, provide the named product or a comparable product by one of the following manufactures:
      1) Davis Colors.
      2) Solomon Colors.
2. Curing and finishing-exterior: Lithochrome Colorwax as manufactured by L.M. Scofield Company. Color-matched, water-based curing compound that complies with ASTM C-309. Application per tech-data A-514.02
3. Curing and sealing-exterior and/or interior: Colorcure concrete cureseal manufactured by L.M. Scofield Company. Color-matched, water-based curing and sealing compound that complies with ASTM C-309. Application per tech-data A-634.03
4. Concrete surface repellent-vertical and/or flatwork: Repello surface treatment, invisible chemical treatment barrier system.

2.5 HARDENERS & SEALERS

A. Curing and finishing-exterior: Sinak HLQ-125 as manufactured by Sinak Corporation. Clear, non-yellowing water-based curing compound that complies with ASTM C-309.

2.6 AGGREGATE BASE

A. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
   1. Integral Color Admixture: Basis of Design: All concrete designated as integrally colored concrete in plans or specifications shall contain the proper proportion of Solomon ColorFlo Liquid Color Pigments for color conditioned concrete as manufactured by the Solomon Colors. It shall be certified that the colored admixtures comply with the requirements of paragraph 407 of ACI 318-83 (Building code requirements for reinforced concrete) as water-reducing admixtures, and that their water-reducing components have tested for compliance with ASTM C494. The color-conditioned admixture shall be a single-component pigmented, water-reducing concrete admixture, factory formulated, and

packaged in pails, not multiple additives and pigments to dosed separately into the mix. The pigment portion of the colored admixture shall comply with ASTM C979.

2. Other Acceptable Manufacturers:
   a. Davis Colors.
   b. LM Scofield Company.
3. Color: Match color as indicated on drawings.

C. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
   1. Color: As indicated on drawings.

B. Glass Beads: AASHTO M 247, Type 1.

2.9 CONCRETE MIX, DESIGN, AND TESTING

A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (superplasticizer), air-entraining admixture, and water to produce the following properties:
   1. Compressive Strength:
      a. Typical: 3000 psi, minimum at 28 days, unless otherwise indicated.
      b. Curbs & Gutters: 3500 psi, minimum at 28 days.
   2. Slump Limit: 8 inches minimum for concrete containing high-range water-reducing admixture (superplasticizer, limited to flatwork only, not for use on walls); 4 inches for other concrete.
   3. Air Content: 5 to 8 percent.
   4. Water/Cement Ratio: 0.5

C. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.
   1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

D. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

2.10 INTEGRAL COLORED PROPORTIONING AND MIXES

1. Mixing of integrally colored concrete- The concrete color admixture shall be added at the concrete batch plant. Minimum batch size shall be three (3) yards. The same brand of cement, source of sand, and water/cement ratio must be maintained for each load of the same color. The batching procedures shall be as follows: Before adding color-conditioning admixture, the mixing drum must be thoroughly cleaned and wetted with approximately 40 gallons of the mix water and/or a portion of the aggregates. The contents of each pail of admixture needed to properly color the concrete should be added to the mixer. Proceed with normal batching of balance of ingredients After loading is complete, mix at mixing speed for a minimum of 130 revolutions before discharging. No water should be added after a portion of the load has been discharged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
   1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
   2. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Section 31 0000 "Earthwork and Grading".

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

C. Slope step treads at 1/4-inch per foot to drain

3.4 AGGREGATE BASE

A. Granular Course: Cover subgrade with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch (0 mm) or minus 3/4 inch (19 mm).

1. Place and compact a 1/2-inch- (13-mm-) thick layer of fine-graded granular material over granular fill.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.6 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation (Expansion)Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated on plans and drawings.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction (Control) Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
3. Do not continue steel across joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.7 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Screed pavement surfaces with a straightedge and strike off.

J. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

K. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

L. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true

planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

C. Final Tooling: Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

1. 3/8-inch wide radius at surface, tapered, with top edges rounded to 1/8-inch radius.

3.9 SPECIAL FINISHES

A. Integral Colored Finish:

1. Flatwork: Strike off concrete to specified level using wooden strike off bar, immediately following strike off, further level and consolidate concrete with wooden bull float or wood darby. Begin floating operation before free moisture rises to the surface. After the concrete has reached a point where bleed water disappears, finishing may proceed. For uniformity of appearance, consistent finishing practices must be used when applying specified finish. Water must not be sprinkled or otherwise added to the surface while finishing. All final hand finishing must be done in the same direction. Furnish appropriate curing and/or sealing compound as per manufacturer's recommendations (see section 2.0 1E) reference tech-data A304. 10
2. Vertical Concrete: Formwork for vertical colored concrete shall be a resin, high density overlay, an epoxy or urethane coated plywood. Release agents must be non-staining approved by the color admixture manufacturer.. Joints shall be sealed with a urethane or silicone sealant. Form ties shall leave no metal closer than 1 ½ inches from the surface. The location of form ties shall be selected to minimize the impact on the overall appearance of the structure. All walls shall be cast in such a manner as to eliminate cold joints or lift lines in the finished product. All forms shall be stripped at the same age and a light sandblasting performed to remove minor form marks and surface residue. Patching and repair shall be performed using a compatible concrete patch in a matching color. Finished surfaces shall receive an application of a clear water repellent after the walls have been allowed to cure a minimum of 28 days.

B. Abrasive-Blast (Sandblast) Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi (13.8 MPa). Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.

1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:

a. Light to Medium: Generally expose coarse aggregate; with slight reveal, a maximum of 1/4 inch (6 mm).

4. Allow concrete to cure minimum 28 days prior to commencing sandblasting operations.
5. Protect adjacent materials and finishes from dust, dirt and other surface or physical damage during finishing operations,; provide protection as required and remove at completion of Work.
6. Repair or replace other work damaged by sandblasting operations to the Owner's satisfaction.
7. Comply with applicable codes and requirements of applicable authorities for sandblasting operations.
8. Perform sandblast finishing in as continuous an operation as possible, utilizing same work crew to maintain continuity of finish.

3.10 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.11 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches, unless otherwise indicated.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.12 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Owner and Engineer of Record.

B. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Spread glass beads uniformly into wet pavement markings at a rate of 6 lb/gal.

3.13 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 20 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Owner, Architect and Engineer of Record, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer of Record but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer of Record.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.15 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, cracked, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Engineer of Record, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

3.16 CLEANUP

A. Remove all concrete over pours, and waste from the site.

B. Provide a final power wash of all concrete surfaces.

- END OF SECTION -

- SECTION 32 1323 -

DETECTABLE/TACTILE WARNING SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Cast In Place Detectable/Tactile Warning Surface Tiles.

1.3 RELATED SECTIONS

A. Section 32 1313 “Pedestrian Concrete Paving” for concrete walkways and finishes, aprons, curbs and gutters.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s literature describing products, installation procedures and routine maintenance.

B. Samples for Verification Purposes: Submit two tile samples minimum 6”x6” for each kind indicated.

C. Shop drawings are required for products specified showing fabrication details, composite structural system, tile surface profile, sound on cane contact amplification feature, plans of tile placement including joints, and material to be used as well as outlining installation materials and procedure.

D. Material Test Reports: Submit complete test reports from qualified accredited independent testing laboratory’s to qualify that materials proposed for use are in compliance with requirements and meet or exceed the properties indicated on the specifications. All tests shall be conducted on a Cast In Place Detectable/Tactile Warning Surface Tile system as certified by a qualified independent testing laboratory and be current within a 24 month period.

E. Maintenance Instructions: Submit copies of manufacturer’s specified installation and maintenance practices for each type of Detectable Warning Surface Tile and accessory as required.

1.5 QUALITY ASSURANCE

A. Provide Detectable/Tactile Warning Surface Tiles and accessories as produced, engineered and field tested products by a single manufacturer with a minimum of three (3) years experience in the manufacturing of Cast in Place Detectable/Tactile Warning Surface Tiles.

B. Installer's Qualifications: Engage an experienced Installer certified in writing by Detectable/Tactile Warning Surface Tile manufacturer as qualified for installation, who has successfully completed installations similar in material, design, and extent to that indicated for Project.

C. California Code of Regulations (CCR): Provide only approved DSAAC detectable warning products as provided in the California Code of Regulations (CCR) Title 24, Part 2, Section 205 definition of "Detectable Warning". Section 1117A.4 and 1127B.5 for"Curb Ramps" and Section 1133B.8.5 for "Detectable Warnings at Hazardous Vehicular Areas".

D. Americans with Disabilities Act (ADA): Provide Detectable/Tactile Warning Surface Tiles which comply with the detectable warnings on walking surfaces section of the Americans with Disabilities Act (Title III Regulations, 28 CFR Part 36 ADA Standards For Accessible Design, Appendix A, Section 4.29.2 Detectable Warnings On Walking Surfaces).

1.6 DELIVERY, STORAGE AND HANDLING

A. Detectable/Tactile Warning Surface Tiles shall be suitably packaged or crated to prevent damage in shipment or handling. Finished surfaces shall be protected by sturdy plastic wrappings to protect tile from concrete residue during installation and tile type shall be identified by part number.

B. Detectable/Tactile Warning Surface Tiles shall be delivered to location at building site for storage prior to installation.

1.7 SITE CONDITIONS

A. Environmental Conditions and Protection: Maintain minimum temperature of 40°F in spaces to receive Detectable/Tactile Warning Surface Tiles for at least 24 hours prior to installation, during installation, and for not less than 24 hours after installation.

B. The use of water for work, cleaning or dust control, etc. shall be contained and controlled and shall not be allowed to come into contact with the general public. Provide barricades or screens to protect the general public.

1.8 WARRANTY

A. Cast In Place Detectable/Tactile Warning Surface Tiles shall be guaranteed in writing for a period of five (5) years from date of final completion. The guarantee includes defective work, breakage, deformation, fading and loosening of tiles.

