SECTION 16745

TELECOMMUNICATIONS COPPER CABLE DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for installation of a centrally managed Telecommunications Premises Wiring Distribution System (PWDS) by Tenants, in Tenant facilities and spaces within Ted Stevens Anchorage International Airport, hereinafter referred to as "ANC". Requirements include strict adherence to ANC's established materials and methods, designer and installer qualifications, and telecommunications space and pathway utilization.

B. ANC has established system manufacturers and strict design requirements for PWDS at all facilities at ANC. Tenants are required to maintain compatible systems, including parts, installation methods, extended warranty, etc., for all lease spaces. Tenants are encouraged to employ ANC's designated, pre-qualified telecommunications contractor. However, tenants may utilize a different, ANC-approved, **qualified** specialty contractor, subject to the qualifications of this Section.

1.2 SCOPE OF WORK

A. Provide complete design and installation of all building infrastructure, cabling, outlets, jacks, etc., required to support Tenant's telecommunications requirements, including engineering, materials, equipment, labor, testing and documentation, in accordance with ANC's requirements.

B. Minor adds, moves and changes to telecommunication wiring within an existing tenant space may not require additional design documents to obtain a permit from ANC, but shall be installed and documented in accordance with this Section, by qualified installers.

1.3 QUALITY ASSURANCE

A. Provide system engineering and design required to produce drawings and specifications for all Work to be installed in Tenant facilities. Submit drawings and specifications to ANC for approval and permits prior to beginning Work. See Referenced Standards and Submittal Requirements below for system design requirements.

B. Design and layout of the Tenant's telecommunications system shall be performed by a Professional Electrical Engineer, Registered in the State of Alaska, or by a BICSI Registered Communications Distribution Designer (RCDD). Submit the name and qualifications of the system designer as specified in this Section.

C. Perform Work in accordance with all regulatory rules and regulations as well as references in this specification.

D. Perform Work in accordance with ANC Terminal Construction Standards, as required by this and all related Sections. ANC Telecom Standard Details are available from ANC and shall be utilized as a basis for the system arrangement.

E. Perform all Testing in accordance with ANSI/TIA/EIA-568-B specifications and submit printed reports to ANC.

F. Perform all labeling and documentation of the installation in accordance with Section 16748 - Communications Cable Management Documentation and submit all required documentation to ANC.

G. Qualifications:

1. The telecommunications work specified in this Section requires special skills mastered by education, experience, or both. A specialty telecommunications contractor, who may be a division of, or a sub-contractor to, the Tenant's electrical contractor shall perform telecommunications work described in this Section.

2. These systems will become part of an airport wide structured cabling system (Premises Wiring Distribution System – PWDS) based on **Krone** UTP copper cabling and **Corning** fiber cabling systems. **The installer of cabling systems specified herein shall be a certified installer of the respective system, pre-qualified by the Manufacturer for the purpose of offering the extended system Warranty as specified in this Section. Refer to Section 16747 – Tenant Telecommunications Fiber Optic Distribution for requirements for fiber optic cabling systems.**

3. Specialty contractors performing telecommunications work shall have a minimum of five years experience in the construction, testing, and servicing of systems of the type specified herein. The contractor shall have direct access to all tools and test equipment required to complete the telecommunications work.

H. Regulatory Requirements

1. Where a Nationally Recognized Testing Laboratory (NRTL) listing or classification exists for a product and the product is suitable for the purpose specified and indicated, the product shall bear the appropriate marking indicating the listing or classification.

2. Where a UL Standard is in effect, equipment shall:

a. Meet that Standard.

b. Bear the UL Label.

1.4 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only, **latest edition** with all addenda. The reference codes and standards are minimum requirements

Reference	Title/Revision
ANSI/NFPA 70	National Electrical Code
ANSI/TIA/EIA-568-B	Commercial Building Telecommunications Cabling Standard
ANSI/TIA/EIA-569-A	Commercial Building Standards for Telecommunications Pathways and Spaces
ANSI/TIA/EIA-571	Environmental Considerations for Telephone Terminals
ANSI/TIA/EIA-607	Commercial Building Grounding and Bonding Requirements for Telecommunications
BICSI	Telecommunications Distribution Methods Manual
IEEE	LAN Standards: 802.3; 802.4; 802.5; 802.6

B. Related Terminal Construction Standards Sections:

1. 16111 – Conduit and Fittings

2. 16115 – Cable Tray

3. 16131 – Outlet Boxes
4. 16450 – Grounding
5. 16747 –Telecommunications Fiber Optic Distribution
6. 16748 –Communications Cable Management Documentation

1.5 DEFINITIONS

A. “PWDS” refers to the Telecommunication Premises Wiring Distribution System cabling and hardware infrastructure internal and external to a building or buildings used to transmit voice and data, etc.

