

# **UW Medicine MASTER SPECIFICATION**

## **– COMMUNICATIONS SYSTEMS INFRASTRUCTURE**

### **PART 1 - GENERAL**

#### **1.1 SCOPE**

- A. Provide a complete voice, data, and CATV communications infrastructure system as specified herein and as shown on the Contract Drawings. This raceway system shall support cable plant for voice, data, wireless 802.11x and CATV networks.
- B. Work Included
  - 1. The Contractor shall provide all necessary labor, materials, equipment, services, and other items required to furnish a complete and functional raceway system. Among the items required are
    - a. Interconnecting raceway between campus network and Riser Rooms (TEC and TDR)
    - b. Vertical riser sleeves and conduit
    - c. Grounding and bonding system
    - d. Horizontal distribution tray and conduit
    - e. Station drop conduits
    - f. Communications outlet boxes
    - g. TDR Room provisioning
- C. Comply with all requirements of 26 05 00 and 26 05 33.
- D. Coordination Requirements
  - 1. The Contractor performing the work in this section is required to coordinate with all trades prior to installation to assure trade conflict resolution.
  - 2. The Contractor performing the work in this section is required to work with Division 27 contractor to assure infrastructure is installed to meet project scope requirements.

#### **1.2 QUALITY ASSURANCE**

- A. Contractor Qualifications
  - 1. The Contractor performing this work shall have been in this business for a minimum of five (5) years and shall have completed at least four (4) projects of similar size and scope to this project.
  - 2. Contractor performing this work shall have a staff RCDD who will be available for regular review of infrastructure installed within this section. Staff RCDD shall be available for site pre-installation walk-through and two (2) further reviews prior to completion of drywall during construction of infrastructure. RCDD shall coordinate to walk project with UWIT staff on these occasions.
  - 3. Submit RCDD certificate within thirty (30) days prior to commencing work in this section.
- B. Warranty: Refer to Division 01.

C. Regulatory Requirements

1. All work shall be subject to the strictest applicable governing codes and standards.
2. All work shall be performed in accordance with the latest revisions of all national, state, and local governing codes and standards, including:
  - ANSI American National Standards Institute
  - ASTM American Society for Testing and Materials
  - BICSI Building Industry Consulting Services International
  - EIA Electronic Industries Association
  - FCC Federal Communications Commission
  - ICEA Insulated Cable Engineers Association
  - IEEE Institute of Electrical & Electronics Engineers
  - NCTA National Cable & Telecommunications Association
  - NEC National Electrical Code
  - NECA National Electrical Contractors Association
  - NEMA National Electrical Manufacturers Association
  - NESC National Electrical Safety Code
  - NETA National Electrical Testing Association
  - NFPA National Fire Protection Association
  - NIST National Institute of Standards & Technology
  - OSHA Occupational Safety and Health Administration
  - TIA Telecommunications Industries Association
  - UL Underwriters Laboratories, Inc.
3. Other Regulatory Requirements
  - a. Work shall be performed in accordance with the latest revisions of all ANSI/TIA/EIA, BICSI, and UWIT Standards. The strictest documents shall take precedence.

D. Conflicts Among Governing Codes and Documents

1. Refer to Division 00 & 01; Specifications, Drawings, and other Documents.

1.3 SUBMITTALS

A. General Requirements

1. Refer to Div 01.
2. Shop Drawings
  - a. Shop drawings indicating trade-coordinated proposed routing of cable trays, conduit, placement of junction boxes and all outlets, as well as indicating access to infrastructure.
3. Record Drawings
  - a. Contractor shall maintain field drawings during construction specifically showing pathway routing modifications and shall provide a copy to UWIT while on
4. Products
  - a. Provide complete manufacturer's product literature (not distributor's catalog sheets) for all products specified here in, referenced to the applicable paragraph in Part 2 the Product Section.
  - b. Provide manufacturer's recommended installation methods and installation instructions including storage, handling, protection, examination,

preparation, installation maximum cable pull tension and minimum bend radius of all cable.

- c. Organize product submittal in the same order the products appear in the Specification Section Part 2.
- d. Provide pointers/markers to identify product being submitted if more than one product is listed on a page.
- e. Non-compliance with the above provisions will result in submittal rejection.

B. Product Substitutions

- 1. Refer to Division 01.
- 2. All product substitution requests relating to materials in this section must be approved by UWIT prior to reception of proposal on project.

