LACCD INFORMATION TECHNOLOGY STANDARD	Orig. Date: **3.1.09**	Control No.: **ITSTD-2009-03-INF**
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Technical Team: **CFM Group**	Approval: **DTC**	Page **1** of **20**

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I. INSTRUCTIONS

Please check latest revision of this standard at the time of implementation. This document serves as a standard and is not intended to be the specific bid document, rather a guideline for installation practices. Contractor shall utilize this document in combination with industry best practices, campus specifications and project drawings to identify project requirements.

II. PURPOSE

The District provides education programs to the community that meet the changing needs of students for academic and occupational preparation. Providing robust, sustainable technology systems at each of the nine colleges enhances these educational programs. This IT standard is meant to provide guidance in designing, building, and renovating these IT systems. Specifically, the purpose of this standard is to identify the performance and design characteristics of Data Center facilities throughout LACCD.

This Standard provides minimums and guidelines for the design, construction and renovation of EF and IDF rooms at all LACCD Campuses and select facilities. It ensures a secure, consistent, robust facility with physical, electrical, communication and temperature controlled environments for all network and telephony equipment deployed at LACCD. Each environment will have unique specifications based on the size, local codes, regulations and function of the facility.

LACCD requires meeting or exceeding the performance levels defined herein for EF and IDF rooms deployed within any of the nine colleges, District Office and satellite locations (Districtwide).

III. SCOPE

The criteria contained in this document are subject to change, revision and updating as warranted by advances in building construction techniques and communications technology.

This standard applies to all LACCD full time, part time, temporary, consulting, architectural, engineering and contract staff.

IV. KEY TERMS

Key Terms

- ***Must*** *means that the item or course of action is absolutely required.*
- ***Shall*** *means that the District intends that the supplier or consultant adhere to the instruction or command.*
- ***Will*** *means that the existing District systems or conditions require the item or course of action.*
- ***Optional*** *means that the consultant/vendor may choose to include or omit a particular item according to its preference. However, the item chosen must still interoperate or function with the District's existing systems.*
- ***Minimum of*** *means that the stated item or course of action meets the standard but may be superseded.*

V. STANDARDS

There are a number of names and acronyms used to describe Technology Rooms, including Telecommunications Rooms (TR), IDF Closet, Tele/Data Closet, Equipment Rooms (ER), EF, MDF etc. For the purpose of this document relevant to the individual building projects, LACCD has identified two classifications of Technology Rooms:

1. **EF - Entrance Facility**
2. **IDF - Intermediate Distribution Frame**

LACCD reserves the use of the Main Distribution Frame (MDF) and Data Center to spaces that support the entire Campus.

Technology Rooms provide an environmentally suitable and secure space for installing cable, associated hardware, rack and wall mounted technology equipment.

1. Section 1: Entrance Facility (EF) Design Criteria

The EF is a telecommunications acronym for Entrance Facility, in the context of this document, the main Technology Room for the building is the EF. The EF will act as the entrance facility for connection to the campus optical fiber and data network backbone. The EF will support the termination of backbone and campus cabling and house centralized communications and server equipment supporting the entire building.

The EF will also support other building information systems such as media distribution, security, Building Management Systems (BMS) and other building signaling systems. In most cases, the EF will also support the function of an IDF supporting the connection point between backbone and horizontal cabling infrastructure.

1.1 EF Architectural and Building System Requirements

EF - Architectural and Building System Requirements	
Room Size	• The minimum space allocated to the EF shall be 150 SF with a minimum dimension of 15 feet in one direction.
Room Location	• The EF supports outside cabling connections and requires a centralized location on the ground floor no further than 290 feet from the furthest communication outlet. • The EF should be located so that it can support two physically separate points of entry. • The EF shall be accessible for the delivery of large equipment throughout its useful life. Ideally, the EF will be stacked directly under the IDFs to