B. "Stations" refer to individual telephone or computers, or remote peripherals of those systems (e.g., printers, facsimile machines, modems, etc.

C. "Outlets" refer to the group of receptacles or jacks at the location where the stations connect.

D. "Jacks" or "Ports" refer to the individual receptacles where phones, computers, etc., connect.

E. "Station Cables" refer to the equipment connection cords connecting end-user equipment to modular telecommunications outlets at the work station.

F. “Patch Cords” refer to the equipment connection cords connecting horizontal patch panel ports to other ports or to active layer networking equipment in the Telecommunications Room.

G. “Pathways” refer to conduits, sleeves, cable-trays, distribution rings, etc., which are employed to route backbone and horizontal cables between equipment rooms, telecommunications rooms, stations, outlets, etc. .

H. “Backbone Cables”, "Riser Cables" or "Tie Cables" refer to copper cables 25-pair or more and optical fiber cables 6-strand or more, connecting main cross-connect facilities, intermediate cross-connect facilities and telecommunications rooms. These cables may include outside plant cables between buildings and riser cables between floors.

I. "Main Distribution Frame (MDF)" refers to the physical star point for all backbone cabling. It is the facility served from the utilities' Main Point of Presence (MPOP) or inter-building backbone cables.

J. "Telecommunications Rooms (TR)" refer to an area-serving facility for housing cable terminations, cross-connect wiring and telecommunications equipment. This is the point at which all horizontal and backbone cables (copper and fiber) terminate.

K. “Equipment Rooms” (ER) refer to a special-purpose room that provides space and maintains a suitable operating environment for building special systems equipment.

L. "Terminal Blocks" refer to multiple punch down cable terminations.

M. “Cable Management” refers to rings, troughs, gutters etc., mounted in conjunction with telecommunications distribution equipment and terminal blocks, for the orderly routing of cables, patch cords, etc.

N. “LEC” refers to the Local Exchange Carrier providing telephone service to the facility.

O. “Colocation Cabinet” refers to frame mounted, enclosed, compartmentalized, and secured equipment cabinets on standard EIA frames, for segregation of equipment by adjacent users.

1.6 SYSTEM REQUIREMENTS

A. ANC’s telecommunication distribution system is a centrally managed, structured Premises Wiring Distribution System (PWDS) consisting of optical fiber backbone, copper voice

backbone, Category 5e horizontal cabling and a system of interconnected cabling pathways and equipment spaces.

B. Main Distribution Frame rooms (MDF) in the North and South Passenger Terminals serve distributed Telecommunications Rooms (TR) in a star configured backbone cabling system. (Some older documents refer to these rooms as IDFs using the then-current terminology for such spaces. References to TRs and IDFs mean the same type of space.) The South Passenger Terminal MDF is the system's primary MDF, located in close proximity to the serving telecom utilities' Main Point of Presence (MPOP). The primary MDF is accessible from MDF rooms in satellite facilities and the North Passenger Terminal via existing inter-building cable plant owned by ANC.

C. The system is structured for shared Tenant use of ANC owned backbone cabling. Tenants having a single location presence shall utilize ANC's backbone to access utility service via the MPOP. Tenants having multiple location presence shall utilize ANC's backbone for utility access and for transport between non-adjacent tenant spaces. If Tenant's special circumstances require additional backbone capacity, the Tenant shall submit request in writing to ANC. ANC will have the option of modifying or approving tenant modifications to the backbone structure. Use of backbone transport shall be in accordance with Airport Telecommunications Policy. Contact ANC Facilities' Utility Manager for additional information.

D. Horizontal cabling to Tenant equipment such as servers and workstations shall terminate at modular patch panels in the Telecommunications Rooms (TRs). Horizontal cabling, outlets, patch panels and connectivity shall be provided by the Tenant in accordance with Airport requirements as specified herein. The Tenant shall utilize existing Airport-furnished patch panels on a first come, first served, space available basis, subject to approval. If sufficient patch panel space is not available, Tenant shall furnish patch panels.

E. Tenant telecommunications equipment such as network switches and routers may be located in TRs or in adjacent equipment rooms. All equipment racks, cable management, etc shall comply with Airport requirements as specified herein. The Tenant shall utilize existing Airport furnished equipment racks on a first come, first served, space available basis, subject to approval. If sufficient rack space is not available, Tenant shall furnish additional rack(s).

