SECTION 271000 – STRUCTURED CABLING SYSTEM

Part 1 - General

1.1 Work Included

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in the Specifying Documentation.
B. Provide coordination between Division 260000 and 27xxxx specifications.

1.2 Related Work in Other Sections

A. Raceways, cabling and active electronics for;
1. 270010 Communication Raceways
2. 271000 Structured Cabling
3. 272000 Network Electronics
4. 273000 VoIP Telephone
5. 274010 Classroom Audio Visual
6. 277000 Intercom Master/Clock/Paging
7. 279010 Burglar Alarm

B. All 120VAC power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed by Division 260000 contractor.
C. All raceway systems including but not limited to conduit, j-boxes, outlet boxes, floor boxes, & surface mounted raceway shall be furnished and installed by Division 260000 contractor.

1.3 Scope of Work

A. This document describes the requirements for the contractors, products and installation relating to furnishing and installing Telecommunications Cabling systems.
B. The Horizontal Cabling System as described in this document is comprised of cabling, infrastructure, J-hook pathways and termination devices for Data systems.
C. Contractor will provide a bid including all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in this Document. It is the responsibility of the Contractor to provide all material necessary to provide a complete and operable system. If the contractor feels that the system described is incomplete they must address this in writing to the Owner/Owner's Representative before providing a bid.
D. All questions concerning non specified product and services will be address to the Owner's Representative before Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that the Contractor has provided a competent bid for a complete solution.
E. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.4 Regulatory References

A. Contractor will comply will all Federal, State, Local Codes/Regulations and Industries Standards.
1. Federal:
- NFPA 70 - National Electric Code(NEC)
- FCC; Part 15 & Part 6A8

2. State of California:

- CCR Part 2 - Uniform Building Code.
- CCR Part 3 - California Electrical Code
- Occupational Safety and Health Act (OSHA).
- Title 24, Building Standards, State of California.
- Title 19, California Code of Regulations.
- Title 8, Electrical Safety, State of California

3. Industry Standards:

B. Industry Standards:
The following industry standards are the basis for the structured cabling system described in this document.

1. ANSI/TIA
   - ANSI/TIA-568-C.0 - Generic Telecommunications Cabling for Customer Premises, or most recent revision at the time of installation
   - ANSI/TIA-568-C.1 – Commercial Building Telecommunications Cabling Standards, or most recent revision at the time of installation
   - ANSI/TIA-568-C.2 - Balance Twisted Pair Communications and Components Standards, or most recent revision at the time of installation
   - ANSI/TIA-568-C.3 - Optical Fiber Cabling Components Standard
   - ANSI/TIA –942 -Telecommunications Infrastructure for Data Centers, or most recent revision at the time of installation
   - TIA-569-B - Commercial Building Standard for Telecom Pathways and Spaces, or most recent revision at the time of installation
   - ANSI/TIA-606-A – Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, or most recent revision at the time of installation
   - ANSI-J-STD-607-A - Commercial Building Grounding/Bonding Requirements, or most recent revision at the time of installation
   - ANSI/TIA 1152 – Testing of Copper Links
2. National Electric Codes
   - National Electrical Safety Code (NESC) (IEEE C 2)
   - National Electrical Code (NEC) (NFPA 70)
3. ISO/IEC
   - ISO 11801 - Generic Cabling for Customer Premises
4. OSHA Standards and Regulations – all applicable
5. Local Codes and Standards – all applicable
6. BICSI
   - Telecommunications Distribution Methods Manual 12th Ed., or most recent revision at the time of installation.
   - Information Transport Systems Installation Methods Manual (ITSIMM), 5th Edition,, or most recent revision at the time of installation. All parts unless otherwise required must be ROHS compliant.

C. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

D. This document does not replace any code, either partially or wholly. The contractor must be aware of and comply with all local codes that may impact this project.

1.5 Contractor Qualifications/Quality Assurance

A. Safety and Indemnity

1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 A. Safety & Indemnity".

B. Contractor Qualifications

1. Contractors will submit the necessary documentation to demonstrate their compliance with Section 270000 "1.5 B. Contractor Qualification".

C. Quality Assurance
1. Contractor shall comply with all requirements as specified in Section 270000 "1.5 C. Quality Assurance".

D. Warranty
1. Contractor shall comply with all requirements as specified in Section 270000 "1.8. Acceptance & Warranties".

1.6 Submittal Documentation

A. The successful contractor shall provide their submittal package in accordance with the Section 01 20 00 1.06 Submittal Schedule, and Section 270000 "1.6 Submittal Documentation".

1.7 Equivalent Products

A. All Products described and Part Numbers given in this Specification are those of Panduit unless otherwise noted.

B. Approved Equals:
1. Leviton & CommScope
2. Contractors wishing to approve a system other than those specified in this document will be required to perform the following:
   - Provide System specifications and cutsheets for all system components for the proposed new system(s).
   - Provide an itemized comparison to each of the system functions as described in this specification. Include in that document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria: "exceeds"/"matches"/ "unequal".

B. All other products than those specifically addressed in the bid document that the Contractor is seeking approvals for must be submitted in accordance with Division 1, 01620 Product Options and Substitutions.

C. Failure to received written approval for product installed that deviates from the products called for in this specification and/or on the project drawings will result in the contractor having to replace the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.

Part 2 - Products

2.1 Work Area Subsystem

The Work Area shall consist of the connectivity equipment used to connect the horizontal cabling subsystem and the equipment in the work area. The connectivity equipment shall include the following options:

- Patch Cords
- Modular Inserts and Jacks
- Faceplates

A. Patch Cords
1. Category 6A Data/Voice Outlet Patch Cords
   - All category 6AA channel patch cords shall be constructed with a snaggless boot, made of molded PVC, colored matched to the color of the patch cord cable.
   - Category 6A/Class EA, UTP patch cords shall be constructed of 23 AWG stranded copper cable with an enhanced performance modular plug on each end. Copper conductors in patch cable shall be twisted in pairs and

separated by a quadrant separator. All four pairs shall be surrounded by matrix tape and a flame retardant jacket. The patent pending matrix tape shall suppress alien crosstalk and allow 10 Gb/s transmission. Patch cord cable shall be offered in multiple colors and lengths for design flexibility with a strain relief boot on each modular plug. All patch cords shall be compatible with both T568A and T568B wiring schemes. All category 6A channel patch cords shall be 100% factory tested to pass return loss (RL) and near-end cross talk (NEXT).

- ***All patch cords will be delivered to the site and must be signed for by the Owner/Owner's Representative. It will be the responsibility of other to install all Work Area Data Patch Cords.***
- Patch cords will be at least 16 feet long.
- **Color:** Data Patch Cords will be **BLUE**
- **Quantity:** Contractor will provide one patch cord for every outlet cable shown on the drawings.

Part Number	Description
UTP6A16BU	10g Cat 6A Patch Cord-Blue

B. Modular Inserts and Jacks

1. Category 6A/Class EA, 8-position, UTP jack module shall terminate 4-pair, 22 – 26AWG, 100 ohm unshielded twisted pair cable and shall not require use of a punch down tool. UTP jack modules shall use a forward motion termination method to optimize performance by maintaining cable pair geometry while eliminating conductor untwist. The patent pending matrix split foil tape shall suppress the effects of alien crosstalk, allowing 10 Gb/s transmission even in high density 48-port,1RU patch panels. The termination cap shall be color-coded blue to designate Category 6A performance and shall include a universal label coded for T568A andT568B wiring schemes. The Mini-Com® TX6A™ 10Gig™ UTP Jack Module must be installed as part of the TX6A™ 10Gig™ UTP Copper Cabling System to achieve IEEE 10GBASE-T certified performance.

   - **Color:** Data Jacks will be **BLUE or WHITE** (owner preference) and **GRAY** when located in Metallic Surface Raceways
   - **Quantity:** Contractor will provide one jack for every outlet cable shown on the drawings.

Part Number	Description
CJ6X88TGBU	Category 6A, RJ45, 10 Gb/s, 8-position, 8-wire universal module. **Blue**

2. Blank Insert
   - **Color:** Blank Insert to be **WHITE**
   - **Quantity:** Contractor will provide one insert for every video outlet cable shown on the drawings.
   - **Panduit Part#:** CMBWH-X

C. Wall Mount and Modular Furniture Faceplates

1. Voice/Data/Video Wall Plates
   - Faceplates shall be UL Listed and CSA Certified
   - Faceplates shall be 2.75" W x 4.5" H (6A9.8 mm x 114.3 mm)
   - Faceplates shall provide for TIA/EIA 606A compliant station labeling.

- Faceplates shall have plastic covers over the mounting screws that can be replaced with a clear plastic window over a printable paper insert.
- **Color:** Faceplate to be **WHITE**
- **Quantity:** Contractor will provide one single gang faceplate for each outlet shown on the drawings.

Part Number	Description
UICFP2WH	Single gang, vertical faceplate holds up to two Mini-Com® Modules
UICFP4WH	Single gang, vertical faceplate holds up to four Mini-Com® Modules
UICFP6WH	Single gang, vertical faceplate holds up to six Mini-Com® Modules. Requires min. 1.9" wide in-wall box or wallboard adapter for proper installation

2. **Blank Wall Plates**
   - Faceplate shall be constructed from stainless steel.
   - Faceplates shall be UL Listed and CSA Certified
   - Faceplates shall be 2.75" W x 4.5" H (6A9.8 mm x 114.3 mm) for single gang.
   - **Color:** Faceplate to be **STAINLESS STEEL**
   - **Quantity:** Contractor will provide one faceplate for each unused data/voice/video/intercom outlet shown on the drawings.
   - **Part#:** Equal to Hubbell Wiring Device, PN# S13

3. **Surface Mount Raceway Insert**
   Inserts for Wiremold's 4050, 5450 and 5550 Device Mounting Brackets
   - Insert shall allow for two category 6A jacks to be mounted flush.
   - Insert shall match the color of the Raceway installed.
   - **Color:** Faceplate to be **IVORY**
   - **Quantity:** Contractor will provide one 2port insert for each outlet in the Surface Mount Raceway shown on the drawings.
   - **Part#:** Equal to Wiremold, PN# 5507FRJ

2.2 Horizontal Distribution Cabling

The horizontal distribution cabling system is the portion of the telecommunications cabling system that extends from the Work Area (WA) telecommunications outlet/connector to the horizontal cross-connect in the Telecommunications Room

- Cabling Support System
- Copper Station Cabling
- Copper Cross-Connect Cabling

A. Cabling Support System

1. J-Hooks
   - Cable supports shall provide a bearing surface of sufficient width to comply with required bend radii of high-performance cables; cULus Listed.
   - Cable supports shall have flared edges to prevent damage while installing cables.
   - Cable support system shall provide fasteners that allow them to be mounted to wall, concrete, joist, tee-bar wire, treaded rod, beams and raised floor supports.
   - Fasteners shall have the ability to either be factory or jobsite assembled; rated for indoor use in non-corrosive environments; cULus Listed.
   - Fastener to with one non-continuous cable support, factory or jobsite assembled.
   - **Color:** NA

- **Quantity:** Contractor will provide quantities of j-hooks and hanger accessories in the amount necessary to support all horizontal cabling every 4-5 feet. See Drawings for J-hook pathways.

Panduit Part Number	Description
JP75W-L20^ JP75WP-L20^	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw. J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole for user supplied fasteners.
JP131W-L20 JP131WP-L20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw. J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole for user supplied fasteners.
JP2W-L20^‡** JP2WP-L20^	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw. J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole for user supplied fasteners.
JP4W-X20^‡** JP4WP-X20	J Hook for wall mount applications. One 1/4" (M6) mounting hole for user supplied screw. J Hook for powder actuated installation on walls. One 5/32" (M4) mounting hole for user supplied fasteners.

**Suitable for use in air handling spaces in accordance with Sec. 300.22(c) and (d) of the National Electrical Code when mounted as single units or in pairs. JP4 family of parts suitable for use in single unit configurations only. Listed in accordance with CAN/ULC S102.2 when mounted as single units or in pairs. Maximum spacing of 4' (1220mm) required between mount points. (Flame Spread Rating = 0, Smoke Developed Classification = 20) ^ Available in red. Replace -L20 with -L2 or -X20 with -X2 in part number suffix. ‡ Available in blue. Replace -L20 with -L6 or -X20 with -X6 in part number suffix

B. Copper Station Cable

1. Category 6A Data/Voice/ S-Video Copper Unshielded Twisted Pair (UTP) Cable **Cable Specifications**:
   - Exceeds requirements of ANSI/TIA-568-C.2 Category 6A, IEEE 802.3an-2006, and ISO 11801 Class EA channel standards. Exceeds requirements of ANSI/TIA-568-C.2 Category 6A and IEC 61156-5 Category 6A component standards Patent-pending cable design suppresses alien crosstalk with enhanced internal electrical performance
   - Round cable design with reduced cable diameter enables improved cable bundling and optimizes fill capacity. Flame rating: IEC 60332-1 and UL 1685. Cable diameter: 0.305 in. (7.7mm) nominal
   - Installation temperature range: 32°F to 140°F (0°C to 60°C) Operating temperature range: -4°F to 167°F (-20°C to 75°C)
   - Descending length cable markings enable easy identification of remaining cable which reduces installation time and cable scrap
   - The cable shall consist of four unshielded twisted pairs of thermoplastic insulated bare copper enclosed in a thermoplastic jacket.
   - All cable shall conform to the requirements for communications circuits defined by the National Electrical Code (Article 800) and the Canadian Building Code. Cable listed to NEC Article 800-51(a) will be used for "Plenum" installations. Cable listed to NEC Article 800-51(b) shall be installed in vertical runs penetrating more than one floor.
   - Cable shall have been certified with the UL 16A6A6A Vertical Tray Flame Test.
   - Cable shall be available in a Plenum, Riser and Indoor/Outdoor rated jackets.
   - Contractor will use the indoor/outdoor rated cable for all locations where the cable pathway goes underground and/or run in exterior conduit.

- The listed Category 6A cables in this specification are manufactured by General. All other manufactures eligible for Panduit's *Certification Plus* also have been pre-approved.
- **Color:**
  Data cable jacket will be **BLUE**
- **Quantity:** See Drawing for quantity and installation details.

General Part Number	Description
7133819	Genspeed 10k Cat 6A Blue
7131819	Genspeed 10k Cat 6A Blue Plenum

C. Horizontal Copper Cross-Connect Cabling

1. **Data Cross-Connect Cabling**
   - Cable shall meet and/or exceed the UL Listed Type CMR and the ANSI/TIA/EIA 568C.1 standard for Category 6A compliance.
   - Core Construction
     - Conductors: Solid-copper conductors, 23 AWG.
     - Insulation: Polyolefin.
   - Jacket: Gray, Non-Plenum PVC jacket.
   - **Color:** Data cable jacket will be **GRAY**
     Quantity: Will be equal to the number of jacks installed.
     Part#: Equal to General Cable, PN# **7133821**
2. **Voice Cross-Connect Cabling**
   - Cable shall meet and/or exceed the UL Listed Type CMR and the ANSI/ICEA S-80-576A standard.
   - Core Construction
     - Conductors: Solid-copper conductors, 24 AWG.
     - Insulation: Flame retardant semi-rigid PVC.
     - Core Assembly: Cable core will be made up of 100 pair units consisting of four (4) 25 pair sub-units. Each group individually identifiable by color coded unit binders.
   - Jacket: Gray, flame retardant PVC jacket.
   - **Color:** Voice cable jacket will be **GRAY**
   - **Quantity:** See Drawing for quantity and installation details. The number of 25-pair cable between the MDF and the IDF shall be derived by multiplying the number of pairs required for the cross-connect by 1.25 to the nearest 25-pair increment.
   - **Part#:** Equal to General Cable:
     25 pair = PN# 6A97006A5
     50 pair = PN# 6A970123
     75 pair = PN# 7002975
     100 pair = PN# 700296A7

2.3 Backbone Cabling

The backbone cabling system is the portion of the telecommunications cabling system that extends from the Intermediate Distribution Frame (IDF) to the Main Distribution Frame (MDF).

- Fiber Optic Backbone Cabling
- Copper Backbone Cabling

A. Fiber Optic Backbone Cabling

1. Data System Backbone Cabling
   - Cable shall be UL/cUL OFNR/OFN FTA rated and be Flame Resistant in accordance with the UL 16A6A6A.
   - Cable shall an indoor/outdoor rated jacket.
   - Cable shall be constructed utilizing a loose tube design.

- Cable will be fully water blocked combining overall water blocking tape and a moisture blocking gel for each individual tube.
- Cable will maintain the following:
  - Crush Resistance (EIA-455-41) = 2000 N/cm
  - Impact Resistance (EIA-455-25) = 2000 Impacts w/1.6A N-m
  - Min Bend Radius:
    Long Term - No Load = 15x Cable diameter
    Short Term – Load = 20x Cable diameter
  - Operating Temp. = -40°C to +70°C
  - Storage Temp. = -40°C to +80°C
- Cable shall be constructed of 50/125µ Multimode Laser Optimized rated glass and 9/125µ Singlemode capable of:
  1 Gigabit Ethernet Link at 1000m/6A00m (@850nm/1300nm)
  10 Gigabit Ethernet Link at 300m/300m (@850nm/1300nm)
- The Fiber Optic Cable in this specification is manufactured by General cable. All other manufactures eligible for Panduit's *Certified Premise Solution* that meet and/or exceed the below specifications have also been pre-approved.
- **Color:** Fiber Optic cable jacket will be **BLACK**
- **Quantity:** See Drawing for quantity and installation details.
- **Part#:** Equal to General Cable,
  50/125 MM PN# BC006A4M1A-DWB
  9/125 SM PN# AQ006A4M1A-DWB
  **Provide two Field Breakout Kits, General PN# BOKP, for each Fiber Optic Cable run.*
- Contractor may choose to provide a single hybrid sheath instead of two cables at time of installation.

