SECTION 27 15 00 – COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.

B. This section includes the minimum requirements for the installation of horizontal cabling between Telecommunications Rooms and Work Area Outlets.

C. Included in this section are the minimum composition requirements and installation methods for the following:

1. Category 6A/6 Cable
2. Miscellaneous Communications Cabling
3. Secondary Protection Devices
4. Faceplates, Jacks, and Modules
5. Tenant Distribution Panel
6. Jet-Bridge Interface Box
7. Patch Panels
8. Patch Cords
9. Cable Ties
10. Checkpoint Wait Time Sensors

1.2 DEFINITIONS AND TERMS

A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section:

1. ANSI American National Standards Institute
2. AWG American Wire Gauge
3. BICSI Building Industry Consulting Service International
4. CBP Customs and Border Protection
5. CMR Communications Riser Cable
6. CMP Communications Plenum Cable
7. CR Communications Room
8. DCM Design Criteria Manual
9. DFW Dallas/Fort Worth International Airport
10. FEP Fluorinated Ethylene Propylene
11. FOCIS Fiber Optic Connector Intermateability Standards
12. F/UTP Foil Shielded Twisted pair
13. IDC Insulation Displacement Connector
14. IEC International Electrotechnical Commission
15. IEEE Institute of Electrical and Electronics Engineers
16. ISO International Standards Organization
17. MCR Main Communications Room
18. MDF Main Distribution Frame
19. NEMA National Electric Manufacturers Association
20. NEXT Near End Crosstalk

21. NFPA National Fire Protection Association
22. OAR Owner's Authorized Representative
23. OFCP Optical Fiber Conductive Plenum
24. OFCR Optical Fiber Conductive Riser
25. OFNP Optical Fiber Nonconductive Plenum
26. OFNR Optical Fiber Nonconductive Riser
27. OLTS Optical Loss Test Set
28. OTDR Optical Time Domain Reflectometer
29. PCI Panduit Certified Installer
30. RCDD Registered Communications Distribution Designer
31. RL Return Loss
32. STD Standard
33. STP Shielded Twisted Pair
34. TIA Telecommunications Industry Association
35. TSA Transportation Security Administration
36. UL Underwriters Laboratories
37. UTP Unshielded Twisted Pair

1.3 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the OAR.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated, or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the OAR.

C. Strictly adhere to all TIA and BICSI recommended installation practices when installing communications cabling.

D. Contractor's Qualifications:

1. Firms regularly engaged in the installation of Data Communications cabling and that have five (5) years of installation experience with systems similar to that required for this project.
2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked, and the clients will be asked questions relative to the performance of your company.
3. Provide verification that installation personnel responsible have been properly trained to install the products described in this Section.
4. Provide a BICSI RCDD certified professional for oversight on this project. This person does not have to be working on-site but must be accessible to answer questions and provide weekly status reports. The RCDD shall be a full-time employee of the contractor.
5. Provide full time project manager with a minimum of ten (10) years field experience in installation of communications systems and infrastructures. Project manager shall be assigned for the duration of the project and shall not be replaced without written consent from the OAR.

E. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.

F. Material and Work specified herein shall comply with the applicable requirements of:

1. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction, 2015
2. ANSI/NECA/BICSI-568 – Standard for Installing Commercial Building Telecommunications Cabling, 2006
3. ANSI/TIA-568.0-E – Generic Telecommunications Cabling for Customer Premises, 2020
4. ANSI/TIA-568.1-E – Commercial Building Telecommunications Infrastructure Standard, 2020
5. ANSI/TIA-568.2-D – Balanced Twisted-Pair Telecommunications Cabling and Components Standards, 2018
6. ANSI/TIA-568.3-D – Optical Fiber Cabling Components Standard, 2016
7. ANSI/TIA-568.3-D-1 – Optical Fiber Cabling and Components Standard - Addendum 1: General Updates, 2019
8. ANSI/TIA-569-D Commercial Building Standard for Telecommunications Pathways and Spaces, 2015
9. ANSI/TIA-606-D – Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2021
10. ANSI/TIA-607-D – Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, 2019
11. ANSI/TIA-526.7-A – Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, 2015
12. ANSI/TIA-526.14-C – Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant, 2015
13. ANSI/TIA-942-B – Telecommunications Infrastructure Standard for Data Centers, 2017
14. NFPA 70 – National Electric Code, 2017
15. UL 13 – Standard for Safety for Power-Limited Circuit Cables
16. UL 444– Standard for Safety for Communications Cables
17. BICSI – Telecommunications Distribution Methods Manual, 13th Edition
18. BICSI – Information Technology Systems Installation Methods Manual, 8th Edition
19. IEEE 802 – Local Area Network Standard
20. DFW Airport Design Criteria Manual
21. US Customs and Border Protection Airport Technical Design Standard, 2017
22. Applicable codes and directives of authorities having jurisdiction

G. Work:

1. The Work shall be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.4 CONFLICTS

A. This installation shall be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts between the aforementioned, notify the OAR in writing prior to commencement of affected work.

1.5 SCHEDULING

A. The Contractor shall comply with all scheduling requests established by OAR, both prior to commencing Work, and during construction. The Contractor shall provide a detailed schedule of work to be performed.

1.6 REQUIREMENTS

A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The OAR must approve material submittal and substitutions in writing.

B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.

C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein shall be furnished by the Contractor at no additional cost.

D. The requirements as given in this document are to be adhered to unless revised by the OAR in writing.

E. The Owner reserves the right to waive these requirements at any time.

1.7 SUBMITTALS

A. Comply with provisions of Division 01.

B. Comply with provisions of Section 27 05 00.

C. Produce Shop Drawings for ALL horizontal cabling, to include but not limited to, proposed routing and its location relative to building structure (columns, floor or ceiling) and its relationship to electrical, mechanical elements as well as any horizontal copper cables that may exceed 295’ in length (including service loops).

