1 Introduction

In the design of Telecommunications systems in Purdue facilities, the overall consideration should be to understand and treat telecom as a utility. It should be assumed that all new offices will be equipped with telephone circuits and one or more computer workstations. These are currently connected via separate intra-building networks but will eventually migrate to one converged network incorporating both voice and data services. Currently, all dedicated 2-wire and 4-wire, security, fire, etc. operate on a copper backbone. The data network operates on copper from the workstation to the telecommunication room and then is connected via fiber optic cable to the Purdue fiber optic backbone. Purdue’s CATV system (BTV or Boiler Television) operates over a mixture of coaxial cable and fiber optic cables.

2 Design

2.1 The design team for renovations and new building construction shall include a BICSI certified RCDD (Registered Communications Distribution Designer) with 5 years of experience.

3 PIC Quantity and Location

3.1 The program will supersede this table if it calls for more than what is listed in Table 1:

<table>
<thead>
<tr>
<th>Room</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offices</td>
<td>For one staff member, typically 120-180 ASF</td>
<td>1 data PIC location (with 2 ports)</td>
</tr>
<tr>
<td></td>
<td>For multiple staff members, typically 120 ASF per person</td>
<td>1 data PIC location (with 2 ports) for every person</td>
</tr>
<tr>
<td>Computer labs</td>
<td>Adequate number and type of PICs to accommodate equipment 2 video + 2 data per seat</td>
<td></td>
</tr>
<tr>
<td>Conference rooms</td>
<td>1 video, 2 data, minimum</td>
<td></td>
</tr>
<tr>
<td>Classrooms</td>
<td>1 video, 2 data, minimum</td>
<td></td>
</tr>
<tr>
<td>Special areas</td>
<td>See Building Program</td>
<td></td>
</tr>
</tbody>
</table>

Note: PICs shall not be installed in modular furniture. PICS shall be installed in walls where furniture is in close proximity to the wall. Floor boxes and poke-thrus may be installed next to furniture that is not in close proximity to a wall to service the required locations. Owner furnished jumpers can be installed from the floor boxes or poke-thrus through the furniture to provide connectivity to customer equipment. Exceptions will be considered during the design phase on a case by case basis and shall be reviewed by Purdue’s Information Technology Infrastructure Services department.
4 Special Circuit Requirements

4.1 Every FACP (Fire Alarm Control Panel) requires two voice cables, terminated per telecom specifications, to be installed from the nearest telecommunications room.

4.2 Every environmental control cabinet requires two data cables, terminated per telecom specifications, to be installed from the nearest telecommunications room.

4.3 Every building electrical switch gear meter requires two data cables, terminated in an enclosure outside of the metering cabinet per telecom specifications, and to be installed from the nearest telecommunications room.

4.4 Every elevator requires one voice cable, terminated per telecom specifications, to be installed from the nearest telecommunications room.

5 Wireless Network Systems for Data

5.1 Wireless network systems shall be engineered by Purdue’s Information Technology Infrastructure Services (ITIS) department during the design phase of the project. ITIS will provide the A&E with wireless access point locations based on a computer generated site survey for new and existing buildings so they may be incorporated into the construction documents. The contractor will be responsible for installing a turn-key wireless system as part of the project. The wireless system shall be included in the building project budget.

5.2 Existing wireless access points affected by construction shall be removed by Purdue prior to the beginning of construction and reinstalled once construction is complete.

6 Location and Configuration of Telecommunication Rooms (TR)

6.1 Every building shall be served by at least one telecommunications room. Multi-story buildings shall have a minimum of one telecommunications room per floor. These telecommunications rooms shall be located so that every new or future PIC is by wire length within 90 meters of its distribution point in the telecommunications room. This includes areas where PICs are not currently designed to be installed but may be installed in the future (i.e. Far ends of the building, attic spaces, mechanical rooms, etc).

6.2 The BDF room must be located within the building at or near the point where the facilities enter the building. Locate telecommunication room to be accessible directly from a hallway; access through a mechanical room or other space is not permitted.

6.3 The location of the BDF telecommunications room shall be within 50ft of the point where electrical facilities enter the building.

6.4 The BDF and IDF telecommunication rooms shall be sized by ports served and rectangular in shape with no structural obstructions.

