Ted Stevens
Anchorage
International Airport

Draft Terminal Construction Standards

Feb 2003

ADDENDUM TO THE TERMINAL CONSTRUCTION STANDARDS	Page Number 1	No. of Pages 1
Addendum No. 1	Date Issued: May 19, 2003	
Issuing Office Eric Miyashiro, P.E. Chief Engineer Ted Stevens Anchorage International Airport P.O. Box 196960 Anchorage, Alaska 99519-6960 Phone: (907) 266-2406, Fax: (907) 266-2622	Previous Addenda Issued: None	

The Terminal Construction Standards are amended as follows:

DIVISION 0 – AIRPORT BUILDING PERMIT REQUIREMENTS

1. Section 700, Article 3.5 Preconstruction. Delete item g.

2. Section 700, Article 5.1 Delivery of Bonds, Article 5.2 Bonds and Article 5.3 Replacement of Bond and Surety are deleted in their entirety.

DIVISION 1 GENERAL REQUIREMENTS

3. Replace Section 01540 SECURITY in its entirety and replace it with ATTACHMENT 1 (Replacement made).

END OF ADDENDUM

ADDENDUM TO THE TERMINAL CONSTRUCTION STANDARDS	Page Number 1	No. of Pages 2
Addendum No. 2	Date Issued: February 20, 2004	
Issuing Office Eric Miyashiro, P.E. Chief Engineer Ted Stevens Anchorage International Airport P.O. Box 196960 Anchorage, Alaska 99519-6960 Phone: (907) 266-2406, Fax: (907) 266-2622	Previous Addenda Issued: Addendum No. 1 – May 19, 2003	

The Terminal Construction Standards are amended as follows:

1. Replace *TABLE OF CONTENTS*, Feb 2003 with *TABLE OF CONTENTS*, Revision 03/04, attached to and made part of this Addendum

2. Section 00700, Article 6.2 Superintendence by TENANT - delete Article completely and replace with Article 6.2 Construction Coordination by TENANT as follows:

   6.2 Construction Coordination by TENANT:

   6.2.1 The TENANT shall assign a local, competent Project Coordinator to oversee and manage TENANT construction activities at all times during its progress. The Airport Director shall be advised in writing of the Project Coordinator's name, local address, and 24-hour telephone number(s). The Project Coordinator will be the TENANT representative at the site and shall have full authority to manage the TENANT construction contractor(s) and coordinate TENANT work activities with ANC and other contractors.

   6.2.2 The Project Coordinator shall:
   - *a) be on-site during construction activities, or be able to be on-site within 2 hours if needed;*
   - *b) attend weekly coordination meetings with ANC and other contractors;*
   - *c) participate materially in any ANC inspections prior to occupancy, during construction and at completion; and*
   - *d) be the single point of contact with ANC during construction for all formal communications, RFI's, submittals, etc.*

   6.2.3 Further, the Project Coordinator shall have the authority to act on behalf of the TENANT, make final decisions regarding TENANT construction work, direct contractor or TENANT workforces, and commit to TENANT construction related expenditures. Alternatively, the Project Coordinator shall be in direct contact with an individual who has such final authority and can make timely decisions on behalf of the TENANT.

3. Section 00701, DESIGN STANDARDS - add Article 1.05 as follows:

   1.05 CONCOURSE C STRUCTURAL LIMITATIONS FOR TENANT IMPROVEMENTS

   A. Structural designs for Tenant improvements in Concourse C shall comply with the requirements specified in *Appendix D, Concourse C Structural Limitations for Tenant Improvements*, of these Standards.

4. Delete *Section 16745, Telecommunications Infrastructure* entirely and replace with *Section 16745, Telecommunications Copper Cable Distribution*, Revision 03/04, attached to and made part of this Addendum.

TABLE OF CONTENTS

5. Add *Section 16747, Telecommunications Fiber Optic Distribution* and *Section 16748, Communications Cable Management Documentation,* Revision dates 03/04, attached to and made part of this Addendum.

6. Appendix B, Building Permit Forms - delete all forms, except the “Sample” letter, in Appendix B and replace with *Airport Building Permit Application, Certification of Compliance To Terminal Construction Standards,* and *Request For Waiver From Terminal Construction Standards* forms, all Revision 09/03, attached to and made part of this Addendum.

7. Add *Appendix C, ANC Telecommunications*, Revision 03/04, attached to and made part of this Addendum.

8. Add *Appendix D, Concourse C Structural Limitations for Tenant Improvements*, Revision 03/04, attached to and made part of this Addendum.

END OF ADDENDUM

SECTION 00700

GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS

Wherever used in the Terminal Construction Standards the following terms shall be interpreted as set forth below.

Whenever used in the Terminal Construction Standards the following terms have the meaning indicated which are applicable to both the singular and plural thereof. Working titles which have a masculine gender, are intended to refer to persons of either sex.

Terms not defined below shall have their ordinary accepted meanings within the context which they are used. Words which have a well-known technical or trade meaning when used to describe work, materials or equipment shall be interpreted in accordance with such meaning

Airport Building Permit – A permit issued by ANC allowing a TENANT to accomplish construction within the terminal buildings. The Airport Building Permit consists of the Airport Building Permit Application Form, Terminal Construction Standards, Approved Waivers From Terminal Construction Standards, Special Conditions, Permit Modifications and the TENANT's Lease.

Airport Building Permit Time - The number of Calendar Days or the date specified in the construction Airport Building Permit and authorized time extensions which identify how much time the TENANT is allowed to achieve Final Completion.

Airport Director - The person authorized by the Commissioner to enter into and administer the Airport Building Permit on behalf of ANC. He has authority to make findings, determinations and decisions with respect to the Airport Building Permit and, when necessary, to modify or terminate the Airport Building Permit. The Airport Director may authorize persons to act on his behalf.

ANC - The Alaska Department of Transportation and Public Facilities, Ted Stevens Anchorage International Airport. References to "Owner", "State", "DEPARTMENT" mean ANC.

Approved or Approval - Written approval by the Airport Director or his authorized representative.

A.S - Initials which stand for Alaska Statute.

Calendar Day - Every day shown on the calendar, beginning and ending at midnight.

Change Order – A change in the TENANT's work issued after an Airport Building Permit has been issued.

Common Area – Area(s) within the terminal buildings not under lease.

Concourses – The public circulation zones that lead from the South Terminal to the airline's gates. There are three concourses, referred to a A, B, and C Concourses.

Consultant - The person, firm, or corporation retained directly by the TENANT to prepare Contract Documents, perform construction administration services, or other Project related services.

Contract - The written agreement between the TENANT and a Contractor setting forth the obligations of the parties and covering the Work to be performed.

Contract Documents – Drawings, specifications and other documents used to describe the work to be accomplished under an Airport Building Permit.

Contractor - The individual, firm, corporation or any acceptable combination thereof, contracting with the TENANT for performance of the Work.

Defective - An adjective which refers to Work that is unsatisfactory, faulty or deficient, or does not conform

to the Airport Building Permit, or does not meet the requirements of an inspection, reference standard, test or Approval referred to in the Airport Building Permit, or has been damaged prior to Final Acceptance.

Directive - A written communication to the TENANT from the Airport Director interpreting or enforcing an Airport Building Permit requirement.

Drawings - The Drawings which show the character and scope of the Work to be performed and which have been furnished by the TENANT or TENANT's Consultant and are by reference made a part of the Airport Building Permit.

Demising Walls – Walls that mark the lease lines between independent tenant-leased areas or other separately designed spaces, including public spaces, service corridors, etc.

Final Acceptance - ANC's written acceptance of the Work following Final Completion and the performance of all Airport Building Permit requirements by the TENANT.

Final Completion - The Project (or specified part thereof) has progressed to the point that all required Work is complete as determined by the Airport Director.

Holidays - In the State of Alaska, Legal Holidays occur on:

l. New Years Day - January l
2. Martin Luther King's Birthday - Third Monday in January
3. President's Day - Third Monday in February
4. Seward's Day - Last Monday in March
5. Memorial Day - Last Monday in May
6. Independence Day - July 4
7. Labor Day - First Monday in September
8. Alaska Day - October 18
9. Veteran's Day - November ll
l0. Thanksgiving Day - Fourth Thursday in November
ll. Christmas Day - December 25
l2. Every Sunday
l3. Every day designated by public proclamation by the President of the United States or the Governor of the State as a legal Holiday.

If any Holiday listed above falls on a Saturday, Saturday and the preceding Friday are both legal Holidays. If the Holiday should fall on a Sunday, except (l2) above, Sunday and the following Monday are both legal Holidays. See Title 44, Alaska Statutes.

Install - Means to build into the Work, ready to be used in complete and operable condition and in compliance with the Airport Building Permit.

Lease – A contract between the TENANT and ANC for the use of space or the performance of an operation within the terminal buildings.

North Terminal – The airport building used for domestic, international and charter flights located on T13N, R4W Sections 33 and 34.

Payment Bond - The security furnished by the TENANT and his Surety to guarantee payment of the debts covered by the bond.

Performance Bond - The security furnished by the TENANT and his Surety to guarantee performance and completion of the Work in accordance with the Airport Building Permit.

Project - The total construction, of which the Work is performed under the Airport Building Permit .

Permission to proceed - A written notice to the TENANT allowing him to begin the Work and establishing the date on which the Airport Building Permit Time begins.

Regulatory Requirements - Laws, rules, regulations, ordinances, codes and/or orders.

Shop Drawings - All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for the TENANT to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by the TENANT to illustrate material, equipment, fabrication, or erection for some portion of the Work.

Specifications - Written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative and procedural details applicable thereto.

South Terminal – The airport building for domestic flights and the hub of A, B and C Concourses. Located in T13N, R4W Section 34.

Storefronts – The architectural facades of any retail tenant-leased premise's perimeter adjacent to public circulation areas of the terminals, including doorways.

Subcontractor - An individual, firm, or corporation to whom the Contractor or any other Subcontractor sublets part of the Work allowed under the Airport Building Permit.

Substantial Completion - Although not fully completed, the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Airport Director, as evidence by ANC's written notice, it is sufficiently complete, in accordance with the Airport Building Permit, so that the Work (or specified part) can be utilized for the purposes for which it is intended. The terms "Substantially Complete" and "Substantially Completed" as applied to any Work refer to Substantial Completion thereof.

Superintendent - The TENANT's representative at the site that has full authority to act and sign documents related to the Airport Building Permit on behalf of the TENANT.

Supplementary Conditions - The part of the Airport Building Permit which amends or supplements these General Conditions.

Supplier - A manufacturer, fabricator, distributor, materialman or vendor of materials or equipment.

Surety - The corporation, partnership, or individual, other than the TENANT, executing a bond furnished by the TENANT.

Tenant – A corporation, partnership, or individual who has a valid lease with ANC including all airline and food/retail concessionaires in the airport.

Terminal Construction Standards – A document that contains standards for all construction within the terminal buildings at ANC.

Work - Work is the act of, and the result of, performing services, furnishing labor, furnishing and incorporating materials and equipment into the Project and performing other duties and obligations, all as allowed by the Airport Building Permit. Such Work, however incremental, will culminate in the entire completed Project, or the various separately identifiable parts thereof.

ARTICLE 2 - AUTHORITIES AND LIMITATIONS

2.1 Authorities and Limitations

2.1.1 The Airport Director alone, shall have the power to bind ANC and to exercise the rights, responsibilities, authorities and functions vested in the Airport Director by the Airport Building Permit, except that the Airport Director shall have the right to designate in writing authorized representatives to act for him. Wherever any provision of the Airport Building Permit specifies an individual or organization, whether governmental or private, to perform any act on behalf of or in the interest of ANC, that individual or organization shall be deemed to be the Airport Director's authorized representative under this Airport Building Permit but only to the extent so specified. The Airport Director may, at any time during the performance of this Airport Building Permit, vest in any such authorized representatives additional power and authority to act for the Airport Director or designate additional representatives, specifying the extent of their authority to act for the Airport Director; a copy of each document vesting additional authority in or removing that authority from an authorized representative or designating an additional authorized representative shall be furnished to the TENANT.

2.1.2 The TENANT shall perform the Work in accordance with any written order (including but not limited to instruction, direction, interpretation or determination) issued by an authorized representative in accordance with the authorized representative's authority to act for the Airport Director. The TENANT assumes all the risk and consequences of performing the Work in accordance with any order (including but not limited to instruction, direction, interpretation or determination) of anyone not authorized to issue such order, and of any order not in writing.

2.1.3 Should the Airport Director or his authorized representative designate Consultant(s) to act for ANC as provided for in Paragraph 2.1.1, the performance or nonperformance of the Consultant under such authority to act, shall not give rise to any contractual obligation or duty of the Consultant to the TENANT, Contractor, any Subcontractor, any Supplier, or any other organization performing any of the Work or any Surety representing them.

2.1.4 The term "Airport Director" when used in the text of these Conditions or other Airport Building Permit following this section shall also mean any duly authorized representative of the Airport Director when authorized in accordance with Paragraph 2.1.1.

2.2 Evaluations by Airport Director:

2.2.1 The Airport Director will decide all questions which may arise as to:

a. Quality and acceptability of materials furnished;

b. Quality and acceptability of Work performed;

c. Compliance with the schedule of progress;

d. Interpretation of Airport Building Permit;

e. Acceptable fulfillment of the Airport Building Permit on the part of the TENANT.

2.2.2 In order to avoid cumbersome terms and confusing repetition of expressions in the Airport Building Permit the terms "as ordered", "as directed", "as required", "as approved" or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used it shall be understood as if the expression were followed by the words "the Airport Director".

When such terms are used to describe a requirement, direction, review or judgment of the Airport

Director as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Airport Building Permit (unless there is a specific statement indicating otherwise).

2.2.3 The use of any such term or adjective shall not be effective to assign to ANC any duty of authority to supervise or direct the furnishing or performance of the Work.

2.3 Means & Methods:

The means, methods, techniques, sequences or procedures of construction, or safety precautions and the program incident thereto, and the failure to perform or furnish the Work in accordance with the Airport Building Permit are the sole responsibility of the TENANT.

2.4 Visits to Site/Place of Business:

The Airport Director will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Airport Building Permit. The Airport Director may, at reasonable times, inspect that part of the plant or place of business of the TENANT, Contractor or Subcontractor that is related to the performance of the Airport Building Permit. Such observations or the lack of such observations shall in no way relieve the TENANT from his duty to perform the Work in accordance with the Airport Building Permit.

ARTICLE 3 - AIRPORT BUILDING PERMIT: REQUIREMENT AND PROCESS

3.1 Scope and Requirement:

All TENANT constructed projects on ANC are required by the TENANT's lease to have an Airport Building Permit.

3.2 Process

There are five steps in the Airport Building Permit process: pre-application, application, pre-construction, construction and acceptance.

3.3 Pre-application:

The TENANT should conduct a pre-application review with ANC at the beginning of any large or complex project. The intent of the pre-application review is to accelerate the design approval process by correcting standards compliance problems early in the design. A meeting with ANC staff is recommended early in the design to notify ANC staff of the upcoming project and to provide early input and coordination. The TENANT should provide preliminary contract documents for review. For ANC to provide an adequate review, the following items should be submitted:

a. Floor plans (scale maximum 1/8" = 1'0")
b. Sections (scale maximum 1/8" = 1'0")
c. Storefront elevation and section, including signage (scale ¼" = 1'0"). Food service tenants should include front counter details and food presentation concept.
d. Perspective sketches illustrating the design concept or photographs of existing storefronts if related to this application.
e. Design and construction schedule
f. Waiver request form(s) if applicable

3.4 Application:

After a pre-application review has been completed, the TENANT shall submit an Airport Building Permit Application. Incomplete Airport Building Permit Applications will not be processed. The submission of an Airport Building Permit Application by the TENANT is considered a representation that the TENANT has provided a complete set of Contract Documents and is satisfied as to the conditions to be encountered in performing the work. The Contract Documents submitted shall clearly and completely describe the work to be accomplished under the Airport Building Permit. Any Airport Building Permit approved on the basis of an incomplete or erroneous set of Contract Documents will be in default and ANC may require the TENANT to remove any work constructed under the Airport Building Permit at the TENANT's expense.

The TENANT shall submit the Airport Building Permit Application Form, Waiver From Terminal Construction Standards, Certification of Compliance to Terminal Construction Standards and a) nine sets of specifications, one full size plan set and eight half sized plan sets or b) two sets of specifications, one full size plan set, one half size plan set and a Compact Disc with all plans and specifications written on it in Adobe Acrobat pdf files.

The TENANT shall provide the following items when appropriate:

a. Floor plans (scale maximum 1/4" = 1'0")
b. Reflected ceiling plan (scale 1/4" = 1'0").
c. Storefront plan, elevation, and section (1/2 = 1'0")
d. Interior elevations (scale 1/4" = 1'0").
e. Sections (scale 1/4" = 1'0").
f. Details of special conditions (scale 1" = 1'-0").

g. Finish schedules.
h. Materials and finish samples.
i. Waiver request form(s) if applicable
j. Certification of Compliance to Terminal Construction Standards
k. Sign Requirements including:
    1. sign and graphic dimensions
    2. shop drawings (scale minimum ½" = 1'-0")
    3. method of illumination, number and type of fixtures
    4. colors and text or graphic symbols
    5. method of attachment to wall, ceiling or floor
    6. level of sign or graphic element brightness
    7. location drawings for the sign or graphic in plan and elevation (scale minimum 3/8" = 1'-0")
    8. schedule for installation or removal
m. Other items as requested by ANC.

ANC will review the Airport Building Permit Application and determine one of the following:

a. The application is approved without additional conditions.
b. The application is approved with conditions. In this case, a list of Special Provisions will be provided as part of the Airport Building Permit.
c. The application will be returned to the TENANT for resubmission. A list of issues for the TENANT to correct will be provided by ANC.
d. The application is disapproved.

3.5 Pre-construction:

TENANT is required to obtain a Permission to Proceed from ANC before actual construction can begin. ANC must receive from the TENANT all of the following items before a Permission to Proceed is issued:

a. Municipality of Anchorage Building Permit(s)
b. A complete set of the Contract Documents including one full sized and one half sized copies of the plans. Engineering designs shall be sealed by an Engineer currently registered in the State of Alaska.
c. A list of all Contractors and Subcontractors working on the project.
d. Evidence of all contracts between the TENANT and Contractors working on the project.
e. Evidence of all contracts between Contractors and Subcontractors working on the project.
f. Copies of Workers' Compensation insurance, Comprehensive or Commercial General Liability Insurance and Automobile Liability Insurance for all Contractors and Subcontractors working on the project.
g. Performance Bond and Payment Bond if required.
h. All other submittals required by the Terminal Construction Standards and the Special Conditions of the Airport Building Permit.
i. A construction schedule.
j. Superintendent's name, local address and 24 hour telephone number.
k. Airport Building Permit Modification(s) as required.
l. Shop drawings for signs and menu boards (scale 1/2" = 1'0" or larger), elevations and sectional views, letter style and size, colors and materials, method of illumination, and electrical requirements.

The TENANT shall conduct a pre-construction meeting on the airport within normal working hours. The purpose of the pre-construction meeting is to assure that all parties understand the requirements of the Airport Building Permit. At a minimum, the TENANT, Superintendent, Designers, Contractors, Subcontractors, ANC Facilities and ANC Engineering shall be invited to attend. The TENANT shall create an agenda. The TENANT is required to submit meeting minutes of the pre-construction conference prior to beginning construction. At a minimum the agenda shall include the following:

a. introductions of all persons associated with the project
b. a review of the scope of work
c. a discussion of the plans, specifications and the Airport Building Permit. Any unusual conditions, potential construction difficulties or specialty items should be discussed
d. A review of the TENANT's proposed method of construction and schedule of operations
e. Coordination with ANC, other TENANTs and utilities
f. Impacts on operations
g. Noise and dust control

3.6 Construction:

The TENANT is permitted to construct the project in accordance with the Airport Building Permit. The TENANT is solely responsible for the construction of the project. The Airport Director will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Airport Building Permit.

3.7 Final Completion:

3.7.1 Final Inspection - Upon written notice from the TENANT that the entire Work or an agreed portion thereof is complete, the Airport Director will make a final inspection with the TENANT and appropriate Consultant(s) and will notify the TENANT in writing of all particulars in which this inspection reveals that the Work is incomplete or Defective. The TENANT shall immediately take such measures as are necessary to remedy such deficiencies.

3.7.2 Final Completion and Application for Final Acceptance **-** After the TENANT has completed all such corrections to the satisfaction of the Airport Director and delivered all maintenance and operating instructions, schedules, guarantees, bonds, release of lien by all laborers, Contractors, Subcontractors and Suppliers, certificates of inspection, marked-up record documents and other documents - all as required by the Airport Building Permit; and after the Airport Director has indicated in writing that the Work has met the requirements for Final Completion, the TENANT may make application for Final Acceptance. The application for Final Acceptance shall be accompanied by all remaining certificates, warranties, guarantees, releases, affidavits, and other documentation required by the Airport Building Permit.

3.8 Final Acceptance:

3.8.1 After the TENANT has completed all work and met all of the conditions of the Airport Building Permit, ANC will issue a letter of Final Acceptance. Final Acceptance releases the TENANT from further obligations under the Airport Building Permit with the exception of provisions under Article 11 Quality Assurance.

3.9 Intent of Airport Building Permit:

3.9.1 Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Regulatory Requirements of any governmental authority, whether such reference be specific or by implication, shall mean the edition stated in the Airport Building Permit or if not stated the latest standard specification, manual, code or Regulatory Requirements on the Effective Date of the Airport Building Permit. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Airport Building Permit) shall be effective to change the duties and responsibilities of ANC and the TENANT, or any of their consultants, agents or employees from those set forth in the Airport Building Permit, nor shall it be effective to assign to ANC or any of ANC's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work.

3.10 Discrepancy in Airport Building Permit:

3.10.1 Before undertaking the Work, the TENANT shall carefully study the Airport Building Permit. If, during the above study or during the performance of the Work, the TENANT finds a conflict, error, discrepancy or omission in the Airport Building Permit, or a discrepancy between the Airport Building Permit and any standard specification, manual, code, or Regulatory Requirement which affects the Work, the TENANT shall promptly report such discrepancy in writing to the Airport Director. The TENANT shall obtain a written interpretation or clarification from the Airport Director before proceeding with any Work affected thereby. Any adjustment made by the TENANT without this determination shall be at his own risk and expense.

3.10.2 When conflicts, errors or discrepancies within the Airport Building Permit exist, the order of precedence from most governing to least governing will be as follows:

1. Lease
2. Permit Modifications
3. Special Conditions
4. Waiver from Terminal Construction Standards
5. Terminal Construction Standards
6. Airport Building Permit Application Form

ARTICLE 4 - SPACE AND PHYSICAL CONDITIONS

4.l Availability of Space:

4.1.1 The TENANT shall accomplish all work within their leased space.

4.1.2 When construction must occur in space leased by other Tenants, the TENANT shall obtain written permission from the other Tenants allowing entry into their space.

4.1.3 When construction occurs in common space, the TENANT shall submit a work plan. The TENANT shall obtain permission from ANC to use common space during construction.

4.2 Visit to Site:

The submission of an Airport Building Permit Application is considered a representation that the TENANT has visited the site and carefully examined the site and is satisfied as to the conditions to be encountered in performing the Work.

4.3 Utilities:

4.3.1 The TENANT shall determine the horizontal and vertical locations of known utilities.

4.3.2 The TENANT shall have full responsibility for:

a. Obtaining and reviewing all information and data concerning utilities.

b. Locating all underground utilities which may be affected by the Work.

c. Coordination of the Work with the owners of all utilities during construction.

d. Safety and protection of all utilities.

e. Repair of any damage to utilities resulting from the Work.

4.3.3 If Work is to be performed by any utility owner, the TENANT shall cooperate with such owners to facilitate the Work.

4.3.4 In the event of interruption to any utility service as a result of accidental breakage or as result of being exposed or unsupported, the TENANT shall promptly notify the utility owner and the Airport Director. If service is interrupted, repair work shall be continuous until the service is restored. No Work shall be undertaken around fire sprinkler systems until provisions for continued service has been approved by the local fire authority.

4.3.5 The TENANT shall not work on any utility without the written permission of the utility owners.

4.4 Damaged Utilities:

When utilities are damaged by the TENANT, the utility owner shall have the choice of repairing the utility or having the TENANT repair the utility. Unless the utility owner accepts responsibility for the damage, the TENANT shall reimburse the utility owner for repair costs or provide at no cost to the utility owner or ANC, all materials, equipment and labor necessary to complete repair of the damage.

ARTICLE 5 - BONDS, INSURANCE, AND INDEMNIFICATION

5.1 Delivery of Bonds:

The TENANT shall deliver to the Airport Director all required bonds before a “Permission to Proceed” will

be issued.

5.2 Bonds:

The TENANT shall furnish Performance and Payment Bonds, each in an amount as shown on the Airport Building Permit as security for the faithful performance and payment of all TENANT's obligations under the Airport Building Permit. These bonds shall remain in effect for one year after the date of Final Acceptance. All bonds shall be furnished on forms provided by ANC (or copies thereof) and shall be executed by such Sureties as are authorized to do business in the State of Alaska. The Airport Director may at his option copy the Surety with notice of any potential default or liability.

5.3 Replacement of Bond and Surety:

If the Surety on any bond furnished in connection with this Airport Building Permit is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of the Airport Building Permit, or otherwise becomes unacceptable to ANC, or if any such Surety fails to furnish reports as to his financial condition as requested by ANC, the TENANT shall within five days thereafter substitute another bond and Surety, both of which must be acceptable to ANC.

5.4 Insurance Requirements:

5.4.1 The TENANT, Contractors, and Subcontractors shall provide evidence of insurance with a carrier or carriers satisfactory to ANC covering injury to persons and/or property suffered by the State of Alaska or a third party, as a result of operations which arise both out of and during the course of this Airport Building Permit by the TENANT, Contractors or Subcontractor. This coverage will also provide protection against injuries to all employees of the TENANT and the employees of any Contractor or Subcontractor engaged in Work under this Airport Building Permit. The delivery to ANC of a written 30 day notice is required before cancellation of any coverage or reduction in any limits of liability. Insurance carriers shall have an acceptable financial rating.

5.4.2 The TENANT shall maintain in force at all times during the performance of Work under this agreement the following policies of insurance. Failure to maintain insurance may, at the option of the Airport Director, be deemed Defective Work and remedied in accordance with the Airport Building Permit. Where specific limits and coverages are shown, it is understood that they shall be the minimum acceptable. The requirements of this paragraph shall not limit the TENANT's responsibility to indemnify ANC.

a. Workers' Compensation Insurance: The TENANT shall provide and maintain, for all employees of the TENANT, Contractor and Subcontractor engaged in Work under this Airport Building Permit, Workers' Compensation Insurance as required by AS 23.30.045.

The TENANT shall be responsible for Workers' Compensation Insurance for any Contractor or Subcontractor who provides services under this Airport Building Permit, to include:

1. Employer's Liability Protection in the amount of $100,000 per person/$100,000 per occurrence;

2. If the TENANT directly utilizes labor outside of the State of Alaska in the prosecution of the Work, "Other States" endorsement shall be required as a Condition of the Airport Building Permit.

b. Comprehensive or Commercial General Liability Insurance: Such insurance shall cover all operations by or on behalf of the TENANT, Contractor or Subcontractor and provide insurance for bodily injury and property damage liability including coverage for:

premises and operations; products and completed operations; contractual liability insuring obligations assumed under paragraph 5.5, Indemnification; broad form property damage; and personal injury

liability.

The minimum limits of liability shall be:

1. If the TENANT carries a *Comprehensive General Liability* policy, the limits of liability shall not be less than a Combined Single Limit for bodily injury, property damage and Personal Injury Liability of:

   $500,000 each occurrence
   $1,000,000 aggregate

2. If the TENANT carries a *Commercial General Liability* policy, the limits of liability shall not be less than:

   $500,000 each occurrence (Combined Single Limit for bodily injury and property damage)
   $500,000 for Personal Injury Liability

   $1,000,000 aggregate for Products-Completed Operations
   $1,000,000 general aggregate
   The State of Alaska, Department of Transportation and Public Facilities shall be named as an "Additional Insured" under all liability coverages listed above.

c. Automobile Liability Insurance:
   Such insurance shall cover all owned, hired and non-owned vehicles and provide coverage not less than that of the Business Automobile Policy in limits not less than the following:

   $1,000,000 each occurrence
(Combined Single Limit for bodily injury and property damage.)

5.4.3 Evidence, consisting of a certificate of insurance or the policy declaration page with required endorsements attached thereto - all of which have been executed by the insurer's representative and issued to ANC - shall denote the type, amount, class of operations covered, effective (and retroactive) dates, and dates of expiration of policies.

Evidence pertaining to Worker's Compensation, General Liability, or Automobile Liability is required prior to commencement of Work. Acceptance by ANC of deficient evidence does not constitute a waiver of Airport Building Permit requirements as provided for by the Conditions of the Airport Building Permit.

If a certificate is submitted as evidence it shall contain the following statement:

"This is to certify that the policies described herein comply with all aspects of the insurance requirements of (Airport Building Permit Number)."

5.5 Indemnification:

The TENANT shall indemnify, save harmless, and defend ANC, its agents and its employees from any and all claims, actions, or liabilities for injuries or damages sustained by any person or property arising directly or indirectly from the construction or the TENANT's performance of this Airport Building Permit.

ARTICLE 6 - TENANT'S RESPONSIBILITIES

6.l Supervision of Work:

The TENANT shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Airport Building Permit. All Work under this Airport Building Permit shall be performed in a skillful and workmanlike manner. The TENANT shall be solely responsible for the means, methods, techniques, sequences and procedures of construction.

6.2 Superintendence by TENANT:

The TENANT shall keep on the Work at all times during its progress a competent resident superintendent. The Airport Director shall be advised in writing of the superintendent's name, local address, and 24 hour telephone number(s). This written advice is to be kept current until Final Acceptance by ANC. The superintendent will be the TENANT's representative at the site and shall have full authority to accept documents on behalf of the TENANT.

All communications given to the superintendent shall be as binding as if given to the TENANT. The TENANT shall cooperate with the Airport Director in every way possible.

6.3 Character of Workers:

The TENANT shall provide a sufficient number of competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Airport Building Permit. The TENANT shall at all times maintain good discipline, security and order at the site. The Airport Director may, in writing, require the TENANT to remove from the Work any employee the Airport Director deems incompetent, careless, or otherwise detrimental to the progress of the Work, but the Airport Director shall have no duty to exercise this right. Workers who cannot obtain an Airport Badge shall not be allowed access to the AOA.

6.4 TENANT to Furnish:

Unless otherwise specified in the Airport Building Permit, the TENANT shall furnish and assume full responsibility for all materials, equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance testing, start-up and completion of the Work.

6.5 Materials and Equipment:

All materials and equipment shall be of specified quality and new, except as otherwise provided in the Airport Building Permit. If required by the Airport Director, the TENANT shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable Supplier except as otherwise provided in the Airport Building Permit; but no provision of any such instructions will be effective to assign to ANC or any of ANC's Consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work.

6.6 Schedules:

The TENANT shall have a completed work schedule submitted and accepted by the Airport Director prior to beginning work Receipt and acceptance of a schedule submitted by the TENANT shall not be construed to assign responsibility for performance or contingencies to ANC or relieve the TENANT of his responsibility to adjust his forces, equipment, and work schedules as may be necessary to insure completion of the Work within prescribed Airport Building Permit. Should the prosecution of the Work be discontinued for any reason, the TENANT shall notify the Airport Director at least 24 hours in advance

of resuming operations.

6.7 Adjusting Schedules:

Upon substantial changes to the schedule or upon request the TENANT shall submit a revised schedule to the Airport Director for acceptance.

6.8 Substitutes or "Or-Equal" Items:

6.8.1 The TENANT is required to furnish and install specific material products when specified by the Airport Building Permit. Materials or equipment of other Suppliers may be accepted by the Airport Director only if sufficient information is submitted by the TENANT which clearly demonstrates to the Airport Director that the material or equipment proposed is equivalent or equal in all aspects to that named. The procedure for review by the Airport Director will include the following as supplemented in the General Requirements.

6.8.2 Requests for review of substitute items of material and equipment will not be accepted by the Airport Director from anyone other than the TENANT.

6.8.3 If the TENANT wishes to furnish or use a substitute item of material or equipment, the TENANT shall make written application to the Airport Director for Approval thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as the specified. The application will state whether or not acceptance of the substitute for use in the Work will require a change in any of the Airport Building Permit.

6.8.4 All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other TENANTs affected by the resulting change, all of which shall be considered by ANC in evaluating the proposed substitute. ANC may require the TENANT to furnish at the TENANT's expense additional data about the proposed substitute. The Airport Director may reject any substitution request which the Airport Director determines is not in the best interest of ANC.

6.9 Substitute Means and Methods:

If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Airport Building Permit, the TENANT may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to the Airport Director, if the TENANT submits sufficient information to allow the Airport Director to determine that the substitute proposed is equivalent to that indicated or required by the Airport Building Permit. The procedure for review by the Airport Director will be similar to that provided for “Substitutes or "Or-Equal" Items as applied by the Airport Director.

6.10 Evaluation of Substitution:

The Airport Director will be allowed a reasonable time within which to evaluate each proposed substitute. The Airport Director will be the sole judge of acceptability, and no substitute will be installed or utilized without the Airport Director's prior written Approval which will be evidenced by either a Directive or Permit Modification. The Airport Director may require the TENANT to furnish at the TENANT's expense a special performance guarantee or other Surety with respect to any substitute.

6.11 Contractors and Subcontractors:

The TENANT may utilize the services of appropriately licensed Contractors/Subcontractors in accordance

with the following conditions:

6.11.1 The TENANT shall not allow any Contractor/Subcontractor to work on ANC unless the following items have been accepted by the Airport Director:

a. an executed copy of the contract between the TENANT and Contractor/Subcontractor.
b. evidence of insurance as required by the Airport Building Permit

6.11.2 The TENANT is fully responsible to ANC for all acts and omissions of the Contractors, Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under an Airport Building Permit with the TENANT just as the TENANT is responsible for the TENANT's own acts and omissions.

6.11.3 All Work performed for TENANT by a Contractor/Subcontractor will be pursuant to an appropriate written agreement between TENANT and the Contractor/Subcontractor which specifically binds the Contractor/Subcontractor to the applicable terms and conditions of the Airport Building Permit.

6.11.4 Nothing in the Airport Building Permit shall create any contractual relationship between ANC and any such Contractor, Subcontractor, Supplier or other person or organization. ANC will not undertake to settle any differences between or among the TENANT, Contractors, Subcontractors, or Suppliers. No acceptance by the Airport Director of any such Contractor/Subcontractor shall constitute a waiver of any right of ANC to reject Defective Work.

6.12 Use of Premises:

The TENANT shall confine construction equipment, the storage of materials and equipment and the operations of workers the TENANT's lease space and approved storage space, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The TENANT shall assume full responsibility for any damage to any such space resulting from the performance of the Work. Should any claim be made against ANC by any such owner or occupant because of the performance of the Work, the TENANT shall hold ANC harmless.

6.13 Structural Loading:

The TENANT shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the TENANT subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.14 Record Documents:

The TENANT shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Directives, Change Orders, Supplemental Agreements, Airport Building Permit, Permit Modifications and written interpretations and clarifications in good order and annotated to show all changes made during construction. These record documents together with all Approved samples and a counterpart of all Approved Shop Drawings will be available to the Airport Director for reference and copying. Upon completion of the Work, the annotated record documents, samples and Shop Drawings will be delivered to the Airport Director. Record documents shall accurately record variations in the Work which vary from requirements shown or indicated in the construction documents.

6.15 Safety and Protection:

The TENANT alone shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The TENANT shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.15.l All employees on the Work and other persons and organizations who may be affected thereby;

6.15.2 All the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.15.3 Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

The TENANT shall comply with all applicable Regulatory Requirements of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The TENANT shall notify owners of adjacent property and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the TENANT, any , Contractor, Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the TENANT, The TENANT's duties and responsibilities for the safety and protection of the Work shall continue until Final Acceptance.

6.16 Safety Representative:

The TENANT shall designate a responsible safety representative at the site. This person shall be the TENANT's superintendent unless otherwise designated in writing by the TENANT to the Airport Director.

6.17 Emergencies:

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the TENANT, without special instruction or authorization from ANC, is obligated to act to prevent threatened damage, injury or loss. The TENANT shall give the Airport Director prompt written notice if the TENANT believes that any significant changes in the Work or variations from the Airport Building Permit have been caused thereby. If ANC determines that a change in the Airport Building Permit is required because of the action taken in response to an emergency, a Directive or Permit Modification will be issued by the Airport Director.

6.18 Shop Drawings and Samples:

6.18.l After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, the TENANT shall submit to the Airport Director for review and Approval the required number of all Shop Drawings, which will bear a stamp or specific written indication that the TENANT has satisfied TENANT's responsibilities under the Airport Building Permit with respect to the review of the submission. All submissions will be identified as the Airport Director may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable the Airport Director to review the information as required.

6.18.2 The TENANT shall also submit to the Airport Director for review and Approval all samples required by the Airport Building Permit. All samples will have been checked by and accompanied by a specific written indication that the TENANT has satisfied TENANT's responsibilities under the Airport Building Permit with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

6.18.3 Before submission of each Shop Drawing or sample the TENANT shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Airport Building Permit.

6.18.4 At the time of each submission the TENANT shall give the Airport Director specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Airport Building Permit, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to the Airport Director for review and Approval of each such variation. All variations of the proposed Shop Drawing from that specified will be identified in the submission and available maintenance, repair and replacement service will be indicated. The submittal will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such variation. ANC may require the TENANT to furnish at the TENANT's expense additional data about the proposed variation. The Airport Director may reject any variation request which the Airport Director determines is not in the best interest of ANC.

6.19 Shop Drawing and Sample Review:

6.19.1 The Airport Director will review within seven days Shop Drawings and samples, but the Airport Director's review will be only for compliance with the requirements given in the Airport Building Permit and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Airport Building Permit) or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate acceptance of the assembly in which the item functions. The TENANT shall make corrections required by the Airport Director and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review. The TENANT shall direct specific attention in writing to revisions other than the corrections called for by the Airport Director on previous submittals.

6.19.2 The Airport Director's review of Shop Drawings or samples shall not relieve TENANT from responsibility for any variation from the requirements of the Airport Building Permit unless the TENANT has in writing advised the Airport Director of each such variation at the time of submission. Approval by the Airport Director will not relieve the TENANT from responsibility for errors or omissions in the Shop Drawings.

6.19.3 ANC shall be responsible for all review costs resulting from the initial submission and one resubmittal. The TENANT shall pay all review costs incurred by ANC as a result of any additional re-submittals.

6.19.4 Where a Shop Drawing or sample is required by the Airport Building Permit, any related Work performed prior to the Airport Director's review and Approval of the pertinent submission will be the sole expense and responsibility of the TENANT.

6.20 Maintenance During Construction:

The TENANT is responsible for maintenance during construction. Unless stated otherwise in the TENANT's lease or within the Airport Building Permit, the TENANT is responsible for maintenance after construction. When ANC agrees to accept maintenance responsibilities for TENANT construction, the TENANT is responsible for maintenance until Final Acceptance by ANC unless stated otherwise in the Airport Building Permit.

6.21 Assignment:

The Airport Building Permit is issued to a specific TENANT and can not be transferred or assigned.

ARTICLE 7 - LAWS AND REGULATIONS

7.l Laws to be Observed

The TENANT shall keep fully informed of all federal and state Regulatory Requirements and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the Work, or which in any way affect the conduct of the Work. The TENANT shall at all times observe and comply with all such Regulatory Requirements, orders and decrees; and shall protect and indemnify ANC and its representatives against claim or liability arising from or based on the violation of any such Regulatory Requirement, order, or decree whether by the TENANT, Contractor, Subcontractor, or any employee of either. Except where otherwise expressly required by applicable Regulatory Requirements, ANC shall not be responsible for monitoring TENANT's compliance with any Regulatory Requirements.

7.2 Permits, Licenses, and Taxes

The TENANT shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the Work. As a condition of performance of this Airport Building Permit, the TENANT shall pay all federal, state and local taxes incurred by the TENANT, in the performance of this Airport Building Permit.

7.3 Patented Devices, Materials and Processes

If the TENANT employs any design, device, material, or process covered by letters of patent, trademark or copyright, the TENANT shall provide for such use by suitable legal agreement with the patentee or owner. The TENANT and the Surety shall indemnify and save harmless ANC, any affected third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify ANC for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the Work.

7.4 Compliance of Airport Building Permit:

If the TENANT observes that the Airport Building Permit issued by ANC is at variance with any Regulatory Requirements, TENANT shall give the Airport Director prompt written notice thereof, and the Airport Director may issue a Directive or Permit Modification if needed. If the TENANT performs any Work knowing or having reason to know that it is contrary to such Regulatory Requirements, and without such notice to the Airport Director, the TENANT shall bear all costs arising therefrom.

7.5 Accident Prevention:

The TENANT shall comply with AS l8.60.075 and all pertinent provisions of the Construction Code Occupational Safety and Health Standards issued by the Alaska Department of Labor.

7.6 Sanitary Provisions:

The TENANT may use existing facilities during construction operations. The TENANT’s use shall not interfere with the public’s use of the facility. The TENANT shall not use facilities for cleaning of construction equipment.

7.7 Business Registration:

All work shall comply with AS 08.18.011, as follows: "it is unlawful for a person to submit a bid or work as a contractor until he has been issued a certificate of registration by Department of Commerce. A partnership or joint venture shall be considered registered if one of the general partners or venturers whose name appears in the name under which the partnership or venture does business is registered."

7.8 Professional Registration and Certification:

All craft trades, architects, engineers and land surveyors, electrical administrators, and explosive handlers employed by the TENANT and working under the Airport Building Permit shall specifically comply with applicable provisions of AS 08.18, 08.48, 08.40, and 08.52. Provide copies of individual licenses within seven days following a request from the Airport Director.

7.9 Local Building Codes:

The TENANT shall comply with AS 35.l0.025 which requires construction in accordance with applicable local building codes to include the obtaining of required permits.

7.10 Air Quality Control:

The TENANT shall comply with all applicable provisions of AS 46.03.04 as pertains to Air Pollution Control.

7.11 Personal Liability of Public Officials:

In carrying out any of the provisions thereof, or in exercising any power or authority granted to the Airport Director by the Airport Building Permit, there will be no liability upon the Airport Director nor upon state employees authorized as his representatives, either personally or as officials of the State of Alaska, it being always understood that in such matters they act as agents and representatives of ANC.

ARTICLE 8 - OTHER WORK

8.l Related Work at Site:

8.1.1 ANC reserves the right at any time to contract for and perform other or additional work on or near the Work covered by the Airport Building Permit.

8.1.2 When separate Airport Building Permits are let within the limits of the Project, the TENANT shall conduct his Work so as not to interfere with or hinder the work being performed by other TENANTs and/or ANC. The TENANT when working on the same Project with other TENANTs and/or ANC shall cooperate with such other TENANTs and/or ANC. The TENANT shall join his Work with that of the others in an acceptable manner and shall perform it in proper sequence to that of others.

8.1.3 The TENANT is responsible for contacting and coordinating his Work with other TENANTs. The TENANT shall assume all liability, financial or otherwise, in connection with this Airport Building Permit and indemnify and save harmless ANC from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by the TENANT because of the presence and operations of other TENANTs.

8.1.4 Unless stated otherwise in the Airport Building Permit, the TENANTs Work shall be subservient to all ANC Work.

8.2 Access, Cutting, and Patching:

The TENANT shall afford utility owners, other TENANTs and ANC, (if ANC is performing the additional work with ANC's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with the work of others. The TENANT shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work, the TENANT shall not endanger any work of others by cutting, excavating or otherwise altering their work.

8.3 Defective Work by Others:

If any part of the TENANT's Work depends for proper execution or results upon the work of any such other TENANT, utility owner, or ANC, the TENANT shall inspect and promptly report to the Airport Director in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. The TENANT's failure to so report will constitute an acceptance of the other work as fit and proper for integration with TENANT's Work except for latent or non-apparent defects and deficiencies in the other work.

ARTICLE 9 - CHANGES

9.1 ANC's Right to Change

Without invalidating the Airport Building Permit and without notice to any Surety, ANC may, at any time or from time to time, order additions, deletions or revisions in the Work within the general scope of the Airport Building Permit, including but not limited to changes:

9.1.1 In the Airport Building Permit;

9.1.2 In the method or manner of performance of the Work;

9.1.3 In ANC-furnished facilities, equipment, materials, services, or site;

9.1.4 Directing acceleration in the performance of the Work.

9.2 Authorization of Changes within the General Scope.

Additions, deletions, or revisions in the Work within the general scope of the Airport Building Permit shall be authorized by one or more of following ways:

9.2.1 Directive

9.2.2 Permit Modification

9.3 Directive

9.3.1 The Airport Director shall provide written clarification or interpretation of the Airport Building Permit.

9.3.2 The Airport Director may authorize minor variations in the Work from the requirements of the Airport Building Permit which are consistent with the overall intent of the Airport Building Permit.

9.3.3 The Airport Director may order the TENANT to correct Defective Work or methods which are not in conformance with the Airport Building Permit.

9.3.4 The Airport Director may direct the commencement or suspension of Work or emergency related Work.

9.3.5 Upon the issuance of a Directive to the TENANT by the Airport Director, the TENANT shall proceed with the performance of the Work as prescribed by such Directive.

9.4 Permit Modification

Changes to the conditions provided in the Airport Building Permit shall be made by a Permit Modification. Upon receipt of a Permit Modification, the TENANT shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Airport Building Permit.

9.5 Unauthorized Work:

The TENANT shall not be entitled to an extension of the Airport Building Permit Time with respect to any work performed that is not allowed by the Airport Building Permit.

9.6 Notification of Surety:

If notice of any change affecting the general scope of the Work or the conditions of the Airport Building Permit is required by the provisions of any bond to be given to a Surety, the giving of any such notice will

be the TENANT's responsibility, and the amount of each applicable bond will be adjusted accordingly.

9.7 Differing Site Conditions:

9.7.1 The TENANT shall promptly notify the Airport Director in writing of any differing site condition that may require a Permit Modification. The Airport Director shall promptly investigate the conditions, and if the Airport Director finds that such conditions do materially so differ a Permit Modification may be issued or the Permit may be terminated.

ARTICLE 10 - AIRPORT BUILDING PERMIT TIME; COMPUTATION AND CHANGE

10.1 Commencement of Airport Building Permit Time:

The Airport Building Permit Time will commence to run on the day indicated in the Permission to Proceed.

10.2 Starting the Work:

No Work allowed under the Airport Building Permit shall be performed before the effective date of the Permission to Proceed. The TENANT shall notify the Airport Director at least 24 hours in advance of the time actual construction operations will begin.

10.3 Computation of Airport Building Permit Time:

10.3.1 When the Airport Building Permit Time is specified on a Calendar Day basis, all Work under the Airport Building Permit shall be completed within the number of Calendar Days specified. The count of Airport Building Permit Time begins on the day following receipt of the Permission to Proceed by the TENANT, if no starting day is stipulated therein.

Calendar Days shall continue to be counted against Airport Building Permit Time until and including the date of Final Completion of the Work.

10.3.2 When the Airport Building Permit completion time is specified as a fixed calendar date, it shall be the date of Final Completion.

10.4 Airport Building Permit Time Change:

The Airport Building Permit Time may only be changed by a Permit Modification.

10.5 Delay Damages:

Whether or not the TENANT's right to proceed with the Work is terminated, he and his Sureties shall be liable for damages resulting from his refusal or failure to complete the Work within the specified time.

Liquidated and actual damages for delay shall be paid by the TENANT or his Surety to ANC in the amount as specified in the Special Conditions for each Calendar Day the completion of the Work or any part thereof is delayed beyond the time required by the Airport Building Permit, or any extension thereof. If a listing of incidents resulting from a delay and expected to give rise to actual or liquidated damages is not established by the Airport Building Permit, then the TENANT and his Surety shall be liable to ANC for any actual damages occasioned by such delay. The TENANT acknowledges that the liquidated damages established herein are not a penalty but rather constitute an estimate of damages that ANC will sustain by reason of delayed completion. These liquidated and actual damages are intended as compensation for losses anticipated to arise, and include those items enumerated in the Special Conditions.

These damages will continue to run both before and after termination in the event of default termination. These liquidated damages do not cover excess costs of completion or ANC costs, fees, and charges related to procurement. If a default termination occurs, the TENANT or his Surety shall pay in addition to these damages, all excess costs and expenses related to completion.

ARTICLE 11 - QUALITY ASSURANCE

11.1 Warranty and Guaranty:

The TENANT warrants and guarantees to ANC that all Work will be in accordance with the Airport Building Permit and will not be Defective. Prompt notice of all defects shall be given to the Airport Director. All Defective Work, whether or not in place, may be rejected, corrected or accepted as provided for in this article.

11.2 Access to Work:

ANC and ANC's representatives, testing agencies and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. The TENANT shall provide proper and safe conditions for such access.

11.3 Tests and Inspections:

11.3.l The TENANT shall give the Airport Director timely notice of readiness of the Work for all required inspections, tests or Approvals.

11.3.2 If Regulatory Requirements of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved, the TENANT shall assume full responsibility therefor, pay all costs in connection therewith and furnish the Airport Director the required certificates of inspection, testing or approval. The TENANT shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with ANC's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for Approval prior to the TENANT's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals in addition to the above which are required by the Airport Building Permit shall be paid by the TENANT. ANC may perform additional tests and inspections which it deems necessary to insure quality control. All such failed tests or inspections shall be at the TENANT's expense.

11.3.4 If any Work (including the work of others) that is to be inspected, tested or Approved is covered without written concurrence of the Airport Director, it must, if requested by the Airport Director, be uncovered for observation. Such uncovering shall be at the TENANT's expense unless the TENANT has given the Airport Director timely notice of TENANT's intention to cover the same and the Airport Director has not acted with reasonable promptness in response to such notice.

11.3.5 Neither observations nor inspections, tests or Approvals by ANC or others shall relieve the TENANT from the TENANT's obligations to perform the Work in accordance with the Airport Building Permit.

11.4 Uncovering Work:

11.4.l If any Work is covered contrary to the written request of the Airport Director, it must, if requested by the Airport Director, be uncovered for the Airport Director's observation and replaced at the TENANT's expense.

11.4.2 If the Airport Director considers it necessary or advisable that covered Work be observed inspected or tested, the TENANT, at the Airport Director's request, shall uncover, expose or otherwise make available for observation, inspection or testing as the Airport Director may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is Defective, the TENANT shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If it is found that such Work is not Defective, ANC shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing (including but not limited to fees and

charges of engineers, architects, attorneys and other professionals).

11.5 ANC May Stop the Work:

If the Work is Defective, or the TENANT fails to supply suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Airport Building Permit, the Airport Director may order the TENANT to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Airport Director to stop the Work shall not give rise to any duty on the part of the Airport Director to exercise this right for the benefit of the TENANT or any other party.

11.6 Correction or Removal of Defective Work:

If required by the Airport Director, the TENANT shall promptly, as directed, either correct all Defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Airport Director, remove it from the site and replace it with Work which conforms to the requirements of the Airport Building Permit. The TENANT shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

11.7 Correction Period:

Work constructed without or not in conformance with an approved Airport Building Permit, shall be removed or corrected at the TENANT expense regardless of the date of construction or date of discovery by ANC.

For work constructed in conformance with an approve Airport Building Permit, if within one year after the date of Final Acceptance or such longer period of time as may be prescribed by Regulatory Requirements or by any specific provision of the Airport Building Permit, any Work is found to be Defective, the TENANT shall promptly, without cost to ANC and in accordance with the Airport Director's written instructions, either correct such Defective Work, or, if it has been rejected by the Airport Director, remove it from the site and replace it with conforming Work. If the TENANT does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, ANC may have the Defective Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by the TENANT.

11.8 ANC May Correct Defective Work:

If the TENANT fails within a reasonable time after written notice from the Airport Director to proceed to correct Defective Work or to remove and replace rejected Work as required by the Airport Director, or if the TENANT fails to perform the Work in accordance with the Airport Building Permit, or if the TENANT fails to comply with any other provision of the Airport Building Permit, ANC may, after 7 days' written notice to the TENANT, correct and remedy any such deficiency. To the extent necessary to complete corrective and remedial action, the Airport Director may exclude the TENANT from all or part of the site, take possession of all or part of the Work, and suspend the TENANT's services related thereto, take possession of the TENANT's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or approved remote storage. The TENANT shall allow the Airport Director and his authorized representatives such access to the site as may be necessary to enable the Airport Director to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of ANC in exercising such rights and remedies will be charged against the TENANT. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of the TENANT's Defective Work. The TENANT shall not be allowed an extension of time because of any delay in performance of the work attributable to the exercise, by the

Airport Director, of ANC's rights and remedies hereunder.

11.9 Warranty of Title:

The TENANT warrants and guarantees that title to all Work, materials and equipment covered by any the Airport Building Permit will pass to ANC free and clear of any claims, liens, security interests and further obligations.

11.10 TENANT's Continuing Obligation:

The TENANT's obligation to perform and complete the Work and pay all laborers, Contactors, Subcontractors, and materialmen in accordance with the Airport Building Permit shall be absolute. Neither the use or occupancy of the Work or any part thereof by ANC, nor any act of acceptance by ANC nor any failure to do so, nor any review and Approval of a Shop Drawing or sample submission, nor any correction of Defective Work by ANC will constitute an acceptance of Work not in accordance with the Airport Building Permit or a release of the TENANT's obligation to perform the Work in accordance with the Airport Building Permit.

11.11 No Waiver of Legal Rights:

ANC shall not be precluded from showing the true amount and character of the Work performed and materials furnished by the TENANT or that the Work or materials are Defective. ANC shall not be precluded from recovering from the TENANT such damages as it may sustain by reason of his failure to comply with requirements of the Airport Building Permit. The acceptance by ANC shall not operate as a waiver of any portion of the Airport Building Permit or of any right to damages. A waiver by ANC of any breach of the Airport Building Permit shall not be held to be a waiver of any other subsequent breach.

ARTICLE l2 - SUSPENSION OF WORK AND DEFAULT

12.l ANC May Suspend Work:

ANC may, at any time, suspend the Work or any portion thereof by notice in writing to the TENANT.

12.2 Default of Airport Building Permit:

12.2.l If the TENANT:

a. Fails to begin the Work under the Airport Building Permit within the time specified, or

b. Fails to perform the Work in accordance with the Airport Building Permit (including, but not limited to, failure to supply sufficiently skilled workmen, suitable materials or equipment or failure to adhere to the progress schedule estimate), or

c. Performs the Work unsuitably or neglects or refuses to remove materials or to correct Defective Work, or

d. Discontinues the prosecution of the Work, or

e. Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or

f. Disregards Regulatory Requirements of any public body having jurisdiction, or

g. Otherwise violates in any substantial way any provisions of the Airport Building Permit, or

h. For any cause whatsoever, fails to carry on the Work in an acceptable manner, the Airport Director may give notice in writing to the TENANT and his Surety of such delay neglect, or default.

END OF SECTION

SECTION 00701

DESIGN STANDARDS

PART 1 GENERAL

1.01 WALLS

A. Between tenants.
   1. Demising walls between tenants shall be centered on the lease line dividing tenant spaces and shall extend to the structure above.
   2. Partitions shall be metal studs and 5/8" fire rated gypsum board extending from the floor slab airtight to the underside of the deck above, with all voids filled and penetrations sealed as required to provide a one hour rated assembly.

B. Along exit corridors.
   1. Demising walls along exit corridors and other Airport spaces will be provided by ANC and be of a fire rated construction from the floor to the structure above.
   2. The Tenant shall provide approved finishes and make no penetrations without ANC's approval and shall maintain the fire rating.

C. Penetrations.
   1. The Tenant shall seal around all structural shapes, ducts, pipes, and other penetrations through the demising walls in an airtight, code compliant manner because the space above the finished ceiling is used as an air plenum.
   2. Provisions shall be made for return air to ANC's HVAC unit, where dictated by design requirements.

D. Reinforcement.
   1. Additional approved wall reinforcement or independent support is required for demising walls used to support heavy attachments

E. Control joints.
   1. Control joints in partitions, walls, and wall furring runs are not to exceed 30 feet.
   2. Control joints are to be installed where building control joints occur.

1.02 NON PUBLIC AREAS

A. These standards apply to operational space, offices and areas not open to the general public or within secure areas.

B. Tenant interior design shall comply with DESIGN STANDARDS FOR PUBLIC AREAS.

1.03 MAINTENANCE

A. Aircraft maintenance parts and equipment should be stored inside interior spaces and not on the apron.

B. No overhaul, heavy maintenance or welding should occur in the technical or concourse maintenance area.

1.04 STORAGE

A. Tenants' stored parts and materials shall not contain any hazardous materials.

B. Flammable or combustible materials shall be properly stored and labeled.

PART 2 PRODUCTS

2.01 WALLS

A. Paint and finishes shall have a Class I, 0-25-flame spread rating when applied to a noncombustible surface. Interior plaster and gypsum board are to be coated with a primer-sealer and undercoat prior to finish coat application.
B. Wall treatments shall be finished at the floor with a durable base material such as wood, stone, ceramic tile, or stainless steel. Vinyl or rubber base shall not be used in areas visible to the public.
C. Surface mounted shelf standards shall not be used.
D. All wall surfaces in the tenant space that are visible to the public shall be finished in an acceptable manner. The wall treatments should reflect the image established by ANC.
E. Acceptable finishes include painted gypsum board or plaster, commercial grade wall coverings, wood moldings or panel treatments, decorative metal, or natural stone.
F. The use of the following materials shall not be allowed as a wall material in areas visible to the public:
    1. Extensive use of mirrors or common slatwall
    2. Simulated brick or stone
    3. Wood grained or simulated pattern plastic laminates
    4. Pegboard or corkboard
    5. Plywood and rustic or rough sawn wood
    6. Carpeting on walls

2.02 FLOORS

A. Floor treatments should be designed to reinforce the character of the airport concept and image. A suitable floor finish shall be provided at all public areas of the Tenant's premises.
B. The elevation of the finish floor shall match the adjacent common area floor. Bull-nosed tile, reducer strips, or carpet edge guards will not be permitted.
C. Flooring shall comply with ADA Accessibility Guidelines (ADAAG).
D. Floor finish materials that are not permitted in tenant areas visible to the public are quarry tile, rubber/vinyl flooring or vinyl composition tile.
E. Carpet.
    1. When carpeting is used, the Tenant is encouraged to use patterns and borders to define areas of the space.
    2. Carpeting shall be of superior quality with a Class I flame spread rating.
    3. Direct glue-down installation is strongly recommended.
    4. Flush transitions to other materials shall be provided to minimize visual distractions and walking hazards.
    5. Reducer strips shall not be used.
F. Waterproofing.
    1. Tenants shall install an approved waterproof membrane at floor slab and seal all floor penetrations in all toilet rooms, kitchens, and similar water prone areas.
    2. The waterproofing shall extend a minimum of 4" up the perimeter walls of such areas.
    3. Tenant shall provide material or devices required to prevent the passage of water or liquids out of these areas.
G. The Tenant shall prepare the interior slab as needed to provide a smooth, sound substrate to receive Tenant finishes.
H. When an expansion joint occurs within the tenant space, it shall be the Tenant's responsibility to install the finish floor material to this joint in a workmanlike manner.
I. ANC will not be responsible for finished floor material installed over expansion joints.

2.03 CEILINGS

A. The Tenant shall provide a finished ceiling throughout the premises.
B. Exposed structure shall not be permitted.
C. Access shall be provided by the Tenant to any airport equipment, valves, controls, piping, etc., located above the Tenant's ceiling.
D. Avoid ceiling layouts that will produce border areas less then one half of a ceiling panel wide.
E. Approved ceiling finishes for any area visible to the public include the following:
    1. Painted gypsum board or plaster.
    2. Concealed spline acoustical tiles or panels.
    3. 2' x 2' acoustical panels with regular edge.
F. Design standards.
    1. The Sound Transmission Coefficient (STC) of ceilings shall be approved by ANC.
    2. The Noise Reduction Coefficient (NRC) of ceilings shall be approved by ANC.
    3. Ceiling suspension systems shall not be fastened to the underside of the metal roof deck, piping or ductwork above. All fastening devices shall be secured to the structure above.
    4. Gypsum board and plaster ceiling control joints shall not exceed 50 feet in any direction. Tenant shall provide control joints at all building control joints and where ceiling framing changes direction.

2.04 LIGHTING

A. No lighting shall be installed in the common area ceiling.
B. Tenants shall install all lighting subject to the following requirements:
    1. Display lighting
        a. Shall be incandescent or a combination of incandescent, halogen, or low-brightness fluorescent.
        b. In general, light sources (including lamps) shall not be visible from the terminals' public corridors.
    2. Spotlights
        a. Shall be recessed incandescent, adjustable angle fixtures or track-mounted adjustable spotlights.
        b. All adjustable units shall be focused so that brightness is not visible from public area walkways, with the exception of airport halogen spotlights.
    3. Interior general lighting
        a. Fixtures for the tenant space interior shall be of the glare-free type.
    4. Incandescent
        a. Lighting shall be of a low-brightness type.
        b. Colored incandescent bulbs shall not be used.
        c. No light source shall be visible at or below the ceiling line.
        d. Light fixtures may be exposed or shielded, pendant or surface-mounted on walls or ceilings.
    5. Fluorescent Lighting
        a. Shall be of a low-brightness type. Shielding shall be metal parabolic, acrylic paracube, or parawedge-type louvers.
        b. No acrylic lens, "egg crates" or bare fluorescent tubes shall be used for general lighting in tenant areas visible to the public.
        c. Acceptable color temperature of lamps is 3500K.
    6. Accent lighting shall be surface or pendant mounted track and track fixtures.
    7. Emergency lighting shall be installed as required by applicable codes.
    8. Self-illuminated Lighting
        a. Showcases and display cases shall be adequately lit and ventilated.
        b. Direct visual exposure of incandescent lamps and/or fluorescent tubes is prohibited.

2.05 DOORS

A. Doors and locksets to public space shall meet ANC door and hardware standards to allow emergency access by ANC.
B. Doors within Tenant spaces need not conform to ANC standards.
C. Door and room signage shall be coordinated with ANC's door and room numbering system.

END OF SECTION

SECTION 00702

SIGNAGE AND GRAPHICS

PART 1 GENERAL

1.01 SIGN GRAPHICS DESIGN

A. Tenants should use a professionally trained graphic designer to develop signage, graphics and corporate identities. These professionals shall communicate competently on issues of contrast, legibility, typefaces, viewer recognition factors, proportion and semantics of visual communication.
B. Signs shall be consistent with the ambiance and scale created by the architectural design of the Ted Stevens / Anchorage International Terminal Complex. Signs should be an art form.
C. Should incorporate graphic symbolism of trade name or merchandise rather than written copy.
D. Variety and individuality within each Tenant's signage program, throughout the airport concourse, and in other Tenant areas will be emphasized.
E. Signs shall be coordinated with other signs within the Tenant's space.
F. Signs for Tenant facilities shall be an integral part of the storefront design.

1.02 SIGN LOCATIONS

A. Tenant signs are located either within the Tenant space or are two sided blade signs above the Tenant space.
B. Regulatory and temporary signs are provided by ANC and Tenants throughout the Terminals.
C. Tenant signs shall be placed in locations that minimize accidental damage.
D. Signs that are mounted with their leading edges at or below 27 inches above finished floor may protrude any amount.
E. Signs or graphic elements that project from a wall into an area with their leading edges between 27 inches and 80 inches above the finished floor shall project no more than four inches. (1341.0424,Subpart 1 ADAAG 4.4.1)
F. A minimum 80" clearance is required in public areas for the safety of persons walking under signs.

1.03 DIRECTIONAL AND INFORMATIONAL SIGNS

A. ANC provides directional and informational signs within the Terminals. No other signs shall block or interfere with directional or informational signs.

1.04 TENANT SIGNS

A. Tenant Signs shall have distinct color and identity different from the directional and informational signage.
B. Tenants are encouraged to display a strong image, an advertising type storefront sign above their space or entry. Signs are subject to ANC approval.
C. Tenant Signs, except blade signs, shall be parallel to the path of passenger traffic.
D. Blade signs.
    1. Shall be located on columns perpendicular to each Tenant space.
    2. Blade signs within a public area shall be externally illuminated.
    3. Blade signs shall be installed perpendicular to the path of passenger flow.
    4. Blade signs shall incorporate only the Tenant name, standard symbol, or logo. No product or advertising copy shall be included on a blade sign.
    5. ANC will provide the blade sign frame, external light fixtures and the power source.
    6. The Tenant shall provide the blade sign panels and Tenant graphics.
    7. ANC will regulate the blade type signs as to size and image approval.

8. The location will be selected by ANC and shall not interfere with directional and informational type signs.

1.05 REGULATORY SIGNS

A. The goal is to minimize the confusion within the airport by minimizing the number of variables associated with communicating required information to the traveler.
B. It is the responsibility of each airline to provide regulatory signs required by federal regulations and any others required in the future by federal or other applicable regulations.
C. Consolidation of different signs into various combinations for a single display is recommended. Consolidation will result in reducing replacement and inventory costs, create a uniform presentation of the information, and establish a central control for future sign changes.
D. The background color of regulatory signs shall be gray matching Pantone #5635 with matte white Helvetica letters and sign border similar to the International Symbol Border. The surface shall have a matte finish.
E. Regulatory signs are illuminated utilizing ambient light.
F. Regulatory sign attachments shall be blind fastener to the counter face, backscreen or sidewall.
G. Regulatory sign size is dictated by the sign contents, type size and border.

1.06 ADVERTISING SIGNS

A. Advertising signs are coordinated through ANC Leasing & Properties Management and are installed by ANC's exclusive advertising vendor.
B. Advertising Signs may be internally and/or externally illuminated.
C. They shall be wall mounted and a structural engineer shall approve the mounting method employed.

1.05 TEMPORARY SIGNS

A. All temporary signs shall be approved by ANC and approved for a specified duration of display, location, use and quantity prior to being placed in the Tenant space.
B. Temporary signs are restricted to the interior of the Tenant space.
C. Any temporary signage which can be viewed from public areas shall be designed, constructed and executed with quality and professional standards of fabrication.
D. May not be adhered to any glazing or to the building structure.
E. May only be in place for a limited period of time.
F. Airline Tenants may display promotional materials within hold room or gate lobby areas only, and within approved display systems.
G. All temporary signs shall be in ANC standardized displays or frames.
H. Freestanding placard signs will be permitted with ANC approved stands only.
I. Freestanding floor signs shall not be placed within the first five feet of a store.
J. Temporary signs shall be externally illuminated and rely on ambient light.
K. Temporary signs should be made from a foam core panel, which in turn is adhered to the object or area in question using foam tape on the backside.
L. Low contrast complex images or improperly scaled lettering shall not be used.
M. No cardboard, paper, plastic film or sheeting signs, stickers or decals shall be placed on storefront glazing, structure or millwork.
N. Tenants may not paint or adhere permanent or temporary decals, artwork or signing indicating product line, credit card acceptability, boarding restrictions, FAA Compliance or security system warnings to windows or columns in the public view.

1.06 TEMPORARY SEASONAL SIGNS AND DECORATIONS

A. The following lists the current pre-approved U.S. Holidays and event seasonal display time frames:
   1. Halloween — Month of October
   2. Thanksgiving — Month of November
   3. Christmas/Hanukkah — Months of December and January

B. Holiday/Seasonal decorations must be within the Tenant leased areas.

C. No decorations shall be attached from the ceiling within the public concourse, terminal area or hung from the openings of retail or concession entrances.

D. No illuminated decorations or lights shall be used anywhere in any public counter areas.

E. Live Christmas trees shall not be used.

F. Airline tenants with backwalls may have decorations attached anywhere on the backwalls and doors, as long as the decorations do not reduce the aisleway or door width and the methods of attachment meet approval.

G. Seasonal decorations may sit on the floor or furniture behind the counters.

H. Seasonal decorations such as plants may sit on the counters. One per counter section or one per 8 feet of counter. No other decorations may be attached or sit on the counter. The maximum height of the decoration shall not exceed 18" including container.

1.07 BROCHURE RACKS

A. All promotional brochure racks shall be built into the gate podium, backwall or other acceptable fixture system approved by ANC.

1.08 SIGN ILLUMINATION

A. Tenant signs can be internally or externally illuminated and shall not be of a greater illumination than directional signs.

B. Blade signs shall be externally illuminated with the light fixture and armature provided by ANC.

C. The approval for the method of illumination will take into consideration of the level of illumination for the finished sign or graphic and if externally illuminated the appearance of the light fixture and any armature required.