EF - Architectural and Building System Requirements	
	support the distribution of services between the rooms. • Do not locate EFs in any place that may be subject to water infiltration, steam infiltration, humidity from nearby water or steam, heat (e. g., direct sunlight) or any other corrosive atmospheric or adverse environmental conditions. • Avoid locations that are below water level unless preventive measures against water infiltration are employed. • Locate the EF far enough away from sources of EMI (Electromagnetic interference) to reduce interference with telecommunications cabling, including EMI from electrical power supply transformers, motors, generators, radio transmitters, radar transmitters, and induction heating devices. • As EFs are frequently occupied by technicians and sensitive electronic equipment, the room location should not be adjacent to sources of constant, excessive, low or high frequency noise, such as air-handling equipment, pumps, generators, etc.
Room Use	• The EF shall be dedicated solely to Technology and related facilities. • Equipment that does not support the EF (e. g., pipes, duct work, distribution of building power) shall not be located in or pass through the EF.
Ceiling Height	• The minimum ceiling height shall be 8'–6" above the finished floor with ceiling protrusions (e. g., sprinkler heads) placed to assure a minimum clear height of 8 feet clear of obstructions, to provide space over the equipment frames for cables and suspended cable trays. • To permit maximum flexibility and accessibility of cabling pathways, suspended ceilings are not recommended in EFs.
Doors	• EFs shall have lockable doors that are at least 3' – 6" wide. Since large equipment is often located in the EF, a double door 6 feet wide is recommended. • Door sills are not recommended because they impede the movement of equipment. • Doors that open outward provide additional usable space and reduce constraints on EF layout.
Flood Prevention	• Locate EFs above any threat of flooding. • Avoid locations that are below or adjacent to areas of potential water hazard (e. g., restrooms and kitchens).
Wall Requirements	• EF walls should extend from the finished floor to the structural ceiling. • The EF should not have windows installed, nor is it desirable to locate EFs on perimeter/curtain walls where windows comprise the majority surface

EF - Architectural and Building System Requirements	
	of the wall.
Backboard	• Provide AC-grade plywood, 8 feet high with a minimum thickness of 3/4 inch around the perimeter of the room. • Plywood shall be fire-rated and may NOT be painted. • The bottom of the plywood shall be mounted 6 inches above finished floor.
Structural Requirements	• The floor rating under distributed loading must be greater than 4.8 kPa (100 lbf/ ft ^{2}) and the rating for concentrated loading must be greater than 8.8 kN (2000 lbf) in areas that will support telecommunications equipment such as batteries and UPS equipment. • If access flooring is used in the EF, it must be rated accordingly.
Mechanical (HVAC) Requirements	• Provide EF with either dedicated HVAC equipment, or access to the main HVAC delivery system. • Technology equipment requires the HVAC system to function 24 hours per day, 365 days per year. If a building's HVAC system cannot ensure continuous operation (including weekends and holidays), provide a stand-alone HVAC unit with independent controls for the EF. • If an emergency power source is available in the building, connect the HVAC system that serves the EF to it. • The HVAC system that serves the EF should be tuned to maintain a positive air pressure differential with respect to surrounding areas with a minimum of one air change per hour in the EF. • Provide equipment to control humidity and air quality if needed. • Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). • Maintain positive pressure with a minimum of one air change per hour in the IDF. Provide: o Temperature 70 degrees F +/- 10 degrees o Relative humidity 50% +/- 20% • Estimated Heat Loads: 5,000 to 7,500 BTU per equipment cabinet. Confirm heat loads with equipment to be deployed as some equipment may generate more heat than others. UPS and stand-alone air conditioning systems produce additional heat, if present.

1.2 EF Electrical Requirements

EF – Electrical Requirements	
Lighting	• Provide adequate and uniform lighting that provides a minimum equivalent of 50 foot-candles when measured 3 feet above the finished floor level. • Locate light fixtures a minimum of 8'-6" above finished floor.

EF – Electrical Requirements	
	• Locate light switches near the entrance to the EF. • Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage. • Coordinate lighting layout with the equipment cabinet layout, especially overhead cable trays, to ensure that light is not obstructed. • Power for the lighting should be separated from circuits that power technology equipment.
Equipment Power	• Provide individual branch circuit serving a single load from the feeder panel directly to a branch circuit receptacle (for cord-and- plug connected equipment), or equipment power terminal (for hardwired equipment). • Provide branch circuits for equipment power that are protected and wired for 120V, 20A and 120V, 30A. • As a minimum, provide (1) 120V, 20A (NEMA 5-20R) dedicated circuit, with one duplex receptacle per circuit per rack and (2) 208V, 20A (NEMA L6-20R) dedicated circuit per EF mounted at the base of one equipment cabinet (second rack from the wall).
Convenience Power	• Provide separate duplex 120 V, 15A convenience outlets (NEMA 5-15R) for tools, test sets, etc., located at least 18 inches above the finished floor, placed at approximately 6 feet intervals around perimeter walls and identified and marked as such.
Dedicated Power Feeders	• Provide EFs with a power supply circuit that serves only the EF and terminates in its own electrical panel within the EF. The feeders that supply the power for technology equipment in EFs should be dedicated only to supplying that equipment and should be designed to facilitate future growth. More than one dedicated feeder may be required for large installations with a wide variety of technology equipment. Power required for other equipment in the room (e. g., lighting, motors, air conditioning equipment) should be supplied by a separate feeder, conduit, and distribution panel. Contact Information Technology for detailed specifications.
Backup Power	• Due to the "mission- critical" nature of the EF, backup power must be provided by the Central Plant generator. • In addition, a standalone UPS with a minimum of 15 min. battery capacity at full load shall be provided and, if possible, located outside of the EF.
Bonding and Grounding	• Provide a copper signal ground busbar in each EF. • The ground conductor shall be a 1/0 copper cable, cad-welded directly to the Ufer Ground or Main Building Entrance Ground, or building steel.
Conduit Sleeve Penetrations	• Provide horizontal conduit sleeves into the EF for the distribution of the horizontal cable from the cable tray. Provide vertical conduit sleeves from

