PART 1 - GENERAL

1.1. SUMMARY

A. The work covered under this Section shall consist of a design, furnishing of all material, labor, and installation for completion of an operable end to end horizontal structured cabling system throughout the campus and premises. This includes - but is not limited to - furnishing and installing cable, cable supports, cable ties, innerduct and termination components, ancillary equipment, testing, labeling and documentation of cables and connectors.

B. Complete product procurement and installation shall comply with the campus or owner's latest telecommunication and Information Technology standards documents.

PART 2 - PRODUCTS

2.1. MANUFACTURER(S) AND SOLUTIONS

A. Acceptable indoor/premise end to end solutions for horizontal copper:

1. Berk-Tek LANmark-XTP UTP Plenum Category 6A.

B. Acceptable indoor/premise end to end solutions for termination components.

1. Ortronics Category 6A Connectivity Solutions.

C. Acceptable indoor/outdoor end to end solutions for horizontal copper and components:

1. Berk-Tek / Nexans LANmark Industry Solutions.
2. Ortronics / Legrand Industrial Solutions.

2.2. BASIC ENVIRONMENTAL REQUIREMENTS

A. Cabling shall be suitable for environment in which they are to be installed.

B. Cabling shall be plenum rated within interior premise installations.

C. Cabling shall be outdoor rated within exterior installations subject to outdoor environmental conditions.

2.3. HORIZONTAL STATION CABLE

A. Cable shall consist of 4 pair #24 AWG insulated solid copper conductors. Each pair shall be unshielded and twisted.

B. Transmission characteristics of the cables shall exceed Category 6A performance as defined by industry standards.

C. The jacket color for Voice cables shall be Yellow.

D. The jacket color for Data cables shall be Blue.

2.4. HORIZONTAL STATION INDOOR/OUTDOOR CABLE

A. Cable shall be provided wherever it shall run within a wet environment or where it would be exposed to an outdoor condition.

B. Transmission characteristics of the cables shall meet full Category 6A performance as defined by industry standards.

C. Cable shall be suitable for installation both indoors and outdoors.

D. Cable shall be suitable for both direct burial and underground conduit installations.

E. Cable shall retain an OFNP plenum rating to meet the listing requirements per NFPA for use within building premises.

F. Cable shall be constructed with a dry or gel-filled type water blocking material.

2.5. INDOOR JACKS

A. Jacks shall be non-keyed 8-pin 8 conductor (8P8C) modular jacks.

B. Data termination hardware shall meet full Category 6A performance specifications as defined by industry standards.

C. Jacks shall be UL verified and listed.

D. Color of the Voice jack shall be Ivory or White depending on Faceplate to match.

E. Color of the Data jacks shall be Orange.

2.6. OUTDOOR JACKS

A. In outdoor conditions as indicated on drawings provide IP67 rated jacks.

B. Jacks shall be terminated and installed within appropriate outdoor rated stainless steel faceplate as indicated by manufacturer instructions.

C. Provide weather seals on outlets as needed to equal that of outdoor rated products in the project and per manufacturer's recommendations.

D. Provide IP67 rated screw on covers produced by the same jack manufacturer for every outdoor jack installed.

E. Data termination hardware shall meet full Category 6A performance specifications as defined by industry standards.

F. Jacks shall be UL verified and listed.

2.7. TELECOM OUTLET - STANDARD INDOOR

A. The combined faceplate and connector jack assembly is referred to as the Information Outlet (IO).

B. Connector assemblies shall utilize modular jacks as specified in Paragraph 2.5.

C. Outlet faceplates shall incorporate recessed designation strips for identifying labels. Designation strips shall be fitted with clear plastic covers.

D. The faceplate of the IO shall be constructed of high impact plastic (except where noted otherwise).

E. Single-gang faceplates shall be 2.75 x 4.5 inches.

F. Faceplates shall be UL listed.

G. Color of the wall plate shall be Ivory or White depending on electrical outlet color to match.

2.8. TELECOM OUTLET - STANDARD OUTDOOR

A. Faceplates shall be IP67 rated faceplate.

B. Faceplate shall be stainless steel and tamper resistant.

C. Provide weather seals on faceplate as needed to equal that of outdoor rated products in the project and per manufacturer's recommendations.

D. The combined faceplate and connector jack assembly is referred to as the Information Outlet (IO).

E. Connector assemblies shall utilize modular jacks as specified in Paragraph 2.6.

F. Outlet faceplates shall include area for integrating waterproof labels. Designation strips shall be fitted with clear waterproof covers.