D. No exposed lamps or tubing shall be used.

E. All electrified signs shall bear the Underwriters Laboratory's label.

F. All electrified sign installations shall comply with all local building and electrical codes.

G. No exposed raceways, crossovers, or conduit will be permitted.

H. All cabinets, conductors, transformers and other equipment shall be concealed.

I. Electrical service to all signs shall be on the Tenant's electrical meter.

J. Neon can be an acceptable signage element when used creatively and in conjunction with other design elements.
   1. Where neon is approved for use, it shall be used in a subtle and tasteful manner at the opinion of the ANC.
   2. Overwhelming colors such as bright red, which discolors adjacent storefronts and the Airport Concourse, shall not be allowed. Where such colors are installed they shall be removed at the Tenant's cost, even when previously approved by ANC.
   3. Neon Lighting may only be utilized for the name identification, log or graphics of the Tenant in question.
   4. Exposed neon lighting shall only be utilized in the sign ban over a retail tenants space (which shall be 8'-0" AFF or greater).
   5. Tenant with neon signs shall be responsible for their maintenance and repair. In the event the neon sign becomes broken or malfunctions in any way, it shall be removed immediately by the Tenant and the sign fascia shall be repaired within thirty days.

1.08 PROHIBITED SIGNS AND MATERIALS

A. No animated, flashing, or audible signs will be permitted, exceptions: information kiosks, TV monitors without sound within the Tenant space perpendicular to the concourse and ten feet back from lease line.

B. No hand painted, lettered or handcut stencil signs shall be used, outside or inside the Tenant spaces.

C. Televised, electronic and video displays are not allowed within 10' of the Tenant's lease line when directed toward public circulation. (Except approved FIDS and e-ticketing machines.)

D. Materials used in all signage & graphics shall be non-glare to avoid reflections from external light sources.

PART 3 EXECUTION

3.01 INSTALLATION

A. All signs shall be installed by a professional sign vendor. All signs requiring power shall be installed by a licensed electrician.

SECTION 00703

ADDITIONAL AIRLINE TENANT DESIGN STANDARDS

PART 1 GENERAL

1.01 GENERAL

Airline tenant improvements shall comply with the requirements of the design standards as well as the additional requirements below.

1.02 TICKET COUNTERS

A. Ticket Counter Shells.
   1. ANC will provide ticket counter shells.
   2. Ticket counter inserts shall be provided by the airlines.

B. Ticket Counter Backwalls shall have ANC standard backwall finishes.

C. Signage shall comply with the Signage and Graphics design criteria as well as the additional requirements below:
   1. The maximum logo height is 36".
   2. The maximum letter height is 18".
   3. The maximum relief or projection of signage is 6".

D. Back wall graphics
   1. Shall be located within the airline identity band.
   2. Messages will be limited to corporate logo, copy, and office identification only.
   3. Only one logo or carrier name per 20 linear feet of counter length is permitted.
   4. Advertisement signs are not permitted on the back wall.
   5. Size and space utilized should be proportional to the counter area.
   6. Samples of materials and colors shall be submitted to ANC for approval before proceeding with fabrication and installation.

E. Lighting
   1. Interior illumination sources shall not be used.
   2. Flashing or blinking lights or signs shall not be used.
   3. Direct, white colored lighting shall be used.

F. Temporary signs, banners, or counter signs
   1. Shall not be installed unless approved by ANC.
   2. Baggage tag information and frequent flyer applications are exempt.
   3. Security information required by the FAA or other regulatory agency shall be displayed after approval by ANC.

G. Banners
   1. At airline ticket counters shall only be used to notify passengers of a new service, advise passengers of a new Airline, or the relocation or discontinued Airline operation and only after prior ANC approval.
   2. Airlines shall only display "new service" (new destinations) for up to 45 days. No promotions, club bonus, campaigns or fares shall be displayed.

H. Ticketing signage
   1. Above the counter shall consist of an airline location sign and surface mounted letters on the continuous "sign box" above the canopy.
   2. Airline logos, names, slogans, or other messages are prohibited on these signs.

I. Sign box letters
   1. Shall be limited to the common, carrier name.
   2. The letter size shall be 10" high by ¾" thick or less. Letters shall be all capitals, white, and use Helvetica Medium.

3. The letters shall be centered vertically between the top and bottom of the box, and horizontally on panels.
4. Locations of signage with current and future monitor locations (built-in) shall be coordinated.

J. Tenants shall not install lighting in the ticket counters.

1.03 QUEUES

A. Queue control
1. Queuing at ticket counters shall be controlled by movable, post-mounted barrier straps.
2. The posts shall be 2-1/4" diameter stainless steel posts with a 13" diameter, weighted stainless steel base (with a simple ¼" high taper to the post on a ½" high vertical), and a 4-1/2" high by 2-1/2" diameter stainless steel cap.
3. All stainless steel shall have a satin finish.
4. Retractable barrier straps shall be attached to the post caps.
5. Straps shall be nylon fabric with a solid color, coordinated with the airline's logo and background color.

B. Queue dimensions
1. Queuing depth shall be limited to a maximum of 25' in front of the ticket counter.
2. A clear path of 15' between the queue area and the structure opposite the ticket counter shall be maintained.

C. The number and type of check-in accessories, including luggage sizing equipment, podiums, tag dispensers and other equipment may be limited by ANC to maintain safe conditions, queuing and traffic flow, and to minimize clutter.

1.04 GATES

A. Podiums
1. Gate Podiums shall be supplied by the airline and represent the airline with their corporate colors and design.
2. Finishes for podiums shall match or exceed the quality standards set by the ANC supplied ticket counter shells.

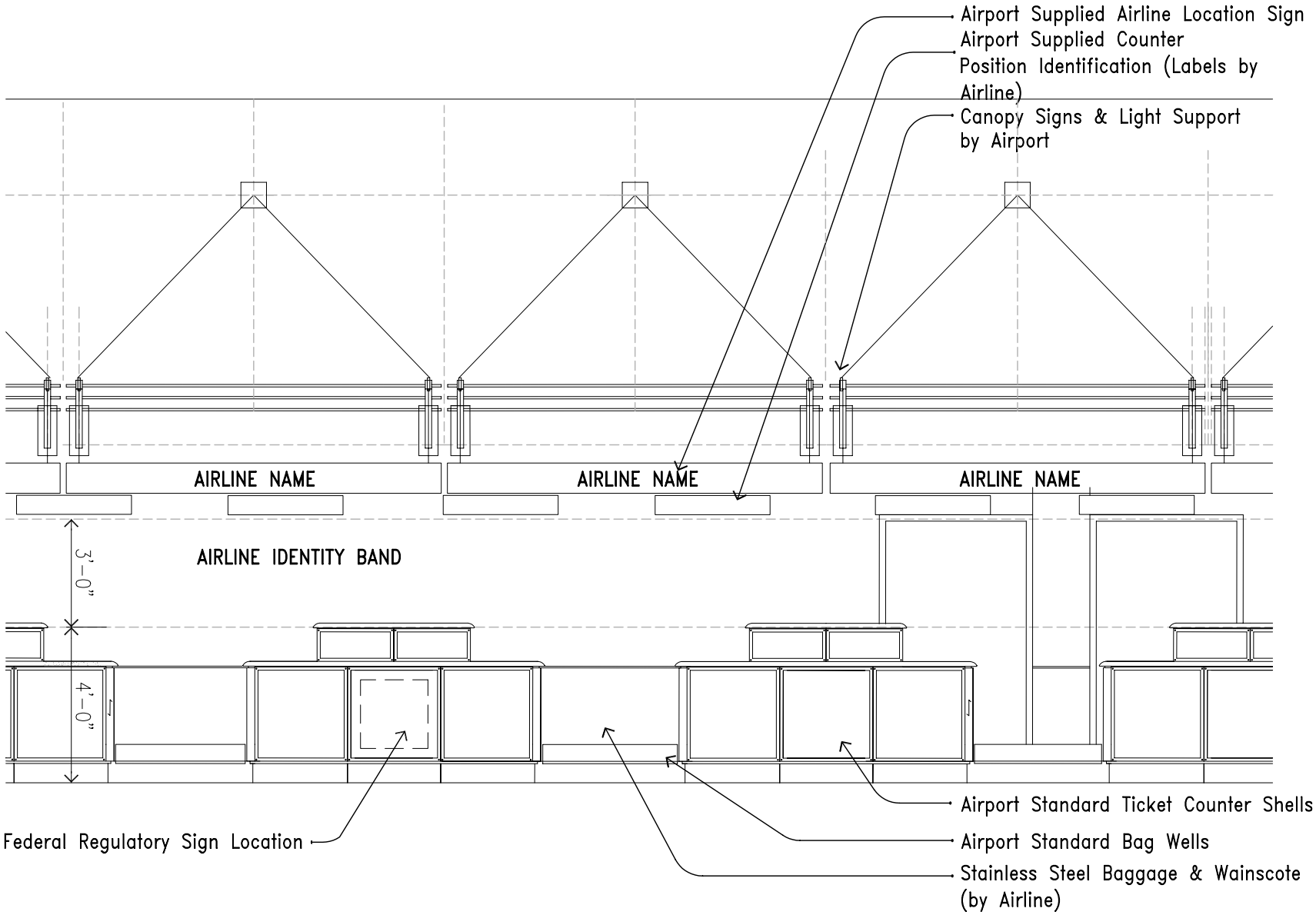
B. A backscreen with airline identity and gate flight information shall be located behind each podium.

C. Electronics in the gate area shall be limited to monitors or LED signs displaying flight information for the airline at the gate.

D. Signage shall also comply with the Signage and Graphics design criteria.
1. The maximum logo height is 36".
2. The maximum letter height is 18".
3. The maximum relief or projection of signage is 6".

E. Gate lounge wall graphics.
1. Shall be no lower than 3'-6" or higher than 7'-0" above the finished floor. The maximum logo height is 36". The maximum letter height is 18". The maximum relief or projection of signage is 6".
2. Messages will be limited to corporate logo, copy, and office identification only.
3. Only one logo/carrier name per gate lounge shall be displayed.
4. Flight information signs shall be displayed on the gate lounge counter back wall, but routes or services signs shall not.
5. Size and space utlilized shall be proportional to the counter area.
6. Samples of materials and colors shall be submitted to the ANC for approval before proceeding with fabrication and installation.
7. Only "new service" banners are allowed at gate lounge counters. All such banners shall be displayed against a tenant wall or podium. No banners shall hang from the ceiling.

F. Lighting.
   1. Interior illumination sources shall not be used.
   2. Only direct, white colored lighting shall be used.
   3. Flashing or blinking lights or signs shall not be used.



NOT TO SCALE

PLOTTED: Feb 2, 2003

AIRPORT ENGINEERING

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

Ted Stevens Anchorage International Airport

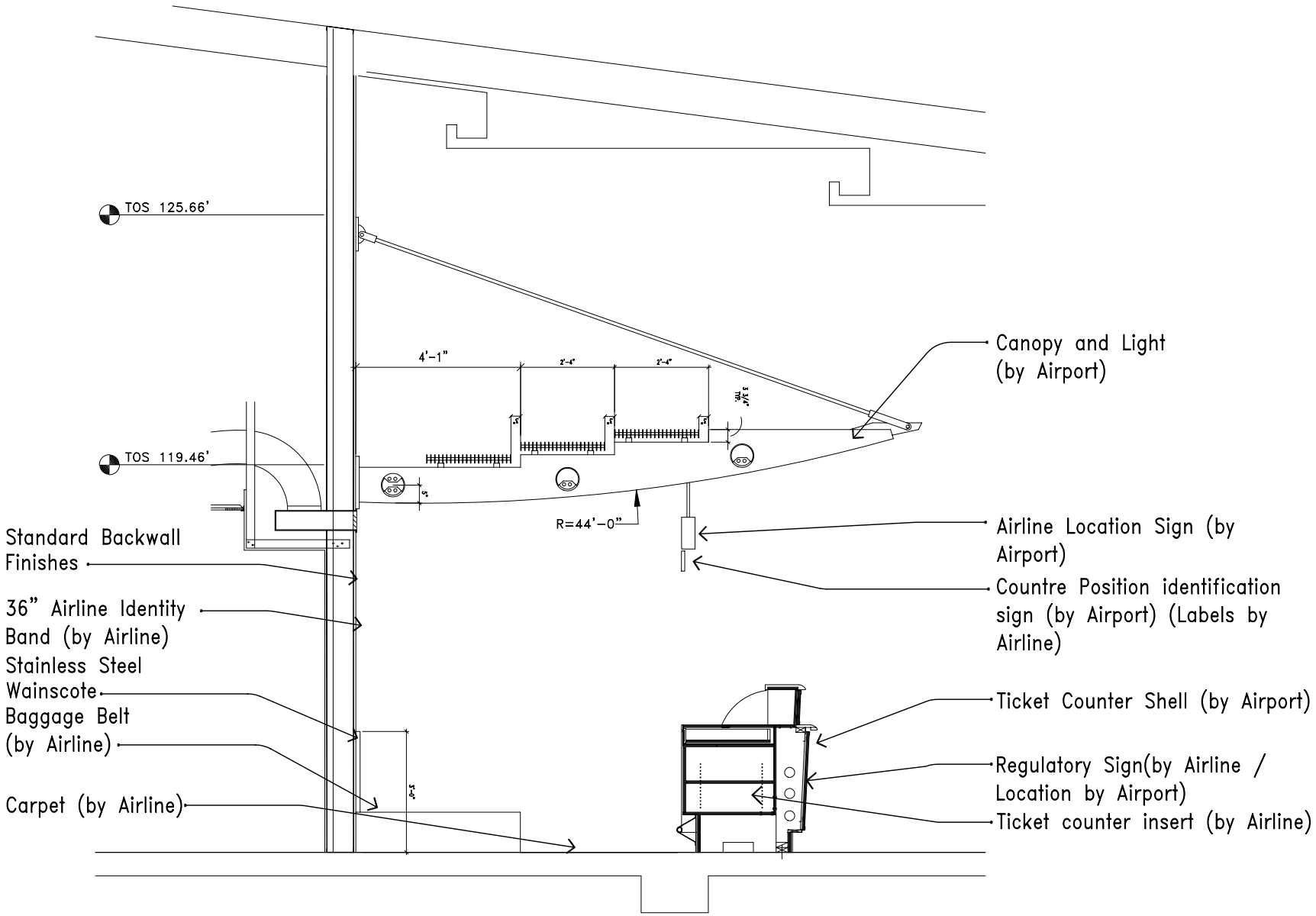
TICKET COUNTER FRONT ELEVATION

SHEET 1 of 1

ANC Terminal Const Stds

00703-4

Feb 2003 Draft



	NOT TO SCALE PLOTTED: Feb 2, 2003 AIRPORT ENGINEERING	STATE OF ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES Ted Stevens Anchorage International Airport	TICKET COUNTER SECTION	SHEET 1 of 1

SECTION 00704

ADDITIONAL RETAIL TENANT DESIGN STANDARDS

PART 1 GENERAL

1.01 GENERAL

Retail Tenant improvements shall comply with the requirements of the design standards as well as the additional requirements below.

1.02 STOREFRONT DESIGN

A. Construction Limits
   1. Storefront construction shall extend from the floor slab to the horizontal neutral bulkhead or ceiling above and shall abut the vertical demising systems at both sides of the demised Concession Tenants' premises.
   2. Storefronts (including blade signs) may project up to 2'-0" beyond the lease line for a maximum vertical distance of 4" starting at a point at 9' above the finished floor, if sightlines to the surrounding Tenants are not obstructed.
   3. No element of the storefront shall extend beyond the Tenant's lease line without ANC's consent.

B. Recessed Storefronts.
   1. Tenant shall finish any soffit or neutral pier returns exposed by recessing the storefronts at Tenant's cost to match ANC's neutral surround construction and finishes.

C. Base.
   1. All storefronts, except entry doors, shall have a minimum of a 6" high base of durable and maintainable material integrated with the storefront design.
   2. Acceptable materials include brass, chrome, aluminum, natural stone, or hardwood.

D. Transparency.
   1. High transparency in the storefront design is encouraged.
   2. The Concession Tenants' overall storefront area shall have a minimum of 75% visual transparency/openness.

E. Storefront designs
   1. Should create a three dimensional treatment by recessing the closure line or other portions of the storefront.
   2. Incorporation of multiple planes relative to the lease line is encouraged. This can be achieved at the bulkhead over the storefront, inside the lease line or with ANC approval outside the lease line when it does not interfere with the terminal operation or adjacent Tenants.

1.03 STOREFRONT ENTRIES

A. Entry width.
   1. A limited portion of the Tenants' overall storefront area shall be designated as storefront entries.
   2. Storefronts up to 45 feet wide shall have a maximum entry width of 1/3 of the total storefront leased area width. Storefronts greater than 45 feet in width shall have a maximum entry width of 15 feet.

B. Openings or setbacks from the storefront leaseline will be prohibited within 5'-0" of any demising pier.

C. Flooring between the lease line and the Tenant storefront or closure line is the responsibility of the Tenant and shall either match the common area flooring or match the Tenant floor finish.

D. Electronic surveillance.
   1. Or other shoplifting detection devices and security systems shall be integrated within Tenant's storefront design.
   2. Freestanding posts or columns, suspended boxes, suspended rails or other exposed equipment shall not be used.

E. The soffit at the recessed entries shall be a minimum of 8'-6" above the finished floor.

F. Recessed down lights.
   1. Shall be provided in recessed entry areas. Illumination of these lights shall be controlled by a time clock.

G. Decals on glass shall be limited to 6" x 6" or less for loss prevention and credit card information.

H. Storefront Closures.
   1. Sliding grille gates shall not be used in any location. Storefront closure systems generally permitted include:
      a. Recessed, hinged outswinging doors with multipane glass, fully glazed, or frameless glass doors on pivots. Doors shall not swing beyond the lease line when fully opened.
      b. Sliding glass doors which slide behind one another and stay open; these doors shall be pocketed in and above the storefront enclosure unless specifically approved by ANC.
      c. Rolling vertical or horizontal coiling grilles are acceptable provided that all portions of the frame or track that are visible match the metal finishes used elsewhere in the storefront. Grilles shall be independently supported. ANC's structure shall be used for lateral support only. The structural support for the rolling grille shall be incorporated into the Tenant's storefront design.

1.04 DISPLAY AREAS

A. The use of creative Display Areas is strongly encouraged. Innovative merchandising, quality materials, and appropriate lighting should be used to convey the tenant's merchandise identity and generate activity and excitement. Tenants are encouraged to provide ceiling heights as high as possible within the Display Area.

B. Floor finishes shall be limited to durable materials such as stone, ceramic tile, and wood. No carpet is allowed in this area for reason of appearance and maintenance.

C. Show windows shall be adequately ventilated and shall be illuminated with low voltage track lights, recessed incandescent lighting, or approved specialty lighting.

D. Display lighting shall be on a dimmer. Glare visible to the common area shall not be allowed.

E. No fluorescent lighting or acoustical tile ceiling shall be used in Display Areas.

F. Store fixtures.
   1. Shall be professional and industry standard for display windows
   2. No pegboard or metal shelving shall be used.

G. Signs shall not be taped or fastened to the display windows or hung from the soffit.

H. No checkout counters, temporary sale racks or mass merchandising systems (slatwall) shall be used in the Display Area.

1.05 STOREFRONT FINISH MATERIALS

A. All storefronts shall be constructed of high quality, durable materials that can be easily maintained.

B. Tenants are encouraged to use materials in a creative manner. All materials and their finished installation are subject to the approval of ANC.

C. Acceptable materials include:
   1. Marble, granite, limestone and other natural stone products.

2. Wood: top grade mill quality, natural or stained finish hardwood.
3. Ceramic tile.
4. Decorative finished metals such as polished chrome, stainless steel, brass, bronze, anodized aluminum or factory painted steel. This material shall not comprise more than 10% of the storefront.
5. Frameless clear glazing of tempered or laminated safety glass with polished exposed edges.
6. Framed clear glazing with wood or metal glazing mullions, only if acceptable to ANC based on Tenant's design intent.
7. Ornamental glass, such as tinted, etched, sandblasted, stained, beveled, or leaded.

1.06 STOREFRONT SIGNAGE

A. Signage shall also comply with the Signage and Graphics design criteria.
B. Each Tenant is allowed one blade sign.
C. Sign Dimensions:
   1. The maximum height of the sign letters shall not exceed 14 inches and the maximum height of any individual letter shall not exceed 20 inches.
   2. The maximum length of the sign shall not exceed 70% of the total storefront width.

1.07 DEMISING PARTITION DOORS.

A. The Tenant shall furnish and install a minimum 3'-0" wide by 7'-0" high door connecting to the service corridor.
B. Doors to exit corridors shall be fully recessed so as not to project into the corridor when open.
C. The door recesses, where required, shall be provided by the Tenant. Doors, frames, and recesses shall be painted to match the corridor paint color.
D. All interior doors used to access fire exit corridors shall be "B" labeled fire door assemblies, complying with local codes.

1.08 STORE LAYOUT

A. Tenants shall give careful consideration to the use of colors and materials on all floor, wall, and ceiling surfaces, complementing the aesthetic and quality established in the main public areas.
B. Layouts should react to passengers' limited time with displays arranged to encourage impulse purchases, ease of browsing and speed of transaction.
C. Aisle widths shall be adequate for passengers with baggage or luggage carts and shall also accommodate disabled persons, particularly those in wheelchairs.
D. Displays should be attractive and call attention to the products featured, but shall not interfere with the egress or access to the store.
E. Restaurants, lounges, and snack bars should have room available near or underneath tables for the storage of bags and packages.

1.09 LIGHTING STANDARDS.

A. Low-voltage type lighting is recommended for high impact on merchandise displays.
B. Track and track fixtures
   1. Shall be painted to match the ceiling color of tenant's store.
   2. If the track and track fixtures are a part of the interior decor and other paint finishes are required, they shall be approved in advance in writing by ANC.
C. Decorative lighting.
   1. Incandescent or fluorescent pendant units, chandeliers, or wall brackets, may be used only if Tenant has established an identity based on this design theme, and shall be approved in advance of build-out by ANC.
   2. No strobe, spinner or chase-type lighting shall be used.

3. Luminous ceilings shall not be used.

D. A seven-day, calendar type, 24-hour timing device shall be provided by the Tenant for the lighting of the Tenant's storefront and to show window areas during required hours as designated by ANC.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 WORK BY OTHERS

A. Cooperate with other tenants and ANC to minimize conflict with construction operations.

1.2 WORK PLANS

A. A work plan is required for all projects that may impact ANC, the public or other tenants.

B. At a minimum, the work plan shall consist of a sketch of each area impacted by the TENANT's work and a schedule for each major construction activity or trade for each phase of work. The sketch shall show the limits of construction, work enclosures, barricades, temporary partitions, staging areas, haul routes for construction materials, obstruction of exits or other items affecting the operation of area outside of the TENANT's lease area. The work plan shall also address the following: service disruptions, noise control, odor control, dust control and vibration.

C. Notify the Airport Director in writing at least 5 (five) working days, not including weekends or Holidays, prior to beginning work in the area identified in the work plan.

D. No construction operations affecting safety or comfort of the public shall begin until the work area is closed off from the public.

E. Where work is adjacent to or above existing cabinetwork, equipment, or other fixtures, include means and method of protection as a part of the work plan. This requirement is for coordination with other tenants and is not intended to relieve the TENANT of the responsibility for safety and protection of the existing building and facilities.

F. When an exterior staging area is allowed, the TENANT shall be responsible for snow removal within the Staging Area.

G. It shall be the responsibility of the TENANT to coordinate all construction and haul activities with the Airport Operations Office and to comply with their instructions concerning apron closures and the movements of construction equipment, men and materials in the vicinity of the existing ramp areas. All such requests shall be made at least 48 hours (excluding weekends) in advance of any planned closure or change.

1.3 SHUTOFFS / DISRUPTIONS TO SERVICE

A. Provide written notification of work in area at least five working days (not including weekends) in advance.

B. Plan work to minimize down time. Coordinate with ANC and other tenants to schedule disruption for a time that minimizes impact on airport operations.

1.4 TENANT'S USE OF PREMISES

A. Work within the TENANT's lease area that does not affect ANC, the public or other tenants may proceed after all of the requirements of the Airport Building Permit are met. Any construction that activity that may affect other tenants, the public or ANC will require advance notification and approval from ANC and ANC may limit the time and duration of these activities.

B. Work within the existing common areas will require advance notification and approval. Security measures must remain in-place. Noise, odor, and dust control measures must be in place. Barricades or temporary construction walls will be required to isolate work in common areas. Work determined by ANC to be noisy or disruptive shall be conducted during non-peak (2:00am-5:00am) ANC operating hours.

C. Assume full responsibility for the protection of the existing terminal building and contents, aircraft, and airline equipment from damage due to construction operations.

D. Obtain and pay for use of additional storage or Work areas beyond the TENANT's lease area.

E. Do not stop or otherwise impede traffic without prior written approval from the Airport Director. Include traffic control layout plan and traffic control schedule in the work plan when requested by ANC.

F. Maintain access to emergency exits during construction.

1.5 USING AGENCY OCCUPANCY

A. Airport tenants will continue operations adjacent to the site during entire construction period. Schedule operations to minimize conflict with ANC and other tenants and to facilitate Airport operations.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01 SUMMARY

A. Submit written request in advance of cutting or alteration which affects:

1. Structural integrity of any element of the building.
2. Integrity of weather-exposed or moisture-resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight-exposed elements.
5. Work of ANC or other tenant.

B. Include in request:

1. Identification of the TENANT and Airport Building Permit.
2. Location and description of affected Work.
3. Necessity for cutting or alteration.
4. Description of proposed Work, and products to be used.
5. Alternatives to cutting and patching.
6. Effect on Work of ANC or other tenant
7. Written permission of affected tenant
8. Date and time Work will be executed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Those required for original installation.

PART 3 EXECUTION

3.01 GENERAL

A. Execute cutting, fitting, and patching to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.
2. Uncover Work to install ill-timed Work.
3. Remove and replace non-conforming and Defective Work.
4. Remove samples of installed Work for testing.
5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

3.02 INSPECTION

A. Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

B. After uncovering, inspect conditions affecting performance of work.

C. Beginning of cutting or patching means acceptance of existing conditions.

3.03 PREPARATION

A. Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Project from damage.

B. Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

3.04 PERFORMANCE

A. Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

B. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

C. Restore Work with new products in accordance with requirements of Contract Documents.

D. Fit Work tightly to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

E. At penetrations of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated material, full thickness of the construction element or in accordance with listed U.L. assembly requirements.

F. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.

3.05 HAZARDOUS MATERIAL

A. Review previous hazardous material sampling within the work area(s) with the ANC Environmental Office prior to submitting an Airport Building Permit.

B. The TENANT is responsible for the testing and abatement of asbestos and all other hazardous materials encountered during the project. The testing and abatement will be done at the TENANT's expense.

C. Avoid disturbance of materials known to contain hazardous materials.

D. Do not mount conduit, equipment, hangers or other accessories on surface materials known to contain hazardous materials.

E. If hazardous materials are discovered, immediately notify ANC in writing and conform to the applicable regulatory requirements.

F. No asbestos or other hazardous material shall be used or reused at ANC.

END OF SECTION

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.03 ELECTRICITY, LIGHTING

A. Connect to existing service, provide branch wiring and distribution boxes located to allow service and lighting by means of construction-type power cords. DEPARTMENT will pay costs of energy used.

B. Provide lighting for construction operations.

C. Take precautions to conserve energy. Wasteful use of power will be back charged to the TENANT.

1.04 HEAT, VENTILATION

A. Provide as required to maintain specified conditions for construction operations, to protect materials and finishes from damage due to temperature or humidity.

B. Do not use permanent facilities for temporary purposes.

C. Fully exhaust to the outside welding fumes generated from operations related to performance of the Work.

D. Provide ventilation of enclosed areas to cure materials, to disperse humidity, and to prevent accumulations of dust, fumes, vapors, or gases.

1.05 TELEPHONE SERVICE

A. Provide telephone service if required for construction operations.

1.06 WATER

A. Provide service required for construction operations. Extend branch piping with outlets located so that water is available by use of hoses.

B. Airport will pay for water used.

C. Hoses or temporary piping will not be permitted in public areas where a hazard to the public may be created.

1.07 SANITARY FACILITIES

A. Existing facilities may be used during construction operation; maintain in clean sanitary condition. Do not use facilities for construction for cleaning of construction equipment.

1.08 BARRIERS

A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

1.09 BARRICADES, WARNINGS, AND MARKINGS (AIRPORT OPERATIONS)

A. The TENANT shall furnish, erect, and maintain all barricades, warning signs and markings for hazards, as necessary to protect the public and the Work.

B. For vehicular and pedestrian traffic, the TENANT shall furnish, erect, and maintain barricades, warning signs, lights and other traffic control devices in reasonable conformity with the Manual of Uniform Traffic control Devices for Streets and Highways (published by the United States Government Printing Office).

C. When the work requires closing an Air Operations Area of the airport or portion of such area, the TENANT shall furnish, erect and maintain temporary markings and associated lighting conforming to the requirements of FAA Advisory Circular 150\5340-1, Marking of Paved Areas on Airports.

D. The TENANT shall furnish, erect, and maintain markings and associated lighting of open trenches, excavations, temporary stockpiles, and his parked construction equipment that may be hazardous to the operation of emergency, fire-rescue, or maintenance vehicles on the airport in reasonable conformance to FAA Advisory Circular 150/5370-2, Safety on Airports During Construction Activity.

E. The TENANT shall identify each motorized vehicle or piece of construction equipment in reasonable conformance to FAA Advisory Circular 150/5370-2.

F. Open-flame type lighting shall not be permitted.

1.10 PROTECTION OF INSTALLED WORK

A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.

B. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings. Protect finished floors and stairs from traffic, movement of heavy objects, and storage.

1.11 WATER CONTROL

A. Protect the interior of the terminal from water and moisture infiltration

1.12 CLEANING DURING CONSTRUCTION

A. In accordance with Part 2 and Part 3 of this specification.

1.13 REMOVAL

A. Remove temporary materials, equipment, services, and construction prior to Final Completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities.

C. Restore existing facilities used during construction to specified, or to original, condition.

PART 2 PRODUCTS

2.1 CLEANING EQUIPMENT

A. Provide covered containers for deposit of materials, waste materials, debris, and rubbish. When located on where exposed to wind, prop wash or jet blast, containers/materials shall be adequately secured to prevent release of waste materials.

PART 3 EXECUTION

3.1 GENERAL CLEANING

A. Maintain areas under the TENANT's control free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Apron areas shall be kept clean of loose waste materials, debris or rubbish that may result in damage to aircraft or the terminal building.

C. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to closing the space.

D. Immediately clean interior areas after completion of the work to provide suitable conditions for ANC, the public and other tenants .

E. Broom clean interior areas prior to start of surface finishing, and continue cleaning on an as needed basis.

F. Control cleaning operations so that dust and other particulate will not adhere to wet or newly-coated surfaces.

G. The TENANT shall immediately clean any area identified by ANC as being in an unsafe or unsanitary condition due to the TENANT's actions.

3.2 WASTE DISPOSAL

A. Remove waste materials, debris, and rubbish from site periodically and dispose of off airport property in accordance with all Federal, State and local regulations.

3.3 FACILITY KEYS

A. Facility Key Request - Submit a written key request on TENANT company letterhead to the ANC Airport Building Permit Coordinator a minimum of 5 working days prior to the time key(s) will be needed. A deposit of $500 per key will be required. Include the following information in the written request:

1. List all Contractors and Subcontractors needing access.

2. Name the person who will carry the key on his/her person.

3. A List of all door numbers where their access is denied

4. Provide a reason for the request, i.e., specific type of work to be performed by the key holder

5. The Signature of the person authorized by the TENANT who is authorized to request keys of this project.

B. Key Issuance - Keys shall be picked up by the TENANT directly from the Airport Key Shop.

C. Key Security Deposits – Provide company check for the key deposit made payable to: State of Alaska, Airport Accounting. Reference the Airport Building Permit number and "Key Request" on the check. Deposits will be refunded only upon receipt of a request for refund letter with a copy of the Airport Key Shop receipt.

D. Key Control – The TENANT shall maintain a Key Control Log for all requests/issuances/returns of keys for the project. A copy of the Employee Information sheet shall be signed by all key holders and a copy of this form and the Key Control Log shall be provided to the Airport Key Shop.

E. Key Returns – Return all keys directly to the Airport Key Shop. Provide a copy of the ANC Key Shop Return receipt to the Airport Building Permit Coordinator.

F. Lost Keys – Report all missing keys immediately to the Airport Building Permits Coordinator and the Airport Key Shop.

G. Lost Key Fee – The fee for changing each lock operated by the lost key shall be $50 per lock. Refunds of deposit may be made only after these charges have been taken from the deposit amount. See "Key Security Deposits" for refund of deposit. In the event the deposit does not cover the entire lost key fees, the TENANT shall pay any additional costs above the amount of the deposit.

3.4 LOCKOUT/TAGOUT PROCEDURE

A. The TENANT is solely responsible for complying with all Federal, State and local laws and regulations governing lockout/tagout procedures. The TENANT is responsible for coordinating the TENANT's lockout/tagout procedures with ANC's procedures to ensure the safety of the TENANT's workmen, other tenant's workmen and ANC's workmen.

B. The lockout/tagout procedure used by ANC is provided below. This lockout/tagout procedure is provided for information only and ANC does not warranty that the procedure complies with the most recent Federal, State and local laws and regulations.

1. **Employee Instruction:** Employees shall be instructed in the safety significance of the lockout/tagout procedure. Each new or transferred employee and other employees whose work operations are or may be in the area shall be instructed in the purpose and use of the lockout/tagout procedure.

2. **ANC Notification:** Notify ANC that a lockout/tagout system is going to be utilized and the reasons why. Notifications are to be made to the ANC Facilities for all lockout/tagouts. Document which employees are to be authorized to perform a lockout/tagout, which areas are affected by the lockout/tagout, and forward a copy to the Airport Building Permit Coordinator.

3. **Preparation:** Prior to a lockout/tagout, a survey shall be conducted to locate and identify all isolating devices to be certain which switch(es), valve(s), or other energy isolating devices apply to the equipment to be locked or tagged out. More than one energy source (electrical, mechanical, or others) may be involved. Each of these shall be listed for each isolation point and a copy forwarded ANC. If more than one individual is required to lockout/tagout equipment, a multiple lockout/tagout device (hasp) shall be used.

4. **Equipment Shutdown:** Prior ANC Facilities approval is required to shutdown operating equipment. An approved Restricted Access form (available from ANC Facilities) is required to access restricted mechanical/electrical equipment rooms. Contact ANC Operations for access after hours. The telephone numbers are as follows: ANC Facilities (907) 266-2432, ANC Operations: (907) 266-2638

5. **Affixing Lockout or Tagout:** Determine if ANC Facilities has a specific lockout/tagout procedure developed for the work to be performed. Coordinate with ANC Facilites when specific procedures do not exist. Lockout and/or tagout the energy isolating devices with individual lock(s) and tag(s). Tagouts are only acceptable in equipment rooms requiring a special security key for access or with a person standing by the energy-isolating device that has been tagged. Lockout shall be used in all other situations.

6. **Restoring Locked Equipment to Normal Operation:** After the servicing and/or maintenance is complete, check the machines or equipment to ensure that no one is exposed prior to energizing the system.

END OF SECTION

SECTION 01540

SECURITY

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01010 - Summary of Work.

B. Section 01500 - Construction Facilities.

PART 2 PRODUCTS Not Used.

PART 3 EXECUTION

3.01 SECURITY PROGRAM

A. The Transportation Security Administration (TSA) requires ANC to control access and prevent unauthorized persons from entering Air Operations Areas (AOA). In compliance with this requirement, ANC has established procedures to authorize or deny access to the AOA and to identify and control persons while in these areas.

3.02 INSPECTIONS AND FINES

A. TENANT shall be liable for any fines levied against ANC, by the Transportation Security Administration (TSA), resulting from actions by the TENANT, or those whom the TENANT is responsible for, that cause a failure in the maintaining of security in the area of construction, to include any points of entry into the Air Operations Area (AOA) utilized for the construction project. Failure to maintain security will also include failure to abide by the identification program or other requirements pertaining to the security of the AOA.

B. TENANT personnel are subject to random checks for compliance with the badging and permit regulations. These checks may be conducted by either Airport Safety, Airport Operations, or the TSA.

C. In order to maintain an accountability for all Airport Identification Badges issued, the TENANT is responsible for physically collecting and returning to the Airport Badge Office all outstanding badges no longer used for the construction project. Proof of return is State Receipt issued by the Airport Badge Office.

D. A fine of $300.00 will be levied against the TENANT for each unreturned badge either upon badge expiration or completion of the project, whichever is sooner.

E. Temporary ramp permits shall be turned back to Airport Badge Office at 6040 DeHaviland, next to the Safety Building upon completion of work or expiration of the ramp permit(s), whichever is sooner. There is a $50.00 fine for each permit not returned.

3.03 AOA ENTRY CONTROL

A. TENANT is responsible for preventing unauthorized access to the AOA by way of the construction site, to include maintaining ANC perimeter gates in either a locked condition or attended by appropriately badged persons who ensure that only authorized personnel or vehicles are admitted through them into the AOA.

B. Those persons designated to control access points into the AOA shall be instructed in the proper procedures of identification requirements for persons and vehicles. The TENANT will provide these persons with the capability to communicate directly with Airport Operations and or dispatch.

C. The TENANT will be responsible for maintaining, as a minimum, a six (6) foot clear area on both sides of any perimeter fence line affected by the TENANT or any authorized representative.

D. Any opening of the AOA security fence requires prior coordination with Airport Operations. The TENANT is responsible for providing an appropriately badged person at any unsecured AOA access gate or opening. Contact ANC Operations at 266-2600.

3.04 AIRPORT IDENTIFICATION BADGES

A. The Airport Identification Badge, developed and adopted by the ANC, is the only identification system recognized as authority to enter the Security Identification Display Area (SIDA). Only persons identified by this system are permitted access. All Airport Identification Badges must be worn on the outermost garment above the waist.

B. Any person found in the SIDA, not in compliance with this program, will be removed from the area and action will be taken against violators as appropriate under Alaska State Statute or Alaska Administrative Code.

C. Airport issued Identification Badges are not required outside the SIDA area. For leaseholds and roadways outside the SIDA, ANC approves the use of a valid driver's license in conjunction with TENANT company identification cards issued from a person's employer.

D. Control Authority

1. The Airport Manager has been delegated authority for approving issuance, system control, implementation, and accountability of this program to the Airport Operations, Badge and Vehicle Permit Office.

2. An individually - assigned Airport Identification Badge will be used by each TENANT employee granted access to the airport SIDA area for construction projects. It does not grant access to aircraft and is valid only for the area in which their construction is actually taking place and the approved routes to and from that area.

3.05 BADGE ISSUE PROCEDURES

A. All fingerprint and badging requests must be channeled through the TENANT. The following briefly outlines those procedures. For further information and the required paperwork, you may contact the Airport Badge Office at 266-2409. The Airport Badge Office is located at 6040 DeHaviland Avenue. Hours are from 7:00 AM – 4:00 PM, Monday through Friday (closed holidays).

B. Badging is a two step process.

1. The first step is that each person requiring an Airport Identification Badge must submit to a FBI fingerprint based Criminal History Records Check. This takes place at the Airport Badge Office, Monday through Friday from 8:00 am to 2:00 PM. If the Records Check shows no TSA disqualifying criminal offense within the preceding ten years from the date of fingerprint submission the TENANT is notified and the person may proceed to step two. Allow one to two weeks for this process to take place.

2. Step two is the Security and Ramp Driver training. This training class is available at the Airport Badge Office on Monday, Wednesday or Friday at 8:00am.Training takes approximately 90 minutes. Upon completion of step two, an Airport Identification Badge may be issued.

C. In lieu of an Airport Identification Badge, for those employees working in the same area together, there needs to be only one employee with an Airport Identification Badge while the other employees in the area may be issued a visitor badge. Note: there must be an Airport Identification Badged employee monitoring them at all times. A person using a visitor badge is not required to view the training video, but is expected to follow all regulations while on the restricted areas of the airport.

D. Any falsifications can result in revocation of the badges by the party in question, and any fines incurred from the violations will be passed to the responsible party.

E. The request letter will be considered valid for 30 days from the date it was originally signed and dated.

G. Upon issuing an Airport Identification Badge, each badged employee will be issued a set of airport rules and regulations they shall be held responsible for while working in restricted areas of the airport.

H. The fingerprinting fee is $29.00 and badge fee is $10.00. Payment is required at time of service for each. All fees shall be paid by the TENANT.

I. At Airport Operation's option, an Alaska Public Safety Information Network records check will be made on the employee, to include checking current driver's license status for ramp license requests.

J. The TENANT shall be responsible for the maintenance of records necessary to ensure the retrieval of badges from employees and contractor(s).

1. Whenever a badged person's employment authorized by the TENANT is terminated, the TENANT is responsible for immediately recovering the Airport Identification Badge and returning it to Airport Badge and Vehicle Permit Office.

2. When someone terminates employment, the TENANT shall immediately notify the Airport Badge Office at 266-2409 so the badge can be deactivated. If someone terminated his or her employment outside of the normal working hours, the TENANT shall notify Airport Dispatch at 266-2415 of the termination. A fee of $300.00 will be levied against the TENANT for each badge not recovered and turned into the Airport Badge Office from a terminated employee. All badges must be returned to the Badge Office within five (5) days of an employee's termination date or the completion of the project, whichever is sooner.

K. All persons holding an Airport Identification Badge shall immediately notify their employer if they lose their Airport Identification Badge. Employers shall immediately notify the Airport Badge Office at 266-2409 during normal business hours or Airport Safety Dispatch at 266-2415 after normal business hours. The employment status of any person losing a badge will be confirmed by the Badge Office prior to the reactivation their badge. A replacement request letter and a $50.00 lost badge fee is required for a replacement Airport Identification Badge.

L. The ANC requires each TENANT and badge holder to agree to abide by the provisions of this identification program. The TENANT shall designate one or more badge control officer(s) to act as the point of contact for coordination in matters of badge program administration and security matters.

M. Any person requiring a ramp driver's license must first successfully complete the Airport's Ramp Driving Program. This program consists of a one hour classroom presentation including a test. Employees must pass the written test before a ramp license will be issued. Classes are on Monday, Wednesday or Friday at 8:00 AM in the Badge Office. Call 266-2409 for further information or to schedule groups of more than 4 persons.

3.06 VEHICLE ACCESS ON AOA

A. The TSA requires the ANC to control access and prevent unauthorized vehicles from entering the AOA. In compliance with this requirement, the ANC has established procedures to authorize or deny access to the AOA and to identify and control vehicles while in the AOA.

B. Proper individual identification, ramp operator's licenses, and vehicle permits must be obtained through Airport Badge and Vehicle Permit Office before attempting to enter an Air Operations Area.

3.07 VEHICLE IDENTIFICATION STANDARDS

A. All TENANT vehicles requiring access to the AOA shall display a temporary ramp access permit as issued and instructed by Airport Badge and Vehicle Permit Office. Permits for temporary access shall be available from 7:00 AM to 4:00 PM Monday through Friday at the Airport Badge and Vehicle Permit Office, located at 6040 DeHavilland, phone 266-2409. All permit requests must come through each TENANT's Badge Control Officer.

3.08 AREA OF AUTHORIZATION

A. TENANT vehicles are only authorized in the areas where their contract work is being performed and on the access routes to and from that area.

3.09 AUTHORIZED VEHICLES

A. Any TENANT vehicle is authorized onto the AOA when it is within its area of authorization, the temporary ramp permit is properly displayed, and all occupants have the required airport identification properly displayed.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 - GENERAL

1.1 PRODUCTS FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Templates and other installation data required prior to hardware delivery, or at fabricators located off the job site. Furnish in a timely manner per construction schedule.

1.2 RELATED SECTIONS

A. Section 08110 - Steel Doors and Frames

B. Section 08465 – Automatic Sliding Entrance Doors

C. Section 08711 - Door Schedule

D. Section 08911 - Aluminum Curtain and Window Walls

E. Section 13710 – Access Control System

1.3 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this Specification. Publications may be referred to in the text by basic designation only. In case of conflict the most stringent shall govern:
   1. Underwriters Laboratories, Inc. (UL) - Fire Resistance Index, and Building Materials Directory.
   2. National Fire Protection Association (NFPA) - Standard for Fire Doors and Windows, No. 80.
   3. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA) A156 series as specified.
   4. American Society of Testing and Materials (ASTM) ASTM D1056 - Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
   5. ASTM D2497 - Tolerances for Man-Made Organic Base Filament Single Yarns.
   6. Americans with Disabilities Act (ADA) Accessibility Guidelines (ADAG).

1.4 PERFORMANCE REQUIREMENTS

A. When manufacturer and model number is given, it shall be used to establish minimum equivalent technical data and performance requirements for other manufacturers unless "no substitute" is specified.

B. Substitutions per Specification Section 01600 – Material and Equipment.

1.5 FIRE RESISTIVE OPENINGS

A. When a fire-resistive classification is scheduled, provide hardware compatible with the Underwriters Laboratories (UL), Warnock Hersey or other testing agency approved by building authority listed for condition of use required by the opening assembly.

B. Entire opening assembly shall be compatible and function in compliance with the Uniform Building Code (UBC) Standard 7-2 as amended by local building authority.

1.6 SUBMITTALS

A. Samples may be required for any proposed alternatives to hardware listed to establish equivalency. Samples will be returned after inspection.

B. List manufacturers, model numbers, key schedule, and location and mounting heights of hardware in completed work. Use Contract Document door designations. Provide abbreviation legend for abbreviations used.

C. Manufacturer's certificate that fire rated hardware meets specified requirements.

D. Manufacturer's descriptive literature for each different item.

E. Vertically schedule (list) each door opening separately. Use Contract Document door designations.

F. Maintenance-Adjustment Manuals and parts list with name and telephone number of stock location.

G. Indicate location of closers on doors and frames.

H. Supply templates to door and frame manufacturers, to enable proper sizing and locations of cut outs and reinforcements for hardware.

I. Manufacturers experience qualification.

1.7 QUALITY ASSURANCE

A. Manufacturers: Companies specializing in commercial building hardware in the U.S. for the past 5 years minimum.

1.8 MANUFACTURER ASSISTANCE

A. Provide assistance of the finish hardware supplier representative knowledgeable in the system specified for the following meetings in Anchorage, Alaska.
   1. Final Installation and adjustment and maintenance of Door Hardware: Minimum 8 hours.

1.9 PACKAGING AND MARKING

A. Single group of hardware packaged separately for each opening complete with all necessary accessories, fasteners, and templates.

B. Mark each package with group numbers corresponding to the approved hardware schedule identifying its contents and location in the completed work.

1.10 DELIVERY AND STORAGE

A. Hardware shall be checked upon arrival to job site and acceptance verified by the DEPARTMENT Representative in writing.

B. Hardware shall be adequately protected from corrosion and pilferage until acceptance of building.

1.11 MAINTENANCE ACCESSORIES

A. Provide special field adjustment and maintenance tools, such as special screwdrivers and wrenches, and dogging keys for each different item supplied.

1.12 EXTRA HARDWARE

A. For subsequent repair and maintenance by DEPARTMENT provide hardware matching that installed in new work.
   1. 2 door closers.
   2. 2 locksets. (Office entry function).
   3. 1 rim exit device.
   4. 2 door sets of weather stripping.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide items as listed in schedule and as specified for "Typical" door installations. If not scheduled or noted, provide specified items for each hardware group.

2.2 FINISHES

A. Exterior: ANSI A156.18 No. 630 Satin Stainless Steel (US 32D Stainless Steel, satin finish)

B. Interior: ANSI A156.18 No. 652 Satin Chrome plated (US 26D Brushed Chrome).

C. Matte Aluminum paint for door closers.

D. Mill finish aluminum for weatherstrip and seal moldings.

E. Exit Devices: Clear anodized aluminum body with brushed stainless steel touch bar.

2.3 MOUNTING ACCESSORIES

A. Screws, bolts, escutcheons, brackets and similar supplemental items as necessary and recommended by manufacturer for conditions of use for complete functional use. Provide stainless steel fasteners which are compatible with both hardware and substrate which will not cause dissimilar metal corrosion. Mount surface hardware on doors with shouldered thru-bolts.

2.4 HINGES (TYPICAL)

A. Full mortise, plated steel with steel pins at interior, stainless steel with stainless steel pins at exterior: Stanley, Hager, McKinney or Lawrence.

B. Heavy weight hinges not less than 0.180 inches thick on exterior doors, doors over 3 feet wide, and doors over 100 pounds.

C. Standard weight hinges not less than 0.134 inches thick on interior doors three feet and less in width.

D. Doors up to 7 feet high shall have 3 hinges.

E. Use ball bearing hinges on doors with closers.

F. Hinges on lockable doors shall have non-removable pins secured with setscrew in barrel or other method tamperproof when door is closed.

G. Width of hinges shall be sufficient to clear trim detail conditions and provide up to 180-degree door swing or until door returns to adjacent wall.

H. 4-1/2 inch minimum height of hinges. For doors over 3 feet wide use 5-inch high hinges.

2.5 MORTISE LOCKSETS

A. Heavy duty commercial mortise type ANSI A156.13 Grade I operational of one manufacturer and design: Corbin Russwin ML2000 Series or equivalent Sargent 8100, or equivalent Schlage L series with threaded cylinder enclosure ready to receive DEPARTMENT provided MEDECO 6-pin biaxial interchangeable key core specified in KEYING.

B. Backset 2-3/4 inch.

C. 3/4-inch latch throw. Provide locking doors with auxiliary latch. Dead bolts not allowed.

D. Operating Handles: approximately 4-1/2-inch cast lever handle curved to within ½ inch of door face with wrought 7-1/2 by 2-1/4 inch escutcheon trim plate. Knurled or abrasive coating at outside of utility, mechanical and electrical rooms.

E. UL listed for use on fire resistive doors.

F. Boxed strike with extended curved lip to fit jamb.

2.6 KEYING

A. DEPARTMENT will provide MEDECO 6-pin biaxial interchangeable key core for locks and exit devices. Contractor shall provide cylindrical threaded lock housing that will accept this core for each lock provided.

B. DEPARTMENT will provide MEDECO interchangeable “construction” key cores and 20 construction keys. A cash deposit refunded upon return of construction keys will be charged. At completion acceptance of work DEPARTMENT will provide and install permanent key cores and keys.

2.7 CLOSERS (TYPICAL)

A. UL and UBC 7-2 positive pressure fire listed cast iron shell with steel rack and pinion-piston type surface mount rectangular enclosure non-handed, field adjustable for interior and exterior doors to 48 inch wide rated for heavy duty high-use by manufacturer for conditions of use: LCN 4041, or equivalent Norton, or Corbin Russwin.

B. Adjustable closing speed, 3 second maximum from 70 degrees to 3 inches from the latch for accessible use separate adjustable latching speed and separate adjustable back check.

C. 5-pound adjustable maximum opening pressure on interior non-fire rated doors.

D. Through mounting bolts with spacers or sex bolts and mounting bracket adaptors as necessary for door and frame conditions. Special extra clearance mount arms so that weather striping and sound seals and smoke seals are not cut, and clearance is provided for overhead stays and coordinators. Mount closer on inside of exterior doors, and room side of corridor doors.

E. Fire resistant and low temperature fluid for satisfactory operation to 30 degrees F and no permanent damage if subjected to minus 30 degrees F.

F. Closers may be regular arm type or heavy-duty parallel arm type as required for mounting on room side of corridor doors and inside of exterior door.

G. Full metal cover.

H. Closer mounting appurtenances shall permit door to open as far as construction permits.

2.8 EXIT DEVICES

A. Horizontal Surface Touch Bar: Von Duprin 98 Series or as approved.
1. Rim or vertical surface rod type as scheduled.
2. Electric Mortise Lock: Remote lock and unlock without retracting latch bolt on security doors: Von Duprin E7500.
3. Outside Trim on Pull Side: Round bar lever handle operation with vandal resistant breakaway or free wheeling feature and key cylinder lock. Lever handle curved to within ½ inch of door face: Von Duprin No. 03. Key unlocks and locks lever.
4. Vertical rod and latch guard: protects bottom rod from impacts stainless steel: Von Duprin RG-27 or as approved.
5. UL listed as accident – panic and fire hardware.
6. Keying: DEPARTMENT provided cylinder as specified in KEYING.
7. Roller strike plate.
8. Shims as necessary over vision light moldings.
9. Self-contained “request to exit” signal switch – on security doors.
10. Self-contained signal switch monitoring touch bar and latch bolt – on security doors.
11. Self-contained electric latch retraction.
12. Self-contained delayed exit device and associated electrical accessories for controlled egress.

B. Operation:
1. When exit device is operated, alarm will sound along with rapid flashing of indicator light. Push pad will remain in locked state for predetermined period of delay. After delay period, push pad will unlock allowing retraction of latch bolt permitting egress.
2. Time delay shall be factory set to 15 seconds.
3. Depression of exit device for more that 2 seconds shall signal internal audible alarm. Momentary depression of exit shall not operate delayed release or signal alarm in order to eliminate nuisance alarms from casual touches.
4. Connect to fire alarm system to automatically release lock when fire alarm is active.

C. Control unit operating modes:

1. Emergency safe exit mode where door is immediately released and alarm sounded upon safety alarm or power failure. System shall be manually reset.
2. Secure mode with alarm and conditional release: When exit device is operated, alarm sounds and electromagnetic lock is activated to hold door closed for 15-second delay. Alarm shall be manually reset.
3. Authorized exit mode: Authorized exit through use of card reader allows release of door without sounding alarm.
4. Acceptable manufacturer: Von Duprin “Chexit” or approved equal.

D. Provide with interface control module, power supply and other accessories needed for proper operation.
1. 24 VDC 2 amp/12 VDC 4 amp, regulated, UL listed, power supply with keylock and batter backup (2 hours minimum).
2. 19 gage steel housing.
3. Acceptable manufacturer: Von Duprin PS873-BK or approved equal.

2.9 AUTOMATIC FLUSH BOLTS

A. Concealed mortise type for door pairs inactive leaf: top and bottom bolts: Door controls INC 800 series, Trimco 3800 Series, or Glynn-Johnson FB 30/40.
1. U.L. Listed for fire doors.
2. Strikes to fit jambs detailed. Dust proof floor strike.

2.10 AUTOMATIC DOOR COORDINATOR

A. U.L. listed for fire doors, for door pairs with astragal, to ensure inactive door closes prior to active door stop mount rectangular bar type with filler: Door Controls International 600 Series, Hager 279, Trimco 3094, or Glynn-Johnson COR.

2.11 EXIT DEVICE SIGN

A. Sign reading: “EMERGENCY EXIT-KEEP PUSHING THIS DOOR WILL OPEN IN 15 SECONDS. ALARM WILL SOUND.” Sign lettering shall be at least 1-inch high with minimum stroke width 1/8 inch.

B. Sign material shall be non-glare light colored letters on dark background vinyl adhesive applied film.

C. Install above and within 12-inches of each delayed device on door.

2.12 ASTRAGAL

A. Provide for door pairs with fire rating over 20 minute: U.L. listed 2 inch by 3/16 inch steel astragal, prime painted: Pemko 357SP or equivalent Stanley or Zero.

B. Door pairs without fire rating: "T" shaped concealed screw attach with pile sound seal: Pemko 355 or equivalent Stanley or Zero.

2.13 BALANCED MAGNETIC SWITCH

A. Balanced magnetic type switches signals door position.

B. Device shall consist of two units mounted adjacent to each other in door and frame.
   1. Switch unit: Doorframe mounted containing magnetic switch.
   2. Magnet unit: Door mounted, containing permanent magnet.

C. Acceptable manufacturer; Sentrol 2767 High Security or approved equal.

2.14 ELECTROMAGNETIC LOCKS

A. Concealed into jamb shear type, comply with ANSI 156.23 UL listed, 12 volt, beveled edge. Provide type to accommodate door application:
   1. Single door application; Vertical mount; Acceptable manufacturer: Von Duprin SL4120 Series RC12 or approved equal.
   2. Double door application; Horizontal mount; Acceptable manufacturer: Von Duprin SL4110 Series RC12

B. Holding force: 1775 pounds.

C. Provide with interface control module, power supply and other accessories needed for proper operation.
   1. 24 VDC 2 amp/12 VDC 4 amp, regulated, UL listed, power supply with keylock and battery backup (2 hours min.)
   2. 19 gage steel housing.
   3. Acceptable manufacturer: Von Duprin PS873-BK or approved equal.

2.15 ELECTRICAL POWER TRANSFER (EPT)

A. Electric power transfers compatible with hardware being installed, electrical requirements, and access control functions. Transfers transfer electrical current and signal from frame to door.

B. Type: Door/frame mount. Unit shall be completely concealed when door is in the closed position. 180-degree door swing, 10 conductor, 24 gage, 1 amp Von Duprin EPT-10, or approved equal.

2.16 ELECTRIC STRIKES

A. Allow release of locked door without retracting latch bolt through release of electric strike lip. When door closes, latch bolt rides up over lip and secures in pocket.

B. Compatible with 3/4 inch latch bolt throw.

C. UL listed for fire and Burglary-Resistant Electric Strike Doors.

D. Fail secure feature (FSE): On loss of power, strike is locked.

E. Voltage: 12 VDC

F. Gold plated contacts for low current operation.

G. Mounting:
   1. Jamb mount for use with mortise lock without deadbolt; Acceptable manufacturer: Von Duprin 6213 FSE with monitor switch option, or approved equal.

2. Door mount for use without deadbolt, Acceptable manufacturer: Von Duprin 6223 FSE with monitor switch option, or approved equal.

H. Provide with interface control module, power supply and other accessories needed for proper operation.
   1. 24 VDC 2 amp/12 VDC 4 amp, regulated, UL listed, power supply with keylock and battery backup (2 hours min.)
   2. 19 gage steel housing.
   3. Acceptable manufacturer: Von Duprin PS873-BK or approved equal.

2.17 MANUAL FLUSH BOLTS

A. Mortise extension lever type UL listed for fire door 12-inch minimum extension length per ANSI A156.16 type L 04081.

B. Install in pairs, 1 at top and 1 at bottom.

C. Dustproof floor strike, use wood, concrete, or threshold type floor installation as required.

2.18 DOOR KICK AND ARMOR PROTECTION PLATES

A. Satin finish stainless steel, at least 0.05 inch thick and 2 inches less than door width, or as required to fit special door seals per ANSI A156.6.

B. Kick plates: 10 inches high.

C. Mop plates: 4 inches high.

D. Armor plates: 40 inches high.

E. Provide 1 kick plate at push side of door for all doors with closers and when scheduled. When kick plate is scheduled together with armor plate install on pull side. Kick plates both sides scheduled as "2 kick plates".

2.19 PUSH PLATE

A. Satin finish stainless steel 15 inch by 6 inch by 1/8 inch cut out for cylinder where scheduled, beveled 4 sides with square corners per ANSI A156.6. Attachment screws to match plate finish.

2.20 PUSH BAR

A. 1 inch round solid stainless steel bar 90 degree end return 2 inch projection by 3-1/2 inch less than door width: per ANSI 156.6 type J501.

2.21 DOOR PULL

A. 1 inch round solid stainless steel bar 90 degree end return 2-1/4 inch projection by 10 inch center to center long through bolt per ANSI A156.6 type J401.

B. Mount on stainless steel 15 inch by 3 inch by 1/8 inch ANSI A156.6 plate. Cut out for cylinder where scheduled.

2.22 DOOR STOPS

A. Provide for all doors, preventing knobs, lever handles and pulls from striking wall surfaces or other doors. Provide floor stops where wall stops not possible. Not required when overhead door stay scheduled.
   1. Wall stops: 2-3/8 inch round resilient-rubber: with metal mount screw attach: ANSI A156.16 grade 1, type L0210.
   2. Floor stops: Metal-rubber: dome type screw and peg attach: ANSI A156.16 Grade 1, Type L0216 as necessary for door and floor construction.

2.23 DOOR HOLDERS

A. Door surface mount, plunger type, with rubber tip per ANSI A156.16 type L01411.

2.24 THRESHOLDS (TYPICAL)

A. Exterior: Extruded aluminum full width single piece at exterior doors. 6 inch by 1/2 inch with anti-slip fluted top in accord with ANSI/BHMA A156.21: J32130, Pemko 172A or equivalent Zero or Reese.

B. Interior: Extruded fluted aluminum full width single piece at fire-rated doors. Not required at 20-minute doors. 2-1/2 inch by 5/16 inch Pemko 166A or equivalent Zero or Reese. Use carpet separator threshold specified below where carpet occurs on both sides of fire rated door, and at exterior vestibules.
   1. Carpet Separator Threshold: Extruded aluminum full width single piece 4 inch wide by 7/16 inch high saddle with fluted top in accord with ANSI/BHMA A156.21 J32140: Pemko 2364A or equivalent Zero or Reese.
   2. Carpet-to-vinyl, carpet-to-concrete, and vinyl-to-concrete separator threshold: Extruded aluminum full width single piece 2-1/2 inch wide by 3/8 inch high saddle with fluted top and offset in accord with ANSI/BHMA A156.21 J32180: Pemko 174C or equivalent Zero or Reese.

2.25 WEATHERSTRIPPING

A. Dense layered plastic bristle brush weatherstrip. Install at exterior doors and interior vestibule doors. Brush fibers fused into place, flexible at minus -30 degrees F. held in extruded aluminum holder-mount with pre-punched pre-slotted holes for mounting with screws. Mount on inside warm face. ANSI and Sealeze Corporation numbers listed, equivalent Pemko, or Zero acceptable.

B. Full-length single piece.

C. U.L. listed when used on fire doors.

D. Door Top and Side Jambs: 40 to 45-degree angle mount, 3/8 inch brush ANSI R3A36 Sealeze J140.

E. Door Bottom: 1-inch brush; ANSI R3A415 and Sealeze D480.

F. Paired Doors Meeting Rails: 1/2-inch brush; ANSI R3A635 and Sealeze C380.

G. Manufacturers standard pile or nylon brush weatherstripping is acceptable for aluminum doors. Coordinate with door manufacturer.

2.26 SMOKE SEALS

A. 1/4-inch compressible silicone rubber bulb seal ANSI R0E154, self-adhesive mount to door head and side jambs. Install at 20-minute smoke rated and at fire door assemblies.
   1. UBC Standard 7-2 positive pressure tested for fire rated assemblies.
   2. Pemko S88 - Silicone Seal, black color, or approved.
   3. Pemko 305DN overlapping neoprene at door pair meeting rails.

2.27 (DESIGN MEMO 36)FIRE DEPARTMENT KEY BOX

A. Hardened steel plate recessed in wall approximately 7 inch W by 7 inch H by 5 inch D double entry lock, neoprene weather seal, dark bronze color: KNOX 4400-R telephone 800/552-5669 or equal as approved by Fire Department.

B. Build into exterior wall near main entry where directed by DEPARTMENT.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the DRAWING details and field conditions for defects that will adversely affect the work, and for deviations beyond allowable tolerances.

B. Beginning of installation shall mean acceptance of the interfacing surfaces as capable of producing an acceptable job.

3.2 SOLID BACKING

A. Provide within structure and doors for hardware mounting, including wall doorstops and closers. Coordinate as required during construction. Provide special mounting accessories, built-in if required.

3.3 MOUNTING LOCATION

A. Per ADAG, approved submittals, manufacturer's standard practice and coordinated with door and frame manufacturers.

B. Closers shall be mounted on least trafficked side of door, i.e.: Mount on boiler side of corridor to boiler room door. Mount closers on interior side of exterior doors and on room side of corridor doors.

C. Mount resilient weatherstrip on inside of door assembly to form vapor retarder.

D. Other Mounting Shall Be As Follows:
   1. Wall DoorStop: lockset handle to strike center of stop.
   2. Exit Device Operating Bar: 37 inches from finished floor to center.
   3. Pull Plates: 42 inches from finished floor to center 5-inch backset to center of push and pulls.

3.4 INSTALLATION

A. In accord with applicable ANSI standards, approved submittals, the manufacturer's written instructions and ADAG for the conditions of use. Install closers and closer arm with bolts through doors and frames.

B. Do not install surface mounted items until finishes are completed on substrate. Coordinate as necessary. Remove hardware after fitting if necessary for painting and reinstall.

C. Apply exterior hardware with gaskets or in continuous silicone sealant bed specified in Section 07920 - Joint Sealants. Do not cut weatherseal at closers.

D. Electrical device installation:
   1. Perform work in accord with National Electrical Code as amended locally using applicable portions of Division 16 – Electrical.
   2. Coordinate exact location for electrical power and control wiring connections.
   3. Verify electrical power and control is operative.

3.5 FINAL ADJUSTMENT

A. Per manufacturer's written instructions, including cleaning and lubrication and to meet ADAG.

B. Adjust doors, compensating for completed, operating heating system. Latches and bolts shall engage keepers in latched position and not rattle.

C. Doors with closers shall close and latch without assistance.

D. Doors shall open and close smoothly and easily with 1 hand. Weather-strips, smoke gaskets, and sound seals shall be in continuous contact in latched position.

3.6 CLEANING

A. Remove shipping labels and leave hardware surfaces clean.

3.7 TYPICAL HARDWARE GROUPS

A. Provide 1 set for each opening.

B. Provide typical items such as hinges, thresholds and weatherstrips as specified under "Products" and as shown on DRAWINGS for each set.
   1. Provide unique items such as locksets and closers according to Door Hardware Schedule. ANSI A156.13 (mortise locks) lock functions listed.
      a. F01 “Passage” function: Latch bolt operated by lever from either side at all times.
      b. F04 “Entry” function: Latch bolt operated by lever either side except when outside lever is made inoperative by toggle on case strike face; when outside lever locked, latch bolt is retracted by Key outside or by operating lever inside. Auxiliary dead latch, no deadbolt.
      c. F07 “Storeroom” function: Latch bolt operated key outside or by lever inside. Outside lever always inoperative. Auxiliary dead latch, no deadbolt.
      d. F22 “Privacy” function: Latch bolt operated by lever from either side except when locked by turn inside and by emergency release from outside.

C. Include any special maintenance adjustment tools necessary.

D. Refer to DRAWINGS and Door Schedule for locations and details. “Security 1, etc:” Coordinate with Section 13710 – Access Control System and DRAWINGS X701 and X702.

