INFRASTRUCTURE DESIGN STANDARDS for

TELECOMMUNICATIONS

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Do NOT rely on locally saved copies, always refer to latest TELECOMMUNICATION STANDARD found here:

(see link):

[Refer to Communication Systems Standards 2025]

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SEATTLE-TACOMA INTERNATIONAL AIRPORT (SEA) STATEMENT

The Airport is owned and operated by the Port of Seattle which was founded in 1911 by a vote of the people as a special purpose government, the Port of Seattle's mission is to promote economic opportunities and quality of life in the region by advancing trade, travel, commerce and job creation in an equitable, accountable and environmentally responsible manner.
Our vision is to add 100,000 jobs through economic growth led by the Port, for a total of 300,000 Port-related jobs in the region, while reducing our environmental footprint. **We are committed to creating opportunity for all, stewarding our environment responsibly, partnering with surrounding communities, promoting social responsibility, conducting ourselves transparently and holding ourselves accountable.**

The Port of Seattle is a **leader in moving people** and cargo across the country and around the world. With facilities and property ranging in scope from a half-acre park to **one of the largest airports** and container terminals **on the West Coast**, we maximize the public assets in our portfolio with an eye toward best uses and environmental sustainability.

Seattle-Tacoma International Airport (SEA), like the greater region, experienced unprecedented growth in the last decade. We are modernizing our airport to meet current and forecast traveler demand. Improvements made will benefit our region for years. New time-saving technology and safety measures improve customer convenience and well-being. Airport infrastructure investments keep our essential supply chain stocked and maintain an economic lifeline for local businesses.

SEA is working to elevate your experience from curb to gate. We are committed to meeting our region's future needs with an improved level of service: reduced congestion, less crowded terminals, and more efficient airfield traffic, all while investing in our community and its environmental health. For more specific project information, (see link): Airport Capital Projects (Upgrade SEA) | Port of Seattle

These **Telecommunication Standards** will ensure we carry on the Port of Seattle's mission while providing our northwest region a first-class airport with an eye towards technology. To implement the ever growing and changing technological advancements, we must have a solid base plan for our

REVISION TABLE

REVISION HISTORY

REV:	Description:	By:	Date:
0	Initial release [Facilities and Infrastructure "Design Principles"]	G. Mullin	2004-02-26
1.0	Added appendix 6; renumbered old appendix 6 to appendix 7	G. Mullin	2004-07-22
1.1	Modified section IX.E. (firestopping) Added appendix 7; renumbered old appendix 7 to appendix 8	G. Mullin	2004-10-19
1.1(a)	Inserted new section VII. (PWDS) and new section XI. (Pathways). Renumbered remaining sections. Updated Appendix 1 and added Appendices 9 & 10.	G. Mullin	2004-10-29
2.0	Modified section XI. (Pathways). Modified section XII. (Acceptance Testing) paragraph A.6.b)(8)(b) - added Fluke DTX-1800 to list of acceptable Cat 6 test equipment.	G. Mullin	2005-07-26
2.1	Modified Section VII. to update Systimax part #'s for 25-pair Cat 5 cable. Modified section VIII. (codes) to include "DEMOLITION OF CABLING". Various updates as per review comments.	G. Mullin	2007-02-17
2.2	Removed section IV as AFUS is no longer used. Revised versions of related standards and agreements	D. Dennis	2021-07-15
3.0	Facilities and Infrastructure "Design Principles" henceforth shall be the Infrastructure Design Standards for Telecommunications. Reformat of entire Standard with focus towards holistic view of Facility and Infrastructure's telecommunication infrastructure from design concept to implementation. **Completed for 2025: Intro., Part 1, and Part 2.**	M. Schuman	2025-03-31 **CURRENT RELEASE**

Internal Note for future revisions:
When reviewing year over year, note the following searchable sentence headers for quick reference and use these headers to add new information to maintain quick search capabilities during review sessions now and into the future.

1- *"See Part or See Section" -placed ahead of location reference to another Part/Section herein SEA COMM Standard*
2- *"See Standard" -placed ahead of location to another SEA Standard outside this SEA COMM Standard*
3- *"See Link" -placed ahead of any Port of Seattle public facing file/site links for more information*
4- *"See Division Spec." - placed ahead of location reference to any related Division Specification section for SEA.*
5- *"See Detail" -placed ahead of location reference to any details/drawings reference herein.* ***Also*** *please use SEA Infrastructure Design Standards section identifier in file name when storing all drawings utilized herein*

CONTRIBUTING CONTENT and EDITORS

Port of Seattle, Aviation Group:

- Facilities and Infrastructure
  - Standards content curator
    - Oversight, vision, and updates through collaboration with below noted teams
  - Infrastructure ownership and asset management
    - Facility, spaces, pathways, and media implementation
  - Enforcement body for adherence to communication standards
- Information and Communications Technology (ICT)
  - Core (standards) input:
    - Assist with communication infrastructure insight and usage forecast of all media (cable) through direct knowledge gained from performance of day-to-day connectivity operations for all tenant and Port networks
    - Direction on hardware placement (racking of gear) within communication spaces
    - Provide cable media nomenclature and termination position assignments
    - Manage ICT system networks on the infrastructure
    - Provide direct input and assist in reviews and revisions of these standards
- AV Electrical and Electronic Systems performed by the Electronic Technician's (ET)
  - Core (standards) input:
    - System ownership and/or maintenance group that provides direct input for such key systems as: security, audio, video, radio, building management systems, and airline common use
    - Maintain device hardware and computer peripherals
    - Able to support connections on the communication plant infrastructure
    - Manage ET system networks on the infrastructure
    - Provide direct input and assist in reviews and revisions of these standards
- Port of Seattle Fire Department
  - Code enforcement, interpretation, and support as the Authority Having Jurisdiction (AHJ)
- Communication Standards support contact:
  - avcommittees@portseattle.org / Subject Line: "COMM Standards Support"

SEA COMMUNICATION TERMS and ABBREVIATIONS

A

ABD	Airport Building Department (Authority- Code enforcement)
ACS	Access Control System; active door equipment and network (ET Network)
AD	Administrative Building (legacy facility; original MT)
ADR	Airport Dining and Retail (Supporting dept. of this branch of SEA tenants)
AHJ	Authority Having Jurisdiction (Authority- Code enforcement)
AOA	Airport Operations Area
AOB	Airport Office Building (facility)
ATO	Airport Transit Operations; see also BMF and TOC
AVM	Aviation Maintenance

B

BHS	Baggage Handling System
BIM	Building Information Modeling
BMF	Bus Maintenance Facility; original name and matches comm nom. Now ATO (facility)
BMS	Building Management System

C

C1	C1 [Building]; Construction reference to an added facility where CC & CD meet -see CCE
C4	Combined Communications and Control Center (facility)
CCE	Concourse C Expansion; Constr. ref. to new facility (design) started 2022; formally C1
CAT(#)	Category of copper media; CAT6 and 6A current and legacy media of CAT3, 5, and 5e
CA	Concourse A (facility)
CAF	Construction Advisory Form
CB	Concourse B (facility), also Copper Backbone (media)
CC	Concourse C (facility)
CCTV	Closed circuit television
CD	Concourse D (facility), also Copper Data -outlet (media)
CDT	Conduit (pathway)
CER	Communication Equipment Room (space)
CIBS	Communication Infrastructure Backbone System
CH	Copper Horizontal (media)
CM	Cable Management (infrastructure connectivity software), also ‘CM’ for OSP structures and Construction Manager
COMM	Communications, also ‘COM’ and ‘CM’ for OSP structures
CP	Consolidation Point, edge network equipment cabinet to feed horizontal data drops
CTE	Central Terminal Expansion (Construction reference to new facility; west of AD)
CUSE	Common Use Systems Equipment
CUSS	Common Use Self-Service (shared airline kiosk for passenger self-check in)
CV	Copper Voice -outlet (legacy media)

D

DAS	Distributed Antenna System
DMARC	Demarcation Panel for SEA tenants (EQuipment)

E

EF	Entrance Facility: legacy space- see MMR (space)
ENT	[LAN] Enterprise Local Area Network (ICT Network)
ER	Equipment Room (space)
EQ	EQuipment; Racks and Cabinets designation
ET	Electronic Technician (Comm system partner and media resource operator)

F

FAA	Federal Aviation Administration
F&I	Facilities and Infrastructure at SEA (Facility Owner)
FB	Fiber Backbone (media)
FH	Fiber Horizontal (media)
FIDS	Flight Information Display System
FMS	Facility Management System, retired acronym, refer to ICS
FTBS	Fiber to the backstand airline shared gate cabinet (EQuipment)

G

GIDS	Gate Information Display System
GIS	Global Information System (Communication infrastructure mapping tool)

H

HH	Hand Hole (pathway)

I

IAF	International Arrivals Facility
ICS	[LAN] Industrial Controls System Local Area Network; formerly the Facility Management System FMS (ET Network)
ICT	Information and Communications Technology (Comm system partner and media resource operator)
ID	Innerduct (pathway)
ISP	Inside Plant (pathway and/or media)

J

JB	Junction Box (pathway), also Jet Bridge

K

KO	Knock Out (pathway)

L

LAN	Local Area Network

M

MD	Main Distribution or MDR Room (space)
MDC	Micro Distribution Cabinet (EQuipment)
MH	Maintenance Hole (pathway)
MM	Multimode or MMF Fiberoptic; general term for all MMF (media) -Note SEA uses M5 (50 micron) in LIMITED capacity and M6 (62.5 micron) has been RETIRED
MMR	Meet-Me-Room; Service provider(s) point of entry, Wan to LAN handoff
MT	Main Terminal (facility)
MTR	Main Telephone Room; legacy EF facility, sunset date of 2030 (space)

N

NC	N Concourse, formerly NS (facility)
NEPL	North Employee Parking Lot (facility)
NS	North Satellite; retired name, now NC. NS still found on many cable identifiers (facility)

O

OPS	[LAN] Operations Local Area Network (ICT Network)
OSP	Outside Plant (pathway and/or media)

P

PA	Public Address
PB	Pull Box (pathway)
PCS	Port Construction Services (Port of Seattle Small Works Construction Dept.)
PDOC	Police Department Office Consolidation (Construction reference to AD facility)
PIDS	Perimeter Intrusion Detection System (security)
PLB	Passenger Loading Bridge
PM	Project Manager
PMG	Project Management Group
PORT	Port of Seattle, also POS, PoS (owner)
PT	Parking Terminal (facility)

R

RCF	Rental Car Facility (facility)
RF	Radio Frequency
RFI	Request for Information
RU	Rack Unit

S

SC	S Concourse, formerly SS (facility)
SDC	Small Distribution Cabinet (EQuipment)
SD	Secondary Distribution or SDR Room (space)
SEA	Branding reference to SEAttle-Tacoma International Airport; matches Airport Code
SM	Singlemode or SMF Fiberoptic (media)
SPOC	Refer to 'SSDR'
SSDR	Special Systems Design Review (Special Systems oversight committee)
SS	South Satellite; retired name, now SC. SS still found on many cable identifiers (facility)
START	Refer to 'TDR'
STEP	South Terminal Expansion Project (Construction reference to AOB/CA/C4 facilities)
STIA	Seattle-Tacoma International Airport (facility)
SPT	Shielded Twisted Pair (media)

T

TC	Telecommunications Closet (space)
TDR	Telecom Design Review (Communication oversight committee)
TEL	Telecommunications
TOC	Transit Operations Center; intermediate name between BMF and ATO (facility)

	TWVP	Terminal Wide Voice Paging (when added/ending in: S=System N=Network)
U		
	UPS	Uninterruptible Power Supply
	UTP	Unshielded Twisted Pair (media)
V		
	VoIP	Voice over Internet Protocol
W		
	WA	Work Area; destination point of horizontal media (space)
	WAN	Wide Area Network
	WAP	Wireless Access Point (hardware, ICT)
	WF	Wall Field (space)
X		
	-	
Y		
	-	
Z		
	-	

REFERENCED CODES and STANDARDS

Applicable Codes and Industry Standards Include BUT Are Not Limited To:

1. National Electrical Safety Code
2. State of Washington Standards and Codes
   a) National Electrical Code® as amended and administered by the State of Washington.
   b) Washington Administrative Code (WAC), particularly WAC 296-46 and 296-401A for electrical.
   c) Revised Codes of Washington (RCW), particularly RCW 19.28 for Electricians and Electrical Installations.
   d) Washington Codes for Seismic Structural design and bracing
   e) Washington revised version of the Uniform Building Code
3. State of Washington Department of Labor and Industries Regulations (L&I)
4. National Electrical Manufacturers Association (NEMA)
5. National Fire Protection Association (NFPA), including:
   a) NFPA-70, National Electrical Code® (NEC®), 2023 edition, particularly:
      Article 110, Requirements for Electrical Installations
      Article 250, Grounding and Bonding
      Article 392, Cable Trays
      Article 110-V, Manholes and other Electric Enclosures Intended for Personnel Entry
      Article 645, Information Technology Equipment
      Article 770, Optical Fiber Cables and Raceways
      Chapter 8, Communications Systems
      Article 800, Communications Circuits
   b) NFPA-70E, Standard for Electrical Safety in the Workplace
   c) NFPA-72, National Fire Alarm and Signaling Code
   d) NFPA-75, Standard for the Fire Protection of Telecommunications Facilities
   e) NFPA-101, Life Safety Code
   g) NFPA-262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
   g) NFPA-297, Guide on Principles and Practice for Communications Systems
   h) NFPA-780, Standard for the Installation of Lightning Protection Systems
6. American National Standards Institute (ANSI)
7. Underwriters Laboratories Inc.® (UL), including:
   a) UL Subject 444, Communications Cables
   c) UL 1310, class 2 power units
   d) UL 1651 Standard for Optical Fiber Cable
   e) UL 1666, Test for Flame Propagation Height of Electrical and Optical-Fiber Cables Installed Vertically in Shafts
   f) UL 2024, Standard for Cable Routing Assemblies and Communications Raceways
   g) UL 2257, Identification Tests for Jacket and Insulation Materials Used in Plenum Cables
8. The Institute of Electrical and Electronics Engineers (IEEE), including:

a) ANSI/IEEE PC62.41-1, Guide on the Surge Environment in Low-Voltage (1000V and less) AC Power Circuits
b) ANSI/IEEE C62.43-1, IEEE Guide for Surge Protectors and Surge Protective Circuits Used in Information and Communication Technology Circuits
c) ANSI/IEEE Standard P1187-2013, IEEE Recommended Practice for Installation Design and Installation of Valve Regulated Lead-Acid Storage Batteries for Stationary Applications.
d) IEEE Standard 81-2012, IEEE Guide to Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
e) IEEE Standard 3003.1-2019Recommended Practice for Grounding of Industrial and Commercial Power Systems
g) IEEE Standard 450-2020, IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
i) IEEE Standard 1184-2006, IEEE Guide for Batteries for Uninterruptible Power Systems.
j) IEEE Project 802, Local and Metropolitan Area Network Standards Committee (LMSC)

10. International Electrical Testing Association
11. National Electrical Contractors Association
12. Federal Aviation Administration (FAA) Regulations
13. Federal Communications System (FCC) Regulations as applicable:
14. International Building Code (IBC)
15. InterNational Electrical Testing Agency (NETA)
16. Occupational Safety and Health Administration (OSHA)
17. SeaTac Telecommunications Review Team
18. International Cable Engineers Association, Inc. (ICEA), including:
    a) Telecommunications Cable for Outside Plant Applications
    b) Communications Wire and Cable for Premises Wiring
19. Telecommunications Industry Association / Electronic Industries Alliance (EIA/TIA) standards, including:
    a) TIA/EIA-455-B, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices, and Other Fiber Optic Components
    b) TIA/EIA-526, Standard Test Procedures for Fiber Optic Systems
    c) ANSI/TIA/EIA-568, Commercial Building Telecommunications Cabling Standard
    f) ANSI/TIA/EIA-569, Telecommunications Pathways and Spaces
    g) ANSI/TIA/EIA-598, Optical Fiber Cable Color Coding
    h) ANSI/TIA/EIA-606, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
    i) ANSI/TIA/EIA-607, Commercial Building Grounding and Bonding Requirements for Telecommunications
    j) TIA/EIA-758, Customer Owned Outside Plant Telecommunications Infrastructure Standard
21. American Society for Testing and Materials (ASTM)
22. Alliance for Telecommunications Industry Solutions (ATIS)
24. International Electrotechnical Commission (IEC), including:
    a) IEC 60603-7, Part 7 (addresses modular connector physical dimensions, mechanical and electrical characteristics)
    b) IEC 60874, Sectional Specification for Optical Fiber Connectors

25. Information Technology Industry Council (ITI)
26. National Institute of Standards and Technology (NIST)
27. Uniform Building Code (UBC)

References

Applicable Industry References Include:

1. Building Industry Consulting Service International (BICSI), Telecommunications Distribution Methods Manual (TDMM)
2. BICSI LAN and Internetworking Manual
3. BICSI Telecommunications Cabling Installation Manual
4. BICSI LAN and Internetworking Applications Guide
5. BICSI Customer-Owned Outside Plant Design Manual

PART 1- INTRODUCTION to SEA TELECOMMUNICATIONS

SEA is made up of the airport proper as well as many outlying facilities occupied by both Port of Seattle and our diverse grouping of tenants centered around the operations of an international airport. Much of the telecommunication's plant is either connected today via communication pathways and media or in development to fill in any missing links. SEA has setup up the communication infrastructure to be utilized by both Port and Tenant networks to take advantage of dark strands (fiber) or dark pairs (copper) for connectivity throughout the SEA footprint. SEA communication equipment rooms exist within the airport building and are placed to adhere to the horizontal copper cable permanent link limit of 90 meters (297ft.). Our remote facilities vary on equipment room counts as deemed necessary by building size, occupancy, and function. Our typical connection point to tenants is completed by the installation of a demarcation panel fed from the nearest SEA equipment room. This allows tenants to house their communication networks in their leased locations and utilize access to the dark media to interconnect their leased telecom spaces throughout the airport. Internal Port of Seattle employee-operated spaces are typically fed with horizontal copper data drops to nearest SEA equipment room.

The Port of Seattle's Facilities and Infrastructure (F&I) department is the single point of responsibility and "owner" of the Telecommunication Plant at Sea-Tac International Airport (SEA). F&I is responsible for facility planning through development and implementation of the capital improvement plan and ongoing asset management. F&I shall establish design standards and manage the communication facilities at SEA. The operations of the SEA Telecommunications Network are facilitated by the Aviation Electrical and Electronic Systems and the Information and Communications Technology (ICT) teams. ICT's expanded operational role includes the day-to-day operation of the SEA media for use by the Port of Seattle and the airport's tenants.

This shall be a living document with, at a minimum, biennial updates.

1.1 PURPOSE OF TELECOMMUNICATIONS INFRASTRUCTURE DESIGN STANDARDS

The purpose of this Telecommunications Infrastructure Design Standard document is to ensure SEA's built telecommunications plant is cohesive with past, present, and future telecommunication operations. These Standards are meant to align designers and engineers in their understanding of existing communications systems, design goals, technical and non-technical general requirements, information on the design process, and key reference material. We strive to maintain sensible progress with the continuous pace of improvement and expansion of our wired and wireless communications plant. As such, we need the cooperation of telecommunication designers and engineers to adhere to these Standards set forth herein.

To assist our telecommunication designers and engineers please take note of the many referenced links, documents, and details for SEA communications systems as you navigate this document. The supplemental information provided shall clarify the written standards as well as provide actual files for your use in pending designs. Quick access to all available resources is also

grouped and organized in these Standards and may be found in (see section) Part 8- Reference Guide: Materials, Forms, and Agreements. Sheet or file title references to softcopies will be stored in Appendix folder(s) packaged with this Telecommunication Infrastructure Design Standard with further details available in the noted section.

1.1.1 Intent

It is the intention that all technical design work that is performed at SEA be required to follow the latest revision of the Communications Systems Standards. Designer and/or engineer shall coordinate with the Port and its consultant management representatives to ensure that all communication systems and equipment are properly designed and specified.

Facility and Infrastructure's intention is to work with projects as it is a known condition of this airport facility to near always be in a state of active construction. Project and permit start dates can affect version of Standards reviewed and adhered to as some major works projects stretch in decade long periods. We will make every attempt to find common ground for budget, scope, and project deadlines, but in some cases, asking to move to a current standard may be requested for the best interest of the overall facility. More importantly, many codes supersede older project start dates and adherence to new or refined code(s) must be achieved to receive a final certificate of occupancy.

1.1.2 SEA Standards and Specifications distinction

These SEA Communication Standards shall supersede specifications because a broader compliance criteria is set than our specifications offer. The Standards also provide the execution of current and future code requirements for the SEA Airport Facility. Since codes generally set the rules for stating *what* you need to do, the standard will provide direction on *how to* execute the codes. Finally, when a conflict arises, the standard shall generally take precedence. Below is a simple breakdown for further understanding.

Standard:	Specification:
-Defines parameters for product or process	-Details parameters for specific products
-Speaks to the entire SEA Facility	- A focus on products, services, or projects
-Created by subject matter experts (SME)	-Assembled from standard by project cohorts
-Maintained and edited by Airport SME	-Project specific with edits reviewed by SME's
-Example:	
~Define fire code for wiring and applications	*~Specify product(s) approved for Standard/code*

1.1.3 Reference to other SEA Standards

Electronic copies of these additional Port of Seattle-provided Standards and References can be found here (see link):

- Design Standards and Guidelines | Port of Seattle

1.2 TELECOMMUNICATIONS INFRASTRUCTURE SPECIFICATIONS REFERENCE

Unlike the abovementioned standards and codes, our specifications shall outline the requirements of a specific company or product. Specifications may be developed by the engineer or contractor to ensure that materials and equipment meet the required standards and codes. However, the Port also provides guide specifications for use by designers on all Airport projects. These guide specifications encompass the entire airport facility leaning on product and service details (including specifier prompts) rather than the design criteria discussed in the subsequent sections and are intended to be edited by the designer for each Port project.

1.2.1 Telecommunication Specifications; Division 27 and 28

Electronic copies of these guide *specifications* can be obtained for inclusion in construction contract documents found here (see link):

- Guide Specifications (Construction Contract Templates) | Port of Seattle (portseattle.org)
    - Division 27 - Communications
    - Division 28 - Electronic Safety and Security

1.2.2 Product and or System Competition Waiver(s)

- **INFRASTRUCTURE:**
    - Cable Media Infrastructure (CPO-6 Competition Waiver #2023-006)
        - As of September 22, 2023, for a period of ten (10) years set to expire on September 22, 2033, an approved Competition Waiver is active to allow sole specification of CommScope® SYSTIMAX® copper and fiber structured cabling solutions
        - Deviations to specify CommScope® SYSTIMAX® infrastructure due to a proprietary system or any like factor shall be brought before the Telecom Design Review Committee for review on a case-by-case basis. (See Section 1.3.3)
        - CommScope® SYSTIMAX® is a warrantied product
            - **To receive a warranty**, all CommScope® SYSTIMAX® MUST be installed by a CommScope® SYSTIMAX® certified partner/contractor. (see section 1.3.6) for more information
- **SPECIAL SYSTEMS:**
    - AXIS® Genetec (CPO-6 Competition Waiver #2022-003)
        - As of May 13, 2022, for a period of five (5) years set to expire on May 13, 2027, an approved Competition Waiver is active to allow sole specification of AXIS® camera hardware and software solutions
        - Deviations to specify AXIS® infrastructure due to a proprietary system or any like factor shall be brought before the Telecom Design Review Committee for review on a case-by-case basis. (see section 1.3.3)
        - AXIS® is a warrantied product (see section 1.3.6)

  - Common Use Self-Service (CUSS) (CPO-6 Competition Waiver #2022-001)
    - As of April 5, 2022, for a period of five (5) years set to expire on April 5, 2027, an approved Competition Waiver is active to allow sole specification of CUSS kiosk and associated hardware; manufacturer of Embross/ARINC
    - Deviations to specify Embross/ARINC infrastructure due to a proprietary system or any like factor shall be brought before the Telecom Design Review Committee for review on a case-by-case basis. (see section 1.3.3)
    - (warranty details to be confirmed) Embross/ARINC is a warrantied product ([pending] see section 1.3.6)
  - Johnson Controls Incorporated (JCI) (CPO-6 Competition Waiver #2015-021)
    - As of December 17, 2015, for a period of ten (10) years set to expire on December 17, 2025, an approved Competition Waiver is active to allow sole specification of JCI proprietary software, readers, controllers, interface boxes and associated security solutions
    - Deviations to specify JCI infrastructure due to a proprietary system or any like factor shall be brought before the Telecom Design Review Committee for review on a case-by-case basis. (see section 1.3.3)
    - (warranty details to be confirmed) JCI is a warrantied product ([pending] see section 1.3.6)
  - *Additional established and less common for active additions systems:*
  - Flight Information Display System (FIDS) procurement of Digital Display Controllers from Intersystems, Inc. (CPO-6 Competition Waiver #2021-001)
    - As of January 27, 2021, for a period of five (5) years set to expire on January 27, 2026
  - Frequentis Voice Communications System (VCS) (CPO-6 Competition Waiver #2023-005)
    - As of August 21, 2023, for a period of ten (10) years set to expire on August 21, 2033
  - Motorola>module to support CAD/RMS in existing radio system (CPO-6 Competition Waiver #2024-008)
    - Established August 12, 2024
  - Safedock FleX A-VDGS (CPO-6 Competition Waiver #2024-005)
    - As of June 26, 2024, for a period of ten (10) years set to expire on June 26, 2034
  - T2 Systems, Incorporated (CPO-6 Competition Waiver #2021-002)
    - Established January 13, 2021
- Internal list support for all Competition Waivers may be found here:
  - (see link [internal]): Tracking - Competition Waiver Log
- In addition to the above, some materials may be “Owner furnished / Owner Installed. Some common items under this procedure are:
  - Cisco Network hardware

- Dell hardware components
  - Utilize cooperative contracts process as per CPO-5 Policy and Procedures for procurement and receipt of goods and/or services
    - More information may be found here, (see link [internal]):
      - CPO-5.2012.02.21.pdf

1.3 TELECOMMUNICATIONS DESIGN PROCESS AT SEA

This section is meant to provide guidance and understanding the of the support and oversight that is in place to assist with design of SEA telecommunications. Committee review meetings are bi-weekly on Thursdays, typically 30-minutes, held in person in the Airport Office Building and online via a Microsoft Teams, or both. The desire is for Communication and or Special Systems application(s) for connection be submitted at least one week prior to meeting. This can typically be achieved with proper planning by the Port of Seattle Project Manager. Also, if applicable, the Design Review (Bluebeam close date) should coincide as close as possible to scheduled committee meeting. It has been found to be most advantageous to open the design review prior to the review committee meeting, such as one week, to allow committee members insight to project design ahead of the 30-minute session. In turn, the design review close should be scheduled roughly one week after committee meeting to allow for final comments that may have been inspired from meeting. The committee group is best prepared to serve our customer project's by having the application(s) and a chance to see the design ahead of meeting presentations.

No one wants to waste time and effort. Yet from both sides of the table, that has been a common refrain. From the customer side, there are way too many meetings and reviews, or some meetings seem irrelevant. From the oversight committees' side, if design reviews were not skipped over, we would not be so far from center on a proper communication design package.

Therefore, for telecommunication design, F&I (Communication Division) will look to set the tone of following these steps in this order:

- **Kickoff initial-0% Project Status**
  - Assumes limited work on plans, but a conceptual idea of space and the general telecom needs within. No expectations of a Bluebeam design review at this stage). Telecommunications Committee STRONGLY recommends this step. On small projects, we will be in the best position to provide starting point guidance and assistance with expedited review -less meetings! On large projects, we can set the tone for what is required, see the vision, and ensure that Standards are understood. This is a great point to sit down with Airport subject matter experts *before* spending undo hours on a design that may require changes if held off until a later meet -save time and money!

- PMG does typically offer a Design Kickoff meeting to all stakeholders on our larger airport projects. At these meetings, it shall be the responsibility of Telecom and Special Systems representatives to speak up and address their infrastructure concerns. If further discussion is needed, we may request an additional communications specific meeting if all parties agree to additional time commitment
- On all other projects with communications scope, we propose **Scheduling an Initial-0% Committee Review**(s) for Telecom and/or Special Systems -*combined meeting sessions work great for this stage*
    - Goal: Introductions to stakeholders and project scope, support PMG and design team with SEA process and Standards early in the project. Understand proposed Design Review stages and align Telecom/Special Systems Design Reviews with that schedule. High level view of pending connection and/or system requirements

☛ *NOTE: On large projects, per existing AV/PMG processes, Telecom and Special Systems representatives shall watch for and participate in the "Design Kickoff meeting" scheduled by PM for all airport stakeholders. On all other projects with communications scope, PM is encouraged to schedule a kickoff/0% meeting session with appropriate Telecom and/or Special Systems committee.*

- **30% Project Status***
    - **Open 30% Design Review** (Bluebeam session) Recommended at least one week prior to committee meeting and to close roughly one week after committee meeting
    - **Submit 30% Application for Connection** (Communication Systems and/or Special Systems) See section 1.3.2 for more information
        - Goal: Application received and reviewed at least one week prior to committee mtg. used for meeting preparations and to see progress over previous application(s)
    - **Schedule a 30% Committee Review**(s) for Telecom and/or Special Systems
        - Goal: Review team has seen and reviewed the 30% drawings and we can skip the typical page turn and utilize the 30 minute session to focus on specific issues or areas of concern brought forth by either the committee or the design team

And repeat the noted 30% layout steps established above for the following stages

- **60% Project status***
- **90% Project status***
- **100% Project status***

(*) It is known that 30, 60, 90, and 100% benchmarks may change. Large projects require more reviews and small projects may progress quicker.

1.3.1 Design Reviews

The process set forth in these Standards strongly encourages setting up Bluebeam design reviews prior associated applications and committee reviews as detailed at length in the opening statement of this section. Bluebeam reviews are typically at 30, 60, 90, and 100% with the telecom review frequency as applicable to your project needs and as directed by the telecom design review team. Port of Seattle Project Management Group is responsible for setting up Design Reviews and coordination of comment resolution for design team.

1.3.2 Applications for connection to Airport Utilities; Telecommunications

The telecommunications Application to Utilities process shall be complete prior to attending committee meeting at each phase as deemed required (0, 30, 60, 90, and 100%). Best practice to meet this goal is complete application at same time Committee Review meeting is scheduled (see section 1.3.3) All SEA applications for connection, which include support instructions and the necessary application form, may be found here (see link):

- Applications for Utilities Connections | Port of Seattle (portseattle.org)
    - For applications specific to Telecommunications found on above link, please refer to:
        - COMMUNICATIONS SYSTEMS -Application for connections to all communication infrastructure, such as rooms, spaces, cables, and pathways at SEA Airport and adjoining facilities. See Special Systems application for systems hardware and software utilizing communication infrastructure.
        - SPECIAL SYSTEMS -Application for connections of Special Systems hardware and software; includes Cable Television and Radio Frequency System Applications. If not using existing Communication Infrastructure, ensure an application for connection to Communication Infrastructure is also completed.

1.3.3 Committee reviews

A robust design review process is in place at SEA, such as Architectural, Electrical, and Mechanical and of course, Telecommunications. With the Telecommunications group you will find that we are focused on two aspects of telecommunications design. First, we have the Telecom Design Review (TDR) where the focus is on the telecommunication infrastructure build and connectivity. In TDR, we will review and assist designers with ensuring telecom spaces, pathways, and media follow these Standards for SEA. We will also provide direction on usage, size, and amounts of all pathways and media and dictate nomenclature and termination points. Second, we have the Special Systems Design Review (SSDR). Here we focus on the Systems that will utilize the installed telecom infrastructure. SSDR is especially interested in supporting new and not (yet) standardized technological systems.

Port of Seattle Project Management Group is responsible for setting up Committee meeting(s) and shall schedule here (see link [internal]):

- Design Reviews - Home (sharepoint.com)

The telecommunications meetings offered both in-person and if necessary, over Microsoft Teams*. Facilities and Infrastructure committee members will be present, and meetings are typically on the third Floor of the Airport Office Building (AOB). If you are a not a Port of Seattle badged employee, please plan to arrive at least 15 minutes early and follow the below process:

- Guest to arrive at the Conference Center at SEA glass doors and push the intercom button to inform the reception desk who they are and who they are here to see (Chairperson will be listed on committee meeting invite)
- The reception desk would then allow access to guest and ask them to sign in at the kiosk
- The kiosk will print a sticker badge that shall be worn while in the AOB
- Also, the kiosk will send the person they are here to meet an email that their guest is in the lobby waiting for them
- It is then the Port employee's responsibility to come to the lobby and escort their guest upstairs to their destination in the AOB

Further information regarding location, access, and parking validation may be found here (see link):

- Conference Center Location and Directions | Port of Seattle (portseattle.org)

(*) Microsoft Teams etiquette: Please value each other's time as these sessions are only 30 minutes long with a large amount of design material to get through. Do not attempt to take calls or work on other items during an active meeting. If you accepted the committee meeting, you are expected to be present and engaged in that meeting.

1.3.4 Site Inspections

Port telecommunications stakeholders should participate in site inspections, perform periodic quality control inspections, and a final punch list walk. Coordinate with project representative, typically the Construction Manager, see section 1.3.7 for more information.

1.3.5 Telecom Media Testing

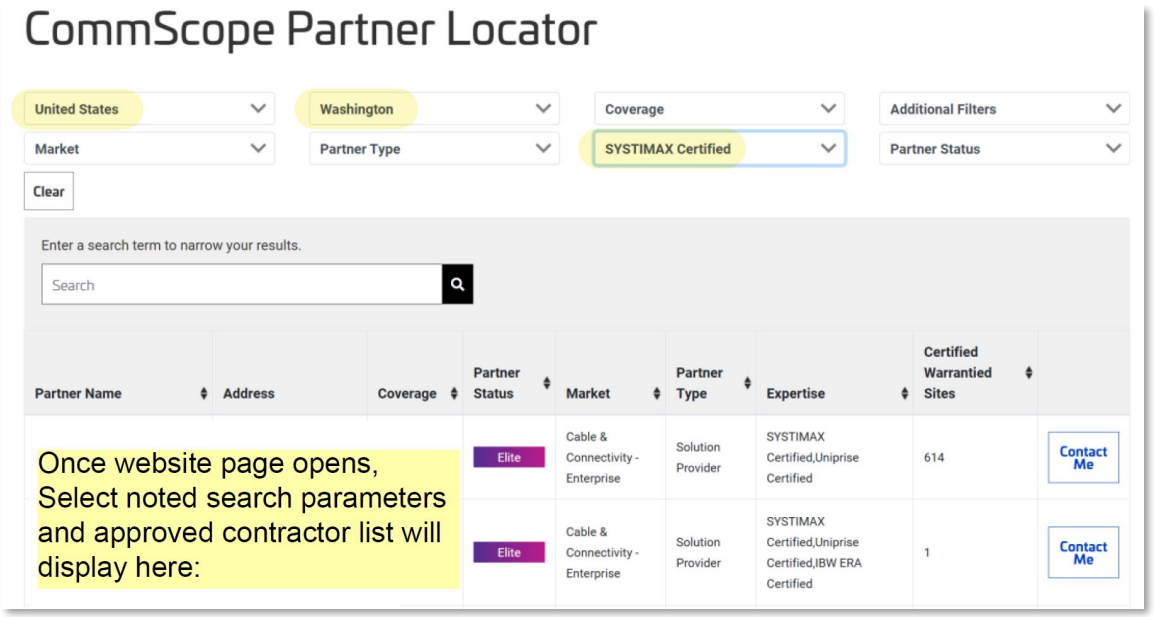
Port telecommunications stakeholders should follow process in place to participate in this submittal. For ongoing support and inclusion throughout project, coordinate with project representative, typically the Construction Manager, see section 1.3.7 for more information.

1.3.6 Telecom Warranty Certificates

Below is a current lineup of telecommunication infrastructure Competition Waived products, and their warranties offered. Port telecommunications stakeholders should follow process in place to participate in this submittal. For ongoing support and inclusion throughout project,

coordinate with project representative, typically the Construction Manager, see section 1.3.7 for more information.

- **CommScope® SYSTIMAX®**: The CommScope® SYSTIMAX® communication infrastructure is warrantied for a period of 25 years as per (see link):
    - CommScope Network Infrastructure System 25 Year Extended Product Warranty
    - Please **ensure that all CommScope® SYSTIMAX® products are installed by a certified (CommScope® Partner) communication contractor**.
    - Approved contractor list can be found here (see link):
        - CommScope Partner Locator Below image supports necessary information to enter to generate list:



    - **To the attention of contractor completing Warranty on the CommScope Partner Portal:**
        - Ensure warranty includes the following information-

CommScope Partner Portal

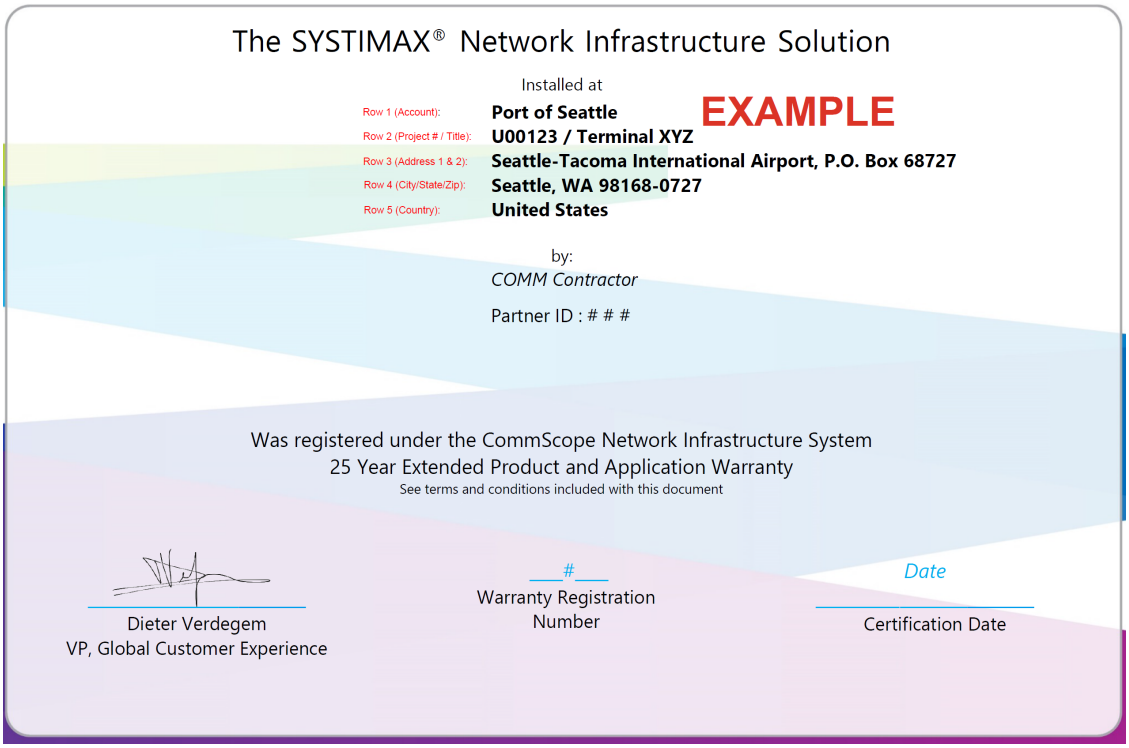
CommScope Partner Portal (requested input):	"Installed at" Order on Certificate	Port requested Info	As noted on Example (below)
Opportunity	Row two	Project # / Project Title	U00123 / Terminal XYZ
Account*	Row One	Port of Seattle	Port of Seattle
Contact	*does not display on warranty*	(pending) Port general email acct.	*n/a*
Site Type	*does not display on warranty*	(pull down) choose most applicable	*n/a*
Solution	*does not display on warranty*	SYSTIMAX (typical)	*n/a*
Stage*	*does not display on warranty*	(pull down) choose most applicable	*n/a*
Estimated Close Date	*does not display on warranty*	(calendar date selection)	*n/a*
Description	*does not display on warranty*	n/a	n/a

Physical Address of Project

CommScope Partner Portal (requested input):	"Installed at" Order on Certificate	Port requested Info	As noted on Example (below)
Project Address 1	Row 3 (left)	Seattle-Tacoma International Airport	Seattle-Tacoma International Airport
Project Address 2	Row 3 (right)	P.O. Box 68727	P.O. Box 68727
Project City	Row 4 (left)	Seattle	Seattle
Project Country	Row 5	United States	United States
Project State / Province	Row 4 (middle)	WA	WA
Zip/Postal Code	Row 4 (right)	98168-0727	98168-0727

(*) Required information on Portal

- Example Certificate:



- **AXIS® Hardware**: AXIS® is a warrantied product, for a period of 5 years from date of purchase as per (see link):
  - Warranty | Axis Communications
  - Please align procurement of hardware as close as agreeable by project schedule to allow for longest warrantied install for life of product.