EF – Electrical Requirements	
	the IDF if stacked above to support the distribution of backbone cables. • Conduit sleeves consist of a minimum of four (4) – 4 inch conduit sleeves stubbed into the EF extending 6 inches on both sides.
Fire Suppression	• Provide sprinkler heads in wire cages to prevent accidental operation. Coordinate the layout of fire protection systems with the equipment layout to avoid obstructing sprinklers, access to the alarm, or other protective measures. • Mount portable fire extinguishers (with appropriate ratings) in the EF as close to the entrance as possible.

1.3 EF Communications Requirements

EF – Communications Requirements	
Ladder Rack	• Provide Ladder Rack within the EFs to route cable to or from sleeves, risers, ducts, cable trays to termination fields within equipment racks or mounted on walls. This cable ladder system shall be contained within the confines of the EF.
Ladder Rack Materials and Applications	• EF cable ladder may be mounted horizontally or vertically on walls and over equipment cabinets and racks. • Vertical ladder will be used to support riser cable from floor to ceiling as it passes between floors. • The Cable Runway system shall be mounted to walls, the top of equipment rack, or hung with threaded rods for bracing and support in compliance with seismic codes.
Ladder Rack Bonding and Grounding	• In the EFs, the ladder rack system shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.
Equipment Cabinets	• Provide a minimum of four (4) Equipment Cabinets in the EF with vertical wire management.
Cabinet Size and Construction	• Each cabinet shall house two (2) – 19 inch internal mounting frames. It shall be possible to adjust the position of each rack in both horizontal directions. Each cabinet to provide a minimum of 77 inch (44U) space for equipment in the vertical plane. • Each cabinet shall have a minimum load-carrying capacity of 1000 lbs. (450 kg.). • Provide grommeted openings at the top of each cabinet requiring top access. The openings shall be a series of 4 inch diameter holes with bushings. The openings shall allow the cables to easily enter the cabinet and be routed into the cabinet's cable management.

EF – Communications Requirements	
	• Each cabinet to be provided with a fan tray mounted at the top of the cabinet at the front. Provide covered vents on the top surface of the cabinet above the fan tray. • Each cabinet to have a lockable Plexiglas front door with documentation wallet and a lockable sheet steel rear door with vents.
Power Requirements	• Each cabinet to have a minimum of two (2) mounted power strips at the rear of the cabinet with eight power sockets each. • One strip will connect to the UPS and one strip will connect to a dedicated 20 amp circuit. • The power receptacles on the connector strip shall be NEMA 5-20R compatible. • The plug shall be NEMA 5-20P compatible.
Installation Requirements	• Provide all mounting components and accessories to securely fix cabinets to floor. • Provide appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines). • Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the cabinet. • Do not allow cables to be unsupported as they run from conduit or cable ladder to equipment cabinets. • To support the cables entering and exiting the cabinet from below, remove bottom plate of the cabinet to allow cables to pass through. • Since the cabinets are to be located in a row, provide side panels for each end of each row only. • Do not provide side panels between adjacent cabinets. • Connect cabinets in rows together using baying kits.
Patch Panels	• Confirm the need for angled or flat patch panels with the IT Manager during the programming phase of each project.
Bonding and Grounding	• The equipment cabinets shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.

