27 0000 | Communications

This section includes guidelines and requirements for the design and construction of communications systems, equipment, materials, and other items covered in Division 27. Unless specifically noted, all standards apply to the healthcare campus, the education campus, and any other sites under the purview of UK ITS requiring communications infrastructure.

The standards are a resource for the designer of record. The requirements are to be reviewed by the design team and incorporated into the contract documents. The standards themselves will not be included in the contract documents. It is the responsibility of the design team to incorporate them throughout the drawings and specifications.

The standard is not intended to encompass all components required in a complete communications design, but to indicate the university's preferences where they exist. Exceptions to these standards may be considered on a case-by-case basis for extraordinary projects or where value engineering is required. All deviations must be approved by the UK ITS Telecom Engineer.

Designers are encouraged to present the university with new or different systems, equipment, or materials when they may provide a better or more valuable product.

Sections

Section 27 0000 | General Communications Requirements

Please note: this document version supersedes all previous versions. Please read thoroughly as this version is in a different format and includes many updates and changes.

UK ITS Networking and Infrastructure Division

In support of the University of Kentucky's (UK) Strategic Plan, the Information Technology Services (ITS) mission is to provide, through customer engagement, outstanding technology infrastructure, services and solutions that advance teaching and learning, enable research, empower staff to provide exceptional services, enrich the student experience, and effectively manage and protect institutional data.

Pursuant to Business Regulation Q-1-1, the UK ITS Networking and Infrastructure division has the responsibility for planning, implementing, managing and maintaining the most effective, efficient and economical telecommunications infrastructure and network system. This responsibility includes existing, renovated, leased and new properties for the University and UK HealthCare. In its role as a system integrator of networks, the UK ITS Networking and Infrastructure division supports the University needs by developing, coordinating and enforcing all voice, data and video communications systems standards. With the convergence of voice, data and video technologies, UK ITS is committed to a seamless and reliable communications services network.

The standards and specifications outlined in this document shall be incorporated in all projects requiring communications infrastructure including renovations and capital projects. The UK telecommunications infrastructure is for the exclusive use of university departments and units. Exceptions to these standards and specifications, as well as use of the UK telecommunications infrastructure must be approved in writing by UK ITS. Unauthorized use of UK telecommunications infrastructure may result in its removal.

UK ITS Contact List

ITS Service Desk Call for general inquiries, reporting problems, and requesting services	859-218-4357
Telecom Infrastructure Design Shelby Avery, Telecom Engineer	859-257-7387
Infrastructure Operations Jeff Banks, Director of Infrastructure Operations	859-562-1199
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Outside Plant Cabling Robert Holder, OSP Supervisor	859-218-1127
Telecom Utility Locating Infrastructure Operations GIS	859-257-9022

1. GENERAL

A. The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

1. MUST This word, or the terms "REQUIRED" or "SHALL", mean that the definition is an absolute requirement of the specification.
2. MUST NOT This phrase, or the phrase "SHALL NOT", mean that the definition is an absolute prohibition of the specification.
3. SHOULD This word, or the adjective "RECOMMENDED", mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications MUST be understood and carefully weighed before choosing a different course.
4. SHOULD NOT This phrase, or the phrase "NOT RECOMMENDED" mean that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
5. MAY This word, or the adjective "OPTIONAL", mean that an item is truly optional.

B. Abbreviations and acronyms

AFF	Above Finished Floor
AWG	American Wire Gage
BAS	Building Automation System
BDF	Building Distribution Frame
BTU	British Thermal Unit
CATV	Community Antenna Television or Cable Television
CDF	Combined Distribution Frame
DAS	Distributed Antenna System (indoor cell phone coverage)
dBmV	decibel-millivolts
EBDF	External Building Distribution Frame
EIDF	External Intermediate Distribution Frame
EMT	Electrical Metallic Tubing
ER	Equipment Room
ESS	Electronic Security System
FC	Foot-candle
HVAC	Heating, Ventilation and Air Conditioning
Hz	Hertz
IDF	Intermediate Distribution Frame
ITS	Information Technology Services

KBC	Kentucky Building Code
LAN	Local Area Network
MDF	Main Distribution Frame
OHM	Unit of resistance
OSP	Outside Plant
PBX	Private Branch Exchange
PPD	Physical Plant Division, University of Kentucky
PVC	Polyvinyl Chloride
RCB	Room Control Board (nurse call system)
RCDD	Registered Communications Distribution Designer
RU	Rack Unit (1.75”)
SF	Square foot
TGB	Telecommunications Grounding Busbar
TMGB	Telecommunications Main Grounding Busbar
TR	Telecommunications Room
UEM	Utilities and Energy Management
UK	University of Kentucky
UTP	Unshielded Twisted Pair
WAN	Wide Area Network
WAP	Wireless Access Point

C. Definitions

1. Building Distribution Frame (BDF) – environmentally controlled room that houses inter-building and intra-building fiber terminations, distribution or aggregation network switches, and other building head end equipment; serves entire building
2. Education campus – buildings housing academic, research, athletics, and support functions
3. Entrance Room (ER) – environmentally controlled room that houses inter-building and intra-building fiber terminations, network distribution or aggregation switches, and other building head end equipment; serves entire building
4. External Building Distribution Frame (EBDF) - environmentally controlled room that houses distribution or aggregation equipment feeding EIDF rooms; serves entire building
5. External Intermediate Distribution Frame (EIDF) – centralized space for security, building automation, fire alarm, nurse call, patient monitoring, and/or other low-voltage equipment not serviced by UK ITS
6. Healthcare campus – buildings where patient care is provided (inpatient and ambulatory)

7. Intermediate Distribution Frame (IDF) – environmentally controlled room that typically houses intra-building fiber terminations, horizontal cabling terminations, cross connects, and access layer network switches; serves floor or partial floor depending on floor size
8. Install or installed – furnish and install
9. Intra-building – within single building
10. Inter-building – between two or more buildings
11. Rack Unit – standard measurement of vertical mounting space on an equipment rack. Each Rack Unit is 1-3/4" high.
12. Telecommunications Enclosure (TE) – case or housing for horizontal cabling terminations and cross connects; may house access layer network switches; typically serves small floor or partial floor
13. Telecommunications Room (TR) – environmentally controlled room that typically houses intra-building fiber terminations, horizontal cabling terminations, cross connects, and access layer network switches; serves floor or partial floor depending on floor size

Important notes regarding terminology in this document:

- **The term TR is equivalent to the term IDF with the terms being used interchangeably**
- **The term ER is equivalent to the terms BDF and MDF with the terms being used interchangeably**

D. References and Standards

1. The following agencies and their codes, standards, and regulations SHALL govern all communications design and installation at UK:
   a. ANSI American National Standards Institute
   b. BICSI Building Industry Consulting Services International
   c. EIA Electronic Industries Alliance
   d. FCC Federal Communications Commission
   e. IEEE Institute of Electrical and Electronic Engineers, Inc
   f. NBC National Building Code
   g. NFPA National Fire Protection Association
   h. NEC National Electrical Code
   i. TIA Telecommunications Industry Association
   j. UL Underwriters Laboratories

2. Contractor qualifications:
   A. Contractor SHALL have been in the communications business for 5 years minimum and SHALL provide references for two successfully completed projects of comparable magnitude

B. Contractor SHALL have a minimum of one RCDD in good standing with BICSI on permanent staff at time of bidding and through the duration of the construction project

C. Minimum 50% of contractor technicians installing, terminating, and testing communications cabling SHALL have current BICSI installer certifications

3. Owner furnishings

A. UK ITS will install, configure and manage all network switches, WAPs, UPS units, DAS equipment and DAS cabling, and cross connect cables (copper and fiber optic patch cables). Funding for these components is the responsibility of the requesting party.

B. All connections and disconnections to UK ITS managed equipment within BDF and IDF facilities SHALL be performed by UK ITS including but not limited to:

1. Copper patch cables to network switches
2. Copper patch cables to wireless access points
3. Copper patch cables for analog devices
4. Fiber patch cables to network switches
5. Fiber patch cables between fiber cables

4. AV systems

A. All work must comply with UK Design Standard 27 400 - Audio Video Communications

5. Network switches connected to the UK network SHALL be ITS-installed and ITS-managed. Funding for these components is the responsibility of the requesting party.No NAT routers or non-ITS managed network equipment shall be permitted on the UK network.

6. If UK communication services are disrupted as a result of contractor’s activities, whether intentional or accidental, the contractor SHALL make continuous efforts to assist in restoring service at no additional cost. If UK ITS involvement is required to restore service, the contractor SHALL be responsible for all associated costs.

7. All work SHALL be performed in a "neat and workmanlike" manner as defined in ANSI/NECA 1 "Standard Practices for Good Workmanship in Electrical Contracting"

8. Firestopping

A. Comply with UK Design Standard Section 07 8414 - Penetration Firestopping

B. Firestopping shall be provided for all penetrations into and through fire-resistance rated assemblies, including walls and floor/ceiling assemblies. Firestopping systems shall meet all local and national code requirements, including the currently adopted Kentucky Building Code (KBC), referenced National Fire Protection Association (NFPA) standards, and Underwriters’ Laboratories (UL) specifications.

C. Prepackaged intumescent materials are the preferred material for firestopping. Do not use mortar, grout, or concrete for firestopping on cable trays, wireways, or conduit. Contractors who use these materials will be required to replace all cables affected. Only use materials as specified in the approved UL firestopping systems and/or those approved by local authorities.

D. Firestopping shall only be provided in fire-resistance rated assemblies. No firestopping shall be installed in walls that are not designated as fire-resistance rated. Current life safety drawings for the building where work is being conducted shall be reviewed before work begins. Fire-resistance rated

assemblies will be identified and the appropriate firestopping systems approved for use in that assembly.

E. All firestop work shall be performed by a certified, third-party contractor. See Standard 078414 Penetration Firestopping.

9. Inspection of work

A. The contractor SHALL:

1. Allow access to construction site at any time
2. Immediately notify UK ITS Telecom Engineer in writing of any change in architectural or mechanical drawings and specifications affecting telecommunications
3. Notify UK ITS when any work is ready for inspection

B. All underground work MUST be inspected and approved by UK ITS Telecom Engineer before the area is covered. Failure to obtain inspection and approval in writing SHALL result in uncovering the area and MAY result in removal and replacement of duct bank or manhole at no cost to UK

C. As-built or final construction documents MUST reflect any infrastructure variations from the design documents

D. The contractor shall provide a final checkout certification letter, and inspection reports to UK ITS Telecom Engineer on all telecommunications work. All systems installed by outside vendors will be required to provide a vendor inspection certificate and a vendor warranty with a binding commitment to a 15-year system performance warranty.