D. Provide all submittal requirements under this section as a single package.

E. Contractor shall not utilize the Consultants’ original design drawings in the submittal or shop drawing process. Contractor shall develop their own original shop drawings.

F. Provide product data for the following:

1. Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.
2. Manufacturer’s certificate of acceptance of the qualifications of the installing Contractor to install, test and maintain the manufacturer’s equipment.
3. Manufacturer’s installation specifications for UTP cabling and optical fiber, indicating minimum bend radius and maximum pull tension.
4. Outline of administration labeling scheme for voice and data communications cabling and termination locations per Section 27 05 53, as well as the latest releases of ANSI/TIA-606, DFW Design Criteria Manual and CBP Airport Technical Design Standards.
5. Proposed format of as-built documentation

1.8 CONTRACTOR CLOSE OUT SUBMITTALS

A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets required is the greater of either the requirements of Division 01 of the Project Manual, or a minimum of four (4) sets.

1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
2. Test reports on all copper and optical fiber cables (electronic file format and hard copy).
3. As-built cable schedules with recorded cable routing and lengths of each designated run.
4. As built documentation of all cabling systems.
5. As built documentation of MDF/CR/IDF modifications and associated cabinet elevations.
6. Laminated as-built drawing sheet of CR/IDF service area representing each level, with a scale of not less than 1/8”, mounted on the wall of each CR/IDF.

B. Warranty and Maintenance:

1. Test Report Binder(s)
2. Record Drawings

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials factory-packaged in containers or reels and handle in accordance with manufacturer’s recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.

B. Storage space on project site may be limited. Contractor shall coordinate delivery and arrange storage of materials and equipment with the OAR.

C. Components sensitive to damage in a harsh environment shall be stored off-site and delivered as needed.

D. Provide protective covering during construction to prevent damage or entrance of foreign matter.

E. Contractor is responsible for on-site security of tools, test equipment and materials.

F. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.

1.10 PROJECT CONDITIONS

A. Verify conditions on the job site are applicable to this Work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.

B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install Work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the Work may be installed.

1.11 WARRANTY

A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01. Repair or replace defects occurring in labor or product within the Warranty period without charge.

B. All surplus parts and pieces to the installation shall be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period shall have a warranty matching that of the original part from date of replacement.

C. In addition to the warranty outlined above, the Contractor shall facilitate a warranty between the Owner and the Manufacturer that provides coverage of the installed cabling system for a period of (25) twenty-five years (Panduit Certification Plus System Warranty). This warranty will cover the installed horizontal cabling system (Patch Panel to Workstation). Copper links originating from patch panels shall be warranted against the link performance minimum expected results defined in the latest issuance of ANSI/TIA-568. Copper links originating from wall mounted 110-style termination blocks shall also be warranted against the link performance minimum expected results defined in the latest issuance of ANSI/TIA-568. Installation shall be performed by a Panduit Certified Installer.

PART 2 - PRODUCTS

2.1 GENERAL

A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 ACCEPTABLE DISTRIBUTORS

A. Subject to compliance with requirements set forth in DFW DCM, Contractor shall procure all horizontal cabling components thru an approved Panduit product distributor.

2.3 ACCEPTABLE VENDORS AND MATERIALS

A. Subject to compliance with requirements, install products from the following manufacturers, except where noted:

1. Cable, Copper
    a. Panduit Corp.
    b. Owner Approved Equivalent
2. Termination Components
    a. Panduit Corp.
    b. Owner Approved Equivalent
3. Cable, Fiber Optic
    a. Corning

b. Owner Approved Equivalent

4. Termination Components

a. Panduit Corp.
b. Owner Approved Equivalent

B. Part numbers are provided for convenience purposes only; the contractor is responsible for complete material list and quantities. All materials listed are manufactured by Panduit Corporation unless otherwise noted. Colors shall be approved by Owner.

2.4 COPPER CABLE AND ACCESSORIES

A. Category 6A UTP Cable

1. Provide Category 6A cabling where indicated in the drawings
2. Cable shall exceed requirements of ANSI/TIA-568.2 Category 6A, ISO 11801 Class EA Edition 2.1, and IEEE 802.3an-2006 standard channel requirements for supporting 10GBASE-T and be third party tested to 650 MHz.
3. The conductors shall be 23 AWG construction with FEP (CMP) insulation.
4. All four pairs shall be surrounded by a metallic Vari-MaTrix tape cut into segments of varying length and a flame-retardant jacket. The tape shall minimize the cable diameter and suppress the effects of alien crosstalk while retaining UTP electromagnetic interface immunity.
5. The jacket color shall be BLUE for DFW outlets.
6. Approved products:

a. Panduit PUP6AHD04xx-G (where xx indicates color) TX6™ 10Gig™ Category 6A UTP Copper Cable, Plenum
b. Owner approved equivalent

B. Category 6A F/UTP Outdoor Rated Cable

1. Provide outdoor rated Category 6A cabling where required in outdoor conditions.
2. Cable shall exceed requirements of ANSI/TIA-568.2 Category 6A, ISO 11801 Class EA Edition 2.1, and IEEE 802.3an-2006 standard channel requirements for supporting 10GBASE-T and be third party tested to 650 MHz.
3. The conductors shall be 23 AWG construction with FEP (CMP) insulation.
4. The jacket color shall be black.
5. Approved products:

a. Panduit TX6™ 10Gig™ Category 6A UTP Copper Cable
b. Superior Essex
c. Belden
d. Owner approved equivalent

C. Category 6 UTP Cable

1. Provide Category 6 cabling to work area outlet locations, where indicated on drawings.
2. Cable shall exceed ANSI/TIA-568-D.2 and ISO/IEC 11801 Class E standards.
3. The conductors shall be 23 AWG construction with FEP (CMP) insulation.
4. The copper conductors shall be twisted in pairs, separated by an integrated pair divider and shall be covered by a low smoke, flame retardant (CMP) jacket or a flame retardant (CMR) jacket.
5. Provide plenum-rated cable for all plenum environments and riser-rated cable for all non-plenum environments.
6. The jacket colors shall be as follows:

a. American Airlines cables shall be white.
b. TSA cables shall be yellow.