1.9 SEQUENCING

A. Coordinate with work as specified in Section 03 3000 "Cast-in-Place Concrete".

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: The design based on VPC Cast-in-Place Detectable/Tactile Warning Surfaces manufactured by Engineered Plastics Inc. Williamsville, NY tel (800-682-2525), www.armor-tile.com .

2.2 CAST-IN-PLACE DETECTABLE WARNING TILES

A. Vitrified Polymer Composite (VPC) Cast in Place Detectable/Tactile Warning Surface Tiles shall be an epoxy polymer composition with an ultra violet stabilized coating employing aluminum oxide particles in the truncated domes. The tile shall incorporate an in-line pattern of truncated domes measuring nominal 0.2" height, 0.9" base diameter, and 0.45" top diameter, spaced center-to-center 2.35" as measured on a diagonal and 1.67" as measured side by side. For wheelchair safety the field area shall consist of a non-slip surface with a minimum of 40 - 90° raised points 0.045" high, per square inch.

1. Dimensions: Cast In Place Detectable/Tactile Warning Surface Tiles shall be held within the following dimensions and tolerances:
   a. Length and Width: 24x48 nominal, unless otherwise indicated.
   b. Depth: 1.375 (1-3/8") (+/-) 5% max.
   c. Face Thickness: 0.1875 (1-3/8") (+/-) 5% max.
   d. Warpage of Edge: 0.5% max.
   e. Embedment Flange Spacing: shall be no greater than 3.1"
   f. Color: Manufacturer's standard color, Charcoal Grey.
   g. Water Absorption of Tile when tested by ASTM D 570-98 not to exceed 0.05%.
   h. Slip Resistance of Tile when tested by ASTM C 1028-96 the combined Wet and Dry Static Co-Efficients of Friction not to be less than 0.80 on top of domes and field area.
   i. Compressive Strength of Tile when tested by ASTM D 695-02a not to be less than 28,000 psi.
   j. Tensile Strength of Tile when tested by ASTM D 638-03 not to be less than 19,000 psi.
   k. Flexural Strength of Tile when tested by ASTM D 790-03 not to be less than 25,000 psi.
   l. Chemical Stain Resistance of Tile when tested by ASTM D 543-95 (re approved 2001) to withstand without discoloration or staining - 10% hydrochloric acid, urine, saturated calcium chloride, black stamp pad ink, chewing gum, red aerosol paint, 10% ammonium hydroxide, 1% soap solution, turpentine, Urea 5%, diesel fuel and motor oil.
   m. Abrasive Wear of Tile when tested by BYK - Gardner Tester ASTM D 2486-00 with reciprocating linear motion of 37± cycles per minute over a 10" travel. The abrasive medium, a 40 grit Norton Metallite sand paper, to be fixed and leveled to a holder. The combined mass of the sled, weight and wood block is to be 3.2 lb. Average wear depth shall not exceed 0.060 after 1000 abrasion cycles when measured on the top surface of the dome representing the average of three measurement locations per sample.

n. Resistance to Wear of Unglazed Ceramic Tile by Taber Abrasion per ASTM C501-84 (re approved 2002) shall not be less than 500.

o. Fire Resistance of Tile when tested to ASTM E 84-05 flame spread shall be less than 15.

p. Gardner Impact to Geometry "GE" of the standard when tested by ASTM D 5420-04 to have a mean failure energy expressed as a function of specimen thickness of not less than 550 in. lbf/in. A failure is noted when a crack is visible on either surface or when any brittle splitting is observed on the bottom plaque in the specimen.

q. Accelerated Weathering of Tile when tested by ASTM G 155-05a for 3000 hours shall exhibit the following result – ΔE <4.5, as well as no deterioration, fading or chalking of surface of tile color No 33538

r. Accelerated Aging and Freeze Thaw Test of Tile and Adhesive System when tested to ASTM D 1037-99 shall show no evidence of cracking, delamination, warpage, checking, blistering, color change, loosening of tiles or other detrimental defects.

s. Salt and Spray Performance of Tile when tested to ASTM B 117-03 not to show any deterioration or other defects after 200 hours of exposure.

t. AASHTO HB-17 single wheel HS20-44 loading “Standard Specifications for Highways and Bridges”. The Cast In Place Tile shall be mounted on a concrete platform with a ½” airspace at the underside of the tile top plate then subjected to the specified maximum load of 10,400 lbs., corresponding to an 8000 lb individual wheel load and a 30% impact factor. The tile shall exhibit no visible damage at the maximum load of 10,400 lbs.

u. Embedment flange spacing shall be no greater than 3.1” center to center spacing.

2.3 ACCESSORIES

A. Fasteners: Color matched, corrosion resistant, flat head drive anchor: 1/4-inch diameter x 1 1/2-inch long as supplied by.

B. Sealant: Sealant as supplied by manufacture.

PART 3 - EXECUTION

3.1 EXAMINATION & PREPARATION

A. During Cast in Place Detectable/Tactile Warning Surface Tile installation procedures, ensure adequate safety guidelines are in place and that they are in accordance with the applicable industry and government standards.

B. Prior to placement of the Cast in Place Detectable/Tactile Warning Surface Tile system, review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Engineer.

3.2 CAST-IN-PLACE INSTALLATION

A. The installation of the structural embedment flange system and related materials shall be in strict accordance with the contract documents and the guidelines set by their respective manufacturers. Not recommended for asphalt applications.

B. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 4 to 7 permitting solid placement of the Cast in Place Detectable/Tactile Warning Surface Tile system. An overly wet mix will cause the tile to float. Under these conditions, suitable weights such as 2 concrete blocks or sandbags (25 lb) shall be placed on each tile.

C. The concrete pouring and finishing operations require typical mason's tools, however, a 4' long level with electronic slope readout, 25 lb. weights, and a large non-marring rubber mallet are specific to the installation of the Cast in Place Detectable/Tactile Warning Surface Tile system. A vibrating mechanism such as that manufactured by Vibco can be employed, if desired. The vibrating unit should be fixed to a soft base such as wood, at least 1 foot square.

D. The factory-installed plastic sheeting must remain in place during the entire installation process to prevent the splashing of concrete onto the finished surface of the tile.

E. When preparing to set the tile, it is important that no concrete be removed in the area to accept the tile. It is imperative that the installation technique eliminates any air voids under the tile. Holes in the tile perimeter allow air to escape during the installation process. Concrete will flow through the large holes in each embedment flange on the underside of the tile. This will lock the tile solidly into the cured concrete.

F. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved. The tile shall be placed true and square to the curb edge in accordance with the contract drawings. The Cast in Place Detectable/Tactile Warning Surface Tiles shall be tamped (or vibrated) into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface. The embedment process should <u>not</u> be accomplished by stepping on the tile as this may cause uneven setting which can result in air voids under the tile surface. The contract drawings indicate that the tile field level (base of truncated dome) is flush to adjacent surfaces to permit proper water drainage and eliminate tripping hazards between adjacent finishes.

G. In cold weather climates it is recommended that the Cast in Place Detectable/Tactile Warning Surface Tiles be set deeper such that the top of domes are level to the adjacent concrete on the top and sides of ramp and that the base of domes to allow water drainage.

H. Immediately after placement, the tile elevation is to be checked to adjacent concrete. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the tile is flush with the surrounding concrete and back of curb so that no ponding is possible on the tile at the back side of curb.

I. While concrete is workable, a 3/8-inch radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.

J. During and after the tile installation and the concrete curing stage, it is imperative that there is no walking, leaning or external forces placed on the tile that may rock the tile causing a void between the underside of tile and concrete.

K. Following tile placement, review installation tolerances to contract drawings and adjust tile before the concrete sets. Two suitable weights of 25 lb each may be required to be placed on each tile as necessary to ensure solid contact of the underside of tile to concrete.

L. Following the concrete curing stage, protective plastic wrap is to be removed from the tile surface by cutting the plastic with a sharp knife, tight to the concrete/tile interface. If concrete bled under the plastic, a soft brass wire brush will clean the residue without damage to the tile surface.

M. If desired, individual tiles can be bolted together using 1/4-inch or equivalent hardware. This can help to ensure that adjacent tiles are flush to each other during the installation process. Tape or caulking can be placed on the underside of the bolted butt joint to ensure that concrete does not rise up between the tiles during installation. Any protective plastic wrap which was peeled back to facilitate bolting or cutting, should be replaced and taped to ensure that the tile surface remains free of concrete during the installation process.

N. Tiles can be cut to custom sizes, or to make a radius, using a continuous rim diamond blade in a circular saw or mini-grinder. Use of a straightedge to guide the cut is advisable where appropriate.

O. Any sound-amplifying plates on the underside of the tile, which are dislodged during handling or cutting, should be replaced and secured with construction adhesive. The air gap created between these plates and the bottom of the tile is important in preserving the sound on cane audible properties of the tile system as required.

3.3 CLEANING, PROTECTING AND MAINTENANCE

A. Protect tiles against damage during construction period to comply with Tactile Tile manufacturer's specification.

B. Protect tiles against damage from rolling loads following installation by covering with plywood or hardwood.

C. Clean Tactile Tiles not more than four days prior to date scheduled for inspection intended to establish date of substantial completion in each area of project. Clean Tactile Tile by method specified by Tactile Tile manufacturer.

D. Comply with manufacturers maintenance manual for cleaning and maintaining tile surface and it is recommended to perform annual inspections for safety and tile integrity.

- END OF SECTION -

- SECTION 32 1540 -

DECOMPOSED GRANITE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Aggregate paving surface course (resin-stabilized decomposed granite).
   2. Edging materials

1.3 RELATED SECTIONS

A. Section 31 0000 "Earthwork and Grading" for building and utility trench excavation, backfilling, compacting and grading requirements, and soil materials.

