

PRE-BID CLARIFICATION FORM

PROJECT NAME:		FILLMORE HIGH SCHOOL NEW ATHLETIC COMPLEX	
PROJECT NUMBER:		Project No. 2024-017 / DSA #03-123950	
TO:		RJ Stump Fillmore Unified School Dist.  Roy Frey WestGroup Designs	
		EMAIL: <a href="mailto:rj.stump@fillmoreusd.org">rj.stump@fillmoreusd.org</a>  <a href="mailto:royf@westgroupdesigns.com">royf@westgroupdesigns.com</a>	
DATE:	2/5/2025		
FROM:	Neil Hulin	EMAIL:	<a href="mailto:nhulin@bowecontractors.com">nhulin@bowecontractors.com</a>
DOCUMENT/DIVISION NUMBER:		DRAWING NUMBER:	E2-1.2/E601

REQUESTED CLARIFICATION:

Please circle all applicable bid packages below, that this RFI pertains to:

Base bid

Alt #1

Alt #2

On drawing sheet E2-1.2 the data symbol shows to use CAT6A. Sheet E601 note #1 shows to use CAT6. Please provide the following information so we can price the cabling correctly: single line, cable schedule, cable specifications.

PRE-BID CLARIFICATION FORM

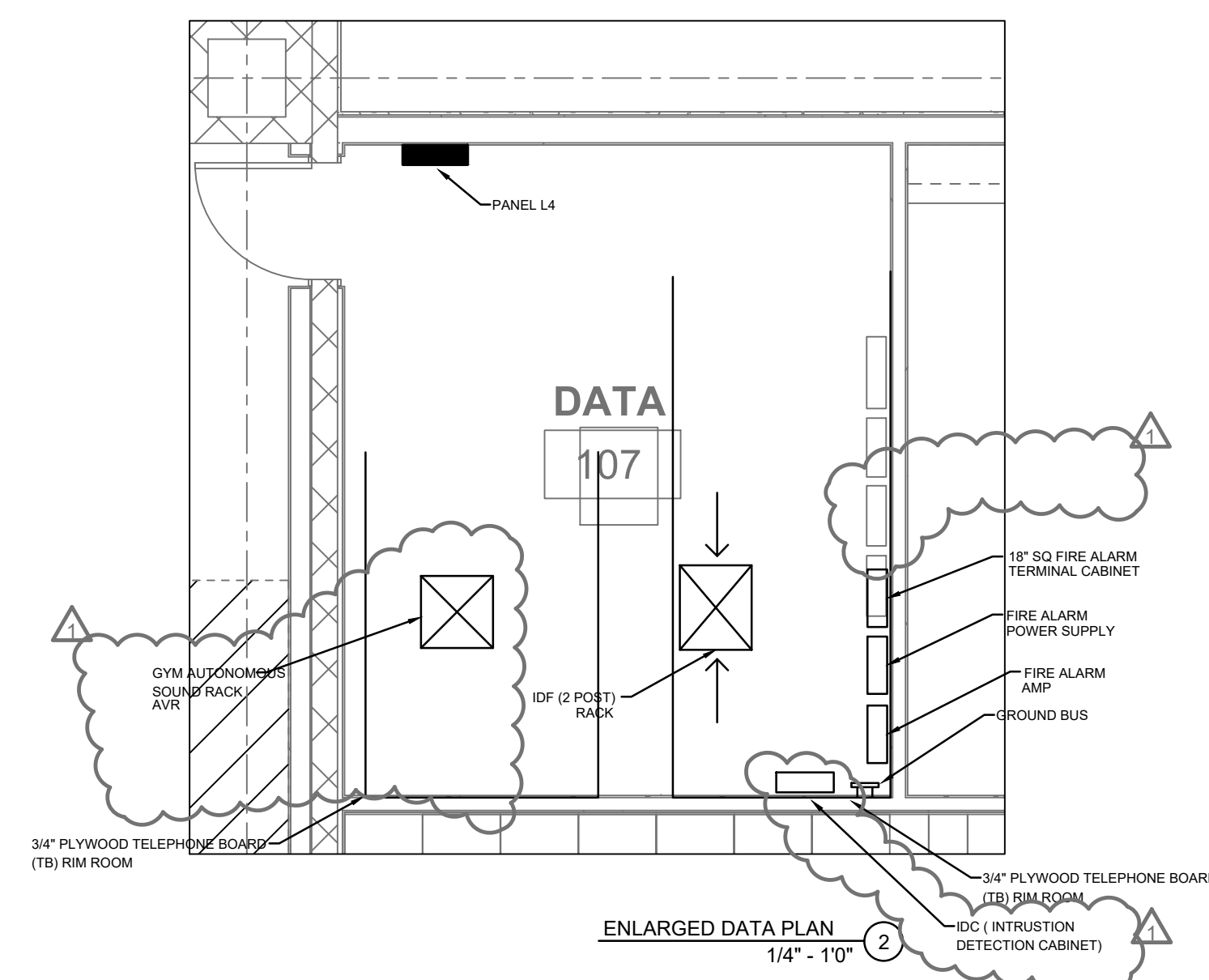
RESPONSE TO CLARIFICATION:

All horizontal structured cabling shall be CAT6A.  
See updated Sheets E2-1.1, E601 and E603. See added specs 27 10 00  
DL, AGD, 2/10/25

Attach additional numbered sheets as necessary; however, only one (1) request shall be contained on each submitted form.



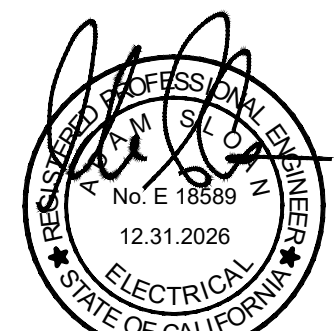
- PLAN NOTE:
- 1 PROVIDE 24" SQ. X 6" DEEP PULL BOX WITH BARRIERS. PROVIDE PATHWAY BETWEEN BOXES.
  - 2 BLEACHER SEATING AP'S NEED TO BE 6-8FT ABOVE TOP OF SEATING, MOUNTED ON WALL.
  - 3 OUTDOOR AP'S, CAMERAS, AND SPEAKER TO BE STANDARD +BED HEIGHT OF 12'.
  - 4 PROVIDE 12" SQ PULL BOX. DROP DOWN TO SCOREBOARD. 1 1/4" PATHWAY TYP. ABOVE.
  - 5 INDICATES RACKING CONDUIT PATHWAYS ABOVE.
  - 6 PROVIDE AT 12" H.F.F. (2) SQ BOXES WITH:
    - ASS LISTENING
    - WIRE MICROPHONE
    - ANTENNAS
  - 7 PROVIDE 6" SQ LOW VOLTAGE PULL BOX LABEL. AV SYSTEM
  - 8 ANTENNA LOCATION. MOUNTED ON WALL AT 12' AFF. HOMERUN 1 1/4" TO AV ROOM.



- SECURITY INTRUSION.
- KEY PAD.
- EXTERIOR WEATHER PROOF SPEAKER (FLUSH GRILL).
- ATLAS CLOCK/SPEAKER (FLUSH MTD).
- 3/4" UP TO ACCESSIBLE CEILING. (2) - INDICATES CAT 6A CABLE.
- FLUSH W/ FLOOR, DEEP BOX.



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FILLMORE HIGH SCHOOL ATHLETIC COMPLEX  
FILLMORE UNIFIED SCHOOL DISTRICT  
555 CENTRAL AVE, FILLMORE CA, 93015

ISSUED FOR:

REVISIONS:

REF.1 1-28-25

REGISTRATION/SIGNATURE:

SHEET TITLE:

1ST FLOOR  
LOW VOLTAGE PLAN

SHEET NUMBER:

E2-1.2

WD PROJ. # 22851 | DRAWN BY: DL, AM | CHECKED: GM | DATE: 06/07/23

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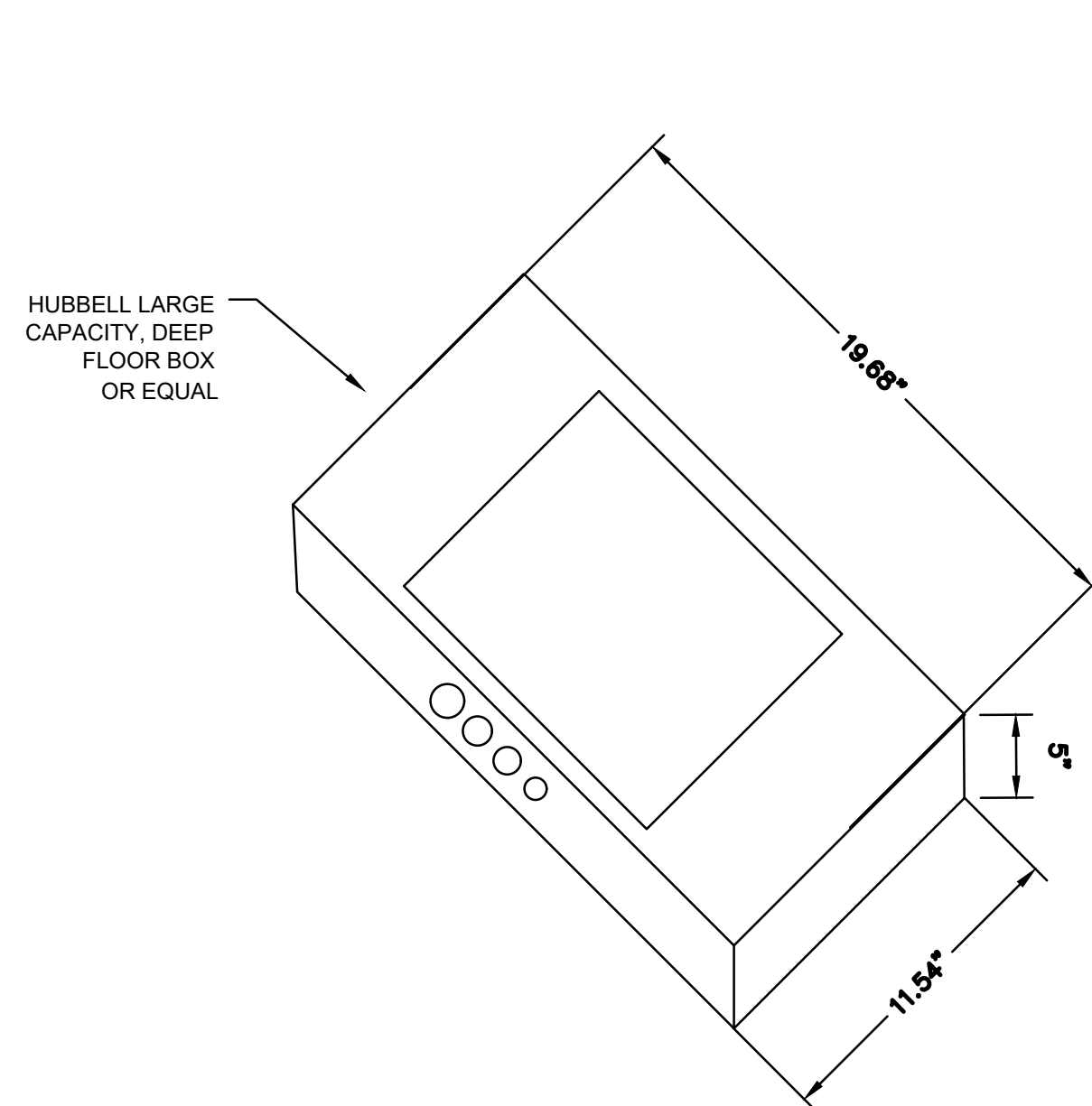
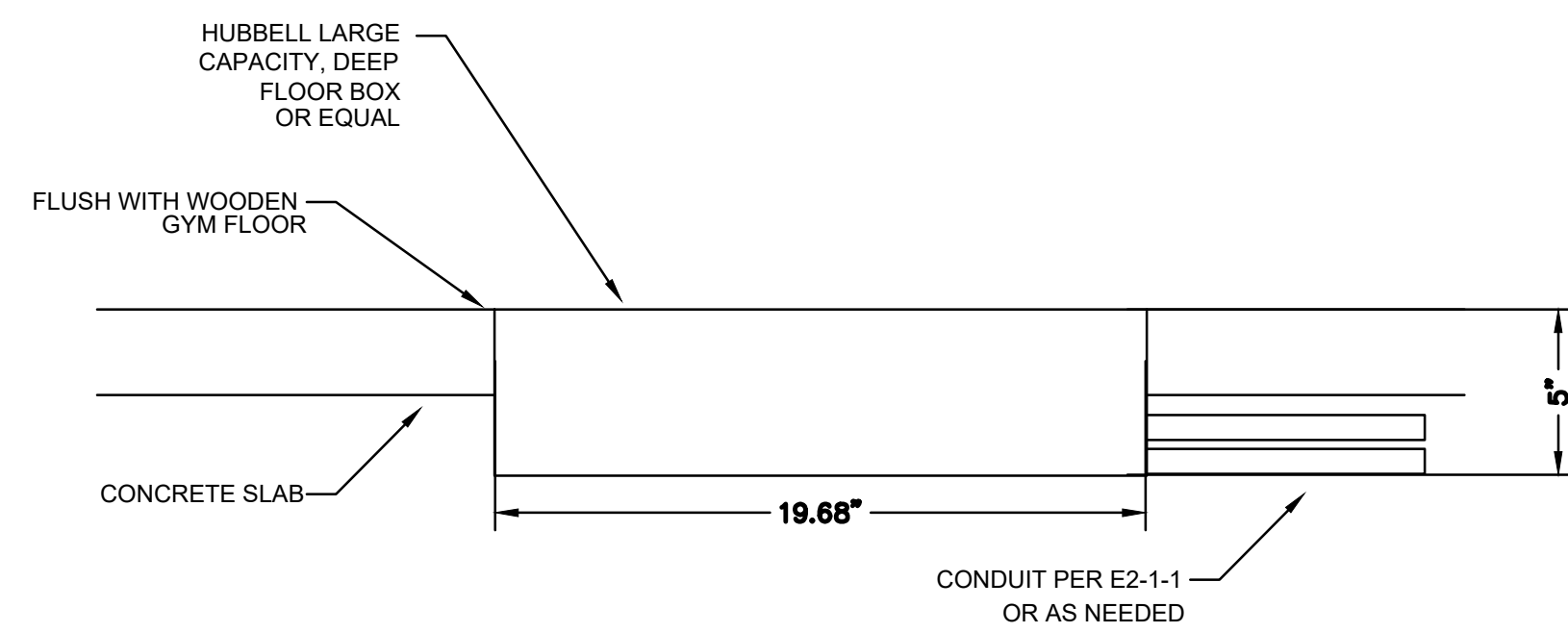
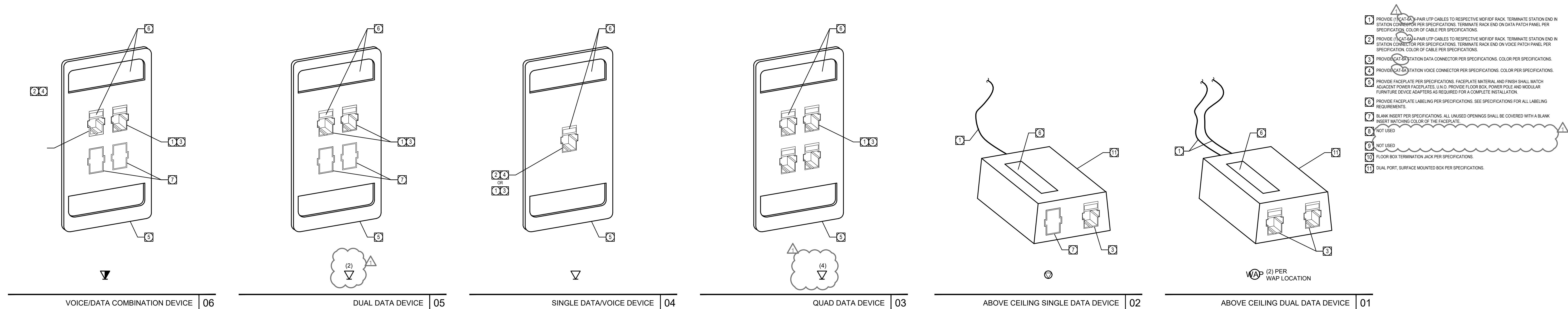
1ST FLOOR LOW VOLTAGE PLAN