Section 27 0526 | Grounding and Bonding for Communications Systems

1. GENERAL
   A. Definitions and abbreviations
      1. Telecommunications Main Grounding Busbar (TMGB): Busbar placed in convenient and accessible location and bonded by means of bonding conductor for telecommunications to building service equipment (power) ground.
      2. Telecommunications Grounding Busbar (TGB): interface to building telecommunications grounding system generally located in telecommunications room. Common point of connection for telecommunications system and equipment bonding to ground and located in telecommunications room or equipment room.
      3. Telecommunications Bonding Conductor: conductor that interconnects telecommunications bonding infrastructure to building's service equipment (power) ground.
      4. Telecommunications Bonding Backbone (TBB): conductor that interconnects telecommunications main grounding busbar (TMGB) to telecommunications grounding busbar (TGB).
      5. Grounding Equalizer (GE): conductor that interconnects elements of telecommunications grounding infrastructure.
      6. Irreversible Compression: permanent mechanical bond between conductors or conductor and connector using mechanical or hydraulic tool.
   B. References and standards
      1. IEEE/ANSI 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems
      2. UL 467 Electrical Grounding and Bonding Equipment
      3. ANSI J-STD-607-B - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
      4. NEC Article 250 – Grounding
      5. NEC Article 800 – Communications Circuits
      6. NFPA 78 – Lightning Protection
2. PRODUCTS
   A. Telecommunications Grounding Busbars
      1. Shall be ¼” thick copper pre-drilled
      2. Insulators and stand-off brackets SHALL electrically isolate busbar from wall or other mounting surface.
      3. Busbars SHALL be listed by nationally recognized testing laboratory
      4. Size:
         a. Telecommunications Main Ground Busbar (TMGB) - 24" x 4" (minimum)
         b. Telecommunications Grounding Busbar (TGB) - 12" x 2" (minimum)

B. Conductors
   1. SHALL be stranded copper with green jacket
   2. Size per referenced standards
      a. Minimum sizes unless noted otherwise:
         (a) TBB: #2 AWG or greater with a maximum resistance of 0.5 ohms
         (b) TGB to cable tray, cable runway, rack, rack mounted ground bar, floor sleeves: #6 AWG
         (c) Cable tray non-UL listed junctions: #6 AWG
         (d) Conduit to cable tray or any other bonding conductors: #10 AWG

C. Connections
   1. Mechanical connectors SHALL be 2 bolt type copper
   2. Compression connectors SHALL be pure wrought copper and irreversible

D. Surge protectors for outdoor UTP terminations
   1. SHALL be Cat 6A 110 punch down type: SurgeGate CAT6A-LAN or equivalent

3. EXECUTION

A. Grounding connections SHALL be tight and be made with UL listed grounding devices, fittings, bushings, etc

B. The Telecommunications Bonding Conductor, Telecommunications Bonding Backbone (TBB) and Grounding Equalizer (GE) connections SHALL be compression type

C. Telecommunications Bonding Backbone (TBB) SHALL be continuous and not interrupted by Telecommunications Grounding Busbars (TGB)
   1. TGBs SHALL be bonded to TBB via tap off of TBB
      a. Exception is "last" TGB on TBB (e.g. furthest from TMGB)
   2. Grounding Equalizer(s) (GE) SHALL connect to TGBs to be interconnected

D. Connections SHALL be bare metal to bare metal contact
   1. Clean surfaces of paint, dirt, oil, etc

E. Terminate each grounding conductor on its own terminal lug

F. Telecommunications grounds SHALL be permanently attached prior to energizing communications equipment

G. Metallic equipment in telecommunications spaces SHALL be bonded to TGB including, but not limited to:
   1. Cable tray, cable runway, rack, rack mounted ground bar, and floor sleeves

H. Equipment in telecommunications racks SHALL be bonded to rack mounted ground bar including, but not limited to:
   1. Network switches, UPS units, and shielded patch panels

I. Grounding and bonding conductors SHALL be installed without splices

J. Surge protectors

1. SHALL be furnished for each horizontal cable that terminates outside a building structure serving devices such as security cameras, WAPs, and Talk-A-Phones

    a. Protectors SHALL be wall mounted in the TR and connected to the TGB per manufacturer instructions

Section 27 0528 | Pathways for Communications Systems

1. GENERAL
   A. All work SHALL meet the specifications of NFPA 70: National Electrical Code, and follow the recommendations found in TIA and BICSI standards
   B. All communications cabling MUST be supported by the options outlined in this section. Cabling laying on ceiling grid, sprinkler pipe, or other utilities is prohibited.
   C. All pathways MUST be approved by the UK ITS Telecom Engineer
   D. In-wall data outlets will have a minimum of one 1” conduit stubbed out to the nearest accessible ceiling space or to the nearest primary horizontal pathway. Each will have the properly sized outlet box identified below in Part 3.
   E. Conduit from outlet boxes to cable trays is REQUIRED in all buildings. Exceptions must be approved by UK ITS Telecom Engineer.
   F. Install raceways and junction boxes to permit access to equipment and/or cabling for maintenance. Relocation of raceways and/or junction boxes as required to provide access SHALL be provided at no cost to UK.
   G. Floor boxes are not preferred termination locations for communications outlets. Their use for communications outlets SHALL be minimized as much as possible. Pathways SHALL be installed to TR on the same floor the box is serving.
   H. DAS pathways
      1. DAS is REQUIRED for most new buildings
      2. DAS equipment and cabling SHALL be designed and typically installed by UK ITS
      3. At minimum, a 2” pathway SHALL be installed from the highest floor cable tray to the roof with a weather head for DAS antenna. Antenna will mount next to weather head on roof.
      4. UK ITS will provide a drawing for any additional required pathways for DAS
   I. Complete pathway system SHALL be shown on 100% Design Document drawings for review and shall include cable trays, horizontal conduit pathways, and vertical pathways
2. CABLE TRAYS
   A. References and Standards
      2. NEMA VE1 Metal Cable Tray Systems
      3. NEMA VE2 Cable Tray Installation Guidelines
   B. General
      1. Cable tray design
         a. Cable tray systems SHALL be designed to accommodate all approved communication cabling (standard ethernet, fiber optic cables and innerduct, access control, lighting control, DAS, nurse call, patient monitoring, etc) and MUST be approved by UK ITS during the initial design phases of a project.
         b. Cable tray sizing

(a) Cable trays SHALL be sized for the quantity of planned cables plus 50% for future growth

(b) Design fill ratio SHALL be 40% of the usable cross-sectional area

(c) Cable tray size reduction as distance from TR increases is encouraged to reduce ceiling congestion

(d) Special attention is needed for sizing cable tray at entrances into ERs, TRs and EIDFs

(e) Cable tray size inside ERs, TRs, EBDFs and EIDFs SHALL be equal to size entering room

c. Cable tray routing

(a) Cable trays should be included in most corridors with accessible ceilings

(b) Cable trays SHALL NOT be installed:

(i) Above gypsum ceilings

(ii) Inside any rooms

1. One possible exception is a large room that requires a dedicated section of tray. Tray system SHALL be designed such that pulling cables through section of tray inside room is not REQUIRED to service other rooms.

(c) Cable tray system SHALL be designed such that access to TR and ER rooms is not required for cabling and systems served from EIDF rooms

2. Contract documents SHALL show cross section of the cable tray with clearance zones, conduit routing and bonding details, clearance to ceiling below, and proper support hardware

3. Cable tray SHALL be installed with a minimum of 12” clearance above the cable tray and a minimum of 24” along one side for access. Access zone SHALL NOT be impeded by the ceiling grid.

4. Cabling for systems such as access control, lighting control, DAS, nurse call, and patient monitoring systems is generally allowed in communications cable tray

a. Cabling for any system with A/C voltage or DC voltage above 48V is not permitted

b. Any type not listed MUST be approved in writing by UK ITS

2. Cable tray SHOULD be continuous as much as possible. When transition to conduit is required, the number of 4” conduits, including de-rating for bends, SHALL provide capacity equal to or greater than the cable tray.

C. Products

1. Acceptable manufacturers: Legrand, Cooper B-Line, Mono Systems, MP Husky

2. Cable tray SHALL be “ladder” style

3. Minimum cable tray dimensions SHALL be 12 inches wide with 4 inch side rails()

4. Rung spacing SHALL be a maximum of 6” over the entire length of the cable tray, except in radius bends

5. Basket type tray not allowed

6. Solid bottom or covered tray not allowed

D. Execution

1. Make intersections, bends, and tees, using fittings of same type and model series as straight run sections – only factory-made fittings allowed
2. Join cable tray sections at ends using manufacturer prefabricated splice plates
3. Cable tray systems SHALL be electrically continuous and bonded to TGB
4. Provide full-width dropouts where cables exit the cable tray
5. Cable trays SHALL be installed at least six (6) inches above the top of the ceiling grid and a minimum of eight (8) feet AFF
6. Cable trays SHALL be the first utility above the ceiling
7. Cable tray support
    a. SHALL be mounted using a trapeze method with threaded rods and unistrut
        (a) No bends in threaded rod are allowed
        (b) Cable tray SHALL be supported in this manner at every section junction and at five foot intervals between joints
        (c) Center-hung hangers are not allowed
8. Splice joints that are hinged, expansion splice plates, or any non-UL listed connections require a separate bonding conductor between the cable tray sections
9. Structural side members SHALL NOT be punched or drilled except for splice-plate and fastener bolt holes
10. Edge protection strips MUST be provided on any exposed cable tray ends
11. Where a cable tray route passes through a fire-resistance-rated wall or barrier, a UL-approved fire-rated cable pathway system such as the STI EZ Path Series 44+ or Hilti CFS-MSL modular sleeve SHALL be installed.
    a. Quantity of devices to provide at least the capacity of cable tray
    b. Devices MUST be ganged together in most space efficient pattern while allowing proper function and cable support and routing
12. Full width radius dropouts SHALL be installed in locations where cables exit the cable tray to a lower elevation
13. Cable tray SHALL NOT be used to support any other utilities such as conduits, junction boxes or ceiling support grid
14. Where screws and/or bolts are REQUIRED to be installed in the side members, the head SHALL be placed on the inside of the tray to prevent sharp objects inside the cable pathway

3. CONDUIT AND OUTLET BOXES

A. References and Standards

1. ANSI/NECA 1 – Standard Practices for Good Workmanship in Electrical Contracting
2. ANSI C80-3 – Electrical Metallic Tubing-Zinc Coated (EMT)
3. NEMA OS 1 – Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

4. NFPA 70 – National Electrical Code
5. UL 1 – Flexible Metal Conduit
6. UL 514A – Metallic Outlet Boxes
7. UL 514B – Conduit, Tubing, and Cable Fittings
8. UL 797 – Electrical Metallic Tubing-Steel
9. BICSI – Telecommunications Reference Manual (TDMM), Latest Edition

B. Design guidelines

1. All voice, data, video wiring inside rooms SHALL be protected by metallic conduit or other means such as surface raceway
2. Standard is in-wall EMT conduit unless conditions dictate otherwise and approved by UK ITS
3. Conduit SHALL be sized for 40% maximum fill, including 50% future growth
    a. For sizing calculation purposes, it SHALL be assumed that each communications outlet will require a minimum of two 4-pair cables

C. Products

1. Conduits
    a. Minimum conduit size shall be 1”
    b. Communications conduit SHALL be blue in color
        (a) Applies to all conduits serving communications, AV, nurse call, and patient monitoring systems
    c. PVC conduit is not acceptable except in caustic environments
    d. Flexible metal conduit is not acceptable – exceptions to be approved by UK ITS
2. Surface mount
    a. All surface mounted pathways will be metal – no plastic allowed
    b. Minimum size is Wiremold 2400BC or equivalent
    c. Inline surface mounted raceway (isoduct) SHALL be 2” deep minimum
        (a) SHALL have separate channels for power and communications cables
3. Outlet boxes
    a. Back box SHALL be 4-11/16” square, minimum 2-1/8” deep, with single gang mud ring
    b. Floor boxes SHALL:
        (a) Have separate compartments from electrical wiring and terminations
        (b) Allow installation of standard faceplates or mounting straps
        (c) Allow patch cables to exit with lid closed

D. Execution

1. No more than an equivalent of 270 degrees of bend, including offsets, are allowed in a conduit run between junction boxes or pull boxes

2. “LB” fittings SHALL NOT be used for any communications pathway
3. Pull boxes SHALL be
    a. Provided in conduit runs longer than 100 feet
    b. Readily accessible
    c. Not located in restricted access rooms, including restrooms
    d. Sized per referenced standards
4. Conduits ending at a cable tray SHALL have plastic bushings and be bonded to the tray
5. Conduits terminating within a communications room SHALL have plastic bushings and be bonded to the cable tray or TGB
6. Each horizontal communications conduit SHALL be home-run to the nearest cable tray. No device-to-device (daisy chained) conduit runs are allowed.
7. Conduits serving the same room MAY be combined into a junction box in the room with a single appropriately sized conduit extending the cable tray. This can reduce both the amount of conduits needed and congestion at the cable tray.
8. Provide bushings on all raceways
9. Surface mounted conduit not allowed except in mechanical rooms – exceptions MUST be approved by UK ITS

