

SECTION 270000
GENERAL COMMUNICATION SYSTEMS REQUIREMENTS

PART 1 GENERAL**1.01 SECTION INCLUDES**

- A. Section Includes
 - 1. General communications system requirements.

1.02 REFERENCES

- A. The following is a list of Standards that may be referenced in the Section.
 - 1. American National Standards Institute (ANSI)
 - a. ANSI-J-STD 607, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 2. Building Industries Consulting Services International (BICSI)
 - 3. Electronics Industries Alliance (EIA)
 - 4. International Building Code (IBC)
 - 5. Institute of Electrical and Electronics Engineers (IEEE)
 - a. Std. 110, Recommended Practice for Powering Grounding Sensitive Equipment
 - 6. National Fire Protection Association (NFPA)
 - a. 70, National Electrical Code
 - b. 75, Protection of Electronic Computer and Data Processing Equipment
 - 7. Telecommunication Industry Association (TIA) / Electronics Industry Alliance (EIA)
 - a. TIA/EIA 455-A , Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connection and Terminating Devices, and Other Fiber Optic Components
 - b. ANSI/TIA/EIA 568-B, Commercial Building Telecommunications Cabling Standard
 - c. ANSI/TIA/EIA 569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
 - d. ANSI/TIA/EIA 606, Administration Standard for Commercial Telecommunications Infrastructure
 - e. TIA/EIA 758 , Customer-Outside Plant Telecommunications Cabling Standard

1.03 PERMITS, FEES AND SERVICE CHARGES

- A. The CONTRACTOR shall obtain all electrical permits required to complete the work and pay all associated fees.
- B. The CONTRACTOR shall coordinate and provide for the installation and operation of franchise utility service (including any telephone and/or leased lines specified) as required during construction, startup, testing, and operation of the work until substantial completion

1.04 CONTRACTOR'S RESPONSIBILITY FOR FIELD VERIFICATION OF EXISTING CONDITIONS

- A. The CONTRACTOR shall be responsible for performing field verification of the existing conditions prior to bidding. The nature of this work inherently requires field observation to understand the existing conditions and scope of work.

- B. Failure to observe the existing conditions or ignorance of existing conditions shall be the responsibility of the CONTRACTOR alone. Additional services shall not be authorized due to the CONTRACTOR'S lack of understanding of the existing conditions.

1.05 CONTRACTOR'S RESPONSIBILITY FOR SHUTDOWNS AND MAINTAINING EXISTING SYSTEMS

- A. Shutdowns of any Division 26, 27, 28 system shall be coordinated with the OWNER prior to performing the shutdown. The CONTRACTOR shall provide the OWNER with a written schedule identifying the system, duration, and impact on the OWNER's facility.
- B. Existing Division 26, 27, and 28 systems not impacted by the work in this project shall be protected and maintained during construction. Any system not identified on the Drawings or within these Specifications shall be brought immediately to the attention of the ENGINEER and OWNER.
 - 1. The CONTRACTOR shall be responsible for bearing the cost of repairing or restoring all electrical systems that are disrupted or damaged during construction. The systems shall be repaired and restored to their original condition

1.06 INTENT OF DRAWINGS AND SPECIFICATIONS

- A. Riser and other diagrams are schematic and are intended to show the approximate location of equipment, and the general alignment of conduits and piping, and shall not be used for obtaining quantities. Dimensions given on the plans shall take precedence over scaled dimensions and all dimensions whether in figures or scaled, shall be verified in the field.
- B. Not all components for the Division 27 systems are shown on the DRAWINGS. The CONTRACTOR shall be responsible for providing a complete system, regardless of whether or not components are shown on the DRAWINGS
- C. The electrical drawings do not show complete details of the site conditions. The CONTRACTOR shall check actual conditions.
- D. The exact location of apparatus, fixtures, equipment, conduit and piping shall be ascertained by the CONTRACTOR in the field, and the work shall be laid out accordingly. Should the CONTRACTOR fail to ascertain such locations or coordinate with work performed by other trades, the work shall be changed at no additional cost to the OWNER when so ordered by the ENGINEER. The ENGINEER reserves the right to make minor changes in the location of conduit, piping and equipment up to the time of installation without additional cost to OWNER.
- E. CONTRACTOR shall provide all labor, materials, equipment, machinery, and tools necessary to provide all electrical equipment specified and shown on the Drawings. All items not specified in detail or shown on the Drawings but necessary for complete installation shall be provided by the CONTRACTOR.

