

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE

PAGE OF PAGES
1 2

2. AMENDMENT/MODIFICATION NO.
0003

3. EFFECTIVE DATE
16 SEP 99

4. REQUISITION/PURCHASE REQ. NO.

5. PROJECT NO. (If applicable)

6. ISSUED BY CODE

7. ADMINISTERED BY (If other than Item 6) CODE

Department of the Army
Corps of Engineers
Fort Worth District

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)

(√) 9A. AMENDMENT OF SOLICITATION NO.
DACA63-99-B-0071

(X) 9B. DATED (SEE ITEM 11)
18 AUGUST 1999

10A. MODIFICATION OF CONTRACTS/ORDER NO.

10B. DATED (SEE ITEM 13)

CODE FACILITY CODE

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

(X) The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers tended.

(X) is extended, () is not ex-

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(√) A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).

C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor () is not, () is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

The Solicitation for TECHNOLOGY AND GENERAL REHABILITATION, FORT KNOX, KENTUCKY, is amended as follows:
See Continuation Sheet.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)

16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)

15B. CONTRACTOR/OFFEROR

15C. DATE SIGNED

16B. UNITED STATES OF AMERICA

16C. DATE SIGNED

(Signature of person authorized to sign)

BY

(Signature of Contracting Officer)

Item 14. Continued.

a. CHANGES TO BID OPENING DATE, Standard Form 1442, First Page, Item No. 13.A.- Change the bid opening date and time from "21 SEPTEMBER 1999, AT 2 P.M. LOCAL TIME" to "27 SEPTEMBER 1999, AT 2 P.M. LOCAL TIME".

b. CHANGES TO THE SPECIFICATIONS

Replacement Sections - Replace the following section with the accompanying new section of the same number and title, bearing the notation "**AM #0003:**"

SECTION 16762 LOCAL AREA NETWORK

END OF AMENDMENT

SECTION 16762[AM #0003] LOCAL AREA NETWORKAM #0003

PART 1 GENERAL

1.1 REFERENCES

Design, installation and testing of all passive components shall be in compliance with the following referenced documents:

- 1) ANSI/TIA/EIA-568-A, Commercial Building Telecommunications Cabling Standard (October 1995).
- 2) ANSI/TIA/EIA-568-A-1, Propagation Delay and Delay Skew Specifications for 100 ? 4-pair Cable (September 1997).
- 3) ANSI/TIA/EIA-569-A, Commercial Building Standards for Telecommunications Pathways and Spaces (Prepublished Copy).
- 4) ANSI/TIA/EIA-570, Residential and Light Commercial Telecommunications Wiring Standard (June 1991).
- 5) ANSI/TIA/EIA-606, The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings (February 1993).
- 6) TIA/EIA TSB-67, Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems (October 1995).
- 7) TIA/EIA TSB-72, Centralized Optical Fiber Cabling Guidelines (October 1995).
- 8) TIA/EIA TSB-75, Additional Horizontal Cabling Practices for Open Offices (August 1996).
- 9) ANSI/NFPA 70, National Electrical Code, National Fire Protection Association.
- 10) EIA-STD-RS-455 Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers and Terminating Devices

1.2 SYSTEM DESCRIPTION AND DEFINITIONS

1.2.1 General

The network model for the DDESS Schools LANs is based on Fast Ethernet upgradeable to ATM, with a fiber backbone and switches with 100Base-T, 100Base-FX and 10Base-T modules. The scope of this project involves, primarily, the Physical Network Layer.

- a. The contractor shall include all plant, labor, equipment, appliances and materials, installation and testing of all passive components of the Local Area Network including category 5 twisted pair cable, optical fiber cable, patch panels, equipment cabinets and cross-connect equipment, data jacks and face plates, cable raceways and managers, in strict accordance with

this section of the specification. The contractor shall include the cost of all materials, installation and testing for the entire cable and distribution system for the LANs.

The contractor shall provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. The contractor shall ensure that they are in compliance with requirements stated or reasonably inferred by the contract documents.

Federal, state, and local codes, rules, regulations, and ordinances governing the work, are as fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or the specifications, construction of which would be code violations, promptly call them to the attention of the government's representative in writing. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

1.2.2 Cable Requirements and Definitions

Intra-building Cable (Inside Plant) - Internal building cable that cross-connects each equipment closet and extends to the final termination of the workstation jacks.

a. Backbone Wiring - Fiber Optic Cable

Intra-building cable that cross connects all equipment closets in the building. The backbone wiring shall be Fiber Optic Multimode Cabling consisting of at least 12 strands, 62.5/125 microns, meeting ANSI x3T9.5 and EIA/TIA-568-A standards. This fiber backbone shall provide interconnects to all fiber patch panels at equipment closet locations and will be totally concealed in non-metallic conduit or raceway systems and protected to ensure minimal damage risk. Fiber optic cable used outdoors shall be a gel-filled type, which provides protection from moisture. All fiber end connections shall be ST type.

b. Horizontal Distribution Wiring - Category 5 UTP

Intra-building cable that cross-connects the workstation data jack to the designated equipment closet. Horizontal wiring shall be four pair, 100-ohm plenum grade Unshielded Twisted Pair (UTP) cable meeting, at a minimum, Category 5 standards. RJ-45 modular connectors will be wired to meet EIA/TIA-568B standards and color code tables. Each connection shall include all eight wires of the four pair cable. All termination patch panels will comply with category 5 standards. Additionally, all equipment selected will meet the manufacturer's end-to-end solution requirements for warranty. All horizontal wiring shall be secured and/or protected to safeguard against damage. All cables that drop below ceiling level will be concealed in non-metallic, surface mount raceway. The data cables shall be run in the raceways with a barrier placed between the data cables and any power cables. In locations where the data cables are run into raceways that will not contain power cables, single channel raceway may be used. Cable pathways will be constructed for all runs.

1.2.3 Patch Panels

Fiber optic patch panels will support 12-strand multimode and/or singlemode

fiber optic cables to allow for flexible backbone configuration and future network developments.

RJ-45 patch panels shall support all the RJ-45 connections for a designated LAN zone.