1.4 CONSTRUCTION SCHEDULE

A. Refer to Division 01, Construction Schedule

B. Site Walk-Through

- 1. Prior to commencing construction of the copper, fiber optic, and coaxial communications infrastructure, the Contractor shall coordinate a pre-installation walk-through with UWIT, Division 27 installation lead, and all trades having work within or connected to the TDR and/or TEC. Walk-through shall address installation of penetrations, sleeves, conduit, cable tray, grounding and bonding, electrical power requirements for TDR'S, and other building support infrastructure.

C. Construction Schedule Requirements (Milestones)

D. In addition to the requirements in the above referenced section, the following milestones shall be referenced in the Project construction schedule:

- 1. Start/completion of continuity-of-service work
- 2. Pre-installation meeting to discuss project-specific issues (bends, early-service concept, etc.)
- 3. Pre-installation walk-through of roughed-in TDR Rooms (prior to provisioning: cable tray route, core drill locations, electrical panel location, HVAC unit, etc.)
- 4. Activation dates for early building service commissioning (HVAC, CAAMS, etc.) and any Authority Having Jurisdiction inspection dates based on system contractor input – not electrical contractor
- 5. Start of TDR work by room
- 6. Date room and adjacent project area will be permanently dust-free
- 7. Walk-through for inspection of early building service pathway
- 8. Walk-through for inspection of overall building pathway (continuity/bushings/pull strings/etc.) prior to drywall cover and drop ceiling installation
- 9. Final inspection of raceway system

E. Early Construction Completion Requirements

- 1. The service provider/UWIT requires access to the TDR one (1) month prior to the early building service activation date. Contractor schedule and work shall be directed to provide TDR finished, including sealed floors, power, lighting, and a dust-free environment to allow installation of systems for the early building

services. The Contractor shall notify the Owner of this date for coordination with the service provider.

2. The Infrastructure Contractor shall complete work early enough that Owner has adequate time to install equipment and related functions prior to substantial completion.

## 1.5 INSPECTION AND SUBSTANTIAL COMPLETION

- A. Refer to Division 01, Contract Closeout

## 1.6 CONTRACT CLOSEOUT

- A. Refer to Division 01, Contract Closeout.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Except as specifically noted below, the cable tray, conduit, and other materials constituting the raceway system shall conform to Division 26 Product Sections.
- B. No "custom" items (e.g., to meet unusual physical requirements of the installation site) shall be used except as specified in the Contract Documents or as reviewed and approved by the Architect, the Engineer, and the Owner.
- C. The installation standards for the cable plant infrastructure system are described below.

### 2.2 COMMUNICATIONS CABLE TRAY

- A. General Requirements
  1. Material construction shall be aluminum.
  2. Straight sections and fitting side rails shall be extruded aluminum. Other components and accessories shall be aluminum.
  3. Provide splice plates with straight sections and fittings.
  4. Splice plate construction shall be designed to permit splice to be located at any point within support span without diminishing cable tray rated loading capacity.
  5. Tray system shall be capable of being hung by the side rail.
  6. Trapeze hangers shall be supported by 3/8" or 1/2" minimum diameter rods.
  7. All surface finishes and section joints shall be smooth to the touch to eliminate cable chafing.
  8. Tray system shall not present sharp edges, burrs, or projections injurious to wiring. Upper flanges shall be rolled out and downward for safety.
  9. Corners shall have generous factory-manufactured curved sweeps (90-degree angles are unacceptable).
  10. Elevation changes shall be made with factory-constructed components matching fabrication and material requirements of straight sections and accessories.
  11. Dropouts shall be made with factory-constructed components matching fabrication and material requirements of accessories.

- B. Size
  - 1. Minimum cable tray size shall be 9-inches wide by 6-inches deep. Other sizes as shown on drawings. Where no size is shown use 18-inch wide by 6-inches deep.
- C. Type
  - 1. Only ladder style tray (with rounded removable rungs spaced no farther than 6 inches apart) shall be used.
  - 2. Upper level cable tray in TEC and TDR Rooms shall be aluminum ladder style tray with adjustable rungs.
  - 3. Required Product: B-Line Redi-Rail Ladder Tray: B-Line H16AR06-XX-120; where "XX" equals the tray width in inches.
- D. Corner Sweep
  - 1. Corners shall have generous factory-manufactured curved sweeps – sharp 90-degree angles are unacceptable.
- E. Elevation Changes
  - 1. Where changes in elevation are unavoidable, a transition piece is required.
  - 2. No 90-degree transitions shall be used.
  - 3. Dropouts (not vertical elbows or "turn downs") shall be provided at elevation changes and cable tray dead-ends.