1  
1/8" = 1'-0"

NOT FOR CONSTRUCTION



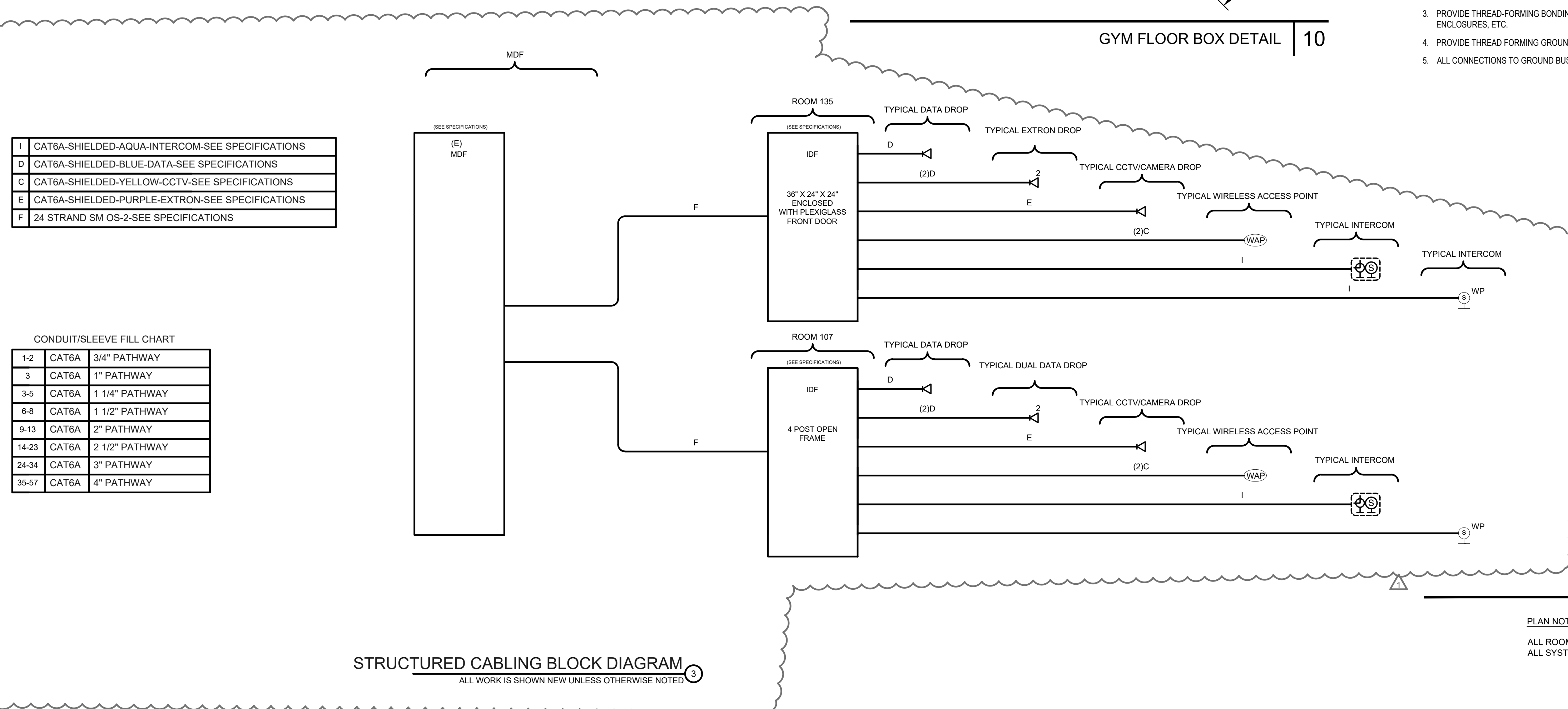
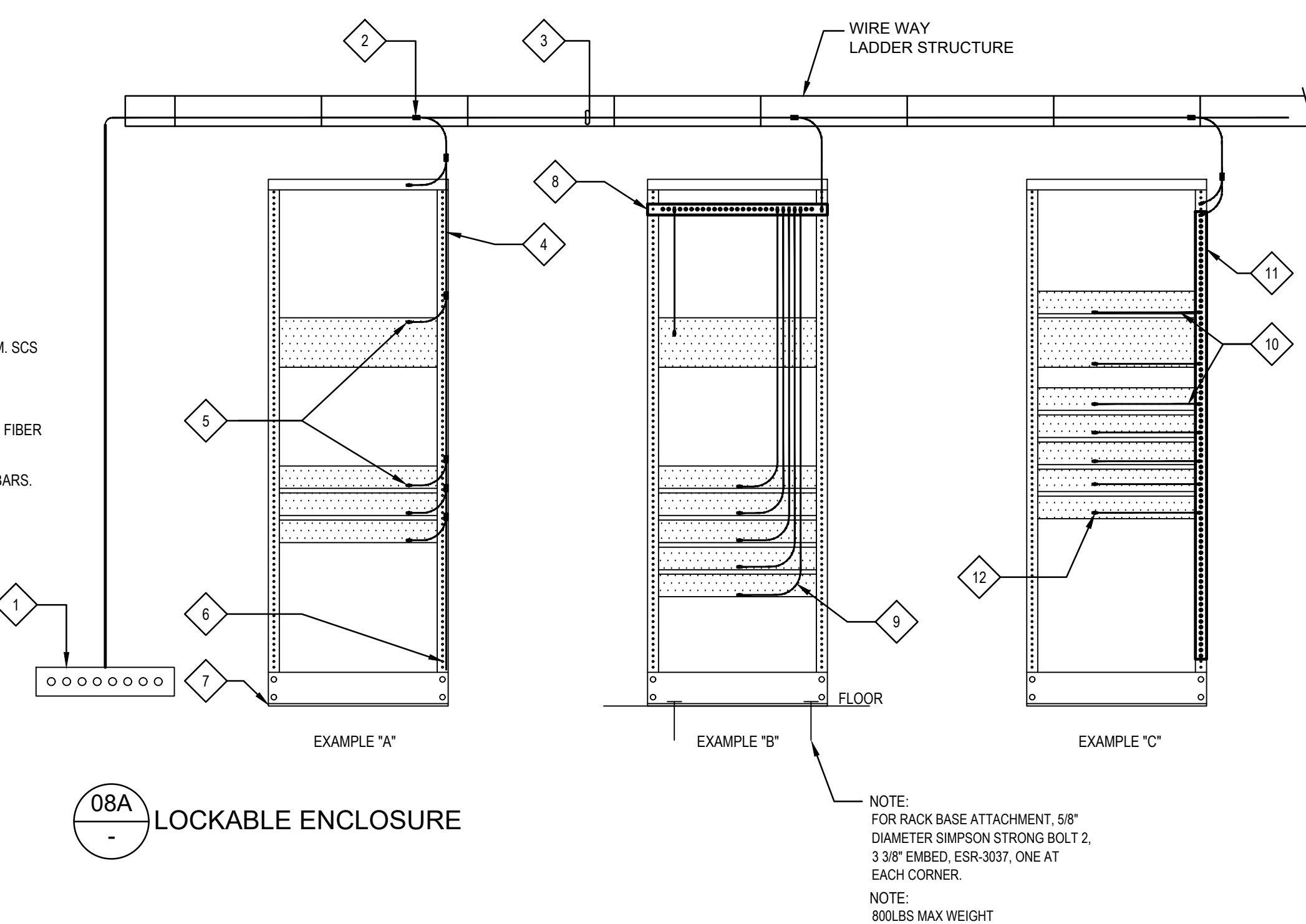


- 1 ANSICOMPLIANT TELECOMMUNICATIONS MAIN GROUND BUSBAR (TMGB), TELECOMMUNICATION GROUNDING BUSBAR (TGB) PER SPECIFICATIONS. SEE GENERAL TELECOMMUNICATIONS GROUNDING NOTES. PROVIDED AND INSTALLED BY E.C.
- 2 IRREVERSIBLE COMPRESSION CONNECTOR
- 3 TELECOMMUNICATION EQUIPMENT BONDING CONDUCTOR (TEBC), #6 AWG GREEN INSULATED GROUND CONDUCTOR, TYPICAL U.O.N.
- 4 RACK BONDING CONDUCTOR. ALL CONDUCTORS ROUTED TO TMGB/TGB.
- 5 INDIVIDUAL EQUIPMENT BONDING CONDUCTORS FROM EACH PIECE OF EQUIPMENT AND RACK TO THE RACK BONDING CONDUCTOR.
- 6 RACK BONDING CONDUCTOR EXTENDED TO BOTTOM OF RACK TO ACCOMMODATE FUTURE GROWTH.
- 7 RACK ISOLATION GROUND PLATES (IF APPLICABLE).
- 8 TOP MOUNTED RACK GROUNDING BUSBAR (RGB).
- 9 MINIMUM BENDING RADIUS MUST BE MAINTAINED ON ALL CONDUCTORS.
- 10 UNIT BONDING CONDUCTOR.
- 11 VERTICALLY MOUNTED RACK GROUNDING BUSBAR.
- 12 INDIVIDUAL EQUIPMENT GROUNDING TERMINAL. TYPICAL EACH PIECE OF EQUIPMENT.

- 1. GENERAL DETAIL ONLY. SCS CONTRACTOR SHALL COORDINATE WITH PLANS AND PROVIDE A COMPLETE SYSTEM. SCS CONTRACTOR SHALL COMPLY WITH ALL ANS, EIA AND TIA STANDARDS.
- 2. ALL ITEMS SHALL BE PROVIDED BY SCS CONTRACTOR UNLESS OTHERWISE NOTED.
- 3. PROVIDE THREAD-FORMING BONDING SCREWS TO ATTACH ALL PATCH PANELS, HORIZONTAL CABLE MANAGERS, FIBER ENCLOSURES, ETC.
- 4. PROVIDE THREAD-FORMING GROUNDING SCREWS TO ATTACH EQUIPMENT GROUND CONDUCTOR TO RACK BUSBARS.
- 5. ALL CONNECTIONS TO GROUND BUSBARS SHALL BE 2-HOLE COMPRESSION LUGS, UNLESS OTHERWISE NOTED.

#### GENERAL CABLING NOTES

- 1. OPTICAL FIBER CABLE SHALL BE PLACED WITH A MINIMUM OF THREE (3) METER MINIMUM SERVICE MAINTENANCE LOOP AT EACH END OF THE RUN. AT EACH SIDE OF A SEISMIC JOINT.
- 2. ALL STATION CABLES SHALL BE NEATLY DRESSED AND SECURED EVERY FOUR FEET AT A MINIMUM.
- 3. ALL STATION CABLES SHALL BE TERMINATED ON THE SAME FLOOR AS THE FLOOR SERVING BOF/IDF UNLESS OTHERWISE NOTED IN THESE DRAWINGS.
- 4. PROVIDE A ONE (1) METER SLACK LOOP FOR ALL WAO SUPPORTED BY OPEN CEILING CABLE DISTRIBUTION. THE SLACK LOOP MUST BE SUPPORTED ABOVE THE WAO IN NEAT AND REPEATABLE FASHION THAT MEETS BOTH INDUSTRY AND MANUFACTURER PRACTICES.
- 5. STANDARD WAO FACEPLATE SHALL CONSIST OF A DOUBLE-GANG PLATE, 8-POSITION, STAINLESS STEEL IN COLOR VOICE - ONE (1) CABLE BEING FOR VOICE USE, AND TERMINATED ON A CATEGORY 6A 110-STYLE IDC RAG INSERT. THE BOF/IDF SIDE SHALL BE TERMINATED ON A WALL-MOUNTED CATEGORY 6A 110-STYLE BLOCK. DATA - TWO (2) CABLES ARE TO BE FOR THE DATA USE TERMINATED ON A CATEGORY 6A 110-STYLE INSERT WITH THE BOF/IDF SIDE TERMINATED ON 110-STYLE IDC GAS-TIGHT CATEGORY 6A 110-STYLE PATCH PANEL MODULE.
- 7. THE CONTRACTOR SHALL PROVIDE WIRE GUIDES FOR ALL EXPOSED AUDIO-VISUAL AND NETWORK DEVICES LOCATED IN AREAS THAT CAN BE SUBJECT TO VANDALISM SUCH AS GYMNASIUMS, RESTROOMS, LOCKER AND SHOWER ROOMS, MULTIPURPOSE DINING, CLASSROOMS, LABS, AND ASSEMBLY ROOMS, AND ALL HALLWAYS AND CORRIDORS ASSOCIATED WITH THESE SPACES.
- 8. ALL CONDUITS CROSSING BUILDING SEISMIC SEPARATIONS OR EXPANSION JOINTS SHALL BE PROVIDED WITH APPROVED CONNECTIONS.
- 9. COORDINATE INSTALLATION OF LIGHTING FIXTURES WITH CABLE TRAY AND EQUIPMENT IN BOF, IDF, AND ALL A/V ROOMS/SPACES TO MAINTAIN REQUIRED LIGHTING LEVELS WITH ALL EQUIPMENT IN PLACE.
- 10. CABLING SHALL COMPLY TO ANSI/TIA/EIA WIRING STANDARDS 568A.
- 11. CONTRACTOR TO CONFIRM LENGTH OF CABLES WITH DISTRICT PRIOR TO ORDERING.