B. Copper System Backbone Cabling

1. Voice/Intercom System Backbone Cabling
   - Cable shall meet or exceed those specified in RUS Bulletin 1753F-208 (REA PE-89)
   - Core Construction
     - Conductors: Solid, annealed copper, 24 AWG unless otherwise noted on design documents.
     - Insulation: Dual insulation consisting of an inner layer of foamed polyolefin skin, colored coded in accordance with industry standards
     - Core Assembly: Cables of 25 pairs and less formed by assembling pairs together in a single group. Cables of more than 25 pairs formed by twisted pairs arranged in groups with each group having a color coded unit binder.
     - Filling Compound: The entire core assembly completely filled with ETPR compound, filling the interstices between the pairs and under the core tape.
     - Core Wrap: Non-hygroscopic dielectric tape applied longitudinally with an overlap.
   - Sheath Construction
     - Aluminum Shield: Corrosion protected plastic coated, corrugated 0.008" aluminum tape.
   - Jacket: Black, linear low-density polyethylene.
   - **Color:** Voice cable jacket will be **BLACK**
   - **Quantity:** See Drawing for quantity and installation details. The number of 25-pair cable between the MDF and the IDF shall be derived by multiplying the number of pairs serving the individual telephone handsets by 1.25 to the nearest 25-pair increment.
   - **Part#:** Equal to General Cable:
     25 pair = PN# 7525758
     50 pair = PN# 7525793
     75 pair = PN# 7525801
     100 pair = PN# 7525819

200 pair = PN# 7525835

2.4 Telecommunication Room

The Telecommunication Room (TR) includes those products that terminate horizontal and backbone cabling subsystems and connect then to the network equipment.

- Patch Cords
- Horizontal Cabling Termination Equipment
- Backbone Cabling Termination Equipment
- Cabinets, Racks, and Enclosures
- Cable Support System
- Grounding and Bonding Equipment

A. Patch Cords

1. Copper Patch Cords

   Category 6A Data/Voice TR Patch Cords

   - TR Copper Patch Cords shall comply with those specified in ***2.1 Work Area Subsystem, A. Patch Cords, 1. Category 6A Data Outlet Patch Cords***
   - *All patch cords will be delivered to the site and must be signed for by the Owner/Owner's Representative. It will be the responsibility of other to install all TR Data and Voice Patch Cords.*
   - **Color:**
     Data Patch Cords will be **BLUE**
   - **Quantity:** Contractor will provide one patch cord for every data and voice outlet cable shown on the drawings. Contractor will provide the quantity of different length patch cords as follows:
     For the HC's, Contractor will provide:
     All patch cords will be 3ft.

Panduit Part Number	Description
UTP6A3BU	Category 6A, 10 Gb/s UTP patch cord with TX6™ PLUS Modular Plugs on each end

2. Fiber Patch Cords

   Fiber Optic TR Patch Cords

   - Patch Cords shall be a Duplex SC to SC 50/125µm "Laser Optimize" Graded-Index Multimode Fiber Patch Cord.
   - All patch cords shall be factory polished and 100% optically tested for superior performance.
   - Cables shall have a Mated Pair MM Insertion Loss of less than 0.6A0 dB (0.25 dB Typical).
   - Cable Retention: > 25 pounds
   - All optical, mechanical and environmental performance shall meet and/or exceed the TIAEIA-56A8-B.3 specifications.
   - Fiber patch cords will be 1 meter long.
   - **Color:** NA
   - **Quantity:** Contractor will provide two fiber patch cords for every TR shown on the drawings.

Panduit Part Number	Description
FXD3-3M1Y	SC to SC multimode duplex patch cord, 3mm jacketed cable (one duplex SC connector on each end) – 10Gig™ 50/125µm.

B. Horizontal Cable Termination Equipment

1. Copper Termination Equipment
   Data/Voice Category 6A Patch Panels
   - Panels shall be made of black anodized aluminum in 24, 48, and 96 port configurations.
   - Panels shall have modular jacks employing a tri-plane staggered contact array with a flat "hairpin" contact design made of Beryllium copper with a minimum 50-micro-inch gold plating on contact surfaces over 50-100 micro-inch of nickel compliant with FCC part 6A8.
   - Panels shall be equipped with 110-style termination made of fire retardant UL 94V0 rated thermoplastic and tin lead solder plated IDC.
   - Panels shall have optional rear cable support bar for strain relief. Cable support bar shall attach to the rear of the patch panel itself without the use of additional fasteners or screws.
   - Panels shall have self-adhesive, clear label holders and white designation labels provided with the panel for each row of 24 ports.
   - Panels shall provide wiring identification & color code and maintain an in-line, paired punch down sequence that does not require the splitting of conductors from individual cable pairs.
   - Panels shall terminate 22-26 AWG solid conductors, maximum insulated conductor outside diameter 0.050".
   - Panels shall be ANSI/TIA/EIA-568-B.1, B.2 and ISO/IEC 11801 category 6A compliant.
   - Panels shall be UL LISTED 1863 and CSA certified.
   - Panels shall be made by an ISO 9002 Certified Manufacturer.
   - Panels installed in a 4-connector channel with a category 6A modular jack, and category 6A patch cords, all from the same manufacturer, and a qualified category 6A cables shall meet or exceed the requirements of Draft 5 of the TIA UTP Systems Task Group PN3727, Category 6A Draft Addendum to the ANSI/TIA/EIA-568-B.2 standard.
   - **Color:** Patch Panel shall be **BLACK**
   - **Quantity:** See Drawing for quantity and installation details. The number of patch panels to be supplied shall be derived by multiplying the number of data/voice cables being terminated at the individual TR by 1.25 and providing additional panels in the nearest 24 port increment.

Panduit Part Number	Description
CPP24FMWBLY	24-port flush mount patch panel supplied with rear mounted faceplates
CPP48HDEWBL	48-port high density flush patch panel with enhanced labeling features and compatibility with Panduit hand-held printers. (Only accepts Mini-Com® Modules for UTP applications)

2. Intercom 110 Wiring Blocks
   - Blocks shall be available in a 100 pair unit.
   - Blocks shall be wall mounted.
   - Wiring blocks shall be available as kits that include the wiring blocks, the proper number of 4 pair connecting clips and label strips.
   - Blocks shall be constructed of a UL94 V0 rated polycarbonate blend.
   - Blocks shall have stand-off legs.
   - Blocks shall be UL VERIFIED for TIA/EIA-56A8-B compliance.
   - **Color:** NA
   - **Quantity:** See Drawing for quantity and installation details. The number of 110 blocks to be supplied shall be derived by multiplying the number of

intercom cables being terminated at the individual TR by 1.25 and providing additional panels in the nearest 100 pair block increment.

- **Part#:** 100 pair block kit, PN# GPBW24-X

C. Backbone Cable Termination Equipment

1. Fiber Optic Connectors
   - TIA/EIA-604 FOCIS-3 compliant connectors
   - Exceed TIA/EIA-568-B.3 requirements
   - Insertion loss: 0.3dB average (multimode and singlemode)
   - Return loss: >26dB (10Gig™ multimode), >20dB (multimode), >50dB (singlemode) Operating temperature: 0-6A0°C
   - Materials:
     Connector ferrule: Zirconia ceramic
     Connector body/nut: Nickel plated brass/zinc or polymer
   - Crimp insert/crimp tube: Nickel plated brass/thermoplastic elastomer polymer
   - Dust cap: Nylon or PVC
   - Strain relief boot: Flame retardant (UL-Rated 94-V0) polymer
   - **Color:** NA
   - **Quantity:** See Drawing for quantity and installation details.

Panduit Part Number	Description
FSCMCXAQ	SC OptiCam® 10Gig™ 50/125µm OM3/OM4 Multimode Simplex Fiber Optic Connector for 900µm tight-buffered fiber installation
FSCSCBU	SC OptiCam® Singlemode Simplex Fiber Optic Connector for 900µm tight-buffered fiber installation.

2. Copper Termination Panels
   Voice/Intercom 110 Wiring Blocks
   - Blocks shall be available in a 300 pair unit.
   - Blocks shall be wall mounted.
   - Wiring blocks shall be available as kits that include the wiring blocks, the proper number of 5 pair connecting clips, wire management and label strips.
   - Blocks shall be constructed of a UL94 V0 rated polycarbonate blend.
   - Blocks shall be mounted to a rugged 16 ga steel distribution frame. Frame shall support the 110 blocks and allow for a through for cables to be routed through the rear of the blocks directly to the termination point.
   - Blocks shall be UL VERIFIED for TIA/EIA-568-B compliance.
   - **Color:** NA
   - **Quantity:** See Drawing for quantity and installation details. The number of 110 blocks to be supplied shall be derived by multiplying the number of voice/intercom cables being terminated at the individual TR by 1.25 and providing additional panels in the nearest 300 pair block increment.

Panduit Part Number	Description
P110B1004R4WJY	Two 100-pair bases and jumper troughs premounted to 19" rack mount panel. 4-pair connector kit included with five 4-pair connectors and one 5-pair connector per row of 25 pairs.

3. OSP Protection Panels
   - 110 connector input and output
   - wall or frame mountable

- designed with an internal splice chamber and cover over incoming and outgoing connections and protection modules
- stackable to allow for future service expansion
- equipped with an internal fuse link
- external ground connectors accept 6-14 AWG ground wire
- accommodates industry standard 5 pin protection modules
- designed to exceed the requirements set forth in Underwriters Laboratory's UL497
- **Color:** NA
- **Quantity:** See Drawing for quantity and installation details.
  Part#: Circa Enterprise inc.
  25 pair block, PN# 1880ECA1-25
  50 pair block, PN# 1880ECA1-50
  100 pair block, PN# 1880ECA1-100

4. OSP Protection Fuse's
   - 75VDC (RUS Approved)
   - Nanosecond response time
   - External failsafe mechanism that permanently carbon arrestors grounds the module under sustained high current conditions
   - Integrated Test Points
   - UL & cUL listed
   - Designed to meet or exceed Telcordia standards
   - ISO 9002 Certified Manufacturer
   - **Color:** RED
   - **Quantity:** See Drawing for quantity and installation details.
     Part#: Circa Enterprise inc. 4B3S-75
     **Provide 100% fuse density for all installed Protection Panels.*

5. Fiber Termination Panels & Enclosures
   HC Rack Mount Fiber Panel
   - Panels shall be constructed of cold rolled 16A gauge steel with a black powder paint finish.
   - The panel shall have a hinged swing-out fiber drawer. Panels shall come with rack mounting brackets that allow it to be mounted on a 19" or 23" rack. Panel shall occupy no more than one rack space.
   - Panel shall be constructed to accept up to 3 adaptor panels.
   - Panels sh*all have cable entrance points i*n the *rear*, which are covered by knock-outs
   - Panels shall be constructed of cold rolled 16A ga. steel with a black powder paint finish and provide for fully enclosed fiber patching and termination.
   - Panels shall be 1 to 3 rack spaces, accepting 3 or 9 adapter panels.
   - Adapter panels shall be available with SC multimode adapters. Adapter shall have a zirconia alignment sleeve.
   - Panel shall have a splice tray mounting stud incorporated into the base for mounting of mechanical or fusion splice trays. Adapter tray shall have cable management anchor points and come with cable anchors allowing for the maintenance of the incoming cable with the proper minimum bend radius.
   - Panels shall have four cable entrance ports on the top and 2 on the bottom, which are covered by knock outs. Panels shall have two jumper ports in the bottom at the front of the panel with plastic dust covers for routing of jumpers.
   - **Color:** Fiber Panel will be **BLACK**
   - **Quantity:** See Drawing for quantity and installation details.

Panduit Part Number	Description
FRME1	1 RU fiber enclosure accepts 3 FAPs
FRME3	3 RU fiber enclosure accepts 9 FAPs
FAP6WBUDSCZ	6-port Duplex SC Adaptor Panel
FAPB	Blank Panels

D. Cabinets, Racks, and Enclosures

Contractor will provide the following 'HC' Enclosures and components based on the number of cables to that will be terminated:

1. Wall-mounted cabinets
   - Wall-mounted cabinets shall be manufactured from steel sheet.
   - Each cabinet will have a rear panel that attaches to the wall, a hinged cabinet body that swings open from the rear panel providing easy access to the rear of equipment and a locking front door.
   - The rear panel will provide cable access with pre-punched knockouts, up to 3", for conduit along the top and bottom edges of the panel. There will also be cutouts in the back of the rear panel so that cables can enter the panel through the wall. The rear panel will provide attachment points for accessory equipment mounting brackets and cable tie points within the panel (cabinet).
   - The cabinet body will include a single pair of vertical 19" EIA equipment mounting rails. The mounting rails will be EIA-310-D compliant with the Universal hole pattern. Mounting holes will have #12-24 threads.
   - Mounting rails will be adjustable in depth so that they can be positioned at any point within the cabinet body. The design of all cabinets will allow an additional pair of mounting rails (for a total of two pairs of mounting rails per cabinet) to be added to the cabinet.
   - The wall-mount cabinet shall provide a hinge design that attaches the cabinet body and the rear panel and allow the rear panel to be removed during installation. The hinge design will allow the cabinet body to open at least 90°. The hasp used to secure the rear panel and the cabinet body together will assist in drawing the components together during the locking action.
   - The cabinet body will include vents that are designed to accept fan kits.
   - The front door will be hinged and locking. The front door and rear panel will be keyed alike. The front door will have rounded edges and corners. The cabinet body will allow the front door to be attached so that it will swing open from the right or left. The cabinet manufacture shall provide an option for a solid or a tinted plexi-glass window front door. The plexi-glass in doors shall be bronze acrylic (not clear) with a UL flammability classification of 94HB or better.
   - Finish shall be epoxy-polyester hybrid powder coat (paint).
   - The cabinet shall have the option of being delivered fully assembled. All cabinets will include installation hardware (hex lag screws) for wood studs and 50 each #12-24 equipment mounting screws.
   - Load bearing capacity for cabinets that wall-mount will be a minimum of 200 pounds per cabinet.
   - Cabinets that are wall-mount only will be certified and UL Listed to standard UL 60950 under category NWIN.
   - **Color**: Wall Mount Cabinet will be **BLACK**
   - **Quantity**: See Drawing for size, quantity and installation details.
   - **Part#**:
     Wall Mount Cabinet
     12U Cabinet equal to Chatsworth Products, PN# 11900-724
     18U Cabinet equal to Chatsworth Products, PN# 11900-736
     26U Cabinet equal to Chatsworth Products, PN# 11900-748

**Contractor will provide an additional set of mounting rails for each wall mount cabinet, equal to Chatsworth Products PN# 12787-5xx.*

Wall/Floor Mount Cabinet
33U Cabinet equal to Chatsworth Products, PN# 13495-760
40U Cabinet equal to Chatsworth Products, PN# 13495-772
**Contractor will provide an additional set of mounting rails for each wall mount cabinet, equal to Chatsworth Products PN# 13276-7xx.*
Fan Kit/Filter Kit
Equal to Chatsworth Products Fan Kit, PN# 12804-701
Equal to Chatsworth Products Filter Kit, PN# 12805-701
Grounding Kit
Equal to Chatsworth Products, PN# 106A10-019
Power Strip with Surge Suppression
Equal to TrippLite's, PN# IBAR12
Horizontal Wire Management
PN# HC119CE1N

2. Floor Mount 2-post Racks
   - Freestanding equipment cabinet provides front and rear support for 19"W (482.6 mm) EIA rack-mount equipment and shelves
   - For indoor use only, in environmentally controlled areas; not harsh environments or in air-handling spaces
   - Includes: Welded steel and bolted aluminum four-post frame, Equipment mounting rails, two pairs, Leveling Feet Factory installed grounding/bonding system, Equipment mounting hardware, Brackets for mounting CPI Vertical Power Strip or PDU in 42U to 47U cabinets
   - Cable access: Cabinet has an open base
   - Equipment support: Two pairs of equipment mounting rails in the cabinet, 1-3/4" (44.45 mm) rack-mount unit, marked and numbered bottom-to-top on all rails, 19"W, EIA-310-D Universal 5/8"- 5/8"- 1/2" (15.9 mm - 15.9 mm - 12.7 mm) vertical hole spacing, Threaded or square-punched holes; square-punched holes accept cage nuts, Adjustable depth, slide front-to-rear; depth marks on frame for easy alignment, Includes 50 each #12-24 screws with threaded rails or 25 each M6 cage nuts and screws with square-punched rails
   - Load capacity: 2500 lb (1134.0 kg)
   - Grounding/Bonding: Mounting rails, top panel, side panels and doors are electrically bonded to the cabinet frame; a Ground Terminal Block is included to attach the frame to ground
   - Certifications: EIA-310-D compliant; UL Listed 60950
   - Material: Steel and aluminum extrusion
   - Construction: Welded/bolted frame, mounting rails bolt to frame
   - **Color: BLACK**
   - **Quantity:** See Drawing for quantity and installation details.
   - **Part#: Chatsworth Products Inc.**
     F-Series TeraFrame Cabinet
     FF1H-213B-C22
     Vertical Wire Managers
     34421-C01

3. Floor Mount 4-post Racks
   - Four-post frame with threaded mounting holes used to support 19" wide rack-mount communications equipment and shelves
   - For indoor use only, in environmentally controlled areas; may not be used
   - outdoors, in industrial or harsh environments, or in plenum spaces

- Includes: (1) top pan, (1) bottom pan, (4) mounting channels, (2) base angles, (2) top angles
- Assembly hardware; (100) #12-24 equipment mounting screws
- Equipment Support: Front and rear pairs of 3" deep C-shaped equipment mounting channels, Fixed in place, 29" apart front-to-rear, 19" wide, EIA-310-D compliant hole pattern
- 1-3/4" high rack-mount units (RMU); RMU spaces are marked and numbered on the channels
- Universal hole pattern, 5/8"-5/8"-1/2" vertical hole spacing
- Threaded #12-24 equipment mounting holes, Includes 100 each #12-24 equipment mounting screws
- Load capacity: 2000 lb of equipment
- Material:; Aluminum extrusion, Aluminum sheet
- Construction: Bolted assembly, Ships unassembled
- **Color: BLACK**
- **Quantity:** See Drawing for quantity and installation details.
- **Part#: Chatsworth Products Inc.**
  Floor Mount 4-Post Open Frame Rack
  CPI# 15053-703
  Grounding Kit
  10610-019

4. Floor Mount Cabinets
   - Four-post frame with threaded mounting holes used to support 19" wide rack-mount communications equipment and shelves
   - For indoor use only, in environmentally controlled areas; may not be used
   - outdoors, in industrial or harsh environments, or in plenum spaces
   - Includes: (1) top pan, (1) bottom pan, (4) mounting channels, (2) base angles, (2) top angles
   - Assembly hardware; (100) #12-24 equipment mounting screws
   - Equipment Support: Front and rear pairs of 3" deep C-shaped equipment mounting channels, Fixed in place, 29" apart front-to-rear, 19" wide, EIA-310-D compliant hole pattern
   - 1-3/4" high rack-mount units (RMU); RMU spaces are marked and numbered on the channels
   - Universal hole pattern, 5/8"-5/8"-1/2" vertical hole spacing
   - Threaded #12-24 equipment mounting holes, Includes 100 each #12-24 equipment mounting screws
   - Load capacity: 2000 lb of equipment
   - Material:; Aluminum extrusion, Aluminum sheet
   - Construction: Bolted assembly, Ships unassembled
   - **Color: BLACK**
   - **Quantity:** See Drawing for quantity and installation details.
   - **Part#: Chatsworth Products Inc.**
     Floor Mount Cabinet
     CPI# M1050-741
     Grounding Kit
     10610-019

E. Cable Support System
1. Ladder Rack Cable Runway
   - Stringers shall be fabricated from 16Aga .375" x 1.5" Cold Rolled Steel tubing.

