# General

## Summary

### Provide all services, labor, materials, tools, and equipment required for the complete and proper installation and termination of new horizontal “station” cabling as called for in these specifications and related drawings.

### The horizontal portion of the telecommunications cabling system extends from the Communication Location (CL) to the termination in the Telecommunications Room (TR).

### This section includes minimum requirements and installation methods for the following:

#### Copper horizontal cabling

#### CL faceplates

#### Copper modular jacks

#### Modular patch panels

#### Wireless Access Points

## sYSTEM DESCRIPTION

### Design Requirements: The horizontal cable plant installed shall be link performance warranted by the chosen manufacturer for a period of 25 years.

## sUBMITTALS

### Product Data: Submit manufacturers’ product information.

## Quality assurance

### Comply with Section 27 00 00

### Must discuss labeling with UNL Project Manager before beginning work

### Labeling must follow the established system used by UNL IS group. Any printed labels must have prior approval of UNL Project Manager as well as meet the performance requirements of UL 969 and TIA 606.

## delivery, storage and handling

### Comply with Section 27 00 00

# products

## manufacturers

### Use the chosen 25-year manufacturer cabling and material for all communications horizontal cabling.

## Materials and fabrication

### Horizontal Cable

#### Install two (2) sheaths of plenum rated, 4-pair unshielded, 23 AWG, twisted copper pair cable for data and one (1) sheath of plenum rated, 4-pair unshielded, 23 AWG, twisted copper pair cable for voice to each CL.

#### Use white cable for data.

#### Use gray cable for voice.

#### Cabling must be rated as Underwriters Laboratories (UL) level V or EIA/TIA and must be stamped with the “UL” approval mark.

### CL Faceplate

#### Data cabling shall terminate at the user (CL) end in ivory 3-hole faceplates on keyed eight (8) conductor jacks.

### CL Data and Voice Jacks

#### Use gray jacks for data.

#### Use ivory jacks for voice.

#### Use T568B jacks.

#### Place the two gray data jacks in CL positions one (1) and two (2) with the ivory voice jack in position three (3).

#### Any specialty CL location including modular furniture, floor plates, or special outlet boxes must have a wiring jack that will allow for the chosen 25-year manufacturer cabling.

### Patch Panels and Blocks

#### Use 48 port patch panels for data.

#### Use 110 Blocks with standoff legs for voice.

### Wireless Access Points (WAPs)

#### Wireless network systems shall adhere to requirements set forth in the ‘Communication Systems’ Design Narrative found at the UNL Design Guidelines website. (link: http://facilities.unl.edu/design-guidelines/communication-systems-narratives).

#### Each WAP location shall have one (1) EQUIPMENT OUTLET (EO). WAPs provide by UNL.

#### Provide communication cables to each WAP location designated on the plans. WAP communication cables shall consist of two (2) CAT 6 cables from the nearest communications room to the WAP EO. Include CAT 6 cables with RJ45 jacks at both ends of the cables. Terminate cables on patch panels as directed by UNL ITS staff. Cables shall be routed along existing communication pathways or a j-hook or cable tray system as required. Cables shall not be routed through building structural members.

#### General WAP EO Placement Guidelines:

##### WAP EO’s shall be positioned every 60 feet between adjacent locations with a maximum of 300 feet from the telecommunications room to each WAP EO. For larger open spaces, provide one WAP location per every 35 persons in the space. WAP EO’s to be as evenly spaced as possible.

##### UNL recommends that a grid of square cells be used when designing coverage areas. An EO (or multiple EOs if link aggregation is being supported) is placed at the center of each cell and an equipment cord connects the EO to a WAP located anywhere within the same cell. The maximum length of this equipment cord is the radius of the circle that circumscribes the square cell. It may be beneficial to offset the cells in the horizontal plane on alternating floors to afford better coverage.

##### Typical Uniform Grid Size: In typical cases, a grid consisting of square cells distributed uniformly throughout the building shall be established. Based on the typical coverage area of currently available wireless access points and common commercial building layouts, a pre-cabled grid with 18.3 m (60 ft.) square cells is recommended. This results in a cell radius (R) of 13 m (42 ft.). See sketch below.