**PLAN NOTES:**

ALL ROOMS SHALL BE COMMISSIONED.

ALL SYSTEMS SHALL BE MUTE/ VOLUME ADJUSTED FOR EMERGENCY PRE-RECORDED MESSAGE.

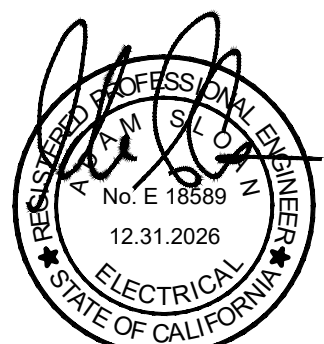
**EQUIPMENT RACK GROUNDING DETAIL 07**

**WD**

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**FILLMORE HIGH SCHOOL ATHLETIC COMPLEX**

**FILLMORE UNIFIED SCHOOL DISTRICT**

**555 CENTRAL AVE, FILLMORE CA, 93015**

**ISSUED FOR:**

**REVISIONS:**

**REF 1 1-28-25**

**REGISTRATION/SIGNATURE:**

**SHEET TITLE:**

**ELECTRICAL DETAILS**

**SHEET NUMBER:**

**E601**

**WD PROJ. #** 22851 **DRAWN BY:** DL **AM** **CHECKED BY:** GM **DATE:** 06/07/23

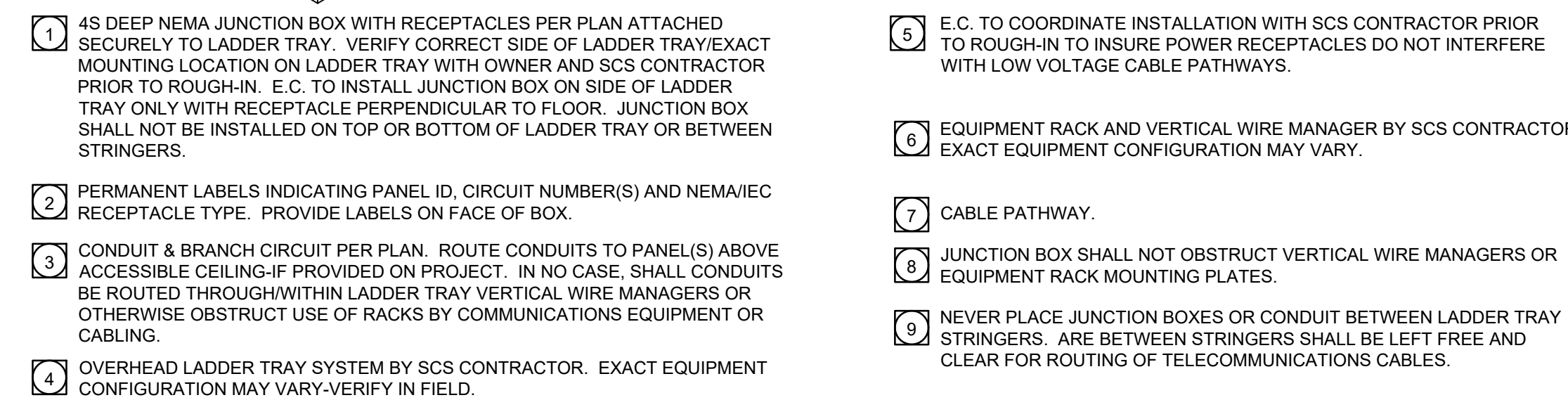
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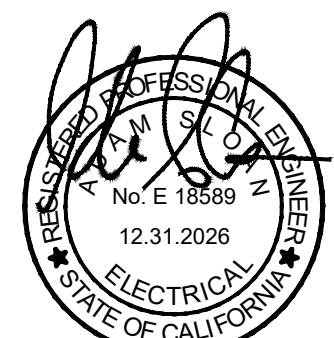


- 1 STANDOFF MOUNTS SHALL BE 14" TO ALLOW STRAPPING TO PASS BEHIND TRAY.
- 2 CABLE FEEDERS.
- 3 WIRE MESH CABLE TRAY. WIDTH SHALL BE THE SPAN OF CONDUITS. HEIGHT SHALL BE FROM BOTTOM OF HORIZONTAL TRAY TO CONDUITS. STRAP CABLE TO WIRE MESH CABLE TRAY AS SPECIFIED.
- 4 EXTEND MESH CABLE TRAY FROM HORIZONTAL TRAY 10" TO BELOW HUNG SLEEVES OR CONDUITS. VERTICAL SPAN LESS THAN 24" MAY NOT REQUIRE A VERTICAL TRAY.
- 5 ALL CONDUITS, CABLE TRAY AND WALL PENETRATIONS SHALL HAVE CABLE RUNWAY RADIOUS DIPS.
- 6 HORIZONTAL CABLE TRAY SHALL BE SUPPORTED AT 4' INTERVALS WITH SPECIFIED SUPPORT BRACKETS.
- 7 PROVIDE CABLE RUNWAY RADIOUS DROUPTS WHEREVER CABLES LEAVE HORIZONTAL TRAY. PROVIDE ONE (1) FOR EVERY CABINET AND TWO (2) FOR EVERY TWO-POST RACK.
- 8 HORIZONTAL CABLE TRAY.
- 9 HORIZONTAL CABLE TRAY SECTIONS SHALL BE SPIKED WITH SPECIFIED CABLE RUNWAY JUNCTION SPIKE KIT. EACH SECTION SHALL BE BONDED WITH SPECIFIED CABLE GROUP STRAP KIT.
- 10 CONDUIT WITH BUSHINGS AND PULL ROPS. SIZE, QUANTITY AND SPECIFICATIONS PER PLANS. SEAL ALL CONDUITS PER NATIONAL FIRE CODE.
- 11 VERTICAL DATA RACK, SIZE AND SPECIFICATION PER PLANS.
- 12 HORIZONTAL CABLE TRAY SHALL BE SUPPORTED AT 4' INTERVALS WITH SPECIFIED CEILING SUPPORTS.

- |    |   |   |
|----|---|---|
| 13 | PLYWOOD BACKBOARD AS SPECIFIED ON PLANS.  | 5 |
| 14 | SLEEVE WALL PENETRATION WITH BUSHINGS: SIZE, QUANTITY AND SPECIFICATIONS PER PLANS. SCS CONTRACTOR SHALL SEAL INSIDE OF SLEEVE AFTER CLAMP INSTALLATION PER NATIONAL FIRE CODE. |   |
| 15 | ANSI COMPLIANT TELECOMMUNICATIONS GROUND BUS BAR PER SPECIFICATIONS. SEE GENERAL TELECOMMUNICATIONS REQUIREMENTS FOR ADDITIONAL REQUIREMENTS.                                   |   |
| 16 | PROVIDE FIRESTOP AROUND ALL CONDUIT PENETRATIONS AS REQUIRED. PROVIDED AND INSTALLED BY E.C.  |   |
| 17 | PROVIDE FIRESTOP LABEL AS REQUIRED BY CODE.   |   |
| 18 | PROVIDE CABLE RUNWAY MOUNTING KIT TO HORIZONTAL TRAY PER SPECIFICATIONS. PROVIDE 2" CLEARANCE BETWEEN HORIZONTAL TRAY AND RACK/CABINETS.  |   |
| 19 | FOR CEILING PENETRATIONS, PROVIDE SLEEVES (WITH BUSHINGS) AND ROUTE THROUGH CEILING.  |   |
| 20 | PROVIDE CLW R/C CLIPS SPACED AT 24" O.C. ON EACH SIDE WITH #10SMS ATTACHING CLIP TO THE LADDER RACK, AND #10S ATTACHING THE CLIP TO THE WALL BACKING, WALL BACKING PER 15090.   |   |
1. GENERAL NOTE: ONLY SCS CONTRACTOR SHALL COORDINATE WITH PLANS AND PROVIDE A COMPLETE SYSTEM. SCS CONTRACTOR SHALL COMPLY WITH ALL CITY, STATE AND FEDERAL STANDARDS.
2. ALL ITEMS SHALL BE PROVIDED BY SCS CONTRACTOR UNLESS OTHERWISE NOTED.
3. SCS CONTRACTOR SHALL COORDINATE ALL HORIZONTAL AND VERTICAL TRAY ROUGH-IN LOCATIONS WITH E.C. AND PROVIDE PROPER CABLE TRANSITION.



## MDF / IDF LADDER TRAY / RECEPTACLE MOUNTING DETAIL 02



FILLMORE HIGH  
SCHOOL ATHLETIC  
COMPLEX  
FILLMORE  
UNIFIED SCHOOL  
DISTRICT  
555 CENTRAL AVE, FILLMORE  
CA. 93015

[illegible]

REGISTRATION/SIGNATURE:			
SHEET TITLE:  <div style="text-align: center; font-size: 2em; font-weight: bold; margin-top: 50px;">           ELECTRICAL DETAILS         </div>			
SHEET NUMBER:  <div style="text-align: center; font-size: 3em; font-weight: bold; margin-top: 20px;">           E603         </div>			
WD PROJ. # 22851	DRAWN BY: DL, AM	CHECKED GM	DATE 06/07/23

## SECTION 27 10 00 - STRUCTURED CABLING SYSTEM

### PART 1 – GENERAL

#### 1.1 SCOPE OF WORK

- A. The work under this section includes all final design, material, equipment, supplies, labor, testing, and accessories required to furnish and install a complete Structured Cabling System (SCS) as indicated on the drawings and as specified herein. These systems shall be defined as all cables, equipment, products, etc., as indicated on the drawings, and mentioned in these specifications.
- B. All miscellaneous system components including, but not limited to, cables, cable supports, termination equipment, punch blocks, patch panels, patch cords, device outlets, ladder runway, backboards, equipment racks, equipment cabinets, enclosures, terminal cabinets, equipment grounding, and any other related items shall be furnished and installed complete under this section, such that the system shall perform all functions listed herein in compliance with all of the specified requirements.
- D. Schedule is paramount to the project's success. With this, the SCS Contractor will have to be a team player, continually working with the team to facilitate expeditious design, procurement, and construction processes.
- E. Contractor shall be responsible to review all plan drawings and bid documents for the entire scope of work required on this project.
- F. Wireless LAN electronics including network switches, access points, and wireless controllers are District-provided and District-installed.
- G. It is a mandatory requirement that a single Contractor perform the work described in the following specification sections:

1. Section 27 10 00 Structured Cabling System

#### 1.2 RELATED WORK, STANDARDS, DOCUMENTS AND PUBLICATIONS

- A. Each agency's relative codes, standards, and recommended practices apply to the voice/data cabling systems and their components as specified herein:

1. American National Standards Institute (ANSI)
  - a. ANSI T1.404 Network and customer installation interfaces – DS3 and metallic interface specification
2. Building Industry Consulting Service International (BICSI)
  - a. Telecommunications Distribution Methods Manual (TDMM) – latest edition.
  - b. Customer-Owned Outside Plant Design Manual (CO-OSP) – latest edition.
3. Federal Communications Commission (FCC)
  - a. FCC Part 68 Rule

4. American Society for Testing and Materials (ASTM)
  - a. E814-02 Standard Test Method for Fire Tests of Through-Penetration Fire Stops
5. International Electrotechnical Commission (IEC)
  - a. IEC 61935-01 Generic Cabling Systems - Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801 Part 1: Installed Cabling
  - b. IEC 61935-02 Generic Cabling Systems - Specification for the testing of balanced communication cabling in accordance with ISO/IEC 11801 Part 2: Patch Cords and Work Area Cords
6. Institute of Electrical and Electronics Engineers (IEEE)
  - a. IEEE 802 Specification for Local Area Networks, latest edition.
  - b. IEEE 802.3an Specification for 10GBASE-T Ethernet, latest edition.
  - c. ANSI/IEEE C62.41 – Guide on the Surge Environment in Low-Voltage (1000V or less) AC Power Circuits, latest edition.
7. International Organization for Standardization (ISO)
  - a. ISO/IEC 11801 Information Technology – Generic Cabling for Customer Premises, latest edition.
  - b. ISO TR 24750 Technical Report
8. National Fire Protection Association (NFPA)
  - a. ANSI/NFPA-70 National Electric Code – Current version as adopted by AHJ(NEC)
  - b. ANSI/NFPA-75 Standard for the protection of information technology equipment
9. National Electrical Manufacturers Association (NEMA)
10. Occupational Safety and Health Administration (OSHA)
11. Telecommunications Industry Association (TIA)
  - a. Optical Fibers Suitable for Manufacturing OS2 Cabled Optical Fiber.
  - b. TIA-526-7 Optical Power Loss of Installed Single-Mode Fiber Cable Plant.
  - c. TIA-526-14-B Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant; IEC 61280-4-1 Edition 2, Fiber-Optic Communications Subsystem Test Procedure- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement.
  - d. TIA-568-C.0 Telecommunications Cabling for Customer Premises, latest edition.
  - e. TIA-568-C.1 Commercial Building Telecommunications Cabling Standard
  - f. TIA-568-C.2 Twisted-Pair Telecommunications Cabling and Components Standard, latest edition.
  - g. TIA-568-C.3 Optical Fiber Cabling Components Standard, latest edition.
  - h. TIA-568-C.4 Broadband Coaxial Cabling and Components Standard
  - i. TIA-569-C Telecommunications Pathways and Spaces, latest edition.
  - j. TIA-598-C Optical Fiber Cable Color Coding.

