SECTION 16010

ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section outlines the general design requirements for electrical systems at ANC (Ted Stevens Anchorage International Airport). Refer to other Division 16 sections for additional requirements including standards for material and construction quality.

B. Index of Electrical Requirements:

16010	Electrical Requirements
16050	Basic Materials and Methods
16111	Conduit and Fittings
16112	Surface Raceways
16115	Cable Tray
16120	Wire and Cable
16131	Outlet Boxes
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16140	Wiring Devices
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16201	Emergency/Standby Generating System
16425	Distribution Switchboards
16440	Disconnects
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16475	Overcurrent Protective Devices
16480	Motor Control Centers
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16500	Lighting Fixtures
16501	Lamps, Ballasts, Accessories
16723	Addressable Fire Alarm System
16745	Telecommunication Infrastructure
16770	Airport Paging Announcement Control System
16920	Power Monitoring and Control System

1.2 CODES AND STANDARDS

A. Codes: Design and construct all work in accordance with all applicable national, state and local codes; including, but not limited to the latest legally enacted editions of the following specifically noted requirements:

1. NFPA 70, National Electrical Code - NEC
2. ANSI-C2, National Electrical Safety Code - NESC
3. International Building Code - IBC
4. International Fire Code – IFC
5. International Mechanical Code - IMC
6. Underwriters Laboratory (UL) or approved equal.

B. Standards: Reference to the following standards infers that installation, equipment and material shall be within the limits for which it was designed, tested and approved, in conformance with the current publications and standards of the following organizations:

1. American National Standards Institute - ANSI
2. American Society for Testing and Materials - ASTM
3. American Society of Heating Refrigerating and Air Conditioning Engineers - ASHRAE (Standard 90-75)
4. Institute of Electrical and Electronics Engineers - IEEE
5. Insulated Cable Engineers Association - ICEA
6. National Electrical Manufacturers' Association - NEMA
7. National Fire Protection Association – NFPA
8. National Electrical Contractors' Association - NECA ("National Electrical Installation Standards").

1.3 GENERAL REQUIREMENTS

A. Electrical systems shall be designed under supervision of and stamped by an Electrical Engineer licensed to practice in the State of Alaska.

B. An Electrical Contractor licensed by the State of Alaska shall install tenant electrical systems. Unlicensed installation by tenant employees is specifically forbidden.

C. Drawings shall be prepared in AutoCAD format.

D. Submittals are required during design phase to show that the proposed electrical systems are compatible with existing systems, and that the installation will meet the requirements of these standards. Refer to SUBMITTALS for specific design phase submittal requirements.

E. Submittals are required during construction phase to

1. Verify that systems designed by the construction contractor based on performance specifications are compatible with existing systems, and meet the requirements of these standards. These include fire alarm, paging and power monitoring shop drawings.

2. Update ANC O&M files. These include O&M manuals, Shop drawings and data files, etc. Refer to technical sections. Tenant information shall be prepared as a separate “Appendix” to existing O&M manuals.

3. Record Drawings as described in RECORD DRAWINGS.

F. Construction phase submittals shall be reviewed and approved by Tenant's Engineer of Record prior to submission to ANC.

G. MOA building permits shall be obtained by the Tenant or their contractor and submitted to ANC prior to the start of construction.

1.4 SUBMITTALS

A. Professional Electrical Engineer qualifications: Submit qualifications described in QUALITY ASSURANCE. Submit with Preliminary Design Submittal.

B. Design Phase Submittals: Submit the following as described under DESIGN PHASE REQUIREMENTS.

1. Coordination Submittal: Submit prior to Preliminary Design Submittal to assist ANC in determining proposed connection points for the Tenant’s equipment.

2. Preliminary Design Submittal: Submit prior to preparing construction documents to demonstrate compliance with these Tenant Electrical Requirements.

3. Final Design Submittal: Submit completed construction documents for review and approval prior to any construction activity.

4. Submit copies of MOA building permits prior to any construction activity.

C. Construction Phase Submittals

1. Submit documents for systems that are designed by the Tenant's Contractor on a performance basis, including but not necessarily limited to:

a. Fire alarm system shop drawings and calculations. Refer to Section 16723.

2. Commissioning Certifications. Refer to Section.

3. O&M Manuals approved by the Tenant’s Engineer of Record - See OPERATIONS AND MAINTENANCE MANUALS.

4. Record Drawings - See RECORD DRAWINGS.

5. Other submittals as may be included in these requirements.

1.5 QUALITY ASSURANCE

A. Provide the services of a Professional Electrical Engineer currently licensed for practice in the State of Alaska to design a complete set of interrelated electrical systems in accordance with the requirements and criteria set forth in this document. Obtain approval of the prepared plans and specifications by ANC prior to construction as noted below.

B. Prior to commencement of design, submit documentation demonstrating that the proposed Electrical Engineer meets all of the current licensing requirements of the State of Alaska Board of Registration for Architects, Engineers and Land Surveyors in accordance with Alaska Statutes. This applies to both personal and business licensing.

C. The Professional Electrical Engineer shall review and approve all product submittals and shop drawings prior to installation. This review shall be before and in addition to submittal and shop drawing review by ANC.

1.6 DESIGN PHASE REQUIREMENTS

A. Preliminary and Final Submittals shall be in accordance with Section 3.1, "Submission Requirements", of ANC's "Airport Tenant Criteria". Additional specific requirements for electrical are noted below.