F. Secure Equipment Racks: ANC Telecommunication Rooms are secured and airport badge readers strictly control access. If the Tenant requires additional security for Tenant's networking equipment, the Tenant shall provide colocation equipment cabinet(s) at location(s) approved by ANC. The Tenant shall furnish cabinets with compartments no larger than required to house the equipment planned for their immediate needs, e.g., for Tenant equipment occupying ¼ of a rack section, Tenant shall furnish a four-section cabinet and use one section. The unused cabinet compartments shall be equipped and usable by the ANC or their Tenants.

G. The Tenant shall furnish and install all required uninterruptible power supplies (UPS) for Tenant equipment. Equipment Rooms and TRs are environmentally controlled, and are provided with Controlled Access and Standby Power.

H. Tenant network servers shall reside within the Tenant's lease space or Equipment Rooms, in accordance with current ANC policy. Only networking equipment requiring direct connection to backbone transport cabling or horizontal cabling, such as equipment identified in Paragraph E, above, may reside in TRs.

I. Tenants may provide locking cabinets in the ER or TR at their expense for an added level of security if desired. Reworking of any existing equipment racks whether occupied or not, to accommodate the provision of locking racks shall be submitted in advance for approval by ANC.

J. All cross connecting shall occur in the TR using patch cords.

K. Tenant telephone switches (PBX) shall be located in accordance with current ANC policy as follows:

1. North Passenger Terminal tenant telephone switches (PBX) may reside in the large Basement Equipment Room adjacent to the MDF or, for small systems, in an equipment room adjacent to the TR. No Tenant equipment will be allowed in the MDF. Voice backbone requirements will depend on the type and location of telephone PBX equipment. Large Tenants who provide their own PBX equipment may require backbone cable modifications at the Tenant's expense. Installing the PBX equipment at an Airport approved location in the Basement Equipment Room will minimize the need for backbone modification. If a Tenant procures direct POTS or Centrex Service from the utility, or if ANC provides PBX functionality to a tenant, existing backbone cabling shall be used from the MDF to the TR cross-connect point. Additional backbone cabling provisions to suit special Tenant needs will be the financial responsibility of the Tenant and shall be approved by ANC.

2. South Passenger Terminal tenant telephone switches (PBX) shall reside in an equipment room adjacent to the TR. No Tenant equipment will be allowed in the MDF. Voice backbone requirements will depend on the type and location of telephone PBX equipment. Large Tenants who provide their own PBX equipment may require backbone cable modifications at the Tenant's expense. If a Tenant procures direct POTS or Centrex Service from the utility, or if ANC provides PBX functionality to a tenant, existing backbone cabling shall be used from the MDF to the TR cross-connect point. Additional backbone cabling provisions to suit special Tenant needs will be the financial responsibility of the Tenant and shall be approved by ANC.

L. Provide outlet boxes, device rings, conduit and cable required to connect telecommunications outlets to the existing cable distribution system. Conduit shall typically be routed from outlet boxes to nearest available existing telecommunications cable tray. Existing cable tray is routed back to the local area TR. In areas without existing cable tray, conduits or new cable trays shall be routed directly back to the local area TR. Verify locations of available cable tray and TRs with ANC. If additional cable tray is required it shall comply with the requirements of this section and Section 16115 – Cable Tray.

M. Provide outlet faceplates, jacks, station cables, patch panels, racks, cable management, patch cords, terminal blocks, tie cables, etc., for a complete Category 5e structured horizontal cabling installation. Provide manufacturer's certificate from Krone for the completed installation with a TrueNet™ Extended Product and System Assurance Warranty as specified in this Section.

1.7 COORDINATION

A. The necessity to plan, schedule and coordinate this work with ANC is emphasized. ANC is not responsible for any omissions, delays and additional cost due to inadequate planning, scheduling, coordination or applications for approval.

B. Coordinate design and installation of Tenant's telecommunications cabling with ANC. Submit design documentation, work schedules, etc., and obtain Airport permits prior to beginning Work.

C. Coordinate work with other contractors and trades. The layout and installation of the systems specified herein shall be coordinated such that special requirements for telecommunications systems are provided and incorporated into the project. The systems to be coordinated include (but are not limited to) mechanical piping, ductwork and equipment, baggage handling systems, electrical raceway, grounding, fire rated assembly, lighting, power distribution, control and instrumentation.

D. Downtime for existing systems shall be avoided. Plan, coordinate, and execute installation activities so that facilities are not interrupted. Periods of unavoidable interruption shall be scheduled well in advance and approved in writing by ANC.