1.4 DEFINITIONS

A. Decomposed Granite (DG): compacted decomposed granite composite utilizing resin emulsion and specified aggregate.

B. Resin emulsion: Liquid binding agent for Decomposed Granite (DG).

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Manufactures product sheets, including installation specifications

B. Samples for Verification: For each of the following:
   1. Decomposed granite or specified aggregate: 5 lb. sample of each color and texture of stone required, in labeled plastic bags.
   2. One foot length of edging materials and accessories, of manufacturer's standard size, to verify color selected.
   3. 12-inch by 12-inch filter fabric (soil separator) membrane.

C. Test reports:
   1. Marshall Stability test results using pre-approved specified aggregate.

2. Final compaction report.

D. Mix design:
1. Source, color and weight of aggregate
2. Quantity of water for pre-wetting
3. Quantity of resin emulsion.
4. Written certification from approved mix manufacturer that all deliveries of mix meet specifications.
5. Weight tickets or weigh-master tickets for each load of mix.

1.6 QUALITY ASSURANCE

A. Preinstallation Meeting:
1. The Contractor shall coordinate, schedule and conduct a meeting to review the installation requirements with the mix supplier and Architect.

B. Mockup:
1. Contractor shall form and install a 4-foot square sample of DG duplicating a small section of actual work to be done for each type, size and color of surfacing material.
2. If work is acceptable, sample may be part of the total production. If work is not satisfactory, sample shall be removed at Contractor's expense and further samples installed until approved as satisfactory by Architect.

C. Installer Qualifications: Installer to provide evidence to indicate successful experience in providing decomposed granite or crushed 3/8" or 1/4" minus aggregate paving containing stabilizer binder additive.
1. Installer shall be a certified by the manufacturer or blender of the resin product.

1.7 SITE CONDITIONS

A. Weather and site requirements
1. Aggregate base or sub-base is to be dry.
2. Do not install DG mix, or apply seal coat if the possibility of rain is forecast within four days following installation.
3. Resin emulsion is diluted with water: protect newly installed pavement and seal coat from water until curing is complete.
4. Install DG mix and seal coat when ambient temperature is above 60 degrees Fahrenheit and overnight temperature is above 32 degrees F.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Warranty Period: Contractor shall provide warranty for performance of product. Contractor shall warranty installation of product for the time of one year from completion.

C. Contractor shall provide, for a period of sixty days, unconditional maintenance and repairs as required.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Aggregate: Furnish one five pound bag for each type, color, and size of material installed.
2. Resin emulsion: Furnish one 40 pound bag of stabilizer.

PART 2 - PRODUCTS

2.1 MANUFACTURES

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.2 AGGREGATE MATERIALS

A. Suppliers: Subject to compliance with requirements, provide material to be incorporated into the Work, but are not limited to, the following suppliers:

1. Pilarcitos Quarry, Half Moon Bay, CA, tel: (650) 726-5286.

B. Color: California Gold as selected by Architect.

C. Nominal maximum size of aggregate:

Sieve	Metric	% Passing
3/8"	9.5 mm	95 -100
# 4	4.5 mm	87 -100
# 8	2.36 mm	73 – 93
# 30	600 um	34 – 54
# 50	300 um	20 – 40
#200	75 um	min 11 - 23

2.3 STABILIZING AGENT

A. Basis of Design: Design is based on “Stabilizer” manufactured by Stabilizer Solutions, Inc. 205 South 28th St., Phoenix, AZ 85034; phone (602) 225-5900, (800) 336-2468; fax (602) 225-5902; website stabilizersolutions.com; email lphubbs@stabilizersolutions.com, or a comparable product by one of the following:

1. Stabilizer Solutions, Phoenix, AZ (800) 336-2468
2. Soil Stabilization Product Company, Inc. Merced, CA (800) 523-9992
3. SoilTac by Soil Works, Inc. CA (760) 345-0771

B. Resin emulsion: Totally natural additive emulsion with high solids content formulated especially for use as a natural flexible pavement binder.
   1. Resin-stabilized DG shall cure to a water-insoluble, high strengths state, equal in strength to hot-mix asphalt concrete.
   2. Resin emulsion shall dry without affecting the color of the aggregate.
   3. Resin emulsion shall be added at an addition rate of 10%-12% during blending operations.
   4. Resin emulsion shall be non-hazardous, non-toxic, non-corrosive, and shall be water-soluble.

C. Water: Fresh, clean, and potable.

D. Seal coat: Resin emulsion.

E. Tack coat: Resin emulsion diluted with water.

2.4 DG MIXES

A. DG mix as supplied by manufacturer-approved blender with not less than 10% - 12% emulsion by dry weight of the aggregate.

B. Blend 12 to 16 lbs.(verify with manufacturer for exact blend) of Stabilizer per 1-ton of decomposed granite or crushed 3/8" or ¼" minus aggregate screenings. It is critical that stabilizer be thoroughly and uniformly mixed throughout decomposed granite or crushed ¼" or 3/8" minus aggregate screenings

C. Installed DG mixture shall meet the following requirements when tested in accordance with the Marshall Stability Test, ASTM D 1599-89. Mix blending facility shall submit test results for review and approval. Requirements for Marshall Stability Flow: Stability Minimum (pounds) shall equal 4,000 lbs.

2.5 EDGING

A. Basis-of-Design Product: Subject to compliance with requirements, provide Trex Composite Lumber, manufactured by Trex Corporation, 1-800-BUY-TREX, www.trex.com.

B. Refer to plans and details for sizes and dimensions of Trex materials.

2.6 WEED BARRIER FABRIC

A. Basis-of-Design Product: Subject to compliance with requirements, provide Mirafi N-Series, Model 140N manufactured by Mirafi, Pendergrass, GA (706) 693 2226, www.mirafi.com,

B. Spun or woven, non-degrading geotextile fabric that blocks 95% of weed growth and is permeable to air, water, gases and fertilizer.
   1. Filter Fabric: Composite fabric geotextile consisting of woven, needle-punched polypropylene geotextile substrate bonded to a non-woven polypropylene fabric, weighing not less than 4.8 oz./sq. yd. (160 g/sq. m).

2.7 SOIL STERILANT

A. Soil Sterilant: Oxycil Ureabor, as manufactured by Best Products Division, Occidental Chemical Company, Lathop, CA

2.8 HERBICIDE

A. Chemical herbicide shall be Surflan or Dacthol pre-emergent. All material shall have an integral dye so that it is evident which areas have been treated. It is the Contractor's responsibility to post warnings to indicate that the above chemicals are being applied.

1. Chemical herbicide for control of actively growing weeds and grasses shall be Roundup or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site and verify that conditions are suitable to receive work and that no defects or errors are present which would cause defective installation of product or cause latent defects in workmanship and function.

B. Review subgrade to verify that it has been graded correctly and compacted as required for installation of the aggregate base.

C. Before proceeding with work, Contractor shall notify the Architect in writing of any unsuitable conditions and conflicts.

3.2 PROTECTION OF EXISTING CONDITIONS

A. Use every possible precaution to prevent damage, including staining, to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the work.

B. Provide barricades, fences or other barriers as necessary to protect existing conditions to remain from damage during construction.

C. Contractor is fully responsible for all costs associated with replacement of damage caused by his work.

3.3 LAYOUT

A. Establish lines and levels, locate and lay out by instrumentation and similar appropriate means for aggregate paving finish grades.

B. Staking: Provide a sufficient quantity of grade stakes as required to provide aggregate paving with smooth finish grades and positive drainage.

C. Layout and stake edging material in true straight lines and smooth continuous curves. Edging shall be placed parallel to adjacent curbs or headerboard. Stake edging at distances as indicated on plans and as necessary to prevent distortions of the alighment

3.4 SUB-GRADE PREPARATION:

A. Refer to Geotechnical report for subgrade preparation prior to placement of decomposed granite. Grade subgrade with uniform slope between points where elevations are given.

B. Subgrade shall be crowned in the middle, or have a 2% slope from one side to the other.

C. Grade sub-grade surface to within 0.05 foot of finish grade minus aggregate paving thickness.

D. Fill and compact any depressions and remove loose material to finish true to line and grade, presenting a smooth, compacted and unyielding surface.

E. Remove debris, loose dirt and other extraneous materials.

F. Ditches, drains and drain pipes shall be installed if necessary to protect of the pavement and base from cross flows of water. All water flow should be directed off of and away from the pavement and base.

G. Edging materials must be in place prior to placing DG. The DG compacted surface should be no less than 1/8" above the edging material to assure proper drainage.

3.5 INSTALLATION OF DG MIX

A. Install weed barrier fabric over compacted subgrade prior to installation of DG mix.

B. Decomposed Granite (DG) to be installed in 2-inch nominal lifts to the desired overall thickness.

C. Placement: Place mix via a single, continuous operation.
   1. Use a self-propelled, mechanized spreading-and-finishing machine designed specifically for placement of resin emulsion mix.
   2. Machine shall be equipped with a screen or strike-off assembly capable of being accurately regulated and adjusted to a uniform depth.
   3. Small amounts of material may be placed and raked by hand, using asphalt rakes.

D. Provide a structural section of a minimum of 4 inches compacted thickness upon completion of final compaction. Verify required thickness on drawings.

E. DG surface shall be crowned in the middle or have a 2% cross slope, unless finish graded on the drawings.

F. If slope of surfaces to be paved exceed 4 percent, place material in an uphill direction. Do not allow placing equipment to run over un-compacted material.

G. Initial compaction: After mix placement, begin initial compaction as soon as mix will bear roller weight without undue displacement.
   1. If mix will not support compaction equipment due to excess moisture, delay initial compaction until mix achieves adequate stability to support compaction equipment.
   2. Use of non-heeled boots is required for anyone having to walk on resin DG during installation process.
   3. Perform initial breakdown compaction with self-propelled, 1-ton steel drum rollers in static mode only. Walk-behind vibratory plate compactors shall be used for edges and areas where a steel drum roller is not practical.