B. Coordination Submittal: Prior to submission of the Preliminary Design Submittal the Tenant's Design Engineer shall contact ANC to determine proposed connection points for the Tenant's equipment. The Tenant's Design Engineer shall provide the following information to ANC. ANC will provide information for use in preparing the Preliminary Design Submittal.

1. Estimated 277V lighting loads (include estimated number of circuits).
2. Estimated 208Y/120V loads.
3. Estimated 480V, 3 phase loads (if any).
4. Estimated special system requirements for the following systems
    a. Fire Alarm
    b. Telecommunications
    c. Paging System
    d. Power Monitoring and Control System

C. Preliminary Design Submittal: This submittal shall include the items noted below to confirm and document the scope of work and the type and quality of electrical systems. The submittal shall document all proposed electrical systems and their proposed interfaces to building systems.

1. Schematic Design Narrative
    a. Narrative shall:
        1) Document basic assumptions
        2) Communicate system concepts
        3) Identify proposed system connection points for all major systems. If connection to a particular system is not required it shall be noted in narrative.
            i Power (Normal, Standby and Emergency)
            ii Lighting (Normal and Emergency)
            iii Fire Alarm
            iv Telecommunications
            v Paging System
            vi Power Monitoring and Control System
        4) Identify major product choices. Include catalog cutsheets for all light fixtures.

5) Identify proposed lighting levels in each room/area in footcandles.

2. Calculations

   a. Electrical load summary including connected and NEC load calculations.

3. Floor Plans: Submit concept floor plans to demonstrate the viability of proposed design. Drawings shall be prepared using AutoCAD.

   a. Show major electrical equipment and proposed connection points.

   b. If appropriate identify weight considerations for structural engineer.

   c. Include lighting fixture schedule with proposed basis of design light fixtures. Note manufacturer, pertinent fixture features, lamps and mounting requirements.

4. Power one-line diagram.

5. Outline Specifications.

D. Final Design Submittal: Submit Construction Documents suitable for permit approval and construction. Final design shall be based on schematic design previously submitted, and approved by ANC. Required submittal shall include, but is not limited to:

1. Construction Plans as follows:

   a. Separate floor plans for lighting, power, and special systems. Lighting and power plans shall be completely circuited. Special system plans shall show equipment and device locations for all applicable systems.

   b. Power one-line diagram with all equipment and conduits sized. One-line shall include local area ANC electrical room and switchboard/panels providing service and all proposed Tenant equipment, power monitoring devices, conduit and cabling.

   c. Panel schedules indicating circuit description, circuit breaker size and type, electrical load (connected and NEC) and short circuit rating.

   d. Complete fixture schedules with manufacturer, model number, description, number/type of lamps and mounting requirements. Submit catalog cutsheets with product and photometric data sheets for all light fixtures.

   e. Identify telecommunications equipment locations (if applicable) and local area ANC telecom room providing service.

   f. If tenant equipment is located in ANC equipment rooms (subject to ANC approval), provide large scale plan noting all equipment locations and required clearances.

   g. Additional drawings and details so that when used with the specific project specifications, the proposed construction is sufficiently clear to allow permitting and successful project completion without additional drawings.

   h. Drawings shall be prepared using AutoCAD.

2. Specifications to describe specific project requirements, products and execution.

3. Complete electrical calculations in accordance with recognized procedures and specified criteria. Provide step by step calculations, summaries and narratives to explain procedures and results or conclusions. In the title block of each calculation sheet include engineer's name, date, project name, topic, and page number. Provide detailed and annotated engineering calculations including, but not limited to:

    a. Electrical load calculations for tenant distribution equipment and panelboards downstream of connection points to ANC power distribution systems.

    b. Fault current available at tenant distribution equipment and panelboards downstream of connection points to ANC power distribution system. Contact ANC for available fault current at points of connection to ANC distribution systems.

    c. Protective device coordination study in accordance with Section 16475 – Overcurrent Protection Devices. This requirement may be waived at ANC's discretion for work that involves only minor revisions to the existing power distribution systems.

    d. Room by room lighting levels in maintained footcandles. Maintained footcandle levels shall be calculated using appropriate Light Loss Factors (LLF), e.g., LLF=0.7 for grid troffers. Also include ballast factors where appropriate, e.g., for a Motorola electronic ballast, ballast factor= 0.88.

    e. Site lighting levels (provide point-by-point calculations), if applicable. Maintained lighting levels shall be determined using a Light Loss Factor of 0.7.

    f. Tenant feeder voltage drops.

    g. Voltage drop for site lighting circuits (if applicable).

    h. Voltage drop for worst case branch circuits for each tenant panel.

4. Upon review and approval, correct and mark the final documents (including each drawing sheet) "Released For Construction."

1.7 ELECTRICAL - GENERAL

A. General: Coordinate with ANC to determine what existing building services are available at each tenant area.

B. Electrical services available for initial tenant build-out areas in C-Concourse are shown on construction drawings for this area. Refer to Concourse C - Phase 2 - Building Completion drawings, AKSAS 54475 for additional information. Coordinate with ANC to obtain copies of these drawings. See Sections 1.7.D.4 and 1.7.E below for specific power provisions made for proposed Tenants. General allowances for other areas are as noted below.

1. Lighting

    a. Offices: 3.5 VA/sq. ft.

    b. Operations, Gate Lounges: 2 VA/sq. ft.

    c. Mechanical, Electrical, Service Areas: 2 VA/sq. ft.

    d. Corridors: 0.5 VA/sq. ft.

