

SECTION 00910

ADDENDUM NO. 2

SUMMARY

This document includes requirements that clarify or supersede portions of the Request for Proposal. This Addendum is a Contract Document.

General

The following changes, additions and deletions shall be made to the following document(s); all other conditions shall remain the same.

I. BID FORM

A.	Section 00200 – Instructions to Bidders	<u>Modify paragraph 1 to reflect change in bid date:</u> <u>“Sealed bids will be received by Swinerton Management & Consulting for the District at their office no later than 2:00 pm on Wednesday, August 8, 2007.”</u>
B.	Section 00400- Bid Form	<u>Question:</u> <i>Bid form indicates one Alternate. Cover sheet of the drawings indicates five additional alternates. Will the bid form be re-issued?</i> <u>Response:</u> There is only one Alternate (Addendum 1 - Swing Space) as noted on the Bid Form. The Cover Sheet of the project drawings has now deleted all references to the previous Additive Alternates. Refer to attached sketch SKA-01.

II. AGREEMENT

A.	No Changes	
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III. SPECIFICATIONS

Item	Reference	Description
A.	Section 07511 Built-Up Asphalt Roofing	Revise Section 07511 Built-Up Asphalt Roofing 1.01A : Delete item (b) from the scope of this project. There is no work within Building 17 within the scope of this project.
B.	Section 09650 Resilient Flooring	Replace Section 09650 Resilient Flooring its entirety.
C.	Section 10100 Visual	Revise Section 1.01 Summary (A) to read as follows:

	Display Boards	<p>1. Section Includes: tackboards and markerboards with backing and trim. Delete all reference to Base Bid and Additive Alternates regarding this specification section.</p>
D.	Section 13851 Fire Alarm	<p>Modify Specification Section 13851 "Fire Alarm" as follows:</p> <ul style="list-style-type: none"> • Delete Paragraph 2.1.A.1 in its entirety. • Delete Paragraph 2.1.A.3 in its entirety. • Add Paragraph 2.1.A.4 – Pursuant to Section 3400 of the Public Contract Code Siemens MXL fire alarm systems are now in use on the particular 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 "Siemens MXL fire alarm systems" or "Siemens" is designated to match the existing system in place at Canada College. The contractor will furnish and install "Siemens MXL fire alarm systems" as required, and no substitutions shall be deemed to be "or equal" or allowed. • Add Paragraph 3.5.C – The fire alarm must be programmed with the final approved architectural room numbering identification. Programming shall not begin until the contractor has pre-approval from the architect for the final room numbering system.
E.	Section 14240 Hydraulic Elevators	Replace Section 14240 Hydraulic Elevators its entirety.
F.	Section 16701 Low Voltage Underground Cutover	Replace Section 16701 Low Voltage Underground Cutover in its entirety.
G.	Section 16710 Telecommunications Horizontal Cabling	Replace Section 16710 Telecommunications Horizontal Cabling in its entirety.
H.	Section 16711 Telecommunications Backbone Cabling	Replace Section 16711 Telecommunications Backbone Cabling in its entirety.
I.	Section 16719 Telecommunications	Replace Section 16719 Telecommunications Testing in its entirety.

	Testing	
J.	Section 16707 Telecommunications Pathways	<p>Question: <i>In section 16707, page 16707-2, paragraph 2.01 it states that inside plant innerduct shall be riser rated. Is this correct as all ISP cabling is plenum rated.</i></p> <p>Response: ISP cabling is non-plenum as specified in section 16711. Note that there is no ISP fiber backbone cabling specified for this project.</p>

IV. DRAWINGS

Item	Reference	Description
A.	Cover Sheet	<p>Question: <i>Cover sheet of the drawings indicates information regarding additional work will be forthcoming. ??</i></p> <p>Response: There is no work in Building 17 under this contract. Refer to SKA-01 to delete the following note “Minor additional work will be reflected in a forthcoming Addendum”.</p>
B.	Sheet G0.01	<p>ADD: The following drawings to the scope of this project: C1.0 Civil Site Improvement Plan C2.0 Civil Site Details</p>
C.	Various Drawings	<p>Question: <i>Most of the drawings indicate “Conform Set” in the revision box. The following drawings reference addendums from the previous bid but do not indicate “Conform Set”. Are these drawings conformed or do you need to publish previous addendums in order for us to fully understand changes associated with these drawings.</i></p> <p>Response: No Addendums dated previous to July 2007 are required by bidders. These drawings are conformed and approved under the original submittal to DSA.</p>
D.	Various Drawings	<p>Question: <i>Additionally, there are a number of drawings in the set that do not reference either a previous addendum or Conformed Set. Can we assume they are conformed?</i></p> <p>Response: Yes. These drawings are conformed and approved under the original submittal to DSA.</p>

E.	Sheet S3.11	<p>Question: <i>Regarding Underpinning: (See S3.11 for plan view)</i></p> <p>a) 2/S3.12 indicates requirement for underpinning. The new walls sit atop existing footings and I'm at a loss to understand why underpinning is drawn unless you're enlarging an existing footing which then makes it "enlarging existing footing" not underpinning. We can design underpinning but cannot be responsible for enlarging existing footings. Please clarify.</p> <p>Response: The underpinning shown in 2/S3.12 is intended to protect the section of existing footing supporting the north stair wall from being undermined by the new elevator pit. It is the responsibility of the contractor's shoring/underpinning engineer to determine the extent of underpinning that is needed. The dashed line in Section 2/S3.13 shows the assumed extent for underpinning for the said wall.</p> <p>b) 4/S3.12 shows underpinning but there is no section 4 indicated on S3.11. Please advise where this occurs.</p> <p>Response: 4/S31.2 is keyed from 2/S3.13.</p> <p>c) As a courtesy to the Contractors, please provide drawings for existing footings in the vicinity of this work.</p> <p>d) Response: Separately from this Addendum 2, the following original record drawings have been made available through Elite Reprographics solely for the contractor's reference: (Note: Building "N" refers to B16 and Building "Q" refers to B18).</p> <p>S1: Foundation, 1st & 2nd FLR. Framing Plans- Bldg "N" S2: Foundation Sections & Details- Bldg "N" S3: 3rd FLR. & Roof Framing Plans- Bldg "N" S4: Foundation & Floor Framing Plans- Bldg "Q" S5: Foundation Sections & Details- Bldg "N & Q" S6: Sections & Details- Bldg "N & Q" S7: Beam & Slab Schedules & Typical Details- Bldg "N & Q"</p>
F.	Sheet M5.05, Detail 1	ADD: 3-piece ball isolation valve to the CHWS and CHWR lines per attached SKM-11.
G.	Sheet M5.05, Detail 2	ADD: 3-piece ball isolation valve to the CHWS and CHWR lines per attached SKM-12.
H.	Sheet M6.02, Detail 1	Revise Note # 1 to read as follows: Furnish Duct detector- Detectors shall be manufactured by Seimens and are to be No-Flow Type detectors or are to include an air duct velocity range of 100- 4000 ft./min. All Detectors are to be fully compatible with Seimens MXL System (Ref. District Standard 28 31 00, Version 1.2007.02.19)"per attached SKM-13.

I.	Sheet M6.02, Detail 3	<p>ADD Note # 6 to read as follows: All components must be fully compatible with the Seimens MXL Fire Alarm System being installed. Verify compatibility prior to ordering equipment. Ref District Standard 28 31 00, Version 1.2007.02.19. Refer to attached sketch SKM-14</p> <p>ADD Note # 7 to read as follows: Duct Smoke Detectors are to be manufactured by Seimens and are to be No-Flow Type detectors or are to include an air duct velocity range of 100 – 4000 FT./Min. Refer to attached sketch SKM-14.</p>
J.	Sheet T4.11	<p><u>Question:</u> <i>Will we be providing building entrance protector panels for any of the copper OSP? If so what will be specified?</i></p> <p><u>Response:</u> Yes, in B16. (Refer to sheet T4.11) Refer to revised (Addendum No. 2) section 16701 for BEP specification.</p>

VI. CLARIFICATIONS

A.	Sheet T1.02	<p><u>Question:</u> <i>Is there a cable schedule for OSP fiber and copper? If not could you match the cable types/strand/pair count with the narrative on T1.02. It seems that the fiber was crossed out.</i></p> <p><u>Response:</u> Provide new copper backbone cable per sheet T1.03. (Note: Cable 01 in the narrative of work should read “Place one 50-pr cable from MH-02 <u>through</u> MH-01 to B16-TDB.”) Provide new 24 strand single mode OSP fiber backbone cable from building 8 to buildings 16,18, 20 and 22. Refer to fiber replacement narrative on sheet T1.02 for routing and termination information. Refer to revised (Addendum No. 2) section 16701 for OSP fiber specification.</p>
B.	Sheet T1.03 & T4.11	<p><u>Question:</u> <i>The same question for ISP fiber and copper backbone. Where to where and what type/strand/pair count.</i></p> <p><u>Response:</u> -There is no ISP fiber backbone cabling in buildings 16 and 18. OSP fiber backbone cabling routes directly from building 8 to the TDBs in buildings 16 and 18. 50-pr OSP copper backbone cable is routed directly into B16-TDB from splice point in MH-02. Refer to T1.03 and T4.11 for additional information. Provide (N) 50-pr ISP copper backbone cable from existing B18-TDA up to B18-TDB on third floor. Terminate cable in B18-TDB on modular patch panel. Refer to SKT-09 (part of Addendum No. 2) and T4.31 for additional information.</p>

C.	Sheet T1.02	<p><u>Question:</u> <i>Will OSP fiber be installed within innerduct in conduits and PBs/MHs?</i></p> <p><u>Response:</u> Yes</p>
D.	Sheet T4.11	<p><u>Question:</u> <i>Will we be providing building entrance protector panels for any of the copper OSP? If so what will be specified?</i></p> <p><u>Response:</u> Yes, in B16. (Refer to sheet T4.11) Refer to revised (Addendum No. 2) section 16701 for BEP specification.</p>
E.	Sheet T4.11	<p><u>Question:</u> <i>Will OSP fiber and copper be terminated and changed to ISP at MPOE. If so what type of termination blocks and/or panels will be specified?</i></p> <p><u>Response:</u> No. -OSP fiber will run directly into B16-TDB and B18-TDB in buildings 16 and 18 respectively. -In building 16, OSP copper will terminate in a splice enclosure in B16-TDB. Refer to T4.11 for additional information. -In building 18, OSP copper cable will terminate at existing B18-TDA located in mechanical room 105. ISP copper backbone cable will then continue up to B18-TDB. Refer to sketch SKT-09 included in Addendum No. 2 for both ISP copper backbone cable call out and revised pathway from Mechanical room 105 and B18-TDB.</p>

VII. ATTACHMENTS

Item	Sheet Number	Item	Sheet Number	Item	Sheet Number	Item	Sheet Number
1.	SKA-01	7.	C1.0	13.		19.	
2.	SKM-11	8.	C2.0	14.		20.	
3.	SKM-12	9.		15.		21.	
4.	SKM-13	10.		16.			
5.	SKM-14	11.		17.			
6.	SKT-09	12.		18.			

END OF ADDENDUM 2

SECTION 09650

RESILIENT FLOORING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
- *a2 1. Rubber tile.
 - 2. Sheet vinyl.
 - 3. Linoleum.
 - 4. Resilient wall base.
 - 5. Resilient floor accessories.
 - 6. Underlayment.*a2
- B. General provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- C. Related Sections
- 1. Section 03300 - Cast-In-Place Concrete: Provision of cast-in-place concrete.
 - *a2 2. Section 07900 - Joint Sealers: Provision of sealants and caulks.*a2
 - 3. Section 09250 - Gypsum Board: Provision of gypsum board wall surface.
 - 4. Section 09980 - Vapor Emission Treatment Systems: Provision of vapor emission testing and treatment systems for on-grade and above-grade horizontal concrete surfaces receiving resilient flooring.
 - *a2 5. Section 14240 - Hydraulic Elevators: Provision of hydraulic elevators.*a2

1.02 REFERENCES

- *a2 A. ADA - Americans with Disabilities Act*a2
- B. ASTM - American Society for Testing and Materials
- *a2 1. D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - 2. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
 - 4. E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.*a2
 - 5. F710 - Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 - *a2 6. F970 - Standard Test Method for Static Load Limit.
 - 7. F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing.
 - 8. F1344 - Standard Specification for Rubber Floor Tile.
 - 9. F1516 - Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
 - 10. F1861 - Standard Specification for Resilient Wall Base.
- C. FS 0 Federal Specifications
- 1. FS SS-T-312B - Type III, Vinyl Tile.
- D. NFPA - National Fire Protection Association
- 1. 253 - Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.*a2

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data for each type of product specified.
- *a2 B. Samples: Submit samples for initial selection purposes in form of manufacturer's color charts consisting of actual resilient flooring showing full range of colors and patterns available for each different product indicated. Include interior and exterior premolded corner samples for wall base.
- C. Quality Control Submittals
 - 1. Certificates: Submit certification by resilient flooring manufacturer that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).
 - 2. Installer certificates signed by resilient flooring manufacturer certifying that Installers comply with requirements specified under "Quality Assurance" article.
- D. Contract Closeout Submittals
 - 1. Operation and Maintenance: Submit maintenance data for resilient flooring.*a2

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at Site: Deliver installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Storage and Protection
 - 1. Store installation accessories in dry spaces protected from the weather with ambient temperatures maintained between 50 degrees F and 90 degrees Fahrenheit.
 - 2. Store installation accessories on flat surfaces. Move and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

*a2

1.05 PROJECT CONDITIONS

- A. Environmental Requirements
 - 1. Maintain a minimum temperature of 70 degrees Fahrenheit in spaces to receive resilient flooring materials for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 degrees Fahrenheit.
 - 2. Do not install resilient flooring materials until they are at the same temperature as the space where they are to be installed.
 - 3. Close spaces to traffic during resilient flooring materials installation.