3.8 DOOR HARDWARE SCHEDULE

1. Hardware Group 1 – elev, sto, chase, shaft
   1 Lockset FO7 Storeroom Function
   1 Closer
   1 Mag Switch
   1 Kickplate – no plate on Level 4
2. Hardware Group 2, **Security 4 or Security 11** – exit, corr, into stairs
   1 Rim Exit Device
   1 Closer
   1 Mag Switch
   1 Power Transfer
3. Hardware Group 3, **Security 11** – stair, hall
   1 Rim Exit Device
   1 Closer
   2 Kickplates - no plates on aluminum doors
4. Hardware Group 4 – pair – hall, fan-to-fan
   1 Lockset FO7 Storeroom Function
   1 Closer
   1 Pair Manual Flush Bolts
   4 Kickplates
   2 Door holders
5. Hardware Group 5 – hall to toilet
   1 Lockset F22 Privacy Function
   1 Closer
   2 Kickplates
6. Hardware Group 6 – shower, toilet
   1 Lockset F22 Privacy Function
   2 Kickplates
7. Hardware Group 7 – break room, ATO, office, lounge
   1 Lockset FO4 Entry Function
   1 Closer
   1 Door holder where not fire rated
   2 Kickplates

8. Hardware Group 8 – Pair, **Security 2** – hall to sto, bag to PPO, recycle vest
   1 Lockset FO7 Storeroom Function
   2 closers
   1 Pair auto flush bolts
   1 Auto coordinator
   1 Electric strike (inactive leaf)
   1 Power transfer
   2 Mag switches
   1 Astragal
   2 Kickplates – no plates on Level 4
9. Hardware Group 9 – **Security 3** – hall to MDF, elev, PPO, Jan
   1 Lockset FO7 Storeroom Function
   1 closer
   1 Electric strike FSE
   1 Mag switch
   1 Kickplate – no plate on Level 4
10. Hardware Group 10, vest to Fan
   1 Lockset FO4 Entry Function
   1 Closer
   1 Pair Manual Flush Bolts
   4 Kickplates
   2 Door holders
11. Hardware Group 11, access door
   1 Lockset FO7 Storeroom Function
12. Hardware Group 12, Pair **Security 2** – exit opening
   Reuse existing hardware
   Add:
   1 Electric Strike (inactive leaf)
   2 Mag switches
   1 Power transfer
13. Hardware Group 13, Pair – hall to sto
   1 Lockset FO4 Entry Function
   2 Closers
   1 Astragal
   1 Pair Auto Flush Bolts
   1 Auto coordinator
   2 Kickplates
14. Hardware Group 14, **Security 5** – into bag, hall into vest
   1 Lockset FO4 Entry Function
   1 Closer
   1 Electromag lock
   1 Mag Switch
   2 Kickplates
15. Hardware Group 15 – bag to ramp exterior
   1 Lockset FO4 Entry Function
   1 Closer
   2 Kickplates

16. Hardware Group 16, **Security 3** – exterior, hall to Airline
    1 Lockset FO4 Entry Function
    1 Closer
    1 Electric strike FSE
    1 Mag switch
    2 Kickplates

17. Hardware Group 17 – **Security 7**
    2 Exposed Rod Exit Devices
    2 Closers
    2 Mag Switches
    2 Electromag Locks
    2 Power Transfers
    2 Armor Plates
    2 Kickplates
18. Hardware Group 18 - **Security 6**
    1 Rim Exit Device
    1 Closer
    1 Electromag Lock
    1 Power Transfer
    1 Mag switch
    1 Kickplate
19. Hardware Group 19 – chase closet, sprink cab
    1 Lockset FO7 Storeroom Function
    1 Kickplate
20. Hardware Group 20 – Double – 2-way hall
    2 Rim Exit Devices
    2 Push plates
    2 Closers
    4 Kickplates
21. Hardware Group 21, Pair, **Security 8** –into staging, elev to ATO
    1 Lockset FO4 Entry Function
    2 Closers
    2 Electromag locks
    1 Pair Auto flush bolts
    1 Auto coordinator
    2 Mag switches
    1 Astragal
    4 Kickplates
22. Hardware Group 22 – stair out
    1 Rim Exit Device
    1 Closer
    1 Kickplate – no plate on aluminum doors
23. Hardware Group 23, Pair, **Security 1** – hall out
    2 Exposed Rod Exit Devices
    2 Closers
    2 Electromag Locks
    2 Power Transfers
    2 Mag Switches
    2 Kickplates

24. Hardware Group 24, **Security 10** – gate to stair
    1 Rim Exit Device
    1 Closer
    1 Mag Switch
    1 Power transfer
    2 Kickplates
25. Hardware Group 25, **Security 9** – Load bridge to gate
    1 Rim Exit Device
    1 Closer
    1 Electric Strike FSE
    1 Mag Switch
26. Hardware Group 26, Aluminum – Skycap
    1 Lockset FO4 Entry Function
    1 Closer
27. Hardware Group 27, **Security 6** - mid stair, hall to stair
    1 Rim Exit Device
    1 Closer
    1 Electromag Lock
    1 Power Transfer
    1 Mag Switch
    2 Kickplates
28. Hardware Group 28, **Security 5** – onto roof, hall to aisle
    1 Lockset FO4 Entry Function
    1 Closer
    1 Electromag Lock
    1 Mag Switch
    1 Kickplate – no plate on Level 4
29. Hardware Group 29, Pair – roof mech replace
    1 Lockset FO7 Storeroom Function
    1 Pair Manual flush bolts
    2 Door holders
30. Hardware Group 30, Pair, **Security 8** – no fire rate – onto roof chiller
    1 Lockset FO4 Entry Function
    1 Electromag Lock (active leaf)
    1 Pair Manual flush bolts
    1 Power Transfer
    2 Mag Switches
    2 Kickplates
31. Hardware Group 31, **Security 3** – roof into stair
    1 Lockset FO7 Storeroom Function
    1 Closer
    1 Electric Strike FSE
    1 Mag Switch
32. Hardware Group 32, fire rated – RR Tunnel
    1 Rim Exit Device
    4 Hinges
    1 Closer
    1 Kickplate

END OF SECTION

SECTION 15010

MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: This Section outlines the general design requirements for mechanical systems at ANC (Ted Stevens Anchorage International Airport). Refer to other Division 15 sections for additional requirements including standards for material and construction quality.

B. Index of Mechanical Requirements:

15010	Mechanical Design Requirements
15060	Supports, Anchors and Penetrations
15070	Mechanical Sound, Vibration and Seismic Control
15075	Mechanical Identification
15080	Mechanical Insulation
15170	Motors
15300	Fire Protection
15400	Plumbing
15450	Plumbing Equipment
15455	Oil Water Separators
15483	Fuel Gas Systems
15510	Hydronic Piping and Specialties
15540	HVAC Pumps
15550	Heat Generation
15560	Direct Fired Gas Makeup air Units
15640	Chilled Water Cooling System
15720	Component air Handling Units
15730	Equipment Room Air Conditioning Units
15830	Terminal Heat Transfer Units
15850	Fans
15880	Air Distribution
15900	Building Automation System
15910	Control Instrumentation and Hardware
15915	Variable Frequency Drives
15940	Sequences Of Operation
15945	Controls Testing and Acceptance
15990	Testing, Adjusting, and Balancing

1.2 REFERENCES

A. Codes: Design all work in strict 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 and local amendments thereto:

1. International Building Code (IBC).
2. International Mechanical Code (IMC).
3. Uniform Plumbing Code (UPC).
4. International Fire Code (IFC).
5. NFPA 70 - 1999, National Electric Code (NEC).
6. ANSI A117.1 - 1998 Accessible and Useable Buildings and Facilities

1.3 GENERAL REQUIREMENTS

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

B. A Mechanical Contractor licensed by the State of Alaska shall install the Tenant's mechanical 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 mechanical 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 sprinkler and controls shop drawings.
2. O&M Data. These include O&M manuals, Controls drawings and data files, Testing and Balancing reports, etc. Refer to technical sections. Tenant information shall be prepared to be a separate “Appendix” to existing O&M information.
3. Record Drawings as described in RECORD DRAWINGS.

F. Construction phase submittals shall be reviewed and approved by Tenant's Engineer 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 PROJECT CONDITIONS

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

B. Mechanical 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. Drawings and Specifications may not reflect as-built conditions, and it shall

be the responsibility of the Tenant and the Tenant's Engineer to verify current documents to determine actual conditions that will be encountered during construction.

C. Fire Protection Systems

1. Provide sprinkler protection to the tenant spaces. All areas of the terminals are presently sprinklered. Under the basic construction in C-Concourse, upright heads suitable for protecting exposed structure have been installed in unfinished spaces. Revisions of the sprinkler system to suit the tenant improvement shall be done by the Tenant as part of Tenant build-out.

2. New sprinkler zones required by Tenant (as deemed necessary by the Fire Marshall) shall be provided to the space at Tenant expense.

3. Submit and obtain approval of sprinkler shop drawings prior to installation. Refer to Section 15300 for more information regarding sprinkler systems.

D. Plumbing Systems

1. General

a. All plumbing drawings must be submitted to the ANC for review and approval prior to construction.

b. Submit a plumbing fixture schedule with fixture connection sizes and fixture unit demands.

c. Water heaters are generally not required for most non food producing Tenants because the ANC has a central water heating system. Maximum water temperature is 140 degrees F. Provide tempering valves as necessary for hand sinks and showers.

d. Cold water, hot water, and hot water circulation water mains are located near each tenant are for use by the Tenant. The central water heating facility is adequately sized for normal office type hot water usage such as break room sinks, restrooms, and other ordinary uses. It is also sized for anticipated food service needs by the food service concession. It is not sized for large process loads such as vehicle washing systems.

e. Plumbing waste and venting systems are to be available for connection of fixtures.

f. The Airport has experienced extensive corrosion in the past on drain lines from food service areas, presumably from soft drink dispensers. For this reason, drains to the food service areas shall be chemically resistant.

g. ANC will not provide grease interceptors at the terminal. There is no service available in the local area to remove the grease from interceptors, and the Municipal landfill will not accept grease in the large volumes that come from interceptors. Grease traps to service individual fixtures or groups of fixtures shall be provided by the Tenant as part of the tenant build-out. Cleaning and maintenance shall be the Tenant's responsibility.

h. Drains serving areas where motor vehicles operate shall be protected by an oil/water separator system provided and maintained by Tenant.

E. Heating Systems

1. Heating mains routed through the terminal provide space heating needs. Heating medium is water; supply temperature is 190 Degrees F. Heating devices shall be designed with a maximum of 30 Degrees temperature drop of the heating water. The heating system has been designed to provide adequate water flow to maintain the building temperature at design heating conditions, including heating requirements for ordinary ventilation.

2. Distribution piping in C-Concourse has many valved and capped stub-outs to future terminal heating devices in tenant areas. Some of the stub-outs are designed for perimeter heating. Other stub-outs are designed for reheat coils associated with VAV terminal units. Refer to Concourse C - Phase 2 - Building Completion drawings for heating flow allocations to each stub-out. Flows in excess of the allocations will not be allowed.

3. Where multiple tenants draw from the same flow allocation, the flow shall be prorated between tenants.

F. Cooling Systems

1. Space cooling is available through the ventilation system in most areas of the terminal. Supply temperatures are typically 55 Degrees F for most systems. Refer to Ventilation below.

2. Supplemental cooling is available in C-Concourse at each floor from the chilled water system. The chilled water system circulates a propylene glycol solution at 42 Degrees F. during the summer months when the chillers are in operation. During the winter, the cooling towers are used as a dry cooler, with temperature controlled to 50 Degrees F. Temperatures may be higher in the spring and fall. The system is used primarily for equipment room air conditioners that use the chilled water system for cooling the air conditioner condensers. Coordinate with ANC for points of connection to existing risers located in many of the ventilation shafts.

G. Ventilation

1. C-Concourse: Conditioned air supply has been provided to each Tenant space. The air distribution system has been sized for the estimated total heating and cooling requirement of the Tenant lease space and is terminated with capped duct connections within each Tenant lease space. Refer to Concourse C - Phase 2 - Building Completion drawings for locations of outlet connections.

2. The Tenant shall furnish VAV boxes, thermostats, low velocity ductwork, diffusers, and return air grilles to suit the Tenant's need as part of the initial build-out. In subsequent remodels, existing HVAC equipment may be re-used at the Tenant's discretion.

3. The allocated capacity of each outlet is indicated on the drawings, and the VAV terminal schedule. Tenants shall work within the allocated flows.

4. Temperature of the air supplied through the VAV trunk ducts is scheduled to be delivered on the following schedule:

Outside Air Temp	Mixed Air Temp
Minus10 degrees F.	65 degrees F.
55 degrees F.	55 degrees F.

5. Where multiple tenants draw from the same flow allocation, the flow shall be prorated between tenants.

6. Additional connections to the trunk ductwork may be requested in writing during the design process.

7. Return air ducts have been extended to certain areas. Refer to the drawings for locations of these ducts.

H. Environmental (toilet) exhaust

1. The environmental exhaust exhausts for C-Concourse were designed with additional capacity to serve tenants. The designed total capacity of each system is indicated on the Concourse C - Phase 2 - Building Completion drawings.

2. The excess capacity of any environment exhuast system shall be prorated among tenants. Permission to connect to any environmental exhaust system will be dependent on the availability of capacity. Coordinate with ANC for determination of what is available. Provision of environmental exhaust beyond what is currently furnished to the tenant area is the responsibility of the Tenant.

3. Connection points to the environmental exhaust systems shall be at the duct risers at the ventilation shafts.

4. Existing horizontal ductwork serving ANC toilet facilities may not be used for tenant exhaust , except that minor exhaust flows may be accepted with prior ANC approval where the additional flow does not exceed the capacity fo the ductwork.

5. Penetration of the ventilation shafts with environmental ducts may require installation of fire and smoke dampers in accordance with the adopted Building Code.

I. Makeup Air

1. Design of the central ventilation system includes allowances for makeup air purposes for general environmental exhaust for toilet rooms, and for general food service areas with small cooking hoods.

2. There is no allowance for the area designated for large commercial kitchen. Separate makeup air units shall be provided as part of the tenant build-out of this area.

3. The Tenant shall provide makeup air systems for any process exhaust system.

J. HVAC Controls

1. The existing control system is LonWorks based. Refer to 15900 for specific control system design and installation requirements.

2. The Tenant shall provide compatible controls for new equipment installed by the Tenant. In general, the extent of controls work under tenant improvement is limited to installation and programming of the field devices in the tenant area. Coordination with ANC for integration of the new controls into the existing controls is required. Refer to Section 15900.

3. Refer to Section 15940 for specific requirements for Sequences of Operation, monitoring, and alarming.

1.5 SUBMITTALS

A. Professional Mechanical 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. Preliminary Design Submittal: Submit prior to preparing construction documents to demonstrate compliance with these Tenant Mechanical Requirements.

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

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

C. Construction Phase Submittals

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

a. Sprinkler shop drawings and calculations. Refer to Section 15300.

b. HVAC Control drawings, diagrams, and software. Refer to Section 15900.

2. Commissioning Certifications. Refer to Section 15945.

3. O&M Manuals approved by the Engineer - See OPERATIONS AND MAINTENANCE MANUALS.

4. Record Drawings - See RECORD DRAWINGS.

5. Testing and Balancing Reports. See Section 15990.

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

1.6 QUALITY ASSURANCE

A. Provide the services of a Professional Mechanical Engineer (the Tenant's Mechanical Engineer) currently licensed for practice in the State of Alaska to design a complete set of interrelated mechanical 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 Professional Mechanical Engineer meets all 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 Mechanical 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.

1.7 DESIGN PHASE REQUIREMENTS

A. Preliminary and Final Submittals shall be in accordance with ANC's "Airport Tenant Criteria section on "Submission Requirements". Additional specific requirements for mechanical are noted below.

B. 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 mechanical systems. The submittal shall document all proposed mechanical systems and their proposed interfaces to building systems.

1. Schematic Design Narrative

    a. Narrative shall include:

        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 Fire Protection

            ii Plumbing

            iii Heating, cooling and ventilation.

            iv Exhaust systems

            v HVAC Control System

        4) Identify major product choices.

2. Calculations

    a. Mechanical load summaries. Enumeration of specific heating water, chilled water and air flows shall be indicated, and a comparison with flow allocations for the area. Flow demands shall be within the allocations, or alternate sources shall be provided.

3. Floor Plans: Submit 1/8" scale concept floor plans to demonstrate the viability of proposed design.

    a. Show major mechanical equipment and proposed connection points.

    b. Identify all equipment with a weight in excess of 300 lbs. The Tenant's structural engineer shall consider the impact of such weight. The Tenant shall provide any additional structural support where it is required to support the additional weight.

4. Outline Specifications.

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

1. Construction Plans as follows:

    a. Separate floor plans for plumbing and HVAC.

    b. Show all ductwork and piping that will be installed, and their sizes.

    c. Indicate all VAV boxes, grilles, diffuser, plumbing fixtures, heating terminal devices.

    d. Complete fixture schedules with manufacturer, model number,. Submit catalog cutsheets with product data sheets.

    e. 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.

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

3. Complete mechanical 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. Load calculations for heating, cooling and ventilation equipment.

    b. Plumbing fixture calculations.

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

1.8 OPERATION AND MAINTENANCE MANUALS

A. Completed O&M Manuals approved by the Tenant's Mechanical Engineer shall be submitted to ANC upon completion of construction. The manuals shall be prepared as described in the following paragraphs.

B. Organize manual logically and include data and narrative as noted below. Bind manuals in hard-backed loose-leaf binders.

1. If more than one binder is needed, divide into multiple volumes so that all pages in each binder may rest naturally on one side of rings.

2. Provide a separate chapter for each section of the mechanical specifications with subchapters for each class of equipment or system. Provide a table of contents for each chapter, and each major item in each chapter, to indicate the page number of each. Label all pages to assure correct placement in manual. Identify each piece of equipment with its associated nameplate number.

3. Operating Sequence Narrative:

    a. 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 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,

    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 that require no extensive special training or skills.

    c. Provide all information of a maintenance nature covering warranty items, etc., that have not been 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:

   a. Include manufacturers' descriptive literature covering all products used in each system, together with illustrations, wiring diagrams, exploded views and renewal parts lists.

   b. 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 either with the manufacturers' brochures or properly identified in a separate subsection.

7. Valve Directory: List valve number, size, location, function and normal position for each numbered valve required by Section 15075.

1.9 OPERATING INSTRUCTIONS:

A. ANC personnel shall be instructed on the proper operation and maintenance of any mechanical systems, equipment, and controls under this contract that is special or unique to the Tenant. Operating instructions for ordinary air and heating terminal devices are not required.

B. Where instruction is required make available a qualified technician for each component of the installation for this instruction.

C. Give these operating instructions after the systems are commissioned and operational, and the Operation and Maintenance Manuals have been furnished to ANC.

D. Coordinate with ANC for time and location of instruction.

1.10 RECORD DRAWINGS

A. 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. The drawings shall be marked up show the dimensioned location and routing of all mechanical work that 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. The drawings shall be marked as follows:

   1. Full sized "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 pipe and other components shall be accurately dimensioned to the nearest one-inch increment.

   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.

B. Upon completion of construction, prepare "Record drawings" with precise "as-built" conditions based upon the Contractor's mark ups.

C. After review and approval of Record Drawings by the Tenant's Engineer, submit completed drawings to ANC. Submit final approved Record Drawings both in paper copy and electronic format. File format shall be AutoCAD "DWG" or "DXF".

1.11 WARRANTY

A. Require warranties of workmanship, labor, and materials for a period of one year from the date of final acceptance, without limitation, except where longer warranty periods are required in

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 CONSTRUCTION DOCUMENTS

A. Demolition

1. Where demolition of existing systems is required, require the following:

a. Disconnection and removal of abandoned fixtures, terminal units and other products. Remove abandoned controls and associated wiring and conduit, junction boxes, etc. to source of signal and supply.

b. Removal of all abandoned piping and ductwork back to source of supply or other point as shown, and cap tight to accept normal system test pressure. Cut concealed pipes and ducts flush with walls and floors. Remove brackets, stems, hangers and other accessories. Patch and finish surfaces to match surrounding finish work.

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

B. Accessibility of Products

1. All serviceable and/or operable products shall be accessible.

2. Provide access doors in ceilings, walls, floors, etc., for access to all serviceable or operable equipment in concealed spaces.

C. Cleaning and Repair

1. Require cleaning and repair of existing materials and equipment that remain or are to be reused or are affected by this work.

2. Require the exterior of all apparatus and equipment to be thoroughly cleaned at the completion of the work.

END OF SECTION

SECTION 15060

SUPPORTS, ANCHORS AND PENETRATIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes minimum requirements for supports, anchors and penetrations at ANC.

1.2 REFERENCES

A. ASME B31.9 - Building Services Piping.

B. MSS SP58 (Manufacturers Standardization Society) - Pipe Hangers and Supports - Materials, Design and Manufacture.

C. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

D. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 DESCRIPTION

A. This section applies to all piping specified in Division 15 on the project, except:

1. Fire protection piping, which shall be supported in accordance with the provisions of Section 15300, and

2. Plumbing piping, where provisions of this section may conflict with the Plumbing Codes.

B. Design Requirements

1. Select and apply all pipe hangers and supports per MSS SP69.

2. Design support spacing so free span of piping does not exceed the amount indicated in MSS SP69.

3. Design expansion compensation system to adequately protect piping and structure from thermal expansion and contraction forces.

C. Performance Requirements

1. Support and anchor all mechanical equipment, piping and ductwork as required for life safety and protection of property during normal operation and during a seismic event. Anchors and supports shall comply with Section 15070.

2. Provide loops, pipe offsets, and swing joints, or expansion joints where required or indicated.

3. Hangers and supports shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being introduced into the pipe, adjacent supports, or connected equipment.

4. Pipes shall be capable of thermal expansion movement without disengagement of supports.

5. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.

6. Expansion Calculations:

   a. Installation Temperature: 40 degrees F. (four degrees C).

   b. Hot Water Heating: 210 degrees F. (99 degrees C).

   c. Domestic Hot Water: 140 degrees F. (60 degrees C).

   d. Safety Factor: 30 percent.

1.4 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Design expansion compensating system under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Alaska.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. General:

1. All piping and support systems shall be malleable iron, steel or copper, designed and manufactured per MSS SP58 specifically for the piping material and weight application. Systems used for supporting piping outdoors shall be galvanized.

2. All hangers shall be designed to securely lock using a mechanical fastener. Hangers and supports using gravity type locking are not acceptable.

3. Manufacturer's pre-engineered support systems such as Unistrut, Super-Strut, B-Line, and K-Line may be used in accordance with manufacturers load limits.

4. Ductwork: Refer to Section 15880 - Air Distribution

B. Plumbing Piping:

1. Conform to the Uniform Plumbing Code requirements.

C. Hydronic Piping:

1. Conform to ASME B31.9 and the International Mechanical Code.

D. Refrigerant Piping:

1. Conform to ASME B31.5.

PART 3 EXECUTION

3.1 EARTHQUAKE ANCHORAGE

A. Refer to Section 15070, Mechanical Sound, Vibration, and Seismic Control.

3.2 INSTALLATION

A. Flexible connectors: Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.

B. Inserts and Attachments

1. Make all attachments to structure.

2. Structural steel clamps shall engage both sides of member or shall have retaining clips or other approved positive engagement.

3. Use expansion type anchor bolts with precast or existing concrete including concrete masonry units within loading limits of the precast material.

4. Powder-driven studs shall not be used.

5. Plastic screw inserts and caulked lead inserts are prohibited, except for mounting instructions and control diagrams.

C. Pipe hangers and supports

1. Fabricate and install all pipe hangers and supports per MSS SP89 recommended practices and with manufacturer's instructions.

D. Penetrations: Coordinate with architectural and structural construction details. Provide compatible materials, fasteners, adhesives, sealants, and all other products required for proper installation of all mechanical penetrations.

E. Require flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.

END OF SECTION

SECTION 15070

MECHANICAL SOUND, VIBRATION AND SEISMIC CONTROL

PART 1 GENERAL

1.1 SUMMARY

A. This Section describes requirements, products, and methods of execution that relate to seismic restraint, flexible connection, and vibration isolation of all mechanical systems to meet seismic criteria and for limitation of transmission of vibration and sound to acceptable levels.

B. Sound and vibration control is not required for:

1. Branch piping and ductwork serving terminal devices

2. Heating and Air terminal devices that do not contain fans.

1.2 SYSTEM DESCRIPTION

A. All rotating or reciprocating equipment installed by the Tenant shall be controlled for sound and vibration transmission according to this section.

B. Manufacturers and Additional Engineering Required:

1. Design of vibration and seismic restraint systems external to equipment shall be by the vibration and seismic manufacturer, or by a civil engineer registered in the State of Alaska. The Tenant's engineer shall review shop drawing and calculations for compliance with the vibration isolation and seismic restraint requirements.

2. Equipment furnished with internal vibration and seismic control furnished by the equipment manufacturer shall meet the requirements of this section. Design of the vibration and seismic restraint system shall be by the equipment manufacturer. Shop drawings shall be required. The Tenant's engineer shall review shop drawing and calculations for compliance with the vibration isolation and seismic restraint requirements.

C. Sound and Vibration Performance:

1. Isolation of mechanical systems noise and vibration from occupied spaces is recognized as an important part of the mechanical and acoustical design. Material and equipment selection and location must be carefully considered to keep transmission and radiation of noise within acceptable limits.

2. Limit mechanical noise levels in the building to conform to noise criteria recommendations as set forth in the ASHRAE Applications Handbook, latest edition chapter on Noise and vibration Control at or below the design levels as indicated below:

Public Areas	NC 35-40
Conference rooms	NC 25-30
Private offices	NC 30-35
Baggage Handling, Service areas	NC 40-50

3. Mechanical Vibration:

   a. Require vibration isolation supports for equipment, piping, and ductwork to prevent noticeable transmission of vibration to the building structure.

   b. Do not exceed the following vibration levels for rotating equipment as measured on the bearing caps when the equipment is installed and running at its operating speed.

      1) Fans except as noted: 0.075 inch per second RMS.

      2) Other equipment: 0.15 inch per second RMS.

   c. Vibration levels of fans with RPM less than 700 which are installed above spaces designated NC 30 and lower, shall not exceed 0.04 inch per second RMS.

D. Seismic Performance Criteria:

   1. Restrain equipment, piping, and ductwork to resist seismic forces. Design and select restraint devices to resist loads per Section 1621 of the IBC. Minimum Importance factor = 1.0 shall be used in all seismic restraint calculations.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATORS

A. Elastomeric Flexible Connectors: Not allowed.

PART 3 EXECUTION

3.1 MISCELLANEOUS HYDRONIC EQUIPMENT

A. Unit Heaters: Provide hanger isolators and flexible connections for units over 1/2 hp.

3.2 ANCHOR BOLTS

A. Use cast-in-place or epoxy grouted anchor bolts for floor or pad mounted equipment required by any section of these specifications. Do not use expansion anchors to resist seismic or vibratory loads, unless test data is provided to verify the adequacy of the specific anchor and application.

3.3 RUST PROOFING

A. Treat vibration isolation hardware for resistance to corrosion.

B. Provide zinc electro-plated nuts, bolts and washers.

C. Provide steel components PVC coated or primed with zinc chromate primer and painted with industrial grade enamel.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for nameplates, tags, stencils and pipe markers, and for painting elements of mechanical systems.

1.2 DESCRIPTION

A. Provide identification for all equipment. The identification of each piece of equipment shall be with a unique identifier. The scheme of identification shall coordinated with the tags of the existing equipment in the facility, and shall follow the same naming conventions as the existing equipment.

B. Require the following identification of mechanical systems:

1. Labels and tags for valves and equipment.

2. Labels for piping.

C. Require exposed piping and pipe insulation in utility, baggage handling areas, and mechanical rooms to be painted.

1.3 REFERENCES

A. ASME A13.1 (American Society of Mechanical Engineers) - Scheme for the Identification of Piping Systems.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section.

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Laminated three-layer plastic with engraved black letters on light contrasting background color.

B. FR plastic with lettering permanently bonded to the plastic through a sublimation process

C. Minimum 3/4" high lettering.

2.2 TAGS

A. Plastic Tags:

1. Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inches.

B. Brass with stamped letters; tag size minimum 1-1/2 inches with smooth edges.

C. FR plastic with lettering permanently bonded to the plastic through a sublimation process, Unisub process or equal.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:

1. Up to two-inch Outside Diameter of Insulation or Pipe: 1/2-inch high letters.

2. 2-1/2 to six-inch Outside Diameter of Insulation or Pipe: one-inch high letters.

3. Over six-inch Outside Diameter of Insulation or Pipe: 1-3/4 inches high letters.

4. Ductwork and Equipment: 1-3/4 high letters.

B. Stencil Paint: As specified in Section 09910 - Paints, semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.4 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

B. Plastic Pipe Markers:

1. Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:

1. Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers:

1. Bright colored continuously printed plastic ribbon tape, minimum six inches wide by four mil thick, manufactured for direct burial service.

2.5 CEILING TACKS

A. Description: Steel with 3/4-inch diameter color-coded head.

B. Color code as follows:

1. HVAC equipment: Yellow.

2. Fire dampers/smoke dampers: Red.

3. Plumbing valves: Green.

4. Heating/cooling valves: Blue.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordination With Room Numbering

1. Some systems provided under this Division may rely on identification systems that are based on room names or numbers. Require the Contractor to obtain from ANC the final room numbers prior to commencing the numbering of Division 15 systems.

B. Tag all plumbing valves (CW, HW and HWC) and hydronic heating piping (HWS, HWR, GS and GR) main and branch isolation valves indicating valve number. Indicate on the tag whether the valve is normally open or normally closed.

1. Use prefix ‘P’ for plumbing and ‘H’ for heating. Securely fasten to the valve stem or bonnet with a beaded chain.

2. Provide a laminated copy of the complete and approved valve directory, framed and mounted in each mechanical room and fan room.

C. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.

D. Identify air terminal units and radiator valves with numbered tags.

E. Identify ductwork with plastic nameplates or stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

F. Tag automatic controls, instruments, and relays. Key to control schematic.

G. Label all equipment with heat resistant laminated plastic labels having engraved lettering 1/2 inch high and fastened in place with rivets or screws. The label shall include the equipment type name and the specific symbol or tag indicated on the schedules. Examples “PUMP PMP-X” “WATER HEATER WH-X,” “EXHAUST FAN EF-X,” “SUPPLY FAN SF-X,” etc. Names of all equipment shall match the names on the tenant drawings.

H. Provide ceiling tacks to indicate location of VAV Terminal unit, valves or dampers above acoustical (lay-in) type or linear metal ceilings throughout entire building. Locate in corner of panel closest to equipment.

I. Install identifying devices after completion of coverings and painting.

J. Install tags using corrosion resistant chain. Number tags consecutively by location.

3.2 PIPE IDENTIFICATION

A. Identify piping, concealed or exposed, with plastic pipe markers or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

B. Painting: Paint all piping and piping insulation exposed in utility areas, baggage handling areas, and mechanical rooms. Color: White or light gray.

C. Labeling:

1. Provide factory made adhesive or snap on labels and flow arrows at intervals not exceeding 20 feet and where pipes emerge from walls, floors and ceilings. No labels in public spaces.

D. Identification Scheme:

1. Only commonly used nomenclature is listed. Submit proposed lettering for other services.

Designation	Wording
CW	Cold Water
HW	Hot Water
HWC	Hot Water Circulation

Designation	Wording
HWS	Heating Water Supply
HWR	Heating Water Return
CWS	Cooling Water Supply
CWR	Cooling Water Return
RL, ORL	Rain Leader, Overflow Rain Leader
W	Waste
V	Vent
F	Fire Protection Water
Spkr or Sp	Sprinkler Water

E. Install underground plastic pipe markers six to eight inches below finished grade, directly above buried pipe.

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. This section describes specific requirements that relate to the insulation of ducts, pipes and other surfaces of the mechanical installation.

1.2 DESCRIPTION

A. Require insulation as follows:

1. Insulate ductwork and piping as described this specification.

2. Insulate exposed handicapped plumbing fixture piping.

3. Provide duct sound insulation where necessary to meet noise criteria described in 15070.

PART 2 PRODUCTS

2.1 FIRE RATING OF MATERIALS

A. Provide all insulation products used aboveground in building with burning characteristics in compliance with NFPA Standards 90A and 90B: Flame Spread 25, Fuel Contributed 50, Smoke Developed 50. Tested according to UL 723, ASTM E84, or UL 255

B. Insulation specified for use underground and aboveground away from the building might have other burning characteristics. Use such products only where specifically required.

2.2 FIBERGLASS INSULATION

A. Piping: Provide insulation products as follows:

1. Thermal conductivity K equals 0.24 at 100 degrees F. mean temperature. ASTM C335.

2. Factory applied vapor-barrier flame retardant all service jacket and tape, with permeability rating equals 0.02 perms. ASTM E 96.

3. Temperature limits for fiberglass pipe insulation: 350 degrees F, unless otherwise indicated.

B. Ductwork: Provide insulation products as follows:

1. Flexible insulation: Average thermal conductivity K equals 0.24 at 75 degrees F. mean temperature at 1.5 pcf density. ASTM C335.

2. Rigid insulation: Average thermal conductivity K equals 0.24 at 75 degrees F. mean temperature at 3.0 pounds per cubic feet (pcf) density. ASTM C518.

3. Factory-applied vapor barrier flame-retardant Foil-Scrim-Kraft (FSK) or all-service jacket and tape, with permeability rating equals 0.02 perms. ASTM E 96.

4. Temperature limits for fiberglass duct insulation: 250 degrees F. unless otherwise indicated.

2.3 ENGINE EXHAUST INSULATION

A. Hydrous Calcium Silicate

1. Rigid type pre-formed to suit application.

2. Thermal conductivity K = 0.40 at 200 degrees F.

2.4 FLEXIBLE FOAM PLASTIC

A. Thermal Conductivity: 0.27.

B. Water Vapor Transmission: 0.08.

C. Flame-spread rating of 25 or less and a smoke-developed rating of 50 or less as tested by ASTM E 84 .

2.5 FIXTURE INSULATION ASSEMBLY

A. Protective, molded, fire-resistant foam insulation, single piece insulation manufactured specifically for plumbing fixture supplies and drains.

B. 4.5 lbs per cubic foot foam with insulation R factor 2, white fire retardant polyurethane integral skin, twist fasteners.

C. Skal+Gard, Model SG-100B, TCI Products, or approved equal.

2.6 CANVAS JACKETING

A. Insulating Lagging Canvas: Eight ounces per square yard minimum, fire-retardant material complying with fire ratings specified above. Manufacturer: Chas Harmon "Osnaberg", Claremont Company Inc., “Claretex”, or approved equal.

B. Lagging Adhesive: Plastic synthetic resin emulsion adhesive; watertight, mildew resistant, fire retardant. Manufacturer: Miracle LA69, Borden Aeorbol, Childers Chil-Perm CP or approved equal.

2.7 METAL JACKETING

A. 27 gauge (U.S. Standard) heavy corrugated aluminum.

B. Preformed fitting covers.

2.8 COATINGS

A. Coatings: UL labeled.

B. On cold or dual service lines, use vapor barrier type coatings.

2.9 PREFORMED FITTING COVERS

A. One piece premolded PVC jacketing and fitting covers specifically designed for the service intended.

B. Install per manufacturer's instructions and secure with manufacturer's color matching PVC tape.

PART 3 EXECUTION

3.1 GENERAL

A. Do not apply insulation materials until all surfaces to be covered are clean and dry and all foreign material such as rust, dirt, etc. is removed.

B. Keep insulation clean and dry during installation and during the application of any finish.

C. Do not permit installation insulation on pipe fittings, and pipe joints until the piping is tested and approved.

D. Do not permit installation of insulation on ducts or fittings until the ductwork has been tested and approved.

E. Do not apply under conditions of excessive humidity or at temperatures below 50 degrees F. or above 100 degrees F.

3.2 PIPE INSULATION REQUIREMENTS

A. Cold Piping:

1. Includes rainwater piping, domestic cold water, plumbing and other vents through roof, chilled water and other cold piping to zero degrees F.

    a. Insulate aboveground rain leaders from the roof drain to the point pipe penetrates building skin or below grade. Cover underside of roof drain.

    b. Insulate plumbing vents from three feet below the under deck of the roof to the termination above the roofline.

2. Insulate with sectional fiberglass and provide a completely sealed vapor barrier. Provide insulation thickness per Insulation Thickness Table.

3. Insulate valves, fittings, tanks, and air separators except where indicated.

B. Hot Piping:

1. Includes domestic hot water supply and recirculation, and hydronic heating.

2. Insulate with sectional fiberglass. Provide insulation thickness per Insulation Thickness Table.

3. Do not insulate valves, unions, flanges and similar components unless indicated.

C. Buried Piping: Insulate with flexible foam plastic insulation, glue all seams with manufacturer's recommended cement.

D. Outdoor piping: Insulate with flexible foam plastic insulation, glue all seams with manufacturer's recommended cement. Provide metal jacketing.

E. Insulation Thickness Table (All units are in inches)

Fluid Design Operating Temperature Range	Runouts up to 2"	3/4" to 1-1/2"	2" to 2-1/2"	3 to 6	8" and up
Heating Systems (Water and Glycol Solutions)					
141 degrees F -200 degrees F	0.5*	1	1.5	2	2
Domestic (Hot Hater and Hot Water Circulation)					
105 degrees F -140 degrees F	0.5*	1.0	1.5	1.5	2
Cooling Systems (Chilled water and Glycol Solutions)					
40 degrees F -55 degrees F	0.5	0.5	1.0	1.0	1.0
Below 40 degrees F	1.0	1.0	1.5	1.5	1.5
Domestic Cold Water					
	.5	.5	1	1.5	1.5
Rainleaders, Plumbing vents through roof					
	1.0	1.0	1.5	1.5	1.5

*Only runouts less than 12 feet long.

F. In addition to specified jackets, provide heavy corrugated aluminum jacket on piping insulation anywhere piping is exposed below eight feet zero inches above floor in public areas, or outdoors.

G. Locate pipe hangers and rollers outside insulation. Provide insulation saddles or sheet metal shields, around insulation. On pipes two inches and larger, within the area of each insulation shield, use calcium silicate or cellular glass on the lower half of the insulation, equal in thickness to adjacent insulation.

H. Insulate fittings, valves and flanges to the same thickness as the pipe insulation.

I. Pre-formed fitting covers may be substituted for the tape and adhesive covering. Cement and tape fitting covers on cold piping to provide a positive vapor barrier.

3.3 DUCT INSULATION REQUIREMENTS

A. Insulate ductwork as follows:

1. Outside air ducts from air intake to equipment connection with two-inch fiberglass, except for the exposed outside air duct serving AHU -1M as shown where insulation shall be three inches.

2. Exhaust or relief ducts from the point of discharge to back draft or automatic damper, and as indicated, with two inches fiberglass.

3. Supply ductwork: entire system when there is mechanical cooling, otherwise where shown on medium/high velocity trunk schedule, and as indicated, with one-inch fiberglass.

4. Return ductwork passing through unheated space, in mechanical rooms and as indicated with one-inch fiberglass.

B. Insulation Type and Finish:

1. Rigid or semi-rigid board where canvas or metal jacket is required. May also be used in place of blanket insulation where practical.

2. Blanket insulation where rigid board is not specified or indicated. Proper installation is critical. Loose joints and sagging insulation shall require reinsulation of entire branch or main duct before acceptance and during warranty period.

3. Canvas jacket over board insulation in mechanical and boiler rooms, where exposed in finished rooms and where indicated.

4. Ductwork insulation to have a completely sealed vapor barrier, except segmental insulation on medium/high velocity trunk ducts and warm air ducts in concealed spaces, where approved.

3.4 DUCT SOUND INSULATION REQUIREMENTS

A. Install in accordance with manufacturer's installation instructions. Completed installation shall be fastened tightly to ductwork and free of sags.

3.5 ENGINE EXHAUST REQUIREMENTS

A. Provide minimum two-inch calcium silicate insulation.

B. Provide metal jacketing on all insulation.

3.6 PLUMBING FIXTURE INSULATION REQUIREMENTS

A. Insulate hot water supply and waste piping exposed beneath sink and lavatory fixtures designated on drawings or specified in Section 15400 as intended for use by the handicapped. Install in accordance with ANSI A117.1.

3.7 PAINTING

A. Paint all exposed insulation in utility and service areas, baggage handling areas, and mechanical rooms. Color shall be white or light gray.

END OF SECTION

SECTION 15170

MOTORS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes general requirements, products and methods of execution relating to electric motors at ANC and shall apply to motors furnished as integral parts of equipment specified in this and other Divisions.

B. Related Sections and Divisions:

1. Section 15010 - Mechanical General Provisions.
2. Section 15540 - HVAC Pumps
3. Section 15560 - Direct Fired Gas Makeup Air Units
4. Section 15720 - Component Air Handling Units
5. Section 15721 - Hydronic Makeup Air units
6. Section 15850 - Fans

1.2 REFERENCES

A. Motors shall conform to the following codes and standards:

1. Governing NEMA Standards (NEMA MG1).
2. ASA Form C-50 for rotating machinery.
3. NFPA 70-1999, National Electrical Code (NEC)

PART 2 PRODUCTS

2.1 SUPPLY VOLTAGE

A. Motor voltage shall be stamped on the nameplate and relate to the nominal voltage as follows:

THREE PHASE MOTORS

Nominal Volts	Motor Ratings
208 volts	200V, 208V, or 208/220V
480 volts	460V

SINGLE PHASE MOTORS

Nominal Volts	Motor Ratings
120 volts	115V or 115/230V
208 volts	200V or 208V
277 volts	277V

1. If a motor is to be operated on 208 or 277 volts, the nameplate shall indicate that this voltage is suitable.

B. Two speed motors shall have two sets of windings.

C. Voltage variation: Motors shall be designed to operate within the parameters of these requirements at rated load and with a voltage variation from the name plate voltage of plus or minus 10 percent.

D. Motors shall operate successfully at rated load and at rated voltage with a maximum frequency variation of 5 percent above or below rated frequency.

E. Motors shall operate successfully at rated load with a combined maximum variation in the voltage and frequency of 5 percent above or below rated voltage and rated frequency.

F. Motors which operate with a Variable Frequency Drive (VFD) shall be suitable for the application.

1. Motors operated from a PWM (Pulse Width Modulation) type VFD: conform to NEMA MG 1 Part 31 requirements.

2.2 LOCKED ROTOR CURRENT

A. No motor above 15 HP shall have a locked rotor current in excess of NEMA code letter “G”. Smaller motors may have a higher locked rotor rating, but in no case exceeding the recommended NEMA rating as related to motor size.

2.3 MOTOR INSULATION

A. Unless otherwise specified, the motor insulation shall be NEMA Class “B” (or better). Based on 40 degrees C. maximum ambient, and 90 degrees C. maximum rise, total maximum operating temperature shall not exceed 130 degrees C.

2.4 MOTOR LOADING

A. No motors shall be subjected to loads exceeding the motor name plate rating, under any normal operating condition.

2.5 MOTOR RATING

A. Size motors in conformity with the manufacturer’s published information and best information available during design. Verify each motor for adequacy in relation to the specific application.

2.6 HIGH EFFICIENCY AC MOTORS

A. Furnish high efficiency electric motors for equipment that:

1. Requires a three horsepower or larger drive motor.

2. Has a duty cycle classified as continuous.

B. Efficiency of the motors shall be determined by NEMA Standard MG 1 - 12.536 and shall have an efficiency equal to or better than:

Motor Size	Nominal Efficiency
Through 3 HP	89 percent
Over 3 HP through 10 HP	91 percent
Over 10 HP through 30 HP	93 percent
Over 30 HP through 60 HP	94 percent
Over 60 HP through 100 HP	95 percent
Over 100 HP	95 percent

2.7 MOTOR HOUSING FEATURES

A. Motor housings: Open drip-proof, totally enclosed fan cooled (TEFC), or explosion-proof, as appropriate for the use intended and the environment where installed. Provide totally enclosed fan cooled motors for equipment below grade, located outdoors, or operating in damp or dust-laden locations. Provide a continuous moisture drain that is screened against insect entry for totally enclosed motors.

B. Oversize external conduit boxes at least one size larger than NEMA standard.

PART 3 EXECUTION

3.1 GENERAL

A. Electrical connections for the motor shall conform to NEC Articles 430 and 440 as applicable, and to any state and local code having jurisdiction.

B. Unless furnished as part of a complete package including disconnects and control, and/or motor fuse protection, protect motors by Bussmann Fusetron Dual-Element Time Delay fuses.

C. Megger all motor windings prior to starting. Include log of megger readings in the Operations and Maintenance manuals. Include in log full load amps.

D. Verify correct rotation of all motors.

END OF SECTION

SECTION 15300

FIRE PROTECTION

PART 1 GENERAL

1.1 DESCRIPTION

A. Protect all areas with sprinklers.

B. The existing wet pipe sprinkler system consists of an 8" cross-main that runs the length of the building on level 1 from the south end of the main terminal near A Concourse, to the end of C-Concourse. Numerous zones connected to the cross-main. The cross-main is connected to the fire water supply system at three points. There are also three fire department connection points.

C. Copies of drawings of existing sprinkler systems may be obtained from ANC Engineering.

D. All new and remodeled systems shall be designed in accordance with NFPA 13, and shall be approved by ANC, the insurance carrier for the State of Alaska, and the Fire Marshal prior to installation.

E. Provide coverage according to the following occupancy requirements:

1. Terminal passenger handling areas shall be classified as Ordinary Hazard Group 1 Occupancy as required by NFPA 415 and minimum flow rate at most and second most hydraulically remote Class I manual-wet standpipes shall be 500 gpm with a residual pressure of 100 psig.

2. Baggage handling areas elevator shall be classified as Ordinary Hazard Group 1 occupancy.

3. Office areas on level three separated from the passenger handling areas by 1-hour separation walls shall be classified as Light Hazard.

4. All Airline Operations areas on Level 1 shall be classified as Ordinary hazard Group 1 Occupancy.

5. The Liquid storage room as Ordinary Hazard Group 2 occupancy.

1.2 SUBMITTALS

A. Submit shop drawings that have been approved by the Tenant's Engineer, Insurance carrier, and the Fire Marshal. The drawings shall be approved by ANC prior to installation.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

A. Wet Pipe Sprinkler Systems:

1. Any steel piping system currently recognized by NFPA 13 may be used, if listed for the intended service by UL or F.M.

2. Whenever piping other than steel schedule 40 is utilized, submit a statement that the piping complies with NFPA 13 standards and that the piping strength is adequate for the application and piping corrosion resistance ratio shall be equal or greater than schedule 40 pipe. Provide supporting calculations and documentation.

3. Extra lightweight pipe is not allowed.

4. One-inch diameter nominal drop nipples exceeding 36 inches in length shall be schedule 40 pipe, no exception allowed.

B. Dry Pipe Sprinkler Systems:

1. Pipe shall be galvanized schedule 40 steel pipe. No exceptions.

C. Preaction Systems

1. Pipe shall be galvanized schedule 40 steel pipe. No exceptions.

D. Standpipe Manual-Wet Systems

1. Pipe shall be as allowable for wet pipe sprinkler systems that are rated for minimum of 175 psig.

2.2 FITTINGS

A. Grooved Fittings, Couplings, and Mechanical Tees:

1. Grooved Fittings: Victaulic, Gruvlok, Sprink, cast iron, ductile iron or equal. Fabricated or segmented fittings are not acceptable. Couplings and mechanical tees shall be standard painted Victaulic, Gruvlok, or equal.

2. Slip-Fit fittings and couplings utilized for joining branch piping to new main piping shall be “Victaulic” or “Gruvlok” brand as required.

3. Listed PressFit fit for pipe sizes two inch and smaller.

B. Threaded Pipe Fittings:

1. Threaded pipefittings: Cast iron 125 pound ANSI B16.4 or ductile iron 300 pound ANSI B16.3.

C. Pipe Flanges:

1. Pipe flanges: Cast Iron Class 125 pound ANSI B16.5.

D. Welded Pipe Fittings for Wet Pipe Sprinkler Only:

1. Welded pipefittings: Limited to Weld-o-lets, Thread-o-lets, Gruv-0-lets and Welded Flanges in accordance with NFPA 13 limitations.

E. Other means of joining pipe are not permitted.

2.3 SPRINKLER HEADS

A. Provide sprinklers as required by NFPA 13 standards and in compliance with the UBC Chapter 9. Sprinkler heads using O-ring water seals are not allowed. Sprinklers on the wet pipe system shall be quick response types. Sprinkler finish and style to be coordinated with architectural requirements with default as follows:

1. In all areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers, and escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be chrome finish.

2. In all areas with recessed lighting flush to the suspended ceiling finish or pendant mounted not obstructing sprinkler flow, provide recessed standard spray pendant sprinklers. Sprinklers and escutcheons to be chrome finish.

3. Sprinklers in areas with exposed structure shall be bronze finish, standard spray, upright or pendant type.

4. Dry pendant and sidewall sprinklers protecting outside overhangs shall be bronze finish.

5. Dry pendant sprinklers protecting entry vestibules and other finished areas susceptible to freezing temperatures shall be recessed chrome finish. Dry head sprinklers protecting unheated areas and piped from wet pipe systems shall have an “A" Length dimension of not less than 18 inches.

6. Sprinklers of correct temperature rating shall be installed according to NFPA 13.

7. Provide sprinkler wrench for each type of sprinkler.

8. Provide additional sprinklers, as requested by the Fire Marshall, at no additional cost to the Owner.

2.4 PIPING HANGERS, SUPPORTS AND PENETRATIONS

A. Pipe hangers, supports and sway bracing: Conform to NFPA 13 standards including seismic supports on shop drawings and details of all supports used. Calculations used to develop items used and locations installed shall be provided.

B. Retraining straps shall be used on all beam and flange type clamps.

C. Powder-driven fasteners shall not be used.

2.5 INSPECTORS TEST CONNECTIONS

A. Pipe and fittings exposed outside building: Brass or Chrome plate; provide setscrew escutcheon of matching material.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

A. Install piping to conserve building space and route piping around roof hatches and attic access panels.

B. Install low point drain stations in accordance with NFPA 13 and NFPA 14 standards. Identify the location of drain and test stations with signs on access panels, ceiling panels, or walls adjacent to the station, visible from the floor. Discharge test pipes and system main drain to outside. Coordinate discharge point with Contracting Agency.

C. Provide seismic protection for the piping system in accordance with NFPA 13 standards. Provide clearance at all structural penetrations.

D. Piping shall be concealed in all areas with finished ceilings. Coordinate with the other trades to take timely advantage of available space above ceilings, below raised floor, in pipe and duct spaces and elsewhere.

3.2 INSPECTORS TEST PIPING

A. Discharge inspectors test piping to approved floor drains in non-public areas, or outside building, but not on main walkways or over architectural surfaces easily stained or difficult to clean. Do not terminate discharge more than 48 inches above grade. Discharge main test and drain piping used for service line flow testing outside and terminate with a minimum 2-1/2 inch hose connection.

B. Provide visual indicator for proof of flow in accessible warm location for dry pipe and wet pipe risers and zones.

3.3 FLUSHING AND TESTING

A. Provide a letter of certification stating that testing and flushing has been performed in accordance with the applicable codes and standards. Itemize codes and standards complied with. Testing and flushing certification required.

3.4 DRY HEADS

A. Provide dry pendant heads in areas potentially subject to freezing including, but not limited to; ceilings of entry vestibules, freezers and cold storage, overhangs requiring fire protection, rooms with combustion air openings.

B. Provide dry side walls for all exterior overhangs not protected by dry pipe system or dry pendant heads on air-side of building where potential for storage or parked vehicles exist.

3.5 PAINTING

A. Exposed piping in public areas shall be painted.

B. Refer to Architectural requirements. Protect sprinkler heads from paint.

3.6 SPRINKLER HEAD INSTALLATION

A. Install guards on sprinklers subject to physical damage or abuse.

END OF SECTION

SECTION 15400

PLUMBING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for plumbing system materials and installation.

1.2 DESCRIPTION

A. Refer to as-built drawings for extent of existing plumbing systems, however, field verify all piping.

B. Waste and vent piping has been extended to most areas of the building for use by tenants. Connection to this system is anticipated.

C. Extension of waste and vent piping to tenant areas from existing piping is the responsibility of the tenant.

D. Hot and cold domestic water has been extended to most areas of the terminal, with stub-outs provided for tenant service. Domestic hot water circulation lines are also stubbed out to be extended into tenant areas. Each hot water circulation line has been provided with a flow control valve, which shall be the maximum flow available to the tenant for hot water circulation in that area.

E. Use of terminal hot water service for process needs, such as vehicle washing, shall not be permitted. In these cases, provide additional hot water generation shall be provided by the tenant.

F. Provide chemical resistant piping in all drains serving soft drink dispensers. Extend chemical resistant piping from dispenser to a point of dilution downstream of major drainage flows, such as public toilets.

G. Provide acid resistant piping for all drainage flows where corrosive flows are anticipated.

H. Extend hot water circulation lines to all fixtures plumbed with hot water.

I. Provide sand interceptors in all floor drainage systems where motor vehicles operate.

J. Provide trap primers to all traps that do not normally receive drainage flow.

1.3 SUBMITTALS

A. Submit certificate of sterilization of all water piping

PART 2 PRODUCTS

2.1 SANITARY DRAINAGE PIPING, BURIED WITHIN FIVE FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.

2. Joints: Hub-and-spigot, compression type with neoprene gaskets.

B. Hubless cast iron pipe fittings: Use heavy-duty couplings constructed of 304-type stainless steel. Husky Series 4000 or approved equal.

2.2 SANITARY DRAIN AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.

B. Cast Iron Pipe: CISPI 301, hubless.

1. Fittings: Cast iron.

C. Copper Tube: Type L.

1. Fittings: cast bronze, wrought copper.

2. Joints: ASTM B32, solder, Grade 50B.

2.3 SUMP PUMP DISCHARGE PIPING

A. Copper Tubing: hard drawn.

1. Fittings: cast copper alloy or wrought copper and bronze.

2. Joints: AWS A5.8, BCuP silver braze.

2.4 WATER PIPING, ABOVE GRADE

A. Use one material throughout project except that steel pipe four-inch and larger may be used with smaller copper sizes. Provide dielectrically insulating flanges between copper and steel piping.

B. Copper Tubing: Type L hard drawn.

1. Fittings: cast copper alloy or wrought copper and bronze.

2. Joints: ASTM B32, solder, Grade 95TA.

3. Copper grooved coupling piping system may be substituted for cold water piping only.

C. Steel Pipe: Schedule 40, galvanized.

1. Fittings: Cast iron.

2. Joints: Steel piping four-inch and larger may be used with galvanized, groove-joint fittings and couplers. Cold water only.

2.5 WATER PIPING, BELOW GRADE

1. Copper Tubing: ASTM B42, annealed

a. Fittings: ASME B16.26 cast bronze.

b. Joints: Flare

2.6 COPPER MECHANICAL COUPLING PIPING SYSTEM

A. May be used in hot and cold water piping systems.

B. Tubing: Type L hard drawn.

C. Mechanical Coupling: Victaulic Style 606 rigid ductile iron couplings for copper.

D. Gaskets: Molded synthetic rubber designed with an wide annular interior recess open to fluid pressure such that fluid pressure presses the gasket to both the pipe and the coupling.

E. Flange Adapters: Victaulic Sytyle 641, ductile iron, for connecting grooved copper tubing with ANSI Class 125 cast iron and Class 150 steel flanged components.

F. Fittings: Victaulic copper or bronze sand casting fittings.

G. Manufacturer: Victaulic only.

2.7 CHEMICAL RESISTANT DRAINS

A. Cast Iron Pipe: ASTM A861-94e1, hubless, high-silicon chemical resistant.

1. Fittings: High silicon cast iron, ASTM A518.

2. Joints: Chemical resistant clamp-and-shield assemblies.

3. Trade name: Duriron.

2.8 COUPLINGS FOR BURIED HUBLESS CAST IRON SOIL PIPE

A. Heavy duty all stainless band type coupling with four or more clamp bands. Husky Coupling, or approved equal below grade.

2.9 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig saturated steam or 200 psig W.O.G. Packing material or seals shall not contain asbestos.

B. Provide ball valves for shut-off service, 2" and smaller. Larger may be butterfly valves.

2.10 FLOW CONTROL VALVE

A. Refer to Section 15510 - Hydronic Pipe and Specialties.

2.11 WATER HAMMER ARRESTERS

A. Provide all stainless steel balanced expansion bellows type or pressurized piston type water hammer arresters where shown. Provide size noted on drawings per PDI (Plumbing and Drainage Institute) symbol (A, B, etc.).

2.12 TRAP PRIMER VALVES

A. Trap primer valve activated by a drop in building water pressure, no adjustment required. Brass or PVC bodied. Valves shall be factory set for proper operation with water pressure of 30 to 70 psi. Units shall serve one or multiple traps as shown on the drawing.

B. For valves serving more than one trap, provide trap primer distribution units. Units shall have up to four outlets, and evenly distribute water to each outlet. Provide clear or removable cover for observation of trap primer operation.

2.13 FIXTURES

A. Handicapped Fixtures:

1. Provide fixtures in compliance with the ANSI A117.1 – 1998.

2. All Handicap lavatories and sinks: Provide Fixture Insulation Assembly for all fixtures with exposed drains and supplies.

B. Provide sensor operators on all public use toilet, urinal and lavatory fixtures.

C. Floor sinks constructed of fiberglass are not acceptable.

PART 3 EXECUTION

3.1 GENERAL PIPING INSTALLATION REQUIREMENTS

A. Provide Dielectric Isolators when joining pipes of dissimilar metals.

B. Install piping to maintain headroom, conserve space, and not interfere with use of space.

C. Arrange piping in toilet room plumbing chases so that all piping and fixtures are accessible. Do not install water or vent piping across the chase such that the access way is obstructed.

D. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

3.2 INSPECTION AND TESTING

A. Waste Piping: Test as described in this section, and to the satisfaction of the Municipality of Anchorage.

B. Water Piping: Test all water piping to the satisfaction of the Municipality of Anchorage.

END OF SECTION

SECTION 15450

PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes

1. Diaphragm Expansion Tanks.

2. Pumps.

B. It is anticipated that additional plumbing equipment will not be necessary for ordinary domestic water service to tenants. Where addition hot water generation is required, however, provide pumps and tanks with the minimum requirements described in this section.

PART 2 PRODUCTS

2.1 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construct tank of galvanized steel and provide a 100 percent corrosion free NSF approved lining. Provide permanently sealed heavy duty butyl diaphragm with five year written warranty for entire assembly. Test for 125 psig working pressure. ASME Compliance.

B. Factory precharge to 40 PSI.

2.2 DOMESTIC HOT WATER CIRCULATING PUMPS

A. Casing: Bronze, rated for 125 psig (860 kPa) working pressure.

B. Impeller: Bronze.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 15455

OIL WATER SEPARATORS

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide an approved oil water separation (OWS) system in all areas where motor vehicles are operated or stored.

B. Maintenance of OWS shall be the Tenant's responsibility.

PART 2 PRODUCTS

2.1 OIL WATER SEPARATOR

A. Performance:

1. Influent Characteristics: Design separators for intermittent and variable flows of water, oil, or any combination of non-emulsified oil-water mixtures ranging from zero to the maximum flow anticipated, with operating temperatures of the influent oil in water mixture shall range from 40 degrees F. to 100 degrees F. Design for specific gravity of the oils at operating temperatures between 0.68 to 0.95, and the petroleum hydrocarbon concentration less than or equal to 200,000 mg/l (20 percent). The specific gravity of the water at operating temperatures shall range from 1.00 to 1.03.

2. Effluent Characteristics: The free petroleum hydrocarbon concentration in the effluent from the oil water separator shall not exceed 10 mg/l (10 PPM).

B. Provide product level and leak detection.

C. In separator systems where storage capacity exceeds 100 gallons, provide double walled containment. If the storage tank is constructed of metal provide cathodic protection.

PART 3 EXECUTION

3.1 OIL WATER SEPARATOR INSTALLATION

A. Installation: Install in accordance with manufacturer instructions.

B. Submit certification of testing of the completed Oil water separator system.

C. Leak detection system: Provide audible alarm for the leak detection system. Connect alarm contacts to the building automation system.

END OF SECTION

SECTION 15483

FUEL GAS SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes specific requirements, products, and methods of execution relating to the provision of Fuel Gas Systems for the project.

1.2 SYSTEM DESCRIPTION

A. Piping to serve tenant gas appliances shall be provided by the tenant.

B. Gas piping for use by the food service concessionaire(s) has been extended to area of anticipated food service. Refer to the Concourse C - Phase 2 - Building Completion drawings for the extent of the piping. Extension of this piping to the food service concessionaire's gas appliance equipment shall be by the concessionaire.

C. Additional gas service will require installation of a gas meter and distribution piping from the meter to the tenant area by the tenant. Coordinate requirements for routing of gas piping to tenant areas with ANC.

PART 2 PRODUCTS

2.1 FUEL GAS PIPING

A. Low Pressure (under 14 inches water column pressure): Schedule 40 black steel pipe with black malleable iron fittings, threaded or welded black steel piping and fittings.

B. Pressure 14 inches water column or greater: Welded Schedule 40 black steel pipe and fittings.

C. All piping shall be installed in accordance with the UPC and NFPA 54.

2.2 VENT PIPING

A. Type L annealed copper, wrought copper sweat fittings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Gas piping installed on the roof of the building shall be supported a minimum of 8" above the surface by permanent supports fastened securely to the roof structure. Pipes support system shall be designed to support and constrain the piping to remain on the supports without undo stress on the piping or roof support system. All roofing work required to fasten supports shall be by tenant. Roofing work shall be performed provide a waterproof installation, and to maintain any warranty on the roof.

B. Outdoor piping: Clean all gas piping, fittings, valves, etc., of all grease, rust, and paint, with one coat of flat heat-resistant enamel paint over suitable rust-inhibiting primer as required to provide uniform appearance. Color: black.

C. Except for low pressure regulators serving gas appliances, provide a separate vent line to the outdoors for each regulator.

3.2 TESTING

A. Test gas piping before connection to the gas source. Do not enclose or conceal any untested portion of the gas system.

B. Submit inspection report from the Administrative Authority indicating approval of the system.

END OF SECTION

SECTION 15510

HYDRONIC PIPING AND SPECIALTIES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: This section describes specific requirements, products and methods of execution for liquid heat transfer systems of throughout the project.

PART 2 PRODUCTS

1.2 PIPE AND FITTINGS

A. Heating Water Systems (above ground):

1. Copper Pipe:

a. Type 'L' copper hard temper, except where Type 'K' or 'M', or soft temper is specified or indicated.

b. Fittings: Wrought copper, solder joint.

c. Extracted branch joints (T-Drill) may be approved when Contractor can demonstrate satisfactory experience with this method. All joints shall be brazed in accordance with the Copper Development Association Copper Tube Handbook using B-Cup series filler metal.

d. Fit joints using 430 silver solder, 95-5 tin-antimony or other approved lead-free solder. Solder type must be compatible with pipe and fittings. Solder containing lead shall not be allowed on the job site.

e. Soldering flux: Water flushable, low corrosivity type meeting the requirements of ASTM B813. Flux shall have label indicating it meets these requirements.

2. Steel Pipe:

a. Welded: Schedule 40 black with butt weld fittings of type and wall thickness to suit pipe. Weld-O-Lets and Thread-O-Lets may be used on pipe two inch and larger where branch is minimum of two pipe sizes smaller than main. Pipes 12 inches and larger may be Schedule 30.

b. No threaded pipe allowed.

c. Mechanical joint type pipe systems are not permitted.

B. Glycol heating systems:

1. Same as heating system.

C. Heating Water Systems (below ground):

1. Continuous runs of Type K soft copper.

D. Chilled water piping system:

1. Same as heating system.

2. Grooved Piping system

a. Schedule 40 pipe or type L hard drawn copper.

b. Coupling housings constructed with ductile iron. Suitable for rolled or cut grooves.

c. Ductile iron fittings.

d. Gasket suitable and approved for service. Molded synthetic rubber designed with a wide annular interior recess open to fluid pressure such that fluid pressure presses the gasket to both the pipe and the coupling.

e. Furnish a new roll grooving tool the Department capable of direct roll grooves for 2 inch to 6-inch tubes. Tool may be operated with a standard 3/8-inch socket drive. Victaulic VE 226S.

f. Victaulic or equal.

E. Cooling Tower Supply and Return Piping:

1. Same as chilled water piping system.

F. Equipment drains and overflows:

1. Type L copper pipe, wrought copper fittings.

1.3 VALVES

A. Select valves of the best quality and type suited for the specific service and piping system used. Minimum working pressure rating 125 psig saturated steam or 200 psig W.O.G. Packing material or seals shall not contain asbestos.

B. Provide ball valves for shut-off service, 2" and smaller. Larger may be butterfly valves.

1.4 AUTOMATIC FLOW LIMITING VALVES

A. Provide flow limiting valves at all hydronic terminal devices to limit flow to the design values. Provide valves with integral isolation valve, strainer, and pressure test ports.

B. Provide valve with maximum flow set to design flow of the heat transfer device being served at 2-psig differential pressure.

PART 3 EXECUTION

1.5 INSTALLATION

A. Route all pipes and ducts parallel with building lines, and as high as possible, except where underground, or shown otherwise on the drawings.

B. Route piping and ducts to clear all doors, windows, and other openings and to avoid all other pipes and ducts, light fixtures, and similar products.

C. Conceal all pipes and ducts where routed through finished areas, unless authorized by ANC or otherwise indicated on the drawings.

D. Preserve access to all pipes and ducts for future connections and alterations; at the same time optimize space usage by consolidating the routing of pipes and ducts where possible.

E. Avoid combining piping of different materials such as copper and steel in one system, except that brass valves and specialties may be used with steel pipe. When use of dissimilar metals cannot be avoided, provide dielectric isolators.

F. Reduce pipe sizes using reducing tees or reducing fittings. Bushings not permitted except on tanks and similar equipment.

G. Provide air vents with isolation gate valves at high points and where piping turns down in direction of flow. Where large air quantities can accumulate, provide enlarged air collection standpipes. Provide manual air vents at system high points and as indicated.

H. Slope pipelines and provide low point drains for piping and equipment.

I. Provide isolation valves at major piping branches as shown and at all terminal devices. Use ball valves for isolation service. For pipes 2-1/2 inches and larger butterfly valves may be used.

J. Install valves with stems vertical wherever possible, and in no case with stems below the horizontal.

K. Provide automatic flow limiting valves at each point in the fluid system where it is necessary to preset the maximum flow including heating or cooling coils, heating elements, heat exchangers and domestic hot water recirculation branches; also provide at system branches and pump discharge connections where indicated.

L. Install flow-limiting valves and serviceable products for heating terminal units to be operable and adjustable without removal of the finish cover, unless shown otherwise.

M. Provide pressure and temperature test plugs on both sides of heat transfer elements to measure the drop across runs of all heat transfer elements.

N. Thermal Expansion

1. Install all piping to allow for normal thermal expansion and contraction.

2. Provide anchors where necessary and as shown.

3. Provide expansion loops, expansion compensators, and alignment guides to suit conditions and as shown on drawings.

4. Piping shall be guided and restrained as recommended by the manufacturer.

1.6 CONNECTING TO EXISTING SYSTEMS

A. Complete cleaning testing of new system prior to connecting to existing system. Isolate and drain heating and cooling piping loops as necessary to connect new piping.

1.7 CLEANING

A. Thoroughly clean all internal surfaces of the completed heating system as follows:

1. Flush hydronic piping to remove all black magnetic iron oxide and mill scale from the system.

2. Flush system piping with synthetic organic dispersant (CH2O Product 6149) to remove all grease. Circulate solution through system at 150 degrees F. or greater for twelve(12) to twenty-four (24) hours.

3. Repeat process until the system is clean.

4. Flush system with fresh water as necessary to remove residual cleaning agent.

5. Exercise proper care during flushing and cleaning of systems to insure no damage done to equipment, valves, fittings, or work of other trades. Restore damaged system components or work of other trades to new or original condition at no additional cost to Owner.

END OF SECTION

SECTION 15540

HVAC PUMPS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for pumps for HVAC systems. In general, pumping will not be necessary. Where it is, requirements of this section shall be met.

1.2 WARRANTY

A. Provide three year manufacturers' warranty for pumps.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Grundfos, Taco, Armstrong, Bell & Gossett.

B. Substitutions: None. ANC stocks spare parts for only these manufacturers.

2.2 IN-LINE CIRCULATORS

A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 175 psig maximum working pressure.

B. Casing: Cast iron, with flanged pump connections.

C. Impeller: Cadmium plated steel, stamped brass or cast bronze, keyed to shaft.

D. Bearings: Two, oil lubricated bronze sleeves.

E. Shaft: Alloy or stainless steel with copper or bronze sleeve, integral thrust collar.

F. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees maximum continuous operating temperature.

G. Drive: Flexible coupling.

H. Performance: Refer to Schedule on Drawings.

I. Electrical Characteristics:

1. Refer to Schedule on Drawings.

2. Motor: RPM as shown. Refer to Section 15170 - Motors.

3. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.3 VERTICAL IN-LINE PUMPS

A. Type: Vertical, single stage, close coupled, radially [or horizontally] split casing, for inline mounting, for 175 psig working pressure.

B. Casing: Pump volute shall be of Class 30 cast iron. Suction and discharge gage port, casing wear ring, seal flush connection, drain plug, flanged suction and discharge.

C. Internally flushed mechanical shaft seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225 degrees F.

D. Impeller: Cast bronze, enclosed type, dynamically balanced, keyed to the shaft

E. Shaft: Carbon steel with stainless steel impeller cap screw or nut.

F. Performance: Refer to Schedule on Drawings.

G. Electrical Characteristics: Refer to Section 15170 - Motors.

H. Manufacturers: B&G, Taco, Armstrong, Grundfos.

2.4 BASE MOUNTED PUMPS

A. Type: base mounted, single stage, end suction design with a foot mounted volute to allow servicing of the impeller and bearing assembly without disturbing piping connections. Horizontal shaft, single-stage, split casing, for 175 psig maximum working pressure.

B. Casing: Cast iron case, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.

C. Impeller: Bronze, fully enclosed, keyed to shaft.

D. Bearings: Permanently lubricated roller or ball bearings.

E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.

F. Seal: Carbon rotating against a stationary ceramic seat, 225 degrees F. maximum continuous operating temperature.

G. Baseplate: structural steel or fabricated steel channel with fully enclosed sides and ends, and securely welded cross members.

H. Drive: Flexible coupling with coupling guard.

I. Performance: Refer to Schedule on Drawings.

J. Electrical Characteristics: Refer to Section 15170 - Motors.

K. Manufacturers: B&G, Taco, Armstrong.

2.5 SUCTION DIFFUSER

A. Cast or ductile iron, threaded or flanged construction.

B. Flows straightening diffuser cylinder with 3/16 inch perforations with free area at least 5 times pump opening area and a length at least 2-1/2 times the pump opening area.