- k. TIA-606-B Administration Standard for Commercial Telecommunications Infrastructure, latest edition.
  - l. TIA-607-B Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, latest edition.
  - m. TIA-758-B Customer-Owned Outside Plant Telecommunications Infrastructure Standard, latest edition.
  - n. TIA-862-A Building Automation Systems Cabling Standard, latest edition.
  - o. TIA-942-A Telecommunications Infrastructure Standard for Data Centers
  - p. TIA-1152 Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling, latest edition.
12. Underwriters Laboratories Standards (UL)
- a. UL 5 Surface Metal Raceways and Fittings, latest edition.
  - b. UL 5A Nonmetallic Surface Raceways and Fittings, latest edition.
  - c. UL 5B Strut-Type Channel Raceways and Fittings, latest edition.
  - d. UL 5C Surface Raceways and Fittings for Use with Data, Signal, and Control Circuits, latest edition.
  - e. UL 514A Metallic Outlet Boxes, latest edition.
  - f. UL 514B Conduit, Tubing, and Cable Fittings, latest edition.
  - g. UL 514C Nonmetallic Outlet Boxes, Flush-Device Boxes, Covers, latest edition.
  - h. UL 514D Cover Plates for Flush-Mounted Wiring Devices, latest edition.
  - i. UL 1685 Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables, latest edition.
  - j. UL 1863 Communications-Circuit Accessories, latest edition.
13. The Contractor shall be responsible for obtaining and utilizing the latest Structured Cabling, Architectural, Security and Electrical plans.

### 1.3 GENERAL REQUIREMENTS

A. Manufacturer: The term “manufacturer” shall be defined as the company, or group of companies, that actually produces the products meeting the requirements of Section 2 of this document. The manufacturer shall have a minimum of seven (7) years’ experience in manufacturing products of this type and shall be ISO 9001 Certified. The products, summarized in this specification, shall be supplied by a single manufacturer, with the exception of:

- 1. Data racks and other hardware that is not defined as part of the copper cable channel test configuration by TIA-568-C.
- 2. Fiber Optic Cable and Outside plant (OSP) fiber optic cable.
- 3. Channel solutions consisting of cabling and connectivity hardware independently tested as by UL or ETL and that are listed Section 2 of this document.
- 4. Cables manufactured by another manufacturer specifically called out on the drawings.

B. Contractor: The term “Contractor” shall be defined as the company, or group of companies, that actually provides the products per Section 2 and installs the products per Section 3 of this document.



The Contractor selected to provide the installation of this system shall be certified by the manufacturer in all aspects of design, installation and testing of the products described herein.

1. The Contractor shall hold a valid State of California C-10 Electrical contractor and C-7 Low Voltage Systems contractor's license, shall have completed at least ten (10) projects of equal scope, shall have been in business of furnishing and installing systems of this scope and magnitude for at least the past five (5) consecutive years, and capable of being bonded to assure the Owner's Project Manager of performance and satisfactory service during the guarantee period.
2. The Contractor shall be accredited and trained by the manufacturer and such accreditation must be presented with the bid submittal. Contractor must be accredited a minimum of 180 days prior to bid submittal date.
3. The Contractor shall be a manufacturer's Authorized Installer and Warranty Station for the equipment offered and shall maintain a fully equipped service organization capable of furnishing adequate repair service to the equipment.
4. For additional Contractor requirements, see Section 1.06.A.1 (b) of this document in its entirety.
5. All personnel performing work on this project must have successfully completed the manufacturer's training course prior to performance of any work on this project. Accreditation will consist of individual employee certifications issued by the manufacturer. All personnel engaged in the testing of fiber optic and category-6A metallic premise horizontal and distribution systems must have successfully completed the test equipment manufacturer's training. Certification of such training must be presented with the bid submittal.
6. The Contractor selected for this Project shall adhere to the engineering, installation and testing procedures and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
7. The Contractor shall own and maintain tools and equipment necessary for successful installation and testing of fiber optic cable, and Category 6A metallic premise horizontal and distribution systems, and have personnel who are manufacturer trained in the use of such testing tools and equipment.
8. The Contractor shall hold all other licenses required by the legally constituted authorities having jurisdiction (AHJ) over the work.
9. The Contractor shall maintain and provide appropriate liability and worker's compensation insurance coverage.

#### 1.4 QUALITY ASSURANCE

A. It is the intent of these specifications to establish an installation standard of quality for labor and materials. For any proposed product substitution, or when the Contractor intends to include an "or equal" product in the bid pricing, the Contractor shall provide a "Substitution/Or-Equal Request" submittal to the Owner's Project Manager for review no later than fifteen (15) calendar days prior to Bid submittal. This report shall include all of the following items:

1. Description of how the proposed product(s) will impact meeting the project completion date, indicate all item(s) with lead times and expected delivery date(s).
2. Itemized cost comparisons between the proposed product(s) and the listed product(s).
3. Detailed technical analysis of the electrical and mechanical specification differences between the proposed product(s) and the listed product(s).
4. ETL "Verified" or UL "Verified" test lab documentation for the proposed product(s) and assemblies proposed.

5. Proposed product identification, manufacturer literature (specifications and cut sheets).
6. Name, address and contact information of several similar projects where the substituted product(s) have been used.
7. Name, address and contact information of the proposed product(s) manufacturer's local representative.
8. Sample proposed product(s) manufacturer's lifetime component and application warranty. Detailed warranty requirements are described in Section 1.10 General System Product Warranty of this document.

B. Failure to provide all items listed in Section 1.4.A.1 through 8 for review by the Owner's Design Team shall result in rejection of the substitution/or-equal request.

C. The Owner's Design Team/Project Manager must approve any proposed product(s) substitution/or-equal item in writing. The Owner's Design Team/Project Manager reserves the right to require a complete sample of any proposed product(s) and may request a sample tested by an independent testing consultant to prove equality. The decision of the Owner's Design Team/Project Manager regarding equality of proposed product(s) items will be final.

#### 1.5 GENERAL SUBMITTAL REQUIREMENT

A. Submittals shall be presented and formatted per the guidelines in the Division 1 section of this bid package.

B. All cut sheets shall represent the latest version, part number, and revision of the product. Where multiple products or part numbers appear on a page, a bold arrow or circle shall indicate which product or part numbers are to be used as part of the installation. The submittal shall include all descriptive pages associated with the product, not just the page showing the part number. Contractor submittal shall include a materials list. Cut sheets shall be numbered by and match page numbers of each item included on the material list.

#### 1.6 PRE INSTALLATION SUBMITTAL REQUIREMENTS

A. Within ten (10) calendar days after the date of award of the Contract, the Contractor shall submit the following:

1. Submittal Binder: Submit one (1) hard copy and one (1) electronic copy of the complete Submittal Binder to the Project Engineer for review. The binder shall consist of five (5) major sections with each section separated by Index Tabs. Each page in the binder shall be numbered sequentially and shall be summarized in the Index.

a. The FIRST section shall include the following items:

1) The TITLE SHEET which shall include the Submittal Date, Project Title and Address, Contractor's Name and contact information, and name of the Owner.

2) The INDEX sheet which shall list each item included in the binder along with the page number where it may be found.

b. The SECOND section shall include the following items:

1) CONTRACTOR'S LICENSE: A copy of the Contractor's valid State of California license.

2) PROOF OF EXPERIENCE: Proof (written documentation) that the low voltage Contractor has been regularly engaged in the business of low voltage contracting consisting of,



but not limited to, engineering, fabrication, installation, and servicing of communication systems of the type specified herein for at least the past five (5) consecutive years.

3) **PENDING LITIGATION:** Provide a statement summarizing any pending litigation involving any officer or principal of/or the company, the nature of the litigation and what effect the litigation may carry as it relates to this work in the worst-case scenario. Non-disclosure of this item, if later discovered, may result, at the Owner's discretion, in the Contractor bearing all costs and any cost related to the associated delays in the progress of the work.

4) **INSURANCE CERTIFICATES:** Copy of low voltage Contractor's current liability insurance, workers compensation, and state industrial insurance certificates in conformance with the contract documents.

5) **PROJECT LIST:** A List containing at least ten (10) California installations completed within the last five (5) years by the low voltage Contractor that are comparable in scope and nature to that specified in the contract document. Provide up to date contact information for each project listed including contact name, title, email address and phone number.

6) **SERVICE CAPABILITY:** Documentation indicating in detail that the low voltage Contractor has competent engineering, installation, service personnel and facilities with reasonable stock of service parts within 75 air miles of the job site. Do not submit a sales brochure as documentation.

7) **AUTHORIZATION LETTERS:** Letters from the low voltage equipment manufacturer stating that the low voltage bidding Contractor is a Factory Authorized Distributor/Installer, and is trained and certified for the equipment he proposes to use on this project, and is licensed to purchase and install software required to provide the specified functions.

8) **PROOF OF TRAINED PERSONNEL:** Documentation that the Contractor has full time on-staff personnel, manufacturer trained and BICSI certified, for the equipment proposed for this project, and on-staff manufacturer trained and certified by the Test Equipment manufacturer in the proper use of the test equipment required on this project. Provide copies of all manufacturers' training/certification documentation, and Test Equipment manufacturer's training/certification documentation. Provide a statement that personnel meeting these qualifications are in the local facility, and will be maintained at that facility throughout the project and the warranty period.

9) **DOJ FINGERPRINTING:** A fingerprint check must be provided for all personnel working on school sites, performed by the Department of Justice, pursuant to California Education Code Section 45125.1. Fingerprinting shall be performed prior to start of project. All costs associated with DOJ fingerprinting/background checks shall be the full responsibility of the Contractor.

c. The **THIRD** section shall contain a detailed bill of materials including the quantity, product Manufacturer, product part number, product description, and corresponding specification section number or drawing sheet number where that product is referenced. Also listed in the Contractor's bill of materials shall be each item of test equipment to be used to test the optical fiber, copper and coax components. Include all patch cords and other specialized components. See example format below:

Description	Part #	Quantity	Uom	Spec	Test Equipment
CAT6A Station Cable	Siemons 9A6P4-A5 06-R1A	100 Boxes	1000dt/box	2.03	Fluke DTX-1800

This information may be used by the Owner to evaluate the Contractor's general understanding of the project scope during the bid evaluation. Errors or omissions from this bill of material do not relieve the Contractor from providing all material, components, labor, etc., as outlined in this specification and on the drawings to provide a complete and useable structured cabling system.

d. The **FOURTH** section shall contain original manufacturer cut sheets for all of the materials that meet the requirements listed in Section 2 of this specification and all materials described

on the construction drawings. Also include manufacturer's cut sheets for all testing equipment to be used for completion of the project. All pages shall be numbered sequentially corresponding to the bill of materials. On each cut-sheet, provide an indicating arrow next to each part number of proposed material.

e. The FIFTH section shall contain a designation schedule for each system component location and complete full size 30" x 48" (unless otherwise specified) bond drawings (shop drawings), showing system wiring plans. The professionally drafted drawings shall be generated on AutoDesk AutoCAD 2010 (or later) computer design software. These drawings shall also include:

- 1) MDF and IDF Diagrams - Including:
  - a) Cable routing
  - b) Position of all devices, components and apparatus
  - c) Detailed elevation layout of the wall field(s)
  - d) Labeling plan (see District labeling requirements)
- 2) Site Plan – Including:
  - a) Conduit routing of all site conduits including size and quantity
  - b) Building designations
  - c) MDF and IDF locations
  - d) Campus cabling and conduit between MDF and IDF racks including cable type and quantity
- 3) Work Area Floor Plans - Including:
  - a) Detailed cable routes including cable type and quantity
  - b) Device locations and quantities with labeling
  - c) Work area labeling plan (see District labeling requirements)
- 4) Cross Connect Documentation - Including:
  - a) Cross-connect records for all voice and data devices
  - b) Cross-connect records may be in either Excel or Word format
- 5) Riser Distribution Plan
- 6) Rack elevations of all MDF and IDF equipment
- 7) ¼-inch scale floor plans of all data rooms (MDF, IDF, MPOE, etc.)
  - a) Identify all equipment racks, cabinets, terminals, cross connect locations, ground bus bar, and all other components in room(s).
- 8) Cable Tray, Conduit, and Raceway Plans (if applicable)
  - a) Provide ¼-inch scale ladder runway plan for all data rooms.
  - b) Provide scaled plans for all in-building conduit and raceway.

B. Failure to comply with any of the requirements listed above may result in the rejection of the entire submittal package.



## 1.7 PROJECT DIRECTION

A. Single Point of Contact: Contractor shall provide an English-proficient, single point of contact, i.e., Project Manager, to speak for the Contractor and shall provide the following functions:

1. Initiate and coordinate tasks with Owner's Project Manager, and others as specified by Owner's Project Manager.
2. Provide day-to-day direction and on-site supervision of Contractor personnel.
3. Shall be readily available to the Owner/Owner's Project Manager 24 hours a day / 7 days a week throughout the duration of the Project.
4. Shall have full time cellular phone capability, and the ability to send/receive email correspondence, accessible by the Owner's Project Manager.
5. Ensure conformance with all Contract provisions.
6. Participate in weekly site project meetings and construction meetings.
7. Provide detailed and written weekly status reports to Owner's Project Manager. The content shall be substantive enough to bring about a full understanding of all situations current and situations future. Weekly reports shall include but are not limited to detailed progress report, RFI status log (Request for Information), Change Order Log (pending and approved), Project Addendum log, and a two-week look ahead work calendar. Each of the above must show assigned responsibilities and event history. Weekly reports shall include milestone information, resource updates (staff and materials), and any conditions or incidents that may impact the Project Schedule.
8. This individual shall remain as Project Manager for the duration of the project. The Contractor may change Project Managers only with the Owner's Project Manager's written approval.

## 1.8 PLANNING

- A. Planning meetings and schedule: Within five (5) calendar days after the date of award of the Contract, an initial planning meeting will be held with the successful bidder to clarify all requirements (systems, services, distribution methods, etc.), identify responsibilities, and schedule the events that will transpire during the implementation of the project. Within seven (7) calendar days of this initial meeting, the Contractor shall provide a written report and project schedule to clearly document the events and responsibilities associated with the project. Contractor's project schedule shall conform to the overall Project Construction Schedule issued by the Construction Management Company or the Owner. Contractor is required to attend all planning and other construction meetings as requested by the Owner, Architect, or Engineer.

## 1.9 POST INSTALLATION SUBMITTAL REQUIREMENTS

- A. Within fifteen (15) calendar days after the completion of work, the Contractor shall submit the following:

1. Record Documentation:
  - a. Final Test Results – Test results for each cable indicating tests performed, results obtained and values measured. Test results shall be provided in electronic format with the associated application (if required) for viewing. Contractor shall provide individual test results for each cable tested, and a summary sheet listing all cables, test summary, lengths, and the total cable count.