- Rungs shall be fabricated from 16Aga .5" x 1.0" Cold Rolled Steel tubing
- Rungs shall be spaced at 9.0" center to center
- A straight length of ladder shall be capable of supporting 45 pounds per foot when a 10' length is tested according to NEMA VE-1.
- Ladder Rack shall have a powder coat finished.
- Ladder Rack shall be available in standard 6ft. and 10ft. lengths.
- Ladder rack shall be apart of a total system that includes: manufacture bends, wall supports, joining hardware, etc.
- Ladder Rack shall be grounding per the TIA/EIA 6A07-A.
- **Color:** Ladder Rack will be **BLACK**
- **Quantity:** See Drawing for quantity and installation details.
- **Part#:** Equal to Chatsworth Products Cable Raceway, PN# 11252-71X

F. Grounding and Bonding

1. Telecommunications Main Grounding Busbar (TMGB)
   - Telecommunications Main Grounding Busbar (TMGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
   - The busbar shall be 4" (100 mm) high and 12" (300 mm) long and shall have 18 attachment points (two rows of 9 each) for two-hole grounding lugs.
   - The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 15 lugs with 5/8" (15. 8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
   - The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
   - The busbar shall be UL Listed as grounding and bonding equipment.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Telecommunications Main Grounding Busbar: Part Number 40153-012, 12" x 4" (300 mm x 100 mm) Telecommunications Main Grounding Busbar, UL Listed.
2. Telecommunications Grounding Busbar (TGB)
   - Telecommunications Grounding Busbar (TGB) shall be constructed of .25" (6.4 mm) thick solid copper bar.
   - The busbar shall be 2" (50 mm) high and 10" (250 mm) long and shall have 7 attachment points (one row) for two-hole grounding lugs.
   - The hole pattern for attaching grounding lugs shall meet the requirements of ANSI-J-STD – 607-A and shall accept 4 lugs with 5/8" (15.8 mm) hole centers and 3 lugs with 1" (25.4 mm) hole centers.
   - The busbar shall include wall-mount stand-off brackets, assembly screws and insulators creating a 4" (100 mm) standoff from the wall.
   - The busbar shall be UL Listed as grounding and bonding equipment.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Telecommunications Grounding Busbar:
     Part Number 13622-010, 10" x 2" (250 mm x 50 mm) Telecommunications Grounding Busbar, UL Listed.
3. Horizontal Rack Busbar
   - Horizontal rack-mount busbar shall be constructed of 3/16" (4.7 mm) thick by 3/4" (19.1 mm) high hard-drawn electrolytic tough pitch 110 alloy copper bar.
   - Bar shall be 19" EIA or 23" rack mounting width (as specified below) for mounting on relay racks or in cabinets.

- Bar shall have eight 6-32 tapped ground mounting holes on 1" (25.4 mm) intervals and four 0.281" (7.1 mm) holes for the attachment of two-hole grounding lugs.
- Each bar shall include a copper splice bar of the same material (to transition between adjoining racks) and two each 12-24 x ¾" copper-plated steel screws and flat washers for attachment to the rack or cabinet.
- Bar shall be UL Listed as grounding and bonding equipment.
- Design Make shall be:
- Chatsworth Products, Inc. (CPI),
- Horizontal Rack Busbar: Part Number 10610-019, Ground Bar for 19" Rack.

4. Two Mounting Hole Ground Terminal Block
   - Ground terminal block shall be made of electroplated tin aluminum extrusion.
   - Ground terminal block shall accept conductors ranging from #14 AWG through 2/0.
   - The conductors shall be held in place by two stainless steel set screws.
   - Ground terminal block shall have two 1/4" (6.4 mm) holes spaced on 5/8" (15.8 mm) centers to allow secure two-bolt attachment to the rack or cabinet.
   - Ground terminal block shall be UL Listed as a wire connector.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Two Mounting Hole Ground Terminal Block:
   - Part Number 40167-001, Two Mounting Hole Ground Terminal Block, 1 each
   - Compression Lugs
   - Compression lugs shall be manufactured from electroplated tinned copper.
   - Compression lugs shall have two holes spaced on 5/8" (15.8 mm) or 1" (25.4 mm) centers, as stated below, to allow secure two bolt connections to busbars.
   - Compression lugs shall be sized to fit a specific size conductor, sizes #6 to 4/0, as stated below.
   - Compression lugs shall be UL Listed as wire connectors.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Compression Lugs:
   - Part Number 40162-901, Compression Lug, #6 Awg, 5/8" (15.8 mm) hole spacing, 1 each.
   - Part Number 40162-903, Compression Lug, #6 Awg, 1" (25.4 mm) hole spacing, 1 each.
   - Part Number 40162-904, Compression Lug, #2 Awg, 5/8" (15.8 mm) hole spacing, 1 each.
   - Part Number 40162-907, Compression Lug, #2 Awg, 1" (25.4 mm) hole spacing, 1 each.
   - Part Number 40162-909, Compression Lug, 2/0 Awg, 1" (25. 4 mm) hole spacing, 1 each.
   - Part Number 40162-911, Compression Lug, 4/0 Awg, 1" (25.4 mm) hole spacing, 1 each.
5. Antioxidant Joint Compound
   - Oxide inhibiting joint compound for copper-to-copper, aluminum-to-aluminum or aluminum-to-copper connections.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Antioxidant Joint Compound:
   - Part Number 40168-101, Antioxidant Joint Compound, Copper-to-Copper Connections, .5 oz, 1 each.

- Part Number 40168-801, Antioxidant Joint Compound, Copper-to-Copper Connections, 8 oz, 1 each.
- Part Number 40166-101, Antioxidant Joint Compound, Aluminum-to-Aluminum or Aluminum-to-Copper Connections, .5 oz, 1 each.
- Part Number 40166-801, Antioxidant Joint Compound, Aluminum-to-Aluminum or Aluminum-to-Copper Connections, 8 oz, 1 each.
- Part Number 40168-150, Antioxidant Joint Compound, Copper-to-Copper Connections, .5 oz, 50 each.
- Part Number 40168-812, Antioxidant Joint Compound, Copper-to-Copper Connections, 8 oz, 12 each.
- Part Number 40166-150, Antioxidant Joint Compound, Aluminum-to-Aluminum or Aluminum-to-Copper Connections, .5 oz, 50 each.
- Part Number 40166-812, Antioxidant Joint Compound, Aluminum-to-Aluminum or Aluminum-to-Copper Connections, 8 oz, 12 each.

6. C-Type, Compression Taps
   - Compression taps shall be manufactured from copper alloy.
   - Compression taps shall be C-shaped connectors that wrap around two conductors forming an irreversible splice around the conductors; installation requires a hydraulic crimping tool
   - Compression taps shall be sized to fit specific size conductors, sizes #2 AWG to 4/0, as stated below.
   - Compression taps shall be UL Listed.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Compression Taps:
   - Part Number 40163-001, Compression Tap, #6 AWG Solid Run to #6 AWG Solid Tap, 1 each.
   - Part Number 40163-007, Compression Tap, 2/0 Stranded Run to 2/0 Stranded Tap, 1 each.
7. Pipe Clamp With Grounding Connector
   - Pipe clamp shall be made from electroplated tinned bronze. Installation hardware will be stainless steel.
   - Pipe clamp shall be sized to fit up to two conductors ranging in size from #6 to 250 MCM; conductors must be the same size.
   - Pipe clamp installation hardware shall be sized to attach to pipes, sizes 1" to 6" (.75" to 6.63" in diameter), as stated below.
   - Pipe clamp shall be UL Listed as grounding and bonding equipment.
   - Design Make shall be:
   - Chatsworth Products, Inc. (CPI),
   - Pipe Clamps:
   - Part Number 40170-002, Pipe Clamp, for 1" to 1-1/4" pipe, 1 each.
   - Part Number 40170-003, Pipe Clamp, for 1-1/2" to 2" pipe, 1 each.
   - Part Number 40170-004, Pipe Clamp, for 2-1/2" to 3" pipe, 1 each.
   - Part Number 40170-005, Pipe Clamp, for 3-1/2" to 4" pipe, 1 each.
   - Part Number 40170-006, Pipe Clamp, for 5" to 6" pipe, 1 each.
8. Equipment Ground Jumper Kit
   - Kit includes one 24"L insulated ground jumper with a straight two hole compression lug on one end and an L-shaped two hole compression lug on the other end, two plated installation screws, an abrasive pad and a .5 once tube of antioxidant joint compound.
   - Ground conductor is an insulated green/yellow stripe #6 AWG wire
   - Lugs are made from electroplated tinned copper and have two mounting holes spaces .5" to .625" apart that accept 1/4" screws.

- Jumper will be made with UL Listed components
- Design Make shall be:
- Chatsworth Products, Inc. (CPI),
- Equipment Ground Jumper Kit:
- Part Number 40159-010, Equipment Ground Jumper Kit, 1 each.

G. Firestop System
1. See project drawings for detailed fire caulk systems and products.
2. Intumescent fire caulk:
   - The firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.
   - Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
   - All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper firestop equipment.
   - Firestop systems shall be UL Classified to ASTM E814 (UL 1479).
   - **Approved Fire Barrier/Caulk** – 3M Fire Barrier CP25 or equal STI, PN# SSS100

H. Re-Enterable Fire Stop System
1. See project drawings for detailed fire thru systems and products.
   - The re-enterable fire stop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.
   - No additional fire stopping material shall be required to obtain proper fire stopping.
   - The system shall offer full fire resistance whether it is empty or 100% visually filled.
   - The system shall be self-contained, and shall automatically adjust to differing cable loads.
   - The system shall allow add, moves, and changes without additional materials.
   - All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate re-enterable fire stop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper fire stop equipment.
   - Fire stop systems shall be UL Classified to ASTM E814 (UL 1479).
   - The system shall be gang-able using wall plates for additional capacity.
   - **Quantity:** See Drawing for quantity and installation details.
   - **Part #:** Equal to STI
     STI PN# EZDP33FWS
     STI PN# EZDP33WR

Part 3 - Execution

3.1 Installation

A. Work Area Outlets Installation

- No more than 12" of cable shall be stored in an outlet box, modular furniture raceway, or insulated walls.
- Bend radius of the cable in the termination area shall not be less than 4 times the outside diameter of the cable.
- The cable jacket shall be maintained to within 12.7mm (½ inch) of the termination point.
- All UTP cables shall have no more than 12.7mm (½ inch) of pair *untwisted* at the termination point.
- Data jacks, unless otherwise noted in drawings, shall be located in the top position(s) of each faceplate. Data jacks in horizontally oriented faceplates shall occupy the left-most position(s).
- Voice jacks, unless otherwise noted in drawings, shall occupy the next position(s) below the data on the faceplate. Voice jacks in horizontally oriented faceplates shall occupy the position left of the data jack.
- Video jacks, unless otherwise noted in drawings, shall occupy the bottom position(s) on the faceplate. Video jacks in horizontally oriented faceplates shall occupy the position left of the data/voice jack.
- All faceplates installed shall be level.
- All outlets will be labeled according to the approved labeling scheme.
- Each faceplate shall be machine labeled. The labeling shall be placed on the faceplate so that the individual jack can be clearly identified by its associated label.
- Cables shall be identified by a self-adhesive label in accordance with the Identification and Labeling section of this specification and ANSI/TIA/EIA-606A. The cable label shall be applied to the cable no further than 6" behind termination module, behind the faceplate on a section of cable that can be accessed by removing the cover plate.

B. Horizontal Distribution Cable Installation

- Cable shall be installed in accordance with manufacturer's recommendations and best industry practices.
- Tie Wraps will not be allowed for supporting, bundling and/or dressing of any station cables on this project.
- Contractor will provide a three foot "service loop" for all station cables. The service loop will be coiled and secured using Velcro in the accessible ceiling at the conduit stub to the work area outlet box.
- A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in all "common" conduit runs. "Common" Conduit Runs are those that house more than one cable or set of cables that do not specifically feed a Work Station Outlet. Examples of "Common" Conduit Runs are: floor/ceiling penetrations, stub-throughs, distribution conduits, all conduits between J-boxes, etc.
- Cable raceways shall not be filled greater than the TIA/EIA-56A9-A maximum fill for the particular raceway type or 40%.
- Cables shall be installed in continuous lengths from origin to destination (no splices) except for transition points, or consolidation points.
- The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
- Pulling tension on 4-pair UTP cables shall not exceed 25-lb for a four-pair UTP cable.
- The Cable Support System shall be installed in such away that will allow for future cables to be added and to provide sufficient protection of all cable.

- For all installs where station cables are not installed in a continuous conduit run the following guidelines will apply. The Contractor will be responsible to reinstall all cables and pathways that do not meet with the following at no additional cost to the Owner:
  - J-hooks shall be installed to support all station cables every 4ft to 5ft.
  - All pathways shall be run at right angles. No diagonal pathways will be allowed unless otherwise noted on the drawings.
  - Horizontal cables shall be bundled in groups of no more than 25 cables per Caddy's CAT21 J-hook, no more than 40 cables per Caddy's CAT32 J-hook, and no more than 6A4 cables per Caddy's CAT6A4 J-hook.
  - At no point shall cable(s) rest on acoustic ceiling grids, acoustic panels, or lighting fixtures.
  - All cables will be installed so that there is a minimum of 3" of clearance above all ceiling grid and tiles.
  - All cables will be installed so that there is a minimum of 12" of clearance above all florescent lighting.
  - All cables will be installed so that there is a minimum of 6A" of clearance from all fire alarm and electrical system conduits.
  - Cables shall not be attached to the ceiling grid or lighting fixture wires. The contractor will provide their own carriers wires to support their horizontal cabling.
  - All cables shall be installed above fire-sprinkler systems and plumbing system fixtures and devises. Cables shall not be attached to or supported by these fixtures and/or their ancillary equipment or hardware.
  - The cable system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
  - Contractor is responsible for sealing around all cables that penetrate fire rated barriers.
- Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the Owner.

C. Horizontal Cross-Connect Installation

- Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A standard, manufacturer's recommendations and best industry practices.
- The cable jacket shall be maintained to within 12.7mm (½ inch) of the termination point.
- All UTP cables shall have no more than 12.7mm (½ inch) of pair *untwist* at the termination point.
- Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- All cables shall be neatly bundled and dressed continuously from the entrance point of the Telecommunications Room to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame. Contractor will use Velcro strip to bundle cables together. The use of Tie – Wraps is not permitted.
- Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labeled within the bundle, where the label is obscured from view shall not be acceptable.

D. Backbone Cable Installation
- Backbone cables shall be installed separately from horizontal distribution cables.
- Where possible the backbone and horizontal cables shall be installed in separate conduits.
- Where possible backbone cables of the same type shall be combined in conduit runs to maximize conduit fill ratios.
- Where backbone cables and distribution cables are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.
- Pulling tension on Backbone cables shall not exceed the manufacture's limitations.
- The minimum bend radius for all Backbone cables is 16 times the cable diameter or the manufactures specification, which ever is greater.
- All OSP cables may not penetrate more than 50ft into the buildings before be terminated or splices to cable with a fire resistant jacket, unless the jacket is indoor/outdoor rated.
- A pull cord (nylon; 1/8" minimum) shall be co-installed with all cable installed in any conduit.
- All backbone cables shall be securely fastened to the sidewall of the TR on each floor.
- Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip and on alternating floors or as required by local codes.
- Vertical runs of cable shall be supported to messenger strand, cable ladder, or other method to provide proper support for the weight of the cable.
- Large bundles of cables and/or heavy cables shall be attached using metal clamps and/or metal banding to support the cables.

E. Backbone Cross-Connect Installation
- Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A document, manufacturer's recommendations and best industry practices.
- Bend radius of the cable in the termination area shall not exceed 16A times the outside diameter of the cable.
- All cables shall be neatly bundled and dressed continuously from the entrance point of the Telecommunications Room to their respective panels or blocks.
- Contractor will provide a minimum of a 3 foot "service loop" for each backbone cable before terminating to allow future rearrangement. Cables will be coiled and secured above the ceiling where possible or to the Telco Backboard where entrance point is from the floor.
- Wall mounted termination block fields shall be installed with the lowest edge of the mounting frame 18" from the finished floor.
- Contractor shall provide a machine label 1ft. to 2ft. from the entrance point of the TR and 6in. to 12in. from the termination point on each backbone cable. Cable shall be easily identified and fully legible without removing the bundle support ties.