4. On grades of 4% or steeper: Use static rollers, operate equipment at slow speeds and with the drive wheel forward to the uphill direction of work progress.
5. Generally, no more than two passes are required for initial compaction.
6. Warning: If the pavement begins to develop stress cracks, the pavement Is being over-compacted and further compaction should be halted.
7. Test paving surface for slope and smoothness after initial rolling, and correct deficiencies immediately so that finished surface will meet specified tolerances and requirements for smoothness.

H. Final Compaction:
1. Begin final compaction as soon as possible after initial compaction has been completed.
2. The purpose of the final compaction is to eliminate roller marks from the initial compaction and to create an aesthetically appealing pavement surface. The Architect shall be the judge of aesthetic considerations.
3. Contractor may use a 1-ton steel drum roller or small plate compactor. Do not over roll.

3.6 TOLERANCES

A. In-Place compacted thickness:
1. Aggregate paving surface course: maximum 3/16-inch plus, minus 0-inch.

B. Finished surface smoothness:
1. Subgrade: +/- 0.08 foot.
2. Aggregate paving surface course: maximum 3/16-inch in 10-feet in any direction.

3.7 REPLACEMENT OF DEFECTIVE PAVEMENT

A. Replace full depth of paving thickness in paving mixes that are contaminated, pavement that is cracked, or otherwise defective.
1. Skin patching will not be permitted.

B. Edges of Replaced Pavement:
1. Cut edges of pavement to be removed so that sides are vertical and oriented perpendicular and parallel to direction of traffic.
2. Spray edges with a tack coat of resin emulsion.

C. Installation of replacement pavement:
1. After applying tack coat, place pavement mix in areas where paving was removed in sufficient quantity to conform to elevation and tolerance requirements.
2. Thoroughly compact DG mix so that cured patch meets all requirements set forth in this specification.
3. Skin patching of an area that has been rolled will not be permitted.

3.8 FIELD QUALITY CONTROL

A. Density tests:
1. Perform tests in accordance with ASTM D 2950.

2. Perform tests within 48 hours after final compaction.
3. Perform at least three tests, in areas specified by Architect.

B. Surface shall not vary more than 3/16 inch per 10 feet, except at intersections or changes of grade. Areas not meeting specified surface tolerance are to be corrected immediately after initial compaction.

C. DG course thickness: Correct areas not meeting specifications immediately after initial compaction.

3.9 PROTECTION

A. Protect pavement surface against equipment and traffic until pavement has cured sufficiently, a minimum of 72 hours, to support traffic without marring, rutting, tearing, distressing or damaging the pavement in any way. Utilize warning signs, barricades, and protection fencing to protect pavement from traffic.

B. All pavement installed must be protected by covering with plastic sheeting if unforeseen inclement weather occurs prior to complete curing.

C. Contractor is responsible for replacing damaged pavement, if damage was preventable, at his own expense.

- END OF SECTION -

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 31 00 - FENCES AND GATES

1. Section Includes: PVC-coated steel chain link fabric fence and swing gates.

2. Product Data: Submit manufacturer's product data in the form of technical data, specifications, and installation instructions for fencing and gates.

3. Acceptable Manufacturer: Security Fence Manufacturing & Supply Co., Inc., "Secure-Guard", or equal.

4. Steel Chain-Link Fence Fabric
   a. Selvage: Knuckled on both selvages.
   b. Steel Chain-Link Fence Fabric: Fabricated in 1 piece widths for fencing 12 feet and less in height to comply with CLFMI's "Product Manual" and with requirements indicated below:
      1) Height: 8 feet-0 inches, unless otherwise indicated.
      2) Mesh and Wire Size: Galvanized 1-inch mesh, 0.120-inch diameter (9 gauge).
      3) Coating: ASTM F668, Class 1, PVC, thermally fused.

5. Framing
   a. Type I Round Posts: Standard weight (schedule 40) galvanized steel pipe conforming to ASTM F1083, with minimum yield strength of 25,000 psi, not less than 1.8 ounce of zinc per square foot. Type A coating inside and outside, as determined by ASTM A90, and weights per foot as follows:

Actual OD	Weight lb/ft	NPS Size
1.315	1.68	1
1.660	2.27	1-1/4
1.900	2.72	1-1/2
2.375	3.65	2
2.875	5.79	2-1/2
3.500	7.58	3
4.000	9.11	3-1/2
6.625	8.97	6
8.625	28.55	8

   b. Top and Bottom Rail: Manufacturer's longest lengths (17 to 21 feet) with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each gate corner, pull and end post.
      1) Round Steel: 1.660 inch OD Type I steel pipe.
   c. Steel Round End, Corner, and Pull Posts for Fabric Heights Over 6 Feet High: 2.875 inch OD Type I steel pipe.
   d. Swing Gate Posts: Furnish posts to support single gate leaf, or one leaf of a double gate installation, according to ASTM F900, sized as above for steel pipe posts.

6. Fittings and Accessories
   a. Material: Comply with ASTM F626. Mill-finished galvanized iron or steel to suit manufacturer's standards.
      1) Steel and Iron: Unless specified otherwise, hot-dip galvanize pressed steel or cast-iron fence fittings and accessories with at least 1.2 oz. zinc per sq. ft. as determined by ASTM A90.

b. Post and Line Caps: Provide weathertight closure cap for each post.
c. Bottom and Center Rail: Same material as top rail. Provide manufacturer's standard galvanized steel cap for each end.
d. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16-inch by 3/4-inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide 1 bar for each gate and end post, and 2 for each corner and pull post, except where fabric is integrally woven into the post.
e. Tension and Brace Bands: 3/4-inch wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.
    1) Tension Bands: 0.074-inch thick (14 gauge) minimum.
    2) Brace Bands: 0.105-inch thick (12 gauge) minimum.
f. Tie Wires: 0.106-inch diameter (12 gauge) galvanized steel with a minimum of 0.80 ounce per square foot of zinc coating according to ASTM A641, Class 3 to match fabric wire.

7. Privacy Slats: Polyvinyl chloride (PVC), UV-light stabilized, thickness and size to match existing fencing on Campus.
    a. Color: Match existing fencing on Campus.

8. Swing Gates
    a. Comply with ASTM F900.
    b. Dimensions
        1) Single: 3 feet-0 inches wide.
        2) Double: 11 feet-0 inches wide; provide gate wheels.
    c. Fabricate perimeter frames of 1.660 inch minimum OD Type I steel pipe.
    d. Finish: As selected by the Architect.
    e. Gate Hardware
        1) Hinges: Non-liftoff type, offset to permit 180 degree gate opening.
        2) Latch: Forked type or plunger bar type with padlock eye.
        3) Keeper: Provide a keeper for vehicle gates that automatically engages gate leaf and holds it in open position until manually released.
        4) Gate Stops: For double gates, provide gate stops set in concrete, designed to engage a center drop rod or plunger bar. Include a locking device permitting both gate leaves to be locked with a single padlock.

9. Concrete: Provide concrete consisting of portland cement in accordance with ASTM C150, aggregates in accordance with ASTM C33, and potable water. Mix materials to obtain concrete with a minimum 28-day compressive strength of 3,000 psi. Use at least 4 sacks of cement per cubic yard, 1 inch maximum size aggregate, 3 inch maximum slump.
    a. Packaged Concrete Mix: Mix dry-packaged normal-weight concrete conforming to ASTM C387 with clean water to obtain a 2 to 3 inch slump.

10. Installation, General
    a. Install fences in accordance with reviewed shop drawings and manufacturer's installation instructions.
    b. Do not begin installation and erection before final grading is completed, unless otherwise permitted.
    c. Install fencing plumb, taut, and true to line and ground contour. Install fencing to the height and construction as indicated on the Drawings.
    d. Install gates plumb, level, and secure for full opening without interference. Adjust hardware for smooth operation and lubricate where necessary.

11. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.
    a. If not indicated on the Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than 4 times the largest cross section of post.
    b. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

12. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet on center unless otherwise indicated.
    a. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
        1) Unless otherwise indicated, extend concrete footings 2 inches above grade and trowel to a crown to shed water.

13. Chain Link Fence Installation
    a. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
    b. Center Rails: Install center rails in 1 piece between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary.
    c. Brace Assemblies: Install braces at end posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.
    d. Fabric: Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
    e. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches on center.
    f. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
        1) Maximum Spacing: Tie fabric to line posts 12 inches on center and to rails and braces 24 inches on center.
    g. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

14. Gate Installation: Install in accordance with manufacturer's instructions.

15. Privacy Slats: Install slats to match pattern and direction of existing fencing on Campus, securely locked in place.

16. Adjusting of Gates: After repeated operation of completed installation equivalent to 3 day of use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

END OF DIVISION 32

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- SECTION 33 1000 -

WATER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to on-site domestic water and fire water systems serving all buildings and appurtenances. Unless otherwise noted, this section does not apply to irrigation water systems and water systems inside and within 5 feet of buildings. This section applies to:

1. Domestic water distribution and services.
2. Fire water distribution and services.

B. Contractor shall provide all labor, equipment, materials, and testing services unless otherwise noted.

C. Related Sections:

1. Section 31 2333 – Trenching, Backfilling, and Compacting.

1.3 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures

B. Product Data: Manufacturer’s literature and data, including, where applicable, sizes, pressure rating, rated capacity, listing/approval stamps, labels, or other marking on equipment made to the specified standards for materials, and settings of selected models, for the following:

1. Piping and fittings.

2. Gaskets, couplings, sleeves, and assembly bolts and nuts.
3. Gate valves and ball valves.
4. Check valves.
5. Thrust block concrete mix and/or restrained joints and fittings.
6. Service saddles and corporation stops.
7. Identification materials and devices.