7. Approved products:

a. Panduit: PUP6C04WH-WLPZ
b. Owner approved equivalent

D. RS-422 Communications Cable

1. Provide control cabling as described in the drawing set.
2. Cable shall be 24 AWG stranded four conductors, wrapped in a 100% aluminum foil shield, with a 24 AWG drain, and wrapped with water-blocking tape.
3. Jacket shall be constructed of UV-stable polyvinylchloride.
4. Cable shall carry a CM NEC rating, for indoor/outdoor use and a minimum Class 2 rating for power-limited circuits.
5. Acceptable products:

a. Belden
b. West Penn
c. Owner approved equivalent

E. Control and Communications Cable (18/2)

1. Provide control cabling as described in the drawing set.
2. Cable shall be 18 AWG stranded two conductors, wrapped with water-blocking tape.
3. Jacket shall be constructed of UV-stable polyvinylchloride.
4. Cable shall carry a CM NEC rating, for indoor/outdoor use and a Class 2, or Class 3 rating for power-limited circuits.
5. Acceptable products:

a. Belden 5300U1
b. West Penn AQC224
c. Owner approved equivalent

F. Shielded Control and Communications Cable (18/2)

1. Provide control cabling as described in the drawing set.
2. Cable shall be 18 AWG stranded two conductors, wrapped in a 100% aluminum foil shield, with a 24 AWG drain, and wrapped with water-blocking tape.
3. Jacket shall be constructed of UV-stable polyvinylchloride.
4. Cable shall carry a CM NEC rating, for indoor/outdoor use and a minimum Class 2 rating for power-limited circuits.
5. Acceptable products:

a. Belden
b. West Penn
c. Owner approved equivalent

G. Coax Cable

1. Provide coax cabling to each analog camera.
2. Cable shall be RG59/U Coaxial cable with 20 AWG, solid, bare-copper center conductor, a gas-injected polyethylene dielectric, a 90% braided copper alloy shield, surrounded by water-blocking tape.
3. Cable jacket shall be constructed of UV-stable polyvinylchloride.
4. The nominal impedance shall be 75 ohms, with a nominal capacitance of 16 pF/ft.
5. Cable shall carry a CM NEC rating, for indoor/outdoor use.
6. Acceptable products:

a. Belden 5439X5
b. West Penn AQC815

7. Owner approved equivalent
8. Coax Connectors
9. Terminate coax cabling with “F” type connectors.
10. Connectors shall be designed to fit the cabling being terminated.
11. Connectors shall only be installed with manufacturer approved tooling.
12. Connectors may be hex crimp or compression type.
13. Screw-on connectors and connectors with separate crimp on ferrules are prohibited.
14. Approved products:

a. Corning GF-UR-6 for non-plenum RG-6
b. Corning GF-UR-6-PL for plenum RG-6
c. Corning GAF-UR-11-MH for non-plenum RG-11
d. Corning GAF-UR-11-PL for plenum RG-11
e. Owner approved equivalent

H. Underground Cable Termination Hardware

1. Provide Building Entrance Terminals (BET) complete with lockable covers and plug-in protector modules for each pair terminated on the chassis.

a. Protector modules, 3B1E, shall:

1) Each module shall protect both halves of a pair.
2) Each protector shall be UL 497 listed for primary protection.
3) Each module shall have 2 ns to 5 ns response time.
4) Provide over-voltage and sneak current protection.
5) Protector modules shall be black in color.

2. Hardware to exceed the ANSI/TIA-568.2 Category 3 standard.
3. Hardware to be field terminable.
4. Include required quantity of bases and connecting blocks, label holders and labels.
5. Kit shall include jumper troughs.
6. Connecting blocks shall be of the 5-pair variety.
7. Extend copper pair count, with four RJ21 type Amphenol connectors.

a. Connect each with a 25-pair Category 3 cable connectorized with RJ21 type Amphenol connectors on each end.
b. Connected to two 66-style disconnect block with two RJ21 Amphenol connectors each.

8. Acceptable products:

a. Siemon
b. Circa
c. Porta
d. Owner approved equivalent.

I. Multi-Pair Protected Terminal Blocks

1. Provide multi-pair protected terminal blocks. To be utilized for applications requiring non-connectorized 25-pair, or less, terminal blocks.

a. Terminals shall accept wire size up to 12 AWG conductors.

2. Refer to the drawing set for exact copper counts.
3. Protected terminal blocks shall consist of modular, DIN rail mountable surge protectors with screw terminal connections designed for control panels feeding SCADA RTU’s or remote I/O (RIO) modules, security panels, and communications signal lines.

4. Protected terminal blocks shall have both 2 wire modules and 3 wire modules for the safe termination of cable shields.
5. Protection shall be fully hybrid line to line, each line to screen/ground.
    a. Maximum discharge surge current shall be no greater than 10kA.
    b. Nominal discharge surge current shall be 3kA.
    c. Lightning impulse current shall be 2.9kA.
    d. Response time shall be less than 1nano second.
6. Acceptable Products:
    a. Weidmuller SD or SLP Series
    b. Owner approved equivalent

J. Category 6 Surge Protection Devices (SPD)

1. Provide surge protection for any Category 6 cable that enters a communications space from an exterior element, known as OSP.
2. Exceeds Cat 5 and 6 Transmission Values.
3. Shall be a Single Stage Circuit.
4. Protects applications up to 60 Vdc @ 300 mA.
5. Protects each of the 8 pins.
6. Communications Box is to be fitted with:
    a. DIN rail mountable on one channel.
    b. Acceptable Products:
        1) Bussmann BSPD48RJ45
        2) Owner approved equivalent
7. Communications Room is to be fitted with:
    a. Installs in 1U of Rack Space.
    b. Replaceable Modular Design increments of 1 to 8.
    c. Configurable at 48, 24, 16, 12 or 8 Channel.
    d. Acceptable Products:
        1) Ditek DTK-RM12POES
        2) Ditek DTK-RM24POES
        3) Edco RM-CAT6-48POE
        4) Edco RM-CAT6-24POE
        5) Edco RM-CAT6-16POE
        6) Edco RM-CAT6-08POE
        7) Owner approved equivalent

