

## **27 05 33 Conduits and Outlet Boxes for Communication Systems**

(Revision date: 4/16/14)

### **1.0 Purpose**

- A. These guidelines provide requirements for designers to incorporate into bid documents. They are part of the University Wiring Standard (UWS), version 3.0.

### **2.0 General Requirements**

- A. Horizontal pathway system. A pathway system will be installed in campus buildings to route and protect all horizontal telecommunications cabling from the BDF/IDF to the outlets in all work space locations. Station conduits and outlet boxes are part of this system.

### **3.0 Materials and Standards**

- A. Materials. The materials used for this system are generally NOT manufacturer and part number specific. Equivalent, high quality materials may be utilized without submittals to NCSU ComTech. However, the university reserves the right to reject materials that are considered of substandard quality. See Section 27 06 00 Schedules for Communications Systems for a list of materials acceptable for use in NC State University projects.
- B. Construction details. Detail drawings describing various outlet box and conduit systems are available for download and modification by designers at the ComTech website.
- C. Standards. All work shall be in accordance with the latest edition of all applicable campus, State, and Federal regulations and codes. Special considerations should be made to comply with NEC, NFPA, and North Carolina State Construction Office requirements. All work shall also be in accordance with the latest versions of the BICSI TDMM manual and TIA-569 standard, and with manufacturer's recommendations.
- D. Fire safety considerations. The installation of outlet boxes and conduits shall comply with all applicable fire safety and electrical codes. In general, the North Carolina State Construction Office determines the compliance of these systems with codes, and they reserve the right to inspect and approve/disapprove their installation. The horizontal pathway system shall be a completely enclosed, metallic system from the BDF/IDF to the outlet. It will be used to house non-plenum rated cables. All conduit penetrations of rated walls and floors shall be firestopped per applicable UL assembly.
- E. Enclosed pathways. Each of these pathway systems shall be a completely enclosed, metallic system. Typically, the horizontal pathway system consists of outlet boxes at the work space location connected to a nearby wireway via 1" metal (EMT) conduit.
- F. Outlet quantities/locations. The designer should consult with building user groups to determine the exact number and location of outlets needed. While each project has unique requirements, the following guidelines may assist in determining outlet quantities:
  - 1. Standard outlets. University standard outlets consist of three CAT6A RJ45 jacks. Jacks may be used either for voice service (up to two telephones per jack) or for data network connections.
  - 2. Single-jack outlets. Where needed, outlets with one CAT6A RJ45 jack may be installed. These should be installed sparingly and treated as the exception and not the rule. They

are for locations where the need for only one voice or data connection is envisioned. Examples would include outlets for: a CCTV camera high on the wall in a corridor, a wall-mounted TV monitor, a wall telephone at a loading dock, etc. Typical office spaces, labs, classrooms, etc. should be provisioned with standard three-jack outlets instead. Note: the outlet box and conduit are identical for single-jack and three-jack outlets. Single-jack outlets can easily be converted to three-jack outlets at a later date by merely adding two additional cables.