Additional RJ21 to RJ45 patch panels shall be provided by the contractor to facilitate cross connects between the government provided active equipment, and the installed cable termination jacks. It is the contractor's responsibility to, at the time of the pre-bid walk through, get the specific quantities and requirements from a properly designated government representative.

Each port shall be labeled designating the port's destination outlet and port number. All conductors of all cables shall be terminated at both ends.

1.2.4 Equipment Closets

Dedicated locations have been selected to house distribution cabinets, patch panels, cabling and all active and passive data components to facilitate physical connection between the fiber backbone, patch panels, punch down blocks, and switches. Rooms were chosen based on location, availability, and physical suitability. Often, this room will not be dedicated to LAN equipment only. All equipment will be contained in a lockable wall mounted, or floor mounted 19-inch rack cabinet.

1.2.5 User Work Areas (Wall Jacks)

New LAN drops were located in user work areas. To place new LAN drops, every space to receive new LAN drops, power upgrades, or both was surveyed. Physical room conditions were noted and obstructions, such as built-in furniture, windows, sinks, chalkboards, etc., were taken into account. Often, even distribution was not possible due to the abundance of obstructions.

Distribution cabling shall be uniform throughout the system to the extent that potential re-purposing and technological upgrades can be supported. Modular, multi-purpose, EIA/TIA 568-A compliant, single-gang faceplates and data outlets will be mounted in a surface mounted raceway as described under the electrical section of this specification. In locations where three or less data jacks are required, and or no electrical power is required, the contractor may substitute a smaller raceway, provided it meets all other specifications (see section 16762 2.10). All conductors within each cable shall be terminated at the jack. Jacks will be used to cross-connect distribution cables to equipment at all user areas. Outlet locations will correspond to those indicated on the contract drawings.

1.2.6 Additional Equipment

Additional items in the passive LAN system include, but are not limited to, the following: ground wire, ground clamps, terminal housing, data jacks; inside building conduits, cable hooks, pull ropes, all workstation wiring, tie-wraps, Velcro straps, all mounting requirements, cross-connect of all required jumpers and associated support facilities as required.

1.2.7 Removal of Existing LAN

Contractor shall be responsible for removing any existing LAN systems that are to be abandoned. This shall include all cable, raceway, and junction boxes that exist below the ceiling level. The contractor shall also be responsible for repair to any walls or other surfaces that are affected by the removal of any such systems.

1.3 SUBMITTALS

All submitted items of technical data which are specifically identified in this specification will be identified by reference to the particular specification paragraph against which it is furnished. Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The submittals will be in accordance with Section 01330 SUBMITTAL PROCEDURES.

1.3.1 Technical Data Package

1.3.1.1 Pre-Construction Drawings GA

Pre-construction drawings shall be specific to the construction work to be performed and the structure or site that the work will be performed upon. "Typical" drawings will not be accepted for pre-construction drawings. Work shall not commence until the Contracting Officer has reviewed and approved these plans. The Pre-Construction Drawings shall include the following:

System block diagrams, indicating interconnection between system components and subsystems.

Interface requirements, including connector types and pin-outs, to external systems or components not supplied by the contractor.

The proposed layout of all equipment cabinets in each building, cable pathways and attachment methods; specific measurements, including pair counts, core drilling, and firewall repair.

1.3.1.2 Manufactures' Data FIO

The data package shall include manufacturers' data for all materials including field and system equipment provided under this specification. It shall also show how the equipment will operate as a system to meet the performance of this specification. Contractor will provide samples of manufacturers' materials for the following.

Wire, cable, and optical fiber.

Outlets, jacks, faceplates, and connectors.

Nonmetallic, surface raceways, outlet boxes, and fittings.

Patch panels.

Enclosures, racks, and equipment housings.

1.3.1.3 Certifications GA

The contractor shall demonstrate his ability to install a LAN cabling system meeting the requirements of this specification, by including proof of

installation certification with the manufacturer of the channel solution selected, or BICSI.

1.3.1.4 As-Built Documentation GA

After construction of the LAN, but prior to system acceptance, the contractor shall submit as-built documentation for the as-installed plant. Scale drawings for as-built documentation must be produced for each media installed. Drawings shall be provided using AutoCAD Version 12 or higher. The following is the minimum detail required:

- a. Intra-Building Cable Plant (Fiber Optic and Horizontal UTP wiring) including jack locations and identification numbers.

Equipment Closet locations by room and LAN zone.

Terminal identification information at each equipment closet.

Indication of all support hardware and junction boxes.

All installed equipment and hardware locations. Detail drawings as necessary. Indication of associated building structures and equipment (where applicable).

Cable assignment records. A complete list of pair assignments records for all of the UTP plant. The twisted pair assignments records shall include a complete list of cable numbers and show the originating equipment closet and the terminating room name and/or number. This list shall also show the patch panel port number on which the cable is terminated and the length of each cable.

1.3.1.5 Performance Verification Testing Data GA

The contractor shall prepare a test plan and test procedures in accordance with section 3.2 for the performance verification test. The test plan shall describe the applicable test to be performed, and other pertinent information such as specialized test equipment required, and length of performance verification test. The test procedures shall be explained in detail, step-by-step actions and expected results, to demonstrate compliance with the requirements of this specification. The contractor shall deliver test plans for the performance verification tests to the government.

PART 2 PRODUCTS

2.1 Quality Assurance

The contractor shall be an authorized cable system installer for the passive components selected. The contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this size and type. Upon request the contractor shall furnish a list of references with specific information regarding type of product and involvement in providing of equipment and systems.

2.2 Standards for Materials

All materials shall be new, shall conform to current applicable industry standards, NEMA Standards, and shall be Underwriter's Laboratories Standards

listed and labeled unless otherwise indicated. Workmanship and neat appearance shall be as important as the electrical and mechanical efficiency. Defective or damaged materials shall be replaced or repaired prior to final acceptance, in a manner that meets the approval of the government at no additional cost to the owner. All equipment and material shall comply with the latest standards for EIA/TIA, IEEE, NEMA, NEC, UL, RUS, IPCEA, ANSI and ASTM. The National Electrical Code shall be used for minimum requirements only and not as design criteria. Applicable local, state, and Building Industry Consulting Service International (BICSI) construction standards and practices shall be followed.