## 2.3 CONDUIT

- A. General Requirements
  - 1. Conduit types and sizes shall be used only as specifically noted in the Contract Documents and specified herein.
  - 2. All communications circuits shall be installed in EMT, RGS, or IMC or Cable Tray. Minimum size of conduit is 3/4", minimum 1.25" for feeds to SMR/multi-outlet assembly.
  - 3. Provide plastic bushings on conduit ends prior to cable being installed in the conduits.
  - 4. Provide 2" and 4" horizontal conduits that distribute cable into TDRS, and/or cable trays with plastic cable spillways by Bejed Part No. BJ-2049
- B. Flexible Conduit
  - 1. Flexible metal conduit shall not be used except if being installed in an existing wall
  - 2. If flexible metallic conduit is used it shall be de-rated one full size (1" shall be replaced by 1-1/4")
  - 3. Non-metallic conduit shall not be used

## 2.4 OUTLET BOXES

- A. Wall Outlet Box
  - 1. Wall-mounted telephone outlet boxes concealed within a wall or surface-mounted shall be a 4-11/16 inch by 4-11/16 inch box with a minimum depth of 2-1/8-inches. Provide a double-gang mud ring for standard bundle outlets and single-gang mud ring for wall telephone locations.

2.5 Flush floor boxes: Refer to Section 26 05 33.10.

2.6 Floor Outlet Devices Poke Through: Refer to Section 26 05 33.20.

2.7 Plywood Mounting Backboard

A. General Requirements

1. Type: The backboards in the TDR Rooms shall be ACX-type Douglas fir plywood with no voids.
2. Size: 4-foot wide x 8-foot long x 3/4-inch thick
3. Treating: Backboards shall be fire-treated plywood. All exposed backboard surfaces shall be painted with two coats of fire-resistant matte white paint and paint shall have a flame-spread rating no greater than 25 when tested according to ASTM W84. Do not paint over the fire rating stamp.

2.8 TELECOMMUNICATIONS EQUIPMENT GROUND BUS BAR (TMGB and TGB)

A. General Requirements

1. UL Listed.
2. Approved and recommended by ANSI/TIA/EIA and BICSI.
3. Two hole lug configured per ANSI-J-STD-607-A.
4. Insulated stand-off brackets.

B. Sizes

1. TMGB – 4"W by 1/4"H by 20"L.
2. TGB - 4"W by 1/4"H by 12"L.

C. Required Products: Chatsworth Products Inc. (CPI); TMGB – 40153-020; TGB – 40153-012.

2.9 DEVICE PLATES

- A. Provide blank device cover plates for all unwired or "future" outlets. Plates shall match device plates specified in Section 26 27 26 - Wiring Devices except with no device openings.

2.10 PULL STRINGS

A. General Requirements

1. Be a minimum of 3/32-inch diameter
2. Be a minimum of 200-pound strength
3. Be polyethylene line

B. Recommended Product: Greenlee – 430.

2.11 FIRESTOP PATHWAYS

A. General Requirements

1. Furnish and install all fire rated wiring devices and associated hardware as shown on the Contract Drawings and as hereinafter specified.

2. All devices shall be heavy-duty specification grade with an intumescent insert material allowing for 0 to 100-percent visual fill of conductors.
3. The same manufacturer shall supply all furnished fire rated devices and associated hardware.
4. Fire rated wiring devices shall bear the UL Classification marking.
5. Device shall be tested in accordance with ASTM E 814 (ANSI/UL1479).
6. The device shall be tested for smoke leakage (L rating) and shall not require the use of any optional sealing materials to achieve the published rating.
7. The device shall utilize a fire and smoke sealing system that automatically adjusts to the addition or removal of cables.
8. Wiring devices shall be capable of allowing a 0 to 100-percent visual fill of cables.
9. Wire devices shall be of a sufficient size to accommodate the quantity and size of electrical wires and data cables required and shall be suitable for use with new or existing cable installations.
10. The installed device (in normal use) shall require no maintenance and shall accommodate future cable changes without mechanical adjustment and/or removal or replacement of protective materials.
11. Wire devices to be provided with steel wall plates allowing for single or multiple devices to be ganged together.
12. Required Products: Hilti Speed Sleeves CP 653-4".