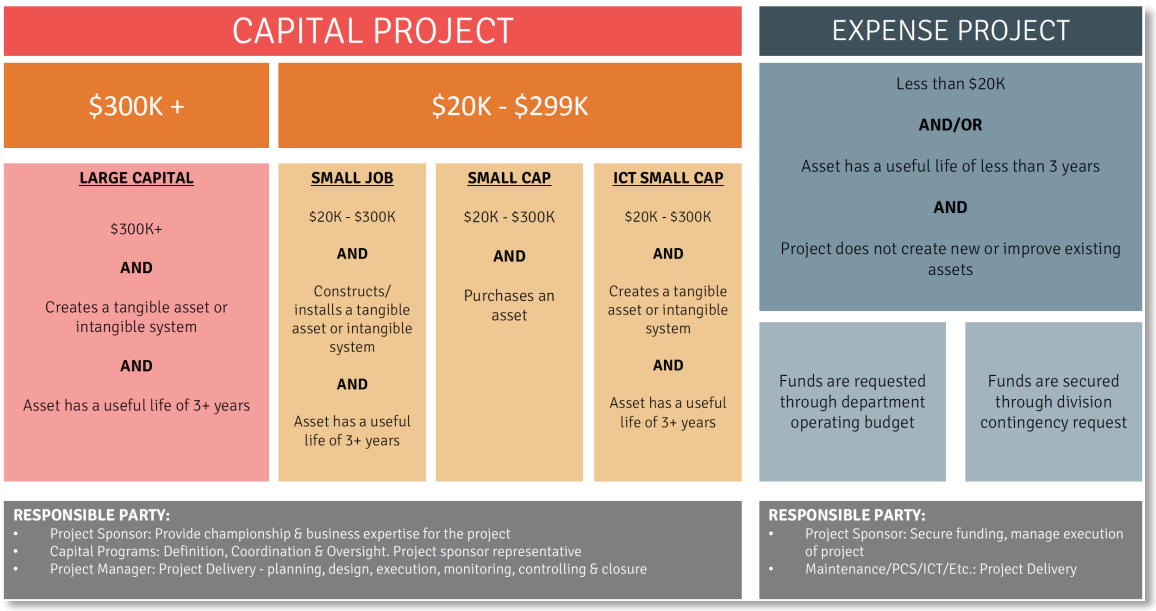
- **Special Systems -OTHER**:
  - Remaining systems list pending

1.3.7 Aviation Project Process (*guide for internal telecommunications stakeholders*)

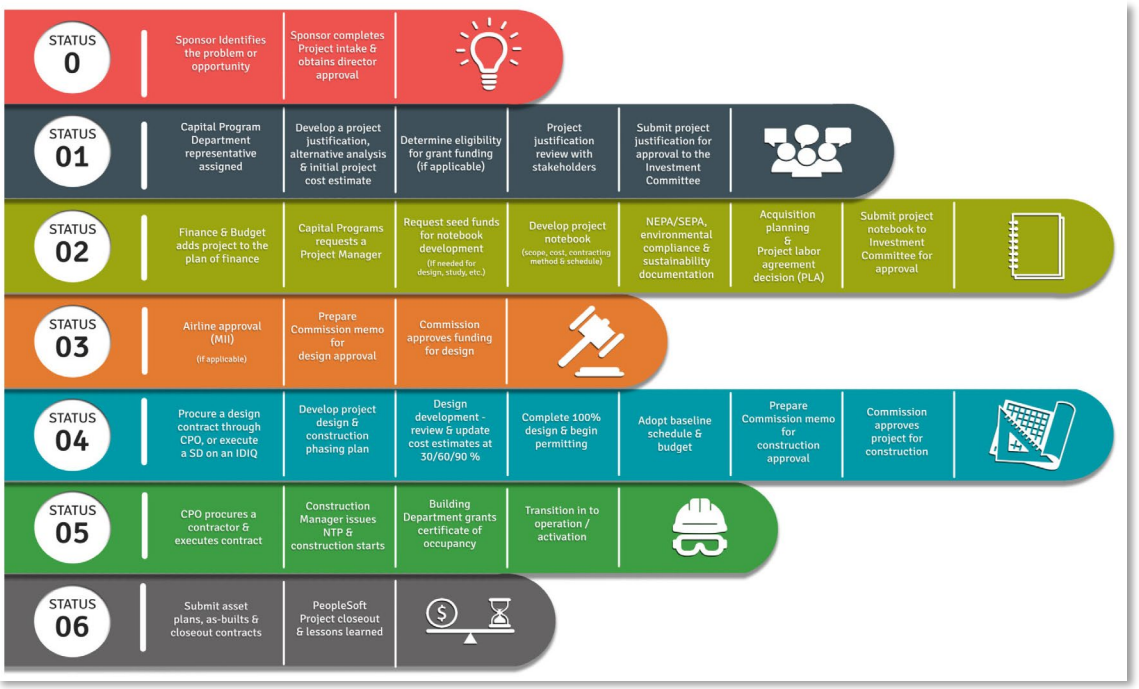
Having broadcast the standard for projects to follow in the preceding (see section) 1.3, it is relevant for internal stakeholders to view a project from sponsor's side. This allows us to see that our request in these Communication Standard's throughout align with the procedures in place by the project teams. This section hopes to educate all with:

a.) That these communication standards are aligning with information or procedures in place and not causing undue steps for PMG to remember or follow *and*
b.) How to navigate or include yourself in PMG processes to receive necessary information and maintain project inclusion

- Typical airport project types:

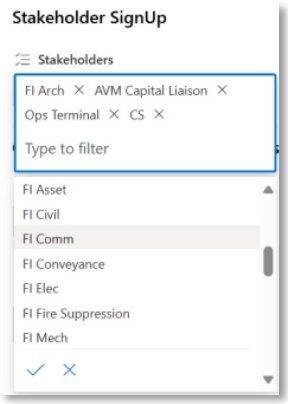


- The Capital Project Process:



- Some stakeholders may be involved in project at Status 01, where typically an email is received from a representative of Aviation Capitol Programs. This "*New Project – Check Stake Holder Status*" email will include an intake link where project details and rough scope may be reviewed for any telecom or special systems oversight requirements.

  ☛ *F&I Note:* *If telecommunications participation is found to be necessary, on the intake form link you receive, click (edit all) proceed to "Stakeholder SignUp" and select "FI Comm"*



Framework of an active Capitol Project brought forth at Status 04 by AV/PMG; Typical steps:

- PM submits Project Reviewer Assignment Form to required department manager groups
  - Department managers review, check (systems), and assign personnel as necessary

Project Reviewer Assignment Form

Design Review Participants:

(Project Manager to identify scope/systems and critical reviewer, Managers/Supervisors to assign reviewers)

√	Scope/System	√	Critical Reviewer	Other Reviewer
Communications				
	Radio Frequency/Wireless		F&I, ICT, ET representation	
	Special Systems (Low Voltage)			
	Telecommunications			
Electrical				

- PM completes Scope of work to define service directive
- PM utilizes Project Reviewer Assignment Form to schedule a PM/Design Kickoff meeting

☛ *NOTE: Communication standards also recommend a 0% kickoff meeting as noted above, see section 1.3*

  - At kickoff meeting, along with all other required airport stakeholders for said project, the Telecom Design Review (TDR) team shall have key stakeholders present to:
    - Receive a broad review of all telecom and special systems requirements
      - On communication "heavy" infrastructure projects, a standalone meeting may be requested by TDR for consideration of the PM team to implement a separate session
    - Speak to project team about any questions, concerns, or clarifications to these communication standards
    - Cover future project meeting schedule (the stakeholder update sessions); typical minimum is once a month, average is bi-weekly
    - Review proposed Bluebeam (design) reviews
    - Cover proposed telecom design review needs
- PM will typically introduce a Construction Manager (CM) by 60% and the CM will prepare the Division 1 specifications for the 90% package for review
  - The CM will take on the day-to-day project lead role once the contract is executed, from this point forward TDR team should expect:
    - At a minimum participate monthly project meetings where you can receive status updates of project such as:
      - Safety
      - Contract(s)
      - 3-week look ahead and overall schedule
      - Environmental
      - Shutdown (CAF) status
      - QC- Inspections
      - Submittals
      - Request for Information (RFI's)
      - General discussion points, etc

☛ ***Attention COMM Stakeholders****- Use these meetings to provide input as necessary for key components such as: Ensuring communication standards are followed, participate or spearhead site walks and inspections as necessary, RFI's are correctly implemented, and test results, labelling, as-builts and warranties are in process or provided*

  - These project meetings also may contain any and all of the following participants at any given meeting, providing you direct access to address most project concerns:
    - Construction Manager
    - Project Manager
    - Port Contracts rep.
    - Port Safety rep.
    - Construction Inspector
    - Communication designer

- By 90%, also watch for AV Document Control email “NEW SUBMITTAL LOG” related to each project
- The AV Document Control email will (typically) link to an Excel spreadsheet (as seen below) by the 90% package. Sign up for all necessary and required submittals.

Submittal Type Legend

AS As Built	**MU** Mock-Up/Proof of Concept	**PC** Pre-Construction Subm.	**SC** Schedule	**TD** Test Data/Reports
CA Calculations	**NP** Notice or Permit	**PP** Plan/Procedure	**SD** Shop Dra	**WA** Warranty
CC Cert. of Compliance	**OM** O&M Manual	**QR** Qualification Resume	**SE** Service Agreement	
MD Manufacturer Product Data	**OT** Owner Training	**SA** Sample	**SU** Substitution	

Contractor Priority

A = Contractor has indicated this is a top priority submittal
B = Contractor has indicated this submittal has medium priority
C = Contractor has indicated this submittal has low priority

Requirements for filling out the Submittal Log:
*Do not add columns
*Do not hide rows
*Follow name format in sample rows 13-15 below (Contractors do not add names)
-Do not delete/change names in yellow cells, please update if dept/position listed
*Remarks should only include instructions to the Contractor
*Identify Deferred Submittals in the Title

At Least One Critical Reviewer and Only One Final Reviewer are Required for Each Submittal

Project Name
MC-#
WP#

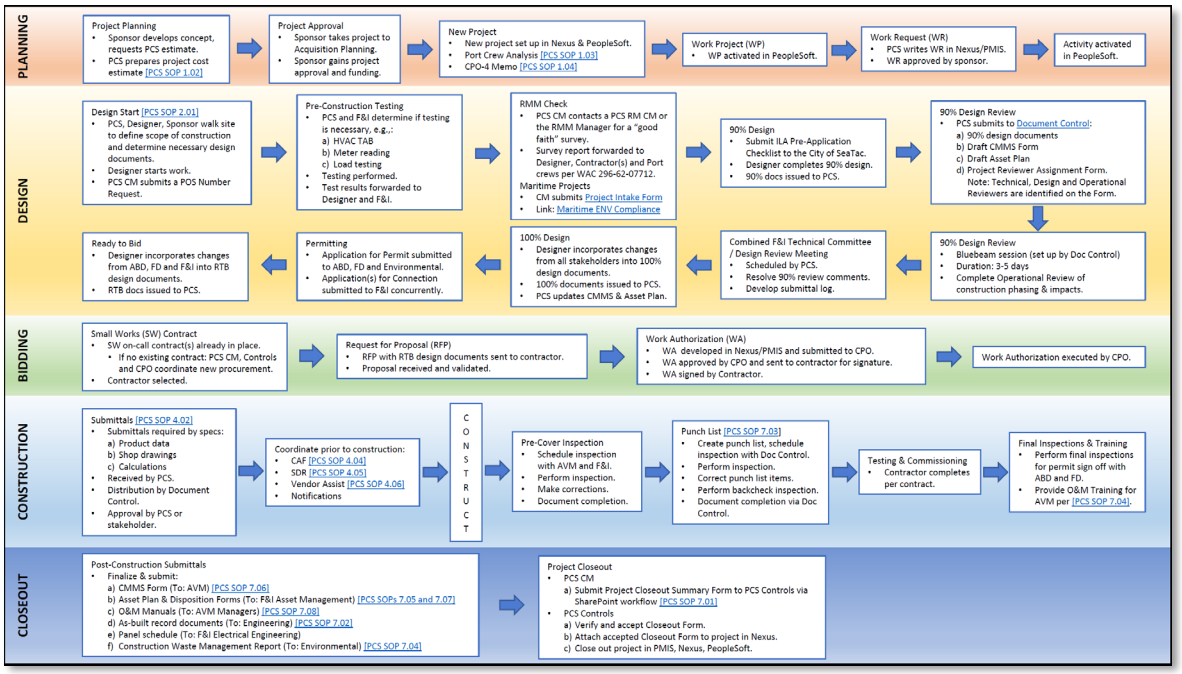
						Design Team Reviewers		F&I / Maintenance Reviewers		Additional Reviewers		CM Reviewers		
Spec. Section No.	Para. No.	Free Type	Title	Submittal Type	Contr Priority	Date Due from Contr	Critical	Other	Critical2	Other2	Critical3	Other3	Pre-Final (Optional) *One Per Submittal*	Final (Required) *One Per Submittal*	Remarks
01 78 29	1.03C		Final As-Built Redline Drawings	AS											
01 78 36	1.04A		Written Warranties	WA											
27 05 13	1.07		Structured Communications Requirements - Extended Systimax Warranty	WA											
27 05 13	1.07B		General Communications Requirements - Installation/Maintenance Technician Certification	QR											
27 05 13	1.08A		General Communications Requirements - Record Documents	AS											
27 05 26	1.03B		Grounding and Bonding for Comm Product Data	MD											

EXAMPLE

sign up for submittals as deemed required

- The following are typical specification sections to receive relevant communication infrastructure submittals:
  - Division 1: Final As-Built redline drawings and Warranties
  - Division 26: Pathways
  - Division 27: All required telecommunications infrastructure
  - Division 28: All required special systems (that reside on telecom. Infra.)

- Additional project types not captured above:
  - For alternative procurements, the critical time for the TDR team to provide input is at the Basis of Design (BOD) or Project Development Document (PDD) development and review. This will set the scope for the alternative procurement design and final construction.
    - Design reviews for Alternative deliveries will always refer back to the BOD or PDD for inclusion or Change order
  - Tenant and Airport Dining and Retail (ADR)
    - The design process of application for connection, telecom design review(s), and other project interaction is streamlined due to the process specific to ADR tenant work found in (see section 2.3.5) special function equipment cabinets; DMARC
  - Small Works Projects
    - These are typically Port Construction Services (PCS) led projects with a PM/CM role fulfilled by PCS and typically fall under an expedited review process
    - Though SW projects are expedited where possible, in the following image, you can see that PCS still has a robust procedure in place



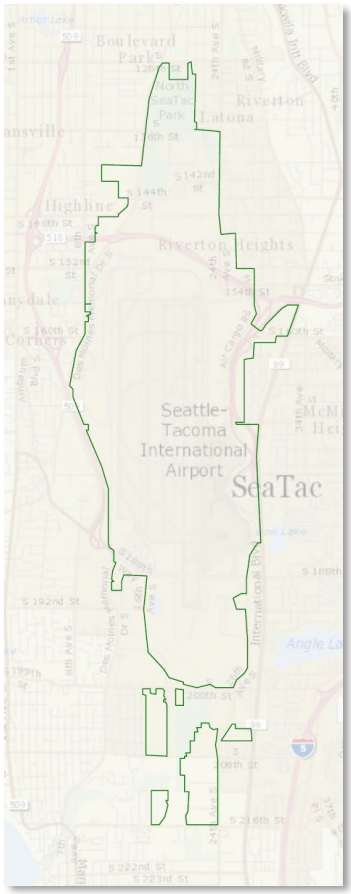
- Internal helpful links for further information (see link [internal]):
  - Director Dashboard Directory | Projects in Development
  - Aviation Small Capital Jobs Dashboard
  - Aviation Project Delivery Hub - Home
  - Design & Operational Review
  - Port Construction Services Standard Operating Procedures (PCS SOP)

1.4 SEA FACILITIES

This Airport facility was built in 1949 to handle half a million passengers which, as of 2024, is now handling over 52 million. All of this is accomplished while working with some of the smallest acreage for an international airport with this noted passenger volume. Within this section you will find all the facilities and basic wayfinding references to communication infrastructure serving these SEA Facilities

Top U.S. Airports in Passenger Volume

Ranking	Airport	Annual Passenger Volume (2018)	Terminal Acreage
1	Hartsfield-Jackson (Atlanta)	107.4 million	4,700 acres
2	Los Angeles International Airport	87.5 million	3,500 acres
3	O'Hare, Chicago	79.8 million	7,627 acres
4	Dallas/Fort Worth	69.1 million	17,207 acres
5	Denver	64.4 million	33,531 acres
6	John F. Kennedy (New York)	61.9 million	4,930 acres
7	San Francisco	57.7 million	4,899 acres
8	**Sea-Tac (SEA)**	**49.8 million**	**2,500 acres**



Source: Wikipedia search result 2022; images (chart and map) have since been updated on referenced site (no longer available)

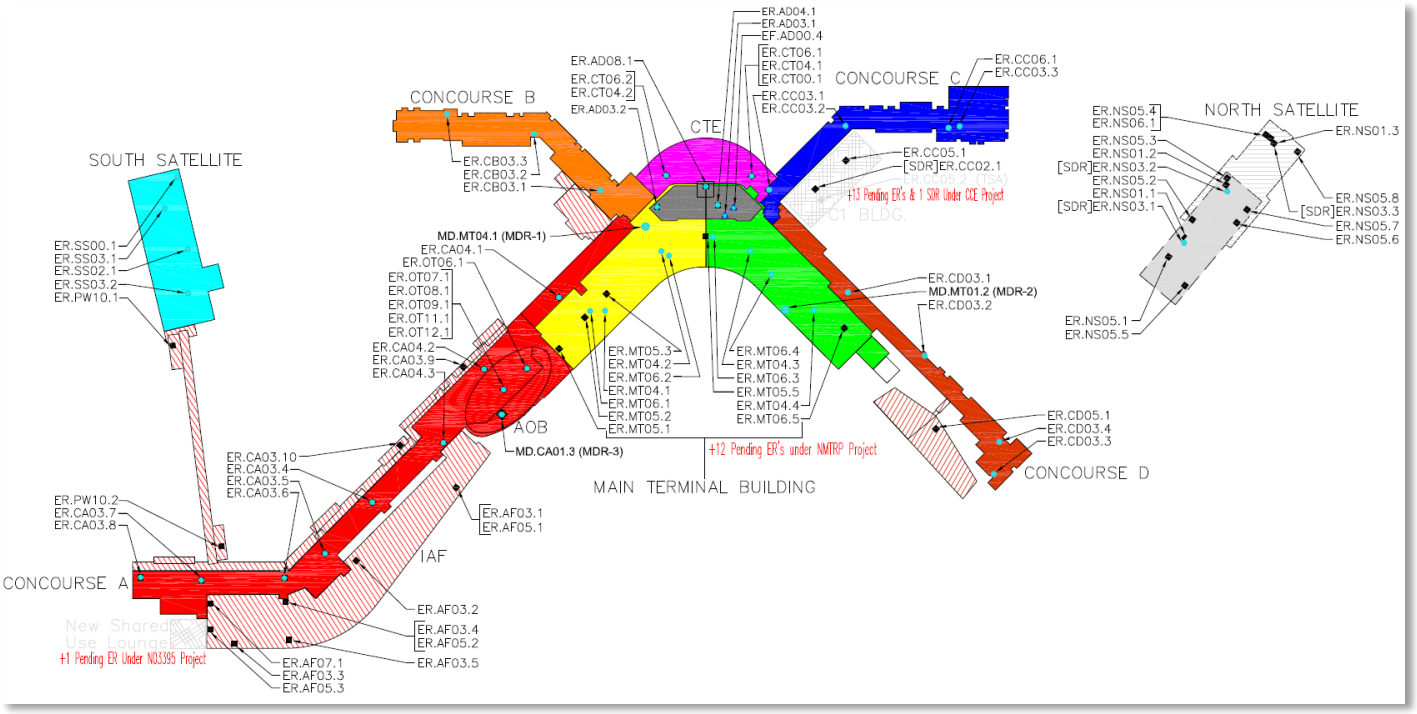
1.4.1 Airport Campus

Core Airport Facility comprised of:

- Main Terminal, north and south campus *(Communication Rooms: 2 MDR* and 15 ER)*
  - Administrative Building *(Communication Rooms: 1 EF [retired] and 4 ER)*
  - Central Terminal *(Communication Rooms: 5 ER)*
- A Concourse *(Communication Rooms: 1 MDR* and 10 ER)*
  - Airport Office Building and C4 *(Communication Rooms: 9 ER)*
  - A Lounge, new addition 2025 (*Communication Rooms: 1 ER*)
- International Arrivals Facility *(Communication Rooms: 9 ER)*
  - Pedestrian Walkway *(Communication Rooms: 2 ER)*

- B Concourse *(Communication Rooms: 3 ER)*
- C Concourse *(Communication Rooms: 4 ER)*
    - Pending 2025-2026 opening CCE *(Communication Rooms: 2 SDR and 14 ER)*
- D Concourse *(Communication Rooms: 4 ER)*
    - D Annex *(Communication Rooms: 1 ER)*
- N Concourse; formerly North Satellite *(Communication Rooms: 3 SDR, 1 TC, and 11 ER)*
- S Concourse; formerly South Satellite *(Communication Rooms: 4 ER)*
- Parking Terminal and North Toll Plaza *(Communication Rooms: 4 ER)*

Communication Rooms at airport terminal campus:



(*) For future planning of SEA campus MDR distribution, please (see section) 2.2.6 Main Distribution Room(s)

1.4.2 Remote Facilities

Nearly 70 Remote Facilities exist around the SEA Terminal. Most of these facilities have (or are in development to have) communication spaces or equipment that serve them via the Port of Seattle backbone cable infrastructure.

Bldg. ID	Address	Port Owned	Remote Facilities COMM Served by (with count)				Alternative Name
			ER or TC	EQ (Cabinet or DMARC)	SDR/ MDR	EF	
146A	2300 S 146th St	**Yes**		1	-	-	NEPL N. Warming House
146B	2006 S 146th St	Yes	-	-	-	-	Boeing Company
146C	2300 S 146th St	**Yes**	-	1	-	-	NEPL Mid-Warming House
146D	2300 S 146th St	**Yes**	-		-	-	NEPL Guard House
146E	2300 S 146th St	**Yes**	-		-	-	NEPL S. Warming House
148A	S 148th St	**Yes**	-	-	-	-	*Future "L" Shape Cargo Bld.*
148B	S 148th St	**Yes**	-	-	-	-	*Future "L" Shape Cargo Bld.*
148C	S 148th St	**Yes**	-	-	-	-	*Future "L" Shape Cargo Bld.*
154A	n/a	**Yes**	-	1	-	-	Airfield Lighting Control Vault
154B	2300 S 154th St	No	-	-	-	-	Flying Food Fare
154C	2358 S 154th St	Yes	-	-	-	-	Sky Chefs, Inc.
156A	2330 S 156th St	No	-	-	-	-	Cargo 1
156B	2451 S 156th St	No	-	1	-	-	Transiplex E
156C	2580 S 156th St	No	-		-	-	Transiplex F
156D	2581 S 156th St	No	-		-	-	Transiplex G
156E	2501 S 156th St	No	-		-	-	Transiplex A (SeaTac Cargo)
156F	2331 S 156th St	**Yes**	-	1	-	-	E190 Guard Shack
160A	2450 S 161st St	No	-	-	-	-	FedEx Express R
160B	3150 S 160th St	**Yes**	11	*	1	1	Rental Car Facility
160C	3036 S 160th St	**Yes**	-	-	-	-	N. Ground Transportation Lot
160D	16135 Host Rd	**Yes**	1	-	-	-	Water Tower Field Office
160E	2755 S 163rd St	Yes	-	-	-	-	Gate Gourmet
161A	2230 S 161st St	No	-	1	-	-	United Airlines Maint.
161B	2460 S 161st St	Yes	-	-	-	-	Bolanos, Pilot Air Freight
161C	2470 S 161st St	**Yes**	-	1	-	-	Pump House
161D	2625 S 161st St	Yes	-	-	-	-	BT Properties
161E	16215 Air Cargo Rd	Yes	-	-	-	-	Cargo 4E
161F	2427 S 161st St	Yes	-	-	-	-	Cargo 4N
161G	2307 S 161st St	Yes	1	-	-	-	Air Cargo 4
165A	2600 S 165th St	Yes	-	-	-	-	Alaska Air Cargo
166A	2385 S 166th St	**Yes**	-	1	-	-	E125 Guard Shack
166B	2380 S 166th St	Yes	-	-	-	-	Cargo 4S, United Air. Cargo
166C	2580 S 156th St	No	2	1	-	-	Air Traffic Control Tower
167A	16745 Air Cargo Rd	Yes	-	-	-	-	Cargo 6
167B	16749 Air Cargo Rd	Yes	-	-	-	-	Cargo 6
168WA	n/a	Yes	-	-	-	-	*Fut. W. Side Maint. Campus*

170W	1006 S 170th St	**Yes**	-	-	1	-	West Side Field Office
170A	2400 S 170th St	**Yes**	-	-	1	-	Aircraft Rescue Fire Facility (POSFD)
170B	2626 S 170th St	No	-	1	-	-	Doug Fox Parking Facilities
170C	2626 S 170th St	No	-	1	-	-	Doug Fox Parking Facilities
170D	17225 Air Cargo Rd	**Yes**	-	-	-	-	E100 Guard Shack
184A	TBD	**Yes**	-	-	-	1	Meet-Me-Room (MMR)
188WA	18291 Starling Rd	No	-	-	-	-	General Aviation FBO, ASIG
188WB	1500 S 184th St	No	-	-	-	-	Paccar/Weyerhauser Hanger
188WC	n/a	**Yes**	1	-	-	-	ARFF-West (POSFD)
188WD	n/a	**Yes**	-	1	-	-	Snow Shed
188WE	n/a	**Yes**	-	2	-	-	IWS Treatment Plant
188F	18650 Alaska Service Rd	No	-	1	-	-	Alaska Airlines Maint. West
188G	18650 Alaska Service Rd	No	-		-	-	Alaska Airlines Maint. East
188H	18601 28th Ave S	No	-	1	-	-	Delta Air Lines Tech Ops
188I	18501 28th Ave S	**Yes**	-	1	-	-	E45 Guard Shack
188J	18627 28th Ave S	No	-	-	-	-	Delta Air Lines Cargo
188K	18650 Alaska Service Rd	No	-	-	-	-	Alaska Airlines GSE
188L	18650 Alaska Service Rd	**Yes**	-	-	-	-	Alaska Airlines Maint. Bldg.
188M	18750 Fill Stand Rd	**Yes**	-	1	-	-	PLB Shop
190A	2350 S 190th St	No	-	-	-	-	Fuel Farm Office
190B	18901 28th Ave S	**Yes**	-	-	-	-	SEPL North Warming Shack
190C	18901 28th Ave S	Yes	-	-	-	-	SEPL Gate Shack
190D	18901 28th Ave S	Yes	-	1	-	-	SEPL South Warming Shack
194A	2529 S 194th St	**Yes**	-	1	-	-	Logistics Buildings
194B	2529 S 194th St	**Yes**	-		-	-	Logistics Buildings
194C	2529 S 194th St	**Yes**	-		-	-	Logistics Buildings
194D	2421 S 192nd St	No	-	1	-	-	Elcon Corp
194E	19425 28th Ave S	**Yes**	-	1	-	-	Port Construction Services
194F	2645 S 194th St	**Yes**	-	1	-	-	Distribution Center
194G	2400 S 194th St	**Yes**	-	-	1	-	Airport Transit Operations
196A	19639-C 28th Ave S	**Yes**	-	-	-	-	Training Center
196B	19639-D 28th Ave S	Yes	-	-	-	-	CBP Cargo Modular
196C	19639-A 28th Ave S	**Yes**	-	1	-	-	Learning Center/NFO
196D	19639 28th Ave S	**Yes**	-	-	-	-	Future Truck Staging Shack

[**BOLD**] Port as sole or Primary Tenant

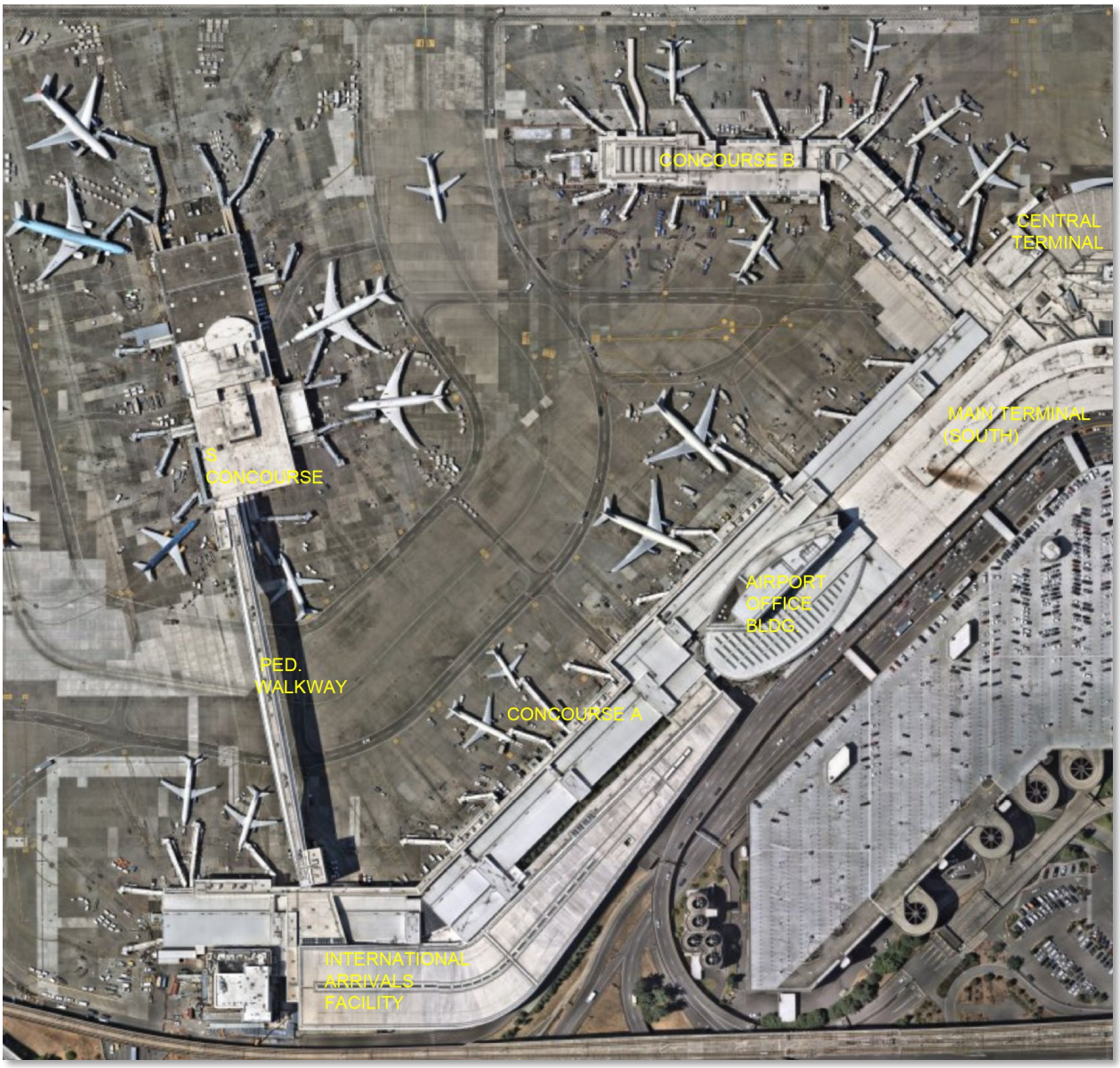
[*] *Facility Supports Demarcation distribution to other tenant(s)*

1.4.3 Maps

The most current aerial reference maps are provided from August of 2024

- Entire SEA Campus

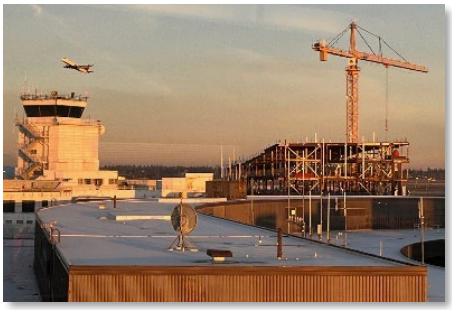
- SEA South Campus



- SEA North Campus

PART 2- DESIGN STANDARDS- COMMUNICATION SPACES

Currently we are in a trend of building up versus out. Our growth has been met with reality of SEA's conflict over the need of more terminal space against the reality of our limited acreage. Also, technology has not relented in equipment room space requirements and our outside plant cabinets have grown tenfold in the last decade. Where at one time it was sufficient to place telecommunication spaces in locations that fed data points both horizontal and vertical from said point, our newest architectural designs have found it advantageous to have rooms stacked and centrally located. In the case of cabinets, they are now dedicated at every gate location and many more have been planned for to reach all points on the airfield and remote buildings.



This trend has in turn put an increased load on all the facilities behind the scenes that support each telecommunication space. Greater care must be made to make sure we size the rooms and cabinets for the space that they serve. Facilities and Infrastructure shall take point on telecommunications room placement and design as we are in the best position to coordinate with all other building aspects within our Facilities and Infrastructure team. When building out a telecommunications space, we must coordinate with other major facility components such as architectural, structural, electrical, and mechanical, as well as any applicable codes that each space must adhere to. Internal operations teams supporting the telecommunication rooms shall also be consulted to ensure we build spaces to handle all current and future communication administration and operational trends.

Building up! As seen in this early 2025 image of the CCE Project.

2.1 GENERAL DESIGN for COMM ROOMS

SEA airport terminal, along with the collection of remote facilities, requires a cohesive communication room design to ensure the proper operation and maintenance of our interconnected communication backbone infrastructure. Compliance to the communication room Standards section ensures we create spaces that will function for today and tomorrow's technology challenges of an airport facility.

Please note that in this section, any reference to "room(s)" shall be implied to mean telecommunications room.

2.1.1 Architectural

- In depth architectural guidelines and standards must be adhered to and link may be found above in (see section) 1.1.3 Reference to other SEA Standards; reference Architectural Guidelines and Standards 2025, or latest version posted
- The following list is a high-level overview of common telecommunications requirements in relationship to architectural parameters in the SEA campus.
    - Location parameters
        - Room access shall be provided from central hallways or corridors and never through another room or mechanical space. Plan for adequate space present and future to facilitate installation of communication equipment
        - Placement of rooms per floor or space shall be backed by elevator or ramp access. This is for the navigation communication equipment from delivery site to proper floor, and upon floor, to room. No stair access to telecommunication room is allowed
        - Rooms are designed as an integral part of the overall building and are considered a fixed location
        - Ingress and egress extend from the room floor up to the deck or ceiling above. Leave ample room for conduit and tray pathways present and future as well as permanent planned access to all pull boxes
        - Please refer to (see section) 2.2 Communication Room Types for a detailed look at how communication standards affect the location layout of communication rooms in a facility
    - Size and dimensions
        - Architectural design needs must take into consideration all the services to be provided in said building. Make every effort to adhere to the provided minimum space consideration as our telecommunication rooms serve the Port and all its customers out of each room
            - SEA has multiple room types depending on communication function and need; please **refer to (see sections) 2.2.2 thru 2.2.9 for each room type and dimension requirements**
    - Construction and Finishes; Room
        - Doors
            - Size no less than 36-inch in width x 84-inch in height
            - No threshold
            - Outward swing (when permitted by code)
            - 90-minute fire rated accessibly for door and frame to adhere to 2-hour rated construction requirements
            - Provide Access Control for entry, (see section) 6.1 SEA Security for more information
        - Floor
            - Sealed concrete or
            - Static Dissipative Tile; Excelon SDT Tile, color 51953 pearl white

        - Wall base material- light gray
    - Walls
        - All four (4) walls shall extend from the floor to the structural slab or ceiling above
        - Walls are to be constructed to maintain a 2-hour fire rated wall assembly
        - Walls to be covered with ¾" A-C FRT plywood, typically wrapped on all four (or more) walls
    - Ceilings
        - Shall be left open to structure above, no (finished) ceiling is required
        - Where fireproofing of exposed ceiling (deck above) is required, treat fireproofing to mitigate airborne dust
        - Height to be a minimum of 10 feet clear from finished floor to above ceiling or floor
- Accessibility: ADA Compliance is not applicable for SEA Communication Rooms and the doors that serve them. Communication rooms are not deemed ADA compliant spaces
    - Though building codes vary as well as the enforcement of these codes, Telecommunication Rooms contain equipment non-complaint to ADA accessibility requirements. For example, the equipment racks will contain equipment up to a height of 90 inches above finished floor that needs to be accessed. Reach of mid-point gear is also restricted due to the nature of the rack footprint and heavy-deep depth equipment typically mounted low. It is recommended that no ADA accessibility design aspects be applied within the SEA Communication Rooms unless superseded by Code

2.1.2 Structural

- Design considerations:
    - Ensure all required structural calculations are performed for communication room assemblies, such as loaded cabinets, racks, overhead ladder racks, wall mount equipment, etc.
    - Designer shall confirm the intended load into cabinets and/or racks with Port Facilities and Infrastructure and the Telecom Design Team
    - Note typical manufacture minimum equipment point loads in communication rooms of up to:
        - 1000 lbs. per rack
        - 3000 lbs. per cabinet

2.1.3 Mechanical

- The following list is a high-level overview of common telecommunications requirements in relationship to mechanical systems. In depth mechanical system standards must be

adhered to and link may be found above in (see section) 1.1.3 Reference to other SEA Standards; reference Mechanical Systems Standards 2023, or latest version posted

- Foreign piping systems such as water, steam, sewer, etc. shall not be installed or pass through communication rooms
  - Avoid placing tenant with restaurant/kitchen services above any communication space
  - Avoid restroom services above any communication space
- Design for **ALL** Room cooling set points to achieve and maintain 75 degrees
- Provide thermostats with a digital read out of current room temperature and system set point for easy confirmation of room conditions and system operation
- Do not allow for local adjustment of thermostat by non-mechanical personal
- Allowable operational temperature set point(s) are as follows:
  - 85 degrees*: All Telecommunications Closets (TC) and Equipment Rooms (ER). These rooms account for 90% of new and existing communication rooms in the facility and are in the size ranges of:
    - TC's 60-70sqft
    - ER's (standard) 215sqft
    - ER's (large) 345sqft
  - (*) Exceptions: TC or ER's with high active equipment load or other heat generating conditions *may* be requested to a lower operational temperature set point

☛ *Please Note: Time in the ER is typically limited to cross connections, condition assessments, and general upkeep. Though frequent visits may occur, they are short in nature and the environmental impact and savings to the mechanical plant are best served by the majority of our rooms set at this benchmark*

  - 75 degrees <u>or ambient temperature set point of occupied spaces</u>: All Secondary Distribution Rooms (SD), Main Distribution Rooms (MD), Meet-Me-Room (MMR), and Data Center. Theses rooms account for 10% of new and existing communication spaces in the facility and are in the size ranges of:
    - SD's 600-650sqft (average of two serving any one concourse)
    - MD's 1000-1250sqft (currently three exist with a maximum forecast of four total to serve SEA)
    - MMR size to be determined (currently one MMR in a remote bldg. exists with a maximum forecast of two total to serve SEA)
    - Data Center spaces require a case-by-case review; one currently exists
      - Data cabinet specific cooling and exhausting is encouraged
- Clean Agent Systems for fire suppression, (see section) 2.1.5 Fire Suppression

2.1.4 Electrical

- The following list is a high-level overview of common telecommunications requirements in relationship to electrical systems. In depth electrical system standards must be adhered to and link may be found above in (see section) 1.1.3 Reference to other SEA Standards; reference Electrical Systems Standards 2025, or latest version posted
    - Lighting within communication spaces
        - Provide partial always on light fixture(s) for lighting at door entrance(s) to support security camera identification of personnel entrance into room
        - Full room lighting to achieve Provide uniform illumination of at least 50 foot-candles
        - Do not install light fixtures over cable tray
    - Grounding and Bonding
        - *Requires comm specific development; refer to Division 26*
    - Electrical Service
        - *Requires continued development; refer to Division 26*
        - A room specific UPS system shall be designed for room load and auxiliary TC's and MDC loads fed from said room. UPS to occupy cabinet position A or space allocated for cabinet. For room specific details (see section) 2.2.4 and 2.2.5
        - Rack power setup in primary row of the Standard Equipment Room (ER) and Secondary Distribution Rooms (SD)
            - Above/in Cabinet 'B' ACS
            - Above rack two (and rack four if present)
                - Second row power -TBD*
                - Additional rows -TBD*
            - On wall field and in the access control power supply and CK721 junction boxes
        - Rack power setup in Telecommunication Closets (TC)
            - Above rack two, second from wall, in the typical TC setup
        - Convenience outlets -amount TBD*

    (*) To be determined via stakeholder meeting with Telecom Design Review (TDR)

2.1.5 Fire Suppression

- The following list is a high-level overview of common telecommunications requirements in relationship to Fire Department Codes and Standards. In depth Fire system standards must be adhered to and link may be found above in (see section) 1.1.3 Reference to other SEA Standards; reference Fire Department Code Amendments, Standards, and Interpretations 2024, or latest version posted
    - Provide communication rooms with a fire extinguisher located next to egress door(s)

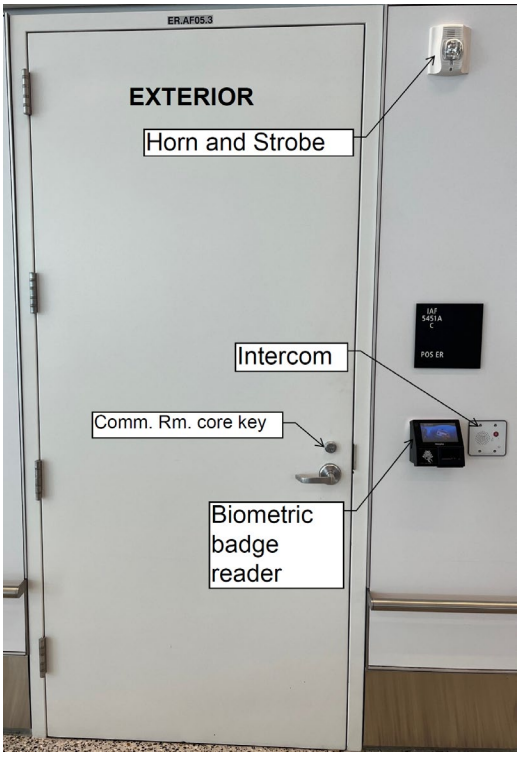
        - All new rooms shall receive a Halotron® type extinguisher which is ideal for use near sensitive electronic equipment. Ensure a minimum 11lb extinguisher is used for ALL communication rooms to achieve a class A, B, and C rating as units below 11lb are NOT rated for class A
        - Facilities and Infrastructure shall direct a phase out of all existing general dry chemical class ABC extinguishers in existing communication rooms over time
    - At a minimum, **ALL** communication rooms shall be 2-hour rated construction
    - Sprinklers are not required **IF** rooms are 2-hour rated and provided with complete smoke detection
        - All Telecommunications Closets (TC) and Equipment Rooms (ER) fall under the above non-sprinklered guidelines
        - Pair these rooms with the below recommended extinguisher type:
            - 11lb. Halotron® class A, B, and C for use near/on sensitive powered communication room equipment
    - Active systems, such as installation of a Clean Agent System in accordance with NFPA 2001 shall be at the sole discretion of Facilities and Infrastructure and reviewed with Port stakeholders within the telecom design review board
        - All Secondary Distribution Rooms (SD), Main Distribution Rooms (MD), Meet-Me-Room (MMR), and Data Center(s) fall under the above Clean Agent System guidelines
        - Pair these rooms with the below recommended extinguisher type:
            - 11lb. Halotron® class A, B, and C for use near/on sensitive powered communication room equipment
    - Fire stops
        - Seal all penetrations to:
            - Maintain 2-Hour wall assembly
                - Use of certified, pre-manufactured, UL-listed mechanical firestop systems for communication media that allow for easy re-entry/adds while maintaining fire resistance ratings through walls and floors is preferred, such as:
                    - STI Firestop EZ-Path®
                    - Hilti Fire Devices and Sleeves
                    - Or approved equal
            - Post compliance signage to note space is 2-Hour rated construction and above all penetrations
            - Examples:

-New or updated to comply comm space. Notice placed on all walls

-Existing rooms, new penetration compliance notice

2.1.6 Security

- ALL Communication rooms shall utilize an access control badge access system for primary ingress access
    - All communication rooms and communication cabinets, such as MDC's, shall be further secured with a 4-59* core key for mortised door, handle set, or padlock
        - *(*) Note: By years end of 2025, the referenced key may be updated/revised post Access Control Comm. Rm. Project (U00493)*
        - For badged spaces, key override access shall **NOT** be permitted, utilize your existing or request missing badge access through proper security protocols
    - For more information (see section) 6.1 SEA Security
    - Typical communication room setup:



2.1.7 Room finishes and trim out: COMMUNICATIONS

- Hardware enclosures and mounting support
    - Equipment Cabinet
    - Equipment Racks
    - Vertical Wire Managers
        - See specific location and layout details per room type here (see sections) 2.2.2 thru 2.2.9
    - Ladder racking- VERTICAL/RISER
        - x
    - Ladder racking -HORIZONTAL; media support and routing
        - Two tier system, wrap room and provide for parallel run over all row(s) of racks, cabinets, or both
            - Upper/ top:
                - Usage- Backbone
                - Height- mount at 12-inches above top of lower rack or 24-inches above top of rack or cabinet
            - Lower/ bottom:
                - Usage- Horizontal
                - Height- mount at 12-inches above top of rack or cabinet
        - Fiber patchcord distribution tray or basket
            - **In development for**:

- Routing fiber cross connections rack-to-rack (or cabinets) and row-to-row
- Mounted directly above racks, cabinets, or both
- No higher than 6" in total height
- Channels or waterfall above each rack (front side) vertical wire manager
- Focus on:
    - Easily accessible across all equipment racks and between all rows
    - Ease of entry and exit for moves, adds, and changes
    - *Contact or review with Telecom Design Review Team or these Standards for future updates and development*

- Service loop; wall mounted

☛ *Please Note: Traditionally we utilized a loop within in the comm room's upper ladder rack with a request of at least 10 meters (33 feet),* ***practice abandoned*** *due to trapping the loop under many fiber pulls, refer to the updated direction below*

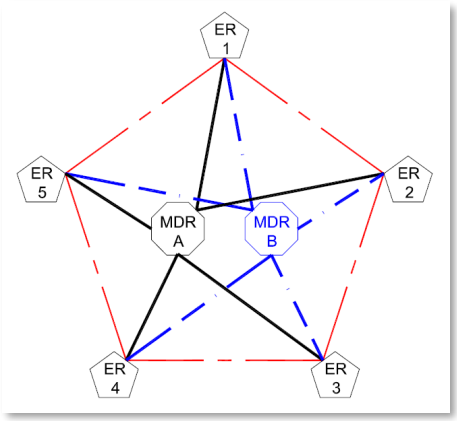
- Backbone Media; **Fiberoptic**
    - Provide for service loop wall mounted bracket(s)
        - Mount unit(s) above/below **all** cable tray entry/exit(s) or above/between conduit entry/exit(s) into communication rooms
        - Unit shall support up to 250 feet of ¾-inch diameter fiberoptic cable
        - Unit shall be designed to hold on average a 36-inch diameter loop or at least 10 feet per turn
            - Provide 5 turns (50 feet or 15 meters) at all MDR's and SDR's
            - Provide 3 turns (30 feet or 10 meters) for all other communication rooms
        - Loop shall be labeled with cable identifier upon entry, the individual grouped bundle, and exit of service loop
            - Multiple fiber runs may be placed on one bracket within manufactures load specifications
            - **Ensure** each loop is independently bound together. Do NOT secure loops to previous loops
        - Upon exit of loop, traverse the upper cable tray DIRECT to assigned Fiberoptic patch panel, no further loop within room is required

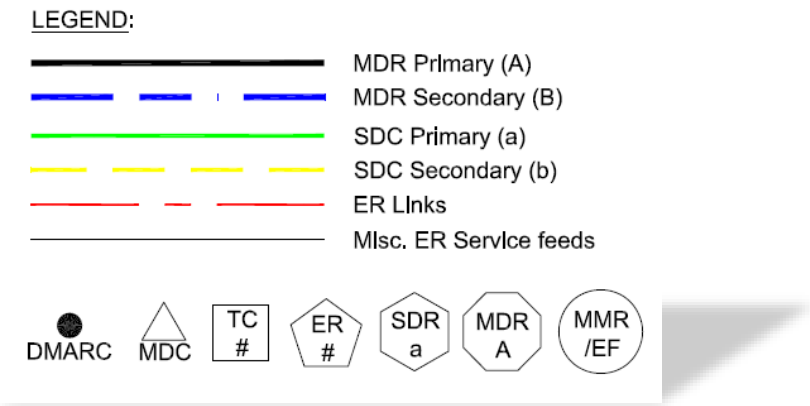
- Backbone Media; Copper (25pr. and above)
    - Secure small “loop” storage by running down/up wall (depending on cable entry) contained within area behind 110 block wall field mounting location
        - When running cable toward floor, maintain 12-inches above finished floor
        - This method should achieve an average of 10-feet on wall plus the travel distance from conduit/tray entry point to 110 block location
            - This installation is deemed acceptable for this legacy low usage media
    - Do **NOT** use above noted fiberoptic dedicated service loop mounting hardware for copper backbone
- Pathways (internal room trays and backbone/horizontal media entry conduit/trays) covered in (see section) Part 3 Communication Pathways
- Backbone and horizontal media further covered in (see section) Part 4 Communication Media
- Room signage, equipment, and media labeling covered in (see section) Part 5 Communication Administration

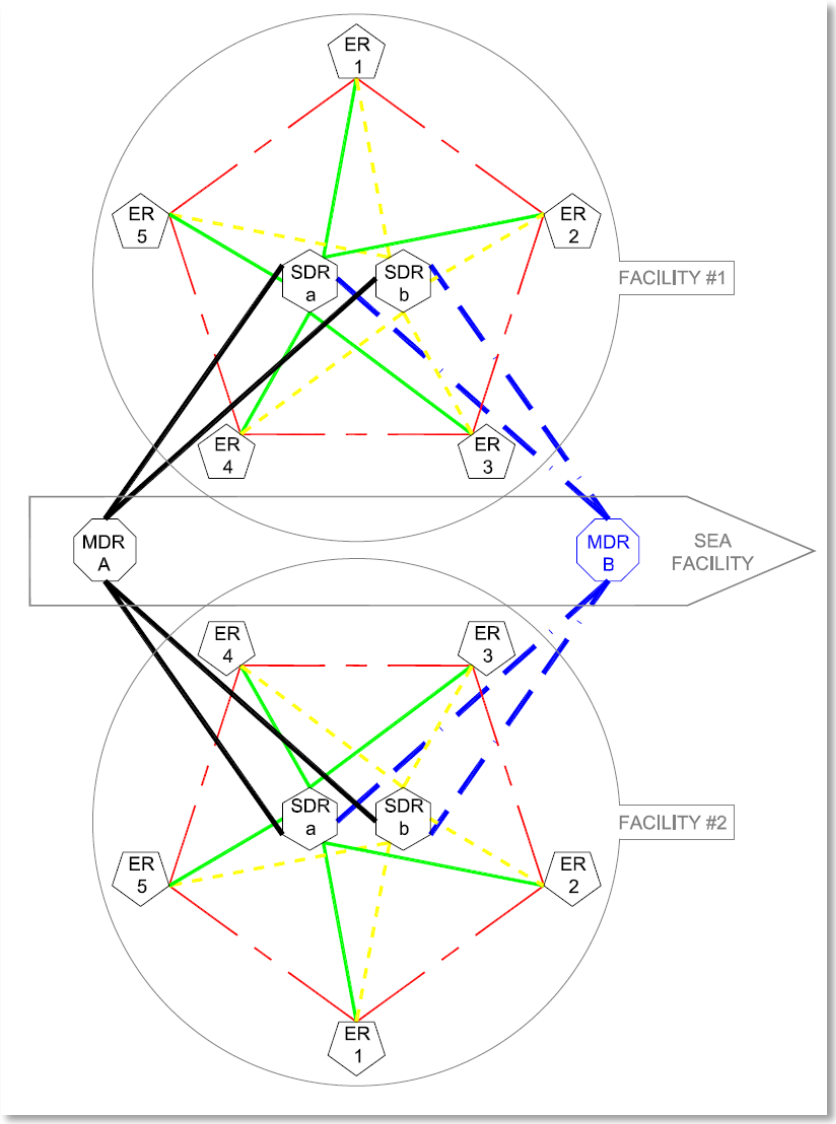
2.2 COMMUNICATION ROOM TYPES

This section covers the spaces at SEA that serve as our Communication Rooms and is laid out from smallest to largest with the last two space types dedicated to the entrance of telco service into SEA. For the most part, the Standard Equipment Room (ER) shall do the heavy lifting of the day-to-day operations for communication infrastructure support to the airport facility. The ER's are supported up stream by a Secondary Distribution Room (SDR) or Main Distribution Room (MDR). All ER's shall connect to either two (2) MDR's or two (2) SDR's with both backbone (fiberoptic) cable **and** pathway redundancy. The ER's in turn serve downstream spaces in the form of adjacent ER's and/or Telco Closets (TC), Micro Distribution Cabinets (MDC), Tenant Demarcation Panels (DMARC), and horizontal copper service cable to end devices.

The image to the right represents the Original Communication Infrastructure Backbone System (CIBS) Topology, or Dual Star. In this setup every existing and new ER was home run to at least two MDR's

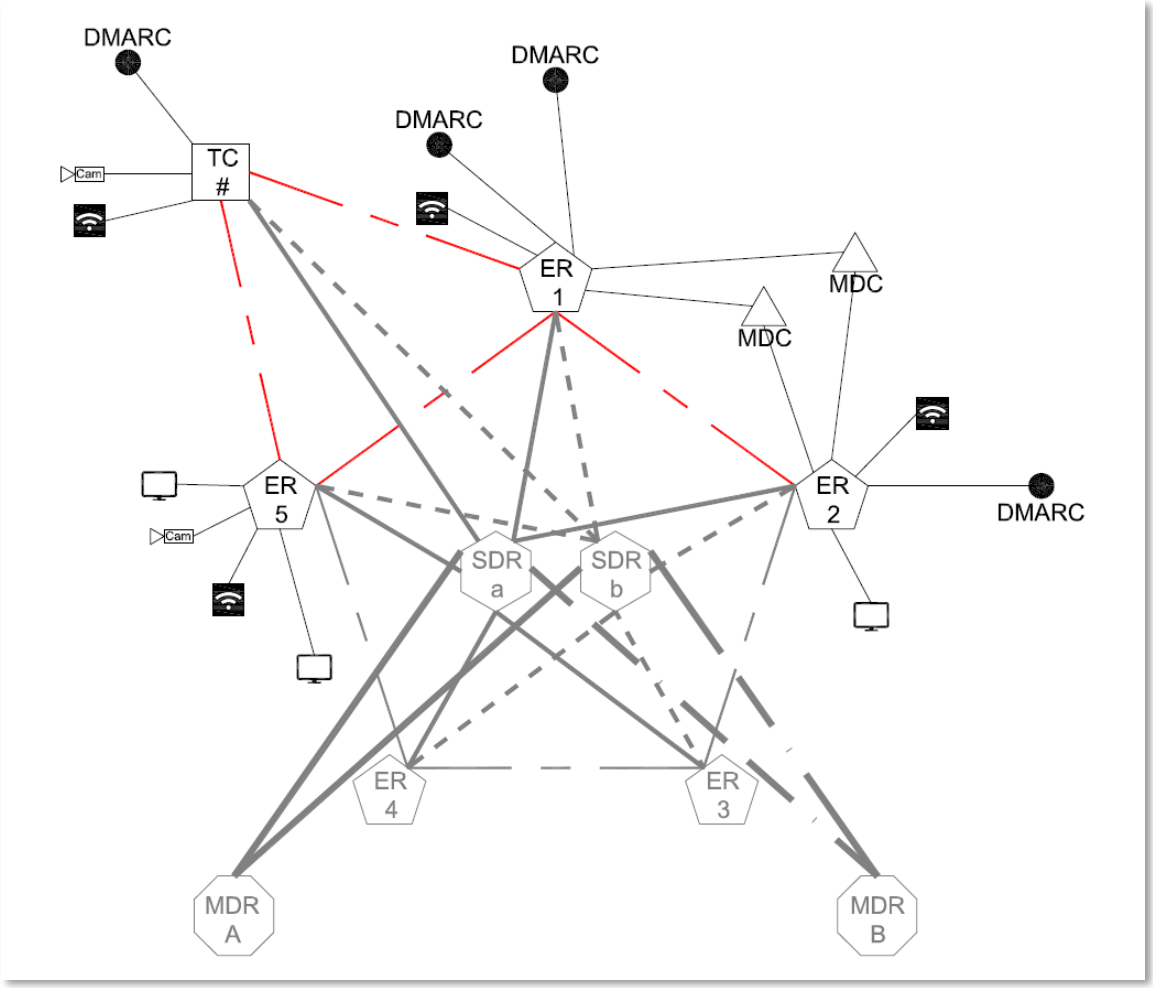






The image to the left represents the addition of the SDR where the MDR's feed a facility or in the airport's case, an entire concourse. As you can see in this example, as the ER footprint expands, having the SDR consolidate a region within the airport will limit the overloading of pathways and or cabling into the MDR. Now, each building segment (or concourse) will act as its own dual star which is backed up by an overall campus dual star topology

The below image is simply meant to give a rough graphical idea of the magnitude of the service level provided by our Equipment Rooms. All rooms need thoughtful design and adherence to the Standards put forth in this document, but that is especially true for our ER's which act as our final connection to all customers both external and internal. The ER must be clean, clear, and maintain continuity of design to assist all Port of Seattle staff that interface with the ER's on a frequent basis.

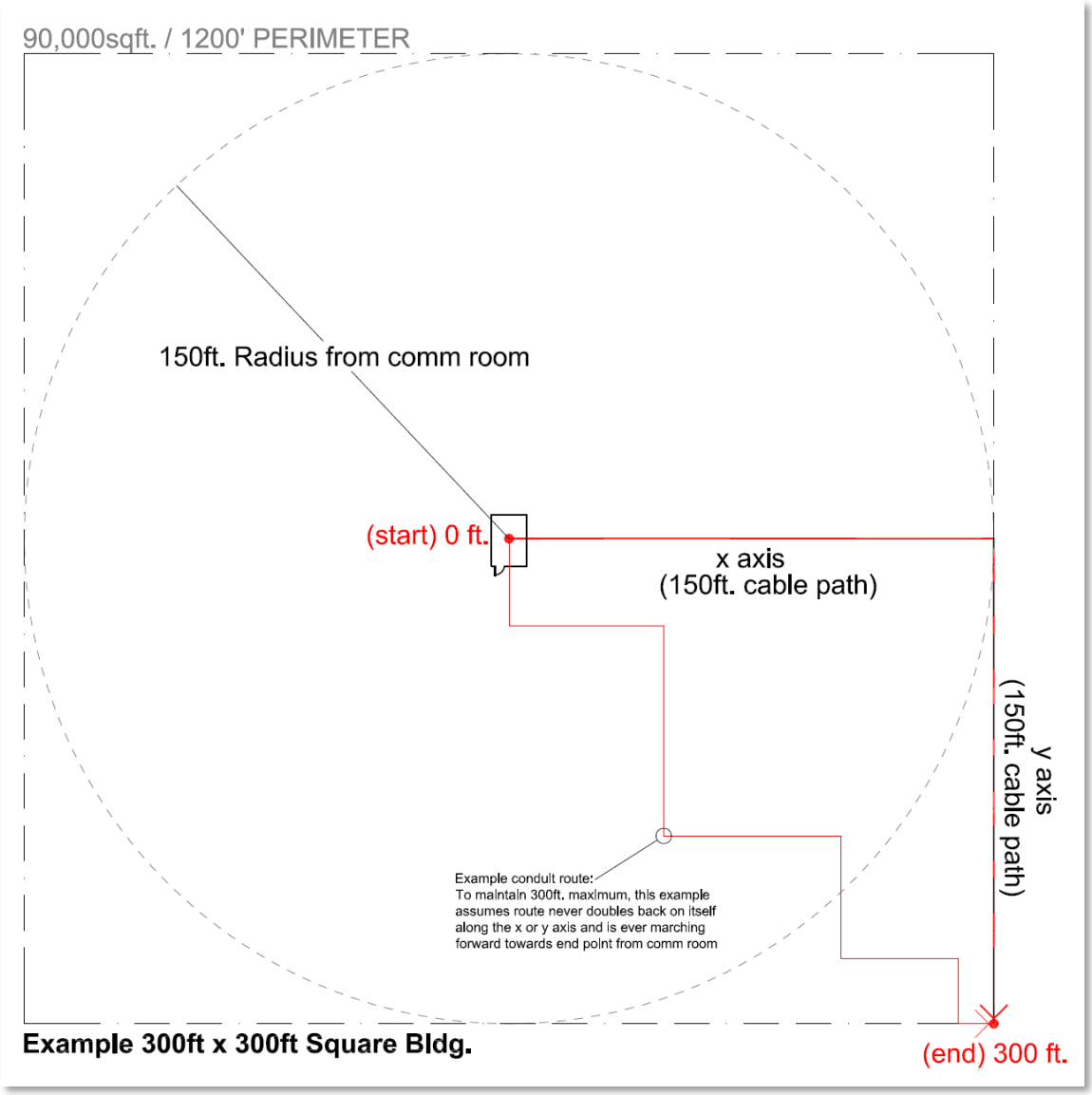


2.2.1 Room Design- Understanding size, amount, and locations

Before we dive into the individual room type layouts, it is beneficial to gain an understanding of the **placement**, **size**, and **number** of rooms are required within a facility, be it new or remodeled. Building square footage is at times a fight for every square inch and the demands to meet the architectural design needs, accessibility, and general function (get our customers efficiently to their destination) is paramount. We are however an important utility that will greatly enhance the user experience as they travel through our airport facility at SEA. Therefore, we have a right and a voice to ensure that these Standards *at least* clear the noted minimum design hurdles. That is our line in the sand where we cross over from a design discussion compromise, such as using a TC in lieu on ER to save space in an area that fits the criteria, to outright forfeit of our ability to properly service the life of the building's communication needs, as in a case where an ER is asked to lose square footage, but still be filled with the same equipment load.

PLACEMENT of new rooms. To truly understand "the where" to place a communication room it is best to start with the data bandwidth requirements which is dictated by the ethernet horizontal copper cable distance limitations. You probably understand the 90-meter (300-feet[1]) distance limitation, but how does that look when carving up real estate for rooms in a new building? The below diagrams roughly detail the distance impact when met with the reality of navigating a pathway and the need to reach all communication devices from one communication room to the next.

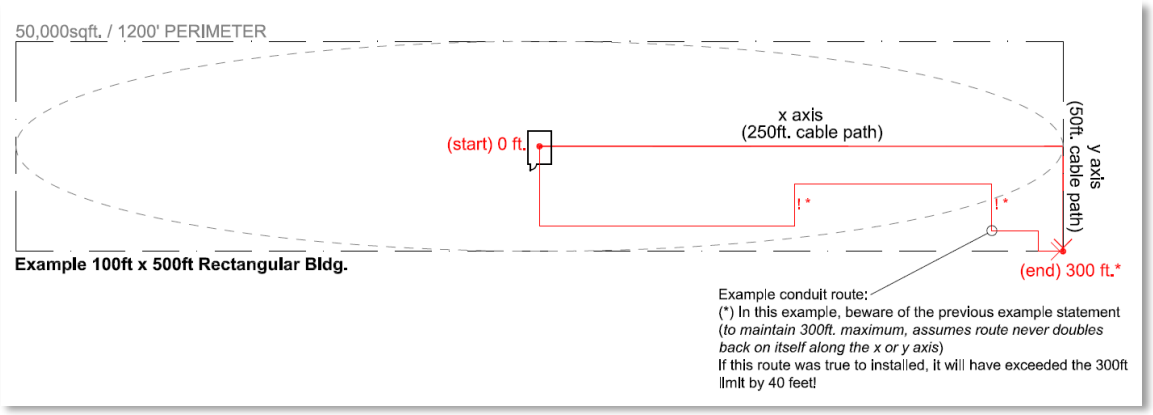
This first example assumes a perfectly flat 300 square foot building. The main objective here is to begin to realize a cables true reach from a communication room to the outermost end device, say a security camera in the SE corner of this building.



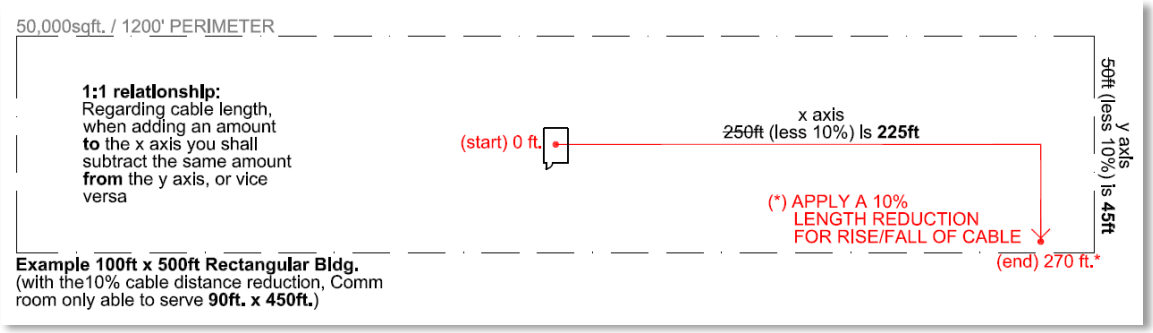
[1] Rounded from 297-feet for simplicity

Expanding on the above layout, if the building was 300ft x 600ft, you would need two (2) communications rooms and attempt to centralize each or the two communication rooms.

Building off the previous example, and falling in line with the opening statement of SEA's growth restrictions due to the reality of limited acreage, let's look at a more terminal and property friendly rectangle building layout.



Now, let's explore the impact of field conditions. The Standards first ask for maintaining the 90m (300ft) horizontal copper cable distance limitations, **but these SEA standards require an additional 10% distance reduction** to allow for typical rise and fall of cable to reach outmost runs. This relates to say, the copper patch panel UP to the ladder rack and conduit exit and DOWN to a wall data outlet at 16-inches above finished floor.



Final thoughts to PLACEMENT of communication rooms. Give preference to centralizing in a building and know your cable reach. When looking at a blank slate of a new floor plan, know that you **only have 270 feet total to run horizontally along the <u>combined</u> distance of the x and y axis**. Beware of any floor plan obstacles that may require doubling back along any of these axis routes which may further reduce a communication room's reach. Also note any excessive ceiling heights that would further reduce reach due to a larger cable rise and fall needs. Once the distance is reached and any building square footage is found to not be covered, additional communication room(s) shall be added. Please review (Comm Room) NUMBER information below for any additional situations you may encounter that could affect total room count.

SIZE of new rooms. For proper sizing, it is important to understand the potential service need to the square footage that each communication room shall serve once placed, both present day and, at a minimum, forecast for the life of the cable media (currently warrantied to 25 years). Further consideration shall be made to attempt to match the life of the building cycle, 50 years.

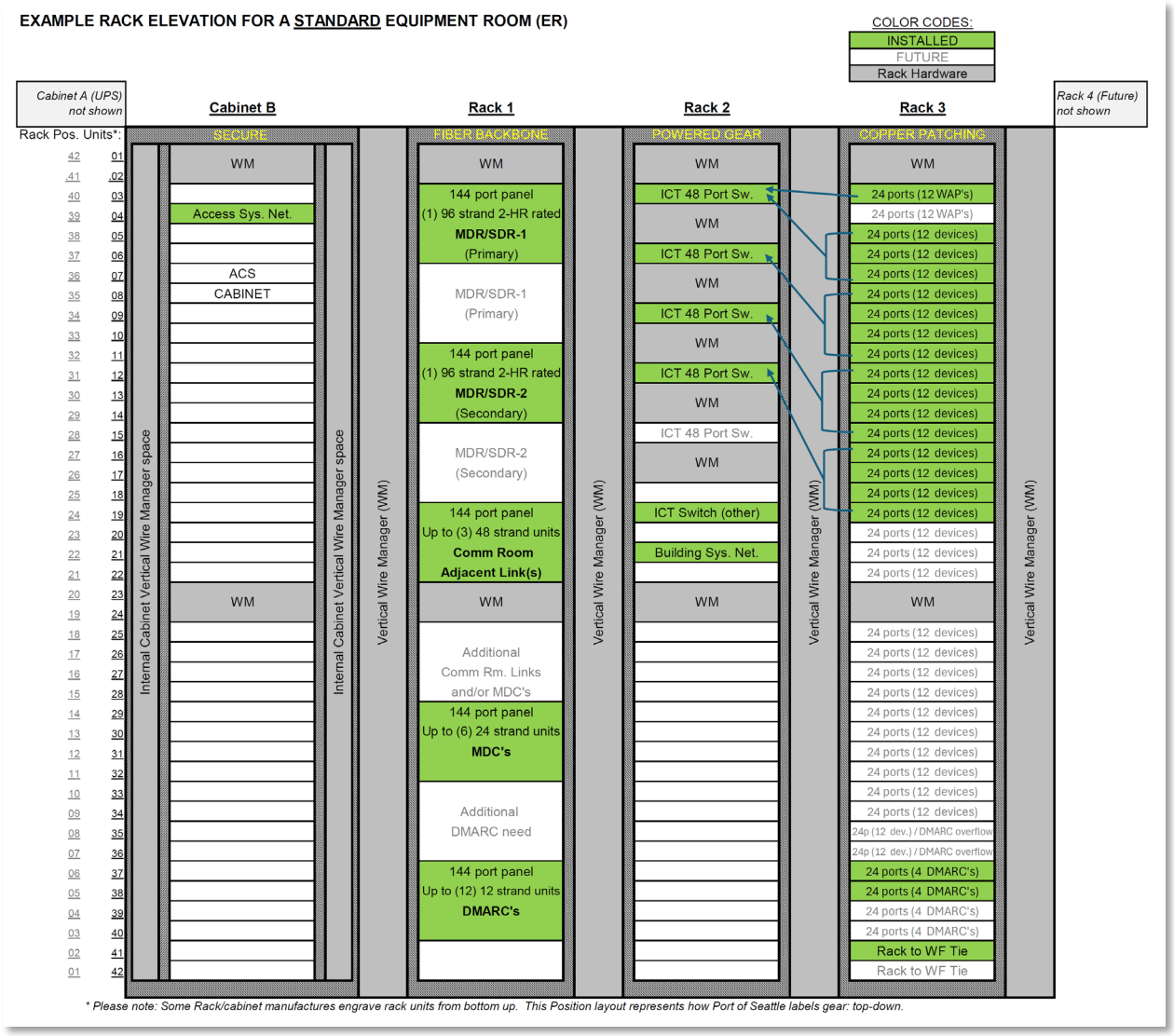
The service need relates to a few key items and their impact to equipment rack and or cabinet loading in each required communication room. **No single rack shall be loaded beyond 50% at time of commissioning a new communication space** unless explicitly noted acceptable in subsequent details. Below are typical rack and cabinet loading situations which are placed in the order of how size of cable or termination hardware drives other needs and not necessary placed in numeric order. For the sake of building out a real example, this list is reflective of the minimum rack and cabinet setup for our most common room, the Standard Equipment Room.

- Rack One, Fiber Backbone. The communication building block to every communication room. Currently, ICT specified Fiberoptic Patch Panels are 4 rack units, 144 stands per FPP, and loaded top to bottom as:
    - MDR or SDR Primary
        - Expansion space opening
    - MDR or SDR Secondary
        - Expansion space opening
    - Adjacent ER (or TC) links
        - Expansion space opening for additional ER, TC links, and MDC's
    - Micro Distribution Cabinets (MDC)
        - Expansion opening for Tenant demarcations
    - Tenant demarcations
- Rack Three, Copper Horizontal. The bulk of the service level media. Typically, all the Category 6 and 6A horizontal data drops to serve a work area or floor space. Based on standard of two (2) cable per device, a single rack loaded at 50% shall handle:
    - 12 Wireless Access Points
    - 180 miscellaneous devices, such as cameras, staff computers, displays, building management systems, etc.
        - For scale reference of what 180 devices of cable saturation to square footage equals, note that one average floor of the Airport Office Building (AOB), which is considered high density usage, has 156 drops. This serves 90 employee desk, 13 offices, 5 conference rooms, and miscellaneous convenience outlets.
    - 8 Tenant demarcations; based on (6) Category 6 per demarcation package
    - (1) 25 pair rack to wall field tie cable for legacy analog needs
- Rack Two, Network Switch Gear. Loading this rack at 50% works in hand with the 50% copper load and is simply based on how many 48 port switches can feed all 180 devices* and ensure all necessary network types are present. The high density of horizontal wire managers is meant to support working room and copper distribution in the area of highest potential for adds, moves, and changes.

(*) We would never expect to have both primary and secondary data cables all networked, but it is handy to assume a load that high to spread out port usage if requested by Network Engineering Team(s)

- Cabinet B, Access Control Cabinet
- Cabinet A, Room centralized UPS

The below detail lends a visual representation of 50% rack loading in a typical Standard Equipment Room build out.



With the knowledge of room placement combined with the look into sizing of rooms for 50% rack loading, we can begin to formulate an idea of the criteria's effect on overall room design. Once the architectural features begin to dictate proposed utility areas, we will know the impact of proposed placement and the reach amount of total devices at 270 feet along the x and y axis. Room(s) can then be sized by how many devices, demarcations, MDC's, etc are within reach of each communication room. The *Standard* ER will handle *many* locations but is <u>not</u> the end all to

the design. Some areas may have a higher density for airport service points such as gates, ticket counters, airline and concessionaire demarcations. Specialty equipment such as audio and visual equipment and new technology on the horizon must be considered. These areas are prime for the Large ER which allows for additional growth. On the flip side, many areas could benefit from a simple Telecommunication Closet as the device penetration will never reach the need to justify a room. These TC friendly areas can be found in such places as large open public receiving halls. Also, back of house areas like penthouses and baggage. Or in general, just extending the reach of an ER. In the last case, if a floor space has one ER established, TC may benefit greatly on picking up the corners or ends of an ER's reach for the few devices that may be present. Building in communication rooms that fit the service need and life of a building greatly enhances other utilities in their space and load planning, such as electrical and mechanical.

Finally, **NUMBER** of new rooms. The placement and room size will basically dictate the *number* in a new or existing facility, but we want to highlight a few points that may drive numbers beyond that. As noted earlier, we are now growing up versus out to best use our limited property at SEA. Make every effort to design in stacked communication spaces when confronted with multiple floor buildings with a communication space on every floor. In areas that are separated by a sterile and non-sterile delineation, it is advantageous to have a room serve each side and the data functions therein. In these couple of room number examples, the count is driven by the necessity to assist staff with daily maintenance and operation of the facility. Lastly, when the need to adjust numbers up is in play, it is very important to utilize the lessons of placement and sizing outlined above to ensure we have a cohesive design and an obtainable ask from project(s) to implement our communication spaces required.

2.2.2 Vender (shared) Service Closet/Cabinet (VC)

Background:

This **new** space requirement is meant to remedy a problem whereas a small lingering group of service venders still require access to **secure Port Communication Rooms**. Providing general access is a non-starter and escorting these service personnel is a strain on a small group of communication room credentialed Airport staff. A successful example of mitigating this problem has been the effort over the past decade where we have been able to back the local Telco provider out of our Demarcation panels to our Equipment Rooms (ER), then out of the ER's back to a select few Main Distribution Rooms (MDR) or the Entrance Facility (EF). We now are in position in the very near future, to push Telco providers out to the Meet-Me-Room (MMR). Unfortunately, the move out to the MMR is not available to such providers as the Public Cellular Network or Cable Television distribution where a local distribution need still exist to reach their end devices. These instances shall call for the VC.

Purpose:

Going forward, **any new facility design and or major remodel of existing system(s)** shall include a provision for a small vender closet(s) or cabinet(s) dedicated for vender use and access. These are not the Telcom Closets (TC) discussed next and are a separate function as noted above.

During the telecom design phase, the size, amount, shared access options, and locations shall be vetted out with the necessary service venders. It is recommended that these closets be placed near or adjacent to Port Communication Rooms, but no more than 90m (300ft) away. Since the services are typically only for use and consumption of the travelling public, one would expect the highest penetration of these closest to be placed in these public areas. This will also benefit the venders in the navigation and access to their equipment.

2.2.3 Telecom Closet (TC)

Background:

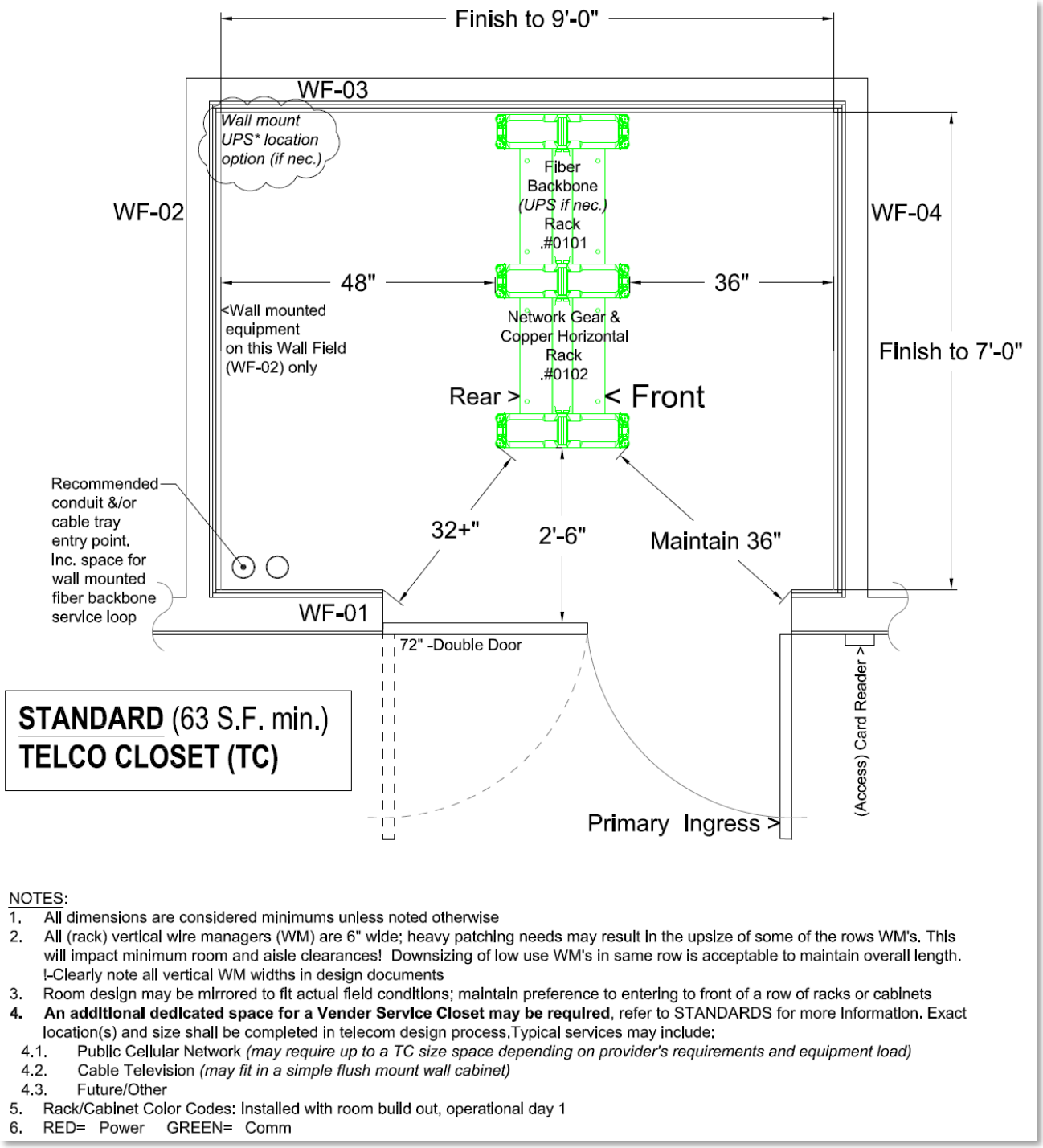
Part of the original Communication Infrastructure Backbone System (CIBS) development, a Telecom Closet (TC) is a communication space much like the name implies. It has been used in a limited fashion, but as the role of the ER footprint grows, having the option of a small space where it fits is key in the development of a new facility. These closets will be a great fit for areas of limited horizontal service cable such floors plans functioning as storage, utility, or large open areas. They are also meant to complement an ER's reach. Having the ER centralized with the TC at the edge, where possibly less horizontal service cable exist, is a better use of resources (such as architectural, electrical, and mechanical) than the addition of a larger ER(s).

Purpose:

A TC is a small space or closet only able to support, at a maximum, two (2) open frame equipment racks. There shall be no expectation of an expansion to a TC or the immediate floor area (communication service drops) of facility that this room serves. A TC must be served by a double door assembly with one door (typically the right) dedicated to the primary egress which must access the FRONT of the equipment rack(s). TC's shall typically receive their power from requirements from the nearest Equipment Room (ER), much in the way that a Micro Distribution Cabinet (MDC) functions. In addition, the backbone media may come from the two nearest/adjacent ER's, again, like the MDC infrastructure. If local SDR's (primary and secondary) are within planned facility, then TC's may run to them if mutually acceptable by Port during one-line backbone layout. A TC is not required or meant to run back to MDR's unless situation of distance (close to) comes into play.

DRAWING DETAILS

- DETAIL 2.2.3:



NOTES:
1. All dimensions are considered minimums unless noted otherwise
2. All (rack) vertical wire managers (WM) are 6" wide; heavy patching needs may result in the upsize of some of the rows WM's. This will impact minimum room and aisle clearances! Downsizing of low use WM's in same row is acceptable to maintain overall length. !-Clearly note all vertical WM widths in design documents
3. Room design may be mirrored to fit actual field conditions; maintain preference to entering to front of a row of racks or cabinets
4. **An additional dedicated space for a Vender Service Closet may be required**, refer to STANDARDS for more Information. Exact location(s) and size shall be completed in telecom design process.Typical services may include:
   - 4.1. Public Cellular Network *(may require up to a TC size space depending on provider's requirements and equipment load)*
   - 4.2. Cable Television *(may fit in a simple flush mount wall cabinet)*
   - 4.3. Future/Other
5. Rack/Cabinet Color Codes: Installed with room build out, operational day 1
6. RED= Power GREEN= Comm

- IF a rack mount UPS is required (room NOT powered from nearest ER power) then place UPS in Rack 1/near wall or utilize a wall mount unit in corner of WF-02 and WF-03 to maximize work area/ walkway clearance

- Outside of the airport footprint, consideration may be given to single rack closets inside a facility. All other above parameters would apply with the exception of the finished room depth.

☛ *NOTE: In your navigation of SEA infrastructure, you may find either of the following:*

- *An ER referred to as a TC. This is found on legacy CIBS documentation where the original rooms were called out as TC-Facility-Unique Number-Level Code (example: TC-MT-1-BR).*
  - *These rooms have been updated to an ER designation in field and on applicable software*
  - *The legacy name is referenced as such on applicable software systems to assist Port staff*
- *Existing rooms designated as an ER when it is clearly no more than a closet and fits this TC designation. Issue exists for rooms prior to this updated standard (pre-2025)*
  - *An effort will be made to correct any existing ER's operating as a TC over time*

2.2.4 Equipment Room (ER)

Background:

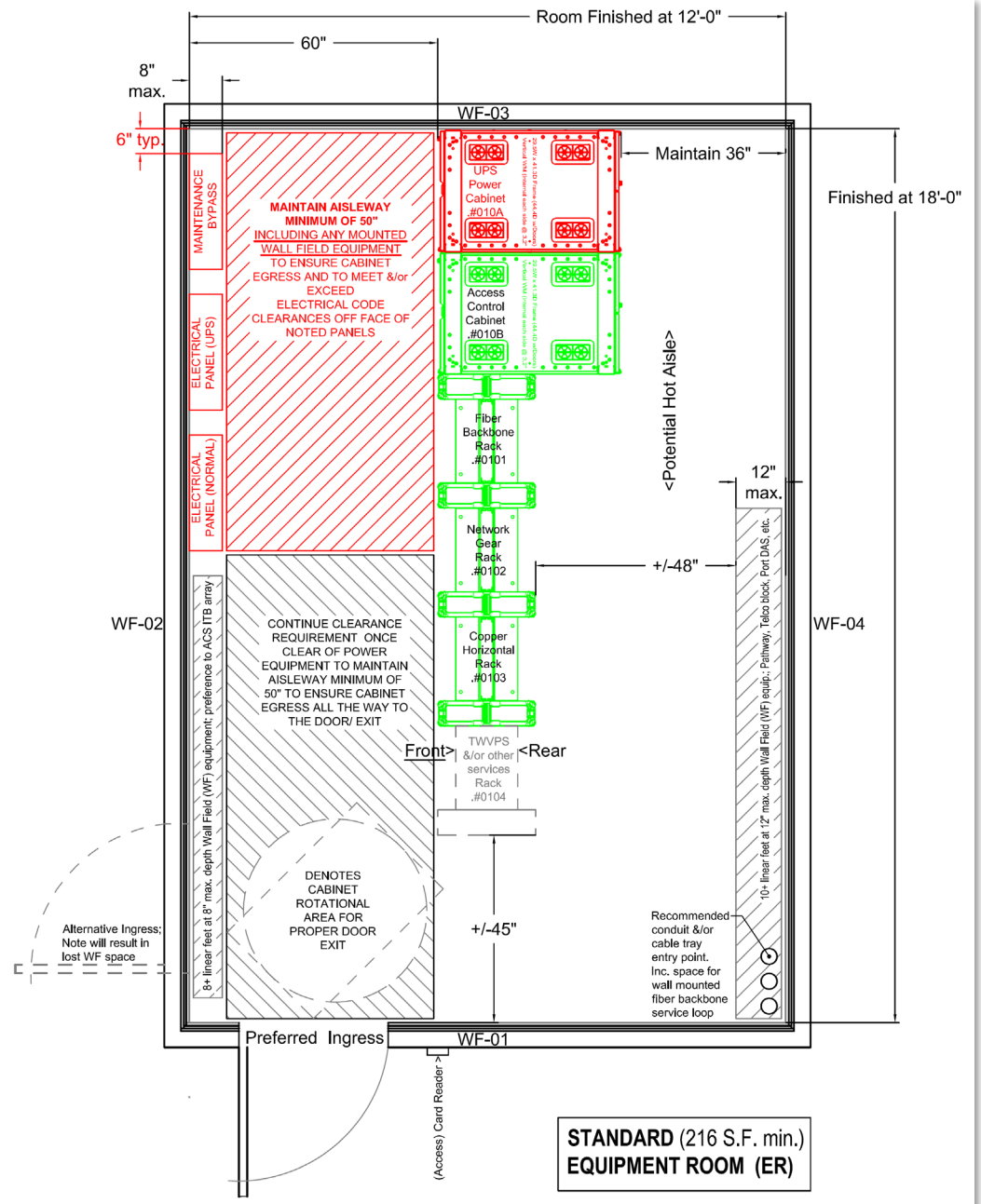
Part of the original Communication Infrastructure Backbone System (CIBS) development, an Equipment Room (ER) has served as the key delivery of telecommunications services to the Airport facility and is the highest count space, currently over 110 spaces.

Purpose:

The Standard ER is a communication room able to support a minimum of three (3) equipment open frame racks preceded by two (2) enclosed communication cabinets. The first cabinet, or position 'A' is dedicated to the comm room Uninterruptible Power Supply (UPS) and the second position 'B' cabinet is dedicated to the Access Control System (ACS).

When required, an ER may be larger to support a second row of equipment. The key difference of a Large ER to the Standard ER is that preference shall be given to the ability to expand row one with cabinets only and row two shall be setup as the two-post rack row.