1.06 SEQUENCING AND SCHEDULING

- A. Install resilient flooring materials and accessories after other finishing operations, including painting, have been completed.
- B. Sequence installing products specified in this Section with other construction to minimize possibility of damage and soiling during remainder of construction period.
- C. Do not install resilient flooring materials over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond and moisture tests.

1.07 MAINTENANCE

- A. Extra Materials: Deliver extra materials to the District. Furnish extra materials matching products installed as described below, packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish 3 boxes of each class, wearing surface, color, pattern and size of resilient floor tile installed.
 - 2. Furnish 100 linear feet in roll form of resilient sheet flooring and wall base installed.*a2

PART 2 - PRODUCTS

*a2

2.01 MANUFACTURERS

- A. Acceptable Manufacturers
 - 1. Rubber Tile: BurkeMercer Flooring Products, "Rouleau"; District Standard.
 - 2. Sheet Vinyl: Altro, "Altro Maxis"; District Standard.
 - 3. Linoleum: Tarkett Commercial, "Linoleum XF"; District Standard.
 - 4. Resilient Base and Accessories: BurkeMercer Flooring Products; District Standard.
 - 5. Underlayment: Ardex, or approved equal.

2.02 PRODUCTS

- A. Rubber Tile: Rubber floor tile with chamfered round stud profile design; stud size 1.08-inch diameter by .015-inch high; complying with ASTM F1344, Class 1A; ASTM E84, Class B; ASTM E648/NFPA 253, Class 1 Fire Rating.
 - 1. Thickness: 0.12-inch.
 - 2. Size: 19.685 inches by 19.685 inches.
 - 3. Slip Resistance: Meets or exceeds ADA recommendations of 0.6 for flat surfaces, in accordance with ASTM D2047.
 - 4. Color: Clay, #527.
- B. Sheet Vinyl: ASTM F1303, Type 2, Grade 1, sheet vinyl flooring with moisture resistant backing Class A; static coefficient of slip resistance in excess of 0.6 when tested in accordance with ASTM D2047; integrated bacteriostat.
 - 1. Thickness: 0.10-inch.
 - 2. Width: 67 inches.
 - 3. Length: 66 feet.
 - 4. Pattern and Color: As selected by the Architect.
- C. Linoleum: Consisting of linseed oil, wood flour and rosin binders, mixed and calendered onto polyglass backing, FS SS-T-312B, with the following properties:
 - 1. Gauge: 1/10-inch.
 - 2. Static Load Limit: Exceeds 700 psi in accordance with ASTM F970.
 - 3. Slip Resistance: Meets or exceeds ADA recommendations of 0.6 for flat surfaces, in accordance with ASTM D2047.
 - 4. Fire Resistance
 - a. Smoke Density: 450 or less in accordance with ASTM E662.
 - b. Critical Radiant Flux: Class 1 in accordance with ASTM E648.
 - 5. Pattern and Color: As selected by the Architect.
- D. Rubber Wall Base: Products complying with ASTM F1861.
 - 1. Style
 - a. Cove with top-set toe at resilient and other smooth flooring.
 - b. Carpet base at carpeted areas.
 - 2. Minimum Nominal Thickness: 1/8-inch.
 - 3. Height: 4 inches unless otherwise indicated.
 - 4. Lengths: Coils in lengths standard with manufacturer but not less than 100 feet.
 - 5. Interior and Exterior Corners and Ends: Premolded.

6. Color and Pattern: As selected by the Architect.
- E. Resilient Accessories: Provide reducer strips, transition edging strip, carpet binder trim and other accessories as required. Match adjoining base.
 1. Transition Edging Strip: As manufactured by Altro, "Visedge VR", or equal.
- F. Installation Accessories
 1. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
 2. Patching Compounds: Latex modified, portland cement based formulation provided or approved by resilient flooring manufacturer for applications indicated.
 3. Underlayment: Portland cement based, latex modified, feather edge, trowelable material; add pea gravel in 1:1 by volume as required; as manufactured by Ardex, "SD-F Featheredge Finish", or approved equal.
 4. Adhesives (Cements): Waterproof type recommended by resilient flooring manufacturer to suit resilient flooring products and substrate conditions indicated. Adhesive shall be compatible with vapor emission treatment system as specified in section 09980.
 5. Caulking: Acrylic latex silicone caulk as specified in Section 07900.
 6. Rod for Heat-Welding Seams: As recommended by floor covering manufacturer.
 - a. Color: Match field color of sheet flooring.*a2

PART 3 - EXECUTION

3.01 EXAMINATION

- A. General: Examine areas where installation of products specified in this Section will occur, with installer present, to verify that substrates and conditions are satisfactory for resilient flooring installation and comply with manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
 1. Slab substrates are dry and free of curing compounds, sealers, hardeners and other materials whose presence would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by resilient flooring manufacturer.
 2. Subfloors are free of cracks, ridges, depressions, scale and foreign deposits of any kind.

3.02 PREPARATION

- A. General: Comply with manufacturers' installation specifications to prepare substrates indicated to receive resilient flooring accessories.
- B. Use trowelable leveling and patching compounds per manufacturer's directions to fill cracks, holes and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- D. Broom or vacuum clean substrates to be covered by resilient flooring immediately before flooring installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation or dust.
- E. The General Contractor shall be responsible for acceptability of moisture emission of concrete.
 1. Before installing resilient flooring, concrete slab shall be tested as specified in Section 09980 for moisture emission. The test shall be conducted around the perimeter of each room, at columns and where moisture may be evident. A diagram of the areas showing the locations and results of

each calcium chloride test shall be submitted to the Architect. At each area where the moisture emission exceeds flooring manufacturer's specified limits, a sealant shall be applied as specified in Section 09980.

- F. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.

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3.03 RESILIENT TILE INSTALLATION

- F. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles square with room axis, unless otherwise indicated.
- G. Match tiles for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles in ashlar pattern with grain running in one direction, unless otherwise directed by the Architect.
- H. Where cabinets and other items are indicated for installing on top of finished tile floor, install tile before these items are installed.
- I. Scribe, cut, and fit tiles to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including, pipes, outlets, edgings, thresholds and nosings.
- J. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- K. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent marking device.
- L. Adhere tiles to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.
- M. Use full spread of adhesive applied to substrate in compliance with tile manufacturer's directions including those for trowel notching, adhesive mixing, and adhesive open and working times.
- N. Hand roll tiles where required by tile manufacturer.

3.04 SHEET VINYL AND LINOLEUM INSTALLATION

- A. Resilient Sheet Flooring Installation
1. Unroll resilient sheet flooring and allow to stabilize before cutting and fitting.
2. Layout resilient sheet flooring to comply with the following requirements:
- Maintain uniformity of resilient sheet flooring direction.
 - Arrange for minimum number of seams and place them in inconspicuous and low-traffic areas and not less than 6 inches away from parallel joints in flooring substrates.
 - Match edges of resilient sheet flooring for color shading and pattern at seams according to manufacturer's written recommendations.
 - Avoid cross seams.
 - Scribe, cut and fit resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including cabinets, pipes, outlets, edgings, door frames and thresholds.
3. Adhere resilient sheet flooring to substrates to comply with resilient flooring manufacturer's written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

4. Heat Welded Seams: Rout joints and heat weld with welding bead, permanently fusing sections into a seamless floor covering. Prepare, weld, and finish seams according to manufacturer's written instructions and ASTM F1516 to produce surfaces flush with adjoining floor covering surfaces.
5. Hand roll resilient sheet flooring in both directions from center out to embed floor coverings in adhesive and eliminate trapped air. At walls, door casings, and other locations where access by roller is impractical, press resilient sheet flooring firmly in place with flat-bladed instrument.

3.05 RESILIENT WALL BASE INSTALLATION

- A. General: Install products specified in this Section using methods indicated according to manufacturer's installation directions.
- B. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 1. On concrete surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 2. Install inside and exterior premolded corners before installing straight pieces.
- C. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that otherwise would be exposed.*a2

3.06 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing installation:
 1. Remove visible adhesive and other surface blemishes using cleaner recommended by manufacturers.
 2. Sweep or vacuum floor thoroughly.
 3. Do not wash floor until after time period recommended by manufacturer.
 4. Damp-mop resilient flooring and accessories to remove black marks and soil.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by resilient flooring manufacturer.
 1. Cover resilient flooring with undyed, untreated building paper until inspection for Substantial Completion.
 2. Do not move heavy and sharp objects directly over flooring materials. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- C. Clean products specified in this Section not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products using method recommended by manufacturer.

END OF SECTION

SECTION 14240

HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Hydraulic passenger elevator as shown and specified. Elevator work includes:
1. Commercial, standard pre-engineered hydraulic passenger elevator.
 2. Elevator car enclosures, hoistway entrances and signal equipment.
 3. Jacks.
 4. Operation and control systems.
 5. Accessibility provisions for physically disabled persons.
 6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
 7. Materials and accessories as required to complete the elevator installation.
- B. Related Sections
1. Section 03100 - Concrete Formwork: Installing inserts, sleeves and anchors in concrete.
 2. Section 05500 - Metal Fabrications:
 - a. Provision of hoist beams, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Provision of steel angle sill supports and grouting hoistway entrance sills and frames.
 - c. Provision of pit ladder.
 - *a2 3. Section 09650 - Resilient Flooring: Provision of rubber floor tile.*a2
 4. Section 09900 - Paints and Coatings: For field painting unfinished and shop primed ferrous materials.
 5. Division 15 - Mechanical
 - a. Sump pit and oil interceptor tank and associated plumbing.
 - b. Heating and ventilating hoistways and machine rooms.
 6. Division 16 - Electrical
 - a. Provision of electrical service to elevators, including fused disconnect switches, electric shunt trip.
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Heat and smoke sensing devices.
 - d. Convenience outlets and illumination in machine room, hoistway and pit.

1.02 REFERENCES

- A. ADA - Americans with Disabilities Act
1. ADAAG - Americans with Disabilities Act - Accessibility Guidelines.
- B. ASME - American Society of Mechanical Engineers
1. A17.1 - Safety Code for Elevators and Escalators.
- C. ASTM - American Society for Testing and Materials
1. A36 - Standard Specification for Structural Steel.
 2. A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 3. A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 4. A276 - Standard Specification for Stainless and Heat-resisting Steel Bars and Shapes.
 5. A366 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
 6. B151 - Standard Specification for Copper-Nickel-Zinc Alloy (Nickel Silver) and Copper-Nickel Rod and Bar.

7. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 8. B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
 9. E2074 - Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.
- D. AWI - Architectural Woodwork Institute
- E. AWS - American Welding Society
- F. CBC - California Building Code, 2001 Edition
- G. NEMA - National Electrical Manufacturers Association
1. LD3 - High Pressure Decorative Laminates.
- H. NFPA - National Fire Protection Association
1. 70 - National Electrical Code (NEC).
 2. 80 - Fire Doors and Windows.
- I. UL - Underwriters Laboratories, Inc.

1.03 DEFINITIONS

- A. Definitions: Terms shall be as defined in ASME Code.
- B. "Call Back": Elevator malfunction or breakdown where the Building Manager calls the Elevator Company to come fix the problem. Sometimes passengers get stuck in an elevator and initiate the call back from the code required telephone inside the elevator.
- C. "Concealed": Embedded in masonry or other construction, installed in furred spaces, within double partitions or hung ceilings, in trenches, in crawl spaces or in enclosures.
- D. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration and similar unusual, unexpected and unsatisfactory conditions.
- E. "Exposed": Not installed underground or "concealed" as defined above.
- F. "Indicated", "Shown" or "Noted": As indicated, shown or noted on the Drawings or as specified.
- G. "Install": To erect, mount and connect complete with related accessories.
- H. "Provide": Furnish and install complete for safe regular operation, unless specifically indicated otherwise.
- I. "Reviewed", "Satisfactory", "Accepted", or "Directed": As reviewed, satisfactory, accepted or directed, by or to the District.
- J. "Similar" or "Equal": Of Base Bid manufacturer, equal in materials, weight, size, design and efficiency of specified product, conforming with "Acceptable manufacturers".
- K. "Supply": To purchase, procure, acquire and deliver complete with related accessories.
- L. "Wiring": Raceway, fittings, wire, boxes, and related items.

- M. "Work": Labor, materials, equipment, apparatus, controls, accessories, and other items required for proper and complete installation.

1.04 SYSTEM DESCRIPTION

A. Design Requirements

1. Structural Tubes for Guide Rails and Hoistway Supports, Guide Rails, Guide Rail Support Brackets and Sill Angles
 - a. Design and size members as required to comply with requirements of CBC Chapter 30 and Appendix 30.
 - 1) Special Loads for Elevators and Elevator Cars: CBC Chapter 16, Table 16B, Category 6 and Table 16P.
 - b. Seismic Requirements for Seismic Zone 4.
 - c. Design work to support normally imposed loads and in conformity with AISC requirements.
 - d. Provide for expansion and contraction.

