Austin-Bergstrom International Airport

AUS Information Technology Design Standards Manual

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1. INTRODUCTION

1.00 PURPOSE

    A. The AUS Information Technology Design Standards Manual (IT DSM) establishes comprehensive standards and guidelines governing the design and installation of IT infrastructure at the Austin-Bergstrom International Airport (AUS) and is maintained by the AUS IT Division (AUS IT). Intended for technology designers, MEP designers, architects, and contractors, its purpose is to provide a foundational understanding of AUS' telecommunications infrastructure and AUS IT's requirements, and expectations to ensure consistency and excellence in the airport's IT infrastructure across all AUS and tenant projects.

    B. The AUS IT DSM is meant to work in conjunction with the AUS DSM.

    C. The scope of this document includes:

        1. Structured cabling for voice, data, and video.

        2. Grounding and Bonding

        3. Cable Pathways

        4. Cable management.

        5. Cabling Testing and Identification

        6. Build-Out of Additional Telecommunications Rooms

    D. Acceptable product part numbers and specifications are provided in Appendix A.

    E. These standards and guidelines address terminals and typical office buildings and structures.

        1. They are not intended for the design of specialty facilities such as data centers that have a significantly higher density of IT infrastructure requiring specialized solutions.

    F. Designers shall not deviate from these standards without explicit written approval from AUS IT. Requests for deviations shall be immediately communicated to AUS IT in writing for consideration and resolution.

    G. These standards and guidelines define the basic minimum criteria to be met but allow for customization to meet unique project requirements, where needed. The final specifications are the responsibility of the Designer, Contractor, and Installation Team as defined by project contractual agreements.

    H. This document supersedes previous AUS IT Standards

1.01 BACKGROUND

    A. AUS owns and controls the shared telecommunications infrastructure throughout the campus used by the Department of Aviation (DOA) and all tenants (e.g., airlines, rental car companies, concessionaires, cargo companies) to support voice and data connectivity. The AUS telecommunications infrastructure is managed by AUS IT.

    B. Within the facilities, dedicated communications rooms provide distribution points for horizontal cabling connectivity to all end devices. The communications

rooms connect via backbone cabling consisting of high pair count copper UTP cabling, and single-mode fiber optic cabling.

C. To ensure performance compatibility of the structured cabling system components and to maintain manufacturer warranty requirements and management across the airport's premises, the copper cable plant is built on CommScope's structured cabling system and the fiber cable plant is built on Corning's optical fiber solutions.

D. The majority of the existing horizontal cable channel products are CommScope Category 6 and the airport is transitioning to Category 6A.

E. Tenant Infrastructure

    1. Tenants are responsible for managing their routing hardware and ISP connectivity.

    2. AUS IT manages layer 2 switching and cable plant infrastructures.

    3. Tenants' Layer 2 handoffs to AUS IT's telecommunications infrastructure is performed within each tenant's colocation cabinet.

2. DEFINITIONS AND TERMINOLOGY

1.01 STREAMLINED FORM

A. These standards and guidelines are written in imperative mood and streamlined form. This imperative language is directed to the Designer and Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

    1. Example, "Conductors: 24 AWG solid annealed copper."

1.02 DEFINITIONS

A. AUS – Austin-Bergstrom International Airport

B. AUS IT – IT Division of the City of Austin's Department of Aviation and AUS IT's Owner Authorized Representative

C. DOA - City of Austin's Department of Aviation

D. Furnish - means to supply and deliver to project site, ready for installation.

E. Install - means to place in position for service or use.

F. Pathways – includes, but not limited to, conduit, inner-duct, underground duct-bank, cable trays, ladder racks, pull boxes, and any wiring systems used to enclose cabling of any type.

G. Provide - means to furnish and install, complete and ready for intended use.

H. Shall – means the requirement is mandatory.

1.03 ABBREVIATIONS

A. AFF – Above Finished Floor

B. ANSI/TIA - American National Standards Institute / Telecommunications Industry Association

C. ASME – American Society of Mechanical Engineers

D. AUS – Austin Bergstrom International Airport

E. BICSI - Building Industry Consulting Service International

F. NECA – National Electrical Contractors Association

G. NEMA – National Electrical Manufacturers Association

H. NFPA - National Fire Protection Association

I. PDU – Power Distribution Unit

J. TR – Telecommunications Room

K. UL - Underwriters Laboratories, Inc.

3. REFERENCES

1.01 AUS DESIGN STANDARDS MANUAL

A. The AUS Design Standards Manual (DSM) is a set of standards, guidelines, and design criteria for development, design, construction, and renovations at Austin-Bergstrom International Airport. It sets policies and standards that will assist the City of Austin Department of Aviation (DOA) in reaching its vision to provide a gateway to the world for all – the AUS way every day.

B. The DSM is intended to be followed by all Airport Tenants, Designers, Contractors, and any other stakeholder performing building and/or site improvements at AUS including, but not limited to work at terminal, concourse, ancillary buildings, landside, apron, and airfield. It is intended to provide general standards for look and feel of projects at AUS and to provide general information regarding the process of completing a project at AUS.

C. It is the responsibility of all members of the design and construction team to be familiar with the most recent version of the DSM.

D. Design professionals must comply with all airport design standards and other information contained within the DSM.

E. This IT Design and Installation Guidelines document works in conjunction with the AUS DSM, providing additional standards, where needed, specific to the needs of IT.

    1. Where there is conflicting guidance, bring this to the immediate attention of AUS IT

1.02 CODES, STANDARDS, AND ORDINANCES

A. Design, manufacture, test, and install telecommunications cabling networks per manufacturer's requirements and in accordance with national codes, state codes, local codes, requirements of authorities having jurisdiction, and the standards listed in this section.

B. Comply with locally adopted version of applicable Codes, Ordinances, Standards, and their amendments, as interpreted and enforced by the local authority having jurisdiction (AHJ).

C. Where not AHJ related, specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of

regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the reference is dated.

D. References to industry and trade association standards and building codes are minimum installation requirements. The codes, standards and agencies listed below shall form a part of all related specification sections. The publications are referred to in the text by basic designation only.

1. BICSI Telecommunications Distribution Methods Manual – 14th Edition

2. ANSI/TIA-568 Commercial Building Telecommunications Cabling Standards

3. ANSI/TIA-569 Telecommunications Pathways and Spaces

4. ANSI/TIA-607 - Generic Telecommunications Bonding and Grounding for Customer Premises

5. ANSI/TIA-455-61 FOTP-61: Measurement of Fiber or Cable Attenuation Using an OTDR

6. ANSI/TIA-455-78 FOTP-78 / IEC 60793 Optical Fibers Part 1-40: Measurement Methods and Test Procedures, Attenuation

7. ANSI/TIA 526-7-A: Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement.

8. ANSI/TIA-526-14-C: Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant

9. ANSI/TIA-568-D.0: Generic Telecommunications Cabling for Customer Premises, and Annex E from ANSI/TIA-568-C.0: Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling

10. ANSI/TIA-568-D.1: Commercial Building Telecommunication Standard

11. ANSI/TIA-568-D.2: Balanced Twisted-Pair Telecommunication Cabling and Components Standard

12. ANSI/TIA-568-D.3: Optical Fiber Cabling Components

13. ANSI/TIA-569-D: Telecommunications Pathways and Spaces

14. ANSI/TIA-606-B: Administration Standard for Telecommunications Infrastructure

15. ANSI/TIA-607-C: Commercial Building Grounding and Bonding Requirements for Telecommunications

16. ANSI/BICSI-002: Data Center Design Standard and Recommended Practices

17. ASME 17.1 / CSA B44 Safety Code for Elevators and Escalators

18. BICSI Electronic Safety and Security Design Reference Manual (ESSDRM)

19. BICSI Information Technology Systems Installation Manual (ITSIMM)

20. BICSI Outside Plant Design Reference Manual (OSPDRM)

21. BICSI Telecommunications Distribution Methods Manual (TDMM)

22. International Fire Code

23. Motorola R56 Standards and Guidelines for Communication Sites

24. NECA 1 Standard for Good Workmanship in Electrical Construction

25. NEMA VE 1 – Metal Cable Tray Systems

26.   NEMA VE 2 – Cable Tray Installation Guidelines

27.   NFPA-70: National Electrical Code (NEC)

28.   NFPA-72: National Fire Alarm and Signaling Code

29.   NFPA-75: Standard for the Protection of Information Technology Equipment

30.   NFPA 76: Standard for the Fire Protection of Telecommunications Facilities

31.   NFPA-101: Life Safety Code

32.   NFPA 1221: Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems

33.   Texas Accessibility Standards

34.   UL 13: Power-Limited Circuit Cables

35.   UL 83: Thermoplastic-Insulated Wires and Cables

36.   UL 478: Standard for Electronic Data-Processing Units and Systems

37.   UL 486A: Wire connectors and soldering lugs for use with copper conductors

38.   UL 910: Test Method for Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces." Provide products which are UL-listed and labeled

39.   UL 969: Standard for Safety of Marking and Labeling Systems

40.   UL 1449: Standard for Surge Protective Devices

41.   UL 1459: Standard for Safety – Telephone Equipment

42.   UL 1581: Standard for Electrical Wires, Cables, and Flexible Cords

43.   UL 1666: Standard for Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts

44.   UL 1863: Standard for Safety – Communications Circuit Accessories

45.   UL Certified: UL's LAN Cable Certification Program

E. Conflicts:

1.   Between referenced requirements, comply with the one establishing the more stringent requirements.

2.   Between referenced requirements and contract documents, comply with the one establishing the more stringent requirements.

1.03   TENANT STANDARDS

A. Customs and Border protection airport technical design standard

B. TSA Planning Guidelines and Design Standards (PGDS)

1.   Security screen checkpoint technology shall include both DOA and operational elements and TSA elements.

2.   TSA systems and telecom infrastructure shall follow the TSA PGDS.

4. QUALIFICATIONS

1.01   CONTRACTOR QUALIFICATIONS

A. General

1.   Provide full-time project manager with a minimum of ten (10) years field experience in installation of communications systems and infrastructures.

2. Contractor's BICSI RCDD oversight supervisor shall:

    a. Possess relevant past-experience and references for a minimum of (5) projects of similar size and scope

    b. Be a full-time employee, employed by the Contractor for a minimum of (1) year.

3. Contractor's BICSI Installer 2 supervising technician(s) shall

    a. Possess relevant past-experience and references for a minimum of (2) two projects of similar size and scope

    b. Be a full-time employee, employed by the Contractor for a minimum of one (1) year.

4. Sub-contractors to the primary structured cabling contractor shall meet the same requirements as the primary structured cabling contractor.

B. Certifications

1. Telecommunications Contractor shall have a currently certified, in good standing, staff BICSI RCDD provide oversight of the Contractor's scope and Work for the duration of the project.

2. At a minimum, installation of communications cabling shall be under the direct on-site supervision of a currently certified, in good standing, BICSI Installer 2, Copper and BICSI Installer 2, Fiber technician.

3. Contractor's team: manufacturer certified for each product, as required by the manufacturer, to purchase, install, and provide manufacturer's warranty upon completion of installation.

4. Copies of Contractor's staff BICSI RCDD certificate for Contractor's RCDD supervisor and required installer certifications.

5. Certifications shall remain current through the duration of the project.

1.02 MANUFACTURER QUALIFICATIONS

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

5. QUALITY ASSURANCE

1.01 GENERAL

A. Materials, equipment, components, and devices: new and unused upon delivery and installation.

1.02 WARRANTY

A. Contractor to provide no less than a 25-year product warranty for structured cabling and connectivity components.

B. Contractor installers shall adhere to the requirements of the existing structured cabling warranty and not void it.

C. Installed structured cabling and components shall adhere to the requirements of the existing structured cabling warranty and not void it.

D. Parts replaced during the warranty period shall have a warranty matching that of the original part from date of replacement.

1.03   PRE-INSTALLATION CONFERENCE

A. Arrange and schedule pre-installation conference prior to beginning any work.

B. Agenda: clarify questions in writing related to work to be performed, scheduling, coordination, etc. with the consultant and/or project manager/owner representative.

C. All individuals who will be in an on-site supervisory capacity shall be required to attend the pre-installation conference. This includes project managers, site supervisor and leads installers. Individuals who do not attend the conference will not be permitted to supervise the personnel that installs, terminates, or tests communications cables on the project. The contractor's RCDD that will oversee the installation is required to attend the pre-installation conference.

D. The manufacturer that will be providing the extended warranty is required to have a representative attend the pre-installation conference.

1.04   WORK

A. Project manager shall

1. Be assigned for the duration of the project and shall not be replaced without written consent from the OWNER.

2. Provide and maintain a detailed schedule of work to be performed.

B. Contractor's RCDD shall

1. Review all work associated with these telecommunications standards and guidelines prior to commencing.

2. Provide weekly status reports.

3. Approve and sign-off on all submitted designs and changes to the design shall be approved and signed off by the Contractor's RCDD.

4. Oversee the installation and will have the end responsibility for the quality of the installation work performed.

5. Be available for consultation and site visits upon request.

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

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

D. In case of conflicts between the aforementioned, notify the OWNER in writing prior to commencement of affected work.

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

F. Installed cabling systems shall not generate nor be susceptible to any harmful electromagnetic emission, radiation, or induction that degrades cabling systems.

G. Backward Compatibility

       1.   The provided solution shall be backward compatible with lower category ratings such that if higher category components are used with lower category components.

       2.   The permanent link and channel measures shall meet or exceed the lower channel's specified parameters.

H.   The Contractor shall secure and pay for all necessary permits and fees required for the execution of this Work.

       1.   Work will not start until all permit applications are approved.

I.   Work should be scheduled not to interfere with day-to-day operations within the facility. Operations vary by area and should be given careful consideration in relation to the schedule.

J.   Pre-installation inspection: Visually inspect all cables, cable reels, and shipping cartons to detect possible cable damage incurred during shipping and transport.

K.   Visibly damaged goods: returned to the supplier and replaced at no additional cost to the owner.

L.   All surplus parts and pieces to the installation shall be maintained as a spare parts inventory at the building site.

M.   Test optical fiber cable while on reels. Use an optical time domain reflectometer (OTDR) to verify the cable length and locate cable defects, splices, and connector, including the loss value of each.