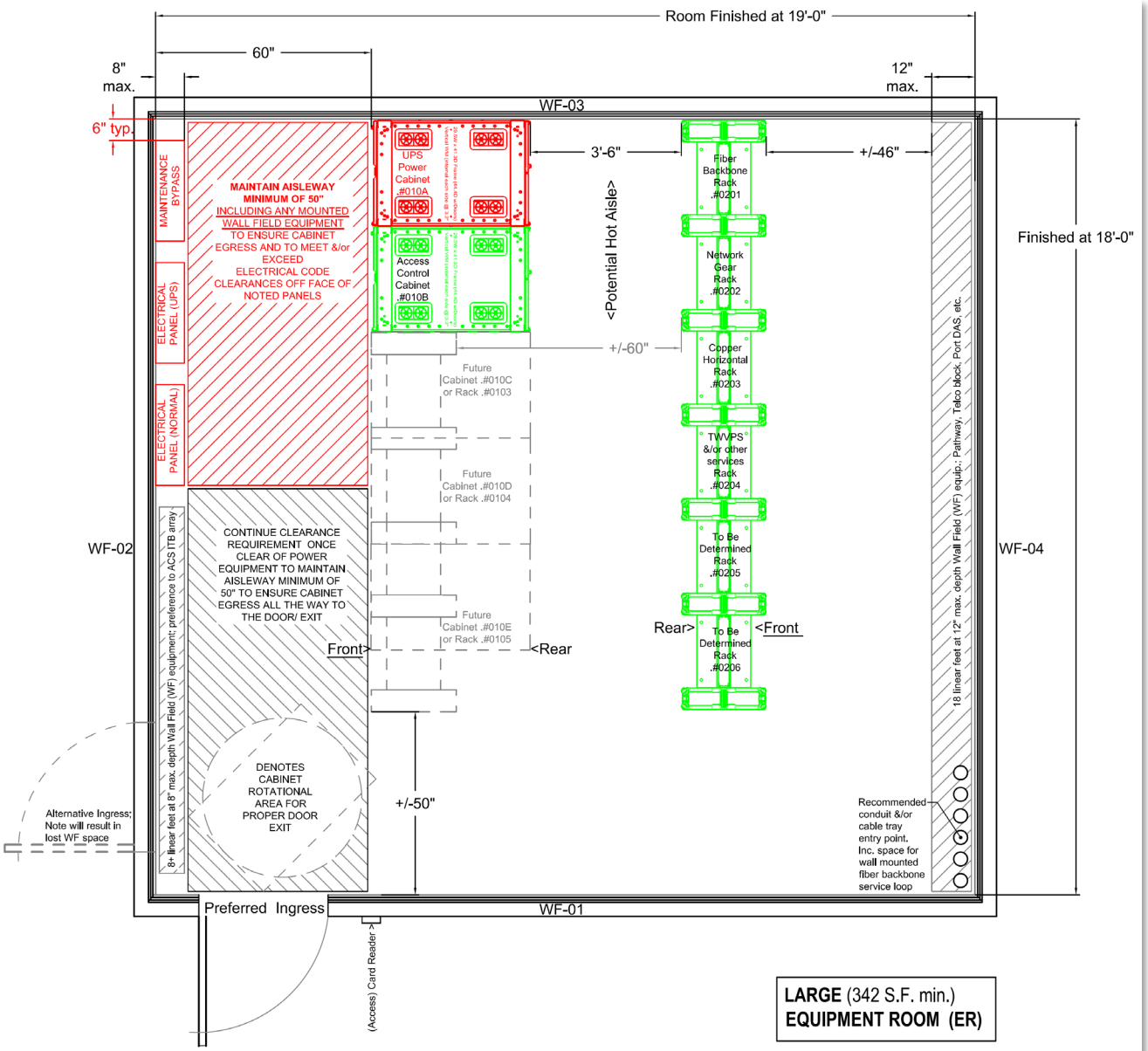
- DRAWING DETAILS
  - DETAIL 2.2.4a (STANDARD ER):



NOTES:

1. All dimensions are considered minimums unless noted otherwise
2. All (rack) vertical wire managers (WM) are 6" wide; heavy patching needs may result in the upsize of some of the rows WM's. This will impact minimum room and aisle clearances! Downsizing of low use WM's in same row is acceptable to maintain overall length. !-Clearly note all vertical WM widths in design documents
3. Room design may be mirrored to fit actual field conditions; maintain preference to entering to front of a row of racks or cabinets
4. **An additional dedicated space for a Vender Service Closet may be required**, refer to STANDARDS for more information. Exact location(s) and size shall be completed in telecom design process.Typical services may include:
   - 4.1. Public Cellular Network *(may require up to a TC size space depending on provider's requirements and equipment load)*
   - 4.2. Cable Television *(may fit in a simple flush mount wall cabinet)*
   - 4.3. Future/Other
5. Rack/Cabinet Color Codes: Installed with room build out, operational day 1
6. RED= Power GREEN= Comm

- DETAIL 2.2.4b (LARGE ER):



NOTES:

1. All dimensions are considered minimums unless noted otherwise
2. All (rack) vertical wire managers (WM) are 6" wide; heavy patching needs may result in the upsize of some of the rows WM's. This will impact minimum room and aisle clearances! Downsizing of low use WM's in same row is acceptable to maintain overall length. !-Clearly note all vertical WM widths in design documents
3. Room design may be mirrored to fit actual field conditions; maintain preference to entering to front of a row of racks or cabinets
4. **An additional dedicated space for a Vender Service Closet may be required**, refer to STANDARDS for more information. Exact location(s) and size shall be completed in telecom design process.Typical services may include:
   - 4.1. Public Cellular Network *(may require up to a TC size space depending on provider's requirements and equipment load)*
   - 4.2. Cable Television *(may fit in a simple flush mount wall cabinet)*
   - 4.3. Future/Other
5. Rack/Cabinet Color Codes: Installed with room build out, operational day 1
6. RED= Power GREEN= Comm

2.2.5 Secondary Distribution Room (SDR)

Background:

This new room need came about in design development of the N Concourse (NC) Project (NSTAR) in 2017. In the NC case example, our total ER footprint feeding the facility went from the original two ER's up to 15 ER's. This trend created a physical load of backbone cable and pathway usage back to the MDR's that was unsustainable. Looking at just Fiberoptic cables, in the original two ER's with diverse backbone to the MDR's, we had four cables. The buildout of the new 15 ER's would have resulted in 30 cables! The new SDR add plays a vital role and now serves as the *local facility MDR* that all ER's home run to. The SDR's in turn shall provide for the diverse cable and pathways back to the appropriate MDR's keeping the above example fiber count at four cables.

☛ *NOTE: This was an early concept in development, the NC ended up with a topology of three SDR's. That is not desired or to be implement in any future design.*

Purpose:

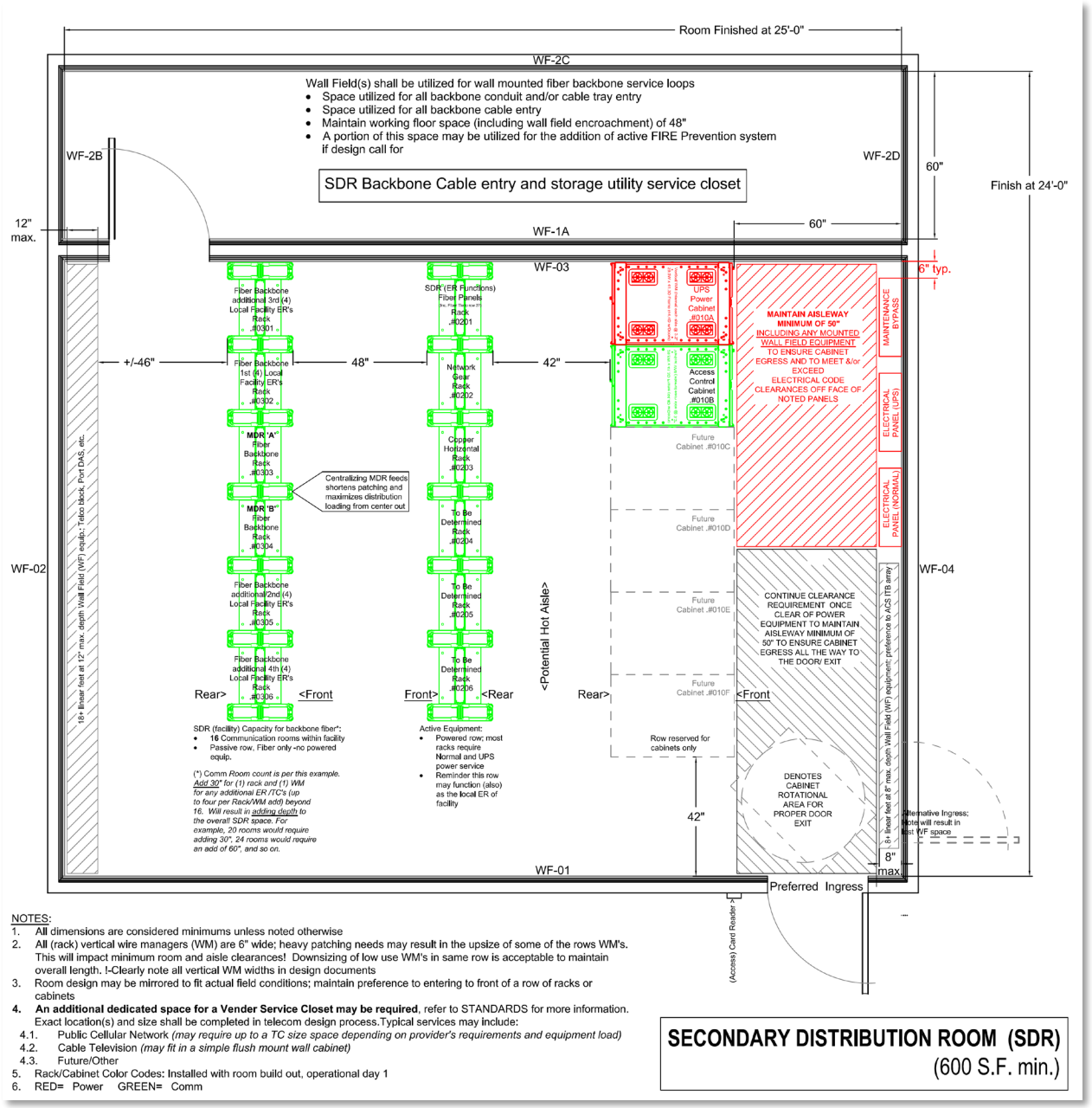
A SDR shall be placed in pairs in a facility to serve all local ER's. Note that a facility may also be connected to the airport, meaning that the remodel of any legacy facility will necessitate the investigation of implementing the SDR buildout. For example, say a Concourse D (CD) expansion or remodel which results in doubling or more in the amount of ER's and TC's would benefit from the add of local SDR's serving all of CD. The same could be said for all other connected concourses, the point being that an SDR is not limited to remote or satellite facilities.

The SDR is a communication room able to support a minimum of three rows of equipment sectioned off as, two (2) rows of open frame equipment racks and one row (1) of enclosed communication cabinets. The first cabinet, or position 'A' is dedicated to the comm room Uninterruptible Power Supply (UPS) and the second position 'B' cabinet is dedicated to the Access Control System (ACS). For the open frame rack row design, one row shall be strictly dedicated to fiberoptic patching. Land the MDR fiber in the center of the row and add the facility TC/ER's to the left and right of the MDR's. This shall greatly assist with the necessary patching and distribution flow. The second row of racks falls in line with the SDR's service needs as the room typically also preforms the role of a local ER and that row will be setup much like what is found in an ER.

One other important note and design add is the (connected) back of house cable entry and storage room. This shall facilitate the entry and service loop storage of all backbone fiber into space.

As noted above, an SDR can also act as the local floor area's ER.

- DRAWING DETAILS
  - DETAIL 2.2.5:



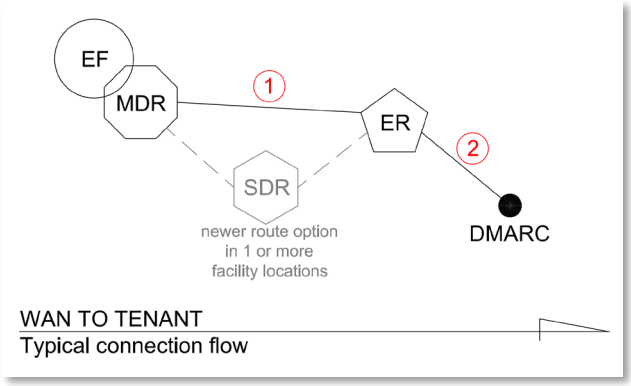
2.2.6 Main Distribution Room (MDR)

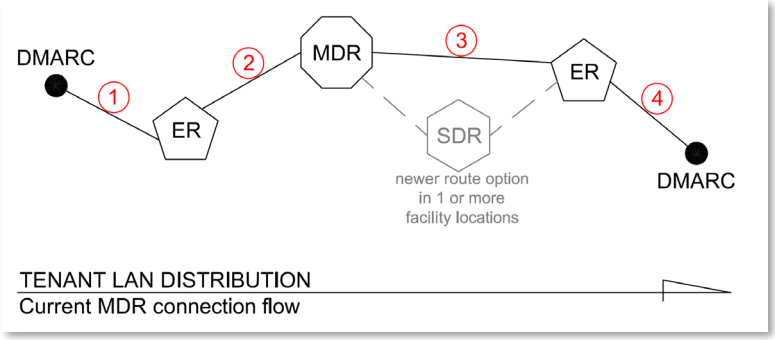
Background:

SEA currently has three rooms functioning as an MDR. The first pair were part of the original CIBS build out and were constructed in the dual star backbone distribution topology. A third MDR was added under the STEP facility build out, though only two MDR's shall typically service any one ER at one time. These MDR's function as large fiber backbone cross connect facilities

and to a minor extent, legacy copper distribution. The MDR's main purpose is to efficiently route connectivity for **all** outlying communication rooms across the entire airport campus.

In the linear view to the right, you can see an example of how a MDR distributes the cross connection of a WAN circuit for service out to a customer demarcation. From roughly 2005 to 2025, one or more of the MDR's have also functioned as the Telco's EF. This setup allowed for the connections to ultimately reach the tenant in just two hops. *Note that the addition of a SDR would add a third hop.*



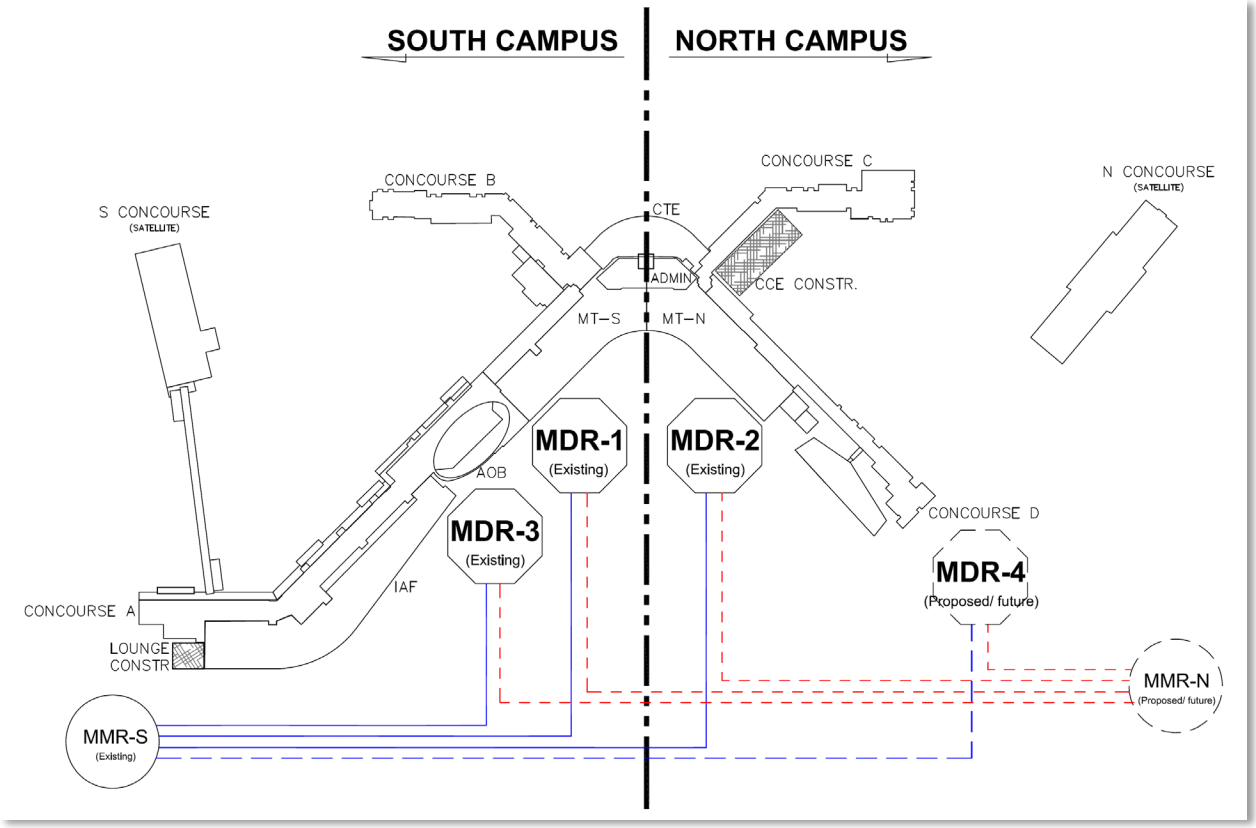


We also have many LAN connections in which the MDR is key for quick distribution support. This example to your left shows how many hops may be required to get from one tenant demarcation to another within the SEA facility and subsequently represents the two furthest ER's from each other, which is still able to be completed in the noted four hops. The MDR's positioning and backbone distribution have allowed us to control insertion loss budgets as we connect the facility on our fiber infrastructure. Finally, a MDR is **NOT** meant to act as a local floor area ER, but it *may* function as an SDR as is the case within the STEP/IAF facility. However, every effort shall be made to keep the MDR's focus as a fiber backbone patching facility and the direct connection to the Meet-Me-Room only.

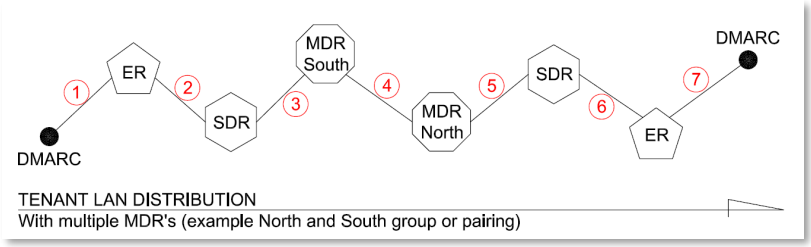
Future planning:

The existing MDR assignments for new ER's and SDR's shall come from input via the Telecom Design Review Team during the design review stages and are assigned for use in pairs of one primary and one secondary. As mentioned above, a third MDR was added under the STEP facility build out. As only two MDR's shall typically service any one communication room at one time, the introduction of a third MDR has caused some balance issues as we move forward with the addition of SDR's buildout. With the addition of the SDR into the backbone distribution method, it will be beneficial to even out the MDR's. F&I will be looking at the addition of a fourth MDR, and any necessary enhancement of the existing three MDR's to ensure the longevity of our backbone system. The below image details segmenting the campus into a North and South paired MDR setup. Though not explicitly shown, please note that the North and South MDR's would have a substantial fiber backbone infrastructure tie in place. Once implemented, we will

use this as guide as we assign the two MDR's for primary and secondary distribution to new communication rooms.



An area of concern with the above setup will be the most drastic LAN tenant connections where a customer may want to connect their leased spaces and are found to fall in the two most extremes of far south to far north of the airport campus. This may result in up to seven hops to connect the demarcation locations together as seen here. In the example, the demarcation runs to an ER, then the local facility SDR, and on to the South MDR group. The South MDR would have a backbone tie to the North MDR group, and the process mirrors the south as it hits the north facility SDR, ER, and finally on to the north demarcation. Why this is brought to attention is to show that seven hops is a simplified linear graph. What may not be apparent is the full insertion loss of all those mated strands as you cross connect from patch panel to patch panel in each communication room. It is also important in the vision for the future fiberoptic



plant to understand the limits we need to enforce upon as we look to alleviate the pressure on cable consolidation and pathway loading. Solving one problem, adding SDR's and balancing the MDR load can have other implications. Luckily, this is a worst-case diagram of the proposed maximum MDR distribution. Also, many tenants are found to cluster service in one area of operations and the connections may even stay within one facility.

Please note that this section purposely did not include any room design details as a future MDR build we be a collaborative effort with all Port stakeholders and telecom design group at that time. In general planning terms, look to a MDR to be at least double the size of the SDR, so approximately 1200 square feet should be allocated.

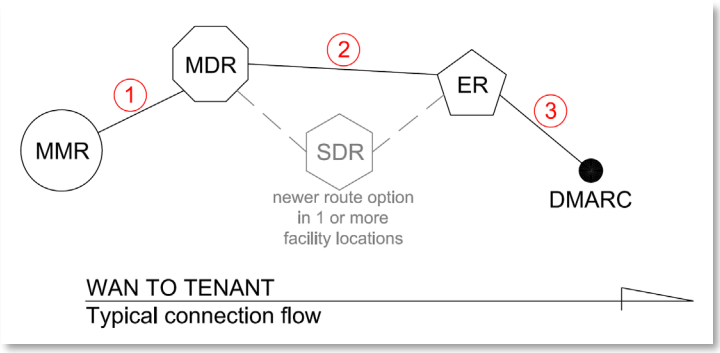
One final note, like the SDR, any new or remodeled MDR design shall add a (connected) back of house cable entry and storage room. This shall facilitate the entry and service loop storage of all backbone fiber into space.

MDR's must NOT act as the local floor area's ER.

2.2.7 Meet-Me-Room (MMR)

Background:

New to the SEA Facility, the MMR shall eventually replace the function of the EF as we migrate legacy connections over time. True utilization of the MMR in the form of extending circuits is trending for 1st quarter of 2026. The MMR is near the largest of all Port communication rooms and is set up in a data center environment. Leased WAN vender cabinets interface with Port fiber infrastructure equipment racks which facilitate fiber backbone access to the existing MDR's for distribution to the entire SEA campus.



What the future linear distribution looks like with the new MMR versus previous diagram shown in the MDR section can be seen here with typically 3 to 4 hops to extend to any Airport demarcation.

Purpose:

Allow Port of Seattle and all airport tenants access to multiple telecom service carriers. Allocation of dedicated (dark) fiber backbone, carrier to customer connectivity, throughout the SEA property.

2.2.8 Entrance Facility (EF)

Background:

This is becoming legacy terminology for our Airport as we transition from a single carrier bringing their outside plant cabling into facility for handoff to Port cable media infrastructure. The Airport has one main legacy EF, known as the Main Telephone Room (MTR), and two of the existing MDR's have telco carrier EF service, as well as a few remote buildings with their own dedicated EF. As we transition to the new MMR, we will work with existing exchange carrier to abandon service and demolish their legacy (mainly large count copper) infrastructure. To rectify our outlying facilities, we are working to build up our OSP fiber backbone distribution throughout the entire SEA footprint which will allow us to bypass those few remaining EF's.

Purpose:

No further built outs or designs necessary. Obsolete and slated for full demolition. Transition to multiple carrier access and fiber backbone delivery out of MMR by 2026.

2.2.9 Rooms, Other

- Radio Room (in development)
    - *Contact or review with Telecom Design Review Team or these Standards for future updates and development*

2.2.10 How to approach Room moves, adds, and changes

Moves, adds or changes, commonly called MAC's, can become very complex depending on size and scope when looking at implementing against any of our above noted room types. Look to this section to be expanded upon during the next standards update cycle. Goal is to provide internal and external teams a starting point for discussions based on knowledge gained from past communication room MAC's completed here at SEA. We will also cover general rules and requirements for bringing a legacy room up to current standards and the typical minimum stakeholder requirements.

2.3 COMMUNICATION ENCLOSURES; CABINETS and RACKS

All termination hardware from backbone to horizontal media, active and passive hardware needs a place reside. This section shall cover all SEA communication equipment enclosures that perform that task from our Main Distribution Cabinets on down to our smallest service cabinets, such as a Tenant Demarcation. From AOA exterior cabinets to communication room two-post racks, this section is broken up to cover each enclosure type, typical usage, location, and any other pertinent information available.

2.3.1 Exterior Equipment Cabinets -Large

Exterior Equipment Cabinets are any outdoor (or open area indoor) NEMA Communication Equipment Cabinet, including Micro Distribution Cabinets (MDC) and mixed-use MDC's, which shall be housed in a weatherproof cabinet. **These MDC's are an extension of our Equipment Rooms** and as such, very specific needs and size requirements are clearly noted to allow for proper equipment loading and service of said cabinets. **NEW IN 2025 STANDARD and construction henceforth:** MDC's shall be built with pathway and media redundancy. A 2-inch conduit is run to the TWO nearest communication rooms.

For reference, these cabinets shall be modeled after the ITS/COMM 332/334 Cabinet with a custom width option of 28" (or greater) for single/2-door or the ITS/COMM 340 Cabinet with a custom width option of 56" (or greater) for double/4-door. See all clarifying specifications below.

☛ *NOTE: These cabinets may also be specified for INTERIOR use when placed outside of a protected barrier, such as a communication room or other walled or fenced barrier. These cabinets will offer both physical and environmental protection in open space interior installations.*

- CABINET STRUCTURE (SHELL)
  - All Cabinets shall be NEMA 3R
  - Cabinets shall carry a UL Label
  - Cabinet shall be constructed of 12-gauge minimum type 316 stainless or 0.125 inch minimum type 5052-H32 mill-finish aluminum.
  - When engineer specified, to achieve a 'X' rating on an aluminum type 3R cabinet, add a clear gloss finish powder coat to the exterior. Where cabinet is potentially full sun exposed, utilize a white gloss coat. These areas will typically be placed near Airport Movement Area (AMA) or airport perimeter road; take active measures to flag cabinet for visibility. White color is only for cabinets exposed to full sun and not meant for high foot and tug traffic areas on Airport Operations Area (AOA) or ramp
  - All seams shall be continuously welded
  - Cabinet shall come from manufacture with horizontally wall welded mounting channels, 12-gauge, T-slot, stainless steel or aluminum 1-5/8" steel channel.
  - Channels shall be capable of equipment rack loading to the minimum weigh limit set forth by engineer. Place a minimum of (2) front to back of cabinet mounting channels per side. Double cabinets shall in addition, require center channels on each side of center wall
  - No cabinets may be furnished with, or field modified with, top/roof penetrations of any kind. Conduit entry shall enter through open base bottom (preferred) or the side wall in bottom third of cabinet on the left or right and utilize insulated watertight hub for rigid/IMC conduit. Telecom grade condulet is allowed for side penetrations

        - FIELD NOTE: Limit all cabinet side penetrations. For Communications, use a maximum of (3) 2" side penetration(s) to a wall or ceiling mounted consolidation Pull Box method for all backbone and horizontal cable runs. Power conduit shall be its own pathway and penetration. For further direction (see section) PART 3: Communication Pathways
    - Cabinet openings (door) shall be double flanged on all sides
    - Up to 4 permanent factory installed lifting eye bolts may be included with enclosures for field handling and placement
    - All external hardware shall utilize non-corrosive material. Do not mix metal types on cabinet

- CABINET SIZING and USE
    - Cabinet sizing (single):
        - Min and max height: 66"H – 72"H
        - Rack Units- Min and max unit: 31RU – 34RU
        - Min and max widths: 27"W – 28"W
        - Min and max depths: 30"D – 36"D
            - This standard and the cabinet depth listed is meant for smaller remote network switch gear. The MDC is meant to extend a communication room's reach, not replace a communication room's function. Engineer to consult with Port of Seattle Network Teams for any switch gear to be placed in cabinet to ensure specified gear, associated front (data), and rear (power) connections fit within specified cabinet.
        - (2) Doors: (1) front and (1) rear
        - SEE DETAIL 2.3.1.A (end of section)
    - Cabinet sizing (double):
        - Min and max height: 66"H – 84"H
        - Rack Units- Min and max units: 31RU – 42RU
        - Min and max widths: 56"W (typical of Port/Tenant cabinet) up to 72"W (typical for shared Access Control cabinet)
        - Min and max depths: 30"D – 36"D
            - This standard and the cabinet depth listed is meant for smaller remote network switch gear. The MDC is meant to extend a communication room's reach, not replace a communication room's function. Engineer to consult with Port of Seattle (and Tenant if applicable) Network Teams for any switch gear to be placed in cabinet to ensure specified gear, associated front (data), and rear (power) connections fit within specified cabinet.
        - (4) Doors: (2) front and (2) rear
        - Additional setup configuration for double cabinets:
            - <u>Shared MDC; ICT & ACS</u>: RIGHT SIDE- Port ICT comms with rack rail system per cabinet racking section below. CENTER- Build

with support system capable of holding the necessary metal channel for ITS rack assembly and ACS Wall field backplane. LEFT SIDE- ACS wall field mounted equipment with vertical metal channel attached to factory sidewall channel which shall hold a metal backplane or board for wall field mounting of gear and wire distribution on each side of backboard. Maintain a minimum of 1.5" clearance around all edges of backboard to allow for cable routing front to rear of backboard mounted equipment

- ACS wall field mounted equipment; typical:
  - (1) Power Supply 26"H 19"W 6"D
  - (1) CK732-A Box: 20"H 16"W 6"D
  - (1-4) ITB enclosures 16"H 12"W 6"D
- ICT and ACS shall be set at max 72" width for a double wide cabinet. To accommodate ACS wall field, ACS shall be no less than 42" and no more than 44" wide. This leaves the ICT rack side at no less than 28" or no more than 30" wide. Engineer's drawings shall dictate chosen dimensions to best suit ICT and ACS needs per build.
  - Cabinet door width note: The adjacent front and rear doors to be sized accordingly; ACS doors shall be larger to accommodate full access to internal wall field
- SEE DETAIL 2.3.1.B (end of section)

- Shared MDC; ICT & TENANT: RIGHT SIDE- Port ICT comms with rack rail system per cabinet racking section below. CENTER- Solid center divider with (3) equally spaced 3" cable pass-thru holes at a min. 1 inch setback from face of cabinet both front and rear for a total of (6) pass-thru penetrations. Provide for cable edge protection with 3" bushing or grommet at all penetrations. LEFT SIDE- Tenant IT comms with rack rail system per Cabinet Racking (Rails) section below
  - Typical usage and placement: Each associated concourse gate, Passenger Loading Bridge, and ramp level communication needs
  - SEE DETAIL 2.3.1.C (end of section)

- CABINET DOORS
  - Cabinet doors shall be front and rear full height solid overlapping access doors with the following:
    - Provided with three-point locking mechanism with duplex nylon rollers, top and bottom

        - Inward-turning handles with minimum provisions for padlocking; Padlock only handles shall not have keyed CH751, double bit, or square locks. Disable non-compliant lock if factory installed.
        - On cabinets with padlock handles: Project shall furnish and install Comm keyed (4-59) padlocks prior to punch list walk; coordinate delivery with Port of Seattle Lock Shop
        - Preference is for securing cabinet doors with spring loaded locks capable of accepting a Best 6 or 7 pin core. A 6 pin construction core (type Blue) shall be installed in each lock core and two standard keys included with each cabinet and delivered to the Engineer
        - On cabinets with Best cores: Project shall coordinate with Port of Seattle Lock Shop for installation of Comm keyed (4-59) cores prior to punch list walk
        - All doors shall have one piece closed-cell neoprene door seal gasket
        - Two position door stop assembly if not part of hinge function
        - Hinge: (3) per door up to 56 inches, not to exceed 14 inches center to center. On doors greater than 56 inches; add hinges as necessary. Preference to door hinge that allow for door lift off (replacement) and built-in door stops
    - Door vents; Passive Ventilation
        - Air intake: Front door, bottom third of door, add a louvered inlet with filter to prevent dirt from entering with air flow. Note: Typically Left/Front door on double cabinet
        - Air exhaust (For non-hood or roof/soffit vented cabinets): Rear door, top third of door, add a louvered inlet with filter to prevent dirt from entering with air flow
        - On cabinets specified in contract to have active heat and air condition assemblies, add passive weather plates for all ventilation points
        - For active ventilation, refer to below details following Power Service to Cabinets

- CABINET RACKING (RAILS)
    - Furnish cabinets with internal 19-inch rack rails for mounting of equipment that are EIA-310-D compliant universal hole pattern and threaded #12-24 equipment mounting
    - Vertical hole spacing at 5/8” -5/8” -1/2”. Rack rails to be depth adjustable, with rack rails both front and rear of cabinet
    - Side wall width for 19” rack rails shall be spaced off cabinet side walls by a minimum of 3.25” (deep strut) or (2) standard 1-5/8” (stacked strut) to allow for vertical cable wire management
    - Set rack rail depth (front and rear) to 6 inches from doors or interior edge of cabinet

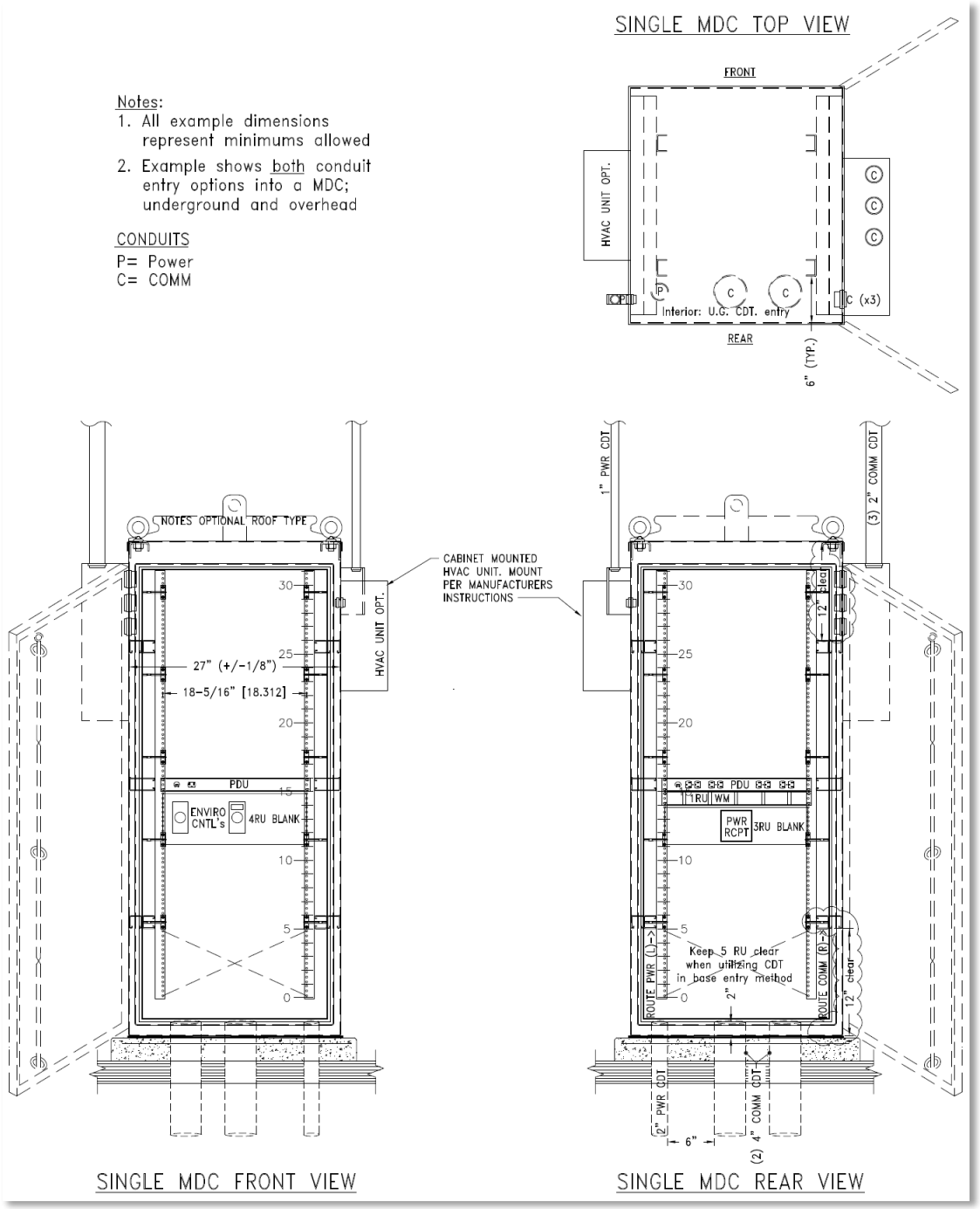
- Provide a minimum 2” wide vertical D-Ring cable managers spaced every 6 rack units top to bottom on each side of front rack rails (for comm cable mgmt.) and on each side of rear rack rail (power distribution on left and backbone cable mgmt. on right side)
- Each cabinet shall be furnished with (50) #12-24 screws (independent of any screws utilized for D-Ring configuration)

- POWER SERVICE to CABINETS
  - **NEW IN 2025 STANDARD and construction henceforth: Look to power MDC’s off nearest ER House and UPS power source when available, otherwise:**
  - Note: Non-powered cabinets shall be approved on a case-by-case basis by the Telecom Design Review Team.
  - Passive (such fiber patching) MDC’s shall still require power to facilitate necessary active environmental controls
  - Engineer shall design cabinet power electrical loads capable of supplying power for environmental controls, project specific network(s), and UPS equipment
  - Power into cabinet as per electrical engineer’s drawings. Power receptacle placement is requested to be mounted to 3RU blank located in the back bottom half of cabinet; SEE DETAIL 2.3.1.A[B & C]
  - If specified, UPS size and configuration specified per electrical engineer’s drawings
  - Rack mounted power distribution unit(s) (PDU) to be installed in the rear of comm cabinet and positioned in the bottom third of cabinet; SEE DETAIL 2.3.1.A[B & C]
  - Thermostats mounted to 4RU blank located in the front bottom half of cabinet; SEE DETAIL 2.3.1.A[B & C]
  - LED light strip shall be provided for cabinet lighting. Light strip shall be approximately 12 inches long, have a minimum output of 320 lumens, and have a color temperature of 4100K (cool white) or higher. Light strip shall be ceiling mounted and oriented parallel to the front and rear door faces. Lighting shall not interfere with the proper operation of any other ceiling or shelf mounted equipment. All lighting fixtures shall energize automatically when any door is opened. Each door switch shall be labeled “Light”
  - Ventilation (Active)
    - Add fan to the exhaust/ hood of cabinet or door -rear/ top. Final location to be determined per cabinet manufacture options and communication engineer’s drawings
    - Temperature controlled fans (top and bottom temperature activation at 40° to 95°)
  - Environmental controls; HVAC
    - Active environmental control product shall be sized to maintain a range of 40° min. to 95° max.; refer to engineer’s drawings.
  - Grounding and bonding:

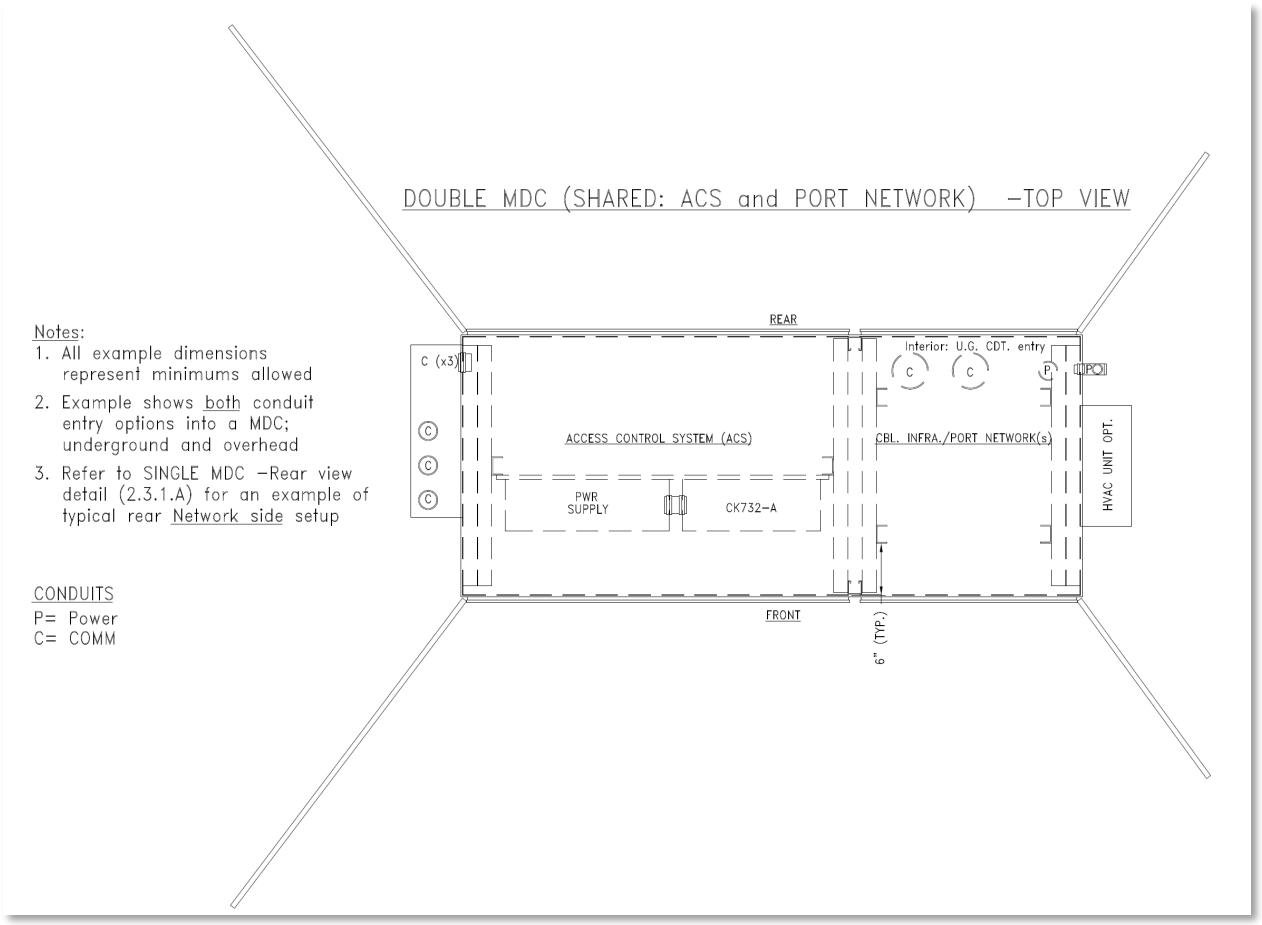
        - Remote cabinets shall bond to earth locally with a ground rod
        - Cabinets near building, such as ramp areas of the AOA shall be grounded to media source Equipment Room grounding bus bar

- CABINET MOUNTING
    - For cabinets in field, not on AOA Ramp, the NEMA Type 3R pad mount cabinet shall drain to a sump and through a min. 3/8” diameter drain pipe to grade
    - Preferred conduit entry is from adjacent placed underground vault, plan for base conduit entry to extend a minimum of 2” above finished pad level. Ground entry conduit shall be placed at rear quarter of cabinet; (see section) PART 3: Communication Pathways for further direction
    - Typical service pad shall be no less than 3” above finished grade.
    - Pad shall be a steel rebar reinforced level concrete service pad and extend no less than 2 inches beyond cabinet width and depth and no greater than 6 inches.
    - Secure cabinet to pad with amount of and size of anchor bolts as specified in engineer’s drawings
    - Protect all cabinets from impacts from vehicles or other large equipment strikes with a minimum of 6” bollards at each exposed corner of cabinet. Secure bollards as specified by engineer’s drawings
        - Bollard placement shall ensure full door operation and access of equipment and staff
    - ATTENTION ENGINEER/DESIGNER: In drawings, details, and/or any other communications to contractor: No field penetrations allowed on top of cabinets. Cabinet entry is allowed either from below or minimal side penetrations; SEE DETAIL 2.3.1.A[B & C]