2.3 Horizontal Distribution Wiring System Requirements

The horizontal cable for workstation wiring is defined as multi-conductor, thermoplastic-insulated, copper cable, air core, with four unshielded twisted pairs rated to a performance criteria of category 5.

- a. Cable protection will be of the highest concern. The cable sheath shall be protected from sharp edges. Where cables pass over a sharp edge, a bushing or grommet shall be inserted to protect the cable.

To reduce EMI induced into the cabling from fluorescent lights, cable sheath shall be installed in a hanging pathway in the area above the drop ceilings to maintain proper clearance of 12 centimeters (five inches) from fluorescent lights.

Testing after installation and termination will be required to ensure a rating to Category 5 performance, and a transmission frequency of 155Mhz.

The cable's outer sheath shall be blue in color.

Horizontal Cable Lengths

Horizontal cabling shall be installed in a star topology. Each work area outlet must be cabled directly to a horizontal cross connect in the appropriate equipment closet.

Splices shall not be permitted for twisted-pair horizontal cabling.

Bridged taps (multiple appearances of the same cable pairs at several distribution points) shall not be permitted in the horizontal cable.

In cases where the overall cable length allows, an additional 3 meters or 10 feet of slack shall be allowed for in the equipment closet.

In cases where the overall cable length allows, an additional 30 centimeters or 12 inches of cable slack shall be allowed for at the workstation outlet.

In no case shall the slack allowances cause the overall length of the cable to exceed the limits as described in paragraphs 1.3.1.1 and 1.3.1.2 of this section.

2.3.1.1 Horizontal Cable Lengths - Fort Knox High, Walker, Mudge, Pierce, Van Voorhis, Powers Alumni Performing Arts Center, Mac Donald, Kingsolver, Scott

The maximum horizontal cable length from the cross connect panel to the

workstation outlet shall not exceed 90 meters or 295 feet. An additional 10-meter or 33 foot allowance has been made for the combined length of patch cables and cables used to connect equipment in the work area and equipment closet.

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Multi-user workstation outlets will be installed to service multiple office clusters within a single room. Provisions have been made to allow work area cables to extend beyond the standard 3-meter or 10-foot allowance.

The maximum horizontal length from the cross connect panel to the workstation outlet shall not exceed 80 meters or 262 feet. An additional 18-meter or 59 foot allowance has been made for the combined length of patch cables and cables used to connect equipment in the work area and equipment closets. Eleven meters or 36 feet of this allowance is for use in the work areas.

A multi-user outlet assembly may not be used for any purpose except its defined purpose of making a direct connection to work area equipment. This assembly may never be used as a cross connect point.

Multi-user outlet assemblies shall be located in fully accessible, permanent locations such as permanent walls. Multi-user outlet assemblies shall not be installed in furniture or moveable partitions.

Final locations of outlets shall be coordinated with a properly designated government representative before installation.

2.3.2 Category 5 High Speed LAN Data specifications

- a. Electrical Specifications:
Impedance 100 ohm \pm 15%
- b. See testing specification for Category 5 performance in paragraph 3.3.2 - Execution for Attenuation and NEXT requirements.
- c. Mutual Capacitance
17pF/ft Max.

2.4 Intra-Building Fiber Optic Cable

Backbone wiring shall consist of a minimum of 12-strands, 62.5/125-micron multimode fiber optic cable. Fiber optic cable shall be plenum rated and meet the operating criteria defined in this specification. The fiber backbone shall provide interconnections to all equipment closets, patch panels, and switches and shall be protected by non-metallic conduits, cabling raceways, or any vertical/horizontal shafts that may exist. This type of cable shall be totally concealed and protected to ensure damage is at minimum risk. All fiber ends shall be terminated with ST style connectors. Provide a minimum of three meters of cable service loop at all equipment closets, and in all fiber junction boxes, to accommodate for future cabling system changes and maintenance. Fiber cable shall meet ANSI X3T9.5 and EIA/TIA 568-A standards capable of supporting Ethernet, Fast Ethernet, FDDI, 10BaseFL, and ATM technologies. The cable shall be terminated in a fiber patch panel. Testing after installation and termination will be required.

- a. The system shall include all required fiber, patch panels, cross

connect jumpers, splices, connectors, junction boxes, cable test, and accessories as specified herein for a complete and functional system.

- b. The contractor shall provide all labor, materials, equipment, and incidentals necessary and required for completion of work.
- c. All fiber strands shall be fully tested for compliance with these specifications.
- d. Single Source Responsibility - All cable shall be a product of a single manufacturer.

2.4.1 Fiber Characteristics

- a. All fibers in the cable must be useable fibers and meet required specifications.
- b. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.
- c. Each optical fiber shall consist of a doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.
- d. The Multimode fiber utilized in the cable specified herein shall meet EIA/TIA-492AAAA-1989, "Detail Specification for 62.5 m Core Diameter/125 m Cladding Diameter Class 1a Multimode, Graded Index Optical Waveguide Fibers."
- e. All optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100kpsi.
- f. The fiber shall be coated with a dual layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.
- g. A thermoplastic buffer shall be applied over the fiber coating. The diameter of the tight buffer coating shall be 900 ± 50 m.
- h. The fiber coating and buffer shall be removable with commercially available stripping tools in a single pass.
- i. Fiber optic cable used outdoors shall be a gel-filled type, providing protection from moisture.

2.4.2 Fiber Specification Parameters

- a. All fibers in the cable shall meet the requirements of this specification.

The attenuation specification shall be a maximum attenuation for each fiber over the entire operating temperature range of the cable.

The attenuation of the cabled fiber shall be uniformly distributed throughout its length such that there are no discontinuities greater than 0.2 dB in any 1-kilometer length of fiber.