C. Test Reports:
1. Water Pressure Report: At the conclusion of work, the Contractor shall engage a qualified testing service to conduct a flow test of the existing campus main(providing flow test data for all mains). Provide date and location of test, type and method of test performed, static pressure and residual pressure in psig, observed flow in gpm, and orifice size.

D. Samples: None specified. Provide as necessary.

1.4 QUALITY ASSURANCE

A. Comply with the latest edition of the following Standards and Regulations:
1. American Water Works Association (AWWA) and American National Standards Institute (ANSI):
   a. C500 Metal-Seated Gate Valves for Water Supply Service.
   b. C504 Rubber-Seated Butterfly Valves.
   c. C509 Resilient-Seated Gate Valves for Water Supply Service.
   d. C550 Protective Epoxy Interior Coating for valves and Hydrants.
   e. C651 Disinfecting Water Mains.
   f. C652 Disinfection of Water-Storage Facilities.
   g. C800 Underground Service Line Valves and Fittings for 1/2 inches - 2 inches.
2. National Fire Protection Association (NFPA):
   a. NFPA 13 Standard for the Installation of Sprinkler Systems.
   b. NFPA 24 Private Service Mains and their Appurtenances.
   c. NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
3. Uni-Bell Plastic Pipe Association (UNI).
   a. PUB 3 PVC Pipe – Technology Serving the Water Industry.
   b. PUB 7 External Corrosion of Underground Water Distribution Piping Systems.
   c. PUB 8 Tapping Guide for AWWA C900 Pressure Pipe.
4. American Society of Testing and Materials (ASTM).
   a. ASTM B88 Standard Specification for Seamless Copper Water Tube.
5. American Society of Mechanical Engineers (ASME).
   a. ASME B16 series for valves, fittings, flanges, and gaskets applicable for use in water systems.
   b. ASME B1.20.1 American Standard Tapered Pipe Threads for factory-threaded pipe and pipe fittings.
6. National Sanitation Foundation (NSF).

a. NSF/ANSI 14 Plastics Piping System Components and Related Materials.
b. NSF/ANSI 61 Standard for Drinking Water Systems Components – Health Effects.

7. Underwriters Laboratories, Inc. (UL).
   a. UL 157 Standard for Safety for Gaskets and Seals.
   b. UL 194 Standard for Safety for Gasketed Joints for Ductile-Iron Pipe and Fittings for Fire Protection Service.
   c. UL 213 Rubber Gasketed Fittings for Fire-Protection Service.
   d. UL 262 Standard for Safety for Gate Valves for Fire-Protection Service.
   e. UL 312 Standard for Safety for Check Valves for Fire-Protection Service.
   f. UL 860 Pipe Unions for Flammable and Combustible Fluids and Fire-Protection Service.
   g. UL 1091 Standard for Safety for Butterfly Valves for Fire-Protection Service.
8. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
9. American Concrete Institute (ACI).
   a. ACI 348 - Meter Pit Construction.
10. Local Water District Standard Specifications and Details.
11. Local Office of the Fire Marshal Regulations.
12. Other authorities having jurisdiction.

B. System Description: Grades and elevations are to be established with benchmarks referenced on Plans.

C. Comply with authorities having jurisdiction for the installation and testing of potable water piping and fire protection systems.

D. All testing of systems specified in this section shall be witnessed by representatives of the local water department or local authority. Provide at least 7 days notice.

E. The Contractor shall prepare shop plans and calculations, and obtain all required approvals for the fire water system of the proposed project. Contractor shall have shop plans and calculations stamped and signed by a Fire Protection Engineer, licensed by the State of California, as required by the local jurisdiction.

PART 2 - PRODUCTS

2.1 PIPING

A. Water Service Line (pipe size 3 inches and smaller)
   1. Copper (Cu): Provide Type K soft or hard copper pipe conforming to ASTM B88.

2.2 FITTINGS, GASKETS, COUPLINGS, SLEEVES, AND ASSEMBLY BOLTS AND NUTS

A. For Cu:
   1. Cast copper alloy solder-joint pressure fittings shall conform to ASME B16.18.

2. Wrought copper solder-joint pressure fittings or wrought copper alloy unions shall conform to ASME B16.22
3. Cast copper alloy flare fittings shall conform to ASME B16.26.
4. Wrought copper alloy body, hexagonal stock, metal-to-metal seating surfaces, and solder-joint threaded ends shall conform to ASME B1.20.1.
5. Compression connections shall be Mueller 110, Ford or approved equivalent.

2.3 GATE VALVES AND BALL VALVES

A. Gate Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
   1. Stuffing boxes shall have O-ring stem seals. Provide stuffing boxes bolted and constructed so as to permit easy removal of parts for repair.
   2. Valves (2-1/2 inches and larger):
      a. Provide valves conforming to AWWA C500 or AWWA C509 and of one manufacturer. Valves shall have a non-rising stem, a 2-inch square nut, and double-disc gates. Valves shall be rated for 250 psi maximum working pressure. Mueller 2360 series, ACIPCO, or approved equivalent.
      b. For the domestic water system, valves shall also conform to ANSI/NSF 61.
      c. For the fire water system, valves 2 inches through 16 inches in size shall also conform to UL 262 and FM 1120 or FM 1130 to a working pressure of 200 psi.

B. Ball Valves: Valves shall open by counterclockwise rotation of the valve stem. Provide valves with ends as appropriate for the adjoining pipe.
   1. Valves (2-inches and smaller):
      a. Provide valves conforming to AWWA C800 and of one manufacturer. Mueller 300 Series, Ford, or approved equivalent.
   2. Provide valve with lockable operating nut or handle as shown on the Construction Documents.

2.4 CHECK VALVES

A. Check Valves: Valves shall have clear port opening and a cast-iron body. Provide spring-loaded or weight-loaded valves where indicated on the Construction Documents.
   1. For the domestic water system, provide swing-check type valves conforming to AWWA C508. Provide valves of one manufacturer. Mueller, Apco, or approved equivalent.
   2. For the fire water system, provide swing-check type valves conforming to FM 1210 and UL 312. Mueller, Watts, or approved equivalent.

2.5 VALVE BOXES, METER BOXES, FRAMES AND COVERS

A. Water Valve Box: Provide pre-cast concrete valve box for each buried valve. Provide box with steel, cast iron or concrete traffic rated cover marked “WATER”. Christy Model G5 with G5C cover or approved equivalent.

B. Valve or Meter Boxes: Contractor shall verify box size required for water system appurtenances as shown in the Construction Documents. Provide a precast concrete utility box for each buried

appurtenance. Provide a traffic-rated lid for H20 loading. A non-traffic rated lid may be used for boxes located in landscape areas. Christy, or approved equivalent.

2.6 THRUST BLOCKS AND PIPE RESTRAINTS

A. Thrust Blocks: Provide thrust blocks in accordance with NFPA 24 Standards. Use concrete conforming to ASTM C94 having a minimum compressive strength of 2,500 psi at 28 days; or use concrete of a mix not leaner than one part cement, 2-1/2 parts sand, and 5 parts gravel, having the same minimum compressive strength.

B. Pipe Restraints: Provide thrust restraint systems for fittings and joints as indicated on the Plans. Restrained lengths for onsite fire system will be as indicated on the Plans.

1. For mechanical joint fittings and joints: Pipe restraints shall be “Mega-Lug” pipe restraint system by EBBA Iron, Inc., or approved equivalent.
2. For push-on joint fittings and joints: Pipe restraints shall be “Field-Lok” gaskets by U.S. Pipe, or approved equivalent.

C. Thrust blocks or mechanical pipe restraints may be used at Contractor’s option, unless otherwise indicated on the Plans.

D. Provide thrust blocks or mechanical pipe restraints at all fittings and changes in angle, alignment or elevation.

E. Where depth or location of existing structures prohibit the use of standard thrust blocks, gravity blocks may be used. Conform to NFPA 24 Standards.

2.7 SERVICE SADDLES AND CORPORATION STOPS

A. Corporation Stops: Provide ground key type; bronze conforming to ASTM B61 or ASTM B62, for a working pressure of 100 psi and suitable for the working pressure of the system.

1. Ends shall be suitable for adjoining pipe and connections, solder-joint, or flared tube compression type joint.
2. Threaded ends shall conform to AWWA C800.
3. Coupling nut for connection to flared copper tubing shall conform to ASME B16.26.
4. Mueller H-15000 Series with “CC” threads and a copper flare straight connection outlet, Ford, or approved equivalent.

2.8 IDENTIFICATION MATERIALS AND DEVICES

A. Marker Tape: Provide marker tape consisting of metallic foil bonded to plastic film not less than 2-inches wide. Film shall be inert polyethylene plastic. Film and foil shall each not be less than 1-mil. thick. The tape shall be identified with lettering, not less than 3/4-inch high, “CAUTION: WATER MAIN BELOW”, repeated at approximately 24-inch intervals.

B. Tracer Wire for Nonmetallic Piping: Provide 12 gage, coated copper or aluminum wire not less than 0.10 inch in diameter in sufficient length to be continuous over each separate run of nonmetallic pipe. Wire shall be tied in at all valves.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where water service is being installed.

B. Do not begin installation until unsatisfactory conditions have been corrected.

3.2 LOCATION OF WATER LINES

A. Where the location of the water line is not clearly defined by dimensions on the Plans, do not lay water line closer than 10 feet horizontally from any sewer line.

B. Where water lines cross under gravity sewer lines, encase sewer line in concrete for a distance of at least 10 feet on each side of the crossing, unless sewer line is made of pressure pipe with rubber-gasketed joints and no joint is located within 3 feet horizontally of the crossing.

C. Where water lines cross sewer force mains and inverted siphons, install water line at least 2 feet above these sewer lines.

D. When joints in the sewer line are closer than 3 feet horizontally from the water line, encase sewer line joints in concrete.