2. Section 2: Intermediate Distribution Frame (IDF) Design Criteria

The IDF, Intermediate Distribution Frame is the room type that supports the connection point between backbone and horizontal distribution cable and network edge devices. IDFs are generally considered to be floor-serving (as opposed to building or campus-serving) spaces.

2.1 IDF Architectural and Building System Requirements

IDF Architectural and Building System Requirements	
Room Size	• IDFs shall be approximately 80 to 120 square feet, depending on the size of the area the room is supporting. • At a minimum, the IDFs shall be 8' X 10', with a minimum clear dimension of 8 feet in one direction.
Room Location	• There must be at least one IDF per floor being served, preferably stacked above the EF. • Multiple rooms are required on a floor, if the cable length between the IDF and the telecommunications outlet, including slack, exceeds 290 feet.
Room Use	• The IDF shall be dedicated solely to Technology and related facilities. • Equipment that does not support the IDF (e.g. pipes, duct work, distribution of building power) shall not be located in or pass through the IDF.
Ceiling Height	• The minimum ceiling height shall be 8'-6" above the finished floor with ceiling protrusions (e. g., sprinkler heads) placed to assure a minimum clear height of 8 feet clear of obstructions, to provide space over the equipment frames for cables and suspended cable trays. • To permit maximum flexibility and accessibility of cabling pathways, suspended ceilings are not recommended in IDFs.
Doors	• IDFs shall have lockable doors that are at least 3 feet wide and 80 inches high. • Door sills are not recommended because they impede the movement of equipment. • Doors that open outward provide additional usable space and reduce constraints on IDF layout.
Flood Prevention	• Locate IDFs above any threat of flooding. • Avoid locations that are below or adjacent to areas of potential water hazard (e. g., restrooms and kitchens).
Wall Requirements	• IDF walls should extend from the finished floor to the structural ceiling (e. g., the slab). • The IDF should not have windows installed, nor is it desirable to locate IDFs on perimeter/curtain walls where windows comprise the entire surface of the wall.
Backboard	• Provide AC-grade plywood, 8 feet high with a minimum thickness of 3/4 inches around the perimeter of the room. • Plywood shall be fire-rated and may NOT be painted. • The bottom of the plywood shall be mounted 6 inches AFF (above finished floor).
Structural	• Provide a minimum floor loading of 2.4 kPa (50 lbf/ ft^2).

IDF Architectural and Building System Requirements	
Requirements	
Mechanical (HVAC) Requirements	• Provide HVAC that will maintain continuous and dedicated environmental control (24 hours per day, 365 days per year). • Maintain positive pressure with a minimum of one air change per hour in the IDF. Provide: o Temperature 70 degrees F +/- 10 degrees o Relative humidity 50% +/- 20% • Estimated Heat Loads: 5,000 BTU per equipment cabinet or rack. • Confirm heat loads with equipment to be deployed as some equipment may generate more heat than others.

2.2 IDF Electrical Requirements

IDF Electrical Requirements	
Lighting	• Provide adequate and uniform lighting that provides a minimum equivalent of 50 foot-candles when measured 3 feet above the finished floor level. • Locate light fixtures a minimum of 8'-6" above the finished floor. • Locate light switches near the entrance to the IDF. • Emergency lighting systems which operate on trickle-charge storage batteries are desirable as a safety precaution in the event of an inadvertent power outage. • Coordinate the lighting layout with the equipment cabinet layout, especially overhead cable trays, to ensure the light is not obstructed. • Power for the lighting should not come from the same circuits as power for the technology equipment.
Equipment Power	• IDFs shall be equipped to provide adequate electrical power. As a minimum, provide (1) 120V, 20A dedicated circuits, with one duplex receptacle per circuit per rack.
Convenience Power	• Provide separate duplex 120V, 15A convenience outlets (NEMA 5-15R) for tools, test sets, etc., located at least 18 inches above the finished floor, placed at approximately 6 feet intervals around perimeter walls and identified and marked as such.
Backup Power	• A standalone UPS with a minimum of 15 minute battery capacity at full load shall be provided and located outside of the IDF when possible. Contact Information Technology for specific details.
Bonding and Grounding	• Provide a copper signal ground busbar in each IDF. The ground conductor shall be a 1/0 copper cable, cad-welded directly to the Ufer Ground or Main Building Entrance Ground, or building steel.