1.07 SUBMITTALS

- A. Contractor shall submit all the product data in Division 27 at the same time. Piecemeal submittals will be rejected as incomplete.
 - 1. The product data shall be bound in a three ring binder with tabs for each Section. The tabs shall be numbered to match the specification Section numbers. Submittals not bound and labeled as specified will be rejected as incomplete.

2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 270000.A01) typewritten in the upper right hand corner of the submittal. The submittals within each Section tab shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.
 3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.
- B. Deferred Submittals
1. Submittals for seismic bracing and anchoring shall be a deferred submittals. Engineering of the seismic bracing and anchoring system shall be provided by a licensed Engineer in the State of Oregon. Submittals shall include calculations and drawings, including connection types/materials/sizes, load, maximum load, dimensions, etc.
- C. The CONTRACTOR shall indicate on the submittals all variances from the Specifications.
- D. Record Drawings. After the completion of construction, the CONTRACTOR shall provide one set of "as-built" drawings to the ENGINEER as specified herein showing the location of buried conduits and all changes or deviations from the original drawings.
- E. Final inspection certificates shall be submitted prior to final payment.

1.08 SUBSTITUTION REQUESTS

- A. All substitution requests shall meet the following:
1. Shall be received by the ENGINEER no later than ten (10) business days prior to date of final addendum during the bid period. Submittals that do not meet this requirement shall be returned as LATE and shall not be considered for a substitution request.
 2. Shall have clearly labeled and marked-up product data, indicating the features and part numbers. Submittals shall be individually labeled with the reference key note number or luminaire identification tag for which the substitution request is being made. Generic product catalog data or unmarked and or unlabeled substitution requests shall not be considered and shall be returned as INCOMPLETE to the CONTRACTOR.
 3. All product data identified as OWNER Standard shall not be eligible for a substitution request

1.09 COORDINATION OF WORK

- A. The CONTRACTOR shall plan his work in coordination with the other trades and with the power and telephone utility authorities.
- B. The CONTRACTOR shall field verify all dimensions of equipment to be installed or provided by others so that correct clearances and connections may be made between the work installed by the CONTRACTOR and equipment installed or provided by others.
- C. The CONTRACTOR shall arrange all conduit runs so that they do not interfere with piping, structural members, etc.
- D. All working measurements shall be taken from the sites, checked with those shown on the drawings, and if they conflict, reported to the ENGINEER at once, and before proceeding with

the work. Should the CONTRACTOR fail to comply with this procedure, he shall alter his work at his own expense as directed by the ENGINEER.

- E. No additional payments will be allowed where obstructions in the work of other trades, or work under this contract requires offsets to conduit runs.
- F. The CONTRACTOR is responsible for all alterations in the work to accommodate equipment differing in dimensions or other characteristics from that shown or specified.
- G. The CONTRACTOR shall provide all temporary power necessary for existing site equipment and for all construction needs.

1.10 SUPERVISION

- A. The CONTRACTOR shall maintain adequate supervision of the work and shall have a responsible person in charge at the site during all times that work under this contract is in progress, or when necessary for coordination with other work.

1.11 CODES

- A. Work shall conform to the National Electrical Code (NEC), and State Codes and other applicable codes, even though not specifically mentioned for each item. These shall be regarded as the minimum standard of quality for materials and workmanship.