F. Cabinets, Racks, Enclosures and Ladder Rack Installation
- Wall Mount Racks/Cabinets shall be securely attached to the Telco Backboard using minimum 5/16" hardware or as required by local codes.
- Floor Mount Racks/Cabinets shall be securely attached to the concrete floor using minimum 3/8" drop-in anchor hardware or as required by local codes.

- All Floor Mount Racks/Cabinets will be either; secured on one side to the wall or attached to the closest wall with ladder rack.
- All Racks/Cabinets shall be braced to meet Zone 4 seismic requirements.
- Contractor will maintain a minimum of 36 inches of clearance from the front of the all rack/cabinets and all other obstructions.
- Floor Mount Racks/Cabinets shall be installed to allow for a minimum of 36A" from rear and all other obstructions.
- All racks shall be grounded to the telecommunications ground bus bar.
- Rack mount screws not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- The plywood bottom edge shall be mounted vertically no less than 12" above the finished floor.
- Contractor will provide all cutouts for the Electrical Contractors expansion rings and electric receptacles as shown on the drawings.
- Ladder Rack must be securely attached to walls, backboards, and racks/cabinets to comply with all Zone 4 seismic requirements.
- Ladder rack shall be installed so that there is a minimum of 8" of unobstructed clearance above rack.
- Ladder Rack shall be installed so that there is a minimum of 12" of clearance from all: florescent lighting, electrical conduits/circuits, and fire alarm conduits/devices.

G. Grounding and Bonding

1. The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current carrying conductor.
2. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607 Telecommunications Bonding and Grounding Standard.
3. The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB).
4. The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.
5. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors.
6. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape.
7. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.
8. Wall-Mount Busbars
   - Attach busbars to the wall with appropriate hardware according to the manufacturer's installation instructions.
   - Conductor connections to the TMGB or TGB shall be made with two-hole bolt-on compression lugs sized to fit the busbar and the conductors.
   - Each lug shall be attached with stainless steel hardware after preparing the bond according to manufacturer recommendations and treating the bonding surface on the busbar with antioxidant to help prevent corrosion at the bond.

- The wall-mount busbar shall be bonded to ground as part of the overall Telecommunications Bonding and Grounding System.

9. Rack-Mount Busbars and Ground Bars
   - When a rack or cabinet supports active equipment or any type of shielded cable or cable termination device requiring a ground connection, add a rack-mount horizontal or vertical busbar or ground bar to the rack or cabinet. The rack-mount busbar or ground bar provides multiple bonding points on the rack for rack and rack-mount equipment.
   - Attach rack-mount busbars and ground bars to racks or cabinets according to the manufacturer's installation instructions.
   - Bond the rack-mount busbar or ground bar to the room's TMGB or TGB with appropriately sized hardware and conductor.
10. Ground Terminal Block
   - Every rack and cabinet shall be bonded to the TMGB or TGB.
   - Minimum bonding connection to racks and cabinets shall be made with a rack-mount two-hole ground terminal block sized to fit the conductor and rack and installed according to manufacturer recommendations.
   - Remove paint between rack/cabinet and terminal block, clean surface and use antioxidant between the rack and the terminal block to help prevent corrosion at the bond.
11. Pedestal Clamp
   - At minimum, bond every sixth raised access floor pedestal with a minimum #6 AWG conductor to the TMGB or TGB using a pedestal clamp sized to fit the pedestal and the conductor and installed according to the manufacturer's recommendations.
   - If pedestal clamps are used to construct a signal reference grid, bond the signal reference grid to the TMGB or TGB and bond each rack and/or cabinet to the signal reference grid using a compression tap or similar non-reversible bonding component sized to fit both conductors.
   - Remove paint between the pedestal and pedestal clamp, clean surface and use antioxidant between the pedestal and the clamp to help prevent corrosion at the bond.
   - Remove insulation from conductors where wires attach to the pedestal clamp.
12. Pipe Clamp
   - Bond metal pipes located inside the data center computer room with a minimum #6 AWG conductor to the TMGB or TGB using a pipe clamp sized to fit the pipe and the conductor and installed according to the manufacturer's recommendations.
   - Remove paint between the pipe and pipe clamp, clean surface and use antioxidant between the pipe and the clamp to help prevent corrosion at the bond.
   - Remove insulation from conductors where wires attach to the pipe clamp.
13. Equipment Ground Jumper Kit
   - Bond equipment to a vertical rack-mount busbar or groundbar using ground jumper according to the manufacturer's recommendations.
   - Clean the surface and use antioxidant between the compression lugs on the jumper and the rack-mount busbar or groundbar to help prevent corrosion at the bond.

H. Firestop System
   - The firestop system is comprised of the item or items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure.

- Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream.
- All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to through penetrations (complete penetration) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item i.e., riser slots and sleeves, cables, conduit, cable tray, and raceways, etc. shall use the proper firestop equipment.
- Firestop systems shall be UL Classified to ASTM E814 (UL 1479).

3.2 Identification and Labeling

A. The contractor shall develop and submit for approval a labeling system for the cable installation. The Owner will negotiate an appropriate labeling scheme with the successful contractor.

B. The approved system will comply with the TIA/EIA -606-A Class 2 designations and include at a minimum, identifiers for all major components of the system: telecommunication rooms, grounding bus bars, racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.

C. All label printing will be machine generated or hand-held printers using indelible ink ribbons or cartridges. Self-laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

D. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme.

3.3 Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-A Addendum 5, TSB-67 and TSB-95. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
2. All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards, the Manufacture's Warranty guidelines and best industry practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.
3. Contractor will notify the Owner/Owner's Representative 72 hours before commencement of testing.
4. Upon receipt of the test documentation, the Customer reserves the right to have the contractor perform a 10% witnessed "spot testing" of the cabling system to validate test results provided in the test document, at no additional cost. If a significant amount of cables are marginal and/or fail during the "spot test" Contractor will retest the entire cable plant at no additional cost.

B. Copper Cable Testing

1. Twisted Pair Cable
   - All twisted-pair copper cable links (including backbone cables) shall be tested for continuity, pair reversals, shorts, opens and performance as indicated below.

- Continuity - Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit 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 and the cable re-tested prior to final acceptance.
- Length - Each installed cable link shall be tested for installed length using a 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 ANSI/TIA/EIA-568-A Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.

2. Category 6 Performance
   - Follow the Standards requirements established in:
     - ANSI/TIA/EIA-568-A -TSB-67
     Wire Map
     Length
     Attenuation
     NEXT (Near end crosstalk)
     - ANSI/TIA/EIA-568-A -TSB-95
     Return Loss
     ELFEXT Loss
     Propagation Delay
     Delay skew
     - ANSI/TIA/EIA-568-A, Amendment 5.
     PSNEXT (Power sum near-end crosstalk loss)
     PSELFEXT (Power sum equal level far-end crosstalk loss)
   - A Level III or better test unit is required to verify category 6 performances and must be updated to include the requirements of TSB-95 and Amendment 5. Testers will be equal to Fluke Network's DXT CableAnalyzer™ Series.
   - All testers shall have been recalibrated with 6 months of use on this project. Contractor will be asked to provide proof of recalibration.
   - Test results shall be automatically evaluated by the equipment, using the most up-to-date criteria from the TIA/EIA Standard, and the result shown as pass/fail. The approved Level Three tester shall provide a printed document for each test that is also available in a downloadable file using an application from the test equipment manufacturer. The printed test results shall include a print out of all tests performed, and the individual test results for each cable.

C. Fiber Optic Cable Testing
   1. 50/125µ Backbone Fiber
      - Each fiber strand shall be tested for attenuation with an Optical Power Meter and light source and with an Optical Time Domain Reflectometer (OTDR) for actual length and splice/connector loss. Cable length shall be verified using sheath markings. The guidelines and procedures established for Tier 1 testing in TIA/TSB-140 shall apply.
      - All fiber optic cables shall be tested from the site's MDF to each fiber terminals located in the IDF. The results of OTDR testing to define the length of each riser cable shall be documented. The Contractor shall conduct a power meter (loss) test of each fiber optic station and riser cable at both wavelengths, 850/1300nm for MM and 1310/1550nm for SM, A to B, B to A, and OSPL (OSPL is defined as La + Lb). No individual station or riser fiber link segment (including connectors) shall measure more than 2.0 dB loss.

Tests shall be conducted using ANSI/EIA/TIA/EIA-526-14A, Method B. Test results evaluation for the panel to panel (backbone) shall be based on the values set forth in ANSI/TIA/EIA-568-B.1.The Contractor shall provide an electronic printout for each strand tested with the Power Meter and the OTDR.

- Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.
- All installed cables must meet or exceed the defined standards for performance. The Contractor shall take all steps necessary to repair or replace any optic not meeting the standard.
- Fiber optic riser and station cable test results shall be provided in electronic format to the Owner.

3.4 System Closeout and as built Documentation

A. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Owner's Representative/Engineer for approval. One (1) to be a hardcopy and two (2) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 calendar days of the completion of each testing phase. At the request of the Owner's Representative/Engineer, the telecommunications contractor shall provide copies of the original test results.

C. The Owner's Representative/Engineer will request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

D. **Test Results** documentation shall be provided in two media, as listed above, one (1) hardcopy and one (1) on disk within three weeks after the completion of the project. The documentation shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s). The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an bi-annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

E. Printouts generated for each cable by the wire test instrument shall be submitted as part of the documentation package.

F. 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 documented.

G. The **As-Built** drawings are to include cable routes, outlet locations and the approved labeling identifiers. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall

be consistent throughout all documentation provided. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD 2008) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

H. Contractor will provide one laminated 11"x17" drawing at each Telecommunications Room (TR) that includes the building layout for that HC/MC, along with the outlet locations and all of the approved labeling.

END OF SECTION

SECTION 272000 - NETWORK ELECTRONICS

Part 1 - GENERAL

1.1 Scope of Work

A. This document describes the requirements for the contractors, products and installation relating to furnishing and installing Network Electronics and Uninterruptible Power Supplies (UPS).

B. Contractor will provide a bid including all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in this Document. It is the responsibility of the Contractor to provide all material necessary to provide a complete and operable system. If the contractor feels that the system described is incomplete they must address this in writing to the Owner/Owner's Representative before providing a bid.

C. All questions concerning non specified product and services will be address to the Owner's Representative before Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that the Contractor has provided a competent bid for a complete solution.

D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities, Part Numbers and Material Descriptions will be provided as an attachment to this document.

1.2 Regulatory References

A. Contractor will comply will all Federal, State, Local Codes/Regulations and Industries Standards.

1. Federal:
   - NFPA 70 - National Electric Code(NEC)
   - FCC
     Part 15
     Part 68
2. State of California:
   - CCR Part 2 - Uniform Building Code.
   - CCR Part 3 - California Electrical Code
   - Occupational Safety and Health Act (OSHA).
   - Title 24, Building Standards, State of California.
   - Title 19, California Code of Regulations.
   - Title 8, Electrical Safety, State of California
3. Industry Standards:
   - Telecommunications Industry Associations/Electronics Industry Association (TIA/EIA)
   - Institute of Electrical and Electronic Engineers (IEEE)
     802.3 (Ethernet)
     802.3ab (Gigabit Ethernet over 4-pair Category 5 or higher)
     802.3ae 10 Gigabit Ethernet
     802.3Z (Gigabit Ethernet over optical fiber)
     802.1D Spanning Tree Protocol
     802.1d/802.1D-1998 (Ethernet Bridging)
     802.1q (VLAN tagging)
     802.1p (Prioritization)
     802.1w (Rapid Spanning Tree)
     802.1X (Port based Authentication)
     802.1ad (Link Aggregation)
     802.1s Multiple VLAN Instances of Spanning Tree

- Underwriters Laboratories Inc. (UL)
- International Organization for Standardization/International Electromagnetic Commission (ISO/IEC) ISO 11801 Generic Cabling for Customer Premises
- Building Industry Consulting Services International (BICSI) LAN Specialty Methods Manual (2009 or latest).

B. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

C. This document does not replace any code, either partially or wholly. The contractor must be aware of and comply with all local codes that may impact this project.

1.3 Contractor Qualifications/Quality Assurance

A. Contractor Qualifications

Contractors will submit the following Qualification Documentation along with their bid proposal:

1. A List of References. Contractor shall have been in business for no less than five (5) years and provide a list of a minimum of three (3) projects of similar size and scope. List will include:
   - Project Name
   - Estimated Telecommunications Project Value
   - Brief Description of Work Performed
   - Contact Person
   - Contact Information, including Name of Business, and Phone Number.
2. A photocopy of your Contractor License Certificate.
3. A photocopy of your Cisco Partner Certificate.
   - Cisco Gold Partner or;
     Cisco Silver Partner with Advanced Routing and Switching Specialization
     Cisco Silver Partner with Advance Wireless LAN Specialization
   - After the winning Contractor has been selected, they will be required to provide proof that at least 50% of the installers that will work on this project have been certified by Cisco with a CCNA or CCDA certification.

B. Quality Assurance

Contractors wishing to provide a proposal for this project are required to comply with the following without exception:

1. The winning Contractor will assign this project to a competent Project Manager who has demonstrated their ability to supervise a telecommunications project of the same size and scope.
   - The contractor will make this person available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.
   - Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
   - Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours notice for non-emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.
2. All material and equipment to be installed on this project will be "new". If the Owner/Owner's Representative discovers that "used" material or equipment has been installed on this project the Contractor will be required to replace said materials and/or equipment with "new" products at no additional cost to the Owner.

- "New" - Materials and products manufactured within one (1) year prior to installation, and meet or exceed the latest published specifications of the manufacture. Also these materials and equipment may not have been in use before installation on this project unless directed otherwise in the project documents.

3. Contractor must warranty all materials, equipment and labor for a minimum of one (1) year.
   - Warranty will provide repair/replacement of all defective or improperly installed materials at no additional cost to the Owner (including Labor, drive time, shipping, taxes, etc.).
   - Contractor is required to be on site to repair/replace defective items no later than 24 hours after receiving trouble call.
   - Warranty will cover normal Business hours, 8am – 5pm, Monday thru Friday. All calls received on a Friday or the day before a holiday will be held until the following regular business day.

1.4 Submittal Documentation

A. The successful contractor shall provide three (3) copies of their submittal package.
B. The Submittal Package will include:
   1. The successful contractor will provide their submittal package in accordance with the RFQ section "Project Management" sub section "Submittals".

1.5 Equivalent Products

A. All Products described and Part Numbers given in this Specification are those of Cisco Systems and TrippLite or equivalent unless otherwise noted.
B. Pre-Approved Equals;
   1. Switching – None add to existing infrastructure
   2. UPS Systems – APC, Liebert or equivalent
C. Contractors wishing to approve a system other than those specified in this document will be required to perform the following:
   3. Provide System specifications and cutsheets for all system components for the proposed new system(s).
   4. Provide an itemized comparison to each of the system functions as described in this specification. Include in that document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria: "exceeds"/"matches"/ "unequal".
D. All other products than those specifically address in the bid document that the Contractor is seeking approvals for must be ***received*** by the Owner's Representative ***no later than ten (10) days before the bid date***. All Approved Equals will be published in addendum form prior to the bid date.
E. Failure to received written approval for product installed that deviates from the products called for in this specification and/or on the project drawings will result in the contractor having to replace the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.

1.6 Technology Clause

A. As technology advances, it is understood that improved or enhanced products may supersede existing products in both price and performance and yet be essentially similar. This request for bids seeks to address the rapid advances in technology by allowing functionally similar or identical products that may be introduced in the future,

during the term of this bid, to be included under the general umbrella of compatible product lines and are thus specifically included in this bid document.

B. Discontinued or end of life products shall be replaced with an equal product to the original specified product at no additional costs to the owner.

Part 2 - Products

2.1 WLAN – System Equipment

A. WLAN Equipment

1. Wireless Controller;
   - Support for up to 500 access points and 7000 clients (licenses as necessary for project)
   - IEEE 802.11a, 802.11b, 802.11g, 802.11d, WMM/802.11e, 802.11h, 802.11n
   - IEEE 802.3 10BASE-T, IEEE 802.3u 100BASE-TX specification, 1000BASE-T. 1000BASE-SX, 1000-BASE-LH, IEEE 802.1Q Vtagging, and IEEE 802.1AX Link Aggregation
   - Ability to simultaneously configure and manage access points
   - Allows access points to dynamically establish wireless connections without the need for a physical connection to the wired network
   - Supports Unified Communications for messaging, presence, and conferencing
   - Supports all Cisco Unified Communications Wireless IP Phones for cost-effective, real-time voice services
   - Supports rogue access point detection and denial-ofservice attacks.
   - Support for adaptive power management to turn off access point radios during off-peak hours to reduce power consumption
   - (8) Uplink: Small Form-Factor Pluggable (SFP) ports
   - The approved Wireless Access Controller shall be Cisco Aironet 5508 # **AIR-CT5508-XX-K9**
2. Contractor shall provide (4) 1000Base-T SFP modules and configure two aggregated 2-Gigabit links to the network, Cisco **GLC-T** module.
3. Contractor to provide licenses as necessary for the wireless access points included in this project.
4. Example Wireless Controller Manufacture Pre-Configured Equipment List

Item	Part Number	Description	Quantity
1	**AIR-CT5508-XX-K9**	Cisco 5508 Series Wireless Controller	1
2	LIC-CT5508-##	AP Base licenses	##
3	LIC-CT5508-BASE	Base Software License	1
4	AIR-PWR-5500-AC	Cisco 5500 Series Wireless Controller Redundant Power Supply	1
5	AIR-PWR-CORD-NA	AIR Line Cord North America	2
6	GLC-T=	1000BASE-T SFP	4
7	SWC5500K9-70	Cisco Unified Wireless Controller SW Release 7.0 or higher	1
8			

This Material List has been configured by Cisco with the design information provided by the District and Consultant. The CONTRACTOR shall verify that this material is the correct material prior to bidding and prior to ordering. It is the CONTRACTORS responsibility for a complete system whether listed here or not.