## PART 3 - EXECUTION

### 3.1 DOCUMENT INTERPRETATION

- A. The Contract Documents provide the primary definition of the work to be completed. They are, however, schematic and are not intended to show all components required but only to aid the Contractor in providing a complete communications infrastructure.
- B. The design represented has been coordinated with other disciplines and shall not be substantially altered without prior approval by the Owner.
- C. The locations of the outlet symbols shown in the Contract Documents represent a close approximation of the exact location where the outlet shall be installed. This location may be shifted left or right eight inches to allow for stud alignment or coordination with electrical outlet locations. The Architect shall approve more extensive adjustments of outlet location.
- D. Outlet Schedule
  1. Refer to the outlet schedule contained herein or in the Contract Documents for outlet mounting height, device box size, and station conduit size.
  2. In order to reference a particular outlet to the Outlet Schedule, each outlet symbol located in the Contract Documents is labeled with a unique, 2-part ID number indicating the outlet number within that room. (At times, the outlet symbols may be labeled with only the sequential number if the room number is clearly marked on the drawing.)

### 3.2 SERVICE INTERRUPTIONS

- A. The contractor shall be responsible for identifying any possible service interruptions. Coordination with Owner shall be required to develop a plan.
- B. Contractor shall provide mandatory walk-through with UW personnel prior to starting any work in area.
- C. The Contractor shall maintain continuity of existing voice, data and multimedia service in the construction area and for building occupants not otherwise affected by the Project throughout the demolition and construction phases, unless prior arrangements have been negotiated.
- D. The Contractor shall notify the Architect in writing of all voice, data, and multimedia communications cables (which are serving occupied spaces) that must be relocated. The Contractor shall be responsible for relocating existing cables that are to remain in service after consultation with Owner.
- E. The Contractor shall prevent interruption of service by identifying and providing temporary supports and protection of all existing communications cables, cross-connect blocks, and equipment throughout demolition and construction.
- F. Upon disruption of telephone, data and multimedia service, the Contractor shall notify the University Construction Coordinator immediately so that a repair crew can be assigned to correct the problem.

### 3.3 COMMUNICATION ROOM (TDR) PROVISIONING

- A. General: The Contractor shall follow the placement of elements within the TDR Room as shown in plan, elevations, and details contained in the Contract Drawings.  
NOTE: Prior to installation, Contractor shall schedule a walk-through with Owner and the Engineer for final placement.
  - 1. Cable Tray
    - a. Install cable tray six inches from the wall: minimum 9-feet 6-inches AFF to bottom.
  - 2. Plywood Backboard
    - a. Install plywood on all walls of the closets extending from 1-foot AFF to 9-feet AFF using standard 3/4-inch thick 8-foot sheets.
    - b. Additional plywood may be required based on final location of conduits and sleeves. (All future cable shall be supported vertically and horizontally at every four feet along the path.)
    - c. Plywood shall be void-free and treated with two (2) coats of matte white fire-resistant paint on all exposed backboard surfaces. Leave fire treated label unpainted on each sheet.
  - 3. Lighting Fixtures
    - a. Lighting fixtures in the TEC Room and in each TDR Room shall be located above the 9-foot 6-inch level or ceiling-mounted in such a manner as not to block cable tray within the room or conduit penetrations or otherwise interfere with cable routing and equipment installation.
    - b. The light switch shall be located just inside and to the right of the doorway.
  - 4. Electrical Outlets



- a. Locate electrical outlets at the corner of the main backboard, just above the top edge approximately 12 inches from the corner. There shall be one outlet for each wall in this location. An additional utility outlet should be located 18-inches AFF aligned below the light switch.
  - b. Electrical outlet boxes and conduit shall not block or restrict use of the backboards. The conduit shall be tightly routed at the intersection of the back wall and the side walls. Faceplates shall be flush with the finished surfaces.
  - c. Electrical outlets at the racks shall be mounted at approximately 6" AFF and located in the adjacent wire trough. Conduit from the outlet shall be routed in the wire trough.
  - d. Provide for a pre-installation meeting with UWIT prior to starting any work. Make all adjustments in routing and mounting to accommodate UWIT requirements.
- 5. Grounding
  - a. The ground bus bar shall be located near the main voice riser floor terminations. Coordinate exact placement with Owner.
  - b. When the resistance to ground is 10 ohms or more, an additional ground is mandated.
  - c. A communications system equipment grounding conductor (EGC) shall be installed in the TEC and continue up through the vertical riser system. It shall be terminated in each TDR on a ground bus bar.
  - d. The EGC shall be a minimum #3/0-AWG insulated wire, continuous and without splices. It shall be connected at a single point to the ground bus end of the building neutral bonding jumper via a readily accessible connection (NEC 250-53a). If splices are necessary, they shall first be approved by the design engineer, then cad welded. The EGC shall be bolted to the ground bus bar in each TEC / TDR with a pass-through clamp. The connection between the EGC and the service entrance equipment shall be such that the resistance measures 5 ohms or less.
  - e. The location and installation of the EGC and bus bars shall conform to NEC requirements. They shall be located at least six inches away from any electrical conductors to minimize induced voltages and routed at edges/corners of backboard to provide the shortest, most direct, continuous path to the ground electrode system.
- 6. Panels
  - a. Install panels so as not to conflict with any communications installation and to minimize EMF interference.
  - b. Any circuits entering panel from outside room must route outside of room until immediately adjacent to panel
  - c. All circuits in room shall be routed clear of plywood backboards and cabling routes. Coordinate routing with UWIT prior to installation.