Provide test reports for all copper cables and fiber optic cables. Testing shall be conducted in accordance with Section 3.06 of this document.

- b. As-Built records – Contractor shall create and provide all backgrounds and floor plans in AutoCAD or Revit file format. Sheet borders shall be either provided by, or approved by, the Architect. Contractor's as-built records shall include all of the items described and listed in section 1.6.A.1.e of this document.
- B. After as-built submittal is approved by Owner, the Contractor shall provide two (2) sets of CDs (or USB Flash Drives) containing all post-installation submittals and close out documentation in AutoCAD (or Revit) format; and in PDF, Word, or Excel formats as required elsewhere in this document.
- C. As-Built Documentation Display in Each MDF and IDF: Within fifteen (15) days after the completion of work, the Contractor shall install a complete Contractor-provided, professionally drafted as-built floor plan in color in each MDF and IDF mounting frame. Each floor plan, generated on AutoDesk AutoCAD 2010 (or later) computer design software and printed in color, shall depict all jack locations in each modular furniture cubicle and all other areas. Also depicted shall be speaker, clock, wireless access point, terminal cabinets, MDF, IDF, pull boxes, vaults, CCTV cameras locations, or any other communications outlet cables by the SCS Contractor. All jack locations shall be color coordinated with the Owner's labeling scheme as described elsewhere in this specification. Contractor's device symbols shall match the device symbols utilized on the bid documents. The Contractor will provide to Owner two (2) sets of CDs (or USB Flash Drives) containing all as-built records in AutoCAD (.dwg) or Revit (.rvt) format, and full size PDF format.
- D. Warranty Documentation:
  - 1. Contractor shall apply for all Manufacturers' Extended Warranties on behalf of the Owner. Contractor shall present to Owner all product Warranty documents per General System Product Warranty Section of this document. Warranty shall commence after final acceptance of System and Project Close Out by the Owner.

#### 1.10 GENERAL SYSTEM PRODUCT WARRANTY

- A. The horizontal communications cabling system installed shall be covered by a Lifetime Warranty to the District.
  - 1. Horizontal channels shall be completed with factory-terminated copper and/or fiber optic patch cords in order to be eligible for the applicable Warranty with Channel Performance guarantees.
  - 2. Approved product shall be listed on the most recent version of the applicable data sheets for each product solution.
- B. Installer shall provide labor, materials, and documentation in accordance with manufacturer's requirements necessary to ensure that the Owner will be furnished with a Lifetime Warranty.
- C. The installed structured cabling system shall provide a warranty guaranteeing installed channel performance above the ANSI/TIA requirements for Category 6A cabling systems or ISO 11801 requirements for Class D, Class E, and/or Class Ea. Standards-compliant channel



performance tests shall be performed in the field with an approved certification tester in the appropriate channel test configuration. See 1.10. A.1 above for channel requirements.

- D. Necessary documentation for warranty registration shall be provided to the manufacturer by the Contractor (within 10 days) following 100 percent testing of cables. Contractor shall submit test results to the manufacturer, in the certification test analyzer's original software files. Contractor shall ensure that the warranty registration is properly submitted to the manufacturer, with all required documentation, within ten (10) days of project completion. Contractor shall provide to the District copies of all submitted warranty documents. Contractor must adhere to the terms and conditions of the respective manufacturer's warranty programs.
- E. Contractor shall ensure that the Owner receives the manufacturer issued project warranty certificate within sixty (60) calendar days of warranty registration.
- F. The first usage date shall be agreed to be in writing by the District and Contractor within five (5) working days of first usage. During this time, the entire system must be kept in proper operating condition at no additional cost to the District.
- G. Cable Manufacturer "site certifications" are prohibited.

#### 1.11 GENERAL ENGINEERING AND DESIGN GUIDELINES

##### A. Cabling System Installation Practices

1. Plastic cable tie (tie wrap) devices shall not be utilized at any time. Only Velcro-type hook-and-loop strap devices are permitted. In the MDF and IDF rooms, all vertically run cables and conductors shall be secured with Velcro at a maximum interval of eighteen (18) inches, and all horizontally run cables and conductors shall be secured with Velcro at a maximum interval of eighteen (18) inches.
2. In the MDF and IDF rooms, all vertically run innerduct shall be secured with Velcro at a maximum interval of eighteen (18) inch intervals. Innerduct installed on ladder runway shall be supported horizontally and vertically at a maximum of eighteen (18) inch intervals.
3. All horizontally run innerduct shall be secured with Velcro at a maximum interval of forty-eight (48) inches when installed horizontal above accessible ceiling spaces or open ceiling spaces.
4. All cables installed above accessible ceiling spaces shall be independently supported
5. All pull ropes are to be installed and/or replaced in all pathways for future use.
6. All intra-building cabling shall be routed either parallel or at right angles to the building structure and/or walls.
7. No cabling is to be pulled through electrical Condulet bodies (L-bend) devices. If Condulet devices are pre-existing and it is determined, at the review of the Owner's representative, that sufficient space in the conduit is available and the Owner provides written approval to utilize the Condulet, the Contractor shall remove the Condulet cap, pull the cable to and beyond the cap then carefully reinstall the cap.
8. Communications cabling shall never be tied or attached to the exterior of electrical conduits, power cables or devices, lighting systems, or co-exist inside any pathway with power cabling.
9. Any visible damage to a cable such as kinks or bends in violation of the minimum bend radius shall render the cable segment defective and shall be removed and replaced by the Contractor at no additional cost to the Owner.
10. All materials shall be new, unused, and delivered to job site in original manufacturer or distributor cartons or packages. No previously installed material shall be used at any time.

11. Reference Part 3 of this document for additional installation guidelines and requirements.
12. All conduit ends shall be protected by plastic bushings for cable protection.

#### 1.12 SPECIFIC SYSTEM REQUIREMENTS

##### A. Backbone Infrastructure Cabling

##### 1. Backbone Fiber Optic Cabling

a. Contractor shall provide (1) 24-strand 8 micron single mode OS-2 fiber optic cable for backbone connectivity between the Main Distribution Frame (MDF) location and each Intermediate Distribution Frame (IDF) location, where indicated on the plan drawings.

- a. In Addition Contractor shall provide (1) Category 5e 25 pair cable for backbone connectivity between the MDF and each IDF. Provide Circa Enterprise line protectors/isolators on each end.
- b. At the MDF, provide a 20-foot slack loop neatly coiled, labeled, and secured. At each IDF, provide a 10-foot slack loop neatly coiled, labeled, and secured.
- c. Splicing of fiber optic cable shall not be permitted unless specifically called out on the bid documents and authorized in writing by the District's engineer.
- d. All exposed fiber optic cable shall be enclosed in innerduct. Innerduct is not required within inter-building conduits.
- e. Provide 2-meter duplex single mode fiber optic patch cords at the MDF, and 1-meter duplex single mode fiber optic patch cords at every IDF. Provide a minimum of two (2) patch cords per 6-strands of fiber optic cable installed.
- f. After installation and testing of new fiber optic backbone system (by Contractor) and new LAN network equipment installation (by District) the Contractor shall remove the original fiber optic backbone cabling complete if any, and shall remove all un-used Cat 6 horizontal cabling.
- g. Refer to Part 2 of this document for fiber optic cable specifications.

##### 2. MDF/IDF UTP Termination Equipment

- a. The MDF equipment shall be mounted in a 19" x 7' enclosed rack. IDF equipment shall be mounted in either 19"x 7' enclosed rack(s), free standing lockable cabinet as detailed on the bid documents/plan drawings, and as described in Part 2 of this document.
- b. When indicated on the plan documents, Contractor shall provide and install two (1) seven-foot high vertical wire management for each 2-post open rack. Contractor will provide and install fiber optic connector enclosures complete for termination of all fiber backbone cable strands. Contractor shall provide and install category-6, 24-port or 48- port modular patch panels, wired to T568B wiring scheme, for termination of all category-6 cabling.
- c. Category-6 patch cords shall be provided by the Contractor. See Part 2 of this document for additional patch cord requirements.
- d. See Part 2 of this document for category-6 copper cable and fiber optic cable components specifications.

## PART 2 – PRODUCTS

### 2.1 STRUCTURED CABLING SYSTEM

- A. Acceptable Manufacturers - all equipment listed herein will be by:

1. SCS components: Siemons

B. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications and the equipment's technical data sheets.

C. The functions and features specified are vital to the operation of this facility; therefore, inclusion of a component's manufacturer in the list of acceptable manufacturers does not release the Contractor from strict compliance with the requirements of this specification.

2.2 OUTLETS

A. Telecommunications outlets (TO) shall consist of one-gang or two-gang utility outlet boxes equipped with 8-pin modular (RJ-45) jacks utilizing the T568B wiring scheme and a faceplate. All outlet cabling shall terminate on patch panels at their associated Intermediate Distribution Frame (IDF) Rooms, or as otherwise indicated on the drawings.

B. Surface mount boxes

1. Surface mount boxes shall be available in single-gang and double-gang size.
2. Single gang box shall be 1.75" deep, double gang box shall be 2" deep.
3. Product specification:  
single gang: Siemons

C. Faceplates

4. All Faceplates shall be available in duplex, quad, or six-plex configuration in a single-gang form.
5. Surface Modular furniture faceplates shall be available in dual and quad configuration for the Owner's modular existing and/or new modular furniture. Faceplates shall be flush-mounted in the modular furniture. Surface mounted boxes/faceplates for modular furniture stations are unacceptable. The Contractor is responsible for coordinating with the Owner's modular furniture Contractor to determine faceplate requirements. The Contractor shall provide and install all parts/fittings necessary to meet the requirements of this section.
6. Wall mounted phone jack faceplates shall be single gang configuration, constructed of stainless steel and have two standard phone mounting posts located above and below the jack opening. Wall mounted phone faceplates will consist of 8p8c modular (RJ-45) jacks.
7. Faceplates shall have two (2) designation windows, one located at top and one located at bottom. Designation windows shall be equipped with clear plastic covers.
8. Color of faceplates shall match adjacent electrical faceplate color, unless otherwise noted.
9. Provide blank faceplate inserts for all unused outlet locations within the faceplate.
10. Product specification: Siemons

D. Category 6A (CAT6A) jacks

1. All category 6 and 6A jacks shall be 8-position/8-conductor (8p8c) modular RJ-45 jacks incorporating 110-style rear termination lugs for termination of Category 6 cable, T568B wiring type.

2. All Category 6 jacks shall meet or exceed channel specifications of TIA-568-C.2 Cat 6 requirements for connecting hardware up to 250MHz
3. Cable entry shall be rear or side.
4. Shall come equipped with a clear dust cover to prevent debris from entering jack.
5. Category 6 and 6A jacks shall include an integrated strain relief and shield clamp.
6. Category 6 and 6A jacks shall be available in U/UTP.
7. Contractor shall verify color with Owner prior to start of work.
8. Category 6 and 6A jacks shall only be terminated on Category 6 cables.
9. Product Specification:  
Siemons Color as depicted on riser line diagram- Z6A-S06.

## 2.3 CATEGORY 6A (CAT6A) STATION CABLE

1. Station cables shall extend between the station location (TO) and its associated MDF/IDF.
2. The Category 6 and 6A (WAPS) cable shall consist of 4-pair, 23-AWG bare copper twisted pairs.
3. Category 6 and 6A (WAPS) cable shall be available in the following types: U/UTP.
4. The cable jacket shall be rated for the environment in which it is installed. Install CMP cable in plenum-rated spaces, CMR cable in riser-rated spaces, and OSP cable in outdoor and underground conduit spaces. In open ceiling spaces and outdoor environments, cable shall be installed in conduit.
5. Category 6 and 6A (WAPS) cable shall be ETL verified to TIA-568-C.2-10 Category 6, and support 1000BASE-T IEEE 802.3an standard.
6. Contractor shall verify color with Owner prior to start of work.
7. Category 6A cable-(WAPS) shall only be terminated on Category 6A rated jacks and patch panels
8. Category 6A cable shall have a maximum outside diameter of 0.354".

## 2.4 MODULAR CATEGORY 6A PATCH PANEL SYSTEM

- A. All modular patch panels shall be wired to ANSI/TIA/EIA 568-C using T568B wiring scheme.
- B. The patch panel shall be able to accommodate 23 AWG cable conductors and be rated for category 6A performance for WAPS.
- C. The patch panel shall be available 2-rack unit (2RU) 48-port sizes. Siemons
- D. Patch panels shall be available in unshielded and shielded versions.
- E. Unshielded patch panels shall incorporate dynamically angled (left and right) jack ports in order to relieve stress on patch cords and improve cable management.
- F. Patch panels shall utilize 45-degree silver-plated insulation displacement connectors (IDC) to provide reliable, gas-tight connections.
- G. Contractor shall provide Category 6A modular jack panels in sufficient quantities to terminate all category 6A cables.
- H. Contractor shall mount patch panels in MDF/IDF cabinets.
- I. Product Specification:  
Siemons

## 2.5 PATCH/STATION CORDS

- A. Provide Category 6A Modular Patch/Station cords for each assigned port on the patch panel and for each outlet in the station locations. Cords shall be equipped with an 8-pin 8-conductor modular connector on each end and shall conform to the length(s) specified. All cords shall be wired to T568B



wiring scheme. All cords shall be factory-built by the cable manufacturer. Fabrication of cords in the field is prohibited.