C. 16 mesh throwaway startup strainer.

D. Support foot fitting.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 15550

HEAT GENERATION

PART 1 GENERAL

1.1 SUMMARY

A. Additional heat generation requirements are not anticipated. In the event new heat generation equipment may be necessary, contact ANC for specific requirements.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 15560

DIRECT FIRED GAS MAKEUP AIR UNITS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes minimum requirements for Direct Gas Fired Makeup Air Units

PART 2 PRODUCTS

2.1 MAKE-UP AIR HANDLING UNIT

A. Casings shall be weather resistant, and include galvanized type zinc coated steel casing and enamel paint. Provide motorized inlet damper with safety interlock contacts.

B. Fan section: motor starter with burner interlock contacts.

C. Burner:

1. All components AGA and UL listed.
2. High temperature safety control.
3. Electronic flame safety control.
4. Special burner area insulating liner.
5. Air-flow proving switch.
6. Electric spark ignition of pilot.
7. Burner and blower service switches on heater.

D. Main fused disconnect switch.

E. Controls: Complete discharge temperature control system, including safeties. Provide interface to Building Automation System, to include unit failure and filter alarms and discharge air temperature indication.

F. Variable Frequency Drives: If furnished with unit, provide drives in accordance with Section 15915 Variable Frequency Drives, including provisions for LonMark protocol. Drives shall be monitored by the building automation system.

G. Filters: Minimum Filter section for 2-inch filters. Units which serve occupied areas shall be provided with final and charcoal filters. Maximum face velocity through final and charcoal filters shall be 300 feet per minute.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 15640

CHILLED WATER COOLING SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. This section describes requirements for chilled water cooling systems.

1.2 DESCRIPTION

A. The building has a chilled water cooling system with branches extended to each floor as shown on the Concourse C - Phase 2 - Building Completion drawings, AKSAS 54475. These branches are available for tenant use. It is anticipated that piping may be extended by the Tenant to points of use in Tenant's area. This piping shall meet the requirements of this section.

B. The cooling system consists of two 375 ton gas engine driven centrifugal chillers, each with a cooling tower. The cooling medium is a 40% solution of propylene glycol. The cooling medium is circulated throughout the building with variable speed pumping year round. In the winter, the chillers are shut down, and one of the cooling towers is utilized as a dry cooler.

C. Cooling medium is maintained at 42 Degrees F. in the summer and winter. The temperature may rise above this temperature in the shoulder seasons.

D. The system serves air handler cooling coils in the winter, and air conditioning units in various communications rooms year round.

E. Tenant use of the system shall be limited to communication/data processing equipment room cooling, and and supplemental office space temperature cooling. Connection to this system for process cooling is not permitted.

F. Chilled water cooling systems installed by the tenant for process cooling shall meet the requirements of this section. Chillers installed by tenants shall meet the requirements of the section.

PART 2 PRODUCTS

2.1 WATER CHILLERS AND COOLING TOWERS

A. It is not anticipated that any tenant will require additional chillers or cooling towers. In the event they are, contact ANC to coordinate for specific criteria regarding location, power, noise control, design, installation, and control interfaces.

2.2 PIPING AND VALVES

A. Refer to Section 15510 – Hydronic Piping and Specialties.

2.3 GLYCOL MAKE-UP SYSTEMS

A. Refer to Section 15510 – Hydronic Piping and Specialties.

2.4 PUMPS

A. Refer to Section 15540 – HVAC Pumps.

PART 3 EXECUTION

3.1 PIPING AND VALVES

A. Refer to Section 15510 – Hydronic Piping and Specialties.

END OF SECTION

SECTION 15720

COMPONENT AIR HANDLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. It is not anticipated that component air handling units will be required by any tenant. In the event they are, contact ANC to coordinate for specific criteria regarding location, power, noise control, design, installation, and control interfaces.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 15730

EQUIPMENT ROOM AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes minimum requirements for equipment room air conditioning units.

1.2 SYSTEM DESCRIPTION

A. Existing equipment rooms are cooled with water cooled air conditioners with economizer cooling coil. These units are connected to the building chilled water system, and are capable of cooling directly with the chilled water through a hydronic cooling coil, with the use of a refrigerant coil, with the condensing system cooled with the chilled water.

B. New equipment room air conditioning units shall include economizer cooling coils.

PART 2 PRODUCTS

1.3 GLYCOL COOLED AIR CONDITIONING UNITS

A. Provide units with direct expansion cooling and glycol cooled condensing units.

B. Economizer cooling coil, three-way valve assembly, and controls to switch to economizer mode automatically when the glycol cooling water is cool enough to provide free cooling.

C. Controls:

1. Microprocessor based.

2. Alarms: Interface with the building automation system with the following points:

a. System Trouble.

b. High temperature.

c. Dirty filter.

D. Return air filter housing and filter. Provide disposable pre-filter meeting the requirements for prefilters in Section 15720.

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 15830

TERMINAL HEAT TRANSFER UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Finned Tube Radiation.
2. Unit Heaters.
3. Cabinet Unit Heaters.
4. Fan Coil Units.

PART 2 PRODUCTS

1.2 FINNED TUBE BASEBOARD

A. Provide approved in-line expansion compensators for finned tube assemblies greater than 20 feet in length.

B. Enclosures:

1. Enclosures in public areas shall have a minimum metal thickness 14 gauge, other areas may be 18 gauge.
2. Access Doors: Provide at all valve and air vent locations. Door latches requiring tool to open.

1.3 UNIT HEATERS

A. Provide control of unit heaters such that fan operation can be disabled when heating water supply is shut off in order to prevent uncontrolled continuous operation of the fans in the summer time.

1.4 CABINET UNIT HEATERS

A. Access: Provide access doors for piping and controls.

B. Finish: Factory applied baked enamel finish of color selected by Contracting Agency.

C. Filter: provide minimum one-inch thick glass fiber throw-away type, located to filter air before coil.

1.5 FAN-COIL UNITS

A. Filter: Provide minimum 2 inch (25 mm) thick glass fiber throwaway type, located to filter air before the coil.

PART 3 EXECUTION

1.6 INSTALLATION

A. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

B. Provide isolation valves on water inlet and outlet to terminal heating units such as radiation, unit heaters, and fan coil units.

C. Install flow control valves and all serviceable products for heating terminal units to be operable and adjustable without removal of the finish cover. For finned tube enclosures specified without access doors, install removable enclosure section over serviceable products.

D. Provide pressure and temperature test plugs on both sides of heat transfer elements to measure the drop across all runs of all heat transfer elements.

END OF SECTION

SECTION 15850

FANS

PART 1 GENERAL

1.1 SUMMARY

A. This section describes minimum requirements for fans.

PART 2 PRODUCTS

2.1 FANS

A. General Requirements for All Fans:

1. All fans shall be constructed to AMCA Standards, AMCA listed and labeled.
2. Fan capacities shall be determined in accordance with AMCA 210.
3. Provide fans that are balanced statically and dynamically at the factory.
4. Paint steel fabricated fan housing, fan wheel, frame, and support brackets with prime coat and enamel finish coat at factory, after properly preparing surfaces. Fan assemblies constructed of aluminum or galvanized steel need not be painted.
5. Arrange fans to be cleanable and so wheel, bearings, shaft, and drive are removable. Gasket joints and bolt airtight.
6. Provide vibration isolation for all fans. Refer to 15070, Mechanical Sound, Vibration and Seismic Control, for specific requirements.

B. Belt Drives for all Fans:

1. Provide v-belt drive for each fan selected for not less than 1.5 times the motor nameplate horsepower. Light duty belts acceptable only with motors less than one horsepower.
2. On each fan 10 HP and smaller, adjustable pitch drive sheave. Select drive sheave and fan pulley combination to provide fan rpm with drive adjusted to near mid-span.
3. Provide OSHA belt guard with hinged tachometer cap.

PART 3 EXECUTION

3.1 FLEXIBLE CONNECTIONS

A. Provide flexible connections at the discharge and inlet where ducts attach to unit, except internally isolated units.

3.2 INSTALLATION

A. Fasten fans securely to structure. Do not support fans on ductwork.

B. Extend lubrication points which cannot be easily reached directly as required and identified.

END OF SECTION

SECTION 15880

AIR DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

A. This section describes minimum requirements, products and methods of execution relating to the project air distribution systems.

PART 2 PRODUCTS

1.2 DUCTWORK

A. Constructed ductwork shall be in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible. Metal thickness and reinforcing shall comply with the Standard for the pressure class of each duct system.

B. Seal all ductwork in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.

C. Materials:

1. Refer to part 3 for the duct material schedule.

2. Steel ducts: Hot-dip galvanized steel sheets per ASTM Standard A 653. Gauge numbers indicated in contract and reference documents are from Manufacturers Standard Gauge. Minimum thickness within tolerance permitted by AISI Steel Products Handbook.

3. Aluminum ducts: Where indicated or scheduled, mill-finish aluminum sheet series 2XXX or 3XXX. Thickness specified in Brown and Sharp gauge numbers. Note that for equal thickness B&S non-ferrous gauge numbers are numerically lower than MSG numbers.

D. Pressure Classes:

1. Construct each duct systems for the appropriate duct pressure classification according to SMANCA. Refer to the schedule in Part 3 for pressure classification of existing air handler distribution ductwork.

2. Where pressure classes are not scheduled or indicated on the contract drawings, duct systems shall be constructed using 1-inch water gauge pressure class methods, except when the duct serves a variable volume supply system.

3. All variable volume duct systems where pressure classes not scheduled or indicated on the contract drawings shall be constructed with 2-inch water gauge pressure class methods upstream of terminal units and 1-inch water gauge pressure class methods downstream of terminal units.

1.3 UNDERGROUND DUCTWORK

A. Direct bury:

1. Duct: Fiberglass reinforced, polyester resin, 3/16 inch wall thickness.

2. Fittings: Fiberglass reinforced, polyester resin, 3/16 Inch wall thickness. Bends may be of mitered construction, with maximum 45 Degree bend per miter.

3. Manufacturers: Spunstrand or equal.

B. Concrete Encased: Provide in accordance with "A" above, or Article 2.1 Ductwork.

C. Insulated: Provide water tight double wall construction with sheet metal inner liner in accordance with Article 2.1, and fiberglass completely filling the void between inner and outer walls.

1.4 PLENUMS AND CASINGS

A. Construct from factory fabricated plenum wall in accordance with the manufacturer's instructions. Acoustical material shall be covered with Mylar or similar material to protect packing from accumulation of dust.

B. Except where otherwise shown or scheduled plenums shall be double wall constructed with an outer sheetmetal layer (20 gauge, minimum), insulated with a thickness of 2 inches (4 inches when designated), and covered with perforated galvanized sheet metal inner layer (22 gauge minimum.). Design Pressure for Plenums and casings shall not be less than the highest point of the fan static pressure curve at design rpm multiplied by 1.25 and considered to be negative or positive depending upon location relative to fan.

C. Acoustical Performance Sound Transmission Losses (dB):

BAND, HZ	125	250	500	1000	2000	4000
2" Plenum	18	21	29	38	49	55
4" Plenum	16	24	35	45	53	58

D. Manufacturers for Double Wall Plenums and Casings: United Sheet Metal, Pace, DynaSonics, IAC, air handling equipment manufacturer when applicable.

1.5 FLEXIBLE DUCT

A. Flexible ductwork between air terminal units and air outlets was included in the noise control systems for the existing air handlers, and may be required to meet noise criteria in finished spaces. A minimum of 8 LF is recommended.

B. Flexible duct shall be Form NM-IL (Nonmetallic, insulated, lined) unless otherwise indicated and shall be listed by UL as complying with Standard 181, Class 1 Air Duct, and shall comply with NFPA 90A.

C. Permitted uses shall be:

1. Connections to air diffusers and returns in lay-in ceiling, 10 to 12 feet in length with one 90-degree bend or a large radius 180-degree curve in addition to connection at diffuser.

2. Connections from medium pressure duct systems to terminal units not permitted.

D. Acoustic characteristics shall not be less than the following, which is based on Thermoflex M-KF. Net insertion loss for 8 inch diameter, 10 feet of straight run:

BAND, HZ	125	250	500	1000	2000	4000	8000
Loss dB	8	12	29	35	36	24	14

E. Manufacturers: Thermoflex (Type M-KF), Genflex or approved equal.

1.6 DAMPERS

A. Volume Dampers:

1. Locate dampers a minimum of 10 feet from diffusers except where clearly shown otherwise.

2. Remote Volume Damper Operators: Provide where damper is otherwise inaccessible.

B. Combination Fire and Smoke Dampers:

1. Dampers shall be UL listed and labeled in accordance with standard UL Standard 555S. Fire/Smoke dampers shall also be classified in accordance with UL Standard 555 for 1-1/2 hour or 3- hour rating as required for the construction in which it will be installed.

a. Temperature resistance classification shall be 250 degrees F.

b. Leakage classification shall be I.

Leakage Classifications

"I" = 4 CFM/SF

At 1-inch water column differential and not more than twice listed value at 4 inches water column.

C. Fire Dampers:

1. Dampers shall be listed and labeled in accordance with UL Standard 555. Rating shall be suitable to the wall construction shown on the architectural drawings but not less than 1-1/2 hour minimum rating. Comply with NFPA 90A requirements.

1.7 AIR TERMINAL UNITS

A. Construction:

1. Casing of not less than 22 gauge galvanized steel.

2. Line with fiberglass duct liner material not less than 3/4-inch thickness and 1-1/2 pcf density. Insulation shall be UL Listed under Standard 181 and conform to NFPA Standard 90A. Cover all edges of insulation with metal flange.

3. Provide inner wall constructed by one of the following methods to minimize the collection of dust and to prevent insulation fibers from entering the air stream:

a. Metal inner panels constructed from 26 gauge A-60 galvanized steel.

b. Mylar or Tedlar film with all edges and tears sealed.

c. Foil Scrim Kraft (FSK) liner with all edges and tears sealed.

4. Sound lining for attenuator plenum section for terminal boxes shall be protected from direct contact with air stream by a FSK, Mylar or tedlar film with all edges and tears sealed using SMACNA recommended duct tape or duct sealant as appropriate.

5. Reheat terminals shall be constructed as specified for basic terminal and with heating coil incorporated into casing. Where necessary a transition piece shall be provided to adapt the heating coil to the discharge opening on the casing.

6. Control Damper: Damper shall have a durable elastomer seal suitable for 100 percent shut off. Pressure drop at maximum rated cfm with valve open shall not exceed 0.35 inches water column static pressure.

7. Factory mounted multi-point, center averaging velocity sensor with minimum of four measuring ports arranged in parallel to the takeoff point, with a minimum of .05 inch differential signal at 500 fpm inlet velocity.

8. Leakage shall not exceed the following:

   a. Casing: Two percent rated cfm at 1.5-inch water column internal pressure.

   b. Damper: Two percent rated cfm at 1.5-inch water column differential pressure.

B. Hot Water Reheat Coils: Supply with terminal unit.

C. Acoustical Performance:

1. Sound Rating: Determine sound power ratings from tests conducted in an Air Diffusion Council certified laboratory in accordance with ADC Standard 1062R. Demonstrate that NC ratings can be directly compared and related to those specified.

2. Basic terminal units, primary air capacity up to 1200 cfm and inlet pressure of one-inch water column shall not exceed the following total radiated noise levels.

Band, Hz	**125**	**250**	**500**	**1000**	**2000**
S.P.L., dB	66	54	49	41	38

3. Sound power levels shall be determined in accordance with the current applicable ASHRAE Standard, and shall be included with submittal.

D. Controllers:

1. Coordinate with Section 15900 – Building Automation System, to have VAV controllers factory mounted.

1.8 LOUVERS

A. Exterior Louvers:

1. Extruded aluminum drainable blades, 3/4 inch square, flattened aluminum bird screen on inside face, zero water penetration at 900 fpm free area velocity; hidden mullions; frame to match installation detailed on Architectural Drawings; Kynar 500 Flouropon, color as selected by Contracting Agency.

1.9 ROOF HOODS

A. Hood shall be a curb-mounted unit.

PART 2 PART 3 EXECUTION

2.1 INSTALLATION

A. Ductwork:

1. Install ductwork and mechanical systems in accordance with SMACNA HVAC Duct Construction Standards.

2. Provide vibration isolation for all supply ductwork for the first four duct support points downstream of the fan (at least 15 feet) in accordance with Section 15070.

3. Seal exhaust ducts along all seams and joints using medium pressure duct sealant. Use of duct tape as a sealant is not acceptable.

4. Coordinate the routing of ducts with other trades and to avoid interference with other building features.

5. Flexible duct shall not be used to connect trunk runouts to terminal units.

B. Duct Supports:

1. Provide generally in accordance with SMACNA HVAC Duct Construction Standards.

2. Provide earthquake bracing for ductwork in accordance with general criteria specified in Sections 15070. Spacing of sway braced points shall not exceed 20 feet, or as indicated.

3. Duct mounted equipment such as heating coils shall be supported independently of duct when 40 pounds, or greater weight. Smaller items shall have duct supports and sway bracing within 12 inches.

C. Air Terminal Units:

1. Locate terminal unit so all access panels, controls, dampers, actuators, and other appurtenances that require adjustment and maintenance are accessible.

2. Support air terminal units independent of duct system. Provide sway bracing within 12 inches of support attachment.

3. Connect to system air inlets with rigid ductwork of the same diameter that is straight for a minimum of 10 duct diameters. Flexible duct is not allowed. Where terminal inlet is smaller than run out connection size shown on the drawing, reduce duct to inlet size 10 duct diameters from the inlet.

4. Provide access panel in boxes with heating coils for cleaning of heating coils.

D. Volume Dampers:

1. Provide air volume dampers at each low-pressure duct main and branch as necessary for air balancing and as indicated.

2. Provide volume dampers at each air outlet branch duct. Locate upstream of flexible duct and immediately adjacent to trunk, except where air outlets are scheduled with volume damper integral to the outlet.

E. Penetrations through exterior building skin:

1. Make all penetrations watertight and weathertight under all weather conditions. Detail ductwork connections to prevent condensation or leakage from entering into surrounding building construction. Provide sleeves, special connections and sealants as required to accomplish this performance requirement.

2. Slope ductwork to drain through wall louvers and openings for hoods or other sidewall devices. Make bottom of ductwork watertight, and drill 1/2-inch minimum diameter weep holes at six inches on center through base of bottom louver blade as required for drain water to escape.

F. Flexible Connections:

1. Air handling units and fans. Provide flexible connections where ducts attach to unit except internally isolated units as specified below.

2. Ducts connecting internally isolated units may require flexible connections to permit relative movement, such as a duct connecting a roof hood to the air handler casing. Provide as indicated and as required.

2.2 PAINT IN MECHANICAL ROOMS

A. Paint all ductwork exposed in mechanical rooms. Where the ductwork is insulated, refer to Section15080 – Mechanical Insulation.

2.3 DUCTWORK MATERIAL SCHEDULE

A. Provide ductwork with the following materials`

Air System	**Material**
Supply	Steel, Aluminum, Fibrous
Buried outside air or exhaust	Glass Fiber Reinforced Plastic
Return and Relief	Steel, Aluminum
General Exhaust	Steel, Aluminum
Kitchen Hood Exhaust	Steel, Stainless Steel
Outside Air Intake	Steel
Combustion Air	Steel

2.4 DUCTWORK PRESSURE CLASS SCHEDULE

A. Provide ductwork for each duct system listed below constructed to the pressure class indicated. All other duct system shall be constructed to 1" pressure class standards.

Air System	**Pressure Class (Inches Water Column)**
AHU-1C	2"
AHU-2C	3"
AHU-3C	3"
AHU-4C	3"
AHU-5C	3"
AHU-6CA	1"
AHU-6CB	3"
AHU-1M	1"
AHU-2MA	1"
AHU-2MB	2"

Air System	Pressure Class (Inches Water Column)
AHU-2MC	2"
AHU-2MD	2"
AHU-3M	2"
AHU-4M	1"

END OF SECTION

SECTION 15900

HVAC Controls

PART 1 GENERAL

1.1 SUMMARY

A. This section describes requirements for HVAC Controls.

1.2 DESCRIPTION

A. Existing System:

1. The existing Building Automation System (BAS) is based on open and interoperable LonWorks. Control network communications (LonTalk) meets the requirements of ANSI/EIA 709.1.

2. Multiple LonWorks Local Area Networks are interconnected on the ANC LAN/WAN using Ethernet connections. The standardized protocols used for all communications are LonTalk and TCP/IP over Ethernet.

3. Network services for the BAS is provided through LonWorks Network Services (LNS).

4. A Supervisory system connected to the ANC LAN monitors all the HVAC controls, and provides a graphical interface. In addition, Web Server Host Systems provides browser-based access to monitor system information and change systems setpoint from anywhere in the controls network, anywhere on the Airport LAN/WAN, or from the Internet.

5. The Bindings Database for the system is maintained by ANC on operator's work stations connected to the BAS over the LAN.

6. The LonWorks LANs are provided with sufficient numbers of routers to serve all the HVAC controls zones shown on the Concourse C - Phase 2 - Building Completion drawings, AKSAS 54475, including those zone indicated as "Future."

7. The supervisory system supports MODBUS protocol, which provides routers to connections to the boiler and chiller controls via the Airport's LAN/WAN.

B. Tenant Requirements:

1. Provide HVAC controls for all controllers installed by the Tenant in accordance as described in the Section.

2. The scope of control work under tenant improvement includes extending local LonWorks LANs. Where the number of devices added by a Tenant exceed the numbers required for the building HVAC control indicated in the Building Completion Drawings additional LonWorks routers may be necessary. These LonWorks routers shall be provided at the Tenant's expense. Requirements for additional interfaces to the ANC LAN are not anticipated, and are not included as a Tenant requirement. Establishing graphical interfaces, setpoints, or alarm reporting to the supervisory system is not included.

3. Interface with existing LonWorks controls. Obtain a copy of the current Master Control drawings for use in designing tenant controls. Obtain approval of the tenant system design from ANC prior to installation.

4. Program new controllers off-line using a tool compatible with the ANC binding database. Obtain approval of system programming from ANC prior to binding the new controllers. Coordinate with ANC to import the new program pages into the binding database, and to bind the controllers.

5. Comply with the requirements described in SUBMITTALS.

6. Hardware Requirements:

   a. Provide LonMark compliant control products that communicate on LonMark LANs or the Ethernet.

   b. Provide LonTalk routers as required to add LonMark LANs if there are insufficient capacity on existing routers.

   c. Provide Application Specific Controllers (ASC), Application Generic Controllers (AGC), and Custom Application Controllers (CAC) as herein specified.

   d. Provide wire, raceway systems, backboxes, 24 DC and/or 24 AC power supplies and final connections to nodes provided by this Division and the following ASCs, AGCs and CACs as provided by other Divisions.

      1) Intelligent Air Terminal Device Controllers (i.e., VAV, Dual Duct, FPB, etc.).

      2) Intelligent Damper Operators.

      3) Intelligent Valve Operators.

      4) Packaged Air Handling Units.

      5) Other HVAC Equipment.

   e. Provide ANC with product literature, External Interface Files (XIF) (floppy, CD-ROM, or Zip disk format), and Object Diagrams for all products.

7. Software Requirements:

   a. All LonWorks devices shall utilize the existing LNS.

   b. Utilize programming and binding tools compatible with the existing binding database.

   c. Provide all programming of devices furnished under the tenant improvement project.

   d. Coordinate with ANC to integrate the database developed by the Tenant into the ANC master database

   e. Coordinate with ANC to bind the Tenant controls into the ANC network.

8. Furnish the services of a Commissioning Agent that is independent of the controls installer to provide commissioning services. Comply with commissioning requirements described in Section 15945 Controls Testing and Acceptance. Provide all equipment necessary to generate trend data required by Section 15945.

9. Comply with specific requirements for sequences of operation described in Section 15940 Sequences of Operation.

C. ANC Responsibilities:

1. Furnish copies of existing control system record documents for use in design of the Tenant's controls.

2. Assistance in clarification of the existing control system design.

3. Review of the Tenant's control design for compatibility with the existing controls, and compliance with the ANC requirements.

4. Integrate the LNS database developed by the Tenant into the master database.

5. Bind the Tenant controls into the Airport control network.

6. Integrate the Tenant controls into the supervisory system, including graphics, alarm reporting.

7. Integrate the Tenant control O&M manuals into the master O&M manuals.

1.3 SUBMITTALS

A. Submit and obtain approval from ANC of system design prior to installation HVAC controls. Include all drawings, calculations, proposed bindings, graphical programming, and product literature.

B. Provide ANC with O&M Manuals of the completed tenant system. Include:

1. All control shop drawings, calculations, proposed bindings, and graphical programming

2. Product Data listed in PRODUCT DATA.

1.4 QUALITY ASSURANCE

A. HVAC Control Installer shall furnish and install LonWorks products manufactured by multiple manufacturers as required.

B. All microprocessor based control products (excluding workstations) used shall include a Neuron chip or other processor with complete implementation of the LonTalk protocol stack.

C. Comply with LonMark Interoperability Association, Interoperability Guidelines for all products. Utilize published functional profiles for all product network message and configuration parameters. Where published profiles do not exist, utilize draft profile standards or submit a proposed draft as part of the submittals required in Section 6. All drafts shall also be submitted simultaneously to the LonMark Interoperability Association and a copy of such transmittal submitted to the Architect

D. Individual products shall conform whenever possible to the LONMARK Interoperability Standards. If products are not certified by the LONMARK organization, product submittals must include the application source code, external interface file, resource files and complete documentation regarding all network variables and configuration properties supported by the device.

E. Control devices connected to the LonWorks control network shall be readily replaceable with devices from other manufacturers.

1.5 PRODUCT DATA

A. For each microprocessor based device on the control network (or proposed for the system), submit the documentation detailed below. ANY control device that is furnished without External Interface Files (XIF) or object diagrams shall be submitted under separate cover with indication of non-compliance to specification.

1. Product literature, External Interface Files (XIF) (floppy, CD-ROM, or Zip disk format), and Object Diagrams.

2. Listing and explanation of both standard and user defined configuration parameters for the device.

3. Product documentation shall display the LonMark symbol indicating conformance to the LonMark Interoperability Standards. Submit the LonMark profile identification and manufacturer's part number for each controller.

4. Each Custom Application Controller (CAC) should additionally be submitted with the following information. These items shall be grouped together under product model for easy reference.

    a. Preliminary logical control diagram indicating the Network Variables in and out of control unit with message bindings visually indicated.

    b. Descriptive sequence of operation.

    c. Programming tool used to produce application.

    d. Application tool source code.

    e. Preliminary programming source code or graphic.

    f. Wiring interconnection diagrams for power, communication and external I/O.

B. Provide detailed cutsheets to ANC indicating the features, accessories and sub-assemblies of the following:

1. Computer equipment, all operating systems, application software, programming tools, network devices.

2. Printers and other peripherals.

3. Ethernet LAN Switches (shared media hubs not acceptable).

4. Repeaters, media converters, bridges and routers.

5. LonWorks Network Services plug-ins.

1.6 SHOP DRAWINGS

A. Submit a marked-up copy of the ANC master control drawings showing exact point of interface to the controls installed by the tenant. Make specific references to the pertinent tenant control drawings on the ANC Master.

B. Submit control drawings for the tenant controls. Requirements include:

1. Specific reference to the ANC master controls at the exact points of interface.

2. Plans: Provide AutoCAD 2000 or later generated floor plans indicating exact installed location of the following equipment and/or devices:

    a. Application Generic controllers.

    b. Application Specific controllers.

    c. Customer Application Controllers.

    d. Sensors located in Finished Areas.

    e. I/O installed in mechanical systems (ductwork, pipes, AHUs, etc.).

    f. Routers, Gateways and Bridges.

    g. Lon Control Units installed by Division M and E trade contractors.

    h. Other BAS related components, sensors and actuators.

i. Scale of floor plan drawings shall be no less than 1/8 inch per foot, and shall be presented with a suitable title block identifying the project, contractor, title of the drawing, date, author, revisions, area of the building with a key plan, and a graphical scale. Drawings may be plotted at half size provided all elements are clearly legible.

3. System Diagrams: Include the following:

a. Logical and physical diagrams for each channel indicating each node, node address (domain, subnet and group) channel type and router specifications. Submit network performance calculations for each channel.

b. Electrical low voltage power wiring schematic indicating voltage drop calculations, wire size, node power consumption, maximum full load circuit amperage.

c. Submit functional temperature control diagrams for each mechanical system served by the BAS. Indicate and Tag each input/output served by each Control Unit or Intelligent Device.

d. Local Area Network and LonWorks Architecture diagram indicating supervisory controllers. Include explicit information regarding configuration of Routers, Bridges and Repeaters installed by the Tenant. Submit performance calculations for all channels to indicate bandwidth utilization and conformance to the requirements outlined in Section 1.1, “LonWorks Network Management”.

e. Interface requirements with other systems including but not limited to: security systems, lighting control, fire alarm, elevator status, power monitoring system. Diagrams detailing the variables mapped between protocols shall be submitted for all gateways.

PART 2 PRODUCTS

2.1 APPLICATION SPECIFIC CONTROLLER (ASC)

A. General Requirements:

1. Application Specific Controllers shall be equipped with *either a 3120 or a 3150 Neuron* microprocessor controller, a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

3. The ASC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.

4. ASC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make all board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement.

B. ASC Interface Software

1. General: ASC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of ASC shall not be required for configuration.

2. ASC shall provide a selection of control applications performable through configuration of the device. Download of new application should not be required for one of these applications.

C. ASC Device Software:

1. General: An ASC shall operate in standalone mode as needed for specified control applications if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

2. O.S. software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage network communications, and scan inputs and outputs. O.S. shall also contain built in diagnostics.

2.2 APPLICATION GENERIC CONTROLLER (AGC)

A. General Requirements:

1. Application Generic Controllers shall be equipped with *either a 3120 or a 3150 Neuron microprocessor controller,* a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

3. The AGC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.

4. AGC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make all board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. Network and power wiring shall allow for 'pass-thru' of signal when electronic boards are removed.

B. AGC Interface Software

1. General: AGC shall be configured, not programmed, via PC based interface software. This software shall be a program applet that runs within the network management tool chosen. Intimate knowledge of operation of AGC shall not be required for configuration.

2. AGC shall provide a selection of control function blocks that can be configured. Download of new applications from network management tool shall be possible, but not required.

2.3 CUSTOM APPLICATION CONTROLLER (CAC)

A. General Requirements:

1. Custom Application Controllers shall be equipped with either a 3120 or a 3150 Neuron microprocessor controller, a minimum of 64K programmable non-volatile (flash) memory for general data processing, power supply, input/output modules, termination blocks, network transceivers.

2. Operating system software, custom operating sequence software and application programs shall be stored in programmable, non-volatile memory.

3. The CAC unit may be equipped with a dedicated software clock battery. If included, the battery shall be capable of maintaining time of day, day of week, date, month, and year, independent of system power for a two-week period. Include an integral calendar with automatic leap year compensation.

4. CAC packaging shall be such that complete installation and checkout of field wiring can be performed prior to the installation of electronic boards. Make all board terminations by means of plug-in connectors to facilitate troubleshooting, repair and replacement. The complete CAC including accessory devices such as relay, transducers, power supplies, etc. shall be factory-mounted, wired and housed in a NEMA 1 enclosure or as required by the location and local code requirements.

5. Equip CAC's with diagnostic indicators for the following:

    a. Transmit.

    b. Receive.

    c. Power up test.

    d. Power up fail.

    e. Power up test okay.

    f. Bus error.

B. CAC Software:

1. General: A CAC shall operate in standalone mode as needed for specified control applications if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

2. O.S. software shall reside in programmable flash memory, operate in real-time, provide prioritized task scheduling, control time programs, monitor and manage CAC to OI communications, and scan inputs and outputs. O.S. shall also contain built in diagnostics.

3. Input/Output Point Processing Software shall include:

    a. Continuous update of input and output values and conditions. All connected points are to be updated at a minimum of one-second intervals.

    b. Analog to digital conversion, scaling and offset, correction of sensor non-linearity, sensing no response or failed sensors, and conversion of values to 32 bit floating point format. Both the maximum and minimum values sensed for each analog input are to be retained in memory. It shall be possible to input subsets of standard sensor ranges to the A/D converter and assign gains to match the full-scale 32-bit conversion to achieve high accuracy readout.

    c. A reasonability check on all analog inputs against the previously read value and discard those values falling outside pre-programmed reasonability limits.

    d. Assignment of proper engineering units and status condition identifiers to all analog and digital input and outputs.

    e. Analog input alarm comparison with the ability to assign two individual sets of high and low limits (warning and actual alarm) to an input or to assign a set of floating limits (alarm follows a reset schedule or control point) to the input. Each alarm shall be assigned a unique differential to prevent a point from oscillating into and out of alarm. Alarm comparisons shall be made each scan cycle.

f. Debounce of digital inputs to prevent nuisance alarms. Debounce timing shall be adjustable from two seconds to two minutes in one second increments.

4. Alarm Lockouts:

   a. Alarm lockout software shall be provided to prevent nuisance alarms. on initial start-up of air handler and other mechanical equipment a "timed lockout" period shall be assigned to analog points to allow them to reach a stable condition before activating alarm comparison logic. Lockout period is to be programmable on a per point basis from 0 to 90 minutes in one minute increments.

   b. A "hard lockout" shall also be provided to positively lock out alarms when equipment is turned off or when true alarm is dependent on the condition of an associated point. Hard lockout points and lockout initiators are to be operator programmable.

   c. Design the power supply to accommodate the power requirements of all components (or nodes) connected, plus 50 percent.

5. Run Time Totalization or Point Trending:

   a. Run time shall be accumulated based on the status of a digital input point. It shall be possible to totalize either on time or off time up to 10,000 hours with one-minute resolution. Run time counts shall be resident in non-volatile memory and have CAC resident run time limits assignable through the operator's terminal.

   b. Totalized run time or trended data shall be batch downloaded using FTP to the SS on a daily or weekly basis. Trended data shall reside on the SS database server. The automatic update of this data shall be determined by the SS and facility management application requirements.

6. Transition Counting: A transition counter shall be provided to accumulate the number of times a device has been cycled on or off. Counter is to be non-volatile and be capable of accumulating 600,000 switching cycles. Limits shall be assignable to counts to provide maintenance alarm printouts.

7. Custom Direct Digital Control (DDC) Loops:

   a. Custom DDC programs are to be provided to meet the control strategies as called for in the sequence of operation sections of these specifications. Each CAC shall have residential in its memory and available to the programs a full library of DDC algorithms, intrinsic control operators, arithmetic, logic and relational operators for implementation of control sequences:

      1) Proportional Control, Proportional plus Integral (PI), Proportional plus Integral plus Derivative (PID), and Adaptive Control (self-learning): The adaptive control algorithm shall be used on control loops, as indicated in I/O summary, where the controlled medium flow rate is variable (such as VAV units and variable flow pumping loops). The adaptive control algorithm shall monitor the loop response characteristics in accordance with the time constant changes imposed by variable flow rates. The algorithm shall operate in a continuous self-learning manner and shall retain in memory a stored record of the system dynamics so that on system shutdown and restart, the learning process starts from where it left off and not from ground zero. Standard PID algorithms are not acceptable substitutes for variable flow applications since they will provide satisfactory control at only one flow rate and will require continued manual fine tuning.

      2) All DDC setpoints, gains and time constants associated with DDC programs shall be available to the operator for display and modification via the SS operator interface, two (2) portable operator's terminal and two (2) SS workstation.

3) The execution interval of each DDC loop shall be adjustable from 2 to 120 seconds in one-second increments.

4) DDC control programs shall include an assignment of initialization values to all outputs to assure that controlled devices assume a fail-safe position on initial system start-up.

2.4 VAV CONTROLLERS

A. Provide terminal units controllers with microprocessor based Interoperable LonMark controller bearing the LonMark interoperability logo on each product delivered. The controller networking communication protocol shall be based on the Echelon Neuron 3150 microprocessor physically located in the controller.

B. Provide manufacturers thermostat matched to controller. Refer to Section 15910 for requirements.

2.5 *LONWORKS* ROUTERS, BRIDGES, REPEATERS AND TRANSCEIVERS

A. Routers, Bridges and Repeaters.

1. Equip each router and bridge with a network transceiver on each network port (inbound and outbound) as dictated by the network type (Type 1 - FTT, Type 2 - TP, Type 3 - PL, Type 4 - LP, Type 5 - RF).

2. The network router shall be designed to route messages from a segment, sub-net, or domain in full duplex communication mode.

3. Routers and bridges shall utilize LonTalk protocol transport, network, session layers to transparently route messages bound for a node address in another sub-net or domain. Routers with TCP/IP capability shall be provided where TCP/IP backbone is used. In this case, Lontalk IP encapsulation shall be utilized in accordance with Lonmark guidelines.

4. Routers, bridges and repeaters shall be fully programmable and permit a systems integrator to define message traffic, destination, and other network management functions utilizing LonWorks technology, NetMaker and Net Profiler installation tools through the LonManager Software package or other LonManager API based Network Management tool.

5. The routers, bridges, and repeaters shall be capable of DIN rail or panel mounting and be equipped with status LED lights for Network traffic and power.

6. Provide a minimum of (2) Neuron 3150 processors for use as the network router communication controller.

B. Transceivers:

1. Type 1 Network Transceiver, Free Topology, Twisted Pair: Provide a transformer isolated, twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:

a. Meets LONMARK Interoperability Association Standards.

b. Differential Manchester encoded signaling for polarity insensitive network wiring.

c. Transformer isolated for common mode rejection.

d. 78 K/ps network bit rate up to distances of 2000m.

e. Free topology supports star, home run, multi drop and loop wiring topologies.

f. Complies with FCC and VDE requirements.

g. UL recognized component.

2. Type 2 Network Transceiver, Twisted Pair: Provide a transformer isolated twisted pair transceiver capable of mounting directly on a printed circuit board. The transceiver shall meet the following specifications:

   a. Meets LONMARK interoperability standards.

   b. Differential Manchester encoded signaling for polarity insensitive network wiring.

   c. Transformer isolation for common mode rejection.

   d. 1.25 Mb/s network bit rate up to distances of 1000 meters.

   e. Unpotted construction.

   f. Less than 1 mA power consumption with +5VDC input voltage.

   g. FCC and VDE Level B requirements compliance.

   h. UL Listed.

3. Type 3 Network Transceiver, Power Line:

   a. Provide a direct sequence, spread spectrum power line transceiver which is equipped with the following signal processing and error correction capabilities to provide robust and error free communications.

      1) Forward Error Correction (FEC) to enable the system to read and reconstruct corrupted packets without sacrificing throughput. The FEC shall require only six percent overhead for error correction.

      2) Automatic sensitivity adjustment algorithm that dynamically changes the receiver sensitivity based on noise characteristics.

      3) Oversampling correlation filter and adaptive data recovery algorithm to synchronize instantaneously to incoming packets.

      4) Tri-state power amplifier/filter combination to provide a powerful output signal with a minimum number of components.

   b. The transceiver shall be able to operate using the controller power supply and coupling circuit. Provide the following general features as a minimum:

      1) Packaged in a rugged, potted module.

      2) Programmable clock output (1.25, 2.5, 5 or 10 Mhz).

      3) 10 Kb/s network transmission rate.

      4) Packet detect output to drive a status indicator LED.

      5) Minus 20 to plus 85 degrees C. operating temperature range.

      6) UL Listed.

4. Type 4 Network Transceiver, Link Power: Provide a twisted pair transceiver that utilizes the twisted pair communication media to provide power for the LonWorks Controller(s). The transceiver shall meet the following specifications:

   a. Free single-in-line package (SIP) construction.

b. Send both network data and power on a twisted wire pair.

c. Meets LONWORKS interoperability standard.

d. Differential Manchester encoded signaling for polarity insensitive network wiring.

e. 78 Kb/s network bit rate up to distances of 320 meters.

f. Supports star, home run, multidrop, and loop wiring.

g. Supplies +5VDC @ 100 mA maximum for node power.

h. Compliance with FCC and VDE requirements.

i. UL Listed.

5. Type 5 Network Transceiver, Radio Frequency: Provide a direct sequence, spread spectrum RF transceiver that meets the following specifications:

a. 100 meter open field range.

b. Wireless communications extends network between buildings and to vehicles and portable devices.

c. FCC type certifiable, 48 MHz.

d. Low-cost miniature circuit board, SMT components.

e. Carrier detect output to drive a status indicator LED.

f. Plus 7 to plus 15VDC input voltage.

g. Minus 20 to plus 60 degrees C. operating temperature range.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Locate all controllers, relays, switches, for equipment within equipment rooms in enclosed control panels with hinged locking doors. For equipment located in exposed areas subject to outside weather conditions, mount all control devices inside weatherproof enclosures. To optimize the design of the system the exact number and location of controller panels must not interfere with operation of any access to other equipment.

B. Mount control panels adjacent to associated equipment on vibration-free walls or freestanding angle channel supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved laminated nameplates on cabinet face.

C. Field equipment outboard of the controller panel shall be installed in field panels. All field mounted devices, equipment, control circuits and contacts and transducers shall be located in field panels. Exception: Point of measurement sensors; i.e. temperature or pressure sensors.

D. Field panels shall be general purpose NEMA 1. Panels located out of doors or installed in high moisture areas shall be NEMA 3R. Panels mounted exterior to the building shall be NEMA 3R and constructed of 16 gage steel (minimum) with a front-hinged door with lock and keyed to building keying system.

E. Application Specific Controllers (ASCs): Terminal unit shall be installed and calibrated for terminal unit operation and control sequences. Settings shall be stored in non-volatile memory. Unit shall come tagged from the factory with identification of all setpoints (minimum and maximum air capacity, heating/cooling setpoints, control sequence, etc.).

F. When a hand-off-auto (H-O-A) switch has been provided, control the equipment while the equipment is in the auto mode only, except that safety shutdown features shall remain operational in all modes of operation.

G. Safeties: All equipment safeties shall be hardwired within the motor control circuit or motor starter. Operational safeties include, but are not limited to: freeze protection thermostats and duct work over pressurization pressure switches. Life safety safeties include, but are not limited to duct smoke detectors. Auxiliary contacts shall be provided to allow supervision by the building automation system.

H. Provide all required ventilation, cooling, structural support, electrical power, power conditioning and surge protection (with reset) as required to ensure system performance and reliable equipment operation.

I. Sensors shall have accuracy as stated in Section 15910. Accuracy shall include total sensor to read-out accuracy. Instrument characteristics such as hysteresis, relaxation of time, span and maximum and minimum limits shall be accounted for in applications of sensors and controls.

J. Use approved designations for all room names, spaces, equipment tags, etc.

3.2 ELECTRICAL RACEWAYS

A. All wiring shall run in conduit, except runouts to terminal unit controllers located above the ceiling may be exposed.

B. Control wiring and AC power wiring shall not share the same conduit nor shall they occupy the same enclosure unless an appropriate grounded metallic barrier is installed between these wiring types.

C. Pneumatic tubing shall not share the same conduit or raceway with control or AC power wiring.

D. Wiring methods shall be in accordance with the requirements of applicable codes and criteria as indicated in Division 16 of these Tenant Requirements.

E. Wiring from remote equipment shall be to terminal blocks. The terminal blocks shall be permanently marked for identification. Protect all circuits to avoid interruption of service due to short-circuiting or other conditions that might adversely affect the connected devices. Number the blocks by circuit pairs, such as one to 25, 26 to 50, etc. Classify each individual signaling circuit as a circuit pair.

F. Label or code each field wire at each end using Ray-Chem or approved equal heat shrink markers. Permanently label or code each point of all field terminal strips to show the instrument or item served. Color coded cable with cable diagrams may be used to accomplish cable identification.

G. Splices shall not be made in shielded wiring except where specifically approved. Splices shall be made on terminal blocks in approved junction boxes. Outlet boxes shall not be used for splices. Comply with labeling requirements noted above.

H. Provide power to the equipment from a source(s) compatible with the load and acceptable to the Contracting Agency.

I. Standby Generator power shall be used to power equipment used for alarms, and for equipment controlling or monitoring systems on emergency/standby power.

J. Plug or cap all unused conduit openings and stub-ups. Do not use caulking compound.

K. Size conduit for a maximum of 40 percent fill.

L. Plenum cable may be used for runouts to terminal unit controllers. Plenum cable shall be UL Listed cable for use in air handling plenums (i.e., Teflon™ coated or mineral insulated wire).

M. Coverplates: Provide blank finished coverplates where required on junction or pullboxes. Finish shall be consistent with existing room decor and approved by the Architect.

N. Conceal raceways above the ceilings and in the walls of occupied spaces.

O. Support raceways and wiring systems from the structure, not from mechanical equipment, mechanical ductwork, suspended ceilings or other building elements.

P. Conceal conduit within finished shafts, ceilings and wall as required. Install exposed conduit parallel with or at right angles to the building walls.

Q. Conduits located in areas where the ceiling is exposed to the structure shall be painted to match the finish of the ceiling.

R. Mark the covers of all junction boxes with "BAS" using a permanent label.

S. Provide supervised field-wiring for all alarm panel monitoring points, asset protection points (safeties, sump pumps, maintenance alarms) and all points identified to include supervised wiring on the points schedule.

T. Where conduit is attached to vibrating or rotating equipment, flexible metal conduit with a minimum length of 18 inches and maximum length of 36 inches shall be installed and anchored in such a manner that vibration and equipment noise will not be transmitted to the rigid conduit.

U. Where exposed to the elements or in damp or wet locations, waterproof flexible conduit shall be installed. Installation shall be as specified for flexible metal conduit.

3.3 IDENTIFICATION

A. Refer to Section 15075 - Mechanical Identification.

B. All panels shall have nameplates.

C. Identify all equipment and panels. Identification shall be with tags describing equipment and panel use and function. Include point names, physical address, and space number of the area served on field sensors and actuators.

D. Valve actuator, control device and monitoring equipment identification shall be by tags that are chain attached or securely fastened to the equipment or device.

E. Apply the numbering system used in the existing controls to new lines and terminals within a panel with line number matching terminals shown on control diagrams. All wires and cables shall be identified with permanent markers at each end.

END OF SECTION

SECTION 15910

CONTROL INSTRUMENTATION AND HARDWARE

PART 1 GENERAL

1.1 SUMMARY

A. This Section describes specific requirements, products, and methods of execution relating to the field hardware related to HVAC controls for the project.

PART 2 PRODUCTS

2.1 TEMPERATURE SENSORS/THERMOSTATS

A. Room sensors/thermostats for zone temperature control of VAV boxes, finned tube radiation and reheat coils. Provide the following features

1. LCD display, day/night override button, and setpoint slide adjustment, or keypad override options. The setpoint slide adjustment shall be software limited by the automation system to limit the amount of room adjustment.
2. Temperature monitoring range: 55/95 degrees F.
3. Output signal: Changing resistance.
4. Accuracy at Calibration point: plus or minus 0.5 degree F.
5. Set Point and Display Range: 55 degrees to 95 degrees F.
6. Wall Mounted unit with finished cover.
7. Control system network connection port for Portable Operator Terminal.

B. Space temperature sensors/thermostats for use with unit heaters, cabinet unit heaters:

1. Digital display.
2. Temperature monitoring range: 55/95 degrees F.
3. Output signal: Changing resistance.
4. Setpoint slide adjustment
5. Accuracy at Calibration point: plus or minus 0.5 degree F.
6. Setpoint and Display Range: 55 degrees to 95 degrees F.
7. Wall Mounted unit with finished cover.

C. Liquid immersion temperature:

1. Temperature monitoring range: Minus 40 to plus 240 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: Plus or minus 0.5 degree F.
4. Provide immersion sensor assembly as specified. Immersion sensors shall include a separate thermowell for sensor installation. Annular space between well and sensor shall be filled with heat conductive compound.

D. Duct (single point) temperature:

1. Temperature monitoring range: 20 to 120 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: plus or minus 0.5 degree F.
4. Sensing element shall be located a minimum of 25 percent across duct width.

E. Duct Average temperature:

1. Temperature monitoring range: 20 to 120 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: plus or minus 0.5 degree F.
4. Sensor Probe Length: 25 feet.

F. Outside air temperature:

1. Temperature monitoring range: Minus 58 to 122 degrees F.
2. Output signal: Changing resistance.
3. Accuracy at Calibration point: plus or minus 0.5 degree F.
4. Provide NEMA3R rated mounting assembly (rain tight).

2.2 THERMOSTAT GUARDS

A. Provide in areas where activity may damage thermostat.

2.3 CURRENT SENSORS

A. Provide current sensors that convert AC current to a proportional (4-20ma) DC current. Accuracy 0.5 percent full range, repeatability 0.1 percent full range. Reverse voltage and high over current capacity, operating range minus 58 degrees F. to 149 degrees F.

B. Nielsen-Kuljian, Veris or approved equal.

2.4 CURRENT SENSING RELAYS

A. Provide current sensing relays for status of fans or pumps as called out in sequences or input/output summary. Provide with field adjustable current setpoint range.

B. Nielsen-Kuljian, Veris or approved equal.

2.5 CONTROL DAMPERS

A. Provide low leakage control dampers with leakage no greater than 10 CFM per square foot at 4 in. W.C. with 20 in.-lbs. torque applied regardless of size.

2.6 ELECTRIC DAMPER AND VALVE ACTUATORS

A. All modulating damper and valve actuators shall be 24vac electric motor type; floating point, 0-10Vdc, 4-20ma or other industry standard input signal type. Actuators shall function properly within the range of 85 to 110 percent of line voltage. (Specific applications may require 0-10 V spring return).

B. Provide actuators in sufficient size, quantity and type to match application. Provide a minimum of one damper actuator for each 24 square feet of damper area. Damper areas shall not exceed manufacturer's ratings.

PART 3 EXECUTION

3.1 INSTALLATION OF EQUIPMENT, MATERIALS AND FIELD HARDWARE

A. Install all sensors and control devices located out of doors or in high moisture areas in weatherproof housings.

B. When proof of flow is specified, the flow proving device for constant volume fans and pumps shall be a current sensor connected to the motor wiring at the starter. Set upper alarm limit to the maximum rated current of the motor, or as advised by the TAB Agency. Set lower alarm limit at 1/2 the motor running amps. Current relays are not acceptable.

C. Where proof of flow is specified for variable speed control system, the flow proof shall be made through utilization of the VFD trouble contacts and the loop control differential pressure sensor.

D. Use differential pressure sensor for filter alarms: The sensor shall be installed across the inlet and discharge side of the filter. The sensor shall be sized for the application and be suitable to withstand all system operating pressures. Set filter alarm pressure as specified. Differential switches for filter alarms not allowed.

E. Pressure Sensors: All pressure sensors located on liquid lines shall be provided with isolation valves, snubbers, and plugged calibration ports.

3.2 TEMPERATURE SENSORS/THERMOSTATS

A. Temperature sensors shall require no field calibrations.

B. Sensors shall be with enclosure where located in finished space.

C. Room sensors/thermostats installed in public spaces shall be mounted at a height of four feet six inches. Provide locking guards over sensors where shown. Temperature sensor assemblies shall be readily accessible and adaptable to each type of application. Sensor assemblies shall allow for quick, easy replacement and servicing without special tools or skills. Coordinate with Architect and Engineer.

D. Provide insulated base for room sensors mounted on sheet metal, steel columns or exterior walls. Where insulated bases are installed, caulk all wire penetrations airtight for prevention of thermal convection.

3.3 FILTER DIFFERENTIAL PRESSURE SENSORS AND GAUGES

A. Provide one gauge for each filter bank where sensors are installed.

B. Mount gauges and sensors with the appropriate sensing tubes located on the equipment being measured.

END OF SECTION

SECTION 15915

VARIABLE FREQUENCY DRIVES

PART 1 PART 1 - GENERAL

1.1 DESCRIPTION

A. This section provides specification requirements for adjustable speed, variable frequency drives or herein identified as VFDs for use with AC motors used at ANC.

B. The VFD manufacturer shall furnish, field test, adjust and certify all installed VFDs for satisfactory operation.

C. Any exceptions/deviations to this specification shall be submitted in writing with the Preliminary Design Submittal.

1.2 QUALITY ASSURANCE

A. The Basis of Design is equipment from Square D Company to set a standard for quality. Equivalent equipment from ABB will also be acceptable.

B. The manufacturer of the VFD shall be a certified ISO 9001 facility.

C. The VFD and all associated optional equipment shall be UL listed according to Power Conversion Equipment UL 508C. A UL label shall be attached inside each enclosure as verification.

D. The VFD shall be designed, constructed and tested in accordance with NEMA, NEC, VDE, IEC standards and CSA certified.

E. Every Power Converter shall be tested with an actual AC Induction Motor 100 percent loaded and temperature cycled within an environment chamber at 104 degrees F.

F. All drive door mounted pilot devices shall be tested to verify successful operation.

G. The VFD shall be submitted to a Hi-Pot test with all enclosed devices mounted and wired, prior to shipment.

H. Documentation shall be furnished to verify successful completion of the tests noted in 1.2.E, 1.2.F and 1.2.G above at the request of ANC.

1.3 REFERENCES AND STANDARDS

A. ANSI/NFPA 70 - National Electrical Code.

B. ANSI C84.1 - Voltages Tolerances for North America

C. CSA C22.2 No. 14-M91 - Industrial Control Equipment

D. IEC 68 Part 2-3 - Basic Environmental Testing Procedures Part 2: tests - Test Ca: Damp Heat

E. IEC 146.1 - Semiconductor Converters-General Requirements and Line Commutated Converters Part 1-1: Specifications of Basic Requirements

F. IEC 664 - Insulation Coordination for Equipment Within Low-Voltage Systems

G. IEC 447 - Man-Machine Interface Actuating Principles

H. IEC 439 Part 1 - Low Voltage Switchgear and Controlgear Assemblies

I. IEC 947 - Low Voltage Switchgear and Controlgear Components

J. IEC 364 - Electrical Installation of Buildings

K. IEC 204/NFPA 79 - Electrical Equipment of Industrial Machines/Industrial Machinery

L. IEC 106 - Guide for Specifying Environmental Conditions for Equipment Performance Rating

M. IEC 529 - Degrees of Protection Provided by Enclosure

N. IEC 1000 - Electromagnetic Compatibility

O. IEC 721 - Classification of Environmental Conditions

P. IEC 255-8 Overload Relays

Q. IEC 801-2,-3,-4,-5 - Immunity Tests

R. NEMA ICS 6 - Industrial Control and Systems Enclosures

S. NEMA ICS, Part 4 Overload Relays

T. NEMA 250 Enclosures for Electrical Equipment

U. NEMA ICS 2-321 - Electrical Interlocks

V. NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives

W. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives

X. UL 50 - UL Standard for Safety Enclosures for Electrical Equipment

Y. UL 98 - UL Standard for Disconnect Switches

Z. UL 507 - UL Standard for Safety Electric Fans

AA. UL 508 - UL Standard for Safety Industrial Control Equipment

BB. UL 508C - UL Standard for Safety Power Conversion Equipment

CC. UL 991 - UL Standard for Safety Tests for Safety Related Controls employing Solid State Devices

DD. OSHA 1910.95 - AC Drive Controller Acoustical Noise

EE. Confirming to National Safe Transmit Association and International Safe Transmit Association Test for Packages Weighing 100 lbs or Over

1.4 SUBMITTALS

A. Provide the following information for all products as part of the Preliminary Design Submittal.

1. Elementary power and control wiring diagrams and enclosure outline drawings. The enclosure drawings shall include front and side views of the enclosures with overall dimensions and weights shown, conduit entrance locations and nameplate legends.

2. Standard catalog sheets showing voltage, horsepower, maximum current ratings and recommended replacement parts with part numbers shall be furnished for each different Horsepower rated VFD provided.

3. Submit Harmonic Analysis including sources of all assumptions. Provide harmonic analysis for operation on utility power and for operation on building standby generators if applicable (with either one or two generators operating).

4. Submit shop drawings showing specific VFD mounting arrangements. Include verification that mounting of VFD is suitable for Seismic Zone 4.

1.5 WARRANTY

A. Three year parts warranty shall be provided on materials and workmanship from date of final completion of project.

1.6 OWNERS MANUALS

A. Furnish two (2) complete sets of Operation and Maintenance Manuals and other information necessary for the operation and maintenance of the system.

PART 2 PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Square 'D'.

B. ABB.

2.2 GENERAL

A. Furnish complete variable-frequency drives (VFD) as specified herein for the fans, pumps and equipment required to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified.

B. MOTOR HEATING: Verify the thermal capability of all motors to be controlled via VFDs. Coordinate with the motor manufacturer to ensure that appropriate temperature detection or sensors are provided for motor protection. Verify that the motor service factor and design type are suitable for use with the VFD.

2.3 PRODUCT TYPE

A. The VFD shall be provided by Square D Company, Class 8839, Type ATV-66, or as approved. Substitutions shall include supporting documentation demonstrating that the alternative manufacturer meets all aspects of the specifications herein.

B. Alternate control techniques other than pulse width modulated (PWM) are not acceptable.

2.4 GENERAL DESCRIPTION

A. The VFD shall convert the input AC mains power to an adjustable frequency and voltage as defined in the following sections.

B. The input power section shall utilize a full wave bridge design incorporating diode rectifiers. The diode rectifiers shall convert fixed voltage and frequency, AC line power to fixed DC voltage. This power section shall be insensitive to phase rotation of the AC line.

C. The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall utilize insulated gate bipolar transistors (IGBTs), bipolar junction transistors (BJTs) or intelligent power modules (IPMs) as required by the current rating of the motor.

2.5 CONSTRUCTION

A. VFDs shall be mounted in a Type 12 enclosure with an external operated disconnect device.

B. A mechanical interlock shall prevent an operator from opening the VFD door when the disconnect is in the *on* position. Another mechanical interlock shall prevent an operator from placing the disconnect in the *on* position while the VFD door is open. It shall be possible for authorized personnel to defeat these interlocks.

C. Provisions shall be provided for locking all disconnects in the *off* position with up to three padlocks.

D. Provide current limiting fuses to protect the VFD input.

E. Provisions shall be made for accepting a padlock to lock the enclosure door.

2.6 MOTOR DATA

A. Refer to the drawings and specifications for listings of all motors requiring VFDs.

B. Motor sizes, voltages, RPM ratings, types, service factors, etc., shown in the documents shall be confirmed with the provider of the motor prior to ordering VFDs.

2.7 APPLICATION DATA

A. Each VFD shall be selected and sized to operate its respective load.

B. The speed range shall be from a minimum speed of 0.5 Hertz to a maximum speed of 250 Hz.

2.8 ENVIRONMENTAL RATINGS

A. The VFD shall be of construction that allows operation in a pollution Degree 3 environment. The VFD shall meet IEC 664-1 and NEMA ICS 1 Standards. VFDs that are only rated for Pollution Degree 2 environment shall not be allowed.

B. The VFD shall be designed to operate in an ambient temperature from 0 to + 40 degrees C (+32 to 104 degrees F).

C. The storage temperature range shall be minus 25 to plus 70 degrees C.

D. The maximum relative humidity shall be 95 percent at 40 degrees C, non-condensing.

E. The VFD shall be rated to operate at altitudes less than or equal to 3,300 feet (1000m). For altitudes above 3,300 feet, de-rate the VFD by 1.2 percent for every 300 feet (100m).

F. The VFD shall meet the IEC 68-2 Operational vibration specification.

2.9 RATINGS

A. The VFD shall be designed to operate from an input voltage of 200 plus or minus 15 percent Vac and 460 plus or minus 15 percent Vac.

B. The VFD shall operate from an input voltage frequency range from 47.5 to 63 Hertz.

C. The displacement power factor shall not be less than 0.95 lagging under any speed or load condition.

D. The efficiency of the VFD at 100 percent speed and load shall not be less than 96 percent.

E. The constant and variable torque rated VFD overcurrent capacity shall be 150 percent and 110 percent respectively for 1 minute.

F. The output carrier frequency of the VFD shall adjustable depending on VFD rating for low noise operation.

2.10 PROTECTION

A. Upon power-up the VFD shall automatically test for valid operation of memory, option module, loss of analog reference input, loss of communication, dynamic brake failure, DC to DC power supply, control power and the pre-charge circuit.

B. The VFD shall be UL 508C listed for use on distribution systems with 65,000A rms available fault current. The Power Converter shall meet short circuit withstandability of 65,000 rms symmetrical amperes as defined by NEMA ICS 7.1.09 and have the value listed on the VFD nameplate.

C. The Power Converter shall be protected against short circuits, between output phases and ground; and the logic and analog outputs.

D. The VFD shall have a minimum AC undervoltage power loss ride-through of 15 msec. The VFD shall have the user defined option of frequency fold-back to allow motor torque production to continue to increase the duration of the power loss ride-through.

E. The VFD shall have a selectable ride through function which shall allow the logic to maintain control for a minimum of one second without faulting.

F. For a fault condition other than a ground fault, short circuit or internal fault, an auto restart function shall provide up to 5 programmable restart attempts. The programmable time delay before restart attempts shall range from 1 second to 600 seconds.

G. The deceleration mode of the VFD shall be programmable for normal and fault conditions. The stop modes shall include free-wheel stop, fast stop and DC injection braking.

H. Upon loss of the analog process follower reference signal, the VFD shall fault and/or operate at a user defined speed set between software programmed low speed and high speed settings.

I. The VFD shall have solid state I^2t protection that is UL listed and meets UL 508 C as a Class 10 overload protection and meets IEC 947. The minimum adjustment range shall be from 0.45 to 1.05 percent of the current output of the VFD.

J. The VFD shall have a programmable fold-back function that shall anticipate a controller overload condition and fold back the frequency to avoid a fault condition.

K. There shall be 3 skip frequency ranges that can each be programmed with a selectable bandwidth of 2 or 5 Hz. The skip frequencies shall be programmed independently, back to back or overlapping.

L. The VFD shall include Metal Oxide Varistors (MOVs) wired to the incoming AC Mains.

2.11 ADJUSTMENTS AND CONFIGURATIONS

A. The VFD shall self-configure to the main operating supply voltage and frequency. No operator adjustments shall be required.

B. The VFD shall be factory pre-set to operate most common applications.

C. A choice of types of acceleration and deceleration ramps shall be available in the VFD software; linear and S curve.

D. The acceleration and deceleration ramp times shall be adjustable from 0.1 to 600 seconds.

E. The volts per frequency ratios shall be user selectable to meet variable torque loads, normal and high torque machine applications.

F. The memory shall retain and record run status and fault type of the past 8 faults.

G. Slip compensation shall be a software enabled function.

H. The VFD shall offer programmable DC injection braking that shall brake the AC motor by injecting DC current and creating a stationary magnetic pole in the stator. The level of current shall be adjustable between 50-150 percent of rated current and available from 0.0-30 seconds continuously.

2.12 OPERATOR INTERFACE

A. The operator interface terminal shall offer the modification of VFD adjustments via a touch keypad. All electrical values, configuration parameters, I/O assignments, application and activity function access, faults, local control, adjustment storage, self-test and diagnostics shall be in plain English.

B. The display shall be a high resolution, LCD back lighted screen.

C. The VFD model number, torque type, software revision number, horsepower, output current, motor frequency and motor voltage shall all be listed on the drive identification display as viewed on the LCD display.

D. The display shall be able to display speed reference, output frequency, output current, motor torque, output power, output voltage, line voltage, DC voltage, motor thermal state, drive thermal state, elapsed time, motor speed, machine speed reference and machine speed.

E. A single keystroke scrolling function shall allow dynamic switching between display variables.

F. The operator terminal shall offer a general menu consisting of parameter setting, I/O map, fault history, and drive configuration. A software lock shall limit access to the main menu. The main menu shall consist of keypad configuration, drive configuration, general configuration, diagnostic mode and drive initialization screens.

G. There shall be arrow keys that shall provide the ability to scroll through menus and screens, select or activate functions or increase the value of a selected parameter.

H. A data entry key shall allow the user to confirm a selected menu, numeric value or allow selection between multiple choices.

I. An escape key shall allow a parameter to return the existing value if adjustment is not required and the value is displayed. The escape function shall also return to a previous menu display.

J. A RUN key and a STOP key shall command a normal starting and stopping as programmed when the VFD is in keypad control mode. The STOP key must be active in all control modes.

K. A user interface shall be available that is a Windows NT based personal computer, Lonworks communication link or detachable operator interface.

L. The Keypad and all door mounted controls shall be similarly rated as the enclosure.

2.13 CONTROL

A. External pilot devices shall be able to be connected to a terminal strip for starting/stopping the VFD, speed control and displaying operating status. All control inputs and outputs shall be software assignable.

B. 2-wire or 3-wire control strategy shall be defined within the software. External relays or logic devices shall not be allowed.

C. VFD shall interface directly with the building control system via a Lonworks communications module provided with the VFD. Provide communications hardware/firmware within VFD to communicate directly with the controls system utilizing the networking communication protocol based on the Echelon Neuron 3150 microprocessor. VFD communication interface shall be Lonmark certified to the variable frequency drive profile. Where a profile has not been established, the profile shall be at a minimum proposed for adoption.

D. The following points shall, as a minimum, be available to the BAS through the Lonworks interface:

1. Inputs:

a. Analog speed input.

b. Start/stop.

c. Motor switching.

d. Fault reset.

2. Outputs:

a. Frequency.

b. Current.

c. Power.

d. Torque.

e. Voltage.

f. Thermal state.

g. Fault Status.

E. The VFD shall operate in standalone mode if network communication fails. Software shall include a complete operating system (O.S.), communications handler, point processing, standard control algorithms, and specific control sequences.

2.14 ISOLATION/BYPASS CONTACTORS

A. The VFD shall include IEC rated isolation and bypass contactors complete with thermal overload relay, molded case switch disconnect interlocked with the door, control circuit transformer, motor flux decay timer and AFC-OFF-BYPASS switch. The operator shall have full control of the bypass starter by operation of the door mounted selector switch.

2.15 HARMONIC ANALYSIS

A. A harmonic analysis shall be performed by the VFD manufacturer based upon system documentation consisting of but not limited to one-line diagrams and specific distribution

transformer and generator (where applicable) information consisting of KVA, %Z, X/R and subtransient reactance data. Vendor shall acquire all necessary input data and include documentation of sources in the submittal of the calculations. The data shall consist of but not be limited to total harmonic voltage distortion, K-factor and total rms current. If the resulting calculations determine that the harmonic distortion will be above the IEEE-519 specifications of 5 percent, additional isolation transformers or line reactors beyond those required below shall be supplied to lower the harmonic levels.

B. Provide minimum 3 percent impedance line reactors in stand-alone NEMA 1 enclosures for mounting separate from the VFD.

PART 3 PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate all details pertaining to the motor control equipment with the Division of these specifications where the controlled equipment is specified.

B. Coordinate with the building controls system to ensure complete compatibility of inputs and outputs prior to submitting submittals and shop drawings for approval.

C. Provide automatic reset of drives after the alarm condition has been cleared and a new “start” or “run” signal is received.

3.2 EXAMINATION

A. Tenant’s contractor shall verify that jobsite conditions for installation meet factory-recommended and code-required conditions for VFD installation prior to start-up. These shall included as a minimum:

1. Clearance spacing.

2. Temperature, contamination, dust, and moisture of the environment.

3. Conduit installation of the motor wiring and power wiring separation.

B. The VFD shall be covered and protected from construction dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

3.3 INSTALLATION

A. Verify that the location is ready to receive work and the dimensions are as indicated.

B. Do not install VFD until the building environment can be maintained within the service conditions required by the manufacturer. Before and during the installation, the VFD equipment shall be protected from site contaminants.

C. All details of the installation shall comply with the manufacturer’s applicable instructions.

D. Minimize the length of conductors between the drive and the motor to avoid motor damage from the reflected wave phenomenon.

E. Where the field conditions dictate long lengths of conductors between the VFD and motor, provide all measures necessary to protect motors from the reflected wave phenomenon. Measures may include coordination with the motor manufacturers to provide higher insulation voltage ratings, protection devices such as output reactors or special terminators, or BJT inverter output.

F. Mounting of VFD shall be suitable for Seismic Zone 4.

3.4 START-UP SERVICE

A. The manufacturer shall provide start-up commissioning of the variable-frequency drive and its optional circuits by a factory-certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer's site. Sales personnel and other agents who are not factory-certified technicians for drive field repair shall not be acceptable as commissioning agents.

1. Start-up services shall include checking for proper operation and installation of the VFD, its options and its interface wiring to the building automation system. As a minimum, this service shall include:

a. Verification of Contractor wire terminations to the VFD and its optional circuitry.

b. One hour of Owner operator training on operation and service diagnostics at the time of the equipment commissioning.

c. Measurement for verification of proper operation on each of the following items:

1) Motor voltage and frequency. Verification of proper motor operation.

2) Control input for proper building automation system interface and control calibration.

3) Calibration check for the following set points (and adjustment as necessary): minimum speed, maximum speed, and acceleration and deceleration rates.