2. Receptacles: 1 VA/sq. ft.

1.8 ELECTRICAL GENERAL REQUIREMENTS - POWER

A. Distribution and Utilization Voltages

1. ANC is served at 12.47kV by CEA (Chugach Electric Association). The . South Terminal is served by a loop feed primary distribution system. Each end of the loop is primary metered by CEA. The medium voltage distribution system after the primary meters is owned and operated by ANC.

   a. The South Terminal is served by eight pad mounted service transformers (Service Transformers No. 1, 2, 3, 6, 7, 8, 10 and 11). A ninth transformer, Service Transformer No. 4, serves the Ground Transportation Lobby and the Parking Garage. All services are 480Y/277V, 3 phase, 4 wire, except for Service No. 2 which is 208Y/120V, 3 phase, 4 wire. Each service transformer feeds a dedicated Main Distribution Panel (e.g., Service No. 8 feeds MDP-8H).

   b. The majority of tenants will be served from existing ANC distribution equipment. The Tenant's Design Engineer shall contact ANC regarding any major equipment or loads that may require the addition of new service equipment.

   c. The following guidelines shall be used in the selection of utilization voltages for equipment. Deviations from the guidelines shall only be allowed if specifically approved by ANC.

      1) Lighting

         i Fluorescent or HID: 277 volts

         ii Incandescent: 120 volts

      2) Motors

         i Motors ¾ HP and above: 480 volt, 3 phase

         ii Motors ¾ HP and above: 208 volt, 3 phase only if required by the application and specifically approved by ANC.

         iii Motors ½ HP and below: 120 or 208 volts

         iv Small Motors (¾ HP and smaller) may be furnished at 277 volts if required by the application.

B. 277V Lighting Circuits: Capacity and space is typically available in ANC 480Y/277V branch circuit panels to serve Tenant 277V lighting circuits. ANC will provide specific direction on where to connect to the system. The Tenant shall provide the following:

1. 20A/1P circuit breakers in ANC's 480Y/277V branch circuit panel for connection to the Tenant's 277V lighting circuits.

2. Branch circuits from ANC's 480Y/277V branch circuit panel to their lease space. Lighting branch circuits are not required to be metered.

3. If space is not available in an existing ANC panel the Tenant may be required to provide a 480Y/277V branch circuit panel and associated feeder circuit breaker and feeder. The panel shall be located as directed by ANC.

C. 208Y/120V Loads: Capacity and space is typically available in ANC 208Y/120V distribution panels to serve Tenant 208Y/120V branch circuit panels.

1. Tenant 208Y/120V loads shall be served from 208Y/120V, 3 phase, 4 wire branch circuit panels located in the Tenant's space.

2. Tenant 208Y/120V branch circuit panels may only be located in ANC electrical rooms by special approval of ANC.

3. The Tenant shall provide the following:

   a. Feeder circuit breakers in ANC's 208Y/120V distribution panel.

   b. Feeders between ANC's distribution panel and the Tenant's branch circuit panel(s).

   c. Energy Meter on each Tenant feeder per ANC Design Requirements. The Energy Meter shall be located in ANC's distribution panel. Refer to Section 16920, Power Monitoring and Control for specific requirements.

4. Capacity, feeder circuit breakers, and conduit only between ANC 208Y/120V distribution panels and proposed Tenant spaces has been provided to feed 208Y/120V Tenant loads as part of the Concourse C – Phase 2 Building Completion Project. The following provisions have been made:

   a. Deli/Bar/C8210: 200A/3P circuit breaker provided in Panel 81NDP-PA and 2 inch conduit only provided from Panel 81NDP-PA to ceiling space of Deli/Bar/C8210.

   b. Restaurant/C3207: 400A/3P circuit breaker provided in Panel 111NDP-PA and 3-1/2 inch conduit only provided from Panel 111NDP-PA to ceiling space of Restaurant/C3207.

   c. Lounge/C3202: 400A/3P circuit breaker provided in Panel 111NDP-PA and 3-1/2 inch conduit only provided from Panel 111NDP-PA to ceiling space of Lounge/C3202.

   d. Electrical Gadgets/C3208: 100A/3P circuit breaker provided in Panel 111NDP-PA and 1-1/4 inch conduit only provided from Panel 111NDP-PA to ceiling space of Electrical Gadgets/C3208.

   e. Arcade/C3209: 200A/3P circuit breaker provided in Panel 111NDP-PA and 2-1/2 inch conduit only provided from Panel 111NDP-PA to ceiling space of Arcade/C3209.

   f. Business Center/C3204: 200A/3P circuit breaker provided in Panel 111NDP-PA and 2-1/2 inch conduit only provided from Panel 111NDP-PA to ceiling space of Business Center/C3204.

   g. Deli/C4102: 100A/3P circuit breaker provided in Panel 111NDP-PA and 2 inch conduit only provided from Panel 111NDP-PA to ceiling space of Deli/C4102.

   h. Fitness/C2115: 100A/3P circuit breaker provided in Panel 111NDP-PB and 1-1/4 inch conduit only provided from Panel 111NDP-PB to ceiling space of Fitness/C2115.

   i. Inline Store/C1203: 100A/3P circuit breaker provided in Panel 111NDP-PB and 1-1/2 inch conduit only provided from Panel 111NDP-PB to ceiling space of Inline Store/C1203.

   j. Inline Store/C1204: 100A/3P circuit breaker provided in Panel 111NDP-PB and 1-1/2 inch conduit only provided from Panel 111NDP-PB to ceiling space of Inline Store/C1204.