- B. Category 6A patch cords shall exceed ANSI/TIA/EIA and ISO/IEC Category 6A specifications.
- C. At the MDF and each IDF, provide one (1) 4-foot cat-6 patch cord for each cat-6 cable terminated in the patch panels. At wireless access point outlets located above a ceiling, provide two (2) 7-foot cat-6A patch cords. At wall mounted wireless access point outlets and outlets located inside polycarbonate enclosures, provide two (2) 4-foot cat-6A patch cords. In instances where longer cords are required, the Contractor shall clarify the requirement with the Owner before installing longer cords. Where the specifications and the plan drawings conflict, the more stringent requirement will apply.
- D. Contractor shall verify required patch cord color with Owner prior to ordering materials. Include all costs in base bid.
- E. All patch cords shall be channel-rated and include a snagless boot.
- F. Category 6A patch cords shall be provided at all Category 6A patch panels and outlets.
- G. Product Specification:  
Seimons

## 2.6 FIBER OPTIC CABLING

- A. 24-strand, OS-2 singlemode, graded-index, laser-optimized fibers with 8-micron core/cladding diameter.
- B. Fiber optic cable shall meet or exceed ANSI/EIA/TIA-492 specifications and ISO/IEC 11801 standards.
- C. All fibers shall be color coded to facilitate individual fiber identification.
- D. Single loose-tube cable with small diameter single-tube construction.
- E. Fibers will have dual wavelength capability; transmitting at 850 and 1300nm ranges.
- F. Single mode fiber shall be designed to support 10 Gigabit Ethernet applications up to 550 meters at 850 nm, and up to 300 meters at 1300nm.
- G. Singlemode fiber maximum attenuation: 3.2 dB/km @ 850 nm, and 1.2 dB/km @ 1300 nm.
- H. Singlemode OFL bandwidth: 3500 MHz/km @ 850 nm, and 500 MHz/km @ 1300 nm.
- I. All fiber in a cable run shall be from the same manufacturer and shall be the same type. A mix of fibers from different manufacturers is prohibited.
- J. All fiber optic cable installed inside buildings shall be installed within contractor-provided innerduct. Innerduct shall be rated for the environment in which it is installed. Innerduct shall be orange in color, unless otherwise noted in the bid documents/plan drawings.
- K. Outdoor-rated and installed cables shall be loose tube construction.
- L. Loose tube cables shall be gel-free and utilize dry, water-blocking technology.
- M. Overall outside diameter of cable shall not exceed 0.29 inches.
- N. Indoor-outdoor-plenum-rated (OFNP) cable shall be installed for backbone cable runs between MDF and all IDFs.

- O. Provide buffer tube fan out kits as required.
- P. Product Specification:  
24-strand single mode Fiber Optic Cable: Siemons

## 2.7 FIBER OPTIC PATCH CORDS

- A. Fiber patch cords shall be Single mode.
- B. Construction shall be available in 1.6mm zipcord, 2.0mm zipcord, 3.0mm zipcord, and 900 micron buffered fiber cable types.
- C. Multimode patch cords shall consist of 8-micron laser optimized OS2 fiber.
- D. Fiber optic patch cord connectors shall utilize ceramic ferrules.
- E. Fiber optic patch cords shall consist of factory-terminated, factory-tested connectors.
- F. Connectors shall be duplex LC-type at both ends of the fiber patch cord.
- G. Color of patch cord jacket, connector housing, and connector booth shall be Yellow.
- H. At the MDF room, provide a minimum of one (1) 2-meter duplex OS-2 singlemode fiber optic patch cord for every 6-strands of fiber optic cable installed. At each IDF cabinet, provide one (1) 1-meter duplex OS-2 singlemode fiber optic patch cord for every 6 strands of fiber optic cable installed. Contractor shall verify final patch cord length and connector types with District's I.T. department prior to ordering product.
- I. Product Specification: Siemons fiber optic patch cords.

## 2.8 FIBER ENCLOSURE/FIBER PATCH PANEL

- A. Contractor shall install Siemons fiber enclosures in MDF/IDF racks and cabinets to accommodate termination of new fiber optic cable(s). Provide additional adapter panels, connectors, etc. as required to terminate all new fiber strands.
- B. Contractor shall provide new fiber enclosures where indicated on the plan drawings and in this document.
- C. Enclosures shall be available in rack-mountable form factors.
- D. Rack mounted enclosures shall incorporate sliding rails and contain sliding and removable front and rear access panels for access.
- E. 1RU size (1.75" high) shall accommodate 3 modular adapter packs, and 2RU size (3.5" high) shall accommodate 6 modular adapter packs.
- F. Contractor shall provide blank adapter plates for unused adapter openings.
- G. Adapter packs shall be available in duplex LC.

- H. Each individual adapter pack shall be equipped with 6 duplex connectors (12 strand capacity)
- I. Adapters utilized for laser optimized OS-2 fiber shall be yellow in color.
- J. Contractor shall verify connector type with District's I.T. department prior to ordering product.
- K. Product Specification:  
Siemons

## 2.9 FIBER OPTIC CONNECTORS

- A. Provide field-installable single mode connectors to terminate fiber optic cables.
- B. The connector shall be field-installable, hand-polished.
- C. Connectors shall utilize a heat-cured or anaerobic (quick cure) adhesive.
- D. The connector shall have a ceramic zirconia ferrule.
- E. Connectors shall be LC-type.
- F. Connectors shall be capable of mounting on either 250-micron or 900-micron buffered fiber.
- G. Average connector insertion loss: multimode 0.1dB, single mode 0.2dB. Maximum insertion loss: multimode 0.5dB, single mode 0.5dB.
- H. Singlemode connector boot shall be yellow in color.
- I. Connectors shall be placed into a duplex configuration by utilizing a duplex clip available by the connector manufacturer.
- J. Product Specification: Siemons.

## 2.10 GROUNDING SYSTEM AND CONDUCTORS

- A. The Contractor shall utilize a Telecommunications Bonding Backbone (TBB) as provided by the Electrical Contractor. The SCS Contractor shall terminate TBB cable(s) on SCS Contractor- provided ground bus bars located at each MDF/IDF Room, or as otherwise indicated on the drawings. Ground bus bars shall be ANSI-J-STD-607-A compliant and UL Listed. MDF telecom main ground bus bar (TMGB) shall be Chatsworth #40153-020. IDF room telecom ground bus bars (TGB) shall be Chatsworth # 40153-012, or as noted on the drawings. Wall-mounted IDF cabinets require a horizontal rack bus bar (Chatsworth #10610-XXX, equal by Harger). All communication system bonding and grounding shall be in accordance with the ANSI-J-STD-607-A (current edition), the NEC/CEC, and NFPA.
- B. Shielded station cables shall be grounded in compliance with ANSI/NFPA 70 and local requirements and practices.
- C. Horizontal equipment including cross connect frames, ladder runway, cable trays, equipment racks, conduits, active telecommunication equipment, test apparatus and equipment shall be bonded to

the ground bus bars utilizing a #6-AWG solid copper green insulated conductor and 2-hole crimp type grounding lugs. All connections shall be bare metal to bare metal using appropriate antioxidant compound. Burndy mechanical-type grounding lugs and terminals are prohibited. Minimize the length and number of bends of the grounding conductors to the busbar. Attachment to every rack and cabinet shall be made as follows:

1. Floor Mounted Cabinet/Racks - Install a dedicated copper horizontal ground busbar strip at the top of the rear rail of each rack and cabinet. Attach ground conductor's 2-hole compression lug to this ground strip using either tri-lobular thread-forming screws (not self-tapping or sheet metal screws) or by using two (2) standard bolts with two (2) "Type B" internal-external tooth lock washers per bolt.
- D. The SCS Contractor shall be responsible for providing an approved ground at all newly installed distribution frames, and/or insuring proper bonding to any existing facilities. The SCS Contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, cable sheaths, circuit protectors, closures, cabinets, service boxes, and framework.
- E. SCS Contractor shall label both ends of each grounding conductor as close as practical to the point of termination in a readable position. Ground tag must indicate the location of both ends of the ground conductor (e.g. Rack#1 to TMGB) and tag must include the warning "If this connector or cable is loose or must be removed, please call the Owner's Telecommunications Manager".

## 2.11 EQUIPMENT RACKS

- A. When shown on drawings, floor mounted equipment racks shall be provided by the Contractor to house fiber enclosures, patch panels, wire managers, LAN electronics, etc.
- B. The floor mounted racks shall be made of aluminum and be U.L. Listed.
- C. Floor mounted rack dimensions shall be 7' High x 19" Wide with 3"-wide C-shaped channels.
- D. Contractor shall provide vertical for patch and equipment cords. Vertical managers shall be double sided, equipped with hinged covers, installed on center of the rack, and be 7' high and 3" wide, unless otherwise noted on the plan drawings or elsewhere in this document..
- E. Equipment racks and rack mount accessories shall be Black in color, unless otherwise noted.
- F. Floor mounted open-racks shall be secured from the base to the structural floor to prevent movement, and secured to ladder tray/runway sections installed above. Contractor shall provide and install a minimum of four (4) fasteners/anchors per floor mounted rack. Reference mounting details in the plan drawings for specific mounting requirements.
- G. Refer to subsection 2.10 of this document for grounding requirements.
- H. Floor mounted racks shall have a static load rating of 1000 pounds.
- I. The racks shall be installed in 4-post open configurations.
- J. Product Specification: Siemons RS1-07-S

## 2.12 EQUIPMENT CABINETS

- A. When shown on the plan drawings, wall-mount cabinets shall be provided by the Contractor to house fiber enclosures, patch panels, wire managers, LAN electronics, etc.
- B. Wall mounted cabinets shall be made of cold rolled steel and have a static load rating of 400 pounds.
- C. Wall mounted cabinets and accessories shall be Black in color, unless otherwise noted.
- D. Wall mounted cabinets shall come equipped with a hinged, tinted Plexiglas front door, hinged rear section, two solid side panels, and solid top and bottom panels.



- E. Contractor shall provide lock kits for both the front door and the rear section. Contractor shall match District's existing key type. See District's I.T. department for required key type.
- F. Wall mount cabinets shall be available in the following dimensions: 12, 18, 24 Rack Units
- G. Each wall-mount cabinet shall include a 120VAC, 4" fan with fan-guard and mounting hardware. Fan shall provide 57 CFM or air movement, and not exceed 36 dBA noise rating.
- H. Wall mounted cabinets shall be securely bolted to structural members (wall studs, wall backing) in accordance with manufacturer's installation directions. Refer to mounting details on the plan drawings for additional information.
- I. Refer to subsection 2.10 of this document for grounding requirements.
- J. Product Specification: Siemons WC2-P101-18 with Versa POD fan kit.

#### 2.13 BACKBOARDS

- A. Where indicated on plan drawings, provide new plywood terminal backboards. Use Douglas Fir plywood, A/C grade, finished A-side facing out, with prime coat painted on all surfaces (front, back and sides), and a finish coat of fire retardant white enamel paint. On each plywood sheet leave one (1) Fire Marshal Stamp unpainted for inspection. Unless otherwise indicated, use 8'-0" high x 3/4" thick plywood x length as shown on the plan drawings.

#### 2.14 UNSPECIFIED EQUIPMENT AND MATERIAL

- A. Any item of equipment or material that is not specifically addressed on the drawings or in this document, but is required in order to provide a complete and functional SCS installation, shall be provided in a level of quality consistent with other specified items.

#### 2.15 FIRE RATED PATHWAY

- A. The firewall through-penetration shall be a manufactured, UL Classified, firestop device/ system designed to allow cables to penetrate fire-rated walls with a built-in fire sealing system that automatically adjusts to the amount of cables installed.
- B. The firestopping device shall be capable of installation in new construction or retrofit in existing structures.
- C. The device shall be UL Tested and Classified in accordance with ASTM E814 (UL 1479) and with ratings up to and including 2 hours.
- D. Manufacturer: Specified Technologies Inc., EZ-Path (#EZDP33FW) or equal by Wiremold.

#### 2.16 EXTERIOR WIRELESS ACCESS POINT ENCLOSURES

- A. All exterior wireless access point equipment shall be installed in a polycarbonate enclosure.
- B. Enclosures and all mounting hardware shall be Contractor -provided Contractor-installed.
- C. The front, sides, top and bottom of the enclosure shall be transparent to wireless signals.
- D. The enclosure shall have either a lockable hinged cover, or a screw-on cover utilizing security type fasteners. Keyed hasp-type locks will be District-provided.
- E. The enclosure shall be NEMA-4 rated to protect against weather, dust and impacts.
- F. Contractor shall secure the enclosure to the building structure with the appropriate hardware. The enclosure shall be secured using a minimum of four (4) fasteners.

- G. Contractor shall provide all weatherproof gland fittings and other connections as required to accommodate all conduit and cable connections to the enclosure.
- H. Contractor shall seal enclosure penetrations to maintain the NEMA 4 rating of the enclosure.
- I. The enclosure shall be sized to accommodate the District-provided electronics, and Contractor-provided data outlets and patch cords. Contractor to coordinate with District prior to rough-in.
- J. Product Specification: Oberon Wireless Enclosures, or equal.

#### 2.17- SPECIAL NOTE

- A. Contractor shall include, in their bid, all cost associated with the installation of (10) dual Category 6A drops that are 'not' shown on the bidding documents. This work shall be shown during time of installation and contractor shall perform this work at no additional cost to the owner. If additional data drops are not requested, this amount of work shall be returned to the owner in the form of a credit.
- B. Contractor shall install jhook support independently for each colored cable. No mixing of color of cables above drop ceilings in jhooks.

### PART 3 – EXECUTION

#### 3.1 GENERAL INSTALLATION REQUIREMENTS

- A. The wiring of the system shall be executed in accordance with the drawings and the equipment manufacturer's wiring diagrams. Should any variations in these requirements occur, the Contractor shall notify the District's Project Manager before making any changes. It shall be the responsibility of the manufacturer-authorized distributor of the approved equipment to install the equipment and guarantee the system to operate as per plans and specifications.
- B. Furnish all conductors, equipment plugs, terminal strips, etc., and labor to install a complete and operable system.
- C. The cables within the rack or cabinets shall be numbered for identification using machine generated labels wrapped around the cable jacket within 6 inches of termination point. Refer to Labeling Requirements section of this document for additional requirements. Hand written labels are prohibited.
- D. Splicing of any cable is prohibited.
- E. The labor employed by the Contractor shall be regularly employed in the installation and repair of communication systems and shall be acceptable to the District's Project Manager to engage in the installation and service of this system.
- F. The system must meet all local and other prevailing codes.
- G. All cabling installations shall be performed by qualified and manufacturer-trained technicians.
- H. Cable lubricants (i.e. Polywater) shall be used to reduce the cable pull tension stated by the cable manufacturer during cable installation in conduits and innerduct. Contractor shall verify the acceptability of the lubricant to be used with the cable manufacturer prior to using such a lubricant. Lubricants that harden after installation (e.g. Yellow 77) are not allowed. Submit all proposed lubricants for approval PRIOR to use on all low voltage, A/V, coax, fiber optic cable, and voice/data cable installations. Cable lubricants shall be allowed to dry a minimum of 15 days before performing cable certification tests.
- I. Cables may be run exposed above accessible ceilings, provided the cabling is supported independent of other utilities such as conduits, pipes, and the ceiling support systems. The Contractor

shall include all costs in base bid for any additional supports/seismic bracing required by the Local Authority having Jurisdiction. The cables shall not be laid directly on the ceiling panels.