2. Edge Wireless Device;
   - IEEE 802.11a/b/g/n access point.
   - Lightweight Access Point Protocol (LWAPP)

- Dual-band Controller-based 802.11a/g/n
- Integrated Antenna
  2.4 GHz, Gain 4 dBi, internal Omni, horizontal beamwidth 360°
  5 GHz, Gain 3 dBi, internal Omni, horizontal beamwidth 360°
- 10/100/1000BASE-T autosensing (RJ-45)
- Supports IEEE 802.3af Standard, 12.95 watts of power
- Advanced Encryption Standard (AES)
- Wi-Fi Protected Access 2 (WPA2) or WPA security
- The approved Edge Wireless Device shall be Cisco Aironet 3602 # **AIR-CAP3602I-A-K9**
- Contractor shall provide one access point for every WiFi outlet shown in contract drawings. Contractor shall provide all antennas, mounting hardware and POE injectors as required for a complete and operable WLAN.
  Cisco AP3600 Power Injectors AIR-PWRINJ4=
  Cisco AP3600 Local Power Supply AIR-PWR-B=
- Example Manufacture Pre-Configured Equipment List **Single AP**

Item	Part Number	Description	Quantity
1	**AIR-CAP3602I-A-K9**	802.11a/g/n Ctrlr-based AP w/CleanAir; Int Ant; A Reg Domain	1
2	AIR-AP-BRACKET-1	1040/1140/1260/3500 Low Profile Mounting Bracket (Default)	1
3	AIR-AP-T-RAIL-R	Ceiling Grid Clip for Aironet APs - Recessed Mount (Default)	1
4	S3G1RK9W8-12423JA	Cisco 3600 Series IOS Wireless LAN Controller-based Recovery	1
5	CON-SNT-CAP362IA	SMARTNET 8X5XNBD 802.11a/g/n Ctrlr-based AP w/CleanAir	1
6			

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3. Wireless Enclosures, Wall-Mounted, Outdoor Use
   - Device will be intended for outdoor ceiling or wall mount installation.
   - Fully hinged locking door with weather-proof lock
   - (2) ¾ trade size cable feed-through openings in the bottom
   - Perimeter gasket door seal.
   - Construction: 30% fiberglass reinforced polyester, grey, paint-able; NEMA-4 capable when openings are properly sealed; Virtually transparent to RF signal
   - Size: 13" x 15" x 6.5" deep
   - UL listed and tested to UL508-4X requirements
   - The approved Outdoor Access Point Enclosure will be Oberon Model 1025-00
     ****Contractor shall provide an enclosure for every outdoor access point provided.*

2.2 Core, Edge LAN – System Equipment

A. Core/Edge Switching

1. 16-Port 10G Core Fiber Switch shall provide;
   - 16 SFP+-based 10Gigabit Ethernet ports

- 800-Gbps switching capacity with 245 Mpps of throughput
- External USB and SD card support for flexible storage options; Type A (storage and boot) up-to 4 GB, Optional External Memory (SD Card) 2 GB
- 10/100/1000 RJ-45 console and management port
- IPv6 support in hardware, providing wired-network-rate forwarding for IPv6 networks and support for dual stack with innovative resource utilization
- Dynamic hardware forwarding-table allocations for ease of IPv4-to-IPv6 migration
- Scalable routing (IPv4, IPv6, and multicast) tables, Layer 2 tables, and ACL and quality of service (QoS) entries to make use of eight queues per port and comprehensive security policies per port
- Optional Module; 8 x10 GE SFP+/SFP - C4KX-NM-8SFP+
- CPU and Memory; Onboard Memory (SRAM DDR -II) 4 GB, Port Buffers 32-MB Shared Memory, CPU Dual Core 1.5 GHz
- Qos Policy Enforcement; Per Port or Per Vlan or Per Port, Per VLAN Granularity, Class of Service (CoS) Yes
- AC Power Max Rating 750W, System Power Consumption 330W nominal/400W max
- Total Output BTU 1122 BTU/hr (330 W) nominal/1365 BTU/hr (400 W) max
- The Cisco limited lifetime hardware warranty (LLW) includes 10-day advance hardware replacement for as long as the original end user owns the product.
- The approved Core Fiber Switch shall be the Catalyst 4500-X 16 Port 10GE (**WS-C4500X-16SFP+**)
- Example Manufacture Pre-Configured Equipment List **Single switch**

Item	Part Number	Description	Quantity
1	WS-C4500X-16SFP+	Catalyst 4500X 16 Port 10G IPB Switch with 750w power supply	1
2	S45XU-33-1511SG	Cisco Catalyst 4500-X Cisco IOS Software XE Release 3.3.0 SG noncrypto universal image	1
3	C4500X-IP-ES	Catalyst 4500-X IP BASE to Enterprise Services upgrade license (paper delivery)	1
4	SFP-10G-SR=	10GBASE-SR SFP Module	As required
5	GLC-T=	1000BASE-T SFP	As required
6			

This Material List has been configured by Cisco with the design information provided by the District and Consultant. The CONTRACTOR shall verify that this material is the correct material prior to bidding and prior to ordering. It is the CONTRACTORS responsibility for a complete system whether listed here or not.

B. LAN Equipment

1. Switches

Edge POE Switches shall provide;

- 10 and 1 Gigabit Ethernet uplink flexibility with Small Form-Factor Pluggable Plus (SFP+), providing business continuity and fast transition to 10 Gigabit Ethernet
- 24 or 48 ports of Gigabit Ethernet desktop connectivity
- Cisco FlexStack stacking module with 20 Gbps of throughput, allowing ease of operation with single configuration and simplified switch upgrade
- PoE+ with up to 30W per port that allows you to support the latest PoE+ capable devices
- Power supply options, with 740W or 370W fixed power supplies for PoE+ switches are available

- Limited lifetime hardware warranty, including next-business-day replacement with 90-day service and support
- The approved 24 Port Edge Switch shall be the Cisco Catalyst 2960-S Series (**WS-C2960S-24PD-L**)
- The approved 48 Port Edge Switch shall be the Cisco Catalyst 2960-S Series (**WS-C2960S-48FPD-L**)

  It shall be the responsibility of the contractor to verify type and quantity of switches. See project drawings for reference. Each MC/HC shall have a minimum of 80% port density. Contractor shall verify POE power requirements and provide additional switches required to power all specified devices.
- Example 48-port Manufacture Pre-Configured Equipment List

Item	Part Number	Description	Quantity
1	**WS-C2960S-48FPD-L**	**Catalyst 2960S 48 GigE PoE 740W, 2 x 10G SFP+ LAN Base**	1
2	C2960S-STACK	Catalyst 2960S FlexStack Stack Module optional for LAN Base	1
3	CAB-16AWG-AC	AC Power cord, 16AWG	1
4	CAB-STK-E-0.5M	Cisco FlexStack 50cm stacking cable	1
5	**SFP-10G-SR=**	**10GBASE-SR SFP Module**	1
6			

This Material List has been configured by Cisco with the design information provided by the District and Consultant. The CONTRACTOR shall verify that this material is the correct material prior to bidding and prior to ordering. It is the CONTRACTORS responsibility for a complete system whether listed here or not.

2. Edge Stacking cable shall provide:
   - The Catalyst 2960 switch supports the Cisco FlexStack stacking with a hot-swappable module and IOS software provides true stacking, all switches in a stack act as a single switch unit.
   - Cisco FlexStack supports cross-stack features including Etherchannel, SPAN and FlexLink technology.
   - The approved Edge Stacking cable is;

     CAB-STK-E-0.5M, FlexStack stacking cable with a 0.5 m length
     CAB-STK-E-1M, FlexStack stacking cable with a 1.0 m length
     CAB-STK-E-3M, FlexStack stacking cable with a 3.0 m length
     WS-C2960S-STACK, FlexStack hot-swappable stacking module
   - It shall be the responsibility of the contractor to verify quantity, type and length of stacking cables required.

C. Network Modules

1. 10GBase SFP+
   - Smallest 10G form factor
   - Supports 10GBASE Ethernet
   - Hot-swappable input/output device that plugs into an Ethernet SFP+ port of a Cisco switch
   - Provides flexibility of interface choice
   - Supports "pay-as-you-populate" model
   - Supports the Cisco quality identification (ID) feature that enables a Cisco switch to identify whether the module is certified and tested by Cisco
   - Optical interoperability with 10GBASE XENPAK, 10GBASE X2, and 10GBASE XFP interfaces on the same link

- 10GBASE-SR Module supports a link length of 26m on standard Fiber Distributed Data Interface (FDDI)-grade multimode fiber (MMF). Using 2000 MHz*km MMF (OM3), up to 300m link lengths are possible; **Cisco SFP-10G-SR**
- 10GBASE-LR Module supports a link length of 10 kilometers on standard single-mode fiber (SMF, G.652); **Cisco SFP-10G-LR**
- SFP+ Copper Twinax cables are suitable for very short distances of up to 10m; **Cisco SFP-H10GB-CU1M, Cisco SFP-H10GB-CU3M, Cisco SFP-H10GB-CU5M**

2. Small Form-Factor Pluggable (SFP) Gigabit Interface
   - Small Form-Factor Pluggable (SFP) Gigabit Interface Converter is a hot-swappable input/output device that plugs into a Gigabit Ethernet port or slot, linking the port with the network.
   - SFPs can be used and interchanged on a wide variety of Cisco products and can be intermixed in combinations of 1000BASE-SX, 1000BASE-LX/LH, 1000BASE-ZX, or 1000BASE-BX10-D/U on a port-by-port basis.
   - The approved 1000BASE-T SFP module shall be Cisco # **GLC-T**
     Shall be for Copper links
     1000BASE-T SFP Transceiver Module for Category 5 copper wire.
   - The approved 1000BASE-SX SFP module shall be Cisco # **GLC-SX-MM**
     Shall be for Multimode Fiber Only
     The 1000BASE-SX SFP, shall be compatible with the IEEE 802.3z 1000BASE-SX standard
     Operate on 50 µm multimode fiber links up to 550 m and on 62.5 µm multimode fibers up to 220 m.
   - The approved 1000BASE-LX/LH SFP module shall be Cisco # **GLC-LH-SM**
     1000BASE-LX/LH SFP for Both Multimode and Single-Mode Fibers
     The 100BASE-LX/LH SFP, compatible with the IEEE 802.3z 1000BASE-LX standard, operates on standard single-mode fiber-optic link spans of up to 10 km and up to 550 m on any multimode fibers.
3. Contractor shall provide modules for each connected end between equipment as shown on the single line drawings. It shall be the responsibility of the contractor to verify type and quantity of modules required.

D. LAN, WLAN Equipment Warranty
1. All Cisco switches shall be provided with **Cisco SP Base Service**
   - Around-the-clock, global access to the Cisco TAC
   - Registered access to Cisco.com
   - Next-business-day, 8x5x4, 24x7x4, and 24x7x2 advance hardware replacement. Return to factory option available1
   - Ongoing operating system software updates2
2. Contractor will provide one year of SMARTnet (CON-SNT-#######) with next-business-day advance replacement from the manufacturer for each Cisco manufactured product in this project.

2.3 Uninterrupted Power Supplies – System Equipment

A. Uninterrupted Power Supplies – UPS
1. Contractor will include an external UPS for the network electronics systems. A single UPS will be provided for each MC or HC designated cabinet.
2. Main Crossconnect – MC rooms shall have "On-Line" UPS equipment. The items described below are a minimum requirement.
   On-Line UPS
   Online UPS Systems provide the highest level of power protection for mission-critical applications. True on-line operation completely isolates connected

equipment from all power problems: blackouts, brownouts, surges, line noise, even harmonic distortion. Double-conversion operation continually converts incoming AC power into DC power, and then resynthesizes it back into normal AC power.

- 3000VA / 3.0 kVA high power density, on-line, double-conversion, extended-run 3U rack / tower UPS - with large internal battery set for longer standard runtime
- Full load runtime 12 minutes (2400 watts)
- Half load runtime 30 minutes (1200 watts)
- Supports extended runtime with optional external battery packs BP72V15-2U (limit 1) and BP72V28RT-3U (multi-pack compatible)
- Maintains sine-wave 110/120V +/-2% output during overvoltages to 138 and brownouts as low as 65V (50/60Hz auto-sensing)
- AC surge suppression 480 joules
- AC suppression response time Instantaneous
- Simultaneous communications via HID compliant USB port, serial port, SNMP/Web card slot and EPO interface
- Fault tolerant auto-bypass mode, current monitoring and switched PDU control via 2 switchable output load banks
- Input: NEMA L5-30P (120V) / Output: 4 NEMA5-15R, 4 NEMA5-15/20R & 1 NEMA L5-30R
- 2 year product warranty / $250,000 Ultimate Lifetime Insurance
- Unit Dimensions (HWD/in) 5.25 x 17.75 x 26
- The approved On-Line UPS shall be Tripp-Lite # **SU3000RTXR3U**

3. Horizontal Crossconnect – HC rooms shall have "Line Interactive" UPS equipment. The items described below are a minimum requirement. 1500VA / 1.5kVA line interactive, extended-run 2U rack/tower UPS
   - Maintains sine-wave 120V nominal output over an input range of 79 to 147V
   - Network communications supported via USB port, serial port, SNMP/Web card
   - slot and EPO interface
   - Current monitoring and switched PDU control via 3 two-outlet load banks
   - Input: NEMA 5-15P (120V 15A) / Output: 8 NEMA 5-15R (120V)
   - Unit Dimensions (HWD/in) 3.5 x 17.5 x 13.5
4. The approved On-Line UPS shall be Tripp-Lite # **SU1500RMXL2UA**

B. SNMP Interface Card

1. Contractor will include an SNMP Interface Card installed in each UPS System provided.
   - Enables remote monitoring and control of UPS and site electrical conditions using the SNMP network management platform or a web browser.
   - Web interface provides remote viewing of current site electrical data, UPS self-test and alert logs, as well as logged power events such as blackouts, brownouts, overvoltages, and other electrical problems
   - Alert notifications via email or SNMP traps give users the added advantage of having an immediate event notification sent to them as a result of a site electrical or UPS problem.
   - Protocols supported include HTTP, HTTPS, PowerAlert Network Management System, SMTP, SNMPv1, SNMPv2, Telnet, FTP, DHCP, BOOTP
   - The approved SNMP Interface Card shall be Tripp-Lite # **SNMPWEBCARD**
   - SNMP interface cards are not elegable for erate discounts.
   - Contractor will provide one THREE year Extended Warranty from the manufacturer for each and every Tripp-Lite manufactured equipment in this

project. Product warranty shall provide a one year extention of the two year standard warranty with additional services
Tripp Lite # **WEXT3-500-1500**
Tripp Lite # **WEXT3-2200-3000**
Tripp Lite # **WEXT3-SNMP**

C. Equipment Rack Surge Suppression Power Strip
1. 12 outlets / 15-ft. cord
2. 3840 joule rating
3. All metal housing with LEDs
4. Adjustable rackmount hardware
5. Isolated filter banks
6. PLUG/OUTLETS: Input: NEMA 5-15P/Output: 12 NEMA5-15R (2 front & 10 rear)
7. ELECTRICAL: 120V AC, 50/60Hz, 15A (Requires NEMA 5-15R wall receptacle)
8. FORMAT: Supports 19 in. rackmount (uses 1 rack space/1U)
9. $25,000 Ultimate Lifetime Insurance
10. The approved Surge Suppression Power Strip shall be a TrippLite # **ISOBAR12ULTRA**

2.4 Contractor's price shall include the cost to install, program and configure all of the above equipment.

Part 3 - Execution

3.1 General

A. All Work described in this specifying document and on the Project drawings shall be performed in accordance with the acknowledged Professional and Industry standards and practices. All installed equipment shall meet and/or exceed the specified manufactures regulations.
B. The Contractor shall maintain a competent supervisor and Manufacture Certified Technician assigned to this installation for the duration of the Project.
C. Furnish and install all materials, devices, components and equipment required for a complete and operational system.
D. It is the contractor's obligation to inform the Owner and/or the Owner's Representative of any and all conflict's, between the project documents and the onsite conditions.
E. It is the Contractor's responsibility and obligation to coordinate with all necessary trades to ensure the integrity and compliance of the Manufacture and Industry standards are meet during the duration of the installation.

3.2 Programming

A. Contractor shall provide all necessary programming to provide a complete operating Local Area Network.
B. Contractor shall include in their bid one four hour planning meeting with the owner and their Representatives to outline all specific programming including, but limited to:
- Notification to Contractor of the Approved IP Range.
- All individual restrictions and permissions.
- Contractor will address all concerns of the Owner and their Representatives.

C. Each switch will include programming to support:
- Account Login and Password for all management ports
- Login Banner
- Multiple IP Addresses

- Radius or TACACS+ security
- Server Time synchronization
- Log Recording (Time stamped, sent to remote server)
- SNMP recording
- Multiple VLAN's
- VLAN trunking
- Multiple Quality of Service policies
- HREAP

Contractor will provide all necessary programming to provide a complete operating Wireless Local Area Network, including software installation and site survey results before and after wireless installation.

Pre-installation survey will include:

- Proposed WAP locations
- Maps showing wireless coverage from proposed locations
- Suggested coverage enhancements or changes

Post-installation survey will include:

- Installed WAP locations with labels
- Maps showing actual wireless coverage with signal strength
- Throughput tests from each WAP

D. Contractor will turn all system passwords and copies of management software over to the District at the completion of this project.

E. Contractor will address all concerns of the Owner and their Representatives.

F. After installation and programming, contractor will test and verify all programming configurations.

3.3 Testing

A. After installation and programming, contractor will test and verify all programming configurations.

B. LAN Testing

1. After installation and programming, contractor will test and verify all programming configurations. Including but not limited to;
   - DHCP
   - VLAN
   - QOS
   - Multi-Protocol Label Switching (MPLS)
   - Multicast
   - IP Ping

C. WLAN Testing

1. The WLAN tester shall;
   - The Analyser should be capable to monitor the 802.11a/b/g and support for 802.11i
   - The Analyzer should be capable to monitor the performance of the WLAN network
   - It should be able to monitor the RF spectrum like SNR, C/N, etc.
   - The device should be capable of
     a. Global Positioning System Device Logging
     b. Record and Play Back WLAN Device Information
     c. World Mode Operation – International Channel Scanning
     d. Fifteen New WLAN Security Alarms
     e. Four New WLAN Performance Alarms
     f. Save and replay captured files in Wireless Sniffer in Ethereal file format

g. Configurable alarm threshold and audible alarm sound
h. Press-and-hold action supported on device icon for ease of navigation
i. Run-time static WEP decryption
j. Access control list (MAC addresses) import capability for rogue AP detection
k. Customizable vendor ID map for MAC address display.