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#### Maximum WAP EO height rough-in location shall be 20 feet above finished floor. Stagger WAP EO locations to ensure locations are not stacked in the same locations vertically between adjacent floors.

#### Project shall test all WAP cable installations and certify all cables for proper performance. Share all testing results with UNL Wireless ITS staff.

#### Provide data cable labels, at both ends of cable, per UNL Wireless ITS requirements.

#### WAP cable rough-in work:

##### Interior wall WAP EO location:

###### Provide an extra deep, mounted 4-11/16” single gang back box with single gang plaster ring matched to drywall thickness. Provide each box with a single gang faceplate with two (2) RJ45 jacks and individual cable labels. Provide a ¾” EMT conduit to each back box location to adjacent cable tray / j-hook path.

###### Wall mount WAP EO locations shall be provided with a right angle wall-mounting bracket with top cover, Oberon 1011 or equal. Oberon 1010 brackets or equal are required. UNL Wireless ITS staff shall make final approval. Wall bracket shall position WAP perpendicular to floor plane.

##### Hard ceiling WAP EO location:

###### Provide an extra deep, flush mounted 4-11/16” square back box with single gang plaster ring matched to drywall thickness. Provide each box with a single gang faceplate with two (2) RJ45 jacks with individual cable labels. Provide a ¾” EMT conduit to each back box location to adjacent cable tray / j-hook path.

##### Interior suspended ceiling WAP EO location:

###### Provide cables to above WAP EO location, coil three feet of each cable above ceiling. Terminate cables on a two (2) jack RJ45 ‘biscuit’ or network jack with individual cable labels on the jack. Provide temporary location label on T-bar grid visible from below for locating the WAP EO location.

##### Exterior wall WAP EO location:

###### Exterior WAP locations shall be provided on a case-by-case basis, coordinate with UNL Wireless ITS staff. At each EO location, terminate the cables on a two (2) jack RJ45 ‘biscuit’ or network jack with individual cable labels on the jack. Locate the jack at the exterior wall location on the interior side of the wall. From the network jack provide exterior rated CAT 6 cables through the exterior wall via a core-drilled penetration. Exact WAP EO locations and heights above grade to be coordinated with UNL Wireless ITS staff prior to work.

###### An outdoor rated wireless mount location with WAP EO shall be provided for all exterior camera locations. Coordinate all camera WAP EO locations with UNL Wireless ITS staff.

###### Wall mount WAP EO locations shall be provided with a right angle wall mounting bracket with top cover, Oberon 1011 or equal. Oberon 1010 brackets or equal are required. UNL Wireless ITS staff shall make final approval. Wall bracket shall position WAP perpendicular to floor plane.

#### In all cases WAP communication cables shall not be painted.

### Installation Materials, Equipment and Tools

#### Furnish all required materials, equipment, and tools necessary to properly complete the horizontal copper cabling system installation including, but not limited to, tools for pulling and terminating the cables, mounting hardware, cable ties, bolts, anchors, clamps, hangers, kits of consumables, lubricants, communication devices, stands for cable reels, cable wenches, etc.

#### Pull-rope to be used shall be polypropylene monofilament line with a minimum pull tensile strength of 200 pounds.

# execution

## Examination

### Comply with Section 27 00 00.

## Installation

### All cable must be installed without any splices or intermediate distribution points.

### Cable installation is “home-run” between the CL and the jack location on the patch panels in the TR.

### Ensure that maximum pulling tensions of specified cables are not exceeded and cable bends maintain the proper radius during placement.

### Ceiling tile shall be removed as necessary for the cable installation and put back in place without damaging or soiling any of the tiles or supporting framework. Ceiling tile shall be handled with clean hands so that no fingerprints or marks are left on the tiles. The Contractor is responsible for the cost of repair or replacement of any damaged or soiled tiles or ceiling hardware.