B. Performance Requirements

1. Capacity: Safely lower, stop and hold up to 125 percent of rated load.
2. Door Opening Time in Seconds from Start of Opening to Fully Open: 2.3 seconds.
3. Door Close Time: Minimum, without exceeding kinetic energy and closing force allowed by Code.
4. Stopping Accuracy: Within 1/4-inch under any loading condition. Level into floor at all times, do not overrun floor and level back.
5. Pressure: Fluid system components shall be designed and factory tested for 500 psi. Maximum operating pressure shall be 400 psi.
6. Operating Qualities: The Architect will judge riding quality of car and enforce the following requirements. Make all necessary adjustments.
 - a. Transition: Starting and stopping shall be smooth and comfortable. Slowdown, stopping and leveling shall be without jars or bumps.
 - b. Full Speed: Riding shall be free from vibration and sway.

1.05 SUBMITTALS

A. Product Data: Submit product data for the following:

1. Elevator car enclosures and hoistway entrances.
2. Operation, control, and signal systems.

B. Shop Drawings

1. Show equipment arrangement in the machine room, pit and hoistway. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
4. Indicate electrical power requirements and branch circuit protection device recommendations.

C. Color Selection: Submit color charts of exposed finishes and materials for color selection.

1. When requested, submit samples of exposed finishes and materials selected for the elevator system materials and components.

D. Certificates: Inspection and acceptance certificates of elevator system installation.

E. Operation and maintenance data. Include the following:

1. Operation and maintenance instructions.
2. Parts list, with recommended parts inventory.

1.06 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturer: An approved manufacturer regularly engaged in manufacturing, installing, and servicing elevators of the type required for the project.
 - a. The manufacturer of the machine, controller, signal fixtures, door operators cab, entrances, and all other major parts of the elevator operating equipment.
 - b. The major parts of the elevator equipment shall be manufactured in the United States, and not be an assembled system.
 - c. The manufacturer shall have a documented, on-going quality assurance program.
 - 2. Installer: The manufacturer or an authorized agent of the manufacturer with not less than 5 years of satisfactory experience installing elevators equal in character and performance to the project elevators.

- B. Regulatory Requirements
 - 1. CBC.
 - *a2 2. ASME A17.1, latest edition or as required by CBC, *a2
 - 3. California Title 24 Building Code.
 - 4. NFPA 70.
 - 5. NFPA 80.
 - 6. ADAAG.

- C. Fire Rated Entrance Assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, UL10B, and NFPA Standard 80. Provide entrance assembly units bearing Class B labels.

- D. Inspection and Testing: Elevator installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - 1. Arrange for inspections and make required tests.
 - 2. Deliver to the District upon completion and acceptance of elevator work.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Acceptance at Site: Deliver elevator materials, components and equipment in manufacturer's protective packaging.

- B. Storage and Protection: Store materials in a dry protected area provided by others. Protect and handle materials in accordance with manufacturer's recommendations to prevent damage, soiling, or deterioration.

1.08 PROJECT CONDITIONS

- A. Prohibited Use: Elevators shall not be used for any purpose during the construction period before Substantial Completion.

- B. Painting
 - 1. Except as otherwise specified, paint all metal work provided by the elevator manufacturer and installer.
 - 2. Provide all ferrous metals installed in the hoistway shop primed with a rust inhibitive primer.

- C. Provide the hole for the jack unit as required, based on excavation through normal soil or clay which can be removed by manual digging or by standard truck mounted regular drilling unit. Provide a casing if required to retain the walls of the hole. General contractor shall remove excavation spoils deposited in the elevator pit.

1. If a physical obstruction or hindrance is encountered below the ground surface, including boulders, rock, gravel, wood, metal, pilings, sand, water, quick sand, caves, public utilities or any other foreign material, obtain written authorization to proceed with excavating using special excavation equipment.
2. Maintain a daily log of time and material costs involved.
3. Elevator contractor will be compensated on a time and material basis for additional costs incurred after encountering the physical obstruction or hindrance, including the cost of the special excavation equipment.

1.09 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 24 months from date of Substantial Completion.

1.10 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 12 months for each elevator from date of Substantial Completion. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation.
 1. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
 2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
 3. Manufacturer shall have a service office and full time service personnel within a 50 mile radius of the project site.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Acceptable Manufacturer: Hesselberg Keese & Associates; ThyssenKrupp Elevator, or equal

2.02 MATERIALS, GENERAL

- A. Colors, Patterns, and Finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- B. Steel
 1. Shapes and Bars: ASTM A36.
 2. Sheet: ASTM A366, cold-rolled steel sheet, commercial quality, Class 1, matte finish, stretcher leveled.
 3. Finish: Factory applied baked enamel.
- C. Stainless steel
 1. Shapes and Bars: ASTM A276, Type 304 (18-8).
 2. Tubing: ASTM A269, Type 304 (18-8).
- D. Aluminum
 1. Sheet and Plate: ASTM B209, alloy 6063-T52.
 2. Extrusions: ASTM B221, alloy 6063-T52.
- E. Plastic Laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050-inch thickness.

2.03 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood subfloor. Underside of the platform shall be fireproofed.
- B. Sling: Steel stiles affixed to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building with steel brackets.
- D. Guide Shoes: Slide guides shall be mounted on top and bottom of the car and counterweight frame and be held in contact with the guide rail by adjustable devices.
- E. Guide Rail Lubricators: Provide a leakproof reservoir on top of upper guide shoes. Wool felt wiper shall apply an even, uniform flow of lubricant which shall thoroughly cover face of guide rail.
- F. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- G. Jack: Jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Jack unit shall consist of the following components:
 - 1. Heavy seamless steel tubing plunger accurately turned and polished.
 - 2. Stop ring shall be electrically welded to the plunger to prevent plunger leaving the cylinder.
 - 3. Internal guide bearing.
 - 4. Packing or seal of suitable design and quality.
 - 5. Drip ring around cylinder top.
 - 6. Cylinder made of steel pipe and provided with a pipe connection and air bleeder.
 - 7. Weld brackets to the jack cylinder for supporting the elevator on pit channels. An auxiliary safety bulkhead shall be provided in the lower end of the cylinder.
 - 8. Jack cylinder and underground piping shall be double wrapped with an approved coating designed to help protect it from electrolytic and chemical corrosion.
 - 9. Provide PVC cylinder protection to protect the cylinder from corrosion and to contain any oil in the event of a cylinder leak.
- H. Automatic Terminal Limits: Place electric limit switches in the hoistway near the terminal landings. Limit switches shall be designed to cut off the electric current and stop the car if it runs beyond either terminal landing.
- I. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for overtravel or undertravel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- J. Failure Protection: Design electrical control circuit so if a malfunction occurs, due to motor starter failure, oil becoming low in the system, or the car failing to reach a landing in the up direction within a pre-determined time, the elevator car will automatically descend to the lowest terminal landing. If power operated doors are used, the doors will automatically open when the car reaches that landing to allow passengers to depart. The doors will then automatically close and all control buttons, except the "door open" button in the car station, shall be made inoperative.
- K. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with NEC. All necessary pipe and fittings shall connect the power unit to the jack unit. Provide proper grade oil.
- L. Emergency Terminal Stopping Device: Provide emergency terminal stopping devices for speeds over 100 FPM. The emergency terminal stopping device shall operate independently of the normal terminal stopping device if it fails to slow down the car at the terminal as intended. Stopping devices shall not

be prevented from functioning by a single short circuit caused by a combination of grounds or by other conditions.

1. Normal and emergency terminal stopping devices shall not control the same controller switches unless 2 or more separate and independent switches are furnished, 2 of which shall be closed in either direction of travel to complete the circuit to the control valve solenoids in the down direction and to complete the circuit to the pump motor for the up direction of travel.

2.04 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit consisting of the following items:
 1. Oil reservoir with tank cover and controller compartment with cover.
 2. An oil hydraulic pump.
 3. An electric motor.
 4. Oil control unit with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and magnetic controller.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Drive: Drive shall be by direct coupling with the pump and motor submerged in the oil reservoir or by multiple V-belts and sheaves of number and size to insure maximum factor of safety. Drive type shall be determined based primarily on the load on the car, travel, and speed.
- D. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating shall comply with specified speeds and loads.
- E. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
 1. Relief valve shall be externally adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 2. Up start and stop valve shall be externally adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 4. Lowering valve and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling when slowdown is initiated.
- F. Power controller shall contain electrical contactors, electro-mechanical switches and thermal overload relays. Mount components in a NEMA 1 enclosure. Logic control system shall be microprocessor based and protected from environmental extremes and excessive vibrations.

2.05 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening.
 1. Manufacturer's standard entrance design bearing UL "B" labels, and consisting of 14 gauge frames with 2 inch profile, 16 gauge doors, hangers, hanger supports, hanger covers, fascia plates, sight guards, and necessary hardware.

2. Elevator wall interface with hoistway entrance assembly shall comply with elevator manufacturer's requirements.
 3. Doors: Flush construction
 - a. Stainless Steel: ASTM A167, Type 304 stainless steel panels, No. 4 satin finish.
 4. Frames: Formed construction.
 - a. Stainless Steel: ASTM A167, Type 304 stainless steel panels, No. 4 satin finish.
 - *a2 b. Interlocks: Equip each hoistway entrance with UL "B" label approved type interlock tested as required by CBC. Interlock shall be designed to prevent operation of the car away from the landing until the doors are locked in the closed position as defined by code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at that landing or is in the leveling zone and stopping at that landing.*a2
- B. Door Hanger and Tracks: Provide sheave type 2 point suspension hangers and tracks for each hoistway sliding door.
1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 2. Hangers: Provide an adjustable slide to accommodate the up-thrust of the doors.
 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- C. Hoistway Sills: Extruded, with grooved surface, 1/4-inch thickness
1. Aluminum: ASTM B221 aluminum, mill finish.

2.06 CAR ENCLOSURE

- A. Walls: Cab type DLP, durable wood core finished on both sides with high pressure plastic laminate. Color and style as selected by the Architect from manufacturer's standard colors and styles.
- B. Canopy: Reinforced 14 gauge cold-rolled steel with hinged exit, with 2 coats of factory applied reflective baked enamel finish.
- C. Ceiling: Suspended type, stainless steel panel with downlight halogen lights. Number of downlights shall be 6.
- *a2 D. Floor: Rubber tile with non-slip pattern of raised discs, as specified in Section 09650.*a2
- E. Front Return, Columns and Transom: Stainless steel, ASTM A167, Type 304 stainless steel panels, No. 4 satin finish.
- F. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane metallic shoes sliding in a smooth threshold groove.
 1. Door Finish: Stainless steel, ASTM A167, Type 304 stainless steel panels, No. 4 satin finish.
 2. Car Sills: Extruded, with grooved surface, 1/4-inch thickness.
 - a. Aluminum: ASTM B221 aluminum, mill finish.
- G. Handrail: Continuous cylindrical, 1.5-inch diameter with ends curved to the wall, stainless steel no. 4. Provide at rear wall only.
- H. Ventilation: 2 speed exhaust fan mounted on the car top.
- I. Pad Buttons: Provide pad buttons on cab front return and walls.
 1. Provide 1 set of vinyl protection pads for each elevator.
- J. Base: Stainless steel no. 4 satin finish.
- K. Car Top Inspection: Provide a car top inspection station with an "emergency stop" switch and constant pressure "up-down" direction buttons to make the normal operating devices inoperative and give the

inspector complete control of the elevator. Mount the car top inspection station in the door operator assembly.

- L. Moving Mats and Hooks: Provide 2 stainless steel hooks at each wall of enclosure with fitted moving mats extending to within 6 inches of floor.

2.07 DOOR OPERATION

- A. Door Operation: Provide a direct current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. Door movements shall be electrically cushioned at both limits of travel and the door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. Direct drive geared operators, AC controlled units with oil checks, or other deviations are not acceptable.
 - 1. No Un-Necessary Door Operation: Car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as the next car up.
 - 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 - 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel will reverse and the door will reopen to answer the other call.
 - 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door movement is obstructed for a field programmable time, a buzzer will sound and the doors will close at reduced speed. If the infra-red door protection system detects a person or object while closing, the doors will stop and resume closing after the obstruction has been removed.
 - 5. Limited Door Reversal: If the doors are closing and an infra-red beam is interrupted, the doors will reverse and reopen partially. After the obstruction is cleared, the doors will begin to close.
 - 6. Door Open Sentinel: If the doors are opening, but do not fully open after a field adjustable time, the doors will recycle closed then open 6 times to try and correct the fault.
 - 7. Door Close Sentinel: If the doors are closing, but do not fully close after a field adjustable time, the doors will recycle open then close 6 times to try and correct the fault.
 - 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Devices: Provide a solid state electronic detector at the entrance of the elevator car and an electro-mechanical reversal edge on the leading edge of the car door. Doors will remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door movement is obstructed for a predetermined time, the doors will resume normal closing operation. If the electro-mechanical reversal edge contacts a person or object while closing, the doors will immediately stop and reopen. Closing will be initiated after the passenger or object has moved from the opening.