1.8 SUBMITTALS AND SHOP DRAWINGS

A. Submit designer and installer qualifications in accordance with this Section:

1. Submit the name, qualifications and experience of the system designer.

a. Submit experience of designer(s) to be assigned to this project on other Telecommunications projects of similar size and magnitude.

b. Designer shall have five years experience on projects of like magnitude and complexity.

c. Refer to designer qualification requirements in the Quality Assurance paragraph of this Section.

B. Submit contractor qualifications in accordance with this Section:

1. If ANC's designated, pre-qualified Telecommunications Contractor is utilized, identification of this fact will satisfy the qualification requirements.

C. If other than ANC's designated, pre-qualified Telecommunications Contractor is utilized, provide proof of qualifications and obtain ANC's prior approval of the Contractor.

1. Submit proof that the Contractor is a certified installer of the Krone TrueNet system, and approved by Krone to provide a fully warranted system.

2. Submit the names of the Contractor's personnel to be assigned to this project and the specific responsibility of each. Submit experience of those to be assigned to this project on other Telecommunications projects of similar size and complexity.

3. The Telecommunications contractor's project superintendent (in office) and foreman (field) shall have five years experience at the superintendent and foreman levels, respectively, on completed Telecommunications projects of like magnitude and complexity.

4. Demonstrate and document to the extent necessary that sufficient physical and personnel resources are available to accomplish the communications work of this project without endangering timely and proper completion of the work.

5. Provide a signed statement indicating that the telecommunications systems contractor has the ability to provide the service required by this Section, using factory trained and qualified technicians for each major system type and shall continue to maintain that capability until the end of the guarantee period.

D. Submit complete product information on the following items to ANC for review prior to beginning Work:

1. Copper Cable

2. Information Outlets (faceplates, jacks, bezels, etc.)

3. Patch Panels

4. Equipment Racks

5. Equipment Cabinets and Colocation Cabinets

6. Terminal Modules

7. Ladder Racking

8. Splice Cases

9. Patch Cords and other accessories

10. Label printing equipment and labeling products

E. Submit complete product information on related items such as conduit, boxes, cable trays, etc., as required by those related Sections.

F. Labeling System: Coordinate with ANC and satisfy all requirements of Section 16748 - Communications Cable Management Documentation for labeling conventions and Cable Management System (CMS) work. Submit completed labeling schedules to ANC for approval and entering into the existing CMS database by ANC before applying any labels.

G. Submit Manufacturers Certificate of Warranty as specified in this Section, including all warranty provisions and procedures for ANC to follow to obtain warranty service.

H. Shop Drawings: Provide detailed shop drawings for all installations. (Simple tenant installations connecting small numbers of horizontal cables to existing patch panels may request a waiver from this requirement.)

1. Detailed designs of equipment in racks shall be in accordance with the ANC Telecom Standard Details.

1.9 WARRANTY

A. The Krone ***TrueNet*** Warranty shall extend **twenty (20)** years from the date of final completion and shall be the standard warranty offered by Krone.

B. The warranty shall be provided to ANC by the manufacturer through a single point of contact (local warranty service agency or contractor) and shall be fully backed by the manufacturer.

C. The Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided consisting of the following.

1. Extended Product Warranty - The Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of ANSI/TIA/EIA 568-B and ISO/IEC IS 11801-B, exceed the attenuation and NEXT requirements of ISO/IEC IS 11801-B for cabling links/channels, and that the installation will exceed the loss and bandwidth requirements of ISO/IEC IS 11801-B for links/channels. Testing shall include the additional test parameters included in ANSI/TIA/EIA-568-B. The warranty shall apply to all passive Telecommunication Distribution System (TDS) components.

2. System Assurance - The System Assurance shall cover the failure of the wiring system to support any existing application, as well as additional application(s) introduced in the future by recognized standards or user forums that use the ANSI/TIA/EIA 568-B or ISO/IEC IS 11801-B component and link/channel specifications for cabling.

3. All ANSI/TIA/EIA-568-B Category 5e communications system components shall be rated for end-to-end system Category 5e, or greater performance levels on all pair combinations and warranted to support any existing or future applications which are designed to operate over a 100 MHz horizontal channel (as defined in ANSI/TIA/EIA 568-B), to include support of the following applications. Performance shall be guaranteed under the Special Warranty at 100 meters (328 feet):

a. IEEE 802.3 10Base-T, 100Base-TX and 100Base-T4

b. IEEE 802.5 16 Mbps token ring

c. IEEE 802.12 Demand Priority Access Control

d. Asynchronous Transfer Mode (ATM) data transmission at 155 Mbps.

e. IEEE 802.3ab 1000Base-T

f. Future applications that become certified under the applicable standards as noted above, *such as* 1000Base-TX.