Conduit Sleeve Penetrations	• Provide horizontal conduit sleeves into the IDF for the distribution of the horizontal cable from the cable tray. • Provide vertical conduit sleeves from the IDF above if stacked to support the distribution of backbone cables. • Conduit sleeves shall consist of a minimum of four (4) – 4 inch conduit sleeves stubbed into the IDF and extended 6 inches on both sides.
Fire Suppression	• Provide wet-pipe system with sprinkler heads in wire cages to prevent accidental operation.

2.3 IDF Communications Requirements

IDF Communications Requirements	
Ladder Rack	• Provide Ladder Rack within the IDFs to route cable to or from sleeves, risers, ducts, cable trays to termination fields within equipment racks or mounted on walls. This cable ladder system shall be contained within the confines of the IDF.
Ladder Rack Materials and Applications	• IDF cable ladder may be mounted horizontally or vertically on walls and over equipment racks. • Vertical ladder will be used to support riser cable from floor to ceiling as it passes between floors. • The Cable Runway system shall be mounted to walls, the top of equipment rack, or hung with threaded rods for bracing and support. Refer to Local Building Codes for additional seismic bracing for code compliance.
Ladder Rack Bonding and Grounding	• In the IDFs, the ladder rack system shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.
Equipment Racks	• Provide a minimum of three (3) Equipment racks in a standard IDF.
Size and Construction	• Each rack shall consist of a modular EIA 19 inches mounting frame, with a minimum of 77 inch (44U) space for equipment in the vertical plane. • The rack shall be manufactured from extruded aluminum / steel with a minimum load-carrying capacity of 1000 lbs. (450 kg.). • Each rack will have both horizontal and vertical cable management. Provide side-mounted vertical cable management on both sides of each rack. • Provide strain relief and cable management at the rear of each rack to ensure tidy routing of all feeder and horizontal cables. • Each rack to have a minimum of eight (8) power sockets mounted on a strip at the rear of the rack. • The power receptacles on the connector strip shall be NEMA 5-20R

IDF Communications Requirements	
	compatible. • The plug shall be NEMA 5-20P compatible.
Power Requirements	• Each cabinet to have a minimum of two (2) mounted power strips at the rear of the cabinet with eight (8) power sockets each. • One strip will connect to the UPS and one strip will connect to a dedicated 20 amp circuit. • The power receptacles on the connector strip shall be NEMA 5-20R compatible. • The plug shall be NEMA 5-20P compatible.
Installation Requirements	• Provide all mounting components and accessories to securely fix racks to floor and supporting walls. Provide appropriate seismic transverse and longitudinal bracing per any local codes and the current NUSIG (National Uniform Seismic Installation Guidelines), and fix each rack to the overhead ladder. • Provide cable bend management fixtures to maintain the proper bend radius as the cables drop into the rack. Do not allow cables to be unsupported as they run from conduit or cable tray to equipment cabinets.
Patch Panels	• Confirm the need for angled or flat patch panels with the IT Manager during the programming phase of each project.
Bonding and Grounding	• The equipment racks shall be bonded to the Telecommunications Ground Bus with 6AWG stranded copper wire.

3. Section 3: Communication Cable System Support – Design Criteria

The horizontal communication cable system infrastructure includes the pathway and support hardware which concentrates, supports and protects horizontal cable between its origination point in the IDF or EF and the workstation outlet location. It also provides a permanent pathway that facilitates the addition or replacement of cable over time. Horizontal support hardware is further defined as continuous, (e.g. Conduit, Cable Tray) and non-continuous (e.g. J-Hooks, Bridle Rings).

3.1 Communication Distribution Cable Tray Requirements

Distribution cable tray shall be installed above the accessible ceiling for the creation of main pathways for the management of high volumes of cable through corridors, and for access and egress to EF and IDFs.

Communication Distribution Cable Tray Requirements	
Construction	• Cable tray shall be the wire basket type manufactured of ASTM A510 high strength steel wires or equal, and comply with NEMA VE1 or the proposed IEC 61537 standards. The cable tray shall be UL (Underwriters Laboratory) listed.
Dimensions	• The cable tray shall be a minimum of 18 inch wide, with a depth of 4 inches. • Narrower cable tray may be used for locations with lower volumes of cable.
Support Requirements	• A trapeze-style support shall be used along the span of the cable tray. The trapeze shall be constructed of channel stock (i.e.Unistrut) and 5/8 inch threaded rod. The trapeze support elevation should allow a minimum of 12 in. between the top edge of the cable tray and the slab above. Appropriate threaded rod anchors shall be selected and approved by the Project Structural Engineer. Trapeze supports shall be placed a minimum of every 10 feet and at cable tray intersections and terminations. • Seismic bracing for the cable tray as required by code, shall be installed along cable tray routes. • Coordination of lateral and oblique bracing locations shall be coordinated with the other disciplines whose equipment and systems share the area above the suspended ceiling.
Bonding and Grounding Requirements	• The cable tray shall be bonded to the Telecommunications Grounding Bus Bar in the IDF(s) on the same floor. • All non-contiguous segments of the Cable tray shall be bonded together using 6AWG stranded copper wire, with crimp-on lugs bolted to each segment of the cable tray to ensure electrical continuity throughout the length of the cable tray system.
Firestopping Requirements	• Cable trays that penetrate fire-rated walls shall be equipped with wall penetration sleeves at each location, and have appropriate firestopping materials installed after the placement of cable has been completed.