1.12 CONTRACTOR'S RECORD DRAWINGS & AS-BUILTS

- A. The CONTRACTOR shall maintain a neatly marked set of record drawings showing the locations of all buried conduits and other utilities encountered or installed during construction. The final locations of equipment racks, panels, field mounted instruments and panels, terminal boxes, junction boxes, cable trays, wiring devices and other materials included in the work shall be shown, as well as conduit routing between them to the extent it differs from the design drawings. Record drawings shall be kept current with the work as it progresses and shall be subject to inspection by the OWNER's Representative at any time. Failure to keep field record drawings current may result in the issuance of a stop work order or delay in the processing of pay requests until the record drawings are made current.
- B. The CONTRACTOR shall provide one complete set of as-built electrical schematics for all patch panels and equipment provided, including horizontal cabling schematics as applicable, panel elementary diagrams, interconnecting wiring diagrams, wire numbers, termination strip locations and numbers. These shall be in the same format and style as those in the Contract Documents and submittal requirements.
- C. All information shown on the CONTRACTOR's field record drawings and as-built schematics shall be subject to verification by the OWNER's Representative. If significant errors or deviations are noted by the OWNER's Representative, new as-builts shall be completed at the CONTRACTOR's expense.

PART 2 PRODUCTS

2.01 PORTABLE OR DETACHABLE PARTS

- A. The CONTRACTOR shall retain in his possession and shall be responsible for all portable and detachable parts or portions of installations such as fuses, key locks, adapters, blocking chips and inserts until completion of his work.
- B. These parts shall be delivered to the ENGINEER and an itemized receipt obtained. This receipt, together with 2 copies of the final inspection certificate, shall be attached to the CONTRACTOR's request for final payment.
- C. All equipment shall be demonstrated to operate in accordance with the requirements of this specification and the manufacturer's recommendations.

2.02 NEW PRODUCTS

- A. All products shall be new without defects and covered by Manufacturer's warranty. Products shall be re-used only where indicated on the Drawings.
- B. All products shall be listed, labeled, and certified by a testing agency approved by the state of Oregon.
- C. All equipment of the same type and capacity shall be by the same manufacturer.

PART 3 EXECUTION

3.01 IDENTIFICATION

- A. All identification labeling shall be in compliance with Section 260553 Electrical and Control Identification.

3.02 WORKMANSHIP & COORDINATION

- A. All work shall be performed by personnel skilled in the particular trade in a workmanlike manner. Workmanship shall conform to the standards of the NEC and the National Electrical Installation Standards (NEIS).
- B. The ENGINEER shall be the sole judge as to whether or not the finished work is satisfactory; and if in his judgment any material or equipment has not been properly installed or finished, the CONTRACTOR shall replace the material or equipment whenever required, and reinstall it in a manner entirely satisfactory to the ENGINEER without any increase in cost to the OWNER.
- C. The CONTRACTOR shall coordinate and verify the installation of all equipment furnished by him to other trades, or equipment provided and installed by other trades that is connected to the electrical or control systems. Work shall include the furnishing of all labor, materials, and equipment required for the installation of a complete and operable system as hereinafter specified and as indicated on the drawings. The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. Unless otherwise specifically stipulated, the term "furnished and installed complete" shall be considered a part of this section.

3.03 TEMPORARY HEATING, LIGHTING AND POWER

- A. The CONTRACTOR shall provide all heat, lighting and power required to construct and protect the work until the work is placed in service by the OWNER for beneficial use of the OWNER. Temporary heaters shall be provided as required to keep the work area and all new electrical components dry.
- B. The source for temporary power shall be from the electric utility or OWNER approved CONTRACTOR supplied auxiliary power units. The installation for electric power shall meet the requirements of local authorities and of OSHA.
- C. The CONTRACTOR shall obtain all permits and pay all costs for connecting temporary power service at no expense to the OWNER.

3.04 SUPPORT BACKING

- A. Provide any necessary backing required to properly support all fixtures and equipment installed under this contract.