N.   Test each pair of UTP cable for open and short circuits. Test results to be submitted to the owner.

6. DESIGN PRINCIPALS

1.01   FUTURE CAPACITY AND EXPANSION

A.   Unless otherwise specified, design and installation plans and completed construction shall provide for (50%) fifty percent future growth. At a minimum, this shall be provided in:

       1.   Spare positions in wall fields, cross-connects, and terminal strips

       2.   Space in cable pathways in campus distribution and riser.

       3.   Equipment cabinets and racks

B.   Design and installation shall facilitate effective use of available future capacity. As an example, a best effort should be made to ensure the current project's wall field installations are configured so the wall field's future capacity space is consolidated and the future routing and management of telecommunications cable and electrical outlet wiring needs are considered.

7. DRAWINGS AND SPECIFICATIONS DOCUMENTATION

1.01   GENERAL

A.   Coordinate design and construction drawings and specifications development with other disciplines.

B.   Division 27 specifications and T-Series drawings shall:

       1.   Be produced as part of the design and construction documents packages.

2.   Be produced in strict accordance with each other.

3.   Be sealed with a current RCDD stamp

C.   Specifications

1.   Use AUS Telecommunications Master Specifications.

D.   Drawings

1.   Shall be drawn to-scale and provide a graphic scale

2.   Shop Drawings shall be

a.   Submitted and approved before implementation is started.

b.   Submitted in accordance with Division 1.

3.   Demolition Drawings

a.   Provide telecommunications demolition drawings for areas requiring demolition and existing telecommunications infrastructure is suspected and/or known to exist.

b.   Shall be provided as separate drawing sheets from drawing sheets illustrating new design elements .

c.   Shall indicate

1)   Removal and disconnection of existing communications equipment

2)   Required repair of finishes.

1.02   PROJECT MILESTONE REVIEW

A.   This section is effectively part of the AUS DSM's VII. Project Process.F.Project Milestone Review sections. It provides telecommunications minimum requirements for each milestone review.

B.   Submittal Minimum Requirements

Schematic Design - 30% Submittal Requirements	% Development
Demolition narrative of telecommunications infrastructure and TRs	50%
Telecommunications Room (TR) 1. Located on architectural plans and sized to scale. 2. Approximate cooling loads of each TR. 3. Describe voltage(s) to be used for each anticipated system.	80%
Backbone cabling pathways' types and routes (including overhead and underground).	80%
Specific description of items to be served by emergency power and	80%
Description of Unusual System Requirements / Recommendations. Develop to 50%.	50%
Preliminary equipment weights given to structure engineer. Develop to 30%.	30%

Provide Riser / Schematic Diagrams listed in the Riser/Schematic Diagrams section of this document	30%
Backbone cabling pathways' types and routes (including overhead and underground).	30%
Review and adjustment of LEED strategies options and recommendations.	35%
Statement of Probable Cost.	30%
Design Development - 60% **Submittal Requirements**	**%** **Development**
General Notes/Information	75%
Demolition Plans	75%
Site Plan	75%
Identify WAO locations, types, and number of drops	60%
Floor plans indicating area(s) supported by each TR.	75%
Enlarged Plans including Reflected Ceiling Plans	75%
Elevations, including for cabinets, racks, and TR walls	75%
Interior and Exterior Details	75%
Manhole Butterfly Detail	75%
Schedules	50%
Riser/Schematic Diagrams listed in the Riser/Schematic Diagram section of this document	75%
Review and adjustment of LEED strategies options and recommendations.	75%
Specifications	75%
Statement of Probable Cost	60%
Construction Documents - 90% / 100% **Submittal Requirements**	**%** **Development**
General Notes/Information	90% / 100%
Demolition Plans	90% / 100%
Site Plan	90% / 100%
Identify WAO locations, types, and number of drops	90% / 100%
Floor plans indicating area(s) supported by each TR.	90% / 100%
Enlarged Plans	90% / 100%
Elevations, including for cabinets, racks, and TR walls	90% / 100%
Interior and Exterior Details	90% / 100%
Manhole Butterfly Detail	90% / 100%
Schedules	90% / 100%
Riser/Schematic Diagrams listed in the Riser/Schematic Diagram section of this document	90% / 100%
Review and adjustment of LEED strategies options and recommendations.	90% / 100%
Specifications	90% / 100%
Statement of Probable Cost	90% / 100%

1.03   RECORD DRAWINGS / AS-BUILTS

    A.   This section specifies additional requirements to which the Contractor's Record Drawings shall adhere during and after construction completion.

    B.   During Construction, Contractor shall:

1. Keep a hard copy set of project drawings at the job site exclusively for recording deviations from the construction drawings.

2. Record locations and depths of buried and concealed conduits from fixed, easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.

3. Mark deviations in a different color so that the work of various systems can be easily identified.

C. Upon Work Completion, Contractor shall

1. Submit two copies of completed "record drawings" on electronic media such as a flash drive to OWNER for distribution.

1.04   RISER / SCHEMATIC DIAGRAMS

A. At a minimum, provide the following one-line schematic and riser diagrams per the associated requirements.

1. Represent building(s) and associated name and number, floor levels and name and number, telecommunications rooms and associated room name and number, telecommunications enclosures and associated enclosure name and number, and key elements listed below.

2. Interior Copper Backbone Cabling Riser Diagram indicating

a. Quantity of cables and associated pairs of each cable represented by each schematic line.

1) Appropriately identify cables as "existing" and "provided by others".

2) Where an item is not identified as "existing" or "provided by others", it is understood to be provided new as part of the project.

3) Example, (2) 300 PR indicates that the schematic line represents two new cables that each contain 300 pair.

3. Interior Fiber Optic Backbone Cabling Riser Diagram, indicating

a. Quantity of each type of fiber cable and associated strand counts of each cable represented by each schematic line.

1) Appropriately identify cables as "existing" and "provided by others".

2) Where an item is not identified as "existing" or "provided by others", it is understood to be provided new as part of the project.

3) Example, (2) 12SM, (1) 24MM (existing) indicates that the schematic line represents two new single-mode fiber cables that each contain twelve fiber strands and one existing multi-mode cable that contains 24 fiber strands.

4. Tenant Fiber Optic Backbone Connectivity Schematic Diagram

5. Tenant Cabinet Horizontal Connectivity Schematic Diagram

6. Interior Cabling Pathways Riser Diagram

a. Include main distribution backbone conduits, cable trays, and cable chases

b. Type, size, and quantity of each conduit, cable tray, and cable chase represented.

1) Appropriately identify as "existing" and "provided by others".

2) Where an item is not identified as "existing" or "provided by others", it is understood to be provided new as part of the project.

3) Example, (1) 4" EMT (existing) indicates that the schematic line represents one existing 4-inch electrical metallic tubing conduit.

7. Grounding and Bonding Riser Diagram

a. Coordinate preparation with the electrical system design engineer

b. Include TMGB, TGB, bonding conductor(s), grounding points to building steel, electrical panels, backbone conduits, grounding electrode.

c. Type and size of each component represented.

1) Appropriately identify component(s) as "existing" and "provided by others".

2) Where an item is not identified as "existing" or "provided by others", it is understood to be provided new as part of the project.

3) Example, (1) 6 AWG indicates that the schematic line represents one 6-gauge bonding conductor.

8. OSP COMM Vault/MH/HH duct bank layouts indicating

a. Manhole (MH) butterfly detail down to individual flexible innerduct and hard innerduct assignments in AutoCAD.

9. OSP Backbone Schematic Diagram

a. Quantity of each type of cable and associated pair and strand counts of each cable represented by each schematic line.

1) Appropriately identify cables as "existing" and "provided by others".

2) Where an item is not identified as "existing" or "provided by others", it is understood to be provided new as part of the project.

3) Example, (2) 12SM, (1) 24MM (existing) indicates that the schematic line represents two new single-mode fiber cables that each contain twelve fiber strands and one existing multi-mode cable that contains 24 fiber strands

1.05 EQUIPMENT SCHEDULES

A. At a minimum, provide the following schedules to describe associated configurations:

1. Copper Cable Schedule

2. Fiber Cable Schedule

3. Work Area Outlet Configurations

1.06   CONDUIT FILL DETAILS

    A.   Conduit fill details: provided for backbone cabling conduits

    B.   A separate conduit fill detail shall be

        1.   Provided for each segment of backbone cable conduit group on the pathways riser diagram.

        2.   Provided for each segment of ductbank conduit group on the Site Plan(s) outside plant drawing(s).

    C.   At a minimum, provide the following illustration and information:

        1.   Illustrate

            a.   Each backbone conduit in a backbone cabling conduit segment.

            b.   Each cable and innerduct within each conduit.

        2.   Identify

            a.   Size and type of each conduit

            b.   Type and pair and fiber strand count for each cable.

            c.   Type and size of innerduct

            d.   The "Typical" designation can be used where appropriate.

        3.   Number each conduit.

1.07   SITE PLANS

    A.   Identify location(s) of new, existing, and renovated project areas and elements of work. This shall also include location(s) of key elements supporting the project scope such as existing back-up generators that will used for providing back-up power.

    B.   Pathway Routes

        1.   Illustrate major pathway routes for communications services including underground and overhead services, ductbanks, manholes, handholes, telecommunications enclosures, telecommunications entrances, and other important features.

        2.   Provide conduit requirements between manholes and handholes and to telecommunications entry points.

        3.   Submit plan and section drawings detailing proposed vault specifications.

1.08   FLOOR PLANS

    A.   Shall, at a minimum, include the following

        1.   Locations of

            a.   Electrical Outlets and types

            b.   Work Area Outlets (WAO) and types

            c.   TRs and other rooms and locations associated with telecommunications Work.

            d.   Equipment Enclosures not located in a telecommunications room

            e.   Major penetrations and pathways (floor, wall sleeves, conduits, cable tray, cable chases).

2. Required power circuits and communications cabling provisions for security, and other miscellaneous systems required by project program are shown.

3. On each floor plan sheet, show graphic scale, compass point, room names and numbers, and key plan corresponding to the architectural drawings.

4. Provide reflected ceiling plans illustrating major pathway routes for communications services including backbone conduits and cable trays.

5. Provide locations of other supporting telecommunications elements, such as: fire sprinkler pre-action systems and outdoor components of split system HVAC units.

1.09 TELECOMMUNICAITONS ROOMS ENLARGED PLANS

A. At a minimum, include the following elements with associated labels and key notes.

1. Electrical Outlets

2. Equipment Room Layouts, including placement of plywood backboards

3. Wall Elevations indicating placement of plywood backboards

4. Equipment Cabinets and Racks

5. Wall Equipment

6. Ladder Racks

7. Major penetrations and pathways (floor, wall sleeves, conduits, cable tray).

8. Associated clearances.

9. Illustrate door swing and enclosure swing of wall mounted enclosures.

10. Illustrate door swing of equipment cabinets

11. Cable runway routing, cable tray, ladder rack, and conduit entry points, grounding busbars, wall-mounted connectivity and other equipment, etc.

12. Outline shape representing major floor and wall mounted equipment provided by others (racks, cabinets, CRAC units, whole room UPS, electrical panel(s), etc.) and associated required clearances.

B. Examples of typical elements to coordinate and ensure are addressed across other design disciplines' drawings include:

1. door hardware on and in the door

2. hardware supporting the door functions (access control, door lock and unlock, mechanical door seals)

3. placement and camera view of interior security camera

4. HVAC details regarding

   a. equipment mounting locations, orientations, and clearances.

   b. duct routing

   c. locations of supply and return air vents

5. Ceiling mounted elements' height, size, clearances, and orientations.

6. Examples of common issues resulting from poor coordination include:

   a. Inadequate service clearances between ladder racks (anticipating them being fully populated with cabling) and ceiling mounted HVAC equipment, ducts, and drip pans

  b. Inadequate clearances of ladder racks and electrical outlets above equipment cabinets and racks

  c. Inadequate heights and clearances of sprinkler heads with other ceiling elements and location relative to equipment cabinets and racks.

  d. Coordinating locations of supply and return air vents to correspond with equipment's hot and cold aisle orientation

  e. Light fixture height and orientation relative to the equipment cabinets and racks, and other ceiling elements, to maximize illumination of the equipment along the front and rear of the cabinets

  f. Location of sprinkler pre-action components and pipe.

  g. Required clearances of equipment provided by various disciplines, such as:

    1) CRAC units

    2) Whole room UPS

    3) Wall mounted equipment properly accounting for distance equipment extends from wall (especially split system HVAC indoor units and DAS equipment)

  h. Locations of ceiling, wall, and floor penetrations relative to required clearances of other room elements.

1.010 EQUIPMENT CABINET AND RACK ELEVATIONS AND DETAILS

  A. Show connectivity and equipment.

  B. Include work by the contractor and space allocated for "work by others".

  C. Provide General and Key Notes to provide needed guidance and requirements and to indicate the work to be provided by other trades and vendors, including but not limited to, equipment installations.

1.011 MISCELLANEOUS

  A. Work area outlet details for each type of work area outlet configuration

  B. Interior cabinet details illustrating cable routing and telecommunications equipment, hardware, and associated hardware and utilities (ex: interior of ticketing and gate counters) installation details.

  C. Individual monitor and monitor bank installation details (ex: FIDS monitors and monitor banks).

8. TELECOMMUNICATIONS ROOMS

1.01 GENERAL TELECOMMUNICATIONS ROOMS (TR)

  A. AUS facilities require dedicated Main Distribution Frame rooms (MDFs) and Intermediate Distribution Frame rooms (IDFs), sized to accommodate network, security, and special systems equipment.

  B. Locations

    1. These rooms shall be spaced as often as required to ensure all ethernet cable lengths are less than the maximum 295-feet including service slack. As an early design metric, BICSI's TDMM recommends that when the usable floor space

served by an MDF or IDF exceeds 10,000 square feet, then the Designer shall consider additional IDFs.

2. Locations must allow accessibility for the delivery of large equipment.

3. The location must be away from sources of electromagnetic interference (electrical transformers, motors, generators, etc.) and must also be away from sources of water (breakrooms, restrooms, concession spaces, mop sinks, etc.).

   a. Transformers shall not be placed in TRs.

4. Shall be located in an accessible area.

   a. Shall not be accessed through a tenant or restroom space.

C. These rooms must not have exterior windows.

D. To aid in the management of cable, reduce cable and distribution costs, increase network distribution robustness, and support LEED/sustainability, locate TRs directly above and below TRs on adjacent floor levels.