E. Do not lay water lines in the same trench with other utilities.

F. Install water lines at 3'-0" minimum depth or as detailed on Plans.

3.3 INSTALLATION OF PIPING

A. Inspection:
   1. Before placing in position, inspect pipe for noticeable defects. Clean the inside and outside of the pipe, fittings, valves, and accessories, and maintain in a clean condition.
   2. Remove fins and burrs from pipe and fittings.

B. Pipe laying and jointing:
   1. Provide proper facilities for lowering sections of pipe into trenches.
   2. Do not drop or dump pipe, fittings, valves, or any other water line material into trenches.
   3. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace any pipe or fitting that does not allow sufficient space for proper installation of jointing material.
   4. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying.
   5. Grade the pipeline in straight lines; avoid the formation of dips and low points.
   6. Support pipe at proper elevation and grade.
   7. Provide secure firm, uniform support. Wood support blocking will not be permitted.
   8. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings.

9. Provide anchors and supports where indicated and where necessary for fastening work into place.
10. Make proper provision for expansion and contraction of pipelines.
11. Keep trenches free of water until joints have been properly made.
12. Do not lay pipe when conditions of trench or weather prevent proper installation.
13. All fittings shall be blocked with appropriately sized thrust blocks as shown in the Construction Documents.

C. Installation of Tracer Wire:
1. Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe.
2. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

D. Connections to Existing Lines:
1. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line.
2. Make connections to existing lines under pressure in accordance with the recommended procedures of a manufacturer of pipe of which the line being tapped is made.

E. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads to keep out debris and contamination.

3.4 INSTALLATION OF VALVES

A. Install gate valves conforming to AWWA C500 and UL 262 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, operation, and Maintenance of Gate Valves) to AWWA C509.

B. Install gate valves conforming to AWWA C509 in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix (Installation, Operation, and Maintenance of Gate Valves) to AWWA C509.

C. Install check valves in accordance with the applicable requirements of AWWA C600 for valve-and-fitting installation, except as otherwise indicated.

D. Provide and assemble joints to gate valves and check valves as specified for making and assembling the same type joints between pipe and fittings.

3.5 INSTALLATION OF VALVE AND METER BOXES

A. Boxes shall be centered over the appurtenance so as not to transmit shock or stress. Covers shall be set flush with the surface of the finished pavement, or as shown in the Construction Documents. Backfill shall be placed around the boxes and compacted to the specified level in a manner that will not damage or displace the box from proper alignment or grade. Misaligned boxed shall be excavated, plumbed, and backfilled at no additional cost to the District.

3.6 SERVICE LINE CONNECTIONS TO WATER MAINS

A. Connect service lines of size shown on plans to the main with a rigid connection or a corporation stop and gooseneck. Install a gate valve on the service line.

3.7 HYDROSTATIC PIPELINE TESTING

A. Requirements:
   1. After the pipe has been laid and backfilled, perform hydrostatic pressure tests.
   2. Do not conduct tests until at least 12 hours have elapsed since pipe laying and at least 5 days have elapsed since placing of concrete thrust blocks.
   3. Fill the pipe with water which shall remain without external application of pressure for 24 hours before tests are conducted.
   4. Prior to hydrostatic testing, flush pipe system with fresh water until piping is free of dirt and foreign matter.
   5. Apply pressure by a pump and measured by a test gage. All necessary apparatus and labor for conducting the pressure and leakage tests shall be furnished by the Contractor.
   6. Ensure the release of air from the line during filling, and prevent collapse due to vacuum when dewatering the line.
   7. For pressure test, use a hydrostatic pressure not less than 200 psi. The duration of the test shall not be less than 4 hours with the variation in pressure of not more than 5 psi for the duration of the test.

B. Leakage Tests:
   1. Perform tests at the same time as pressure tests.
   2. Leakage rate shall be measured for at least 4 hours with a certified water meter, or other approved method. If requested, meter certification shall be submitted to the District for approval prior to testing.
   3. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
   4. Leakage at mechanical couplings and joints, tapping sleeves, saddles, flanged joints, and copper piping will not be accepted. Correct any visible leaks.
   5. Push-on joints: Test ductile iron pipe for leakage in accordance with AWWA C600 as shown in the following table:

TABLE 1

Allowable Leakage per 1000 feet of DIP Pipeline (Gal/Hr)

Average Test Pressure	Nominal Pipe Diameter - Inches									
(psi)	3	4	6	8	10	12	14	16	18	20
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60
275	0.37	0.50	0.75	1.00	.124	1.49	1.74	1.99	2.24	2.49

Average Test Pressure	Nominal Pipe Diameter - Inches									
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12

6. When the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
7. Test polyvinyl chloride pipe for leakage in accordance with the recommendations of the Uni-Bell Plastic Pipe Association (UNI) as shown in the following table:

TABLE 2

Allowable Leakage per 1000 feet or 50 joints of PVC Pipeline (Gal/Hr)

Nominal Pipe Size (inches)	Average Test Pressure in Line (psi.)	
	200	250
4	0.38	0.43
6	0.57	0.64
8	0.76	0.85
10	0.96	1.07
12	1.15	1.28
14	1.34	1.50
16	1.53	1.71
18	1.72	1.92
20	1.91	2.14

8. Should any section of new pipe fail to pass either test, locate and repair the defective pipe and repeat the test.

3.8 STERILIZATION AND FLUSHING

A. General:
   1. Disinfect domestic water lines, mains, and branches by chlorination in accordance with AWWA C601 and as herein specified.

B. Sterilization Methods:
   1. Liquid Chlorine Solution Method:
      a. Flush all foreign matter from mains, branch runs, hydrant runs, and installed services.
      b. Introduce liquid chlorine solution at appropriate locations to assure uniform distribution through the facilities at the proper concentration.
      c. Do not use installed copper service lines to convey the concentrated chlorine solution to the mains.

d. The sanitizing solution shall be retained in the facilities for a period of 24 hours after which each service, hydrant run, branch run and dead end shall be flushed until:
   1) Residual chlorine is less than 1 part per million.
   2) Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.

e. Chlorine shall be a 1 percent solution (containing 10,000 parts per million available chlorine) or shall be obtained by use of dry chlorine in tablet form firmly attached to inside tope of the pipe.

f. The required concentration of chlorine in the pipe is 50 parts per million. This concentration may be attained by adding 5 gallons of the chlorine solution to 1,000 gallons of water.

g. The weight of chlorine or chlorine compound required to make a 1 percent chlorine solution is as follows:

TABLE 3

One-Percent Chlorine Solution Mix

AMOUNT OF PRODUCT COMPOUND		QUANTITY OF WATER (in gallons)
High-Test Calcium Hypochlorite (65-70% Cl)	1 pound	7.50
Chlorinated Lime (32-35% Cl)	2 pounds	7.50
Liquid Laundry Bleach (5.25% Cl)	1 gallon	4.25
Liquid Chlorine (100% available chlorine)	0.62 pounds	7.50

2. HTH Tablet Method:

a. The required concentration of chlorine in the mains may be obtained by the use of HTH tablets as produced by Olin Mathieson in the following quantities or approved equivalent:

TABLE 3

HTH Tablet (70%) Dosage

Number of Tablets Per Length of Pipe

Length of Section	DIAMETER OF PIPE				
	4 inches	6 inches	8 inches	10 inches	12 inches
13 feet or less	1	2	3	4	6
18 feet	1	2	3	5	6
20 feet	1	2	3	5	7

Length of Section	DIAMETER OF PIPE				
30 feet	2	3	5	7	10
36 feet	2	3	5	8	12
40 feet	2	4	6	9	14
100 feet	4	9	15	23	30

b. Tablets are to be fastened to the inside top surface of each length of pipe using "Permatex No. 1" no earlier than the day pipe is laid.

c. Tablets shall not be installed in the pipe and left overnight before laying and shall not be accessible at any time for casual pilferage by the general public or by children. Tablets shall be stored in a hermetically sealed container.

d. The new water lines are to be slowly filled with water. Air is to be exhausted from each dead end, branch run, hydrant run, and installed service.

e. Water shall be retained for a period of 24 hours, after which each service, hydrant run, branch run and dead end shall be thoroughly flushed to clear foreign matter and until:

1) Residual chlorine concentration is less than 1 part per million.

2) Residual chlorine is no greater than the concentration of chlorine in the water supplied for flushing.

C. Bacteriological Testing:

1. Samples shall be gathered and tests conducted at the expense of the Contractor by a laboratory approved by the District.

2. Samples are to be taken at representative points not less than one test per every 500 feet of pipe, plus one test at each end of the pipe; or as required by the District and inspector having jurisdiction.

3. The new water lines shall remain isolated and out of service until satisfactory test results have been obtained that:

a. All samples shall be tested and show the absence of Coliform Organisms, the presence of free chlorine residual (and shall equal to that of source water). Turbidity, PH and Heterotrophic Plate Count shall also match that of the source water.

b. District has accepted the results as indicative of the bacteriological condition of the facilities.

c. If unsatisfactory or doubtful results are obtained from the initial sampling, repeat the chlorination process until acceptable test results are reported.

d. Source water shall be that of the campus.

- END OF SECTION -

- SECTION 33 3000 -

SANITARY SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled "Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California" prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled "Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California" prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to on-site sanitary sewerage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the City of San Mateo; the State of California Department of Transportation.

1. Sanitary Sewer System, including piping and structures.

B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.

C. Related Sections:

1. Section 31 2333 – Trenching, Backfilling, and Compacting.

1.3 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures.