4. J-HOOKS

A. References and Standards

1. NEC 300.11 – Securing and Supporting
2. TIA/EIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces

B. General

1. J-hooks are generally not allowed in new buildings and renovations. Exceptions MUST be approved by the UK ITS Telecom Engineer.
2. J-hooks are only permitted above accessible ceilings
    a. Installation above gypsum ceilings is not allowed
    b. Installation in open ceilings is not allowed
3. MUST be sized to accommodate the planned installation plus 50% growth
    a. Minimum j-hook size in corridors is 4”
4. MUST be installed to provide 6” clearance above j-hooks and 12” side clearance

C. Products

1. MUST have a wide base design and smooth beveled edges: Caddy HP or equivalent

D. Execution

1. Maximum spacing is 48”
2. MUST be installed to provide straight pathway – both horizontal and vertical

3. MUST be installed to prevent cable from resting on other utilities
4. Minimum height above ceiling is 6”
5. MUST be the first utility above ceiling
6. MUST be mounted vertically as designed
7. MUST be routed to provide cable pathway directly from room to corridor
    a. Routing through multiple rooms is not allowed, if possible
8. Acceptable mounting options
    a. Screwed to exposed studs
    b. Toggle bolt in drywall
    c. Beam clamped to exposed beam or truss flange
    d. Metal anchors in concrete
    e. Connected to threaded rod
9. Unacceptable mounting options
    a. Ceiling grid support wire
    b. Any other wire hanger
    c. Ceiling T-grid

5. WIREWAYS
    A. Installation of wireways is not permitted
    B. In buildings with existing wireways:
        1. Connections to wireways MUST NOT block access to or the ability to open the doors
        2. Use suitable insulating bushings and inserts at connections to outlets
        3. Other utilities MUST be installed to keep a 24” clearance along the side of the wireway
6. UNDERFLOOR DUCT SYSTEM
    A. This type of raceway is not permitted

Section 27 0543 | Underground Ducts and Raceways for Communications Systems

1. GENERAL
    A. References and Standards
        1. ANSI C2
    B. Design guidelines
        1. Duct banks
            a. Should be generally parallel and perpendicular to property and building lines
            b. SHALL have a minimum of four 4” conduits between manholes
                (a) Actual sizing to be provided by UK ITS Telecom Engineer
            c. Conduits quantities should be designed in multiples of two
            d. Maximum degrees of bend, including offsets, between pulling locations SHALL be 180 degrees
            e. Additional conduits for power or other services MUST be considered
            f. At least half of the 4” communications conduits in each duct bank shall have three x 3” three-cell fabric innerducts installed. More may be required depending on the planned number of cables in the duct bank.
            g. SHALL be encased in steel reinforced concrete (3500 psi minimum) unless located outside the UK campus boundary
                (a) Encasement requirements for off-campus duct banks SHALL be determined in conjunction with UK ITS Telecom Engineer
            h. In locations subject to increased loads, such as under slabs, roadways, driveways, or foundations will require additional reinforcement in the concrete. PVC conduit MAY require installation in steel sleeves.
            i. Communications duct banks SHALL be a minimum of 24” from perpendicular steam pipes and a minimum of 6’ from parallel steam pipes
            j. Service (building) entrance duct banks
                (a) All campus buildings SHALL be connected to the communications manhole system
                (b) Size SHALL be determined by UK ITS Telecom Engineer
                (c) Minimum requirements
                    (i) Two 4” conduits per entrance
                    (i) All buildings within the UK campus boundary SHALL have two geographically diverse means of access to the communications manhole system
                        1. Exceptions MAY be allowed for support buildings less than 20,000 square feet
                (d) SHALL slope away from buildings to provide drainage toward manhole
                (e) SHALL stub up directly into ER if building configuration permits

(i) If building configuration does permit direct stub up into BDF, terminate PVC conduits in wall enclosure and transition to same quantity of EMT conduits to ER

k. Utility Tunnels

(a) Where raceways are installed in tunnels, they SHALL be kept at least 24” from parallel runs of flues, steam pipes, hot gas pipes, hot water pipes or any other utility line which becomes hotter than 120 degrees during normal operation of the facility it serves.

(b) All conduit sections crossing steam lines SHALL be threaded rigid and SHALL be provided with a means of thermal insulation from the steam lines,

l. Underground conduit to outdoor devices such as security cameras, WAPs, and Talk-A-Phones does typically not require concrete encasement and SHALL be

(a) 1” diameter minimum

(b) Individual home runs (no daisy chaining)

(c) Routed underground directly to nearest TR

m. Direct buried cables are not permitted in any location

2. Manholes

a. Minimum manhole interior dimensions SHALL be 6' wide x 8’ long x 7’ high

b. Maximum depth of all manholes SHALL be ten feet from the bottom

c. Maximum distance between manholes connected in any one run SHALL be 400 feet

d. SHALL be equipped with ladder, sump pit, sump pump, pulling eyes, cabling racks, and float sensor

3. Handholes

a. Typically not used within campus boundary

b. Use MUST be approved by UK ITS Telecom Engineer

2. PRODUCTS

A. Communications duct banks

1. Rigid galvanized steel conduit with threaded fittings

2. Type EPC-40 with matching fittings by same manufacturer as the duct

3. Factory-fabricated rigid PVC interlocking duct spacers appropriately sized for ducts and duct spacing that provide REQUIRED support of ducts during concreting or backfilling

4. Metallic underground line warning tape - refer to UK Design Standards Section 33 0526 - Utility Identification

5. Fabric innerduct shall be Maxcell 3” 3-cell or equivalent

B. Cast in place manholes

1. SHALL meet or exceed the following design criteria:
   a. Earth Load 2 Ft. fill at 130 lb/c.ft.
   b. Surcharge 2 Ft. at 130 lb/c.ft.
   c. Live Load AASHO H 20 truck load with 20% impact.

d. fc 4,500 psi
e. fy 60,000 psi

2. Waterproof exterior surfaces below grade portion of sides and tops of manhole
3. Waterproof sealant SHALL be provided between manhole sections, between manhole and entrance riser castings, and between riser casting and manhole cover frame
4. The manhole SHALL be provided with a manufacturer's warranty against leaks in the manhole resulting from cracks in the manhole structure. The length of this warranty SHALL be for five years from date of installation.
5. Manhole SHALL have a sump with a diameter of 18" and a depth of 18" to house the sump pump

C. Pre-cast manholes

1. SHALL meet the same requirements as cast in place manholes
2. SHALL be one-piece units or units with interlocking mating sections, complete with accessories, hardware, and features.

D. Handholes

1. SHALL comply with SCTE 77 Tier 15
2. Minimum size SHALL be 24"W x 36"L x 24"D
3. Cover SHALL be labeled "COMMUNICATIONS"

E. Manhole accessories

1. All materials used in manholes SHALL be resistant to corrosion. All steel SHALL be galvanized or zinc coated.
2. Frames and Covers
   a. SHALL be 27" diameter Neenah Foundry R-1640-B1 with "COMMUNICATIONS" label and manhole number as assigned by UK ITS Telecom Engineer welded onto the cover if not provided by the manufacturer
3. Collars SHALL be precast concrete, sized to maintain minimum 27" opening, and joints sealed watertight
4. Manhole ladder and extensions SHALL be face mount aluminum with dual ladder extensions - Halliday L1D and L1E or equivalent
5. Sump frame and grate
   a. Provide a removable grating over sump pit flush with the manhole floor with notches as REQUIRED for discharge piping exit
   b. To be located on same wall as ladder
6. Pulling eyes SHALL be installed in each wall opposite to each conduit entrance and one recessed in the center of the manhole floor
7. Cabling racks SHALL be provided on all four walls from top to bottom with brackets as REQUIRED to support cabling
8. Sump pump SHALL be Tsurumi HSZ

a. Ejected water from the manhole MUST discharge into storm sewer
b. This discharge piping to a storm structure must be shown on the drawings.

9. Electrical outlets
   a. One non-GFI single use receptacle for sump pump
   b. One GFI duplex receptacle for general use
   c. Additional receptacles MAY be REQUIRED for network switch, if applicable
10. Float sensor SHALL be SumpAlarm 2359-3
    a. SHALL be installed to send alarm once water level reaches no more than 12” above floor
    b. SHALL be connected to BAS panel and monitored by UK Delta Room
11. Light SHALL be vapor proof ceiling mounted LED fixture Sylvania 74531 or equivalent

3. EXECUTION

A. Duct banks

1. The duct envelope SHALL have a rectangular cross section and provide a minimum concrete thickness of three inches on the top and sides of all conduits and six inches at the bottom of the envelope (see Figure 1).
2. Reinforcement
   a. Rebar rods SHALL be sized according to the number of conduits in the ductbank envelope.
      (a) Four conduits – use #4 (½ ”) rebar
      (b) Six or more conduits – use #6 (¾ ”) rebar
   b. A minimum of four steel reinforcing rods SHALL be installed parallel to the conduit in all duct bank envelopes. Reinforce these rods with perpendicular rods in between the spacers (see Figure 1).
   c. Rebar SHALL be placed to allow 1.5” minimum concrete cover
3. Duct spacers SHALL be provided at a maximum of seven foot intervals. Large duct banks with twelve or more conduits will require spacers installed at shorter intervals.
4. All conduit fittings SHALL be long sweep
5. All joints SHALL be watertight
6. Top of duct bank SHALL be at least 24” below finished grade
7. Where conduits enter a building or a manhole the rebar MUST be doweled into the structure to prevent shearing of the conduits in case of settlement
8. Where trench walls are unstable or the trench width is wider than the designed envelope, the envelope SHALL be formed as required
9. Any dirt or debris fall-in SHALL be removed from trench before concrete is poured
10. Each duct run SHALL be installed with a continuous concrete pour if possible. Broken pours SHALL be minimized and require rebar extension minimum 24” beyond the end of the envelope and at all stub-outs at the end of each day's pour

11. A yellow coloring agent SHALL be added to the top three inches of concrete used for underground communications duct banks.
12. Drainage
    a. Duct banks SHALL be pitched to drain toward manholes
    b. All conduit, tubing, raceways, ducts and duct banks SHALL be installed in such manner to insure against collection of trapped condensation
13. No low spots or dips allowed.
14. When conduits pass through exterior walls of any facility, the entrance SHALL be watertight. Wall sleeves at entrance points MUST be sized to provide appropriate clearance around the conduit to allow for watertight sealing of the penetration.
15. All necessary precautions SHALL be taken by the contractor during construction to prevent the lodging of dirt, plaster or trash in all duct banks, conduit, tubing, fittings and boxes. All conduits in floors, concrete or below grade SHALL be swabbed free of debris and moisture before wires are pulled.
16. Fabric innerduct MUST be installed per manufacturer instructions
    (a) Swivels MUST always be used
    (b) The factory installed pull tape or rope MUST free-float during installation
    (c) When installing three separate sleeves in the same conduit, the center sleeve color stitching MUST be oriented opposite the top and bottom sleeves
17. Concrete SHALL be allowed to cure for a minimum of 24 hours before placing backfill
18. Marking requirements - refer to UK Design Standards Section 33 0526 - Utility Identification
19. Inspection
    a. All duct bank installations SHALL be inspected and approved by UK ITS staff prior to pouring of concrete
    b. At least 24-hour prior notice SHALL be given to UK ITS that a pour will be taking place
    c. Failure to obtain inspection and approval in writing will result in removal of duct bank