4) Total harmonic distortion and K-factor at the input to each VFD system under the full range of load conditions.

d. Submit results of all measurements. In addition, include a copy of all commissioning tests and measurements in the Maintenance Manuals.

3.5 CONTROL WIRING

A. Control wiring and control devices shall be provided under the specification section in which the controlled equipment is specified. Coordinate all related work.

B. Control wiring shall be routed completely separately from power wiring.

3.6 NAMEPLATES

A. Provide nameplates for all VFDs. Coordinate names with mechanical equipment lists.

END OF SECTION

SECTION 15940

SEQUENCES OF OPERATION

PART 1 GENERAL

1.1 SUMMARY

A. This section describes the specific minimum requirements for control monitoring for mechanical systems.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 MOTOR STARTING

A. Sequence 3 phase motors so they do not start simultaneously, whether startup from normal, emergency or standby power.

3.2 OIL WATER SEPARATORS

A. Monitor the system and generate an independent maintenance alarm to indicate system trouble.

3.3 GLYCOL LOOPS

A. On any glycol system added by the Tenant, monitor the system pressure sensor, and generate an alarm on switch closure.

3.4 CABINET UNIT HEATERS/UNIT HEATERS

A. Provide means to disable units when then hot water supply has been shut off.

3.5 FAN COIL UNITS

A. Monitor fan, filters, and space temperature.

3.6 TYPICAL ZONE TEMPERATURE MONITORING

A. Generate maintenance alarm if any zone temperature is not being maintained within the setpoint band tolerance determined by the engineer.

B. Generate critical alarm if any zone temperature falls below 55 degrees F (adjustable).

3.7 TYPICAL CONSTANT SPEED CIRCULATING PUMP FLOW MONITORING

A. Provide current sensors to monitor pump motor current, and input into BAS. Current switches not acceptable.

B. Determine normal and motor inrush currents. Set high and low alarm setpoints based upon normal operating currents. A time delay may be necessary to reduce nuisance alarms due to motor start inrush currents.

C. Generate an alarm if the motor current falls below low alarm setpoint or above high alarm setpoint whenever the pump has been commanded on.

3.8 TYPICAL CONSTANT SPEED FAN FLOW MONITORING

A. Provide current sensors to monitor fan motor current, and input into BAS. Current switches not acceptable.

B. Determine normal and motor inrush currents. Set high and low alarm setpoints based upon normal operating currents. A time delay may be necessary to reduce nuisance alarms due to motor start inrush currents.

C. Generate an alarm if the motor current falls below low alarm setpoint or above high alarm setpoint whenever the fan has been commanded on.

3.9 TYPICAL FILTER MONITORING

A. Provide differential pressure sensor across each filter bank. Provide high pressure alarms as indicated in the sequences.

END OF SECTION

SECTION 15945

CONTROLS TESTING AND ACCEPTANCE

PART 1 GENERAL

1.1 SUMMARY

A. This section describes requirements for operational verification of the controls system.

1.2 DESCRIPTION

A. Provide the services of an agent independent of the HVAC control system installer to provide certification that the controls are installed and functioning as designed. The agent may be the Tenant's Engineer. The agent shall submit documentation demonstrating at least 4 years experience in commissioning HVAC controls.

B. Loop damping and stability shall be verified through trend logging and charting of control loop controlled and feedback variables.

C. Verification of installation and performance shall consist of the following:

1. Installation Examination: Perform on-site Installation check out and start-up of each control point of the control system installation to verify each element of the control system is properly installed and is functioning.

2. Functional Test Requirements: An on-site functional test to verify each controlled device is functioning according to the sequences of operation, and that all control loops are stable in their operation.

1.3 SUBMITTALS

A. Submit qualifications of the controls commissioning agent.

B. Submit Certificate of Controls Completion. Certificate shall attest to:

1. The Installation Examination has been complete, and all elements are installed correctly. Attach completed checklists.

2. The Functional Test has been completed and that all controls are operating according to the sequences of operation, and that control loops are stable in operation. Attach completed checklists, point logs and trend logs demonstrating proper functioning of the system.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

SECTION 15990

TESTING, ADJUSTING, AND BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section describes minimum requirements for testing and balancing of the mechanical systems provided by Tenants.

1.2 REFERENCES

A. American Air Balance Council (AABC) - National Standards for Total System Balance.

B. ASHRAE Standard 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

C. National Environmental Balancing Bureau (NEBB) - Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

D. National Environmental Balancing Bureau (NEBB) Testing, Adjusting, Balancing Manual for Technicians.

E. SMACNA - HVAC SYSTEMS Testing, Adjusting, and Balancing.

1.3 DESCRIPTION

A. Test, balance and adjust Heating, ventilation, and domestic hot water circulation systems installed by the Tenant.

B. Testing and balancing shall include but is not necessarily limited to:

1. Ventilation systems:

   a. Set supply air outlet and duct branch flows.

   b. Set exhaust air inlet flows.

   c. Test and balance fans in fan coil units, unit heaters and cabinet unit heaters that are installed by Tenant, and adjust outlets to proper flow.

2. Fluid systems:

   a. Liquid heat transfer systems (heating and cooling), including pumps, flow control and balancing valves at each device installed by Tenant.

   b. Domestic hot water circulation system, where flow control valves are installed by Tenant.

3. Obtain the services of a qualified independent agent to review and approve the Testing and Balancing Report.

4. Submit three copies of the final approved report to ANC for review and acceptance. Include the report in O&M Manuals.

1.4 SUBMITTALS

A. Submit three copies of the Testing and Balancing Report described in TESTING AND BALANCING REPORT that has been approved by Tenant's Engineer for review and acceptance. Include copies of the Testing and Balancing Agency's NEBB or AABC certification.

B. O&M Manual: Include copies of the approved Testing and Balancing Report in O&M Manuals.

1.5 QUALITY ASSURANCE

A. Testing and Balancing shall be performed by an agency certified by the National Environmental Balancing Bureau (NEBB) or certified by the American Air Balance Council (AABC) for air and hydronic balancing. Attach a copy of the certification to the balancing report.

B. Balancing Standards: balancing shall be performed in accordance with NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems, AABC National Standards for Total System Balance, ASHRAE Standard 111, or SMACNA HVAC SYSTEMS Testing, Adjusting, and Balancing.

C. The balancing report shall be written in a format equivalent to that shown in the SMACNA HVAC Systems Testing, Adjusting and Balancing manual.

1.6 TESTING AND BALANCING REPORT

A. The Testing and Balancing Report shall include the following as a minimum:

1. Report Title Page. Include specific tenant project identification

2. Summary Comments.

3. Instrument Calibration Report:

a. Include a complete list of test equipment used. List the instruments used on the project during the balancing work, on an NEBB “Instrument Calibration Report” form, or equivalent form. This includes flow measuring hoods and other related devices.

B. Air Systems Report. Prepare a report for each air system balanced. Tabulate data separately for each system. Describe balancing method used for each system. At minimum, include the following:

1. System drawings/diagram: Include plans and diagrams showing locations of air terminal units and pitot tube traverses. Identifiers used for equipment on the diagram shall relate to the identifiers used in the report. Include set of reduced size drawings with air outlets and equipment identified to correspond with data sheets.

2. Include appropriate notes, static pressure reading locations, etc., taken during testing and balancing.

3. Air Apparatus or Fan Test Report: Include pertinent data on the test report forms. If test data could not be measured, or is not applicable, indicate such on report forms. List how each actual cfm measurement was obtained (duct traverse, total of outlet airflows, or a combination).

4. Duct Pitot Tube Traverse Reports: Include actual temperature and pressure readings recorded at the time of testing and balancing. Include sketches of ducts showing dimensions and locations of readings so airflow calculations can be verified.

5. Air Outlet Test Reports: Include applicable A_k factors and terminal device sizes. Include all field velocity data necessary to determine airflow. If flow measuring hoods used, indicate their use in the remarks column.

6. Include complete identification of elements. Identify by box number, room name and number, air outlet symbol, orientation in room, etc., as necessary to identify the location of each element clearly and positively.

C. Hydronic Systems Report. Prepare a report including each hydronic device balanced.. Describe balancing method used for each system. At minimum, include the following:

1. Schematic drawings/diagrams: Include plans and diagrams showing locations of all equipment included in the report. Include heat exchange equipment and locations of flow measuring devices. . Identifiers used for equipment on the diagram shall relate to the identifiers used in the report. Record actual locations of thermostats, and balancing valves with settings.

2. Terminal Heat Exchange Equipment: Confirm that heating coil and terminal unit temperatures and pressures were recorded and properly entered on form. List how each terminal unit flow rate was determined. Include listings of balancing manufacturer and model, balancing valve settings, and differential pressure readings across the balancing valve.

3. Include complete identification of elements. Identify by equipment tag number, room name and number, baseboard symbol, orientation in room, etc., as necessary to clearly and positively identify the location of each element.

D. Domestic Water System Report:

1. Schematic drawings/diagrams: Include plans and diagrams showing locations of all equipment included in the report.

2. Include tests for all hot water circulation system branch flow control valves. Include listings of balancing manufacturer and model, balancing valve settings, and differential pressure readings across the balancing valve.

E. Provide report in soft cover, letter size, comb bound manuals, complete with index page and indexing tabs, with cover identification at front and side. Include drawings within report.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 ADJUSTMENT

A. Air Outlets and Inlets: Adjust total to within plus or minus 10 percent of design to space. Adjust individual outlets and inlets in space to within plus or minus 10 percent of design.

B. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

END OF SECTION

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
16132	Pull and Junction Boxes
16140	Wiring Devices
16190	Supporting Devices
16201	Emergency/Standby Generating System
16425	Distribution Switchboards
16440	Disconnects
16450	Grounding
16460	Secondary Transformers
16470	Panelboards
16471	Transient Voltage Surge Suppression
16475	Overcurrent Protective Devices
16480	Motor Control Centers
16485	Motor Starters
16487	Contactors
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

SECTION 16050

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution, which are typical for electrical work at ANC. Additional requirements for the specific systems may be required in addition to these requirements.

1.2 COORDINATION

A. Lay out all the work in advance and avoid conflict with other work. Physical dimensions shall be determined from existing conditions. Verify locations for junction boxes; disconnect switches, stub-ups, etc., for connection to equipment.

1.3 SERVICEABILITY OF PRODUCTS

A. Furnish all products to provide the proper orientation of serviceable components to access space.

B. Coordinate installation of panels, equipment, system components, and other products to allow proper service areas for all items requiring periodic maintenance, inspection or replacement.

1.4 ACCESSIBILITY OF PRODUCTS

A. Arrange all work to provide access to all serviceable and/or operable products. Layout work to optimize net usable access space within confines of space available. Advise ANC, in a timely manner, of areas where proper access cannot be maintained. Furnish layout drawings to verify this claim, if requested.

B. Provide access doors in ceilings, walls, floors, etc., for access to junction boxes, automatic devices, and all serviceable or operable equipment in concealed spaces.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT FURNISHED IN DIVISION 16

A. Materials furnished and installed in permanent construction shall be new, full-weight, standard in every way, and in first class condition.

B. Materials shall conform with the standards of an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner. Only materials designed for the purpose employed shall be used.

C. Materials shall be identical with apparatus or equipment that has been in successful operation for at least two years. All materials of similar class or service shall be of one manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All work that falls under the jurisdiction of the electrical trade shall be performed by Licensed Electricians.

B. Skilled craftsmen shall install all materials and equipment. The norms for execution of the work shall be in conformity with NEC Chapter 3 and the National Electrical Contractors' Association "National Electrical Installation Standards".

C. Repair all surfaces and furnish all required material and labor to maintain fireproof, airtight and waterproof characteristics of the construction.

D. Installation of all equipment shall be in accordance with manufacturers' instructions.

E. Conduit shall be concealed to the greatest extent possible. Surface mounted conduit may only be installed in finished areas where specifically approved by ANC. Where specfically approved to be installed in a finished area, surface-mounted conduit, junction boxes, pull boxes, outlet boxes, etc., shall be painted to match the surrounding surfaces.

3.2 SUPPORT SYSTEMS

A. Fixed-in-place products shall be seismically braced or supported or both to conform to the requirements for Seismic Zone 4.

B. Pipe straps and hanger rods shall be fastened to concrete by means of inserts, expansion bolts, or power-driven fasteners, to brickwork by means of expansion bolts, and to hollow masonry by means of toggle bolts.

C. Hanger rods with spring steel fasteners may be used for 1-1/2 inch EMT and smaller conduits in dry locations.

D. Cable trays, multi-conduit runs, etc., shall be supported by double rods at each point of support and shall be supported independently of any other building system.

E. Refer to Section 16190 for additional requirements.

3.3 MOUNTING HEIGHTS

A. Mounting height shall be to center of box above finished floor (AFF) as noted below unless otherwise approved by ANC.

Lighting switches	48 inches
Convenience outlets and similar devices	16 inches (see note below)
Convenience outlets in mechanical rooms, boiler rooms, baggage makeup/handling areas and workrooms	48 inches
Motor controllers	60 inches to top
Panelboards	76 inches to top
Telephone panels	72 inches to top
Bracket lights	84 inches
Exterior WP convenience outlets	24 inches AFF

Wall mounted microphone stations	54 inches
Wall mounted speakers	90 inches
Telecommunications (Data/Telephone) outlets	16 inches (see note below)
Range outlets	6 inches (or as required for access through drawer)
Dryer outlets	36 inches
Welder outlets	48 inches
Door bell push buttons	48 inches
ACS card readers	48 inches
All bells, chimes, strobes, and similar signal devices	80 inches
Fire alarm manual station	48 inches to highest operable part of device
Fire alarm control panel	72 inches to top
Fire alarm remote annunciator	72 inches to top

B. NOTE: In locations where baseboard-heating enclosures are to be installed, outlet-mounting height shall be raised to 6 inches above top of enclosure or outlets shall be mounted in toe space below baseboard enclosure.

3.4 CUTTING & PATCHING

A. Obtain written permission from ANC before cutting or piercing structural members.

B. Sleeves through floors and walls shall be galvanized steel pipe, flush with walls, ceilings or finished floors, sized to accommodate the raceway. Grout all sleeve penetrations through concrete walls or floors. Holes through existing concrete shall be core drilled. Seal openings with UL Listed fire resistant resilient sealant.

3.5 VAPOR BARRIER PENETRATIONS

A. Penetrations of the building vapor barrier caused by the installation of electrical equipment shall be minimized, and where they are necessary, the opening in the vapor barrier shall be cut smaller than the penetrating object, so that the penetration will be a stretch fit. The penetration shall then be securely sealed with vapor-barrier tape or an adhesive or caulk compatible with the surfaces being sealed.

3.6 FIRESTOPPING

A. Where electrical raceways or other features penetrate fire-rated building surfaces, they shall be securely sealed to the surrounding surface with 3M Fire Barrier Caulk No. CP25, Fire Barrier Putty No. 303, or other accepted equal.

B. Floor penetrations shall be sealed with Nelson CMP firestop compound.

C. All firestopping shall be applied according to the manufacturer's recommendations, and in a manner that is listed by a nationally-recognized independent testing agency (such as UL) as preserving the fire time-rating of the construction.

3.7 PROTECTIVE FINISHES

A. Take care not to scratch or deface factory finish of electrical apparatus and devices. Repaint all marred or scratched surfaces.

B. Provide hot dip galvanized components for ferrous materials exposed to the weather.

3.8 SEPARATION OF SYSTEMS

A. Conductors and equipment of different voltage levels, frequency, current characteristics (AC & DC) or functions (normal vs. emergency, etc.) shall not share the same raceways or enclosures unless specifically approved by ANC, or inherently necessary for correct system function (i.e., at transfer switches, transformers, etc.)

3.9 TESTING

A. Prior to final test, all switches, panelboards, devices, and fixtures shall be in place.

B. Test all electrical systems. They shall be free from short circuits and unintentional grounds.

C. Make all changes necessary to balance the actual electrical loads on the complete system. Arrange for balanced conditions of circuits under connected load demands, as contemplated by the normal working conditions. Final load and balance test shall be demonstrated in the presence of the ANC electrical department.

D. Feeder cables shall be megger tested prior to final termination. The megger test procedure shall be in accordance with the Appendix to Insulated Cable Engineers Association (ICEA) Standard (S-73-532). The test voltage shall be 1000 volts DC. Replace all cables that do not satisfy ICEA Standards and the following requirement. The measured insulation resistance in megohms shall be greater than 2000 megohm-ft/circuit length in feet. Submit logs to the ANC electrical department.

E. Conduct a performance test of ground-fault protection systems in accordance with NEC Article 230-95(c) and the equipment manufacturer's instructions. Prior to the actual ground-fault protection system test, each service shall be de-energized, the neutral bus-link opened, and the entire 480V system neutral megger-tested to ensure that it is free of grounds downstream of the ground-fault sensing. Grounds detected shall be located and removed, so that the neutral tests clear of grounds, before proceeding with the ground-fault testing.

F. Furnish one (1) copy of certified test results to the ANC electrical department prior to final inspection.

3.10 CLEAN-UP

A. Throughout the work keep the work area reasonably neat and orderly by frequent periodic cleanups.

END OF SECTION

SECTION 16111

CONDUIT AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution relating to conduit and conduit fittings approved for use at ANC. Type, size and installation methods shall be as required by code and as specified in the following.

1.2 QUALITY ASSURANCE

A. Conduit and conduit fittings shall be standard types and sizes as manufactured by a nationally recognized manufacturer of this type of materials and be in conformity with applicable standards and UL listings.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Conduit types specifically approved for use shall be of the following types only:

1. Galvanized rigid steel conduit – GRC.
2. Intermediate metal conduit – IMC.
3. Rigid copper-free aluminum conduit.
4. Electrical metallic tubing – EMT.
5. Polyvinyl chloride conduit - PVC: May be Schedule 40 or Schedule 80.
6. Flexible steel conduit - FLEX or flex: In short lengths as specifically permitted.
7. Liquid-tight flexible steel conduit - LT: In short lengths, indoors, as specifically permitted.
8. Extreme temperature liquid-tight flexible steel conduit - AT: Shall have temperature rating of minus 67 degrees F. to plus 220 degrees F., Liquatite “ATLA”, or as approved.
9. Plastic-Coated Conduit - PCC: Shall be hot-dip galvanized Schedule 40 rigid steel conduit, coated outside with a 40 mil jacket of PVC and inside with a urethane compound; PVC coating shall be U.L. Listed for corrosion protection on steel conduit with no disclaimers; RobRoy "Plasti-Bond Red", or as approved.
10. Other products not specifically approved such as ENT, MC Cable, etc., are not allowed unless specifically approved by ANC or noted otherwise in the ANC Electrical Requirements.
11. Manufactured wiring systems are not approved.

2.2 FITTINGS

A. Fittings utilized with rigid steel, IMC, and aluminum shall be galvanized steel or iron or copper-free aluminum and shall be threaded. Conduit bushings shall be provided and shall be of the insulated types. Where grounding bushings are required, provide insulated grounding bushings with integral pressure type ground lugs, Thomas & Betts “Blackjack”, or as approved.

B. Couplings and connectors for EMT shall be made of steel or malleable iron. Die-cast products shall not be used. All connectors shall have insulated throats. Setscrew types are not allowable.

C. Fittings for PVC 40 shall be polyvinyl chloride, installed using PVC solvent to form a watertight joint, except elbows (including bends exceeding 15 degrees) shall be metallic. These metallic elbows and bends shall be of the type specified in this section for the environment in which they are to be installed.

D. Fittings for flexible metal conduit shall be steel or malleable iron only. All throats shall be insulated.

E. Fittings for liquid-tight flexible conduit shall be steel or malleable iron, of a type incorporating a threaded grounding cone, nylon or plastic compression ring, and a tightening gland, providing a low resistance ground connection. All throats shall be insulated.

F. Plastic-Coated Conduit shall be connected only with similarly coated threaded fittings (including conduit bodies) and couplings, with overlapping plastic joints.

PART 3 - EXECUTION

3.1 USES PERMITTED:

A. Conduits shall be sized as required by the application or as required by the NEC, whichever is larger. Base sizes on using type XHHW for wire sizes #6 and smaller and type THHN/THWN wire for wire sizes #4 and larger. Unless otherwise specifically approved, conduits installed in the following locations shall be of the types specifically identified only:

1. Encased in concrete - rigid steel,PVC-40 or IMC.
2. Outdoors aboveground or damp locations - rigid steel, rigid aluminum, IMC or extreme temperature liquid-tight flexible steel conduit (where required).
3. Dry indoor locations, concealed or exposed - rigid steel, rigid aluminum, EMT (where not subject to physical damage), flexible conduit (where required), or IMC.
4. Indoor locations, exposed, where susceptible to physical damage – rigid steel or IMC. This includes baggage handling areas, baggage makeup areas and areas accessible to vehicles less than 96 inches above finished floor.
5. Motor and equipment flexible connections - liquid-tight flexible conduit.
6. Landside underground locations – PCC or PVC-40.
7. Airside underground locations - PCC
8. Service transformer secondary conduits (includes conduits between transformer and CT cabinet and between CT cabinet and MDP) – PCC.

3.2 INSTALLATION METHODS - GENERAL

A. All conduit and tubing shall be cut square and reamed smooth at the ends and all joints made tight. Conduit threads shall be lubricated with an approved thread lubricant.

B. Raceways shall be concealed, except in electrical and mechanical rooms, bag makeup areas, and as otherwise noted or specified. Exposed raceways shall be run parallel or perpendicular to building lines and bent symmetrically or made up with standard elbows or fittings. Concealed raceways shall be routed as directly as possible with a minimum of bends.

Concealed raceways above lay-in ceilings shall be installed a minimum of 12 inches above the ceiling grid.

C. Raceway for power wiring shall not be installed in the floor slab beneath telecommunication distribution rooms or closets.

D. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box or outlet box by means of a locknut on the outside and a locknut/bushing on the inside, or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter. All connections shall be made wrench tight. All locknuts shall be the bonding type with sharp edges and shall be installed in a manner that will assure a locking installation. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into threaded connections. All runs of conduit shall be protected from the entrance of foreign material prior to the installation of conductors.

E. Conduit or tubing deformed or crushed in any way shall not be installed. Conduit shall be bent only with approved bender (hydraulic or hickey). Bending machines shall be used to make field bends in conduit of 1-1/4 inch size and larger. Torches shall not be used in making conduit bends.

F. Raceways shall be spaced at least 6 inches from parallel runs of heating system pipes, flues, other high temperature piping systems, and other heat sources. This basic spacing shall be increased if necessary to ensure that raceways experience no significant temperature rise from external sources. Raceways shall not be embedded in any spray-applied insulation, fireproofing, or other materials that would restrict heat dissipation.

G. Pull wires shall be provided in all spare and unused conduits. (Nylon "jet-line" or equal.)

H. All conduits stubbed up out of floor and terminating inside of an enclosure shall have insulating grounding bushings installed.

I. Raceways penetrating vapor barriers or traversing from warm to cold areas shall be sealed on the inside with a non-hardening duct sealing compound to prevent the accumulation of moisture, and shall be taped airtight to the vapor barrier on the outside.

J. Raceways shall be provided with expansion joints where necessary to allow for thermal expansion and contraction. Set initial opening of expansion joints per manufacturer's instructions, to suit the ambient temperature at the time of installation.

K. Provide flexible conduit connection or approved fitting at all seismic joints to allow for displacement of conduit in all three axes. Connection shall allow for movement in accordance with design of seismic joint. Non-flexible raceways crossing expansion joints or other areas of possible structural movement shall make provision for 3-way movement at such points by means of O-Z/Gedney Type DX fittings, or accepted equal. Such fittings shall be installed so that they are initially in the center of all 3 axes of movement (i.e., not deflected to make part of a conduit bend, or compressed or extended to compensate for incorrect conduit length).

L. Flexible metal conduit with supplemental ground jumper shall be used for connection to vibrating equipment, or where installation conditions warrant its use. Liquid-tight flexible conduit with supplemental ground jumper shall be used for all motor and transformer connections. The ground jumper in flexible conduits shall be within the conduit.

M. Length of flexible conduit shall not exceed 36 inches, except for lighting fixture whips and where specifically noted. Fixture whips shall not exceed 72 inches.

N. Electrical raceways may penetrate roofing membranes only where absolutely necessary. Such penetrations shall be flashed and sealed as required for mechanical piping penetrations of roof.

3.3 INSTALLATION METHODS - TELECOMMUNICATIONS SYSTEMS

A. Installation methods for telecommunication system conduits shall comply with Installation Methods - General, above, unless superseded by more stringent requirements of this section. Telecommunications conduits shall comply with the requirements of ANSI/EIA/TIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces and the Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual. Note that some of these requirements are more stringent than the requirements of the National Electrical Code.

B. There shall be no more than two 90-degree bends between pull points in telecommunications conduit. Pull boxes added to conduit runs as a result of this requirement shall be in accordance with Section 16132 - Pull and Junction Boxes. If it is not practical to install a pull box in the run due to field conditions the conduit size shall be increased to the next trade size for each additional 90-degree bend. Offsets shall be considered as equivalent to a 90-degree bend.

C. Inside radius of conduit bends shall be at least 6 times the internal diameter of the conduit for sizes up to 2 inch trade size; 10 times the internal diameter of the conduit for sizes larger than 2 inch trade size. Where bending machine shoes are not available with the required bending radius for a one-shot field bend, factory bent, large radius 90-degree elbows shall be provided. Conduits of all sizes for use as optical fiber raceways shall have a minimum inside bend radius of 10 times the internal diameter of the conduit.

D. Conduits shall be terminated and supported at cable trays in accordance with Section 16115 – Cable Tray.

E. Use of flexible conduit for telecommunications shall be kept to a minimum and shall be at the discretion of ANC. Obtain prior written approval for the use of flexible conduit. Where required due to physical considerations, flexible metal conduit may be allowed in lengths not exceeding 4 feet. If used, flexible metal conduit shall be increased by one trade size for the application used (see Conduit Sizes).

F. Conduits entering the telecommunications closet or equipment room through the floor shall be terminated 4 inches above finished floor. Conduits entering the telecommunications closet or equipment room from above shall be terminated 4 inches below the finished ceiling, but in no case shall the conduits terminate more than 12 inches above the ladder racking or distribution frame.

G. Conduit sleeves connecting vertically “stacked” telecommunications equipment rooms and closets shall be terminated 4 inches above finished floor. Conduits and cutout openings between floors shall be sealed with firestopping material that is removable and reusable, to accommodate ads, moves and changes in the cabling system.

H. Layout of conduits shall give consideration to nearby sources of electromagnetic energy such as electrical power wiring, large electric motors and generators, induction heaters, arc welders, variable frequency drives, etc. Maintain the greatest separation practicable between telecommunication raceways and sources of electromagnetic interference (EMI). A minimum of 5 inches of separation shall be maintained between telecommunication raceways and fluorescent lighting ballasts.

I. Pull wires shall be provided in all spare and unused conduits. (Nylon "jet-line" or equal.)

J. Maintain minimum separation from ≤ 480V power wiring in accordance with the following table:

Condition	Minimum Separation Distance		
	< 2 kVA	2-5 kVA	> 5 kVA
Unshielded power lines or electrical equipment in proximity to open non-metal telecommunications pathways	5 inches	12 inches	24 inches
Unshielded power lines or electrical equipment in proximity to a grounded metal telecommunications conduit pathway	2.5 inches	6 inches	12 inches
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal telecommunications conduit pathway	--	3 inches	6 inches

3.4 CONDUIT SIZES - GENERAL

A. Minimum sizes for rigid steel, IMC, PCC, rigid aluminum and PVC-40 conduits shall be 3/4 inch.

B. Minimum size for EMT and flexible conduits shall be 1/2 inch, except fixture whips may be 3/8 inch as allowed by the NEC.

C. Maximum size for EMT shall be 3 inch, except telecom backbone conduits may be 4 inch where specifically approved by ANC.

3.5 CONDUIT SIZES - TELECOMMUNICATIONS SYSTEMS

A. Minimum size for conduit runs to outlets is 1 inch (based on six cables of 0.24 inch diameter). Conduit runs for other than six cables of 0.24 inch diameter shall be sized in accordance with the following Table:

CONDUIT	**NUMBER OF WIRES OR CABLES (CABLE DIMENSIONS IN INCHES)**									
TRADE SIZE	**0.13" O.D.**	**0.18" O.D.**	**0.22" O.D.**	**0.24" O.D.**	**0.29" O.D.**	**0.31" O.D.**	**0.37" O.D.**	**0.53" O.D.**	**0.62" O.D.**	**0.70" O.D.**
1	8	8	7	6	3	3	2	1	0	0
1 1/4	16	14	12	10	6	4	3	1	1	1
1 1/2	20	18	16	15	7	6	4	2	1	1
2	30	26	22	20	14	12	7	4	3	2
2 1/2	45	40	36	30	17	14	12	6	3	3
3	70	60	50	40	20	20	17	7	6	6
3 1/2	--	--	--	--	--	--	22	12	7	6
4	--	--	--	--	--	--	30	14	12	7

B. Unless specifically approved by ANC, individual conduit homeruns shall serve no more than one telecommunications outlet. Conduits which serve more than one outlet (where specifically approved by ANC) shall be sized in accordance with the Table above to accommodate the total number of cables for all outlets served, based on a minimum of six cables per outlet.

3.6 STRUCTURAL COORDINATION

A. Layout conduits in slabs to avoid compromising structural integrity. The maximum conduit size in concrete slabs not on grade (steel decks with concrete slabs) shall be 1 inch. Where conduits cross over one another, one of the conduits shall be routed in bottom of the deck flutes to maximize concrete cover. Where raceways are required or permitted to be embedded in concrete, the minimum concrete cover shall not be less than 2 inches.

B. Underfloor raceways for slab-on-grade construction shall be embedded in the fill under the slab, not in the slab itself.

C. Structural members shall not be cut, drilled, or notched for raceways or other electrical features unless specifically approved by ANC.

3.7 CORROSION-RESISTANT CONDUIT SYSTEMS

A. In outdoor, damp, or corrosive areas, LT Flex shall be made up with the plastic-coated conduit manufacturer's matching coated fittings and supports. Straps shall be malleable one-hole type wherever feasible.

B. PVC Conduit supports shall be the manufacturer's standard non-metallic items, arranged so as not to hinder lengthwise movement between expansion joints.

C. Plastic-Coated Conduit supports shall be the manufacturer's matching coated items. Straps shall be malleable one-hole type wherever feasible.

D. Any damage to plastic coatings shall be thoroughly and neatly repaired with the plastic-coated conduit manufacturer's standard touch-up compounds.

E. In outdoor, damp, or corrosive locations, plastic-coated conduit shall enter enclosures by means of the manufacturer's matching plastic-coated weather-tight threaded hubs, and liquid-tight flex shall enter enclosures by means of matching plastic-coated connectors. The plastic jackets of both types of conduit entry fittings shall be sealed to the exterior of the enclosure with the conduit manufacturer's standard touch-up compound. At non-metallic boxes, each entry shall have a bronze bond bushing and NEC-sized copper-bonding jumper inside the enclosure.

END OF SECTION

SECTION 16112

SURFACE RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution relating to surface metal raceway systems at ANC, including but not limited to base, cover, device fittings, entrance fittings, corners, elbows, supports, brackets, vertical and/or horizontal offsets, grounding, devices, and hardware.

1.2 SECTION INCLUDES

A. Surface metal raceways.

B. Multi-outlet assemblies.

C. Wireways.

1.3 REFERENCES

A. NECA (National Electrical Contractor's Association) Standard of Installation.

B. NEMA WD 6 - Wiring Device Configurations.

1.4 QUALITY ASSURANCE

A. Surface raceways shall be of the latest approved design as manufactured by a nationally recognized manufacturer and shall be listed by the Underwriters' Laboratory and bear the UL label.

B. Perform Work in accordance with NECA Standard of Installation.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 SURFACE METAL RACEWAY

A. Surface metal raceway for individual circuit runs shall be one piece surface metal raceway of the appropriate dimensions for the conductors, Wiremold Series 500/700, or as approved.

B. Finish: Raceways shall be factory pre-painted.

C. Provide suitable backing for mounting attachment; hollow wall anchors shall not be used.

D. Provide manufacturer's standard Fittings, Boxes, and Extension Rings:

1. Wall box connectors shall be concealed entry type.

2.2 USES PERMITTED

A. Surface metal raceway shall only be used where specifically approved by ANC. Surface metal raceway installed without ANC's express written approval shall be removed at the Tenant's expense. Concealed conduit shall be used in all other locations, e.g., behind sheet rock walls, above sheet rock ceilings, above linear metal ceilings. Exposed conduit shall only be used for devices mounted on steel structure or concrete in non-public areas such as bag makeup areas, etc.

2.3 WIREWAY

A. Surface wireway in exposed or concealed locations shall be sheet metal channel suitable for use as a wiring trough, with hinged or screw cover, sized in accordance with the NFPA 70. Wireway shall be Square D Class 5100, 5120, 5140, as appropriate for the environment, or as approved by ANC.

B. Wireway shall be of the NEMA Type (general purpose, oil-tight, dust-tight, rain-tight, etc.) appropriate for the environment where installed.

C. Wireway shall be furnished without factory pre-punched concentric or eccentric conduit knockouts. Knockouts shall be field punched as required for the conduits installed.

D. Finish shall be ANSI-49 gray epoxy paint finish applied by cathodic electrodeposition over a corrosion resistant phosphate preparation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.

B. Use flathead screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.

C. Provide field paint touch-up with factory furnished paint to match factory pre-painted finish, for all chips, scraps, scratches, fittings and unpainted sections of the surface raceways and multi-outlet assemblies, after installation of all devices and covers are complete.

D. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

E. Close ends of wireway and unused conduit openings.

F. Ground and bond raceways and wireways under provisions of Section 16450.

END OF SECTION

SECTION 16115

CABLE TRAY

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution relating to cable management systems including tray, tray connectors, supports, brackets, engineered seismic bracing, vertical and/or horizontal offsets, grounding, and hardware for a complete system.

1.2 REFERENCE STANDARDS

A. Underwriters' Laboratories, Inc.

B. National Electrical Code, Article 318

C. Canadian Standards Association

D. ANSI/EIA/TIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces

E. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

F. ASTM A 510 - General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.

G. ASTM B 633 - Electrodeposited Coatings of Zinc on Iron and Steel.

1.3 QUALITY ASSURANCE

A. Wire mesh trays shall be of the latest approved design as manufactured by a nationally recognized manufacturer and shall be listed by the Underwriters' Laboratory and bear the UL label.

B. The Basis of Design for open cable tray systems is equipment from GS Metals Corporation, “FLEXTRAY” to set a standard for quality and style. The Basis of Design for enclosed industrial cable tray systems is P-W Industries, System 5F21 to set a standard for quality and style. Alternative systems may be acceptable providing that the equipment meets the requirements of this section.

1.4 SHOP DRAWINGS

A. Work shall be laid out in advance. Shop drawings shall be submitted to ANC for approval before work begins.

B. Locations of all work and equipment shall be verified to avoid interferences, preserve headroom, and keep openings and passageways clear. Review the plans for the work of all trades and coordinate adjustment of the work of the trades to achieve the best installation. Shop Drawings shall reflect coordination of work under this Section.

C. Submit a complete tray layout drawn at 1/8-inch = 1 foot scale minimum including suspension points, offsets, fire-wall penetrations and other essential information. Layout shall be coordinated with mechanical, plumbing, and fire protection contractors to insure that access to the tray is unobstructed for its entire length. Location of tray shall be dimensioned and closed obstructions shown and noted. Drawings shall include sections of corridors and of areas

where obstructions require special coordination, showing the tray location in relation to work of other trades. Submit tray layout for approval.

PART 2 - PRODUCTS

2.1 OPEN CABLE TRAY SYSTEM

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

1. Mesh system shall permit continuous ventilation of cables and maximum dissipation of heat.

2. Provide a kinked and T-welded continuous top wire safety edge.

3. Wire mesh shall be welded at all intersections.

4. All mesh sections shall have at least one (1) bottom longitudinal wire along entire length.

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

C. Welding Process and Weld Quality Testing:

1. A factory destructive weld test shall be performed to verify strength of welds. This test shall be performed on a welded sample of wires. Records including weld failure lot number, and part number shall be kept on file for customer availability upon request.

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

1. Electro-Plated Zinc Galvanizing: ASTM B 633, Type III, SC-1.

2. Black anodized in all telecom rooms to match appearance of telecom racks.

E. Nominal Dimensions: 12 or 20 inch wide; 4 inches deep. Provide width as required by the application.

1. Mesh: 2 by 4 inches (50 by 100 mm).

2. Straight Section Length: 118 inches (3,000 mm).

3. Standard Widths: 12 inch (300 mm) wide and 20 inch (500 mm) wide tray.

4. Standard Channel Depths: Provide all tray 4 inches (105mm) deep.

5. Wire Diameter: 0.197 inch (5mm) minimum on all mesh sections.

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.

2.2 OPEN CABLE TRAY ACCESSORIES

A. Shielding Divider Strips: Where required, provide pre-galvanized steel, full depth, divider strips following contour of mesh sections to allow systems of different types (when required by the application) to be run in the same tray.

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

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

2.3 ENCLOSED INDUSTRIAL CABLE TRAY

A. Description: Continuous, one-piece corrugated solid bottom aluminum cable tray with solid flat removable covers.

1. Cable tray shall be manufactured and installed in accordance with NEMA Standard VE1-1991.

2. Load/span Class designation: 12B

3. Type: Aluminum corrugated solid bottom with 7/8" wide cable support ribs.

4. Materials:

a. Bottom: Aluminum Alloy 5052-H32.

b. Side Channels: Aluminum Alloy 6063-T6.

5. Inside Depth: 5-inches.

6. Width: 12-inches and 20-inches as required.

7. Fittings: Nominal radius of 24-inches for all vertical and horizontal elbows, tees, etc.

8. Accessories:

a. Covers: Provide aluminum flat "flange-in" covers in 60-inch lengths with cover connector clips at 30-inch intervals.

b. Provide all required tray hangers, support clamps, brackets, hardware, etc., for a complete and seismically rated mounting system.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Proceed with tray installation only after Shop Drawings are approved by ANC. If the Tenant proceeds without approval, the tray shall be relocated as directed by ANC at the Tenant's expense.

B. Install tray level, straight and true to building lines, unless otherwise approved or required due to structural considerations or obstructions. Maintain 12 inches minimum clearance above top of open tray and 18 inches minimum clearance above top of enclosed tray. Where installed above ceilings, maintain 3 inches minimum clearance between top surface of ceiling tiles and lowest point on tray or tray support assembly. Maintain 18 inches minimum clearance to at least one side of tray unless tray is placed at a height that requires greater clearance for workers to gain safe, convenient access to tray. Coordinate layout with work of other trades in advance of installation to provide required access with minimum number of offsets in tray runs. If during construction as-built conditions occur, such that tray becomes inaccessible for any reason, Tenant shall submit immediately to ANC:

1. The type and location of the obstruction, including the trades involved.

2. The means proposed by Tenant to maintain accessibility.

C. Install and support tray system in accordance with span load criteria, assuming 110 percent of maximum allowable cable fill regardless of the number of cables installed.

D. Support Systems: Provide center hung support system for open cable tray in accordance with manufacturer's engineered systems. Provide trapeze hung support systems with two rigid supports per trapeze hanger for enclosed industrial cable tray.

1. Center hung supports, center support tubes shall be full length of rod to structure. Tighten rod to place assembly in tension to maintain tray level with asymmetric loading.

2. Center supports suspended by rods shall have sufficient protective tubing over all exposed all-thread to protect the cable insulation from abrasion.

3. Provide seismic bracing in accordance with NUSIG standards, per manufacturer's recommendations, for Seismic Zone 4.

4. Install all open cable tray in an accessible location, visible from the floor, with minimum length hanger rods to avoid tray tilting under asymmetric loads. If tray tilts at any location, provide 1-1/2 inch pipe in compression over hanger rods, a bar stiffener at hanger rods, or other manufacturer recommended anti-tilt method of mounting tray. Provide stiffener bar at every other support, or in accordance with manufacturer's recommendations.

5. Open cable tray arranged in vertical configuration for rises and drops shall have stand-off support from the wall or structural support surface to facilitate installation of Velcro cable support ties.

E. Install tray to prevent sharp 90 degree bends in cables in any direction. Rises and drops shall be radiused, tees and crosses shall be flared or have radius fittings at junction points.

F. Unless specifically approved otherwise by ANC, above ceiling tray installations shall meet the following conditions:

1. Trays shall not be installed in inaccessible ceiling areas such as those with lock-in type ceiling tiles

2. Trays shall not be installed above lay-in type ceilings at a finished height greater than 11 feet above finished floor.

G. Conduit Entries:

1. Open Cable Tray: Conduits entering open cable trays shall terminate above the tray, within 3 inches laterally and 2 inches vertically of the top of the side rail. Conduits shall be bushed and supported within 6 inches of the termination. No grounding connection shall be provided from the conduit to the tray system.

2. Enclosed Cable Tray: Conduits entering enclosed industrial cable tray shall be connected to the tray at the vertical center line of either side with an approved conduit connector. Conduit connectors shall be bushed inside the cable tray. Conduits shall be installed and supported in accordance with the NEC and Section 16111. Conduits shall be installed so as to allow free removal of all sections of the cable tray top cover.

H. Enclosed cable tray shall be used in unfinished areas and vehicle travel areas such as bag makeup areas. Open cable tray shall typically be used in finished areas with accessible ceilings.

I. Unless specifically approved otherwise by ANC, install tray and all accessories to provide electrical continuity throughout system. Provide grounding and bonding straps to maintain electrical continuity at discontinuous connections.

J. Follow manufacturer's instructions and details for separation of dissimilar metals including steel suspension rod to aluminum splice connectors or tray. Provide nylon bushings at joints, vinyl sleeve at hanger rods.

K. Coordinate installation of tray with cable installers for purposes of symmetric cable loading, supplemental bracing in cases where cable loading will be asymmetric, periodic tie down of cables, and division of tray to maintain required separation of systems.

L. Secure cables in open cable trays using Velcro cable ties in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 16120

WIRE AND CABLE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes specific requirements, products, and methods of execution relating to wire and cable, 600 volts or less, approved for use at ANC.

1.2 QUALITY ASSURANCE

A. Conductors shall be sized according to American Wire Gauge (AWG). Stranding, insulation, rating and geometrical dimensions shall conform to UL and ICEA specifications.

PART 2 - PRODUCTS

2.1 INSULATION TYPES

A. Branch circuit conductors shall be 600 volt insulated, and shall have the following insulation types:

1. Heated indoor spaces - THHN/THWN or XHHW
2. Outdoors or other cold locations (such as unheated attics) - XHHW

B. Feeder conductors shall be 600 volt insulated, and shall have the following insulation types:

1. Heated indoor spaces - THHN/THWN or XHHW-2
2. Outdoors or other cold locations (such as unheated attics) – XHHW-2

C. Nylon-jacketed conductors such as Types THHN or THWN shall not be used in any location subject to ambient temperatures below 20 degrees F.

D. Special applications: Conductors in fluorescent fixture wiring channels shall have 90 degrees C insulation rating, Types THHN, XHHW, or equal. Conductors in high temperature locations shall have one of the special insulation types suitable for the use and as permitted by the NEC.

2.2 FLEXIBLE CORD

A. Flexible cord shall be Type SO or ST, or for the larger sizes, Type G.

2.3 MISCELLANEOUS

A. Miscellaneous: Miscellaneous wire and cable for special purpose applications and not covered in the categories as indicated above or otherwise specified, shall be as required by the intended use.

2.4 MINIMUM SIZES

A. Minimum wire sizes shall be as follows:

1. #12 AWG for branch circuit wiring.

2. #20 AWG for low voltage switching circuits if part of an approved cable assembly, #18 AWG otherwise.

3. #14 for control circuit wiring.

B. On 20A circuits, with one-way conductor lengths measured from panel to farthest receptacle, or center of lighting string (as applicable):

1. #10 AWG for 120V circuits of 75 feet to 120 feet.

2. #8 AWG for 120V circuits of 120 feet to 200 feet.

3. #10 AWG for 277V circuits of 130 feet to 215 feet.

4. #8 AWG for 277V circuits of 215 feet to 330 feet.

C. Similar oversizing shall apply to circuits of other ratings and/or greater lengths, as necessary to comply with the voltage drop limitations in Part 3 of this Section.

D. Cable or conductors for fire alarm systems and other special systems shall be as described in other sections of the specifications, or recommended by the equipment manufacturer, whichever is greater.

2.5 CONDUCTORS

A. Conductors shall be copper, solid or stranded for wiring #10 and smaller, stranded for #8 and larger.

B. Stranded control, communication, and alarm conductors shall have compression terminations where terminated on screw terminals.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise permitted by ANC, all conductors shall be run in raceways as specified in Section 16111. Raceways shall be installed as a complete system, free from obstructions, and clean before conductors are installed.

B. Provide conductors from outlet to outlet and splice branch circuit conductors only at outlet or junction boxes. Install all conductors in a single raceway at one time and leave sufficient cable at all fittings or boxes. Keep all conductors within the manufacturer's allowable tension. Do not violate minimum bending radii. Lubricants for wire pullings, if used, shall conform to UL requirements for the insulation and raceway material.

C. Do not install Type XHHW conductors in temperatures below minus 10 degrees F, or the other types in temperatures below plus 20 degrees F.

3.2 CONDUCTOR SUPPORT

A. Provide conductor supports as recommended by the NEC or cable manufacturer in vertical conduits.

3.3 SPLICING

A. No splicing or joints are permitted in branch circuits except at outlet or accessible junction boxes. Prior to splicing, all conductors shall be stripped to the exposed length recommended by the splicing device manufacturer.

B. Utilize compression type solderless connectors when making splices or taps in conductors No. 8 AWG or larger. Provide heat or cold shrink type insulating tubing on all splices and tape with Scotch #88 plastic tape to secure insulation strength equal to that of the conductors joined.

C. Utilize pre-insulated connectors, hard-shell type only, Ideal Industries, Inc., "Super Nut" or "Wing-Nut" for splices and taps in conductors No. 10 AWG and smaller in dry locations. In damp or wet locations Ideal “Twister DB Plus”, water repellent, sealant filled. UL 486D Listed connector.

D. Keep splices in underground junction boxes, handholes, and manholes to an absolute minimum. Where splices are necessary, use resin splicing kits manufactured by 3M Company to totally encapsulate the splice.

E. Feeder conductors shall be installed with no splices unless specifically approved otherwise by ANC. Splices in feeder conductors, where specifically allowed, shall be compression type butt splices.

3.4 CONDUCTOR TERMINATION

A. Provide all power and control conductors that terminate on equipment or terminal strips with solderless lugs or T & B "Sta-Kon" terminals.

B. Prior to termination, all conductors shall be stripped to the exposed length recommended by the termination device manufacturer.

3.5 CONDUCTOR PHASE COLOR CODING

A. All service, feeder and branch circuit conductors throughout the secondary electrical system shall be color coded as follows:

208/120 Volts	Phase	480/277 Volts
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray (see following)
Green	Ground	Green

1. Permanently post conductor color code at each panelboard in accordance with NEC Article 210-4(d).

2. Where color coded conductors are not commercially available, colored non-aging, plastic tape may be utilized where permitted by NEC.

B. Where neutrals of different systems exist on a project, neutral conductor identification method shall satisfy the Authority Having Jurisdiction, as to compliance with NEC 200-6(d).

C. Phases in panelboards and similar equipment shall be connected Phase A, B, C from left to right, top to bottom, or front to back.

3.6 DERATING OF CONDUCTORS

A. Derating of conductors shall be per National Electrical Code Article 310-15(b)(2).

3.7 VOLTAGE DROP

A. The maximum total voltage drop shall not exceed three (3) percent in branch circuits or feeders, for a total of five (5) percent to the farthest outlet based on steady state design load conditions. Base voltage-drop calculations on NEC Chapter 9, Table 9.

3.8 OPEN WIRING ABOVE LAY-IN CEILINGS PROHIBITED

A. Wiring for all systems shall be installed in raceway systems or cable tray systems.

B. Wiring installed in cable trays in air-handling ceiling spaces shall be approved for the application and the specific system.

C. Raceways and sleeves shall be sized in accordance with the cabling requirements for the special system involved.

3.9 TESTING

A. All feeder cables shall be megger tested prior to final termination in accordance with Section 16050.

END OF SECTION

SECTION 16131

OUTLET BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products and methods of execution relating to outlet boxes for use with wiring devices, lighting fixture outlets and telecommunications outlets approved for use at ANC. Outlet boxes shall be sized per NEC Article 370 unless otherwise noted.

1.2 QUALITY ASSURANCE

A. Underwriters' Laboratory listing for intended usage is required. Manufacturer and Model numbers shall be as indicated herein.

PART 2 - PRODUCTS

2.1 CAST BOXES

A. Cast boxes with threaded hubs, external mounting brackets or holes, and gasketed covers shall be used in the following locations:

1. Exterior locations
2. Wet or damp locations
3. Mechanical rooms and pump stations, etc., where subject to physical damage
4. Adjacent to, water or steam connections
5. Floor boxes installed in concrete
6. Exposed interior locations below 96 inches above floor such as baggage handling areas and areas accessible to vehicles where subject to physical damage
7. Where shown on drawings

2.2 STEEL BOXES

A. Galvanized pressed steel boxes may be used wherever they are permitted by code, except in areas indicated in the preceding paragraph.

B. Flush mounted, pressed steel boxes shall be equipped with external mounting brackets for attachment to framing members with screws or nails.

C. Ceiling boxes and wall boxes for bracket lights shall be not less than 4 inches in diameter by 1 1/4 inch deep and shall have 3/8 inch malleable iron fixture studs if required.

D. Grounding Screw: Stamped steel boxes shall have a drilled and tapped hole in the back of the box for a grounding screw.

E. Accessories: Box covers, extension rings, bases, hanger bars, etc., for use in connection with the installation, shall be approved for use in the various applications.

2.3 TELECOMMUNICATION OUTLET BOXES

A. Boxes for telecommunication outlets shall be a minimum of 4-11/16 inches square by 2 1/8 inches deep.

B. Device rings for telecommunication outlets shall be single-gang, minimum 5/8 inches deep, to provided a minimum internal finished depth of 2- 3/4 inches.

2.4 MULTI-SERVICE FLOOR BOXES

A. Floor boxes shall provide a fully flush appearance whether in use or not. Boxes in use shall have a hinged slot for the egress of cables from outlets to user equipment.

B. Boxes shall consist of a base preset for installation in concrete, and a floor insert with high capacity power, data and communications compartments. Preset castings shall be threaded to accept 1-1/4 inch conduit on one side and 3/4 inch conduit on the other.

C. Box tops shall be Polymide, and shall include carpet/tile floor flange, hinged plate and retractable exit. Color selection shall include charcoal gray, dark brown and medium beige, minimum.

D. Boxes shall be equipped with all wiring devices and data/communications outlets as required by the application. Provide all accessories.

E. Boxes shall be "Steel City GAB Series AFM Pre-set Floor Box" or approved equal except boxes provided for power/telecom connections at floor mounted advertising signs shall be in accordance with 16131-2.5 below. Provide AFM-6 insert capable of up to four duplex receptacles with data and communications.

2.5 MULTI-SERVICE FLOOR BOXES FOR POWER/TELECOM CONNECTIONS AT ADVERTISING SIGNS

A. Floor boxes for power/telecom connections at floor mounted advertising signs shall be the flush type with brass covers to present a flush and protected appearance when not in use. Furnish finish hardware consistent with the floor finish (carpet, wood, concrete, etc.) Floor boxes shall be two gang (one gang power, one gang telecom).

B. The floor box shall be cast iron with a gray powder paint corrosion resistant finish. Each cast iron box shall have a #12 AWG grounding pigtail (green, solid copper, 6 inches long) prewired to the ground screw in the box. The box shall have a removable cover to simplify conduit connections. Floor boxes shall be rectangular, multi-gang boxes; Hubbell Catalog No. B423341 (two gang, 36.5 cubic inches per gang, with 4@1 inch and 2@ ¾ inch threaded conduit hubs) or approved equal.

C. Floor box covers shall be brushed brass, Hubbell S3825 on power side (duplex flap) and Hubbell S2625 on telecom side (combination 2-1/8” x 1” screw opening).

2.6 FIRE RATED POKE THROUGHS

A. Fire rated poke throughs shall provide power and telecommunications service to floor mounted service pedestals via a through floor fitting that installs in a two inch hole.

B. The unit shall incorporate individual EMT tubes for power and telecommunications. Power tube shall be 1/2 inch diameter EMT and telecommunications tube shall be 3/4 inch EMT. Unit shall be UL Listed to accommodate up to ten #12 AWG type THHN wires and up to two 25 pair telecommunication cables. The total allowable copper cross-sectional area shall not be less than 11 square inches.

C. The through floor fitting shall accept 2, 4 and 8 gang service pedestals that are partitioned to permit both power and telecommunications services.

D. All fittings shall be UL classified for fire resistance 1-4 hour rated reinforced concrete floors and 1-3 hour rated floors employing steel form units.

E. Service pedestals shall be equipped with required wiring devices and data/communications outlets. Provide all accessories.

F. Units shall be Hubbell 2 inch diameter fire rated poke throughs with gray service pedestals (2 gang, 4 gang or 8 gang as required by the application).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Outlet boxes shall be securely fastened in position and supported independently of the conduit system.

B. Outlet boxes located in suspended ceiling system shall be fastened to ceiling "t-bar" system with bar-hanger rods manufactured for the purpose, or from hanger rods with solid supports from structure above. "T-bar" hanger rods shall be clipped to cross-members supported by the main ceiling support members. Outlet boxes supported from the suspended ceiling system shall be provided with one safety wire attached to the box or box support clip, or two safety wires attached to the bar hanger.

C. Boxes shall be installed true to the building lines and at equal heights in conformity with mounting heights specified in other sections of the specification.

D. Provide the best suitable box for each outlet requirement. Extension rings shall not be used on new construction except where needed to bring an outlet box out to 1/8 inch of the finished wall or ceiling line.

E. Boxes shall have only the holes necessary to accommodate the conduits at point of installation. All boxes shall have lugs or ears to secure covers.

F. All boxes shall be rigidly secured in position. All recessed boxes shall be so set that the front edge of the box shall be flush with the finished wall or ceiling line, or not more than 1/8 inch back of same. This requirement is more stringent than NEC requirements.

G. All boxes shall be accessible.

H. Provide boxes for each application that will not violate the fire rating of the wall, floor or ceiling assembly in which the box is installed.

I. Do not place order for floor boxes without ensuring that ANC has positively approved submittals for the specific cover types/styles colors necessary for all applications and locations.

J. Recessed boxes shall not be placed back-to-back in adjacent rooms. They shall be offset at least 12 inches, or greater as required by codes (e.g., NEC Article 300-21) and standards applicable to the specific construction.

K. Boxes (electrical boxes, outlet boxes and telecommunication boxes, etc) penetrating fire rated walls or wall types containing sound attenuation batts (sound rated (STC) construction), shall be sealed airtight using STI Series SSP Firestop Putty Pads to reduce sound transmission and increase fire resistance. Mold putty pads around electrical junction boxes and conduits to form an airtight seal in accordance with manufacturer's installation instructions.

END OF SECTION

SECTION 16132

PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products and methods of execution relating to pull and junction boxes approved for use at ANC. Furnish all such boxes required to conform to requirements for maximum pulling length and maximum number of bends allowed.

1.2 QUALITY ASSURANCE

A. Pull and junction boxes 50 cubic inches and smaller shall conform to specifications for outlet boxes, Section 16131.

B. Pull and junction boxes larger than 50 cubic inches shall conform to UL Standard 50-1970, Cabinets and Boxes. The UL label shall constitute proof of acceptable quality.

PART 2 - PRODUCTS

2.1 INDOOR PULL AND JUNCTION BOXES

A. Indoor pull and junction boxes shall conform to Article 370 of the NEC and the following requirements:

1. Sheet metal boxes are approved for use in all dry, interior, nonhazardous locations.

2. Boxes installed in wet locations shall be NEMA 4.

3. Special boxes as required by the application shall be installed in areas of specific service and/or hazards.

B. Junction box extension rings will not be accepted on new boxes. Appropriate size boxes shall be used for each application.

2.2 TELECOMMUNICATION SYSTEM PULL BOXES

A. Telecommunication system Pull Boxes shall also conform to the latest editions of ANSI/EIA/TIA 569 and the BICSI Telecommunications Distribution Methods (TDM) Manual.

B. Dimensions:

1. Pull boxes for straight through pulls shall have minimum interior dimensions in accordance with the following Table:

Maximum Trade Size Conduit	Size of Box			For Each Additional Conduit Increase Width
	Width (inches)	Length (inches)	Depth (inches)	
1 Inch	4	16	3	2 inches
1 1/4 Inch	6	20	3	3 inches
1 1/2 Inch	8	27	4	4 inches
2 Inch	8	36	4	5 inches
2 1/2 Inch	10	42	5	6 inches
3 Inch	12	48	5	6 inches
3 1/2 Inch	12	54	6	6 inches
4 Inch	15	60	8	8 inches

2.3 UNDERGROUND PULL AND JUNCTION BOXES

A. Boxes set in ground shall be either precast concrete or cast iron. Covers shall be galvanized steel or cast iron, and shall be bonded to the grounding system with a stranded grounding conductor secured with a grounding lug. Provide sufficient slack to allow removal of the cover and normal working access.

B. Underground concrete pull boxes installed in traffic areas shall be constructed to withstand AASHTO HS-20 wheel loading (Landside only). Underground concrete pull boxes installed on the Airside (ramp areas) shall be constructed to withstand AASHTO HS-80 wheel loading.

2.4 OUTDOOR ABOVE-GROUND PULL AND JUNCTION BOXES

A. Boxes exposed to rain or installed in wet locations shall be NEMA 4.

B. Outdoor pull and junction boxes and conduit bodies for use with galvanized conduits shall be made of galvanized ferrous metal or cast aluminum, with integral threaded hubs or Myers-type weathertight hubs of matching composition and finish.

C. Outdoor pull and junction boxes for use with PVC or plastic-coated conduits shall be made of fiberglass, with matching gasketed covers secured with captive monel or stainless steel screws; Hoffman A-JFG series or accepted equal. Each metallic conduit entry (including liquidtight flex) shall be provided with a bronze bond bushing and NEC-sized copper bonding jumper inside the enclosure.

2.5 PA SYSTEM TERMINAL CABINETS

A. Refer to requirements in Section 16770 for PA System Terminal Cabinets.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Junction and pull boxes shall be installed so that covers are readily accessible and adequate working clearance is maintained after completion of the installation.

B. Select boxes properly sized per NEC for power and lighting applications.

3.2 TELECOMMUNICATIONS SYSTEM PULL BOXES

A. Where a pull box is required in a 1 inch conduit run, outlet boxes as specified in Section 16131 - Outlet Boxes may be used. Where a pull box is required in a conduit run 1 1/4 inch or larger, or where required for multiple raceways, the box shall be sized in accordance with the Table in this Section

B. Pull boxes shall be located in straight-through sections of horizontal cabling pathways (conduits). Pull boxes shall not be used for angle pulls or to accomplish changes in direction of the pathway

C. Multiple raceways connecting to telecommunications system pull boxes shall penetrate box walls such that they are distributed evenly along the Box wall.

3.3 TELECOMMUNICATIONS SYSTEM JUNCTION BOXES

A. Junction boxes shall not be used in interior horizontal pathway conduits or interior backbone pathway conduits unless specifically allowed by ANC. Where specifically allowed, junction boxes shall be located in a readily accessible location. Junction boxes shall not be located in above ceiling spaces unless specifically allowed by ANC.

B. Junction boxes for telecommunication shall be hinged covered cabinets, sized in accordance with the requirements of ANSI/EIA/TIA-569.

C. Junction cabinets shall have a fire-treated plywood backboard suitable for mounting punch-down style terminal blocks, in accordance with Section 16745.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products and methods of execution relating to line voltage wiring devices for use at ANC.

1.2 QUALITY ASSURANCE

A. Manufacturers mentioned and catalog numbers specified are for establishment of type, configuration and quality.

PART 2 - PRODUCTS

2.1 DEVICES

A. Provide wiring devices indicated. Catalog numbers shown are Hubbell unless noted otherwise. Equal devices manufactured by Arrow Hart, or Bryant are acceptable. Provide all similar devices of same manufacturer. Model numbers are for type and configuration only. Color shall be as selected by the Tenant.

2.2 SWITCHES

A. Provide 20 AMP, 277V rated switches with UL listing for tungsten lamp loads or inductive loads without derating. Switches shall be as follows:

	20A
Single Pole	CAT. NO. 1221
Three-way	CAT. NO. 1223
Four-way	CAT. NO. 1224
Key Operated	CAT. NO. 1221-L
Momentary Cont.	CAT. NO. 1557
Double Pole	CAT. NO. 1222
Pilot Switch	CAT. NO. 1221-PL

B. Multiple 277V switches shall be installed in partition boxes or shall be furnished with shields.

C. Other switch types shall be provided as required by the application.

2.3 INCANDESCENT DIMMERS

A. Provide slide-type electronic incandescent dimmers with square-law dimming and silent mechanical "off" switch. Faceplate shall cover cooling fins. Slide control shall prevent damage to the electronics from mechanical abuse. Lutron "NOVA" series, N-600, 1000, 1500, 2000, or equal, as required by the application. Provide dimmers certified for "low voltage" applications where low voltage fixtures are served.

2.4 FLUORESCENT DIMMERS

A. Provide slide-type electronic dimmer with 500:1 dimming range, square-law dimming and silent mechanical "off" switch. Provide low-end trim control for minimum level preset. Faceplate shall cover cooling fins. Slide control shall prevent damage to the electronics from mechanical abuse. Lutron "NOVA" series NF-10, 20, 30, or equal, as required by the application. Provide compatible ballasts for affected fixtures. Coordinate with Sections 16500 and 16501.

2.5 RECEPTACLES

A. Insofar as commercially available, receptacles shall be of nylon construction. Provide grounding type receptacles as follows, or as required to match equipment furnished in this or other divisions.

Single Phase, 3-Wire Devices

15A-250V	CAT. NO. 5662	NEMA #6-15R
Clock hanger 125V	CAT. NO. S-373-3SS	NEMA #5-15R
20A-125V	CAT. NO. 5362	NEMA #5-20R
20A-125V GFCI	CAT. NO. GF-5362	NEMA #5-20R
20A-125V Tamper Proof	PASS & SEYMOUR CAT NO. SG-63-H	NEMA #5-20R
20A-250V	CAT. NO. 5462	NEMA #6-20R
30A-250V Dryer	CAT. NO. 9430A	NEMA #14-30R
50A-250V Range	CAT. NO. 9450A	NEMA #14-50R

B. Outlets requiring ratings and configurations different from those listed above shall be provided as required by the equipment served.

C. Outlets connected to emergency or standby power shall be red. All others shall be as noted in 2.1.

2.6 DEVICE PLATES

A. Device plates shall be satin-finished 302 stainless steel, unless otherwise approved by ANC.

B. Indoor device plates for surface-mounted boxes shall be stainless or galvanized steel, with design to match the box and device type being used.

C. Weatherproof switch plates shall be cast, gasketed type, Bell 216-LS-series or approved equal.

D. Weatherproof outlet plates shall be of the safety outlet enclosure type that can be closed to remain weatherproof while in use. The outlet cover/enclosure shall be clearly marked “Suitable for Wet Locations While In Use” and “UL Listed”. A gasket shall be provided between the enclosure and the mounting surface, and between the hinged cover and the mounting plate/base to assure a proper seal. Enclosure shall be oversized depth, single-gang, vertical-mount, with non-locking latch, GFCI opening, cord openings, and cover; TayMac; Specification Grade or approved equal.

E. 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.

2.7 OCCUPANCY SENSORS

A. Occupancy sensors in individual offices and similar small rooms shall be wall-mounted, passive infrared; Universal Energy Control, Inc. "Switchomat" model SOM-1000-A-2 with two circuit capability, each with manual override switches.

B. Other products may be utilized if they provide equal or better performance to the sensor specified as the Basis of Design.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install all wiring devices indicated complete with cover plates. Cover plates shall fit snugly against finished surfaces and line up true with adjacent building lines, and be symmetrical in location and appearance.

B. All switches shall be installed so their handles move in a vertical plane.

C. Door swings shall be checked and, if necessary, switches shall be relocated to place them on the strike side of the door.

D. Unless otherwise noted on the drawings, receptacles shall be installed in the vertical position with the grounding pin down unless wording on the face of the device requires other mounting.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Support and align all raceways, cable trays, wireways, cabinets, boxes, fixtures, equipment, etc., in an approved manner.

B. Supports shall be in conformance with the requirements of the current building codes and local amendments, or the requirements of this Section, whichever is more stringent.

C. Seismic anchorages, seismic restraints, and fixture and equipment supports shall be in accordance with the National Uniform Seismic Installation Guidelines (NUSIG).

PART 2 - PRODUCTS

2.1 MATERIAL, GENERAL

A. Support raceways on approved types of wall brackets, ceiling trapeze hangers, or malleable iron straps. "Perforated plumbers strap" not permitted as means of support.

1. Acceptable manufacturer's of support brackets and hangars: "Unistrut", "Kindorf" or "B-line".

2. "Caddy" fasteners are permitted for support of conduit to concealed metal studs and for conduit concealed above suspended acoustical ceilings.

3. All supporting devices located outdoors or in areas subject to moisture shall be hot-dip galvanized or stainless steel.

B. Do not support raceways or equipment from ceiling tie wire or T-Bar, piping or ductwork. Support independently. Exceptions: Outlet boxes located in suspended ceiling systems (e.g., ceiling speaker boxes) as specifically noted in Section 16131 and light fixtures as specifically noted in this Section.

C. Provide safety wires (a minimum of two 12 gauge hangers) or equivalent chains for each light fixture weighing less than 56 pounds installed in T-Bar or other ceiling suspension systems. Safety wires and chains shall be securely attached to diagonally opposite corners of each fixture and to structure. Fixtures weighing 56 pounds or more shall be supported from structure.

D. Surface mounted lighting fixtures supported from T-bar grid shall be attached to the grid with a positive clamp device that completely surrounds the supporting member similar to Caddy "IDS". Provide safety wires as specified in the foregoing.

E. Provide safety wires (a minimum of two 12 gauge hangers) or equivalent aircraft cable for each pendant mounted fixture. Hangars or cable shall be securely attached to fixture, then routed through stem and securely attached to structure.

F. Earthquake Anchorages

1. Anchor all equipment, raceways, cable trays, etc., to the building structure to resist earthquake forces in accordance with the requirements of the National Uniform Seismic Installation Guidelines for Architects, Engineers, Inspectors and Contractors.

2. Total lateral (earthquake) force shall be not less than 1.00 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.

3. Provide equipment supported by flexible isolation mounts with earthquake restraining supports positioned as close to equipment as possible without contact in normal operation (earthquake bumpers). The maximum lateral displacement due to the computed earthquake force from above shall not exceed 1.5 inches. Floor mounted equipment weighing less than 2,000 pounds may have one 6 by 6 by 3/8 by 18 inch steel angle bolted to the floor with four 5/8 inch diameter bolts placed on each of four sides of the equipment.

2.2 HARDWARE COMPOSITIONS AND FINISHES

A. In dry indoor areas, all threaded fasteners and associated hardware shall be steel, with a zinc or cadmium-plated finish.

B. In general, fasteners in outdoor, damp, or corrosive environments shall be of the largest trade size that will fit the item being fastened, shall have the coarsest threads commercially available in that size, and shall be hot-dip galvanized steel. Zinc electroplate will be acceptable only in the smaller sizes where hot-dip galv is not commercially available. On metal construction, install with the full length of the threads and the hole wet with cold galv touch-up compound (Z.R.C. or accepted equal).

C. Where PVC, liquidtight flex, or plastic-coated conduit is installed on wood construction in outdoor, damp, or corrosive environments, fasteners shall be made of monel or a stainless steel alloy suitable for marine environments, such as alloys 430, 446, 18-8, 304, 316, or 347.

2.3 STRUT

A. U-channel strut for use in heated indoor areas shall be steel. For installations that will be finish painted as part of the project, factory finish of the strut shall be paintable galvanizing, or phosphatized and primed. For installations that will not be finish painted, the factory finish of the strut shall be galvanized.

B. For outdoor installation of galvanized conduits and boxes, strut shall be steel, with hot-dip galvanized finish. All field-cut ends and other breaks in the finish shall be thoroughly treated with cold galv touch-up compound (Z.R.C. or accepted equal).

C. U-channel strut for support of PVC or plastic-coated conduits in outdoor, damp, or corrosive environments shall be fiberglass, RobRoy "Rob-Glass" or accepted equal, assembled with the manufacturer's standard end sealant and corrosion-protected hardware and accessories.