- d. Required Fiber Grade - Maximum Fiber Attenuation
<3.75 dB/km @ 850 nm
<1.5 dB/km @ 1300 nm

- e. Minimum Bandwidth Requirements
>160 MHz km @ 850 nm
>500 MHz km @ 1300 nm

2.4.3 Cable Construction (For cables with up to 24 fibers)

- a. The individual fibers shall be stranded around a glass reinforced plastic (GRP) central member and surrounded by layered aramid yarns. The GRP central member provides anti-buckling to ensure consistent attenuation performance across the operating temperature range of the cable. A ripcord shall be applied between the aramid yarns and the outer jacket to facilitate jacket removal. The outer jacket shall be extruded over the aramid yarns for physical and environmental protection.
- b. The strength member shall be a high modulus aramid yarn. The aramid yarns shall be helically stranded around the buffered fibers.
- c. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall be smooth, as is consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.
- d. The cable jacket shall be designed for easy removal without damage to the optical fibers by incorporating a ripcord under each cable jacket. A non-toxic, non-irritant talc shall be applied to the aramid yarns to allow the yarns to be easily separated from the fibers and the jacket.
- e. The nominal thickness of the cable outer jacket shall be sufficient to provide adequate cable protection while meeting the mechanical, flammability, and environmental test requirements of this document over the life of the cable.
- f. The cable shall be all-dielectric.

2.4.4 Identification

- a. The individual fibers shall be color coded for identification. The color-coding shall be in accordance with EIA/TIA-598 Color Coding of Fiber Optic Cables. The coloring material shall be stable over the temperature range of the cable, shall not be susceptible to migration, and shall not affect the transmission characteristics of the optical fibers. Color-coded buffered fibers shall not adhere to one another. When fibers are grouped into individual units, each unit shall be numbered on the unit jacket for identification. The number shall be repeated approximately every six inches.
- b. The outer cable jacket shall be marked at least every two feet with the manufacturer's name or UL file number, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet (e.g. "62.5/125 BELDEN Type OFNR - UL"). The print color shall be black. The printing shall be permanent and legible for the life of the

cable.

2.4.5 Fiber termination Hardware:

- a. Provide adequate cable slacking (looping) in order to meet the minimum bending radius requirements of the fiber optic strands.
- b. Provide a means of securing the cable sheath and storing excess fiber slack.
- c. Provide a means of storing excess jumper slack.
- d. Provide precision ST connector couplers for terminating the cable's ST connectors and precisely aligning them with ST jumper cables.
- e. Provide a means of labeling all terminations and associated cables.
- f. Rack or cabinet mount provisions.
- g. Supports multimode or single-mode operations.
- h. Accept up to twelve connectors minimum.
- i. All necessary components to connect the associated fibers must be provided. Fiber connectors must not be loose in the frame after termination and testing is completed.

2.4.5.1 Specifications for Multimode ST Connectors:

Attenuation: Typical 0.3db, 62.5/125-micron fiber @ 1300nm

Connector Durability: <0.2db increase /1000 matings

Operating Temperatures: -40 to 60 degrees Celsius, temperature cycling

Storage Temperature: -40 to 80 degrees Celsius

2.4.5.2 Specifications for ST Connector Materials:

Ceramic tipped field installed ST compatible connectors, meeting the following minimum requirements:

- a. Meets ANSI/TIA/EIA 568-A specifications.
- b. 0.2 dB typical installation loss.

2.5 Equipment Cabinets

Cabinets shall be modular, sized as required or indicated on the contract documents, and provide for access to equipment via hinged front and rear doors. All steel frame construction, lockable smoked acrylic front door, and lockable rear access door. Leveling feet (for free standing cabinets), and nineteen-inch rack mounting rails shall be included. The cabinet shall have a baked enamel finish.

- a. Accessories for cabinets shall include, but not be limited to, ventilation fans, grounding kits, cable management bars, and in cases of low light levels, light bars. Sufficient slack shall be provided to allow forward removal of any rack mounted equipment.

- b. Equipment cabinets shall be sized to allow space for the active equipment (owner provided) to be installed in the rack along with all specified patch panels. It is the contractor's responsibility to get space requirements for the active equipment and quantities for the RJ21 to RJ45 patch panels from the owner.
- c. Equipment cabinets shall be constructed with nineteen-inch mounting racks built into them.

2.6 Jacks and Patch Panels:

Category 5 rating shall be applied to all connecting hardware appropriate for use with UTP cables specified in the EIA/TIA-568-A. Components used shall be characterized up to a minimum 155Mhz and typically intended for emerging technologies and applications.

2.7 Patch Cables:

Category 5 - This category applies to connecting hardware appropriate for use with UTP cables specified in the EIA/TIA-568-A. Components used shall be characterized up to a minimum 155Mhz and typically intended for emerging technologies and applications. All patch cables shall be constructed using stranded wire, have snagless boots and strain relief. All patch cables shall be of proper length to be routed through cable management brackets, and have an overall neat appearance, when installed with patch panels in section 16762 3.2.5.

2.8 Non-metallic Conduit (Innerduct)

Non-metallic conduit used for indoor fiber runs shall be corrugated wall, CAS 2 M cell, virgin polyvinyl chloride (PVC) conduit, conforming to NEMA publications TC2 and TC3 and UL 94V0 rated for flammability retardance; Carlon or approved equivalent.

2.8.1 Non-metallic Conduit

Non-metallic conduit used for outdoor cable runs shall be heavy wall rigid plastic PVC conduit, fittings and accessories designed for exposed installation. This conduit shall be corrosion resistant, having watertight joints and high-impact strength. It shall also be sunlight resistant and have superior weathering characteristics. Carlon, Plus 40, Plus 80, or equivalent. Conduit supports shall be installed in accordance with National Electrical Code (NEC) Article 347.

2.8.2 Conduit Fittings

Couplings and terminations for PVC Corrugated Conduit shall be schedule 40 non-metallic virgin polyvinyl chloride (PVC) fittings, conforming to NEMA publications TC2 and TC3 and UL 94V0 rated; Carlon or approved equivalent. PVC coupling and solvent cement shall be manufactured by the same manufacturer as the PVC corrugated conduit. Couplings attaching service loop boxes to PVC corrugated conduit shall be PVC to rigid steel. All couplings and connectors shall be sized as to match the conduit.