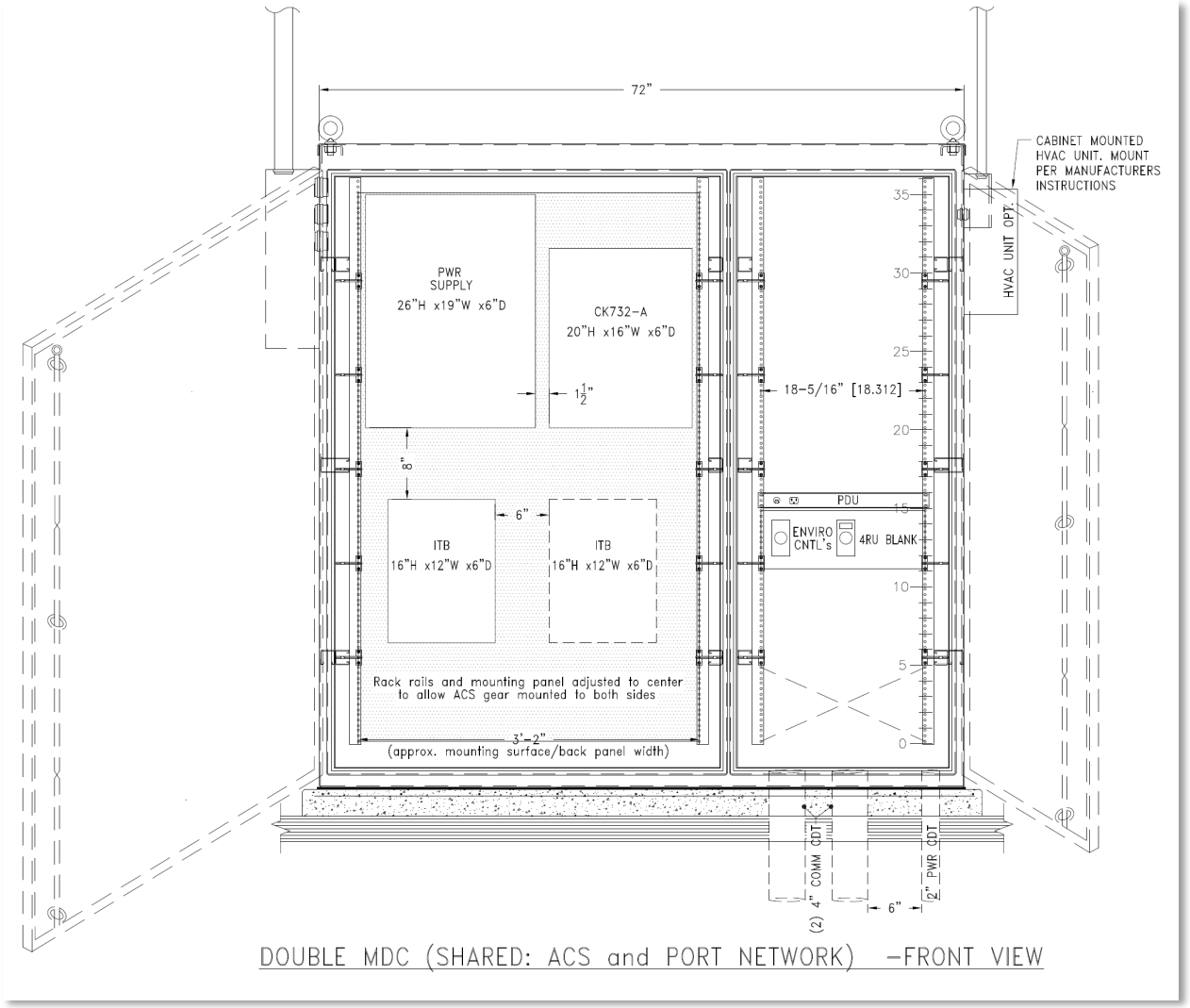
- DRAWING DETAILS
    - DETAIL 2.3.1.A (Cabinet -single):


Notes:
1. All example dimensions represent minimums allowed
2. Example shows both conduit entry options into a MDC; underground and overhead
CONDUITS
P= Power
C= COMM
SINGLE MDC TOP VIEW
FRONT
HVAC UNIT OPT.
C (x3)
Interior: U.G. CDT. entry
REAR
6" (TYP.)
NOTES OPTIONAL ROOF TYPE
CABINET MOUNTED HVAC UNIT. MOUNT PER MANUFACTURERS INSTRUCTIONS
HVAC UNIT OPT.
27" (+/-1/8")
18-5/16" [18.312]
PDU
ENVIRO CNTL's
4RU BLANK
1" PWR CDT
(3) 2" COMM CDT
12" clear
PDU
1RU WM
PWR RCPT
3RU BLANK
Keep 5 RU clear when utilizing CDT in base entry method
ROUTE PWR (L)
ROUTE COMM (R)
2"
2" PWR CDT
4" COMM CDT
6"
(2)
SINGLE MDC FRONT VIEW
SINGLE MDC REAR VIEW

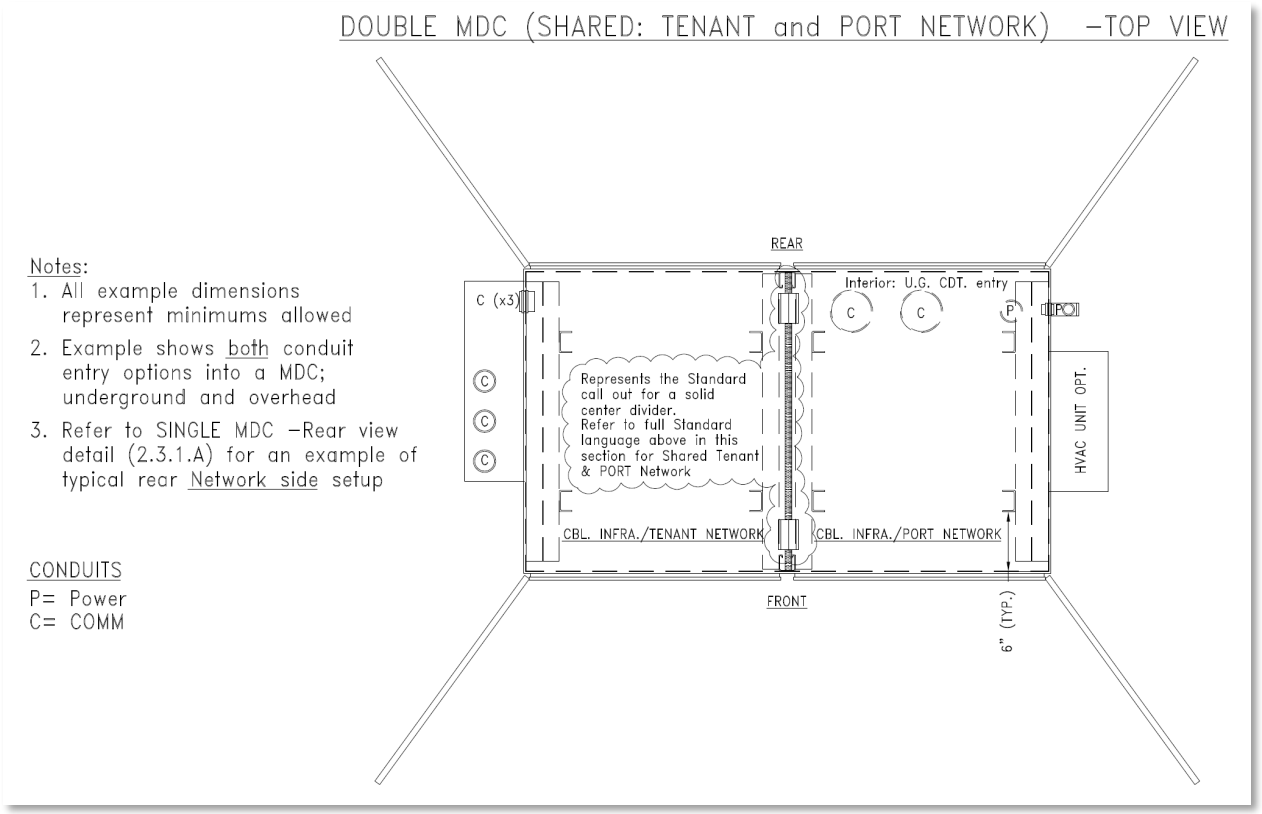
- DETAIL 2.3.1.B (Cabinet -double; Shared MDC for ICT & ACS):
  - Top elevation



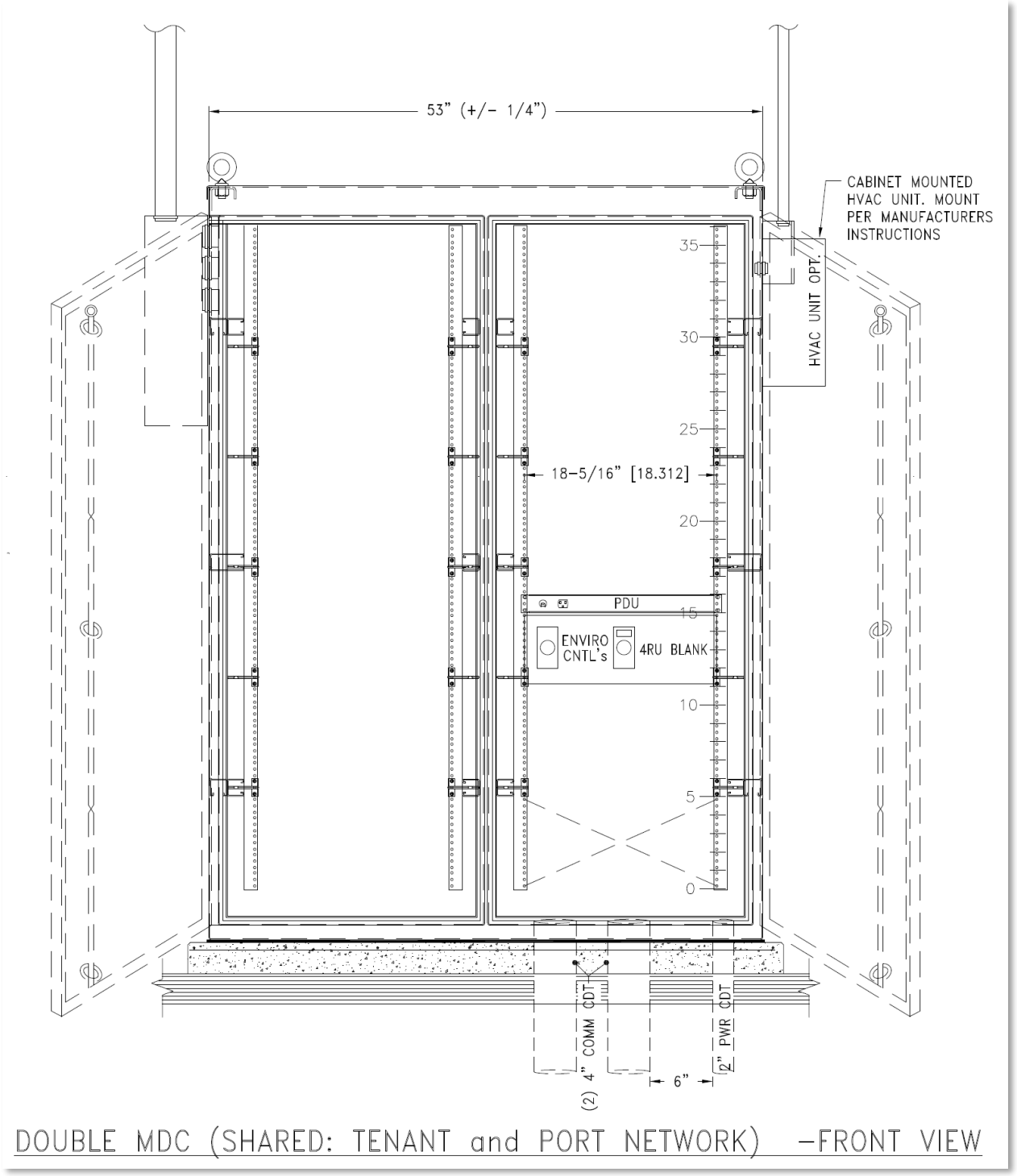
- Front elevation



- DETAIL 2.3.1.C (Cabinet -double; Shared MDC for ICT & TENANT):
  - Top elevation



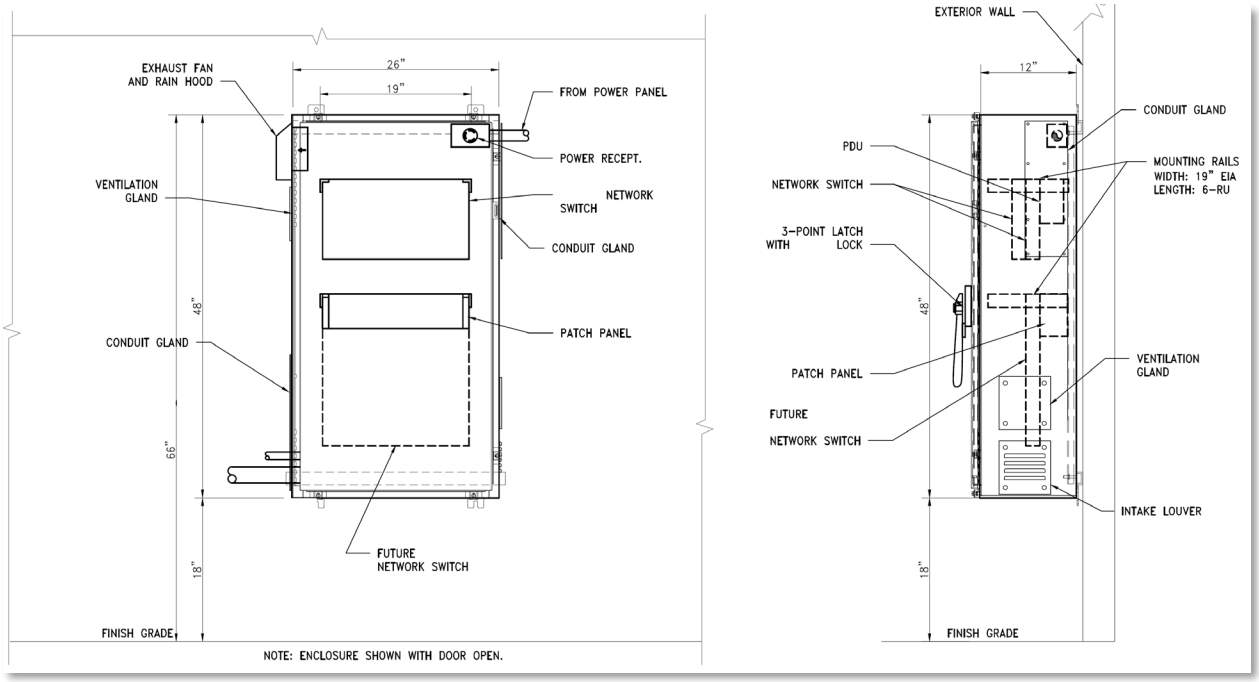
- Front elevation



2.3.2 Exterior Equipment Cabinets -Small

On a case-by-case basis, the Telecom Design Review (TDR) team may allow for the installation of an exterior grade wall mount cabinet. We refer to these as Small Distribution Cabinets (SDC) and they have a limited footprint within our communication infrastructure. Sizing does not allow for a remote UPS battery backup and networks that utilize this cabinet shall NOT be considered critical systems.

- General detail: Final approval and direction for use provided by TDR



2.3.3 Interior Equipment Cabinets

Equipment cabinet for communication rooms, indoor use only in environmentally controlled spaces. These shall be designed based on a data center cabinet that integrate with the needs of our communication rooms and data center alike. All Equipment Rooms (ER's) and Secondary Distribution Rooms (SDR's) shall be outfitted with at least one cabinet to serve the functions of Access Control and/or other secure systems.

Salient characteristics:

- Depth: 41 to 42-inch
- Width: 29 to 30-inch
- Height: 79 to 84-inch (min. 42 rack units)
- Weight capacity: 3500 min. to 5000 lb.
- Color: Black
- Perforated front (single) and rear (double) doors
    - Doors shall be lockable
    - Hinge pins that allow for easy door removal and reversal
- Solid top with grommets, minimum 4 (one per corner)

- Removal solid side panels; typically, 2 per side
- Interior-
    - (2) pairs of square punched equipment mounting rails bolted to frame with front-to-back depth adjustability
    - 1-3/4 -inch high rack unit spacing
    - Rails marked and numbering for rack mount spaces
    - EIA-310 Universal 5/8" – 5/8" -1/2" hole spacing
    - Shall support 19-inch EIA rack-mounted equipment
    - Front vertical wire management. Built in or added; style shall be rack unit fingers per RU with the ability to hold up to 48 cables per RU, covers optional
    - Rear power cord wire distribution- use above or a cable lashing panel to secure and distribute power cabling
    - For data center operation, ensure cabinet selected has air damn kits or built in option as well as other air blocking technology options to mitigate heat/air distribution
- For ease of deployment, preference shall be given to fully assembled product; secured to/shipped on pallet
- Mount cabinet directly to communication space floor per manufacture's setup kit and per engineered drawing details
- Each rack shall be grounded; order ground kits as required by mfg.

2.3.4 Equipment Racks; two-post

Standard 19-inch equipment racks for communication rooms.
Salient characteristics:

- Depth (channel): 6-inch channel preferred to best match depth of vertical wire managers
- Height: 7-foot (84-inch)
- Weight capacity: 1000 lb.
- Color: Black
- Shall support 19-inch EIA rack-mounted equipment
- Include marked and numbering of rack mount spaces
- EIA-310-D standard Universal 5/8" – 5/8" -1/2" alternating hole pattern
- Accepts #12-24 mounting screws
- Accepts four (4) 1/2 concrete floor anchors
- Each rack shall be grounded; order ground kits as required by mfg.

2.3.5 Specific Function Equipment Cabinets; Definition and usage statement

The following shall cover all the necessary types of cabinets utilized to service our communication infrastructure to the edge of the telecommunications plant, such as demarcation panels (DMARC), Consolidation Points (CP), Fiber-to-the-Backstand (FTBS) **- RETIRED**, etc. These cabinet types mainly cover the telecommunications term of the last mile, or the final segment where SEA's infrastructure connects to an end-user's premises. The largest

penetration of this equipment cabinet type to perform this function is the (airport tenant) demarcation panel, or DMARC. We have some variations of the DMARC and they are noted below. We also have equipment cabinet types performing the role of a CP, or edge network cabinets. Fiber is run to a device heavy area and network switch(es) feed necessary horizontal copper from the CP. Examples of this setup are the Electrical Meters and Baggage Handling cameras/devices.

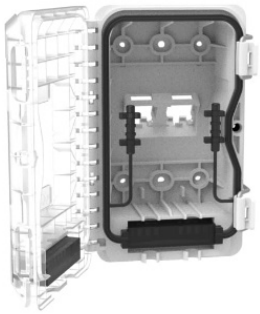
2.3.5.1 Demarcation Cabinet; TENANT- Airline, Concessionaire, Other Support Lessee

This is our most common type of special function communication cabinet and is utilized to allow tenant communication equipment to remain in their control under within their leased space. In turn, the tenant shall have access to Port of Seattle 'dark' or dedicated fiber strands to receive WAN connections and setup LAN's to navigate the SEA Campus. Dedicated copper pairs are also available, but to a lesser extent and need as most systems have transitioned to fiber

- **STANDARD DMARC for leased spaces above 500 square feet**:
    - Communication Standard is for, at a minimum, **Port of Seattle (owner) to install and maintain tenant demarcation (DMARC) pathway to building shell or lease line**
    - Conduit shall be installed from nearest Port communication room to a junction box labeled and reserved for use by future tenant; this process matches airport electrical services setup/delivery
    - Alleviates major hurdle for tenant. Tenant no longer required to work outside their shell (space) knowledge on pathways regarding: Standards, design, construction, and other nuances found beyond the lease line
        - **Whenever feasible**, in addition to above, owner shall run full demarcation package by placing panel next to electrical services and pull, label, terminate, test, and hold warranty for DMARC
        - **Otherwise, tenant shall** complete the task of extending conduit from owner provided conduit/junction box at lease line to planned shared ELEC/COMM utility space in their location. Also, the tenant shall be responsible for completing installation of desired DMARC cable package (source: Port comm room to destination: DMARC box), labeling, terminations, testing, and transfer of warranty to owner
            - Tenant installed DMARC backbone cabling must adhere to product and warranty requirements per (see sections 1.2.2 and 1.3.6) for Owner installed infrastructure to Port Communication Rooms
            - Once either the tenant installs or inherits a complete and warrantied DMARC, a cable package (or tie cables) may be run per tenant's specifications to desired comm head end space within leased space

        - Additional details may be found in (see section 2.4.2) Tenant leased spaces regarding any communication infrastructure requirements within tenant leased space
- Pathway
    - Typically Port installed 2-inch EMT conduit from ER to lease line P.B. sized at 16x16x4
        - Conduit filled with (1) 2-inch 3-cell/pocket fabric innerduct
        - Use RMC conduit in areas required by these standards (see section) Part 3- Communication Pathways
- Media (cable package)
    - Typically Owner selected, furnished, and installed. Must adhere to the requirements for Owner installed infrastructure to Port Communication Rooms noted above
        - Base package
            - 12 strand singlemode fiber
        - Premium package (above plus)
            - (6) Category 6 copper data
            - (1) RG-11 for television service
- Enclosures
    - See detail 2.3.5.1 below for general information
        - All supported DMARC drawings information located in (see section) 8.1.2 Cabinet and Rack Details

- **MINI DMARC for leased spaces below 500 square feet or kiosk environment**:
    - All above DMARC comments apply with the following exceptions
    - DMARC placed near tenant communications equipment if no electrical panel is present
    - Pathway
        - 1” conduit allowed
        - P.B. may be reduced to 12x12x4
        - From P.B., run 1-inch backbone conduit to 4-square/deep box
    - Media
        - Single Media package offering of (1) 6 strand SMF; all 6 strand terminated, 4 in service, 2 stored in back box as spares
            - Media typically Owner furnished and installed per above noted requirements for Owner installed infrastructure to Port Communication Rooms
        - Tie cable process: Tenant to patch tenant provided LC fiber patch cord(s) to their communication point of service
    - Enclosure
        - CommScope 760246284 / OUT-OUT-FP enclosure mounted to pathway provided 4-square backbox per mfg. instructions



☛ *NOTE: For MINI DMARC, floor boxes are not desired due to maintaining integrity of fiberoptic circuits*

2.3.5.2 Demarcation Cabinet; PORT (Space operated or occupied by Port personnel)

Any tenant DMARC may work for Port, but typical procedures for addressing Port office space shall proceed in the following order:

- Horizontal infrastructure from office space to nearest SEA Communication room. Required cable package shall be scoped out by Port stakeholders occupying space to meet their communication needs
- Fiber from communication room to a consolidation point to house necessary network(s) and branch out service horizontal copper Infrastructure to local devices
- Utilize a DMARC panel. Scale as necessary from simple connection to DMARC up to tie cables to a CP cabinet (setup CP as noted above)

2.3.5.3 Fiber-to-the-Backstand (FTBS) -RETIRED SOLUTION

As of the 2025 Standard update, the FTBS shall be retired and all concourse level service counter, gate podium(s), and backstand horizontal wire to be run down to the corresponding passenger loading bridge (PLB). Utilize the per gate dedicated MDC for any new or remodeled buildings or PLB's

- Designers shall make every effort to place gate MDC within reach of corresponding gate concourse operations and end of PLB
    - Any concourse level to ramp level MDC's horizontal copper length concerns shall be brought to the attention of the Telecom Design Review Team for final direction and/or approved variance

2.3.5.4 Elevator Machine Room Interface

Run a modified DMARC package specific to elevator(s) as noted below. The source of conduit and cabling shall be the nearest Port Comm Room with the destination set adjacent to Elevator Machine Room. This space shall be built for separate access from the machine room to adhere to Washington State Department of Labor and Industries regulations. DMARC enclosure shall be within a 2-Hour rated constructed room or cabinet. In the case of a room, a simple 36-inch wide 90-min rated outswing door to access a 12 to 16-inch deep space is sufficient

A cable package will be required from DMARC closet/cabinet to elevator machine room and necessary equipment interface or system patching. This shall be accomplished with necessary patchcords. This pathway is to allow for passage of patch cords (copper and/or fiber). Ensure the penetrations are fire rated/ fire sleeved for easy patch cord placement. Support patchcords in machine room via small cable wire basket or D-rings; consult with machine room stakeholders for final approved design.

- Pathway:
    - (1) 2-inch conduit with (1) 2" 3-cell fabric innerduct
- Media (BACKBONE cable package):
    - (6) Plenum CommScope/Systimax CAT6 data cables
        - Used for:
            - Elevator cab phone(s) commonly referred to as pots lines. Patch copper thru to comm room via DMARC; you *may* spit pairs of 1 or more CAT6 if nec. as one CAT6 can be up to 4 pots lines
            - ICS data connections. Copper patch thru to comm room via DMARC (if whole connection is under 90m) otherwise install small switch or media converter(s) and utilize DMARC fiber
            - Elevator Cab video and corresponding Fire lobby video phone

☛ *NOTE: The above copper (CAT6) cable is **NOT** 2-hour rated due to connecting to ELEV wire harness that only meets 15-minute flame test requirements*

    - (1) 12 strand 2-hour survivable CommScope/Systimax singlemode fiber
        - Used for:
            - Area of refuge intercoms
            - Future; ensures we have an installed solution that will meet 2-hour survivable adds or changes to code into future; all current connections/systems and more could run on this fiber
                - Refer to (see section) 8.4.1 MOU for 2-Hour Survivable Cable Infrastructure for more information
- Media (HORIZONTAL cable package):
    - Area of Refuge Intercom(s)
        - (1) 2-hour survivable CAT5/3 copper data cable per intercom
            - Refer to (see section) 8.4.1 MOU for 2-Hour Survivable Cable Infrastructure for more information
        - Used for:
            - Intercoms at area of refuge ONLY
- Enclosure
    - 2-hour rated construction with 90-minute rate access door or a rated enclosure/cabinet

2.3.5.5 Electrical Meters Interface

A modified demarcation package shall supply service to all electrical rooms for meter data connectivity.

- Pathway:
    - (1) 1.25-inch conduit with (1) 1.25-inch, 3-cell fabric innerduct
    - Place a pull box above/near demarcation enclosure to house a small service loop and to allow the storage of slack so that cables may be “direct length” into termination panels within the enclosure
        - Typically, conduit shall enter bottom right of enclosure for comm and the bottom left for power
- Media (cable package):
    - (1) 6 strand singlemode fiber
        - In lieu of above noted fiber, and if within 90 meters to comm room network connection, (2) CAT6A may be utilized for remote switch uplink
- Enclosure:
    - Small, minimum 5 RU, wall mounted metal enclosure with top access
        - Top of enclosure no greater than 48-inches A.F.F.
        - Ensure depth allows for network switch rear power supply and front patchcord clearance

2.4 COMMUNICATION SPACES; OTHER

Space reserved for future development to cover the typical space types used by the Port and out tenants. Shall cover (or expand upon) and communication needs or requirements for those space types.

2.4.1 Port of Seattle owned spaces

Pending development

2.4.2 Tenant leased spaces

Airport campus tenants consist of Airline Lounges, Ticket Offices, Ramp Operations, back of house operations/offices, etc. Spaces such as Restaurants and retail stores or kiosk fall within the development of Airport Dining and Retail. Specific DMARC instructions for pathway and media for both tenant types are covered in (see section) 2.3.5.1

The communications infrastructure within any tenant leased space may adhere to the tenant's communication design, standards, installation, labeling, and warranty requirements with the following exceptions:

- All tenant owned communication cabling in leased space not in conduit shall be plenum rated
- Port of Seattle shall delivery tenant ordered telecommunication services (provided by third party) to the demarcation panel only. No expectation of supporting tenant owned horizontal media
- Newly constructed (shared) lounges shall typically contain a Port controlled TC or ER

2.4.3 Remote Building Tenant

Pending development -As it stands: run demarcation package to any available MDC if able

PART 3- DESIGN STANDARDS- COMMUNICATION PATHWAYS

ATTENTION:

This section is NOT completed to reflect this latest standard format. As you will see, these sections present themselves more as a specification and will need to migrate over to match this standard format in pending updates. The legacy formatted "Standard" for 27 05 28 COMMUNICATION PATHWAYS is placed directly below and noted in *ITALICS* with the original numbering scheme for that document.

Immediately following the legacy referenced standard (27 05 28) are the most notable and applicable pathway updates or changes that may not be clear in 27 05 28 version.

This section shall be fully updated by next revision posting. Pathway questions or clarifications required? Please reach via email to avcommittees@portseattle.org / Subject Line: "COMM Standards Support -PATHWAYS"

3.1A 27 05 28 COMMUNICATION PATHWAYS (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of "Communication Pathways" Work is shown in the Contract Documents. The Contractor shall furnish and install cable pathways as shown in the Drawings and specified herein. Pathways shall include, but not be limited to, solid-trough cable trays with solid covers, ladder rack cable tray, metallic conduit, plastic and fabric innerduct, pull boxes, structural supports, seismic bracing, handholes and boxes for exterior underground cabling.

B. The Contractor shall provide and install all hardware, fasteners, or other materials required to install and support cable trays as shown on the drawings.

C. All conduit and cable tray assemblies shall be rated for Seismic Zone 4.

D. Cable pathways should also include open form cable trays for horizontal cable, in addition to other types of flexible cable trays.

E. The use of aluminum cable tray is allowed.

1.02 RELATED REQUIRMENTS

A. Electrical Standard 26 05 43 – Underground Ducts and Raceways for Electrical Systems.

B. Electrical Standard 26 05 33 – Raceways and Boxes for Electrical Systems.

1.03 GOVERNING CODES, STANDARDS AND REFERENCES

A. American National Standards Institute (ANSI)

B. ANSI/UL-1666(1997) Test For Flame Propagation Height Of Electrical And Optical-Fiber Cables Installed Vertically In Shafts

C. American Society for Testing and Materials (ASTM) A123 - Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.

D. ASTM A607 - Specification for Steel Sheet and Strip, Hot-Rolled and Cold-Rolled, High Strength, Low-Alloy Columbium and/or Vanadium.

E. ASTM A653 SQ - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality

F. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

G. National Electrical Code (NEC)

H. National Electrical Manufacturers Association (NEMA) VE 1 – "Metal Cable Tray Systems"

I. NEMA VE2, "Cable Tray Installation Guidelines"

J. National Fire Protection Agency (NFPA) 70

K. NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" cable tray systems

L. Underwriters Laboratory (UL)

M. UL 910 Test for Flame-Propagation and Smoke Density

N. UL 2024 Standard for Cable Routing Assemblies and Communications Raceways

O. Washington State Labor and Industry

P. American National Standards Institute (ANSI)/National Fire Protection Agency (NFPA) 70 - National Electrical Code (NEC).

1.04 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Layout Drawings: Submit layout drawings of cable tray and conduits where field conditions require deviation from routes indicated on the drawings and where additional bends or vertical transitions are needed.

2. Submittal Drawings: Submit drawings of typical cable tray and accessories including clamps, brackets, hanger rods, splice plate connectors, expansion joint assemblies, and fittings, showing accurately scaled components.

3. *Product Data: Submit manufacturer's data on cable tray including, but not limited to, types, materials, finishes, inside depths, and fitting radii. For side rails, submit cross sectional properties including Section Modulus (Sx) and Moment of Inertia (Ix).*

1.05 QUALITY ASSURANCE

A. *Manufacturers: Firms regularly engaged in manufacture of cable trays and fittings of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.*

B. *NEMA Compliance: Comply with NEMA standards publication number VE1, "Cable Tray Systems."*

C. *NEC Compliance: Comply with NEC, as applicable to construction and installation of cable tray, conduit, and innerduct systems.*

D. *Listing Compliance: Provide products that are UL labeled or Washington State Labor and Industry recognized.*

E. *NFPA Compliance: Comply with NFPA 70B, "Recommended Practice for Electrical Equipment Maintenance" pertaining to installation of cable tray systems.*

1.06 DRAWINGS

A. *The Drawings indicate the general route of the cable trays and conduits. Data presented on the Drawings are as accurate as preliminary surveys and planning can determine. Accuracy is not guaranteed, and field verification of all dimensions and routing is required.*

B. *Specifications and Drawings are for assistance and guidance, but exact routing, locations, distances, and levels will be governed by actual field conditions. The Contractor shall make field surveys as part of his Work. Deviations from indicated routes, additional bends, and vertical transitions shall be submitted to the Construction Manager for approval prior to installing cable trays or conduits.*

PART 2 PRODUCTS

2.01 COMMUNICATION CABLE TRAYS

A. *General: The Contractor shall furnish and install a complete cable tray system to support innerduct and cable as indicated on the drawings or included in the scope of Work.*

B. *Manufacturer: Cable tray systems shall be as manufactured by B-Line Systems, Chatsworh Products, Inc., Or Approved Equal.*

C. *Cable Tray Sections and Components:*

1. *General: Provide metal cable trays of types, classes, and sizes indicated within the scope of Work; with splice plates, bolts, nuts and washers for connecting units. Construct units with rounded edges and smooth surfaces; in compliance with applicable standards; and with the following additional construction features.*

2. *Supports: Cable tray supports shall be placed so that the support spans do not exceed the maximum span indicated on the Drawings or as recommended by the cable tray manufacturer. Supports shall be as shown on the Structural plan.*

3. *Accessories: Special accessories shall be furnished as required to protect, support, and install the cable tray system. Accessories shall consist of, but are not limited to, ground-bonding jumpers, blind-end plates, clamps, hangers, brackets, conduit adapters, installation hardware, and other appurtenances as required for a complete installation.*

4. *NEC compliance: Cable trays shall be manufactured, to meet requirements of NEC Article 318 – Cable Trays. Bonding and grounding shall meet the requirements specified in Section 26 05 26 - Grounding.*

2.02 CONDUIT REQUIREMENTS

A. Size conduit for wires and cables as noted on Drawings. Typical Port minimum applications noted:

B. Conduit penetrations into a new Equipment Room (ER) for Horizontal and Tenant Backbone infrastructure shall run to a minimum of one 36x36x16 Pull box (meet-me-box) with (4) 4" conduits into the ER.

C. 4" conduit from Entrance Facility to Outside Plant (OSP) shall be (4) 4" conduits

D. 4" conduit from (if no cable tray is present) Equipment Room (ER) to ER shall be (4) 4" conduits

E. OSP ductbanks

1. *Comply with 26 05 43 Underground Ducts and Raceways for Electrical Systems.*

2. *Minimum accepted; (2) 4" from each Maintenance Hole (MH)*

3. *Backbone ductbank; (4) 4" from each Maintenance Hole (MH), concrete encased.*

4. *Tenant Demarcation conduit; One 2" conduit with (1) 2" 3-cell fabric innerduct to closest service Port telecommunications space*

5. *Micro Distribution Cabinet (MDC) Two 2" conduits with (1) 2" 3-cell fabric innerduct in each conduit. Conduit-1 of 2: The closest primary service Port telecommunications space and conduit-2 of 2: to the next closet Port telecommunications space which serves as the secondary connection*

6. *Horizontal Data information outlet locations shall be 1" conduit to a 4x4 box, reducer to 1-gang.*

F. Floor, roof and structural ceiling penetrations: Use rigid steel conduit. Extend through floor, roof and structural ceiling to at least 4 inches above

and below penetration. Sleeves for raceways and cables shall meet requirements specified in Section 26 05 33 – Raceways and Boxes.

G. The Contractor shall provide all metal conduits with threaded plastic bushings and pull cords.

H. Routing of any metallic media cabling such as voice, data or coaxial in the same conduit as power conductors is not allowed.

I. For inside plant, continuous conduit runs shall not exceed 100 ft or have more than two 90 degree bends with out using appropriately sized pull boxes.

J. For outside plant, continuous conduit runs shall not exceed 500 ft or have more than two 90 degree bends with out using appropriately sized maintenance or hand holes.

K. Maximum conduit pathway capacity shall not exceed a 40% fill.

2.03 INNERDUCT

A. Acceptable manufacturers:

1. Pyramid

2. Carlon

3. Or Approved Equal.

B. Specifications non-fabric duct

1. Color: Orange

2. Construction: Heavy duty corrugated

3. Pull Tape: Preinstalled, with footage markings

4. UL: UL 910 and/or 2024 list with tags or marking and for cables listed under ANSI/UL-1666 (1997) or Washington State Labor and Industries recognized.

5. National Electrical Code (NEC) Compliance: Comply with NEC as applicable.

C. Flexible fabric innerduct

1. For 4" conduit install (3) 3" 3-cell fabric innerduct. Each cell shall be rated for 1" or larger diameter cables. For 2" conduits, install (1) 2" 3-cell fabric innerduct. For 1.25" conduits, install (1) 1.25" 3-cell fabric innerduct

2. Color: Use three unique colors, use one color per 3-pack (color shall be in stitched spine or on fabric material)

3. For outside plant, one of the three packets shall be a traceable fabric innerduct

4. Use product where innerduct will meet Port of Seattle cable infrastructure growth requirements in 2" and above backbone conduit runs.

5. *Fabric innerduct shall not be used in cable trays*
6. *Pull Tape: Provide tape per fabric innerduct.*
7. *UL: UL 910 and/or 2024 list with tags or marking and for cables listed under ANSI/UL-1666 (1997) or Washington State Labor and Industries recognized.*
8. *National Electrical Code (NEC) Compliance: Comply with NEC as applicable.*

D. *Fittings: Non-metallic couplings suitable for the application as recommended by the innerduct manufacturer.*

2.04 SUPPORTS, IN ADDITION TO STRUCTURAL SEISMIC SUPPORTS AND BRACING

A. *Structural supports and seismic bracing for cable trays shall be as shown in the design drawings and details. Seismic control shall meet requirements specified in Section 26 05 48 – Seismic Controls for Electrical and Communication Work.*

2.05 SLEEVES FOR PATHWAYS AND CABLES

A. *Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends, with plastic bushings.*

B. *Sleeves for Rectangular Openings: Galvanized sheet steel.*

1. *Minimum Metal Thickness:*
   a. *For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).*
   b. *For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).*

2.06 PULL CORD

A. *The conduit/pathway installing contractor shall be responsible for installing a pull cord and true tape from end to end in every conduit, cable tray, and/or innerduct.*

1. *The pull cord shall be new polypropylene over polyester rope with a minimum 1700 lb. tensile strength.*
2. *The Contractor shall leave at least 18 inches of pull cord accessible at both ends of the conduit, cable tray, or innerduct.*
3. *The pull cord shall be continuous with no knots or splices for the length installed.*
4. *Pull cord shall be installed by same contractor that installs the pathway.*

2.07 GROUNDING SYSTEM AND CONDUCTORS

A. Bonding and grounding shall meet the requirements specified in Section 26 05 26 - Grounding.

2.08 TRACER WIRE

A. Single conductor copper wire, solid or stranded, #8 AWG

B. High Molecular Weight Polyethylene (SMWPE) insulation

2.09 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.

B. All installation shall be in accordance with manufacturer's published recommendations.

C. Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.02 SEPARATION FROM EMI SOURCES

A. Comply with TIAEIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

B. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.

2. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.

3. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

C. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

1. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.

2. *Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.*

3. *Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.*

D. *Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:*

1. *Electrical Equipment Rating Less Than 2 kVA: No requirement.*

2. *Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.*

3. *Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.*

E. *Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or higher: A minimum of 48 inches.*

F. *Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.*

3.03 SUPPORTS AND BRACING

A. *Install in accordance with applicable codes and regulations and as shown on the structural plans and details.*

B. *Fasten support channels, hanger rods, raceway clamps, and outlet and junction boxes to building structure using expansion anchors, beam clamps, metallic brackets, supports and bolts and spring steel clips.*

C. *Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports as called out in the plans and details. Provide additional supports on each side of bends.*

D. *Use metallic toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; metallic expansion anchors or preset inserts in solid masonry walls; sheet metal screws in sheet metal studs and wood screws in wood construction; and channel supports clamped or bolted to joists, purlins, steel angles and beams.*

E. *Do not fasten supports to piping, ductwork, mechanical equipment, or raceway.*

F. *Do not use powder-actuated anchors.*

G. *Do not drill or weld to existing structural steel members without specific permission of Construction Manager.*

H. *Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.*

I. *Do not use nylon or plastic tie wraps, wood or plastic expansion inserts or adhesives as principal or secondary support means.*

J. *Install enclosures and panel-boards with minimum of four anchors.*

K. Do not support raceway from ceiling wire supports.

L. Where multiple runs of conduit can be run grouped together, run conduit in racks supported from the building structure. Form racks from strut-channel supported by at least two threaded rods, secured to the structure above.

M. Cap top of open channel and pipe supports to prevent ingress of moisture and dirt.

3.04 SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Each pipe sleeve, horizontal or vertical, shall have a plastic type "end-bushing" on both ends to protect cables from abrasion when pulled through sleeves. The "end-bushing" shall be installed prior to install cables through sleeve.

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls with respect to plastic "end-bushings". The plastic "end-bushing" shall be plenum rated if applied in plenum space.

G. Extend sleeves installed in floors 2 inches above finished floor level with respect to plastic "end-bushings". The plastic "end-bushing" shall be plenum rated if applied in plenum space.

H. Size pipe sleeves to provide ¼-inch annular clear space between sleeve and pathway or cable, unless indicated otherwise.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Section 07 84 00 – Firestopping.

L. Roof-Penetration Sleeves: Weather seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing Work.

3.05 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals, and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

C. Provide sleeves for new conduit and cable penetrations of building construction.

1. Openings to accept sleeves in new building construction will be formed in building construction by the Contractor for General Construction Work. Openings to accept sleeves in existing building construction shall be provided under this division of the Specifications. Refer to Article, CUTTING AND PATCHING in this section.

2. Use galvanized rigid conduit sleeves for penetrations through exterior masonry/concrete walls and foundations, concrete floor slabs on grade and above grade, and concrete-filled decks.

3. Use only fire-rated listed assemblies for the type of sleeve being installed through CMU walls or gypsum walls for communications penetrations. Sleeve type shall be galvanized rigid conduit.

D. Where conduits are installed before building construction being penetrated, install sleeves loose around conduits. Split, fit, and weld steel sleeves over existing conduits, with respect to anything flammable in the surrounding environment.

E. Secure sleeves firmly in place using filling and patching materials (grout) that match with surrounding construction.

F. In floor penetrations, extend sleeve 4 inches above finished floor unless noted otherwise. In wall penetrations, cut sleeves flush with wall surface and use metal escutcheon plates in finished interior areas.

G. Seal voids between sleeves and building construction with joint sealants. Make allowances for and coordinate the Work with installation of firestopping, conduit insulation, and waterproofing as applicable.

H. The Contractor shall be fully responsible for final and correct location of sleeves. Sleeves which are omitted or incorrectly located in existing building construction, shall be corrected and provided by the Contractor, at no additional costs to the Port.