3. Offices. Typically, a single occupancy office is equipped with one outlet. Some offices may require a second outlet (due to size or egress issues). Normally, the outlet is located near the corner of the room farthest from the door.
  4. Modular furniture. Typically, one outlet per cubicle workspace is installed. Careful coordination is required in the design of the horizontal pathway system and the modular furniture system design/purchase. The designer should coordinate with ComTech when specifying outlets for modular furniture. Outlet box and conduit requirements vary based on the type of furniture system chosen.
  5. Classrooms. Most classrooms include a lectern that houses audio/visual (A/V) control equipment. Two outlets should be installed at the lectern base, and may be of wall mount, tombstone, or floorbox mount/poke-thru type:
    - a. Wall mount. If a portion of the lectern abuts a permanent wall, then the outlets can be installed on that wall such that they will be accessible from inside the lower portion (equipment area) of the lectern. Since the lectern will conceal these outlets, the lectern should be designed so that the faceplates of both outlets are fully accessible after the A/V equipment is installed.
    - b. Tombstone. For lecterns that are fixed to the floor, tombstone outlets can be installed in the lower portion of the lectern. Again, the lectern should be designed to maintain accessibility to the two faceplates after all A/V equipment is installed.
    - c. Floorbox/poke-thru. For lecterns that are not fixed, a floorbox or poke-thru can be installed under the lectern to house the two telecom outlets (along with power and/or A/V cables). The cover of the floorbox or poke-thru should remain accessible after installation of the A/V equipment.Additional outlets maybe installed on the walls of the room as needed. Outlets are not typically installed at ceiling mount projector locations. See campus guidelines for A/V systems for more information.
  6. Conference rooms. At a minimum, two outlets are installed in each conference room, one at each end of the room. Typically an additional outlet is installed under the conference table. If the table is not meant to be moved, a tombstone outlet may be installed. If the table is designed to be moved, a floor box or poke-thru should be used. Some conference room furniture is designed for outlets to be installed integrated with the table surface. The designer should coordinate with ComTech if these systems are to be used.
  7. Security System Interface (SSI) outlets. These outlets allow for a clean demarcation between the building telecom infrastructure and the building security system devices/infrastructure. SSI outlets are of two types: SSI-A outlets support two standard outlets and SSI-B outlets support one standard outlet.
  8. Other requirements. As building systems and user equipment becomes increasingly network enabled, additional outlets are required to provide connectivity for a wide range of devices.
- G. Outlet placement. Typically, all outlets are installed at 18" AFF. For aesthetics purposes in new construction, the bottom of the outlet box should be installed even with the bottom of electrical receptacle boxes. Outlet boxes may be mounted higher if necessary to be located above furniture, counter tops, or equipment. Outlet boxes should not be located too close to wet areas (e.g. sinks) where faceplates or patch cords could come into contact with water. Boxes also should not be located too close to sources of excessive heat, dust, chemicals, or electromagnetic interference (EMI).

Outlet boxes should also be located so that they will be accessible to technicians for patch cord installation or for jack retermination even after furniture and equipment is installed. Boxes should not be installed behind heavy equipment or modular furniture panels. Ergonomics and egress factors should be considered when planning outlet locations. Outlets should be located so as not to require telephone or data patch cords to be installed across doorways, aisles, or other "people" traffic areas.

- H. Outlet box type. Wall construction type normally determines the type of outlet box to be installed.

Flush mounted outlet boxes should be installed in all walls of gypsum board and standard stud (3 5/8" deep) construction. The top and bottom flanges (ears) of old work boxes should be adjusted so that the box itself does not protrude at all beyond the surface of the gypsum board. In general, flush mounted outlet boxes should be installed exactly straight (perpendicular to walls and floor) and flush with the surface of the gypsum board (after plaster ring installation). No visible gaps between the edge of the faceplate and the gypsum board should be present after final installation. Conduit is to be installed so as to enter the top of the box, into one of the back knockouts.

Surface mounted outlets should be installed onto all other wall types (masonry, plaster, prefabricated wall panels, etc.). In most cases these outlets will consist of a standard surface mounted outlet box with a surface mounted 1" conduit routed up the wall to the nearest wireway. The conduit and outlet box should be painted to match the surrounding wall surface. In cases where aesthetics are of concern, the 1" conduit may be replaced with Wiremold 2400 metal raceway. The raceway and box may or may not be painted to match the surrounding wall surface. For cleanest appearance, a bead of latex caulk should be applied between the wall and each side of the 2400 raceway.

- I. Conduit requirements. The length of flexible conduit installed in the ceiling area should be minimized. Flex conduit should be transitioned to EMT immediately after it exits the hollow wall with the flex conduit supported at its exit from wall. Conduits should be installed with appropriate offsets (box kicks) where they are connected to outlet boxes and junction boxes to keep surface mounted conduits flush against walls and decks.

A maximum of 180 degrees between pull points shall be maintained in all conduit runs. This does not include the box kicks described above. No LB-type (or similar) condulets shall be used. Use junction boxes to create pull points. These should be placed in straight sections of conduits where possible, but may be used to replace conduit bends where bends are impractical. When junction boxes are used in lieu of bends, the conduits should be connected to the junction box with maximum separation to allow the maximum cable radius within the box as possible. Only compression connectors and couplings shall be used in all conduit runs. No set screw connectors and couplings shall be used.

- J. Support structures. Outlet conduits are usually fastened to nearby walls or decks with one-hole straps. Surface mounted conduit hangers "mineralac straps" will not be used where visible. Conduit hangers with threaded rod used for overhead support may be used.