4. Extended Product Warranty - The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).

a. In the event the Contractor, who is a certified installer for the manufacturer, is unable to perform, goes out of business or ceases to exist, the manufacturer shall be responsible for identifying a new contractor to assume the warranty work.

b. Manufacturers shall bear full responsibility for the work of their certified installer, including all aspects of the design and installation.

5. System Certification - Upon successful completion of the installation and subsequent inspection, ANC shall be provided with a numbered certificate, from the manufacturer, registering the installation.

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS OUTLET BOXES

A. Provide telecommunications outlet boxes and device rings in accordance with Section 16131 – Outlet Boxes.

2.2 TELECOMMUNICATIONS CONDUIT

A. Provide conduit for telecommunications horizontal cabling in accordance with Section 16111 – Conduit and Fittings.

2.3 TELECOMMUNICATIONS CABLE TRAY

A. Provide cable tray for telecommunications horizontal cabling in accordance with Section 16115 – Cable Tray.

2.4 TELECOMMUNICATIONS ROOM OVERHEAD CABLE SUPPORT SYSTEM

A. Size: 4-inch deep by 12 or 20-inch wide, or other width as required.

B. Description: Continuous, rigid, welded steel wire mesh cable management system.

1. 2 x 4 inches (50 x 100 mm). mesh system.

2. Kinked and T-welded continuous top wire safety edge.

3. Welded at all intersections.

4. Minimum of one (1) bottom longitudinal wire along entire length.

C. UL Classification: Straight sections shall be UL classified as an equipment grounding conductor.

D. Material: Carbon steel wire, ASTM A 510, Grade 1008. Wire welded, formed, and then surface treated.

E. Finish for Carbon Steel Wire: Finish applied after welding and bending of mesh.

1. Electroplated Zinc Galvanizing.

F. Fittings: Field fabricated, (in strict accordance with manufacturer's instructions), from straight sections.

G. Provide hardware, including splice connectors and support components available from manufacturer.

H. Accessories:

1. “Z” brackets: Provide “Z” brackets were needed for support of trays under floors, to support vertical sections down walls, to terminate dead-end runs, etc.

2. Provide continuous strut support channel to support bottom of tray system and prevent sagging due to cable loading.

3. Cable Drops: Provide bend radius drop out fittings for cable drops from tray system.

4. Grounding: Provide grounding clip for continuous ground of cable management system.

I. Equipment: Flextray by GS Metals, or approved equal.

2.5 OPTIONAL FREE-STANDING EQUIPMENT CABINETS

A. Provide compartmentalized, full height enclosed modular 19 inch NEMA standard equipment colocation rack cabinet with the following features:

1. 12 gauge steel frame with floor mounting brackets.

2. 19-inch EIA 310-D compliant equipment mounting angle brackets, front and rear.

3. Locking compartment-height steel doors front and back, with ventilation openings.

4. Frame mounted divider shelf with ventilation openings.

5. Top, bottom, and side cable entry/exit openings for each compartment.

6. Maximum cabinet depth shall be 35.5 inches.

7. Top mount fan tray with four 120 volt axial cooling fans.

8. Full compartment height, vertically mounted, plug strip permanently attached to the right rear vertical interior rack support member.

9. Electrically isolated 0.125”x1” chassis ground bus bar on the right rear side of the rack compartment as the isolated chassis ground system (CGS). Mount on 1” insulating bushed standoffs. Bond to the chassis with #6 braided x 6” long bonding jumpers one at each end of the bus bar. Identify with engraved nameplate.

10. Equipment: Hoffman Proline-CL, or as approved.

2.6 FREE-STANDING EQUIPMENT RACKS

A. Provide extruded aluminum, full height 19-inch wide NEMA standard open rack frame designed with footprint not to exceed 24” width.

1. Provide with 6” wide by 105” deep vertical side distribution cable troughs between racks and 6” wide trough on each end of row (one 6” trough required between adjacent racks), Hubbell NextFrame Vertical Cable Management, VC76.

2. Provide an electrically isolated 3/16”x3/4”x18 5/16 chassis ground bus bar on the top rear side of the rack as the isolated chassis ground system (CGS) busbar. Bond to the chassis with #6 braided x 6” long bonding jumpers one at each end of the bus bar.