3.06 UNDERGROUND DUCTS AND RACEWAYS

A. Comply with 26 05 43 – Underground Ducts and Raceways for electrical systems.

B. Tracer wire is required on all non-metallic underground conduits..

1. Tape tracer wire to side of conduit every 8-10 feet.

2. Terminate wire with purpose-built waterproof connectors.

3. Perform a locate on the installation after conduit/ductbank has been buried, prior to project substantial completion..

3.07 PENETRATION OF BUILDING SURFACES

A. Above Grade Level or Non-waterproof Areas

1. Seal each annular space between conduits or cable and building surfaces. Pack space with Oakum, other rope packing, or backer rod materials and cover with fire-resistant sealant or other protection materials.

2. Provide sleeves as specified in Article, SLEEVE-SEAL INSTALLATION in this section for conduit and cable penetrations. Seal each space between conduit or cable and sleeve. Sealing shall be as specified in above paragraph.

B. Waterproof Areas (Above and Below Grade)

1. In new and existing construction for penetrations through concrete below grade, ground water level, or in other waterproof areas, provide through-wall and floor seals having galvanized fittings, sealing assemblies, and sleeves as specified.

2. In existing construction when core bore drilled openings are used for conduit penetrations below grade, ground water level, or in other waterproof areas, provide sealing.

C. Fire-resistant Areas

1. Provide through-penetration firestop systems for penetrations through fire-rated walls, floors, and other partitions of building construction. Comply with requirements in Section 07 84 00 – Firestopping.

2. In walls or partitions with 2-hour or less fire ratings, provide only metallic outlet or device boxes installed per UL Fire Resistance Director, NEC, and other national building code requirements.

3.08 TESTING

A. Test cable trays to ensure electrical continuity of bonding and grounding connections, and to demonstrate compliance with specified maximum grounding resistance. Refer to Section 26 05 26 - Grounding for testing and test methods.

B. Manufacturer shall provide test reports witnessed by an independent testing laboratory of the “worst case” loading conditions outlined in this

specification and performed in accordance with the latest version of NEMA VE-1.

3.09 CUTTING AND PATCHING

A. Provide openings, cutting, coring, and patching of openings in existing building construction as required.

B. Perform cutting as not to impair structural stability of the building system. Do not drill holes or weld attachments to beams and other structural members without prior written approval from the Engineer.

C. When penetrating fire walls, a UL listed, Or Approved Equal, fire stopping method shall be used at the penetration to maintain the fire rating of the wall.

End of COMMUNICATION PATHWAYS 27-05-28 Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

01/29/2015 Revised References

01/23/2017 Incorporated ICT specifications

07/15/2021 Clarified requirements for pull cord.

01/01/2022 Removed reference to air blown fiber. Added requirements for exterior installations including ductbank.

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-Part 2 Measurement and Payment

3.1 Outside Plant (OSP) -Backbone Only

This section shall be built out in future updates, refer to document in 3.1A

3.1.1 Maintenance Holes (MH) and other structures

This section shall be built out in future updates

3.1.2 OSP Conduits

This section shall be built out in future updates

3.1.3 OSP Innerducts

This section shall be built out in future updates

3.2 Inside Plant (ISP) -Backbone

This section shall be built out in future updates, refer to document in 3.1A

3.2.1 ISP Cable Trays -Backbone

This section shall be built out in future updates

3.2.2 ISP Conduit -Backbone

This section shall be built out in future updates

3.2.3 ISP Innerducts -Backbone

This section shall be built out in future updates

3.3 Inside Plant (ISP) -Horizontal

This section shall be built out in future updates, refer to document in 3.1A

3.3.1 ISP Cable -Trays Horizontal

This section shall be built out in future updates

3.3.2 ISP Conduit -Horizontal

This section shall be built out in future updates

3.3.3 ISP Innerduct -Horizontal

This section shall be built out in future updates

3.4 Comm Room Pathways (ladder racks, pathway entry systems and methods, etc.)

This section shall be COMPLETELY built out in future updates, refer to document in 3.1A

3.4.1 Ladder Rack -Horizontal

Upper Tier, Lower Tier, and future provisions for fiber patchcord routing, reference (see section) 2.1.7 Room finishes and trim out: COMMUNCATIONS

- *Additional details pending*

3.4.2 Ladder Rack -Vertical

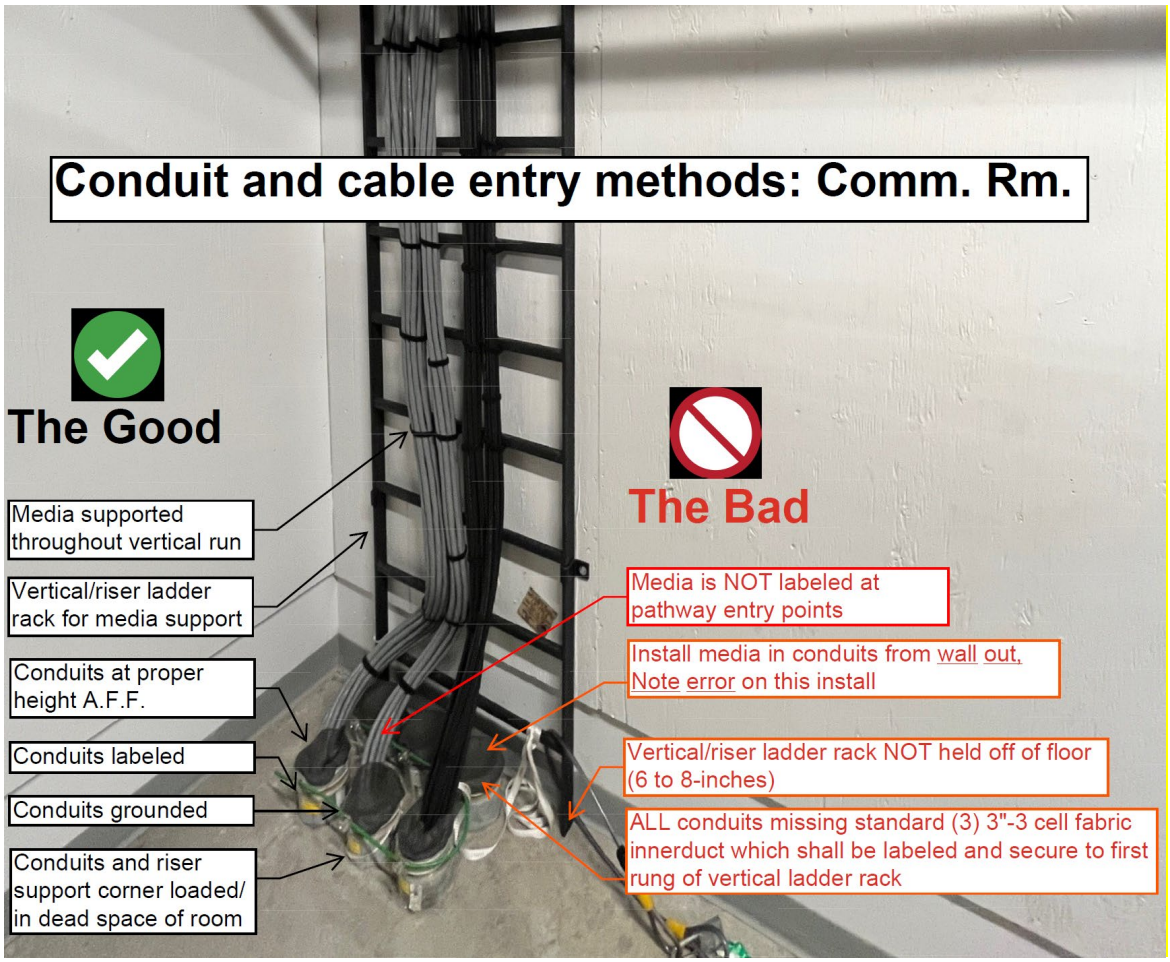
Used to efficiently and safely route media from floor to proper Backbone (upper) or Horizontal (lower) horizontal ladder rack pathway systems

- Ad*ditional details pending*

3.4.3 Pathway entry systems and methods

Section shall cover the proper and most efficient means and methods to enter/exit a telecommunications space

- Following examples provided capture installs with both standard compliance met and errors found



Whereas in this cable tray and cable entry, ladder rack is at proper height, secured to strut and all media is secured and labels in an organized fashion

3.5 Reclaiming existing pathways -Rules and regulations

This section shall be built out in future updates, refer to document in 3.1A

PART 4- DESIGN STANDARDS- COMMUNICATION MEDIA

ATTENTION:

This section is NOT completed to reflect this latest standard format. As you will see, these sections present themselves more as a specification and will need to migrate over to match this standard format in pending updates. The legacy formatted "Standard" for 27 13 00 BACKBONE CABLING REQUIREMENTS *and* 27 15 00 HORIZONTAL CABLING is placed directly below and noted in *ITALICS* with the original numbering scheme for those documents.

Immediately following the legacy referenced standards of (27 13 00 and 27 15 00) are the most notable and applicable communication media updates or changes that may not be clear in 27 13 00 and 27 15 00 versions.

This section shall be fully updated following the Part 3 Communication Pathways update. Media (cable) questions or clarifications required? Please reach via email to avcommittees@portseattle.org / Subject Line: "COMM Standards Support -CABLE INFRA"

4.1A 27 13 00 BACKBONE CABLING REQUIREMENTS (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY

A. Summary of Work: The Work of this section includes the construction, test, documentation, and warranty of a fiber optic cable and unshielded, twisted-pair (UTP) copper backbone cable plant for the Premises Wiring Distribution System (PWDS) in accordance with the specifications and Drawings.

B. This Work specified in this section includes installation of backbone cabling for Port wide installations. For this Work, the Contractor shall:

1. Provide optical fiber backbone cable and associated accessories.

2. Provide UTP backbone cable and associated accessories.

3. Termination hardware

4. Conduct testing.

1.02 DEFINITIONS FOR PORT OF SEATTLE INFRASTRUCTURE

A. Refer to Section 27 05 13 –General Communications Requirements, BACKBONE sections: 1.02.A.1.2 and 1.02.B.1.2.

1.03 RELATED WORK

A. As related Work, the Contractor shall:

1. Provide backbone pathway materials and construct pathways, as described in Section 27 05 28 - Communication Pathways; reference applicable backbone pathway options

B. Work performed by other contracts:

1. Work required to be completed by others prior to the Work in this section may include the following:

a. Construction of backbone cable with end and patch panel termination and placement of conduit and overhead cable trays.

b. Placement of open frame racks in communication rooms and equivalent locations available for backbone wiring accessories and cable termination.

2. Work that will be typically performed by the Port of Seattle after the Work described in this section is substantially complete will include the following:

a. Installation of optical fiber and UTP jumpers and patch cords for backbone cross connects and network port connections:

(1) Between backbone cable patch panel ports and electronic equipment.

(2) Between horizontal cable patch panel ports and electronic equipment.

(3) Call the Port of Seattle Service Desk at 206-787-3333 to schedule Port of Seattle staff support of backbone system connections.

1.04 SCOPE OF WORK

A. The Contractor shall provide materials and labor required to deliver a complete backbone cable system as indicated on the Contract Drawings, schedules, and these Specifications.

B. This Work shall include, but may not be limited to, the following tasks:

1. The Contractor shall provide backbone optical fiber cable that is pre-installation tested, correctly installed and terminated, and Contractor-tested prior to final acceptance by POS or testing by a systems contractor.

2. The Contractor shall provide backbone copper cable that is correctly installed and terminated, and Contractor-tested prior to final acceptance by POS or testing by a systems contractor.

3. The Contractor shall provide patch panels, termination blocks and end point termination devices to enable the termination and identification of the backbone cable system.

4. The Contractor shall provide and install cable devices and accessories, such as patch panels, in racks installed by other contracts and in racks provided by the Contractor.

5. Contractor shall fusion splice fiber optical pigtails onto ALL CIBS MDR to ER fiber optical cabling.

a. Fusion splice loss of single mode fiber shall be no more than 0.3 dB per fusion splice.

b. Port has the right to change fusion splicing requirements per application

C. Label devices, cables, and ports per Section 27 05 53 - Identification and Labeling, and enter data in the cable management system. The Port may elect to enter data into the Port cable management system based on data from the Contractor. This does not alleviate the Contractor from their responsibility to provide personnel to manage cable management system such as maintaining Excel spreadsheets of all necessary installed cable data.

1. *Conduct testing on backbone cabling per Port of Seattle specifications.*

1.05 REFERENCES

A. American National Standards Institute (ANSI):

B. Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA):

1. *EIA-440-A (Current Edition): Optic Fiber Terminology*
2. *TIA/EIA 455-B, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and other Fiber Optic Components*
3. *FOTP-78 (TIA/EIA-455-78A) (Current Edition): Fiber Optic Test Procedure 78 - Spectral Attenuation Cutback Measurement for Single-Mode Optical Fibers*
4. *TIA/EIA 455-B (Current Edition): Standard Test Procedures for Fiber Optic Cable Fibers, Cables, Transducers, Connecting and Terminating Devices*
5. *TIA/EIA-526 (Current Edition): Standard Test Procedures for Fiber Optic Systems*
6. *TIA/EIA-568 (Current Edition): Commercial Building Telecommunications Cabling Standard, with addenda*
7. *ANSI/TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces*

C. National Fire Protection Association (NFPA):

1. *NFPA 70 National Electrical Code (NEC)*

1.06 SUBMITTALS

A. Submittals shall be in compliance with Section 01 33 00 - Submittals.

B. The Contractor shall provide the following administrative submittals:

1. *Certification that the cable will be installed by a Washington state Systimax Solutions-certified installation contractor.*
2. *Documentation that termination crafts-people are properly trained for optical fiber termination and testing, and high-performance data cable termination and testing. Documentation shall be from a technical school, manufacturer's school, or labor union training.*
3. *Discrepancy report describing existing backbone cable, equipment, and rack conditions that would affect the ability of the Contractor to successfully complete the Work.*
4. *Systimax Solutions 25-year approved warranty on the completed Systimax Solutions portions of the backbone cable system.*
5. *Warranty documentation on non-Systimax Solutions products.*

C. The Contractor shall provide the following technical submittals:

1. Manufacturer's complete product data and specifications, with drawings as applicable for materials furnished by the Contractor.

2. Backbone cable testing results in hard and soft copy formats.

a. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.

3. Results of pre-installation optical fiber reel tests for Construction Manager review and approval.

4. Conduit and cable tray fill plan indicating initial cable fill percentages and the use of innerduct. The plan may be submitted by installation area if this method is more effective.

5. Shop drawings and single-line schematic diagrams showing final device placements, cable groups, termination details and cross-connections.

6. Cable Pulling Plan: The Contractor shall submit a cable pulling plan, as follows:

a. Indicate the installed backbone conduit layout in schematic format, including junction boxes and distances between junction boxes.

b. Indicate contents of each conduit.

c. Indicate the cable pulling calculations, conduit fill ratios and actual cable runs and tensions.

d. Include detail and schedule showing the construction sequence of communications rooms.

e. Installation of cabling shall not commence prior to approval of the pulling plan and calculations by the Engineer.

7. Contractor's test plan for the required optical fiber and metallic (copper) cable tests.

8. Requests for inspections and substantial completion inspection for acceptance testing by the Port-designated test contractor.

9. Final as-built backbone wiring drawings and documentation.

1.07 CABLE MANAGEMENT SYSTEM DATA ENTRY

A. Contractor to provide as-built labeling information and as-built drawings to Port of Seattle within three (3) weeks of project completion.

B. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.

C. *Data Entry provided to the Port of Seattle: Data shall be provided in a consistent and accurate manner in a format approved by the Engineer. Data provided shall include, but not be limited to:*

1. *Tabular nomenclature data for spaces, pathways, cables, termination hardware, splices, ground buses, ground conductors, and ground bonds.*
2. *Diagrammatic drawings and data for spaces, pathways, cables, termination hardware, splices, ground buses, ground conductors, and ground bonds.*
3. *Status data for installation, tests, defects, and corrections.*

1.08 PROJECT CONDITIONS

A. *Verification: Obtain specific cable lengths and location of racks and equipment by field measurement and by Contractor's shop drawings after contract award. Do not vary from the routes indicated in the drawings without prior approval from the Construction Manager.*

1.09 QUALITY ASSURANCE

A. *Standards:*

1. *Provide system components that are Underwriters Laboratories (UL) listed and labeled when applicable.*
2. *UL 910 – Test Method for Fire and Smoke Characteristics of Electrical and Optical Fiber Cables Used in Air-Handling Spaces.*
3. *UL 1666 – Standard Test for Flame Propagation Height of Electrical and Optical Fiber Cables Installed Vertically in Shafts.*
4. *Electronics Industry Association (EIA)-455-B – Standard Test Procedures for Fiber optic Fibers, Cables, Transducers, Connecting and Terminating Devices.*
5. *ANSI/TIA/EIA-568-B – Commercial Building Communications Cabling Standard, including addenda.*
6. *ANSI/TIA/EIA-569-A – Commercial Building Standard for Communications Pathways and Spaces.*
7. *ANSI/TIA/EIA-598-A – Optical Fiber Cable Color Coding.*
8. *ANSI/TIA/EIA-606 – The Administration Standard for the Communications Infrastructure of Commercial Buildings.*
9. *ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Communications.*
10. *TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.*

B. *Codes and Regulations:*

1. *National Electrical Code (NEC) Compliance: Comply with NEC as applicable.*

2. *Local Codes: Comply with state and local codes as applicable.*

C. *Manufacturer's Recommendations: Install items per manufacturer's recommendations. Recommendations shall include, but not be limited to, cable handling, bending, and pulling requirements or limits; termination methods and materials; and use of specific tools and disposables.*

D. *Tests: Perform tests as specified in Part 3 – Execution of this section.*

1.10 DELIVERY, HANDLING, AND STORAGE

A. *Materials shall be delivered in original packages with labels intact and identification clearly marked.*

B. *Storage temperature range: -40°F to 149°F (-40°C to 65°C).*

C. *Protect equipment and materials from foreign objects such as dirt, dust, paint, fumes, liquids, construction debris, and other contaminants. Protect from weather, humidity, temperature, and sunlight. Protect from physical damage.*

D. *Keep dust caps in place on patch panels and replace after testing. Protect 110 blocks with masking until construction is complete.*

E. *Equipment damaged prior to system acceptance shall be replaced with new at no additional cost to the Port.*

F. *Port-furnished Material: Port-furnished material will be made available to the Contractor at the airport logistics site. The Contractor shall be responsible for inspection, testing, or other verification of the condition of the materials upon receipt from the Port. By accepting materials from the Port, the Contractor warrants that said materials are free from defects. Remedy for subsequent discovery of damage or defects shall be the responsibility of the Contractor.*

PART 2 PRODUCTS

2.01 GENERAL

A. *Backbone cabling infrastructure shall be manufactured by Systimax Solutions, No Equal; any substitutions must be approved by Port of Seattle Telecommunications Review Team (TDR)*

B. *New construction of a Port ER, requires a minimum of 144 (SMF) single mode fiber each, to a minimum of (2) MDRs. Telecommunications Review Team (TDR) committee will confirm the MDR assignments during project design review*

C. *Products and materials shall be new and fit the intended purpose.*

D. *Contractor is responsible to re-certify existing infrastructure when re-installed, re-located, and ALL existing infrastructure in immediate location to be operational prior to system acceptance, and at no additional cost to the Port*

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E. Damaged or defective products and components shall be replaced by the Contractor at no additional cost to the Port.

F. Cabling and termination hardware damaged prior to system acceptance shall be replaced by the Contractor at no additional cost to the Port.

G. Miscellaneous materials required for a complete and operational cabling system shall be provided by the Contractor.

H. All communication materials shall be subjected to final approval by the Port of Seattle Telecommunications Review Team (TDR).

PART 3 EXECUTION

3.01 PRE-INSTALLATION TESTING

A. General: The Contractor shall perform pre-installation tests on all fiber optic cables prior to installations. The Contractor shall accept only materials that pass the test.

B. Testing:

1. General: Test data shall include cable reel serial number and cable product number for identification. Report defective cables immediately to the Construction Manager. Repeat pre-installation tests if necessary when cable reels are stored unprotected on the job site or are mishandled. Do not install defective cables.

2. Records: Cable reel serial number and cable product number shall be recorded and included in the test results for each reel. Printouts of the traces and test parameters shall be submitted to the Construction Manager within 5 working days of completing the test.

3. Tests: The Contractor shall perform tests on 100% of fiber strands with an optical time-domain reflectometer (OTDR) at 1310 nanometers and 1550 nanometers for singlemode fibers. The OTDR shall have a loss resolution of 0.01 dB or less, and a distance resolution of one (1) foot or less. Submit images of the OTDR traces for review and approval.

4. Test Criteria: A cable shall pass the test only if all strands have an attenuation no greater than the maximum attenuation stated in the manufacturer's published specifications, and if no strands have point discontinuities greater than 0.1 dB maximum for singlemode (1310 nm and 1550 nm windows).

3.02 SCHEDULING AND COORDINATION

A. Scheduling of Work shall be coordinated with the Construction Manager and tenant representatives to minimize impact on operations and the traveling public.

B. Scheduling of cable installation shall be coordinated with other trades within the Contract and through the Construction Manager with trades working other projects.

3.03 SURVEY AND PREPARATION

A. The Contractor shall survey existing cable trays, conduit paths and routes, and report discrepancies and issues with the use of these for cable installation. Failure to perform this inspection and submit the report holds the Contractor at cost risk for corrective actions and schedule impacts later in the Work.

B. Contractor shall be responsible for storage of all materials until installation.

3.04 INSTALLATION OF PULL STRINGS

A. The conduit/pathway installing contractor shall be responsible for installing a pull cord and true tape from end to end in every conduit, cable tray, and/or innerduct.

B. Pull strings shall be left in place.

C. In existing conduits or cable tray with existing pull strings, the Contractor shall replace used pull strings with new pull strings.

D. Pull strings are not required where conduit or innerduct fill is greater than 33% after installation of cable.

3.05 INSTALLATION OF PATCH PANEL AND ASSOCIATED DEVICES

A. The Contractor shall inspect patch panels, associated devices, and materials for compliance with these Specifications and with the Contractor's orders.

B. Patch panels and associated devices shall be installed according to manufacturer's instructions.

C. Patch panels and termination hardware shall be installed with matching mounting screws at each location.

3.06 GENERAL CABLE INSTALLATION

A. The system shall be installed to comply with all applicable standards, codes, and regulations. In general, where the specifications, drawings, standards, regulations, and codes conflict, the most stringent requirement shall apply; however, the Contractor shall notify the Construction Manager immediately of conflicts for determination of a resolution.

B. Cables shall be installed in innerducts that are installed in conduits, raceways, pull boxes, cable trays, or cable runways as shown on the Drawings. No aerial or unsupported cables are permitted unless specifically indicated on the drawings and approved by Telecommunications Review Team (TDR).

1. Refer to Section 27 05 28 –Communication Pathways, PART 2 section: 2.04 for approved innerduct

C. Typically Backbone fiber and copper cable shall be installed with no splices.

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1. *This entry is to not be confused with the definition of fusion splicing, which is required per 27.05.13.1.05 and 27.13.00.1.04.*

D. *The Contractor shall protect cables from dirt and moisture by laying cables on a clean, new ground covering.*

E. *The Contractor shall inspect and clean as necessary existing and new cable trays and conduits to ensure that they are clean and free of obstructions prior to installing pull strings or pulling cable.*

F. *The Contractor shall not install damaged or defective cables or components. The Contractor shall carefully inspect cable jacket for defects as cable is pulled off the reel.*

G. *Cable Pulling:*

1. *Pull cable in accordance with manufacturer's recommendations and industry-accepted practices, and within the limits of cable bend radius and pulling tension specifications.*
2. *Use of pulling lubricants is not allowed per Commscope/Systimax specifications*
3. *Cables shall be hand pulled when possible or when required by manufacture. The Contractor shall use a recording tensiometer on pulls that may exceed 100 pounds pulling tension and always when a winch is used for pulling. Tensiometer printouts shall be identified by cable and submitted to the Construction Manager for each pull requiring use of a tensiometer.*
4. *Pulling fixtures shall be attached to cable strength members. If indirect attachments are used, the grip diameter and length shall be matched to the cable diameter and characteristics, and the pulling forces shall be reduced to ensure that the fibers or copper pairs are not damaged from forces being transmitted to the strength member.*
5. *Hand feed and guide cable through each 90-degree corner, through pull boxes, and as otherwise required for a free-flowing cable pull.*
6. *Cable installation methods shall not exceed the cable manufacturer's specified pull tension for the specific cable.*
7. *The mechanical stress placed upon a cable during installation shall be such that the cable is not twisted or stretched, nor shall the process kink or crush the cable.*
8. *A cable feeder guide shall be used between the cable reel and the face of the cable tray or conduit to protect the cable and guide it into the cable tray or conduit as it is played off the reel.*
9. *The Contractor shall hand feed and guide cable through each cable tray 90-degree corner and as required for a proper, free-flowing cable pull.*

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10. *The Contractor shall follow the manufacturer's installation instructions and its specifications for minimum bend radius; the bend radius shall not exceed the manufacturer's minimum bend radius*

11. *Cable fill shall not exceed NEC standard.*

H. Communication room entry

1. *BACKBONE (updated/additional information) covered in (see section) 2.1.7, see service loop; wall mounted*

2. *Backbone cable runs shall be routed on the upper tier of overhead ladder racking where there are multiple tiers. Contactor shall confirm these locations prior to installing cable.*

3. *Optical fiber cable shall be routed from the conduit or cable tray entry point in communication rooms or equivalent spaces in the room tray system without innerduct (when transitioning into room from installed in conduit/tray), but in combed and tied bundles to the termination locations.*

4. *Copper cable shall be routed from the conduit or cable tray entry point in communication rooms or equivalent spaces in the room tray system without innerduct, but in combed and tied bundles to the termination locations.*

5. *Cable being routed through communications rooms shall be installed in innerduct or conduit.*

6. *Demarcation backbone cable bundles (copper and fiber) are the exception, which are to run on lower tier. Store service loop at temet end pull box only above unless length of data backbone is in danger of exceeding cable limitation of 90 meters.*

I. Vertical Cable Runs

1. *When possible, use gravity to assist in cable pulling. Pull cable from top of run to bottom of run. After installation, the vertical tension on the cable shall be relieved at maximum intervals of 20 feet using a split support grip.*

2. *The Contractor shall provide sufficient tools, equipment, and manpower at required pull points to prevent damaging cables.*

J. Backbone Service loops of at least 10 meters in length shall be provided at both ends of each cable and at every Maintenance Hole (MH) in OSP applications. For communication rooms, provide a minimum of one lap around the cable tray.

K. Cable shall not be twisted, kinked, crushed, stretched, split, scarred, or otherwise damaged. Inspect cable jacket carefully for defects as cable is played off the reel. Protect cable from contaminants and physical damage at all times.

L. All strands of fiber optic cables shall be terminated to patch panels unless indicated otherwise in the drawings. All pairs of UTP copper cables shall be terminated to patch panels or 110 blocks.

M. Fiber optic cable and UTP copper cables shall be 100% usable after installation, termination, and testing. Replace defective or damaged cables and terminations with new at no additional cost to the Port. Repair splicing of damaged cables is not permitted.

N. Cable Preparation and Breakout: Cables shall be dressed and routed at termination points. Cables shall be combed and each strand shall run parallel with the other strands. After combing and straightening strands, Contractor shall separate strands into bundles according to routing requirements and termination points. Bundles shall be secured with hook-and-loop cable strap material specified in Part 2 – Products of this section. Cable ties of hard polymer material shall not be used.

O. Cables run in cable runways in communications rooms shall be fastened with nylon cable ties or Velcro at intervals of 3 feet. Do not pinch cables or use mechanical cable tie "guns".

P. Splices and Intermediate Terminations: Cables shall be run continuous between termination points shown on the drawings and shall be spliced only where indicated. Intermediate terminations or splices for the convenience of pulling or to repair a damaged or defective cable shall not be made. Where branch cables are spliced to backbone cables, branch cables shall enter the shelf splice and backbone cables shall enter the shelf termination. The subunit(s) of the backbone cable to be spliced shall route through the shelf terminations in a manner that provides the best protection of the subunit and the least interference with access to the other fiber strands. Obtain the Facilities and Infrastructure and ICT's approval (in written submittal) of which subunit(s) to splice and of the routings through shelves prior to splicing or terminating the cable.

Q. Routing of any metallic media cabling such as voice, data or coaxial in the same conduit as power conductors is not allowed.

R. Cabling in ceiling interstice (i.e. - between false ceiling and structure) shall be one of the following:

1. Riser or plenum rated when cable is installed in metallic conduit or fully enclosed metal tray. Plenum rating is optional in this case.

2. Plenum rated when cable is installed in open tray, ventilated tray, or ladder tray, or otherwise exposed.

3. Cabling in areas with open ceilings (like bagwell) shall be Plenum rated.

3.07 CABLE TERMINATION

A. Optical fiber cable termination

1. Optical fiber terminations shall be made by personnel trained and certified by the manufacturer of the fiber and connectors and shall

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be installed using the appropriate tool kit and equipment approved by manufacture.

2. *ALL Optical fiber shall be terminated in duplex LC connectors and fusion spliced for connectors unless noted or approved (in writing) otherwise. Existing environments with SC duplex coupler bulkheads; update to LC quad plex connectors; CommScope P/N 1695790-4 Fiber Optic Adapter, LC quad, flanged, blue*
3. *Final direction of fiber connector type will be determined by Telecommunications Review Team (TDR).*
4. *Optical fiber connectors shall not exceed manufacturer's acceptable loss budget.*
5. *Contractor shall fusion splice fiber optical pigtails onto ALL CIBS MDR to ER fiber optical cabling.*
    a. *Fusion splice loss of single mode fiber shall be no more than 0.3 dB per fusion splice.*

B. *Category 5e and/or 6/6a cable termination*

1. *Terminated cables shall meet the required performance with no degradation due to termination.*
2. *Category 6/6a cables (Data backbone) shall be terminated in RJ45 female plugs or information outlets at the field ends in T568B configuration. Field termination of male ends will not be accepted, nor will it pass proper Link testing.*
3. *Category 5e 25 pair cables shall be terminated 110-block units in T568B configuration.*

3.08 SEISMIC JOINT PENETRATIONS

A. *When conduit or pathway penetrates a building expansion joint, the Contractor shall furnish and install a seismic coupling.*

3.09 FIRE AND SMOKE PARTION PENETRATIONS

A. *The Contractor shall install cables so as to maintain the fire and smoke spread-rating of all building surfaces penetrated. Materials and methods specified under Section 07 84 00 Firestopping shall be used.*

3.10 FIELD QUALITY ASSURANCE

A. *The Contractor shall perform inspections per Section 27 05 13 - General Communications Requirements.*

B. *The Contractor shall perform horizontal cable testing as part of the field quality assurance for this Work.*

C. *The Construction Manager may arrange for interim inspections by a manufacturer's representative as conditions deem necessary.*

3.11 SYSTEM PERFORMANCE

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A. Fiber Optic Cable and Terminations: The maximum attenuation of each fiber strand, not including terminations, shall be no greater than the manufacturer's specified maximum attenuation for the cable. The maximum attenuation of a mated pair of connectors shall be no greater than the manufacturer's specified average attenuation of a mated pair of connectors plus 0.3 dB. The maximum attenuation of a fiber strand, terminated at both ends, shall be no greater than the actual measured attenuation of the fiber strand plus the manufacturer specified average attenuation of the mated connectors plus 0.5 dB. The average attenuation of all connectors on a fully terminated cable shall be no greater than the manufacturer's specified average attenuation of the mated connectors.

B. UTP Copper Cable and Terminations: The UTP copper system, including cables and terminations, shall meet the requirements of TIA-568-B, including all applicable addenda and service bulletins.

3.12 GENERAL REQUIREMENTS FOR BACKBONE CABLING TESTING

A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform specified testing.

B. Prior to testing the cable, the Contractor shall verify that the components and systems being tested have been installed in accordance with the Contract Documents.

C. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test

D. Test results are required to be submitted to the Port of Seattle before any network switch or network device activation will occur. This to ensure the entire cable channel meets all industry and manufacturer requirements.

E. Cable testing shall be completed by the Contractor and accepted by the Construction Manager as a condition of Substantial Completion.

3.13 BACKBONE CABLE TEST PLAN

A. The Contractor shall submit a general backbone cable test plan to the Construction Manager for review and approval 20 working days prior to the start of on-site cable installation Work, and 20 working days prior to pre-installation optical fiber reel testing.

B. Contractor is responsible to re-certify existing infrastructure when re-installed, re-located, and ALL existing infrastructure in immediate location to be operational prior to system acceptance, and at no additional cost to the Port

C. The test plan shall include:

1. Schedules for the following:

a. Optical fiber pre-installation reel testing by the Contractor

b. Optical fiber terminated cable testing by the Contractor, by area

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c. Copper cable terminated cable testing by the Contractor, by area

d. Release of optical fiber and copper cables for acceptance testing by the systems contractor or POS.

2. The test plan shall include a list of the test equipment to be used by the Contractor, including model number of sample test reports and wave forms, manufacturer training certificates for technicians operating test equipment and calibration certificates, for approval by the Construction Manager prior to the start of testing. Test equipment shall have the latest firmware upgrades installed prior to testing. Port-specified test equipment shall be as follows:

a. Recommended tester is Fluke DTX or approved Level 5 test meter equivalent.

b. A Tier 1 Optical Loss Tester (OLT) shall be used to produce test results. The OLT is used to certify the fiber optical terminations as warrantable.

(1) An OTDR shall not be used to record link loss and shall only be used as a troubleshooting tool.

(2) Recommended tester is Fluke DTX or approved Level 5 test meter equivalent.

c. Optical Loss Tester (OLT). The Contractor shall submit the OLT model number and calibration certificates to Construction Manager for approval prior to testing.

d. Unshielded twisted pair (UTP) cable tester. The Contractor shall submit UTP cable tester model number and calibration certificates to Construction Manager for approval prior to testing.

(1) Recommended tester is Fluke DTX or approved Level 5 test meter equivalent.

3. Summary of the tests that are to be performed by the Contractor, and the test results that are to be submitted.

D. Backbone cable test results - submittals

1. The Contractor shall provide test results in hard copy and soft copy format. The format, content, and graphic scales shall be submitted to the Construction Manager for approval prior to performing tests.

2. Contractor shall furnish to the Construction Manager the licensed software required to view electronic copies of test results.

3. Final testing shall use Port of Seattle cable naming convention in all test records.

4. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.

5. *Test results are required to be submitted to the Port of Seattle before any network switch or network device activation will occur. This to ensure the entire cable channel meets all industry and manufacturer requirements.*

3.14 OPTICAL FIBER PRE-INSTALLATION REEL TESTING

A. The Contractor shall compare factory test data with data obtained by conducting a pre-installation reel test as follows.

B. The Contractor shall pre-test single mode fiber at 1310/1550 nm.

C. Dual-pulse Function. A fiber shall be tested at a single wavelength with two pulse widths.

D. Two traces shall be displayed, one for each pulse width. (The short pulse provides optimal event resolution, while the longer pulse provides excellent distant measurements.)

3.15 OPTICAL FIBER TERMINATED CABLE

A. The Contractor shall test fiber with launch and receive cables in both ways and record measurements for the following:

1. *Link loss. The one-way backbone link loss shall be less than 2.0 dB, measured at either 1310nm or 1550nm.*
2. *Fiber attenuation (dB/km)*
3. *Splice and connector loss*
4. *Reflectance and optical return loss*
5. *Length*

B. Optical fiber cable shall comply with the following singlemode standards:

1. *ANSI 2136.2*
2. *EIA-440-A*
3. *Fiber optic test procedure (FOTP) FOTP-8 (TIA/EIA-455-8)*
4. *FOTP-61 (TIA/EIA-455-61-A)*
5. *FOTP-77 (TIA/EIA-455-77)*
6. *FOTP-78 (TIA/EIA-455-78A)*
7. *FOTP-95 (TIA/EIA-455-95)*
8. *FOTP-171 (TIA/EIA-455-171)*
9. *TIA/EIA-455-B*
10. *TIA/EIA-526*

3.16 CATEGORY 5 AND/OR 6/6a TERMINATED CABLE TESTING

A. The Contractor shall test and record measurements for the following:

1. *TIA Category 6/6a per TIA addendum #1 to TIA/EIA-568B*

2. *IEEE 802.3 1000 Base-T*

B. *Category 6 terminated cable shall comply with the following standards:*

1. *Category 6/6a per Addendum #1 to TIA/EIA-568-B*
2. *ISO/IEC 11801, Class C and D*
3. *ANSI INCITS 263 (TP-PMD)*
4. *IEEE 802.3 (for 10BASE-T, 100BASE-TX, and 1000BASE-T)*
5. *IEEE 802.5*

C. *The Contractor shall use Level 5 permanent link adapters on test equipment.*

1. *Recommended test unit:*
   a. *Fluke DTX*
   b. *Approved Level 5 test unit*

D. *The following Category 6/6a test results shall be submitted*

1. *Line Map*
2. *Cable Length*
3. *Attenuation*
4. *Cross Talk*
5. *Return Loss*
6. *Propagation Delay*
7. *Delay Skew*

E. *Refer to POS "Communications System Standards Design Principles" for Acceptance Testing.*

3.17 POST-INSTALLATION TESTING

A. *General: Perform post-installation tests on fiber optic cables and terminations, and on UTP copper cables and terminations as required by the Systimax Solutions Systimax or others extended warranty programs.*

B. *Final testing shall use Port of Seattle cable naming convention in all test records.*

C. *Third Party Testing: The Port may use an Independent Cable Test contractor for independent testing of the fiber optic cable and UTP copper system in addition to the testing required by the installation Contractor. This independent testing is not included in the Work of this contract. Coordination with the Port and the Independent Cable Test contractor is required as Work of this contract and shall be required as follows:*

1. *The Contractor shall notify the Construction Manager when terminated cables have passed the tests necessary to satisfy the requirements of the Systimax Solutions extended warranty program.*

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2. *The Port will schedule an Independent Cable Test contractor thereafter. It is anticipated that testing by this contractor will closely follow the progress by the Contractor. The Contractor shall coordinate with and assist the independent Cable Test contractor to the maximum extent possible.*

3. *Cables and terminations found by the Independent Cable Test contractor to be damaged, defective, improperly installed, or that fail to meet performance requirements shall be remedied by the Contractor to the satisfaction of the Construction Manager, and shall be retested by the Contractor to meet the Systimax Solutions extended warranty program requirements, at no additional cost to the Port.*

3.18 LABELING AND COLOR CODES

A. Identification, labeling, and product color selection shall comply with Section 27 05 53 - Identification and Labeling, Section 27 05 53.13 – Communications Standard for Labeling and Nomenclature, and Section 27 05 53.23 - Port of Seattle Color Code Requirements.

End of Section 27 13 00

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

01/29/2015 Revised Sole Source

01/23/2017 Incorporated ICT specifications

01/01/2022 Added fusion splice requirements; added test report timeline; clarified pull requirements, testing requirements and timeline, ER room requirements.

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-1.09 Quality Assurance (CommScope/ Systimax items; covered in updated standard)
-1.11 Warranty (covered in updated standard -CommScope/ Systimax)
-Part 2 Measurement and Payment

4.1B 27 15 00 HORIZONTAL CABLING (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of "Horizontal Cabling" Work is shown in the Contract Documents. The Work of this section includes the construction, test, documentation, and warranty of a fiber optic cable, unshielded, twisted-pair (UTP) copper horizontal cabling and RG-11 Coaxial cable in accordance with the specifications and Drawings.

B. This Work specified in this section includes installation of horizontal cabling for Port wide installations. For this Work, the Contractor shall:

1. Provide optical fiber horizontal cable and associated accessories.

2. Provide UTP horizontal cable and associated accessories.

3. Provide RG-11 Coaxial cabling

4. Termination

5. Conduct testing.

C. Definitions For Port Of Seattle Infrastructure

1. Refer to Section 27 05 13 –General Communication Requirements, sections: 1.02.A.1, 1.03.A and 1.03.B

1.02 RELATED WORK

A. As related Work, the Contractor shall:

1. Provide horizontal pathway materials and construct pathways, as described in Section 27 05 28 -Communication Pathways; reference applicable horizontal pathway options

B. Work performed by other contracts:

1. Work required to be completed by others prior to the Work in this section may include the following:

a. Construction of horizontal cable with end and patch panel termination and placement of conduit and overhead cable trays.

b. Placement of open frame racks in communication rooms and equivalent locations available for horizontal wiring accessories and cable termination.

2. Work that will be typically performed by the Port of Seattle after the Work described in this section is substantially complete will include the following:

a. Installation of optical fiber and UTP jumpers and patch cords for backbone cross connects and network port connections:

(1) Between backbone cable patch panel ports and electronic equipment.

(2) Between horizontal cable patch panel ports and electronic equipment.

(3) *Call the Port of Seattle Service Desk at 206-787-3333 to schedule Port of Seattle staff support of horizontal system connections.*

1.03 SCOPE OF WORK

A. The Contractor shall provide materials and labor required to deliver a complete horizontal cable system as indicated on the Contract Drawings, schedules, and these Specifications.

B. This Work shall include, but may not be limited to, the following tasks. The Contractor shall:

1. Provide horizontal optical fiber cable that is pre-installation tested, correctly installed and terminated, and Contractor-tested prior to final acceptance testing by the systems contractor.

2. Provide horizontal data and voice and audio-related copper cable that is correctly installed and terminated, and Contractor-tested prior to final acceptance testing by the systems contractor.

3. Provide RG-11 Coaxial cable, install, terminate and test.

4. Provide patch panels, termination blocks, face plates and end point termination devices to enable the termination and identification of the horizontal cable system.

5. Install Contractor-furnished cable devices and accessories, such as patch panels, in racks installed by other contracts and in racks provided by the Contractor.

C. Label devices, cables, and ports per Section 27 05 53 - Identification and Labeling and enter data in the cable management system. The Port may elect to enter data into the Port cable management system based on data from the Contractor. This does not alleviate the Contractor from their responsibility to provide personnel to manage cable management system such as maintaining Excel spreadsheets of all necessary installed cable data.

1. Conduct testing on horizontal cabling per Port of Seattle specifications.

1.04 GOVERNING CODES, STANDARDS AND REFERENCES

A. American National Standards Institute (ANSI):

B. Telecommunications Industry Association/Electronics Industries Alliance (TIA/EIA):

1. EIA-440-A (Current Edition): Optic Fiber Terminology

2. TIA/EIA 455-B, Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting and Terminating Devices and other Fiber Optic Components

3. FOTP-78 (TIA/EIA-455-78A) (Current Edition): Fiber Optic Test Procedure 78 - Spectral Attenuation Cutback Measurement for Single-Mode Optical Fibers

4. *TIA/EIA 455-B (Current Edition): Standard Test Procedures for Fiber Optic Cable Fibers, Cables, Transducers, Connecting and Terminating Devices*
5. *TIA/EIA-526 (Current Edition): Standard Test Procedures for Fiber Optic Systems*
6. *TIA/EIA-568-B (Current Edition): Commercial Building Communications Cabling Standard, with addenda*
7.