4. Section 4: Communication Cable System Conduit – Design Criteria

Provide Communications cable conduit in locations where access to cable tray is unavailable or where portions of the pathway span are inaccessible (i.e. embedded in walls or inaccessible ceilings). Provide conduit for small quantities of cable where cable tray is impractical. Conduit materials may be used to house non-rated cables between end points to ensure NEC Code compliance.

Conduits serving individual workstation outlets shall be a minimum of one inch. The one inch conduits shall be connected to double-gang, deep device boxes (2-1/2 inch deep), equipped with a single-gang mud ring at the outlet location. Individual workstation conduits are to be dedicated to only one outlet box each, and shall not be "daisy-chained" together.

4.1 Communication Cable System Conduit Requirements

Communication Cable System Conduit Requirements	
Rigid Galvanized Steel (RGS)	• Rigid conduit shall be used in areas exposed to the outside elements above ground and used for the containment of non-rated cable as specified in the NEC. • RGS shall be installed using threaded couplers and fittings.
Intermediate Metallic Conduit (IMC)	• IMC conduit shall be used in areas exposed to the outside elements. • IMC conduit shall not be used for non-rated cable installations but it may be used to carry riser-rated cable and innerduct in vertical and horizontal cable applications. • IMC conduit shall be installed using threaded couplers and fittings.
Thinwall Electrical Metallic Tubing (EMT)	• EMT shall be used for installations within the confines of an environmentally-controlled building. • EMT conduit is not acceptable for non-rated cable installations. • EMT conduit may be used, however, to carry riser-rated cable and innerduct in vertical and horizontal cable applications. • EMT conduit may be used as sleeves for wall penetrations, and for floor core riser penetrations. • EMT conduit connectors and fittings shall be installed using "Set-Screw" type or air-tight "Compression" type fittings.
Flexible Conduit ("Flex")	• Flexible conduit shall not be used for communication cable installation when EMT conduit is available. • Flex conduit may be used for connections into modular furniture or similar applications. • When using Flex conduit, increase the diameter of the Flex by one trade size over what the requirement would be using smooth-wall conduit.
Plastic Conduit/ Polyvinyl Chloride (PVC)	• Plastic and PVC conduit shall be used for underground duct construction between buildings and vaults. • PVC conduit shall not be used within buildings per NEC Code and UBC (Uniform Building Code). • The PVC conduit shall be a minimum of Schedule 40 PVC plastic.

4.2 Conduit Installation Guidelines

Conduit Installation Guidelines	
Support Requirements	• Conduits shall be installed with support systems such as channel stock/threaded rod trapeze supports. Individual conduits may be supported using threaded rods with clamps. Conduits may be attached to the underside of cable trays and affixed to walls where practical. Seismic bracing shall be installed as required by local building codes, DSA, and NUSIG (National Uniform Seismic Installation Guidelines). Accommodations for lateral and oblique bracing struts must be coordinated with the other disciplines that vie for critical ceiling space.
Bonding and Grounding	• Bonding of conduits to the Telecommunications Grounding System is required. At the termination of conduit runs within IDFs, attachment of a ground wire between the Telecommunications Ground Bus to grounding rings installed on conduit box connectors should be accomplished to ensure electrical continuity of the conduit system.
Firestopping	• Partially filled and empty conduits that pass through fire-rated walls or through floors shall be firestopped in accordance with Local Fire Codes. Material shall be flexible firestopping putty or pillows.

5. Section 5: Innerduct

Innerduct shall be installed to establish multiple pathways in a larger conduit or provide a pathway across a cable tray. Innerduct shall be used for the protection of fiber optic cabling, but copper cabling may be installed in the innerduct to prevent tangling with other cables already present. Innerduct shall be used to protect fiber optic cabling in cable trays, exposed areas in ceilings, IDFs, and EFs.