E. Best practice is to serve data outlets from a TR on the same level. Given airport architectural building designs, in some spaces (ex: ticketing area), it may be necessary to serve data outlets from a TR on a level above or below.

F. AUS MDFs and IDFs should be rectangular rooms without columns or vertical shafts, and should avoid locations that are restricted by building components that limit flexibility, such as elevators, exterior walls, or other fixed building walls.

G. Shall be sized to accommodate the quantity of equipment racks and wall mounting space required to service all building systems devices served within the room's service boundary.

H. Doors

1. Open to the building interior.

2. Shall not be located on exterior walls

3. The entrance shall be minimum 36" wide and 80" high doorway, with no doorsill, and hinged to open outward (code permitting).

   a. If the door must open inward, the size of the room should be increased accordingly.

4. Shall be badged access.

5. BEST key system: provided as backup access

I. Cabinets and Racks

1. MDFs and IDFs are to only utilize floor mounted equipment racks; no equipment cabinets.

2. Only floor mounted equipment cabinets are utilized in Data Centers; no equipment racks.

3. Vertical cable managers shall be sized to accommodate no more than 20% maximum calculated cable fill in order to accommodate the looped patch cable slack within the vertical manager.

J. Walls, floors, and ceilings: treated to minimize dust.

1. Finishes shall be light in color to enhance room lighting.

K. Floors

      1.   Static-Control Resilient Flooring

      2.   Static Dissipative Concrete Sealer

L.   Interior Walls

      1.   Properly install plywood backboards for mounting telecommunications equipment.

      2.   Each wall of the IDF shall be covered with rigidly fixed ¾ inch void free A-C plywood, 8 feet high, capable of supporting attached equipment.

      3.   Plywood shall be fire treated and painted with two coats of fire-retardant white paint.

      4.   Leave the fire-rated stamp exposed so that it is clearly visible. Do not paint over the stamp.

M.   Ceilings

      1.   New construction:

            a.   Open ceilings exposed to concrete at a minimum height of 10 feet above finished floor.

            b.   Ceiling finish should minimize dust.

            c.   Should be painted white.

            d.   False (suspended) ceilings are prohibited.

N.   Mechanical, electrical, plumbing, fire protection, and other utilities shall not pass through an MDF or IDF unless they serve equipment in the room.

O.   Plumbing and fire suppression which serves equipment in the TR must be routed away from rack and electronics.

P.   Electrical

      1.   Provide dedicated branch circuits to each IT rack.

      2.   Provide separate duplex 120V AC non-emergency convenience outlets 18-inches AFF at 6-foot intervals around perimeter walls.

      3.   Emergency power for equipment located within the TR: supplied from a power panel located within the room.

      4.   Non-emergency power panels may be located in another room (e.g. building electrical room).

      5.   Power for lighting and telecommunications equipment: provided by separate power panels.

      6.   Outlets are to be on non-switched circuits.

      7.   Provide dedicated duplex outlets for security devices.

      8.   Provide emergency power to room cooling equipment.

      9.   Remote temperature monitoring: provided via data connectivity to UPS with external temperature monitoring.

      10.   Transformers shall not be located within telecommunications space.

Q.   Pathways

1. TRs shall have overhead telco-style ladder rack for routing of cabling around the perimeter of the rooms, above the equipment racks, and vertically adjacent to the riser cabling pathway within the room.

2. The layout of the telco-style ladder rack must not impede or inhibit access to the overhead infrastructure.

3. Ladder racks shall be designed and constructed to support projected amount of cabling associated with a fully populated buildout of the telecommunications space, plus (10) percent overage.

4. Secure and support cables at intervals not exceeding 30 inches and no more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

R. Lighting

1. Lighting must be provided in the MDFs and IDFs to support 50 foot-candles, measured 3-feet above the finished floor in the front and back of equipment racks.

2. Emergency lighting shall be included and as required by code.

3. Lighting fixtures must not be powered from the same electrical distribution panel as the telecommunications equipment receptacles.

4. The same lighting found in equipment rooms, personnel office spaces, and storage closets can also be used in IT support spaces.

5. The fixtures in equipment rooms shall consider the pathways and IT hardware and infrastructure.

6. Provide a minimum

   a. horizontal illuminance of 50fc measured at 36" AFF

   b. vertical illuminance of 20 fc measured on the equipment racks.

7. Fixtures: mounted above the center of the equipment cabinet and rack aisles such that they illuminate the interior front and rear of the cabinets and front and rear of the equipment racks.

S. Mechanical

1. TRs shall have independent controls for temperature and humidity with thermostat and sensor located in the room.

2. Primary equipment dedicated to serving MDF and IDF rooms shall be located outside of the room and shall be ducted into the room. A separate DX split system on emergency power shall be required for backup.

3. Air devices shall not be installed directly over IT equipment and shall be located and directed to provide adequate ventilation of IT equipment.

4. Access panels for mechanical equipment above inaccessible ceilings shall be provided.

5. Ventilation shall be provided per minimum ventilation requirement according to the latest version of ASHRAE 62.1 and City of Austin (COA) Amendments.

6. Air distribution systems shall comply with acoustical requirements for this space.

7. A backup, non-ducted, split system on emergency power shall be provided and shall activate upon failure of the primary system.

8. IT Rooms shall have their own independent temperature controls.

9. Air conditioning system shall only support the telecommunications space.

10. Shall provide cooling and conditioning 24 hours per day, 365 days per year. Even when main building systems are shut down.

11. Ensure positive air pressure differential is maintained within telecommunications spaces with respect to surrounding spaces and environment

T. Security

1. MDFs and IDFs shall have electronic access control on the entry door, with video surveillance inside the room monitoring the door.

2. Access to rooms: directly from hallways. Not through other rooms. offices, janitorial, or mechanical rooms.

3. Security cameras

a. Provide (1) ceiling mounted security camera inside each TR that provides a view of a person entering and exiting through the door.

1.02   MDF

A. Typical MDF Room Layout
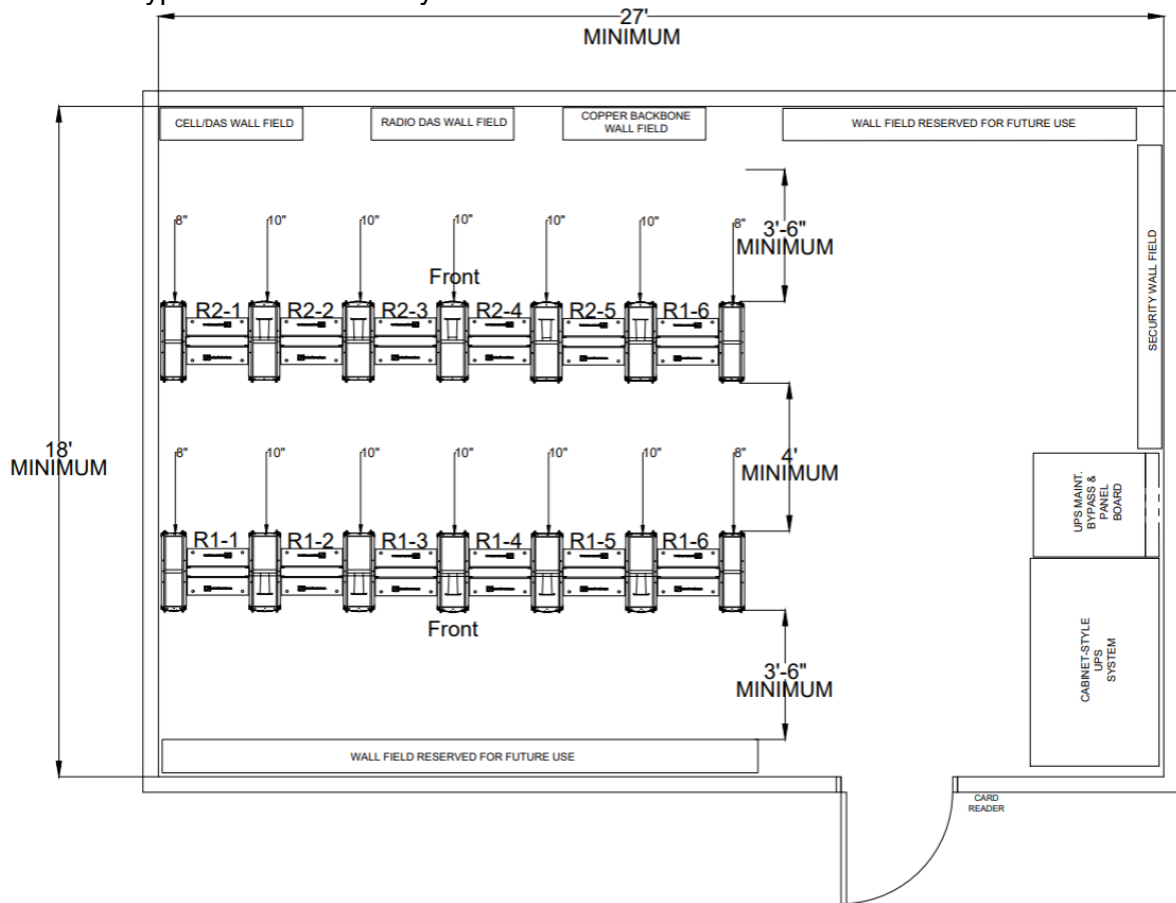
B. Power

1. Electrical service: provided above the racks per the figure below with both non-emergency (normal grid) circuits and emergency (UPS) circuits, sized to accommodate MDF system requirements.

a. Non-emergency receptacle: White, NEMA L21-20R

      b.   Emergency receptacles:

           1)   Orange, NEMA L21-20R

           2)   Orange, 3-wire 120V AC 20R spade, quad electrical outlet

2.   Provide PDUs installed on rear of racks where shown in the figure below.

3.   Emergency receptacles: connected to TR's UPS.

4.   Provide a single UPS that supports electronic equipment for a minimum of 30 minutes.

5.   UPS is to be connected to an emergency power generator.

Typical MDF Power

Rear of racks shown
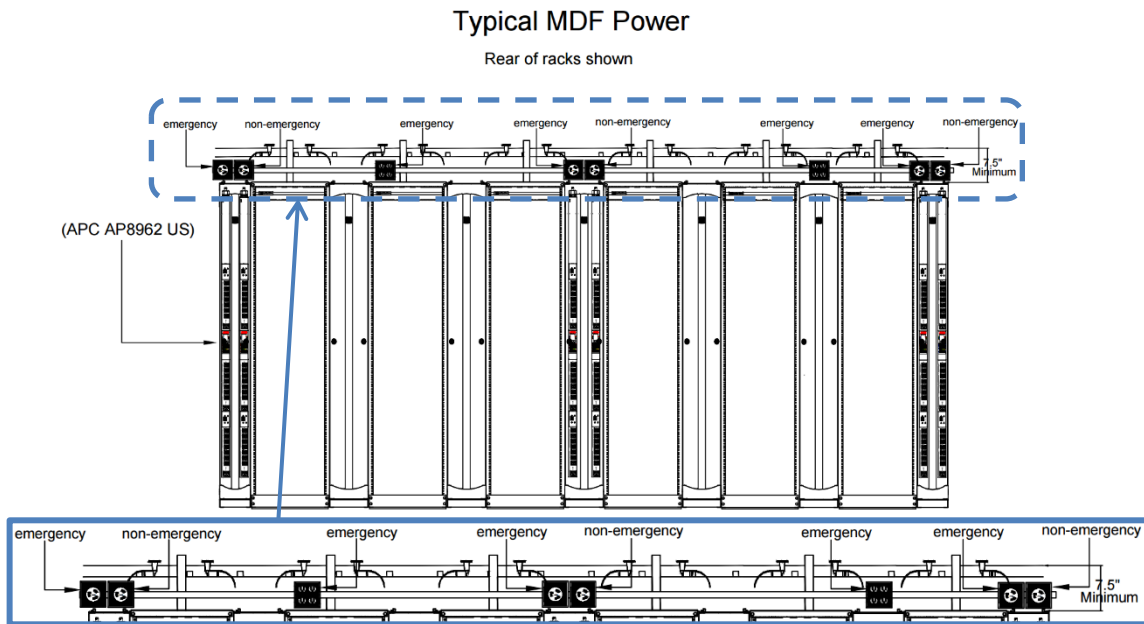
C. HVAC

1.   Redundant cooling units, independent of main building HVAC

D. Fire Suppression

1.   MDFs shall have double-interlocked pre-action fire suppression system in each room.

2.   Chemical pre-action system

3.   Pre-action valve equipment must be located outside of the room.

1.03   IDF

A. Configurations

1.   A typical IDF will require no less than five (5) 2-post equipment racks to support up to a total of (672) patch panel ports (or fourteen 48-port patch panels).

      a.   If the quantity of cables is close to that limit then a larger room with an additional 2-post rack shall be required.

      b.   Coordinate exact rooms sizes with AUS IT early during the design process.

2. IDFs may also house and support tenant or 3rd party radio equipment. These rooms shall be sized to accommodate a divisible partition within the room to maintain secure separation between the airport's infrastructure and 3rd party infrastructure.