k. News/C2203: 100A/3P circuit breaker provided in Panel 111NDP-PB and 1-1/4 inch conduit only provided from Panel 111NDP-PB to ceiling space of News/C2203.

l. ACVB/C2118: 100A/3P circuit breaker provided in Panel 111NDP-PB and 1-1/4 inch conduit only provided from Panel 111NDP-PB to ceiling space of ACVB/C2118.

m. Outdoor Wear/C5204: 100A/3P circuit breaker provided in Panel 111NDP-PC and 1-1/4 inch conduit only provided from Panel 111NDP-PC to ceiling space of Outdoor Wear/C5204.

n. News and Alaskana/C5205: 100A/3P circuit breaker provided in Panel 111NDP-PC and 1-1/4 inch conduit only provided from Panel 111NDP-PC to ceiling space of News and Alaskana/C5205.

o. Coffee and Snacks/C3206: 100A/3P circuit breaker provided in Panel 111NDP-PC and 2 inch conduit only provided from Panel 111NDP-PC to ceiling space of Coffee and Snacks/C3206.

D. 480V, 3 Phase Loads: Capacity and feeder circuit breakers have been provided to feed 480V, 3 phase Tenant loads in the Concourse C – Phase 2 Building Completion Package as follows:

1. Gate C1 General Power: 60A/3P circuit breaker provided in Panel 71NHP.
2. Gate C2 General Power: 60A/3P circuit breaker provided in Panel 71NHP.
3. Gate C1 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 71NHP.
4. Gate C2 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 71NHP.
5. Alaska Airlines 400 Hz Power System: 800A/3P circuit breaker provided in MDP-8H.
6. Gate C3 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
7. Gate C4 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
8. Gate C5 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
9. Gate C6 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
10. Gate C7 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
11. Gate C8 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
12. Gate C9 General Power: 60A/3P circuit breaker provided in Panel 81NDP-HA.
13. Gate C3 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
14. Gate C4 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
15. Gate C5 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
16. Gate C6 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
17. Gate C7 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
18. Gate C8 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.
19. Gate C9 PC Air Supply Fan: 80A/3P circuit breaker provided in Panel 81NDP-HA.

E. Emergency/Standby Power: A limited amount of Emergency/Standby Power is available for Tenant use as noted below. Emergency loads are those that are required for life safety only such as emergency egress lighting, exit signage and fire alarm system equipment. Emergency circuits shall be in accordance with NEC Article 700. Standby loads are those for which it is desired to provide backup power to in order to prevent damage to the facility, to aid in rescue or evacuation, or to aid in continuing operation of the airport in a limited capacity. Standby loads may include mechanical equipment required for freeze protection, telecommunications systems and checkstand equipment (computers and processors). Proposed Tenant emergency and standby loads must be submitted and approved by ANC as part of the Design Submittal process.

1. Emergency power (277V): A limited amount of capacity and space is available in ANC 480Y/277V branch circuit panels to serve Tenant 277V emergency lighting circuits. ANC will provide specific direction on where to connect to the system. The following requirements apply:

    a. Tenant shall provide all required circuit breakers, conduit and wiring required to connect to ANC's system.

    b. Emergency circuits are not required to be metered.

    c. If space is not available in an existing panel the Tenant may be required to provide a 480Y/277V branch circuit panel and associated feeder circuit breaker and feeder. The panel shall be located as directed by ANC.

    d. The emergency power branch circuit shall be used for connection of life safety equipment only (emergency egress lighting, exit signs, etc.).

    e. In Tenant spaces with a limited number of emergency fixtures, ANC may direct the Tenant to connect to a local available 277V emergency lighting circuit.

2. Emergency power (120V): A limited amount of capacity and space is available in ANC 208Y/120V branch circuit panels to serve ANC approved Tenant 120V emergency loads. ANC will provide specific direction on where to connect to the system. The following requirements apply:

    a. Tenant shall provide all required circuit breakers, conduit and wiring required to connect to ANC's system.

    b. Emergency circuits are not required to be metered.

    c. If space is not available in an existing panel the Tenant may be required to provide a 208Y/120V branch circuit panel and associated feeder circuit breaker and feeder. The panel shall be located as directed by ANC.

    d. Emergency power branch circuits shall be used for connection of life safety equipment only (fire alarm system equipment, fire suppression system equipment, etc.) as permitted by NEC Article 700 and as specifically approved by ANC. Emergency egress lighting may be served at 120V only when Tenant's approved fixture/lamp selection is not available in 277V.

3. Standby power: A limited amount of capacity and space is available in ANC branch circuit panels to serve ANC approved Tenant standby loads. ANC will provide specific direction on where to connect to the system. The following requirements apply:

    a. Tenant shall provide all required circuit breakers, conduit and wiring required to connect to ANC's system.

b. Standby circuits are not required to be metered.

c. If space is not available in an existing panel the Tenant may be required to provide a branch circuit panel and associated feeder circuit breaker and feeder. The panel shall be located as directed by ANC.

d. Standby power circuits shall be used for connection of standby loads only (mechanical equipment, checkstand equipment, computers, processors and telecommunications equipment) as specifically approved by ANC.

1.9 ELECTRICAL GENERAL REQUIREMENTS – LIGHTING SYSTEMS

A. Interior Lighting

1. Calculations: Design light levels shall be calculated using the zonal cavity method or computer generated point by point calculations.

2. Lighting in general office areas, mechanical rooms, electrical rooms, corridors and similar applications shall be fluorescent type. Lamps and ballasts shall be in accordance with Section 16501 – Lamps, Ballasts, Accessories.