3.05 CUTTING, PATCHING AND FRAMING

- A. The CONTRACTOR shall determine in advance the locations and sizes of all sleeves, chases, and openings necessary for the proper installation of his work.
- B. Whenever practical, inserts or sleeves shall be installed prior to covering work. Cutting and patching shall be held to a minimum. All required holes in concrete construction shall be made with a core drill and patched with non-metallic non-shrink grout.
- C. Cutting, fitting repairing and finishing of carpentry work, metal work, or concrete work, and the like, which may be required for this work shall be done by craftsmen skilled in their respective trades. When cutting is required, it shall be done in such a manner as not to weaken walls, partitions, or floors; and holes required to be cut in floors must be drilled without breaking out around the holes.
- D. Penetrations through fire and smoke rated partitions shall be sealed in accordance with Section 078400 Firestopping.

3.06 ACCESS PANELS

- A. The CONTRACTOR shall provide all access panels in hard ceilings to allow NEC-required access to junction boxes and pull boxes. The CONTRACTOR shall submit to the ENGINEER for approval floor plans (1/8" = 1'-0" scale minimum) which clearly indicate proposed access panel locations.

3.07 CLEANING AND TOUCH-UP PAINT

- A. Upon completion of work, all electrical equipment shall be cleaned.
 - 1. Vacuum all dirt, metal shavings, and foreign materials from all enclosures. The use of compressed air shall not be acceptable.
 - 2. All stains, dirt, and fingerprints shall be removed from enclosures, and all other electrical and communications equipment covers.

- B. Provide touch-up paint on equipment that has been scraped, scratched, or chipped during construction. Paint color shall match color of equipment.

END OF SECTION

SECTION 270533
CONDUITS AND BOXES FOR COMMUNICATION SYSTEMS

PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes:
1. This section includes requirements pertaining to pathways for communications systems.

1.02 SUBMITTALS

- A. Contractor shall submit all the product data in Division 27 at the same time. Piecemeal submittals will be rejected as incomplete.
1. The product data shall be bound in a three ring binder with tabs for each Section. The tabs shall be numbered to match the specification Section numbers. Submittals not bound and labeled as specified will be rejected as incomplete.
 2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 270533.H01) typewritten in the upper right hand corner of the submittal. The submittals within each Section tab shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.
 3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.
- B. Product Data.
1. Pursuant to Section 01300 Submittal Procedures.
 2. Manufacturer's data including materials of construction, equipment weight and related information for each item specified in PART 2 PRODUCTS.
 3. Seismic calculations and drawings.

PART 2 PRODUCTS**2.01 MATERIALS**

- A. **Electrical Nonmetallic Tubing (ENT) (270533.C02)**
1. Shall be UL 1653 Listed and Approved for installation in accordance with NEC Article 362. All associated boxes, fittings, and accessories shall be similarly Listed and Approved.
 2. Shall be recognized for use in 1-hour and 2-hour rated construction.
 3. Color shall be as follows:
 - a. Blue – Communications
 4. Carlon Flex-Plus, or equal.
- B. **Non-Metallic Boxes (270533.B02)**
1. Shall be UL Listed, PVC, non-metallic.
 2. Carlon, or approved equal.

2.02 FIRESTOPPING

- A. Firestopping products shall be provided in all fire and smoke rated partition penetrations per Specification Section 078400 Firestopping.