B. Typical IDF Room Layout
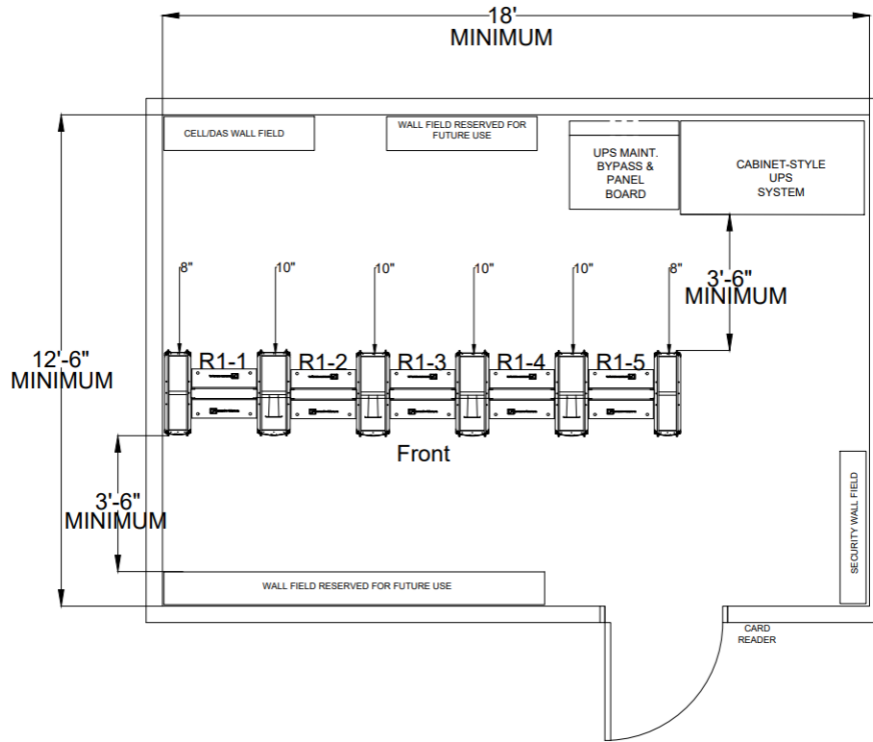
C. Typical Airline Radio Room Layout
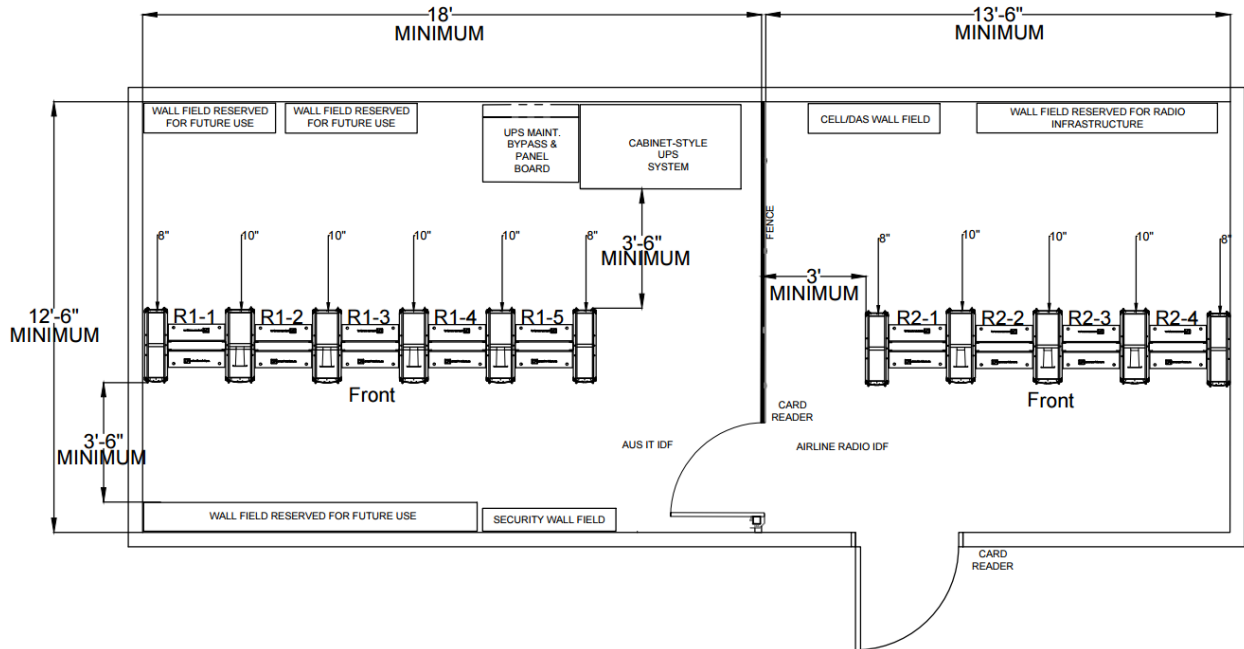
D. Power

1. Electrical service: provided above the racks per the figure below with both non-emergency (normal grid) circuits and emergency (UPS) circuits, sized to accommodate IDF system requirements.

   a. Non-emergency receptacle: White, NEMA L21-20R

   b. Emergency receptacles:

      1) Orange, NEMA L21-20R

      2) Orange, 3-wire 120V AC 20R spade, quad electrical outlet

2. Provide PDUs installed on rear of racks where shown in the figure below.

3. Emergency receptacles: connected to TR's UPS.

4. Provide a single UPS that supports electronic equipment for a minimum of 30 minutes.

5.   UPS is to be connected to an emergency power generator.
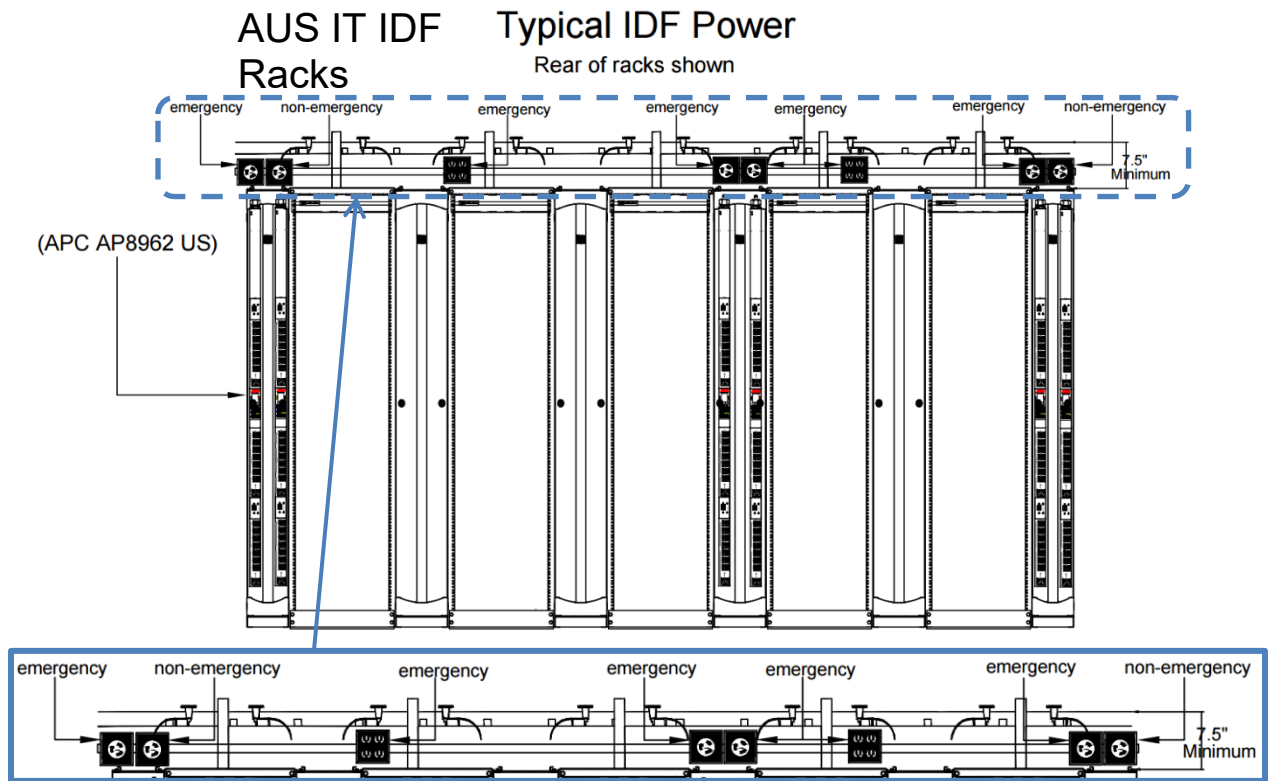
Airline Radio IDF Racks

Typical Radio Room Power

Rear of racks shown

(APC AP8962 US)
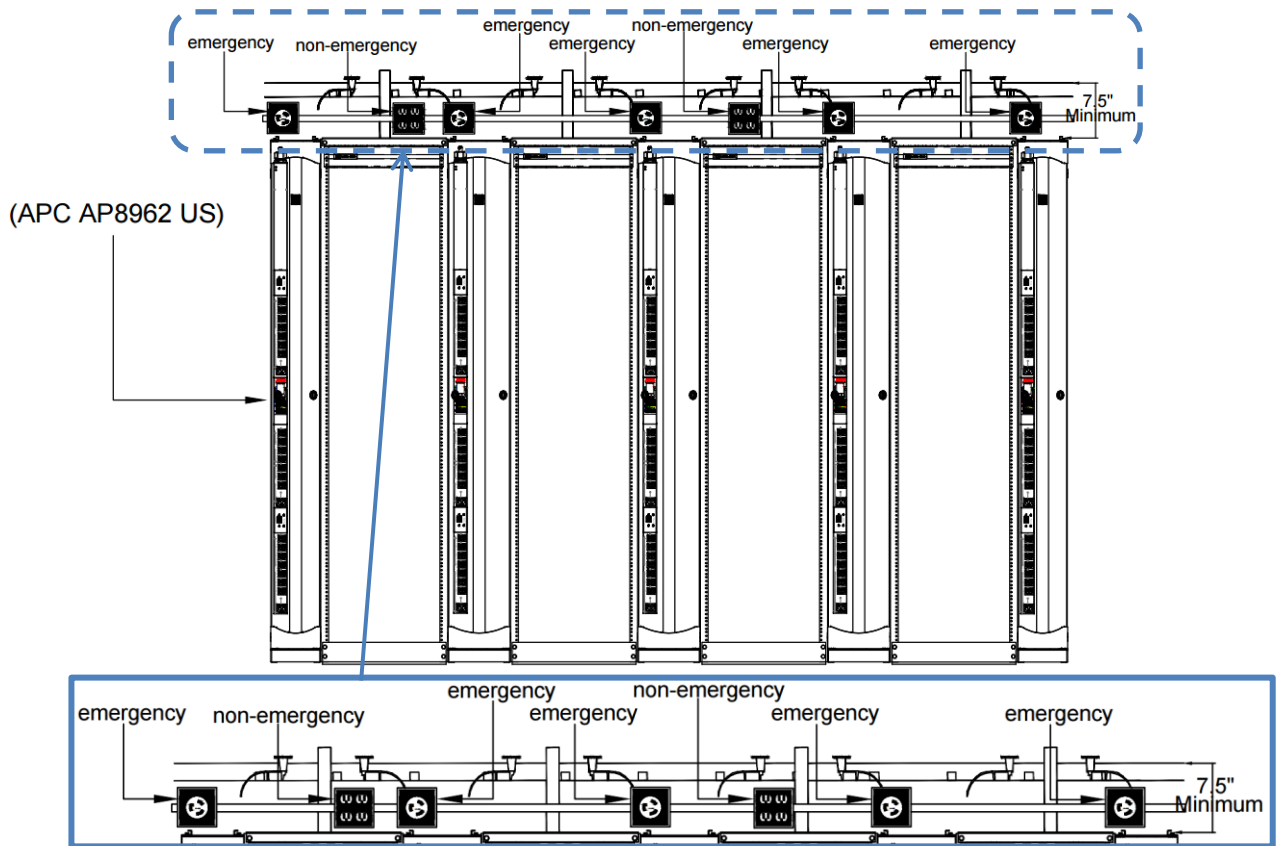
E. HVAC

　　1.　Single cooling unit

　　2.　Extending the building's air cooling system into the room is permissible (will provide some cooling in the event of the single unit's failure) if it is not capable of supplying heat to the TR. It shall not be provided in lieu of a dedicated backup air cooling system.

F. Fire Suppression

　　1.　Pre-action sprinklers only

　　2.　Pre-action valve equipment must be located outside of the room.

9. PATHWAYS

1.01　GENERAL

A. Horizontal and backbone cable pathways shall consist of cable tray and conduit systems.

B. Non-continuous cable supports (such as "j-hooks") are not allowable.

C. Cable trays infrastructure shall consist of aluminum ladder or wire basket construction, depending upon the environment and installation condition.

   1. Cable tray systems must be sized to accommodate all horizontal cabling, plus additional capacity to support 100% growth.

   2. Cable trays shall not be deeper than 6-inches.

D. Cable tray must be routed above accessible ceilings, ideally at a reasonable height above the accessible ceiling to ease future maintenance.

   1. The tray shall be provided with minimum 6-inches clearance to accessible ceiling below, to allow opening of acoustical ceiling tiles below tray.

   2. Open ceiling environments may require conduit or cable tray liners & covers in lieu of typical cable tray.

E. Conduit infrastructure within buildings shall consist of Electrical Metallic Tubing (EMT) or Rigid Metallic Conduit (RMC), depending upon the environment and installation condition.

F. Conduits shall be sized to accommodate the required quantity of cables and must not exceed a 40% calculated fill ratio.

G. Backbone conduit pathways shall include (1) one additional empty conduit for future growth.

H. Separate and physically diverse pathways: used to route backbone cabling back for buildings with redundant MDFs.

I. A maximum of 6-feet of flexible conduit is permitted with AUS IT's written authorization, for specific applications.

J. Refer to the Division 26 (Electrical) section for additional conduit requirements, including conduit color code labeling requirements. Where conflicts may exist between sections, the more stringent shall prevail.

1.02 ISP PATHWAYS

A. Shall be a minimum 1-inch in diameter.

B. Indoor and outdoor above ground conduits shall have no more than two (2) 90-bends between pullboxes or exceed 100-feet between pullboxes.

C. Conduits protruding through floor: terminated (4) inches AFF

D. Conduits protruding through floor and next to a wall: located (1) inch from the finished wall. For walls with wall mounted plywood backboards, the (1) inch distance shall be measured from the exposed face of the plywood backboard.

E. Conduits protruding through floor: located minimum (1) inch from adjacent conduit

F. Conduit protruding through wall: located minimum (1) inch from adjacent wall and conduit

G. Horizontal Pathways

   1. The distribution pathway for horizontal cabling in corridors from the TRs is an 18" x 4" overhead cable tray with a 6" metal separator. 12" separation for network cabling and 6" separation for all other cabling.

2.   The horizontal telecommunications cable distribution system will be run from each WAO above the finished ceiling in conduit transitioning to cable tray or conduit, routed to the nearest TR.

3.   The maximum allowed distance from the TR patch panel to the WAO is 295 feet.

4.   Each WAO will consist of a double gang box fed by two (2) 1" conduits with pull strings.

5.   For TR conduits terminating on the exterior of the building and in non-conditioned spaces (e.g. baggage make-up), provide a conduit sealing fitting immediately outside of TR and seal per manufacturer's instructions. This is to prevent the condensation build up and run-off into the TR due to the temperature differences between the TR's interior and the outside air.