3. Incandescent lighting shall only be used where appropriate and specifically approved by ANC for the application, e.g., in restaurants, bars, lounges, etc.

4. Occupancy controls shall be utilized where appropriate, e.g., in individual offices or rooms.

5. HID fixtures used for interior illumination shall be Metal Halide type. Where HID fixtures are used for interior illumination, a portion of the fixtures shall be equipped with quartz restrike lamps or instant restrike ballasts.

6. Exit signs shall be LED type with brushed aluminum housing, green diffuse stencil letters, vandal resistant shield and tamperproof screws.

B. Exterior Lighting

1. Exterior lighting is typically provided by ANC. Any exterior lighting added by Tenants shall be consistent with existing Terminal site, parking and roadway lighting. Proposed exterior lighting shall be submitted to ANC for review and approval as part of the Design Review process.

1.10 ELECTRICAL GENERAL REQUIREMENTS – SPECIAL SYSTEMS

A. Fire Alarm System

1. South Terminal: The South Terminal is equipped with a Siemens Building Technology, Landis Division, EST-3, analog addressable fire alarm system with voice evacuation.

2. Fire Alarm System equipment shall be provided and installed in accordance with Section 16723 – Addressable Fire Alarm System.

3. Submit shop drawings and calculations required by Section 16723 – Addressable Fire Alarm System to ANC for review after review and approval by the Authority Having Jurisdiction.

B. Telecommunications

1. ANC's designated Telecommunications Contractor shall install, test and commission horizontal telecommunication cabling, outlets and jacks required for each tenant (Category 5e minimum). Pricing will be in accordance with ANC's established indefinite quantity, indefinite delivery pricing schedule established with ANC's designated Telecommunications Contractor. Tenant shall install all cable pathway including outlet boxes and conduit to local area cable tray serving area or local area Telecom Room (TR) as directed by ANC for installation of horizontal cabling. Backbone cabling in the new C Concourse area will be installed as part of the C Concourse Phase 2 Building Completion Package. Use of backbone transport shall be in accordance with ANC's Telecommunications Policy. Contact Mr. Dan Aldrich, Manager of ANC's ISD Department, (907) 266-2547 for additional information.

2. Telecommunications Infrastructure shall be provided and installed in accordance with the following specification sections:

   a. 16111 – Conduit and Fittings

   b. 16115 – Cable Tray

   c. 16131 – Outlet Boxes

   d. 16745 – Telecommunications Infrastructure

C. Airport Paging Announcement Control System

1. The Airport Paging Announcement Control System (PACS) is being installed in the South Terminal as part of the Concourse C, Phase 2 Building Completion Project. The basic system and peripheral equipment manufacturer is Innovative Electronic Designs, Inc., (IED). The PACS manages and controls microphone page stations and associated queuing, telephone interfaces, external system interfaces, distribution of emergency announcements, local announcements, terminal announcements, background music, recorded announcements, pre-recorded and assembled messages, and visual display paging.

2. PACS work shall be in accordance with Section 16770 – Airport Paging Announcement Control System.

3. Submit all required information to ANC to allow shop drawings to be properly updated and maintained as required by Section 16770 – Airport Paging Announcement Control System.

D. Power Monitoring and Control System

1. The Airport Power Monitoring and Control System (PMCS) is being installed in the South Terminal as part of the Concourse C, Phase 2 Building Completion Project. The PMCS is a Square D Powerlogic system. The PMCS provides the following functionality:

   a. Monitoring of electrical system status, including alarm conditions.

   b. Gathering and storage of load information for general administration of the electrical system.

   c. Detailed analysis and trouble-shooting of the electrical system, including harmonics analysis, waveform capture and analysis, etc.

   d. Energy and demand metering of tenants for revenue purposes.

2. Power monitoring equipment shall be provided and installed in accordance with Section 16920 – Power Monitoring and Control.

3. Submit shop drawings required by Section 16920 – Power Monitoring and Control System.

1.11 PERMITS, TESTS AND INSPECTIONS

A. Schedule, obtain, and pay for all permits and fees required by local authorities and by these Design Requirements.

B. Request for Tests: Notify ANC a minimum of 72 hours in advance of tests. In the event that ANC does not witness the test, certify in writing that all specified tests have been made in accordance with the ANC Electrical Requirements.

C. Deficiencies: Immediately correct all deficiencies that are evidenced during the tests and repeat tests until system is approved. Do not cover or conceal electrical installations until satisfactory tests are made and approved.

D. Operating Tests: Upon request from ANC, place the entire electrical installation and/or any portion thereof, in operation to demonstrate satisfactory operation.

1.12 IDENTIFICATION

A. Equipment Labels and Nameplates

1. Provide rigid engraved labels and nameplates of laminated plastic 1/16 inch thick with white letters on a black or gray background. Label emergency equipment red with black letters. Label standby equipment yellow with black letters.

   a. Securely attach labels with threaded fasteners or pop-rivets. (Adhesive attachment not acceptable.)

   b. Temporary markings not permitted on equipment. Repaint trims, housings, etc., where markings cannot be readily removed. Refinish defaced finishes.

   c. No labeling abbreviations will be permitted without prior approval.

2. Include item designation and branch circuit designation (panel and circuit number) on disconnects, starters, equipment and device nameplates, e.g., “FAN #4, Circuit 71NHA-30”).

3. Label and Nameplate Locations

   a. Provide 1/2 inch minimum height letters on following equipment:

      1) Service disconnect (red background).