PART 3 - EXECUTION

3.1 FASTENING

A. Secure boxes, wall brackets, cabinets, and hangers by means of toggle bolts in hollow masonry; preset inserts or expansion bolts in solid masonry and concrete; machine screws, bolts or welding on metal surfaces; and wood or sheetmetal screws in wood construction. Obtain permission from ANC before using any type of powder powered studs.

3.2 FIXTURE SUPPORTS

A. For other than T-bar ceiling fixtures and for all fixtures weighting more than 56 pounds, support luminaires from structural members capable of supporting total weight, under seismic conditions and independently from wiring system. Attach to steel members by approved beam clamps and rods.

3.3 PENDANT FIXTURES

A. Loop and hook or swivel hanger assemblies for pendant fixtures shall be fitted with a restraining device to hold the stem in the support position during earthquake motions. Pendant-supported fluorescent fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.

3.4 ASSEMBLY MOUNTED OUTLET BOX

A. A supporting assembly that is intended to be mounted on an outlet box shall be designed to accommodate mounting features on 4-inch boxes, 3-inch plaster rings, and fixture studs.

3.5 WALL-MOUNTED EMERGENCY LIGHT UNIT

A. Each wall-mounted emergency light unit shall be secured in a manner to hold the unit in place during a seismic disturbance.

3.6 SAFETY WIRES

A. Attach safety wires to lighting fixtures so that no part of the fixture, in event of ceiling suspension system failure, will drop more than six inches below normal ceiling height. Each end of each wire shall be secured with a minimum of three tight wraps.

3.7 STRUCTURAL ATTACHMENTS

A. Provide adequate backing at structural attachment points to accept the forces involved.

B. Attachment to plaster or gypsum board not permitted unless specifically approved in writing by ANC on a case-by-case basis. Where approved, such attachment shall be by means of molly or toggle bolts.

END OF SECTION

SECTION 16201

EMERGENCY/STANDBY GENERATING SYSTEM

PART 1 - GENERAL REQUIREMENTS

1.1 SUMMARY

A. This section describes the requirements for additions to the existing ANC Emergency/Standby electric generating distribution system.

B. A limited amount of Emergency/Standby Power is available for Tenant use.

1. 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.

2. 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).

3. Proposed Tenant emergency and standby loads must be submitted and approved by ANC as part of the Design Submittal process.

4. Refer to Section 16010 – Electrical Requirements for additional information.

C. Tenant emergency/standby loads will typically be limited to branch circuits for emergency and standby loads as noted above. The Tenant's Design Engineer shall contact ANC regarding any major equipment or loads that the Tenant desires to provide generator support for. Support of major non-essential loads may require the addition of new generators or transfer switches at the Tenant's expense.

D. Uninterruptiple Power Supplies (UPS) are the responsibility of the Tenant. No UPS capacity is available from ANC for Tenant use.

E. Related Sections:

1. 16010 Electrical General Provisions

1.2 DESCRIPTION

A. The existing system complies with the applicable requirements of NFPA 110 - Emergency and Standby Power Systems for Level 1, Type 10, Class 2 systems.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Emergency system wiring shall comply with NEC Article 700. Standby system wiring shall comply with NEC Article 702.

B. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction.

END OF SECTION

SECTION 16425

DISTRIBUTION SWITCHBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products, and methods of execution relating to Distribution Switchboards approved for use at ANC. Type, size, ratings, etc., shall be as required by the application and in accordance with UL and NEMA standards.

B. Provide factory-assembled, metal enclosed switchboards for distribution and control of power from incoming line terminals to outgoing feeder terminals, installed and tested in place.

C. Related Sections:

1. 16920 Power Monitoring And Control System

1.2 QUALITY ASSURANCE

A. Distribution Switchboards shall be of the latest approved design as specified in U.L. standard 891 and as manufactured by Square D Company to match equipment provided in the C Concourse Phase 2 Building Completion Package. Switchboards shall be listed by the Underwriters' Laboratory and bear the UL label.

1.3 REFERENCES

A. The switchboard(s) and overcurrent protection devices referenced herein shall be designed and manufactured according to latest revision of the following specifications:

1. ANSI/NFPA 70 - National Electrical Code (NEC).
2. ANSI/IEEE C12.1 - Code for Electricity Metering.
3. ANSI C39.1 - Electrical Analog Indicating Instruments.
4. ANSI C57.13 - Instrument Transformers.
5. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
6. NEMA KS 1 - Enclosed Switches.
7. NEMA PB 2 - Deadfront Distribution Switchboards.
8. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
9. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.
10. UL 50 - Cabinets and Boxes
11. UL 98 - Enclosed and Dead Front Switches
12. UL 489 - Molded Case Circuit Breakers
13. UL 891 - Dead-Front Switchboards
14. UL 943 - Ground Fault Circuit Interrupters
15. UL 977 - Fused Power Circuit Devices

16. CSA 22.2 No. 5 - M1986 Molded Case Circuit Breakers

17. Federal Specification W-C-375B/Gen - Circuit breakers, molded case, branch circuit and service.

18. Federal Specification W-C-870 - Fuse holders (For plug and enclosed cartridge fuses)

19. Federal Specification W-S-865 - Enclosed Knife Switch

1.4 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

PART 2 - PRODUCTS

2.1 SWITCHBOARD - GENERAL

A. Short Circuit Current Rating: Service equipment shall have an integrated short circuit rating suitable for the available short circuit amps.

B. Future Provisions: All unused spaces provided shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

C. Enclosure: Type 1 - General Purpose.

1. Sections shall be aligned front and rear.

2. Switchboard height shall be 91.5 inches including 1.5 inch floor sills and excluding lifting members and pull boxes.

3. The switchboard(s) shall be of deadfront construction.

4. The switchboard frame shall be of formed steel rigidly bolted together to support all cover plates, bussing and component devices during shipment and installation.

5. Steel base channels shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.

6. Each switchboard section shall have an open bottom and an individually removable top plate for installation and termination of conduit.

7. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.

8. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.

9. Top and bottom conduit areas shall be clearly indicated on shop drawings.

D. Pull Sections

1. Pull sections shall be provided as required by the application.

E. Nameplates: Provide per Section 16010-1.11.

F. Bus Composition: Shall be plated copper. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as required by the application. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.

G. Bus Connections: Shall be bolted with Grade 5 bolts and conical spring washers.

H. Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

I. Accessibility: Accessible from the front of the switchboard.

J. The distribution section shall contain provisions for mounting distribution circuit breakers. Distribution circuit breakers shall be totally front accessible and front connectable. They shall be mounted in the switchboard to permit installation, maintenance and testing without reaching over any line side bussing. The distribution circuit breaker's connection to the distribution panel bussing shall be of a "blow-on" design such that the connections grip the bus bars firmly under heavy fault current conditions. The distribution section shall have a continuous current rating as required by the application. Bussing shall be "full length" of the section to provide maximum usable space. "I-Line" type construction shall be provided for maximum flexibility to mount any branch device in any location.

2.2 SWITCHBOARD - INCOMING MAIN SECTION DEVICE

A. Electronic trip insulated case full function 100 percent rated circuit breaker individually fixed mounted. Circuit breaker shall have power terminals to accommodate cable connections.

B. Electronic trip circuit breaker with Full Function Trip System shall be Square D Full function type SE as specified in Section 16475.

2.3 SWITCHBOARD - DISTRIBUTION SECTION DEVICES

A. Branch circuit breakers over 400 A shall be electronic trip molded case circuit breakers with Full Function Trip System.

B. Electronic trip breakers with Full Function Trip System shall be Square D Full function type LE, ME, NE as specified in Section 16475.

C. Branch circuit breakers 400 A and under shall be Square D molded case circuit breakers as specified in Section 16475.

2.4 POWER AND TRIP HISTORY MONITORING

A. System Description

1. Customer monitoring shall consist of an electronic Circuit Monitor, as described in Section 16920 - Power Monitoring And Control System, installed as designated in Section 16920.

2. Provide a Square D PowerLogic Series 4000 circuit monitor with waveform capture provisions to monitor the main disconnect in the switchboard.

B. Circuit Monitor Installation

1. Electronic circuit monitors shall be installed by the switchboard manufacturer for circuits as indicated in this Section and in Section 16920.

2. All control power (current and voltage transformers) and communications wire shall be factory wired and harnessed within the switchboard lineup.

3. Where external circuit connections are required, terminal blocks shall be provided and the manufacturer's drawings shall clearly identify the interconnection requirements including wire type to be used.

2.5 MIMIC BUS

A. Show the entire single line switchboard bus work, as depicted on the factory record drawing, on a photo engraved nameplate. The nameplate plate shall be at least .032 inch thick anodized aluminum and located at eye level on the front cover of the switchboard incoming service section.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive switchboard to insure adequate clearance for switchboard installation.

B. Check that concrete pads are level and free of irregularities.

C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install switchboard in accordance with manufacturer's written instructions, and NEC.

B. Provide minimum 3 inch high concrete pad with minimum 2 inch reveal on front and sides for mounting switchboard. Concrete pad shall comply with code requirements.

C. Provide switchboard sections with adequate lifting means; capable of being rolled or moved into position and bolted directly to floor without use of floor sills.

D. Level switchboard and securely fasten to floor. Carefully align bus connection before bolting together.

E. Provide cable supports for all cables entering switchboard from point of entrance to their respective overcurrent devices.

3.3 FIELD QUALITY CONTROL

A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

B. Measure, using a Megger, the insulation resistance of each bus section phase to phase and phase to ground for one minute each, at minimum test voltage of 1000 volts DC; minimum acceptable value for insulation resistance is one megohms. NOTE: Refer to manufacturer's literature for specific testing procedures.

C. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.

D. Conduct a performance test of the ground-fault protection system in accordance with NEC Article 230-95(c) and the equipment manufacturer's instructions.

3.4 ADJUSTING

A. Adjust all operating mechanisms for free mechanical movement per manufacturer specifications.

B. Tighten bolted bus connections in accordance with manufacturer's instructions.

C. Adjust circuit breaker trip and time delay settings to values established by coordination study.

3.5 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION

SECTION 16440

DISCONNECTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products, and methods of execution relating to fusible and non-fusible disconnecting devices approved for use at ANC.

1.2 QUALITY ASSURANCE

A. Devices shall be of the latest approved design as manufactured by Square D Company to match equipment provided in C Concourse Phase 2 Building Completion Package. Equipment shall be in conformity with UL listings and the governing NEMA standards.

PART 2 - PRODUCTS

2.1 SAFETY SWITCHES

A. Safety switches, fusible and non-fusible, shall conform to NEMA Standard KSI-1990 for type HD (Heavy Duty) unless otherwise noted.

1. Switch Interior: All switches shall have switch blades that are fully visible in the OFF position when the door is open. Switches shall be of dead-front construction with permanently attached arc suppressers. Lugs shall be UL listed for copper and/or aluminum cables and be front removable.

2. Switch Mechanism: Switches shall have a quick-make and quick-break operating handle and mechanism that shall be an integral part of the box, not the cover. Switches shall have a defeatable dual cover interlock to prevent unauthorized opening of the switch door in the ON position or closing of the switch mechanism with the door open. The switch shall be capable of being locked in the OFF position with three (3) padlocks.

3. Enclosures: Switch enclosure shall be suitable for the environment in which the switch is mounted. NEMA 1 enclosure shall be code gauge, UL-98, sheet steel, treated with a rust inhibiting phosphate and finished in gray, baked enamel. NEMA 3R enclosure--same requirements as NEMA 1 except galvanized prior to painting.

4. Rating: Ampere, volt and horsepower ratings, as well as number of poles and presence of neutral bar shall be shown on the name plate.

2.2 CIRCUIT BREAKERS

A. Circuit breakers used as disconnects shall meet requirements specified in Section 16475 - OVERCURRENT PROTECTIVE DEVICES. Enclosures for same shall meet the requirements as specified above.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate all details pertaining to size of motor and/or equipment, location and requirements to enclosure, ratings, etc., so as to provide the most suitable unit for the intended purpose.

B. Provide nameplates for all disconnects. Coordinate names with mechanical equipment lists.

C. Where the rating of a fused disconnect exceeds the ampacity of the conductors being protected, a permanent label noting maximum fuse size shall be installed in a conspicuous location within the switch.

D. Where recommended or required by the equipment manufacturer, or required by underwriters' laboratories, disconnects shall be the fusible type, fused in accordance with the equipment nameplate information.

E. Provide all code-required disconnects. For equipment which is under the jurisdiction of the UMC, a disconnect shall be provided within sight of the equipment.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products and methods of execution relating to the furnishing and installation of grounding systems at ANC.

1.2 MINIMUM REQUIREMENTS

A. The minimum requirements for the system shall conform to Article 250 of the NEC.

1.3 SPECIAL REQUIREMENTS

A. Unless specified elsewhere, the ohmic values for grounds and grounding systems shall be as follows:

1. For grounding metal enclosures and frames for electrical and electronically operated equipment--5 ohms maximum.

2. For grounding systems to which electrical utilization equipment and appliances are connected--5 ohms maximum.

3. For grounding secondary distribution systems, neutrals, noncurrent carrying metal parts associated with distribution systems, and enclosures of electrical equipment not normally within reach of other than authorized and qualified electrical operating and maintenance personnel -- 10 ohms maximum.

1.4 TELECOMMUNICATIONS GROUNDING SYSTEM

A. ANC Telecommunications ground systems include the following items, which shall be utilized in the execution of Tenant Improvement projects.

1. Telecommunication Bonding Backbone (TBB) - A copper conductor that extends from the telecommunications main grounding busbar (TMGB) to each telecommunications grounding busbar (TGB).

2. Telecommunications Main Grounding Busbar (TMGB) - The TMGB serves as a dedicated extension of the building grounding electrode system for telecommunications infrastructure. The TMGB is located in the main telecommunications room (MDF).

3. Telecommunications Grounding Busbar (TGB) - A busbar placed in an accessible location in each telecommunications room (TR) (formerly referred to as Intermediate Distribution Frame Room (IDF)) that is connected back to the TMGB. All equipment served from the TR shall be connected to the local TGB.

4. Site grounding system - connects the TMGB in each structure to the low resistance earth grounding system.

1.5 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of this specification. The publications are referred to in the text by basic designation only, latest edition.

NUMBER	TITLE
ANSI/IEEE C2	National Electrical Safety Code
ANSI/NFPA 70	National Electrical Code
ANSI/TIA/EIA 606	Administration Standard for Telecommunications
ANSI/TIA/EIA-607	Commercial Building Grounding and Bonding Requirements for Telecommunications
NFPA 70	National Electric Code (NEC) - Codebook and Handbook

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. All grounding conductors and equipment required for ground systems shall be listed for the purpose intended and approved by a Nationally Recognized Testing Laboratory (NRTL), and be in accordance with UL 467 and as follows:

1. Grounding conductors shall be copper.

2. Grounding conductor for telephone/data panels shall be minimum #6 insulated copper. Comply with inter-system bonding requirements of NEC.

3. Grounding conductor for television and radio distribution systems shall be #6 AWG insulated copper. Comply with intersystem bonding requirements of NEC.

2.2 CONNECTIONS

A. Joints in grounding conductors below grade shall be made with exothermic welding process or hydraulically-crimped fittings listed for direct burial. Terminations above grade shall be made with solderless lugs, securely bolted in place.

B. Clamps, lugs, connectors, bonding bushings, and all other such grounding and bonding items shall be:

1. Labeled or listed for the purpose.

2. Shall be made (both body and hardware) of hot-dip galvanized steel, bronze, or other corrosion-resistant alloy (except bushing throats shall be plastic).

3. Shall be the products of O-Z/Gedney, T & B, Raco, or accepted equals.

4. In outdoor, damp, or corrosive environments, metals for these items shall be copper (with or without tin-plating), bronze, or other corrosion-resistant alloys only; O-Z/Gedney or accepted equal.

2.3 TELECOMMUNICATIONS SYSTEM BONDING

A. Bond all telecommunication equipment chassis, ladder racks, cable trays, conduits, equipment frames, cabinets, and all other *telecommunications room and equipment room* metallic components to a local TGB with #6 AWG, 600 volt, insulated copper conductor.

B. Bonding of grounding conductors shall be with the following methods as specified herein:

1. Connections to grounding busses: Cool Amp Plating, field applied to both surfaces for all bolted and compression connections.

    a. Approved gas tight two hole copper grounding compression lugs T&B 54205 series two hole, crimp Cool Amp plated compression type for connection to grounding busses.

    b. Fasteners shall be nickel plated steel nuts, bolts and lockwashers.

2. Conductor splices and connection to ground rods:

    a. Cadweld exothermic welds. All bonds below grade shall be exothermic.

    b. Burndy type “YG” extruded wrought copper prefilled with Pentrox heavy duty compression connectors with probe holes (Type YGA and YGS not acceptable).

    c. High frequency copper tape shall be bonded by spot welding, or exothermic welding or brazed with silver alloy rod.

2.4 IDENTIFICATION AND LABELING

A. Grounding conductors shall be marked with tie wrap style cable markers.

PART 3 - EXECUTION

3.1 SERVICE GROUND

A. An equipotential plane for the grounding system at service entrance equipment has been created by connecting the following to the service entrance ground bus:

1. The commercial system's grounded neutral conductor.

2. All metallic water services to the building.

3. The service entrance equipment and all conduits entering and leaving the equipment.

4. The metallic piping systems in the building.

5. The metallic gas piping system upstream from the equipment shutoff valve.

6. "Ufer" ground in accordance with NEC 250-50.

7. Structural steel columns. All columns in or adjacent to (within 50 feet) of existing electrical rooms with separately derived systems.

B. Current carrying capacity of the grounding and bonding conductors shall be in conformity with Table 250-66 of the NEC. Exception: The bonding conductor for metallic gas piping shall be sized in accordance with Table 250-122 based on the largest overcurrent device protecting feeder conductors exiting the main distribution switchboard serving that area.

3.2 EQUIPMENT GROUND

A. The raceway system shall be bonded in conformity with NEC requirements to provide a continuous ground path.

B. Provide separate grounding conductor securely bonded and effectively grounded to the enclosures at both ends of all non-metallic raceways and all flexible conduit.

C. Provide an equipment grounding conductor sized in conformity with Table 250-122 of the NEC, unless larger size noted, for all feeder and branch circuit conduits. Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately according to circular mil area.

D. Refeeding existing feeder/branch circuits that do not have an existing equipment grounding conductor: Bond equipment grounding conductor of new feeder or branch circuit to junction box and new and existing conduits.

3.3 CONCEALED CONNECTIONS

A. Permanent grounding connections, where permitted by the NEC to be concealed, shall not be so concealed until inspected and accepted by the local Authority Having Jurisdiction.

3.4 CORDS AND NONMETALLIC CABLES

A. Unless specifically permitted otherwise, all cords and nonmetallic cables shall be furnished with integral Code-sized grounding conductor. Securely bond all metal components and effectively ground the entire electrical system.

3.5 TELECOMMUNICATIONS GROUNDING SYSTEM

A. Telecommunications Bonding Backbone (TBB)

1. The TBB between each TGB and the TMGB is connected in a star configuration to minimize ground loops.

B. Telecommunications Main Grounding Busbar (TMGB)

1. Equipment and metallic raceways located in the same room as the TMGB shall be bonded to the TMGB.

2. TBB connections to the TMGB shall be made with listed two hole compression connectors or exothermic type welded connections.

C. Telecommunications Grounding Busbar (TGB)

1. Equipment and metallic raceways located in the same room as the TGB shall be bonded to the TGB.

2. TBB connections to the TGB shall be made with listed two hole compression connectors or exothermic type welded connections.

D. Bonding and Connections

1. General

a. Cadweld or braze all concealed or below grade connections.

b. All compression connections shall be made using a hydraulic 4 way compression die.

c. All compression connections shall be exposed.

d. All insulated wire splices shall be insulated with preformed wire covers.

2. To Building Steel

a. Cadweld all connections to building steel.

E. Identification and Marking

1. Show all conductors on neatly marked record drawings.

2. Grounding conductors shall be marked per ANSI/TIA/EIA 606. Mark each cable end using tie wrap style cable markers.

3.6 EXTERNAL BONDING JUMPERS

A. Not permitted; all bonding jumpers shall be run inside the raceways for the circuits they serve.

3.7 SEPARATELY DERIVED SYSTEMS

A. Separately derived systems shall be grounded in accordance with NEC Article 250-30.

1. Bonding jumper

a. The bonding jumper shall be sized in accordance with NEC Table 250-66. Where the derived phase conductors are larger than 1100 kCMIL copper, the bonding jumper shall have an area that is not less than 12-1/2% percent of the area of the largest phase conductor.

b. The bonding jumper shall be used to connect the equipment grounding conductors of the separately derived system to the grounded conductor.

c. The bonding jumper shall be located within the enclosure of the source of the separately-derived system, unless specifically noted otherwise.

2. Provide termination lugs for the co-located grounded conductor, grounding electrode conductor and bonding jumper terminations, using Listed compression-type connectors suitable for all conductors landed at each location.

3. The grounded conductor of the separately derived system shall be bonded to the nearest available point of the interior metal water piping system in the area served by the separately derived system. The bonding jumper shall be sized in accordance with NEC Table 250-66.

4. Grounding electrode

a. The grounding electrode shall be as near as practical to and preferably in the same area as the grounding electrode conductor connection to the system.

b. The grounding electrode conductor, sized in accordance with NEC Table 250-66, shall be used to connect the grounded conductor of the derived system to the grounding electrode.

c. The grounding electrode shall be the nearest one of the following:

1) Effectively grounded structural metal member of the structure.

2) Effectively grounded metal water pipe within 5 feet from the point of entrance into the building.

END OF SECTION

SECTION 16460

SECONDARY TRANSFORMERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products, and methods of execution relating to transformers approved for use at ANC. Type, size, ratings, etc., shall be as required by the application and in accordance with UL and NEMA standards.

B. Section includes all power and control transformers through 600 volts in this and other Divisions, including items such as: Control, communications systems, lighting and power, distribution and signal systems transformers, whether furnished as an integral component of an item of equipment or separately provided.

1.2 QUALITY ASSURANCE

A. Transformers shall be of the latest approved design as manufactured by Square D Company to match equipment provided in the C Concourse Phase 2 Building Completion Package. Transformers shall be listed by Underwriters' Laboratory and bear the UL label.

PART 2 - PRODUCTS

2.1 TRANSFORMERS

A. All transformers shall be dry-type.

B. Single phase transformers shall be 480 volt primary and 120/240 volt secondary. Three phase transformers shall be 480 volt delta primary and 208 wye volt secondary. Transformers 25 KVA and larger shall have a minimum of four 2-1/2 percent full capacity primary taps (two above normal and two below).

C. Transformers 15 KVA and larger shall be 115 degrees C temperature rise above 40 degrees C ambient. All insulating materials to be in accordance with NEMA ST20-1972 standards for a 220 degrees C UL component recognized insulation system.

D. Transformer coils shall be of continuous wound construction and shall be impregnated with non-hygroscopic, thermo-setting varnish.

E. All cores shall be constructed of high grade, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. The core laminations shall be clamped together with structural steel angles. The complete core and coil shall then be bolted to the base of the enclosure but isolated therefrom by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. On transformers 500 KVA and smaller, the vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices are not acceptable.

F. Transformers shall have a "K" factor if required to permit them to withstand harmonics. Distribution panels that feed branch circuit panels with a large proportion of non-linear loads shall be fed from transformers with a minimum “K” factor of 4 (typically transformers 112.5 kVA and larger). Branch circuit panels with a large proportion of non-linear loads that are fed directly by a transformer shall be fed from transformers with a minimum “K” factor of 13 (typically transformers 75 kVA or smaller). Transformers with a “K” rating of 13 shall be equipped with 200% rated neutrals and neutral lugs.

G. Transformers 15 KVA and larger shall be in a heavy gauge, sheet steel, ventilated enclosure. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code standards for ventilated enclosures. Single phase transformers 15 KVA through 167 KVA, and three phase transformers through 112.5 KVA shall be designed so they can be either floor or wall mounted. Larger transformers shall be designed only for floor mounting.

H. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed, and finished with gray, baked enamel.

I. The maximum temperature of the top of the enclosure shall not exceed 50 degrees C rise above a 40 degrees C ambient.

J. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI standards.

K. The transformer shall be listed by Underwriters' Laboratory for the specified temperature rise.

2.2 SOUND RATINGS

A. Sound levels shall be guaranteed by the manufacturer not to exceed the following:

1. 15 to 50 KVA: 45dB
2. 51 TO 150 KVA: 50dB
3. 151 TO 300 KVA: 55dB
4. 301 TO 500 KVA: 60dB

2.3 TRANSIENT INRUSH CURRENT

A. Primary overcurrent protection for dry type step down transformers shall be sized to allow for transient inrush current.

2.4 TRANSFORMER SHIELDS

A. All transformers with a "K" rating shall be supplied with a quality, full width electrostatic shield resulting in a maximum effective coupling capacitance between primary and secondary of 33 picofarads. With transformers connected under normal, loaded operating conditions, the attenuation of line noise and transients shall equal or exceed the following limits:

Common Mode: 0 to 1.5Hz - 120db; 1.5 to 10kHz - 90db; 10 to 100kHz - 65db; 100kHz to 40db.

Transverse Mode: 1.5 to 10kHz - 52db; 10 to 100kHz - 30db.

PART 3 - EXECUTION

3.1 MOUNTING

A. Provide all required structural provisions including floor, wall brackets, or trapeze suspended from structural members, or as approved by ANC.

B. Transformers up to 100 kVA: Mount transformers on double-deflection neoprene-in-shear isolators (no harder than 50 durometer) sized for the following static deflections:

1. 0.2” static deflection for slab on grade installations.

2. 0.75” static deflection for other than slab on grade installations.

3. Mason Industries or as approved.

C. Transformers over 100 kVA: Mount transformers on floor mounted spring isolators with seismic snubbers sized for the following static deflections:

1. 0.5” static deflection for slab on grade installations.

2. 0.75” static deflection for other than slab on grade installations.

3. Mason SSLF with Z-1011 seismic snubbers, Mason SLR with integral snubbers, or as approved.

D. Ceiling mounted transformers: Mount transformers on spring hangers with 0.5” static deflection. Mason HS type or as approved.

3.2 ADJUSTMENT

A. Adjust transformer taps to provide rated voltage at the secondary bus with all connected loads "on", except the no-load secondary line-to-neutral voltage shall not exceed 125 volts on nominal 120 volt phases. Submit log of final voltage and current readings at no load and full load to ANC electrical department.

3.3 ELECTRICAL CONNECTIONS

A. Liquid-tight flexible metal conduit with supplemental ground jumper shall be used for all transformer connections. The flexible conduit shall be installed in a slack, shallow "U" form and shall prevent rigid contact between the transformer components and the nearby structure, conduits, etc. The ground jumper in flexible conduits shall be within the conduit.

3.4 GROUNDING AND BONDING

A. Transformer wye secondaries shall be grounded as separately derived systems. Transformers and conduits shall be bonded per NEC requirements.

3.5 NEUTRAL CONDUCTORS ON K-13 RATED TRANSFORMERS

A. Provide 200 percent rated secondary neutral conductors on K-13 rated transformers.

END OF SECTION

SECTION 16470

PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general provisions, products, and methods of execution relating to branch circuit panelboards approved for use at ANC. Type, size, ratings, etc., shall be as required by the application and in accordance with U.L. Standards 50 and 67.

1.2 SPECIAL REQUIREMENTS

A. Special features such as double main lugs, feed through lugs, extended side gutters, integral transient voltage surge suppression (TVSS), etc., shall be provided as required by the application.

1. Trims shall be furnished to be compatible with type of mounting.

2. “Door-in-door” construction shall be furnished on all panelboards unless specifically authorized otherwise in writing by ANC.

3. Provide 6 inch extended side gutters on distribution panels that require energy meters on distribution circuit breakers.

1.3 QUALITY ASSURANCE

A. Panelboards shall be of the latest approved design as manufactured by Square D Company to match equipment provided in the C Concourse Phase 2 Building Completion Package. Panelboards shall be listed by Underwriters' Laboratory and bear the UL label.

PART 2 - PRODUCTS

2.1 CABINETS AND FRONTS

A. Panelboard assembly shall be enclosed in a steel cabinet. Fronts shall include doors and have flush, brushed stainless steel, cylinder tumbler-type locks with catches and spring-loaded door pulls. All panelboard locks shall be keyed alike. Fronts shall have adjustable, indicating trim clamps that shall be completely concealed when the doors are closed. Doors shall be mounted by completely concealed steel hinges. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4 inch high by three inches long or equivalent for each circuit. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish. Cabinets shall be labeled in accordance with Section 16010.

2.2 SAFETY BARRIERS

A. The panelboard interior assembly shall be dead front with panelboard front removed.

2.3 BUS ASSEMBLY

A. Panelboard bus structure and main lugs or main breaker shall have current ratings as required by the application. Bus structure shall allow 1, 2 and 3-pole breakers of various frame sizes to be mounted in any location and in any combination up to the capability of the panel.

2.4 SHORT CIRCUIT CURRENT RATING

A. Each panelboard, as a complete unit, shall have a short circuit current rating (SCCR) as required by the application. The SCCR rating shall not, in any case, be less than 10,000 A at 240 volts, and 14,000 A at 480 volts.

2.5 PROTECTION DEVICES

A. Circuit breakers shall individually comply with Section 16475 - OVERCURRENT PROTECTIVE DEVICES. The type to be furnished shall be as required by the application. If no withstand rating is specified, minimum requirements shall be as necessary to comply with the preceding requirements.

2.6 NEUTRAL TERMINAL BAR

A. All panelboards shall be equipped with an insulated neutral terminal bar.

B. Panelboards fed from transformers with a “K-rating” of 13 shall be equipped with 200 percent rated neutrals and neutral lugs and shall be U.L. Listed as suitable for non-linear loads.

C. Panelboards with a large proportion of non-linear loads shall be equipped with 200 percent rated neutrals and neutral lugs and shall be U.L. Listed as suitable for non-linear loads.

D. Panelboards with integral TVSS devices shall be equipped with 200 percent rated neutrals and neutral lugs and shall be U.L. Listed as suitable for non-linear loads.

2.7 EQUIPMENT GROUNDING TERMINAL BAR

A. Panelboards shall be equipped with an equipment grounding terminal bar to terminate equipment grounding conductors.

B. Panelboards shall be equipped with an isolated, insulated equipment grounding terminal bar to terminate isolated equipment grounding conductors where required.

2.8 HANDLE LOCK-OFF EQUIPMENT

A. Circuit breakers serving as the required disconnecting means for appliances or other equipment shall be equipped with equipment to allow the breaker to be padlocked in the "off" position.

2.9 INTEGRAL TVSS DEVICES

A. Provide panelboards with integral TVSS devices if required by the application in accordance with Specification Section 16471 - Transient Voltage Surge Suppression.

B. Integral TVSS devices shall be factory installed in the panelboard.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify mounting arrangements for each location. Where cabinets are recessed, verify adequate thickness of wall and make arrangements for furring or trim as required. In general, all conduits shall enter the top or bottom of panel.

B. Provide additional wire gutters or pull boxes to facilitate orderly entry of conduits into cabinets. Bundle and support wires and arrange them in an orderly manner in the designated wire gutters.

C. Panelboards shall not be used for pull boxes for wiring not terminating in the panelboard.

3.2 SPARE CONDUITS

A. Provide spare conduits from flush mounted panels into accessible ceiling or floor spaces as follows:

No. of Poles (Spares + Spaces)	Spare Conduits
1 - 3	One 3/4"
4 - 6	Two 3/4"
7 or more	Two 3/4", One 1"

3.3 PANELBOARD LABELS

A. In addition to applicable NEC requirements for emergency systems, series rated applications, etc., label panelboards in accordance with Section 16010.

1. First line shall be panelboard name.
2. Second line shall be voltage and phase.
3. Third line shall indicate if panelboard is "NORMAL" (black background), or "STANDBY" (yellow background) or "EMERGENCY" (red background).

END OF SECTION

SECTION 16471

TRANSIENT VOLTAGE SURGE SUPPRESSION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This specification describes requirements for the Transient Voltage Surge Suppression (TVSS) devices for the protection of all AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching. The TVSS devices shall be suitable for application in Category B3 environment as described in ANSI/IEEE C62.41.

B. TVSS devices shall be provided as required by the application. Where provided TVSS devices shall comply with the requirements of this section.

1.2 SPECIAL REQUIREMENTS

A. TVSS devices shall be integral to the panelboard they protect. The TVSS shall be installed, delivered, and warranteed by the electrical distribution equipment manufacturer at the factory.

1.3 WARRANTY

A. The TVSS shall have a warranty period of five years, incorporating unlimited replacements of suppressor parts if transients destroy them during the warranty period.

1.4 CODES AND STANDARDS

A. U.L. compliance and labeling: Each complete suppression device shall be listed per U.L. 1449 (second edition) as a transient voltage surge suppressor.

B. TVSS shall be designed to allow installation in accordance with current National Electrical Code.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers include: Advanced Protection Technologies, Liebert, Current Technology, or approved equal. The manufacturer shall be regularly engaged in the manufacture of TVSS devices for ANSI C62.41 B and C exposure categories for at least five years.

B. Where TVSS devices are specified as an integral part of distribution equipment, the manufacturer of the TVSS device shall be partnered with the distribution equipment manufacturer in providing a UL listed device.

2.2 TVSS DEVICES GENERAL

A. TVSS shall be compatible with the electrical system voltage, current, configuration and intended application.

B. TVSS shall be parallel in design.

C. TVSS shall be modular in design. Each suppression element shall be a user replaceable surge current diversion module (MOV based). Each surge current diversion module shall be fused with 200,000 AIR rated fuses. Provide one spare module for each unit.

D. TVSS shall have a maximum continuous operation voltage (MCOV) not less than 115 percent of the nominal RMS voltage continuously without degradation. For example, devices that use 130V MOVs for 120V systems are not acceptable.

E. TVSS shall have a minimum EMI/RFI filtering of -50dB at 100kHz with an insertion ratio of 50:1 using MIL STD. 220A methodology.

F. TVSS shall provide both visual and audible indication of properly performing protection for each phase.

G. TVSS shall provide full cycle tracking circuitry to provide tight transient clamping regardless of the transient position on the sine wave.

H. TVSS modules shall be fused and TVSS shall be capable of safely interrupting the power system's available fault current.

I. TVSS shall incorporate a low impedance surge diversion platform for the surge current path. The surge current shall be symmetrically disbursed to all suppression elements to insure equal stressing and maximum performance of the suppression elements. The surge diversion platform shall provide equal impedance paths to each suppression element for shunting of high frequency surges. The surge current diversion modules shall be bolted directly to the platform to insure reliable low impedance connections. Small gauge round wiring or plug-in connections shall not be used in the path for surge current diversion.

J. TVSS shall have remote monitoring capability.

K. TVSS shall have summary alarm form C relay contacts.

L. A transient counter shall be provided with the TVSS. Transient counter shall utilize a lithium battery to provide power to the counter in the event of a power failure.

2.3 BRANCH PANELBOARD TVSS DEVICES

A. TVSS shall be tested against ANSI C62.41 Category B3 impulse and Category B3 ringwave transients.

B. TVSS shall be capable of surviving 5000 sequential ANSI C62.41 B3 impulses, without failure or degradation of UL 1449 suppressed voltage rating by more than 10 percent.

C. TVSS shall have a maximum single impulse current rating of 160,000 amps per phase.

D. TVSS shall have a U.L. 1449 suppressed voltage rating (SVR) or clamp rating as follows: 400 volts (L-N and N-G) for 120/208 volt systems; 800 volts (L-N and N-G) for 277/480 volt systems.

E. TVSS shall provide protection in the following modes:

Three Phase Wye
line-to-neutral (L-N)
neutral-to-ground (N-G)

F. Provide overcurrent protection and a means of disconnect for the TVSS. Overcurrent and disconnect devices shall be exclusively utilized for TVSS. Size overcurrent protection in accordance with manufacturer's recommendations.

2.4 TVSS DEVICES INTEGRAL TO DISTRIBUTION EQUIPMENT

A. TVSS shall be Component Recognized in accordance with UL 1449, Standard for Safety, Transient Voltage Surge Suppressors.

B. The TVSS diagnostic monitoring devices shall be mounted on the front of the distribution equipment enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide TVSS devices integral to panels in accordance with Section 16470 - Panelboards. Where TVSS devices are provided as an integral part of the distribution equipment, they shall be installed as follows:

1. TVSS shall be installed by and shipped from the electrical distribution equipment manufacturer’s factory.

END OF SECTION

SECTION 16475

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Thermal Magnetic Molded Case Circuit Breakers - Circuit breakers rated 400A or less shall be this type.

B. Electronic Trip Molded Case Circuit Breakers - Circuit breakers rated over 400A shall be this type.

C. Insulated Case Electronic Type Circuit Breakers - Main service disconnects shall be this type.

D. Fusible switches and fuses - Furnish as specified herein.

1.2 REFERENCES

A. The circuit breakers referenced herein shall be designed and manufactured according to the latest revision of the following standards.

1. NEMA AB 1 - (National Electrical Manufacturers Association) Molded Case Circuit Breakers and Molded Case Switches

2. UL 489 - (Underwriters Laboratories Inc.) Molded Case Circuit Breakers and Circuit Breaker Enclosures

3. UL 943 - Standard for Ground Fault Circuit Interrupters

4. CSA C22.2 No. 5.1 - M91 - (Canadian Standard Association) Molded Case Circuit Breakers

5. Federal Specification W-C-375B/GEN - Circuit Breakers, Molded Case; Branch Circuit and Service

6. Federal Specification W-C-865C - Fusible Switches

7. National Fire Protection Association NFPA - 70 (National Electrical Code)

1.3 QUALITY ASSURANCE

A. Devices shall be the latest approved design in conformity with applicable standards and UL listings as manufactured by Square D Company to match equipment provided in C Concourse Phase 2 Building Completion Package.

1.4 COORDINATION STUDY

A. Provide a complete protective device coordination study for the affected parts of the electrical distribution system. Provide specific recommendations for circuit breaker settings (trip, time delays, etc.), relays and ground fault devices. The study shall be performed by a Registered Professional Engineer who has at least five (5) years experience in performing system studies. Submit qualifications with study. This requirement may be waived at ANC's discretion for work that involves only minor revisions to the existing power distribution systems (e.g., addition of Tenant panels downstream of ANC distribution system equipment). ANC will advise the Tenant after receiving the Coordination Submittal information required in Section 16010.

1.5 SHORT CIRCUIT CALCULATIONS

A. Provide short circuit calculations for all new equipment added to the electrical distribution system.

B. Provide coordination data to check protective devices. Provide electronic and hard copy time/current characteristic trip curves (and Ip & I^2t let through curves for current limiting circuit breakers) for each type of circuit breaker.

C. All information required to verify compliance with the short-circuit withstand and interrupting ratings.

PART 2 - PRODUCTS

2.1 MOLDED CASE CIRCUIT BREAKERS – 400 A OR LESS

A. Circuit breakers rated 400 A or less shall be molded case circuit breakers.

B. General

1. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end use equipment along with the statement "Caution - Series Rated System xx,xxx Amps Available. Identical Replacement Component Required".

2. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position.

3. Lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 75 degrees C rated wire or 90 degrees C rated wire, sized according to the 75 degrees C temperature rating in the National Electrical Code.

C. Thermal-Magnetic Circuit Breakers

1. Circuit protective devices shall be Square D molded case circuit breakers. Amp ratings and amp interrupting ratings (AIR) shall be as required by the application.

2. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.

3. Thermal trip elements shall be factory preset and sealed. Thermal elements shall be factory calibrated to operate in a 40 degrees C ambient environment. Thermal elements shall be ambient compensating above 40 degrees C.

4. Two- and three-pole circuit breakers shall have an internal common trip crossbar to provide simultaneous tripping. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker that allows the user to simultaneously select the desired trip level of all poles.

2.2 ELECTRONIC TRIP CIRCUIT BREAKER WITH FULL FUNCTION TRIP SYSTEM – OVER 400 A

A. Circuit breakers rated over 400 A shall be electronic type with full function trip system.

B. Shall be Square D Full Function type: LE, ME, NE, or PE.

C. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and/or drawings.

D. The integral trip system shall be self-powered and shall contain electronic components to measure ampacity, time the output from internal current sensors, and initiate automatic tripping action.

E. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100 percent of their ampere rating continuously (except for 600 A frame LE and 2500 A frame PE).

F. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.

Long Time Pickup	Instantaneous Pickup
Long Time Delay	
Short Time Pickup	Ground Fault Pickup ($\geq$1000A)
Short Time Delay (I^2t IN and I^2t OUT)	Ground Fault Delay (I^2t IN and I^2t OUT) ($\geq$1000A)

G. Circuit breakers with adjustable short-time function shall be provided with defeatable instantaneous adjustment and 30 cycle short-time withstand ratings. Short time withstand ratings shall be specified in rms symmetrical amperes, as shown on the schedules and/or drawings.

H. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

I. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

J. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True rms with two percent accuracy.

K. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

L. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

M. Circuit breakers (except LE) shall be equipped with back-up thermal and magnetic trip system.

N. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

O. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.

P. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short-time and ground fault functions compatible with other electronic trip circuit breakers and external ground fault sensing systems.

2.3 INSULATED CASE CIRCUIT BREAKER WITH FULL FUNCTION TRIP SYSTEM – MAIN SERVICE DISCONNECT

A. Main service disconnects shall be insulated case electronic type circuit breakers with full function trip system.

B. Shall be Square D Insulated Case type SE. Circuit breaker shall be Fixed, Individually Mounted construction.

C. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated schedules and/or drawings.

D. The integral trip system shall be self-powered and shall contain electronic components to measure ampacity, time the output from internal current sensors, and initiate automatic tripping action.

E. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.

F. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and switch adjustments shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 100 percent of their ampere rating continuously.

G. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent from all other adjustments.

Long Time Pickup	Instantaneous Pickup
Long Time Delay	
Short Time Pickup	Ground Fault Pickup
Short Time Delay (I^2t IN and I^2t OUT)	Ground Fault Delay (I^2t IN and I^2t OUT)

H. Circuit breakers with adjustable short-time function shall be provided with defeatable instantaneous adjustment and 30 cycle short time withstand ratings. Short time withstand ratings shall be specified in rms symmetrical amperes, as shown on the schedules and/or drawings.

I. A means to seal the rating plug and trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.

J. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.

K. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in True rms with two percent accuracy.

L. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.

M. The trip system shall include a Long Time memory circuit to protect against intermittent overcurrent conditions above the long time pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.

N. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

O. Communications capabilities for remote monitoring of circuit breaker trip system, to include phase and ground fault currents, pre-trip alarm indication, switch settings, and trip history information shall be provided.

P. Circuit breakers shall be provided with Zone Selective Interlocking (ZSI) communications capabilities on the short time and ground fault functions compatible with all other electronic trip circuit breakers and external ground fault sensing systems.

Q. True two-step stored energy mechanism with five (5) cycle closing time shall be provided. All circuit breakers shall have multiple CHARGE/CLOSE provisions allowing the following sequence:

R. CHARGE, CLOSE, RECHARGE, OPEN/CLOSE/OPEN

S. Local control pushbuttons to OPEN and CLOSE circuit breaker shall be provided. Color-coded visual indication of contact position (OPEN or CLOSED) shall be provided on the face of the circuit breaker. Local manual charging following CLOSE operation shall be provided. Color-coded visual indication of mechanism CHARGED and DISCHARGED position shall be provided on the face of the circuit breaker. Visual indicator shall indicate CHARGED only when closing springs are completely charged.

T. Each circuit breaker shall be electrically operated to permit remote CHARGE, CLOSE, and OPEN capabilities. Electrically operated circuit breaker shall be equipped with charge contact switch for remote indication of mechanism charge status.

U. All circuit breakers shall be equipped with electrical accessories as noted on the schedules and/or drawings.

2.4 EQUIPMENT GROUND FAULT PROTECTION (ELECTRONIC TRIP CIRCUIT BREAKERS)

1. Equipment shall be Square D.

   a. Full Function - True RMS Sensing type: LE, ME, NE, PE, SE (with ground fault option).

2. Circuit breakers shall be provided with integral equipment ground fault protection for grounded systems. The circuit breaker shall be suitable for use on three-phase, three-wire circuits where the system neutral is grounded but not carried through the system or on three-phase, four-wire systems.

3. A separate neutral current transformer shall be provided for three-phase four-wire systems.

4. Ground fault sensing system shall be residual sensing type.

5. The trip system shall include a ground fault memory circuit to sum the time increments of intermittent ground faults above the pickup point.

6. A means of testing the ground fault system to meet the on-site testing requirements of NEC Section 230-95(c) shall be provided.

7. Local visual trip indication for a ground fault trip occurrence shall be provided.

8. Zone Selective Interlocking (ZSI) communications capabilities on the ground fault function compatible with all other electronic trip circuit breakers and external ground fault sensing systems.

9. Circuit breakers shall be provided with communications capabilities for remote alarm indication only (no trip) per NEC Section 700-7(d) for emergency systems (Full Function circuit breakers only).

2.5 FUSIBLE SWITCHES

A. Fusible switches shall be designed for individual mounting as specified in Section 16440 - Disconnects, or for panelboard mounting.

B. Switches designed for panelboard mounting shall have the same properties as specified for the individually mounted switches.

C. Switches shall conform to NEMA and UL 67 standards.

D. Switches shall be used in conjunction with fuses as specified in the following in order to constitute a complete "Overcurrent Protective Device."

2.6 FUSES

A. Manufacturer: Shall be Bussmann

B. Fuses shall be of the sizes and types required by the application, or as recommended by manufacturer of equipment served (as applicable). Fuses shall be capable of interrupting the prospective fault current. Furnish one complete set of spare fuses of each rating installed to the Owner. Provide fuse puller(s) for fuse sizes used.

C. Fuses through 600 Amperes: Current limiting, time delay, one-time fuse, voltage and Class as required by the application or recommended by the equipment manufacturer.

D. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install circuit breakers in accordance with manufacturers instructions, the National Electrical Code and applicable local codes.

B. Size devices as required by the load being served.

3.2 ADJUSTMENTS

A. Circuit breaker pick-up level and time delay settings shall be adjusted to values indicated in the coordination study, unless otherwise directed by ANC.

END OF SECTION

SECTION 16480

MOTOR CONTROL CENTER

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes the General Requirements for Motor Control Centers (MCC) at ANC.

1.2 QUALITY ASSURANCE

A. Equipment shall be of the latest approved design as manufactured by Square D Company to match equipment provided in the C Concourse Phase 2 Building Completion Package. MCCs shall be in conformity with the requirements set forth by Underwriters' Laboratories publication UL-845, NEMA publication number ICS-2-322 and the National Electrical Code.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Shall be Square D Company Class 8998 Model 6 MCC.

B. Additions to existing MCCs shall be the same as the original manufacturer.

2.2 MATERIALS

A. Steel material shall comply with UL 845 and CSA requirements.

B. Each MCC shall consist of one or more vertical sections of heavy gauge steel bolted together to form a rigid, freestanding assembly. A removable 7 gauge structural steel lifting angle shall be mounted along the full width of the MCC lineup at the top. Removable 7 gauge bottom channel sills shall be mounted underneath front and rear of the vertical sections extending the full width of the lineup. Vertical sections made of welded side-frame assembly formed from a minimum of 12 gauge steel. Internal reinforcement structural parts shall be of 11 gauge steel to provide a strong, rigid assembly. The entire assembly shall be constructed and packaged to withstand all stresses included in transit and during installation.

2.3 FINISH

A. All steel parts (except plated parts) shall be provided with UL Listed and CSA certified acrylic/alkyd baked enamel paint finish. All painted parts shall undergo a multi-stage treatment process, followed by the finishing paint coat.

B. The standard paint finish shall be tested to UL 50 per ASTM B117 (5% ASTM salt spray) with no greater than 0.125 in (3 mm) loss of paint from a scribed line.

C. Paint color shall be #49 medium light gray per ANSI standard Z55.1-967 (60-70 gloss) on all surfaces, unless otherwise specified. Control station plates and escutcheon plates shall be painted a contrasting gray. All unit component mounting pans for combination starters shall be painted white for better visibility inside the unit.

2.4 STRUCTURES

A. Structures shall be totally enclosed, dead-front, freestanding assemblies. Structures shall be capable of being bolted together to form a single assembly.

B. The overall height of the MCC shall not exceed 90 in (2286 mm) (not including base channel). Base channels, of 1.5 in (38 mm) in height, shall be removable. The total width of one section shall be 20 in (508 mm). The depth of the MCC shall be 20 in (508mm).

C. Structures shall be NEMA 12 (industrial duty).

D. Each section shall have all the necessary hardware and bussing for modular plug-in units to be added and moved around. All unused space shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

E. Each section shall include a top plate (single piece or two-piece). NEMA 12 units shall also include a bottom plate. Top and bottom plates shall be removable for ease in cutting conduit entry openings.

2.5 WIREWAYS

A. Structures shall contain a minimum 12 in (305 mm) high horizontal wireway at the top of each section and a minimum 6 in (152 mm) high horizontal wireway at the bottom of each section. These wireways shall run the full length of MCC to allow room for power and control cable to connect between units in different sections.

B. A full-depth vertical wireway shall be provided in each MCC section that accepts modular plug-in units. The vertical wireway shall connect with both the top and bottom horizontal wireway and shall be isolated from unit interiors by a full height barrier. The vertical wireway shall be 4 in (102 mm) wide minimum with a separate hinged door. There shall be a minimum of 4,000 in^3 (65,548 m^3) of cabling space available. Access to the wireways shall not require opening control unit doors. Structures that house a single, full section control unit are not required to have vertical wireways. Those control units shall open directly into the MCC horizontal wireways.

2.6 BARRIERS

A. All power bussing and splice connections shall be isolated from the unit compartments and the wireways. The horizontal bus shall be mounted onto a glass filled polyester support assembly that braces the bus against the forces generated during a short circuit. The horizontal bus shall be isolated from the top horizontal wireway by a two-piece grounded steel barrier. This barrier shall be removable to allow access to the bus and connections for maintenance.

B. The vertical bus shall be housed in a molded glass-filled polyester support that provides bus insulation and braces the bus against the forces generated during a short circuit. These supports shall have openings every 3 in (75 mm) for unit stab-on connections. Each opening shall be provided with a manual shutter to close off the stab opening. These shutters shall be attached to the structure so that when they are removed (to allow a stab connection) they are retained in the structure and are readily accessible for use should a plug-in unit be removed from the MCC.

C. Barriers shall be provided in the vertical structure and unit designs to prevent the contact of any energized bus or terminal by a fishtape inserted through the conduit or wireway areas.

2.7 BUSSING

A. All bussing and connectors shall be tin-plated copper.

B. The main horizontal bus shall be rated at 600 A continuous and shall extend the full length of the MCC. Bus ratings shall be based on 65° C maximum temperature rise in a 40° C ambient. Provisions shall be provided for splicing additional sections onto either end of the MCC.

C. The horizontal bus splice bars shall be pre-assembled into a captive bus stack. This bus stack shall be installed into the end of the MCC power bus to allow the installation of additional sections. The main bus splice shall utilize four bolts, two on each side of the bus split, for each phase. Additional bolts shall not be required when splicing higher amperage bus. The splice bolts shall secure to self clenching nuts installed in the bus assembly.

D. Each section that accepts plug-in units shall be provided with a vertical bus for distributing power from the main bus to the individual plug-in starter units. This bus shall be of the same material and plating as the main bus, and shall be rated at 300 A continuous. The vertical bus shall be connected directly to the horizontal bus stack without the use of risers or other intervening connectors. When a back-to-back unit arrangement is utilized, separate vertical bus shall be provided for both the front and rear units.

E. A tin-plated copper ground bus shall be provided that runs the entire length of the MCC. The ground bus shall be 0.25 in (6.0 mm) x 1.0 in (25 mm) and be rated for 300 amps. A compression lug shall be provided in the MCC for a 4/0-250 kcmil ground cable. The ground bus shall be provided with (6) 0.38 in (10 mm) holes for each vertical section to accept customer-supplied ground lugs for any loads requiring a ground conductor.

F. Each vertical section shall have a copper vertical ground bus that is connected to the horizontal ground bus. This vertical ground bus shall be installed so that the plug-in units engage the ground bus prior to engagement of the power stabs and shall disengage only after the power stabs are disconnected upon removal of the plug-in unit.

G. The power bus system shall be braced for a short circuit capacity of 42,000 rms amperes minimum.

2.8 WIRING:

A. The control center wiring shall be NEMA Class I, Type B.

B. As defined by NEMA Standard ICS-2-322, Class I control centers shall include no interconnections between control units.

C. Type B wiring shall include terminal blocks mounted on lift out brackets in the units.

2.9 UNIT CONSTRUCTION

A. Units with circuit breaker disconnects through 250 A frame, and fusible switch disconnects through 200 A, shall connect to the vertical bus through a spring reinforced stab-on connector. Units with larger disconnects shall be connected directly to the main horizontal bus with appropriately sized cable or riser bus. Stabs on all plug-in units shall be solidly bussed to the unit disconnect. Cabled stab assemblies are not permitted.

B. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material to prevent accidental contact with those parts.

C. Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. All plug-on units shall use a twin-handle camming lever located at the top of the bucket to rack in and out the plug-on unit. The cam lever shall work in conjunction with the hanger brackets to ensure positive stab alignment.

D. A metal handle operator shall be provided on each disconnect. With the unit stabs engaged into the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit disconnect with clear indication of the disconnects status. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.

E. A mechanical interlock shall prevent the operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent the operator from placing the disconnect in the ON position while the unit door is open. It shall be possible for authorized personnel to defeat these interlocks.

F. A non-defeatable interlock shall be provided between the handle operator and the cam lever to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position.

G. The plug-in unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

H. Provisions shall be provided for locking all disconnects in the OFF position with up to three padlocks.

I. Handle mechanisms shall be located on the left side to encourage operators to stand to the left of the unit being switched.

J. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully compartmentalized design.

2.10 COMPAC Ô 6 UNIT CONSTRUCTION

A. Units with circuit breaker disconnects through 100 A frame, and fusible switch disconnects through 100 A, shall connect to the vertical through a spring-reinforced stab-on connector. Stabs on all plug-on units shall be cable connected to the unit disconnect. Compac™ 6 fusible units shall accept Class J fuses only and to be rated for 100,000 AIR (amperes interrupting rating) at 600 volts. Compac™ 6 units with breakers shall be rated for 65,000 AIR at 480 volts.

B. All conducting parts on the line side of the unit disconnect shall be shrouded by a suitable insulating material.

C. Unit mounting shelves shall include hanger brackets to support the unit weight during installation and removal. All Compac™ 6 plug-on units shall be installable without the assistance of a camming device so as to allow maximum accessibility with the unit installed.

D. A metal handle operator shall be provided on each disconnect. With the unit stabs engaged into the vertical phase bus and the unit door closed, the handle mechanism shall allow complete ON/OFF control of the unit disconnect with clear indication of the disconnects status. All circuit breaker operators shall include a separate TRIPPED position to clearly indicate a circuit breaker trip condition. It shall be possible to reset a tripped circuit breaker without opening the control unit door.

   1. A mechanical interlock shall prevent an operator from opening the unit door when the disconnect is in the ON position. Another mechanical interlock shall prevent an operator from placing the disconnect in the ON position while the door is open. It shall be possible for authorized personnel to defeat these interlocks.

   2. A non-defeatable interlock shall be provided between the handle operator and the structure to prevent installing or removing a plug-on unit unless the disconnect is in the OFF position. The plug-on unit shall have a grounded stab-on connector which engages the vertical ground bus prior to, and releases after, the power bus stab-on connectors.

E. Provisions shall be made for locking all disconnects in the OFF position with up to three padlocks.

F. Handle mechanisms shall be located on the bottom left side of the unit and operate horizontally to encourage operators to stand to the left of the unit being switched.

G. Unit construction shall combine with the vertical wireway isolation barrier to provide a fully-compartmentalized design.

H. Each vertical section shall hold up to a twelve Compac™ 6 units without placement restrictions in new or existing applications.

2.11 COMPONENTS

A. Combination Starters

1. Combination starters shall utilize a unit disconnect as specified in the previous article. Square D Company Type S magnetic starters shall be furnished in all combination starter units. All starters shall utilize NEMA rated contactors. Starters shall be provided with 3-pole, external manual reset, overload relay for solid state motor overload protection.

2. Control circuit transformers shall include internal primary protection 280 V to 480 V (separate primary fuse on 600 V) and one secondary fuse (in the non-ground secondary conductor). The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads. The transformer rating shall be fully visible from the front when the unit door is opened.

3. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.

4. Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.

5. NEMA Size 1-4 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) shall connect directly to the starter terminals without the use of interposing terminals. Larger starters shall be arranged so that power wiring may exit through the bottom of the starter cubical without entering the vertical wireway.

B. Terminal Blocks

1. Terminal blocks shall be the pull-apart type 600 volt and rated at 25 amps. All current carrying parts shall be tin plated. Terminals shall be accessible from inside the unit when the unit door is opened. Terminal blocks shall be DIN rail mounted with the stationary portion of the block secured to the unit bottom plate. The stationary portion shall be used for factory connections, and shall remain attached to the unit when removed. The terminals used for field connections shall face forward so they can be wired without removing the unit or any of its components.

2. Type B wiring: all starter units shall be provided with unit control terminal blocks.

2.12 COMPONENTS FOR COMPAC$^{\hat{O}}$ 6 UNITS

A. Compac™ 6 Combination Starters

1. Compac™ 6 combination starters shall use a unit disconnect as specified in the previous article. NEMA rated units shall use Square D Company Type S magnetic starters and shall be furnished in all Compac™ 6 combination starter units. All starters shall use NEMA-rated contactors. Starter units shall be provided with a 3-pole, external manual reset, overload relay for solid state motor overload protection.

2. Control circuit transformers shall include internal primary protection 280 V to 480 V (separate primary fuse on 600 V), and one secondary fuse (in the non-ground secondary conductor.) The transformer shall be sized to accommodate the contactor(s) and all connected control circuit loads.

3. When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.

4. Auxiliary control circuit interlocks shall be provided where indicated. For NEMA rated starters, auxiliary interlocks shall be field convertible to normally open or normally closed operation.

5. NEMA Size 1 starters shall be mounted directly adjacent to the wireway so that power wiring (motor leads) will connect directly to the starter terminals.

B. Terminal Blocks for Compac™ 6 Units

1. Starter units shall be provided with unit control terminal blocks.

2. Terminal blocks shall be pull-apart type, 250 V, and rated for 10 amperes. All current-carrying parts shall be tin-plated. Terminals shall be accessible from inside the unit when the unit door is opened. The stationary portion of the terminal block shall be used for factory connections and will remain attached to the unit when the portion used for field connections is removed. The terminals used for field connections shall be accessible so they can be wired without removing the unit or any of its components.

2.13 NAMEPLATES

A. Provide per Specification Section 16010 – Electrical General Provisions.

1. First line shall be MCC name.

2. Second line shall be voltage and phase.

3. Third line shall indicate if MCC is "NORMAL" (black background), or "STANDBY" (yellow background).

4. Fourth line shall indicate source of power “Panel designation – disconnect number”.

2.14 ADDITIONAL FEATURES:

A. Provide the following additional features and options

1. All required fuses and spares, and a spare fuse cabinet by each MCC.

2. 120 volt coil control voltage.

3. Red running pilot lights in cover of all starters.

4. H.O.A. switch in cover of all starters unless otherwise required.

5. Control transformer with fuse protection, for each starter, 480/120 volts, sized for the individual application.

2.15 QUALITY CONTROL

A. The entire MCC shall go through a quality inspection before shipment. This inspection will include physical inspection of the structure and electrical conductors; including bussing, and general wiring. The quality inspection shall include general electrical tests of the power circuit phasing, control circuit wiring, instrument transformers, meters, ground fault system, and device electrical operation. The quality inspection shall include AC dielectric tests of the power circuit and control circuits.

B. The MCC Markings/Labels shall include instructional type, Underwriters Laboratory (UL)/Canadian Standards Association (CSA), and inspector's stamps.

C. The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.

2.16 SHORT CIRCUIT CURRENT RATING

A. Each MCC, as a complete unit, shall have a minimum short circuit current rating (SCCR) equal to or greater than 30,000 A at 480 volts as required by the application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items in accordance with manufacturer's instruction and applicable code requirements.

B. Provide fuses for all fused disconnect switches. Size fuses in accordance with nameplate requirements for each load served.

C. Provide overloads for all starters. Size overloads in accordance with nameplate requirements for each load served.

END OF SECTION

SECTION 16485

MOTOR STARTERS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products, and methods of execution relating to manual and magnetic motor starters provided for use at ANC.

1.2 QUALITY ASSURANCE

A. Equipment shall be of the latest approved design as manufactured by Square D Company to match equipment provided in C Concourse Phase 2 Building Completion Package. Equipment shall be in conformity with the governing standards.

PART 2 - PRODUCTS

2.1 AC FRACTIONAL MANUAL STARTERS

A. The manual starter shall consist of a manually operated toggle switch equipped with red pilot light and melting alloy type thermal overload relay.

B. Thermal unit shall be one-piece construction and interchangeable. Starter shall be inoperative if thermal unit is removed.

2.2 AC MANUAL STARTERS--LINE VOLTAGE TYPE

A. Manual starters shall be constructed and tested in accordance with the latest published NEMA standards.

B. The manual starters shall consist of a manually operated switch equipped with red pilot light and melting alloy type thermal overload relays in every phase conductor. Thermal units shall be one-piece construction and the starter shall be inoperative if any thermal unit is removed.

C. Starters shall be furnished in a NEMA 1 general purpose enclosure unless otherwise indicated on the plans or required by the conditions of the area in which they are installed.

2.3 AC MAGNETIC STARTERS--LINE VOLTAGE TYPE

A. Motor starters shall be across-the-line magnetic type rated in accordance with NEMA standards, sizes and horsepower ratings.

B. Starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on plans or required by the conditions of the area in which they are installed. NEMA 12 enclosures shall be provided for starters located in Level 4 Fan Rooms or other rooms used to transport environmental air.

C. Starters shall be furnished with overload relays in every phase conductor and starters shall be inoperative if any overload unit is removed.

1. Overload relays shall be the solid state type. Trip current rating shall be established by selection of overload relay and shall be adjustable (3 to 1 current range). The overload shall be self-powered, provide phase loss and phase unbalance protection, have a permanent tamper guard, and be ambient insensitive. Overload shall standard trip (Class 20) and shall have a mechanical test function.

D. Starters through NEMA size five (5) shall be equipped with double break silver alloy contacts. All contacts shall be replaceable without removing power wiring or removing starter from panel.

E. Coils shall be of molded construction and shall be 120 VAC. Starters shall have a fused 120V control power transformer in enclosure, or alternatively on 120/208 volt systems, the power system neutral conductor may be utilized. In all cases, control power shall be disconnected by the starter disconnecting means, unless otherwise specifically approved.

F. Starters shall be suitable for field-addition of at least four (4) auxiliary electrical interlocks of any arrangement, normally-open or normally-closed.

G. All starters shall have enclosure-mounted red running pilot light and Hand-Off-Auto switch.

2.4 AC COMBINATION STARTERS WITH FUSIBLE DISCONNECT SWITCH OR CIRCUIT BREAKER

A. Combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes and horsepower ratings.

B. Disconnect switch combination starters shall consist of a visible blade disconnect switch and a motor starter.

C. Combination starters shall be mounted in NEMA 1 general purpose enclosures unless otherwise indicated on the plans or required by the conditions of the area in which they are installed. NEMA 12 enclosures shall be provided for combination starters located in Level 4 Fan Rooms or other rooms used to transport environmental air.

D. The disconnect handle used on combination starters shall always be in control of the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "on" or "off".

E. Magnetic starters provided under all Divisions shall be in accordance with this Section.

PART 3 - EXECUTION

3.1 COORDINATION

A. Coordinate all details pertaining to the motor control equipment with the Division where the equipment is specified.

3.2 CONTROL WIRING

A. Control wiring and control devices shall be provided under the Division in which the controlled equipment is specified. Coordinate all related work.

3.3 CONNECTIONS

A. Provide liquid-tight flexible conduit connections to motors and other equipment subject to vibration. Minimum length 12".

3.4 NAMEPLATES

A. Provide engraved nameplates for all starters. Coordinate names with mechanical equipment lists.

3.5 REDUCED VOLTAGE STARTERS

A. Reduced voltage starters shall be provided for all motors larger than:

208 volts	25 horsepower
460 volts	50 horsepower

1. This requirement shall apply to starters furnished in this Division and other Divisions.
2. Motors controlled by Variable Frequency Drives (VFDs) are not subject to this requirement.

3.6 TWO SPEED STARTERS

A. Provide two speed starters for all two speed motors. Starters shall comply with the requirements of the equipment and motor manufacturers.

B. This requirement shall apply to starters furnished in this Division and other Divisions.

END OF SECTION

SECTION 16487

CONTACTORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General purpose contactors.

B. Lighting contactors.

1.2 REFERENCES

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

B. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

C. ANSI/NFPA 70 - National Electrical Code.

1.3 QUALITY ASSURANCE

A. Contactors shall be of the latest approved design as manufactured by Square D Company to match equipment provided in C Concourse Phase 2 Building Completion Package. Equipment shall be listed in the Underwriters' Laboratory and bear the UL label.

B. Contactors of each type provided shall include the features as required by the application.

PART 2 - PRODUCTS

2.1 CONTACTOR FEATURES - GENERAL

A. ENCLOSURES

1. Enclosures shall be ANSI/NEMA ICS 6, Type 1.

B. ACCESSORIES

1. Provide the following accessories as indicated for each contactor:

a. Pushbutton: ON/OFF. NEMA ICS 2, heavy duty type.

b. Selector Switches: ON/OFF or HAND/OFF/AUTOMATIC. NEMA ICS 2, heavy duty type.

c. Indicating Lights: NEMA ICS 2, push-to- test type.

d. Auxiliary Contacts: field convertible, quantity indicated.

e. Other: as indicated.

C. Coil Voltages: 120 volts, 60 Hz.

D. Poles: As required for the specific application.

E. Contact Rating: as required to meet conditions of the installation.

F. Size: As required by the load.

G. Configuration: Provide types as required by the application:

1. Electrically held shall have continuously rated, encapsulated coils.

2. Mechanically held shall be electrically operated with encapsulated coils. Standard coil clearing contacts are to be provided so that the contactor coils shall be energized only during the instance of operation.

2.2 GENERAL PURPOSE CONTACTORS

A. Square D Company - 8502 Type S

B. Description: NEMA ICS 2, AC general purpose magnetic contactor.

C. Coil: encapsulated type.

D. Contacts: Totally enclosed, double-break silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring.

E. Wiring: Straight-through wiring with all terminals clearly marked.

2.3 POWER LIGHTING CONTACTORS

A. Square D Company - 8903 Type S.

B. Description: NEMA ICS 2, magnetic lighting contactor.

C. Wiring: Straight-through wiring with all terminals clearly marked.

D. Disconnect Means: Contactor shall not provide the disconnecting means in the same enclosure.

2.4 MULTIPOLE LIGHTING CONTACTORS

A. Square D Company - 8903 Type L & LX.

B. Description: magnetic lighting contactor.

C. Contact Rating: 20 amperes for all types of ballast and tungsten lighting, resistive heating, and motor loads.

D. Contacts: Totally enclosed, double-break silver-cadmium-oxide power contacts. Contact inspection and replacement shall be possible without disturbing line or load wiring. All contacts shall have clearly visible N.O. and N.C. contact status indicators.

E. Wiring: Straight-through wiring with all terminals clearly marked.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 16500

LIGHTING FIXTURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products and methods of execution relating to lighting fixtures approved for use at ANC.

1.2 QUALITY ASSURANCE

A. The fixture shall be a standard catalog item as made by a nationally recognized manufacturer unless specifically approved by ANC.

PART 2 - PRODUCTS

2.1 GENERAL AND ACCESSORIES

A. Provide fixtures with all required flanges and supports. Lighting fixtures shall be provided complete with all suspension, trim, mounting, and operating accessories normally considered necessary for a complete, functional, and safe installation.

B. Canopies for pendant-hung fixtures shall be of the ball-joint type. Where more than one pendant is used per fixture, as in the case of fluorescents, a ball-joint fitting shall also be provided in the fixture-end of each pendant.

C. Provide ball-joint canopies for cable hung fixtures.

2.2 LENSES

A. Lenses for recessed fluorescent fixtures shall be 100 percent virgin acrylic with a minimum overall thickness of 0.125".

2.3 LINEAR FIXTURES

A. "Linear" fixtures shall be provided with all corners, transitions, adjustable sections, custom angles, etc., to provide continuous linear systems. These features shall be provided to center the lamp cavity(s) of the fixtures within the designated mounting space(s) (typically wall-to-wall).