K. Coax Surge Protection Device

1. Provide surge protection for Coax Type-N cable that enters a communications space from an exterior element.
2. Acceptable Products:
    a. Edco CX-HFN-FF
    b. Edco CX-HFN-FM
    c. Owner approved equivalent

L. Category 6A UTP Jack Modules

1. Provide Category 6A jack modules to terminate both ends of each Category 6A horizontal cable.

2. Module shall exceed requirements of ANSI/TIA-568.2 Category 6A, ISO 11801 Class EA Edition 2.1, and IEEE 802.3an-2006 standard channel requirements for supporting 10GBASE-T component standards.
3. Module shall meet requirements of IEEE 802.af and IEEE 802.3at for Power over Ethernet (PoE) applications.
4. Module shall be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
5. Module color shall be BLUE for DFW outlets.
6. Approved products:

    a. Panduit CJ6X88TGxx (where xx indicates color) Mini-Com® TX6™ 10Gig™ UTP Jack Module.
    b. Owner approved equivalent

M. Category 6 UTP Jack Modules

1. Provide Category 6 jack modules to terminate both ends of each Category 6 horizontal cable.
2. Module shall exceed requirements of ANSI/TIA-568-D.2 Category 6, ISO 11801 Class E channel standards and exceed requirements of ANSI/TIA-568-D.2 Category 6 and IEC 61156-5 Category 6 component standards.
3. Module shall meet requirements of IEEE 802.3af / 802.3at, and proposed IEEE 802.3bt type 3 and 4 for Power over Ethernet (PoE) applications.
4. Module shall be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
5. Modules shall be:

    a. Blue for American Airlines “Data 1”
    b. White for American Airlines “Data 2”
    c. Grey for American Airlines “Voice”
    d. Yellow for American Airlines Wireless Access Points

6. Modules in MER/TR patch panels shall match the color of jack at the faceplate.
7. Approved products (where “xx” = color):

    a. Panduit: CJ688TGxx
    b. Owner Approved Equivalent

N. Category 6A Copper Patch Cords within Communications Rooms

1. Provide Category 6A patch cords for patching within the MCR/MER, CR/TR or data center.
2. Patch cord shall exceed requirements of ANSI/TIA-568.2 Category 6A, IEEE 802.3an-2006, and ISO 11801 Class EA channel standards.
3. Shall meet requirements of IEEE 802.af and IEEE 802.3at for PoE applications.
4. Each patch cord shall be 100% performance tested and wired T568B.
5. Patch cord shall be constructed of TX6A™ 10Gig™ 28 AWG stranded copper cable and TX6™ PLUS Modular Plugs for superior performance.
6. Patch cord plugs shall meet all applicable ANSI/TIA-968-A requirements and exceeds IEC 60603-7 specifications.
7. Plugs shall use an integral pair manager to optimize performance and consistency by reducing untwisting of conductors within the plug.
8. Patch cord shall perform in center of TIA component range, ensuring interoperability and 10GBASE-T Ethernet channel performance.
9. Patch cord shall be labeled with an identification of performance level, length, and a quality control number.
10. Provide a variety of 5’, 7’ and 10’ length patch cords. Include a quantity necessary to patch every available patch panel port:

a. 25% of the patch cords are to be 5' in length.
b. 50% of the patch cords are to be 7' in length.
c. 25% of the patch cords are to be 10' in length.

11. Approved products:

a. Panduit UTP28X5BU Category 6A Copper Patch Cord, 5’, Blue
b. Panduit UTP28X7BU Category 6A Copper Patch Cord, 7’, Blue
c. Panduit UTP28X10BU Category 6A Copper Patch Cord, 10’, Blue
d. Owner approved equivalent.

O. Category 6A Copper Patch Cords for Work Area Outlets (WAO)

1. Provide Category 6A patch cords for patching Category 6A work area outlets.
2. Patch cord shall exceed requirements of ANSI/TIA-568.2 Category 6A, IEEE 802.3an-2006, and ISO 11801 Class EA channel standards.
3. Shall meet requirements of IEEE 802.af and IEEE 802.3at for PoE applications.
4. Each patch cord shall be 100% performance tested and wired T568B.
5. Patch cord shall be constructed of TX6A™ 10Gig™ 24 AWG stranded copper cable and TX6™ PLUS Modular Plugs for superior performance.
6. Patch cord plugs shall meet all applicable ANSI/TIA-968-A requirements and exceeds IEC 60603-7 specifications.
7. Plugs shall use an integral pair manager to optimize performance and consistency by reducing untwisting of conductors within the plug.
8. Patch cord shall perform in center of TIA component range, ensuring interoperability and 10GBASE-T Ethernet channel performance.
9. Patch cord shall be labeled with an identification of performance level, length, and a quality control number.
10. Provide a variety of 5’, 7’ and 10’ length patch cords. Include a quantity necessary to patch every available patch panel port:

a. 25% of the patch cords are to be 5' in length.
b. 50% of the patch cords are to be 7' in length.
c. 25% of the patch cords are to be 10' in length.