      2) Secondary feeder breakers in distribution equipment. Designation as required by load served.

      3) Special equipment housed in cabinets on outside of door.

      4) Panelboards, switchboards, motor control centers on outside of door or enclosure.

      5) Security equipment and enclosures.

   b. Provide 1/4-inch minimum height letters on:

1) Disconnects and starters for motors or fixed appliances.

2) Designated electrical equipment.

c. Provide 1/8-inch minimum height, engraved device plates on switches and receptacles where item controlled is not visible from the switch.

d. Engrave branch circuit designation (panel and circuit number) on receptacle and light switch device plates, e.g., “81NPA-30”). Verify final panel designations with ANC prior to engraving nameplates.

e. Provide 1/8-inch minimum height letters on lighting control relays, dimmer controls and remote lighting control equipment.

f. External Power Sources: Provide 1/8-inch white letters on red background on all starters or controllers that receive power from an external source that is not de-energized by operating the associated disconnecting means.

g. Provide 1/8-inch minimum height letters on security equipment wire terminals.

B. Branch Circuit Panelboard Designations

1. Branch circuit panelboards shall be designated consistently with the following system. Panelboard names shall be submitted for approval as part of the Preliminary and Final Design submittals.

a. Sample Designation: 81NPC-2

1) First Character: Numeral designates number of transformer source (7=Service Transformer No. 7; 8= Service Transformer No. 8, etc.).

2) Second Character: Numeral designates floor (0=Level 0, 1=Level 1, 2=Level 2, etc.).

3) Third Character: Letter designates distribution system (N=Normal, S=Standby, E=Emergency, Q=Normal Bagbelt Equipment).

4) Fourth Character: Letter designates voltage (H=480Y/277V, P=208Y/120V)

5) Fifth Character: Letter designates panel number in sequence (First panel in sequence=A, Second panel in sequence=B, etc.).

C. Distribution Panelboard Designations

1. Distribution panelboards shall be designated consistently with the following system. Distribution Panelboard names shall be submitted for approval as part of the Preliminary and Final Design submittals.

a. Sample Designation: 81NDP-PA

1) First Character: Numeral designates number of transformer source (7=Service Transformer No. 7; 8= Service Transformer No. 8, etc.).

2) Second Character: Numeral designates floor (0=Level 0, 1=Level 1, 2=Level 2, etc.).

3) Third Character: Letter designates distribution system (N=Normal, S=Standby, E=Emergency, Q=Normal Bagbelt Equipment).

4) Fourth/Fifth Character: “DP” identifies panelboard as a distribution panelboard.

5) Sixth Character: Letter designates voltage (H=480Y/277V, P=208Y/120V)

6) Seventh Character: Letter designates panel number in sequence (First panel in sequence=A, Second panel in sequence=B, etc.).

D. Branch Circuit Panelboard Directories: Provide neatly typed schedule (odd numbered circuits on left side or top, even on right side or bottom) under plastic jacket or protective cover to protect the schedule from damage or dirt. Securely mount on inside face of panelboard door. Define briefly, but accurately, nature of connected load (i.e., Lighting Room 2989, Receptacles Janitor Room, Etc.) as approved. Sequentially numbered schedules shall not be used. Neatly update existing panel schedules that are affected by the work.

E. One-Line Diagram: Provide approved updated print for the "As-Built" Tenant distribution systems to ANC to allow ANC to update existing one-line diagrams located at each main switchboard affected by the work.

F. Empty Conduits: Provide tags with typed description of purpose, and location of opposite end, wired to each end of conduits provided for future equipment.

G. Conduits: Mark all conduits entering or leaving panelboards with indelible black magic marker with the circuit numbers of the circuits contained inside. Identify all Fire Alarm System conduits with red paint or red tape wrapped a minimum of four times around the conduit every 10 feet and at each fire alarm system junction box.

H. Junction Boxes: Mark the circuit numbers of wiring on all junction boxes with sheet steel covers. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover. Paint all Fire Alarm System junction boxes with sheet steel covers red. Mark all other Special System junction boxes with sheet steel covers with appropriate system designation, e.g., "Paging", "Telecom", etc. Mark with indelible black marker. On exposed junction boxes in finished areas mark on inside of cover.

I. Code Required Markings and Warnings: Provide all placards, markings and identification systems required by Code or these Design Requirements, such as (but not limited to) "series rated systems", special conductor identification and legends, emergency systems markings, multiple services placards, etc. Warning messages shall include an appropriate plain language imperative command, such as "DANGER HIGH VOLTAGE - KEEP OUT".

1.13 CLEARANCE STRIPING

A. For electrical equipment located in areas with uncarpeted floors, the clearances dictated by NEC Article 110 shall be indicated by two inches wide colored striping on the floor.

B. Striping shall be of a bright color (typically red or yellow) that contrasts with the floor color, and shall be applied by the most durable process that is commercially available for the particular floor finish. Examples are: epoxy paint on concrete floors, and colored tile segments in composition tile floors. Striping color and method shall be subject to approval by ANC.

C. On the floor immediately inside the striping, stencil in two inch block letters the statement: "ELECTRICAL CLEARANCE -- STORAGE ILLEGAL INSIDE THIS ZONE." For floor types where painted stenciling is not feasible or sufficiently durable, this message shall instead be posted on the wall below the equipment as an engraved label of the type specified in this Section, with 1/2-inch lettering. Note the specific clearance requirements on the engraved label.

1.14 RECORD DRAWINGS

A. Mark up a clean set of drawings as the work progresses, to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing and location of items cast in concrete or buried underground. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.