3. Provide all racks and rack mounted hardware with black finish.

4. Equipment: Hubbell NextFrame CR1976, or as approved.

2.7 CABLE MANAGEMENT

A. Backboard mounted cable management:

1. Distribution rings installed in communication rooms shall be “D” ring type. No bridle rings are permitted.

2. Distribution rings shall be sized according the number and size of cables to be supported plus 25 % spare capacity.

3. Vertical trough-type cable management shall be minimum 6-inch wide, cable management trough, 110 Vertical Cable Management trough, or as approved.

4. Horizontal trough-type cable management shall be minimum 3 1/2-inch wide, cable management trough, 110 Horizontal Cable Management trough, or as approved.

B. Rack mounted cable management:

1. Vertical trough-type cable management for use with standard 7 foot equipment rack are specified above with equipment racks.

2. Provide horizontal split D ring style, standard 19-inch rack mounted cable management panels, single rack unit height (1-3/4-inch).

3. Approved equipment: Refer to Appendix C.

2.8 IDC TERMINAL MODULES

A. Copper backbone cables shall be terminated on rack mounted IDC terminal modules.

B. Connecting blocks shall match cables punched down under block, i.e., 5-pair for 5-pair color scheme, 4-pair for 4-pair cable, 3-pair for 3-pair cable, etc. When six pair are used 2-3 pair connecting blocks shall be used. For 25-pair or larger, use the 5-pair for 5-pair color scheme. All hardware shall be rated for ANSI/TIA/EIA 568-B Category 5e ratings and installed in accordance with ANSI/TIA/EIA 568-B guidelines. Blocks shall be color coded according to drawings and documented in accordance with ANSI/TIA/EIA 606A and Section 16748 – Communications Cable Management Documentation. Blocks shall be identified using clear label holders and labels. Blocks shall be UL Listed.

C. Connecting blocks shall be in 100 or 300 pair modules. Provide a retaining trough between every 100 pair termination block.

D. Approved equipment: Refer to Appendix C.

2.9 DISCONNECT BLOCKS

A. Provide Disconnect Blocks and cross connect ahead of Backbone Terminal Modules for testing.

1. Mount Disconnect Blocks in the top rack unit spaces of the equipment rack.

2. Provide tie cables on the rear side of rack between disconnect blocks and terminal blocks mounted below. Disconnect blocks shall have the same characteristics as termination blocks, but shall have a center mounted disconnect module for bi-directional testing capability. Blocks shall be panel mounted for a 19-inch rack mounted panel or wall mounted, as shown on the drawings.

3. Approved equipment: Refer to Appendix C.

2.10 PATCH PANELS

A. Patch Panels: Modular jack panels shall be in 24 or 48 port configurations. Modular jack panel installations shall contain a retaining trough between every panel. Modular Jack Panels shall be wired for T568A configuration

B. Designation labels for each jack shall be provided for front/rear labeling of each patch panel. All cables shall be terminated in numerical sequence and labeled as to outlet number and jack position (A, B, C, D). Provide color-coded inserts ("icons") for all jacks at patch panels and at each outlet.

C. Approved Equipment: Refer to Appendix C.

2.11 INFORMATION OUTLETS/JACKS

A. Faceplates

1. All Faceplates shall be available in single, duplex, triplex, quad-plex, arrangement in a single gang configuration with both top and bottom labeling positions included.

2. Surface mount boxes may be used only where impractical to provide flush mounted box. Surface boxes may be single or dual gang versions, or surface mount boxes with side/bottom exits for one to twelve jack configurations.

B. Outlets for Voice and Data:

1. Provide 8-pin modular (8P8C) jacks with reusable insulation displacement terminations, utilizing T568A termination style.

2. Unless otherwise noted on the floor plans or within this document, all wall outlets shall be:

a. Equipped with modular jacks

b. Provided with blank module inserts for all unused module locations.

c. Provided with colored snap-in icon denoting the current media service (e.g., phone, data, video, etc.)

C. Approved Equipment: Refer to Appendix C.

2.12 PATCH CORDS

A. Provide factory assembled Category 5e Modular Patch Cords for each assigned port on the patch panel.

B. Provide Patch Cords of required length and type, colored blue for data and white for telephone.

C. All patch cords shall be Category 5e, 24-AWG copper, stranded patch cords manufactured by **Krone**, for TrueNet system channel performance.

D. Patch cords become the property of ANC upon termination of Tenant lease.

2.13 HORIZONTAL CABLES

A. High Speed Cables

1. Horizontal cables shall be installed continuous between the outlet and its associated TR and shall consist of 4 pair, 24 gauge, UTP, and shall be properly terminated at each end and tested.