### All cables in the ceiling space:

#### Shall not be run “wild” (unsupported by conduit or cable tray) for distances greater than 5 feet;

#### Shall not be attached to the suspended ceiling structure or laid directly on the ceiling grids as a means of support and, whenever possible, the bottom of a cable or cable bundle shall remain a minimum of 6 inches above the ceiling grid;

#### Shall not be supported by or attached by any means to fire sprinkler heads or delivery systems, any environmental sensor, or the exterior of any conduit or raceway;

#### Shall be routed at right angles to the electrical power circuits where the cable is not enclosed in conduit or in cable tray.

### Where discontinuity of cable trays or conduit occurs, support all cables over the discontinuity using hangers, brackets, hooks, rings, and other applicable supporting devices installed as specified in section 270529, “Hangers and Supports for Communication Systems.

### All cables in the ceiling space and cable tray shall be bundled with plenum-rated cable ties that are snug but which do not deform the cable geometry.

### The total length of any horizontal station cable from the jack location to the termination block shall not exceed 90 meters.

### Maintain the following clearances from EMI sources:

#### Unshielded power lines or equipment less than or equal to 5 kVA near cable in open or non-metal pathway: 12 inches.

#### Unshielded power lines or equipment greater than 5 kVA near cable in open or non-metal pathway: 24 inches.

#### Unshielded power lines or equipment less than or equal to 5 kVA near cable in grounded metal pathway: 6 inches.

#### Unshielded power lines or equipment greater than 5 kVA near cable in grounded metal pathway: 12 inches.

#### Power lines enclosed in grounded metal conduit less than or equal to 5 kVA near cable in grounded metal pathway: 3 inches.

#### Power lines enclosed in grounded metal conduit greater than 5 kVA near cable in grounded metal pathway: 6 inches.

#### Fluorescent fixtures near cable in open or non-metal pathway: 12 inches.

#### Fluorescent fixtures near cable in grounded metal conduit: 6 inches.

#### Motors or transformers near cable in non-metal pathway: 48 inches.

#### Motors or transformers near cable in grounded metal pathway: 36 inches

### Manage slack to avoid excess cable or kinking.

### All cables shall be tied and dressed neatly with a minimum bend radius of 10 times the cable diameter. Provide necessary hardware to maintain the proper bend radius at corners.

### All cables shall be firmly held in place. Fastenings and supports shall be adequate to support loads with ample safety factors.

### Cables with jackets that are chaffed or burned exposing internal conductor insulation or have any bare copper (shiners) shall be replaced.

### Do not roll or store cable reels without an appropriate underlay.

### Neatly and permanently label all horizontal cables with the cable number at both ends.

### Firestop all sleeves and conduit openings; after the cable installation is complete.

### Install faceplates and copper jacks at each CL as indicated on the project drawings. Place blank covers in the unused openings on each faceplate.

### Faceplates shall be secured with mechanical fasteners. Adhesive fasteners shall not be allowed.

### Data cable termination shall be EIA/TIA-568 with wiring option T568B.

### Terminate the data cable in the TR on the 48-port patch panels.

### Terminate the voice cable on the 110 blocks with legs for voice.

### Termination must conform to the chosen manufacturers Structured Cabling System installation rules and meet the full performance standards and certification.

### All outlets shall be tested and certified to meet performance standards of the chosen manufacturers Structured Cabling specifications. Testing shall be done regularly as a floor or building is completed and test results provided to the UNL IS Project Manager. UNL IS Project Manager will also conduct random testing.

### All outlets must be labeled at both the work area location and on the patch panels in the Communications Room using the approved UNL IS standard labeling scheme. Labels must be of the printed variety (pencil or ink hand labeling not allowed).

## adjustments

### Comply with Section 27 00 00.

### Contractor will provide a set of “as built” diagrams to UNL IS Infrastructure at the completion of the project. Additionally, Contractor will provide two sets of specific cable design and installation data in a machine-readable format contained on floppy or hard disk. Both the “as built” drawings and the machine-readable data must comply with UNL’s requirements for permanent documentation of the cable plant. UNL’s documentation scheme will be provided upon contract award.

END OF SECTION 271500