2.9 Fastening Products

2.9.1 J-hooks

J-hooks shall be steel, rated for indoor use in non-corrosive environments. UL listed; ultimate static load limit 50 lbs. Rated to support and secure Category 5 cable. If required, assemble to manufactures recommended specialty fasteners including beam clips, flange clips, C and Z purlin Clips.

2.9.2 Wide-Base cable supports

Wide-base cable supports shall be rated for indoor use in non-corrosive environments. UL listed; ultimate static load limit 100 lbs. Rated to support and secure Category 5 cable, and rated suitable for air handling spaces. If required, assemble to manufactures' recommended specialty fasteners including beam clips, flange clips, C and Z purlin Clips.

Raceway (Perimeter Pathways)

Surface raceway shall consist of base, cover and related fittings and hardware, that mounts directly on walls at appropriate work levels to provide a continuous perimeter pathway. Telecommunication outlets are located along the raceway and may be moved or added after initial installation if desired.

New installations of perimeter raceway systems shall be sized using a cable fill based on 40% of the raceway's cross-sectional area.

Perimeter raceways shall follow the bend radius requirements of all cable placed inside. A 1" bend radius shall be used for category 5 UTP.

Raceways and their elbows, couplings, and similar fittings shall be so designed that the sections can be mechanically coupled together and installed without subjecting the wires to abrasion.

Raceway shall be mechanically fastened to the mounting surface (screwed onto). Mounting fasteners shall be appropriate for mounting surface, meaning use a masonry fastener for attaching to brick: a wood screw for attaching to studs, etc. Fasteners heads shall be the "panhead" type to reduce the possibility of damaging the cable's insulation. Fasteners shall be spaced every 16 inches and within 1 ½" of each end of the raceway.

Raceway, faceplates and associated hardware shall be of complementary colors approved for use by a properly appointed government representative.

Raceway shall include a full complement of bend radius control (BRC) and standard fittings consisting of, but not limited to: elbows (internal and external), couplings for joining raceway sections, blank end fittings for closing open ends of the raceway, entrance fittings, reducer fittings, and tee fittings. The BRS fittings shall incorporate a minimum 1" bend radius.

Raceway finish shall be pure color, shall resist scratches and dents, and will not peel or corrode.

Raceway shall be tamper-resistant and shall be manufactured from impact-resistant material with flammability rating of UL94V-0.

Data and Fire Alarm Protectors

Data and Fire Alarm protectors as qualified by UL 497B will be required where

a circuit is potentially exposed to lightning surges.

Any copper cable that goes between buildings shall have a protector, between the exposed area of the cable and the termination point of the cable, on both ends of the cable.

Protector shall be rated for use with Category 5 LAN cabling and equipment.

Protector shall respond to fast moving transient voltage in less than 5 nanoseconds, and automatically reset, or fail the connection, for continuous protection.

Protector shall be solid state protection

2.10 Cable Tray

A metallic cable tray designed for the purpose of distributing low voltage, high speed, communications cable shall be placed in all main corridors, as shown on drawings. All trays shall be securely mounted to the structure in accordance with the manufacture's recommendations.

PART 3 EXECUTION

CONTINUITY OF SERVICES

Contractor shall take no action that will interfere with, or interrupt existing building services unless previous arrangements have been made with the government's properly appointed representative. Contractor shall arrange all work to minimize shutdown time.

Government's personnel will perform shutdown of operating systems. The contractor shall give three (3) days' advance notice for system shutdown.

Should services be inadvertently interrupted, contractor shall immediately furnish labor, including overtime, material, and equipment necessary for prompt restoration of interrupted service.

INSTALLATION

System components shall be installed in accordance with the manufacturer's instructions and as shown. All necessary interconnections, services, and adjustments required for a complete and operable passive LAN shall be provided.

Only existing pathways previously allocated for communications shall be reused in the distribution design; use of any existing electrical distribution conduit in any part of the system for communication cable may be used if approved by the government in advance.

Cable shall be routed in such a way as to not interfere with the operation or maintenance of any device along its path. The contractor is responsible for correcting any malfunction resulting from poor or improper cable installation.

If a cable crosses a fire barrier or enters a plenum area, it shall be continuously plenum rated. The cable shall be fire-stopped at the point of termination. One or more methods, as specified by the government, shall be

used to accomplish this.

Building riser cable will be supported by cable clamps or support devices at intervals not to exceed five feet (5'). Deviation from this support footage will not be allowed.

All entrance and intra-building riser penetration, conduit cores, wall and ceiling penetrations will be sealed with a fire retardant material as specified in section 07840 Firestopping. In the event that the contractor routes cable facilities through existing "core" areas, (where existing cable may be) the contractor will be responsible for sealing these areas as described above.

Contractors' personnel shall not interfere with fire detection or suppression devices. If the possibility exists of interference with such a device, the government must be contacted to give approval before work commences. The Contractor will be responsible for damages caused by unplanned discharge of fire suppressants.

Layout and design of distribution cabinets and associated equipment must be approved by the government prior to installation.

Cables shall be routed in such a way as to minimize interference with cross connect wiring on patch panels.

Horizontal wiring shall present a neat appearance when complete, utilizing wall and floor outlet boxes. Surface mounted wire raceway will be used to conceal all exposed cable. The Contractor must notify the government in advance of construction, and provide enough information for the government to review, including proposed routing.

3.2.1 Universal Wiring Plan

The Contractor shall utilize a Universal Wiring Plan and the hardware contained therein for the interconnection of the copper cable network. The Universal wiring plan and associated hardware must be designed as follows:

- a. Horizontal wiring shall be uniform throughout the system. Securely mounted modular, duplex terminal jacks- EIA/TIA 568-A compliant will be used to cross-connect station pairs to the station line cord. Wiring and designation of the duplex jack will be as follows:
- b. The station cables used for administration shall be terminated on a modular wall plate with one (1) Universal 8 position, 8 wire RJ-45 unkeyed jack EIA/TIA 568B pin/pair wiring standards:

PAIR	PIN	COLOR
ONE	4&5	BLUE, BLUE/WHITE
TWO	1&2	WHITE/ORANGE, ORANGE
THREE 3&6		WHITE/GREEN, GREEN
FOUR	7&8	WHITE/BROWN, BROWN

Compatible wall plates with removable designation strips shall be used at each jack location. Designation strips shall be typed with final, required information.