- The device should capture 802.11 frames to the device trace file, Device should record all WLAN device information at the end of a real time session into the trace file.
- The device should be able to spot misconfigured WLAN devices operating in violation with regulatory rules.
- The device should come with following security alarms:
- Urgent AP with WEP disabled
- Warning Client station with WEP disabled
- Warning WEP initialization vector (IV) reused
- Info Device using Open authentication
- Warning Device probing network with NULL SSID
- Urgent Authentication failures abnormally high
- Urgent AP unconfigured
- Urgent Rouge AP
- Urgent Rouge client station
- Urgent Spoofed MAC address detected
- Warning Crackable WEP initialization vector (IV) used
- Info Device unprotected by VPN
- Urgent Device unprotected by 802.1X
- Warning AP broadcasting SSID
- Warning Ad-hoc mode station detected
- Urgent EAP rekey timeout too long
- Urgent Denial-of-service attack association flood
- Urgent Denial-of-service attack authentication flood
- Urgent Denial-of-service attack EAPOL-logoff
- Urgent Denial-of-service attack EAPOL-start
- Urgent Denial-of-service attack EAPOL ID flood
- Urgent Denial-of-service attack EAPOL spoofed success
- Urgent Denial-of-service attack EAPOL spoofed failure
- Urgent Denial-of-service attack De-authentication broadcast
- Urgent Denial-of-service attack De-authentication FLOOD
- Urgent Denial-of-service attack Dis-association broadcast

2. The contractor shall provide a complete system detail for all WLAN tests.

D. Contractor will perform a witnessed testing for minimum of 10% of all new network devices installed as a part of this project.

3.4 System Documentation

A. Upon completion of the installation, the electronics contractor shall provide four (4) full documentation sets to the Owner's Representative/Engineer for approval, one (1) to be a hardcopy and three (3) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is includes system single line drawings and maintenance and operation manuals, and all warranty information.

C. The Device Information documents are to be in an Excel spreadsheet format. Each device installed will have individual information entered in the spreadsheet including:

- Manufacturer and Model of device
- Physical Location (may include a digital picture), and mount type
- Serial Number of device
- IP Address(es) assigned to device
- Firmware revision installed
- Address and contact information of responsible staff

D. Each Device Configuration document shall be provided in both an electronic and text document format. One (1) to be a hardcopy print and three (3) to be electronic copies. The Device Configuration documents are to be in a text file format. Each device installed will have the following configuration information included (if applicable):

- Manufacturer and Model of device
- Current installed (running) configuration
- Firmware revision installed
- Installed modules, blades, or accessories

E. Equipment documentation shall include the items listed below:

- Maintenance and Operations Manuals
- All System Passwords and Management/Programming Software

END OF SECTION

SECTION 273000 – DIGITAL HYBRID TELEPHONE SYSTEM

Part 1 - GENERAL

1.1 General

A. This document describes the requirements for the contractors, products and installation relating to furnishing and installing a Digital Hybrid Telephone System.

B. Contractor will provide a bid including all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in this Document. It is the responsibility of the Contractor to provide all material necessary to provide a complete and operable system. If the contractor feels that the system described is incomplete they must address this in writing to the Owner/Owner's Representative before providing a bid.

C. All questions concerning non specified product and services will be address to the Owner's Representative before Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that the Contractor has provided a competent bid for a complete solution.

D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities, Part Numbers and Material Descriptions will be provided as an attachment to this document.

1.2 Regulatory References

A. Contractor will comply will all Federal, State, Local Codes/Regulations and Industries Standards.

1. Federal:
   - NFPA 70 - National Electric Code(NEC)
   - FCC Part 15, Part 68
2. Industry Standards:
   - Telecommunications Industry Associations/Electronics Industry Association (TIA/EIA)
   - Institute of Electrical and Electronic Engineers (IEEE)
   - Underwriters Laboratories Inc. (UL)
   - International Organization for Standardization/International Electromagnetic Commission (ISO/IEC)
     ISO 11801 Generic Cabling for Customer Premises
   - Building Industry Consulting Services International (BICSI)
     LAN Specialty Methods Manual (2009 or latest).

B. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

C. This document does not replace any code, either partially or wholly. The contractor must be aware of and comply with all local codes that may impact this project.

1.3 Quality Assurance

A. Quality Assurance

Contractors wishing to provide a proposal for this project are required to comply with the following without exception:

1. The winning Contractor will assign this project to a competent Project Manager who has demonstrated their ability to supervise a telecommunications project of the same size and scope.
   - The contractor will make this person available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.
   - Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
   - Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours notice for non-emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.
2. All material and equipment to be installed on this project will be "new". If the Owner/Owner's Representative discovers that "used" material or equipment has been installed on this project the Contractor will be required to replace said materials and/or equipment with "new" products at no additional cost to the Owner.
   - "New" - Materials and products manufactured within one (1) year prior to installation, and meet or exceed the latest published specifications of the manufacture. Also these materials and equipment may not have been in use before installation on this project unless directed otherwise in the project documents.
3. Contractor must warranty all materials, equipment and labor for a minimum of one (1) year.
   - Warranty will provide repair/replacement of all defective or improperly installed materials at no additional cost to the Owner (including Labor, drive time, shipping, taxes, etc.).
   - Contractor is required to be on site to repair/replace defective items no later than 24 hours after receiving trouble call.
   - Warranty will cover normal Business hours, 8am – 5pm, Monday thru Friday. All calls received on a Friday or the day before a holiday will be held until the following regular business day.

1.4 Submittal Documentation

A. The successful contractor shall provide three (3) copies of their submittal package.

B. The Submittal Package will include:
   1. The successful contractor will provide their submittal package in accordance with the RFQ section "Project Management" sub section "Submittals".

1.5 Equivalent Products

A. All Products described and Part Numbers given in this Specification are those of Iwatsu Enterprise-CS v9.0 or higher and TrippLite or equivalent unless otherwise noted.
   Pre-Approved equals;
   1. Avaya

B. Contractors wishing to approve a system other than those specified in this document will be required to perform the following:
   1. Provide System specifications and cutsheets for all system components for the proposed new system(s).
   2. Provide an itemized comparison to each of the system functions as described in this specification. Include in that document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria: "exceeds"/"matches"/ "unequal".

C. All other products than those specifically address in the bid document that the Contractor is seeking approvals for must be ***received*** by the Owner's Representative ***no later than ten (10) days before the bid date***. All Approved Equals will be published in addendum form prior to the bid date.

D. Failure to received written approval for product installed that deviates from the products called for in this specification and/or on the project drawings will result in the contractor having to replace the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.

E. All proposed system documentation must be sent to the Owner's Representative via one of the following; mail, fax or email. The Contractor will include the project name, their contact information, and the specification section number that the proposed system is comparable to.

1.6 Technology Clause & ERATE

A. As technology advances, it is understood that improved or enhanced products may supersede existing products in both price and performance and yet be essentially similar. This request for bids seeks to address the rapid advances in technology by allowing functionally similar or identical products that may be introduced in the future, during the term of this bid, to be included under the general umbrella of compatible product lines and are thus specifically included in this bid document.

B. Discontinued or end of life products shall be replaced with an equal product to the original specified product at no additional costs to the owner.

Part 2 - Products

2.1 System Description

A. System will be capable of IP switching communications between IP handsets and the capability of providing network connections to multiple site IP-based communications systems.

B. System will also provide for traditional TDM switching between legacy stations and trunks.

C. The System shall provide a minimum of an additional 4 analog Trunk connections from the existing Intercom system. Telephone System handsets shall be able to interface with the existing Classroom Intercom speakers and the perform Zone and All page capabilities.

D. System will include an Internal Battery Back-Up to maintain normal system

E. System will include a Call Accounting system.

2.2 System Minimum Quantities

A. Telephone System

The following table provides the minimum requirements for system quantities. Contractor will include in their price the cost to provide a complete and operational system including all any materials/services not specifically addressed in this document.

Item	Site Name	System Type	Qty/Type of Trunk Ports	# of Analog Station Ports	Desktop Client & VM License	Site License
1	New McFarland Elem	Iwatsu Enterprise-CS Iwatsu Enterprise Suite Messaging	1 PRI T1 12 1MB (POTS)	4	50	1
2						

**** Contractor will provide system with 25% future VoIP ^ Voice Mail growth at each site, this may require different hardware that shown above.***

2.3 Digital/IP Hybrid Telephone System

A. The following table provides the minimum requirements for system quantities and configuration. Contractor will include in their price the cost to provide a complete and operational system including all any materials/services not specifically addressed in this document.

1. The Contractor will provide the phone system configured to accept 12 (twelve) analog trunk lines. Contractor will also provide all equipment and key codes to support 1 (one) future PRI circuit and 4 (four) IP trunks.
2. The Telephone System shall be capable of the following Standard functions:
   - PBX/Key system functionality
   - Fully integrated voicemail
   - Automated Attendant with Custom Call Routing
   - Computer Telephony Integration
3. The Telephone System's microprocessor shall provide the memory, logic, and sensing and control circuitry.
4. System shall be modular and expandable with the use of cartridges and/or cards.
5. The Telephone System shall be expandable up to 1024 station ports.
6. The System shall provide a data port for remote connection to provide the ability of off site diagnostic functions.
7. The System shall provide the ability to receive a minimum of an 4 analog Trunk connections from the Intercom system. Telephone System handsets shall be able to interface with the Classroom Intercom speakers and the perform Zone and All page capabilities.
8. The Voice Communication System shall be installed with Tenant Partitioning. The District Office and the Elementary school will appear as separate tenants.
9. The Telephone System shall have the ability to accept the following trunk services:
   - Centrex Lines
   - Dedicated Analog lines
   - Integrated Services Digital Network (ISDN)
   - Primary Rate Interface (PRI)
   - Basic Rate Interface (BRI)
   - IP Trunks
   - T-1 Service

B. The System shall be able to provide all of the following functions:

#	Feature
1	All Call Paging
2	ANI/DNIS Support
3	Automatic Route Selection
4	Background Music
5	Battery Backup
6	Call Costing and SMDA Reports
7	Call Forwarding
8	Conferencing (7 Party)
9	Digital Wireless Telephone Support
10	Direct Inward Dialing (DID)
11	Direct Inward System Access (DISA)
12	Disconnect Supervision
13	DSS Status Button
14	E&M Tie Line support
15	E911 Line Type
16	Enhanced Night Mode
17	External Paging Interface
18	Flexible Station Numbering Plan
19	Hot-Desking
20	Industry Standard Telephone Support
21	Interface (TSAPI) Support
22	ISDN-PRI Interface Support
23	Line Groups
24	Meet-Me Answer Page
25	Modem Support
26	Multiple Redial
27	Music Interface
28	Music on Hold
29	Networking (Both IP and ISDN)
30	Paging Access
31	Power Failure Transfer
32	Self Diagnostics
33	Station Hunting
34	Station Speed Dial
35	System Speed Dial
36	System Status Reports

C. The system will provide the minimum of the following Key and PBX system features:

#	Feature	#	Feature
1	One Touch Optimized Key	30	Station Restriction Password
2	On-Hook Dialing	31	System Alarm
3	Optimized Routing	32	System Announcements
4	Outside Line Call Restriction	33	System Clock

5	Outside Line Interfaces	34	Text Messaging
6	Outside Line Pick-Up Restriction	35	Time Reminder
7	Paging	36	Toll Restriction
8	Personal Ringing Tones	37	Tone Pulse Dialing
9	Power Failure Backup Memory	38	Tone / Voice Calling
10	Power Failure Backup System	39	Transfer
11	Preset Dial / Backspace Dialing	40	Unanswered Incoming Outside Line Warning
12	Prime Line Access	41	Tone
13	Privacy / Privacy Release	42	Uniform Call Distribution (UCD)
14	Private Line	43	Universal Night Answer
15	Protected Line	44	Voice Mail / Automated Attendant Integration
16	Protected Station	45	Voice Mail Message
17	Quick Mode Operation	46	Voice Mail Monitor
18	Remote Programming / Diagnostics	47	Whisper Page
19	Remote Relay Control	48	Centralized System Reporting and Monitoring
20	Ring Muting	49	Peer to Peer
21	Save Number Redial	50	Local Survivability
22	Shift Call	51	Dynamic Bandwidth Allocation
23	Single Line Telephone Features	52	Networked ACD Groups with Distributed
24	SMDR	53	Agents
25	SNMP	54	Reduced Hardware and Software Costs
26	Speakerphone	55	Remote System Reset
27	Speed Dial	56	Shared Resources
28	Station Coaching	57	Total Feature Transparency
29	Station External Ringer Connection		

D. The Digital Hybrid Telephone System shall be the **Iwatsu Enterprise-CS**.

2.4 Unified Communications

A. Voice Mail System

1. The Voice Mail System shall be an integrated in to the Telephone system and shall provide for the following:
   - The Voice Mail System shall be capable to expand up to a maximum of 10000 Voice Mailboxes, and allow up to 150 hours of storage.
   - The Voice Mail System shall be enabled with 10/100 Ethernet ports, with the capability to support Web-based Management applications.

2. The Voice Mail Features shall include:

#	Feature
1	Account Number Boxes
2	Auto Attendant
3	Automatic Call Distribution
4	Call Queuing
5	Call Recording
6	Call Screening
7	Caller ID
8	Dial-by-Name
9	Directory Box
10	Fax Tone Transfer
11	Group Box
12	Individual Voice Mailboxes
13	Integrated Design
14	Pager Notification
15	Q&A Box
16	Routing Boxes
17	Transfer Off-Premise

B. Auto Attendant System

1. The Telephone System shall provide an Auto Attendant Feature that includes the following standard options:

#	Feature
1	Auto Message Forward to Alternate Extension
2	Call Blocking
3	Call Forwarding
4	Call Recording
5	Call Screening
6	Customizable System Prompts
7	Directories and Dial-by-Name
8	Fax Tone Transfer
9	Future Message Delivery Scheduling
10	Greetings Based on Port/Trunk
11	Message Recall
12	Message Waiting Lights
13	Multilingual Capability
14	New User Tutorial

C. The Unified Messaging System shall be the **Iwatsu Enterprise Suite Messaging**.

2.5 Telephone Handset and Devices

A. Although not eligible for erate discount telephone handsets are required for this project. Contractor shall cost allocate telephone handsets as 0% eligible. The owner may wish to procure these handsets via lease option. Contractor

can provide lease information if available thru this contract.

Trade-in of owners existing equipment may also be used to relieve the total cost of ownership to the district. Trade-in agreements shall be made prior to material orders. NO GIFTS will be accepted for ineligible components.

Contractor will include in their price for the quantity of devices as listed in the handset schedule.

1. Basic Classroom Telephone: Telephones shall have the following features:
   - Fully Modular
   - 9' Handset Cord
   - Single-Gong Ringer
   - Ringer Volume Control
   - Hearing Aid Compatible
   - Five-Year Limited Warranty
   - Nationwide Support System
   - ADA Volume Control Compliant
   - Message waiting indicator lamp
   - The approved Basic Classroom Telephone is **Cortelco 255444-VBA-27M**.

2. Two Line Digital Telephone: Telephones shall have the following features:
   - 2-line, 16-character LCD
   - Oversized incoming call / message waiting indicator lamp
   - 9 programmable flexible feature keys with red and green LEDs, expandable to 18
   - 5 fixed feature keys
   - Headset jack
   - Full-duplex speakerphone
   - The approved Single line Telephone is **Iwatsu Icon IX-5800**.

3. Admin 10/16 Button Digital Telephone: Telephones shall have the following features:
   - 7-line, 24-character LCD with backlight
   - Oversized incoming call / message waiting indicator lamp
   - 10 self-labeling flexible feature keys with red and green LEDs (Times 2 screens)
   - 16 programmable feature keys with red and green LEDs, expandable to 24
   - Full-duplex speakerphone
   - Optional integrated Bluetooth® headset interface
   - Integrated wall mount
   - The approved Admin 12/16 Digital Telephone is **Iwatsu Icon IX-5810**.

4. Admin 30 Button IP Telephone. Telephones shall have the following features:
   - 15-line, 24-character LCD with backlight
   - Oversized incoming call / message waiting indicator lamp
   - 30 self-labeling flexible feature keys with red and green LEDs (Times 2 screens)
   - Ergonomic handset design

- Full-duplex speakerphone
- Optional integrated Bluetooth® headset interface
- Power Over Ethernet or local power supply
- Integrated wall mount
- The approved Admin 30 IP Telephone is **Iwatsu Icon IX-5930**.

5. 30 Button Key lamp Indicator Module The KIM shall have the following features:
   - 30 Keys by 2 Screens; 60 Feature Keys Max
   - 15-Line, 24-Character
   - POE or Local Power Connection
   - The approved 30 Key Indicator Module (KIM) is **Iwatsu Icon IX-59DS**.

6. Cordless Telephone The cordless phone shall have the following features:
   - Size: 5.5" H x 1.7" W x 0.9" D
   - Weight: 3.7 oz.
   - Display: 3 lines/12 characters per line with back lighting
   - Keys: 8 programmable backlit multipurpose keys with red/green LED, 9 backlit feature keys, 12 backlit dial pad keys
   - Battery: Rechargeable Lithium Ion Battery Pack
   - Charge Time: 7 hours
   - Talk Time: 4.5 hours
   - Standby Time: 320 hours
   - Average Range From Base Station: 150 feet
   - The approved Cordless Telephone is the **Iwatsu Icon Omegatrek PS6**.