1.03   OSP PATHWAYS

A.   IT Outside Plant (OSP) duct pathways consist of both AUS and FAA pathways.

B.   OSP pathway sizing, routes, and design shall be coordinated with AUS IT and obtain AUS IT approval during initial draft design phase.

C.   FAA pathways shall be coordinated with FAA.

D.   General requirements for OSP pathway should follow the following guidelines:

1.   The OSP communication connection to a site facility should be to the nearest existing manhole that provides sufficient capacity.

2.   Underground conduits shall have no more than two (2) bends or 600-feet between pullboxes.

3.   A minimum of (4) 4-inch ducts should be installed from the existing pathway to a new facility's entrance facility.

4.   Provide a minimum of (1) 3-cell fabric mesh innerduct in spare conduits with pre-lubricated, woven polyester, low friction, and high abrasion resistant yarn in each spare conduit. Coordinate with AUS IT before specifying.

5.   Shall be a minimum of 1.5-inch conduit and may be used for connection of IT enclosures and field devices.

6.   Cut trenches uniformly and slope uniformly (4 inches per 100 feet) away from building entrance; restore surface of areas disturbed by excavation and establish original grades.

7.   Separate the OSP ducts by minimum of 3 inches from exterior wall and minimum of 2 inches between ducts.

          a.   Provide separators a minimum of every 5 feet and secure separators to earth and ducts.

8.   Backbone OSP duct conduits should be encased in concrete with minimum of 3 inches of concrete over ducts.

          a.   Provide a minimum of 30 inches from top of duct to finished grade

          b.   Bury warning tape 12 inches above concrete over centerline with additional tape every 12 inches off centerline.

9.   Direct buried pathway may be utilized for runs serving a maximum of (1) hardened field switch or for individual device horizontal pathway.

10.   Maintenance holes (handholes and manholes) should be installed at distance no greater than 500 feet apart, with

a. Not more than 90 degrees of total bend between; all intersections of ducts and

b. 90 degree bends shall include a maintenance hole.

11. Building entrance maintenance holes should be provided within 30 feet of buildings with a minimum size of 12 feet by 10 feet by 8 feet.

12. Handholes should be a minimum of 40 inches by 60 inches by 30 inches.

13. Provide maintenance hole ancillary elements (e.g., grounding, ladders).

14. Develop maintenance hole design based on load ratings/traffic ratings.

15. Label maintenance holes as "Communications."

16. Provide telecommunications grounding and bonding

10. FIRESTOPPING

1.01 DESIGN

A. Designers are responsible to provide telecommunications firestop requirements based on the architectural partition ratings as part of a complete design. UL-listed mechanical firestop devices are required where horizontal cables penetrate fire-rated partitions.

1.02 PRODUCTS

A. Provide fire resistant materials to restore fire ratings to all wall, floor, or ceiling penetrations used in the distribution and installation for communications cabling system.

B. The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and remain resilient and pliable to allow for the removal and/or addition of communication cables without the necessity of drilling holes in the material

C. "STI EZ Path" shall be utilized in high density wiring locations for all fire-stop penetrations.

1.03 INSTALLATION

A. Prior to purchase and installation

1. Coordinate fire stopping procedures and materials with General Contractor and Electrical Contractor.

2. Solutions and shop drawings/submittals for fire stop materials and systems shall be presented to the General Contractor for written approval.

B. Materials shall be installed per manufacturer instructions, be UL listed for intended use, and meet NEC codes for fire stopping measures.

C. The fire stopping material shall maintain/establish the fire rated integrity of the wall/barrier that has been penetrated.

D. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instruction, and product carton instruction for installation.

E. Site Verification of Conditions

1. Verify substrate conditions are acceptable for product installation in accordance with manufacturer's instructions.

F. Install fire stopping to comply with listed fire rated assemblies in accordance with ASTM and UL requirements

G. Installer shall be trained and approved by the manufacturer

H. Protect installed products from damage during construction operations until final completions.

I. Code official or building inspectors to review proper installation using manufacturer guidelines.

11. BACKBONE CABLING

1.01 GENERAL

A. Provide plenum-rated cable for all plenum environments and riser-rated cable for non-plenum environments.

B. Terminate all conductors and fiber strands. No cable shall contain unterminated elements.

1.02 COPPER BACKBONE CABLE

A. Provide multi-pair Category 3 cabling for copper backbone connectivity.

1.03 FIBER BACKBONE CABLE

A. Fiber backbone shall terminate in Fiber Patch Panels mounted in 19-inch racks.

1.04 PRIMARY AND SECONDARY CONNECTIONS

A. Each AUS MDF is required to include primary and secondary backbone connections to the AUS network core locations.

B. Each terminal building is to have (2) MDFs.

C. Within terminal buildings, each IDF is to have a backbone connection to each MDF. One connection serves as the "Primary" connection and the other as the "Secondary" connection.

D. Primary and Secondary backbone cable connections shall be routed via physically separate and diverse pathways.

1. Primary backbone cables: in conduit.

2. Secondary backbone cables may be in cable tray or separate dedicated conduit.

E. Coordinate the design details with AUS IT in the initial design phase.

1.05 OSP BACKBONE CABLE

A. Fiber Optic Cable

1. OSP backbone fiber optic cabling should be armored indoor/outdoor single mode.

2. OSP backbone fiber optic cabling should have a minimum 20-foot service loop at

a. Both ends of each cable

b. Each manhole and maintenance hole

c. Service loop: wrapped around interior.

       3.   Terminations should be fusion spliced to factory provided "pig-tail" SC-terminated cables.

    B.   Copper Cable

       1.   OSP backbone copper cabling should be Category 5 flooded UTP (unshielded twisted pair).

       2.   Should terminate in entrance facility with lightning protection and then in rack mounted RJ-45 patch panel.

12. HORIZONTAL CABLING

1.01 GENERAL

    A.   Horizontal cable channel products shall meet Category 6A cabling performance standards and must comply with AUS's campus-wide standard and maintain the manufacturer's extended warranty.

1.02 CABLE

    A.   Horizontal copper data cabling for AUS work areas shall be plenum rated, unshielded twisted pair category 6A (augmented) with a Limited Power (LP) rating which complies with NEC section 725.144(B), unless otherwise indicated.

    B.   Shielded cabling may be required where electromagnetic interference is a concern due to environment (such as near electrical transformers) or signal type (such as HDMI-over-twisted pair extenders).

    C.   Patch Cords - Provide two (2) Category 6A patch cords per horizontal data cable installed: 50% 15 ft. length (Blue) & 50% 7 ft. length (Blue)

1.03 INSTALLATION

    A.   Cabling

       1.   Horizontal data cabling lengths which exceed the 100-meter distance limitation may be accommodated for select applications, such as jet bridge devices. These select applications may be accommodated with an extended distance twisted pair cable (e.g. Anixter UTG20 compliant products) or with horizontal optical fiber infrastructure (e.g. Composite Fiber/Copper cabling).

       2.   UTP cables may not be spliced.

       3.   Secure and support cables at intervals not exceeding 30 inches and no more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

       4.   Horizontal data cabling in TR shall only terminate on rack mounted Category 6A flat Patch Panels.

    B.   Work Area Outlets

       1.   In general, the total number of data cables to provide at each WAO should follow the guideline that for every (1) to (3) required data cable connections, add (1) spare cable to the total quantity of data cables for the WAO. The following table provides examples of WAOs with varying quantities of required data cable connections to meet the project's initial design requirements, the spare cables added per this guideline, and their sum resulting in the total number of data cables to be provided for the WAO:

No. of Required Data Connections / Cable	No. of Spare Data Cables Added	**Total No. of WAO's Data Cables**

1	1	**2**
2	1	**3**
3	1	**4**
4	2	**6**
5	2	**7**
6	2	**8**
7	3	**10**
…	…	**…**

    2.   Typical office work area outlets (WAO) will consist of a total of four (4) data cables with 568B terminations.

    3.   Inserts will be flush-type mounted into conduit and boxes installed in the hollow wall space or in floor poke-thru devices.

C. Wireless Access Points

    1.   Typical Wireless Access Points (WAPs) will consist of two (2) data cables with 568B terminations.

    2.   Inserts: flush-type mounted into 2-port surface mount plenum box housed in a double gang electrical box with cover.

    3.   A 20ft service loop at the access point end is required for final placement of access point after post coverage survey.

D. Card Readers

    1.   Each card reader location to receive one (1) data cable for future biometric reader. This cable is an addition to the electrified door composite cable.

E. Security IP Camera

    1.   Typical security IP camera will consist of one (1) data cable with 568B termination.

    2.   Inserts will be flush-type mounted into 1-port surface mount box housed in a double gang electrical box with cover.

13. GROUNDING AND BONDING

1.04   GENERAL

A. The section includes the minimum requirements for the design, installation, and testing of a telecommunications grounding system and bonding infrastructure.

1.05   COMPONENTS

A. Key elements include:

    1.   Telecommunications Main Grounding Busbar (TMGB)

    2.   Telecommunications Grounding Busbar (TGB)

    3.   Telecommunications Bonding Backbone (TBB) conductor(s) from the TMGB to each TGB.

    4.   For large buildings with multiple TBBs, a Grounding Equalizer (GE) shall be run between the TBBs at every third floor.

    5.   Rack Grounding Busbar (RGB).

B. TMGB shall be

1. A predrilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors to be used

   a. Sized for the immediate requirements and future growth

   b. Minimum dimensions are 6 mm thick x 100 mm wide, with variable length

   c. Electrotin plated for reduced contact resistance

2. Installed in each MDF, Data Center, or Building Entrance as close to the electrical panel as possible. Designer is responsible for proper placement of the TMGB within the room.

3. Grounded and Bonded directly to

   a. The nearest electrical service ground within the room and telecommunications primary protectors.

   b. Nearest building structural metal if the structural metal is electrically continuous to earth ground.

      1) Concrete reinforcing steel must not be considered as structural metal.

4. The TMGB shall be insulated from its support with a recommended separation of 2" (two inches).

C. TGBs shall be

1. A predrilled copper busbar with standard NEMA bolt hole sizing and spacing for the type of connectors to be used

   a. Sized for the immediate requirements and allow for 100% growth

   b. Minimum dimensions are 6 mm thick x 50 mm wide, with variable length

   c. Electrotin plated for reduced contact resistance

2. Installed in each IDF and other telecommunications enclosures as close to the electrical panel as possible. Design is responsible for proper placement of the TGB within the room.

   a. Multiple TGBs within a room (if applicable): bonded together with an appropriately sized conductor.

3. Grounded and Bonded directly to

   a. The nearest electrical service ground within the room and telecommunications primary protectors.

   b. Nearest building structural metal if the structural metal is electrically continuous to earth ground.

      1) Concrete reinforcing steel must not be considered as structural metal.

4. The TGB shall be insulated from its support with a recommended separation of 2" (two inches)

D. TMGB and TGBs

1. Shall be grounded and bonded to the following that is located within the same room and telecom enclosure:

   a. Surge suppression equipment

   b. Cable shields

      c.   Each row of racks and cabinets using AWG #6 THHN green jacket.

            1)   Each row shall have its own ground cable

      d.   Telecommunications Raceways and Support Systems

            1)   Ladder rack

            2)   Cable tray

            3)   Provide flexible bonding jumpers and/or straps around raceway expansion joints and across cable tray joints specifically parted to allow for expansion and hinged cable tray connections

            4)   Where a grounding conductor is run in or on a cable tray, bond grounding conductors to each section of cable tray with a cable tray ground clamp

      e.   Metallic items that interact electro-magnetically with Network / Communications equipment shall have their framework bonded and grounded to the communications grounding system with a minimum 6 AWG grounding conductor. Example includes switch frames, battery stands, storage cabinets, fences, and other metallic objects.

      f.   Frame-to-frame "Daisy Chaining" connecting of these conductors is not permitted.

      g.   Horizontal and Backbone Metal Conduits via grounding bushing

      h.   Attachment of ground conductor to busbar shall utilize a listed compression two hole lug or irreversible compression-type bus bar connector.

   2.   Grounding conductors: a minimum of 6 AWG, stranded, green insulated, copper conductor used for communications to accommodate different code requirements and allows for future changes.

 E.   The TBB conductor shall be

   1.   Within a building, routed as a continuous conductor originating at the TMGB and extending through the building using the telecommunications backbone pathways to the TGB in the last IDF on the top floor.

      a.   No splices are permitted.

   2.   Each IDF along the route shall have a TBB that extends from its TGB to the continuously routed TBB conductor and bonded using exothermic weld.

      a.   TBB is not to be connected through a TGB.

   3.   Where only grounding conductor is installed in a metal conduit, bond both ends of conduit to grounding conductors.

   4.   Minimum 2AWG conductor size.

   5.   Bonding conductors shall be routed with minimum bends or changes in direction and shall be made directly to the point being bonded. Change of direction shall be taken over as wide a radius as possible with a minimum radius of one foot.

   6.   Make connections only to dry surfaces with paint, rust, oxides, scales, grease and dirt removed. Ensure proper conductivity.

   7.   Metallic cable shield shall NOT be used as a TBB.

   8.   Interior water piping system shall NOT be used as a TBB.

F. IDFs which support radio systems must also comply with the grounding requirements in Motorola Standard R56.

1.06   INSTALLATION

A. Bond each rack to the TGB via a separate conductor. Alternately, a single bonding conductor may be run from the TGB to the row of racks and a conductor for each rack tapped off of the single bonding conductor.

14. MISCELLANEOUS

1.01   ELEVATOR CARRIER CABLE

A. Install (2) Category 6A UTP cables

15. LABELING

1.01   GENERAL

A. This labeling standard ensures proper cable identification and organization, facilitating efficient cable management and maintenance.

B. Labels shall be

1. Printed by a label printer. Label printer shall be of the thermal transfer type capable of printing self-laminating labels.

2. As large as practicable while fitting properly.

3. White in color with black printed characters.

C. No handwritten labels are permitted.

D. Label material shall be suitable for intended usage and environment, meeting the legibility, defacement and general exposure requirements listed in UL 969 for indoor and outdoor use.