B. Product Data: Manufacturer's literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:

1. Piping and fittings.
2. Jointing material.
3. Gaskets, couplings, and sleeves.

4. Pipe to Structure Connection Seal.
5. Clean-out boxes.

C. Field Test Reports: Indicate and interpret test results for compliance with performance.

1.4 QUALITY ASSURANCE

A. Comply with the latest editions of the following Standards and Regulations:
1. American Concrete Pipe Association (ACPA).
   a. ACPA 01-102 (1988) Concrete Pipe Handbook.
   b. ACPA 01-103 (1995) Concrete Pipe Installation Manual.
2. American National Standards Institute (ANSI).
   a. ANSI B18.5.2.1M (1981; R 1995) Metric Round Head Short Square Neck Bolts.
3. American Railway Engineering & Maintenance-of-Way Association (AREMA).
   a. AREMA 1-5 (2001) Pipelines.
4. American Society for Testing and Materials (ASTM).
   a. A 123/A 123M (2001a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   b. A 307 (2000) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   c. A 47 (1999) Ferritic Malleable Iron Castings.
   d. A 47M (1990; R 1996) Ferritic Malleable Iron Castings (Metric).
   e. A 48 (1994ae1) Gray Iron Castings.
   f. A 48M (1994e1) Gray Iron Castings (Metric).
   g. A 536 (1984; R 1999e1) Ductile Iron Castings.
   h. A 563 (2000) Carbon and Alloy Steel Nuts.
   i. A 563M (2001) Carbon and Alloy Steel Nuts (Metric).
   j. C 920 (2002) Elastomeric Joint Sealants.
   k. C 972 (2000) Compression-Recovery of Tape Sealant.
   l. D 1784 (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
   m. D 1785 (1999) Poly(Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120.
   n. D 2235 (2001) Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
   o. D 2241 (2000) Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   p. D 2321 (2000) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   q. D 2412 (1996a) Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
   r. D 2464 (1999) Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
   s. D 2466 (2001) Poly(Vinyl Chloride)(PVC) Plastic Pipe Fittings, Schedule 40.
   t. D 2467 (2001) Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
   u. D 2680 (2001) Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping.

v. D 2751 (1996a) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
w. D 3034 (2000) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
x. D 3139 (1998) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
y. D 3212 (1996a) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
z. D 3350 (2002) Polyethylene Plastics Pipe and Fittings Materials.
aa. D 4101 (2002) Propylene Injection and Extrusion Materials.
bb. D 412 (1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
cc. D 624 (2000) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
dd. F 1336 (2002) Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
ee. F 402 (1993; R 1999) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings.
ff. F 405 (1997) Corrugated Polyethylene (PE) Tubing and Fittings.
gg. F 477 (1999) Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
hh. F 714 (2001) Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
ii. F 758 (1995; R 2000) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage.
jj. F 794 (1999) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
kk. F 894 (1998a) Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe.
ll. F 949 (2001a) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.

5. ASME International (ASME).
   a. B1.20.1 (1983; R 2001) Pipe Threads, General Purpose, Inch.
   b. B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings.
   c. B18.2.2 (1987; R 1999) Square and Hex Nuts.
   d. B18.5.2.2M (1982; R 2000) Metric Round Head Square Neck Bolts.
6. American Water Works Association (AWWA).
   a. C900 (1997) Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Distribution.
   b. M23 (1980) Manual: PVC Pipe - Design and Installation.
7. Uni-Bell PVC Pipe Association (UBPPA).
   a. UNI-B-3 (1992) Recommended Practice for the Installation of Polyvinyl Chloride (PVC) Pressure Pipe (Nominal Diameters 4-36 Inch).
   b. UNI-B-6 (1990) Recommended Practice for the Low-Pressure Air Testing of Installed Sewer Pipe.
8. City of San Mateo Standard Plans and Specifications.
9. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
10. Other authorities having jurisdiction.

B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Plans.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage
   1. Piping: Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.
   2. Metal Items: Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

B. Handling
   1. Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. When handling lined pipe, take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

PART 2 - PRODUCTS

2.1 PIPING

A. Polyvinyl Chloride (PVC) Pipe: PVC pipe shall be used for pipes with a diameter less than or equal to 12". PVC pipe conforming to ASTM D3034, SDR 26 with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.

2.2 CLEAN-OUTS

A. A box shall be provided for each clean-out. Boxes shall be pre-cast concrete with traffic rated cast iron frame and cover marked "SAN SEWER"; Christy G5 with G5C lid or approved equivalent.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. Pipe shall be installed in conformance with Section 31 2333 – Trenching, Backfilling, and Compacting, and manufacturer's recommendations.

B. Pipe laying:
   1. No pipe shall be laid until the Geotechnical Project Manager inspects and approves the conditions of the bottom of the trench.

2. Pipe laying shall proceed “up grade” with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.
3. Each section of pipe shall be laid true to line and grade and in such a manner as to form an close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

C. Debris Control:
1. The interior of the sewer pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and bulled forward past every joint immediately after joining has been completed.

3.2 PIPELINE AIR TESTING AND FLUSHING

A. All new sections of sanitary sewer shall be tested using the following procedures:
1. Test is conducted between two consecutive manholes, or as directed by the Project Manager.
2. The test section of the sewer shall be plugged at each end. One of the plugs used at the manhole shall be tapped and equipped for the air inlet connection for filling the line from an air compressor.
3. All service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged and carefully braced against the internal pressure to prevent air leakage by slippage and blowout.
4. Connect air hose to tapped plug selected for the air inlet. Connect the other end of the air hose to the portable air control equipment, which consists of valves and pressure gauges used to control the air entry rate into the sewer test section, and to monitor the air pressure in the pipeline. More specifically, the air control equipment includes a shut-off valve, pressure regulating valve, pressure reduction valve, and a monitoring pressure gauge having a pressure range from 0-5 psi. The gauge shall have minimum divisions of 0.10 psi and an accuracy of 0.40 psi.
5. Connect another air hose between the air compressor (or other source of compressed air) and the air control equipment. This completes the test equipment set-up. Test operations may commence.
6. Supply air to the test section slowly, filling the pipeline until a constant pressure of 3.5 psig is maintained. The air pressure must be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig.
7. When constant pressure of 3.5 psig is reached, throttle the air supply to maintain the internal pressure above 3.0 psig for at least 5 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall. During this stabilization period, it is advisable to check all capped and plugged fittings with a soap solution to detect any leakage at these connections. If leakage is detected at any cap plug, release the pressure in the line and tighten all leaky caps and plugs. Start the test operation again by supplying air. When it is necessary to bleed off the air to tighten or repair a faulty plug, a new 5-minute interval must be allowed after the pipeline has been refilled.
8. After the stabilization period, adjust the air pressure to 3.5 psig and shut-off or disconnect the air supply. Observe the gauge until the air pressure reached 3.0 psig. At 3.0 psig,

commence timing with a stopwatch until the pressure drops to 2.5 psig, at which time the stop watch is stopped. The time required, as shown on the stopwatch, for a pressure loss of 0.5 psig is used to compute the air loss.

9. If the time, in minutes and seconds, for the air pressure drop from 3.0 to 2.5 psi is greater than that shown in the following table for the designated pipe size, the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued at any time.
10. If the time, in minutes and seconds, for the 0.5 psig drop is less than that shown in the following table for the designated pipe size, the section of the pipe shall not have passed the test; therefore, adequate repairs must be made and the line retested.

Requirements for Air Testing

Pipe Size	Time	
(in inches)	Minutes	Seconds
4	2	32
6	3	50
8	5	6
10	6	22
12	7	39
14	8	56
15	9	35
16	10	12
18	11	34
20	12	30

(For larger diameter pipe use the following: Minimum time in seconds = 462 X pipe diameter in feet).

11. For 8 inch and smaller pipe, only: if, during the 5 minute saturation period, pressure drops less than 0.5 psig after the initial pressurization and air is not added, the pipe section undergoing test shall have passed.
12. Multi-pipe sizes: when the sewer line undergoing test is 8 inch or larger diameter pipe and includes 4 inch or 6 inch laterals, the figures in the table for uniform sewer main sizes will not give reliable or accurate criteria for the test. Where multi-pipe sizes are to undergo the air test, the Project Manager can compute the “average” size in inches which is then multiplied by 38.2 seconds. The results will give the minimum time in seconds acceptable for a pressure drop of 0.5 psig for the “averaged” diameter pipe.
13. Adjustment Required for Groundwater:
    a. An air pressure correction is required when the ground water table is above the sewer line being tested. Under this condition, the air test pressure must be increased .433 psi for each foot the ground water level is above the invert of the pipe.
    b. Where ground water is encountered or is anticipated to be above the sewer pipe before the air testing will be conducted, the following procedure shall be implemented at the time the sewer main and manholes are constructed.

1) Install a ½ inch diameter pipe nipple (threaded one or both ends, approximately 10 inch long) through the manhole wall directly on top of one of the sewer pipes entering the manhole with threaded end of nipple extending inside the manhole.
2) Seal pipe nipple with a threaded ½ inch cap.
3) Immediately before air testing, determine the ground water level by removing the threaded cap from the nipple, blowing air through the pipe nipple to remove any obstruction, and then connecting a clear plastic tube to the pipe nipple.
4) Hold plastic tube vertically permitting water to rise in it to the groundwater level.
5) After water level has stabilized in plastic tube, measure vertical height of water, in feet, above invert of sewer pipe.
6) Determine air pressure correction, which must be added to the 3.0 psig normal starting pressure of test, by dividing the vertical height in feet by 2.31. The result gives the air pressure correction in pounds per square inch to be added.

Example: if the vertical height of water from the sewer invert to the top of the water column measures 11.55 feet, the additional air pressure required would be:

$$\frac{(11.55)}{(2.31)} = 5.0 \text{ psig}$$

Therefore, the starting pressure of the test would be 3.0 plus 5 or 8.0 psig, and the ½ pound drop becomes 7.5 psig. There is no change in the allowable drop (0.5 psig) or in the time requirements established for the basic air test.