2.08 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in stainless steel no. 4 integral swing return panel requiring no applied faceplate. The panel shall consist of a series of modules, inclined 20 degrees from vertical for optimum viewing and accessibility.
 - 1. The lowest module shall contain the "door open", "door close", "alarm" buttons, and a keyed "emergency stop" switch.

2. Intermediate modules shall contain ADA compliant floor buttons which illuminate when a call is registered and remain illuminated until the call is answered. Raised floor indications and handicap symbols shall be located immediately adjacent to the floor buttons and be fully integrated in the module design. No applied symbols or floor indications or symbols on the buttons shall be permitted.
 3. The next module shall contain required switches.
 4. The top module shall contain fire service features in accordance with ASME A17.1, Rule 211.3, including operating instructions.
- B. Position Indicator: An electronic dot matrix position indicator inclined 20 degrees from vertical and mounted in a module matching the control panel for optimum viewing. As the car travels, its position in the hoistway shall be indicated by the illumination of the alpha/numeric character corresponding to the landing which the elevator is stopped or passing.
- C. Emergency Light: An emergency light and capacity plate shall be integrated into a module inclined 20 degrees from vertical. Emergency light shall illuminate automatically upon loss of the building's normal power supply.
- D. Emergency Communications System: Provide an emergency communications device mounted in the swing return. Emergency communications device shall comply with ADA requirements. Service by others.
1. Telephone Cabinet: Stainless steel. Identify telephone cabinet with engraved letters and a raised international telephone symbol in accordance with ADA requirements. Engrave building name, address and elevator number on the inside face of the cabinet door.
 2. Telephone: Provide ADA compliant telephone compatible with the telephone system, operable with push button.
 3. Traveling Cables: Flexible and suitably suspended relieving strain on individual conductors.
- E. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the car strike jamb. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door begins to close. Provide voice call and bell indicators for every floor.
- F. Special Accessories: 2 speed fan key switch.

2.09 CONTROL SYSTEMS

- A. Controller: The elevator control system shall be microprocessor based and software oriented and be linked together for purposes of communication by a serial communications link. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
1. Momentary pressing of 1 or more buttons shall dispatch the car to the designated landings in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be canceled when answered.
 2. When the car is traveling in the up direction, it shall stop at all floors for which car buttons or "up" hall buttons have been pressed. The car shall not stop at floors where "down" buttons have been pressed, unless the stop for that floor has been registered by a car button or unless the down call is at the highest floor for which any buttons have been pressed. Pressing the "up" button when the car is traveling in the down direction shall not intercept the travel unless the stop for that floor has been registered by a car button or unless the up call is the lowest for which any button has been pressed.
 3. When the car has responded to its highest or lowest stop, and stops are registered for the opposite direction, its direction of travel shall reverse automatically and it shall then answer the calls registered for that direction. If both up and down calls are registered at an intermediate floor,

only the call corresponding to the direction of car travel shall be canceled upon the stopping of the car at the landing.

- B. Microprocessor: Locate the main microprocessor and car controller in the Elevator Machine Room.
 - 1. Microprocessor door operator shall reside in the door operator and control all functions of the elevator door.
 - 2. Electronic selector shall reside on the car top and contain hall effect transducers that detect magnetic fields. Locate the magnetic fields on a perforated metal tape that runs the length of the hoistway.
- C. Group Operation: The system shall operate on a real time response, demand basis, constantly scanning and calculating the most efficient car assignment. Hall call assignments shall be based on the availability of each car in the group and shall be based primarily on the principle of the nearest car selection and priority call assignment. Car available status is determined based on the following input:
 - 1. Car position.
 - 2. Direction of car travel.
 - 3. Car calls registered.
 - 4. Direction and unanticipated delay.
 - 5. Perform new calculation and reassignment for each occurrence.
- D. Provide a key operated switch in the elevator for the purpose of removing the car from normal operation. When the switch is in the "independent service" position, the elevator will bypass all landing calls and answer only car calls. The operator will have complete control over the operation of the car.
- E. Emergency Power 10D-4A: In the event of a normal power supply failure, the elevator system shall operate from an emergency power supply. The emergency power supply, including transfer switch and auxiliary contacts, is provided as part of the work of Division 16 and shall be available to all elevators in the system through the normal power feeders.
 - 1. Emergency power shall be of the same characteristics as the normal power and have the same phase rotation.
 - 2. A signal to the elevator system shall be provided approximately 20 seconds before normal power is restored to the system or testing of emergency power when normal power is present.
 - 3. Provide a manual switch to override the automatic selection procedure.

2.10 HALL STATIONS

- A. Hall Stations, General: Provide 2 position key switches for the indicated direction. Faceplates shall be stainless steel No. 4 satin finish. Provide 1 set of risers.
 - 1. Each terminal station shall contain 1 standard key switch.
 - 2. Each intermediate station shall consist of 2 key switches, 1 for the up direction and 1 for the down position.
 - 3. Phase 1 firefighters service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with ADA requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pit and Machine Room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with NEC for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- D. Jack Unit Excavation: Include in bid an amount for digging the cylinder hole and furnishing auxiliary casing, if required.
- E. Drill or otherwise excavate below elevator pit construction as required to install the jack unit.
 - 1. Install casing for jack unit.
 - 2. Set casing for jack unit assembly plumb, and fill water-settled sand, eliminating voids.
 - 3. Immediately before installation of jack unit-cylinder assembly, remove water and debris from casing and provide watertight, permanent plug at bottom of casing.
- F. Set jack unit-cylinder assembly plumb, centered accurately and shimmed to proper elevation, using centering lugs to prevent dislocation during filling. Fill space between casing and cylinder with clean, dry, compacted sand. Seal at pit slab with 4 inch thickness of non-shrinking concrete grout.
- G. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- H. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- I. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
- J. Sound Isolation: Mount rotating and vibrating elevator equipment, guide rails and components on vibration-absorption mounts, designed to effectively prevent the transmission of vibrations to the structure, and eliminate sources of structure-borne noise from the elevator system.
- K. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
- L. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascias and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- M. Lubricate operating parts of system, including ropes, as recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

- A. Acceptance Testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.
- B. Advise the District, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.

3.06 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

- A. Instruct the District's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train the District's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make final check of each elevator operation, with the District's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE

- A. Elevator
 1. Elevator Model: Hesselberg Keese & Associates; ThyssenKrupp Elevator Company, or equal.
 2. Rated Capacity: 2500 pounds.
 3. Rated Speed: 100 feet per minute.
 4. Operation System: DMC-I Microprocessor.
 5. Travel: Verify.
 6. Openings/Stops: 3.
 7. Clear Car Inside: 6'-8" wide by 4'-3" deep.
 8. Platform Size: 7'-0" wide by 5'-0" deep.
 9. Cab Height: 8'-0" clear under suspended ceiling.
 10. Hoistway Entrance Size: 3' -6" wide by 7'-0" high single speed.
 - a. Hoistway door and frame finish: Stainless steel.
 11. Door Type: Single slide right side opening.

12. Door Operation: Automatic, direct current powered.
13. Power Characteristics: 208 volts, 3 Phase, 60 Hz.
14. Seismic requirements for Zone 4.
15. Special Features: Nudging; door standing time saver, and platform with Class A.

END OF SECTION

***a2 SECTION 16701**

LOW VOLTAGE UNDERGROUND CUTOVER

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes backbone outside plant (OSP) twisted pair and fiber optic cabling and power conductors for the duct bank relocation.

1.02 REFERENCES

- A. Comply with Division 1 References requirements.

1.03 DEFINITIONS

- A. Refer to Division 1 for Definitions.
- B. In addition, the following list of terms as used in this specification shall be defined as follows:
 - 1. "BEP": Building Entrance Protection [systems]
 - 2. "CMP": Communications Media Plenum [NEC plenum rating]
 - 3. "CMR": Communications Media Riser [NEC riser/non-plenum rating]
 - 4. "HDPE": High Density Polyethylene
 - 5. "ISP": Inside Plant [cabling]
 - 6. "LDPE": Light Density Polyethylene
 - 7. "MDPE": Medium Density Polyethylene
 - 8. "MMF": Multimode fiber type
 - 9. "OSP": Outside Plant [cabling]
 - 10. "PE": Polyethylene
 - 11. "PIC": Plastic Insulated Conductor
 - 12. "PVC": Polyvinyl Chloride
 - 13. "SMF": Singlemode fiber type

1.04 SYSTEM DESCRIPTION

- A. General
 - 1. Refer to Division 1 for a full description of the project and building.
- B. Base Bid Work
 - 1. Base bid work includes engineering, labor, materials, apparatus, tools, equipment, and transportation required to provide continuation within new duct bank of existing cabling.
 - 2. In general, the base bid work includes:
 - a. Submittals.
 - b. Backbone outside plant twisted pair (copper) cables and splicing.
 - c. Backbone outside plant fiber optic cables.

- d. Power (clock system) wires and splicing.
 - e. Cable identification tags and system labeling.
 - f. Record Documents.
 - g. Warranty.
3. The relocation work of this section affects ITS (voice and data) services to the buildings beyond MH01 (B1, B22, and Trailers). Planning and advance notice is critical to the success of this work and to minimize telecommunications downtime resulting from cutting of affected cables. Close coordination with the District ITS Department is required.

1.05 SUBMITTALS

- A. Comply with Division 1 for procedural, quantity, and format requirements.
- B. Submittal Requirements Prior To Start Of Construction:
 - 1. Product Data Submittal, indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
 - 2. Schedule Submittal, consisting of proposed schedule of work and cutover. Also refer to "Schedule" requirements of article 3 (this section).
 - 3. Shop Drawings Submittal, consisting of proposed changes to cable routing, or termination locations/configurations.
- C. Submittal Requirements at Closeout:
 - 1. As-Built Drawings.
 - 2. Cutover records.

1.06 QUALITY ASSURANCE

- A. Comply with Division 1 Quality Assurance requirements.

1.07 PRODUCT DELIVERY, HANDLING AND STORAGE

- A. Comply with Division 1 Delivery, Storage and Handling requirements.

1.08 WARRANTY

- A. Comply with Division 1 Warranty requirements.
- B. Warrant the operation of the entire cabling link, not just the new portion within the duct bank relocation, for a period of one year after substantial completion.

PART 2 - PRODUCTS

2.01 TWISTED PAIR UNDERGROUND CABLES

- A. Application:
 - 1. Cable shall be suitable for outdoor installations, within underground conduit.
 - 2. Cable shall be twisted pair PIC type cable, filled core, with an "ASP" sheath. Cable shall be compatible with Bell System type "ANMW".
- 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 PE, covered with an outer layer (skin) of solid PE.
 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 (super 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-hygroscopic polypropylene film, or equivalent.
 2. Filled: Cable core and sheath shall be flooded with filling compound to protect against moisture penetration. Filling compound: "FLEXGEL", or equivalent.
 3. Sheath Type: "ASP". Sheath shall consist of a shield and an outer jacket.
 - a. Shield: Dual corrugated tape of inner aluminum and outer steel longitudinally applied, with a locking overlap.
 - b. Jacket: PE, bonded to shield.
- D. Manufacturer:
1. Superior Essex "Filled ASP ANMW" series cables.

2.02 TWISTED PAIR UNDERGROUND SPLICE CLOSURES AND ACCESSORIES

- A. Splice Closure – Underground Vault Type
1. Application: Splice closure system shall be suitable for outdoor installation within underground vault and/or maintenance hole.
 2. Enclosure:
 - a. Enclosure shall be re-enterable.
 - b. Through-splice or butt-splice configurations will be accepted.
 - c. Size enclosure based on splice bundle diameter and largest incoming cable.
 3. Manufacturer:
 - a. 3M "Better Burried" series gravity filled closures
 - b. 3M #4460; shield bond connector for cables 100-pair or larger
 - c. 3M #4460-D; shield bond connector for cables 100-pair or smaller
 - d. 3M #25T Ground Braid or #25T Ground Braid with Eyelets
- B. Splice Module – 710 Filled Straight Type
1. Application: In-line or branch splicing of OSP cables in underground vaults or manholes.
 2. Splice modules shall accept mixed solid wire gauges (26 AWG – 19 AWG).
 3. Splice modules shall accept PIC or PVC insulation.
 4. Splice modules shall be "preloaded" (filled) with water resistant compound.
 5. Manufacturer: 3M Telcom, or equal:
 - a. #3M710-SC1-25; 25-pair 710 type filled straight splicing module.
- C. Encapsulant
1. Application: Encapsulant shall be suitable for outdoor installation within underground splice closures (vault and/or maintenance hole).

2. Encapsulant shall be re-enterable.
3. Manufacturer, or equal:
 - a. 3M Telcom #4442; "High Gel" re-enterable encapsulant.