G. Single-gang faceplates shall be 2.75 x 4.5 inches.

H. Faceplates shall be UL listed.

2.9. TELECOM OUTLET - WALL PHONE

A. Faceplate shall be stainless steel flush to utilize a single modular jack.

B. Faceplate shall have standard mounting stubs on top and bottom suitable for wall mounting a standard phone directly over it.

C. Outlet shall be placed at a location providing 12” x 12” clearance at all sides to accommodate the phone.

2.10. TELECOM OUTLET - MODULAR FURNITURE

A. Outlet module shall be formulated to fit all jacks in row for use within furniture cabling provision or raceway. Contractor must confirm compatibility of outlet with the raceway manufacturer prior to ordering.

B. Outlet module shall allow jacks to retain the configuration of the standard information outlets shall accommodate easy to read labels configured horizontally.

C. Color of the outlet module should be Ivory or White depending on electrical outlet color to match.

2.11. TELECOM OUTLET - FLOORBOX/POKE-THRU

A. Faceplate shall include mounting slots for accommodating required jacks within the floorbox/poke-thru. Contractor must confirm compatibility of faceplate with the floorbox/poke-thru

B. Faceplate shall be able to fit within standard NEMA provision as well as low voltage floorbox and poke-thru provisions.

C. Color of the faceplate shall be Ivory or White depending on electrical outlet color to match.

2.12. TELECOM OUTLET - RACEWAY

A. Outlet module shall be formulated to fit all jacks for use within the raceway’s provisions. Contractor must confirm compatibility of outlet with the raceway manufacturer.

B. Outlet module shall allow jacks to retain the configuration of the standard information outlets shall accommodate easy to read labels configured horizontally.

C. Color of the outlet module should be Ivory or White depending on electrical outlet color to match.

2.13. HORIZONTAL STATION CABLE PATCH PANEL

A. The data patch panel shall utilize modular jacks as described in Paragraph 2.5.

B. Patch panels shall be 19” wide and rack mounted.

C. Individual patch panels shall contain a maximum of 48 ports.

D. The data patch panel as a system shall be rated to match or exceed the ANSI/TIA/EIA rated wiring terminated on the panel.

E. Patch panel shall be complete with rear strain relief mechanism for the incoming cables.

F. The patch panel shall have integral designation strips to identify each port on the front and rear of the panel.

G. Patch panels shall have a minimum of 20% spare ports.

2.14. COMMUNICATIONS INDOOR OUTLET PATCH CORDS

A. Patch cords shall be factory manufactured by the same manufacturer providing the horizontal cabling and meet the requirements of Category 6A cabling.

B. Be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted pairs within a flame-retardant jacket.

C. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.

D. Provide one patch cord per installed jack.

E. All workstation patch cords shall be 14 feet in length.

F. For the TR patch cords, 80% shall be 7 feet, and 20% shall be 14 feet in length from the total number.

2.15. COMMUNICATIONS OUTDOOR OUTLET PATCH CORDS

A. In outdoor conditions as indicated on drawings provide IP67 rated patch cords.

B. Patch cords shall be from the same manufacturer as the outdoor rated jacks submitted for installation.

C. Patch cords shall be factory manufactured by the same manufacturer providing the horizontal cabling and meet the requirements of Category 6A cabling.

D. Be round, and consist of eight insulated 24 AWG, stranded copper conductors, arranged in four color-coded twisted pairs within a flame-retardant jacket.

E. Be equipped with modular 8-position plugs on both ends, wired straight through with standards compliant wiring.

F. Provide patch cord for all outdoor drops.

G. Each patch cord shall be 5 feet in length.

2.16. HORIZONTAL FIBER OPTIC STATION CABLE

A. Cable shall be a minimum of two fibers.

B. Fiber shall be multi-mode with a core diameter of 50.0 $\pm$ 3μm.

C. Cable materials shall be all dielectric.

D. All fibers shall have been subjected to a minimum tensile proof test by the fiber manufacturer equivalent to 100-kpsi.

E. Outer sheath shall be marked with the manufacturer's name, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet.

F. Maximum attenuation shall be 3.5 dB/km @ 850nm; 1.5 dB/km @ 1300nm.

G. Minimum Bandwidth shall be 160 MHz*km @ 850nm; 500 MHz*km @ 1300nm.

PART 3 - EXECUTION

3.1. HORIZONTAL DATA STATION CABLE AND TERMINATIONS

A. All horizontal Data Station Cables shall terminate on modular patch panels in their respective Telecommunications Rooms (TR) or Equipment Room (ER) as specified on the drawings.