11. Provide plenum rated patch cords for work area outlets installed above the ceiling and not patched inside of a raceway (i.e. the patch cord is exposed inside the plenum). These scenarios may include, but are not limited to:

a. CCTV cameras
b. Wireless Access Points

12. Approved products:

a. Panduit UTP6A5BU Category 6A Copper Patch Cord, 5’, Blue
b. Panduit UTP6A7BU Category 6A Copper Patch Cord, 7’, Blue
c. Panduit UTP6A10BU Category 6A Copper Patch Cord, 10’, Blue
d. Panduit UXPP5BU Category 6A Plenum Rated Copper Patch Cord, 5’, Blue
e. Panduit UXPP7BU Category 6A Plenum Rated Copper Patch Cord, 7’, Blue
f. Panduit UXPP10BU Category 6A Plenum Rated Copper Patch Cord, 10’, Blue
g. Owner approved equivalent

P. Category 6 Copper Patch Cords within Communications Rooms

1. Provide Category 6 patch cords for patching Category 6 outlets within MCR/MER or CR/TR.
2. Patch cord shall meet or exceed ANSI/TIA-586-D.2 Category 6 and ISO 1180 Class E specifications.
3. Shall meet requirements of IEEE 802.af and IEEE 802.3at for PoE applications.

4. Each patch cord shall be 100% performance tested and wired T568A.
5. Patch cord shall be constructed of solid cordage, with modular plugs.
6. Patch cord plugs shall meet all applicable ANSI/TIA-968-A requirements and exceeds IEC 60603-7 specifications.
7. Patch cord shall be labeled with an identification of performance level, length, and a quality control number.
8. Provide a variety of 8”, 1', 3', 5’, 7’, 9' and 15’ length patch cords. Include a quantity necessary to patch every available patch panel port:
9. Include a quantity of different length cords for 100% of all installed cables. Coordinate count of each length with Owner (e.g. DFW or AA).
10. Patch cord color shall be:

    a. Blue for American Airlines “Data 1”
    b. White for American Airlines “Data 2”
    c. Grey for American Airlines “Voice”
    d. Yellow for American Airlines Wireless Access Points

11. Approved products (Replace the "*" with the color code):

    a. Panduit: UTP28SP(8-INCH)*
    b. Panduit: UTP28SP1*
    c. Panduit: UTP28SP3*
    d. Panduit: UTP28SP5*
    e. Panduit: UTP28SP7*
    f. Panduit: UTP28SP9*
    g. Panduit: UTP28SP15*
    h. Owner approved equivalent

Q. Category 6 Copper Patch Cords for Work Area Outlets (WAO)

1. Provide Category 6 patch cords for Category 6 work area outlets.
2. Patch cord shall exceed ANSI/TIA-568-D.2 Category 6 and ISO 11801 Class E standards.
3. Shall meet requirements of IEEE 802.af and IEEE 802.3at for PoE applications.
4. Each patch cord shall be 100% performance tested and wired T568A.
5. Patch cord shall be constructed of Category 6, 24 AWG UTP stranded cable and TX6™ PLUS Modular Plugs; plug contacts plated with 50 micro-inches of gold for superior performance.
6. Patch cord plugs shall meet all applicable ANSI/TIA-968-A requirements and exceeds IEC 60603-7 specifications.
7. Plugs shall use an integral pair manager to optimize performance and consistency by reducing untwisting of conductors within the plug.
8. Patch cord shall perform in center of TIA component range, ensuring interoperability and excellent performance.
9. Patch cord shall be labeled with an identification of performance level, length, and a quality control number.
10. Provide a quantity of 7', 9' and 15' length patch cords for every port on every work area outlet. Coordinate count of each length with Owner (e.g. AA).
11. Provide plenum rated patch cords for work area outlets installed above the ceiling and not patched inside of a raceway (i.e. the patch cord is exposed inside the plenum). These scenarios include, but are not limited to:

    a. AA Video Surveillance Camera
    b. AA Wireless Access Points

12. Patch cord color shall be:

    a. Blue for American Airlines “Data 1”
    b. White for American Airlines “Data 2”

c. Grey for American Airlines “Voice”
d. Yellow for American Airlines Wireless Access Points

13. Approved products (Replace the "*" with the color code):

a. Panduit: UTPSP7*
b. Panduit: UTPSP9*
c. Panduit: UTPSP15*
d. Owner approved equivalent
e. Owner approved equivalent

R. RJ-45 to 110 Patch Cords

1. Provide RJ-45 to 110 patch cords for patching voice circuits in TR locations.
2. Patch cord shall be constructed of 1- and 2-pair, 24 AWG UTP stranded cable.
3. Patch cord to be factory assembled with 1-, or 2-pair 110 connector on one end and an RJ-45 plug on the other.
4. 75% of the cords shall be 1-pair; the other 25% shall be 2-pair.
5. Provide a variety of 5’, 7’ and 10’ length patch cords for TR locations. Include a quantity necessary to patch two ports for each work area outlet:

a. 25% of the patch cords are to be 5' in length.
b. 50% of the patch cords are to be 7' in length.
c. 25% of the patch cords are to be 10' in length.

6. Approved products:

a. Panduit
b. Owner approved equivalent

2.5 WORK AREA OUTLET PRODUCTS

A. Wall Mount Faceplates

1. Provide wall mount faceplates for voice and data work area outlets.
2. Faceplate shall accept four (4) or six (6) Mini-Com® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Include label/label covers for easy port identification.
4. Raised rail design for aesthetic appeal.
5. Faceplate shall be white in color.
6. Approved products:

a. Panduit CFPE4WHY Mini-Com® Executive Series Faceplate, 4Port, White.
b. Panduit CFPE6WHY Mini-Com® Executive Series Faceplate, 6Port, White.
c. Owner approved equivalent.

B. Wallphone Plates

1. Provide faceplates for wallphone locations.
2. Faceplate shall be of stainless-steel construction.
3. Faceplate shall include mounting studs on plate which are positioned to mount standard wall mount telephones with keystone adaptation flush to wall surface.
4. Include a Category 6 TX PLUS keystone jack module.
5. Approved products:

a. Panduit KWP6PY Keystone Phone Plate, Cat 6 TX Plus
b. Owner approved equivalent.