B. After the line has passed the air test, it shall be balled and flushed with water to clean. A metal screen shall be used downstream at the point of connection to the existing system to collect and remove any rock or other debris that is flushed out during cleaning.

3.3 DEFLECTION TESTING

A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.

C. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection-measuring device.

D. Pull-Through Device:
1. Provide a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft.

a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.

b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.

2. Ball, cylinder, or circular sections shall conform to the following:

a. A diameter, or minor diameter as applicable, of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.

c. Center bored and through bolted with a ¼ inch minimum diameter steel shaft having a yield strength of not less than 70,000 pounds per square inch, with eyes or loops at each end for attaching pulling cables.

d. Each eye or loop shall be suitably backed with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

3. Pull-Through Device:

a. Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water.

b. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions as specified.

E. Deflection measuring Device:

1. Sensitive to 1.0 percent of the diameter of the pipe being tested and accurate to 1.0 percent of the indicated dimension.

2. Obtain approval of deflection measuring device prior to use.

F. Deflection Measuring Device Procedure:

1. Measure deflections through each run of installed pipe.

2. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction.

3. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, remove pipe which has excessive deflections, replace with new pipe, and completely retest in same manner and under same conditions.

G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.4 CLEANING

A. Thoroughly clean storm drain lines, manholes, catch basins, field inlets, culverts, and similar structures, of dirt, debris, and obstructions of any kind.

3.5 TELEVISION INSPECTION

A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the sewer line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original disc and log sheets shall be provided to the Project Manager for review.

1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
    a. Low spot (1 inch or greater - mainlines only).
    b. Joint separations (3/4 inch or greater opening between pipe sections).
    c. Cocked joints present in straight runs or on the wrong side of pipe curves.
    d. Chips in pipe ends.
    e. Cracked or damaged pipe.
    f. Dropped joints.
    g. Infiltration.
    h. Debris or other foreign objects.
    i. Other obvious deficiencies.
    j. Irregular condition without logical explanation

- END OF SECTION -

- SECTION 33 4000 -

STORM DRAINAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report:

1. A geotechnical report is available and is titled “Preliminary Geotechnical Investigation: Improvements at College of San Mateo, San Mateo, California” prepared by TRC, dated June 8, 2007.
2. A supplemental geotechnical report is available and is titled “Supplemental Pavement Recommendations, College of San Mateo, San Mateo, California” prepared by Cornerstone Earth Group, dated May 22, 2008.

1.2 SUMMARY

A. This section describes general requirements, products, and methods of execution relating to on-site storm drainage excluding portions within five feet of buildings unless otherwise noted. Any work within the public right-of-way shall be constructed to the standards of the City of San Mateo; State of California Department of Transportation.

1. Storm drain piping.
2. Storm drain structures including cleanouts and area drains.
3. Storm drain outfalls.

B. Contractor shall provide all labor, equipment, and materials, unless otherwise noted.

C. Related Sections:

1. Section 31 2333 – Trenching, Backfilling, and Compacting.

1.3 SUBMITTALS

A. Comply with provisions of Section 01 3219 – Submittal Procedures.

B. Product Data: Manufacturer’s literature and data, including, where applicable, pressure rating, capacity, labels, or other markings on equipment made to the specified standards for materials, for the following:

1. Piping and fittings.

2. Jointing material.
3. Gaskets, couplings, and sleeves.
4. Precast concrete structures, including cleanouts and area drains.
5. Concrete mix design for precast and cast-in-place structures.
6. Cleanout lids and frames.
7. Pipe to Structure Connection Seal.
8. Area drain grates and frames.
9. Trench drain grates and frames.

1.4 QUALITY ASSURANCE

A. Comply with the latest editions of the following Standards and Regulations:
   1. American Society for Testing and Materials (ASTM).
      a. C150: Portland Cement.
      b. C478: Precast Reinforced Concrete Manhole Sections.
      c. C494: Chemical Admixtures for Concrete.
      d. C920-02: Elastomeric Joint Sealants.
      e. D2241-00: Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
      f. D2680-01: Acrilonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Piping.
      g. D2729: Perforated PVC Drain Pipe.
      h. D3034-00: Type PSM Polyvinyl Chloride (PVC) Sewer pipe and Fittings.
      i. F1336-02: Poly(Vinyl Chloride) (PVC) Gasketed Sewer Fittings.
   2. California Department of Transportation (CDT): Standard Specifications:
      a. Section 51: Concrete Structures
      b. Section 52: Reinforcement
      c. Section 72: Slope Protection
      d. Section 90: Portland Cement Concrete
   3. City of San Mateo Standard Plans and Specifications.
   4. American Association of State Highway and Transportation Officials (AASHTO) for H20 Loading.
   5. American Concrete Institute (ACI).
   6. Other authorities having jurisdiction.

B. System Description: Grades and elevations are to be established with reference to the benchmarks referenced on the Plans.

PART 2 - PRODUCTS

2.1 PIPING

A. Polyvinyl Chloride (PVC) Pipe: PVC pipe shall be used for pipes with a diameter less than or equal to 12". PVC pipe conforming to ASTM D3034, SDR 26 with bell-and-spigot type of rubber gasket joints. Bells shall be integral with pipe. Spigot end pipe with separate double hub couplings is not acceptable.

B. High-Density Polyethylene (HDPE) Pipe: HDPE Pipe is NOT an acceptable product, and will not be considered for product substitution.

2.2 AREA DRAINS

A. Grate and Riser: Area drain shall be 12"x12" square cast iron grate and frame or approved equal. Riser shall be constructed of 6-inch PVC SDR 26 piping per paragraph 2.1(A) of this section and connected to area drain by a gasket joint. Riser shall be vertical except as otherwise noted in the plans. Riser may include a reducer if necessary to make connection to the storm drain line.

B. Elevation and Grading: Area Drain grate elevation shall be set and area around area drain shall be graded to drain away from any adjacent structures, walks, or roadways and towards area drain.

2.3 CLEAN-OUTS

A. A valve box shall be provided for each clean-out. Boxes shall be pre-cast concrete with cast iron frame and cover marked "STORM DRAIN"; Christy G05T with G05CT lid or approved equivalent.

2.4 CULVERT AND OUTFALL HEADWALLS

A. All headwalls shall be constructed in conformance with CDT Standard Plans as indicated.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

A. Pipe shall be installed in conformance with Section 31 2333 – Trenching, Backfilling, and Compacting, and manufacturer's recommendations.

B. Pipe laying:

1. No pipe shall be laid until the Geotechnical Engineer inspects and approves the conditions of the bottom of the trench.
2. Pipe laying shall proceed "up grade" with the spigot section of the bell-and-spigot pipe pointing in the direction of the flow.

3. Each section of pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets in the flow line.
4. Pipe shall not be laid when the condition of the trench or the weather is unsuitable.

C. Debris Control:
1. The interior of the storm pipe shall be kept clean of dirt and debris at all times. When work is not in progress, open ends of pipe and fittings shall be plugged.
2. Where clearing after laying is difficult because of small pipe size, a suitable swab or squeegee shall be kept in the pipe and pulled forward past every joint immediately after joining has been completed.

3.2 POURED-IN-PLACE CONCRETE

A. Concrete shall be mixed in accordance with applicable provisions of Section 90 of the CDT Standard Specifications. Concrete shall consist of Type I/II cement.

B. Construction of concrete structures shall conform to applicable provisions of Section 51 of the CDT Standards Specifications. Unless otherwise noted herein or in the Drawings, exposed surfaces of structures shall be Class 1 surface finish.

C. Curing shall conform to applicable portions in Section 90 of CDT Standard Specifications. No pigment shall be used in curing compounds. All work shall be subject to inspection. No concrete shall be placed until the Project Manager has approved the forms and reinforcement.

D. Concrete shall not be cropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six feet. Spouts, elephant trunks, or other approved means shall be used to prevent segregation.

3.3 PIPELINE FLUSHING

A. Newly constructed storm drain pipes shall be flushed with water to clean. A metal screen shall be used to collect and remove any rock, silt and other debris that is flushed out during cleaning.

3.4 DEFLECTION TESTING

A. Upon completion of work, perform a deflection test on entire length of installed plastic pipeline. Completed work includes superimposed loads adjacent to and over the pipeline, such as compacted backfill and earthwork, and does not include paving, concrete curbs and gutters, sidewalks, walkways, and landscaping.

B. Under external loads, deflection of pipe in the installed pipeline shall not exceed 4.5 percent of the average inside diameter of pipe.

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   a. Circular sections shall be so spaced on the shaft that distance from external faces of front and back sections will equal or exceed diameter of the circular section.
   b. Pull-through device may also be of a design approved by the Uni-Bell Plastic Pipe Association, provided that the device meets the applicable requirements specified in this paragraph, including those for diameter of the device.
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   b. A homogeneous material throughout, with a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.
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G. Warranty Period Test: Pipe found to have a deflection of greater than 5 percent of average inside diameter when deflection test is performed just prior to end of 1 year warranty period shall be replaced with new pipe and tested as specified for leakage and deflection.

3.5 CLEANING

A. Thoroughly clean storm drain lines and structures of dirt, debris, and obstructions of any kind.

3.6 TELEVISION INSPECTION

A. After completion of the pipe installation, service connections, flushing and cleaning, and prior to placement of pavement, the storm drainage line shall be televised with a color closed-circuit television with tilt-head camera recorded in DVD format. The original videotape and log sheets shall be provided to the District.

1. The following observations from television inspections will be considered defects in the construction of sewer pipelines and will require correction prior to placement of pavement:
    a. Low spot (1 inch or greater - mainlines only).
    b. Joint separations (3/4 inch or greater opening between pipe sections).
    c. Cocked joints present in straight runs or on the wrong side of pipe curves.
    d. Chips in pipe ends.
    e. Cracked or damaged pipe.
    f. Dropped joints.
    g. Infiltration.
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- END OF SECTION -