2.03 SPLICE CLOSURES AND ACCESSORIES – BUILDING ENTRANCE TYPE

- A. Application: Splice closure system shall be suitable for indoor installation within entrance facilities for splicing between OSP and ISP cable.
- B. Closure:
 1. Enclosure shall be re-enterable.
 2. Through-splice or butt-splice configurations will be accepted.
 3. Sleeve shall be solid / Solid or split sleeve will be accepted.
 4. Size enclosure based on splice bundle diameter and largest incoming cable.
 5. End caps shall accept eight single collared or shall have multiple holes.
- C. Include all required accessories, such as collars, grommets, bushings, bonding connectors, etc. for a complete installation.
- D. Closure system shall be air and water tight. Closure system shall be RUS listed and UL approved.
- E. Manufacturer, or equal: 3M Telcom:
 1. #R-3
 2. #4460-D; shield bond connector for cables 100-pair or smaller
 3. #25T Ground Braid or #25T Ground Braid with Eyelets

2.04 TWISTED PAIR SPLICE MODULES - DRY TYPE.

- A. Application: Cable transition (OSP to ISP) in telecommunications rooms.
- B. Modules shall accept solid wire, gauges 26 AWG to 19 AWG.
- C. Modules shall accept mixed insulation types (PIC, PVC, pulp or paper insulated conductors), up to maximum insulation outside diameter of 0.70 inches.
- D. Manufacturer, or equal: 3M Telcom #3M710-SD1-25; 710 type 25-pair dry straight splicing module.

2.05 BEP TERMINAL – 190 TYPE

- A. Application: BEP terminal shall be suitable for indoor installation, within a telecom room (such as an Entrance Facility or 'MPOE'). BEP terminals shall provide termination of the backbone twisted pair cables and shall protect premises equipment against induced voltages and stray currents.
- B. Configuration: BEP terminal shall be designed for a wall mounted configuration, shall have the capacity to accept 50 or 100 incoming and outgoing pairs, and shall accept 5-pin type protector modules.
- C. Media Interfaces:
 1. Input shall be 25-foot 26 AWG fusible link stub.
 2. Output shall be 25-foot 24 AWG stub.
- D. Manufacturers:
 1. Porta Systems #26050-ST-MST; 190 type BEP terminal

2. SYSTIMAX #190A1-50 (102 995 073); 50-pair 190 type BEP terminal

2.06 BEP MODULES – WITH SNEAK CURRENT PROTECTION

- A. BEP modules shall be standard 5-pin type, and be suitable for installation into BEP terminals.
- B. Overvoltage Device: solid state. DC Breakdown Voltage: 220 V. Response time: <100 nsec.
- C. Sneak Current Device: heat coil. Sneak Current: 1 A. Response Time: < 15 sec.
- D. Manufacturers:
 1. Porta Systems #115SCG-250V; solid state module, 220V – 300V breakdown voltage with sneak current protection, black
 2. SYSTIMAX #4C1S (104 386 545); solid state module, 220V – 300V breakdown voltage with sneak current protection, black.

2.07 FIBER OPTIC UNDERGROUND CABLE

- A. Application:
 1. Cable shall be suitable for outdoor installations within underground conduit.
 2. Cable and fiber strands shall exhibit stable performance in an outdoor 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. Singlemode fiber strands shall meet or exceed the following geometry criteria:
 1. Core diameter = 8.3 μm .
 2. Mode field diameter = 8.8 $\mu\text{m} \pm 0.5 \mu\text{m}$
 3. Cladding diameter = 125 μm , $\pm 1.0 \mu\text{m}$.
 4. Core/Cladding Concentricity = $\leq 0.8 \mu\text{m}$.
 5. Minimum Tensile Strength = 100,000 psi.
- C. Singlemode fiber strands shall meet or exceed the following performance criteria:
 1. Attenuation = 0.4 dB/km at 1310 nm and 0.3 dB/km at 1550 nm wavelengths, maximum.
 2. Cutoff wavelength = 1260 nm.
 3. Dispersion = 3.5 ps/nm•km at 1285-1330 nm.
- D. Buffering:
 1. Fibers shall be loosely buffered, either in a core tube or in multiple tubes around a dielectric central member.
 2. The buffer tube/tubes shall be flooded with filling compound to protect against moisture penetration. Filling compound: "FLEXGEL", or equal.
 3. Buffer Tubes (if applicable): Each buffer tube shall be color coded to allow identification, and shall meet the requirements of ANSI/TIA/EIA-598-A-1995. (Also, ref. ANSI/ICEA Publication S-80-576, and EIA-230).
- E. Sheath:
 1. Sheath shall consist of a strength member, armor, and an outer jacket.

2. Strength Member: Aramid yarn (e.g., Kevlar®), or reinforced fiberglass rods.
 3. Armor shall be a corrugated steel tape.
 4. Jacket: UV-resistant MDPE.
 5. Rated tensile load: 600 lb. maximum rated load.
 6. Operating Temperature Range: -40 to 158°F (-40 to 70°C)
 7. Listing: RUS 7 CFR 1755.900
- F. Manufacturer: Corning Cable Systems, or equal.
1. #024EWC-T4101D20; 24 strand singlemode outdoor 'ALTOS' armored sheath

2.08 FIBER OPTIC TERMINATION

- A. SC Type Fiber Optic Connectors
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 installable via either epoxy or anaerobic method.
 4. Manufacturer, or equal: Corning Cable Systems
 - a. #95-250-08-BP; SC connector, singlemode

2.09 FIRE ALARM CABLES

- A. Manufacturer: West Penn Wire #AQ294

2.10 POWER UNDERGROUND CABLES

- A. THWN type wire.
- B. Conductor: 12 AWG, solid.
- C. Sheath Colors: Yellow (YEL), black (BLK), red (RED), and blue (BLU).

2.11 POWER UNDERGROUND SPLICING

- A. Splice Connector
1. Connectors/splices shall be suitable for underground vault applications and shall be waterproof.
 2. Manufacturer, or equal:
 - a. King Innovation "DRYCONN" waterproof connectors

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with Division 1 General Execution requirements.

3.02 SCHEDULING

- A. Produce work schedule of all activities.

- B. Issue this work schedule to Owner's Representative. Obtain written acceptance of work schedule from Owner's Representative two months in advance of the notification of cutover (see next requirement).
- C. Schedule with the Fire Marshall three weeks prior to cutover activities. Provide manned watch, per Fire Marshall's requirements, within the buildings affected by the cutover.

3.03 PREPARATION

- A. Prior to relocation activities, produce work schedule of all activities. Issue this work schedule to Owner's Representative. Obtain written acceptance of work schedule from Owner's Representative.
- B. Prior to installation, verify pathways (underground conduits, etc.) are complete and ready for cables by physical examination.
- C. Verify cable is fully operational – both cable sheath and conductors – prior to installation.
- D. Prior to cutover, test existing cables end to end to verify cabling link's operation.

3.04 INSTALLATION

A. Twisted Pair Underground Cabling

1. Cable Placement

- a. Bend Radius: Maintain a minimum bend radius of 6 times the cable diameter during and after installation.
- b. Pulling: Maintain pulling tension within manufacturer's limits. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.
- c. Protection: Protect cable during installation. 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. Install cables within designated pathways.

2. Grounding and Bonding

- a. Bond cable shield to splice closure bond assembly. Provide bonding conductor from splice closure bond terminal to ground terminal within maintenance hole, if available.
- b. Size bonding conductor 6 AWG up to 25 feet in length; size as 1000 circular mils per foot if longer than 25 feet.

3. Labeling

- a. Provide labels on each splice module and binder group in splice closure.

B. Fiber Optic Underground Cable

1. Cable 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. Use a pulling tension meter when using mechanical assistance during installation. Record maximum pulling tension for each cable run and submit to the Engineer for review if requested. Replace runs when manufacturer's maximum pulling tension is exceeded.
- 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. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.

- f. Provide a 30 feet (minimum) sheathed cable slack loop at each end of the run within the Telecommunications Rooms; place the slack either on the overhead cable tray/runway or coiled and fastened on the wall.
 - g. Install cables within designated pathways.
 - h. Secure cabling to communication vault sidewall by use of racking. Provide racking if not already present in vault.
 - i. Place and suspend cables in a manner to protect them from physical interference or damage.
2. Termination
- a. Existing Conditions
 - 1) In Bldg 8, the existing fiber optic patch panel is a Siecor (now Corning) FCC type patch panel.
 - 2) In Bldg 3, the existing fiber optic patch panel is a Siecor (now Corning) WIC type patch panel.
 - b. Provide new fiber patch panels and adapter plates to accommodate the new fiber optic cable.
 - c. Bond the cable sheath's armor to ground per manufacturer's instructions.
 - d. Terminate multimode strands with multimode SC connectors and terminate singlemode strands with singlemode SC connectors
- C. Fire Alarm Underground Cable
- 1. Cable Placement
 - a. Maintain minimum bend radius and pulling tension within manufacturer's limits. Only use UL approved cable-pulling compounds when necessary to reduce pulling tensions.
 - b. Protect cable during installation. Place and suspend cables in a manner to protect them from physical interference or damage. Replace cable if damaged during installation. Place cables with no kinks, twists, or impact damage to the sheath.
 - c. Install cables within designated pathways.
 - 2. Grounding and Bonding
 - a. Bond cable shield to splice closure bond assembly. Provide bonding conductor from splice closure bond terminal to ground terminal within maintenance hole, if available.
 - 3. Labeling
 - a. Provide labels on each splice module and binder group in splice closure.
- D. Power Underground Cable
- 1. Cable Placement
 - a. Protect cable during installation. Place and suspend cables in a manner to protect them from physical interference or damage. Replace cable if damaged during installation. Place cables with no kinks, twists, or impact damage to the sheath.
 - b. Install cables within designated pathways.
 - 2. Underground Splicing Systems
 - a. Provide splicing connectors per spliced conductor, per manufacturer's instructions.

3.05 TESTING

- A. Test cables to be spliced before relocation tasks. Issue test reports to Prime Builder for Owner's Representative's review. Obtain Owner's Representative's written acceptance of the test results.
- B. Test all cables after relocation tasks are complete. Issue test reports to Prime Builder for Owner's Representative's review. Obtain Owner's Representative's written acceptance of the test results immediately after completing testing work.

***a2SECTION 16710**

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 16700.
 - 2. Section 16707 - Telecommunications 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.
- D. Allowances: None.

1.02 REFERENCES

- A. Comply with the References requirements of Section 16700.

1.03 DEFINITIONS

- A. Refer to Section 16700 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, plenum rating; synonymous with "MPP"
 - 2. "CMR": Communications Media Riser, riser rating; synonymous with "MPR"
 - 3. "UTP": Unshielded Twisted Pair
 - 4. "CAT6": Category 6 [UTP]
 - 5. "FEP": Fluorinated Ethylene Propylene
 - 6. "PVC": PolyVinyl Chloride
 - 7. "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.
 - 8. "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.

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. Submittals.
 - 2. Horizontal cables, terminations, and outlets.
 - 3. Cable management.
 - 4. Patch cords and cross-connects.
 - 5. Cable identification tags and system labeling.
 - 6. Record Documents.
 - 7. Warranty.
- C. Alternate Work: None.

1.05 SUBMITTALS

- A. Comply with the Submittals article of Section 16700 for procedural, quantity, and format requirements.
- B. Submittal Requirements at Start Of Construction:
 - 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. Type A Outlet Sample, including faceplate, faceplate label, connectors/jacks, port labels, cables (about 12" sample), and cable labels.
- C. Submittal Requirements at Closeout:
 - 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 16700.
- B. Contractor Qualifications
 - 1. In addition to the Contractor Qualifications requirements of Section 16700, 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 DELIVERY, STORAGE AND HANDLING

- A. Comply with the Delivery, Storage and Handling requirements of Section 16700.

1.08 WARRANTY

- A. The telecommunications horizontal 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 cabling system to the specific category per ANSI/TIA/EIA-568-B performance criteria for Permanent Link (minimum) or the Channel Link (preferred).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Connectivity products shall be by Panduit.
- B. Cable products should be by Berk-Tek or equal by General Cable, Panduit, SYSTIMAX, CommScope, or Belden.

2.02 SUBSTITUTIONS

- A. Comply with the Substitutions requirements of Section 16700.

2.03 HORIZONTAL CABLE – PLENUM RATED

- A. CAT6 UTP 4-Pair Cable
 - 1. Application: Suitable for indoor installation, within cable tray (or other pathway systems) and above ceiling.
 - 2. Conductors:
 - a. Insulated Conductors: 23 AWG solid-copper fully-insulated with a flame retardant thermoplastic material (material = PVC, or equivalent).
 - b. 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).
 - 3. Cable Sheath:
 - a. The cable shall have a seamless outer jacket (material = LS-PVC, or similar) applied to and completely cover the internal components (four twisted pairs). The cable shall be unshielded.
 - b. Flame Rating: NEC (Article 800) rated as CMP, and UL listed as such.
 - 4. Electrical Performance: Meet or exceed TIA/EIA-568-B.2-1 and ISO/IEC 11801 requirements for CAT6 UTP cabling.
 - 5. Color:
 - a. For voice cables: Gray
 - b. For data cables: Blue
 - 6. Manufacturer: Panduit, or equal by General
 - a. #PUP6004BU-U; "TX6000" CAT6 4-pair UTP cable, CMP, Blue

2.04 PATCH CORDS AND CROSS-CONNECT WIRE

A. CAT6 Modular Patch Cords

1. Modular patch cords shall be suitable for indoor installation within a telecommunications room or workstation environment. Cords shall be assembled from a single, continuous length of cordage, homogenous in nature, and shall be terminated at both ends via 8 position modular plugs. Splices are not permitted anywhere.
2. Cordage
 - a. Insulated Conductors: 24 AWG stranded copper, fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).
 - b. Twisted Pairs: Two insulated conductors “twisted” into a “pair” (twisted pair), and individually color-coded.
 - c. Sheath shall be unshielded, flame-retardant polyvinyl chloride (PVC) jacketed.
 - d. Flame Rating: NEC CM (or higher) rated and UL listed as such.
3. Electrical Performance: Comply with TIA/EIA 568-B for CAT6 UTP patch cords and Channel requirements (minimum).
4. Manufacturer, or equal: Panduit #UTPSPx (“x” varies for length)

2.05 TERMINATION EQUIPMENT

A. Modular Patch Panel

1. Suitable for installation within a telecommunication facility for the termination of the CAT6 UTP 4-Pair Cable (previously specified). The patch panels shall be horizontally oriented for a rack-mounted configuration. The patch panels shall be capable of supporting, organizing, labeling and patching/cross-connecting between the horizontal termination field and the equipment and/or the equipment termination field.
2. The patch panel shall be discrete port type. This is, each connector is inserted into each port. The patch panel shall be compatible, in the opinion of the Engineer, with the Data CAT6 modular connector (later specified).
3. Manufacturer: Panduit #CPPL24M6BL, 24-port patch panel.