C. Stainless Steel Faceplates

1. Provide stainless steel faceplates in mechanical, electrical or unfinished spaces.
2. Faceplate shall be of stainless-steel construction.
3. Faceplate shall accept four (4) or six (6) Mini-Com® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
4. Include label/label covers for easy port identification.
5. Approved products:

    a. Panduit CFPL4SY Mini-Com® Stainless Steel Faceplate, 4-Port, White.
    b. Panduit CFPL6SY Mini-Com® Stainless Steel Faceplate, 6-Port, White.
    c. Owner approved equivalent.

D. Surface Mount Outlet Box

1. Provide surface mount outlet boxes for work area outlet locations where outlets cannot be recessed.
2. Shall accept Mini-Com® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Mount easily with supplied mounting screws, adhesive tape or optional magnet.
4. Cable entry from side and rear knockouts and from opening in center of base.
5. Outlet box shall be white in color.
6. Approved products:

    a. Panduit CBX1WH-A Surface Mount Box, 1 Port
    b. Panduit CBX2WH-AY Surface Mount Box, 2 Port
    c. Panduit CBX4WH-AY Surface Mount Box, 4 Port
    d. Panduit CBXSD6AW-AY Surface Mount Box, 6 Port
    e. Owner approved equivalent.

E. Furniture Faceplate

1. Provide faceplates for work area outlet locations inside of modular furniture.
2. Shall accept Mini-Com® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Coordinate the exact faceplate assembly with the furniture manufacturer.
4. Faceplate shall be black in color.
5. Approved products:

    a. Panduit CFFP4BL Furniture Faceplate, 4 Port
    b. Owner approved equivalent.

F. Tamper Resistant Faceplate

1. Provide wall mount faceplates for voice and data work area outlets.
2. Accept Mini-Com® Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Include two tamper resistant screws to prevent unauthorized access to the connections (combo head screws also included).
4. Two-piece hinged design.
5. Sloped design improves bend radius control.
6. Faceplate shall be off white in color.
7. Approved products:

    a. Panduit CFPTR4IW Mini-Com® Tamper Resistant Faceplates, 4Port, Off White.
    b. Owner approved equivalent.

G. Blank Modules

1. Populate any unused faceplate module openings with blank modules.
2. Populate any unused patch panel module openings with blank modules.
3. Blank module color shall match the patch panel color.
4. Approved products:

    a. Panduit CMBWH-X Mini-Com® Blank Module, White
    b. Panduit CMBBL-X Mini-Com® Blank Module, Black
    c. Owner approved equivalent.

H. Patch Panels (DFW)

1. Provide modular patch panels in MCR and equipment cabinet locations for all horizontal cabling.
2. Patch panel shall accept Mini-Com® Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Use of two label pocket faceplates allowing both port and panel identification.
4. Can be clearly identified with the PanTher™ LS8E or Cougar™ LS9 Hand-Held Thermal Transfer Printers.
5. Use either 24-port or 48-port angled patch panels. Approved products:

    a. Panduit CPPLA24WBLY Angled Patch Panel, 24 Port, with labels, Black
    b. Panduit CPPLA48WBLY Angled Patch Panel, 48 Port, with labels, Black
    c. Owner approved equivalent

I. Patch Panels (AA)

1. Provide modular patch panels in MER/TR locations for all horizontal cabling.
2. Patch panel shall accept Mini-Com® Modules for UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Use of two label pocket faceplates allowing both port and panel identification.
4. Can be clearly identified with the PanTher™ LS8E or Cougar™ LS9 Hand-Held Thermal Transfer Printers.
5. Use either 24 and 48-port patch panels in TR locations, as identified on drawings.
6. Provide a separate 24-patch panel in TR locations to terminate wireless access point, IP camera outlets and miscellaneous data applications as needed.
7. Approved products:

    a. Panduit UICMPP24BLY Patch Panel, 24 Port, Ultimate ID, Black
    b. Panduit UICMPP48BLY Patch Panel, 48 Port, Ultimate ID, Black
    c. Owner approved equivalent.

J. Tenant Distribution Panel (TDP)

1. Provide a structured media enclosure in each concession space.
2. Enclosure to be a minimum 24" H.
3. Enclosure shall be equipped with a locking metal cover.
4. Provide a Media Distribution Mini-Com Modular Patch Panel (8-port).
5. Acceptable manufacturers:

    a. Panduit

        1) MS8PP Modular Patch Panel

    b. Leviton

        1) 47605-28N 28”-High Enclosure
        2) 47605-28D Hinged Door
        3) 5L000-L0K Lock Kit

    c. Legrand

d. Owner approved equivalent.

K. Jet Bridge Interface Box (JIB)

1. Provide a jet bridge cabling interface where indicated on the drawing set.
2. The enclosure shall be meet NEMA 4X requirements, with a foam-in-place gasket and a door with a continuous hinge.
3. Enclosure to be 24" H x 24" W x 12" D.
4. Include a mounting surface inside the enclosure.
5. Enclosure mounted outside are to be equipped with a solar shield.
6. Include a locking wing-nut with 2 keys.
7. Enclosure shall be equipped with a locking metal cover.
8. Acceptable products:

a. Hoffman COMLINE Wall-Mount Enclosure System:

1) ECL606020 Enclosure
2) EP6060AL Mounting Surface
3) DL36 Locking Wing Nut
4) ESSH6020 Solar Shield

b. Owner approved equivalent.

2.6 MISCELLANEOUS PRODUCTS

A. Cable Ties

1. Provide “hook & loop” cable ties for bundling cables.
2. The material shall consist of nylon loops with polypropylene hooks.
3. Use plenum-rated ties in plenum spaces.
4. Approved products:

a. Panduit TTS-20R0 Hook & Loop Roll, Low Profile, 20'L, .75"W, Black
b. Panduit HLSP*S-X0 Hook & Loop Cable Tie, Plenum
c. Owner approved equivalent.

B. Checkpoint Wait Time Sensors

1. Provide checkpoint wait time sensors where required, to support updates to checkpoint queues.
2. The new sensors shall be coordinated with the existing sensors.
3. The sensors shall be located and installed according to the manufacturer’s instruction.
4. Approved products:

a. Xovis PC2R-UL
b. Owner approved equivalent.