1. Where insert labels are used the insert label shall be covered with clear cover and shall be securely held in place under the normal operating conditions and usage to which the labeled infrastructure element is applied.

E. Items to be labeled: labeled at the time they are installed.

1.02   WORK AREA OUTLET FACEPLATE LABELING

A. Addresses labeling of work area outlet (WAO) faceplates (also referred to as data faceplates).

B. Label Format

1. IDF Number: This is the IDF room number from which the outlet's horizontal cables originate. The IDF number must be placed in the top left-hand corner of the faceplate. This number should be clearly visible and easily identifiable.

2. Data Port Numbers: Each data port has a unique DXXX number that corresponds with the horizontal cable's patch panel port in the IDF. These DXXX numbers are to be composed of three digits each. They should be positioned neatly and legibly underneath their respective data ports.

C.   Unused data ports are not to be labeled.
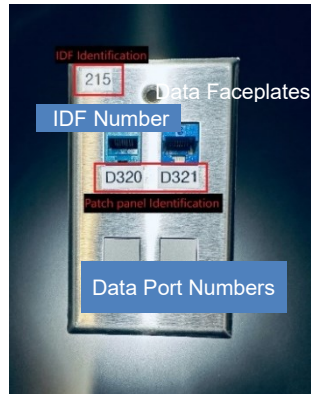
1.03   HORIZONTAL CABLE LABELING

A.   Affix cable labels to:

1.   The user end of the cable immediately next to the cable termination.

2.   Behind the corresponding patch panel approximately 6-8 inches from the cable termination.

B.   Label Format

1.   Reference the figure below with the sample cable label and the format IDF-DXXX

a.   IDF: Replace the text "IDF" with the MDF/IDF room number from which the outlet's horizontal cables originate.

b.   DXXX: Each data cable has a unique DXXX number that corresponds with the horizontal cable's patch panel port in the MDF/IDF. These DXXX numbers are to be composed of three digits each.

C.   Label Material: The label shall be constructed of self-laminating vinyl.

D.   Label Dimensions: Each label shall measure 1.50 inches (38.1 mm) in length and 1.00 inch (25.4 mm) in width.

E.   Cable Diameter Supported: The label shall accommodate cables with an outside diameter ranging from 0.16 inches (4.0 mm) to 0.32 inches (8.1 mm).

F.   Printing: The print-on area height on the label shall be 0.50 inches (12.7 mm) and shall be white in color with black machine-printed characters.

G.   Approved Label Types:

1.   S100X150VAC Self-Laminating Label, P1 Cassette

2.   S100X150YAJ Self-Laminating Label, Laser/Ink Jet

3.   S100X150VAT Self-Laminating Label, Thermal Transfer

H.   Suppliers:

1.   Panduit

2.   Brady

3.   HellermannTyton

1.04   COPPER PATCH PANEL LABELING

    A.   Ink/laser printed labels shall be constructed of die-cut, adhesive polyolefin.

    B.   Thermal transfer labels shall be constructed of die-cut, adhesive polyester.

    C.   Label shall be 3.79" (96.3 mm) W x 0.30" (7.6 mm) H.

    D.   The label shall be white in color, with black machine-printed characters.

    E.   Acceptable products:

        1.   Panduit

            a.   C379X030FJC Component Label, P1 Cassette

            b.   C379X030FJJ Component Label, Laser/Ink Jet

            c.   C379X030YPT Component Label, Thermal Transfer

        2.   Brady

        3.   Brother

            a.   TZE Label Tape BROTHER® P-TOUCH®

    F.   Label placement

        1.   WAO jack assignment number and TR patch panel port number shall be the same number. Example: A horizontal cable terminated on WAO jack D001 shall be terminated on patch panel port D001. A horizontal cable terminated on WAO jack D099 shall be terminated on patch panel port D099.

        2.   Start patch panel port labeling at the first port in the patch panel that is at the top of the equipment rack closest to the wall. Work left to right and down that equipment rack to the last patch panel port within that equipment rack. Continue to the next equipment rack, starting in its upper left-hand corner and moving down the rack, if more than one (1) equipment rack supporting WAO horizontal cabling is installed in the IDF.

Patch Panel Port Label

1.05 CABINET AND RACK LABELING

A. Labels shall be

    1. ¾-inch flexible industrial strength nylon label tape - white

    2. Affixed to the front and rear, top-center of cabinets and racks.

    3. Numbered by position as shown in the Typical MDF Room Layout, Typical IDF Room Layout, and Typical Airline Radio Room Layout figures provided in the Telecommunications Rooms section.

1.06 BACKBONE FIBER PATCH PANEL LABELING

A. Ink/laser printed labels shall be constructed of die-cut, adhesive polyester, or black-on- white vinyl tape.

B. Label shall be 3.50" (88.9 mm) W x 1.00" (25.4 mm) H.

C. The label shall be white in color, with black machine-printed characters.

D. Acceptable products:

    1. Panduit

        a. C379X030FJC Component Label, P1 Cassette

        b. C379X030FJJ Component Label, Laser/Ink Jet

        c. C379X030YPT Component Label, Thermal Transfer

    2. Brady

    3. Brother

        a. TZE Label Tape BROTHER® P-TOUCH®

E. Label Placement: Use label strips on front cover of fiber patch panel.

    1. At the top of the label strip of each 6-12 strand fiber panel, place a label with the backbone cable's destination TR room number. The TR to which the other end of the fiber backbone cable is connected. This information helps in network mapping and troubleshooting.

    2. Provide a label for each pair of fibers terminated on a row, moving down each column of the patch panel. Use the following labeling scheme: AABBCC-DD

        a. AA – Represents fiber cable type. "SM" for single mode or "MM" for multi-mode

        b. BBCC represents a fiber strand count of 4-digits

            1) BB represents the first two digits of the fiber strand count

2)   CC represents the last two digits of the terminated fiber strand (moving from left to right)

    c.   DD represents the last two digits of the next terminated fiber strand.

3.   If cable is a hybrid make sure both strand type counts are accounted for in header label.

4.   When installing a new fiber box, assign the next set of numbers based on the next lowest available number in that given IDF.
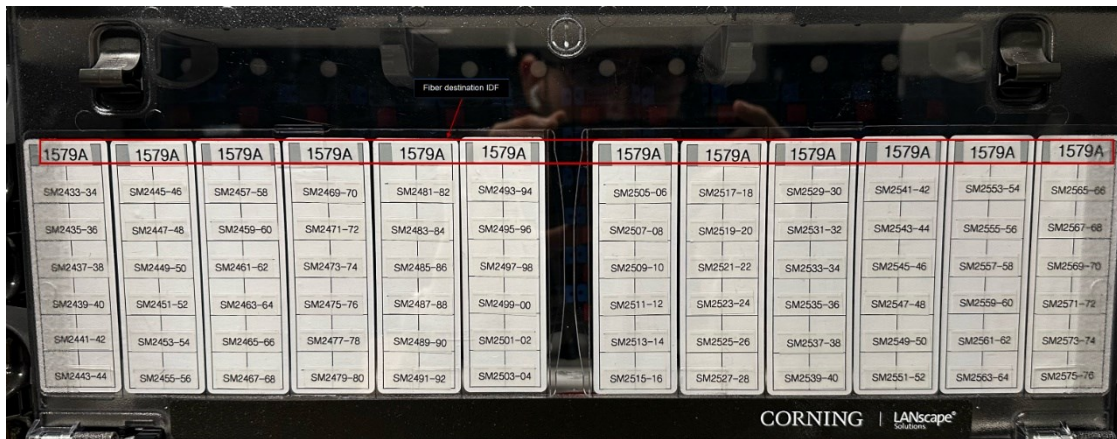
1.07   BACKBONE CABLE LABELING

A.   At a minimum, backbone cables shall be labeled:

1.   Within 12 inches of the termination panel

2.   The point at which the cable enters/exits the room

B.   The following is a new labeling scheme for the labeling of backbone cabling with the label's TR location (Origin) first, followed by the remote termination end of the cable:

1.   Cable Type.Strands/Pairs.Origin Building Number.Origin Room Number.Origin Rack Number> Remote Building Number.Remote Room Number.Remote Rack Number

    a.   Cable Type:

        1)   SM – Singlemode

        2)   CR – Copper

    b.   Building Number

        1)   Each building on AUS' premises has a unique assigned 4-digit building number

        2)   Contact AUS IT for a complete list of building numbers.

    c.   Room Number

        1)   Each TR has a unique assigned room number which may contain numbers and letter(s).

    d.   Rack Number

        1)   Each rack in a TR has a unique assigned number. This is the number of the equipment rack on which the cable is terminated.

e. Strands/Pairs

1) For copper backbone cable, this is the cable pair numbers.

2) For fiber optic cable, this is the fiber strand numbers

2. As an example: SM.001-144.7035.1579A.R2>7355.123.R3

a. This is 144 strand singlemode cable that is routed from the current location of the Terminal (Building 7035), Room Number 1579A, Rack 2 to the remote termination location in IT Building 7355, Room 123, Rack 3

1.08 CONDUITS

A. Refer to AUS DSM for color code of "Data" conduits and J-boxes.

B. Label conduit sleeves and penetrations in TR as well as conduit terminations in ceiling and cable trays, with destination building and room number.

C. Install pathway and cable labels so they are visible and able to be read by a person standing on floor with no obstructions in the way. Additional types of labeling materials necessary to keep labels visible shall be provided by Contractor and installed by Contractor.

1.09 GROUNDING CONDUCTORS

A. Both ends of the grounding conductors shall be equipped with a printed destination label recording the far end termination. The label shall be applied within 6 inches of the termination and be visible from the floor.

16. COMMISSIONING/TESTING

1.01 FUTURE SECTION

17. DEMOLITION

1.02 GENERAL

A. The contractor shall be responsible for maintaining all communications service to areas of the building scheduled to remain in service during the period of renovation.

B. Notify AUS IT 30 days prior to the start of demolition work taking place in existing TRs.

C. Coordinate removal of equipment and cabling within existing TRs with AUS IT.

D. Where removal is indicated in Drawings, remove communications cable from termination point back to originating TR and, if applicable, tenant TR space.

E. Coordinate removal at terminating blocks and panels with AUS IT.

F. Coordinate removal of cross-connects and patch cables with AUS IT.

G. Demolition and removal of cabling shall not impact the operation of active systems.

H. Unless otherwise noted, discard removed items. Do not reuse cable.

I. Remove abandoned cables in accordance with NEC 800.25

APPENDIX A: PRODUCTS

1.01   GENERAL

      A.   Whenever a product is specified by using a proprietary name or the name of the particular manufacturer or vendor, the specific item mentioned shall be understood as establishing type, function, dimension, appearance, and quality desired. Other manufacturers' products might be accepted provided:

          1.   Sufficient information is submitted to allow AUS IT to determine that products proposed are equivalent to those named.

          2.   The use of proposed alternative cabling product(s) does not void AUS IT's current 25-year product warranty for AUS' structured cabling and connectivity components.

      B.   Products specified in this document do not constitute the exhaustive list of products required to complete the statement of work. Contractor is responsible for providing parts and materials needed to deliver Contractor's scope for a complete and working system.

1.02   NETWORK EQUIPMENT RACK

1.	Description:	Free-standing Network Equipment Rack and related products
2.	Specifications	

1. Racks shall be manufactured from aluminum extrusion.
2. Each rack will have two L-shaped top angles, two L-shaped base angles and two C- shaped equipment-mounting channels. The rack will assemble with nut and bolt hardware. The base angles will be pre-punched for attachment to the floor.
3. Equipment mounting channels will be 3" deep and punched on the front and rear flange with the EIA-310-D universal hole pattern to provide 45 rack-mount spaces for equipment. Each mounting space will be marked and numbered on the mounting channel.
4. When assembled with top and bottom angles, equipment-mounting channels will be spaced to allow attachment of 19" EIA rack-mount equipment. Attachment points will be threaded with 12-24 roll-formed threads. The rack will include assembly and equipment- mounting hardware. Racks will include 50 each combination pan head, pilot point mounting screws.
5. The assembled rack outside dimensions will be 7' (84") high, 20" wide and 15" deep. The sides (webs) of the equipment-mounting channels will be punched to allow attachment of vertical cable managers along the sides of the rack or for rack-to-rack baying.
6. The rack will be rated for 1,000 lb. of equipment.
7. The rack will be UL Listed.
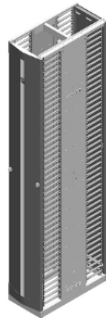8. Finish shall be epoxy-polyester hybrid powder coat in the color black.

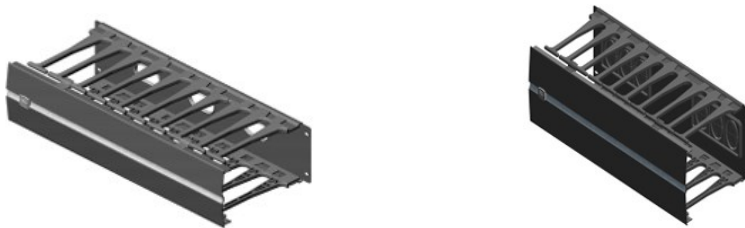| 3.	Installation	1. Provide Radius Drop (Waterfall) from ladder rack to top of each Network Equipment Rack
4.	Acceptable Products:	Chatsworth Products, Inc. (CPI) Part Number: 55053-703, Standard Rack, 19" x 7', Color: Black, UL Listed.
5.	Related Products:	1. CPI Part Number: 40605-005, Equipment Mounting Screws, #12-24, 50 pack, Color: Black 2. CPI Part Number: 40604-003, Concrete Floor Rack Installation Kit, Concrete Slab, Zinc 3. CPI Part Number: 40117-719, Single Sided Vented Shelf, 2U x 19in x 15in Deep, Color: Black

1.03   EQUIPMENT CABINET

1.	Description:	Equipment Cabinet for use in Data Center Rooms

2.	Specifications:	1. Provide Network Cabinets with the following options
		   a. Roughly 83.4", 31.5" Wide and 40" Deep. Color: Black;
		   b. Locking Single Perforated Doors in the Front and Locking Double Perforated Door in the Rear;
		   c. Side Panels between each cabinet and at end of each row
		   d. Vertical Wire Management installed on both sides, front and back.
		   e. Provide grounding bar in the base of each cabinet

3.	Installation:	1. Provide Radius Drop (Waterfall) from ladder rack to top of each Network Cabinet
4.	Acceptable Products:	1. Part Number: CPI TSZ1533483-ZETAFRAME

1.04   DOUBLE-SIDED VERTICAL CABLE MANAGER

1.	Description:	Double-sided Vertical Cable Manager related products
2.	Specifications	

1. Dimension options: 8-inch wide and 10-inch wide and height shall match rack and frame height.
2. Bolt to side of rack and frame with included hardware
3. Must have minimum width of 8 inches.
4. Shall be manufactured from steel, aluminum and plastic.
5. Shall include the following
   a. Double-sided H-shaped trough
   b. Front and Rear Door
   c. Doors shall open to right or left with single latch
   d. Doors: removable
   e. Doors: contoured
   f. Rear door shall have easy open latches
   g. Independent front and rear cable pathways
   h. Front and rear sides: T-shaped cable guides separated by openings that align with each U space on the rack.
6. Middle: Mostly open to allow easy cable pass-through
7. Three movable mid-sections shall: allow attachment of cable management accessories inside the cable manager.
8. The movable mid-sections shall adjust front-to-rear to allow a 40/60, 50/50 or 60/40 front/rear split of the interior cable management space.