### 3.4 COMMUNICATIONS PATHWAYS

#### A. Cable Tray Pathways

##### 1. Mounting

- a. Cable trays shall be mounted or hung in a manner that ensures a 12-inch minimum vertical clearance above and a minimum 18-inch continuous horizontal clearance on at least one side to allow for future access.

- b. There shall be 5" clearance between the bottom of the cable tray hangers and removable ceiling tiles.
- 2. Transition
  - a. Cable trays shall be mounted between 8 and 10-feet AFF.
  - b. Provide gradual sloping raceway transition sections where changes in horizontal mounting height are unavoidable.
- 3. Routing
  - a. Cable tray shall be routed so as not to interfere with installation of other systems or access to these systems for maintenance. Coordination with other systems shall be maintained so that where these systems traverse above or below the tray, there shall be direct access and unrestricted clearance 12 inches above and 18 inches to one side of the tray.
- 4. Installation
  - a. Cable tray shall be installed as a continuous raceway system connected to the building ground in compliance with NEC 318.
  - b. When assembling tray, rounded heads of fasteners shall be placed in the interior of the tray.
  - c. Install cable tray level and plumb according to manufacturer's written instructions, coordination drawings, original design, and referenced standards.
  - d. Mount bottom of tray approximately 6" above suspended ceilings. Maintain 10" minimum vertical spacing between multiple cable trays.
  - e. Support cable tray from single channel hangers with spacing in accordance with NEMA VE 1. Provide additional hangers on ends and two additional hangers at tees and corners. Attach brackets to structural ceiling with 3/8" threaded steel rods.
  - f. Brace cable tray to structure with diagonal braces spaced 30' maximum on center.
  - g. Support cable tray from wall brackets where single channel hangers cannot be installed.
- 5. Coordination
  - a. Coordinate installation of the cable tray with mechanical ductwork, piping, structural members, fireproofing and sprinkler system piping so that tray remains accessible (minimum 1 foot clear above tray bottom) after installation. Coordinate exact routing with all trades to avoid interference.
- 6. Supports
  - a. Load Rating: As required to support cable tray load rating NEMA 8C in accordance with NEMA VE 1.
  - b. Single Channel Hangers: formed steel type.
  - c. Wall Brackets: Steel without hooks or projections

### 3.5 CONDUIT PATHWAYS

- A. General
  - 1. Conduit and pull boxes shall not be installed above 10 feet. Use factory sweeps of minimum 8" radius.
- B. Penetrations
  - 1. Vertical riser conduit/sleeves between floors shall be "stacked" (i.e., aligned vertically from floor to floor). They shall be located on the side wall of the space,

most often to the right of the main backboard wall. They shall be clustered as close to the wall as possible and out of the way of foot traffic.

2. Horizontal conduit/sleeves shall be grouped to one side of door at the 9-foot 6-inch level.
3. Where conduit does not homerun, it shall either end at tray or when there is no tray it shall stop at the wall or floor.
4. Where conduit/sleeves penetrate horizontally HIGH through the wall (above three feet from top edge of tray), they shall be provided with a turn down and stop between 1½–3 feet above the top edge of the tray or top of the backboard in the Riser Room.
5. Where conduit/sleeves penetrate horizontally LOW through the wall (below three feet from top edge of tray), they shall stop at the top edge of the tray closest to the conduit/sleeves.
6. Where conduit/sleeves penetrate horizontally LOW through a wall when there is no tray, they shall stop as flush as possible with the wall.
7. Where conduit/sleeves penetrate horizontally HIGH through a wall when there is no tray, they shall turn down and extend downward at the top of the backboard in the Riser Room.
8. Where conduit/sleeves penetrate vertically down through the ceiling, they shall extend from between 1½-3 feet to either the top edge of the tray or top of the backboard in the Riser Room.
9. Where conduit/sleeves penetrate vertically up through the floor, they shall stop 3-inches AFF.