B. Manholes
1. SHALL be situated to prevent water runoff from entering lid
2. All conduits entering a manhole will be sealed from the outside of the manhole prior to backfilling
3. All conduits SHALL terminate in the manhole wall with bell ends
4. Any joints in manholes are REQUIRED to be watertight
5. Access opening SHALL be offset to align with ladder
6. Waterproofing SHALL be installed after concrete has cured for at least three days
7. Before pulling cables through manhole:
    a. Internal surfaces, including sump, SHALL be cleaned and any foreign material removed
    b. Systems (power, light, pump, float sensor) SHALL be functional

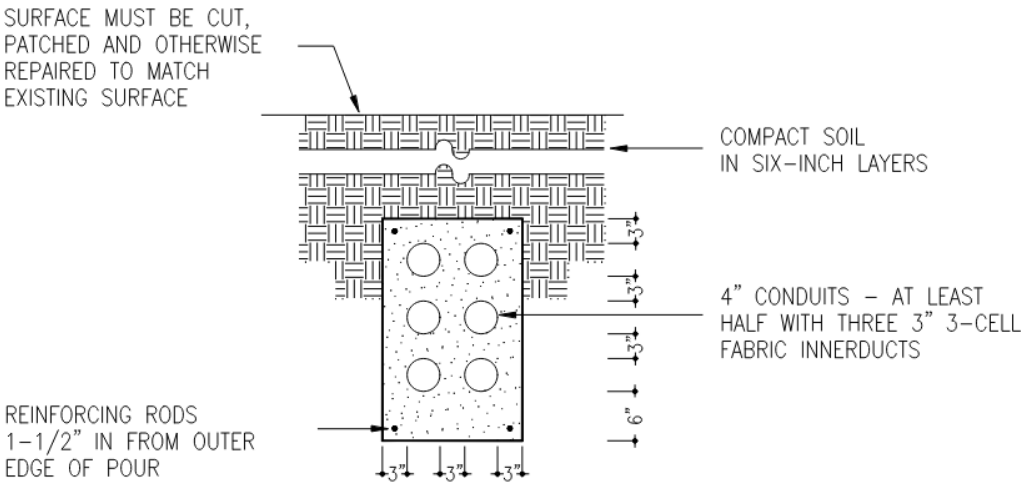
C. Inspection

a. All duct bank and manhole installations SHALL be inspected and approved by UK ITS staff prior to pouring of concrete or manhole setting

b. At least 24-hour prior notice SHALL be given to UK ITS that manhole setting or concrete pouring will be taking place

c. Failure to obtain inspection and approval in writing SHALL result in uncovering the area and MAY result in removal and replacement of duct bank or manhole at no cost to UK

FIGURE 1 – Typical Communications Ductbank Cross Section



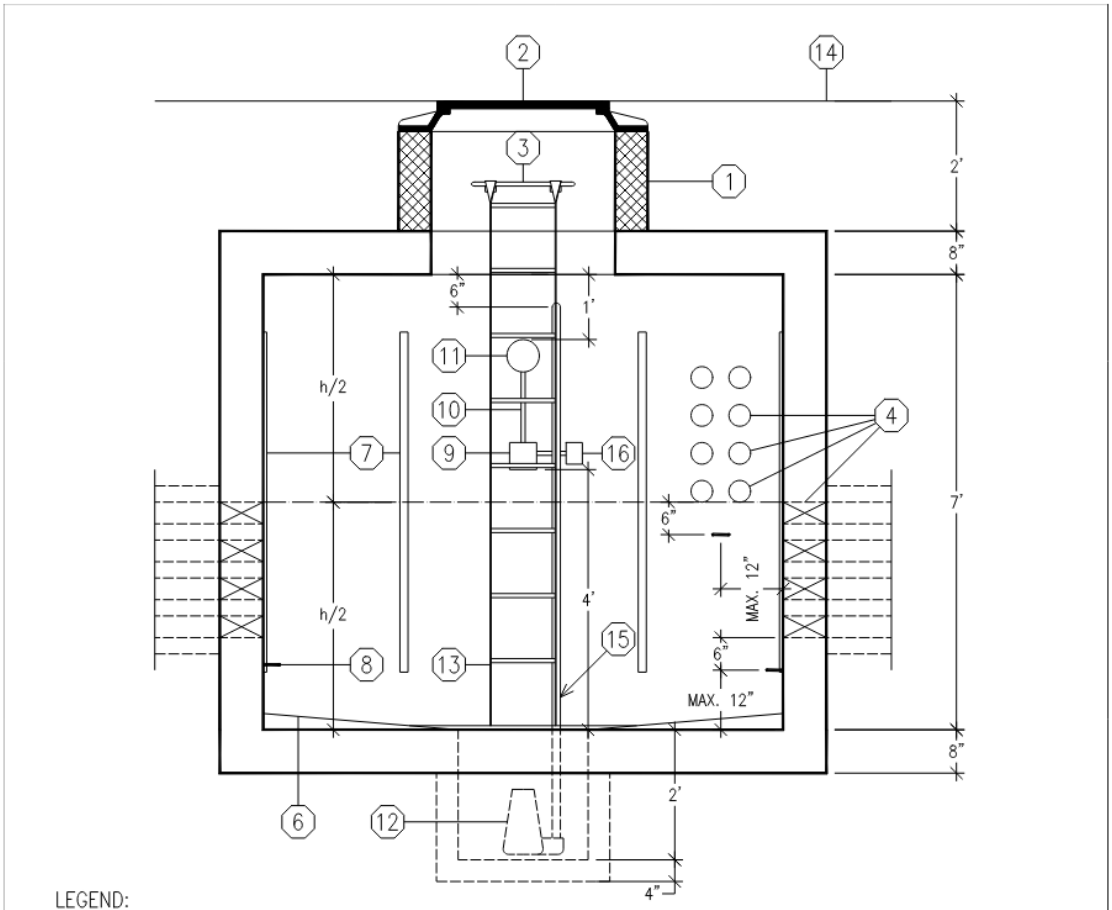
NOTES:

1. TOP OF CONCRETE ENCASEMENT SHALL BE INSTALLED A MINIMUM OF 24" BELOW FINISHED GRADE. DYE CONCRETE TOP YELLOW.
2. DUCT BANKS SHALL PROVIDE POSITIVE DRAINAGE BETWEEN MANHOLES AND SLOPE AWAY FROM BUILDINGS.
3. DUCT SPACERS REQUIRED AT MAXIMUM 7' INTERVALS.
4. ALL CONDUIT FITTINGS SHALL BE LONG SWEEP.
5. WHERE CONDUITS ENTER A BUILDING OR MANHOLE, REBAR SHALL BE DOWELED INTO THE STRUCTURE.
6. DIRT OR DEBRIS FALL-IN SHALL BE REMOVED BEFORE CONCRETE IS POURED.

Information Technology Services

Communications Duct Bank

FIGURE 2 – Typical Communications Manhole Cross Section



LEGEND:

1. BRICK/CONCRETE COLLAR
2. 27" CAST IRON FRAME AND COVER NEENAH FOUNDRY CAT. NO. R-1640-B1 LETTER LID – "COMMUNICATIONS"
3. 3/4" ø STEEL BAR
4. END BELL ROUND 4" #1203
5. 2" ø SLEEVE
6. GRADE APPROXIMATELY 1/4" PER FOOT
7. STANDARD CABLE RACK #16-101
8. STRAIGHT PULL-IN IRON #23-004
9. 2 GANG WEATHERPROOF BOX WITH SWITCH AND GFI RECEPTACLE
10. 3/4" ø CONDUIT
11. ROUND WEATHERPROOF LIGHT
12. TSURUMI HSZ
13. HALLIDAY L1D AND L1E OR EQUIVALENT
14. FINISHED GRADE
15. SUMPALARM 2359-3
16. SUMP PUMP RECEPTACLE

Information Technology Services

Communications Manhole - Cross Section

Section 27 0553 | Communications System Identification

1. GENERAL
   A. All cables, outlets, patch panels, enclosures and equipment racks SHALL be clearly labeled and uniquely identified
   B. Outside vendors are required to install readily identifiable cable labels in the locations outlined in this section following their own labeling scheme
   C. References and Standards
      1. TIA/EIA-606-B - Administration Standard for Commercial Telecommunications Infrastructure
2. PRODUCTS
   A. Labels, tags, and straps SHALL be high quality that will endure over the life of the cable plant
   B. Cable labels SHALL be self-laminating, white/transparent vinyl and incorporate an integrated clear lamination which, when label is wrapped around cable, covers printed part of label
   C. Handwritten labels are not permitted except where indicated otherwise
   D. Characters SHALL be black in color and printed on white background
   E. Characters SHALL be 10-point font minimum
   F. Labels SHALL be as large as practical while fitting properly
   G. Surfaces SHALL be cleaned before applying label
3. EXECUTION
   A. Telecommunications Outlet
      a. Top Label of Outlet:
         (a) Room Number of Outlet Location
         (b) Location in room going clockwise starting at corridor door (1,2,3…)
            (i) Example: In room A06112, the top of the first faceplate going clockwise in the room SHALL be labeled

            “A06112-1”

      b. Bottom Label of Outlet:
         (a) Room Number of source IDF/EIDF Room
         (b) Patch panel ID
         (c) Patch panel port number (1, 2, 3…)
            (i) Example: In room A06112 fed from IDF A06C002 and terminated on patch panel A ports 1 and 2, the bottom of the first faceplate going clockwise in the room SHALL be labeled

            “A06C002-A-1,2”

   B. Wireless Access Point Outlet
      a. Top Label of Outlet:
         (a) Room Number of Outlet Location

(b) AP

(c) Location in room/space going clockwise (1,2,3…)

(i) Example: In room A06112, the top of the second wireless access point faceplate going clockwise in the room/space SHALL be labeled

"A06112-AP-2"

b. Bottom Label of Outlet:

(a) Room Number of source IDF/EIDF Room

(b) Patch panel ID

(c) Patch panel port number (1, 2, 3…)

(i) Example: In room A06112 fed from IDF A06C002 and terminated on patch panel B port 10, the bottom of the first faceplate going clockwise in the room SHALL be labeled

"A06C002-B-1"

A. Security Camera Outlet

a. Top Label of Outlet:

(a) Room Number of Outlet Location

(b) SC

(c) Location in room/space going clockwise (1,2,3…)

(i) Example: In room A06112, the top of the first security camera faceplate going clockwise in the room/space SHALL be labeled

"A06112-SC-1"

b. Bottom Label of Outlet:

(a) Room Number of source IDF/EIDF Room

(b) Patch panel ID

(c) Patch panel port number (1, 2, 3…)

(i) Example: In room AO6112 fed from IDF AO6C002 and terminated on patch panel C port 48, the bottom of the first faceplate going clockwise in the room SHALL be labeled

"A06C002-C-48"

B. Modular Patch Panel

1. Label each patch panel in each rack in alphabetical order (A,B,C…) starting at the top of each rack. Labels SHALL be unique within each room.

a. Label each patch panel port:

(a) Faceplate ID

(b) Jack ID

(c) Example: For the data jack 1 in faceplate 1 within room A06112:

"A06112-1-1"

C. Coaxial Patch Panel

1. Label each patch panel in each rack in alphabetical order (A,B,C…) starting at the top
2. Label each patch panel port:
    a. Faceplate ID
        (a) Example: In for the coaxial jack 1 in the patch panel 1 within room A06112:

"A06112-1-1"

D. Horizontal Cabling
    1. Label each end of horizontal cable to match patch panel label
    2. Label at patch panel end to be placed within 10" of termination
    3. Label at outlet end to be placed within 2" of termination
E. Backbone Copper Cable
    1. Label each backbone cable at both ends at termination point with unique identifying code
    2. Label cable sheath at point where sheath ends and where viewing of label is not obscured by termination blocks or other visual barrier
    3. Label SHALL be on plastic tag tie-wrapped to cable sheath, or placed on adhesive labels adhered to cable sheath
    4. Label Intra-building cables with:
        a. From and To locations
        b. Pair Count
        c. Date installed
            (a) Example: 25-pair copper twisted pair cable from BDFA0B211 to IDFA06002:

BDFA0B211 – IDFA06002

001-025

10/2024

F. Copper Termination Blocks
    1. Label termination positions in horizontal row with position identifier
    2. Place termination block labels above or below termination
    3. IDF 110-style cabling blocks SHALL be labeled consistent to patch panels
    4. Intra-building (within building) 110-style backbone cabling blocks SHALL identify:
        a. Cable origin & destination
            (a) Repeat on every designation strip
        b. Pair #
            (a) Label 1st and 25th positions on each row (e.g. 001 & 025, 026 & 050, etc.).
                (i) Example: BDFA0B211 to IDFA06002:

001 BDFA0B211 – IDFA06002 025

026 BDFA0B211 – IDFA06002 050

G. Backbone Fiber Optic Cabling
    1. Label each backbone cable at both ends at termination point with unique identifying code
    2. Inter-building (OSP) cables SHALL be labeled in each manhole, handhole, and any other

exposed locations

3. Label Intra-building (ISP) cables with:
    a. From and To room numbers
    b. Fiber count
    c. Fiber type (SM, OM1, OM4, etc)
    d. Date installed.
    e. Example: 24 strand single mode fiber cable from BDFA0B211 to IDFA06002:

BDFA0B211 – IDFA06002

24SM

10/2024

4. Label Inter-building cables (OSP) with:
    a. From and To buildings and room numbers
    b. Fiber count
    c. Fiber type (SM, OM1, OM4, etc)
    d. Date installed
        (a) Example: 72 strand single mode fiber cable from building PS2 Room 012E to Pav A BDFA0B211:

PS2 12E – Pav A BDFA0B211

72SM

10/2024

5. Armored fiber cables SHALL be labeled per Section 3I – Innerduct

H. Fiber Optic Enclosures
1. Label front of all fiber enclosures with unique information for each cable terminated within
2. Each label SHALL include:
    a. Fiber count
    b. Fiber type (SM, OM1, OM4)
    c. POS
    d. Starting termination panel and position/Ending termination panel and position
    e. To building (only if in different building) and room number
        (a) Example: 04U enclosure located in Pav A BDFA0B211 with 72 strand single mode fiber optic cable to building PS2 Room 012E and 24 strand OM4 fiber optic cable to Pav A IDF A06002:

72SM POS A1/C24 TO PS2 012E

24OM4 POS D1/D24 TO IDFA06002

I. Innerduct - Indoor
1. Innerduct containing fiber optic cable SHALL be labeled where exposed
    a. Includes the following areas:
        (a) Manholes

(b) Handholes

(c) Telecommunications spaces

(i) Within 5’ of entry exposure into room

(ii) Within 2’ of termination enclosure

(iii) At each entrance and exit from slack loops

(d) Cable trays (every 100’)

(e) Junction boxes

2. Label innerduct with durable yellow polyethylene tag that reads "CAUTION FIBER OPTIC CABLE"
   a. Tag SHALL provide blank spaces for adding fiber count and cable destination information
3. Label Tag to include:
   a. Identifier(s) of cable(s) contained therein
      (a) Use Section 3G - Backbone Fiber Optic Cabling labeling formats
4. Hand lettering with indelible ink MAY be used on tag
5. Tag SHALL be secured to innerduct using self-locking ties

J. Equipment Racks

1. Labels SHALL be placed at the top of each rack
2. Rack labeling scheme
   a. When looking at the front of the racks, the left most rack will be R1
   b. Each rack to the right will be labeled in numerical order
   c. If a TR contains more than one row of racks, the row closest to the door will be Row A
      (a) Each row will be labeled in alphabetical order from Row A
   d. Examples:
      (a) The third rack in a single row of racks in a TR:

R3

(b) The second rack in the second row of racks in a TR:

B R2

Section 27 1100 | Communications Equipment Room Fittings

1. GENERAL
   A. This section provides design and installation requirements for telecommunications spaces and their associated fittings
      1. Telecommunications spaces are the rooms and areas where telecommunications cabling systems are terminated, cross connected, and interconnected to installed telecommunications equipment.
         a. Types of telecommunications spaces included in this section:
            (a) TRs – Telecommunications Rooms
            (b) ERs – Equipment Rooms
            (c) TEs – Telecommunications Enclosures
            (d) EIDFs – Equipment Intermediate Distribution Frames
            (e) EBDFs – Equipment Building Distribution Frames
         b. Terminology in this section:
            (a) The term TR is equivalent to the term IDF (Intermediate Distribution Frame) with the terms being used interchangeably
            (b) The term ER is equivalent to the terms BDF (Building Distribution Frame) and MDF (Main Distribution Frame) with the terms being used interchangeably
      2. Telecommunications room fittings include:
         a. Cabinets, racks, frames, and enclosures
         b. Cable management – horizontal and vertical
         c. Cable runway
         d. Patch panels
         e. Copper termination blocks
         f. Fiber enclosures
   B. Design guidelines
      1. Telecommunications spaces are special-purpose rooms that have stringent requirements due to the nature, size, expense, and complexity of the equipment housed in them. Telecommunications spaces vary in size according to the size of the building, number of floors, tenancy characteristics, and telecommunications services required. The current and future needs of the facility and the end users MUST be considered in both the size and locations of the rooms.
      2. TRs, ERs, and TEs are for UK ITS equipment only. All vendor and other non-UK ITS communications equipment SHALL be installed in an EIDF or other location where available. Typical systems installed in EIDFs are building automation systems (BAS), electronic safety and security (ESS), energy management systems (EMS), lighting control, fire alarm, intercom (e.g., aiphone), nurse call, patient monitoring, intrusion detection, and sound masking. Careful planning of cable termination locations is required to meet these requirements.

3. Architectural requirements
    a. Every building SHALL have at least one TR and EIDF per floor
        (a) A TE MAY be allowed for buildings smaller than 3,000 square feet or with less than 48 horizontal cables and MUST be approved by UK ITS Telecom Engineer
    b. Horizontal cable lengths, including termination and slack, must not exceed 295'. Multiple TRs per floor are required when this distance cannot be maintained
    c. In buildings with one TR per floor, they SHOULD be placed near the middle of the building, instead of either end
    d. In buildings with multiple floors, TRs SHALL stack one above the other
        (a) Care SHALL be taken to locate rooms such that floor cores will avoid structural beams or other members and be installed within 4” of the wall
    e. EIDFs SHOULD be located adjacent to or near TRs
        (a) EIDF and TR adjacency is a requirement in healthcare campus buildings due to the cross connect requirements between the rooms
    f. Every building SHALL have at least one ER
        (a) All healthcare campus buildings and those education campus buildings deemed to have critical network uptime requirements by UK ITS SHALL have two ERs in separate areas of the building
        (b) For buildings with three or less total TRs, one of the TRs MAY serve as the ER and does need to meet minimum ER size requirements
    g. Room sizing
        (a) TRs
            (i) Two floor racks
                1. Minimum size SHALL be 8’ x 10’
                2. Typically accommodates up to 300 Cat 6A horizontal cables
            (ii) Three floor racks
                1. Minimum size SHALL be 10’ x 12’
                2. Typically accommodates up to 600 Cat 6A horizontal cables
            (iii) Rooms requiring larger capacities SHALL be coordinated in size and layout with UK ITS Telecom Engineer
        (b) ERs
            (i) Minimum size SHALL be 10’ x 12’
                1. Sizing SHALL be coordinated with UK ITS Telecom Engineer
        (c) EIDFs
            (i) Education campus
                1. Typically contains wall mounted equipment
                2. Size SHALL be based on wall space for planned equipment in the room while

allowing access to equipment and pathways in the room

(ii) Healthcare campus

1. Typically contains both wall mounted and rack mounted equipment
2. Two racks typically provided
3. Minimum size SHALL be 8’ x 10’

(iii) Sizing SHALL be coordinated with UK Facilities Maintenance and UK ITS Telecom Engineer

(d) EBDFs

(i) REQUIRED in healthcare campus inpatient buildings only

(ii) SHALL be located adjacent to each ER

(iii) Sizing SHALL be coordinated with UK Facilities Maintenance and UK ITS Telecom Engineer

(e) All room sizes SHALL provide 36” minimum clearance between the front, back, and one side of rack group (including wire management and any other attachments) and the nearest obstruction such as walls, cooling units, floor cores, panels, or other items

h. Rooms shall be located in accessible areas (e.g., hallway) and shall not require entry through other department secure spaces

i. Floors SHALL be sealed concrete or VCT

j. Ceilings SHALL be open to deck and at least 10’ in height

k. All walls SHALL extend to deck and be covered with fire rated ¾” thick plywood. Plywood will generally begin at 4” AFF and extend to 8’-4” AFF. Plywood SHALL be painted with two coats of white paint with one fire-treated label/stamp on each piece of plywood left visible.

l. Doors SHALL be 3’ x 6”-8” minimum, swing outward into corridor, be equipped with door sweeps, and have badge readers matching UK Design Standard Division 28 000 - Security System Standard

(a) In locations where badge readers are not available, rooms shall be keyed to the university’s standard for telecom rooms

m. Rooms SHALL NOT have floor drains or be located in an area susceptible to flooding

n. Rooms shall not contain windows

4. Mechanical, Electrical, and Plumbing requirements

a. Environmental control

(a) Rooms SHALL be environmentally controlled 24 hours per day and year-round to maintain a room temperature range of 65 to 75 degrees Fahrenheit with a maximum relative humidity level of 50 percent

(b) Cooling equipment SHALL be sized to the anticipated heat load of the room plus 50% minimum for future growth

(i) Minimum design heat load for IDF and BDF rooms is 15,000 BTU per hour

(c) Cooling equipment SHALL be connected to emergency power

(d) Cooling systems MUST be monitored and controlled by the UK BAS (Delta Room) with any local thermostat control of units locked out

(e) Cooling units SHALL be located such that access to both communications equipment and pathways in the room is not impeded but also provides required space for maintenance

b. Liquid carrying pipes such as water, chilled water, waste, roof drains, and steam SHALL NOT be routed through or above rooms

(a) If this is not possible in existing room locations, drain pans SHALL be installed to catch dripping water and direct it to an appropriate drain

(i) Drain pan SHALL NOT impede access to communications equipment and pathway access in the room

c. Fire protection

(a) Rooms SHALL have 5lb fire extinguisher with appropriate rating installed just inside the door

(b) Sprinkler heads installed in rooms SHALL be of at least an intermediate temperature classification, with a nominal temperature rating equal to or greater than 175 degrees Fahrenheit

(c) Sprinkler piping inside rooms shall be routed to avoid dripping on racks as much as possible

(d) Sprinkler heads SHALL have wire cages

d. Electrical

(a) Lights SHALL be pendant hung led strips and provide a minimum illumination of 100 FC per square foot

(i) Lights SHALL be located such that access to both communications equipment and pathways in the room is not impeded

(ii) Lights SHOULD be fed from emergency power if available

(b) Receptacles

(i) In rooms requiring both emergency and normal power receptacles, the intent is to eliminate single sources of failure. Options such as receptacles both on emergency power and fed by two separate and redundant transfer switches with separate power feeds to the electric panels MAY also be accepted.

(ii) The following are typical receptacle requirements for UK ITS provided UPS units. UK ITS Telecom Engineer will provide receptacle requirements for each project.