3.	Acceptable Products:	1. 8-inch Wide Part Number: CPI 35522-703, Vertical Cable Manager, 7' High x 8" Wide x 24.3" Deep
		2. 10-inch Wide Part Number: CPI 35523-703 Vertical Cable Manager, 7' High x 10" Wide x 24.3" Deep
4.	Related Products:	1. Cable Distribution Spool Part Number: CPI 15008-001, Pack of 4, Black
		2. Cable Distribution Spool Kit Part Number: CPI 13935-701, Pack of 4, Black
		3. Cable Lashing Bar Kit Part Number: CPI 13928

1.05   HORIZONTAL CABLE MANAGER

1.	Description:	Horizontal Cable Manager; 1U, 2U, 3U rack units high
2.	Specifications	

1. Dimensions
   a. Width shall match rack-mount width of rack and frame.
   b. Shall fit in standard EIA-310-D or EIA-310-E Universal rack- mount spacing (1-3/4in high U).
2. Shall attach to front and rear of rack and frame with screws
3. Shall have a single-sided C-shaped trough with a cover.
4. Cover shall be
   a. removable
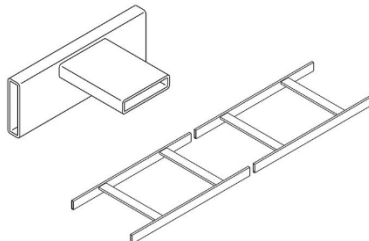   b. hinged to open up and down

		c. snap on to secure cover in closed position. 5. 2U and 3U high cable managers shall have three edge-protected oval openings at rear to facilitate front-to-rear cabling through horizontal manager. 6. Front shall have T-shaped cable guides extending along top and bottom surfaces. 7. T-shaped cable guides shall be evenly spaced cable openings. This shall allow cables to enter and exit cable manager. 8. Shall be manufactured from steel, aluminum and plastic. 9. Finish: epoxy-polyester hybrid powder coat paint. 10. Color: Black. 1.
3.	Acceptable Products:	1. 1U Part Number: CPI 35441-701, Evolution Single-Sided Horizontal Cable Manager, 1U x 19inEIA x 8.2in Deep (208 mm), Color: Black 2. 2U Part Number: CPI 35441-702, Evolution Single-Sided Horizontal Cable Manager, 2U x 19inEIA x 8.2in Deep (208 mm), Color: Black 3. 3U Part Number CPI 35441-703, Evolution Single-Sided Horizontal Cable Manager, 3U x 19inEIA x 8.2in Deep (208 mm), Color: Black

1.06   RACK POWER DISTRIBUTION UNIT (PDU)

1.	Description:	Rack PDU, 2G, switched, 0U, 20A, 120V and 208V, 24 NEMA 5-20R sockets
2.	Specifications	

1. 20A, Input Voltage: 208V 3 phase; Output Voltage 120V
2. Input Plug Type: NEMA L21-20P
3. Total Number of Outlets: (24)
4. Outlet Type: NEMA 5-20R
5. User-customizable power control and active monitoring.
6. Remote outlet level controls to allow power on and off functionality of individual outlets.
7. Power sequencing delays allow users to define the order in which to power up or down attached equipment.
8. Prioritized load shedding during power recovery and to extend uptime of critical equipment.
9. Real-time remote monitoring of connected loads.
10. Includes power monitoring, a temperature/humidity sensor port, locking IEC receptacles, and low profile circuit breakers, user-defined alarms. User access, configure, and control of PDU through secure Web, SNMP, or Telnet Interfaces and complimented by APC Centralized Management platforms using InfraStruxure Central, Capacity Manager and Change Manager.

3.	Acceptable Products:	Part Number: APC AP8962 US

1.07   LADDER RACK

1.	Description:	Ladder Rack (Cable Runway) and related products
2.	Specifications	

1. Shall be manufactured from 3/8" wide by 1-1/2" high tubular steel with .065" wall thickness.
2. Ladder rack (side stringers) will be 9'-11½" long.
3. Cross members: welded between stringers on maximum 12-inch centers beginning 5-3/4" from one end so there are a minimum 10 cross members per ladder rack.
4. Maximum 10-1/2" of open space in between each cross member.
5. Finish shall be epoxy-polyester hybrid powder coat (paint).
6. Designer to specify required width.

3.	Acceptable Products:	1. "xx" denotes nominal width 2. Color: Black 3. CPI Part Number: 10250-7xx 4. Eaton B-Line Part Number: SB17TxxBFB
4.	Related Products:	

1. Color: Black, unless otherwise specified
2. Ladder Rack (Cable Runway) Horizontal 90° Turns
    a. "xx" denotes nominal width
    b. CPI Part Number: 10822-7xx
    c. Eaton B-Line Part Number: SB17HRBxxFB
3. Ladder Rack (Cable Runway) Vertical-To-Horizontal 90° Turns
    a. "xx" denotes nominal width
    b. CPI Part Number: 10724-7xx
    c. Eaton B-Line Part Number: SB16VRBxxFB
4. Ladder Rack (Cable Runway) Corner Brackets
    a. "xx" denotes nominal radius
    b. CPI Part Number: 11959-7xx
    c. Eaton B-Line Part Number: SB2104FB
5. Ladder Rack (Cable Runway) Butt-Splice Kit
    a. CPI Part Number: 11301-701
    b. Eaton B-Line Part Number: SB2107BZ
6. Ladder Rack (Cable Runway) Junction-Splice Kit
    a. CPI Part Number: 11302-701
    b. Eaton B-Line Part Number: SB2101ABZ
7. Ladder Rack (Cable Runway) Insulator Bar Kit
    a. "xx" denotes kit quantity
    b. CPI Part Number: 10842-xxx
8. Ladder Rack (Cable Runway) Splice Plates
    a. CPI Auxiliary Framing Channel Splice Cable Runway: 11301-701
9. Ladder Rack (Cable Runway) Bonding Strap Kit
    a. CPI Cable Runway Bonding Strap Kit
    b. 8-inch long, #6 AWG green insulated stranded copper conductor connected on both ends to ladder rack using two-hole compression lugs and stainless-steel hardware.
10. Ladder Rack (Cable Runway) Triangular Support Bracket
    a. "xx" denotes nominal width
    b. CPI Part Number: 11312-7xx
    c. Eaton B-Line Part Number: SB213xxKFB
11. Ladder Rack (Cable Runway) Wall Angle Support Kit
    a. "xx" denotes nominal width
    b. CPI Part Number: 11421-7xx
    c. Eaton B-Line Part Number: SB2113xxFB
12. Ladder Rack (Cable Runway) Rack-to-Runway Mounting Plate
    a. "xx" denotes nominal width
    b. CPI Part Number: 10595-7xx

c.   Eaton B-Line Part Number: SB2133xxFB
13. Ladder Rack (Cable Runway) Threaded Ceiling Kit
    a.   CPI Part Number: 11310-001
    b.   Eaton B-Line Part Number: SB2221ABZ
14. Ladder Rack (Cable Runway) Protective End Caps
    a.   CPI Part Number: 10642-001
    b.   Eaton B-Line Part Number: SB110A1B
15. Ladder Rack (Cable Runway) Radius Drop, Cross Member
    a.   "xx" denotes nominal width
    b.   CPI Part Number: 12100-7xx
    c.   Eaton B-Line Part Number: SB2129xxFB
16. Ladder Rack (Cable Runway) Radius Drop, Stringer
    a.   "xx" denotes nominal width
    b.   CPI Part Number: 12101-7xx
    c.   Eaton B-Line Part Number: SB2120DSxxFB
17. Ladder Rack (Cable Runway) Moveable Cross Member
    a.   "xx" denotes nominal width
    b.   CPI Part Number: 12115-7xx
    c.   Eaton B-Line Part Number: SB17RKxxFB

1.08   FIBER OPTIC BACKBONE CABLE

1.	Description:	Fiber Optic Backbone Cable

2.	Specifications:	1. Fiber Optic Backbone Cable: Single mode
		2. Optical fibers shall be minimum OS2 compliant.
		3. Maximum attenuation coefficient shall be:
		      a. 0.65 dB/km at 1310 nm
		      b. 0.65 dB/km at 1383 nm
		      c. 0. 5 dB/km at 1550 nm.
		4. Provide plenum-rated cable for all plenum environments and riser-rated cable for non- plenum environments.
		5. Jacket color: yellow.
		6. Jacket to be imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

3.	Acceptable Products:	1. Part Number: Corning MIC® Interlocking Armored Plenum Cable
		      a. "xxx" denotes fiber strand count
		      b. xxxE88-31131-A3 (2-24 fibers)
		      c. xxxE88-61131-A3 (36-48 fibers)
		      d. xxxE88-T3131-A3 (60-144 fibers)

1.09   FIBER OPTIC CABLE CONNECTORS

1.	Description:	Fiber Optic Cable Connectors for Fiber Optic Backbone Cable
2.	Specifications:	1. Provide SC pigtail connectors to fusion splice to each fiber. 2. Quick-connect, duplex, type SC connectors. 3. Connector to comply with FOCIS specifications of TIA-604-10A. 4. Insertion loss of not more than 0.75 dB. 5. SC Fusion Splice Field Terminated SM Connector, UPC
3.	Acceptable Products:	Part Number: Corning SOC-SCU-2MM-SM

1.010 FIBER ENCLOSURES

1.	Description:	Fiber Optic Cable Closet Connector Housing (Patch Panel); 1RU, 2RU, 3RU, 4RU sizes
2.	Specifications:	1. Provide rack mount modular fiber enclosures. 2. Enclosures shall accept splice cassettes and fiber adapter modules.
3.	Installation:	1. Populate unused fiber adapter panel openings with blank filler plates.
4.	Acceptable Products:	1. Part Number: Corning CCH-01U Rack Mount Fiber Enclosure 1RU 2. Part Number: Corning CCH-02U Rack Mount Fiber Enclosure 2RU 3. Part Number: Corning CCH-03U Rack Mount Fiber Enclosure 3RU 4. Part Number: Corning CCH-04U Rack Mount Fiber Enclosure 4RU

1.011 FIBER OPTIC SPLICE CASSETTES

1.	Description:	Fiber Optic Cable Pigtailed Splice Cassette, SC UPC Duplex
2.	Specifications:	1. Provide pigtailed fusion splice Cassettes 2. Cassettes shall accept up to 12 fusion splices. 3. Cassettes shall be duplex, type SC, UPC 4. DAS applications only: Cassettes shall be duplex, type SC, APC for DAS 5. Cable type: singlemode (OS2) 6. Modules shall be designed to install in rack mount fiber enclosures. 7. Provide a quantity of modules to accommodate every splice within each enclosure.
3.	Acceptable Products:	1. Part Number: Corning CCH-CS12-59-P00RE Fiber Optic Cassette 2. Part Number: Corning CCH-CS12-D9-P00RE Fiber Optic Cassette (DAS Applications Only)

1.012 FIBER OPTIC PATCH CORDS

1.	Description:	Fiber Optic Patch Cords (Fiber Jumpers)
2.	Specifications:	1. Provide factory-made, duplex fiber jumpers. 2. Singlemode jumpers shall be constructed of 9/125µm OS2 fiber. 3. Provide a variety of lengths (2M, 3M, and 5M), as needed, based on the rack elevations in the drawing set. 4. Provide a mixed variety of patch cord quantities for each closet. 5. Provide a 50% ratio of terminated ports to patch cords of each type and an additional 20% for spares.
3.	Acceptable Products:	1. Part Number: Corning 7272-02-R5120-***-M SC to SC Fiber Jumper, Duplex, Singlemode 2. Part Number: Corning 7204-02-R5120-***-M SC to LC Fiber Jumper, Duplex, Singlemode 3. Part Number: Corning 0404-02-R5120-***-M LC to LC Fiber Jumper, Duplex, Singlemode

1.013   FIBER OPTIC UNDERGROUND SPLICE CASE

1.	Description:	Fiber Optic Underground Cable Splice Case
2.	Specifications:	1. Provide fusion splice Case 2. Modules shall be designed to install in rack mount fiber enclosures.
3.	Installation:	1. Protect the splice in a fiber optic splice case fastened to a pair of cable rack arms. 2. Document the installed splice case on the record drawings.
4.	Acceptable Products:	Part Number: CommScope FOSC® 450 Fiber Optic Splice Closure

1.014   COPPER BACKBONE CABLE

1.	Description:	Multi-pair Category 3 copper backbone cable; Plenum and Non-Plenum Rated
2.	Specifications	
	1. Conductors shall be 24 AWG solid annealed copper. 2. Pairs shall be formed into 25-pair binder groups. 3. For non-plenum spaces, outer jacket shall be constructed of flame retardant PVC. 4. Comply with ICEA S-90-661 for mechanical properties. 5. Comply with ANSI/TIA-568 for performance specifications. 6. Provide plenum-rated cable for all plenum environments and riser-rated cable for all non-plenum environments.	
3.	Acceptable Products:	1. Part Number: CommScope Category 3 Plenum 2. Part Number: CommScope Category 3 Non-Plenum 3. Part Number: CommScope Category 3 CMR/CMP