B. Handset Schedule

Room #	Basic/Classroom Handsets	Two Line Digital Telephone	Admin 10/16 Button Digital Telephone	Admin 30 Button IP Telephone	Expansion Console	Wireless Handset
Reception 1				1	1	
Reception 2				1	1	
Office 1			1			
Office 2			1			
Office 3			1			
Office 4			1			
Office 5			1			
Conference			1			
Vice Principal			1			
Principal			1			1
Nurse		1				
Library			1			
Media Lab		1				
Computer Lab		1				
Teacher Lounge		1				

Janitorial	1					1
Rm 1	1					
Rm2	1					
Rm3	1					
Rm4	1					
Rm5	1					
Rm6	1					
Rm7	1					
Rm8	1					
Rm9	1					
Rm10	1					
Rm11	1					
Rm12	1					
Rm13	1					
Rm14	1					
Rm15	1					
Rm16	1					
Rm17	1					
Rm18	1					
Rm19	1					
Rm20	1					
Rm21	1					
Rm22	1					
Rm23	1					
Rm24	1					
Rm25	1					
Rm26	1					
Rm27	1					
Rm28	1					
Rm29	1					
Rm30	1					
Rm31	1					
Rm32	1					
Rm33	1					
Rm34	1					
Rm35	1					
Rm36	1					
Rm37	1					
Rm38	1					
Rm39	1					
Rm40	1					
Misc	5	2				

2.6 System Battery Backup

A. Integrated Switch Backup Unit
1. The integrated backup unit shall be/have:
   - Wall Mounted
   - 24Volt; 20AH
   - 3 HOUR minimum run time

B. Uninterrupted Power Supply (UPS)
1. The Uninterrupted Power Supply (UPS) unit shall have:
   - 2200VA / 2.2kVA line interactive, extended-run tower UPS
   - Maintains 120V nominal output over an input range of 79 to 147V
   - Network communications supported via 2 USB ports, 2 serial ports, SNMP/Web card slot and EPO interface
   - Current monitoring and switched PDU control via 3 two-outlet load banks
   - Input: NEMA 5-20P (120V 20A) / Output: 2 NEMA 5-15/20R, 7 NEMA 5-15R (120V)
   - 2 year product warranty / $250,000 Ultimate Lifetime Insurance (USA, Puerto Rico & Canada only)
   - The approved UPS Unit is **Tripplite SMART2200VSXL**.

Part 3 - Execution

3.1 General

A. All Work described in this specifying document shall be performed in accordance with the acknowledged Professional and Industry standards and practices. All installed equipment shall meet and/or exceed the specified manufactures regulations.

B. The Contractor shall maintain a competent supervisor and Manufacture Certified Technician assigned to this installation for the duration of the Project.

C. Furnish and install all materials, devices, components and equipment required for a complete and operational system.

D. Erate Eligibility is based on School's and Libraries' Eligible Services List. It is the bidder's responsibility to verify with USAC the eligibility of all components in the project.

E. It is the contractor's obligation to inform the Owner and/or the Owner's Representative of any and all conflict's, between the project documents and the onsite conditions.

F. Telco Coordination - Contractor will coordinate with all telephone service providers and local communications facilities as deemed necessary for complete of work.

3.2 Installation

A. Contractor shall provide all Telephone System equipment in accordance to the Manufacture specification and Installation Manuals.

B. The Telephone System and corresponding terminations and ancillary equipment will be installed in such a manner as to provide future expansion.

C. Contractor shall supply all cross connects needed to provide a complete and operational Telephone System. The contractor will also provide the additional cross connects for the following, if required:

1. Fax Lines
2. Modem Lines
3. Music on Hold
4. All connections from other vendor's equipment that interface with the Contractor's Telephone Switch.

3.3 Programming

A. Contractor shall provide all necessary programming to provide a complete operating Telephone System.

B. Contractor shall include in their bid one (1) four (4) hour planning meeting with the owner and their Representatives to outline all specific programming issues including, but limited to:
   1. Notification to Contractor of the Approved Extension List.
   2. Finalized floor plan with the locations of extensions will be given to Contractor.
   3. All individual restrictions and permissions will be discussed and assigned to these extension numbers.
   4. Contractor will address all concerns of the Owner and their Representatives regarding system operation features and programming issues at this time.

3.4 Training

A. Contractor shall provide no less than three (3) two (2) hour training sessions.
   1. The first training session will be a "Train the Trainer". The owner will appoint their representative to be provided extensive training so that he/she will be able to provide additional support once the project has been completed.
   2. The additional training sessions will be provided as a general overview of the system operation for one large group or several smaller groups as designated by the owner.

3.5 System Documentation

A. Upon completion of the installation, the electronics contractor shall provide four (4) full documentation sets to the Owner's Representative/Engineer for approval, one (1) to be a hardcopy and three (3) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is includes system single line drawings and maintenance and operation manuals, and all warranty information.

C. The Device Information documents are to be in an Excel spreadsheet format. Each device installed will have individual information entered in the spreadsheet including:
   - Manufacturer and Model of device
   - Physical Location (may include a digital picture), and mount type
   - Serial Number of device
   - IP Address(es) assigned to device
   - Firmware revision installed
   - Address and contact information of responsible staff

D. Each Device Configuration document shall be provided in both an electronic and text document format. One (1) to be a hardcopy print and three (3) to be electronic copies. The Device Configuration documents are to be in a text

file format. Each device installed will have the following configuration information included (if applicable):

- Manufacturer and Model of device
- Current installed (running) configuration
- Firmware revision installed
- Installed modules, blades, or accessories

E. Equipment documentation shall include the items listed below:

- Maintenance and Operations Manuals
- All System Passwords and Management/Programming Software

F. As apart of the Close-Out Documentation the Contractor shall provide copies of all system warranty and certification documentation, a copy of the One year Workmanship Warranty, a list of telephone extensions with the name assigned to each.

G. The **As-Built** drawings are to include Telco Back Board Telephone Switch Equipment Layout and System Single Line Drawings.

END OF SECTION

SECTION 275000 - VIDEO DISTRIBUTION SYSTEM

Part 1 - General

1.1 Work Included

A. Provide all labor, materials, tools and equipment required for the complete installation of work called for on the Construction Drawings and described in the Specifying Documentation.

1.2 Related work in other sections

A. Structured cabling shall be provided by the Division 17100 Contractor.

B. CATV/MATV viewing devices (Televisions, VCR, projectors, etc...) shall be provided by the owner.

C. All 120VAC power conductors and conduits associated with power circuits to all equipment locations shall be furnished and installed by Division 16000 contractor.

D. All raceway systems including but not limited to conduit, j-boxes, outlet boxes, floor boxes, surface mounted raceway, grounding & bonding, communication backboards shall be furnished and installed by Division 16000 contractor.

1.3 Scope of Work

A. This document describes the products and execution requirements relating to furnishing and installing the Video Distribution Systems. The Video Distribution System Electronics and installation requirements are covered under this document.

B. All equipment, related terminations, support and grounding hardware shall be furnished, installed, wired, tested, labeled, and documented by the Telecommunications contractor as detailed in this document, unless otherwise noted. The intent of these Specifications is to provide a complete Video Distribution System and it is the responsibility of the bidding Contractor to provide a complete solution. It is also the responsibility of the Contractor to provide all material necessary to provide a complete system even if the material is not described specifically in the following documentation.

C. All questions concerning non specified product and services will be address to the Owner's Representative before Contactor provides a bid. Owner expects that by accepting the Contractor's bid proposal that the Contractor has provided a competent bid for a complete solution.

D. Product specifications, general design considerations, and installation guidelines are provided in this document. Quantities of telecommunications outlets, typical installation details, cable routing and outlet types will be provided as an attachment to this document.

1.4 Regulatory References

A. Contractor will comply will all Federal, State, Local Codes/Regulations and Industries Standards.

1. Federal:
   - NFPA 70 - National Electric Code(NEC)
   - FCC
     Part 15
     Part 68

2. State of California:
   - CCR Part 2 - Uniform Building Code.
   - CCR Part 3 - California Electrical Code
   - Occupational Safety and Health Act (OSHA).
   - Title 24, Building Standards, State of California.
   - Title 19, California Code of Regulations.
   - Title 8, Electrical Safety, State of California

3. Industry Standards:
   - Institute of Electrical and Electronic Engineers (IEEE)
   - Underwriters Laboratories Inc. (UL)
   - International Organization for Standardization/International Electromagnetic Commission (ISO/IEC) ISO 11801 Generic Cabling for Customer Premises
   - Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (2000 or latest).

B. If there is a conflict between applicable documents, then the more stringent requirement shall apply. All documents listed are believed to be the most current releases of the documents. The Contractor has the responsibility to determine and adhere to the most recent release when developing the proposal for installation.

C. This document does not replace any code, either partially or wholly. The contractor must be aware of and comply with all local codes that may impact this project.

1.5 Contractor Qualifications/Quality Assurance

A. Contractor Qualifications

1. Contractor shall have been in business for no less than five (5) years and provide a list of a minimum of five (5) projects of similar size and scope.

B. Quality Assurance
Contractors wishing to provide a proposal for this project are required to comply with the following without exception:

1. The winning Contractor will assign this project to a competent Project Manager who has demonstrated their ability to supervise a telecommunications project of the same size and scope.
   - The contractor will make this person available to the Owner/Owner's Representative before the start of this project for an interview. This person must be deemed acceptable by the Owner and/or their Representative before work can begin.

- Project Manager will be required to be available for scheduled on site project meetings at no additional cost to the Owner.
- Project Manager will be required to be available to meet on site with the Owner/Owner's representative with a minimum of 24 hours notice for non-emergency issues, and a minimum of 4 hours for emergency issues at no additional cost to the Owner.

2. All material and equipment to be installed on this project shall be "new". If the Owner/Owner's Representative discovers that "used" material or equipment has been installed on this project the Contractor will be required to replace said materials and/or equipment with "new" products at no additional cost to the Owner.
   - "New" - Materials and products manufactured within one (1) year prior to installation, and meet or exceed the latest published specifications of the manufacture. Also these materials and equipment may not have been in use before installation on this project unless directed otherwise in the project documents.
   - Warranty will cover normal Business hours, 8am – 5pm, Monday thru Friday. All calls received on a Friday or the day before a holiday will be held until the following regular business day.

1.6 Submittal Documentation

A. The successful contractor shall provide three (3) copies of their submittal package. This documentation is due 2 weeks from the mailing date of the "Letter of Intent" or the Signed Contract, which ever comes first.

B. The Submittal Package will include:

1. All documentation given will be in a Bond Cover or in a Three (3) Ring Binder.

2. A coversheet on the Contractor's Company Letterhead including:
   - Contractor's Name
   - Contractor's License Number
   - The Project Name
   - The Specification Number and Description
   - The date documentation was submitted.

3. A spreadsheet with a full material list of products and equipment included in the Contractor's bid price. Spreadsheet will provide:
   - Manufacture Name
   - Part Number
   - Description
   - Quantity to be installed for each part.

4. A legible copy of the Manufacture's Catalog Cutsheet for each part included in the Contractor's bid.
   - The Catalog Cutsheets shall be placed in the same order as shown on the spreadsheet.

5. Copies of the Manufacture's Certification for a minimum of the Project Forman and 50% of the installation crew.

6. Sample of Labeling Scheme. Contractor will provide a sample for each identifier to be used on this project.

Part 2 - Description

2.1 System Function

A. This section specifies the furnishing, installing, and testing of a complete and operating Broadband Master Antenna TV (MATV) System (here-in-after referred to as "the system"), and associated equipment. The system shall include, but not be limited to, broadband TV antennas, antenna tower, antenna masts, headend cabinet, broadband TV headend amplifier, necessary combiners, traps and filters, distribution amplifiers, cable and connectors, and necessary passive devices such as splitters, directional couplers, television (TV) outlets, and multi-taps.

B. The system shall be delivered free of engineering, manufacturing, installation, and operating defects. It shall be engineered and installed for ease of operation, maintenance, and testing.

C. The system shall receive the specified off air Very High Frequency (VHF) and Ultra High Frequency (UHF) TV channel signals, convert the UHF channels to vacant Community Antenna Television (CATV) channels and shall process and distribute them to the designated TV outlets shown on the drawings.

D. The system shall be capable of delivering all NTSC color and monochrome signals to EIA standard television receivers without discernable degradation.

E. The coax based network frequency spectrum is 5 MHz to 1000 MHz. The system has been designed with dual frequency methods. Frequencies employed in forward direction 150 - 1000 MHz, reverse 5 - 112 MHZ.

F. The system shall provide adjacent channel operation of a minimum (MIN) of 35 TV channels. The headend equipment shall be installed and interfaced according to the manufacturer's headend schematic diagram for adjacent TV channel operation. A 32 deci-Bel (dB) directional coupler shall be provided in the headend equipment rack as a test port that provides access for each TV channel without the need to disconnect distribution cables or equipment. Each TV channel shall be processed as a single channel.

G. The system shall provide for connection of a standard CATV cable ready TV receiver to the designated TV outlets in all areas as shown on the drawings.

H. Broadband (i.e. combined VHF and UHF types) antennas shall be used. A means of balancing and adjusting the individual TV channel carrier input(s) to the headend single channel or distribution amplifier(s) shall be provided.

I. **A system design where "looping" the coaxial cable from room to room shall not be permitted**. Each floor or ward distribution system shall be a "tap" design where each room's TV outlet is fed from a directional multi-tap provided from a centrally located (usually in the corridor) lateral trunkline cable. Each ward or floor lateral trunkline cable shall be connected to a vertical trunkline riser cable in the associated signal closet. Each vertical riser trunkline cable shall be connected to the headend output. Distribution (floor or riser) amplifiers shall be provided to satisfy system's TV outlet signal level requirements.

2.2 System Performance

A. The signal level of each TV channel at each TV outlet shall be +10 dB per mili-Volt (dBmV), ±5 dBmV across 75 Ohms.

B. The system shall meet the following MIN parameters at each TV outlet:
   1. Cross Modulation: -46 dB
   2. Hum Modulation: -55 dB
   3. Return Loss: -14 dB
   4. Isolation (outlet-outlet): 24 dB
   5. Aural Carrier Level: 13 dB to 17 dB below visual
   6. Impedance: 75 Ohm

C. Balance
   1. (1) Overall signal balance within the distribution system shall be a maximum of 3 dB difference between any two user connections in the forward direction as measured at the tap port at design frequencies.
   2. Overall system signal balance shall be within a 3 dB difference between any two carriers at the design frequencies, regardless of direction. Measurements shall be taken at both the headend and user tap ports in each distribution leg.

Part 3 - Products

3.1 Equivalent Products

A. All Product provided in this Specification are those of :
   1. Modulators, BLONDER TONGUE
   2. Demodulators, BLONDER TONGUE
   3. Combiners, BLONDER TONGUE
   4. Distribution Amplifier, BLONDER TONGUE
   5. Splitter/Tap, BLONDER TONGUE, TONER

B. Pre-Approved Equals:

   1. There are no pre approved equals at this time.

   2. Contractors wishing to approve a system other than those specified in this document will be required to perform the following:
      - Provide System specifications and cut sheets for all system components for the proposed new system(s).
      - Provide an itemized comparison to each of the system functions as described in this specification. Include in that document how the proposed system compares to the specified system described in this document on a line by line basis, using one of the following three criteria: **"exceeds"/"matches"/"unequal"**.

C. All other products than those specifically addressed in the bid document that the Contractor is seeking approvals for must be submitted in accordance with Division 1, 01620 Product Options and Substitutions.

D. Failure to received written approval for product installed that deviates from the products called for in this specification and/or on the project drawings will result in the contractor having to replace the unapproved materials and equipment with the originally specified products at no additional cost to the Owner.

E. All other products than those specifically address in the bid document that the Contractor is seeking approvals for must be received by the Owner's Representative ***no later than 5 days before the bid date***. All Approved Equals will be published in addendum form prior to the bid date.

3.2 Video Distribution System

A. The approved Modular Headend Chassis shall have the following characteristics:
   1. Chassis shall provide for a minimum of 12 Vertical Slots
   2. Chassis shall utilize a variety of Slide-In Modules:
      - Channelized Modulator with Channel Ranges up to 750 MHz
      - SAW Filtered Demodulators - 54-806 MHz
      - VHF/UHF & 54-750 MHz
      - CATV

B. Power Supply for Chassis shall support all configurations of modules.

   The approved Modular Headend Chassis shall is the Blonder Tongue Model# MIRC-12. Contractor will provide one Power Supply Blonder Tongue Model# MIPS-12B for each Modular Headend Chassis.

C. The approved Modulators shall have the following characteristics:
   - Frequency Range: 54-860 MHz
   - Channels: VHF, CATV
   - Output Level - Min: +45 dBmV
   - Output Level Adjust: 10 (a) dB
   - Aural/Visual Carrier Ratio: -9 to -20 dB
   - Visual Carrier Frequency Tolerance
     Standard Channels: ±10 kHz
     FCC Aeronautical Channels: ±5 kHz
   - Aural Carrier Frequency
     Offset from Visual Carrier: +4.5 MHz
     Accuracy, Settable To: ±1.5 kHz
   - Spurious Outputs: -60 dBc
   - C/N Ratio In Channel: 60 dB
   - Broadband Noise: -90 dBc
   - Output Impedance: 75 Ω
   - Output Return Loss: 12 dB
   - VIDEO
     Input Level: 1.0 (b) V p-p
     Frequency Response: fv-0.5 MHz to fv+4.2 MHz: ±1.00 dB
     P-P Video to RMS Hum Ratio: 60 dB
     Video Signal-to-Noise Ratio, Weighted: 60 (c) dB
     Differential Gain: ±4.0 (b) %
     Differential Phase: ±2.0 (b) °
     Group Delay Response: see note (d) ns
     Input Impedance: 75 Ω
     Input Return Loss: 18 dB
   - AUDIO
     Input Level: 140 (e) mV RMS
     Frequency Response 20 Hz to 20 kHz: ±1.0 (f) dB
     Pre-Emphasis-Mono: 75 µs
     Total Harmonic Distortion (%): 1.0 (g)
     Input Impedance - Unbalanced: 10 kΩ
   - SUB-CARRIER AUDIO MICM-45B Units
     Frequency: 4.5 MHz
     Stability (typ.): ±5 (h) kHz

- GENERAL
  Power Requirements
  Voltage: +12 / +5 VDC
  Current (Max): 170 / 35 mA
  Power (Max): 2.25 W
  Temperature Range: 0 to +50 °C
- MECHANICAL
  Dimensions (WxHxD): 1.15 x 3.5 x 7.50 in
  Weight: 0.65 lbs
- CONNECTORS (Rear Panel)
  Video Input: "F" type, female
  Audio Input: RCA Phono, female
  RF Output: "F" type, female
  Power: Header, 3 Pin
- CONTROLS (Front Panel)
  Video Level: Control
  Aural Carrier Level: Control
  Audio Level: Control
  RF Output Level: Control
- INDICATORS (Front Panel)
  Power ON: LED, green

The approved Modulator is the Blonder Tongue Model# MICM-45.