2.06 WORKSTATION OUTLETS

A. Flush Mount Outlets – Standard Faceplates

1. Refer to outlet schedule for port quantity per outlet type.
2. Faceplates shall include required accessories, such as icons, blank inserts, and labels. Faceplates shall be by the same manufacturer as the connectors.
3. Manufacturer: Panduit
 - a. #CFP2S, Mini-Com stainless steel faceplate, 2-port
 - b. #CFP4S, Mini-Com stainless steel faceplate, 4-port
 - c. #CFP6S, Mini-Com stainless steel faceplate, 6-port

B. Flush Mount Outlets – Standard Wall Phone Faceplates

1. Wall phone faceplates shall come equipped with 1 modular jack and two mounting studs.
2. Manufacturer: Panduit #KWP6P, Stainless Steel Wall Phone faceplate with CAT6 Keystone style jack.

- E. 110 Termination Block Labels
 - 1. Color: Blue for horizontal termination field.
 - 2. Manufacturer, or equal: Panduit
 - a. #DSL110-BU; label inserts, blue

2.10 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 16700.

3.02 INSTALLATION

- A. Horizontal Cable
 - 1. General
 - a. Cable runs shall have continuous sheath continuity, homogenous in nature. Splices are not permitted anywhere.
 - b. A cable bundle shall contain no more than 24 individual cables.
 - 2. 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.
 - 3. Routing
 - a. Maintain maximum cable length of 90 meters from the termination in the Telecommunications Room to the termination at the outlet.
 - b. When routing horizontally within Telecommunications Room, utilize the overhead cable support. When routing vertically within Telecommunications Room, fasten the cable bundles using approved cable to the wall mounted vertical cable every 24 inches on center.
 - c. Place and suspend cables in a manner to protect them from physical interference or damage.
 - d. Route cables a minimum of 6" away from power sources to reduce interference from EMI.
 - e. When routing cables in areas without primary horizontal pathways, install cables onto secondary pathways or approved support devices, such as cable hangers.
 - f. 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.
 - g. 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.

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 16705 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.

3.04 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

***a2SECTION 16711**

TELECOMMUNICATIONS BACKBONE 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 16700 Basic Telecommunications Requirements.
 - 2. 16707 Telecommunications Pathways.
 - 3. 16719 Telecommunications Testing.

1.02 REFERENCES

- A. Comply with Section 16700 References requirements.

1.03 DEFINITIONS

- A. Refer to Section 16700 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 16700 for a full description of the project and building.
- B. Work Provided Under Another Section
 - 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.) work will be covered under another section. 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. 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 16700.
- B. Submittal Requirements Prior To Start Of Construction:
 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 167xx 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 16700
- B. Contractor Qualifications:
 1. In addition to the Contractor Qualifications requirements of Section 16700, 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 16700.

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. SYSTIMAX ARMM series cables.
 2. General Cable Air Core Cables "Foam Skin ALVYN Riser Cable" series cables.

2.02 FIBER OPTIC CABLES

- A. All fiber optic cables specified for this project are OSP type. Refer to Section 16701 for fiber optic cable specification.

2.03 TERMINATION EQUIPMENT

- A. Twisted Pair Cabling 110 Block
1. Termination apparatus shall be suitable for installation within a telecommunication facility for the termination of the backbone twisted pair cables, suitable for rack-mount configuration. Termination apparatus shall be "110 block" type.
 2. 110 Blocks, with the management panels, shall be capable of supporting; organizing, labeling and patching/crossconnecting the backbone cables to successfully achieve the design intent.
 3. Manufacturer: Panduit:
 - a. #GPB484R4WJ; 110 Block kit (rack bracket, two 100-pair blocks, forty-eight 4-pair IDC connectors.)
 - b. #GPCB5; 5-pair IDC connector / connection block
- 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: Corning Cable Systems, or equal.
 - a. #CCH-01U; 1U fiber shelf – two panel slots
 - b. #CCH-04U; 4U fiber shelf – twelve panel slots
 - c. #CCH-CP06-3C; connector panel – 6 simplex SC singlemode adapters

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 installable via either epoxy or anaerobic method.
4. Manufacturer: Corning Cable Systems, or equal.
 - a. #95-250-08-BP; SC connector, singlemode.

2.05 CROSSCONNECT WIRE

A. Crossconnect Wire, 1-Pair

1. Crossconnect wire shall be suitable for installation within a telecommunication facility and fully compatible with the termination apparatus. Each and every crossconnect wire shall be manufactured from a single, continuous length of insulated wire, homogenous in nature; Splices are not permitted.
2. Factory splices of insulated conductors are expressly prohibited.
3. Conductors:
 - a. Insulated Conductors: Conductors shall be 24 AWG solid copper. Conductors shall be fully insulated with a flame retardant thermoplastic material (such as PVC, or equivalent).
 - b. Twisted Pairs: Two insulated conductors shall be "twisted" into a "pair" (twisted pair). Twisted pairs shall be individually color coded.
4. Manufacturer: SYSTIMAX, or equal:
 - a. CCW-F 1/24 S1000 (105 597 231) crossconnect wire, 1 pair, Whi-Red / Red-Whi
 - b. CCW-F 1/24 S1000 (105 597 264) crossconnect wire, 1 pair, Whi-Blu / Blu-Whi

2.06 LABELS

A. Labels for ISP Backbone 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

B. Labels for 110 Blocks

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.
2. Color: White for backbone termination field; gray for 2nd level backbone termination field.
3. Manufacturer: Panduit, or to match 110 block kit.
 - a. #DSL110; label inserts, white

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply General Execution requirements of Section 16700.

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. Install the termination blocks such that the bottom row of terminations is at a height as shown on the drawing. If no height is shown, install bottom at 24" AFF (+/- 3").

3. Mount blocks plumb and square.

C. Crossconnects

1. In the Entrance Facility, provide one 1-pair crossconnect to length from the OSP field to the backbone field based on the records from the Telecommunications Rooms crossconnections.
2. Utilize the horizontal and vertical management components to properly route the crossconnect wire.
3. Color:
 - a. For digital handsets, provide: White-Blue / Blue-White
 - b. For analog handsets, provide: White-Red / Red-White
4. Splices in crossconnect wire are prohibited.

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, "B16-TDA".
 - b. Second field shall identify the ending termination room identifier as shown on the plans; for example, "B16-TDB".
 - c. Third field shall identify the cable type: "CBT" (for Cable, Backbone, Twisted pair).
 - d. Fourth field of the identifier shall be the campus pair count range; for example, "0401-0600"

****2SECTION 16719**

TELECOMMUNICATIONS TESTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Section Includes: Testing of Telecommunications Cabling, both 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 16700 – Basic Telecommunications Requirements
 - 3. Section 16710 - Telecommunications Horizontal Cabling
 - 4. Section 16711 – Telecommunications Backbone Cabling
- C. Products Furnished and Installed Under Other Sections:
 - 1. Telecommunications Cabling and Pathways Systems/Subsystems

1.02 REFERENCES

- A. Comply with Section 16700 References requirements.
- B. Additional references to those listed in Section 16700.
 - 1. TIA/EIA-526-14 (“OFSTP-14”) Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
 - 2. TIA/EIA-526-7 (“OFSTP-7”) Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant
 - 3. 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 Section 16700 and Section 16710.
- 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. Backbone Cabling
 - a. The Backbone Cabling includes UTP and fiber cabling from the entrance telecommunications room to the new main telecommunications room.
- 2. Horizontal Cabling
 - a. Refer to Section 16710 for a more complete System Description of Horizontal Cabling.
 - b. 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 16719-1.1: Tests For Fiber Optic Passive Link Segments

Subsystem	Type	Test	Direction	Wavelength
Backbone	Singlemode	Characterization	Both	1310nm and 1550nm
Backbone	Singlemode	Passive Link Ins. Loss	One	1310nm and 1550nm

- b. Multipair/UTP cabling:

Table 16719-1.2: Tests For Multipair/UTP Cabling

Subsystem	Type	Test	Configuration	Notes
Backbone	Riser	*see "Notes"	-	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 16700 for procedural, quantity, and format requirements.
- B. Submittal Requirements at Start Of Construction:
 - 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).
 - 3. Schedule Submittal, consisting of proposed schedule of work. This schedule may be combined with the schedule developed for 167xx 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) Contractor's 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 16700.

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. LASER-based light source for singlemode fiber testing shall have a:
 - 1. Center wavelength of $1310\text{nm} \pm 20\text{nm}$ and $1550\text{nm} \pm 20\text{nm}$.
 - 2. Spectral width (FWHM) of $\leq 5\text{nm}$ at 1310nm and $\leq 5\text{nm}$ at 1550nm .
 - 3. Minimum output power level of $\geq 3\text{dBm}$.
- D. 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).
- E. Equipment:
 - 1. Agilent Technologies' WireScope 350 test set
 - a. #450-2020 Fiber SmartProbe testing adapter, singlemode 1300nm.
 - b. ScopeData management software (version 5.20 or higher).
 - 2. Corning Cable Systems
 - a. #OS-301 light source
 - b. #OS-302 light source
 - c. #OS-100D light source
 - 3. Fluke Networks' DSP-4300 test set
 - a. #DSP-4300; "CableAnalyzer" test kit, loaded with firmware version 3.0.4.
 - b. #DSP-FTA430S; 'Singlemode' fiber testing adapter, LASER-based (1310nm, 1550nm).
 - c. LinkWare; "LinkWare" management software (latest version).
 - 4. Laser Precision #5150 test set

2.03 FIBER OPTIC POWER METER

- A. The power meter the 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 $\pm 0.2\text{dB}$.

D. Equipment:

1. Agilent Technologies' WireScope 350 test set
 - a. #450-2020 Fiber SmartProbe testing adapter, singlemode 1310nm.
 - b. 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 and 17 mm for 62.5/125 fiber. For unjacketed buffered (0.9 mm) fiber, mandrel diameter shall be 25 mm for 50/125 um fiber and 20 mm for 62.5/125 fiber.
- B. Equipment: Fluke Networks
 1. #NF-MANDREL-50; red mandrel for jacketed 50/125 um fiber
 2. #NF-MANDREL-625; gray mandrel for jacketed 62.5/125 um fiber

2.05 FIBER OPTIC OTDR

A. Singlemode Source Module:

Wavelength	Dynamic Range	Attenuation Deadzone	Reflective Deadzone	Loss Resolution	Distance Accuracy
1310nm	40dB	6.0mt	3.5mt	0.001dB	0.1mt
1550nm	28dB	12.0mt	3.5mt	0.001dB	0.1mt

B. 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. Singlemode Fiber Optic Test Cord

1. The fiber of the singlemode test cord(s) shall have the mode field diameter nominally equal to that of the singlemode 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 ≤ 0.5 dB loss per connection @ both 1300nm and 1550nm, as measured per FOTP-171 D3.
5. All singlemode connectors shall inhibit Fresnel reflections (i.e., have a "PC" finish).

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 16710 and 16711. Update testing schedule when changes in the cabling construction schedule occur.

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:

Singlemode	SYSTIMAX	1.466 @ 1310nm	1.467 @ 1550nm
	Corning SMF-28	1.4675 @ 1310nm	1.4681 @ 1550nm
 - b. Pulse Width: multimode: 20ns; singlemode: 50 ns.

Singlemode	10 ns for cable lengths up to 2,000 meters
	50 ns for cable lengths from 2,000 meters to 20 kilometers
 - c. Backscatter: multimode: -67dB @ 850nm, -74dB @ 1300nm; singlemode: -74dB @ 1310nm and 1550nm.
 - d. Event Threshold: 0.05dB
 - e. Reflection Threshold: multimode: -45dB, singlemode: -60dB.
 - f. Fiber Break/End-Of-Fiber: 3dB.

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. Cable identifier, fiber number, and fiber type (e.g., "multimode")
 - c. Measurement direction,
 - d. Date measurement was obtained,
 - e. Operator (name an company),
 - f. Test equipment model and serial number(s),
 - g. Set up parameters (minimum - pulse width, refractive index, event threshold.)
 - h. Wavelength,
 - i. OTDR trace,
 - j. Length of fiber,
 - k. 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 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) = $|P_{sum} - P_{ref}|$
 - 2) If P_{sum} and P_{ref} are in watts: Connection Attenuation (dB) = $|10 \times \log_{10} [P_{sum}/P_{ref}]|$.