C. *National Fire Protection Association (NFPA):*

1. *NFPA 70 National Electrical Code (NEC)*

D. *Underwriters Laboratories (UL)*

1. *UL 910 – Test Method for Fire and Smoke Characteristics of Electrical and Optical Fiber Cables Used in Air-Handling Spaces.*
2. *UL 1666 – Standard Test for Flame Propagation Height of Electrical and Optical Fiber Cables Installed Vertically in Shafts.*
3. *ANSI/TIA/EIA-569-A – Commercial Building Standard for Communications Pathways and Spaces.*
4. *ANSI/TIA/EIA-598-A – Optical Fiber Cable Color Coding.*
5. *ANSI/TIA/EIA-606 – The Administration Standard for the Communications Infrastructure of Commercial Buildings.*
6. *ANSI/TIA/EIA-607 – Commercial Building Grounding and Bonding Requirements for Communications.*
7. *TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.*

E. *Codes and Regulations:*

1. *National Electrical Code (NEC) Compliance: Comply with NEC as applicable.*
2. *Local Codes: Comply with state and local codes as applicable.*

1.05 SUBMITTALS

A. *Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.*

B. *Submittals shall include the following:*

1. *The Contractor shall provide the following technical submittals: If required in the scope of Work in Work Authorization.*

a. *Manufacturer's complete product data and specifications, with drawings as applicable for materials furnished by the Contractor.*

b. Horizontal cable testing results in hard and soft copy formats.

c. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.

d. Results of pre-installation optical fiber reel tests for Construction Manager review and approval.

e. Conduit and cable tray fill plan indicating initial cable fill percentages and the use of innerduct. The plan may be submitted by installation area if this method is more effective.

f. Shop drawings and single-line schematic diagrams showing final device placements, cable groups, termination details and cross-connections.

g. Contractor's test plan for the required optical fiber and metallic (copper) cable tests.

h. Requests for inspections and substantial completion inspection for acceptance testing by the Port-designated test contractor.

i. Final as-built horizontal wiring drawings and documentation per Port of Seattle standards.

2. The Contractor shall provide the following administrative submittals:

a. Certification that the cable will be installed by a Washington state Systimax Solutions-certified value-added reseller or installation contractor.

b. Documentation that termination crafts-people are properly trained for optical fiber termination and testing, and high-performance data cable termination and testing. Documentation may be from a technical school, manufacturer's school, or labor union training.

c. Discrepancy report describing existing horizontal cable, equipment, and rack conditions that would affect the ability of the Contractor to successfully complete the Work.

d. Systimax Solutions 25-year approved warranty on the completed Systimax Solutions portions of the horizontal cable system.

e. Warranty documentation on non-Systimax Solutions products.

1.06 CABLE MANAGEMENT SYSTEM DATA ENTRY

A. Contractor to provide as-built labeling information to Port of Seattle within two (2) weeks of project completion.

B. Data Entry provided to the Port of Seattle: Data shall be provided in a consistent and accurate manner in a format approved by the Engineer. Data provided shall include, but not be limited to:

1. Tabular nomenclature data for spaces, pathways, cables and termination hardware.

2. Diagrammatic drawings and data for spaces, pathways, cables and termination hardware.

3. Status data for installation, tests, defects, and corrections.

1.07 PROJECT CONDITIONS

A. Verification: Obtain specific cable lengths and location of racks and equipment by field measurement and by Contractor's shop drawings after contract award. Do not vary from the routes indicated in the drawings without prior approval from the Construction Manager.

1.08 QUALITY ASSURANCE

A. Manufacturer's Recommendations: Install items per manufacturer's recommendations. Recommendations shall include, but not be limited to, cable handling, bending, and pulling requirements or limits; termination methods and materials; and use of specific tools and disposables.

B. Tests: Perform tests as specified in Part 3 – Execution of this section.

1.09 DELIVERY, HANDLING, AND STORAGE

A. Materials shall be delivered in original packages with labels intact and identification clearly marked.

B. Protect equipment and materials from foreign objects such as dirt, dust, paint, fumes, liquids, construction debris, and other contaminants. Protect from weather, humidity, temperature, and sunlight. Protect from physical damage.

C. Keep dust caps in place on patch panels and replace after testing. Protect 110 blocks with masking until construction is complete.

D. Equipment damaged prior to system acceptance shall be replaced with new at no additional cost to the Port.

E. Port-furnished Material: Port-furnished material will be made available to the Contractor at the airport logistics site. The Contractor shall be responsible for inspection, testing, or other verification of the condition of the materials upon receipt from the Port. By accepting materials from the Port, the Contractor warrants that said materials are free from defects. Remedy for subsequent discovery of damage or defects shall be the responsibility of the Contractor.

1.10 WARRANTY

A. General: Refer to Division 1 General Requirements for general warranty requirements.

B. Systimax Solutions Extended Warranty: In addition to the general warranty requirements, the fiber optic cable and UTP copper cable and termination hardware shall have an overall Systimax Solutions Systimax manufacturer's warranty for a period of 25 years covering the entire system as a whole. The warranty shall cover the cost of materials and labor for repair or replacement of cables and terminations due to defects in materials or installation. The Port shall receive a Systimax Solutions certificate of warranty for the project prior to final closeout.

C. Other approved manufacturer's warranty shall be equal to or greater than 25 years. The warranty shall cover the cost of materials and labor for repair or replacement of cables and terminations due to defects in materials or installation. The Port will expect a certificate of warranty for the project prior to final closeout.

PART 2 PRODUCTS

2.01 GENERAL

A. Horizontal cabling infrastructure shall be manufactured by Systimax Solutions, No Equal; any substitutions must be approved by Port of Seattle Telecommunications Review Team (TDR).

B. Products and materials shall be new and fit the intended purpose.

C. Damaged or defective products and components shall be replaced by the Contractor at no additional cost to the Port.

D. Cabling and termination hardware damaged prior to system acceptance shall be replaced by the Contractor at no additional cost to the Port.

E. Miscellaneous materials required for a complete and operational cabling system shall be provided by the Contractor.

F. All communication materials to be subjected to final approval via the Port of Seattle Telecommunications Review Team (TDR).

PART 3 EXECUTION

3.01 SCHEDULING AND COORDINATION

A. Scheduling of Work shall be coordinated with the Construction Manager and tenant representatives to minimize impact on operations and the traveling public.

B. Scheduling of cable installation shall be coordinated with other trades within the Contract and through the Construction Manager with trades working other projects.

3.02 SURVEY AND PREPARATION

A. The Contractor shall survey existing cable trays, conduit paths and routes, and report discrepancies and issues with the use of these for cable installation. Failure to perform this inspection and submit the report

holds the Contractor at cost risk for corrective actions and schedule impacts later in the Work.

B. Contractor shall be responsible for storage of all materials until installation.

3.03 INSTALLATION OF PULL STRINGS

A. The conduit/pathway installing contractor shall be responsible for installing a pull cord and true tape from end to end in every conduit, cable tray, and/or innerduct.

B. Pull strings shall be left in place.

C. In existing conduits or cable tray with existing pull strings, the Contractor shall replace used pull strings with new pull strings.

D. Pull strings are not required where conduit or innerduct fill is greater than 33% after installation of cable.

3.04 INSTALLATION OF PATCH PANEL AND ASSOCIATED DEVICES

A. The Contractor shall inspect patch panels, associated devices, and materials for compliance with these Specifications and with the Contractor's orders.

B. Patch panels and associated devices shall be installed according to manufacturer's instructions.

C. Patch panels and termination hardware shall be installed with matching mounting screws at each location.

3.05 GENERAL CABLE INSTALLATION

A. The system shall be installed to comply with all applicable standards, codes, and regulations. In general, where the specifications, drawings, standards, regulations, and codes conflict, the most stringent requirement shall apply; however, the Contractor shall notify the Construction Manager immediately of conflicts for determination of a resolution.

B. Cables shall be installed in conduits, raceways, pull boxes, cable trays, or cable runways as shown on the Drawings. No aerial or unsupported cables are permitted unless specifically indicated on the drawings and approved by Telecommunications Review Team (TDR).

1. Refer to Section 27 05 28 –Communication Pathways, PART 2 section 2.01

C. Horizontal cable shall be installed with no splices.

D. The Contractor shall protect cables from dirt and moisture by laying cables on a clean, new ground covering.

E. The Contractor shall inspect and clean as necessary existing and new cable trays and conduits to ensure that they are clean and free of obstructions prior to installing pull strings or pulling cable.

F. The Contractor shall not install damaged or defective cables or components. The Contractor shall carefully inspect cable jacket for defects as cable is pulled off the reel or box.

G. Cable Pulling:

1. Pull cable in accordance with manufacturer's recommendations and industry-accepted practices, and within the limits of cable bend radius and pulling tension specifications.

2. Use of pulling lubricants is not allowed on horizontal cable runs

3. Horizontal cables shall be hand pulled as required by manufacture.

4. Hand feed and guide cable through each 90-degree corner, through pull boxes, and as otherwise required for a free-flowing cable pull.

5. Cable installation methods shall not exceed the cable manufacturer's specified pull tension for the specific cable.

6. The mechanical stress placed upon a cable during installation shall be such that the cable is not twisted or stretched, nor shall the process kink or crush the cable.

7. A cable feeder guide shall be used between the cable reel and the face of the cable tray or conduit to protect the cable and guide it into the cable tray or conduit as it is played off the reel.

8. The Contractor shall hand feed and guide cable through each cable tray 90-degree corner and as required for a proper, free-flowing cable pull.

9. The Contractor shall follow the manufacturer's installation instructions and its specifications for minimum bend radius; the bend radius shall not exceed the manufacturer's minimum bend radius

10. Cable fill shall not exceed NEC standard.

H. Station cables and tie cables used in this project shall be routed at right angles to electrical power circuits and supported in accordance with the Contract Drawings.

I. Riser and tie cables extended between communication rooms shall use inter-floor conduit sleeves per Section 27 05 28 - Communication Pathways.

J. Use of ceiling tiles, grid, or hanger wires for support of cables shall be prohibited. Cable shall be installed in cable tray, cable runway, conduit, hangers, hooks, or other means of approved support.

K. Penetrations of fire zones shall be sealed to rating of the separation (1 hour, 2 hour, etc).

L. Routing of any metallic media cabling such as voice, data or coaxial in the same conduit as power conductors is not allowed.

M. Cabling in ceiling interstice (i.e. - between false ceiling and structure) shall be one of the following:

1. Riser or plenum rated when cable is installed in metallic conduit or fully enclosed metal tray. Plenum rating is optional in this case.

2. Plenum rated when cable is installed in open tray, ventilated tray, or ladder tray, or otherwise exposed.

N. Communication room entry -Horizontal

1. Horizontal cable runs shall be routed on the lower tier of overhead ladder racking where there are multiple tiers. Contactor shall confirm these locations prior to installing cable.

2. Optical fiber cable shall be routed from the conduit or cable tray entry point in communication rooms or equivalent spaces in the room tray system without innerduct (when transitioning into room from installed in conduit/tray), but in combed and tied bundles to the termination locations. Service loops of at least 10 meters in length shall be stored in destination end pull box only.

3. Copper cable shall be routed from the conduit or cable tray entry point in communication rooms or equivalent spaces in the room tray system without innerduct, but in combed and tied bundles to the termination locations. Service loops of up to 10 meters in length shall be stored in destination end pull box only. Exception on length is the necessity to maintain Data cable limitation of 90 meters.

O. All strands of fiber optic cables shall be terminated to patch panels unless indicated otherwise in the drawings. All pairs of UTP copper cables shall be terminated to patch panels with high count (25pr. and above) to 110 blocks.

P. Fiber optic cable and UTP copper cables shall be 100% usable after installation, termination, and testing. Replace defective or damaged cables and terminations with new at no additional cost to the Port. Repair splicing of damaged cables is not permitted.

3.06 VERTICAL CABLE RUNS

A. When possible, the Contractor shall use gravity to assist in cable pulling; cable shall be pulled from the top of the run to the bottom of the run.

B. The Contractor shall provide sufficient tools, equipment, and manpower at required pull points to prevent damaging cables.

C. After installation, the vertical tension on the cable shall be relieved at maximum intervals of 20 feet using a split support grip or hook-and-loop straps.

3.07 SERVICE LOOPS (APPLICATIONS OUTSIDE OF COMMUNICATION ROOM)

A. At the information outlet the Contractor shall provide service loops 24 inches in length minimum, or as indicated on the Contract Drawings, for outlet locations in back boxes.

B. At locations using surface mount boxes, service loops shall be placed in locations indicated on the Contract Drawings or per Construction Manager's instructions.

C. The Contractor shall provide service loops of up to 10 meters at destination end pull boxes, such as prior to entering a demarcation enclosure, or as indicated on the Contract Drawings.

D. Service loops shall not be smaller than the minimum bend radius of the cable.

E. See section 3.5.N for service loop direction at communication rooms.

3.08 CABLE DRESSING

A. Cables shall be neatly dressed and routed at termination points.

B. Cables shall be combed and each cable shall run parallel with the other cables.

C. Bundles shall be secured with hook-and-loop strap material.

D. Cable ties manufactured from a hard polymer material, such as plastic or nylon, shall not be used.

E. The Contractor shall begin to bundle and strap cables within 2 inches of exit from conduit, and bundles shall have cable straps applied at intervals not greater than 12 inches for entire length of vertical and horizontal run in communications closets.

3.09 CABLE TERMINATION

A. Optical fiber cable termination

1. Optical fiber terminations shall be made by personnel trained and certified by the manufacturer of the fiber and connectors and shall be installed using the appropriate tool kit and equipment approved by manufacture.

2. All environments to accept Systimax LC duplex connectors.

3. Any existing environments that are not LC shall seek solutions approved solutions from the Telecom Design Review team (TDR)

4. Optical fiber connectors shall not exceed manufacturer's acceptable loss budget.

B. Category 6/6a cable termination

1. Terminated cables shall meet the required performance with no degradation due to termination.

2. Category 6/6a cables shall be terminated in RJ45 female plugs or information outlets at the field ends in T568B configuration. Field termination of male ends will not be accepted, nor will it pass proper horizontal Link testing.

3. Category 6/6a cables shall be terminated in patch panel units in T568B configuration.

3.10 SEISMIC JOINT PENETRATIONS

A. When conduit or pathway penetrates a building expansion joint, the Contractor shall furnish and install a seismic coupling.

3.11 FIRE AND SMOKE PARTION PENETRATIONS

A. The Contractor shall install cables so as to maintain the fire and smoke spread-rating of all building surfaces penetrated. Materials and methods specified under Section 07 84 00 Firestopping shall be used.

3.12 FIELD QUALITY ASSURANCE

A. The Contractor shall perform inspections per Section 27 05 13 - General Communications Requirements.

B. The Contractor shall perform horizontal cable testing as part of the field quality assurance for this Work.

C. The Construction Manager may arrange for interim inspections by a manufacturer's representative as conditions deem necessary.

3.13 SYSTEM PERFORMANCE

A. Fiber Optic Cable and Terminations: The maximum attenuation of each fiber strand, not including terminations, shall be no greater than the manufacturer's specified maximum attenuation for the cable. The maximum attenuation of a mated pair of connectors shall be no greater than the manufacturer's specified average attenuation of a mated pair of connectors plus 0.3 dB. The maximum attenuation of a fiber strand, terminated at both ends, shall be no greater than the actual measured attenuation of the fiber strand plus the manufacturer specified average attenuation of the mated connectors plus 0.5 dB. The average attenuation of all connectors on a fully terminated cable shall be no greater than the manufacturer's specified average attenuation of the mated connectors.

B. UTP Copper Cable and Terminations: The UTP copper system, including cables and terminations, shall meet the requirements of TIA-568-B, including all applicable addenda and service bulletins.

C. ICT Data Center designs may require more current and stringent horizontal infrastructure standards which will be addressed on the Engineer documents.

3.14 GENERAL REQUIREMENTS FOR HORIZONTAL CABLING TESTING

A. The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform specified testing.

B. Contractor is responsible to re-certify existing infrastructure when re-installed, re-located, and ALL existing infrastructure in immediate location to be operational prior to system acceptance, and at no additional cost to the Port

C. Prior to testing the cable, the Contractor shall verify that the components and systems being tested have been installed in accordance with the Contract Documents.

D. An approved Level 5 test meter for copper and fiber is required

1. Tier 1 Optical Loss Tester (OLT) shall be used to produce test results

2. Recommended test unit is a Fluke DTX or approved equivalent

E. Cable testing shall be completed by the Contractor and accepted by the Construction Manager as a condition of Substantial Completion.

3.15 HORIZONTAL CABLE TEST PLAN

A. The Contractor shall submit a general horizontal cable test plan to the Construction Manager for review and approval 20 working days prior to the start of on-site cable installation Work, and 20 working days prior to pre-installation optical fiber reel testing.

B. The test plan shall include:

1. Schedules for the following:

a. Optical fiber pre-installation reel testing by the Contractor

b. Optical fiber terminated cable testing by the Contractor, by area

c. Copper cable terminated cable testing by the Contractor, by area

d. Release of optical fiber and copper cables for acceptance testing by the systems contractor

2. The test plan shall include a list of the test equipment to be used by the Contractor, including model number of sample test reports and wave forms, manufacturer training certificates for technicians operating test equipment and calibration certificates, for approval by the Construction Manager prior to the start of testing. Test equipment shall have the latest firmware upgrades installed prior to testing. Port-specified test equipment shall be as follows:

a. Optical Loss Tester (OLT). The Contractor shall submit the OLT model number and calibration certificates to Construction Manager for approval prior to testing.

b. Unshielded twisted pair (UTP) cable tester. The Contractor shall submit UTP cable tester model number and calibration certificates to Construction Manager for approval prior to testing.

(1) Recommended tester is a Fluke DTX or approved equivalent.

3. Summary of the tests and test results performed by the Contractor and submitted to the Port for review.

C. Horizontal cable test results - submittals

1. The Contractor shall provide test results in hard copy and soft copy format. The format, content, and graphic scales shall be

submitted to the Construction Manager for approval prior to performing tests.

2. *Contractor shall furnish to the Construction Manager the licensed software required to view electronic copies of test results.*
3. *Final testing shall use Port of Seattle cable naming convention in all test records.*
4. *Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.*
5. *Test results are required to be submitted to the Port of Seattle before any network switch or network device activation will occur. This to ensure the entire cable channel meets all industry and manufacturer requirements.*
6. *An Optical Time Domain Reflectometer (OTDR) shall not be used to record link loss and shall only be used as a troubleshooting tool*

3.16 OPTICAL FIBER PRE-INSTALLATION REEL TESTING

A. The Contractor shall compare factory test data with data obtained by conducting a pre-installation reel test as follows.

B. The Contractor shall pre-test singlemode fiber at 1550 nm in one direction.

3.17 OPTICAL FIBER TERMINATED CABLE TESTING

A. The Contractor shall test and record measurements for the following:

1. *Optical Power*
2. *Link loss. Testing shall considt of a bidirectional, dual wave length end to end test. The system loss measurements shall be provided at 1310 and 1550 nm..*
3. *Fiber attenuation (dB/km)*
4. *Splice and connector loss*
5. *Reflectance and optical return loss*
6. *Length*

B. Optical fiber cable shall comply with the following singlemode standards:

1. *ANSI 2136.2*
2. *EIA-440-A*
3. *Fiber optic test procedure (FOTP) FOTP-8 (TIA/EIA-455-8)*
4. *FOTP-61 (TIA/EIA-455-61-A)*
5. *FOTP-77 (TIA/EIA-455-77)*
6. *FOTP-78 (TIA/EIA-455-78A)*
7. *FOTP-95 (TIA/EIA-455-95)*

8. *FOTP-171 (TIA/EIA-455-171)*
9. *TIA/EIA-455-B*
10. *TIA/EIA-526*

C. *Optical fiber cable shall comply with the following multimode standards:*

1. *ANSI 2136.2*
2. *FOTP-77 (TIA/EIA-455-77)*
3. *FOTP-171 (TIA/EIA-455-171)*
4. *TIA/EIA-568-A*

3.18 CATEGORY 6/6a TERMINATED CABLE TESTING

A. *The Contractor shall test and record measurements for the following:*

1. *TIA Category 6/6a per TIA addendum #1 to TIA/EIA-568B*
2. *IEEE 802.3 1000 Base-T*

B. *Category 6/6a terminated cable shall comply with the following standards:*

1. *Category 6 per Addendum #1 to TIA/EIA-568-B*
2. *ISO/IEC 11801, Class C and D*
3. *ANSI INCITS 263 (TP-PMD)*
4. *IEEE 802.3 (for 10BASE-T, 100BASE-TX, and 1000BASE-T)*
5. *IEEE 802.5*

C. *The Contractor shall use Level 5 permanent link adapters on test equipment.*

1. *Recommended test unit*
   a. *Fluke DTX*
   b. *approved Level 5 test unit*

D. *Refer to POS "Communications System Standards Design Principles" for Acceptance Testing.*

3.19 POST-INSTALLATION TESTING

A. *General: Post-installation tests on fiber optic cables and terminations, and on UTP copper cables and terminations as required by the Systimax Solutions Systimax or others extended warranty programs.*

B. *Final testing shall use Port of Seattle cable naming convention in all test records.*

C. *Third Party Testing: The Port may use an Independent Cable Test contractor for independent testing of the fiber optic cable and UTP copper system in addition to the testing required by the installation Contractor. This independent testing is not included in the Work of this contract.*

Coordination with the Port and the Independent Cable Test contractor is required as Work of this contract and shall be required as follows:

1. *The Contractor shall notify the Construction Manager when terminated cables have passed the tests necessary to satisfy the requirements of the Systimax Solutions extended warranty program.*
2. *The Port will schedule an Independent Cable Test contractor thereafter. It is anticipated that testing by this contractor will closely follow the progress by the Contractor. The Contractor shall coordinate with and assist the independent Cable Test contractor to the maximum extent possible.*
3. *Cables and terminations found by the Independent Cable Test contractor to be damaged, defective, improperly installed, or that fail to meet performance requirements shall be remedied by the Contractor to the satisfaction of the Construction Manager and shall be retested by the Contractor to meet the Systimax Solutions extended warranty program requirements, at no additional cost to the Port.*

3.20 LABELING AND COLOR CODES

A. Identification, labeling, and product color selection shall comply with Section 27 05 53 - Identification and Labeling, Section 27 05 53.13 – Communications Standard for Labeling and Nomenclature, and Section 27 05 53.23 - Port of Seattle Color Code Requirement.

End of Section 27 15 00

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 & revisions

01/29/2015 Revised Sole Source

01/23/2017 Incorporated ICT specifications

01/01/2022 Added recertification requirement, cable testing requirements added.

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-1.08 Quality assurance- Items related to Contractor Qualifications for Systimax
-Part 2 Measurement and Payment

4.1 Fiber Backbone

This section is not completed but does have supporting clarifications to documents in 4.1A and 4.1B when available

4.1.1 Singlemode Fiber Backbone

This section shall be built out in future updates

4.1.2 Multimode Fiber Backbone

This section shall be built out in future updates

- 62.5 retired May of 2024; slated for demo

4.1.3 120 Minute/2-Hour Survivable Fiber Backbone

Note:

- Refer to (see section) 8.4.1 MOU for 2-Hour Survivable Cable Infrastructure for more information

4.2 Copper Backbone -Analog/Voice Service

This section shall be built out in future updates and shall describe all backbone copper, limited to legacy voice/analog circuits and air-ground radio distribution

4.2.1 CAT5e

25pr. and above

4.2.2 CAT3

25pr. and above

4.3 Copper Backbone -Other Services

This section shall be built out in future updates

4.3.1 DAS Public Cellular

This section shall be built out in future updates

4.3.2 800MHz Port Radio/emergency

This section shall be built out in future updates

4.4 Fiber Horizontal

This section shall be built out in future updates

4.5 Copper Horizontal

This section shall cover all copper horizontal infrastructure placed to serve field devices and hardware. For our data Category 6 and 6A media, note the total distance limit set at 270-feet as explained in (see section) 2.2.1 Room Design- Understanding size, amount, and locations. There shall be no expectation of a service loop for all copper horizontal in communication space beyond the navigation necessary on lower ladder rack to travel to proper termination rack or cabinet(s)
Under review and consideration: The two (2) copper horizontal per device.

4.5.1 Category 6A Horizontal

Currently, CAT6A is mainly only utilized for all Port Wireless internet services. *May* be used in ICT data center distribution

- Orange jacketed cable
- Orange colored information modules (data jacks)

4.5.2 Category 6 Horizontal

CAT6 is utilized for most all horizontal distribution to all devices and hardware with the above noted exceptions under CAT6A

- Red jacketed cable
- Red colored information modules (data jacks)

4.5.3 120 Minute/2-Hour Survivable Copper Horizontal

Meets code to service area of elevator refuge intercoms only. Rated at around a CAT5 performance. No data expectations beyond intercoms

- Refer to (see section) 8.4.1 MOU for 2-Hour Survivable Cable Infrastructure for more information

4.5.4 Extended Reach Copper Horizontal

At times adding a communication space may be too costly for a few standard horizontal copper data cables when the distance exceeds the 270-foot limit set herein these standards. CommScope offers a product (GigaREACH XL Extend Category 6) that may fit the role. The usage of this cable infrastructure must be reviewed via the Telecom Design Review process and approved by all necessary stakeholders. This is a category 6 cable that shall have an extended reach as noted below:

- 1 Gbps/90 W up to 150m (most common option that could be considered)
- 100 Mbps/90 W up to 200m

- 10 Mbps/90 W up to 250m
    - CommScope warrants the above performance though the SYSYTIMAX applications assurance warranty
    - Available in Plenum, LSZH, and outdoor solutions

4.5.5 600v Category 6A requirements and locations

In some cases, a 600v rated ethernet cable must be used. This has come up on the SEA campus for parts of the SCADA system and locations such as placing inside our exterior light poles when running copper horizontal to camaras or wireless access points. Due to the nature of this industrial rated ethernet cable type's performance, consideration to data applications on passenger loading bridges and security gates should also be considered. For the purpose of standardization, only CAT6A shall be utilized.

Installation method shall be as follows or wherever applicable on outdoor installs:

- Maintain equal to or less than 90m for entire assembled cable (destination to source)
- Run 600v rated cable from exterior destination equipment or hardware to junction box at facility
- Terminate cable to a POE surge protector
- Transition to CommScope/Systimax CAT6A for the cable run to the source end termination in a copper patch panel within communication space

The usage of this cable infrastructure must be reviewed via the Telecom Design Review process and approved by all necessary stakeholders. Approved cable options are noted below:

- LUTZE MOTIONFLEX ETHERNET TPE, P/N A1040030
- BELDEN DataTUFF, P/N IEA004
- Or approved equal
    - Defining characteristics beyond CMR-CMX Outdoor 600v CAT6A rated:
        - Industrial ethernet
        - Suitable for repetitive movement, flexing and torsional stress
        - Sunlight resistant
        - Maintain cable outside diameter at 0.322-inch or less
        - Typical jacket color of Aqua
    - If Plenum is required, part numbers will change, but noted sources, or others, currently carry options

4.5.6 Retired Copper Horizontal

Information provided to support identification in field if discovered

- Yellow colored information modules (data jacks) at (wall) outlet
    - Equals CAT6 (red jacketed cable) terminated to a 110 voice block in communication room
        - These may be reallocated to data copper patch panels on a reviewed case-by-case basis

        - Terminate to red module, re-test, and re-label
        - No expectation of warranty due to age
- Blue colored information modules (data jacks) at outlet
    - Equals CAT5e (blue jacketed cable) terminated to a 110 voice block in communication room
        - Update to new CAT6 (or current standard) as able

PART 5- DESIGN STANDARDS- COMMUNICATION ADMINSTRATION

ATTENTION:

This section is NOT completed to reflect this latest standard format. As you will see, these sections present themselves more as a specification and will need to migrate over to match this standard format in pending updates. The legacy formatted "Standard" for 27 05 53.13 LABELING AND NOMENCLATURE, 27 05 53.23 COLOR CODE REQUIREMENTS, *and* 27 05 53 IDENTIFICATION AND LABELING is placed directly below and noted in *ITALICS* with the original numbering scheme for those documents.

Immediately following the legacy referenced standards of (27 05 53.13, 27 05 53 23, and 27 05 53) are the most notable and applicable communication media updates or changes that may not be clear in 27 05 53.13, 27 05 53.23 and 27 05 53 versions.

This section shall be fully updated following the Part 4 update. Media (cable) questions or clarifications required? Please reach via email to avcommittees@portseattle.org / Subject Line: "COMM Standards Support -ADMIN"

5.1A 27 05 53.13 LABELING AND NOMENCLATURE (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of "Communications Standard for Labeling and Nomenclature" Work is shown in the Contract Documents. This section includes the label formatting and structure requirements, and is intended to work in conjunction with Port of Seattle specification Section 27 05 53 - Identification and Labeling and TIA-606 "The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings".

1.02 GOVERNING CODES, STANDARDS AND REFERENCES

A. TIA-606 "The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"

B. Table "Termination Hardware" TIA-606

1.03 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.

1.04 ELEMENTS REQUIRING LABELS

A. The following elements of the telecommunications infrastructure shall require identifiers and labels:

1. Spaces

a. A telecommunications space shall refer to any area used for housing the installation and termination of telecommunications equipment and cable. Telecommunications spaces include, but are not limited to, entrance facilities, racks and cabinets, equipment rooms, work areas and hand holes.

2. Pathways

a. A pathway shall refer to the facility or element used for the placement of telecommunications cable. Examples of pathways include cable tray, conduit and innerduct.

3. Cabling

a. Cabling shall include all fiber and copper conductor media used for the transmission of voice, video and data signals. Examples of cable includes, backbone, tie and horizontal cables and jumpers.

4. Termination Hardware

a. Termination hardware refers to the discrete point or element where telecommunications conductors are terminated. Termination hardware includes but is not limited to patch panels, punch down blocks, interconnections units, voice/data jacks and protector panels.

5. Splices

a. A splice is any joining of fiber or copper conductors in a splice enclosure meant to be permanent.

6. Grounding System

a. Grounding system elements include but are not limited to bonding conductors and grounding busbar.

1.05 TELECOMMUNICATIONS IDENTIFIERS

A. Spaces "sp"

1. Space labels shall take the following form: [sp.fczz.nnnnn]

a. "sp" represents the unique space code as identified in section 1.05.A.2.

b. "fc" represents the Port of Seattle (POS) facility code as identified in section 1.06.

c. "zz" represents the level in the particular facility as identified in section 1.07.

d. "nnnnn" represents a (5) five digit sequence number.

2. Space Codes "sp"

MD	*Main Distribution room*
SD	*Secondary Distribution room*
ER	*Equipment Room*
TC	*Telecommunications Closet*
EQ	*Equipment Rack or Cabinet*
EF	*Entrance Facility*
WF	*Wall Field*
WA	*Work Area*
HH	*Handhole*
MH	*Maintenance hole*
JB	*Junction Box (access to wiring/splice)*
JT	*Junction - cable Tray*
PB	*Pull Box*

3. Space Label General Application Notes

a. Main distribution room sequence numbers shall be unique. All other sequence numbers shall restart with each level of the facility.

b. For Equipment Racks and Cabinets (space type EQ) located in a room a five digit number (ABCDE) shall be determined as follows:

(1) A: Is determined by the last digit of the room sequence number in which the rack or cabinet is located. For equipment racks or cabinets not within a room, "A" shall be represented by a "0"

(2) BC: Is the row designator for the room

(3) DE: Is the sequence designator for the row.

c. For Wall Fields (space type WF) located in a room, a seven digit number (ABCDE.pp) shall be determined as follows:

(1) *A: Is determined by the last digit of the room sequence number in which the rack or cabinet is located. For wall fields not within a room, "A" shall be represented by a "0"*

(2) *BC: Is the wall designator for the room (note that most rooms have 4 sides).*

(3) *DE: Horizontal position of the wall field*

(4) *pp: Vertical position of the wall field.*

d. Additionally, a suffix ".pp" shall be appended to ABCDE to designate vertical position within the wall field. Example: ABCDE.pp

e. For Existing cable vaults, man holes or handholes, use the existing name if available.

B. Pathways "ptw"

1. Pathway labels shall take the following form: [ptw.fc.nnnnn]

a. "ptw" represents the unique pathway code as identified in section. 1.05.B.2.

b. "fc" represents the POS facility code as identified in section 1.06.

c. "nnnnn" represents a (5) digit sequence number.

2. Pathway Codes "ptw"

a. CDB ConDuit Backbone

b. CDO ConDuit Other

c. CTB Cable Tray Backbone

d. CTO Cable Tray Other

e. CDT ConDuit Telecom

f. CTT Cable Tray Telecom

g. DDO innerDuct Other

h. DDT innerDuct Telecom (for fabric, add ".F#" num/#= cell count)

i. SLT SLeeve Telecom

3. Pathway Label Application Notes

a. For a pathway occupying two or more facilities use the facility code "fc" with the majority of the run in it.

C. Cables "cb"

1. Cable labels shall be identified by two or three text lines, as illustrated below.

27 05 53.13 Labeling & Nom.

a. Composite (multimode and singlemode) Backbone Cables: The POS cable management system treats composite cable as if each cable type were an individual cables.

(1) 1st text line: cb.st.fc.nnnnn.ss (1st cable type)

(2) 2nd text line: cb.st.fc.nnnnn.ss (2nd cable type)

(3) 3rd text line: sp.fczz.nnnnn-sp.fczz.nnnnn (from- to)

b. Non-composite Backbone Cables:

(1) 1st text line: cb.st.fc.nnnnn

(2) 2nd text line: "Blank"

(3) 3rd text line: sp.fczz.nnnnn-sp.fczz.nnnnn (from- to)

c. Horizontal Cables:

(1) 1st text line: cb.st.fczz.nnnnn

(2) 2nd text line: "Blank"

(3) 3rd text line: sp.fczz.nnnnn-th.fczz.nnnnn (from- to)

(4) "cb" represents the cable type code identified as follows in section 1.05.C.2.

(5) "st" represents the cable subtype code identified as follows in section 1.05.C.3.

(6) "fc" represents the POS facility code identified as follows in section 1.06.

(7) "zz" represents the level in the particular facility identified as follows in section 1.07.

(8) "nnnnn" represent a (5) five digit sequence number

(9) "ss" represents the composite cable sub-subtype identified as follows in section 1.05.C.4.

2. Cable Type Codes "cb"

a. CB Copper cable Backbone

b. FB Fiber cable Backbone (also used for composite fiber cable Backbone)*

c. CH Copper cable Horizontal

d. FH Fiber cable Horizontal (also used for composite fiber cable Horizontal)

e. CO Copper cable Other

f. FO Fiber cable Other (also used for composite fiber cable Other)*

*g. * Indicates cable types that require a unique sequence number*

27 05 53.13 Labeling & Nom.

3. *Cable Subtype Codes "st"*
   - a. *XM** composite cable*
   - b. *M6** Multimode, 62.5 Micron fiber cable*
   - c. *M5* Multimode, 50 Micron fiber cable*
   - d. *SM Single mode, Matched clad*
   - e. *SD Single mode, Depressed clad*
   - f. *SA Single mode, Allwave*
   - g. *UT Uncategorized unshielded Twisted pair*
   - h. *U3 category 3 Unshielded twisted pair*
   - i. *U5 category 5 Unshielded twisted pair*
   - j. *U6 category 6 Unshielded twisted pair*
   - k. *ST Shielded Twisted pair*
   - l. *CX Co-axial copper cable*
   - m. *MU Unshielded multi-conductor copper cable*
   - n. *MS Shielded multi-conductor copper cable*
   - o. *RX Radiating Coax*
   - p. *US Universal Station cable*
   - q. *FX Fiber station cable*
   - r. *JS fiber Jumper, Simplex*
   - s. *JD fiber Jumper, Duplex*
   - t. *CC Copper cross Connect*
   - u. *WC Wireless Coax*
4. *Composite Cable Sub-Subtype Codes "ss"*
   - a. *M5* Multimode, 50 Micron fiber cable*
   - b. *M6** Multimode, 62.5 Micron fiber cable*
   - c. *SM Single mode, Matched clad*
   - d. *SD Single mode, Depressed clad*
   - e. *SA Single mode, Allwave*

   (*) Limited use

   (**) Retired; slated for demo
5. *Cable Label General Application Notes*
   - a. *Backbone or riser cables do not require the level "zz" code; all other cables require it*

b. *For a cable occupying two or more facilities (or levels), use the facility "fc" and level "zz" where the cable originates or where most of the cable resides.*

D. *Termination Hardware "th"*

1. *Termination hardware labels other than cross connects shall take the following form: [th.fczz.nnnnn]*

   a. *""th" represents the unique space code identified as follows in para. 1.05.D.2.*

   b. *"fc" represents the POS facility code identified as follows in section 1.06.*

   c. *"zz" represents the level in the particular facility as identified in section 1.07.*

   d. *"nnnnn" represent a (5) five digit sequence number.*

2. *Termination Hardware Codes "th"*

   a. *AT Antenna*

   b. *CD Copper Data jack*

   c. *FD Fiber Data jack*

   d. *CV Copper Voice jack*

   e. *FV Fiber Voice jack*

   f. *CU Copper Universal Outlet*

   g. *PP Protector Panel*

   h. *TV Video*

   i. *CM Intercom*

   j. *VP Voice Paging*

3. *Cross connect termination hardware labels shall take the following form: [t.stc.fczz.nnnnn.nn]*

   a. *t" represents the cross connect type code identified as follows in section 1.05.D.4.*

   b. *"stc" represents the cross connect subtype code as identified in section 1.05.D.5.*

   c. *"fczz.nnnnn is determined by the rack or cabinet where the termination hardware resides.*

   d. *"nn" represents the (2) two digit sequence position within the rack or cabinet. The numbers shall be determined by labeling the equipment in sequential order starting at the top of the rack or cabinet.*

4. *Cross connect type code "t"*

   a. *Main cross connect*

b. Intermediate cross connect

c. Horizontal cross connect

5. Cross connect subtype code "stc"

a. CPP Copper Patch Panel (RJ45)

b. CPB Copper Punchdown Block (66, 110)

c. FPP Fiber optic Patch Panel

d. FSS Fiber Splice Shelf

e. XPP hybrid Patch Panel with copper RJ45 and fiber optic ports

f. FIU Fiber optic Interconnection Unit

g. CES Network Switch

h. CXP Coaxial Patch Panel

i. CPT CoPper Terminal block/strip

j. FCS Fiber optic Combination Shelf splice/termination or interconnection unit

E. Splices "sc"

1. Splice labels shall take the following form: [sc.fczz.nnnnn]

a. "sc" represents the unique splice code identified as follows in section. 1.052.E.2.

b. "fc" represents the POS facility code identified as follows in section 1.06.

c. "zz" represents the level in the particular facility identified as follows in section 1.07.

d. "nnnnn" represent a (5) five digit sequence number.

2. Splice Codes "sc"

3. CS Copper Splice

4. FS Fiber Splice

F. Grounding System "gs"

1. Grounding system labels shall take the following form [gs.fczz.nnnn]

a. ""gs" represents the unique grounding system code identified as follows in para. 1.05.F.2.

b. "fc" represents the POS facility code as identified in section 1.06.

c. "zz" represents the level in the particular facility identified as follows in section 1.07.

d. "nnnnn" represent a unique (5) five digit sequence number.