C. Biometric Reader Mounts

1. Provide gate counter mounting assembly per hold lounge position.
2. Provide a Chief Manufacturer Array Pole, trimmed to approximately eight-inches tall.
3. Provide two (2) Chief manufacturer Articulating Arms.
4. Provide a Chief Manufacturer Pole Mount Grommet.
5. Approved products:

a. Chief ‘Array Pole’, part number KTA1014B
b. Chief ‘Articulating Arm’, part number K1P120B
c. Chief ‘Pole Mount Grommet’, part number KTA1000B

d. Owner approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify conduit, raceways, boxes, fittings and bodies are properly installed as described in Division 26.

B. Verify grounding and bonding following Section 270526.

C. Verify supporting devices are properly installed following Section 270528.

D. Verify conduit has a minimum 1-inch diameter for UTP or F/UTP home runs.

E. All protected telecommunication terminations require bonding, grounding and a busbar.

3.2 INSTALLATION

A. General

1. Cables shall be pulled in accordance with the manufacturers recommended practices and in compliance with the NEC and the BICSI Telecommunications Distribution Methods Manual. Planning and care shall be taken to prevent abuse and damage during the handling or installation phase. Specified minimum cable bend radius shall be met without deviation.
2. Pull cables simultaneously where more than one is being installed in same raceway. Use pulling compound or lubricant where necessary. Compound used must not deteriorate conductor or insulation. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips that will not damage media or raceway.
3. Protect cable from tension, compression, torsion, bending, squeezing and vibration. Do not pull cables improperly or exceed the Manufacturer’s tensile rating. This value shall be not more than thirty-two (32) lbf. force (provide breakable link for all cable pulling). There shall be no coils of excess cable left in the ceilings, cable trays, or raised floor areas unless specified otherwise. A trailer pull string shall be left in all conduits before and after cables have been installed. The cabling within the wiring closets/cabinets shall be routed and dressed neatly to their termination points such that no excess cable is present. As cables are pulled into the cabinet, bundle them in groups with Velcro type straps according to their terminating row position. Strap exposed cables for strain relief at the termination in the communications rooms.
4. All strapping and lashing of cable within the CR(s) and IDF(s) shall be made with "Velcro" type straps for easy access to cable bundles to facilitate future "adds and changes". No plastic tie-wraps will be allowed for support of cable.
5. All cabling will be rated for a minimum operation range of -20°C to 75°C
6. All floor and wall penetrations shall be fire-stopped in accordance with local codes and restrictions.
7. New cabling will be installed in cable tray, conduit, and/or J-hooks (where allowed) throughout entirety of cable path.

B. Horizontal Cable

1. Install voice and data cable locations and configurations as depicted on drawings.

2. Test all cable prior to installation. Upon failure to perform testing, the installer shall accept the cable as good and assume all liability for the replacement of the cable should it be found defective at a later date.
3. All conformance standards must be certified for multipair and individual cable runs.
4. Jacketing and insulation must satisfy the Underwriter's Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.
5. Any pulling compound or lubricant used in cable installation must not deteriorate the conductor or the insulation. Provide 3M type WLC or an approved equal.
6. Copper cable runs shall not exceed 295 feet. All runs shall be continuous. No splicing is allowed.
7. The Contractor shall install copper cable with a minimum bend radius of six times the diameter of the cable.
8. Provide a 10-foot, patch cable with RJ-45 connectors for 50% of each work area outlet insert installed, unless noted otherwise. Provide a combination of 5, 7 and 10-foot patch cords for each termination in the CR/IDF rooms, unless noted otherwise. The patch cable rating and connector shall match the horizontal cable/connector rating.
9. Install 10-feet of spare copper cable (service loop) in each closet prior to termination. Provide Velcro straps for cable support and organization.
10. Install minimum 12-inches of spare copper cable in ceiling plenum prior to dropping down wall to outlet. Support slack to structure with J-Hook (where allowed) and Velcro ties. If there is no plenum, loop shall be located in box prior to termination. Provide box of sufficient size to accommodate spare cable, termination equipment if applicable and maintain required bend radius.
11. Install 10-feet of spare copper cable (service loop) at each above ceiling outlet prior to termination. Provide Velcro straps for cable support and organization.
12. All horizontal cable shall be rated for plenum use, unless noted otherwise.
13. The maximum pulling tension for 4-pair 23 AWG horizontal UTP and F/UTP cables shall not exceed 32 lbf. The Contractor shall provide a tension meter during the pulling of all cables. If the meter shows that the tension has exceeded 32 lbf, the Contractor shall discard the cable and pull new cable at no additional cost to the Owner.

3.3 WORKSTATION TERMINATION

A. At the workstation termination point, cables shall be routed and dressed to provide a service loop in case re-termination is necessary. Leave 12 inches of slack at the junction box. Provide strapping of voice and data cable to provide strain relief of cable in relation to outlet termination.

B. Each horizontal workstation cable shall terminate on a "Mini-Com" modular jack connector and attached to the outlet faceplate. All unused faceplate ports will have a blank insert.

C. The Contractor shall adhere to the latest termination procedures as specified by manufacturer's instructions.

D. Follow TIA T568-A termination procedures.

3.4 PATCH SYSTEM

A. Each horizontal data cable will terminate on a "Mini-Com" modular jack, inserted into the patch panel module. Horizontal termination of individual data cables within the communications room shall be the same as aforementioned termination procedures for the workstation cables.

B. Mount the distribution panels starting at the upper most position of the racks/rails beginning with contractor provided fiber patch panels. Allow for sufficient space between the distribution panels

to allow for horizontal wire managers and cross connect component installation. Provide a detail of your elevation plan to the OWNER or Owner's Representative before proceeding.

C. Patch cables shall be provided and installed as noted within Part 2 of this section and as noted in the drawing set. Ten-foot cables used for WAO and five/seven/ten foot cables for cabinet patching, unless noted otherwise.