Each conduit shall be supported within 3' from where it connects to a wireway, junction box, or outlet box. The conduit shall be supported at intervals not exceeding 5' in the remainder of its run. Multiple conduits may be supported by a trapeze. No conduit shall lie directly on top of an acoustic tile ceiling grid or be supported by the grid or the grid supports (wire).

- K. Direct conduit systems. By default, 1" conduit runs from outlets should be connected to the wireway system and not be directly routed to the IDF. However, for IDFs serving a very small number of outlets or a very small geographic zone, a wireway system may not be necessary. In these cases, all of the 1" conduits may be installed in a homerun fashion directly back to the IDF. The conduits should penetrate the wall of the IDF and be terminated with a conduit connector (no plastic bushing needed). As much as possible, the conduits should be terminated near the corners of the IDF to facilitate cable routing. Conduits that penetrate the IDF between 7'- 6" and 9'- 0" may be terminated horizontally on the wall. Conduits that penetrate above 9'- 0" should be turned down vertically and terminated above 7'- 6". Conduits that penetrate below 7'- 6" should be turned up vertically and terminated above 7'- 6".

Occasionally, with IDFs equipped with a wireway system, it is impractical to route particular 1" conduits to the wireway. These can be routed directly to the IDF per the above guidelines.

- L. Floor boxes, poke-thrus, and tombstone boxes. In general, installation of telecom outlets on walls is preferred. However, in certain locations, it makes sense to use floor boxes, poke-thrus, or tombstones. These devices must support standard UWS hardware. In the past, use of specific boxes that were not compatible with UWS hardware has created great difficulty on campus projects. The designer should specify the exact box to be used. No other floor boxes, poke-thrus, or tombstones will be accepted unless specifically approved by ComTech. Generally, in floor devices should be connected to a nearby wireway via 1" conduit. The conduit should be routed so that these outlets are fed from the same IDF as the wall outlets in that room.
- M. SSI outlets. SSI-A outlets consist of two standard surface mount outlet box installed inside a 10"x 10"x 6"D screw cover junction box. Boxes are connected to each other via a conduit nipple. The upper outlet box is then connected to the nearest wireway via 1 1/2" conduit. SSI-B boxes are similar except they house only one surface mount outlet box inside an 8"x 8"x 6"D junction box. The outlet box is connected to the wireway by 1" conduit.
- N. Aesthetics. Generally, all visible conduits should be painted to match surrounding surfaces. Conduits installed in locations not visible by building occupants do not require painting. Ideally, all elements of the horizontal pathway system except for the actual outlet boxes in work spaces will be completely hidden from view. However, if this is not possible, the designer should carefully determine routing and components used to minimize negative aesthetics impacts.
- O. Installation checklist. The standard checklist below has been developed to govern the installation of station conduits and outlet boxes. It is not intended as a substitute for the drawings, specifications, applicable codes, or good work practices.

#### Surface outlets

- Is the outlet box level?
- Is the outlet box painted to match wall (if required)?
- Are proper conduit offsets (box kick) installed?
- Is the conduit painted to match surrounding surface?
- Is the conduit strapped within 3' of outlet box?
- Is the conduit strapped or supported every 5'?
- Are junction boxes located between every 180 degrees of conduit bends?
- Are all junction box covers screwed shut?
- Is a pull string installed with minimum 12" at each end?
- Are penetrations of rated walls firestopped properly?
- Are visible penetrations of all walls patched and painted properly?
- Is the conduit connected to the top or back of wireway (unless approved otherwise)?
- If conduit connects to the wireway cover, is the cover cut, deburred, and screwed shut?

Is the outlet level?  
Is the outlet flush with the gypboard surface?  
Are the box ears or plaster ring adjusted to recess box into wall?  
Are the center (device screw hole) tabs cut into gypboard?

Is the outlet secure, with jiffy clips tight?  
Is the locknut secure?  
Are all junction box covers screwed shut?  
Is a pull string installed with minimum 12" at each end?  
Is the flex penetration hole patched?  
Is the flex securely strapped as it exits the hollow wall?  
Is the flex to EMT connection installed properly?  
Is the conduit strapped or supported every 5'?  
Are junction boxes located between every 180 degrees of conduit bends?  
Are penetrations of rated walls firestopped properly?  
Are visible penetrations of all walls patched and painted properly?  
Is the conduit connected to the top or back of wireway (unless approved otherwise)?  
If conduit connects to the wireway cover, is the cover cut, deburred, and screwed shut?

End of Section