1. Education campus TR

a. With 2 racks: one L6-20R and one L6-30R on emergency power

b. With 3 racks: one L6-30R and one 70A disconnect on emergency power

2. Education campus ER

a. One L6-20R and one L6-30R on emergency power

b. One L6-20R and one L6-30R on normal power

3. Healthcare campus TR – ambulatory buildings
    a. With 2 racks: one L6-20R and one L6-30R on emergency power; one L6-20R and one L6-30R on normal power
    b. With 3 racks: one L6-30R and one 70A disconnect on emergency power; one L6-30R and one 70A disconnect on normal power
4. Healthcare campus ER – ambulatory buildings
    a. One L6-20R and one L6-30R on emergency power
    b. One L6-20R and one L6-30R on normal power
5. Healthcare campus TR and ER – 24/7 patient care
    a. Emergency and normal receptacles to be coordinated with UK ITS Telecom Engineer
6. Healthcare campus EIDF rooms – 24/7 patient care
    a. One L6-30 on emergency power
    b. One L6-30 on normal power

(iii) A minimum of one duplex outlet per wall on normal power is REQUIRED for all rooms

(iv) TEs will generally require a 5-20R or L6-20R – coordinate with UK ITS Telecom Engineer

(c) All circuits are to be labeled both at the receptacle and electrical panel

(d) Electrical panels SHALL NOT be installed in rooms, unless providing dedicated service to the room

(e) Cable tray matching the size entering the room SHALL loop the entire inside perimeter of the room at a height 12” above the floor racks and 4” away from walls

(i) EIDFs rooms are exempt from this requirement unless floor racks are installed in the room

(ii) See Section 27 0528 - Pathways for Communications Systems for cable tray requirements

(f) Cable runway SHALL be installed across the tops of the floor racks spanning the width of the room

(i) Size SHALL be 12” wide for rooms with two racks

(ii) Size SHALL be 18” wide for rooms with three racks

(iii) For rooms with four or more racks, coordinate with UK ITS Infrastructure Engineer

(g) Floor sleeves SHALL be installed between stacked TRs

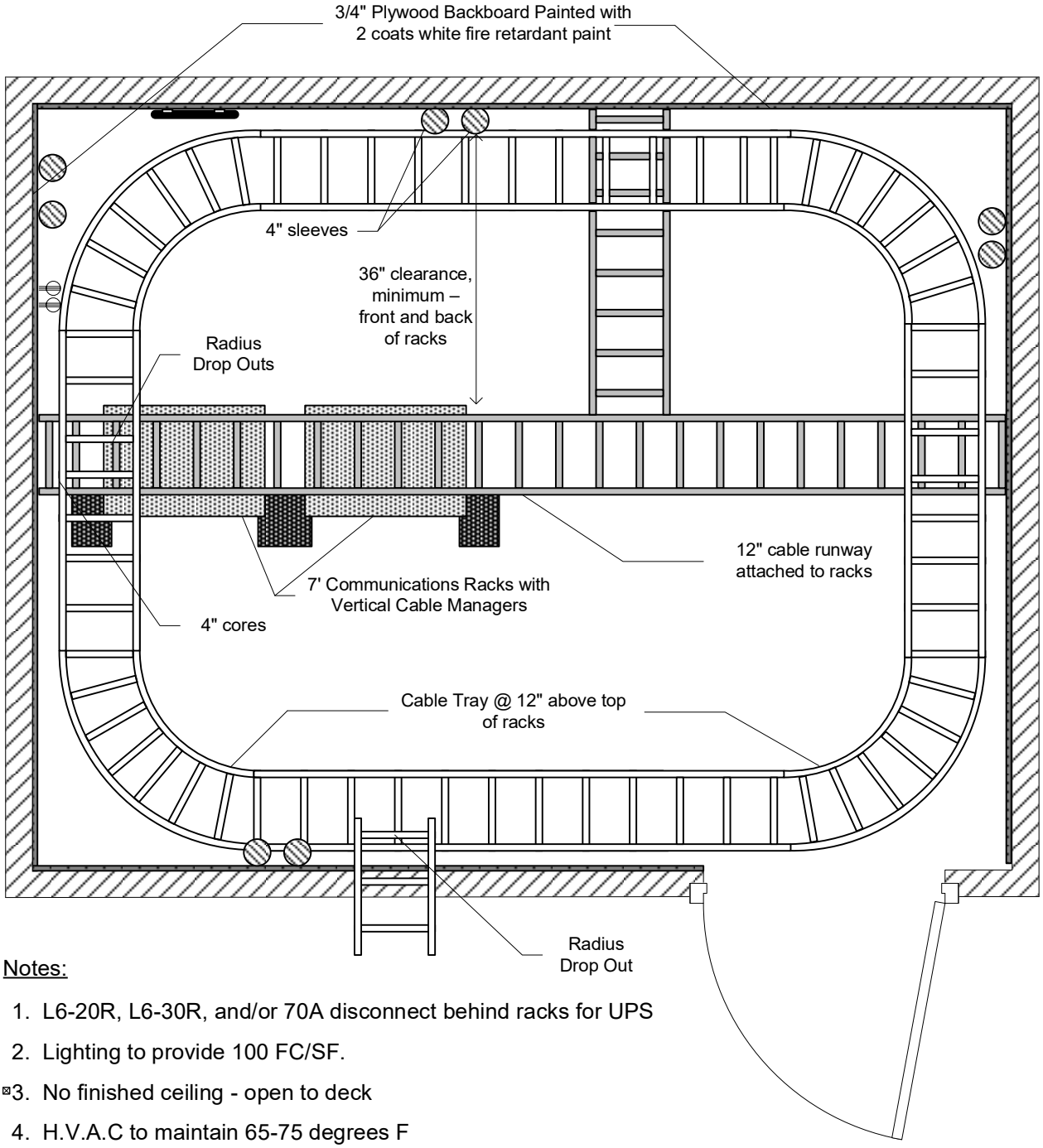
(i) A minimum of two sleeves SHALL be installed on each of three walls

1. Requirements will depend on the number of floors above the TR and how many TRs MUST be served on each of those floors – coordinate with ITS Telecom Engineer

(ii) Sleeves SHALL be extend from 4” AFF to a maximum of 10’ AFF of the floor below

5. Room and rack elevation drawings SHALL be provided for every ER, TR, EBDF, and EIDF and shall include at least the following items:
   a. Room drawings – plan view
      (a) Rack layout with rack numbers identified
      (b) Cable tray and ladder runway layout
      (c) Floor sleeve quantity and locations
      (d) Electric receptacles (UPS and convenience)
      (e) Light locations
      (f) Ground bar location
      (g) HVAC unit location
      (h) Plywood covered walls
   b. Rack elevation drawings
      (a) Racks with vertical wire managers (include rack numbers)
      (b) Fiber enclosure sizes and locations
      (c) Horizontal cabling patch panels and wire managers
      (d) Owner provided network equipment areas
      (e) UPS location(s)
      (f) Copper backbone rack mount 110 block location
6. Shared telecommunications spaces
   a. In cases where telecommunication rooms are shared, such as some existing campus and off-site locations, all UK ITS equipment and cabling SHALL be installed in a separate lockable area or lockable wall cabinet with a dedicated UPS
7. See Figures 3 and 4 for typical two rack telecommunications room layout and rack elevations

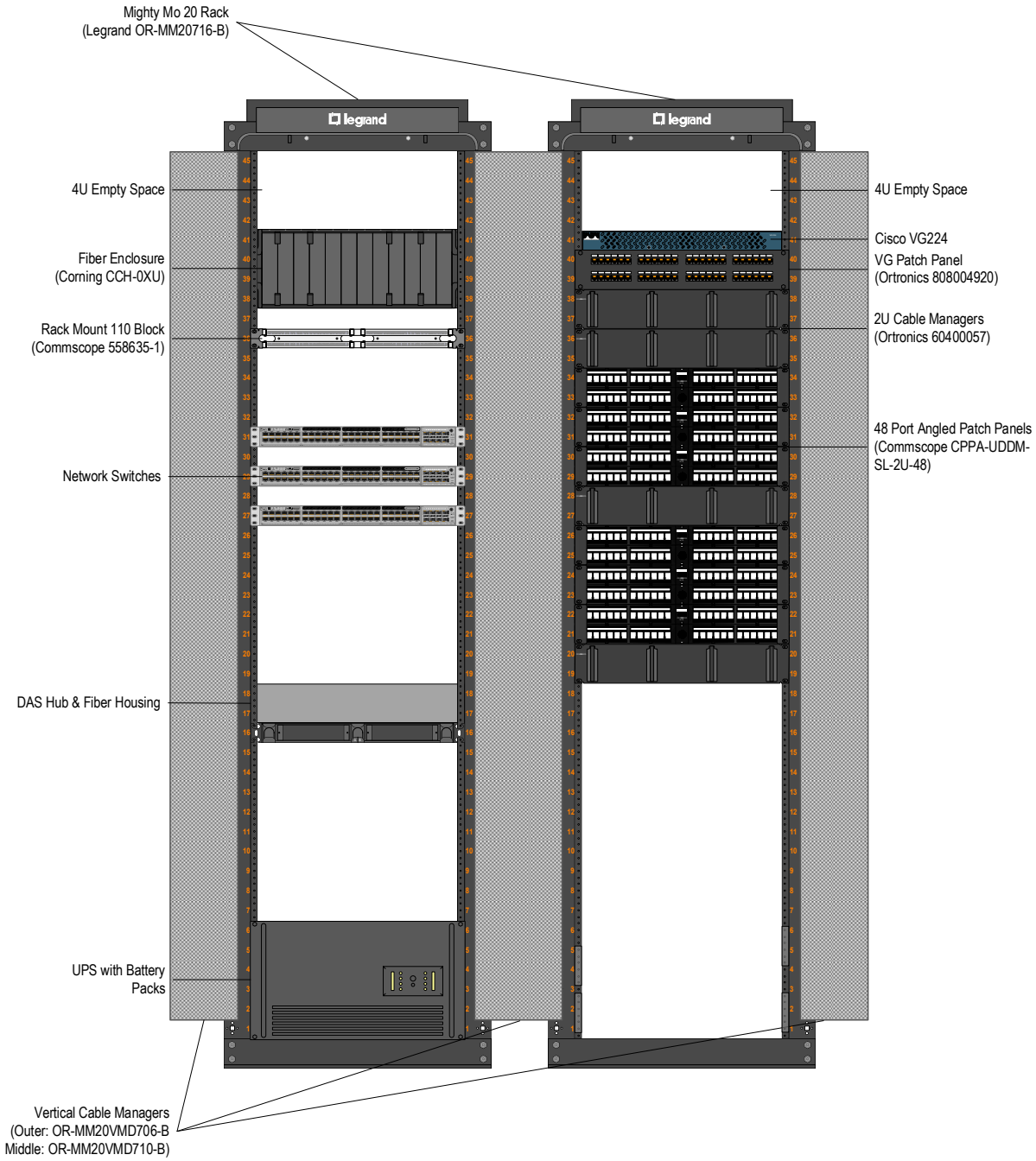
FIGURE 3 – Typical Two Rack Telecommunications Room Layout



Notes:

1. L6-20R, L6-30R, and/or 70A disconnect behind racks for UPS
2. Lighting to provide 100 FC/SF.
3. No finished ceiling - open to deck
4. H.V.A.C to maintain 65-75 degrees F
5. Fire Rated plywood backboard mounted starting at 4" AFF and ending at 8'4" AFF
6. Dedicated groundng system for all Telecommunications Rooms
7. Factory radius drop outs will be installed wherever cables exit the cable tray to a lower elevation

FIGURE 4 – Typical Two Rack Elevation Layout



Notes
- Minimum of two racks per room
- Equipment rack will be next to wall
- ITS will provide and install network, UPS, and DAS equipment