- c. All wires shall be numbered at both ends (jack and patch panel)

utilizing the pattern in section 3.1.3.1. Sequential numbering of each jack using designation strips at the jack end following the Owner's Wiring Plan is required.

3.2.2 Fiber Optic Cable

The contractor shall install intra-building fiber cable (12-strand multimode tight buffer) connecting equipment closets as specified to facilitate backbone connection over an Ethernet network. All fiber cables shall be placed inside of non-metallic conduit between patch panels. All fibers shall be terminated on a patch panel located in the equipment cabinet within each LAN zone. Each fiber will be terminated using ST type connectors.

- a. In situations where multiple cables are placed in the same non-metallic conduit, and one or more of the cables are peeled off from the main pathway, a junction box will be provided by the contractor. Carlon circuit safe series enclosures, or approved equivalent, will be used as junction boxes. Enclosures shall have a bolted opaque cover. All boxes shall be securely fastened to the building construction, independent of conduit and raceway systems. The conduit will be securely attached to the box at all penetration points. All boxes shall be sized to allow room for service loops to be placed in the boxes. Service loops shall be added to both terminating ends, and in all junction boxes of the fiber runs. The total service loop allowance for a fiber run shall be three meters at each loop location.
- b. The contractor shall test all terminated fiber strands in accordance with the test specification as described within section 3.2.

3.2.2.1 Intra-Building Cable Distribution

The contractor shall re-wire each building indicated on the contract drawings in accordance with standards set forth in the BICSI "Telecommunications Distribution Methods Manual" and the BICSI "Cable Installation Manual". Every building that is rewired shall be wired using a universal wire plan that must accommodate the cables described in this specification. The wiring plan is designed to provide adequate pairs to support the campus LAN system's high-speed data connections.

- a. One four-pair Category 5, 100-ohm plenum rated UTP cable shall be provided for each data port.
- b. Category 5, RJ-45 modular connections shall be wired to meet EIA/TIA-568B pin, pair and color designation.
- c. Each connection shall include all eight conductors of the four pair cable.
- d. All overhead cabling shall be securely and neatly supported using Category 5 J hooks or hangers placed no more than 1.5 meters (five feet) apart, or in cable trays designed for telecommunications type cable. In locations where the overhead cable is suspended from an exposed ceiling, and is exposed to view, the supports shall be placed no more than three feet apart. All cabling that descends below the ceiling level shall be concealed and protected in non-metallic raceways.

- e. Placement relative to nearby noise sources, such as electric power wiring, radio frequency (RF) sources, large motors and generators, induction heaters, fluorescent light ballast, etc. shall be avoided. If necessary, place exposed cables not closer than 1.2 meters (four feet) from large motors or transformers, 30 centimeters (one foot) from conduit and cables used for electrical power distribution and twelve centimeters (five inches) from fluorescent lighting.
- f. Installation shall be in compliance with EIA/TIA 568-A Telecommunications Cabling Standard, EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces, and ANSI/NFPA 70 National Electric Code. Installation shall also meet any additional manufacturer's requirements to fulfill warranty specifications.
- g. Provide a minimum of 1.5 meters (five feet) of cable slack in the equipment cabinets and 30 centimeters (twelve inches) at the outlet for each cable run to accommodate for future cabling system changes.

3.2.3 User Work Area

Distribution of drop locations will be as indicated on the contract documents. Typically, there will be eight data jacks per classroom, and one data jack per administrative location, flush mounted in a two compartment, surface mounted raceway. The computer labs will typically include thirty-two data jacks located and flush mounted in two compartment, surface mounted raceway and/or tele-power poles. In instances where tele-power poles are utilized an additional 3 meters (ten feet) of cable slack shall be incorporated into the in-ceiling suspension system, to allow for possible future movement of the pole.

- a. Category 5 patch cables shall cross-connect all data jacks to active switches (switches provided by owner).
- b. Where possible, all wall-mounted connections will be mounted at least sixteen inches above the finished floor. Surface raceway and faceplates shall be color matching and fully conceal the UTP cables.

Labeling

All data outlets, patch panel ports, and both ends of each cable shall be clearly and neatly labeled. Two cable identification schemes will be used, one for the end of the cable in the work area, and one for the end of the cable at the patch panel. The labeling schemes shall be as follows:

Work Area Scheme: The first digit of the I.D. number will use a numeric character, designating the LAN zone in which the jack is located. The first digit will be followed by a dash (-). The next character will be an alphabetic designator to identify the patch panel in which the cable is terminated. This character will be followed by a dash (-). The last digit will be a numeric designator corresponding with the patch panel port into which the cable is terminated. For example: The cable to the first port in the first patch panel in LAN Zone 1, will be designated as 1-A-1. The cable to the second port will be 1-A-2. Cables to the second patch panel will be labeled 1-B-1, 1-B-2, 1-B-3, etc. The contractor will be responsible for clearly and visibly labeling each patch panel in accordance with the scheme described above.

Patch Panel Scheme: The first portion of the I.D. number will correspond with the room number to which the cable runs. This number will be followed by a dash (-). The next portion of the I.D. number will be an alphabetic designator to identify the faceplate in the work area where the cable is terminated. This character will be followed by a dash (-). The last portion of the I.D. number will be a numeric designator that corresponds with the faceplate jack in which the cable is terminated. For example: The cable to the first jack in the first faceplate in Room 32 will be designated as 32-A-1. The cable to the second jack will be 32-A-2. Cables to the next faceplate in Room 32 will be labeled 32-B-1, 32-B-2, 32-B-3, etc. The contractor will be responsible for clearly and visibly labeling each faceplate in accordance with the scheme described above. Faceplates should be lettered in a clockwise sequence beginning at the main entrance into the room. Jacks on each faceplate will be sequenced in a clockwise direction beginning from the upper left-hand side of the faceplate. In situations where cable is run to an unnumbered room, the contractor will be responsible for coordinating with the appropriate government representative(s) to assign a number to the room.