B. The maximum station cable drop length shall not exceed 90-meters. This length shall be measured from the patch panel in the wiring closet to the outlet in the work area. The Contractor is responsible for installing station cabling in a fashion to avoid runs that exceed this distance. Any areas that violate the above constraints shall be identified and reported to the Consultant prior to installation.

C. All cables shall be continuous and splice-free.

D. During pulling operation provide adequate resources to observe cable at all points of duct entry and exit.

E. Avoid abrasion and other damage to cables during installation.

F. All cable shall be installed free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.

G. Cables shall be supported according to applicable codes. J-hooks used for cable support shall be manufactured solely for the purpose of supporting communication cables.

H. Supports should be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 12-inches, another support shall be used.

I. Cable shall never be supported by the ceiling grid.

J. Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or the outside of existing electrical or communications conduit.

K. Manufacturer's minimum bend radius specifications shall be observed at all times. Cable ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.

L. Cable sheaths shall be protected from damage by sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable. Bushings shall be used at both ends of all EMT and rigid steel conduit.

M. Maintain the following minimum separation distances between power and data cables.

Condition	Minimum Separation Distance		
	< 2kVA	2-5 kVA	>5kVA
Unshielded power lines or electrical equipment in proximity to open or nonmetal pathways	5"	12"	24"
Unshielded power lines or electrical equipment in proximity to a grounded metal conduit pathway	2.5"	6"	12"
Power lines enclosed in a grounded metal conduit (or equivalent shielding) in proximity to a grounded metal conduit pathway		3"	6"
Electrical motors and transformers			48"

N. Maintain the following minimum separation distances between data cables and specific electromagnetic interference sources:

Source of Disturbance	Minimum Separation
Fluorescent lamps	6"
Neon lamps	6"
Mercury vapour lamps	6"
High-intensity discharge lamps	6"
Arc welders	6"
Frequency induction heating	40"

O. Cables shall be routed through channel in modular furniture. Communication cabling shall not run in channel with power wiring.

P. Information Outlets shall be flush mounted on wall-mounted boxes, in floor-mounted boxes, and in modular furniture as shown on Drawings.

Q. All data and voice cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number.

R. Termination hardware (Blocks and Patch Panels) positioning and layout must be reviewed by the Consultant prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.

S. Patch panels shall be installed to allow for future cables to be added without disrupting existing installation.

T. Cables shall have a 12” service loop in outlet box or supported properly above ceiling.

3.2. JACKS

A. Jacks shall be wired per TIA-568B pin outs.

3.3. INFORMATION OUTLET

A. The same orientation and positioning of jacks and connectors shall be utilized throughout the installation.

B. Outlet boxes shall be secured to building with minimum of two mechanical fasteners per box. Adhesive fasteners are not allowed.

C. All extra openings to be filled with blank inserts.

3.4. COMMUNICATIONS PATCH PANEL

A. Panels shall be fully populated with jacks.

B. Install copper patch panels below fiber optic patch panels in telecommunications rack.

3.5. HORIZONTAL DATA STATION CABLE PATCH CORDS

A. The patch cords shall be installed per manufacturer’s written instructions.

B. Contractor must coordinate with the owner for installing all patch cords within the TR.

C. Any left-over patch cords which are not used for the initial installation shall be placed in a box and handed over to the owner. Patch cords must be new and within the original unopened package.

3.6. FIBER OPTIC CONNECTOR

A. The fiber optic connector shall be installed per manufacturer’s written instructions.

3.7. FIBER OPTIC PATCH CORDS

A. The fiber optic patch cords shall be installed per manufacturer’s written instructions.

B. Contractor must coordinate with the owner for installing all patch cords within the TR.

C. Any left-over patch cords which are not used for the initial installation shall be placed in a box and handed over to the owner. Patch cords must be new and within the original unopened package.

3.8. TELEVISION COAX AND TERMINATIONS

A. When preparing the coax cable for termination, manufacturer installation procedures shall be adhered to. Special care shall be taken to insure the proper center conductor length as specified by the manufacturer.

B. The connectors shall be mated to female/female feed-thru couplings at both the outlet and TR locations. These couplings shall be matched to the male connector. Couplings shall be of sufficient length as to allow for the male connector to fully seat on both sides.

END OF SECTION