<table>
<thead>
<tr>
<th>Serving Area by Telecommunications Data Port Counts</th>
<th>Minimum Telecommunication Room Size (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 864 ports</td>
<td>10’ x 15’ (rectangular in shape free of building structural obstructions)</td>
</tr>
<tr>
<td>More than 864 ports</td>
<td>10’ x 15’ + 3’ per each additional 288 ports (rectangular in shape free of building structural obstructions)</td>
</tr>
</tbody>
</table>

7 Construction of the Telecommunication Room Service Entrance

7.1 Typical service entrance for Telecommunications shall be a minimum of two 4” rigid conduits from nearest utility tunnel location or maintenance hole (manhole) into a BDF room. Additional entrance conduits may be required based upon area (ASF) of building and number of Telecommunications circuits required. Preferred method is to install conduits below grade between the tunnel and the BDF room.

7.2 No more than 180° of total bends are allowed between pulling points when installing underground entrances. All bends must be long, sweeping bends with a radius of no less than ten times the internal diameter (ID) of the conduits.

7.3 Where maintenance holes (manholes) are required, a separate maintenance hole and maintenance hole entry must be provided for Telecommunications facilities. Maintenance hole covers must be marked “COMMUNICATIONS”. All hardware in maintenance holes must be galvanized. Maintenance holes must be equipped with bonding inserts and struts for racking, pulling eyes, and ladders. Maintenance holes must be equipped with...
PHYSICAL FACILITIES  
2020 Consultant’s Handbook  
Division 27 Communications  
0000 Communications Guidelines

8 Construction of Communication Pathways
8.1 To keep average horizontal cable runs to 50 meters, with a maximum of 90 meters, locate each telecommunication room close to the center of the area it serves and vertically aligned up through the building as practicable.

8.2 Communications pathways shall be easily accessible and designed for flexibility and relative ease of modification.

8.3 Pathways shall be designed for voice, data, video, and Owner-approved low voltage cabling. Systems, such as fire alarm, security, building automation, etc., shall have a separate pathway for wire management. This may be a separate tier on the corridor cable basket/tray.

8.4 Provide cable basket/tray system, properly designed to handle required cable loading for building plus 50% expansion for future applications, above the ceilings in the corridors and elsewhere as required.

8.5 Design a distribution cable basket/tray system within the corridors that allows 3" of clearance between the basket/tray and the ceiling, 6" of clearance in front of the basket/tray, and 12" of clearance above the basket/tray. No systems shall pass through the cable tray. Basket type cable tray is recommended and may be center hung or wall hung on each side of the corridor. Basket tray shall be easily accessible.

9 General Construction of the Telecommunication Rooms
9.1 All telecommunication room walls shall have an added layer of 3/4" plywood, B-B ext. grade 5. Plywood must be fire-retardant and unpainted. Install the plywood vertically on walls from 6" to 8'-6"AFF from corner to corner. All walls shall be painted with a light-colored paint.

9.2 All walls shall extend from floor to underside of upper decking to create an environmentally-controlled enclosed space free of dirt and debris.

9.3 All BDF and IDF telecommunication rooms shall have ladder type cable tray installed around the perimeter of the room. (Typical elevation is 7'-2" AFF or per direction from Purdue ITIS department.)

9.4 Suspended ceilings are not permitted in telecommunications rooms.

9.5 Minimum ceiling height shall be 8’6”.

9.6 Doors shall be lockable, opening 90° or greater and 36” wide x 80” min height.

9.7 Hinge doors to open outward unless corridor width will not accommodate out-swing without reducing egress. If door must swing in, then assure that BDF room size is increased to accommodate in-swinging door.

9.8 Fire rating of doors and sprinkling of room shall be as required by code.

9.9 Hardware: hinges, lockset, stop, kick plate and closer by Purdue Standards. Prep doors for card access.

9.10 Locking: Cylinder shall be Purdue standard for BDF rooms. Deliver cylinder to Owner for keying and installation by the General Contractor. All new construction Telecom Rooms must be equipped with Blackboard Card Swipe access.

9.11 It is not permissible to route any mechanical, electrical, or special application systems through the telecommunication room, including HVAC ducts, plumbing, gas lines, air lines, clean outs, door access controls, etc. that do not directly serve the telecommunications room.

9.12 Departmental IT equipment is not permissible within ITaP Telecommunication Rooms.

10 Structural Requirements of Telecommunications Rooms
10.1 The floor rating under distributed loading shall be greater than 100lb/ft².