PART 3 EXECUTION

3.01 INSTALLATION

- A. General.
1. Galvanized sheet metal boxes shall be used for all surface mount applications.
 2. No section of conduit shall exceed two 90 degree bends.
 3. Sections of conduit shall not exceed 100 feet without a pull point.
 4. Condulets shall not be used for bends unless approved by the ENGINEER. Utilize field or factory bends only.
 5. Where specific pathways are not shown on the Drawings, the design of the pathway shall be CONTRACTOR's choice.
 6. CONTRACTOR shall be responsible for coordination the installation of conduits and boxes with other trades.
 7. Conduits shall be reamed.
 8. Metallic threads shall all be coated with conduit thread lubricant before assembly. Failure to install the lubricant will result in removal of all conduit and reassembly with the conduit lubricant.
 9. Exposed conduits shall be installed parallel or perpendicular to the structural members and surfaces and shall be level and or plumb.
 10. When two or more conduits are routed in the same general direction their routing shall be parallel with symmetrical bends.
 11. Conduits shall be bent with equipment specifically designed for this purpose and for the specific size and type of conduit.
 12. Conduits that are creased or crushed shall be replaced.
 13. Install conduits such that they do not interfere with the proper and safe operation of equipment and do not block or otherwise interfere with the ingress and egress and installation of removable hatches and covers.
 14. Install expansion joints as needed across expansion joints in the structure and at other locations where necessary to compensate for thermal or mechanical expansion or contraction.
 15. Conduits shall be routed at least six (6) inches from high temperature piping, ducts and flues
 16. Conduits over 10 feet in length shall be provided with a pull string.
 17. Raceways shall be electrically and mechanically complete before the conductors are installed.
 18. Routing of conduits may be adjusted to avoid obstructions. Coordinate with other trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation and removal and reinstallation to resolve conflicts shall be at the CONTRACTOR's expense.
- B. Conduit for Exposed Wiring
1. No Division 27 wiring shall be exposed. In all areas where wiring is exposed, conduit shall be provided as described in Part 2.1 Rough-In Requirements of this Specification.
- C. Conduit Sleeves Above Inaccessible Ceilings or for Penetrations
1. Conduit sleeves shall be provided across inaccessible ceilings to allow cables to be pulled across these areas both during construction and in the future.
 2. Conduit sleeves shall be for through-wall or through-floor penetrations to allow cables to be pulled across these areas both during construction and in the future.

3. Major conduit sleeves have been shown on the Drawings. However, the CONTRACTOR shall be responsible for providing all sleeves required for a complete installation. The final quantity and location of all sleeves shall be provided by the CONTRACTOR, whether or not they have been shown on the DRAWINGS. Coordination of sleeve requirements with the Division 27 installer shall be the responsibility of the CONTRACTOR.
4. Any penetration 7/8" or smaller shall not require conduit sleeves, but shall be fire stopped, grout filled, and / or filled with drywall.
5. If conduit sleeves are not shown on the Drawings, they shall be provided by the CONTRACTOR. When sleeves are not shown on the Drawings but are required, the CONTRACTOR shall provide appropriately sized sleeves. The sleeves shall meet the following Codes and standards:
 6. NEC / OESC.
 7. TIA / EIA standards.
 8. 25% spare capacity minimum.

END OF SECTION

**SECTION 27 1500
COMMUNICATION HORIZONTAL CABLING****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes.
1. The section includes requirements for communication horizontal cabling.

1.02 REFERENCES

- A. The following is a list of Standards which may be referenced in this Section.
1. Telecommunications Industry Association (TIA)
 - a. TIA / EIA 568B
 - b. TSB-36
 - c. TSB-40A
 2. Institute of Electrical and Electronics Engineers
 - a. IEEE 802.3 100Base-T

1.03 SUBMITTALS

- A. Contractor shall submit all the product data in each section at the same time. Piecemeal submittals will be rejected as incomplete.
1. The product data shall be submitted in PDF format. Each PDF shall only contain products from a single specification section, products in a different specification section shall be in a separate PDF.
 2. A submittal is required for each product specified. Each individual product submittal shall have the corresponding Reference Keynote Number (example - 271500.C01) typewritten in the upper right-hand corner of the submittal. The submittals within each PDF shall be in the same sequential order as they are listed in the specification Section. Submittals not containing the Reference Keynote Number will be rejected as incomplete.
 3. No typical submittals will be accepted. Each submittal shall be project specific and clearly identify specifically which components or parts are being submitted for approval. Any product submittals, such as a catalog sheet, which do not clearly identify which components or parts are being submitted for approval, will be rejected as incomplete.
- B. Product Data
1. Pursuant to Section 013000 Submittal Procedures.
 2. Manufacturer's data including materials of construction, methods of installation and related information for each item specified in PART 2 PRODUCTS.
- C. Warranty
1. The Horizontal Cabling System will consist of 4-pair unshielded twisted pair (UTP) Category 6A voice and data network cabling. A minimum 20-year, end-to-end solution warranty is required for the completed installation of these products.