J. Cables for wireless access points shall be terminated above the accessible ceiling tile utilizing a surface mount box. Cable ratings for wireless access points shall be CAT-6A. The surface mount box shall be secured to a metal backplate, and suspended from the building structure with pencil rod or threaded-rod. Cable slack shall be supported via j-hooks. Surface mount boxes shall not be installed unsupported above accessible ceilings. The surface mount box for the wireless access point and the associated cable slack shall be located 10" to 12" above the accessible ceiling tile.

K. The cable jacket composition must meet local and all other prevailing fire and safety codes.

L. All firewalls penetrated by structured cabling shall be sealed by use of a non-permanent fire blanket, UL Classified or Listed firestop device, or other method in compliance with the current edition of NFPA and the NEC or other prevailing code and must be a UL Listed or Classified System. The Contractor must not use concrete or other non-removable substance for fire stopping on cable trays, wireways or conduits. Contractors who use this method will be required to replace all cables affected and provide the original specified access to each effected area. This requirement also applies to maintaining fire ratings of all floors penetrated by conduits or devices designated for use by voice and data cabling.

M. All equipment racks and cabinets shall be bolted to the structural floor by the SCS Contractor in the location shown on drawings. Wall mounted relay rack and wall mounted cabinet kits shall be fastened to structural studs, not drywall or backboard only.

N. Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor before final acceptance at no cost to the Owner.

O. The cable manufacturer's minimum bend radius and maximum pulling tension shall not be exceeded.

P. Cable raceways, when required, shall not be filled greater than the NEC maximum fill for the particular raceway type. Innerduct fill shall not exceed 40 percent.

Q. Cabling that penetrates a wall assembly shall be installed within a conduit sleeve. The conduit sleeve shall have bushings on both ends and be secured to the wall assembly to prevent movement. The Contractor shall provide and install all conduit sleeves as required, whether or not they are indicated on the plan drawings. In non-fire-rated wall assemblies, the Contractor shall provide wool batting in both ends of the conduit sleeve for sound dampening. Refer to sub-sections 2.18 and 3.2.B of this document when penetrating fire-rated assemblies.

### 3.2 SPECIFIC SYSTEM INSTALLATION REQUIREMENTS

A. All communications cabling used throughout this project shall comply with the requirements as outlined in the NEC Articles 725, 760, 770, and 800 (or related CEC Articles), and the appropriate local codes. All copper cabling shall bear UL listed type CMP (Plenum Rated) and/or CM/G (General Purpose) and/or CMR (Riser Rated). All fiber optic cabling shall bear OFNP (Plenum Rated) and/or OFNR (Riser Rated) and/or OFN/G (General Purpose). The SCS Contractor is responsible for installing appropriately rated cable for the environment in which it is installed.

B. Sealing of openings between floors, into or through rated fire and smoke walls, existing or created by the Contractor for placement of new or removal of old cable into or through shall be the responsibility of the Contractor. Sealing material (Approved UL listed system) and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the Contractor's work. Any openings created by or for the Contractor and left unused shall also be sealed as part of this work.

1. Fire stopping work shall be performed by a single Contractor to maintain consistency and accountability on the project.

2. The Contractor shall install penetration firestop seal materials in accordance with design requirements, and manufacturer's instructions.
3. The Contractor's installer shall be certified, licensed or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements.
4. All installed through-penetration firestops shall be identified via label, or stencil. Label shall state that the fill material around the penetrating item is a firestop, and that it shall not be disturbed except by an authorized Contractor. The label shall include the firestop brand name, and the classified system number for which it was installed.

a. Sample Label:

MANUFACTURER'S NAME:  
ATTENTION  
Fire Rated Assembly  
For Any Changes To This System, Please Refer To UL System Listed Below  
PRODUCT:  
HOUR RATING:  
UL SYSTEM:  
INSTALLATION DATE:  
INSTALLED BY: (Contractor's Company name)  
CONTRACTOR LICENSE NUMBER:  
BUSINESS PHONE:  
EMAIL ADDRESS:

- C. The Contractor shall be responsible for damage to any surfaces or work disrupted as a result of his work. Repair of surfaces, including painting, shall be included as necessary.
- D. Cable bundles within the MDF/IDF shall be dressed into bundles of no more than twenty-four (24) cables. Maintain each bundle with half inch-wide hook and loop strips spaced every twelve (12) inches maximum.
- E. All installation shall be done in conformance with TIA/EIA 568-C standards, BICSI TDMM guidelines and manufacturer's installation guidelines. The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide, in a timely fashion, any additional material and labor necessary to properly rectify the situation to the satisfaction and written approval of the District's Project Manager. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.
1. Power Separation: The Contractor shall not place any distribution cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus. Maintain a minimum of 12 inch separation from light fixtures.
  2. Miscellaneous Equipment: The Contractor shall provide any necessary screws, anchors, clamps, hook & loop ties, distribution rings, wire molding (MDF & IDF locations), miscellaneous grounding and support hardware, etc., necessary to facilitate the installation of the System.
  3. Special Equipment and Tools: It shall be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to properly complete the System. This may include, but is not limited to, tools for terminating cables, testing and splicing equipment for copper/fiber cables, communication devices, jack stands for cable reels, or cable winches.
  4. Labeling: The Contractor shall be responsible for printed labels for all pull boxes, conduits, cables, protectors, racks, cabinets, patch panels, connector panels, cords, distribution frames,



and outlet locations, according to the specifications. Hand written labels are prohibited. See LABELING REQUIREMENTS Subsection 3.9 of this document for more information.

5. Cable Storage: The Contractor shall not roll or store cable reels without an appropriate underlay and the prior written approval of Owner's Project Manager.

### 3.3 STRUCTURED CABLING GENERAL INSTALLATION DESCRIPTION

A. The structured cabling system shall consist of any or all of the following subsystems:

1. Work Area Subsystem
2. Horizontal Subsystem
3. Administration Subsystem
4. Backbone Subsystem
5. Equipment Subsystem

B. Work Area Subsystem: The Work Area Subsystem provides the connection between the telecommunications outlet (TO) and the station equipment in the work area. It consists of cords, adapters, and other transmission electronics.

1. Contractor shall supply the wiring or cords that connect terminal devices to telecommunications outlets. This includes mounting cords and connectors, as well as extension cords.

C. Horizontal Subsystem: The Horizontal Subsystem provides connections from the horizontal cross connect to the telecommunications outlets in the work areas. It consists of the horizontal transmission media, the associated connecting hardware terminating this media and outlets in the work area. Generally, each floor of a building is served by its own Horizontal Subsystem(s).

Many two-story buildings have each floor served by IDF rooms/cabinets located on the first floor.

1. Horizontal Cabling

a. Contractor shall supply horizontal cables to connect each telecommunications outlet to the backbone subsystem as shown on the drawings.

b. Unless otherwise noted on the floor plans or within this document, the type of horizontal cables used for each work location shall be 4-pair unshielded twisted pair (UTP).

c. The 4-pair UTP cables shall be run using a star topology format from the administration subsystem to every individual telecommunications outlet. All cable routes, other than those dictated on the drawings, are to be approved by District's Project Manager prior to installation.

d. The length of each individual run of horizontal cable from the administration subsystem to the telecommunications outlet shall not exceed 295-ft (90 m).

e. Contractor shall observe the bending radius and pulling strength requirements of the 4-pair UTP cable during handling and installation.

f. Each run of cable between the termination block and the telecommunications outlet shall be continuous without any joints or splices.

g. All station cable shall be placed in the interior of walls unless otherwise noted in the bid documents/plan drawings.

h. In the event Contractor is required to remove ceiling tiles, such Work shall not break or disturb the ceiling grid. Removal of the ceiling grid must be coordinated with the Owner's Project Manager. All insulation shall be replaced in its original location. Contractor shall be responsible to replace any ceiling tiles that they damage during the course of their work, at no additional cost to the District.

i. Avoid electromagnetic interference (EMI) by maintaining adequate physical separation between telecommunications cabling and possible sources such as, but not limited to, electric motors, electric erasers, electric pencil sharpeners, transformers, fluorescent lighting that share distribution space with telecommunications cabling, copiers that share work area space with line cords and terminals, large fax machines and power cords that supports such equipment. Minimum separation shall be six (6) inches.

j. Contractor shall provide District's Project Manager with detailed cable run diagrams for cable runs within raised floors (if shown on plans) detailing exact locations of cable for review and written approval by Owner's Project Manager.

k. Conduit runs installed above grade by the Contractor should not exceed 100 feet or contain more than two 90 degree bends without utilizing appropriately sized pull box. Pull boxes are not to be used in lieu of a bend.

l. Station cables and riser cables installed within ceiling spaces shall be routed through these spaces at right angles to electrical power circuits.

m. Each station cable shall have a minimum of 3' feet of service slack configured in an "S" shape via J-hooks at rack or wall field end, and 1 foot of service loop at the station outlet end. Service slack shall be located within 15' of the MDF/IDF as required to maintain a neat and "workmanship-like" installation.

D. Administration Subsystem: The Administration Subsystem links all of the subsystems together. It consists of labeling hardware for providing circuit identification and patch cords or jumper wire used for creating circuit connections at the cross connects. All wall field layouts must be approved by Owner's Project Manager prior to rough-in and installation.

1. Separate termination fields shall be created for voice/data, wireless access points, paging, surveillance cameras, clocks, and building energy management system applications.

2. Termination blocks that require rotation after connection of horizontal/vertical wiring will not be allowed.

3. Contractor shall supply cross-connect wire, patch cords and fiber patch cords for cross-connection and inter-connection of termination blocks and fiber optic cable inter-connection units.

E. Backbone Subsystem:

1. The main cable route between two or more buildings is called the Backbone Subsystem. It links the main distribution frame (MDF) in the equipment room to each intermediate distribution frame (IDF). It consists of the backbone transmission media between these locations and the associated connecting hardware terminating this media. It is normally installed in a star topology, with first-level backbone cables beginning at the main cross connect. If needed, second-level backbone cables begin at intermediate cross connects.

2. The backbone subsystem shall include vertical runs (riser) of in-building cable between floors of a multi-story building, if applicable.

3. When called for on the plan drawings, all backbone fiber optic cable(s) installed outside of buildings or underground shall be installed in conduit and terminated in the MDF/IDF Rooms, or as otherwise indicated on the plan drawings, with connectors, in rack mounted or wall mounted fiber patch panels equipped with sufficient panels, couplers and jumper storage shelves to terminate and secure all fibers.

4. When called for on the plan drawings, all backbone multipair copper cable(s) will be terminated in the MDF/MPOE/IDF rooms, or as otherwise indicated on the plan drawings. Backbone multipair cable shall be terminated on building entrance fused protectors as specified elsewhere in this document. The minimum pair count for multipair copper cable between buildings shall be 4-pairs. Refer to bid documents/plan drawings for all required pair counts.

F. Equipment Room Subsystem: The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications closet and the transmission media required to terminate this equipment on distribution hardware.

### 3.4 DAMAGES

A. The Contractor will be held responsible for any and all damages to portions of the building caused by it, its employees or sub-Contractors; including but not limited to:

1. Damage to any portion of the building caused by the movement of tools, materials or equipment.
2. Damage to any component of the construction of spaces.
3. Damage to the electrical distribution system.
4. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.
5. Damage to the materials, tools and/or equipment of the Owner, its consultants, agents and tenants.

### 3.5 PENETRATIONS OF WALLS, FLOORS AND CEILINGS

A. Unless specifically shown on the drawings, the Contractor shall make no penetration of floors, walls or ceiling without the prior written approval of the Owner's Project Manager.

B. Any penetrations through acoustical walls or other walls for cable pathways/cables shall be sealed by the Contractor in compliance with applicable code requirements and as directed by Owner's Project Manager.

C. Any penetrations through fire-rated walls for cable pathways/cables shall be sealed by the Contractor as required by code and as directed by Owner's Project Manager. The Contractor shall be required to work together with the General Contractor and the Electrical Contractor to coordinate and develop all fire stopping methods prior to any cable installation. The Contractor shall also, prior to the commencement of on-site activities, submit to Owner's Project Manager, details of any special systems to be used.

D. Roof penetrations are prohibited. No conduit shall be installed on roofs unless specifically noted on the plan drawings, or approved in writing by the Architect's engineer.

### 3.6 TESTING/WARRANTY

A. Structured Cabling System

1. The Contractor shall provide competent, test equipment manufacturer-trained engineers and/or technicians, authorized by the manufacturer of the cabling system, to technically supervise and participate during all tests for the systems.

2. The Contractor shall test and certify the cabling system to minimum standards as set forth in the TIA/EIA-568-C specifications for Category 6A cable, token ring, and 1000baseT signals.

3. All cables and termination hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions. All conductors of each installed cable shall be verified usable by the Contractor before system acceptance. Any defect in the cable system installation including but not limited to cable, connectors, feed-through couplers, patch panels, splices, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.

4. Each cable shall be tested for continuity on all pairs and/or conductors. Twisted-pair voice cables shall be tested for length, continuity, pair reversals, opens, shorts, transpositions, presence of AC and DC voltages and opens. Twisted-pair horizontal cables shall be tested for the all of the above requirements, plus tests that indicate installed cable performance. Category-6A cables shall be tested using a TIA-568-C.2-1 Category 6A Level III/IEC 61935 Level III or better, ETL certified cable tester/analyzer.

5. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests.

6. The test shall be recorded as pass/fail as indicated by the test set in accordance with the manufacturers recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected/replaced, and the cable re-tested before final acceptance.

7. Each installed cable shall be tested for installed length using a Time Domain Reflectometer (TDR) type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the TIA-568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number.

8. Multi-pair cables – Contractor shall record the following tests on every cable pair in each multipair cable using a TDR type device: record the shortest pair length, continuity, pair reversals, shorts, opens, transpositions, presence of AC and DC voltage.

9. Enhanced Category 6A data cable shall be performance verified using an automated test set. This test set shall be capable of testing for the continuity and length parameters defined above, and provide results for the following tests:

- a. Attenuation (Insertion Loss).
- b. Return Loss (RL).
- c. Near End Crosstalk (NEXT) – measured at both ends of each cable pair.
- d. Attenuation to Crosstalk Ratio (ACR).
- e. Power Sum Near End Crosstalk (PSNEXT).
- f. Power Sum Attenuation to Crosstalk Ratio (PSACR).
- g. Far End Crosstalk (FEXT).
- h. Equal Level Far End Crosstalk (ELFEXT).
- i. Power Sum Equal Level Far End Crosstalk (PSELFEXT).

10. Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the ANSI/TIA/EIA Standard, and the result shown as pass/fail. Individual test results shall be printed directly from the test unit or from a download file using an application from the test equipment manufacturer. The printed individual test results shall include all tests performed, the expected test result, and the actual test result achieved. Contractor shall provide all individual test reports and a summary report of all tests performed.

11. Optical Fiber Cable Testing: All fiber testing shall be performed on all fibers in the completed end to end system by test equipment manufacturer-trained engineers and/or technicians. There shall be no splices unless clearly defined in Section 3 of this specification or on the plan drawings. Testing shall consist of a bi-directional end to end OTDR trace performed per ANSI/TIA/EIA 455-61 & ANSI/TIA/EIA 526 and a bi-directional end to end power meter test performed per ANSI/TIA/EIA 455-53A. The system loss measurements shall be provided at 850 and 1300 nanometers for multimode fibers and 1310 and 1550 for single mode fibers.



a. Pre-installation cable testing: The Contractor shall test all fiber optic cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective during the warranty period.

b. Loss Budget: Fiber links shall have a maximum loss of: (allowable cable loss per km) x (km of fiber in link) + (.4dB) x (number of connectors) = maximum allowable loss.

c. Any link not meeting the requirements of the standard shall be brought into compliance by the Contractor, at no additional cost to District.

12. The Contractor shall provide test documentation to the District's Project manager in a three ring binder(s) and in CD format within three weeks after the completion of a specific project. The binder(s) shall be clearly marked on the outside front cover and spine with the words "Test Results", the project name, and the date of completion (month and year). The binder shall be divided by test type. A paper copy of the test results shall be provided that lists all the links that have been tested, and include link name, overall pass/fail evaluation, date and time of test, cable type and NVP value. Detailed test results shall be provided for each link tested and shall include length, propagation delay, delay skew, insertion loss, return loss, NEXT, ELFEXT, ACR, PSNEXT, PSELFEXT, and PSACR. Detailed test results for each link will also include customer site name, name of standard selected to execute the tests, date and time test results were saved in memory of test unit, brand name model and serial number of tester and revision of the tester software and test standards database in the tester. Individual test data within each section shall be presented in the sequence listed in the test summary records. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation.

13. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be collocated in the binder.

14. The entire SCS system shall be warranted free of mechanical or electrical defects by the Contractor for a period of one (1) year after final acceptance of the installation.

15. Any equipment that is not installed per the manufacturer's recommendation shall be replaced promptly and at no additional cost to the District.

16. Any material showing mechanical or electrical defects shall be replaced promptly at no additional cost to the District.

17. Provide all labor and material warranties for each system, as described elsewhere in this document.

18. At the District's direction, the Contractor shall perform additional random testing which shall consist of a random sample of up to 10% of each installation distribution system. The Contractor shall assume responsibility for providing the proper test equipment and staff to conduct tests. The District's representative shall witness the tests.

19. Should the initial 10% test not be 100% successful (all drops testing over CAT6A specification), the Contractor shall assume responsibility to repair/replace non-passing links, at the direction of the District, and the links to re-verify and resubmitted. A 20% random sample shall then be conducted to ensure proper performance of the system.

20. Should there be failure in this re-test, the Contractor shall be responsible to replace the failed cabling components (cable, jack, patch panel, patch cord, etc.) and repeat the re-test procedure until such time as all cabling is verified.

### 3.7 COMPLETION OF WORK:

A. At the completion of the Systems, the Contractor shall restore to its former condition, all aspects of the project site and on a daily basis, shall remove all waste and excess materials, rubbish debris, tools and equipment resulting from or used in the services provided under this Contract. All clean up, restoration, and removal noted above will be by the Contractor and at no cost to Owner. If the Contractor fails in its duties under this paragraph, Owner may upon notice to the Contractor perform the

necessary clean up and deduct the costs thereof from any amounts due or to become due to the Contractor. It shall be the Contractor's responsibility to remove trash from the areas it is working in and bring trash and debris to the Contractor provided dumpster.

### 3.8 INSPECTION

A. On-going inspections shall be performed during construction by the District's representative. All work shall be performed in a high quality manner and the overall appearance shall be clean, neat and orderly. Any work that does not meet the District's representative's approval shall be removed and reinstalled by the Contractor at no additional cost to the District.

### 3.9 LABELING REQUIREMENTS

A. Numbers must be assigned to each outlet location using a logical designation convention. Contractor will provide the equipment as necessary to generate Panduit PAN-CODE (or Equal) laser printer generated self-laminating labels using the numbering convention shown below and as specified herein. Before any permanent labels are installed on blocks, face plates or cables, Contractor shall submit a sample label of each various type listed below to District's Project Manager for written approval to ensure compliance with the labeling scheme, legibility, etc. Contractor is responsible to provide the labeling scheme as described herein.

B. Station Faceplate (Telecommunications Outlet) Labeling. Contractor shall consult with Owner on preferred labeling scheme. Contractor shall provide sample labels to Owner for review and approval before final labels are printed and installed.

C. Patch Panel Labeling. All copper category 6A rack mounted patch panels shall be sequentially numbered, beginning with the uppermost panel in the rack. Patch panel number shall be printed and attached to both left and right edges and centered. Numbers shall be minimum 1/2" high and printed white on a black background. Contractor shall consult with Owner on preferred labeling scheme. Contractor shall provide sample labels to Owner for review and approval before final labels are printed and installed.

D. Station Cable Jacket Labeling. All Category 6A cables shall be labeled within six inches of each termination end (e.g., at both ends: outlet end and MDF/IDF end) using machine-generated, "P-Touch" type, self-laminating cable markers.

1. Example: IDF2-4/9
2. IDF location where cable originates (i.e., IDF room "#2").
3. Patch panel and port numbers where cable terminates (i.e., patch panel #4, port #9)

E. Backbone and Riser Multipair Cable Labeling. All backbone and riser cables (copper, fiber, coax, etc.) will be labeled to reflect the Origin and Destination abbreviation for the cable and pair counts on large font (16 pitch) self-laminating labels, which shall be located within 18 inches of each end of the cable. Labels shall be placed on the cable to be visible without relocating surrounding cables.

1. Example #1: IDF2/IDF3/CP100/01
2. IDF2: Cable Origination
3. IDF3: Cable Destination
4. CP100: Cable Type & Pair or Strand Count (ex. Copper Cable 100-pair). Other possibilities include CX for coax, HB for hybrid fiber cable, MM for multimode cable, and SM for single-mode cable.)

5. 01: Cable identification number (ex. cable 01). Provide this identifier when there is more than one backbone or riser cable with the same Origin/Destination and pair count.

F. Multipair Cable Termination Block Labels. All multipair cables will be labeled using appropriate terminal-block label strip with label holders. Termination blocks shall be labeled in such a manner to indicate Termination Block number (ex: W1, W2, etc) and type of cables (ex. Fire Alarm-FA, Security Alarm-SE, Paging-PA, FAX machine, etc.).

1. Termination Block Label:
2. Example: W1 – Alarm Cables 1st Floor
3. W1: Wall Field 100-pair 110-block #1
4. Individual cable numbers on label strip:
5. Example: 001
6. Station #1

G. Multipair Cable Termination Block Labels. All multipair riser blocks shall be labeled using appropriate terminal-block label strip with label holders and shall follow the labeling scheme outlined above. Building interconnect cable termination block labels shall be per ANSI/TIA/EIA-606-B. Final label scheme shall be determined by the District's decision.

H. Fiber Enclosure Labels. All fiber enclosures and panels will be labeled using self-laminating laser label markers. Fiber labels shall include all information as specified by the District. Contractor is responsible to provide a labeling scheme that meets with the District's satisfaction. At a minimum, the fiber enclosure label card shall indicate: Destination of connected cables, slash (/), Origination of connected cables, slash (/), and the fiber enclosure number and port number.

1. Example: MDF/IDF2/1-1
2. MDF: Destination Patch Panel Location Designation
3. IDF2: Origination Patch Panel Location Designation
4. 1-1 Indicates fiber enclosure number and fiber port number on both origin and destination fiber enclosures.

I. Equipment Rack/Cabinet Labeling: All equipment racks/cabinets shall be labeled according to their room identifier and a two-digit number. The labels will be engraved plastic plates, with 1"-high white letters on black background. The labels will be attached to the cross member at the top front of each frame or rack with appropriately sized sheet metal screws. Self-adhesive strips, glues, etc. are unacceptable. Racks and cabinets within the same room shall be numbered sequentially from left to right, when facing the front of the racks/cabinets.

1. Example: MDF-01
2. MDF Room Designation
3. 01 Rack Identifier

J. Telecommunications Main Grounding Busbars (TMGB, TGB): All telecom grounding busbars shall be labeled using large font (16 pitch) self-laminating labels. Labels shall indicate "TMGB" or "TGB". If more than 1 busbar is in the room, include a numerical indication (ex: TMGB-1).

### 3.10 MISCELLANEOUS PROJECT REQUIREMENTS

A. Site Cleaning: Throughout the progress of the plant construction, the Contractor shall keep the working area free from debris of all types and remove from the premises all rubbish resulting from any

work done by Contractor. On a daily basis and at the completion of its work, the Contractor shall, to the extent possible, leave the premises in a clean and finished condition.

B. Conduits: All backbone cabling will run through dedicated conduits. All new conduits will be supplied with a pull string. Contractor shall supply pull string and pull rope for the installation of all cables in existing conduits. For all underground conduits left with available capacity, Contractor shall replace pull strings with 1/4-inch pull rope during the course of his work. Contractor must seal all underground low voltage conduits within manholes, underground vaults/pull boxes, and underground conduits that enter a facility, with an approved mechanical water/gas/air tight plug. Unused conduits shall be sealed with a blank plug.

C. Seismic Requirements: Contractor will install all equipment racks, equipment cabinet enclosures, cable runways, etc. according to DSA and local, state and/or federal code. Contractor will notify District's Project Manager of such requirements and shall provide such bracing as required. Contractor to coordinate all installation with the structural Engineer of Record.

D. Safety Requirements: Contractor will utilize appropriate personnel and display warning signs, signals, flags and/or barricades at the work site to ensure adherence to safety regulations and as prudence requires.

E. Specification/Drawing Status: All specifications and drawings related to this project will be "frozen" after shop drawing approval. The District reserves the right to negotiate any future changes with the Contractor at any time.

### 3.11 MISCELLANEOUS SUPPORT REQUIREMENTS

A. Upon approval of shop drawings, Contractor shall immediately place orders for all required materials, components, and supplies. In addition, Contractor shall secure and forward written confirmations (including orders and shipping dates) direct from each manufacturer/vendor to the District's Project Manager.

B. Contractor shall expedite shipment of all materials, components and supplies, as necessary to ensure the successful completion of the Project by the date required. All costs for expediting shall be included within Contractor's pricing as provided below. The system cost herein shall include administration/maintenance training for at least five (5) District representatives with a minimum allotment of two (2) four-hour sessions. All training shall include written and/or video materials that shall remain the property of District. If materials are written, they shall be provided in quantities sufficient for each person trained; if materials are video, one (1) copy of each will be required. The administration/maintenance training shall include, but not be limited to, the following:

1. Review of as-built documentation, including an on-site demonstration of MDF/IDF rooms, typical vaults and pull boxes, station outlets, etc.
2. All warranty information.

C. Minimum standards for maintenance purposes shall include optional access to service on a 24 hour-a-day, 365 day-a-year basis. In addition, Contractor shall, upon notification, respond as follows:

1. Emergency Response: Contractor must respond by utilizing remote diagnostics capabilities (as applicable) within thirty minutes of notification. If necessary, Contractor must dispatch at least one certified technician for arrival on-site within two hours of notification.
2. Non-Emergency Response: Contractor shall respond by utilizing remote diagnostics capabilities and or cause dispatch of at least one certified technician for arrival on-site within one business day of notification.

3. Definition of "Emergency": For maintenance purposes, "emergency" shall be defined as one or more of the following conditions:

- a. Defects of any riser pairs and/or components involving at least ten percent (10%) of any riser cable's capacity.
- b. Defects of station cable pairs and/or components involving at least ten percent (10%) of any department or group of voice and/or data stations.
- c. Defects significantly impairing any single attendant console.
- d. Defects of any fiber optic cable and/or components involving at least ten percent (10%) of any department or group's fiber-based systems and/or stations.
- e. Any pre-defined failure as submitted by District and agreed to be Contractor.

### 3.12 FINAL ACCEPTANCE

A. The District or District's representative may visit the site during the installation of the system to ensure that correct installation practices are being followed.

B. The District or District's representative will conduct a final job review once the Contractor has finished the job. This review will take place within one (1) week after the Contractor notifies the District.

C. Two (2) copies of all certification data and drawings for all identifications shall be provided to the District before the District's review.

D. The District or District's representative will review the installation and certification data prior to the system acceptance.

E. The District or District's representative may test some of the systems features to ensure that the certification data is correct. If a substantial discrepancy is found, the District reserves the right to have an independent consultant perform a certification of the entire system. If such a procedure is undertaken, the cost of the testing will be billed back to the Contractor.

F. In the event that repairs or adjustments are necessary, the Contractor shall make these repairs at his own expense. All repairs shall be completed within ten (10) days from the time they are discovered.

G. The Contractor shall provide two (2) copies of an "operating and servicing manual" for the system within fourteen (14) calendar days of District's final acceptance of the system. The manuals shall be bound in flexible binders. All data shall be printed material or typewritten. Each manual shall include the following: instructions necessary for the proper operation and servicing of the system; complete as-built installation drawings of the system (11"x17"); equipment specification cut sheets, complete performance test data, complete warrantee information and replacement parts list with current prices listed, contact information for repair and warranty work requests.

1. The Contractor shall mount a full size 30" x 42" bond copy of each scaled Site Plan within MDF room with removable Plexiglas front cover. Frame and cover shall be sized to house the site plan and floor plan drawings. Coordinate location of frame with District's Project Manager prior to installation.

2. In each IDF cabinet, the Contractor shall provide a full size 30' x 42" bond copy of the Site Plan and the floor plan of the building in which the IDF cabinet is located. These plans shall be folded and inserted into a protective document holder and labeled on the outside as "As-Built Documents".

3. The Contractor shall hand to the District a copy of any applicable installation specific software configurations including all log-in passwords in CD or USB flash drive format.

END OF SECTION