6. Section 6: Communication Cable System Pull Boxes

A pull box shall be installed in conjunction with conduit installations to provide access to cables at appropriate locations for distribution to tributary locations, and to facilitate cable installation.

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6.1 Communication Cable System Pull Boxes

Communication Cable System Pull Boxes	
Materials	• For indoor use, use NEMA Type 1 pull boxes. • For areas exposed to heavy moisture, chemicals or weather elements, NEMA Type 3 or 4 pull boxes shall be installed. • The pull box shall be equipped with hinged covers, or removable covers which are screwed or bolted on. • The pull boxes shall have hardware for supporting and securing cabling and pulling eyes to facilitate cabling installation.
Placement	• A pull box shall be installed after 100 feet of conduit has been placed, and/or after 180 degrees of directional change in the conduit pathway has been affected. • The installation of a pull box shall not be used for directional change.
Support Requirements	• Pull boxes shall be attached directly to the ceiling slab, or suspended by 4-point threaded rod supports anchored to the ceiling. Pull boxes require seismic bracing to comply with Local Building Codes. • Seismic bracing shall be installed as required by local building codes, DSA, and NUSIG (National Uniform Seismic Installation Guidelines). • Accommodations for lateral and oblique bracing struts must be coordinated with the other disciplines that vie for critical ceiling space.

7. Section 7: Horizontal Cable Support Hardware (Non-Continuous)

Horizontal Cable Support Hardware such as J-Hooks shall be used in locations where the communication cable is not supported by continuous systems such as cable trays or conduit.

Provide J-Hooks every 48 inches at a minimum, attached to threaded rod or ceiling hangers to provide support for cable bundles or innerduct. The J-Hooks shall be metal stampings configured in a “J” form providing a broad cradle or saddle for supporting for of cable.

8. Section 8: Interbuilding Communication Ductbanks and Transition Structures

Interbuilding Communication Infrastructure Ductbanks shall be installed to carry communication cables between the tunnel system and buildings on Campus. The Duct shall be constructed of contiguous segments of PVC conduit. The Ductbanks shall be encased in slurry.

Transition structures, manholes, shall be installed as required to allow technicians access to cable and splices to perform maintenance or to modify distribution configurations. The size of the Transition Structures shall be selected for installation by the number of ducts and potential cable count the structure must contain.

The following provides general requirements for all Interbuilding Communication Duct Banks and Transition Spaces as components of the overall communication cable system infrastructure.

8.1 Interbuilding Communication Ductbanks

Interbuilding Communication Ductbanks shall be designed to provide a permanent and durable pathway system which is available for the delivery of entrance cable from the campus connection point in the adjacent utility tunnel or as part of a campus Interbuilding backbone system connecting several buildings to the Campus Loop.

Interbuilding Communication Ductbanks	
Configuration	• There shall be minimum of four (4) – 4 inch conduits between the campus buildings and the campus connection point. • The Ductbanks shall be configured in arrays, with several rows stacked together such as 1 x 4, 2 x 2, 3 x 4 and shall correspond to the arrangement of duct openings in pre-cast concrete vaults and manholes where transitions occur.
Construction Materials and Methods	• Ductbanks shall be encased in slurry. Where Ductbanks share underground pathways with other underground infrastructure components such as water lines, gas lines, sanitary systems, it is critical that the communications infrastructure be installed with the highest level of durability. • The duct material itself shall be Trade Size 4 (4-inch diameter), PVC Schedule 40 or equal, and suitable for contact with concrete. Conduits shall be cut square, with the cut ends reamed and deburred. Plastic bushings are to be installed over the each end of every conduit. • Place a 1/4 inch nylon or polyethylene pull rope in each conduit from end to end. • Install conduit plugs in each empty outside plant conduit to prevent the introduction of noxious gases or water into the building.
Ductbank Placement	• Duct routing shall be coordinated with the Campus Infrastructure project, with consideration for distance between Transition Structures and difficulty of cable pulls, particularly when high-count multipair copper cables are necessary. The minimum radius for curves is 15 feet. • Slurry-Encased Ductbank Dimension Guidelines: Ground Cover — Minimum of 24 inches

Interbuilding Communication Ductbanks		
	Top Level of Slurry	Minimum 3 Inches above top duct
	Slurry on Outer Sides of Ductbank	Minimum 3 inches
	Slurry Between Ducts	1.5 inch (above, below and to each side)
	Bottom Level of Slurry	Minimum 3 inches
Ductbank Marking	• A metallic warning tape, detectable with magnetic location equipment, should be buried directly over the path of the Ductbank approximately 18 inches below the surface.	
Ductbank Termination at The Building	• Communication Ducts should be terminated with bell-end connectors, flush with the inner surface of the wall.	