1.015   HORIZONTAL UTP CABLE

1.	Description:	Unshielded Twisted Pair Cable for Horizontal Cable Distribution; Plenum and Non-Plenum
2.	Specifications:	1. ANSI/TIA-568 Category 6A cabling for voice and data applications. 2. The conductors shall be 23 AWG construction with FEP (CMP) or polyolefin (CMR) insulation. 3. The copper conductors shall be twisted in pairs, separated by an integrated pair divider and shall be covered by a low smoke, flame retardant jacket. 4. Provide plenum-rated cable for plenum environments and riser-rated cable for non- plenum environments.
3.	Acceptable Products:	1. Color: Blue 2. CommScope (ADC KRONE) Category 6A UTP Copper Cable, Plenum 3. CommScope (ADC KRONE) Category 6A UTP Copper Cable, Non- Plenum

1.016   UTP JACK MODULES

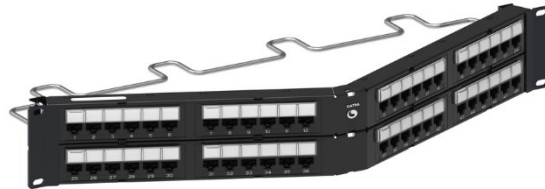| 1.	Description:	Unshielded Twisted Pair Jack Modules for Horizontal Cable Terminations

2.	Specifications:	1. Unshielded Twisted Pair Jack Modules: used for terminating horizontal cable in TR patch panels and at WAOs.
		2. UTP Jack Modules: Category 6A
		3. UTP Jack Modules: RJ45
		4. UTP Jack Modules shall meet or exceed the following requirements
		    a. ANSI/TIA-568.2-D Category 6A
		    b. IEEE 802.3an
		    c. ISO 11801 Class EA channel standards
		    d. IEEE 802.af (POE)
		    e. IEEE 802.3at (POE+)
		    f. IEEE 802.3bt (POE++)
		5. Wiring: T568B
		6. No dust cover
		7. Mounting: Keystone faceplates and panels

3.	Installation:	1. Use to terminate horizontal cable at WAO. 2. Modules: 100% tested to ensure NEXT and RL performance 3. Each module: labeled with unique identifier for traceability.
4.	Acceptable Products:	1. WAO Module Color: Blue 2. CommScope KJ Series Modular Jack, RJ45, Category 6A, Unshielded a. Part Number: UKJ10G

1.017   UTP CEILING CONNECTOR ASSEMBLY

1.	Description:	Unshielded Twisted Pair Connector Assembly for Ceiling Horizontal Cable Terminations (ex: IP camera, Wi-Fi Access Point)

2.	Specifications:	1. UTP Cord RJ45 to Ceiling Connector Assembly shall be
		    a. Category 6A
		    b. RJ45 plug
		    c. Plenum rated
		    d. U/UTP (unshielded)
		2. Shall meet or exceed the following requirements
		    a. ANSI/TIA-568-C.2 Category 6A
		    b. IEEE 802.3an
		    c. ISO 11801 Class EA channel standards
		    d. IEEE 802.af (POE)
		    e. IEEE 802.3at (POE+)
		    f. IEEE 802.3bt (POE++) (Designer to verify compliance)
		3. Wiring: T568B

3.	Installation:	1. Use to terminate horizontal cable in ceiling for ceiling mounted Wi-Fi Access Points and IP cameras 2. Modules: 100% tested to ensure NEXT and RL performance 3. Each module: labeled with unique identifier for traceability.

| 4. | Acceptable Products: | 1. Color: White
2. CommScope CCA-CAT6A-LSZH-White-N018 (IP Camera applications)
   a. Part Number: 760235590
3. CommScope CCA-CAT6A-WH-15FT (Wi-Fi Access Point applications)
   a. Part Number: CO1SJO2-88F015 |

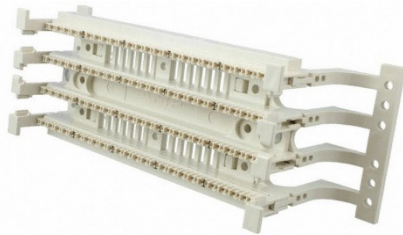## 1.018   HORIZONTAL CABLE PATCH PANELS

1.	Description:	Horizontal Cable Unshielded Distribution Module (Patch) Panel, Cat 6A, 1U and 2U
2.	Specifications:	1. Provide 19-inch rack mounted patch panels in TR locations for all horizontal cabling. 2. Panel style: angled 3. Cable type: unshielded 4. Module connector: RJ45 5. Conductor gauge supported: 23 AWG 6. Component certified to meet or exceed ANSI/TIA-568.2-D for Category 6A 7. Component certified to meet or exceed IEEE 802.3bt 8. Shall be UL listed and labeled. 9. Use of two label pocket faceplates allowing both port and panel identification. 10. Wire Plan: EIA/TIA T568B. Active Pins: 1 through 8. 11. Can be clearly identified with Hand-Held Thermal Transfer Printers. 12. Use 48-port patch panels in AUS IT and TSA TR locations. 13. Patch panels shall not exceed 48-ports.

3.	Acceptable Products:	1. Color: Black
		2. CommScope Uniprise Angled Distribution Module Panel, Cat 6A, UTP, 1U, 24 port
		   a. Part Number : UNPA-6A-DM -1U-24
		3. CommScope Uniprise Distribution Module Panel, Cat 6A, UTP, 2U, 48 port
		   a. Part Number : UNPA-6A-DM -2U-48

1.019   COPPER PATCH CORDS

| 1. | Description: | Unshielded Twisted Pair Copper Patch Cords for Patch Panels |
| 2. | Specifications: | 1. Copper patch cords: provided for horizontal data cables
2. Shall be factory assembled
3. Shall be constructed of Category 6A, 24 AWG UTP, RJ- 45 Plugs
4. Shall be reduced diameter cable.
5. Provide two (2) patch cords per horizontal data cable installed
6. Provide patch cords lengths per the following quantities
   a. 50% patch cords: 15 ft. length
   b. 50% patch cords: 7 ft. length
7. Shall exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class E standards.
8. Shall meet requirements of IEEE 802.af and IEEE 802.3at for PoE |

		applications. 9. Patch cord plugs shall meet all applicable ANSI/TIA/EIA-968-A requirements and exceeds IEC 60603-7 specifications. 10. Plugs shall use an integral pair manager to optimize performance and consistency by reducing untwisting of conductors within the plug. 11. Shall be 100% performance tested and wired T568B. 12. Shall perform in center of TIA/EIA component range, ensuring interoperability and excellent performance. 13. Provide plenum rated patch cords for WAOs where the patch cord is exposed inside a plenum space.
3.	Acceptable Products:	1. Color: Blue 2. CommScope CO199K2 (Non-plenum) Cord MiNo6A Series Category 6A U/UTP Reduced Diameter LS-CM Dual Rated Cord

1.020 110 COPPER WIRING BLOCK

| 1.	Description:	110 Copper Wiring Block Kit
2.	Specifications	
1. Hardware to exceed the TIA/EIA-568-B.2 Category 5 standard. 2. Hardware to be field terminable. 3. Pair count: 100. 4. Color: Ivory 5. Mounting: wall mount 6. Termination Type: IDC.		
3.	Acceptable Products:	1. CommScope 569440-1

1.021 LIGHTNING PROTECTED 110 BLOCK

1.	Description:	Lightning Protected 110 Block
2.	Specifications	

1. 110 style connector input and output
2. Pair count: 100
3. Stack-able
4. External ground connectors accept 6-14 AWG ground wire
5. standard 5 pin protection modules
6. Exceeds UL497
7. Supports gas tube, solid state, and hybrid versions
8. Dimensions (H"xW"xD"): 14.5" x 10.75" x 5.45"

3.	Acceptable Products:	1. Circa Telecom 1880ENA1/NSC-100

1.022 POE CIRCUIT SURGE PROTECTOR

1.	Description:	POE Circuit Surge Protector
2.	Specifications	

1. Compatible with CAT5e, CAT6 and CAT6A cabling infrastructure
2. Hybrid design: SAD and GDT technologies
3. Supports up to 10GbE
4. Connection: RJ45 female
5. External grounding screw
6. Compliance: all IEEE Power over Ethernet standards
7. UL497B Listed

3.	Acceptable Products:	1. IC Realtime – DTK-MRJPOES

1.023 CABLE TRAY
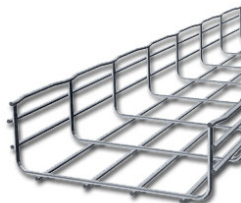
1.	Description:	Wire Mesh Cable Tray and related products
2.	Specifications	

1. Cable trays infrastructure shall consist of wire basket construction.

2. Shall be manufactured from round steel wire that is a minimum of .196" (5mm) in diameter.
3. Wires: welded at intersections to form a 2" x 4" (50.8mm x 101.6mm) grid pattern.
4. Shall be U-shaped with equal height sidewalls.
5. Shall be zinc electroplated after fabrication.
6. Cable tray in corridors from TR shall be minimum 18" Wide x 4" Deep
7. Cable tray ends will be formed downward at 90° to allow easy drop-in installation with approved supports.
8. Shall be UL Classified for grounding purposes.

3.	Acceptable Products:	1. Cablofil CF-105 series
4.	Related Products:	

1. Cable Tray Bend Radius Kit
    1. Part Number: Cablofil EZT90KIT
2. Cable Tray Elevation Change Kit
    1. Part Number: Cablofil EAC
3. Cable Tray Conduit Adapter
    1. Part Number: Cablofil CE40CC & CH
4. Cable Tray Supports
    1. Part Number: Cablofil FASP 700.
5. Cable Tray Conduit Splices and Fasteners
    1. Part Number: Cablofil EDRN
    2. Part Number: Cablofil PRECLICK
    3. Part Number: Cablofil FASLOCK
    4. Part Number: Cablofil GNDSB
    5. Part Number: Cablofil GNDCL

1.024   SURFACE MOUNT OUTLET BOX

1.	Description:	Surface mounted outlet box
2.	Specifications	

1. Provide surface mount outlet boxes for WAO locations where outlets cannot be recessed.
2. Mount easily with supplied mounting screws, adhesive tape or optional magnet.
3. Cable entry from side and rear knockouts and from opening in center of base.
4. Outlet box color: coordinated with AUS IT and Architect.

3.	Acceptable Products:	1. CommScope Surface Mount Box TrueNet Series 2, 2 Port 2. CommScope Surface Mount Module, Keystone,4 port

1.025   TELEPHONE WALL PLATE – STAINLESS STEEL

1.	Description:	Stainless Steel Telephone Wallplate
2.	Specifications:	1. Material: Type 302 stainless steel 2. Finish: Brushed 3. Shall meet minimum rectangular NEMA openings 4. Shall accept all QuickPort snap-in connectors and adapters 5. Recessed design a. Allows connector to extend out from plate and fit clearly with telephone's slide-rail mechanism 6. Easily mounts any standard-size wallphone 7. Shall be cULus Listed 8. Shall meet ANSI/TIA-568-C.0
3.	Acceptable Products:	1. Leviton Stainless Steel QuickPort Telephone Wallplate a. Part number: 4108W-1SP

1.026 STAINLESS STEEL WALL MOUNT FACEPLATE

1.	Description:	Stainless Steel Wall Mount Faceplate; 4-port and 6-port
2.	Specifications:	1. Provide faceplates for voice and data work area outlets. 2. Faceplate: of stainless steel construction. 3. Faceplate shall accept four (4) or six (6) modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes. 4. Include self-adhesive labels covers for easy port identification.
3.	Acceptable Products:	1. Refer to AUS IT for acceptable product.

1.027 OUTDOOR TELECOMMUNICATIONS ENCLOSURES

1.	Description:	Outdoor Telecommunications Enclosures
2.	Specifications:	1. Outdoor telecommunications enclosures shall be constructed of material to withstand a harsh environment, all weather enclosures with locks, NEMA rated, designed with withhold electrical and communications equipment. 2. UL Listed. 3. EIA 19" Rack rails to support equipment. 4. All components listed must be installed at a minimum, to be considered a complete assembly.
3.	Acceptable Products:	1. DDB Unlimited 2. WOD-30DXC Outdoor Enclosure 3. ZP-NDCPP OD Door louver cover plate, painted cream, NEMA 4. 4. OD-INS 5. ACP-2000-T20-110 AC Unit. 6. WCB24-DXC 2 Foot high stand base WCB3-style with corner support access panels painted cream. Installed MRP.

		7. ZP-BTMCUTOUT – cutout in floor of enclosure leaving a 3" lip. Installed MRP. 8. LC-60 60 amp main, 8 space siemens load center w/ 2 populated 4 sq on 20 amp breaks and junction box. Installed on hinge sidewall MRP. 9. ZZ-LED LightBar installed over both front and rear doors.

1.028 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR

1.	Description:	Telecommunications Main Grounding Busbar (TMGB)

2.	Specifications:	1. Shall be
		    a. Predrilled copper busbar that complies with NEMA Standards for bolt hole sizing and spacing for the type of connectors to be used.
		        i. Both holes, in two-holed lugs, shall be attached to busbar.
		    b. Sized for the immediate requirements and 100% future growth
		        i. Minimum dimensions: 6 mm thick x 100 mm wide, with variable length. Designer to appropriately size.
		    c. Copper for reduced contact resistance
		2. Shall include wall-mount stand-off brackets, assembly screws and insulators creating a 2-inch standoff from the wall.

3.	Acceptable Products:	1. Chatsworth Part Number: 40153-012

1.029 TELECOMMUNICATIONS GROUNDING BUBAR

1.	Description:	Telecommunications Grounding Busbar (TMGB)

2.	Specifications:	1. Shall be
		    a. Predrilled copper busbar that complies with NEMA Standards for bolt hole sizing and spacing for the type of connectors to be used.
		        i. Both holes, in two-holed lugs, shall be attached to busbar.
		    b. Sized for the immediate requirements and 100% future growth
		        i. Minimum dimensions: 6 mm thick x 50 mm wide, with variable length. Designer to appropriately size.
		    c. Copper for reduced contact resistance
		2. Shall include wall-mount stand-off brackets, assembly screws and insulators creating a 2-inch standoff from the wall.

3.	Acceptable Products:	1. Chatsworth Part Number: 13622-012