2. PRODUCTS
    A. Cabinets, racks, frames, and enclosures
        1. Floor racks
            a. SHALL be used for all standard installations
            b. Standard floor rack SHALL be 7’ tall, with 16.25” channel depth, and black Ortronics MM20716-B
                (a) Options that MAY be REQUIRED by UK ITS:
                    (i) 8’ tall racks in dense cabling environments
                    (ii) 6” deep racks in off-campus locations or small campus buildings
            c. All racks SHALL be furnished with a ground bar: Ortronics OR-GBH19KIT or equivalent
        2. Wall enclosures
            a. Only allowed in off-campus locations or very small campus buildings and MUST be approved by UK ITS Telecom Engineer
            b. When greater than 48 cables are anticipated:
                (a) Use Middle Atlantic CWR Series wall rack 32” deep with plexiglass door (CWR-XX-36PD4) or equivalent
                    (i) Requires 95cfm dual fan kit (CWR-FKIT) installed per manufacturer instructions
            c. When fewer 48 cables are anticipated:
                (a) Use Tripp Lite vertical mount 6U wall rack (SRWF6U36) or equivalent
    B. Cable management
        1. Horizontal: 2RU metal with rings: Ortronics OR-60400057 or equivalent
        2. Vertical:
            a. Ortronics Mighty Mo 20 Series
                (a) Manager height SHALL match rack height
                    (i) 6.5” MM20VMDX06-B
                    (ii) 10.5” MM20VMDX10-B
    C. Cable runway
        1. Black, 12” width minimum: CPI 10250-7XX or equivalent
            a. Requires cable runway mounting mounting brackets: Ortronics MM20CRBXXXX-B
            b. Requires foot kits for wall attachment: CPI 11309-701 or equivalent
            c. MAY require splice kits or other mounting hardware
    D. Modular patch panels
        1. 48 port unshielded angled patch panel: Commscope CPPA-UDDM-SL-2U-48
        2. 48 port unshielded flat patch panel: Commscope CPP-UDDM-SL-2U-48
        3. 24 port versions MAY be allowed in low cable count installations, but MUST be approved by UK ITS Telecom Engineer
    E. Coaxial patch panels
        1. 24 port unshielded flat patch panel: Commscope CPP-UDDM-SL-1U-24

a. With F-type coupler SL series inserts: Commscope 1499855-2
b. Requires wall bracket assembly: Commscope 558267-1

F. Termination blocks
1. Rackmount 100 pair 110-style: Commscope 558635-1
a. Requires 110 Cross-Connect Block, 5 pair count: 110C-5

G. Fiber optic enclosures
1. Standard SHALL be Corning CCH-0XU
2. In locations with dense fiber termination Corning EDGE-0XU MAY be REQUIRED by UK ITS

3. EXECUTION

A. General
1. Bond all racks, runways, cable trays, sleeves, etc. to TGB as outlined in Section 27 0526 - Grounding and Bonding for Communications Systems

B. Racks
1. A minimum of two floor racks are REQUIRED for all standard TRs

C. Cable management
1. Horizontal
a. Provide one 2RU cable manager at the top of patch panels in each rack
b. Provide one 2RU cable manager below every group of three horizontal patch panels in equipment racks
2. Vertical
a. Provide one 10.5” cable manager between racks
b. Provide one 6.5” cable manager on outside of end racks

D. Cable runway
1. SHALL be provided wall to wall across the top of all rows of racks
a. If door prevents installation to wall, stop runway ~2’ short of wall and add perpendicular runway to side walls
2. SHALL be installed perpendicular between rows of racks, if applicable
3. Full width radius dropouts SHALL be installed in locations where cables exit the runway to a lower elevation

E. Modular patch panels
1. Provide panels as needed to accommodate horizontal cables
2. Position cables in sequence of outlet ID
a. Group wireless access point cables on separate patch panel
b. Group security camera cables on separate patch panel
3. Follow rack elevation diagram for placement

F. Coaxial patch panels
1. Provide panels as needed to accommodate horizontal cables
2. Position cables in sequence of outlet ID

3. Place at 7’ height on wall, away from racks
    a. Coordinate placement with UK ITS Telecom Engineer

G. Fiber optic enclosures
1. 04U enclosures are standard for all fiber terminations
    a. 01U and 02U enclosures SHALL only be used in locations with space limitations and when approved by UK ITS Telecom Engineer
    b. Inter-building (OSP) cables SHOULD be terminated in separate enclosures from intra-building (house) cables

Section 27 1300 | Communications Backbone Cabling

1. GENERAL
   A. Backbone cabling refers to indoor and outdoor cabling between:
      1. Buildings
      2. ERs and TRs and/or TEs
      3. TRs
   B. Backbone cabling sizes to be provided by UK ITS
   C. All backbone cabling SHALL be installed in pathways defined in Section 27 0528 - Pathways for Communications Systems
   D. All backbone cabling SHALL be continuous (no splices) between termination points
   E. All buildings within the UK campus boundary SHALL have two geographically diverse inter-building fiber optic cables that provide diverse circuit routes to the planned distribution or core switches
      1. Exceptions MAY be allowed for support buildings less than 20,000 square feet
   F. Single mode fiber is REQUIRED:
      1. To each building
      2. To each TR and TE
      3. To each AV enclosure that requires a UK managed network switch
   G. All healthcare campus buildings and those education campus buildings deemed to have critical network uptime requirements by UK ITS SHALL have geographically diverse fiber optic cables from the ER(s) to the TRs and between the ERs
   H. Choose riser or plenum rated cables per building environment
   I. Demolition
      1. Coordinate with ITS before removing cables
      2. Cables planned for demo SHALL be completely removed back to source – cut cables are not allowed to remain in place
   J. Whenever possible, all abandoned cable SHALL be removed from cable trays, conduit, wireways, manholes, and tunnels. If it is not feasible to remove abandoned cable, it SHALL be clearly tagged at both ends as abandoned, with appropriate labeling per Section 27 0553 - Communications System Identification, and reported to UK ITS Telecom Engineer.
2. PRODUCTS
   A. Copper
      1. SHALL be 24 AWG solid copper UTP, Category 3 minimum, gray jacket
      2. SHALL be sized per drawings, 12 pairs minimum to each IDF
      3. Manufacturer SHALL be General Cable
      4. See Section 27 1100 | Communications Equipment Room Fittings for termination hardware
   B. Fiber optic

1. Manufacturer for fiber optic cable and termination hardware SHALL be Corning
2. Cable - indoor
    a. SHALL be MIC 250 or Corning EDGE MTP trunk unless otherwise indicated below
        (a) Single mode OS2, yellow jacket unless otherwise indicated below
        (b) Sized per drawings
            (i) Minimum 24 strands to each IDF
            (ii) Minimum 12 strands to: classroom AV equipment racks
        (c) Fire alarm panel
            (i) SHALL be MIC tight-buffered 62.5-micron multi-mode OM1, orange jacket
            (ii) SHALL be sized per drawings, minimum six strands
        (d) Commonly used cables and part numbers
            (i) MIC 250 24SM armored: 024ZD8-T1301-MA
            (ii) MIC 250 12SM: 012ZD9-T1301-M2
            (iii) 24SM EDGE MTP trunk non-armored indoor plenum 100': G909024GPNDDU100F
            (iv) MIC 6OM1: 006K81-31130-24
3. Cable – outdoor
    a. SHALL be ALTOS gel-free loose tube with FastAccess technology unless otherwise indicated below
        (a) Single mode OS2
            (i) Sized per drawings
                1. Minimum 24 strands to each building
                2. Minimum 12 strands to:
                    a. Talk-A-Phones (if fiber REQUIRED)
                    b. Outdoor telecommunication enclosures
        (b) Multi-mode OM1
                1. Sized per drawings
                    a. Minimum 12 strands to each building
        (c) Indoor/outdoor rated cable MAY be REQUIRED if more than 50’ of cable is exposed inside building
            (i) Product SHALL be FREEDM loose tube
        (d) Commonly used cables and part numbers
            (i) ALTOS 24SM: 024EU4-T4700D20
            (ii) ALTOS 12OM1: 012KU4-T4730D20
            (iii) FREEDM riser 48SM: 048EUF-T4101D20

4. Terminations
    a. SHALL be UPC LC duplex connectors unless otherwise indicated below
    b. SHALL be pigtailed splice cassettes or MTP module, 12 or 24 strands as REQUIRED
        (a) CCH or EDGE type, depending on enclosure
        (b) Exceptions:
            (i) Termination at fire alarm panel SHALL be SC unicams
            (ii) Termination at AV enclosures SHALL be in single panel housings
    c. Commonly used fiber optic termination hardware and part numbers
        (a) CCH pigtailed splice cassette 24SM: CCH-CS24-A9-P00RE
        (b) EDGE pigtailed splice cassette 12SM: EDGE-CS12-AE-P00RE
        (c) CCH MTP module 24SM: CCH-UM24-04-89G
        (d) EDGE MTP module 12SM: ECM-UM12-04-89G
        (e) SC unicams: 95-000-41
        (f) Single panel housing 12SM: SPH-CS12-A9-P00RE

C. Innerduct
1. Indoor
    a. SHALL be 1” diameter unless cable requires larger size, orange in color, UL listed
        (a) Riser: Carlon Riser-Gard or equivalent
        (b) Plenum: Carlon Plenum-Gard or equivalent
2. Outdoor
    a. SHALL be 3” three-cell fabric with 1250lb mule tape: MaxCell MXC3456 or equivalent

D. Coaxial
1. SHALL be Commscope 0.540 diameter: QR 540 JCA or equivalent

3. EXECUTION

A. General
1. To facilitate future cable installations, a new pull string, tied off at both ends, SHALL be installed in all pathways simultaneously with the pulling of cable
2. All strands/pairs SHALL be 100 percent terminated
3. Cables SHALL be installed and terminated per manufacturer requirements and instructions
4. Cables SHALL be labeled per Section 27 0553 - Communications System Identification
5. All cable placed along runways, cable trays, racks and distribution shelves SHALL NOT exceed the manufacturers bend radius requirements for that particular type cable
6. Where cables are secured by straps or other fasteners they SHALL NOT be pulled so tight at any point that the cable cladding is crushed flat or indented. Cable MUST move back and forth within the strap or fastener.

7. Damages incurred to any existing cables are the responsibility of the party involved. All damages SHALL be reported immediately to UK ITS.

B. Copper

1. SHALL be tested for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors

C. Fiber Optic

1. General

a. Splices of any type, except at termination hardware, are prohibited

b. Cables SHALL be sufficiently free of surface imperfections and inclusions

c. A minimum 30’ slack loop SHALL be mounted in a circular configuration on the telecommunication room wall at each end of the cable run

(a) Loop SHALL be

(i) Neatly coiled

(ii) Greater than the minimum bend radius of the cable

(iii) Dedicated to individual fiber cable (multiple cables on the same loop are not allowed)

d. Each cable SHALL be individually attached to the fiber enclosure per manufacturer instructions

e. Testing requirements

(a) All fiber strands SHALL be field-tested. Any strand that fails these requirements SHALL be diagnosed, corrected, and re-tested.
(b) All testing procedures and field-test instruments SHALL comply with applicable requirements of ANSI/EIA/TIA-568
(i) Tier 2 testing is REQUIRED
(c) All tests SHALL be documented including overall loss measurements, OTDR traces and event tables, and length measurements
(d) Test results SHALL be provided electronically to UK ITS Telecom Engineer. UK ITS will not install fiber circuits on and fiber strands before test results are received.