3.2.4 Equipment Closets

Equipment closets should provide adequate space to contain the equipment cabinet and its associated wiring systems. Note: the area around the cabinets must be kept clear, providing access to the cabinets.

- a. Equipment closets shall provide physical connection between the fiber backbone, patch panels, and switches.
- b. Equipment closets shall house equipment cabinets and associated passive cabling components.
- c. All cabling components not contained in the equipment cabinet shall be concealed within raceways or risers. No cables run below ceiling level shall be exposed.

3.2.5 Patch Panels

Modular, high density, low profile patch panels shall be used in all locations. Patch panels may vary in number of ports provided, but shall be of the same manufacturer and series, for all closets. All patch panels will be populated with port counts that equal or exceed total ports needed, plus 10%, for each closet.

3.2.5.1 UTP Patch Panels

All patch panels used to terminate UTP cables shall comply with Category 5 and AT&T 110 standards. Provide patch panels in 24 or 48 port increments, providing sufficient ports to support all UTP cables connected to that equipment location.

- a. Patch cables connecting data work ports to the LAN switches shall be Category 5 compliant, both cordage and couplers. Patch cables shall be constructed of stranded cable. Although the switches and other active components will be provided by the owner, all patch cables shall be provided by the contractor to provide connection to these active components. The contractor shall also provide each site a quantity of spare patch cables equal to 10% of the total used at that site. Patch cables shall be appropriately sized to allow for a neat and

maintainable system.

- b. All ports will be labeled in accordance with the labeling scheme described in part 3.1.3.1 of this specification.

3.2.5.2 Fiber Optic Patch Panels

Fiber optic patch panels will be rack mounted, consisting of distribution centers containing both connector panels, and splice trays, in quantities sufficient to accommodate the backbone fiber. All fibers shall be terminated with ST style connectors.

Fiber optic patch cords shall provide two STs to one SC duplex connectors. The fiber optic patch cords shall conform to the same specifications as the backbone wiring cable in quality and performance. Although the switches and other active components will be provided by the owner, all patch cables shall be provided by the contractor to provide connection to these active components. The contractor shall also provide each site a quantity of spare patch cables equal to 10% of the total used at that site. Patch cables shall be appropriately sized to allow for a neat and maintainable system.

RJ21 to RJ45 patch panels

Fast Ethernet 10/100Base-T, Category 5 patch panels with 24 or 48 RJ45 ports on the front, and telco style, 50 pin, RJ21 connectors on the back (Superior Modular Products part numbers DCC2484/25V-100 & DCC4884/25V-100 or approved equivalent), shall be provided by the contractor and mounted into the equipment cabinets. The panels shall be of a high-density profile with a method provided for port identification on the face of the panel. The RJ21 interface cables to connect these panels to the active equipment shall be provided by the government. It shall be the contractors' responsibility to get quantities needed from the government. It shall also be the contractors' responsibility to ensure that all equipment and patch panels fit into the equipment cabinets selected, based upon the information, as to requirements, provided by the government.

3.3 TESTING

3.3.1 Fiber Optic Testing and Documentation:

The contractor shall provide calculated loss budgets for their proposed cable plant designs. The calculated loss budget will be an important factor in the evaluation of the design. The government approved calculated loss budget shall be met during the performance test. The system will not be accepted until these parameters are met at both frequencies.

- a. Testing and documentation shall be done on all fibers and connectors. The contractor shall provide the calibration date of the unit used to perform the measurements to the government prior to beginning the test. That date must be within three months of test beginning at the owner's campus (or less if recommended by the manufacturer). The contractor shall document OTDR (Optical Time Domain Reflectometer) settings for each test. Fiber loss and quality, and connector loss shall be checked from connector to connector. All errors are to be corrected at the contractor's expense prior to providing the completed records to the government.

List manufacturer's data, including calibration data for bandwidth measurement equipment.

Tests shall be made at both 850 and 1300 nanometers to assure compliance with fiber and connector specifications. OTDR tapes for each fiber shall be provided as part of the permanent documentation of the fiber optic network.

- d. System attenuation measurements shall be taken with a power meter and light source by the contractor at both 850 and 1300 nanometers for proof of performance for loss budget to be submitted to and approved by the government.
- e. Acceptance of the system by the government will be determined by the results of a sequence of system measurements performed by the contractor and submitted to the government in an appropriate written report. Government or an authorized representative shall be present during the entire testing phase. Test results shall be recorded on a form provided by the contractor and signed by the government or approved representative and contractor.
- f. A plan shall be presented to the government by the contractor, with the bid, describing the test procedures that the contractor will follow prior to beginning optical fiber installation through the government acceptance. The acceptance test shall be carried out after the entire system is completed.

3.3.2 Horizontal Wiring Testing

Testing of all data horizontal UTP cables shall be performed in accordance with EIA/TIA TSB-67 to ensure rating of Category 5 performance. Test parameters shall include wire mapping, attenuation, NEXT and noise measurements to verify a limit below 100mV.

- a. All distribution plant facilities associated with the new wiring system shall be tested and verified after installation activities and all major plant rearrangements have been completed. Tested copper pairs shall conform to the design guidelines as specified, as well as manufacturer's standards. Cable plant testing of the data jack will diagnose the presence of all open-loop conductors, noisy lines and distortion, low-loop current, high-loop loss, ringer failures, grounded, shorted or crossed conductors, dB loss, split connections, attenuation range, and/or near-end cross-talk. The contractor will supply complete testing and correction reports/information and explanation to the government, or designated representative, for review prior to acceptance of the system(s). The contractor and the government or designated representative will develop a mutually acceptable format for recording and reporting of testing results prior to the start of testing activities. All errors are to be corrected at the contractor's expense prior to providing the completed records to the government.

Each installed data-link will be measured in accordance with TIA/EIA TSB-67 Category 5. The basic link consists of Category 5 UTP data cable, data receptacle and the patch panel. The measurement cable and test instrument will be plugged into the installed data receptacles.

- c. A wire map test will be performed as per TIA/EIA TSB-67. This test

will be used to verify pair to pin termination at each end and check for installation connectivity errors.