2.4 RECESSED FIXTURES

A. Fixtures shall have thermal protection conforming to NEC and shall so be identified as thermally protected unless fixture is:

1. Identified for use and installed in poured concrete, or

2. Identified as suitable for installation in cavities where the thermal insulation will be in direct contact with the fixture.

PART 3 - EXECUTION

3.1 INSTALLATION AND CLEANING

A. Install fixtures level, plumb and true. Align rows accurately in three dimensions. Verify type of ceilings as shown on architectural drawings.

B. Support suspended acoustical ceiling fixtures according to the requirements of the applicable building codes as well as any local amendments, and Section 16190.

C. Clean all fixtures and lenses prior to final acceptance.

END OF SECTION

SECTION 16501

LAMPS, BALLASTS, ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section describes general requirements, products, and methods of execution relating to lamps, ballasts and related products approved for use at ANC.

1.2 QUALITY ASSURANCE

A. Lamps specified in this Section shall be as manufactured by Osram Sylvania, Philips, General Electric or Venture.

B. Verify that the fixture types submitted for approval contain components complying with the product specifications of this section.

PART 2 - PRODUCTS

2.1 INCANDESCENT LAMPS

A. Incandescent lamps installed in air handling units or mechanical spaces shall be extended life (A/99) with a design voltage of 130 volts, suitable for operating between 120 and 130 volts.

2.2 FLUORESCENT LAMPS

A. Unless otherwise approved by ANC fluorescent lamps shall be tri-phosphor type, 32 watt, T-8, 3500?K, CRI 82 or greater, RE835, 2950 initial lumens. Four foot fluorescent lamps shall be low mercury type and shall meet the requirements for classification as non-hazardous waste when subjected to the Toxic Characteristic Leaching Procedure (TCLP) prescribed by the Environmental Protection Agency at end of life. Low mercury lamps shall be clearly identifiable from other lamp types. Philips “Alto” or as approved.

B. Unless otherwise approved by ANC, compact fluorescent lamps (long “biax”, short “biax”, double "biax", triple tube, or 2-D types) shall be amalgam type, 4 pin bases (suitable for operation on electronic ballasts) 3500°K, CRI 82, RE835. To the extent that they are commercially available all compact fluorescent lamps shall be low mercury type as noted in 2.2.A above.

C. Unless otherwise approved by ANC, low temperature, high output (800ma) fluorescent lamps shall be tri-phosphor type, T-12, 3500°K, CRI 82 or greater, RE835.

D. Lamps shall comply with all provisions of this specification.

2.3 HIGH INTENSITY DISCHARGE LAMPS

A. Metal halide lamps shall be Venture “Performance Plus” for lamps greater than 150 watts and Venture “Precision Plus” for lamps less than 150 watts or as approved with pulse start technology. Lamps shall be 3700°K nominal color temperature with lumen maintenance greater than 80%, hot restrike time less than 4 minutes.

2.4 FLUORESCENT BALLASTS - ELECTRONIC HIGH OUTPUT (800MA)

A. High output fluorescent ballasts shall be electronic type with a power factor greater than 95%, CBM rated, ETL tested and meet applicable UL standards and be so labeled. All ballasts shall be Class "P".

B. Ballasts shall be sound rated "B" or better, and be so labeled. Ballasts shall meet the requirements of FCC Rules and Regulations, Part 15, Class A.

C. Ballasts shall have a frequency of operation of 20 kHz or higher and operate lamps without visible flicker. Input current THD shall be below 20% at maximum ballast lamp rating. Ballasts shall withstand transients as defined in IEEE Publication 587, Categories A and B.

D. Ballasts shall be Advance Electronic type or as approved and shall maintain constant light output over operating ranges of 90V to 145 V (120V ballasts) and 200V to 320V (277V ballasts).

E. Ballasts installed in unheated areas, freezers, coolers, garages or areas that at some time may approach ambient exterior temperature shall have a minimum starting temperature of -20 degrees Fahrenheit.

2.5 FLUORESCENT BALLASTS - ELECTRONIC NON-DIMMING

A. Fluorescent ballasts shall be constant wattage electronic type with a power factor greater than 95%, ballast factor between 0.87 to 1.00, crest factor less than 1.55, CBM rated, ETL tested and meets applicable UL standards and be so labeled. The ballasts shall be Class "P".

B. Ballasts shall be sound rated "A" and so labeled. Ballasts shall meet the requirements of FCC Rules and Regulations, Part 15, Class A.

C. Ballasts shall have a frequency of operation of 20 kHz or higher avoiding operating frequencies of 33kHz – 40kHz and 66kHz – 80kHz (to minimize Infrared interference). Ballasts shall operate lamps without visible flicker. Input current THD shall be below 10% at maximum ballast lamp rating. Ballasts shall withstand transients as defined in IEEE Publication 587, Categories A and B.

D. Ballasts shall provide “rapid start” lamp starting, and shall maintain filament heating after starting. “Instant start” is not acceptable.

E. Ballasts shall have a full 5-year warrantee.

F. Ballasts shall be Motorola, Advance, or MagneTek or as approved, and shall maintain constant light output over operating ranges of 108V to 132V (120V ballasts) and 249V to 305V (277V ballasts).

2.6 COMPACT FLUORESCENT BALLASTS - ELECTRONIC NON-DIMMING

A. Non-dimming compact fluorescent ballasts shall be electronic type with a power factor greater than 95%, ballast factor greater than 0.87, low inrush current (less than 25 times operating current), CBM rated, ETL tested and meet applicable UL standards and be so labeled. The ballasts shall be Class "P" with automatic reset.

B. Ballasts shall be sound rated "A" and so labeled. Ballasts shall meet the requirements of FCC Rules and Regulations, Part 15, Subpart J, and Part 18.

C. Ballasts shall produce a sinusoidal output waveform and have a frequency of operation of 27 kHz or higher. Flicker shall not exceed 3%. Input current THD shall be below 10% with the third harmonic below 5% at maximum ballast lamp rating. Lamp crest factor shall be less than 1.55. Ballasts shall withstand transients as defined in IEEE Publication 587, Categories A and B.

D. Ballasts shall provide reliable starting down to 0°C.

E. Ballasts shall provide “preheat start” or “rapid start” lamp starting. “Instant start” is not acceptable.

F. Ballasts shall provide end of life lamp protection.

G. Ballasts shall have a full 3-year warrantee.

H. Ballasts shall be Energy Savings, Inc., as approved and shall maintain constant light output over operating ranges of 90V to 145V (120V ballasts) and 200V to 320V (277V ballasts).

2.7 FLUORESCENT BALLASTS – CONTROLLABLE ELECTRONIC DIMMING

A. Controllable fluorescent dimming ballasts shall be electronic type with a power factor greater than 98% at full light output and greater than 90% throughout the control range. Ballasts shall meet applicable UL standards and be so labeled. The ballasts shall be Class "P".

B. Ballasts shall be sound rated "A" and so labeled. Ballasts shall meet the requirements of FCC Rules and Regulations, Part 18 RFI/EMI.

C. Ballasts shall have a frequency of operation of greater than 40 kHz and operate lamps without visible flicker. Input current THD shall be below 10% at maximum ballast lamp rating.

D. Ballasts shall meet ANSI 62.41 Category A standards for transient voltage protection.

E. Ballasts shall meet ANSI C82.11 standards for harmonic distortion.

F. Ballasts shall provide smooth and continuous dimming without flicker down to 5% light.

G. Ballasts shall be capable of striking lamps at any light level without first flashing to full light.

H. Ballasts shall be programmed start.

I. Ballasts shall be controllable via a Class 1 or Class 2 low voltage 0-10VDC control circuit.

J. Ballasts shall operate from a nominal line voltage of 277 volts (200-305 volts). Ballasts shall maintain a constant light output with a line voltage variation of $\pm$10%

K. Ballasts shall be Advance Mk VII controllable electronic dimming ballasts or as approved.

2.8 HIGH INTENSITY DISCHARGE LAMP BALLASTS

A. High Intensity discharge lamp ballasts shall be of the regulator type (constant wattage). The ballast shall be high power factor (95%) and operate the lamp satisfactorily with a voltage variation of plus or minus 13%. Provide ballast with an integral ignitor for pulse start Metal Halide lamps.

2.9 TAMPERPROOF-TYPE FIXTURES

A. Furnish one tamperproof screwdriver to ANC Electrical Shop of each type required by fixtures specified on this project.

2.10 INCANDESCENT DIMMERS

A. Refer to Section 16140.

2.11 FLUORESCENT DIMMERS

A. Refer to Section 16140. Dimmers shall be coordinated with ballasts and shall be fully compatible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures with integral ballasts shall have the ballast installed and prewired at the factory.

B. Fixture pendants, canopies, blank sections, corners, tees and other such accessories shall be finished to match their respective fixture.

C. Fluorescent lamps on fluorescent dimmers shall be aged 100 hours at full brightness prior to operation at reduced brightness.

D. Fluorescent dimming ballasts shall be installed per manufacturer's recommendations.

E. Tandem wiring harnesses, receptacles and internal fixture wiring shall be factory assembled and receptacles shall be installed in all pairs of fluorescent fixtures which share a single two-lamp ballast. All wiring harnesses shall include an integral copper grounding conductor, and be approved for use in air plenums.

END OF SECTION

SECTION 16723

ADDRESSABLE FIRE ALARM SYSTEM

1 PART 1 GENERAL

1.1 DESCRIPTION

A. This section outlines the requirements for the installation, programming and configuration of Addressable Fire Alarm System equipment at ANC. The existing system includes Fire Alarm Control Panels, Automatic and Manually Activated Voice Evacuation Alarm Subsystem, Automatic and Manually activated alarm Initiating and Indicating Peripheral Devices and Appliances.

B. The existing South Terminal Siemens Building Technology, Landis Division fire alarm system will be networked with the existing North Terminal Landis & Staefa system (now Siemens Building Technology, Landis Division) via the existing color graphic operator terminal located in the South Terminal as part of the Concourse C, Phase 2 Building Completion Package. An additional color graphic operator terminal will also be provided in the North Terminal located in the Building Maintenance Office (Room NA163 adjacent to the front lobby) as part of the project.

1.2 SYSTEM REQUIREMENTS

A. New fire alarm devices and equipment shall match existing devices and equipment as manufactured by Siemens Building Technology, Landis Division or EST. No other manufacturers are acceptable. While under warranty all modifications to the system shall be accomplished by the original equipment installer to preserve the warranty (Siemens Building Technology, Landis Division). ANC requirements noted below exceed minimum code requirements in some cases.

B. Provide additional control panels, zone/signal cards, equipment, batteries, programming (including programming at operator terminals and remote annunciators), etc., required to support new and existing fire alarm devices. All devices shall operate in accordance with existing system requirements.

C. Manual Pull Stations

1. Manual pull stations shall be provided at every exit from every level and additional pull stations shall be provided as required to ensure the travel distance to the nearest pull station does not exceed 200 feet.

D. Detection Requirements

1. Duct Detectors: Provide photoelectric duct detectors in supply and return paths of air supply fans larger than 2,000 cfm.

2. Fire/Smoke Dampers:

a. Provide photoelectric duct detectors for operation of fire/smoke dampers located in ducts in accordance with the IBC/IMC.

b. Provide 4D Multisensor smoke detectors for operation of fire/smoke detectors located in unducted openings in accordance with the IBC/IMC.

c. Detectors for operation of fire/smoke dampers in elevator shafts without sprinkler protection shall generate an alarm condition and cause operation of the associated damper, but shall not generate a general building alarm. Duct detectors associated with other smoke/fire dampers shall generate a general building alarm.

3. Door Release Service: Provide 4D Multisensor smoke detector(s) for door release control in accordance with NFPA 72 and Part 3 of this section.

E. Notification Appliance Requirements

1. Voice evacuation speakers/strobes shall be provided in Group A and B occupancy areas (typically all public and office areas). In other areas (typically bag makeup areas and mechanical/electrical rooms) combination horn/strobe units shall be provided. Service areas in Level 0 shall be provided with speaker/strobes. The type of device to be used in each area will be reviewed and approved by ANC as part of the Design Submittal reviews.

2. Required Sound Levels (as established by written agreement with the AHJ): The required sound levels for audible notification appliances shall be as follows:

a. Terminal/bag makeup areas: 70dBA

b. Office areas: 60dBA

In areas with voice evacuation the announcement tone shall meet the noted sound level requirements. The voice message shall be intelligible but has no specific sound level requirement.

3. Visual Signaling: Visual notification appliances shall be provided in accordance with NFPA 72 and MOA requirements.

F. Monitoring Requirements

1. Provide monitoring of sprinkler flow, tamper and pressure switches as noted in Part 3 of this Section.

2. Provide monitoring of pre-action sprinkler control panels as noted in Part 3 of this Section.

3. Provide monitoring of kitchen hood extinguishing systems as noted in Part 3 of this Section.

G. Door Unlocking Devices

1. Any device or system intended to effect the locking/unlocking of emergency exits shall be connected to the building fire alarm system. These exits shall unlock upon receipt of fire alarm signal as noted in Part 3 of this Section.

1.3 REFERENCES

A. The equipment and installation shall comply with the current provisions of the following Codes and Standards:

1. National Electric Code, Article 760.

2. National Fire Protection Association Standards:

a. NFPA 72 , National Fire Alarm Code

b. NFPA 101, Life Safety Code

3. International Fire Code.

4. International Building Code.

5. International Mechanical Code.

6. Local and State Building Codes.

7. Local Authorities Having Jurisdiction.

8. Underwriters Laboratories Inc.

B. The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

1. UL 864/UOJZ, APOU Control Units for Fire Protective Signaling Systems.
2. UL 268 Smoke Detectors for Fire Protective Signaling Systems.
3. UL 268A Smoke Detectors for Duct Applications.
4. UL 217 Smoke Detectors Single Station.
5. UL 521 Heat Detectors for Fire Protective Signaling Systems.
6. UL 228 Door Holders for Fire Protective Signaling Systems.
7. UL 464 Audible Signaling Appliances.
8. UL 1638 Visual Signaling Appliances.
9. UL 38 Manually Activated Signaling Boxes.
10. UL 1971 Standard for Signaling Devices for the Hearing-Impaired.
11. UL 1481 Power Supplies for Fire Protective Signaling Systems.
12. UL 1711 Amplifiers for Fire Protective Signaling Systems.

C. Americans with Disabilities Act (ADA)

D. International Standards Organization (ISO)

1. ISO-9000
2. ISO-9001

1.4 SHOP DRAWING SUBMITTALS

A. Submit to the Authority Having Jurisdiction and obtain a written statement of Approval of proposed system revisions. This Approval shall be obtained prior to submitting to ANC.

B. Submit complete one-line risers and point-to-point-wiring diagrams prepared especially for the installation.

C. Provide conduit layout drawings of the system, indicating type, size and number of all conductors, conduits and junction boxes.

D. Provide calculations verifying standby battery capacity per NFPA 72, including manufacturer's published current consumption data for all equipment on the System.

E. Provide calculations verifying that notification appliance circuits voltage drops do not exceed the limits further specified in this Section.

F. Provide calculations verifying that audio amplifier circuits are sized in accordance with this Section.

G. Shop Drawings shall be prepared using CAD. Final approved Shop Drawings shall be updated with precise "as-built" conditions and shall be submitted with the Operations and Maintenance Manuals. File format shall be AutoCAD "DWG" or "DXF".

2 PART 2 PRODUCTS

2.1 GENERAL

A. Additional equipment furnished shall be new and unused. Existing equipment in good condition may be relocated and reused. The existing fire alarm system shall remain operational while the new equipment is being integrated into the system with exceptions only as allowed in Section 16010. The revised system shall be final accepted by the local authorities having jurisdiction and ANC.

B. System installation and operations shall be verified by the manufacturer's representative and a verification certificate presented upon completion. The manufacturer's representative shall be responsible for an on-site demonstration of the operation of the system in accordance with Part 3 of this section.

2.2 AUTOMATIC ALARM OPERATIONS

A. Alarm operations noted below are for each specific building, i.e., an alarm in the South Terminal shall only cause the noted alarm operations in the South Terminal.

B. Operation of each alarm input device shall show on the LCD display at each Control Panel and the Remote Alphanumeric Display Annunciators and shall light specified LEDs at the Remote Graphic Annunciator. Each Intelligent device shall annunciate individually except at the Remote Graphic Annunciator (see Remote Graphic Annunciator for specific requirements).

C. LCD display messages and Graphic Annunciator layout shall be approved by the Authority Having Jurisdiction and ANC prior to programming. Changes required by the AHJ or the Owner shall be implemented.

D. The system shall print the event on each system printer with the time and date, type, condition, and a user defined message.

E. The system shall display operational status of each signal circuit to inform the emergency user of the system status.

F. Upon alarm, the system shall sound the evacuation signals throughout the building.

G. Upon alarm, the system shall shut down the building's air supply fans. Shutdowns shall be hardwired from the Fire Alarm System (i.e., not implemented via building automation controls) and immediate acting, and shall not be overridden by Hand-Off-Auto switches or other controls.

H. Upon alarm, the system shall de-energize door holders to release fire doors. Provide separate circuit(s) as necessary for operation of all door holders. Door holder circuits shall be 120VAC, circuits from a normal power, 208Y/120V panelboard in the vicinity of the controlled doors. Submit for approval all proposed power sources prior to installation or connection of equipment.

I. Upon alarm, the system shall de-energize smoke dampers and smoke/fire dampers to close dampers. Provide a commandable relay for control of each damper.

J. Detectors for operation of fire/smoke dampers in elevator shafts without sprinkler protection shall generate an alarm condition and cause operation of the associated damper, but shall not generate a general building alarm. Detectors associated with other smoke/fire dampers shall generate a general building alarm.

K. Upon alarm, the system shall effect the locking/unlocking of emergency exits connected to the building fire alarm system.

2.3 EQUIPMENT

A. The existing South Terminal Addressable Fire Alarm System is a Model EST3, as manufactured by Siemens Building Technology, Landis Division.

B. The System includes the following features:

1. Audio Paging and Emergency Evacuation subsystem with fully digitized and multiplexed audio. One amplifier shall be supplied per speaker circuit to enhance system survivability.

2. Local Control and Display Annunciators

   a. Each panel in the installed system includes local Control and Display Annunciators.

3. Remote System Display (Point) Annunciators

   a. Each remote display annunciator panel in the installed system includes remote Control and Display Annunciators.

   b. No system control functions shall be accessible from the existing display annunciator located in the Safety Building.

4. Signalling line circuits shall be Class A (Style 7).

5. Hard Wired NAC Circuits: Supervised hard-wired Notification Appliance Circuits (NAC) for the control of 24Vdc Signaling Appliances shall be wired Class A (Style Z).

6. Integrated Audio

   a. The system includes distributed audio amplifiers, minimum of one for each speaker circuit, to ensure system survivability. If additional speaker circuits are required provide sufficient amplifiers to power system speakers at **maximum rated capacity of connected speakers (i.e., all speakers set at maximum tap)**. Include allowance for future speakers on new speaker circuit. Refer elsewhere in this section for spare capacity requirements (allowance for additional future system speakers).

2.4 INTELLIGENT DETECTORS

A. The System Intelligent Detectors shall be as follows:

1. Photoelectric Smoke Detector, SIGA-PS The photo detector shall be rated for ceiling installation at a minimum of 30 ft (9.1m) centers and be suitable for wall mount applications. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0 percent to 3.5 percent. The photo detector shall be suitable for operation in the following environment:

   a. Temperature: 32 degrees F to 120 degrees F (0 degrees C to 49 degrees C)

   b. Humidity: 0-93 percent RH, non-condensing

   c. Elevation: no limit

2. 4D Multisensor Detector, SIGA-IPHS: The 4D Multisensor smoke detector shall be rated for ceiling installation at a minimum of 30-feet (9.1m) centers and suitable for wall mount applications. The percent smoke obscuration per foot alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0 percent to 3.5 percent. The integral heat sensor shall cause an alarm when it senses a change in ambient temperature of 65 degrees F (35 degrees C) or reaches it fixed temperature alarm set point of 135 degrees F (57 degrees C) nominal. The 4D Multisensor detector shall be suitable for operation in the following environment:

   a. Temperature: 32 degrees F to 100 degrees F (0 degrees C to 38 degrees C)

b. Humidity: 0-93 percent RH, non condensing

c. Elevation : Up to 6,000 ft (1828 m)

3. Detector Mounting Bases

a. Standard Detector Mounting Bases, SIGA-SB / SIGA-SB4: Provide standard detector mounting bases (SIGA-SB or SIGA-SB4 as required).

b. Isolator Detector Mounting Bases, SIGA-IB / SIGA-IB4: Provide isolator detector mounting bases (SIGA-IB or SIGA-IB4 as required) every 10 devices.

4. Duct Detector Housing, SIGA-DH: Provide smoke detector duct housing assemblies (SIGA-DH) to facilitate mounting an intelligent analog photoelectric detector (SIGA-PS), along with a standard or isolator detector mounting base. Provide remote alarm LEDs (SIGA-LED) for each duct detector. Remote alarm LEDs shall be located in a readily visible location in the vicinity of the duct detector. Field coordinate exact location of remote alarm LEDs with ANC.

2.5 INTELLIGENT MODULES

A. Intelligent Modules shall be provided for monitoring or controlling equipment or circuits as required by the application.

1. Single Input Module, SIGA-CT1

2. Dual Input Module, SIGA-CT2

3. Monitor Module, SIGA-MM1

4. Waterflow/Tamper Module, SIGA-WTM

5. Single Input Signal Module, SIGA-CC1

6. Dual Input Signal Module, SIGA-CC2

7. Control Relay Module, SIGA-CR

8. Universal Class A/B Module, SIGA-UM

2.6 INTELLIGENT MANUAL PULL STATIONS

A. Double Action Manual Pull Station, SIGA-278

1. Provide intelligent double action, single stage fire alarm stations (SIGA-278). The fire alarm station shall be of Lexan construction with an internal toggle switch. Provide a key locked test feature. Finish the station in red with white “PULL IN CASE OF FIRE” lettering.

2.7 NOTIFICATION APPLIANCES

A. Self-Synchronized Strobes

1. Strobes, 405 Series: Provide strobes manufactured by EST, Cat No. 405 Series. In - Out screw terminals shall be provided for wiring. The strobes shall have a red metal faceplate. They shall provide 15 cd, 15/75 cd, 30 cd, 60 cd or 110 cd synchronized flash outputs as required by the application. The strobe shall have lens markings oriented for wall mounting. Provide weatherproof wall boxes for outdoor mounting.

B. Horns

1. Temporal Horns, 757 Series: Provide electronic horns manufactured by EST, Cat. No. 757 Series. In - Out screw terminals shall be provided for wiring. The horn shall have a

red plastic housing. Horns shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady or temporal output. Selection of steady or temporal output shall be reversible. Provide weatherproof wall boxes for outdoor mounting.

C. Horn/Strobes

1. Temporal Horn/Strobes, 757 Series

a. Provide electronic horn/strobes manufactured by EST, Cat. No. 757 Series. In - Out screw terminals shall be provided for wiring. The horn/strobe shall have a red plastic housing. Horn/strobes shall be selectable for high or low dBA output. Selection of low or high output shall be reversible. Horns shall be selectable for steady or temporal output. Selection of steady or temporal output shall be reversible.

b. The strobe shall provide 15 cd, 15/75 cd, 30 cd or 110 cd synchronized flash output as required by the application. The strobe shall have lens markings oriented for wall mounting.

c. Provide weatherproof wall boxes for outdoor mounting.

D. Cone Speaker/Strobes

1. Four inch Wall or Ceiling Mount as required by the application, 757 Series

a. Provide speaker/strobes with a 4 inch Mylar cone as manufactured by EST, Cat. No. 757 Series. Paper type cones are not acceptable. The rear of the speaker shall be completely sealed protecting the cone during and after installation. In - Out screw terminals shall be provided for wiring. Speaker/strobe housings shall be red. Speakers shall be provided for use with 25V systems. Speakers shall provide power taps at 1/4w, 1/2w, 1w, and 2w. Speaker/strobes shall provide UL confirmed 87 dBA sound output at 2w.

b. Strobes shall provide 15 cd, 15/75 cd, 30 cd or 110 cd synchronized flash output as required by the application. The strobe shall have lens markings oriented for wall mounting or ceiling mounting as indicated on the drawings.

2.8 ANCILLARY DEVICES

A. Remote Relays: Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc.

1. Multi Voltage Control Relays, MR-100 Series: Relay contact ratings shall be SPDT and rated for 10 amperes at 115 VAC. A single relay may be energized from a voltage source of 24 VDC, 24 VAC, 115 VAC, or 230 VAC. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

2. Multi Voltage Control Relays, MR-200 Series: Relay contact ratings shall be DPDT and rated for 10 amperes at 115 Vac. A single relay may be energized from a voltage source of 24 VDC, 24 VAC, 115 VAC, or 230 VAC. A red LED shall indicate the relay is energized. A metal enclosure shall be provided.

2.9 ELECTROMAGNETIC DOOR HOLDERS, 1500 SERIES

A. Provide electromagnetic door holders with the following features.

1. Flush mounted wall units or floor units as required by door and application.

2. Silent operation.

3. Minimum 25 Lbf. (111 Nt) holding force.

4. 120V 60Hz operation.

5. Finish shall be brushed zinc.

6. EST 1500 Series.

2.10 EXISTING "FIREWORKS" COLOR GRAPHIC OPERATOR TERMINAL (SOUTH TERMINAL)

A. The existing Color Graphics Package (CGP) is an EST "Fireworks" Intelligent Interactive Computer Terminal. The CGP shall have full control over the systems being monitored through operator sign off/sign on procedures that are completely password controlled.

B. If required, existing floor plans will be updated by ANC for changes in the floor plan of the protected premises. Tenant shall provide ANC with AutoCAD plans suitable for this purpose.

C. The existing "Fireworks" color graphic terminal will be upgraded to a network compatible "Fireworks" terminal as part of the Concourse C, Phase 2 Building Completion Package. The existing terminal will be networked with the network capable "Fireworks" color graphics terminal being provided in the North Terminal as part of the Concourse C, Phase 2 Building Completion Package.

2.11 EXISTING "FIREWORKS" COLOR GRAPHIC OPERATOR TERMINAL NORTH TERMINAL

A. An EST "Fireworks" Intelligent Interactive Computer Terminal is being provided as part of the Concourse C, Phase 2 Building Completion Package. The CGP shall have full control over the systems being monitored through operator sign off/sign on procedures which are completely password controlled.

B. If required, existing floor plans will be updated by ANC for changes in the floor plan of the protected premises. Tenant shall provide ANC with AutoCAD plans suitable for this purpose.

2.12 EXISTING GRAPHIC ANNUNCIATOR PANEL

A. If required, the existing graphic layout will be revised to show revisions to the basic floor plan of the building by ANC. Tenant shall provide ANC with AutoCAD plans suitable for this purpose.

B. The South Terminal Annunciator Panel is located in a Level 1 entry vestibule at Baggage Claims.

C. The North Terminal Annunciator Panel is located in the Main Entry Lobby of the North Terminal.

2.13 SYSTEM MAP

A. If required, the system map on the wall beside each Fire Alarm Control Panel, will be updated by ANC to show any floor plan revisions, similar to that on the graphic annunciator. Tenant shall provide ANC with AutoCAD plans suitable for this purpose.

2.14 CONDUCTORS

A. In general, conductors shall be of the sizes and types recommended by the system manufacturer.

B. Voltage drop on Notification Appliance Circuits shall not exceed 10 percent at the most distant device on each circuit (including future devices as noted in 2.15 below).

2.15 SPARE CAPACITY

A. If available, existing spare capacity on existing notification and signaling line circuits may be utilized for additions to the system.

B. If additional Speaker Notification Appliance Circuits are required they shall be sized to allow a minimum of five additional future speakers to be added to each new circuit provided. Additional Notification Appliance Circuits (horn/strobe and strobe circuits) shall be sized to allow a minimum of five additional future devices to be added to each new circuit provided (assume 75cd strobes). For voltage drop calculation purposes, assume fifty feet for each added device (a total length of 250 feet).

C. If additional Signaling Line Circuits are required they shall be sized to provide a minimum of 20 percent spare capacity to allow future addition of devices.

2.16 SECONDARY SUPPLY CAPACITY AND SOURCES

A. The secondary power supply for emergency voice/alarm communications service shall be capable of operating the system under maximum quiescent load for 24 hours and then shall be capable of operating the system during a fire or other emergency for a period of 2 hours. Fifteen minutes of evacuation alarm operation at maximum connected load shall be considered the equivalent of 2 hours of emergency operation. For a combination system, the secondary supply capacity required above shall include the load of any non-fire related equipment, functions, or features which are not automatically disconnected upon transfer of operating power to the secondary supply.

B. The secondary supply consists of the following:

1. An automatic starting, engine driven generator arranged in accordance with NFPA 72 and storage batteries with 24 hours of capacity arranged in accordance with NFPA 72.

2. Operation on secondary power shall not affect the performance of the fire alarm system.

3 PART 3 EXECUTION

3.1 INSTALLATION (GENERAL)

A. The entire system shall be installed in a workmanlike manner in accordance with approved manufacturer's manuals and wiring diagrams. Provide all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the NEC, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.

B. All penetration of floor slabs and fire walls shall be fire stopped in accordance with all local fire codes.

C. Existing remote alphanumeric display annunciator, printer, and associated equipment in Safety Building dispatch room: ANC will provide all required reprogramming of display annunciator to support the revised system.

D. Existing Fireworks colorgraphic operator terminals in North and South Terminals: ANC will provide all required reprogramming of operator terminals to support the revised system.

E. Existing control and display annunciators in control panels: ANC will provide all required reprogramming of control and display annunciators to support the revised system.

F. Field coordinate exact mounting locations for all devices.

G. Wall mounted devices in finished areas such as pull stations and notification appliances shall be recessed in flush mounted junction boxes. Surface mounted box extensions shall not be used.

H. Adjust each detector in accordance with manufacturer's recommendations for the specific location and circumstance.

I. Control functions which include outputs activated by specific inputs, such as door releases, elevator recall, fan shutdown, damper operation, etc., shall have both inputs and associated outputs connected to the same control panel. All control functions shall be accomplished with addressable control modules. Control through relay bases is not acceptable.

J. Control relays shall be located within three feet of the device or circuit controlled in accordance with NFPA 72.

3.2 SYSTEM WIRING

A. All wiring shall be in metal raceways shared by no other system. Raceways shall be installed in accordance with Section 16111-CONDUIT AND FITTINGS. Paint conduit red at every box and at 10 foot intervals between boxes.

B. Field devices shall be installed in accordance with Section 16131-OUTLET BOXES. Paint boxes and covers red.

C. Install Conductors in accordance with Section 16120-WIRE AND CABLE. No wire nuts shall be used. All wires shall be landed on device terminals, or terminal strips or blocks, and shall be labeled and numbered at their terminations. All wiring shall be installed in a neat and workmanlike manner. Bundles of wiring shall be secured with self-locking nylon or Velcro cable ties, not tape. If terminal strips or blocks are required to transistion wire size down at devices, they shall not be located in the device junction box unless adequate space is available. Surface mounted box extensions shall not be used at recessed device locations to provide adequate room. If required, locate terminal strips or blocks in properly sized, separate junction boxes, located in accessible ceiling spaces. Clearly mark covers of junction boxes per Section 16010.

3.3 DUCT DETECTORS

A. Smoke dampers and fire/smoke dampers: Coordinate installation of duct-mounted detectors for control of smoke dampers and smoke/fire dampers with equipment and ANC. Locate duct mounted smoke detector within five feet of smoke/fire damper with no air inlets or outlets between detector and damper. Damper shall close when smoke detector goes into alarm.

B. Air Handling Units: Coordinate installation of duct-mounted detectors with equipment and ANC. Duct detectors shall be located in accordance with NFPA 72 and manufacturer's recommendation to the greatest extent practical. Proposed duct detector locations shall be submitted for approval during construction prior to installation of duct detectors. Submit duct detector differential pressure measurements to verify proper operation of duct detectors.

C. Provide remote LED indicators for all duct mounted smoke detectors. Provide a descriptive label in accordance with Section 16010 - IDENTIFICATION. Field coordinate location of remote LED indicators with ANC.

3.4 DETECTORS FOR DOOR RELEASE SERVICE

A. Coordinate installation of smoke detectors for control of bagbelt roll down area separation doors with ANC during construction prior to installation of detectors. All bagbelt roll down doors associated with the same bag makeup area shall close whenever any of the detectors controlling separation doors in the area go into alarm. All bagbelt roll down doors on the Level 2 shall close upon general alarm.

B. Ceiling-mounted detectors for door release service shall be centered on the opening, at a maximum distance of 5'-0" from opening. Minimum distance from opening shall be as noted in NFPA 72.

C. Overhead Doors: Provide local release only for overhead doors. Power roll down door release mechanism from battery backed-up fire alarm auxiliary power source.

3.5 MAGNETIC DOOR HOLDERS

A. Unless otherwise noted or specified or dictated by the specified holder design, magnetic door holders shall be mounted near the top of the doors they serve, and within 6 inches of the latch-side edge of each door served.

B. Door holders shall produce no objectionable hum. Repair, replace, or relocate all holders that produce audible hum.

3.6 DOOR UNLOCKING DEVICES

A. Any device or system intended to effect the locking/unlocking of emergency exits shall be connected to the building fire alarm system. The exits in each building shall unlock upon receipt of fire alarm signal in that specific building.

3.7 INTERCONNECTIONS TO OTHER SYSTEMS

A. Provide input modules for sprinkler flow, tamper, and low air pressure switches. Provide sufficient modules to give each switch an individual address. Connect supervised circuits from modules to switches and program system to provide specified functions for each switch.

B. Monitor pre-action sprinkler control panels for sprinkler flow, tamper and low pressure (if applicable) conditions. Provide output from fire alarm system to pre-action panel to operate pre-action valve to charge sprinkler piping when a minimum of two smoke detectors in the covered area go into alarm.

C. Connect kitchen hood extinguishing systems to fire alarm system so that activation of extinguishing system results in a general fire alarm condition. Provide control and monitor modules and connections to the extinguishing system panel alarm contacts to provide fire alarm functions and maintain shutdown functions. Coordinate connections with Division that hood system is provided under.

3.8 PROGRAMMING

A. ANC will provide system programming as required for operation of system.

3.9 TESTING AND REPORTS

A. Upon completion of the system installation, an Approved representative of the system manufacturer shall conduct a thorough test of the system and all related devices and components of the system, and submit a written report of the findings to ANC **at least 72 hours prior to the substantial completion site observation**. The testing shall include, as a minimum, verification of the following:

1. The functional operation of resettable initiating devices (manual stations, detectors, etc.) and circuit.
2. The functional operation of alarm devices and circuits.
3. The functional operation of monitored device circuits.
4. The functional operation of control and output circuits.
5. The supervision function of Initiating, Indicating, Monitoring, Control and Supply Circuits.
6. Central Station automatic signaling.
7. Proper initiation and execution of mechanical systems control sequences.

8. Verify that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100 percent of devices being in alarm or operated simultaneously. Test shall include the following as a minimum:

    a. Place detectors and monitor modules in alarm. Each shall display its address and alarm condition. At least the first ten devices on each circuit shall also have their alarm LEDs lighted, where applicable.

    b. Operate control modules for the alarm or operated condition. Each module shall display its address and condition.

    c. Reset alarmed and operated devices. The panel shall display the address of any off-normal devices.

9. Test a representative number of detectors for trouble by removing the detector from its base. The address and trouble condition for each shall be displayed. Insert a different type of detector into the base. The address and trouble condition shall be displayed. The detector shall return to normal only when the proper detector type is reinserted into the base.

10. Print out the English-language descriptor, currently sensed value, prealarm threshold value, alarm threshold value and status of each sensor. Also print out the English-language descriptor and status of each module. The printout shall also include the date and time.

3.10 EXAMINATION

A. Prior to the commencement of the work, an examination and analysis of the area(s) where the Fire Alarm / Life Safety System and all associated components are to be installed shall be made.

B. Any of these area(s) which are found to be outside the manufacturers' recommended environments for the particular specified products shall be noted on a Site Examination Report which shall be given to ANC.

C. Any shorts, opens, or grounds found on existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

3.11 DEMONSTRATION

A. Each of the intended operations of the installed Fire Alarm / Life Safety System shall be demonstrated to ANC and the Local Authority Having Jurisdiction by the Installing Engineered System Distributor.

END OF SECTION

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

SECTION 16747

TELECOMMUNICATIONS FIBER OPTIC DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Requirements for installation and modification of fiber optic distribution systems by Tenants, for use 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 fiber optic systems at all facilities on ANC premises. 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 additions and modifications to facility fiber optic telecommunications systems required to support Tenant's telecommunications systems, including engineering, materials, equipment, labor, testing and documentation, in accordance with ANC's requirements.

1.3 QUALITY ASSURANCE

A. Provide system engineering and design required to produce drawings and specifications for all Work to be installed in support of 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 fiber optic telecommunications Work 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/EIA/TIA-455-A, ANSI/TIA/EIA-526-7 and ANSI/TIA/EIA-526-14A 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 work specified in this Section and related telecommunications Sections 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 fiber optic 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 16745 – Tenant Telecommunications Copper Cabling Distribution for requirements for copper telecommunications 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.

4. Fiber optic cable terminations and testing shall be made by journeymen fiber optic cable installers who have had a minimum of 3 years of individual experience in terminating fiber optic cables.

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.

I. Factory Testing Program:

1. Test all fiber optic cables on the spools at the factory prior to shipping. Submit factory test reports in accordance with submittal requirements.

1.4 REFERENCE CODES AND STANDARDS

A. The publications listed below form a part of this section to the extent referenced. 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/EIA/TIA- 455-A	STANDARD TEST PROCEDURES FOR FIBER OPTIC FIBERS, CABLES AND TRANSDUCERS, SENSORS, CONNECTING AND TERMINATING DEVICES AND OTHER FIBER OPTIC COMPONENTS
ANSI/TIA/EIA-526-7	OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED SINGLE MODE FIBER CABLE PLANT
ANSI/TIA/EIA-526-14A	OPTICAL POWER LOSS MEASUREMENTS OF INSTALLED MULTIMODE FIBER CABLE PLANT
ANSI/TIA-472CAAA	DETAIL SPEC. FOR ALL DIELECTRIC FIBER OPTIC CABLE FOR PLENUM USE

REFERENCE	TITLE/REVISION
ANSI/TIA-472DAAA	DETAIL SPEC. FOR ALL DIELECTRIC FIBER OPTIC CABLE FOR OUTSIDE PLANT USE
ANSI/TIA-492AAAA-A	DETAIL SPEC. FOR 62.5/125 MULTIMODE, GRADED INDEX OPTICAL FIBERS
ANSI/TIA-492AAAB	DETAIL SPEC. FOR 50/125 MULTIMODE, GRADED INDEX OPTICAL FIBERS
ANSI/TIA-492BAAA	DETAIL SPEC. FOR CLASS 4A DISPERSION-UNSHIFTED SINGLEMODE OPTICAL FIBERS
ANSI/ICEA S-83-596	FIBER OPTIC PREMISES DISTRIBUTION CABLE
ANSI/ICEA S-83-640	FIBER OPTIC OUTSIDE PLANT COMMUNICATION CABLE
ANSI/TIA/EIA-568-B	COMMERCIAL BUILDING TELECOMMUNICATION CABLING STANDARD
ANSI/TIA/EIA-569-A	COMMERCIAL BUILDING STANDARD FOR TELECOMMUNICATIONS PATHWAYS AND SPACES
ANSI/TIA/EIA-598-A	OPTICAL FIBER CABLE COLOR CODING
ANSI/TIA/EIA-606A	ADMINISTRATION STANDARD FOR THE TELECOMMUNICATIONS INFRASTRUCTURE OF COMMERCIAL BUILDINGS
ANSI/TIA/EIA-607	COMMERCIAL BUILDING GROUNDING AND BONDING REQUIREMENTS FOR TELECOMMUNICATIONS
ANSI/TIA/EIA-758	CUSTOMER-OWNED OUTSIDE PLANT TELECOMMUNICATIONS CABLING STANDARD
ANSI/TIA/EIA-758-1	ADDENDUM TO ANSI/TIA/EIA-758
ANSI Z136.2	AMERICAN STANDARD FOR THE SAFE OPERATION OF OPTICAL FIBER COMMUNICATION SYSTEMS UTILIZING LASER DIODE AND LED SOURCES
BICSI	TELECOMMUNICATIONS DISTRIBUTION METHODS MANUAL

B. Related Terminal Construction Standards Sections:

1. 16111 – Conduit and Fittings
2. 16115 – Cable Tray
3. 16745 – Tenant Telecommunications Copper Cable Distribution
4. 16748 – Communications Cable Management Documentation

1.5 DEFINITIONS

A. "Fiber" refers to optical fiber cable.

B. “Composite” – refers to cable constructed with single-mode and multi-mode fibers within a single hybrid cable jacket.

C. “Pathways” refers to conduits, sleeves, cable trays, distribution rings, etc., which are employed to route backbone and stations cables between equipment rooms, telecommunications closets, stations, outlets, etc.

D. “Backbone Cables”, "Riser Cables" or "Tie Cables" refers to optical fiber cables 6-strand or more, connecting main cross-connect facilities, intermediate cross-connect facilities and telecommunications Closets. These cables may include outside plant cables between buildings and riser cables between floors.

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

F. "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.

G. “Patch Panel” refers to rack or frame mounted multiple fiber terminations with the type of connectors as specified herein.

H. “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.

I. “FTTD” Fiber to the Desk, refers to two-strand, multi-mode fiber optic cable installed from the TR to the end user equipment for horizontal telecommunications circuits.

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. Where Tenants are unable to utilize existing ANC backbone fiber optic cabling, additional cables shall be installed by the Tenant in accordance with the requirements of this Section. ANC’s telecommunications backbone raceway system is a managed system. Obtain all required permits and duct assignments before installing backbone cabling.

1. Where required for inter-building fiber optic circuits, provide all trenching and backfill, raceways, innerducts, pull ropes, sleeves, boxes, etc.

2. Where required for intra-building fiber optic circuits, provide all cable trays, raceways, innerducts, pull ropes, sleeves, boxes, firestopping etc.

3. Where existing facilities are insufficient, provide all racks, shelves, enclosures, shelf and enclosure supports, fiber optic cables, connectors, patch panels, splice trays, patch cords, Fiber Distribution Units (FDUs), splices, connections, cable management, labeling, testing, etc., and all other material, equipment, and labor required to make the systems fully operational.

4. Provide patch panel capacity for the full termination of all installed fiber.

5. Provide termination and systematic identification of all cables, including all spare and unused fibers, on both ends.

6. Perform testing of all fiber strands, including all spare and unused fibers, in accordance with the requirements herein.

7. Provide factory assembled fiber patch cords of the proper configuration and termination type for the patching of circuits and connection of equipment.

E. The Tenant may install FTTD cabling in lieu of horizontal copper cabling or in the case of special equipment needs. FTTD cabling shall be in accordance with the requirements of 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 Work 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 Corning LANscape® system, and approved by Corning 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. Fiber Optic Cable

2. Fiber Optic Terminations

3. Pre-connected Fiber Optic Pigtails

4. Splice Cases

5. Splice Organizers (Splice Trays)

6. Pre-Connected Cable Assembly (Fiber Patch Cords)

7. Fiber Optic Patch Panels

8. Fiber Distribution Units

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. Provide detailed shop drawings for all installations.

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

I. Submit factory test reports for all fiber optic cable shipped. Refer to Section on Quality Assurance for testing requirements.

J. Shop Drawings: Submit Shop Drawings for approval by ANC as follows:

1. Dimensioned routing of conduits and innerducts for fiber optic cables as provided under this specification and indicated on the Drawings. Dimensioned layouts for existing conduit systems are not required.

2. Dimensioned rack plan layouts for all fiber optic termination equipment in all telecommunication rooms.

3. Dimensioned rack elevation layouts for all fiber optic termination equipment in all telecommunication rooms.

4. 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.

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

1.9 WARRANTY

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

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 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. The warranty shall apply to all passive 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.

    1) FDDI

    2) IEEE 802.3z 1000Base-SX, 1000Base-LX

    3) Future application certified under the applicable standards as noted above.

3. 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).

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

5. Warranty work on the certificated system shall be authorized by the manufacturer and performed by any factory certified installer of LANscape® system components.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where available the Tenant may utilize existing ANC owned and managed fiber optic cable, equipment racks patch panels, etc., on a first come, first served, space available basis, subject to approval

B. Where required, provide Corning LANscape® optical fiber cabling, connecting hardware, and related hardware manufactured by Corning Cable Systems.

2.2 MULTIMODE FIBER

A. Multimode (MM) fiber: Provide 50 μm dual window graded index optical glass with nominal 125 μm cladding diameter. The optical fiber shall comply with ANSI/TIA/EIA-492AAAB.

B. Each multimode optical fiber shall meet the following graded performance specifications.

1. Maximum Attenuation: 3.5 dB/Km @ 850 nm, 1.5 dB/Km @ 1300 nm
2. Minimum LED Bandwidth: 500 MHz-km @ 850 nm, 500 MHz-km @ 1300 nm
3. Gigabit Ethernet Distance Guarantee: 600 meters @ 850 nm, 600 meters @ 1300 nm
4. Numeric Aperture: 0.20 ± 0.015
5. Core Diameter: 50.0 ± 3.0. μm
6. Cladding Diameter: 125.0 ± 2.0 μm
7. Core/Cladding Concentricity Error: ≤ 3.0 μm
8. Cladding non-circularity: ≤ 2.0 %
9. Core Non-circularity: ≤ 6.0 %
10. Minimum Tensile Strength: 100,000 psi
11. Colored Fiber Diameter: 250 μm $\pm$ 15 μm

C. All fibers shall be color coded to facilitate individual fiber identification. Fibers shall have either AFC2 OR CPC6 coating or approved equivalent to ensure color retention, minimize micro-bending losses and improve handling. The coating shall be mechanically strippable.

2.3 SINGLEMODE FIBER

A. Singlemode (SM) fiber: Provide 8.3 μm step-index optical glass with nominal 125 μm core/cladding diameter. The optical fiber shall comply with ANSI/TIA/EIA-492CAAA.

B. Each singlemode optical fiber shall meet the following graded performance specifications.

1. Maximum Attenuation:
    a. Indoor Applications (1-4 fiber): 0.4 dB/Km @ 1310 nm, 0.3 dB/Km @ 1550 nm
    b. Indoor Applications (5-144 fibers): 0.4 dB/Km @ 1310 nm, 0.3 dB/Km @ 1550 nm
    c. Outdoor Applications and Indoor/Outdoor Applications:): 0.4 dB/Km @ 1310 nm, 0.3 dB/Km @ 1550 nm

2. Gigabit Ethernet Distance Guarantee: 5000 meters

3. Numeric Aperture: 0.12 ± 0.015

4. Core Diameter: 8.8 μm

5. Cladding Diameter: 125.0 ± 1.0 μm

6. Core/Cladding Concentricity Error: ≤ 0.8 μm

7. Cladding non-circularity: ≤ 1.0 %

8. Core Non-circularity: ≤ 6.0 %

9. Minimum Tensile Strength: 100,000 psi

10. Colored Fiber Diameter: 250 μm ± 15 μm

C. All fibers shall be color coded to facilitate individual fiber identification. Fibers shall have either AFC2 OR CPC6 coating or approved equivalent to ensure color retention, minimize micro-bending losses and improve handling. The coating shall be mechanically strippable.

2.4 FIBER CABLE

A. Provide fiber cables of loose-tube or tight-buffered construction, comprised of all multi-mode, all single-mode or composite single-mode/multi-mode fibers.

B. Interior: Provide optical fiber cable of all dielectric, tight buffered design for interior applications.

1. Provide cables OFNR labeled and FT-4 Listed, which meet the requirements of NEC Article 770.

2. Riser rated:

a. Multimode, $2 \leq 24$ count: Refer to Appendix C

b. Multimode, $24 \leq 72$ count:Refer to Appendix C

c. Multimode, $72 \leq 144$ count: Refer to Appendix C

3. Plenum rated:

a. Multimode, $2 \leq 24$ count: Refer to Appendix C

b. Multimode, $24 \leq 72$ count: Refer to Appendix C

c. Multimode, $72 \leq 144$ count: Refer to Appendix C

C. Exterior: Provide optical fiber cable of all dielectric, stranded loose tube design for exterior applications.

1. Loose-tube, non-stranded designs are acceptable for fiber counts of 12 or less in exterior applications.

2. Provide UL-1666 OFNR compliant cables for interior/exterior applications to allow entry into the building beyond 50 feet without a splice.

a. The indoor/outdoor rated cable shall meet the flame retardant characteristics required for Riser rated cable while maintaining mechanical and environmental performance required for outside plant applications.

b. The cable shall consist of a dry block core design meeting all Bellcore outside plant water penetration requirements.

c. Environmental Specifications:

1) Operating Temperature Range: -40° F to 167° F (-40° C to 75° C)

2) UV protected jacket

d. Approved Equipment: Refer to Appendix C

3. The mechanical and environmental specifications for all-dielectric outside optical fiber cable shall be in accordance with ANSI/ICEA S-83-596. All other constructions of outside optical fiber cable shall be in accordance with ANSI/ICEA S-83-640.

2.5 FIBER DISTRIBUTION EQUIPMENT RACK

A. Provide fiber distribution equipment racks in TR spaces designated by ANC, as follows:

1. 19-inch free standing 7-foot high racks with 44 rack units, pre-installed jumper trough at the top and standard 1.75 inch TIA/EIA hole spacing, Hubbell NextFrame, or as approved.

2. On each side of the equipment rack provide inter-bay vertical cable management attachments with moveable front mounted flanged spools and moveable radiused cable guides. Adjacent racks require only one inter-bay unit between them.

3. Below and adjacent to each installed patch panel provide one two-unit (3.5 inch) horizontal cable management panel.

4. Provide a two unit (3.5 inch) horizontal cable management trough at the lowest useable position of each rack, or just below the bottom of the lowest mounted equipment, which ever is highest. Troughs on adjacent racks shall be at the same elevation to facilitate cross-connecting cables between racks.

2.6 FIBER PATCH PANELS

A. Provide low-density termination and administration point for fiber cables in the telecommunications equipment rooms with 24 or fewer fiber terminations:

1. 19-inch rack mountable frame with six adapter panel positions per two-unit (3.5 inch) frame.

2. Pre-punched and pre-loaded adapter panels with fiber adapters of the types specified herein, recessed a minimum of 2.5” from the front of the shelf for patch cable management. Provide full compliment of fiber adapters and adapter panels for each frame and label unused adapters “spare”.

3. Fiber management provisions to protect connectorized fibers from mechanical stress, macro-bending loss at the connection point and prevent tampering with the circuits.

4. Provisions for individual fiber identification on the panel faceplate.

5. Full front and rear accessibility.

6. Factory installed lock kit for hinged front panel, with two keys furnished for each panel. All panels provided for this project shall be keyed to match existing ANC panels.

7. Hinged translucent polycarbonate-tinted door in front of the connector panels.

8. Approved Equipment: Refer to Appendix C.

B. Patching Equipment:

1. Multimode Adapter Panel:

a. Type ST compatible with ceramic inserts and composite housing.

b. Approved Equipment: Refer to Appendix C.

2. Singlemode Adapter Panel:

a. “SC” simplex/UPC style with ceramic inserts, factory pre-pigtailed with single-mode MIC cable.

b. Approved Equipment: Refer to Appendix C.

C. Fiber Splicing Equipment:

a. Provide rack mounted splice cabinets with capacity as required to connect all single-mode fibers to pre-terminated pigtails for connection to fiber patch panels:

1) 19-inch rack mountable three-unit housing with 4.5 inch projection containing individual splice trays for transition splicing to pigtails.

2) Fiber management provisions to protect fibers from mechanical stress.

3) Full front and rear accessibility.

4) Sliding shelf to provide access to individual splice trays and routing guides.

5) Factory installed lock kit for hinged front and rear panels, with two keys furnished for each panel. All panels provided shall be keyed to match existing ANC panels.

6) Hinged translucent polycarbonate-tinted door in front of the connector panels.

7) Approved Equipment: Refer to Appendix C.

b. Provide adequate number of splice trays to fully transition all installed single-mode fibers to pre-terminated single-mode pigtails at each telecommunications room.

2.7 FIBER OPTIC CABLE CONNECTORS

A. Fiber Optic Connectors – Multi-mode:

1. Provide type ST field installable connectors to terminate multi-mode fiber optic cables from cable-to-cable, cable-to-equipment or equipment-to-equipment, and to make jumpers:

a. Insertion Loss: 0.2 dB

b. Fiber OD: 125 μm

c. Cable OD: 3.0 / 0.9 mm

d. Axial Load, min: 20 lb with less than 0.2 dB change

e. Temp. Stability: -40°C to 80°C

f. Ceramic Ferrule

g. Meet EIA and IEC standards for repeatability and have a locking feature to the coupler and assure non-optical disconnect.

h. Approved Equipment: Refer to Appendix C.

B. Fiber Optic Connectors – Single-mode:

1. Provide type SC simplex factory pigtailed connectors to terminate single-mode fiber. Refer to pigtailed connector panels specified above.

   a. UPC polish with $\leq$ 55 dB reflectance

2.8 PATCH CORDS AND JUMPERS

A. Multimode Patch Cord Specifications:

1. Provide fiber patch cord consisting of buffered, graded-index fiber with a 50 micron core and a 125 micron cladding for multimode. The 900 micron fiber coating shall be covered by aramid yarn and a jacket of flame retardant PVC. Ceramic ferrules.

2. Provide two-strand riser rated zipcord style cords for all duplex patch through and equipment connection applications. Provide single strand cords for single equipment connections.

3. Provide the quantity and length of patch cords required, to make an orderly, manageable connection between all patch panels and equipment being cross-connected.

4. Provide patch cords factory terminated with ST compatible connectors for multi-mode circuits.

5. Mated Connector Loss 0.2 dB typical, guaranteed maximum 0.5 dB, 500 insertions

6. Operating temperature: -40°C to 80°C, <0.3 dB change

7. Cable Retention: 20 lb. minimum, <0.2 dB change

B. Single mode Patch Cord Specifications:

1. The fiber patch cord shall consist of Corning SMFC/28 fiber with a 8 micron core and a 125 micron cladding for single mode. The 900 micron fiber coating shall be covered by aramid yarn and a jacket of flame retardant PVC. Provide connectors with ceramic ferrules and UPC polish.

2. Provide two-strand riser rated zipcord style cords for all duplex patch through and equipment connection applications. Provide single strand cords for single equipment connections.

3. Provide the quantities and length of patch cords required, to make an orderly, manageable connection between all patch panels and equipment being cross-connected.

4. Provide patch cords factory terminated with SC connectors for single-mode circuits.

5. Mated Connector Loss 0.2 dB typical, guaranteed maximum 0.5 dB, 500 insertions

6. Operating temperature: -40°C to 80°C, <0.3 dB change

7. Cable Retention: 20 lb. minimum, <0.2 dB change

2.9 FIBER SPLICES

A. Fiber optic splices are not allowed except where pre-terminated pigtails are used for single-mode fiber terminations. If field conditions are discovered that require additional splices, submit a request in writing to ANC and obtain approval prior to performing splice

B. Fiber optic splices shall be fusion splices performed in the field by a qualified splicer. Mechanical splices are not allowed.

C. Splicing equipment shall provide 3-axis alignment for fiber coatings of 250 micrometers to 900 micrometers and a splice loss of less than 0.05 dB for single-mode fibers.

D. Provide heat shrink splice protection for all fiber optic splices.

E. Fiber Optic splices, including single-mode termination pigtails, shall be performed within Splicing Cabinets:

a. Provide rack mounted splice cabinets with capacity as required to connect all single-mode fibers shown on the Drawings to pre-terminated pigtails for connection to fiber patch panels:

1) 19-inch rack mountable three-unit housing with 4.5 inch projection containing individual splice trays for transition splicing to pigtails.

2) Fiber management provisions to protect fibers from mechanical stress.

3) Full front and rear accessibility.

4) Sliding shelf to provide access to individual splice trays and routing guides.

5) Factory installed lock kit for hinged front and rear panels, with two keys furnished for each panel. All panels provided for this project shall be keyed alike.

6) Hinged translucent polycarbonate-tinted door in front of the connector panels.

7) Approved Equipment: Refer to Appendix C.

b. Provide adequate number of splice trays to fully transition all installed single-mode fibers to pre-terminated single-mode pigtails at each telecommunications room.

2.10 FIBER OPTIC FLEXIBLE DUCT

a. Provide conduit innerducts for use with fiber optic cabling in accordance with Section 16111.

b. Fiber optic innerducts shall extend to the racks or equipment cabinet unbroken via conduit or cable tray, and terminate at the top of the rack.

PART 3 - EXECUTION

3.1 FIBER SPLICES

A. All fiber optic cable splices shall be fusion splice type.

B. No FACTORY or OTHER splices are allowed except where pre-terminated pigtails are used for single-mode fiber terminations.

C. Completed splices shall be covered with a protective sleeve, heat shrink type, to restore the protective properties of the fiber coating and buffering. Deviations to the splice, location and pulling plan will be permitted, upon approval by ANC. All fiber colors shall be continuous from end to end. No switching or staggering of color scheme within the cable at splice points shall be allowed. Fibers shall be spliced in order.

D. Cables shall be brought out of the splice enclosure in a controlled environment to perform the fiber fusion splice operation. Splice shall be completed by returning the cable to the splice enclosure such that the excess cable does not impede future entrance and utilization. Cable shall be secured at regular intervals.

3.2 OPTICAL FIBER PATCH PANELS

A. All cable terminations shall be made on optical fiber patch panels. All installed fibers shall be terminated.

B. Optical fiber cables shall be enclosed in flexible duct over their entire length up to the fiber distribution equipment rack

3.3 CABLE INSTALLATION FOR ALL CABLES

A. Test each reel of received fiber optic cable using an Optical Time Domain Reflectometer (OTDR) prior to installation. Cables with detected flaws shall not be installed.

B. Follow cable manufacturer's specifications regarding handling methods, bend radius and maximum pulling tension limitations.

C. No copper cables shall be installed in same raceway as optical fiber cables.

3.4 UNDERGROUND CABLE INSTALLATION

A. All underground optical fiber cable shall be run in flexible ducts. Either three 1-1/4 inch flexible ducts or four 1 inch flexible ducts are to be installed in each 4 inch conduit.

B. Flexible duct shall enclose all optical fiber cable in conduit and ladder rack. Flexible duct shall be securely fastened to ladder rack and shall end directly above the rack in which the fiber is terminated.

C. Inner duct assignment of individual cables shall be as Approved by ANC. Cables shall not be placed in ducts other than those Approved.

D. Fiber optic cables transitioning through handholes and manholes shall be enclosed in flexible duct and positioned to avoid damage by personnel or equipment.

3.5 SECURING CABLE

A. Immediately after cable placement, a permanent identification tag shall be attached to visible cable sections. Cables shall be checked to ensure that the markings are intact.

B. Cables and equipment shall be supported and secured. Supports and fasteners shall be used to secure cables and equipment in position. Metallic supports and fasteners shall have a corrosion resistant finish. All cables shall be routed along the interior sides of manholes. Maintain manufacturer's specified minimum bend radius. Cables shall not be kinked during installation.

C. Corrosion resistant clamps and straps shall be used as necessary to properly secure the cable.

3.6 BENDING

A. Caution shall be used when bending cable to avoid kinks or other damage to the sheath. Bend radius shall be as large as possible with a minimum of 20 times cable diameter. Minimum radius shall be increased when necessary to meet cable manufacturer's recommendation. Cables shall not rest against any sharp edges.

3.7 CABLE PULLING 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 are not allowed.

3.8 CABLE PULLING

A. Pulling lines shall be attached to both cable ends when cable is destined for bi-directional pull, and fitted with factory-installed pulling eyes where possible. Cables not equipped with a pulling eye shall have the pulling line attached to the cable end by means of a cable grip. Core hitches shall not be used.

B. Cable reels shall be located and aligned so that the cable is paid out from the top of the reel by rotating the reel in the feed direction at the rate of pull into the duct or conduit in a long, smooth bend without twisting. Cable shall not be paid out from the bottom of the reel or by pulling. A cable feeder guide of proper dimensions shall be used at the mouth to guide the cable into the duct or conduit.

C. Rigging shall be set up at the pulling end so that the pulling line and cable exit on a line parallel with the duct or conduit to prevent either from rubbing against the edge or mouth. Cable ends shall not be pulled around sheave wheels. When the sheave or pulley cannot be positioned to obtain sufficient cable end slack for proper racking and splicing with the pulling line attached to the end of the cable, a split cable grip may be used to obtain the necessary slack.

D. All equipment and the pulling set shall be checked to minimize interruptions once pulling begins. Cable shall be paid out without stopping until the required amount of the cable has been placed. If the pulling operation is halted before the pull is completed, the tension of the pulling line shall not be released. When pulling is resumed, the inertia of the cable shall be overcome by increasing the tension in small steps a few seconds apart until the cable is in motion.

E. Pulling tension shall not exceed 500 lbs or cable manufacturer's recommendation, whichever is less.

3.9 DAMAGE AND DEFECTS

A. Contractor shall use a tension monitoring device to ensure that the maximum pulling tension that may be applied to the cable to be pulled into a conduit section is not exceeded. Contractor shall replace cable if cable manufacturer’s maximum pulling tension is exceeded at any time during a pull.

B. Cable shall be carefully inspected for sheath defects or other irregularities as it is paid out from the reel. When defects are detected, pulling shall stop immediately and the cable section shall be repaired or replaced. A system of communications shall be maintained between pulling and feed locations so that pulling can be stopped instantly, when required.

C. Cable shall be hand guided through intermediate pull points and into the next duct section when making pull-throughs. Proper rigging shall be used in the intermediate pull points to keep the pulling line and cable aligned with the exit duct to prevent the line or cable from rubbing against the edge of the duct. Cables in intermediate pull points shall be set up and/or racked before the cable ends in adjacent manholes are set up and/or racked.

D. Cable ends pulled into manholes, vaults, pull boxes, or terminal locations that are not to be racked or otherwise permanently positioned immediately shall be tied in fixed positions to prevent damage to the cables and provide adequate working space.

E. Adequate care shall be exercised when handling and storing reels of cable to prevent damage to the cable. Cable with dents, flat spots, or other sheath distortions shall not be installed.

3.10 SEAL

A. Ducts or inner ducts in which cable is placed shall be sealed with urethane foam duct seal. This material shall be inserted between the cable and the duct or inner ducts of which it is in, between the inner ducts and the duct, and in all unused inner ducts, in order to prevent damage to the cable sheath and to prevent the entrance of dirt or water into the manhole or vault.

3.11 TESTING

A. Upon receipt of fiber, verify in factory test reports that all fiber cables tested good prior to shipping.

B. Perform in-place testing of all installed, terminated fibers in accordance with TIA/EIA OFSTP-7 and OFSTP-14 methods. Document and submit all tests results in accordance with specifications.

C. Multi-mode Testing:

1. Perform optical power loss measurements in accordance with TIA/EIA Standard OFSTP-14 using method C. In addition, perform OTDR testing on multi-mode fiber in accordance with tester manufacturers procedures and examine traces for events indicating faults or flaws which may effect network performance.

    a. Method C: Using an Optical Loss Test Set (OLTS) with hard-copy and disk output capability to test each installed multi-mode permanent link fiber from both directions at 850 and 1300 nm.

    b. Using an Optical Time Division Reflectometer (OTDR) test each installed fiber from both directions at 850 and 1300 nm for multi-mode fiber permanent link, minus patch cords.

    c. Calculate and document test results in accordance with TIA/EIA Standard OFSTP-14.

D. Single-mode Testing:

1. Perform optical power loss measurements in accordance with TIA/EIA Standard OFSTP-7 using both methods A.3 and B.

    a. Method A.3: Using an Optical Loss Test Set (OLTS) with hard-copy and disk output capability to test each installed single-mode permanent link fiber from both directions at 1310 and 1550 nm.

    b. Method B: Using an Optical Time Division Reflectometer (OTDR) test each installed fiber single-mode permanent link fiber from both directions at 850 and 1300 nm.

E. Provide a graph which indicates the attenuation and distance of each optical fiber for each test performed. The OTDR and associated software shall be Tektronics TFP2 FiberMaster OTDR with FiberMaster Trace Analysis Package or approved equal. Note on each page of test output:

1. Date and Time

2. Test Location

3. Test Technician’s Name

4. Test Equipment Used

5. Cable number

6. Strand number
7. Strand Color
8. Direction of Test
9. Attenuation
10. Length

F. Test each strand in both directions and produce a graph for each direction. At completion of the project, provide photocopies of the OTDR and OLTS printouts on 8.5" x 11" pages. Also provide output data on CD and submit to ANC at project closeout.

G. Test jumpers shall be of the same fiber core size and connector type as the cable system.

H. The power meter and the light source shall be set to the same wavelength.

I. The light sources, OTDR or OLTS shall operate within the ranges of operation specified for 850 nm, 1300 nm, 1310 nm and 1550 nm in accordance with TIA/EIA-526-14 and TIA/EIA-536-7, or the manufacturer's recommendation whichever is the more stringent. Power meters shall be calibrated and traceable to the National Bureau of Standards.

J. All system connectors, sleeves and jumpers shall be properly cleaned before measurements are taken.

K. All testing shall be certified as passing testing standards established by TIA/EIA specification for fiber optic cable.

L. Test Reports

1. Contractor shall submit optical fiber test results for each fiber installed. Optical Time Domain Reflectometer (OTDR) Optical Loss Test Set (OLTS) output test result graphs shall be provided for each fiber installed on 8.5" x 11" pages. Also provide output data on CD. The OTDR CD files shall be for use with the OTDR analysis package software. If equipment or software used is incompatible with ANC's OTDR analysis software, a copy of the OTDR analysis package software, licensed to the Owner, shall be delivered to ANC upon completion of the project.

END OF SECTION

SECTION 16748

COMMUNICATIONS CABLE MANAGEMENT DOCUMENTATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes: General requirements of procedures and documentation for Tenant space communications systems infrastructure at Ted Stevens International Airport, hereafter referred to as “ANC”.

B. Tenant communication systems infrastructure shall be labeled and documented by the Tenant in compliance with this Section and related Sections. Documentation shall be submitted to ANC for registration and inventory in ANC’s cable management system (CMS).

C. ANC or its agent will use the CMS to inventory communication cable plant and associated infrastructure throughout Tenant and the airport facilities. ANC’s CMS database will inventory all communication systems infrastructure including backbone cable plant and cross-connects to horizontal wiring feeding tenant space.

D. ANC is requiring Tenants to submit detailed information on communication infrastructure residing in tenant space, primarily for the following reasons:

1. The computerized tracking of cable plant offered by CMS will be used to increase the quality of service for tenants through increased efficiency of tracking circuits and troubleshooting faults.

2. The 2002 edition of the National Electric Code (NEC) mandates that the type of cable plant referenced in this Section must be terminated, labeled, and considered operational and being used by the tenant. Any unused or abandon cables must be removed or the local Fire Marshal may impose fines for violation of fire codes.

1.2 SCOPE OF WORK

A. Provide complete communication system identification, submitted in a labeling format compatible with ANC’s Cable Management System (CMS). Refer to ANC Telecom Standard Details for labeling scheme.

B. Provide complete communication system drawings, submitted in AutoCAD format compatible with ANC’s Cable Management System (CMS).

1.3 QUALITY ASSURANCE

A. All Tenant owned communication system infrastructure shall be labeled and identified in submittals to ANC. Cabling and associated infrastructure installed but not submitted to ANC shall be removed.

B. All Tenant owned communication system infrastructure shall be illustrated in drawing submittals. Drawings shall be accurate to +/- 0.5 feet of actual installed location. Communication cabling and associated infrastructure installed but not indicated on drawings submitted to ANC shall be removed at the Tenant’s expense.

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.

B. National Electric Code (NEC) 2002 Edition, specifically defined in the following articles:

1. Article 640 – Audio Speaker Wires
2. Article 645 – Information Technology
3. Article 745 – Power-Limited Circuits
4. Article 760 – Fire Alarm Systems
5. Article 770 – Optical Fiber Cables
6. Article 800 – Communication Circuits
7. Article 810 – Radio, Television or Satellite
8. Article 820 – Coaxial cable
9. Article 830 – Network-Powered Broadband

C. Telecommunications Industries Association/ Electronics Industries Association (EIA/TIA)

1. TIA/EIA 606A: The Administration Standard for the Identification and Labeling of Telecommunications Infrastructure in Commercial Buildings.
2. TIA/EIA 607A: - Administration Standard for the Telecommunication Infrastructure of Commercial Buildings.
3. TIA/EIA 568B - Commercial Building Telecommunication Standard.
4. TIA/EIA 569 -Commercial Building Standard for Telecommunication Pathways and Spaces.