10.2 Walls may be of concrete block or stud wall construction. In stud wall construction, studs should be 20 GA galvanized channel type with 5/8" Type X gypsum board. Walls shall be finished to underside of deck and deck painted.

11 Mechanical Construction Requirements of Telecommunication Rooms
11.1 Provide heating, ventilation and air conditioning that will maintain a temperature range of 60° - 80° Fahrenheit. Dedicated fan coil units (FCU) are preferred since the telecommunications rooms operate 24/7. FCU shall be installed just outside of the telecommunications rooms and ducted to the room. FCUs should be equipped with economizers where possible.

11.2 No mechanical equipment shall be installed on or in front of the plywood or impair the routing of telecommunication cables.

11.3 Mechanical designers shall work with
telecommunications designers to ensure that space is available for access to cable tray in corridors. No utilities other than telecommunications shall be installed within 6” of either side of the tray or 12” above the tray. Cable tray shall be installed a minimum of 3” above ceiling grid.

12 Electrical Construction Requirements of Telecommunication Rooms

12.1 Provide a minimum lighting level of 50 foot-candles measured one meter above the finished floor level.

12.2 Every Telecommunications Room must have an Uninterruptable Power Supply (UPS) integrated into its design to ensure power reliability. The preferred approach is a centralized UPS which must be a 3-phase system with internally redundant power, battery and intelligence modules. These systems must be modular, user-replaceable and hot-swappable. In the case of a double failure in any of these systems, a static bypass feature must throw the loads onto utility power as a last resort.

12.2.1 Electrical Construction Requirements of Telecommunication Rooms with a centralized building UPS (preferred):

12.2.1.1 Provide a minimum of two (2) dedicated 110V, 15A (NEMA 5-15R) double-duplex electrical outlets on two separate 20A circuits, located on the wall behind the equipment frame and/or on the wall directly adjacent to the frame. One circuit to be fed from the central UPS and the other from normal house power.

12.2.1.2 Provide a minimum of two dedicated, 208V, 30A, twist lock (NEMA L6-30R), single phase electrical outlets, located behind the equipment frame on the wall in each telecommunications room BDF and IDF for a UPS. These outlets are to be installed in a 24” section of 6000 Wiremold surface mount raceway along with the 20A outlets. Each to be phased as follows: 1st outlet on A-B, 2nd on B-C, or on C-A. One circuit to be fed from the central UPS and the other from normal house power.

12.2.1.3 Provide a minimum of two dedicated, 208V, 20A, twist lock (NEMA L6-20R), single phase electrical outlets, located behind the equipment frame on the wall in each telecommunications room BDF and IDF for a UPS. These outlets are to be installed in a 24” section of 6000 Wiremold surface mount raceway along with the 30A outlets. Each to be phased as follows: 1st outlet on A-B and 2nd on B-C. One circuit to be fed from the central UPS and the other from normal house power.

12.2.1.4 If the building has a backup generator, then the MIB in the UPS shall be fed from the Automatic Transfer Switch and the normal house power circuits are non-emergency circuits.

12.2.2 Electrical Construction Requirements of Telecommunication Rooms with distributed UPS modules in each TR:

12.2.2.1 Provide a minimum of two (2) dedicated 110V, 15A (NEMA 5-15R) double-duplex electrical outlets on two separate 20A circuits, located on the wall behind the equipment frame and/or on the wall directly adjacent to the frame.

12.2.2.2 Provide a minimum of two dedicated, 208V, 30A, twist lock (NEMA L6-30R), single phase electrical outlets, located behind the equipment frame on the wall in each telecommunications room BDF and IDF for a UPS. These outlets are to be installed in a 24” section of 6000 Wiremold surface mount raceway along with the 20A outlets. These outlets shall be backed up by the building generator. Each to be phased as follows: 1st outlet on A-B, 2nd on B-C, or on C-A.

12.2.2.3 Provide a minimum of two dedicated, 208V, 20A, twist lock (NEMA L6-20R), single phase electrical outlets, located behind the equipment frame on the wall in each telecommunications room BDF and IDF for a UPS. These outlets are to be installed in a 24” section of 6000 Wiremold surface mount raceway along with the 30A outlets. These outlets shall be backed up by the building generator. Each to be phased as follows: 1st outlet on A-B and 2nd on B-C.

12.3 A separate duplex 110V, 20A outlet to be labeled as “service” shall be provided within the telecommunications room for tools, test sets, etc.