PART 2 PRODUCTS**2.01 CABLING REQUIREMENTS**

- A. **CAT5e Horizontal Cabling (271500.C60).**
1. Shall be unshielded twisted (UTP) copper conductors, Category 5e, four-pair.
 2. Riser rated.

3. Indoor rated.
4. Shall be rated for applications up to 100 BASE-T Ethernet.
5. Conductors shall be 23 AWG solid bare copper.
6. Color shall be Blue.
7. Superior Essex, or approved equal.

B. CAT5e RJ45 Jacks (271500.J60).

1. Jacks shall be CAT5e compliant, suitable for 100 BASE-T applications.
2. Color shall be Blue.
3. Legrand Ortronics, or approved equal

C. Low Voltage Device Plates (271500.W01).

1. Shall be single gang.
2. Shall be provided with blank covers for all unused ports.
3. Shall be white themoplastic.
4. Legrand Ortronics, or approved equal

2.02 ACCESSORIES

A. Velcro Cable Wrap (271500.T01).

1. Shall be black in color.
2. 3/4" size.
3. Shall be plenum rated, regardless of whether ceiling is utilized as a return air plenum.

PART 3 EXECUTION

3.01 INSTALLATION

A. General.

1. Cables shall be installed between patch panels and outlet jacks utilizing cable trays shown on the Drawings. Cables shall be routed in cable trays to the room containing the outlet jack. Utilize J-hooks or conduit as described within Specification Section 270529 Hangers and Supports for Communications Systems and 270533 Conduits and Boxes for Communications Systems to route cable to the outlet jack.
2. Cable shall not be secured to ceiling hanger wire.
3. Cable installation shall maintain the following clearances:
 - a. Power conduits - 18 inches.
 - b. Luminaires - 18 inches.
 - c. Mechanical equipment - 18 inches.
 - d. Transformers - 18 inches.
 - e. Other sources of AC Power – 18 inches.
4. Neatly group cables together that terminate on the same patch panel in MDF and IDF rooms. Utilize velcro cable ties.
5. Cable runs shall not obstruct walkways or service access to mechanical and electrical equipment. All cabling shall be self-supported and attached to the structure as required by Code. Cables shall follow a common path where possible. Sweep 90-degree bend radii shall be installed.

6. Cables shall be installed parallel and perpendicular to the structural elements of the building. Line of sight "spider webs" shall not be permitted.
 7. Cables installed above accessible ceilings shall not block access to access panels, mechanical equipment, piping valves, electrical equipment, or other equipment requiring access for maintenance and service.
 8. Cables shall not be supported by any temporary building structure, including conduit, duct work, water pipes, hydronic piping, storm water piping, T-bar ceiling tiles, and/or support wires.
 9. Cables above accessible ceilings shall be supported every 4-6 feet.
 10. Cables shall be bundled in groups no larger than 48. Cable bundles shall be of a similar system only (i.e. IT, Security). Bundling cables of different systems shall not be acceptable. Individual cable runs shall neatly branch off the main run.
 - a. Exception: If no more than six cables of different systems serve the same area, they shall be permitted to be combined in bundles using j-hooks.
 11. Cables in cable tray shall be combed to avoid crossing.
 12. Cables bundles terminating on patch panels shall not cross the centerline of the patch panel. Split the cable bundle and install cables from each side of the patch panel.
 13. All cables in exposed areas shall be installed in a surface raceway.
 14. All cables within walls or soffits shall be installed in metallic conduit.
 15. All cables above inaccessible ceilings shall be installed in metallic conduit.
 16. All cable runs shall have a minimum 15' service loop at the equipment room and 10' at the station end.
 17. Through-wall penetrations and through-floor penetrations smaller than 7/8" shall not require a metallic conduit sleeve. All penetrations shall be neatly made and sealed after cable installation. Penetrations through fire-rated partitions shall be sealed to maintain the required fire rating.
- B. Identification
1. All horizontal cabling shall be provided with a heat-shrinkable type-written label at BOTH ends.
 2. All horizontal cabling shall be identified at each junction and pull box and within 10 feet of through-wall fittings, conduits, and within 10-feet of any access points in ceilings, voids, or plenums.
 3. All identification labeling shall comply with Section 260553 Electrical and Control Identification.
- C. Patch Cable Installation
1. Do not move, disconnect, or relocate any existing patch cables without OWNER approval.
 2. Prior to the installation of all patch cables, verify the termination ports with the OWNER.
- D. Testing
1. Patch cable length shall be the shortest possible between termination points. Patch cable installation shall utilize wire management on cabinets and racks.
 2. Excessively long patch cable installation shall not be coiled up. The CONTRACTOR shall be responsible for providing the correct length of patch cable.