- 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 Table 3 (below).

Table 16719-3.1: Acceptable Test Cord Connection Attenuation

	ST or SC Cord	Mini-Connector Cord
Multimode (62.5, 50)	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.
 - 2) The fiber of the singlemode test cord shall contain Class IVa singlemode fiber, with a mode field diameter of $5.0\mu\text{m} \pm 0.5\mu\text{m}$ for 850nm tests and $9.0\mu\text{m} \pm 1.0\mu\text{m}$ for 1300nm tests.
 - 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): $CPR (dB) = |P_{sum} - P_{ref}|$
- 2) If P_{sum} and P_{ref} are in watts: $CPR (dB) = |10 \times \log_{10} [P_{sum}/P_{ref}]|$

Table 16719-3.2: Coupled Power Ratio (CPR) in dB, for 62.5/125µm Fiber

	Cat-1 Overfilled	Cat-2	Cat-3	Cat-4	Cat-5 Underfilled
850nm source	25 – 29	21 – 24.9	14 – 20.9	7 – 13.9	0 – 6.9
1300nm source	21 – 25	17 – 20.9	12 – 16.9	7 – 11.9	0 – 6.9

16719-3.3: 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) = $|P_{sum} - P_{ref}|$
 - 2) If P_{sum} and P_{ref} are in watts: Link Segment Attenuation (dB) = $|10 \times \log_{10} [P_{sum}/P_{ref}]|$
- 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. Singlemode Insertion Loss Measurement

- a. After setting up the test equipment and verifying the performance of the test cords, 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) = $|P_{sum} - P_{ref}|$
 - 2) If P_{sum} and P_{ref} are in watts: Link Segment Attenuation (dB) = $|10 \times \log_{10} [P_{sum}/P_{ref}]|$
 - h. Record P_{sum} for inclusion into the Record Documents. Refer to Records (ref. PART 3: EXECUTION) for all of the information to record.
6. 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. 62.5/125 μ m Multimode Insertion Loss Coefficients
 - 1) Cable Loss = Cable Length (km) x (3.5 dB/km @ 850-nm or 1.0 dB/km @ 1300-nm).
 - 2) Connection Loss (ST or SC Connectors) = (Connections x 0.39 dB) + 0.42 dB.
 - 3) Connection Loss (Other mini-connectors) = (Connections x 0.14 dB) + 0.24 dB
 - 4) Splice Loss = Splices x (0.05 dB for fusion or 0.10 dB for mechanical).
 - 5) CPR Adjustment = See table below

16719-3.4: Multimode Light Source CPR Adjustment

	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

- d. 50/125 μ m 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 table below

16719-3.4: Multimode Light Source CPR Adjustment

	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

- e. Singlemode Insertion Loss Coefficients
 - 1) Cable Loss = Cable Length (km) x (0.50 dB/km @ 1310-nm or 0.50 dB/km @ 1550-nm)
 - 2) Connection Loss (ST or SC Connectors) = (Connections x 0.44 dB) + 0.42 dB
 - 3) Connection Loss (Other mini-connectors) = (Connections x 0.24 dB) + 0.24 dB
 - 4) Splice Loss = Splices x (0.07 dB for fusion or 0.15 dB for mechanical)
 - 5) CPR Adjustment = Not applicable for singlemode.

F. Record Documents:

1. 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.
2. Measurements shall carry a precision through one significant decimal place (minimum).
3. Each test report shall contain the following information (not necessarily in this order):
 - a. Project name and address,
 - b. Contractor's name,
 - c. Operator's name(s),
 - d. Date of measurement,
 - e. Ambient temperature,
 - f. Test equipment - manufacturer, model, and serial number,
 - g. Cable identifier, fiber and fiber type,
 - h. Measurement direction,
 - i. Wavelength, and
 - j. 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. Contractor's 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 16710.
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

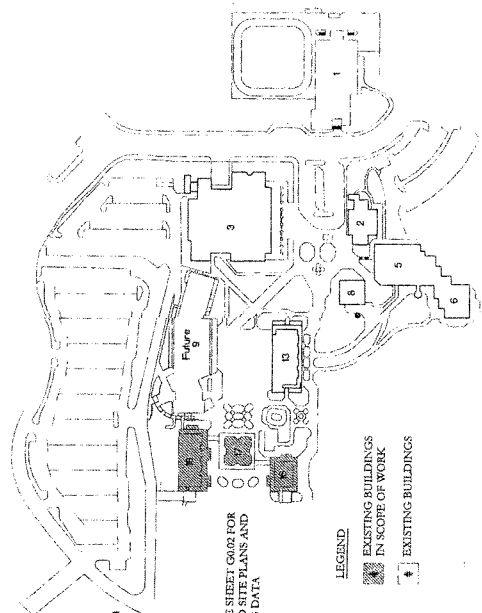
1. For each Horizontal Category 6 test measurement, record the following information:
 - a. Project name and address,
 - b. Contractor's name,
 - c. Operator's name(s),
 - d. Date of measurement,
 - e. Ambient temperature,
 - f. Test equipment - manufacturer, model, and serial number,
 - g. Cable identifier,
 - h. Overall test result, and
 - i. Measured values of minimum requirements.

END OF SECTION

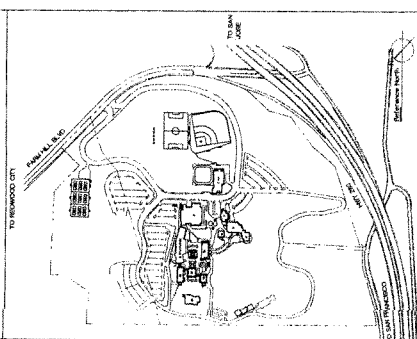
Cañada College

Building 16, + 18 Renovation
SMCCCD
3401 CSM Drive
San Mateo, CA 94402

DATE: JULY 2, 2007
SUBMIT ITEMS PER TITLE 24 COR PART 1-6.11(6)
NOTE: FABRICATION OF DEFERRED APPROVAL ITEMS SHALL NOT BEGIN WITHOUT RECEIPT OF APPROVED FINAL OF PLANS AND SPECIFICATIONS BY ESA.



VICINITY MAP



SCOPE OF WORK

BUILDING 16:
A new hydraulic elevator is proposed at the southeast corner of the existing building. The new elevator and ground floor extension are to be cast-in-place concrete construction. ADA accessibility upgrades will include new approach, building entrance, signage, floor, and ramp. New laboratory workstations, including lab benches, lab sinks, and lab equipment, will be replaced throughout with new air conditioning being provided to all rooms. Individual offices will be served by new recessed ceiling fan coil units. New plumbing fixtures will include vitreous china wall hung water closets, lavatories, and urinals, stainless steel sinks, and drinking fountains or electric water coolers, and cast iron service units, as well as laboratory fixtures. The existing building will be upgraded to meet current code requirements. Multi-outlet surface areas, as well as new recessed wall, in-floor and casework outlets will be provided in many lab and prep spaces. New light fixtures and occupancy sensors will be provided in the existing restrooms, labs, and prep spaces as necessary. New Access Control and Alarm Monitoring System will be installed on many new and existing doors. Fire alarm system will be upgraded to meet current code requirements. All existing sprinklers will be removed and replaced. No new sprinkler work required.

BUILDING 17:

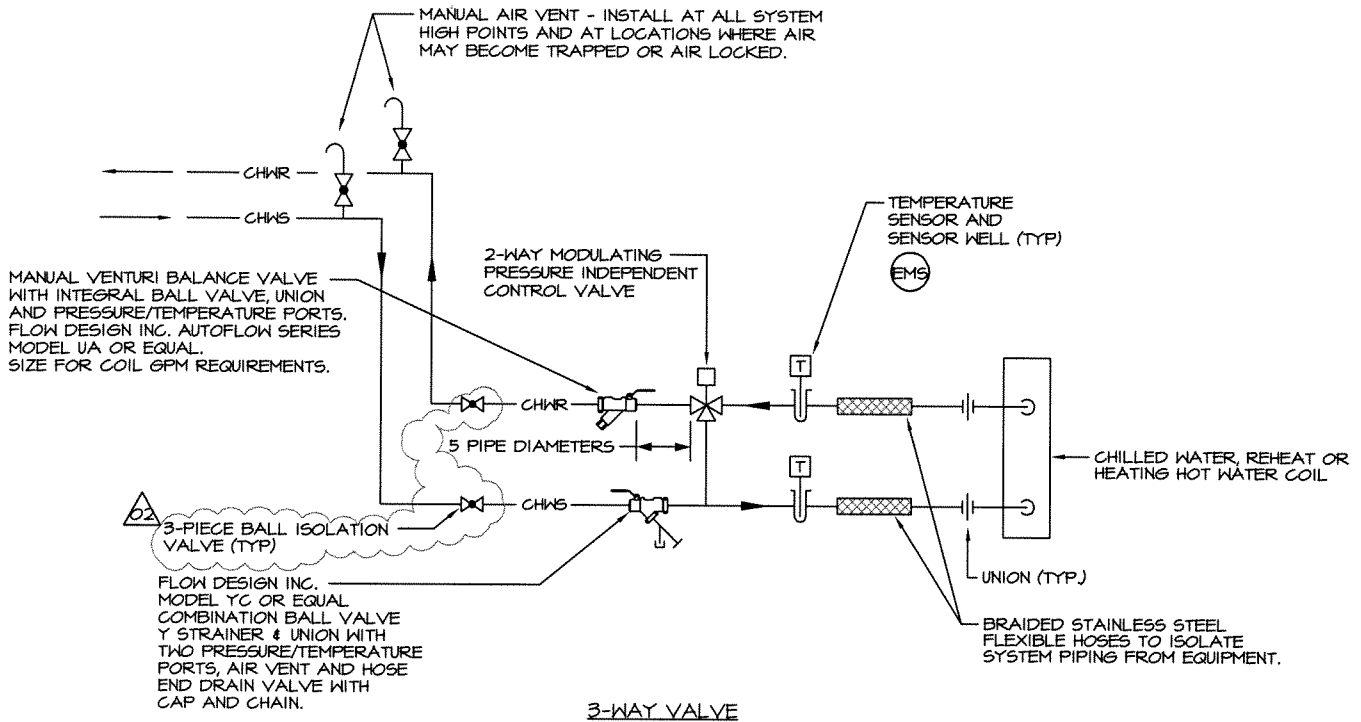
ADA accessibility has already been completed under a separate project. This building will be upgraded to meet current code requirements. All existing sprinklers will be removed and replaced. No new sprinkler work required.

BUILDING 18:

ADA accessibility upgrades will include existing elevator controls, door approach, building entrance, signage, and ground floor extension. A new hydraulic elevator is proposed at the southeast corner of the existing building. The new elevator and ground floor extension are to be cast-in-place concrete construction. ADA accessibility upgrades will include new approach, building entrance, signage, floor, and ramp. New laboratory workstations, including lab benches, lab sinks, and lab equipment, will be replaced throughout with new air conditioning being provided to all rooms. Individual offices will be served by new recessed ceiling fan coil units. New plumbing fixtures will include vitreous china wall hung water closets, lavatories, and urinals, stainless steel sinks, and drinking fountains or electric water coolers, and cast iron service units, as well as laboratory fixtures. The existing building will be upgraded to meet current code requirements. Multi-outlet surface areas, as well as new recessed wall, in-floor and casework outlets will be provided in many lab and prep spaces. New light fixtures and occupancy sensors will be provided in the existing restrooms, labs, and prep spaces as necessary. New Access Control and Alarm Monitoring System will be installed on many new and existing doors. Fire alarm system will be upgraded to meet current code requirements. All existing sprinklers will be removed and replaced. No new sprinkler work required.

PROJECT TEAM

Discipline	Company	Contact	Phone	Fax
Architects	Noll & Tam Architects	725 Heinz Avenue, Suite 7 Berkeley, California 94710	Tel: 510.849.8295	FAX: 510.849.3008
Construction Management	Swinerton Management & Consulting	4220 Farm Hill Blvd Redwood City, California 94061	Tel: 650.306.3477	FAX: 650.306.3455
Civil Engineers	Sandis Humber Jones	1700 Broadway, Suite 300 Oakland, California 94612	Tel: 510.873.8866	FAX: 510.873.8868
Mechanical/Plumbing Engineers	McCracken & Woodman	355 Grand Avenue Oakland, California 94610	Tel: 510.763.4891	FAX: 510.763.0619
Electrical Engineers	YEL Engineers, Inc.	Edgewater Park Plaza 7700 Edgewater Drive, Suite 826 Oakland, California 94623	Tel: 510.383.1050	FAX: 510.383.1057
Structural Engineers	Forell/Elkesser Engineers, Inc.	160 Pine Street San Francisco, California 94111	Tel: 415.837.0700	FAX: 415.837.0800
Elevator Consultant	Hesseberg Keese & Associates	221 Main Street, Suite 1580 San Francisco, California 94105	Tel: 415.243.0315	FAX: 415.243.0315
Telecommunications Engineers	TeeCom Design Group	133 Broadway Street Oakland, California 94612	Tel: 510.337.2800	FAX: 510.337.2800



COIL PIPING DIAGRAM

NO SCALE

1
M5.05

NOTES:

1. ALL VALVES AND FITTINGS, (OTHER THAN CONTROL VALVES) SHALL BE SAME SIZE AS PIPING UNLESS OTHERWISE NOTED.
2. CONTROL VALVES AND BALANCE VALVES ARE TO BE SIZED AS REQUIRED TO PROVIDE PROPER GPM CONTROL RANGE. SELECT VALVES WITH LOWEST AVAILABLE PRESSURE DROP. SMALL BODY VALVES DELIVERING THE REQUIRED FLOWS AT HIGH PRESSURE DROPS ARE NOT ACCEPTABLE.