12.4 No electrical panel boards are permitted within the telecommunication room.

13 Removal and/or Relocation of Telecommunications

13.1 Existing PIC cabling may be reused if the cable is long enough to reach the new location and passes the most recent category test for the particular cable. Where existing cables will not reach, new cables shall be installed to the TR. We require all relocated cables to be tested prior to moving to ensure the cable will meet the category performance level set at the time it was manufactured.

13.2 Per the NEC (National Electrical Code), legacy voice and data systems not used within
renovated areas shall be removed as part of the project. The A&E firm shall identify legacy systems within the proposed renovated areas and contact ITIS for usage verification.

Note: Some legacy cabling still contains active circuits which must be verified and relocated in such a manner as to minimize customer disruption.

### Table 3

<table>
<thead>
<tr>
<th>Sheet</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-0xx</td>
<td>Site Plans</td>
<td>Exterior pathways and inter-building backbones</td>
</tr>
<tr>
<td>T-1xx</td>
<td>Floor Plans</td>
<td>TR distribution zones and backbone riser system complete for each floor. Include symbols legend.</td>
</tr>
<tr>
<td>T-2xx</td>
<td>BDF and IDF Distribution Zones</td>
<td>All telecommunications drop locations and cable IDs</td>
</tr>
<tr>
<td>T-3xx</td>
<td>Equipment Rooms</td>
<td>Plan views, TR details, wall elevations, equipment frame layouts, and etc. for all communication rooms</td>
</tr>
<tr>
<td>T-4xx</td>
<td>Typical Drawings</td>
<td>Faceplate configurations, labeling, grounding, risers, firestopping, ADA, etc.</td>
</tr>
<tr>
<td>T-5xx</td>
<td>Schedules</td>
<td>Cable wiring schedule</td>
</tr>
</tbody>
</table>

### 14 Bid package specifications and drawings

14.1 The design team shall utilize the latest Purdue University Master Specifications for Telecommunications on all projects. Contact Purdue IT Infrastructure Services by email for the latest version of available specifications, or questions regarding such:

itis-fieldops@purdue.edu

14.2 Items that do not apply may be edited out of the Master Specifications for a specific project. New items may not be added or changed without the consent of the Purdue Information Technology Department.

14.3 Telecom drawings should have their own "T" series, numbered as outlined in Chapter 2 “General Requirements & Communication” as shown below. Drawings are to include no less than the following:

14.4 The design team shall use the following Purdue standard telecommunication symbols on the floor plans:
15 Activation of Telecommunications Services

15.1 Prior to the activation of Telecommunications Voice and Data Services on the Purdue Campus, the following items must be complete:

15.1.1 All electronic test reports and as-builts submitted to ITIS
15.1.2 PIC verification testing complete by Purdue IT Infrastructure Services and resulting punch list items addressed by Contractor
15.1.3 PICs shall be properly labeled (both in the telecommunications room and at customer end)
15.1.4 PICs must pass ANSI/EIA/TIA-568C standards
15.1.5 Locations of PICs and cable pathways to be accurately depicted on project telecommunication as-builts
15.1.6 Labeling of PICs match Purdue-assigned room numbers
15.1.7 Cable management installed properly in telecom rooms and building distribution system
15.1.8 Telecommunications room must be accessible, wiped down and lockable
15.1.9 Test Results and Asbuilts must be submitted to Purdue IT Infrastructure Services no later than 4 weeks before substantial completion of each Telecommunications Room to ensure timely activation

15.2 Prior to the installation of Network Equipment in new Telecommunications Rooms, the following items must be complete:

15.2.1 Telecommunications rooms must have a lockable door (limited access)
15.2.2 Telecommunications rooms must be clean and remain clean
15.2.3 Telecommunications rooms must have permanent lighting
15.2.4 Telecommunications rooms must have permanent electrical power and ground
15.2.5 Telecommunications rooms must have permanent HVAC system installed and operational
15.2.6 Telecommunications room must be accessible

15.3 Prior to the activation of Critical Circuits, the following items must be complete:

15.3.1 Test results and as-builts for the requested circuits must be submitted no later than 3 weeks before circuits are needed for fire alarm, elevator inspections, and any other critical circuits
15.3.2 The Purdue Project Manager shall coordinate with Purdue Fire and Elevator shops prior to scheduling inspections to make sure specific requirements are met