D. The approved Agile Demodulators shall have the following characteristics:

- Input Frequency Range MIDM 7740B: 54-806 MHz VHF, UHF
- Channels: CATV, Standard, IRC or HRC
- Input Level - Range: -5 to +30 dBmV
- Noise Figure: 8-11 dB
- Image Rejection
  VHF: 65 dB
  UHF: 50 dB
- Input/Output Impedance: 75 Ω
- VIDEO:
  Output Level: 1.0 V p-p
  Output Impedance: 75 Ω
- AUDIO:
  Output Level: 1.0 V p-p
  Impedance - Unbalanced: 600 Ω
- GENERAL:
  Power Requirements
  Voltage: +12 VDC
  Current: 200 mA
  Power: 2.5 W
  Temperature Range: 0 to +50 °C
- MECHANICAL:
  Dimensions (WxHxD): 1.15 x 3.5 x 7.50 in
  Weight: 0.65 lbs
- CONNECTORS (Rear Panel):
  RF input: "F" type, female
  Video Output: "F" type, female
  Audio Output: RCA Phono, female
  Power: Header, 3 Pin
- CONTROLS (Front Panel):

Channel Selection: Push buttons
Video Level: Control
Audio Level: Control

- INDICATORS (Front Panel):
  Power ON: LED, green
  MIDM-806B: LED, 7 segment, 2 digit

The approved Agile Demodulator is the Blonder Tongue Model# MIDM-806.

E. The approved Passive Combiners shall have the following characteristics:

- Number of Inputs: 8
- Frequency Range: 5-1000
- Flatness - Relative to Slope: 0.4 - 0.5
- Slope: 2.75
- Insertion Loss - Individual Port
  40 to 450 MHz: 11.5 - 12
  450 to 1000 MHz: 13 - 14
- Isolation - Adjacent Ports
  40 to 450 MHz: 25 - 22
  450 to 1000 MHz: 25 - 22
- Isolation - Non-Adjacent Ports
  40 to 1000 MHz: 40 - 35
- Selectivity: NA
- Test Port Level: -20
- Impedance - All Ports: 75
- Input Return Loss
  40 to 450 MHz: 20 - 18
  450 to 1000 MHz: 19 - 17
- Output Return Loss
  40 to 450 MHz: 20 - 18
  450 to 1000 MHz: 19 - 17
- MECHANICAL
  Dimensions (WxHxD): 19.0 x 1.75 x 15.25
  Weight: 6.5 7.0 10.5 lbs.
- CONNECTORS (Rear Panel)
  RF Input: "F" type female
  RF Outputs: "F" type female
- CONNECTORS (Front Panel)
  Test Port: "F" type female

The approved Passive Combiner is the Blonder Tongue Model# OC-8d.

F. The approved Rack Mount Distribution Amplifier shall have the following characteristics:

- Frequency Range: 47-860 MHz
- Channel Loading: 129
- Flatness: ±1.00 dB
- Gain: 31 dB
- Noise Figure (c): 8.0 dB
- Output Level: +44 (e) dBmV
- Test Port Level
  Input: -20, ±2 dB
  Output: -20, ±2 dB

- Gain Control Range: 15 dB
- Slope Control Range: 10 dB
- Composite Triple Beat - CTB: -50 dB
- Cross Modulation - XMOD: -50 dB
- Composite Second Order - CSO: -56 dB
- Hum Modulation: -70 dB
- Number of Hybrids: 2
- Hybrid Technology: Push-Pull
- Impedance - All Ports: 75 Ω
- Return Loss
  Input: 14 dB
  Output: 14 dB
- GENERAL
  Power Requirements
  Voltage: 117 VAC, ±10%
  Frequency: 60 Hz
  Power (f): 10-21 W
  Fuse: 1/2 A
  Temperature Range: -20 to +60 °C
- MECHANICAL
  Dimensions (WxHxD): 19.00" x 1.75" x 5.13"
  Weight: 8.00 lb
- CONNECTORS (Rear Panel)
  RF Input: Type "F", female
  RF Output: Type "F", female
- CONTROLS (Front Panel)
  Gain: Var. Control
  Slope: Var. Control
- INDICATORS
  Power ON: LED, red
- CONNECTORS (Front Panel)
  Input Test Port (g): Type "F", female
  Output Test Port (g) : Type "F", female

The approved Rack Mount Distribution Amplifier is the Blonder Tongue Model# RMDA 860-30A.

G. The approved Splitter shall be:

1. Solder Back Indoor/Outdoor Splitters
   - Housing, equal to Blonder Tongue model# SXRS, SCVS.
   - Superior Performance to 1000 MHz
   - 2,3,4, 6 (SCVS Only) and 8 Way Models
   - Die Cast Housing
   - RFI Shielding 120 dB
   - Built-in Ground Block
   - SCVS-2 1902 Splitter, 2 Way Solder Back, 5-1000 MHz, L Style
   - SCVS-3 1903 Splitter, 3 Way Solder Back, 5-1000 MHz, L Style
   - SCVS-4 1904 Splitter, 4 Way Solder Back, 5-1000 MHz, L Style
   - SCVS-6 1906 Splitter, 6 Way Solder Back, 5-1000 MHz, L Style
   - SCVS-8 1908 Splitter, 8 Way Solder Back, 5-1000 MHz, L Style
   - SXRS-2 1922 Splitter, 2 Way Solder Back, 5-1000 MHz, In-Line Style

- SXRS-3 1923 Splitter, 3 Way Solder Back, 5-1000 MHz, In-Line Style
- SXRS-4 1924 Splitter, 4 Way Solder Back, 5-1000 MHz, In-Line Style
- SXRS-8 1928 Splitter, 8 Way Solder Back, 5-1000 MHz, L Style

H. The approved Tap shall be:

1. Solder Back Directional Couplers
   - Housing, equal to Blonder Tongue model# SCW, SDC-4 & SRT.
   - 1 GHz Bandwidth
   - 120 dB RFI Shielding
   - Die Cast Housing
   - SCW 1930 Directional Tap, 1 Output 5-1000 MHz, L Style, Values: 4 ,6, 9, 12, 16, 20, 24, 27, 30 dB
   - SDC-4 1950 Directional Tap, 4 Output 5-1000 MHz, In-Line Style, Values: 8, 12, 16, 20, 24, 30 dB
   - SRT 1940 Directional Tap, 1 Output 5-1000 MHz, T Style,Values: 4, 6, 9, 12, 16, 20, 24, 27, 30 dB

2. Modular Tap shall system shall house up to 24 ports and is equal to the Total Tap manufactured by Toner. The Tap System shall contain the following products:
   - Housing, equal to Toner model# TXMT-3H.
   - 26db 8 port Tap, equal to Toner model# TXMT108-26T.
   - 23db 8 port Tap, equal to Toner model# TXMT108-23T.
   - Blank Plate, equal to Toner model# TXMT-B.

I. CABLE CONNECTORS

1. 1. All connectors utilized to provide interfacing of cabling to equipment or splices shall be solderless, 75 ohm impedance, with integral radiation sleeve and compression ring.
   Connectors shall be Gilbert GRS series cable connectors or equivalent.

2. Trunk Connectors - .750
   - CATV solid coaxial connector, with integral radiation sleeve, internally seized center conductor with captive center conductor pin, outer compression ring and "O" ring seals. Use CPT-750 to prepare cable end.
   - Manufacturer: GILBERT GRS-750-CH-DU-01

3. Trunk Splice Connector - .750
   - CATV solid shield coaxial splice connectors, with integral radiation sleeve, internally seized center conductor, outer compression ring and "O" ring seals. Use CPT-750 to prepare cable end.
   - Material: Machined aluminum, chromate film coating
   - Environmental: Weatherproof, compatible with shrink tubing
   - Manufacturer: GILBERT GRS-750-SP-DU-01

4. Trunk/Distribution Connectors - .500
   - CATV solid shield coaxial connector, with integral radiation sleeve, feed through center conductor pin type with internal center conductor seizure, outer compression ring and "O" ring seals. Use CPT-500 to prepare cable end.
   - Fitting interface: Standard 5/8 x 24 diameter

- Material: Machined aluminum, chromate film coating
- Environmental: Weatherproof, compatible with shrink tubing
- Manufacturer: GILBERT GRS-500-CH-DU-03

5. Trunk/Distribution Splice Connectors - .500
   - CATV solid shield coaxial splice connector, with integral radiation sleeve, internally seized center conductor, outer compression ring and "O" ring seals. Use CPT-500 to prepare cable end.
   - Material: Machined aluminum, chromate film coating
   - Environmental: Weatherproof, compatible with shrink tubing
   - Manufacturer: GILBERT MODEL GRS-500-SP-DU-03

6. Housing to Housing Connectors
   - Standard CATV/Male coupling connector for joining two equipment housings.
   - Interface: Standard 5/8 x 24 diameter
   - Material: Machined aluminum, chromate film coating
   - Environmental: Weatherproof, compatible with shrink tubing
   - Manufacturer: GILBERT G-KS-KS-M-T or G-KS-KS-M

7. Cable to 90 Degree Adapter and 180 Degree Adapter
   - Type: Male-VSF to female-VSF 90 degree adapter. Used to make right angle connections between cable and equipment housing. Female accepts any VSF-5/8 x 24 connector, center conductor is seized by tightening hex plug on end of the connector. The pin is 1.16 inch with standard 5/8 x 24 threads.
   - Manufacturer: GILBERT MODEL GP-90, GP-PA SERIES

8. Splice block
   - Type: Universal splice for two 5/8 X 24 threaded connectors.
   - Manufacturer: GILBERT MODEL G-SPB-2.0

9. Distribution Connectors - RG6-QS, Non-Plenum and Non-Teflon Jacket Plenum
   - Type: Standard CATV "F-56" connector with integral ferrule. Use Gilbert G-CRTUSA or equivalent .360 hex crimp tool.
   - Interface: Standard "F" female ports
   - Material: Aluminum, chromate film coating
   - Environmental: Indoor applications without weather boot
   - Manufacturer: GILBERT GF-6-AHS-1312 OR GF-6-AHS/USA

10. Connectors - .500 to "F"
    - Type: Standard CATV/female coupling connector. Used to connect .500" cable to "F" fitting. Connector has center conductor internal seizing with an integral sleeve. These connectors may not be used on any cable carrying power.
    - Manufacturer: GILBERT MODEL GRS-500-BAFF-DU-03

11. Series Splice
    - Type: Standard CATV/female adapter for joining two "F" connectors with 3/8 x 32 thread.
    - Manufacturer: GILBERT MODEL GF-81-S

J. REDUCER CONNECTOR:

1. Type: Standard 5/8 x 24 to female "F" Adapter with long pin and 60 Hz AC Termination
2. Manufacturer: GILBERT GF-625-CH-DCB-T

K. TERMINATION, GENERAL

1. The terminators utilized shall be provided for system matching and termination which minimizes reflections and spurious signal ingress onto the system.
2. Trunk Terminators
   - Type: Standard 75 ohm impedance, with RF and AC blocking characteristics, and 30 dB return loss. Completely weatherproof with soldered internal connections.
   - Manufacturer: GILBERT GTR-M-T
3. Tap Port Termination
   - Type: Standard 75 ohm impedance, with RF termination characteristics, and 30 dB return loss. RF only.
   - Manufacturer: GILBERT GTR-59-A
4. End of Line Terminators
   - Type: When a trunk or distribution cable is not terminated in an active or passive device it shall be terminated with an appropriate AC blocking RF terminator of 75 ohms impedance. Termination shall grip both the center conductor and sheath with a seizing type grip. Cable type for connector selector shall be based on Times Fiber for non-plenum and CommScope plenum cable.
   - Manufacturer: GILBERT
   - (500 cable type) GRS-500 TR-xxxx
   - (750 cable type) GRS-750 TR-xxxx
5. Room Drop Termination
   - Type: Dual cable device which will mount in a deep single gang electrical box. Box depth to be not less than 2.5 inches. Termination devices to be determined as needed to comply with the planned telecommunications assembly to be installed in the wall. For standard duplex cover plate installations utilize a Blonder-Tongue V-2GF-FT Versa Tap device. Either assembly is to use Gilbert G-MF/90 adapters as needed to comply with minimum cable bend radii within the outlet box.

L. Lightning Arrestor:

1. The lightning arrestor shall be a grounding block assembly for grounding of the antenna coaxial lead-in cable shield by the use of a gas discharge tube. It shall be made of noncorrosive metal and shall be securely bonded to the earth ground for lightning protection by a MIN #6 American Wire Gauge (AWG) stranded copper conductor.
2. Designed For HFC Or FTTC Broadband Network Application
3. Transparent To Analog/Digital Bi-directional Signal Transmission
4. Impedance Matched To 75 Ohms
5. Power Passing
6. Integral Failshort Mechanism
7. Return Loss 30 dB @ 1GHz (Typical)
8. Insertion Loss <0.1 dB
9. Frequency Range DC-1.5 GHz
10. Listed To UL 497 & CSA Certified

- Manufacturer: TII "Toner Cable"
- Part Number: 212FF75F22521

Part 4 - Execution

4.1 General

A. All Work described in this specifying document and on the Project drawings shall be performed in accordance with the acknowledged Professional and Industry standards and practices. All installed equipment shall meet and/or exceed the specified manufactures regulations.

B. The Contractor shall maintain a competent supervisor and Manufacture Certified Technician assigned to this installation for the duration of the Project.

C. Furnish and install all materials, devices, components and equipment required for a complete and operational system.

D. It is the contractor's obligation to inform the Owner and/or the Owner's Representative of any and all conflict's, between the project documents and the onsite conditions.

E. It is the Contractor's responsibility and obligation to coordinate with all necessary trades to ensure the integrity and compliance of the Manufacture and Industry standards are meet during the duration of the installation.

4.2 Installation

A. Contractor shall provide all System equipment in accordance to the Manufacture specification and Installation Manuals.

B. The Video Distribution System electronics, corresponding terminations and ancillary equipment will be installed in such a manner as to provide future expansion.

C. Contractor shall supply all connections needed to provide a complete and operational System.

D. All coaxial cable connections to wall outlets shall be screw on "F" cable connectors.

E. The wall outlet shall be fed from a directional coupler multi-tap or be an additional directional coupler in order to balance the system.

F. All trunk, branch, and interconnecting coaxial cables and unused ports/taps shall be terminated with a 75 Ohm terminating resistor designed for TV cable systems **without adapters**.

4.3 Grounding:

A. The Contractor shall ground all Contractor installed equipment to eliminate all shock hazard and to minimize, to the maximum extent possible, all ground loops, common mode returns, noise pickup, crosstalk, etc.

B. The Contractor shall install lightning arrestors and grounding in accordance with the NFPA and this specification.
C. Ground wires for antenna masts shall be at least No. 6 AWG stranded copper wire.
D. Ground wires for equipment shall be at least No. 14 AWG stranded copper wire.
E. Ground wires for equipment cabinets or racks shall be at least No. 10 AWG stranded copper wire.

4.4 Testing

A. Contractor to provide the Owner's Representative with one week notice of the date for final testing.
B. All testing documentation will be supplied as a part of the Contractors As-built Documentation.

C. The Contractor is responsible for furnishing all test equipment required to test the system in accordance with the parameters specified. Unless otherwise stated, the test equipment shall not be considered part of the system. The Contractor shall furnish test equipment of an accuracy better than the parameters to be tested. The test equipment furnished by the Contractor shall have a calibration tag of an acceptable calibration service dated not more than 12 months prior to the test. As part of the proposal, a test equipment list shall be furnished that includes the make and model number of the following type of equipment as a minimum:
   1. Spectrum Analyzer
   2. Signal Level Meter
   3. Volt-Ohm Meter
   4. Color TV Receiver, CATV cable ready.

D. Upon completing installation of the system, the Contractor shall align, balance, and completely pretest the entire system.

E. During the system test, the Contractor shall verify (utilizing the approved spectrum analyzer and signal level meter) that the system is fully operational and meets all system performance requirements of this specification.

F. The Contractor shall measure and record the visual and aural carrier levels of each channel at each of the following points:
   1. Antenna outputs.
   2. Preamplifier inputs and outputs.
   3. Strip amplifier or Channel Processor inputs and outputs.
   4. Headend signal level and S/N for each TV channel specified.
   5. Distribution amplifier inputs and outputs.
   6. Last outlet of each leg.
   7. A random sampling of 25% of TV Outlets.

4.5 Training

A. Contractor shall provide no less than two (2) two (2) hour training sessions.

   1. The first training session will be a "Train the Trainer". The owner will appoint their representative to be provided extensive training so that

he/she will be able to provide additional support once the project has been completed.

2. The additional training session will be provided as a general overview of the system operation for large groups or several smaller groups as designated by the owner.

4.6 System Documentation

A. Upon completion of the installation, the telecommunications contractor shall provide four (4) full documentation sets to the Owner's Representative/Engineer for approval, one (1) to be a hardcopy and three (3) to be electronic copies. Documentation shall include the items detailed in the sub-sections below.

B. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive system single drawings and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.

C. The **As-Built** drawings are to include Equipment Rack Elevations and Layout and System Single Line Drawings. The Owner will provide floor plans in paper and electronic (DWG, AutoCAD 2004) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information as defined above and returned to the Owner.

D. The Contractors shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD 2004) form.

END OF SECTION