B. Maintain "record document" drawings in an up-to-date fashion in conjunction with the actual progress of installation. Accurate progress mark-ups shall be available on-site for examination by ANC or their representative at all times.

C. Prepare wiring diagrams on reproducible media for all individual special systems as installed. Identify all components and show all wire and terminal numbers and connections. Include all diagrams from the shop drawings and submittals, updated to show as-built condition.

D. Tenant's red lines (record drawings or so-called "as-builts"), shall be prepared in accordance with to the standard of care criteria as defined in this section. ANC reserves the right to reject any or all such "as-built" drawings if, in their opinion, these criteria have not been met or if the work is not clear. Any costs incurred as a result of the Tenant's failure to meet these criteria such as, but not limited to, resubmittals, meetings, site visits and written correspondence, shall be reimbursed. Embedded imbedded The acceptable standard of care includes the following:

1. "As-built" drawings shall be neatly marked-up by the Tenant's Contractor to show actual installation conditions using the symbols, line types and abbreviations as shown in the contract document's legends and abbreviations. Red shall be used to show items to be added, green for items to be removed and blue for general clarification comments not to be drafted.

2. All line work shall be drawn using a straight edge and all notes shall be neatly printed and legible. Leaders and sheet notes shall be used where necessary using a similar style to that shown throughout the drawings.

3. All under slab and otherwise inaccessible conduit and other components shall be accurately dimensioned to the nearest one-inch increment. Complete and submit "as-built" drawings that include inaccessible components, such as electrical conduit on underfloor plans involving slab on grade floor construction, for review prior to pouring of the slab.

4. Where equipment is furnished having different dimensions than those shown, the drawings shall be modified to show the dimensions of the equipment provided.

5. Where equipment is shown in more than one drawing location, (i.e., plan and section), revised equipment arrangement shall be shown in all drawing locations.

6. At completion of project, deliver "as-built" record drawings to ANC and obtain written receipt.

7. After review and approval of record drawings by ANC update construction documents using CAD. Submit final approved Record Drawing CAD files updated with precise "as-built" conditions to ANC. File format shall be AutoCAD "DWG" or "DXF".

1.15 OPERATING INSTRUCTIONS

A. Prior to final acceptance, instruct authorized representatives of ANC on the proper operation and maintenance of all electrical systems and equipment provided. Make available a qualified

technician for each component of the installation for this instruction. Submit written certification, signed by the Tenant's Contractor and an authorized representative ANC, that this has been completed.

1.16 OPERATION AND MAINTENANCE MANUALS

A. Completed O&M Manuals approved by the Tenant's Engineer or Record shall be submitted to ANC upon completion of Tenant construction. Tenant information shall be prepared as a separate "Appendix" to existing O&M manuals. The manuals shall be prepared as described in the following paragraphs.

1. Organize manual logically and include data and narrative as noted below. Submit all 8-1/2 by 11 inch literature and equipment data in hard-back, three-ring, loose-leaf binders. Cardboard or paper binders are unacceptable.

2. Provide a separate chapter for each section of the electrical specifications with sub-chapters for each class of equipment or system applicable to the Tenant work. Provide a table of contents for each chapter, and each major item in each chapter, to indicate the page number of each. Provide a summary of product warranty terms and duration for each piece of equipment. Label all pages to assure correct placement in manual. Identify each piece of equipment with its associated specification description.

3. Operating Sequence Narrative

   a. In each chapter, describe the procedures necessary for personnel to operate the system and equipment covered in that chapter.

   b. Describe procedures for start-up, operation, emergency operation, and shutdown of each system. If a particular sequence is required, give step-by-step instructions in that order.

   c. Describe all seasonal adjustments that should be accomplished for each system.

   d. Provide the above descriptions in typewritten, simple outline, narrative form.

4. Maintenance Instructions

   a. Provide complete information for preventive maintenance for each product, including recommended frequency of performance for each preventive maintenance task.

   b. Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments that may be performed without special tools or test equipment and which require no extensive special training or skills.

   c. Provide all information of a maintenance nature covering warranty items, etc., that are not discussed in the manufacturers literature or the operating sequence narrative.

   d. Provide complete information data for all the spare and replacement parts for each product and system. Properly identify each part by part number and manufacturer.

5. Manufacturers' Brochures: Include manufacturers' descriptive literature covering all products used in each system, together with illustrations, exploded views and renewal parts lists. Highlight all applicable items and instructions, or mark-out non-applicable items.

6. Shop Drawings: Provide a copy of all corrected, approved shop drawings for the project, updated to show as-built condition, either with the manufacturers' brochures or properly identified in a separate subsection.

1.17 PROJECT COMPLETION AND DEMONSTRATION

A. Tests: During final inspection, conduct operating tests for approval. Demonstrate installation to operate satisfactorily in accordance with requirements of Design Requirements and specific approved project Contract Documents. Should any portion of installation fail to meet requirements of the approved Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply. Have instruments available for measuring light intensities, voltage, and current values and for the demonstration of continuity, grounds, or open circuit conditions. Furnish personnel to assist in taking measurements and making tests. In the event that systems are not complete and fully operational at the time of final inspection, all costs of any subsequent inspections shall be borne by the Tenant at no additional cost to ANC.

B. Commissioning: Tenant work that affects airport wide systems (Fire Alarm, Paging, Power Monitoring and Control, and Building Automation System) is complete and the systems are ready for final commissioning by ANC.