2. All 4 pair UTP cables shall be UL Listed Type CMP (plenum).

3. Cables shall meet or exceed performance specifications for the Channel as defined by ANSI/TIA/EIA-568-B.2.

4. Approved Equipment: Refer to Appendix C.

PART 3 - EXECUTION

3.1 GENERAL

A. Telecommunications work shall be in complete accordance with the following:

1. ANC design and installation requirements.

2. National Electrical Code (NEC), latest legally enacted edition.

3. Regulations of the State Fire Marshal.

4. National Fire Protection Association (NFPA) Codes.

5. All state, county and local codes and ordinances.

B. Provide, connect and test all equipment and materials for the systems herein specified.

C. Cables shall be run in cable tray or raceway and shall be neatly tied or laced in cabinets and terminated on terminal strips provided for the purpose. Use of bridle rings or J-hooks is prohibited.

D. Cables shall be identified by an approved marking system at each end.

E. Outlets and jacks shall be identified with machine printed labels. Hand lettered labels shall not be used.

F. Provide color coded snap-in icons for workstation outlets to mark jacks for analog and digital telephones, unique classes of data, etc. Maintain existing color code and symbology currently in use at ANC.

G. Coordinate installation of lighting, ventilation and all other systems in the telecommunication rooms to avoid interferences.

H. Work under this section shall be closely coordinated with work under other sections of the project.

3.2 CODES AND PERMITS

A. Apply and pay for all fees, permits, and obtain serving utility and governmental approvals.

B. Coordinate all work with the serving utility.

3.3 LAYOUT

A. Work shall be laid out in advance and Shop Drawings submitted for review by ANC.

3.4 COLOR CODE SYSTEM

A. Horizontal cables for one floor may be run in the tray system of another floor where necessary, and shall be clearly identified by their unique floor-specific color. One color shall be used for all horizontal cables terminating on a floor. A different color shall be used for the floor above, and another unique color for the floor below. Conform to ANC's existing color coding scheme or provide as directed by ANC.

B. Where applicable, provide color coded cable in areas of the terminal or facility in accordance with existing or planned multi-level cable routing scheme.

3.5 LABELING

A. Provide labeling of equipment and telecommunications circuits in accordance with ANC's standards and labeling conventions. Label cables, outlets and patch panels with preprinted permanent labeling system.

B. Submit telecommunications circuit data to ANC, in accordance with Section 16748 – Communications Cable Management Documentation, for approval and entering into ANC's existing cable management database prior to applying labels.

3.6 EQUIPMENT RACKS

A. Equipment racks shall be seismically braced by securely bolting to the structural floor supplemented with additional braces as required for the Seismic Zone.

1. Mount ground bars on insulating bushed standoffs.

2. Electrically separate open racks with insulating washers and nonconductive screws

3. Electrically separate enclosed racks with insulating washers and nonconductive screws.

3.7 SEISMIC BRACING

A. Ladder racks and freestanding equipment racks shall be seismically braced in accordance with requirements for seismic Zone 4, as required by Section 16190 of these Specifications. Seismic bracing shall consist of rigid supports. Cables, wires, chains or other non-rigid materials shall not be used for seismic support. Provide approved fixed equipment anchorage assemblies as published by the manufacturer. In lieu of manufacturer's published seismic bracing assemblies, the Contractor shall provide seismic installations approved by a licensed structural engineer.

B. Approved drawings of seismic assemblies shall be made available for review by ANC or the inspecting Authority Having Jurisdiction upon request.

3.8 DELIVERY AND STORAGE

A. Materials and Equipment shall be stored with protection from mechanical damage, weather, humidity and temperature variation, dirt and dust, and other contaminants.

B. Materials shall be inspected and inventoried promptly upon receipt.

C. Report and record all serial numbers received and/or rejected.

3.9 CABLE INSTALLATION

A. Follow cable manufacturer's specification regarding handling methods, retaining/support methods, bending radius and maximum pulling tension limitations.

B. Telecommunication cables shall not be installed in the same raceway as power cables or fiber optic cables.

C. Cables placed in cable trays shall be installed in a neat and orderly manner and shall not cross or interlace other cables except at breakout points.

D. Cables in vertical trays shall be individually retained with straps at a maximum of 6 feet on center.

E. Tie wraps shall not deform the cable insulation when tightened.

F. Cables shall be routed to minimize EMI and RFI interference. Cable shall be routed with minimum spacing according to the following table.