C. Bushings

1. Provide conduit/sleeve end bushings on all riser and horizontal distribution conduits.

D. Bonding

1. All conduits shall be bonded to the tray with a grounding strap, bolted lugs, and green insulated grounding wire.

E. Bends

1. Maximum Three bends shall be allowed
2. Conduit bends shall conform to accepted radii for the size of conduit used. There shall be no more than 270-degrees of bend in any one conduit run without inclusion of a pull box. No bend shall exceed 90 degrees.
3. No 90-degree fittings shall be used.

F. Pull boxes

1. Pre-approval by Owner and the A&E is required for installation of intermediate junction boxes or pull boxes. These boxes shall be noted on the Contractor's Field Drawings.
2. Pull boxes shall be installed in accessible areas 8- to 10-feet AFF. Provide 30-inch clearance in front of the pull box for maintenance and pull space. The location of each box shall be clearly marked on Field Drawings. The color purple has been designated to identify Communications pull boxes from other utility pull boxes.
3. Conduits entering or leaving pull boxes or outlet device boxes shall be centered in the body of the box, unless noted otherwise in Contract Documents. Where

multiple conduits penetrate into one side of pull box, conduits shall be evenly spaced and centered in the body.

G. Unused Sleeves

1. Thread and cap.

H. Pull Lines

1. A 3/32-inch-diameter, 200-pound-strength polyethylene pull line shall be installed in all raceway and conduit runs (with and without cable) and secured at each end.

I. Fire Stopping

1. In situations where cable tray, conduit, or sleeves extend outside the construction area into occupied portions of the building, they shall be fire-stopped in accordance with NEC 300-21 throughout the duration of the Project.

3.6 Labeling

- A. All station drop conduits shall be permanently marked with an outlet ID at the tray or in the TEC or TDR when directly routed to a Riser Room.

3.7 Riser and Horizontal Distribution Pathways

- A. All building entrance conduits and vertical/horizontal interconnecting riser conduits and sleeves shall be four inches in diameter.

B. Station Drop Pathways

1. Sizing
  - a. All station drop conduits to outlet device boxes shall be 1-inch diameter minimum except as specifically noted in the Contract Documents.
  - b. Dedicated multimedia station drop conduits from cable tray to outlet boxes shall have a 1.5-inch diameter.
  - c. All station drop conduit to SMR shall be minimum 1-1/4 inch diameter except as specifically noted as larger on the Contract Documents.
2. In divided raceway, wherever communications and/or electrical outlets are closely co-located, a minimum of 2 inches of horizontal separation between device plates shall be provided.
3. The SMR front cover shall be cut and installed in a manner that provides a short (12-inch) fixed section of cover where the end of an SMR segment abuts a wall, corner, structural deviation, etc.

C. Outlet Box Installation

1. Outlet Box Mounting
  - a. Height: Unless noted otherwise in the Outlet Schedule, all communication outlet boxes shall be installed at the same height as electrical outlets, except wall-mounted telephone outlets which shall be installed so that the highest operable part on the actual telephone instrument is no higher than 48-inches AFF.
  - b. Co-located Spacing: All wall-mounted phone boxes shall have 12" clearance from adjacent boxes.

- c. Multimedia/AV boxes shall be mounted at the height indicated on the drawings.
  - 2. Outlet Boxes and Mud Rings - Finish Work
    - a. Care shall be exercised during mounting of outlet boxes to ensure that the mud ring face shall be flush with the surface of the finished wall and "square" with the floor. All joint compounds shall be wiped clean while soft so as not to cover mounting holes in the mud ring or box.
- 3.8 Pre-Installation walk-through
- A. Prior to commencing installation of infrastructure, Contractor shall schedule a site walk-through with the Owner to conceptually layout and mark intended installation. Contractor shall provide seven days advance notice for scheduling the walk-through. Contractor's Foreman and actual installation crew shall be at the walk-through.
  - B. In addition, the electrical, fire alarm, access control, plumbing, sprinkler, piping, and HVAC contractors shall be present at the walk through.

END OF SECTION