C. Certificate of Completion: Submit at time of request for final inspection, a complete letter in the following format:
I,_____(Name), of_____(Firm), certify that the electrical work is complete in accordance with approved Contract Plans and Specifications, and authorized change orders (copies of which are attached hereto) and will be ready for final inspection as of _____(Date). I further certify that the following requirements have been fulfilled:

1. Megger readings performed, ____ copies of logs attached.
2. Operating manuals completed and instruction of operating personnel performed, _____ (Date) _____(Signed)
Owner's Representative
3. Record document drawings up-to-date, accurate, and ready to deliver to ANC.
4. Emergency systems tested and fully operational.
5. Fire Alarm System tested and fully operational.
6. Security System tested and fully operational.
7. Telecommunications System test reports have been submitted to and approved by ANC. The test reports shall certify that the Telecommunications System is complete, passes all test criteria, is fully operational, and that all work has been witnessed as specified.
8. Airport Paging Announcement Control System tested and fully operational.
9. Ground-fault systems performance tests complete, copies of logs attached.
10. All other tests required by approved Contract Documents have been performed.
11. All specified Owner training complete.
12. All systems are fully operational. Project is ready for final inspection.

SIGNED:_____DATE:_____
TITLE:_____

1.18 WARRANTY

A. Warranty work shall be promptly coordinated and performed at the Tenant's sole expense. All workmanship, labor and materials (without limitation) in this Division shall be warranted for the longer of the following:

1. For a minimum period of one year from the date of final acceptance.

2. For the extended warranty period specified in a specific Section under this Division.

B. Where a specific product carries a longer warranty as a standard offering of its manufacturer, extended warranty coverage beyond these requirements shall be retained by ANC. ANC will have recourse back to the manufacturer only in these cases, when the warranty as specified in A above has expired.

C. Warranties on existing ANC building wide systems still under construction or still under warranty shall be maintained (e.g., Fire Alarm, Paging, Power Monitoring and Control, and Building Automation and Control). Work on these systems shall be accomplished in accordance with the applicable warranty requirements to preserve all of ANC's rights and privileges under the existing warranties.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 COORDINATION WITH ROOM NUMBERING

A. Certain systems rely on identification systems that are based on room names or numbers. Systems labeled in this fashion include, but are not limited to, panelboard circuit directories, communication and data systems identifiers, fire alarm systems, etc.

B. The numbering scheme indicated in the approved Contract Documents may be based on room numbers assigned during the design process. ANC reserves the right to change the numbers prior to substantial completion, and the final names and numbers will not necessarily match those found in the approved Documents. Obtain from ANC the final room numbers prior to commencing the final numbering of Division 16 systems. Tag and label all system circuits and devices in accordance with the final numbering scheme at no additional cost.

3.2 ACCESS DOORS

A. Provide access doors required for access to equipment provided under Division 16. Doors shall be rated for the surrounding construction. Use of access doors shall be minimized, and all locations and cosmetic features shall be submitted for approval in advance.

B. Doors shall be finished to match surrounding surfaces as approved by ANC.

3.3 DEMOLITION

A. Provide all required demolition as noted below:

1. Disconnect electrical systems in walls, floors, ceilings, etc., scheduled for removal.

2. Coordinate service outages with ANC.

3. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

4. Existing Electrical Services: Maintain existing systems in service. Disable systems only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling systems. Make temporary connections to maintain service in areas adjacent to work area.

5. Existing Fire Alarm System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and applicable Fire Department Authorities at least 72 hours in advance before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area. Provide fire watch for entire affected area for entire duration of outage.

6. Existing Paging System: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Make temporary connections to maintain service in areas adjacent to work area.

7. Existing Power Monitoring System: Maintain existing system in service. Disable system only to make switchovers and connections. Obtain permission from Owner at least 72 hours before partially or completely disabling system. Make temporary connections to maintain service in areas adjacent to work area.

B. Demolition of Existing Electrical Work

1. Remove, relocate, and extend existing installations to accommodate new construction.

2. Remove abandoned wiring and cabling to source of supply. Demolition of existing telecommunication cabling shall be by ANC's designated Telecommunications Contractor.

3. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut concealed conduit flush with walls and floors, and patch surfaces.

4. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets, which are not removed. In finished areas, blank covers shall be blank plates matching the device plates specified for new work, unless otherwise noted or specified.

5. Disconnect and remove abandoned panelboards and distribution equipment.

6. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

7. Disconnect and remove abandoned light fixtures. Remove brackets, stems, hangers, and other accessories.

8. Repair adjacent construction and finishes damaged during demolition and extension work.

9. Maintain access to existing electrical installations that remain active. Modify installation or provide access panels as appropriate.

10. Restore circuits and systems to remain that are affected in any way by demolition Work, such as loads downstream of demolished equipment, switched lighting circuits where selected fixtures are demolished, etc.

11. Salvage or disposal of removed items shall be as noted on the approved drawings or as directed by ANC. Items, which ANC does not desire to retain, shall be disposed of at a legal disposal site.

C. Cleaning and Repair

1. Clean and repair existing materials and equipment that remain or are to be reused or are affected by the work.

2. Panelboards: Clean exposed surfaces and interior of cabinet and retorque electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

3. Light Fixtures: Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry.

3.4 REPAIR OF EXISTING

A. Repair all surfaces damaged or impacted by the work. Restore to original condition or better. Retexture surfaces to match surrounding surfaces. Repaint all affected surfaces, with extent of paint to include adjacent surfaces to next wall or other clean break to avoid mismatched finish.

END OF SECTION