2. Grounding System Codes "gs"

BC	*Bonding Conductor*
EG	*Equipment bonding conductor*
GB	*Grounding Busbar*
TG	*Telecom. Grounding busbar*
TM	*Telecom. Main grounding busbar*

1.06 Facility Codes "fc" - 2 characters as required for POS facility

MT	*Main Terminal*
AD	*Admin Building*
OT	*Office Tower*
PT	*Parking Terminal*
AF	*(International) Arrivals Facility*
CA	*Concourse A*
CB	*Concourse B*
CC	*Concourse C*
CD	*Concourse D*
NC	*N Concourse (NS legacy nom. North Satellite)*
SC	*S Concourse (SS legacy nom. South Satellite)*
CT	*Central Terminal*
NZ	*North Toll Plaza*
RC	*Rental car Facility*
A4	*Air Cargo 4*
EX	*Exterior*

1.07 Facility Level Codes "zz" 2 digits as required for POS facility

A. MT Main Terminal

00	*Utility Tunnel*
01	*Transit (STS)*

02	*Interstitial Space / GTX Tunnel*
03	*Baggage Claim*
04	*Bridge*
05	*Ticketing (Concourse)*
06	*Mezzanine*
07	*Mechanical Penthouse*

B. AD Administration Building

00	*Ground*
01	*Not Used*
02	*Second Floor*
03	*Third Floor*
04	*Fourth Floor*
05	*Fifth Floor*
06	*Sixth Floor*
07	*Seventh Floor*
08	*Eighth Floor*
09	*Ninth Floor*

C. AD Office Tower

06	*Mezzanine*
07	*Office Level 1*
08	*Office Level 2*
09	*Office Level 3*
10	*Office Level 4*
11	*Office Level 5*
12	*Penthouse Level*

D. PT Parking Terminal

00	*Basement*

01	*First Floor*
02	*Second Floor*
03	*Third Floor*
04	*Fourth Floor*
05	*Fifth Floor*
06	*Sixth Floor*
07	*Seventh Floor*
08	*Eighth Floor*
09	*Ninth Floor*

E. CA Concourse A

01	*Transit (STS)*
02	*Interstitial Space*
03	*Baggage Claim*
04	*Ramp/Bridge*
05	*Concourse (Ticketing)*
06	*Mezzanine*
07	*Mechanical Penthouse*

F. CB Concourse B

01	*Transit (STS)*
03	*Ramp*
05	*Concourse*
07	*Mechanical Penthouse*

G. CC Concourse C

01	*Transit (STS)*
03	*Ramp*
05	*Concourse*

07	*Mechanical Penthouse*

H. CD Concourse D

01	*Transit (STS)*
03	*Ramp*
05	*Concourse*
07	*Mechanical Penthouse*

I. NC /NS N Concourse (Satellite)

01	*Transit (STS)*
03	*Ramp*
05	*Concourse*
07	*Mechanical Penthouse*

J. SC /SS S Concourse (Satellite)

00	*Tunnel (Basement)*
01	*Transit (STS)*
02	*Mezzanine (FIS)*
03	*Ramp*
04	*International Corridor*
05	*Concourse*
07	*Mechanical Penthouse*

K. CT Central Terminal

01	*Transit (STS)*
03	*Baggage Claim*
04	*Bridge*
05	*Concourse (Ticketing)*
06	*Mezzanine*

07	*Mechanical Penthouse*

L. NZ North Toll Plaza

01	*Floor 1*
02	*Floor 2*

M. RC Rental Car Facility

01	*Ground Level*
02	*Floor 2*
03	*Floor 3*
04	*Floor 4*
05	*Floor 5*

N. AC Air cargo 4

01	*Grade Level*

O. EX Exterior location

01	*Grade Level*

PART 2 APPLICATION

2.01 Labeling products shall be applied to spaces, pathways, cables, termination hardware, splices, grounding busbars, and grounding conductors as indicated in the table below:

IDENTIFIER CATEGORY	***WHAT TO LABEL***	***PRODUCT TO USE***	***WHERE TO LABEL***	***HOW TO ATTACH***	***NOTES***
Space	*Entrance Facility (EF)*	*Phenolic space label*	*On backboard or wall in approved location*	*Screws*	
	Equipment Rack (EQ) for open relay racks	*Phenolic rack label and phenolic cabinet label*	*Rack label on front of top angle, centered horizontally.* *Cabinet label on front of self-supporting base angle,*	*Screws or metal rivets*	

			centered horizontally and low on base.		
	EQ for cabinets and enclosures	*Phenolic cabinet label*	*On front of all cabinet/enclosure doors, centered horizontally in door panel, 6" below top of door panel.*	*Screws or metal rivets*	
	WF for wall fields	*Phenolic*	*On wall, above wall field area.*	*Screws*	
	Equipment Room (ER), Main Distribution Room (MD), and Telecommunications Closet (TC)	*Phenolic space label*	*Above door on outside of room in approved location*	*Screws*	
	Handhole (HH) and Manhole (MH)	*Embossed, engraved, imprinted, or etched in cover*	*Integral to handhole or manhole cover*		*Submit method for approval*
	Pull Box (PB)	*Phenolic space label* *Pathway warning label*	*Space label: At top-front of outside of cover if cover is hinged; otherwise on body of box in approved location.* *Pathway warning label: At center of outside of cover if cover is hinged and on inside of box where visible; otherwise on body of box on outside and inside where visible*	*Space label: Screws* *Pathway warning label: Self adhesive*	
	Work Area (WA)	*None*			*Not applicable*
Pathway	*Conduit Backbone*	*Conduit label*	*Within 12" on both sides of penetrations, within 12" of box*	*Self-adhesive with clear overlay*	

	(CDB), Conduit Telecom (CDT)		*entry, at ends, at intervals of 25 feet*		
	Cable Tray Backbone (CTB), Cable Tray Telecom (CTT)	*Cable tray label* *Pathway warning label*	*Cable tray label: Within 12" of tray ends, within 12" of intersections (tees, etc.), within 12" on both sides of penetrations, at each floor level in risers, where entering/exiting risers, at intervals of 25 feet.* *Pathway warning label: At intervals of 25 feet for horizontal runs, at intervals of 6 feet for vertical runs.*	*Cable tray label: Self-adhesive with clear overlay* *Pathway warning label: Self-adhesive*	*Place where visible on bottom of tray for overhead tray, or on both sides of tray at specified intervals where bottom of tray is not easily visible.*
	Innerduct Telecom (DDT)	*Innerduct label*	*Within 12" of end of run, in boxes, in manholes, in handholes, at tray intersections, at end of tray runs, where entering/exiting trays, within 12" of penetrations, at each floor level in risers, where entering/exiting risers*	*Plastic cable tie*	
	Sleeve Telecom (SLT)	*Sleeve label*	*Depends on field conditions. May be similar to conduit label, innerduct label, phenolic label, or other approved type.*	*Depends on field conditions*	*Submit proposed method for approval*
Cable	*All backbone cables, tie cables, outdoor cables, and cables of O.D. greater than 0.28"*	*Cable tag*	*At each end of cable, in boxes*, handholes1, and manholes1, at cable tray intersections1, where entering/exiting tray1 or conduit1, where entering/exiting innerduct, and where entering/exiting ER1, MDR1, or TC1.*	*Plastic cable tie*	

	All other cables with O.D. of 0.28" or less.	*Cable label*	*At each end of cable, in boxes, handholes1, and manholes1, at cable tray intersections1, where entering/exiting tray1 or conduit1, where entering/exiting innerduct, and where entering/exiting ER1, MDR1, or TC1.*	*Self-adhesive with clear overlay*	
Termination hardware	*CD, FD, CV, FV, CU, PP, TV, CM*	*Jack label*	*Use labels supplied with, or compatible with faceplates*	*Slip-in or self-adhesive*	*Use slip-in when label has plastic label cover on faceplate. Use self-adhesive only when faceplate is not used or has no label provision*
Termination hardware	*CPP, CPB, FIU, FCS, FPP, XPP, FSS*	*Termination label*	*For 110 blocks: Label block using label supplied with, or compatible with block. Label with block number and label all pairs.* *For RJ45 patch panels: Label patch panel using label supplied with, or compatible with patch panel. Label with patch panel number and label patch ports with outlet number on front, and label 110 terminations with outlet number on back.*	*Slip-in or self-adhesive* *Slip-in or self-adhesive*	*For all terminati on types:* *Use color-coded terminati on labels per color coding standards of TIA-606.*

			For fiber optic patch panels and protector panels: Label panel on front of cover and on inside of housing with panel number. Label protector panel positions with cable number(s) and pair(s).	*Slip-in and self-adhesive*	*Submit proposed products and labeling method for approval.*
Splice	*Type CS*	*Wire tag*	*Within 6" of splice*	*Small plastic wire tie through pair twist*	
	Type FS	*As provided with or compatible with splice connector*	*Label splice block, cables, and pairs*	*Slip-in or self-adhesive*	*Submit proposed products and methods for approval*
	Type FCG, FCN, FWG, FWN	*Cable tag*	*Attached to closure or on cable within 6" of closure*	*Plastic cable tie*	*Obtain approval of attach-ment location*
	Type FCS, FSS	*Termination label*	*Label enclosure on front of cover and on inside of housing.*	*Self-adhesive*	
Grounding system	*BC, EG*	*Cable label*	*At each end of conductor, in boxes*, handholes1, and manholes1, at cable tray intersections1, where entering/exiting tray1 or conduit1, where entering/exiting innerduct, and where entering/exiting EF1, ER1, MDR1, or TC1.*	*Self-adhesive with clear overlay*	
		Ground warning	*Within 3" of each end of conductor, at any tee splice*	*Plastic cable tie*	

	GB, TG, TM	*Cable tag*	*Attached to busbar*	*Plastic cable tie*	

**If a conductor is within an innerduct or conduit that runs without interruption through these locations, the cable does not require a label at this location.*

PART 1 EXECUTION - NOT USED

End of Section 27 05 53.13

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

02/07/2017 Incorporated Office Tower Facility code

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-Part 2 Measurement and Payment

5.1B 27 05 53.23 COLOR CODE REQUIREMENTS (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of "Port of Seattle Color Code Requirement" Work is shown in the Contract Documents. Section includes: Products and requirements for color coding cables for the Port of Seattle's Communications Infrastructure.

1.02 HORIZONTAL CABLE COLOR CODE SYSTEM

*A. The color code system for fixed cable plant, 4-pair horizontal cables shall be per **Table 17190B-1:***

TC/IC TERMINATION TYPE	***CABLE TYPE***	***CABLE COLOR***	***OUTLET TYPE***	***OUTLET COLOR***	***GENERAL USAGE***	***USE FOR NEW CONSTR.***
RJ45 Patch Panel	*Category 6*	*Red*	*RJ45*	*Red*	*Data/ Universal*	*Yes*

1.03 COPPER AND FIBER JUMPER CORD COLOR CODE SYSTEM

*A. The jacket color for copper and fiber jumper cords shall be per **Table 17190B-2:***

CABLE TYPE	***CABLE JACKET COLOR***
Singlemode Fiber	*Yellow*
Multimode Fiber	*Orange*
Multimode Fiber (used for DDC support system)	*Gray with Brown marker tape*
Cat 5 and 5e	*Blue*
Category 6	*Red*
Category 6a	*Orange*
Category 7	*Lilac*
Coax / RF (1/2" diameter or greater)	*Black jacket with Green marker tape**
Coax / RF (1/2" diameter or less)	*White jacket with Green marker tape**
Coax / CATV	*Black jacket with White marker tape**
Coax / CCTV	*Black jacket*
Coax / Wireless Systems (1/2" & 7/8" hardline plenum)	*Blue jacket*
Coax / Wireless Systems (1/2" & 7/8" hardline non-plenum)	*Black jacket*
Reserved	*Gray*
Reserved	*Green*
Special purpose	*Sable (Brown)*

Marker Tape Color. Black marker tape shall not be used to identify jumper cable purpose. Apply black marker tape as a background "color" when using a system identification marker tape of the same color as the jumper cable. Marker tape color shall be per **Table 17190B-3:*

27 05 53.23 Color Code Req.

SYSTEM TYPE	***SYSTEM***	***MARKER TAPE COLOR***
None	*None*	*Black (use for background contrast only)*
Passenger information systems	*Electronic information video display, voice messaging system*	*Blue*
Support systems	*Master clock, network management system, supervisory control and data acquisition, building management system*	*Brown*
Airline operational systems	*Common use terminal equipment, gate management, baggage reconciliation. Also, OPSLAN fiber jumpers.*	*Green*
Port of Seattle corporate airport systems	*Information Technology local area network, maintenance local area network*	*Gray*
Passenger service systems	*Common use self service*	*Orange*
Critical systems	*To be determined*	*Red*
Wireless access points	*All*	*Violet*
Voice systems	*Telephone, paging, intercom*	*White*
Tenant-owned systems	*All*	*Yellow*

1.04 COMMUNICATIONS INNERDUCT COLOR CODE SYSTEM

*A. The communications innerduct color shall be per **Table 17190B-4:***

27 05 53.23 Color Code Req.

INNERDUCT TYPE	*INNERDUCT COLOR*
Plenum	*White*
Riser	*Orange*
General purpose	*Orange*
Outdoor	*Orange*

1.05 COMMUNICATIONS CONDUIT COLOR CODE SYSTEM

A. POS has standardized on the following conduit color codes for communications systems. The color shall be applied with a clearly visible ring of paint on both ends of the conduit, in addition to the conduit connectors. The paint ring shall be 1" width, marked with oil-based primer and oil based paint.

SYSTEMS	*COLOR*	*FEDERAL STANDARD NO. 595A COLOR CODE*
Tel/Data	*Orange*	*32473*
Security/Intercom /Access Control	*Pink*	*31638*
CATV	*White*	*37886*
CCTV	*Green*	*34138*
Paging	*Brown*	*30140*
Controls	*Black*	*37038*

End of Section 27 05 53.23

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

27 05 53.23 Color Code Req.

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

02/07/2017 Added ~~START~~ review comments [Telecommunications Review Team (TDR)]

01/01/2022 Removed references to 110 Block

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-Part 2 thru 4 vacant (not used) on previous version

5.1C 27 05 53 IDENTIFICATION AND LABELING (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

A. The extent and location of "Identification and Labeling" Work is shown in the Contract Documents. Section includes: Products and requirements for cable and equipment Identification and labeling for the Port of Seattle's Communications Infrastructure.

B. General: Label all spaces, pathways, cables, termination hardware, terminations, ground buses, and ground conductors using the Port of Seattle (Port) Section 27 05 53.13 - Communications Standard for Labeling and Nomenclature. See Part 3 – Execution of this section for application of label products. Coordinate specific label content and products with the Construction Manager prior to labeling. Coordinate labels with data entered in the Cable Management System.

1.02 SUBMITTALS

A. Submit materials data in accordance with of Section 01 33 00 - Submittals. Furnish manufacturers' technical literature, standard details, product specifications, and installation instructions for all products.

B. Submittals shall include the following:

1. Product data

2. Label Schedule

PART 2 PRODUCTS

2.01 GENERAL

A. Label product names used herein are coordinated with applicable product names used in the Section 27 05 53.13 - Communications Standard for Labeling and Nomenclature. Product names are generally categorized

herein but are not intended to limit the use of those products to that category only.

2.02 SPACE LABELS

A. Phenolic Space Label:

1. White core laminated phenolic plastic. White lettering on black background, same style throughout.

2. Single line of 5/8" high lettering, all capitals. Background to be 1.0" high, width as required. Leave minimum of 1" margin on left and right of text, text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".

B. Phenolic Rack Label:

1. White core laminated phenolic plastic. White lettering on black background, same style throughout.

2. Single line of 3/8" high lettering, all capitals. Background to be 3/4" high, width as required. Leave minimum of 1" margin on left and right of text, text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".

C. Phenolic Cabinet Label:

1. White core laminated phenolic plastic. White lettering on black background, same style throughout.

2. Single line of 1/2" high lettering, all capitals. Background to be 1.0" high, width as required. Leave minimum of 1" margin on left and right of text, text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".

2.03 PATHWAY LABELS

A. Pathway labels require a source/destination label only.

1. Source refers to MDR, ER, EQ, in that order.

2. Destinations are a description of device (WAP, camera), EQ name, room number, or grid line.

B. Refer to ICT infrastructure group for precise source/destination labeling.

C. Labeling nomenclature may be altered with an approval from Telecommunications Review Team (TDR).

D. Pathway labels shall be placed at all ends or breaks in conduit run such as communication rooms, cabinets pull boxes, maintenance holes, fire penetrations, etc. Label conduit every 25 feet on continuous runs.

E. Pull box (PB)labels shall not receive a unique name, but rather a grid line designation. Confirm that project drawings incorporate current, recognized gridlines, per F&I. Coordinate and confirm gridline labeling wit ICT infrastructure group

F. Conduit Label:

1. Label material: Water and chemical resistant material, "bright yellow" in color, ultraviolet (UV) resistant, suitable for indoor and outdoor use, permanent self-adhesive, suitable for use with indelible ink printing.

2. Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.

3. Lettering: One line of text, containing "source""destination", lettering per table below, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1". Size of font shall be as indicated under "Label size" below.

4. Label size: Label size and font size shall be determined by the application per the table below:

CONDUIT TRADE SIZE	TYP. LABEL SIZE (W X H)	MIN. FONT SIZE IN POINTS	ROWS OF TEXT	NOTES
½" & ¾"	3.00" x 0.50"	12	1	Source/Destination: Center all text on label (refer to figure 1 below)
1", 1-1/4" & 1-1/2"	4.00" x 0.75"	14	2	Same as above
2" and up	7.50" x 1.00"	20	2	Same as above

FIGURE-1 (example text)

MD.MT04.1 - ER.CB03.1

G. Cable Tray Label:

1. *Label material: Water and chemical resistant material, "bright yellow" in color, UV resistant, suitable for indoor and outdoor use, permanent self-adhesive, suitable for use with indelible ink printing.*
2. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*
3. *Lettering: Single line of lettering, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, 48 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "l" shall be distinct from the numeral "1".*
4. *Label size: Labels shall be 7.50" wide x 1.00" high.*

FIGURE-2 (example text)

CTT.MT.01234

H. Pathway Warning Label (refer to Figure 3):

1. *Typical placement is on closed cable trays, Backbone conduit entry/exit points within communication rooms and any other area(s) requested by the Port of Seattle*
2. *Label material: Water and chemical resistant material, "day-glow orange" in color, UV resistant, suitable for indoor and outdoor use, permanent self-adhesive.*

3. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*
4. *Label size: Labels shall be 5.0" wide x 4.0" high.*
5. *Lettering: Text style shall be equivalent to Windows™ TrueType™ Arial font. The word "WARNING" shall appear centered at the top of the label in 48-point bold, all capitals, centered horizontally. The body of the text shall be in 20-point normal and bold lettering, all capitals, left and right justified, and laid out with line breaks.*

FIGURE-3 (actual text)

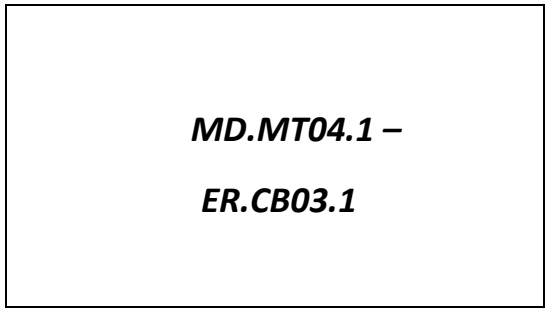
WARNING

THIS CABLE PATH IS A MANAGED RESOURCE OF THE PORT OF SEATTLE. UNAUTHORIZED CABLES MAY BE CUT AND REMOVED WITHOUT NOTICE. CALL PORT AV/NETWORK CONTROL AT 206-787-7638 (787-PNET) FOR INFORMATION OR TO REPORT PROBLEMS.

I. Innerduct Label:

1. *Label material: Data plate labels of polyester/polycarbonate composite material, semi-rigid non-adhesive film with excellent strength properties and flame resistance, water and chemical resistant, white in color, UV resistant, suitable for indoor and outdoor use, suitable for use with indelible ink printing, with two slot holes at each end for attachment using two plastic cable ties for each label.*
2. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*
3. *Lettering: Two lines of text, first line is "source –" field, final row is the "destination" field. Center all text on label (refer to figure 4 below). Text style shall be equivalent to Windows™ TrueType™ Arial font, 12 or 14 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".*
4. *Label size: Labels shall be 2.50" wide x 1.00" high.*

FIGURE-4 (example text)



2.04 CABLE AND WIRING LABELS

A. Cable Tag:

1. *Label material: Data plate labels of polyester/polycarbonate composite material, semi-rigid non-adhesive film with excellent strength properties and flame resistance, water and chemical resistant, white in color, UV resistant, suitable for indoor and outdoor use, suitable for use with indelible ink printing, with two slot holes at each end for attachment using two plastic cable ties for each label.*
2. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*
3. *Lettering: Two lines of lettering with line of text split at "from-to" hyphen with hyphen at end of 1st line, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, 14 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".*
4. *Label size: Labels shall be 2.00" wide x 0.75" high. Utilize two labels in series in order to achieve 4" overall width.*

B. Cable Label:

1. *Label material: Self-extinguishing and meets or exceeds 94V-0 flammability requirements, water and chemical resistant, white in color, UV resistant, suitable for indoor and outdoor use, suitable for use with indelible ink printing, self-adhesive with self-laminating overlap.*
2. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*

3. *Lettering: One, two or three lines of lettering per table below, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1". Size of font shall be as indicated under "Label size" below.*

CABLE TYPE (AS DEFINED IN "COMMUNICATIONS STANDARDS FOR LABELING AND NOMENCLATURE")	*FONT SIZE IN POINTS*	*ROWS OF TEXT*	*NOTES*
CB, CF, CO, CS, FB, FO and FT (Backbone) *Refer to Figure 5*	*9 to 14; size per CBL O.D.*	*2 or 3 as needed*	*Split line(s) of text after (each) cable. Last row to be "to-from" field*
CH and FH (Horizontal) *Refer to Figure 6*	*9*	*1*	*Wrap around label: Three lines of text, split first line at end of Conduit name, follow with "from –" field, final row is the "to" field. Center all text on label*

4. *Label size: Label size shall be 1.00" wide by 1.38" high with print-on area to be 2.00" wide by 0.50" high. Utilize two labels in series in order to achieve 2" overall width.*

FIGURE-5 (example text)

CB.U5.MT.01234

MD.MT04.1 - ER.CB03.1

Or

FB.SM.MT.01234

MD.MT04.1 - ER.CB03.1

FIGURE-6 (example text)

CH.U6.MT04.01234

ER.CB03.1 –
WA.CB05.GATE-01

C. Wire Tag:

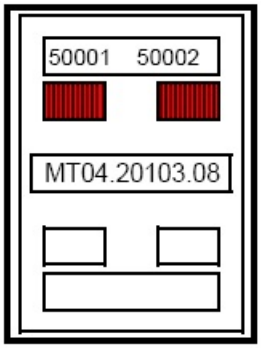
1. *Label material: Data plate labels of polyester/polycarbonate composite material, semi-rigid non-adhesive film with excellent strength properties and flame resistance, water and chemical resistant, white in color, UV resistant, suitable for indoor and outdoor use, suitable for use with indelible ink printing, with one pinfeed hole at each end that also is used to attach the label using one plastic cable ties for each label.*
2. *Ink: Indelible ink, black in color, resistant to UV radiation, abrasion, and chemicals.*
3. *Lettering: One line of lettering, all capitals, text to be centered horizontally on background, and text to be vertically aligned to miss pinfeed holes. Text style shall be equivalent to Windows™ TrueType™ Arial font, 10 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".*
4. *Label size: Labels shall be 3.00" wide x 1.0" high including pinfeed holes.*

2.05 TERMINATION HARDWARE LABELS

A. Jack Label:

1. *Label material: Use labels supplied with jack or compatible label. Submit proposed products for approval.*
2. *Ink: Black in color.*
3. *Lettering: One line of lettering, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, 10 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".*
4. *Label size: As required to fit label holder.*

FIGURE-7 (example text)



<Typical Information Outlet
2-Data (Category 6)

<Main Label: Destination of Data cables
Label as fczz.nnnnn.nn
<Blank inserts for future cable additions

B. *Termination Label:*

1. *Label material: Use labels supplied with termination hardware or compatible label. Labels shall be color coded per TIA-606 color-coding standards. Submit proposed products for approval.*
2. *Ink: Black in color.*
3. *Lettering: One line of lettering, all capitals, and text to be centered horizontally and vertically on background. Text style shall be equivalent to Windows™ TrueType™ Arial font, 10 point, bold face, black. The letter "O" shall be distinct from the numeral "0" and the letter "I" shall be distinct from the numeral "1".*
4. *Label size: As required to fit label holder.*

FIGURE-8 (example text for all below figures)

Copper Terminations-

110 BLOCK: HORIZONTAL Cables

30001	*30002*	*30003*	*30004*	*30005*	*30006*
30007	*30008*	*30009*	*30010*	*30011*	*30012*

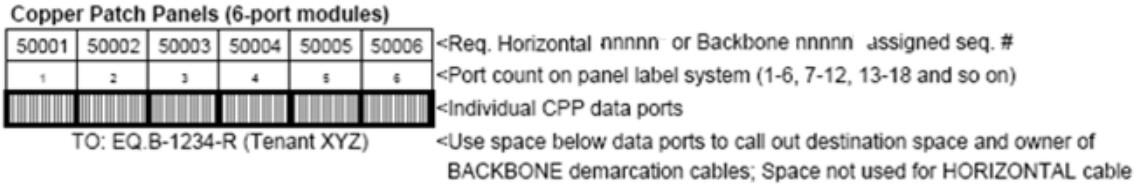
110 BLOCK: BACKBONE Cables

(1-25) CB.U5.MT.15001 *MD.MT04.1 - ER.CB03.1*	*(26-50) CB.U5.MT.15002* *MD.MT04.1 - ER.CB03.1*

(51-75) CB.U5.MT.15003 *MD.MT04.1 - ER.CB03.1*	*(76-100) CB.U5.MT.15004* *MD.MT04.1 - ER.CB03.1*

110 Block Notes:

1. *Continued on to end of block count, typically 100pr. or 300pr.*
2. *The (# - #) is pair count on block that the 25pr. cable is terminated to*



C. *Fiber Terminations*

1. *No figures currently available; seek Telecommunications Review Team (TDR) direction. Typical backbone layout is to attach a label as seen in Figure-5 which details cable name followed by To-From field. Attached to FPP lid on specific ports terminated to.*

2.06 GROUNDING SYSTEM LABELS

A. *Ground Warning: Ground warning tag, UV resistant legend printed on both sides, semi-rigid polyethylene material, 2.75" wide by 1.38" long, one attachment slot of 0.13" x 0.63", bright yellow background color, black lettering, text to read "WARNING, GROUND WIRE, DO NOT REMOVE".*

PART 3 EXECUTION

3.01 GENERAL

A. *Contractor shall ensure that spaces, pathways, cables, termination hardware, terminations, splices, grounding buses, and grounding conductors have been correctly installed prior to labeling and testing.*

B. Contractor shall supply labels, labeling equipment, and labor as required to create and apply labels as specified and per the Port of Seattle Section 27 05 53.13 - Communications Standard for Labeling and Nomenclature.

3.02 LABEL APPLICATIONS

A. Apply labels in accordance with the "Application" section of the Port of Seattle Section 27 05 53.13 - Communications Standard for Labeling and Nomenclature.

End of Section 27 05 53

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

01/29/2015 Revised Repeated Text

1/23/17 Incorporated ICT specifications

01/01/2022 Pathway Label requirement update

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-Part 4 Measurement and Payment

5.1 Color Codes

This section shall be built out in future updates; sec section 5.1B Color Codes

5.1.1 Pathways

- *This section shall be built out in future updates*

5.1.2 Cable

- *This section shall be built out in future updates*

5.1.3 Hardware

- Fiber Couplers
    - Singlemode -BLUE

  - APC (Limited Use/Video) -GREEN
  - Multimode 50 micron -AQUA
  - Multimode 62.5 micron (retired) -BEIGE
- Information Modules (data jacks)
  - Category 5/5e (retired) -BLUE
  - Category 6 -RED
    - Category 6 CABLE terminated to a 110 Block (practice retired) -YELLOW
  - Category 6A -ORANGE

5.2 Labeling and Nomenclature

This section shall be COMPLETELY built out in future updates; see sections 51.A and 51.C

5.2.1 Facilities identifiers

- *This section shall be built out in future updates*

5.2.1.1 Facility level codes

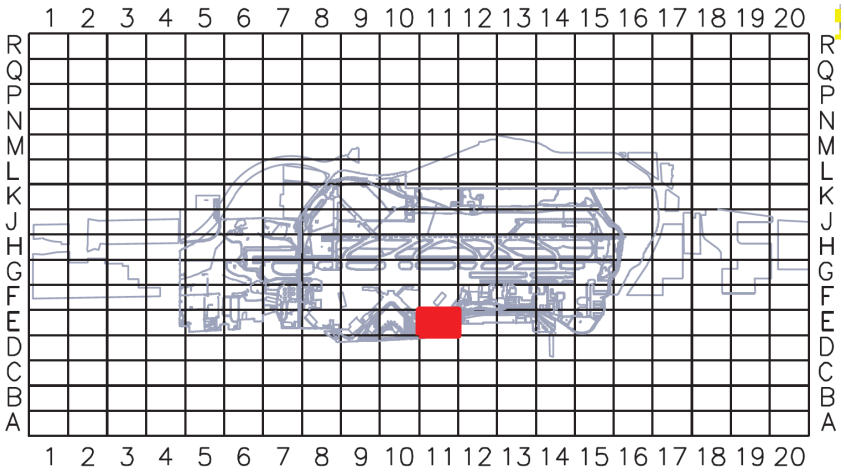
- *This section shall be built out in future updates*

5.2.1 Space designations

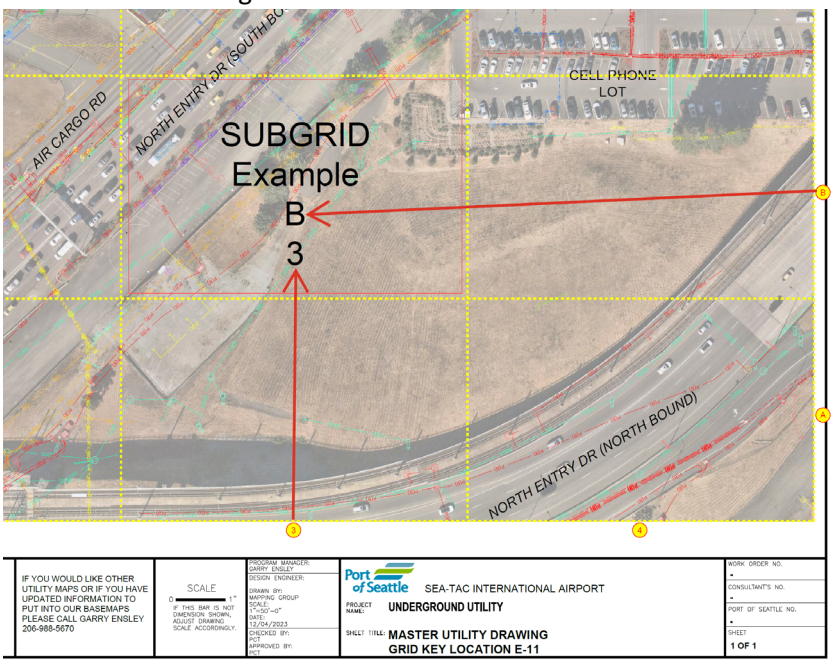
- *This section shall be built out in future updates*

5.2.2 Structure identifiers

- OSP Maintenance Holes (inc. MH, HH, and Vaults)
  - Build by utilizing the established Port Engineering Services EN Survey and Mapping Airport Utility Maps found here (see link [internal]):
    - S&M Library - _SPO_STIAGrid_Index_UTIL.pdf - All Documents (sharepoint.com)
  - **EXAMPLE:**
    - **CM.** =Comm
    - **E-11**. = Grid Key from Master Util. Dwg: All options based off starting point of established STIA grid system: -these maps are roughly 900ft x 1400ft



- **B3.** =<u>Subgrid method</u>: Breaks the 900ft x 1400ft area into sixteen (16) 225'x350' areas. We followed the same naming convention for letters and numbers starting from the southeast corner



- **05** = segment identifier
- Used to add a number assignment to a contiguous main duct bank system
    - **Provided by Facilities and Infrastructure Communication** at this time
    - Add a '-Letter' assignment for branches off any main segment (example "05-A")
    - File kept and maintained by F&I for all segment numbers (01 thru 99 avail.) and branch letters (-A thru -Z)
- *Full Nomenclature String for Example structure name:* **CM.E-11.B3.05**

- Structure Naming Recap; quick view:

```
XX.X-##.X#.##.#
|   |   || |  |
|   |   || |  └─ Designator letter branch ID (assigned by F&I)
|   |   || └──── Unique Ductbank num. system ID (assigned by F&I)
|   |   |└────── Subgrid (1-4, south to north, 350')
|   |   └─────── Subgrid (A-D, east to west, 225')
|   └─────────── EN Survey and Mapping Grid (900' x 1,400')
|                 _SPO_STIAGrid_Index_UTIL.pdf
└──────────────── Structure Type:
                    AF=Airfield Lighting
                    CM=Communication
                    MV=Medium Voltage (>1kV)
                    PW=Power (<1kV)
```

- Pull Box (PB)
  - *Pending an Update as*: Typically based off building Grid lines which are under review for updating sequence by F&I Architectural
- Junction Box (JB)
  - Same status as PB

5.2.3 Pathway identifiers

- *This section shall be built out in future updates*

5.2.4 Cable identifiers

- *This section shall be built out in future updates*

5.2.5 Hardware identifiers

- *This section shall be built out in future updates*

PART 6- DESIGN STANDARDS- SPECIAL SYSTEMS

Special Systems are *systems* that mainly align with a majority of CSI MasterFormat; Division 28 00 00 Electronic Safety and Security and 28 50 00 Specialized Systems. Exceptions, systems found in Division 27 00 00, are noted in footnotes within this (Part 6) section. The SEA goal for Special Systems is to treat any systems that resides on the communications infrastructure under one umbrella and review board, the Special Systems Committee and stakeholders.

ATTENTION:

This section is NOT completed to reflect this latest standard format. As you will see, these sections present themselves more as a specification and will need to migrate over to match this standard format in pending updates.

This section shall be fully updated following Part 5 updates. Special Systems questions or clarifications required? Please reach via email to avcommittees@portseattle.org / Subject Line: "COMM Standards Support -DIV28"

6.1A Links to all available Special Systems (Legacy formatted standard section)

- Security Standards 2020.zip
- Radio Frequency Standards 2005.zip
- Signage Standards 2025.zip (see VOL 1; Video display info)

6.1 SEA Security Systems

This section shall be built out in future updates, refer to link in 6.1A

6.1.1 Access Control System

This section shall be built out in future updates

6.1.2 Security Camera Systems

This section shall be built out in future updates

6.1.3 Perimeter Intrusion Detection System

This section shall be built out in future updates

6.2 SEA 800MHz RADIO (or radio systems)[2]

This section shall be built out in future updates, refer to link in 6.1A

6.3 Wireless Access Points (SEA wireless internet)[3]

This section shall be built out in future updates, refer to link in 6.1A

[2] Noted under Special Systems to align with SEA Standards allocation of all *systems* on Port communication infrastructure to reside in one place and under one review committee (Special Systems). Note that **Internal Cellular, Paging, and Antenna Systems** Specifications shall be placed in 27 53 19 per CSI MasterFormat; Division 27 Communications

[3] Noted under Special Systems to align with SEA Standards allocation of all *systems* on Port communication infrastructure to reside in one place and under one review committee (Special Systems). Note that the **Wireless Access Points** Specifications shall be placed in 27 21 33 per CSI MasterFormat; Division 27 Communications

6.4 SEA Audio System[4]

This section shall be built out in future updates, refer to link in 6.1A

6.5 SEA Video Systems[5]

This section shall be built out in future updates, refer to link in 6.1A

PART 7- COMMISSIONING, MAINTENANCE, and BEST PRACTICES

This section shall be built out in future updates to include commissioning and maintenance practices such as patching, room cleanliness, etc

Preferred commissioning process: (example of) F&I team turning over a new space: ARCH/Structural, MECH, ELEC, and COMM complete room review and punch list. Only then may space be turned over to all specific system stakeholders to begin their areas of infrastructure needs and installs

ATTENTION:

This section is NOT completed to reflect this latest standard format. As you will see, these sections present themselves more as a specification and will need to migrate over to match this standard format in pending updates. The legacy formatted "Standard" for 27 08 00 INFRASTRUCTURE COMMISSIONING is placed directly below and noted in *ITALICS* with the original numbering scheme for that document.

Immediately following the legacy referenced standard (27 08 00) are most notable and applicable pathway updates or changes that may not be clear in 27 08 00 version.

This section shall be fully updated following Part 6 updates. Commissioning questions or clarifications required? Please reach via email to avcommittees@portseattle.org / Subject Line: "COMM Standards Support -Cx"

7.1A 27 08 00 INFRASTRUCTURE COMMISSIONING (legacy formatted standard section)

PART 1 GENERAL

1.01 SUMMARY OF WORK

[4] Noted under Special Systems to align with SEA Standards allocation of all *systems* on Port communication infrastructure to reside in one place and under one review committee (Special Systems). Note that the **Audio-Video Systems** Specifications shall be placed in 27 41 00 per CSI MasterFormat; Division 27 Communications

[5] Noted under Special Systems to align with SEA Standards allocation of all *systems* on Port communication infrastructure to reside in one place and under one review committee (Special Systems). Note that the **Audio-Video Systems** Specifications shall be found in 27 41 00 per CSI MasterFormat; Division 27 Communications

A. The extent and location of "Communications Infrastructure Commissioning" Work is shown in the Contract Documents.

1.02 Definitions

A. Unshielded twisted pair cable (UTP cable)

B. The following UTP cable types shall be utilized for data and voice circuits:

1. Data circuits: 4-pair Category 6/6a (Cat 6/6a)

2. Voice circuits: 25-pair Category 5e (Cat 5e)

1.03 RELATED WORKS

A. Commissioning shall be completed for the following Work in this Contract:

Construction of cable trays and raceways, backboards, and other communications cabling equipment indicated in Section 27 05 28 - Communication Pathways, Section 27 13 00 - Backbone Cabling Requirements, and Section 27 15 00 - Horizontal Cabling.

1. Construction and testing of the backbone cable plant as indicated in Section 27 13 00 - Backbone Cabling Requirements.

2. Construction and testing of the horizontal cable plant as mandated in Section 27 15 00 - Horizontal Cabling Requirements.

3. Identification and Labelling as indicated in Section 27 05 53

4. Completion of cable administration documentation using the Cable Administration System as indicated in Section 27 13 00 - Backbone Cabling Requirements, and as mandated in Section 27 15 00 - Horizontal Cabling Requirements.

B. Commissioning shall include Work not performed under any contract, but required for completion and commissioning of Work in any specific contract.

1. Cable trays installed as required for backbone cable installation or extension.

2. Backbone cable elements installed and tested that are integrated with the cable system in this Contract.

3. Cable conduit, shafts, and communications rooms that are used to route and install backbone branch cable to communications rooms.

4. Branch cable installed between communications rooms and Security Master Plan assigned locations designated in this Contract.

5. Labeling done as required.

C. Port may contract with an independent test contractor for full commissioning and testing of Work performed under this contract.

1.04 INSPECTIONS AND TESTING

A. Inspection of the quality of Work completed is the primary commissioning tool for communications infrastructure.

B. Testing and documentation are the commissioning methods for communications cable plant and termination equipment.

C. Testing and documentation shall be executed per this section and other Division 27 Communications sections in this contract.

PART 2 PRODUCTS

2.01 SUBMITTALS

A. All submittals (documents and drawings) required for commissioning by the Contractor shall be submitted electronically as Microsoft Word or Excel documents, or as pdf and AutoCAD drawings. Electronic files shall be compatible with the latest version of the authoring software or as approved by the Engineer.

PART 3 EXECUTION

3.01 INSPECTION OF WORK

A. Contractor inspections shall be conducted of all Work in the Work area to be commissioned, and a punch list of corrections shall be prepared and submitted to the Engineer for review.

B. The Contractor shall execute the punch list corrections prior to requesting Port commissioning inspections of the Work area.

C. Port pre-test inspections shall begin upon notice that the Contractor's punch list Work is completed or at a point of completion mutually agreeable to the Engineer. The request to start the Port inspection shall be provided in writing by the Contractor.

D. The Contractor shall coordinate Port inspections with the Engineer with at least (3) days notice.

E. Depending upon the Work quality determined by the Port inspection, the Engineer may authorize the Contractor to start testing prior to completion of inspection of the entire Work area to be commissioned.

F. The Engineer will provide the Contractor with a correction punch list after each Port inspection. The Contractor shall provide an action plan for each punch list within 5 calendar days, and begin corrections within the same 5-day period.

3.02 CONTRACTOR TESTING

A. Contractor tests may not start without Engineer approval of the Contractor Test Plan and Procedures.

B. Prior to the testing Work in the first Work area to be commissioned, the Contractor shall provide a demonstration to the Engineer of the testing process for ten (10) of each type of test being performed.

C. Upon completion and approval of the demonstration tests, the Contractor shall complete testing.

D. Testing may be executed in stages within a Work area depending upon the progress of pre-test inspections.

E. Test results are required to be submitted to the Port of Seattle no later than 14 days from the date of the individual test.

F. If the Contractor finds more than 2% of the tests do not meet specifications, testing shall stop, the Engineer shall be notified, and the Contractor shall immediately take corrective actions and reschedule testing.

G. Test results and cable administration information shall be submitted to the Engineer only when all testing in the Work area being commissioned is complete.

H. Test results shall be provided to the Port on both disk and hardcopy.

I. Upon receipt of the independent test report and Work or identification deficiency report, a correction plan shall be submitted within 5 working days.

J. Work and identification deficiencies shall be corrected in a professional and timely manner. Each correction shall be documented and reported to the Engineer.

3.03 FINAL CLOSURE OF WORK

A. Final closure of infrastructure facilities shall not occur until after Engineer approval of the commissioning of each designated Work area.

B. Closure sequence shall be:

1. Closure of pull boxes and junction boxes after final inspection and approval of cable, cable labels, and box identification. Pull and junction boxes shall be cleaned prior to closure.

2. Closure of cable trays after final inspection and approval of innerducts, cables, cable labels, flex joint treatment, cable tray grounding, and cable tray labeling. Cable trays shall be cleaned prior to closure.

3. Closure of ceilings after cable tray approval and closure. Inspection locations in ceilings shall be identified at ceiling closure.

4. Closure of patch panels and splice panels after post-testing inspection and approval of terminations, identification, cable dressing, patch panel labeling, and patch panel security. Patch panels and rack areas shall be cleaned prior to final closure.

5. Repair of finishes and disposal of all waste material.

C. Hardcopy and softcopy (MS Word or Excel) of testing and cable administration information shall be properly identified and packaged for delivery to the Engineer.

End of Section 27 08 00

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2 and revisions

01/20/2017 Added labeling verification

01/01/2022 Cat 5 changed to Cat5e. Timeframe for test results added.

03/31/2025 Pasted in the legacy STANDARDS format until this section is updated to reflect the new format.

Removed:
-Part 4 Measurement and Payment

7.1 Pending section

This section shall be built out in future updates, refer to document in 7.1A

PART 8- REFERENCE GUIDE: Drawings, Materials, Forms, & Agreements

This section provides a quick reference guide to all available drawings, material support, forms requested, and any active agreements found in or referenced within this Standard. For drawing details, proceed to section 8.1. These files may be used in your planning and/or formulation of communication drawings for SEA. In section 8.2 is a list of proven and preferred materials to implement builds of our Telecommunications Infrastructure at SEA. Section 8.3 shall contain most all necessary forms commonly utilized in support of telecommunications implementation here at SEA. Finally, section 8.4 contains any agreements between SEA stakeholders to support an agreed upon direction or code compliance issue for SEA telecommunications infrastructure. All below files are stored here (see link): PART 8 Reference Guide to Communication Standards

8.1 Drawings

Refer to below list per telecommunications designation type for drawing detail number, description, and Standards appendix folder storage location.

☛ *NOTE:* *Provided drawings may or may not meet all Port of Seattle AutoCAD required standards found here (see link): 2025 Port CAD_Standards When utilizing below details, update layers and line types as necessary.*

8.1.1 Room details

DETAIL NUMBER:	DETAIL NAME:	FILE TYPE(S) AVAILABLE:	STORED IN APPENDIX:
2.2.3	TELECOM CLOSET (TC)	DWG, PDF	ROOMS
2.2.4	EQUIPMENT ROOMS (ER)	DWG, PDF	ROOMS
2.2.5	SECONDARY DISTRIBUTION ROOMS (SD)	DWG, PDF	ROOMS

8.1.2 Cabinet and Rack details

DETAIL NUMBER:	DETAIL NAME:	FILE TYPE(S) AVAILABLE:	STORED IN APPENDIX:
2.3.5.1	DMARC TENANT Setup	DWG, PDF	8.1.2 CAB-RK
	More items pending		

8.1.3 Pathway details

Available Details List Pending

8.1.4 Structured media details

Available Details List Pending

8.1.5 Administrative/ label details

Available Details List Pending

8.1.6 Special Systems details

Available Details List Pending

8.2 Materials

This section covers the most common communication infrastructure materials utilized at SEA. When applicable, be it single or listed in a group, parts with preferred or no substitution as covered under an

active Competition Waiver (see section 1.2.2) will be noted in **BOLD**. Refer to below provided list sorted per telecommunications designation type. Files in noted appendix shall be saved by material identifier and packaged with the Telecommunications Standards. In addition to the below material references, all SEA approved materials for CommScope SYSTIMAX may be found by contacting an ICT infrastructure staff member for the latest list via email at: z-it-telecom-infra@portseattle.org

8.2.1 Specific materials for comm room build

MATERIAL ID:	MATERIAL TYPE:	ACCEPTABLE MFG(s):	STORED IN APPENDIX:
RK-6D-84H	2-post 19-in Equipment Racks; 84-in height	**CommScope**, Chatsworth Products, EATON-B-Line	n/a
WM-V-84H	3, 6, 8, 12-in Vertical Wire Managers	**CommScope**, Chatsworth Products, EATON-B-Line	n/a
WM-H	2 RU horizontal Wire Managers	**CommScope**, Chatsworth Products, EATON-B-Line	n/a
LDR-OH	Ladder Racking (room cable tray) Overhead	**CommScope**, Chatsworth Products, EATON-B-Line	n/a
CAB-ACS	Data Cabinet	Chatsworth Products, EATON-B-Line, or approved equal	n/a
SRV-LP	30" Fiber Service Loop storage brackets	American Products, AFL Global, or approved equal	n/a

Remaining ROOM Material List Pending

8.2.2 Communication cabinet (other) materials

Material List Pending

8.2.3 Pathway materials

Material List Pending

8.2.4 Structured media materials

Material List Pending

8.2.5 Administrative/ label materials

Material List Pending

8.2.6 Special Systems materials

Material List Pending

8.3 Forms

Pending forms section: This section will cover the most common telecommunication infrastructure forms utilized in supporting documentation and submittals of required infrastructure or hardware installations at SEA.

8.4 Agreements

This section covers any active agreements, such as a Memorandum of Understandings (MOU) between any required parties operating at SEA to memorialize a telecommunication infrastructure decision. Currently we have one active MOU last ratified in 2023

8.4.1 MOU for 2-Hour Survivable Cable Infrastructure

- Document posted in Agreements folder

~END OF INFRASTRUCTURE DESIGN STANDARDS FOR TELECOMMUNICATIONS~