D. Small diameter patch cords, which are installed in the IT spaces (Communications Room/Telecommunications Rooms/IT Rooms) shall installed in a manner as to limit the bundling of patch cords to no more than 24 patch cords.

3.5 110- BLOCK SYSTEM

A. Mount 110-block panel kits starting that the upper most position of the rack/rails below the contractor provided patch panels. Provide a detail of your elevation plan to the OWNER or Owner's Representative for review and approval before proceeding.

B. Each horizontal data cable shall be routed through slots in the base. Each pair of each cable shall be inserted into position in the wire strip slots while maintaining the proper color sequence and punched-down. Secure the connecting block over the wired base.

C. Terminate cross-connect wires to the top of the connecting blocks, maintaining the proper color sequence and polarity.

3.6 LABELING

A. Comply with Section 270553 - Identification for Communications Systems.

3.7 TESTING

A. General Requirements:

1. Provide a minimum of 72 hours' notice to the OAR prior to testing. All testing may be witnessed by OAR, at OAR's discretion.
2. Follow recommended procedures for testing as published by test equipment manufacturer.
3. Test equipment shall be calibrated within the last 12 months prior to the date of testing, or within a period of time recommended by the test equipment manufacturer. Test results shall include calibration documentation.
4. Contractor shall test each pair or strand of every cable prior to acceptance, with 100% Passing results.
5. Contractor shall supply all of the required test equipment and personnel certified by the equipment manufacturer to perform acceptance tests.
6. Contractor shall submit acceptance documentation as defined below. No cabling installation is considered complete until test results have been completed, submitted and approved.
7. Test results saved within the field-test instrument shall be transferred into a Windows™ based database utility that allows for the maintenance, inspection and archiving of the test records. These test records shall be uploaded to the PC unaltered, i.e., "as saved in the field-test instrument". The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.
8. Standards Compliance and Test Requirements:

a. Horizontal copper shall exceed requirements as defined within the latest release of ANSI/TIA-568.2-D Copper Cabling Components and meet the manufacturer's specifications for the installed product.
b. Horizontal optical fiber shall exceed requirements as defined within the latest release of ANSI/TIA-568.3-D Optical Fiber Cabling Components Standard and meet the manufacturer's specifications for the installed product.

B. Copper Media Testing:

1. Contractor shall utilize personnel trained in the operation of the test equipment, which shall provide a minimum Level IIIe accuracy:

   a. Fluke DSX-5000 Series
   b. Ideal LanTEK Series
   c. VIAVI Certifier Series
   d. Or approved equal

2. All cables and termination hardware shall be 100% tested for defects in installation and to verify permanent link performance under installed conditions. The Contractor prior to system acceptance shall verify all conductors of each cable useable. Any defect in the cable system installation including but not limited to cable, connectors, patch panels and connector blocks shall be repaired or replaced at no additional cost to the Owner, to ensure 100% useable conductors in all cables installed.
3. Perform end to end link testing of all cabling and connections with specified equipment and certify as meeting the criteria as defined within the latest publication of ANSI/TIA-568.2
4. Provide equipment calibration reports with test results.
5. Provide 72 hours' notice to the OAR prior to testing.

C. Optical Fiber Media Testing:

1. Contractor shall utilize personnel trained in the operation of the test equipment. Test equipment shall comply with ANSI/TIA-526-7-A and ANSI/TIA-526-14-C.

   a. Fluke Networks
   b. Exfo Inc.
   c. Or approved equal

2. Contractor shall perform end to end testing of all installed fiber strands and connections with specified equipment, and certify all strands as meeting the criteria as defined within the latest publication of ANSI/TIA-568.3
3. OLTS Reports: Testing shall consist of a bi-directional, dual wavelength end to end test. The system loss measurements shall be provided at 850 and 1300 nanometers for multi-mode fibers and 1310 and 1550 for single mode fibers.
4. OTDR Reports: Testing shall consist of a bi-directional end to end OTDR trace performed per TIA-455-78-C.
5. A testing loss budget shall, at a minimum, incorporate the following loss budgets, unless noted otherwise.

   a. Reflective events (connections) shall not exceed 0.75 dB.
   b. Non-reflective events (splices) shall not exceed 0.3 dB.
   c. A fusion-spliced connector or pigtail shall not exceed the manufacturer-specified maximum insertion loss. Therefore, the optical loss budget for a fusion-spliced connector or pigtail shall not be 1.05 dB (0.75dB + .3dB) unless that is the published maximum insertion loss by the manufacturer.

6. Testing of the cabling shall be performed using high-quality test cords (not patch cords) of the same fiber type as the cabling under test, as recommended by the equipment manufacturer. The test cords for OLTS testing shall be between one meter and five meters

in length. The test cords for OTDR testing shall be approximately 100 meters for the launch cable and at least 25 meters for the receive cable.

3.8 CLEANING

A. Upon completion of the installation, make all components free of any oil, grease, dust and debris.

B. Work areas will be cleaned at the end of each workday and a final cleanup will occur at project completion.

3.9 DOCUMENTATION

A. Electronic submittal, via CD ROM, of required cable test results, As-Built drawings, and warranty information will be submitted to the Owner or Owner's representative at least ten (10) working days before Certificate of Occupancy is awarded. CAD files will be submitted in Micro Station (.dgn) or Autocad (.dwg) format. When proprietary software is needed to view cable test results, the contractor will provide a licensed copy for DFW ITS Department's use. DFW ITS Department maintains the cable management software database. The Contractor is responsible for providing the installed wiring infrastructure data on a CD in native, PDF, and Microsoft Excel (.xls) formats. The Contractor shall coordinate the specific document requirements with DFW ITS Department.

3.10 ACCEPTANCE

A. Review test results and conduct a final inspection and punch list walk-thru with Owner and/or OAR, to inspect installation and obtain concurrence. Concurrence does not waive the responsibility of the Contractor to correct deficiencies.

PART 4 - END OF SECTION 27 15 00