2. Indoor

a. SHALL be armored or SHALL be installed in innerduct or dedicated 1” conduit

b. SHALL be bonded per Section 27 0526 and manufacturer recommendations

c. Fire alarm

(a) SHALL be routed from BDF to fire alarm panel

(b) SHALL be installed entirely in conduit and/or cable tray from BDF to fire alarm panel

3. Outdoor

a. Pathways

(a) All fiber optic cables between buildings within the UK campus service boundary SHALL be installed in concrete encased duct banks

(i) Allowable exceptions:

1. Fiber optic cables serving devices such as Talk-A-Phones and outdoor communications enclosures SHALL be installed in 1-1/4” conduit – concrete encasement is not required
2. Locations outside the UK campus service boundary as approved by UK ITS Telecom Engineer

(b) The UK telecommunications duct bank system is not uniform across campus and has various configurations. The types of available pathways are likely to vary along the length of the cable pull. The following acceptable fiber optic pathways are listed in preference order and SHALL be used based on highest priority pathway available along each section of the route:

(i) Dedicated 1-1/4” conduit

(ii) Empty cell of fabric innerduct inside conduit

1. Cells MUST be filled in the following order
   a. Middle cell starting with the middle sleeve, then bottom sleeve, then top sleeve
   b. Bottom cell starting with the middle sleeve, then bottom sleeve, then top sleeve
   c. Top cell starting with the middle sleeve, then bottom sleeve, then top sleeve

(iii) Empty existing rigid innerduct inside conduit

(c) If one of the above approved pathways are not available, new fabric innerduct SHALL be installed

(i) Standard installation is three x 3” three-cell sleeves in an empty 4” conduit

(ii) An individual 3” three cell sleeve MAY be installed in a partially filled 4” conduit

(iii) Fabric innerduct MUST be installed per manufacturer instructions

a. Swivels MUST always be used
b. The factory installed pull tape or rope MUST free-float during installation
c. When installing three separate sleeves in the same conduit, the center sleeve color stitching MUST be oriented opposite the top and bottom sleeves

(d) Aerial cable SHALL NOT be installed within the UK campus service boundary unless approved by UK ITS, UK UEM Executive Director, and the campus Architect

b. Cables in manholes and handholes

(a) SHALL be routed along walls of enclosure and supported by cable racks if available

(b) SHALL NOT be pulled tightly between ducts

(c) SHALL NOT be looped

c. Only cables specified within this document SHALL be installed in any communications facility. There SHALL be no cable with voltages higher than 48 volts DC in communications duct banks except:
   (a) Electrical feeders for sump pumps, lights and outlets
      (i) SHALL be installed according to the National Electrical Code requirements for wet locations and isolated in separate conduits.

D. Coaxial

1. Leave 15’ of slack at each end – CATV provider will terminate both ends

Section 27 1500 | Communications Horizontal Cabling

1. GENERAL
   A. Definitions
      1. Horizontal cabling is the portion of the communication system that connects horizontal or intermediate cross-connects (typically at IDF rooms) and communications outlets
      2. A communications outlet is considered to be a faceplate into which modular jacks or other couplings snap and labeling/identification components
   B. All horizontal cabling SHALL be continuous (no splices) from the cross connect to the communication outlet
   C. All horizontal cabling SHALL be installed in pathways outlined in Section 27 0528 - Pathways for Communications Systems
   D. Cabling for AV systems SHALL match horizontal cabling specifications
   E. Design guidelines
      1. Standard communications outlets SHALL:
         a. Consist of a single gang faceplate with two Category 6A cables terminated with modular jacks
         b. Be mounted at standard heights unless otherwise REQUIRED
            (a) Desk: 16” AFF
            (b) Wall phone (ADA): 48” AFF
            (c) TV/Monitor: coordinate with mount
      2. Locations and Quantities
         a. Unless otherwise specified, the following number of outlets SHALL be installed in the following quantities, depending on end user requirements and UK ITS guidance
            (a) **General Offices:** at least one communications outlet per designated occupant and SHOULD be placed on the wall near the planned desk location. An additional communications outlet on the opposite wall is RECOMMENDED for future flexibility.
            (b) **Clerical Areas:** at least one communications outlet at the location of each desk and one additional outlet for a printer. Add outlets as necessary for additional staff members in the same area.
            (c) **Conference Rooms:** quantity to be determined based on the AV design and consultation with UK ITS. Minimum of one communications outlet for TV/monitor and one for conference phone.
            (d) **Graduate Student Offices:** at least one communications cable for every occupant
            (e) **Laboratories:** at least one communications outlet per table
            (f) **Classrooms/Lecture Halls/Auditoriums:** quantity to be determined based on the AV design and consultation with UK ITS
            (g) **Residence Halls:** at least one communication outlet per room

(h) **Patient Care Rooms:** quantity to be determined based on consultation with end users, IT support staff, and UK ITS

(i) **Storage Areas:** at least one communication outlet per room

3. Wireless Access Points (WAPs)
   a. All WAP layouts SHALL be designed by UK ITS
   b. All indoor WAPs with integrated antennas SHALL be mounted below ceiling
   c. One Cat 6A data cable SHALL be installed to each WAP
   d. UK ITS will furnish and install all WAPs
   e. Typical WAP mounting options:
      (a) Indoor WAPs
         (i) **Lay-in ceiling areas:** cable to terminate in accessible standard outlet box 6” to 18” above ceiling with faceplate. WAP will mount to the ceiling grid with patch cable up to faceplate.
         (ii) **Gypsum (hard) ceiling areas:** cable to terminate on RJ45 jack in standard outlet box cut-in to ceiling with single gang mud ring. WAP will mount directly to mud ring with short patch cable to jack. Outlet box MUST be located to allow room for WAP.
         (iii) **Open ceiling areas:** cable to terminate on RJ45 jack in accessible standard outlet box with single gang mud ring located at or slightly below surrounding ductwork, pipes, lights, etc. WAP will mount directly to box which MUST be located to allow room for WAP.
         (iv) **With exterior antennas:** access point to be installed above accessible ceiling or 24” x 24” access panel. Cable to terminate on RJ45 jack in standard outlet box 6” – 18” above ceiling with single gang mud ring. Access point will mount directly to mud ring with short patch cable to jack. Outlet box MUST be located to allow room for access point. 1-1/4” conduit sleeve with bushings REQUIRED through exterior wall flush with outer surface. Sleeve to slope slightly downward toward outer surface. Antenna will mount to outer wall surface.
         (v) Other options must be coordinated with UK ITS Telecom Engineer
      (b) Outdoor WAPs: to be coordinated with UK ITS
4. Nurse call and patient monitoring systems are typically REQUIRED in buildings providing inpatient care on the healthcare campus. Design requirements for each system will be provided by the manufacturer, but typical horizontal cabling is:
   a. Nurse call
      (a) White Cat 6 cable with:
         (i) Modular plug terminations for all device connections
         (ii) RCB horizontal cables have modular plug terminations at the RCB and modular jack terminations on patch panels in the EIDF
   b. Patient monitoring
      (a) Orange Cat 6 cable with modular jacks terminating on:

(i) Faceplates at outlet boxes

(ii) Patch panels in TRs and EIDFs

1. Cables serving patient room monitors terminate in TRs
2. Cables serving central monitors and telemetry terminate in EIDFs

5. Locations requiring outdoor rated cable SHALL be installed with underground pathways directly to the BDF/IDF. Pathways SHALL be designed such that transition from outdoor rated to indoor rated cabling is not REQUIRED. All outdoor cables SHALL be installed in conduit.
6. Coaxial cable for CATV service is declining in use at UK. Consult with end users and UK ITS Telecom Engineer if CATV service is required.

2. PRODUCTS

A. Faceplates

1. SHALL be Commscope FP-LBL
   a. Select color to match electrical faceplates
   b. Select quantity to match number of cables
   c. Provide Commscope blanks to match faceplate color: 1116412-X

B. UTP cable

1. Standard data SHALL be:
   a. Cat 6A U/UTP with non-continuous shield: Commscope SYSTIMAX X10D
      (a) Standard jacket color is blue:
         (i) Unique jacket color MAY be specified for specific systems – to be coordinated with UK ITS Telecom Engineer
      (b) Riser: 1091SD
      (c) Plenum: 2091SDB
2. Nurse call SHALL be Cat 6 U/UTP with white jacket: Commscope Uniprise CS37
3. Patient monitoring SHALL be Cat 6 U/UTP with orange jacket: Commscope Uniprise CS37

C. UTP cable hardware

1. Standard data SHALL be Commscope Cat 6A SL unshielded modular RJ 45 jack
   a. Standard jack color is blue: USL10G-BL
      (a) Unique color MAY be specified for specific systems – match to cable jacket color
2. Nurse call SHALL be:
   a. Modular jack: Commscope USL600-P.WH
   b. Modular plug: Commscope FT-MP
3. Patient monitoring SHALL be: Commscope USL600-OR

D. Coaxial cable

1. SHALL be RG-6 type, quad-shield: Commscope 4103904/10 | 2229V WHRL RG6 QD BC 1000 or equivalent

E. Coaxial cable hardware

1. SHALL be threaded male F-type: Commscope 1-1499855-X or equivalent

a. Color to match faceplate

3. EXECUTION

A. Cable installation and termination

1. General

a. All horizontal cabling SHALL be 100 percent terminated

b. Cables SHALL be neatly dressed from cable tray to cable runway, through the rack, and into the patch panels

c. Cables SHALL NOT be bundled, tie-wrapped, or lashed in cable trays but SHALL be neatly routed into and through racks with the minimum amount of velcro REQUIRED

d. Follow manufacturer's recommended termination practices

e. Label per Section 27 0553 - Communications System Identification

f. As-built drawings with all communications outlets identified SHALL be provided electronically to UK ITS Telecommunications Engineer upon completion of cabling

g. Paint on cable jackets voids the warranty. All cables with painted jackets SHALL be replaced at no cost to UK.

2. Faceplates

a. Mount modular jacks and connectors into faceplates and secure faceplates to outlet box or modular furniture

b. Ensure back box space allows for minimum cable bend radii behind each faceplate

3. Horizontal UTP cable

a. Terminate cables using 568B wiring standard

b. UTP horizontal cable length SHALL NOT exceed 295 ft measured from cross-connect to the communications outlet

(a) Includes slack REQUIRED for installation and termination

(b) Contractor is responsible for installing horizontal cable to avoid unnecessarily long runs

(c) Any area that cannot be reached within above constraints SHALL be identified and reported to design engineer prior to installation

c. Organize cables on patch panels per Section 27 1100 - Communications Equipment Room Fittings

d. Preserve pair twists to point of termination

4. Horizontal coaxial cable

a. Minimum bend radius SHALL be 6x cable diameter for coaxial cable

b. Terminate each end of cables to F-type connector
   (a) Prepare cables per manufacturers recommendations for connector type used
   (b) Insure proper center conductor length as specified by manufacturer
c. In IDF, terminate cable to wall-mounted patch panel

B. Field testing
1. All horizontal cables SHALL be tested
2. Final test results SHALL be on cables after jacks are installed in faceplates and faceplates are mounted in final configuration
3. Any cable that fails these requirements SHALL be diagnosed, corrected, and re-tested
4. Test results SHALL be provided electronically to UK ITS Telecom Engineer. UK ITS will not activate ports on any cables before test results are received.
5. Horizontal UTP cable
   a. Testing procedures and instruments SHALL be per TIA/EIA-568-C - permanent link test configurations
   b. Testing SHALL include:
      (a) Wire map
      (b) Length
      (c) Insertion loss
      (d) NEXT (Near-End Crosstalk)
      (e) PS NEXT (Power Sum Near-End Crosstalk)
      (f) Return loss
      (g) Propagation delay
      (h) Delay skew
6. Horizontal coaxial cable
   a. All cables SHALL be tested using wire test Instrument to:
      (a) Locate breaks/faults/incorrect terminations
      (b) Verify length
      (c) Verify impedance
      (d) Measure return loss (5-MHz to 1-GHz)
      (e) Signal strength: verify signal level at outlet is nominal 10 dBmV +/- 5 dBm

C. Demolition
1. Coordinate with ITS before removing cables
2. Cables planned for demo SHALL be completely removed back to source – cut cables are not allowed to remain in place

REVISION DATE	PAGES	REMARKS
04/2026	All	Re-write of entire document