D. Related Terminal Construction Standards Sections:

1. 16111 – Conduit and Fittings
2. 16115 – Cable Tray
3. 16131 – Outlet Boxes
4. 16450 – Grounding
5. 16745 –Telecommunications Copper Cable Distribution
6. 16747 –Telecommunications Fiber Optic Distribution

1.5 SUBMITTALS TO BE FURNISHED TO ANC BY THE TENANT

A. Provide communication systems infrastructure manufacturers product description cut-sheets.

1. Submit 3 copies of Product Manual: Loose leaf, three ring binder.
2. Manuals shall include a cover identifying tenant space occupant, installing Contractor and date of submittal.
3. Manuals shall include labeled section tabs identifying categories of products

B. Provide communication systems infrastructure identities and labeling schedules in a format compliant with the CMS database.

1. Submit 3 copies of schedule spreadsheets (Hardcopy): Loose leaf, three ring binder.

2. Hardcopy schedules shall include a cover identifying tenant space occupant, installing Contractor and date of submittal.

3. Submit 2 electronic file copies (softcopy) of schedule spreadsheets saved in a .CSV (Comma Separated Value) format on CD media. Coordinate with ANC and CMS manufacture (iTRACS) for exact format requirements, which include header rows assignments and related spreadsheet setup requirements.

4. Softcopies of schedules shall include jewel cases with cover identifying tenant space occupant, installing Contractor and date of submittal

C. Provide communication systems infrastructure drawings in a format compliant with ANC's CMS AutoCAD revisions and CAD Standards.

1. Submit 3 copies of full size drawings (Hardcopy):

2. Hardcopy drawings shall include a cover sheet identifying tenant space occupant, key plan of portion(s) of ANC illustrated in drawing set, installing Contractor and date of submittal

3. Submit 2 electronic file copies (softcopy) of drawings saved in AutoCAD format compatible with current AutoCAD version in use at ANC.

4. Softcopies of drawings shall be master files used to produce hardcopy drawings. Include jewel cases with cover identifying tenant space occupant, installing Contractor and date of submittal

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. General: ANC's CMS is standardized on the following software package. Softcopy submittals shall be fully compliant with data import format requirements of the CMS:

1. iTRACS: 1501 W. Fountainhead Parkway, Suite 190, Tempe, AZ, 85282. Phone: 480-557-8000, Email URL for technical support: support@itracs.com

2.2 SAMPLE SPREADSHEET FILE FORMAT

A. The following table is a sample of the type of format the tenant shall use for documentation of communication infrastructure. The exact format and identities shall be coordinated with ANC.

	A	B	C	D	E	F	G	H
1	Column Group	1	1	1	2	2	3	3
2	Action	u	u	u	u	a	u	u
3	Connections							
4	Class/Category	Active Equip	Blade	Port	Store	Patch Cable	Patch Panel	Position
5		Switch 1	B1	Port 01	Links	Patch1	PP 1	12
6		Switch 1	B1	Port 02	Links	Patch2	PP 1	13
7		Switch 1	B1	Port 03	Links	Patch3	PP 1	14

2.3 MANDATORY INVENTORY ITEMS

A. The following list includes tenant installed communication infrastructure items/identities considered mandatory for inclusion in the documentation submittals to ANC.

1. Building Name
2. Building Floor
3. Communication Room
4. Racks
5. Patch Panels
6. Patch Panel Ports
7. Data/Telephone Outlets
8. Copper and fiber cables: backbone, horizontal, riser, and inter-building cables.
9. Cable topologies and capacities.
10. Pathways between termination points.
11. Telecommunications bonding and grounding.

2.4 TENANT'S OPTIONAL INVENTORY ITEMS

A. General.

1. Each tenant may (at the tenants option) include submittal of additional communication infrastructure information for the purpose of tracking and documenting detailed information. Additional information may offer the tenant troubleshooting tools to increase operational efficiency.

B. Optional Tenant CMS Inventory Items

1. Circuit assignments
2. IP addresses
3. Telephone subscriber line numbers
4. Workstations and other devices.
5. Switches, routes, hubs and other transmission equipment port assignments

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to installation of communication infrastructure cabling, pathways and associated products, the tenant shall submit sample copies of softcopy documentation formats for review by ANC.

B. Documentation shall comply with this and related Sections.

3.2 CABLE AND OUTLET LABELING

A. Cable and outlet labeling shall comply with Appendix C – ANC Telecommunications Cable/Outlet Labeling Standards.

END OF SECTION

SECTION 16770

AIRPORT PAGING ANNOUNCEMENT CONTROL SYSTEM

PART I - GENERAL

1.1 SUMMARY

A. This section describes the requirements for the installation of Airport Paging Announcement Control System (PACS) equipment at ANC. ANC will provide programming and configuration of the PACS. The PACS is being installed in the South Terminal as part of the Concourse C Phase 2 Building Completion Project.

B. Contact ANC for paging system requirements in the North Terminal.

C. Only microphone stations in Concourse C will have access to all system functions (e.g., Flight Announcement System). Other areas of the South Terminal will have access to paging zones only throughout the South Terminal via telephone handsets. Microphone paging stations will be provided in the rest of the South Terminal as part of the Phase 3 South Terminal Renovation Project after completion of the Concourse C Phase 2 Building Completion Project.

D. Note that microphone paging stations can be provided elsewhere in the South Terminal (other than Concourse C) prior to the Phase 3 project, however, this will require routing the microphone station cabling from the microphone station back to the PACS headend equipment located in the Main Telecom Room (MDF) in the basement of Concourse C. Contact ANC for additional information.

E. Tenant shall coordinate PA System Input/Output Zones with ANC and receive approval from ANC.

1.2 SYSTEM DESCRIPTION

A. The Paging Announcement Control System (PACS) is a multifunction system that utilizes microprocessors and appropriate digital processing to control the system's operation and controls.

B. The microprocessor manages and controls all system functions and hardware including 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.

C. The complete PACS is comprised of several subsystems, that form a complete system for airport announcement and message management.

1. Networked Industrial Pentium Computer with Microsoft Windows® software-based graphic user interface (GUI) input setup screens for user configuration and control.

2. Networked Computer based Paging Announcement Control System (PACS).

3. Networked Industrial Pentium Computer(s) for Courtesy Announcement System workstations.

4. Multi-bus Digital Recording and Playback system.

5. Ambient Noise Analysis system.

6. Equalization System.

7. Automatic Test and Monitor system.

8. Microprocessor based Microphone Paging Stations.

9. Networked Visual Information System (VIS) (graphic display signs) to meet the requirements of the Americans with Disabilities Act (ADA).

10. Comprehensive Flight Announcement Software for announcement control and multi-lingual messages.

11. Comprehensive Courtesy Announcement System Software with synchronized recorded voice and visual text playback capability.

12. Redundant Power Supply systems.

13. Power Amplifier systems.

1.3 QUALITY ASSURANCE

A. All PACS equipment shall be UL Listed.

B. The basic system and related peripheral equipment for the Paging Announcement Control System is Innovative Electronic Designs, Inc., (IED) Model ACS500 and associated components.

C. Common system components such as speakers, visual display screens and cabling shall match existing equipment provided in the Concourse C Phase 2 Building Completion Project.

D. All materials and equipment shall be new and currently in production. The latest available model of each component shall be furnished, whether or not specifically specified.

E. The installer shall have been regularly engaged in the installation of electronic audio systems for a minimum of five (5) years.

F. While under warranty all work on the system shall be accomplished by the original equipment installer to preserve the system warranty. Contact ANC for information regarding status of the warranty.

G. System components generating electromagnetic interference or radio frequency interference (EMI/RFI) shall be designed and constructed in accordance with IEEE 299 and CFR 47, Part 15.

1.4 SHOP DRAWINGS

A. ANC will update and maintain Shop Drawings for the system. Provide all required information to ANC to allow shop drawings to be properly updated and maintained (loudspeaker types/locations, microphone types/locations, cabling types/routing, termination locations/designations, etc.).

1.5 RECORD DRAWINGS

A. Keep up to date "As-built" record drawings at the job site detailing the layout of equipment and terminations, including a typed listing of cables/rooms served by each terminal block. Refer to Section 16010 for other Record Document requirements.

B. At the completion of construction and testing and after acceptance of the completed Tenant-area system, record drawing information shall be submitted to ANC. ANC will update the master Record Drawings for the entire system.

1.6 PERFORMANCE REQUIREMENTS

A. Paging Announcement Control System (PACS): The PACS includes microprocessor control for up to 120 microphone page stations and 120 zone outputs. All microphones are assignable

to any combination of the output zones. Assignments may be readily changeable by qualified authorized personnel.

B. The basic system is expandable up to 600 microphone stations and 600 total zone outputs.

C. The PACS processors and the microcomputer control stations are networked on standard 10/100 Mb/s Ethernet hardware to support common and remote control of all system features.

1. Priority Levels: Announcement and messages shall be processed and dispatched based upon defined levels of priority. These priority levels are established as follows:

Priority Level	Message Type
1	Emergency Direct Announcement
2	Emergency Message
3	Local
	Multi Local Zone Group Announcement
	Multi Local Zone Group Message
	Local Zone Group Announcement
	Local Zone Group Message
4	Terminal
	Terminal Zone Group Announcement
	Terminal Zone Group Message
5	Background Music

2. Multiple emergency announcements may be made at one time if no zone conflicts for that class of announcement exists. Regardless of zone assignments, the emergency announcement immediately suspends all other announcements and messages. An emergency announcement or message shall interrupt and prevent any other use of the affected zones until completed or cancelled.

3. A local or multi-local announcement shall not prevent a terminal announcement from playing, but it shall interrupt and override the terminal announcement in the zones that have been assigned to its use.

D. Microphone Paging Stations: Microphone stations shall originate announcements into zone groups. ANC will make these group determinations. Coordinate with ANC to determine required paging zones for each paging station. Any microphone page station shall be capable

of being programmed into any zone group. Microphone stations shall be capable, when so programmed of making emergency zone group announcements, terminal zone group announcements, local zone group announcements, and multi local group announcements.

E. Microphone stations so equipped and programmed, shall be capable of performing any or all of the control functions for pre recorded and assembled messages. These control functions shall include initiating a playback sequence, stopping a playback sequence, recording a message, monitoring a message, or playing back a message to its own multi local group, or to a terminal zone group instead of to the zone map assigned to that message. (Note some functions are limited to full function page stations only).

F. The microphone stations shall include a microphone; either handheld or gooseneck mounted type. Each microphone station shall have buttons for zone group selection to activate that microphone station for announcements into preprogrammed zones. Green and Red LEDs shall indicate ready or busy respectively. Any 5 second pause after the green LED has illuminated shall terminate the announcement. Each station shall include its own microphone preamplifier, test oscillator, compressor, and balanced output line amplifier for driving long lines without appreciable high frequency loss. The PACS microprocessor, under software control shall continuously interrogate all of the following:

1. Full Function Page Stations: Full function page stations shall have a (12) button keypad for data entry, a LCD digital display and ready/busy LEDs. Non-announcement functions shall include keypad disable/enable, self-test, and setup.

2. Limited Function Page Stations: Limited function page stations shall have (4) zone group select buttons and ready/busy LEDs. Models with handheld microphones shall have the capabilities of using a push-to-talk button on the microphone as a fifth zone select button. Each button may be assigned to any zone group, message type, or prerecorded message function.

3. Expansion Page stations: An expansion page station shall act as a slave to a full function or limited function page station. Up to (3) expansion page stations may be connected to a full function or limited function page station and shall follow the function of the mic switch assignment.

4. Telephone Interfaces: The telephone interface shall include DTMF decoding for connection to the telephone system. Function shall be similar to the full function page stations with the exception that no LCD display is available nor functions that require LCD prompting.

5. Operation: When a page station initiates an announcement, the system shall assign it to an open DRP channel. The ready (green) LED shall be illuminated on the page station and the announcement recorded. The ready LED shall begin to flash 5 seconds before the end of the record time. The announcement shall be played back if the microphone switch or announcement button is released prior to the end of the record time. If the microphone switch is pressed and held during a 5-second silence period, the announcement shall be cancelled when the green ready LED goes off. The announcement shall playback automatically, to the selected zones, in its assigned queue position.

6. The busy LED (red) shall illuminate on the page station when all DRP channels are busy. The microphone station shall be able to select a desired zone group when all DRP channels are busy. The busy LED shall flash acknowledging acceptance of the station into the queue (first in, first out). When the station reaches the top of the queue, the station beeper shall sound and the ready LED shall illuminate signaling the station can proceed with its announcement recording.

G. Permanent Digital/Record Playback System (PDRP): The PDRP system is capable of recording, storing and playback of permanent messages via the DRP system. The system

allows up to (8) messages to be played at one time. Message "takes" are stored in nonvolatile memory. Multilingual capabilities are available to allow a minimum of (8) different languages.

1. Operation: Two types of permanent messages are provided; standard and assembled.

    a. Standard messages include:

        1) Emergency evacuation announcements and instructions.

        2) Public service announcements (no parking, no smoking, etc.)

        3) Regulatory announcements such as do not leave bags unattended, etc.

        4) Other institutional messages.

    b. Standard messages are assignable to any zone or zones and may be initiated by any assigned paging station or scheduled for play by the quartz controlled system clock. Each message may be up to 16 takes long.

    c. Assembled messages allow message "takes" or phrases to be "assembled" in real time to create a complete message. Assembled messages allow dynamic information provided by the user or a database to be included within the message to provide for specific information or instructions. These may include:

        1) Flight boarding announcements.

        2) Flight arrival and bag claim announcements.

        3) Gate change announcements.

        4) Delayed flight or cancelled flight announcements.

H. Ambient Noise Analysis System (ANAS): The ANAS system adjusts signal levels in response to either ambient noise levels or computer commands. Three (3) modes of operation are possible:

1. Automatic: Changes attenuation levels in response to noise levels reported by remote sensors.

2. Controlled: Changes attenuation levels based on remote sensors of an automatic channel.

3. Fixed Attenuation: Fixed attenuation as set by the computer and user.

I. Automatic Test and Monitor: The automatic test and monitor system (ATMS) provides for self-diagnostics that operate in real time under software control. This self-testing includes testing of logic, audio operation, power supplies, power amplifiers, wiring, loudspeakers and network communications.

J. Visual Information System (VIS): The Visual Information System (VIS) interface with the Paging Announcement Control System(s) provides automatic visual messages in text form on display devices simultaneously with audible prerecorded/assembled messages generated by the PACS.

K. Courtesy announcement workstations are provided in several locations in the C Concourse to allow creation, dispatch, and logging of courtesy paging announcements.

L. Power Amplifiers: The power amplifiers are of a modular design using slide in amplifier cards installed in a mainframe. ANC will provide additional amplifiers if required.

M. 1/3 Octave equalization is provided for all zones. ANC will provide additional equalizers if required.

N. Paging Announcement Control System Software: The PACS is software controlled using Microsoft Windows® based programming. The software can support:

1. Digital Recording and Playback of announcements for queuing and distribution
2. Full operational control of the Automatic Test and Monitor System (ATMS)
3. Full operational control of the Ambient Noise Analysis System (ANAS)
4. Support for Flight Announcement System Software
5. A Multilevel password control system is provided that establishes a password account for each individual. A person of a given level can only assign access and passwords to a person of an access level equal to or lower than his own. Each feature of the system is individually assignable/limited to each individual. The password system keeps a program log of the last 500 log-ins to the system. This log includes the individual, date, time, and type of actions taken.

O. Flight Announcement System Software: FAS software operates in conjunction with the PACS Software. It is designed to assemble and dispatch all normal announcements related to flight arrivals, departures, boarding and baggage information from prerecorded message segments.

1. The system user shall only be required to select a message and key in variable information as prompted via the microphone paging station keypad. The software has the ability to assemble and play the messages in up to (8) languages.
2. A database has been provided to store dynamic airline information including Cities, Flight Numbers, Airlines Names, Days of Operation, Languages, Boarding Row Groups, Airline Slogans, Frequent Flyer Programs, Mileage, etc. The database shall be updateable by airline personnel using secure passwords to reach only their airline specific information. ANC will provide additional information upon timely request.
3. The system has the ability to input new flight information in advance and establish an effective date for implementation.

P. Courtesy Announcement System Software: CAS software provides for management of messages and courtesy paging. The software provides the ability to:

1. Create templates for various message types.
2. Record message requests into a database
3. Create visual messages and play them through the Visual Information System in synchronization with the audio message.
4. Retrieve message requests from the database at any Courtesy Announcement Workstation and delete them after they are fulfilled.
5. Maintain a log of person's name, receiving operator, dispatching operator, date, number of plays and time of plays.

PART 2 - PRODUCTS

2.1 PAGING ANNOUNCEMENT CONTROL SYSTEM

A. The PACS is a modular mainframe system with plug in circuit cards to allow custom configurations. ANC will provide circuit cards as required to meet the functional requirements of the system. Tenant shall clearly communicate requirements in a timely manner to allow ANC time for procurement and installation.

B. Modular, slide in power supplies provide load sharing and full redundancy.

C. An industrial microcomputer provides for the user interface and monitor/test reporting. It is a rack mount unit with rack mounted SVGA monitor, keyboard, mouse, and locking keyboard drawer. It includes network and interface cards as necessary to interface to and control the system(s). The computer includes networking software to allow any computer to log-in and control any ACS in multiple computer/ACS installations.

D. Video/Keyboard/Mouse Switcher: A 6x1 master CPU switcher allows rack mounted monitor, keyboard and mouse to interface with all system CPUs.

E. Network Interfaces: Network interfaces network the ACS(s), microcomputer(s), sign server(s), advertising computer, flight announcement computer and courtesy announcement work stations. Networking is IEEE Standard 802.3 10/100 Mb/s Ethernet, via the building Category 5e UTP copper cable system.

2.2 PAGING STATIONS

A. Limited Function Page Stations: Limited function page stations shall have (4) zone group select buttons and ready/busy LEDs. Mounting configurations shall be; horizontal or vertical orientation, flush or surface mount, desktop, or locking door enclosure. Microphone options shall be handheld or gooseneck.

1. Acceptable Products:

a. IED Series 500 Microphone Page Stations.

b. Model and quantity as required.

B. Full Function Page Stations: Full function page stations shall have a (12) button keypad for data entry, a LCD digital display and ready/busy LEDs. Mounting configurations shall be; horizontal or vertical orientation, flush or surface mount, desktop, rack mount (with or without powered speaker), or locking door enclosure.

1. Microphone options shall be handheld or gooseneck.

2. Acceptable Products:

a. IED Series 508 Microphone Page Stations.

b. Model and quantity as required.

C. Expansion Page Stations: An expansion page station shall act as slave to a full function or limited function page station.

1. Acceptable Products:

a. IED 500FME Microphone Page Stations.

b. Model and quantity as required.

D. Page Station Enclosures: Wall mounted microphone page stations shall be installed in flush mounted, locking door enclosures.

E. Individual Password Access: Full function paging stations shall be capable of being programmed with individual password access accounts, for use by multiple users at varying levels of access (e.g., User 1 – local paging only, User 2 – local and all-call, etc.)

F. Telephone Interfaces: The telephone interface shall include DTMF decoding for connection to the telephone system.

1. Acceptable Products:

a. IED 508T-1 (1 Channel) or 508T-2 (2 Channel).

b. Model and quantity as required.

2.3 PERMANENT DIGITAL RECORD AND PLAYBACK

A. Provides permanent message capability.

2.4 AUTOMATIC TEST AND MONITOR SYSTEM

A. The (ATMS) provides for self-diagnostics that operate in real time under software control. This self-testing includes testing of logic, audio operation, power supplies, power amplifiers, loudspeaker wiring and loudspeakers.

2.5 AMBIENT NOISE ANALYSIS SYSTEM

A. The ANAS system consists of a modular mainframe that accepts a power supply, CPU card and up to (11) channel input cards. Tenant shall provide remote ambient sensors and cabling back to Remote Terminal Cabinets in Equipment Rooms. ANC will determine sensor requirements and required mounting configurations.

B. Remote Sensors shall be one of the followings as determined by ANC:

1. IED 540S-2 Sensor on 2 Gang Plate.

2. IED 540S-8 Sensor in 8 inch Speaker Basket.

2.6 VISUAL INFORMATION SYSTEM

A. The VIS consists of multicolor displays, RS485 router, a Pentium class computer called a sign server and a Pentium class computer called the advertising computer. Tenant shall provide multicolor displays and cabling back to ANC provided router in Equipment Room. ANC will determine display requirements and required mounting configurations.

B. The displays shall support still or moving text, graphics and animated images that are in compliance with the Americans with Disabilities Act (ADA). Minimum Specifications shall be:

1. Displays for indoor use shall have minimum viewing angle of 160 degrees

2. Brightness: 450 cd/m^2 (amber green) and 550 cd/m^2 (red)

3. Block Matrix shall be 160 pixels wide X 64 pixels high.

4. Character height:

Single line	15.1"
Two lines	7.32"
Three lines	4.72"
Four lines	3.54"
Eight lines	1.65"

5. Display Brightness: 4 levels.

6. Acceptable products:

a. IED 500CVIS Display System, or approved equal

C. Sign Server: The sign server is a networked Pentium class rack mounted computer.

D. Advertising Computer: The Advertising computer is a networked Pentium class desktop computer

2.7 POWER AMPLIFIERS

A. The power amplifiers are a modular design using slide in amplifier cards installed in a mainframe. ANC will provide additional amplifiers if required.

2.8 EQUALIZATION

A. 1/3 Octave equalization is provided for all zones. ANC will provide additional equalizers if required.

2.9 UNINTERRUPTIBLE POWER SUPPLY (UPS)

A. An UPS system provides power to all equipment controlled by CPUs.

2.10 REMOTE TERMINAL CABINETS

A. Remote Terminal Cabinets are located in Equipment Rooms adjacent to Telecom Rooms (TRs/IDFs) in the C Concourse for termination of microphone, loud speaker and ambient analysis sensor circuits.

B. Existing cabinets typically have spare terminal capacity. If new terminal cabinets are required they shall match existing cabinets.

C. Terminal strips are mounted in vertical column(s) using machine thread screws.

D. Provide screw mounted cable tie mounts between columns of terminal strips and along the perimeters of the cabinet interior for the neat dressing and securing of conductors.

2.11 TERMINAL BLOCKS

A. If additional terminal space is required provide DIN rail mounted, compression clamp type terminal blocks to match existing in remote terminal cabinets and on terminal backboards for termination of PA system cabling.

2.12 CABLES

A. Microphone and Line Level Cables in Conduit: 22 gauge, 1-pair, with 100% overall shield and tinned copper drain wire, Belden 8451, or approved equal. Provide cables with distinctly different colored outer jacket for microphone audio cables and power/control cables.

B. Microphone and Line Level Cables in Rack: 22 gauge, 1-pair, with 100% overall shield and tinned copper drain wire, Belden 8451, or approved equal. Provide cables with distinctly different colored outer jacket for microphone audio cables and power/control cables.

C. Loudspeaker Circuits: 14 gauge, 1 twisted-pair, copper conductors with 100% overall shielded and 16 gauge drain wire, Belden 8720, or approved equal.

D. Ambient Analysis Sensor Circuits: 22 gauge, 1 twisted-pair, copper conductors with 100% overall shielded and 22 gauge drain wire, Belden 8761, or approved equal.

2.13 LOUDSPEAKER ASSEMBLIES

A. Type A: Eight-inch diameter flush ceiling mounted coaxial Loudspeakers shall match existing.

B. Type B: Eight-inch diameter pendant ceiling mounted coaxial Loudspeakers shall match existing.

C. Type D: Flange mounted double reentrant loudspeakers with compression driver mounted in framed speaker recess with flush round stainless steel or brushed aluminum grille to match column cladding finish material shall match existing.

D. Type E: Eight-inch diameter surface wall mounted coaxial Loudspeakers shall match existing.

E. Type F: Flush ceiling mounted outdoor double re-entrant type Loudspeakers shall match existing.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Provide all microphone stations, telephone interfaces, loudspeakers, ambient analysis sensors, station/speaker/sensor cabling and cabling terminations at Remote Terminal Cabinets in Equipment Rooms. ANC will provide all central system equipment and programming. Provide all Visual Information Displays and cabling back to Equipment Rooms. ANC will provide all routers, central system equipment and programming.

B. All equipment shall be firmly held in place. This shall include loudspeakers, enclosures, cables, etc. Fastenings and supports shall be adequate to support their loads with a safety factor of at least three. Connectors shall be clearly, logically and permanently marked. Wires and cables shall be identified at every termination and connection point with permanent type markers in accordance with existing standards. Equipment shall be shock isolated for seismic conditions according to codes and regulations.

C. Recessed ceiling mounted loudspeakers shall be securely attached to the building structure or the T-bar ceiling structure and shall not depend on the ceiling tiles for support. Provide tile bridges, hanger bars, etc., as required to support fixtures. In addition, in suspended T-bar ceiling areas provide a minimum of one dedicated support wire to each speaker backbox for seismic support independent of ceiling

D. All PA system wiring shall be in conduit.

E. Provide cables (circuits) as required by the application. Cables shall be routed via PA system Remote Terminal Equipment cabinets in Equipment Rooms in the C Concourse.

F. ANC will provide simplified step by step paging station operating instructions on placard or laminated instruction sheet.

G. Take such precautions as are necessary to prevent and guard against electromagnetic and electrostatic hum and to install the equipment so that it may be safely operated.

H. Care shall be exercised in wiring, so as to avoid damage to the cables and to the equipment. All joints and connections shall be made with rosin-core solder, or with approved mechanical connectors. All wiring shall be executed in strict adherence to standard broadcast practices.

I. The installation of all work shall be neat. Boxes, equipment, etc. shall be plumb and square.

J. Freedom From Buzzes, Rattles and Objectionable Distortion: ANC will apply a slow sine-wave sweep from 50 to 10,000 Hz at a level of 6 dB below rated power amplifier output voltage. Listen carefully for buzzes, rattles, and objectionable distortion (each major loudspeaker system shall be tested individually). Correct any causes of these defects, unless the cause is clearly outside the sound amplification system equipment and installation, in which case the cause shall be brought to the attention of ANC.

3.2 TESTS AND ADJUSTMENTS

A. ANC will perform final Testing and adjustment of the completed paging system as follows:

1. Provide personnel to assist in testing.

2. Provide written notification to ANC when installed equipment is ready to test. Provide minimum of 10 days notice of desired time for tests.

3. ANC will test the audio system for proper operation and adjustment in accordance with existing system and Manufacturer's requirements. As a minimum, the tests will include:

    a. Proper operation of system interfaces.

    b. Measured impedance of loudspeaker circuits.

    c. Measured hum and noise levels of the system for each microphone and line-level input channel.

    d. Measured electrical distortion of the system for each line-level input channel.

    e. Measured sound pressure level of each loudspeaker, on-axis at 5'-0" AFF using pink noise.

    f. Measured sound pressure level uniformity of coverage for each zone or area.

    g. Polarity check of loudspeaker circuits.

    h. Ensure that all systems are free of spurious oscillation and radio frequency pickup when system is quiescent (absence of audio input signal) and when system is driven to full output at 100 Hz.

    i. Adjust, align and balance all equipment in accordance with manufacturer's specifications.

B. Schedule and coordinate all system tests and initial level adjustments when the installation is complete and the area is unoccupied. Final wall, floor and ceiling finishes shall be in place and the Contractor's tools and equipment shall be for the most part removed from the area.

C. Demonstrate operation of each major component and of the complete installation, using all microphone positions and all other inputs, under all operating conditions required by ANC.

D. Listening tests shall include subjective tests by observers at various positions, listening under various operating conditions.

E. To meet the minimum performance requirements the Tenant shall be responsible for:

1. Use of equipment in the manner specified, each component's conformance with its manufacturer's published specifications, and other requirements as stated herein.

2. If these tests show that the equipment is in any way defective or at variance with the requirements of these specifications, the Tenant shall make any changes necessary at his expense. The Tenant shall also pay the expenses of any subsequent testing required to demonstrate compliance with these requirements.

3. If the need for further adjustments becomes evident during the demonstration and testing, the work shall be continued until the installation operates properly to the satisfaction of ANC.

END OF SECTION

SECTION 16920

POWER MONITORING AND CONTROL SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. This section describes requirements for the Power Monitoring and Control System at ANC. The system is being installed in the South Terminal as part of the Concourse C, Phase 2 Building Completion Project. Power monitoring devices shall be provided as noted below for distribution equipment installed at ANC (North and South Terminal).

1.2 GENERAL DESCRIPTION

A. Work under this section includes providing Power Monitoring and Control System equipment to provide the following functionality:

1. Monitoring of the electrical system status, including alarm conditions.
2. Gathering and storage of load information for general administration of the electrical system.
3. Detailed analysis and trouble-shooting of the electrical system, including harmonics analysis, waveform capture and analysis, etc.
4. Energy and demand metering of multiple tenants for revenue purposes.

B. Two existing Personal Computer Workstations provide for storage of collected data, system operation and running the analytical software.

C. System information shall be transmitted to and integrated into the Building Automation System Controls Supervisory System. ANC will provide all interfacing required (cabling, device communication interface hardware and programming).

1.3 SYSTEM DESCRIPTION

A. Furnish and install Power Monitoring and Control System (PMCS) equipment as described in these specifications. The existing system includes remote devices for monitoring, control and protection, device communication interface hardware, inter-communication wiring, personal computer workstations, software, interfacing, printer, and ancillary equipment.

B. The existing PMCS is a Square D Powerlogic system. All new equipment shall be Square D Powerlogic to match existing.

C. The existing PMCS utilizes Ethernet as the high-speed backbone network.

D. Each Personal Computer Workstation (PCW) connected to the network has equal access to information provided by the power monitoring devices for centralizing data display, data logging, alarming, event recording, and other power monitoring operations.

E. The high-speed network allows direct access to data provided by the power monitoring devices for implementing automatic control.

F. ANC will provide connections to the Building Automation Control System (BAS) LonWorks network, including Graphical monitoring and alarm reporting to the Building Automation Control System (BAS) Supervisory System. ANC will provide all programming and graphics generation.

1.4 QUALITY

A. PMCS components included within power equipment lineups shall be factory installed, wired and tested prior to shipment to the job site.

1.5 SHOP DRAWINGS

A. Provide detailed Shop Drawings suitable for installation and ongoing operation and maintenance of PMCS System components provided by the Tenant.

1. Indicate electrical characteristics and connection requirements.

2. When PMCS components are installed by the power equipment manufacturer, the power equipment shop drawings shall clearly identify the components, the internal connections, and all external connections.

3. The PMCS drawings shall show all PMCS components including necessary component dimensions; type, size, and weight; location of conduit entry and exit; single line diagram indicating external wiring requirements.

4. Drawings shall identify terminal blocks used for interconnections and wire type to be used.

1.6 MONITORING DEVICES

A. Energy Meters: Energy meters shall be provided to monitor the following feeders:

1. Feeder breakers in Main Distribution Switchboards. Exception: when feeder breaker feeds a 480V:208Y/120V step down transformer the energy meter shall be located in the panel downstream of the transformer.

2. Feeder breakers in Distribution panels that feed the following (Exception: when feeder breaker feeds a 480V:208Y/120V step down transformer the energy meter shall be located in the panel downstream of the transformer.)

a. Downstream Distribution panels.

b. Tenant Panels.

B. Circuit Monitors: Electronic circuit monitors shall be provided in new main distribution switchboards to monitor the main circuit breaker(s).

PART 2 - PRODUCTS

2.1 ENERGY METERS

A. The Enercept Meter shall consist of three split-core CTs hinged at both axes with the power metering electronics embedded inside of the master CT.

B. The Enercept Meter shall directly accept any voltage input from 208-480 VAC.

C. The Enercept Meter series shall have models available for amperage ranges of 100-2400 Amps.

D. ANC will provide network connections to Enercept Meters.

2.2 CIRCUIT MONITORS – SERIES 4000

A. Electronic circuit monitors shall provide true RMS metered values. Information provided by each circuit monitor shall include frequency, temperature, current, demand current, voltage, real power, reactive power, apparent power, demand power, predicted demand power, power

factor, accumulated energy, accumulated reactive energy, total harmonic distortion (THD) of each current and voltage, and K-factor of each current. Circuit Monitors shall be the Square D CM4000.

B. The Circuit Monitors shall accept metering inputs of up to 600Vac; direct connection or from industry standard instrument transformers (120 VAC secondary PTs and 5 A secondary CTs). Connection to 480Y/277 VAC circuits shall be possible without use of PTs. Provide Square D CMV.

1. PT primaries through 1.2 MV shall be supported

2. CT primaries through 32 kA shall be supported

C. On four-wire systems a fourth CT input shall be provided to measure neutral current. In four-wire connections the Circuit Monitor shall utilize the circuit neutral common reference and not earth ground, to provide metering accuracy.

D. Display type shall match existing circuit monitors provided in Concourse C Phase 2 Building Completion Project.

E. ANC will provide network connections to Circuit Monitors.

F. Circuit Monitor Input/Output Module: Provide circuit monitors with one solid state output suitable for KYZ pulse initiation; four solid state status inputs; three (10A) mechanical output relays

2.3 MOLDED CASE CIRCUIT BREAKER ELECTRONIC TRIP UNITS

A. Electronic Trip Units shall be provided as noted in Section 16475 – Overcurrent Protective Devices.

B. Electronic Trip units shall be monitored by the PMCS network. ANC will provide network connections to Electronic Trip Units.

2.4 PMCS NETWORK

A. ANC will provide network connections of Power Monitoring Devices.

B. Interface to Other Systems: ANC will interface the high-speed network utilized by the PMCS system with the Building Automation System (BAS).

2.5 EXISTING PERSONAL COMPUTER WORKSTATIONS (PCWS)

A. The PMCS includes two Personal Computer Workstations. ANC will integrate Tenant devices into the PCWS.

2.6 PMCS APPLICATION SOFTWARE

A. The PMCS monitors the devices in the system, recording events, indicating alarm conditions, and displaying and logging device data. ANC will integrate Tenant devices into the PCWS.

PART 3 EXECUTION

3.1 INSTALLATION

A. PMCS components, including Circuit Monitors and Electronic Trip Units, included within the power equipment lineups shall be factory installed, wired and tested prior to shipment to the project site.

B. All control power, CT, PT and data communications wire shall be factory wired and harnessed within the equipment enclosure.

C. Where external circuit connections are required, terminal blocks shall be provided and the manufacturer's drawings shall clearly identify the interconnection requirements including wire type to be used.

D. ANC will provide all wiring required to externally connect equipment lineups.

3.2 BAS INTERFACE AND GRAPHICS

A. ANC will provide physical and software interfacing for connection and uploading of system information to the BAS network.

B. All system alarm and status information will be presented in graphical form on the BAS Controls Supervisory System Operator Workstations.

END OF SECTION

DRAFT AIRPORT BUILDING PERMIT PROCESS WITHIN TERMINALS

Tenant	ANC Stakeholders							Airport Director	Operations Manager	Development Manager	Manager of Eng, Env & Fac	Chief Engineer
	Permit Coordinator	Engineering	Facilities	Env	TRP	Leasing	ISD					

Meet with the ANC to discuss proposed contruction (schedule 1 week in advance)

Prepare preliminary drawings and specifications for review

Distribute for Review (1 - 2 days)

Review submittal (1 - 3 weeks)

Compile and review comments (1 - 3 days)

Discuss review comments

N Additional draft review needed? Y

Preapplication phase complete

Prepare and submit Airport Building Permit Application

N Is application complete? Y

Distribute for review (1 - 2 days)

Review application (1 - 3 weeks)

Consolidate and review comments (1 - 5 days)

N Approval Recommended? Y

Revise to address comments

Resubmit Airport Building Permit

N Approval Recommended? Y

Assemble and forward for approval (1 - 2 days)

N Approve application? Y

N Approve application? Y

N Approve application? Y

N Approve application? Y

N Approve application? Y

Issue Airport Building Permit

Submit MOA Building Permit, construction contracts, insurance, bonds, sealed construction documents & other submittals

N Submittals complete and accepted? Y

Issue Permission to Proceed

Preconstruction meeting (schedule 1 week in advance)

Begin Construction

Construct improvements Construction inspection

Schedule final inspection

Final inspection

N Construction conforms to permit? Y

Modify construction to meet permit

Final Completion

Submit as-builts

Final Acceptance

TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT
AIRPORT BUILDING PERMIT APPLICATION
(For work in terminal buildings)

Permit No._____
Lease/ADA No._____

The Tenant/Leaseholder shall complete lines 1 through 14.

1. First Name	M.I.	Last Name
2. Title		
3. Company Name		
4. Mailing Address		
City	State	Zip Code
5. Telephone No. Fax No. Email Address		

6. Point of Contact (Representative with Tenant decision authority)
Name
Telephone No.
Fax No.
Email Address

7. Description of proposed improvements

8. Location/Room No.(s)	9. Estimated Cost
10. Proposed construction start date	11. Proposed construction end date

12. Application Submittal Requirements (minimum)		Attached	N/A
A.	Four complete sets of construction contract documents (four specification sets, two full-size plan sets, and two half-size plan sets), ANC Engineering may require additional sets and/or a CD having a single Adobe Acrobat pdf format file containing the specification set and another, single pdf format file containing the plan set to facilitate reviews.	☐	☐
B.	8-1/2" x 11" Site Plan/Floor Plan showing location of proposed work.	☐	☐
C.	Certification of Compliance to Terminal Construction Standards.	☐	☐
D.	Request for Waiver from Terminal Construction Standards.	☐	☐
E.	Copy of MOA Building Permit or Permit Application	☐	☐
F.	_____	☐	☐

The Tenant agrees to the following conditions:

A. The Airport Building Permit consists of the Airport Building Permit Application, the Terminal Construction Standards, approved Waiver Request from Terminal Construction Standards, Special Conditions, Permit Modifications and the Lease.
B. Compliance with local, state and federal regulatory requirements is the responsibility of the Tenant. Approval of this permit does not imply that the Tenant has met all regulatory requirements.
C. A Permission to Proceed shall be obtained from ANC before starting construction.
D. The Applicant shall post a copy of this permit at the construction site.
E. This permit expires one year after the Airport Director's date of signature unless noted otherwise in the Special Conditions.

13. Signature of Tenant/Leaseholder	14. Date

--------The following section is for Airport Staff use only---------

ANC STAFF RECOMMENDATIONS	Approve	Disapprove
Facilities	☐	☐
Leasing	☐	☐
Engineering	☐	☐
_____	☐	☐
_____	☐	☐
_____	☐	☐

Staff Comments

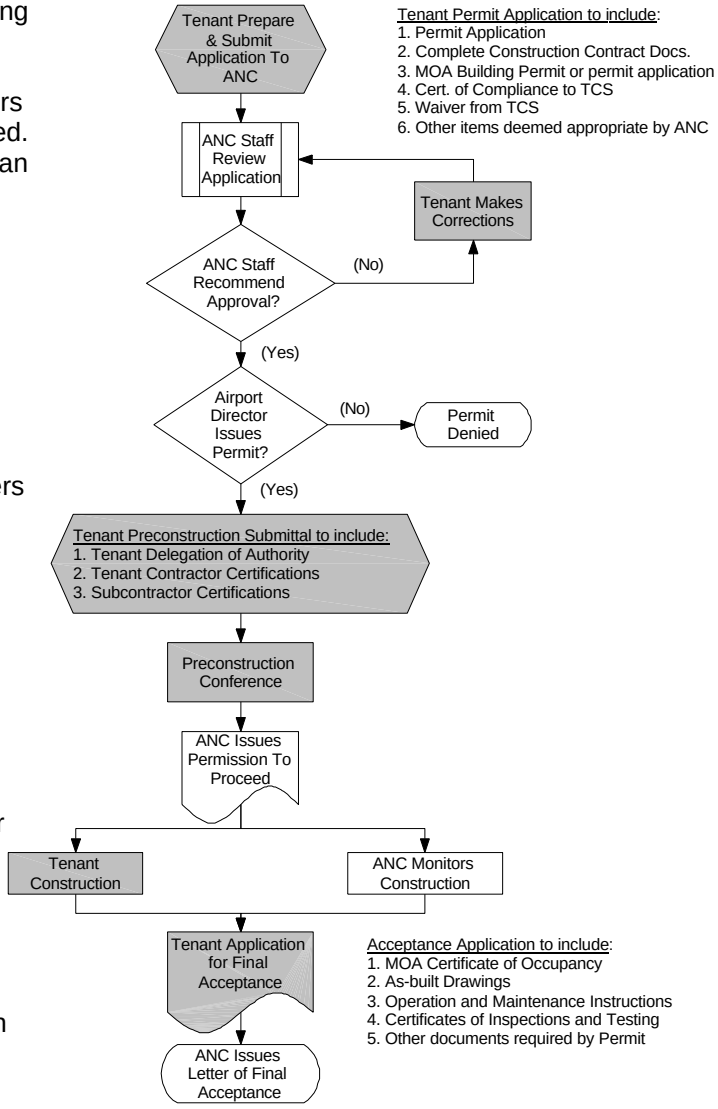
In addition to any Special Conditions attached, approval is subject to the following:	Attached	Separate Cover
A. _____	☐	☐
B. _____	☐	☐
C. _____	☐	☐
D. _____	☐	☐

Chief Engineer	Date
Deputy Director Comment	
Signature	Date
Airport Director	Permit Approved ☐ Permit Disapproved ☐
Comment	
Signature	Date

TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT
AIRPORT BUILDING PERMIT APPLICATION INSTRUCTIONS
(For work in terminal buildings)

1. Write the name of the person applying for the Airport Building permit in this box. This person must be the person designated on the Airport Lease Agreement. Permit applications signed by others, including architects, engineers and contractors working for the lessee, will not be processed. Call Airport Leasing at 266-2420 if you are uncertain who can apply for this permit.
2. Enter the Applicant's title.
3. Enter the company name.
4. Enter the company's mailing address (Do not use a post office box).
5. Enter the applicant's phone and FAX numbers and email address.
6. Enter in Point of Contact name, telephone and FAX numbers and email address (Point of Contact is the Tenant representative having decision-making authority for the improvements being proposed).
7. Describe the proposed improvements.
8. Enter the room number(s) or location(s) where the construction is proposed.
9. Enter the estimated cost. This number may be used by Airport Leasing to evaluate future lease extensions.
10. Proposed construction start date (allow at least 2 weeks for permit processing).
11. Proposed construction end date.
12. The Airport requires the following attachments:
    - A. Four complete sets of construction contract documents (four specification sets, two full-size plan sets, and two half-size plan sets). ANC Engineering may require additional sets and/or a CD having a single Adobe Acrobat pdf format file containing the specification set and another, single pdf format file containing the plan set to facilitate reviews.
    - B. 8-1/2"x11" Site Plan/Floor Plan drawing(s) showing location of the proposed improvements.
    - C. Request(s) for Waiver from Terminal Construction Standards.
    - D. Certification of Compliance with Terminal Construction Standards.
    - E. Copy of the MOA Building permit or Building permit application for the proposed improvements.
    - F. Other submittal as required by the airport.
13. The Tenant/Leaseholder signature here.
14. Enter the date of signature here.

Submit the completed form to Ron Placko, Building Permits



CERTIFICATION OF COMPLIANCE TO TERMINAL CONSTRUCTION STANDARDS

The Tenant certifies the design contained within the construction documents submitted for an Airport Building Permit complies with the current version of the Ted Stevens Anchorage International Airport (ANC) *Terminal Construction Standards*. The Tenant acknowledges that any construction not in conformance with the *Terminal Construction Standards* shall be removed at the Tenant's expense ANC has approved a *Request for Waiver from Construction Standards for Tenant Improvements* for the nonconforming construction.

The Tenant agrees to abide by all construction and security processes and procedures required by the *Terminal Construction Standards*. The Tenant agrees to remove any company or employee who violates the construction and/or security processes and procedures required by the *Terminal Construction Standards*.

AGREE:

_____
Tenant/Leaseholder Company Name

_____
Signature of Tenant/Leaseholder

_____
Date

AGREE With Exceptions:
Request For Waiver(s) Attached

_____
Tenant/Leaseholder Company Name

_____
Signature of Tenant/Leaseholder

_____
Date

TED STEVENS ANCHORAGE INTERNATIONAL AIRPORT **Permit No.**_____
AIRPORT BUILDING PERMIT APPLICATION **Lease/ADA No.**_____
(for work in terminal buildings)

REQUEST FOR WAIVER FROM TERMINAL CONSTRUCTION STANDARDS

The Tenant/Leaseholder shall prepare a separate Request for Waiver from Terminal Construction Standards for each non-compliant design standard.

1. Write the Standard for which a waiver is being requested. Provide the section number.

_____
_____
_____
_____
_____

2. Write the reason for the waiver request. Explain why Ted Stevens Anchorage International Airport should approve this waiver request. Provide alternate design.

_____
_____
_____
_____
_____
_____
_____

_____
Tenant/Leaseholder Company Name

_____
Signature of Tenant/Leaseholder

_____
Date

----------*The following section is for Airport Staff use only* ----------

RECOMMENDATIONS	Approve	Disapprove
Leasing	☐	☐
Facilities	☐	☐
Engineering	☐	☐
_____	☐	☐
_____	☐	☐
_____	☐	☐

Staff Comments:

Airport Engineer	Date	Approve	Disapprove

Ted Stevens
Anchorage
International Airport

State of Alaska DOT & PF
PO Box 196960
Anchorage, Alaska 99519-6960

SAMPLE

February 10, 2003

Mr. Boris Batenoff
Station Manager
Very Far East Airlines
2600 Postmark Dr.
Anchorage, Alaska 99501

Re: Airport Building Permit 02-XXX
PERMISSION TO PROCEED

Dear Sir:

You are authorized to proceed with the subject project, effective 12:01 a.m., February 30, 2003.

The permit allows 60 calendar days to complete the project.

The inspector for Airport Building Permit compliance will be John Doe who will be working under my general direction. I have been delegated the authority to act on behalf of the Airport Director on all matters concerning the execution of approved Airport Building Permits. If you have any questions concerning this Permission to Proceed please contract John Doe at 266

Sincerely,

Eric Miyashiro, P.E.
Chief Engineer

cc: John Barsalou, Leasing
Christine Klein, Facilities
John Doe, Engineering
Scott Lytle, Environmental

APPENDIX C – ANC TELECOMMUNICATIONS

C1 - ANC TELECOMMUNICATIONS APPROVED EQUIPMENT

SECTION 16745 - COPPER CABLE DISTRIBUTION APPROVED EQUIPMENT

Description	TCS Section	Manufacturer	Part No.
Cable Management	16745-2.7	KRONE	6653-2-700-03
IDC Terminal Modules	16745-2.8	KRONE	7014-1-003-01
Disconnect Blocks	16745-2.9	KRONE	7014-1-004-01
Patch Panels – 24 Port	16745-2.10	KRONE	6653-1-587-24
Patch Panels – 48 Port	16745-2.10	KRONE	6653-1-587-48
Telecom Outlet Jacks	16745-2.11	KRONE	6467-1-081-10
Telecom Outlet Faceplates	16745-2.11	KRONE	6644-1-156-0X
Horizontal Cables	16745-2.13	KRONE	TN5ESP-XX02

SECTION 16747 – FIBER OPTIC DISTRIBUTION APPROVED EQUIPMENT

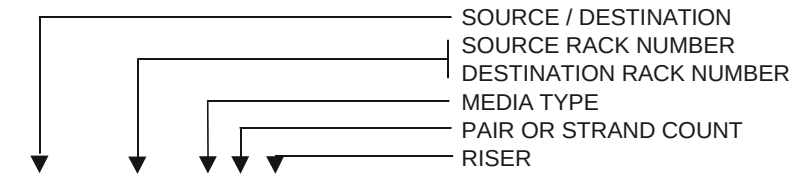
Description	TCS Section	Manufacturer	Part No.
Riser Rated Multi-Mode Cable (2-24 count)	16747-2.4	Corning	MIC nnnC81-3X131-24*
Riser Rated Multi-Mode Cable (24-72 count)	16747-2.4	Corning	Unitized MIC nnnC81-61131-24*
Riser Rated Multi-Mode Cable (72-144 count)	16747-2.4	Corning	Unitized MIC nnnC81-T3131-24*
Plenum Rated Multi-Mode Cable (2-24 count)	16747-2.4	Corning	MIC nnnC88-3X131-29*
Plenum Rated Multi-Mode Cable (24-72 count)	16747-2.4	Corning	Unitized MIC nnnC88-61131-29*
Plenum Rated Multi-Mode Cable (72-144 count)	16747-2.4	Corning	Unitized MIC nnnC88-T3131-29*
Exterior and Interior/Exterior	16747-2.4	Corning	FREEDM nnn(C/R)WF-141(31/01)A20**
Fiber Equipment Racks	16747-2.5	Hubbell	NextFrame CR1976, or as Approved
Fiber Horizontal Cable Management Panel	16747-2.5.A.3	Corning	CJP-02U, or as approved
Fiber Horizontal Cable Management Panel – Bottom of Rack	16747-2.5.A.4	Corning	CDF-CJT-02U-19, or as approved
Fiber Patch Panel Housing	16747-2.6.A	Corning	CCH-02U
Multimode Adapter Panel	16747-2.6.B.1	Corning	CCH-CP06-15T
Singlemode Adapter Panel	16747-2.6.B.2	Corning	CCH-CP06-5C-P03-RH
Closet Splice Housing	16747-2.6.C	Corning	CSH-03U
Fiber Optic Connectors – Multi-mode	16747-2.7	Corning	95-050-51

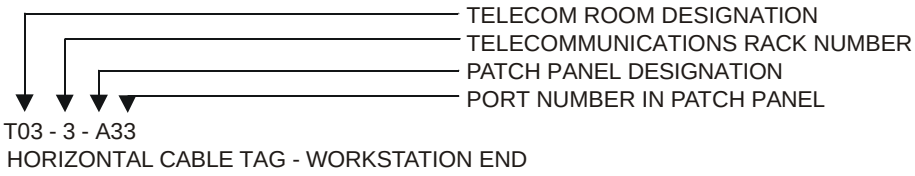
a. * nnn = fiber count; X = fiber identification scheme

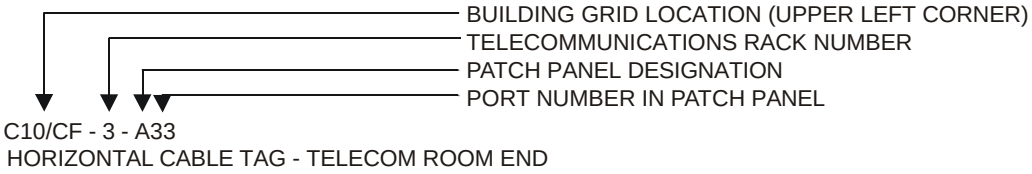
b. ** (C/R) and (31/01) = either 50/125 micrometer multi-mode, single-mode or composite.

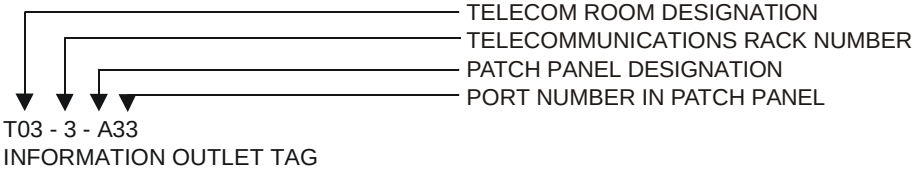
C2 - ANC TELECOMMUNICATIONS CABLE/OUTLET LABELING STANDARDS

TELECOM CABLE/OUTLET LABELING









TELECOM LABELING LEGEND

SOURCE / DESTINATION
DESIGNATED BY TELECOM ROOM

MEDIA TYPE
C = COPPER UNSHIELDED TWISTED PAIR (UTP)
MM = FIBER OPTIC MULTI-MODE, 50/125 MICRON
SM = FIBER OPTIC SINGLE-MODE
R = COPPER COAXIAL CABLE

TELECOM ROOM
REFER TO PLANS AND ONE-LINES

RACK NUMBER
SEQUENTIALLY NUMBERED IN EACH ROOM
WM = WALL MOUNTED IDC BLOCKS

PAIR OR STRAND COUNT
NUMERICAL AS INDICATED

RISER
A DATA BACKBONE
B DATA BACKBONE
BLANK = N/A

PORT NUMBER
NUMERICAL AS INDICATED

Appendix D - Concourse C Structural Limitations for Tenant Improvements

A.

OPEN WEB STEEL JOISTS: Location	Allowable eccentric load (on side of bottom chord) POUNDS. Total if no existing hangers/loads present.	Allowable load centered on bottom chords (total between each panel point if no existing hangers/loads present) POUNDS	Allowable load centered on bottom chords if existing hangers/loads present. POUNDS	Allowable eccentric load (on one side of top chord) POUNDS. Total between each panel point if no existing hangers/loads present	Allowable load centered on top chords POUNDS. Total between each panel point if no existing hangers/loads present	Allowable load centered on top chords if existing hangers/loads are present POUNDS
1. Area C3 and Area C4, Level 3	0	40	0	50	150	0
2. Area C4, Level 4	0	60	0	50	200	0
3. Level 5 (Grids C2 to C30 between Grids CC.4 and CC)	0	250	0	50	300	0
4. Lvl 5 (Grids C1 to C30 West of Grid CC)	0	80	0	50	200	0
5. All other areas of building with roof joists	0	40	0	50	150	0

A. See attached sketch 1 / TI for loading diagram
B. If these loading conditions are not exceeded additional angle braces (connecting top and bottom chords) are not required.
C. Where loads are exceeded, additional supports shall be added to reduce point loads or alternate support detail shall be submitted to the DEPARTMENT for review and approval prior to installation.
D. No items which may impose lateral loads on bottom chords of joists (braces, kickers etc) may be attached to the bottom chords of steel joists under any

DEFINITIONS:
Tributary width: Width of decking above (and associated loads on the decking) that is supported by each joist (perpendicular to joist span). Typically is the sum of half the distance from the joist to each adjacent structural support member.

Eccentric Load : Vertical loads where line of action is not aligned with the vertical axis of the joist. Typical eccentric loads are attached to only one of the two bottom (or top) chord angles.

Chord: Horizontal angles that form top and bottom of joist. Each joist has 2 back to back steel angles which form the top chord and 2 angles which form the bottom chord.

Panel point: Location where web members (vertical or diagonal) connect to the top or bottom chords (typically by welding).

Appendix D - Concourse C Structural Limitations for Tenant Improvements

B.

CONCRETE HANGERS: (*These are structural support items that are attached to concrete from below that will support items to be hung below the concrete slab*): Location	Maximum allowable gravity point load. POUNDS (Concrete span only. Contractor to design hanger and connection to concrete)	Notes
1. Concrete on metal decking: Level 1 and 2 Area C1 and C2. Levels 2, 3, and 4 in remaining concrete on metal deck areas	500	Contractor to locate and avoid damage to all rebar, embedded conduit, etc. 3 inch maximum embedment into existing slab. Cutting of welded wire fabric is acceptable. Newly installed hangers shall be spaced 8 feet on center minimum.
2. Two way slab Level 1 Area C4 and Area C6	750	Contractor to locate and avoid damage to all rebar. Newly installed hangers shall be spaced 8 feet on center minimum.
3. Large loads on precast concrete panels Area C1 and C2 Level 1 and Level 2 (old C mechanical building)	500	Attachment to the existing threaded rods at panel seams only. See the attached sketch 2/TI. No drilling of concrete allowed (Connection to threaded rods only by addition of Unistrut or other bracket). Maximum of 1 additional 500 pound load for each existing threaded rod. May not attach to existing Unistrut.
4. Small loads on precast concrete panels Area C1 and C2 Level 1 and Level 2 (old C mechanical building)	less than 100	No drilling of concrete allowed. Connection to existing threaded rods or existing Unistrut. Maximum 1 additional hanger for each existing Unistrut span. Place minimum approximately 12 inches away from existing hanger. Contractor to verify Unistrut capacity as required if existing hangers present.

Appendix D - Concourse C Structural Limitations for Tenant Improvements

c.

CONCRETE ANCHORS AND CORE DRILLING: (*Anchors are structural support items that will prevent items that are sitting on top of concrete slabs from sliding or overturning. These would be attached to the concrete from above)* Location:	Allowable gravity point load. POUNDS. Concrete span only. Contractor to design anchor and connection to concrete)	Notes
1. Concrete on metal decking: Level 1 Area C1 and C2. Level 2, 3, and 4 and remaining concrete on metal deck areas	500	Contractor to locate and avoid damage to all rebar, embedded conduit, etc. 3 inch maximum embedment into existing slab. Cutting of welded wire fabric is acceptable. Newly installed hangers shall be spaced 8 feet on center minimum.
2. Two way slab level 1 (Same as level 0 ceiling) Area C4 and Area C6	750	Contractor to locate and avoid damage to all rebar, embedded conduit, etc. Cutting of welded wire fabric in 2 inch topping slab is acceptable. Newly installed hangers shall be spaced 8 feet on center minimum.
3. Core drilling 2 way slab level 1 Area C4 and Area C6	0 (See 1 above for allowable loads)	All rebar (top and bottom bars) shall be located by the contractor prior to drilling. No rebar shall be damaged in any way under any circumstances. All core drill locations shall be documented and submitted to Department for approval prior to
4. Precast concrete panels Area C1 and C2 Level 1 and Level 2 (old C mechanical building)	500	Contractor to locate and avoid damage to all rebar, embedded conduit, etc. Cutting of welded wire fabric in 2 inch topping slab is acceptable. 2 1/2 inch maximum embedment for all items.
5. Core drilling precast concrete panels Area C1 and C2. Level 1 and Level 2 (old C mechanical building)	0 (See 4 above for allowable loads)	All rebar and tendons shall be located by the contractor prior to drilling. No rebar or tendons shall be damaged in any way under any circumstances. All core drill locations shall be documented and submitted to Department for approval prior to drilling.
NOTE 1: For core drilling concrete on metal deck or installing anchors (from above or below), no rebar shall be cut or damaged (typically rebar occurs as trim bars at openings and diaphragm chord steel along perimeter of each area). Contractor shall locate all rebar prior to drilling and avoid damaging this rebar in any way. Cutting of WWF is acceptable.		
NOTE 2: For core drilling concrete on metal deck or installing anchors (from above or below), no embedded conduits shall be cut or damaged (there is approximately 80 miles of conduit in the concrete slab on metal decks). Contractor shall locate all conduits prior to drilling and avoid any and all damage.		

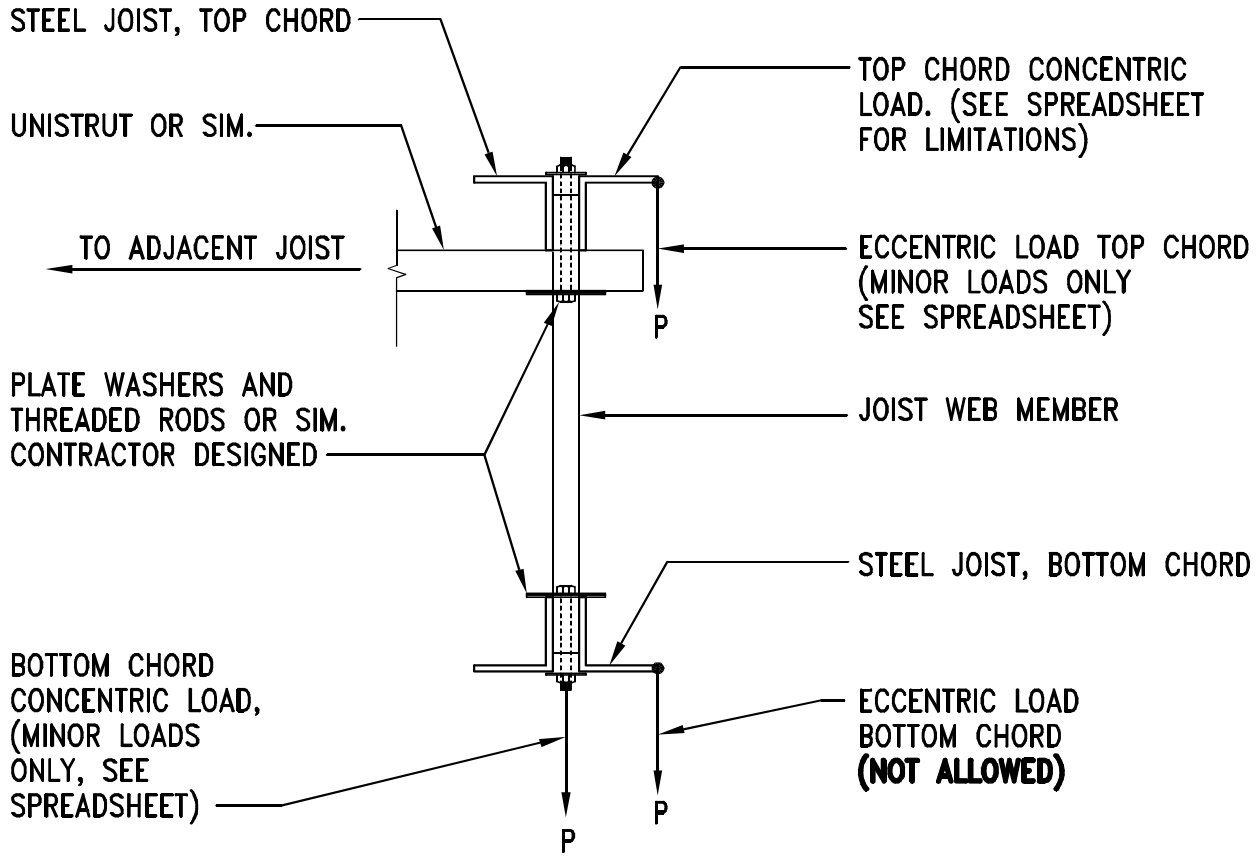
Appendix D - Concourse C Structural Limitations for Tenant Improvements

D.

METAL DECKING:	Maximum allowable gravity point load POUNDS. Deck span only. Contractor to design hanger and connection to metal decking	Notes
Hangers to be attahed to decking to support items hung from below decking. All areas	No loads exceeding 40 pounds	All hangers shall be spaced a minimum of 3 feet from any adjacent hanger (existing or new).
Roof penetrations	1000 total load distributed along perimeter of penetration	For all roof penetrations provide 6x6 angles along each edge. Angles parallel with deck span shall span between adjacent steel framing members (joists or beams). See Sketch 3/TI and 4/TI attached. Where loads exceed 1000 pounds contractor to submit a structural support system to the DEPARTMENT for review and approval prior to start of work.

FOR ANY LOCATIONS WHERE CONTRACTOR FEELS THAT THE COST TO COMPLY WITH THE BELOW REQUIREMENTS IS PROHIBITIVE, A SPECIFIC ALTERNATE PLAN OF WORK SHALL BE SUBMITTED TO THE DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO INITIATION OF SUCH WORK.

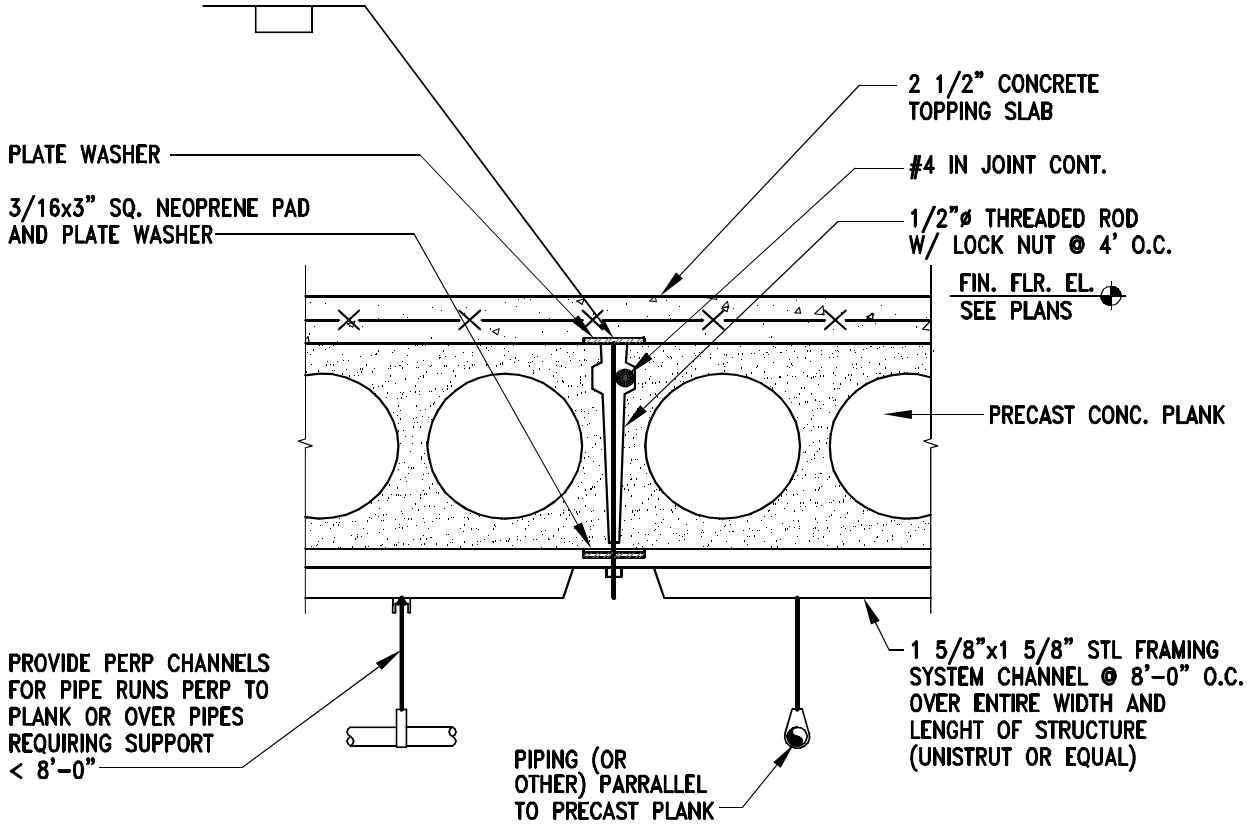
Appendix D - Concourse C Structural Limitations for Tenant Improvements



1/TI **JOIST LOADING DIAGRAM**

SCALE: 1 1/2" = 1'-0"

Appendix D - Concourse C Structural Limitations for Tenant Improvements

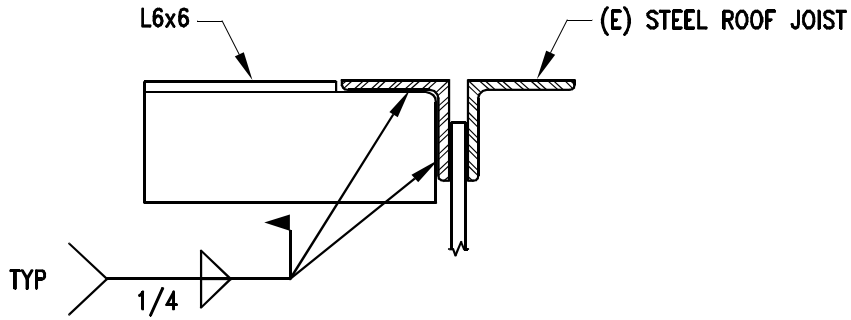


RECORD DOCUMENT

2 / TI **SUPPORT DETAIL IN C MECH BLDG**

SCALE: 1 1/2" = 1'-0"

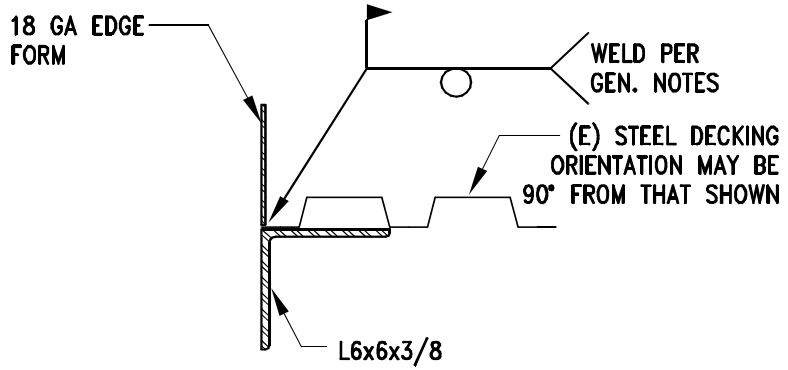
Appendix D - Concourse C Structural Limitations for Tenant Improvements



3
T1

EDGE ANGLE TO ROOF JOIST

SCALE: 1 1/2" = 1'-0"



4 / TI **EDGE ANGLE AT ROOF OPENING**

SCALE: 1 1/2" = 1'-0"