8.2 Communication Transition Structures

Ductbank Transition Structures shall be provided allow access to cable installed within underground ductbanks. The transitions structures shall provide a location for the storage of splice cases and slack loops of cable. The transition structures shall facilitate the distribution of cable to multiple locations by providing a junction point for ducts radiating in several directions.

Communication Transition Structures	
Selection of Transition Structure Type	• The type of structure chosen for installation shall be dependent on the number of ducts in the span. The ductbank transition structure shall be preformed concrete structures have weight-bearing cover/lid capacities that range from light pedestrian traffic to deliberate heavy vehicular traffic. The appropriate rating should be selected based on the anticipated exposure of the structure to these differing traffic types.
Placement of Transition Structures	• Structures shall be placed after 180 degrees of directional change has been affected in the ductbank route. In straight or relatively straight runs, there shall be no more than 400 feet between structures. Structures shall not be used as the apex of 90-degree change in duct direction. Sweeps and structures shall be planned such that the sweep occurs outside of the structure, allowing straight cable pulls through the structure itself.
Transition Structure Accessories and Equipment	Transition structures require the following equipment: • A sump, or gravel drainage in the case of small hand holes • Corrosion-resistant pulling eyes • Cable racking • Grounding cables installed per applicable codes or practices • Ladders and steps • Watertight duct plugs

VI. RELATED STANDARDS

In addition to the standards set forth above in Section IV "Standards," the following standards must also be compliant with:

- LACCD IT Standard - Structured Cabling Systems

VII. EXCEPTIONS OR WAIVER REQUIREMENTS

Process

Exceptions or waivers to this Standard must be approved by the District Technology Committee and documented using the following process:

A request for exception or waiver to any portion of the standards listed above shall be electronically delivered to the local College IT Leadership and Chief Information Officer. In order to be considered, the request must include the following information:

1. The specific standard number, revision, and title
2. Description of standard section being considered for exception or waiver
3. Reason for request
4. Name and contact information of the requesting party

Compliance

Failure to comply with the exception or waiver requirements and process may lead to the removal of non-compliant equipment and associated software at the expense of responsible parties.

VIII. REQUESTS FOR CLARIFICATION

A request for clarification on any of the standards listed above may be emailed to the local IT Leadership or Chief Information Officer. In order to be considered, the request must include the following information:

1. The specific standard number, revision and title
2. Section(s) of the standard needing clarification
3. Name and contact information of the requesting party

IX. GLOSSARY

The following terms are defined as follows:

1. **Need** means that the item or course of action is essential and it will be absolutely required at the time indicated in the standard. (e.g. A high level risk assessment **needs** to be performed…)
2. **Call for** means that the item or course of action is absolutely required.

3. **Are to be provided** means that the item or course of action must be supplied in order to meet the standard.
4. **May be required if** means that if the condition stated in the standard is met, the capability, performance expectation, or any other description in the standard is absolutely required.
5. **Recommended** means that the course of action is in accordance with (Insert Applicable Area such as Security) Best Practices and should be adopted.
6. **Not Recommended** means that a course of action is not consistent with (Insert Applicable Area) Best Practices and/or other laws, codes, or requirements and should not be adopted.
7. **May/Might/Can** mean "optional." The items specified using this language may be included or omitted depending upon the consultant/vendor's preferences. However, even if one particular item is optional, the item chosen must still interoperate or function with the District's existing systems.
8. **Preferred/encouraged** mean that one item or course of action is favored over other optional courses of action because of proven favorable outcomes.
9. **Acceptable** means that the item or course of action is only a minimum, and the consultant/vendor may supersede the quality or performance of that item or course of action.

X. DOCUMENT HISTORY

REV NO.	OLD SECTION NO./ PARA	NEW SECTION NO./ PARA	DESCRIPTION OF CHANGE	DTC APPROVAL DATE
R1	All	All	Document Format	11.8.13
	-	I, II, III, IV	Added sections	
	All	All	Replaced term "Building Distribution Frame (BDF)" with "Entrance Facility (EF)"	