Minimum Separation of Telecommunications pathways from 480 volt or less power lines

Condition	<2 kVA	2-5 kVA	>5 kVA
Unshielded power lines or electrical equipment in proximity to telecommunications open or nonmetal pathways.	5 in	12 in	24 in
Unshielded power lines or electrical equipment in proximity to telecommunications grounded metal conduit pathways	2.5 in	6 in	12 in
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a telecommunications grounded metal conduit pathway	N/A	3 in	6 in
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to telecommunications open or nonmetal pathways.	2.5 in	6 in	12 in
Mechanical ductwork, metal floors and other metallic planes to telecommunications open or nonmetal pathways.	2 in		
Mechanical ductwork, metal floors and other metallic planes to telecommunications open or grounded metal conduit pathways.	0 in		
Fluorescent or HID lighting fixtures	5 in	5 in	5 in

3.10 LUBRICANT

A. Pulling lubricant, shall be used to minimize pulling tension and prevent sheath damage when pulling cables into ducts and conduits. Lubricant shall be applied to the cable sheath with a lubricator. When pulling has been completed, the exposed cable ends shall be wiped clean of lubricant.

B. Lubricants shall be compatible with and intended for use with plastic-sheathed cables. Soap and grease type lubricants shall not be allowed.

3.11 TERMINATION MODULES

A. Lay out telephone and data terminal blocks consistently with existing ANC installations. Provide spacing as recommended by manufacturer.

3.12 CROSS-CONNECTIONS

A. Cross-Connections at and/or between all terminal hardware shall be provided to form a complete and functioning system.

B. Patch Cords shall be used to make all Cross-Connections, except where tie cables are used in voice backbone connections to disconnect blocks.

C. Patch cords shall be color-coded white for voice and blue for data.

D. Cross-Connections from Disconnect Blocks to Terminal Modules shall be 4-pair wide and serve a single jack or termination in the horizontal distribution.

3.13 COMPLETION AND TESTING

A. All inspection and testing shall be performed under the observation of ANC at ANC's option. Provide three (3) working days advance notice of tests.

B. Telecommunications System test reports shall be submitted to and approved by ANC. The test reports shall certify that the Telecommunications Distribution System is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.

C. After installation and test of each system is complete, each system and the entire system shall be demonstrated and tested for proper operation. The Tenant shall schedule a demonstration with the following representatives present:

1. Tenant's representative.

2. Manufacturer's representative for each major communications subsystem.

3. Airport's representative.

D. Test all systems in accordance with the Krone ***TrueNet*** Warranty Program. The following requirements will generally familiarize users of this Section with the testing requirements.

E. Final Inspection Tests

1. Testing of copper wiring shall be performed prior to system acceptance. 100 percent of the horizontal and riser wiring pairs shall be tested. Link testing of copper cabling shall be performed. Complete, end to end test results shall be submitted to ANC.

a. Category 5e cable runs shall be tested for conformance to the specifications of EIA/TIA 568-B, Category 5e. Testing shall be done with a ANSI/TIA/EIA 568-B ETL verified Level II-E test set, with accuracy per Proposed TIA Level III standards.

1) Test shall include all requirements of ANSI/TIA/EIA 568-B, including wiremap, length, characteristic impedance, insertion loss, ambient and impulse noise, NEXT, PSNEXT, FEXT, ELFEXT, PSELFEXT, return loss, ACR, PSACR, Propagation Delay and Delay Skew.

2) Supported test frequency shall be 1-350 MHz.

3) "Full Plot" storage shall store entire test, and be capable of uploading saved data and re-characterizing cables against new or evolving performance standards. Testers only saving worst case data are not acceptable. Test data shall be saved and provided to ANC in neatly bound hardcopy and electronic format compatible with ScopeData Pro® software.

4) Reports shall be graphic, showing test results plotted against standards. Reports shall include a pass/fail summary of all network types specified.

5) Any cables not meeting the requirements of the standard shall be brought into compliance at no charge to ANC.

6) Tester shall be equal to **Agilent Technologies (HP)** WireScope 350 or Fluke DSP-4000.

2. Test cables from both ends.

3. Re-test cable disturbed after testing, at the direction of ANC.

F. Replace rejected materials.

G. Test AC grounds and voltages in equipment racks.

1. Record voltage at equipment rack power source both at no load and at 15 Amp resistive load.

3.14 INSTRUCTION AND TRAINING

A. Provide instruction to familiarize ANC with all additions and modifications to the PWDS.

END OF SECTION