3. The permanent link shall be tested.
4. All test results shall be used by the CONTRACTOR to determine any polarity and noise anomalies and CONTRACTOR shall take immediate corrective action for all anomalies.
5. Test results shall be used by the CONTRACTOR and the Authorized Representative to determine the viability of each sheath for transmission in accordance with the specifications of the cable manufacturer and the requirements imposed by the transmission system. This shall form part of the acceptance procedure for the cable plant. All results obtained by use of pair-scanner testing shall be collated by terminal outlet number and or riser pair number and presented to the Authorized Representative at the conclusion of the testing. Test compilation shall be initialed and dated by the CONTRACTOR's technician performing the test.
6. The CONTRACTOR shall utilize a level-III Fluke, PentaScanner, Wavetek or equal, twisted pair test instrument for the testing of all System Category 6A copper cabling. All Category 6A cable paths shall be tested at each jack for the following parameters and meet the requirements imposed by the TIA/EIA 568-B3 building wiring standard, ANSI/TIA-568-C.4 Broadband Coaxial Cabling and Components Standard, and the manufacturer's written specification.
 - a. All required certification tests shall be performed at 350 MHz.
7. Category 6A and data cabling systems shall be performance verified using an automated test set. This test set shall be capable of testing for the continuity and length parameters defined above and provide for the following tests.
 - a. Wire Map.
 - b. Cable Length.
 - c. Pair-to-Pair NEXT.
 - d. Power Sum NEXT.
 - e. Attenuation.
 - f. Pair-to-Pair ELFEXT.
 - g. Power Sum ELFEXT.
 - h. Return Loss.
 - i. Propagation Delay.
 - j. Delay Skew.
8. Coaxial cable shall be performance verified using an automated test set. The test set shall be capable of testing for the continuity and length parameters defined above and provide the following tests:
 - a. Cable Length
 - b. Cable Impedance
 - c. Propagation Delay
 - d. Insertion Loss
9. A complete cable certification report shall be provided covering all locations.
10. The CONTRACTOR shall compile test results into the forms that contain all applicable test data. Hard copy indicating successful testing for every location is required by the OWNER. A flash drive or disc containing the test data and appropriate application (software) to display such in a windows-based environment shall also be provided. All forms shall be neatly completed and legible when submitted. Hard copy optical traces shall be neatly and securely attached to the test results.
11. A copy of the test results shall be maintained by the CONTRACTOR for one (1) year from the time of acceptance by the OWNER.

E. As-Built Documentation

1. All outlet locations, cable routes, core-drills and penetrations shall be documented by the CONTRACTOR on a set of as-built plans.
2. Outlet locations shall include their respective unique identification numbers.
3. As-built documentation is due within three (3) weeks after final wiring installation is accepted by the OWNER.
4. A copy of the as-built drawings shall be maintained by the CONTRACTOR for one (1) year from the time of acceptance by the OWNER.

END OF SECTION