- d. Cable Length (DC loop resistance) - Electrical length will be measured using Time Domain Reflectometry (TDR). Ensure a total cable length of less than ninety meters from the distribution equipment location to the workstation outlet.

3.3.2.1 Horizontal Wiring Testing (Test from both ends)

The following parameters will be measured from both sides of the link:

- a. Attenuation - a measure of signal loss in the link.
- b. Near-end crosstalk loss (NEXT) - a measure of signal coupling from one pair to another within a UTP cabling link and is derived from swept/stepping frequency voltage measurements.

3.3.2.2 Noise Testing

The noise level testing associated with the data circuit will only be required if problems occur with the previous test procedures, or if the manufacturer requests it for warranty purposes. If tested, it shall be measured over seven different frequencies.

- a. Noise will be measured by recording interference from all outside sources (for example, power cables). The noise is generally steady throughout the entire frequency range and permanently exists. Acceptable levels will be the lower of, the manufacturers' specifications, or less than 100mV.
- b. Noise peaks will be measured by adjusting a threshold. All peaks that exceed the threshold will be documented. Acceptable peaks will be determined by the manufacturer's specifications, or by IEEE 802.3 10BaseT Ethernet Standards.

3.3.2.3 Additional Testing

Any additional testing and/or documentation required by the manufacturer to show full compliance with warranty requirements shall be provided to the government by the contractor. Final test results will meet manufacturer's guidelines for the cabling channel.

3.4 REMOVAL

3.4.1 Removal of Existing LAN Cabling

The contractor shall remove all existing, obsolete LAN components including cables, raceways, device boxes, faceplates, data jacks and other associated components internal to the building at a date to be specified by the Contracting Officer. This shall take place after the new LAN has been installed, tested, and is fully operational. The contractor shall perform all work in a neat and workmanlike manner.

Furnish equipment, materials, labor and services, and perform operations required to demolish existing LAN cabling systems. Removals shown on drawings and/or other contract documents are general indications and may not

indicate the full extent of the removals that may be required to complete work.

Remove wiring, punch blocks, cabinets, outlets, raceways, and equipment not required for new system.

Abandon flush mounted device and junction boxes and cover with blank plate.

Remove surface outlets and raceways.

Remove wiring from abandoned conduits and raceways.

Unless otherwise noted, hangers, foundations, and structural supports for said materials shall be removed.

Equipment and materials to be removed that is not desired by the government shall be removed from the site in a timely and proper manner.

PART 4 WARRANTY AND MAINTENANCE

4.1 WARRANTY

Contractor shall warranty all equipment, components and installation comprising the communications system described in this specification, and furnished by contractor under contract for same, for a period of one year following government acceptance of the system. Such acceptance date or dates shall be formally acknowledged by the government, in writing, signed by an authorized individual. Contractor's warranty shall commence on the day following such acceptance and shall conclude one year later. By accepting this obligation, contractor warrants that the system shall be in and remain in good working order and is installed in a workmanlike manner, compliant with the specifications. During the warranty period contractor shall correct all deficiencies in materials, components or workmanship discovered by the owner, and shall correct any failures in performance of the system as described in this specification and contract documents resulting from contractor's response to this specification, and any change orders agreed between government and contractor.

4.1.1 Fulfillment

Contractor shall fulfill such warranty obligations by taking all necessary action to correct, repair or replace the non-performing or improperly installed equipment and components, at no cost to the owner and in accordance with the response standards set forth in section 1.8 (Maintenance), so as to restore the system to the level of performance and/or quality set forth in this specification. Restoration or repair shall be deemed accepted by the owner based upon inspection by the government, completion of acceptance test as defined herein on the affected portion of the system, or other appropriate approval process acceptable to the government. All charges and/or repairs made by the contractor in fulfillment of the warranty obligation shall be documented to the government in accordance with the standards for documentation contained in this specification.

4.1.2 Additional Warranty

Additional warranty provisions shall apply to all types of cables and jacks installed in the system. These components shall be warranted to perform in

accordance with the specifications contained herein for a period of fifteen (15) years from the date of acceptance. The government will accept warranty from the manufacturer of the cable, or connection components, in place of contractor's warranty for this additional warranty, provided that such manufacturer's warranty covers both replacement of components and all installation of such replacement within the system, at no cost to owner.

4.1.3 Obligations

If contractor shall fail to provide its best efforts to perform warranty obligations in a timely manner, owner may, at its sole discretion, secure the necessary services from other suppliers selected by the owner, and contractor shall reimburse the owner for the cost of such services.

4.2 Maintenance

Contractor shall offer a maintenance contract for repair, replacement or modification of the system upon the expiration of the warranty period. Owner may elect to enter into such contract, or make other arrangements at the owner's sole discretion, and will inform the contractor of its intentions in this regard no later than thirty days before the expiration of the warranty period. If not so notified, contractor may be excused from providing such maintenance contract at its option.

- a. Contractor shall offer a maintenance contract covering service between the hours of six AM and eight PM, Monday through Friday, with options to extend this coverage to twenty-four hours per day and to include Saturdays. Owner will classify request for maintenance services as major or minor, based on the likely impact on the owner's ability to be able to continue substantial use of the system. Contractor shall respond to minor requests by dispatching maintenance personnel, with the appropriate tools and components such that they arrive at the owner's premises within two days of receiving notification from the owner. Response for major requests shall be similar, but shall be within twenty-four hours. These response standards shall apply during the warranty period, except that during the contractor's warranty period (one year), the contractor shall be obliged to respond as if a twenty-four hour per day, seven day per week maintenance contract was in effect.
- b. Contractor agrees that all maintenance requests shall be handled expeditiously in accordance with best commercial practice. Contractor shall provide the owner with an escalation plan for the resolution of all maintenance problems that cannot be completed within eight hours of the response for major items and twenty-four hours for minor items. All warranty services shall automatically be classified as major items. Contractor shall be responsible for notifying the owner of the need for application of the escalation plan.
- c. Contractor shall provide the owner with a sample maintenance contract, including escalation plan, with its response to this bid.

-- End of Section --