Noll & Tam
Architects

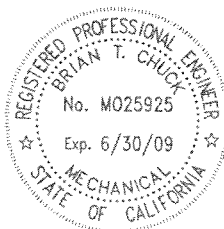
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Cañada College
Building 16+18 Renovation

DSA FILE NO. 41-C1
APPLICATION NO. 01-107611

REV. NO./DESCRIPTION

ADDENDUM NO.2
BLDG 16 + 18
RENOVATION

DATE 07.30.07

REFERENCES:

M5.05

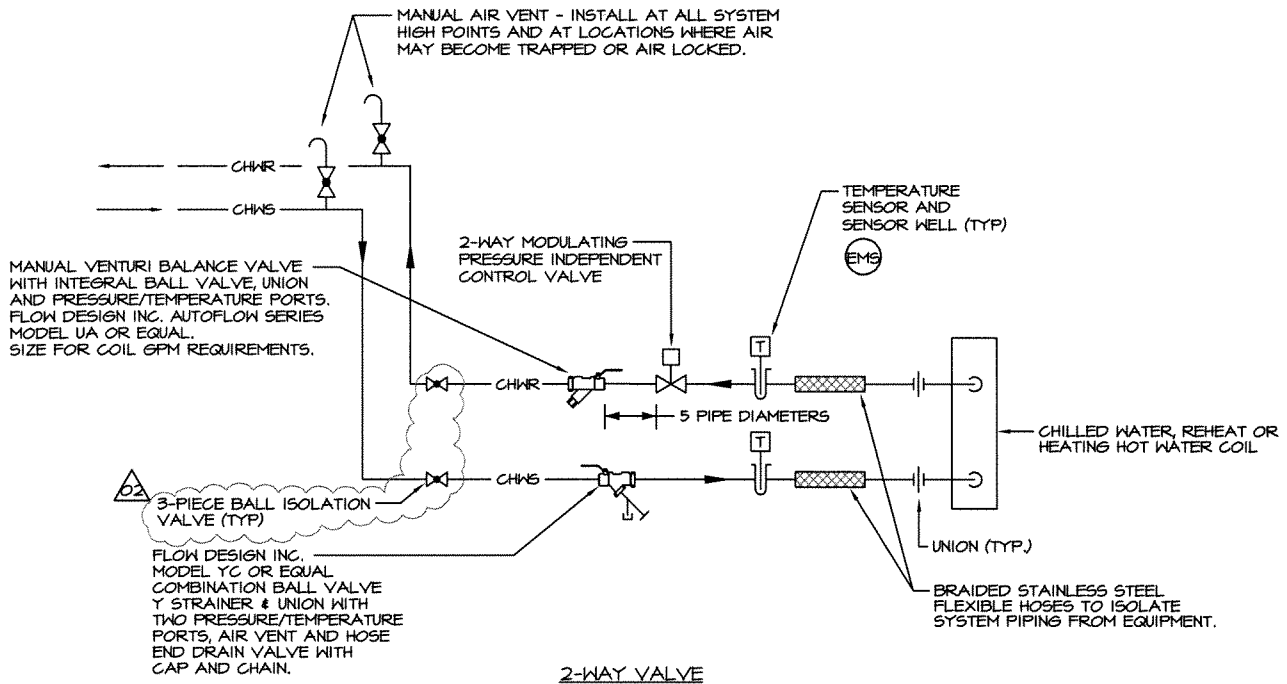
SHEET NUMBER

SKM-11

SHEET ___ OF ___

SCALE NONE

JOB NO. 2220.64



COIL PIPING DIAGRAM

NO SCALE

2
M5.05

NOTES:

1. ALL VALVES AND FITTINGS, (OTHER THAN CONTROL VALVES) SHALL BE SAME SIZE AS PIPING UNLESS OTHERWISE NOTED.
2. CONTROL VALVES AND BALANCE VALVES ARE TO BE SIZED AS REQUIRED TO PROVIDE PROPER GPM CONTROL RANGE. SELECT VALVES WITH LOWEST AVAILABLE PRESSURE DROP. SMALL BODY VALVES DELIVERING THE REQUIRED FLOWS AT HIGH PRESSURE DROPS ARE NOT ACCEPTABLE.

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Cañada College
Building 16+18 Renovation
DSA FILE NO. 41 - C1
APPLICATION NO. 01 - 107611

SHEET NUMBER

SKM-12

REV. NO./DESCRIPTION

02 ADDENDUM NO.2
BLDG 16 + 18
RENOVATION

DATE 07.30.07

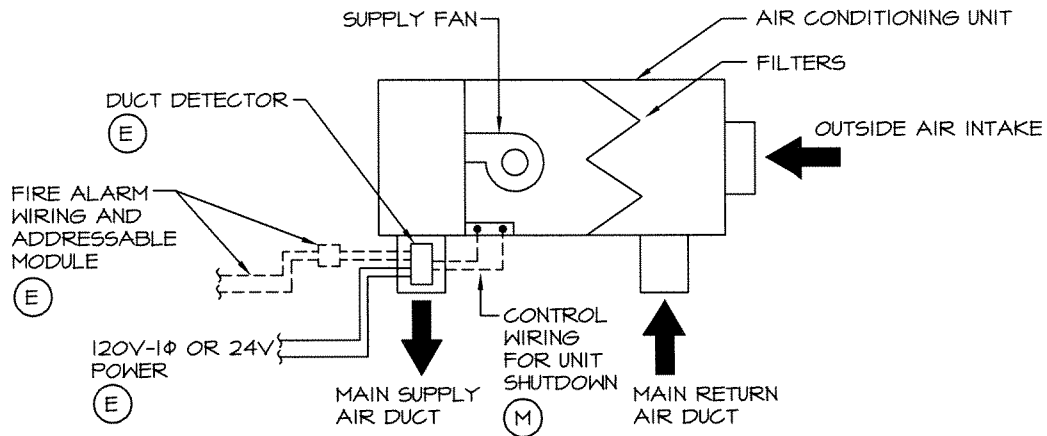
REFERENCES:

M5.05

SHEET ___ OF ___

SCALE NONE

JOB NO. 2220.64



DIV. 15 (MECH.):

1. INSTALL DUCT DETECTOR.
2. FURNISH AND INSTALL CONTROL WIRING FROM DETECTOR TO MECH. EQUIPMENT TO SHUTDOWN UNIT UPON DETECTION OF SMOKE.

DIV. 16 (ELEC OR FIRE ALARM):

1. FURNISH DUCT DETECTOR. DETECTORS TO BE MANUFACTURED BY SEIMENS AND ARE TO BE NO-FLOW TYPE DETECTORS OR ARE TO INCLUDE AN AIR DUCT VELOCITY RANGE OF 100 - 4000 FT./MIN. ALL DETECTORS ARE TO BE FULLY COMPATIBLE WITH THE SEIMENS MXL SYSTEM (REF. DISTRICT STANDARD 28 31 00, VERSION 1.2007.02.19).
2. FURNISH AND INSTALL POWER WIRING FOR DETECTOR.
3. FURNISH AND INSTALL FIRE ALARM WIRING AND DEVICES FOR FIRE ALARM SYSTEM TO MONITOR DUCT DETECTOR.

NOTES:

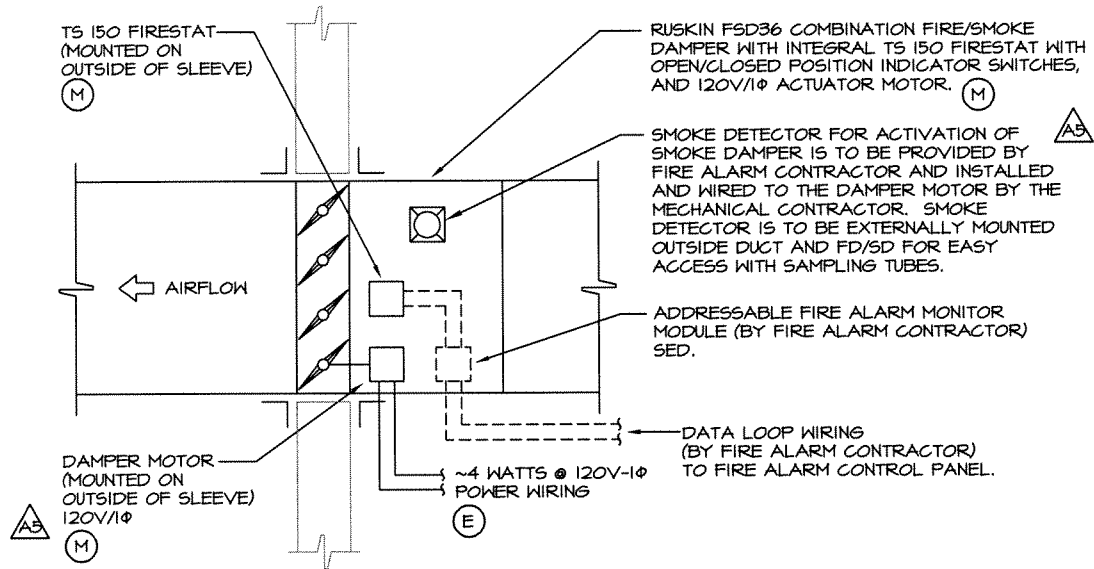
1. DIV. 15 AND DIV. 16 TO COORDINATE CLOSELY TO ENSURE ALL ITEMS ARE INSTALLED AND FUNCTIONING CORRECTLY.

AIR CONDITIONING AUTOMATIC SHUTOFF DETAIL

NO SCALE

1
M6.02

<p>Noll & Tam <i>Architects</i> 729 Heinz Avenue Berkeley, California 9 4 7 1 0 tel 510.649.8295 fax 510.649.3008</p>	<p>McCracken & Woodman, Inc. 355 Grand Ave. Oakland, CA 94610 Tel: (510) 763-4891 Fax: (510) 763-0619</p>		<p>Cañada College Building 16+18 Renovation DSA FILE NO. 41 - C1 APPLICATION NO. 01 - 107611</p>	<p>SHEET NUMBER SKM-13</p>	
			<table border="1"> <tr> <td> <p>REV. NO./DESCRIPTION 02 ADDENDUM NO.2 BLDG 16 + 18 RENOVATION</p> </td> <td> <p>REFERENCES: M6.02</p> </td> </tr> <tr> <td> <p>DATE 07.30.07</p> </td> <td></td> </tr> </table>	<p>REV. NO./DESCRIPTION 02 ADDENDUM NO.2 BLDG 16 + 18 RENOVATION</p>	<p>REFERENCES: M6.02</p>
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<p>DATE 07.30.07</p>					



FIRE/SMOKE DAMPER CONTROL DIAGRAM

3
M6.02

NO SCALE

NOTES:

1. FOR LOCATIONS ADJACENT TO WALL GRILLES USE RUSKIN FSD36FA FRONT ACCESS COMBINATION FIRE/SMOKE DAMPER WITH INTEGRAL TS 150 FIRESTAT WITH OPEN/CLOSED POSITION INDICATOR SWITCHES, AND 120V-1Ø ACTUATOR MOTOR.
2. FOR ROUND DUCT LOCATIONS USE RUSKIN FSD60-2, SAME OPTIONS AS LISTED IN NOTE 1 ABOVE.
3. COMBINATION FIRE/SMOKE DAMPER TO BE FURNISHED AND INSTALLED BY MECHANICAL CONTRACTOR. SEE DIV. 16 FOR ALL WIRING.
4. INSTALL PER MANUFACTURER'S INSTALLATION INSTRUCTIONS. (AS)
5. THE MECHANICAL CONTRACTOR AND THE FIRE ALARM CONTRACTOR ARE TO COORDINATE CLOSELY TO ENSURE THE DUCT SMOKE DETECTORS ARE COMPATIBLE WITH THE DAMPER ACTUATOR AND THE SMOKE DETECTOR INSTALLATION MEETS THE REQUIREMENTS OF THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

6. ALL COMPONENTS MUST BE FULLY COMPATIBLE WITH THE SEIMENS MXL FIRE ALARM SYSTEM BEING INSTALLED. VERIFY COMPATIBILITY PRIOR TO ORDERING EQUIPMENT. REF. DISTRICT STANDARD 28 31 00, VERSION 1.2007.02.19. (AS)
7. DUCT SMOKE DETECTORS ARE TO BE MANUFACTURED BY SEIMENS AND ARE TO BE NO-FLOW TYPE DETECTORS OR ARE TO INCLUDE AN AIR DUCT VELOCITY RANGE OF 100 - 4000 FT./MIN.

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Cañada College
Building 16+18 Renovation
DSA FILE NO. 41-C1
APPLICATION NO. 01-107611

SHEET NUMBER

SKM-14

REV. NO./DESCRIPTION	REFERENCES:
02 ADDENDUM NO.2 BLDG 16 + 18 RENOVATION	M6.02
DATE	07.30.07

SHEET	OF
SCALE	NONE
JOB NO.	2220.64

