

SECTION 16703

COMMUNICATIONS STANDARD SPECIFICATIONS - ENGINEERING SERVICES

PART 1 - GENERAL

1.01 DESCRIPTION OF ENGINEERING SERVICES

- A. The Contractor is required, under WMATA Communications Systems Specifications, to design, furnish, install, test, and document communications systems that conform to WMATA operational, performance and other requirements outlined therein. Standard Specifications apply where more specific requirements are not included in other (specific systems) specifications.

1.02 SECTION INCLUDES

- A. Standard Specifications for Contractor-furnished engineering services. These Specifications apply to all engineering services and to all equipment furnished unless otherwise specified elsewhere in this Contract (i.e. conflicting Specification requirements found in other Specification sections or on Contract Drawings take precedence over Standard Specifications in this section).

1.03 UNIT PRICES

- A. Unit Prices include all Required Contractor furnished engineering services for the communications systems and facilities and incidental items, not specifically mentioned, but required for complete and proper system operation.

1.04 RELATED SECTIONS

- A. Section 16706 - Communications System Submittals & Services
- B. Section 16710 - Communications Grounding.
- C. Section 16721 - Communications Telephone System.
- D. Section 16723 - Communications Garage Emergency Telephone System.
- E. Section 16727 - Communications Passenger Emergency Reporting System.
- F. Section 16731 - Communications Fire and Intrusion Alarm System.
- G. Section 16733 - Communications Kiosk System.
- H. Section 16771 - Communications Carrier Transmission System.
- I. Section 16776 - Communications Fiber Optics System.
- J. Section 16791 - Communications Mobile Radio System.
- K. Section 16820 - Communications Public Address System.
- L. Section 16821 - Communications Automatic Public Address Announcement System.

- M. Section 16851 - Communications Passenger Station Closed Circuit Television System.
- N. Section 16852 -Communications Parking Garage Closed Circuit Television System

1.05 REFERENCES

- A. Federal Communications Commission (FCC) (Specifically Parts 15, 90 and other applicable regulations).
- B. National Electrical Code. (NEC).
- C. Underwriters Laboratories.(UL).
- D. American National Standards Institute.(ANSI).
- E. Rural Electrification Administration.(REA).
- F. Insulated Cable Engineers Association.(ICEA)
- G. Electronic Industries Alliance (EIA).
- H. National Electrical Manufacturers Association.(NEMA).
- I. Institute of Electrical and Electronic Engineers , Inc. (IEEE).
- J. Association of American Railroads.(AAR).
- K. WMATA General Provisions and Standards Specifications for Construction Projects.

1.06 SUBMITTALS

- A. Submit under provisions of Section 16706.

1.07 ENVIRONMENTAL

- A. The communications system/facility shall be such that, when operating within the specified environmental limits, the maximum temperature attained by any component shall be lower than that which will adversely affect the life or performance of equipment.
- B. Unless otherwise specified, equipment shall be fully operable without damage or functional degradation under any combination of the following:
 - 1. Ambient Temperature -18EC to 55EC.
 - 2. Relative Humidity 0 percent to 95 percent.(This requirement does not apply to equipment installed at the Jackson Graham Building).
- C. Permanently mounted equipment, exclusive of the equipment installed and operated in the Jackson Graham Building, shall be so constructed or installed that it will remain fully operative while being vibrated with simple harmonic motion having an amplitude of 0.005 inch (total excursion of 0.01 inch), with the frequency varied uniformly from 10 cycles to 55 cycles per second for a period of 30 minutes in each of three mutually perpendicular planes.
- D. All moving contacts (including relay contacts, jack contacts, switch contacts) shall be protected from dust.

- E. Equipment panels shall be furnished with dust covers. Proper internal air flow shall be provided when dust covers are in position during operation of the equipment.
- F. Unused mounting spaces in equipment racks, equipment cabinets, Kiosk cabinetry and consoles shall be provided with blank panels which are consistent with the arrangement of the assembly.
- G. The circuitry of Kiosk equipment panels, yard console equipment panels, and other custom-developed equipment shall be completely enclosed to protect against moisture and dust.
- H. Each system, facility, and subsystem element will generally be operated in the unfavorable electrical environment of a Rail Rapid Transit System characterized by heavy direct-current and chopper-controlled pulsating direct-current propulsion equipment, which will cause electrostatic, electromagnetic, and radiated interference. Suitable effective engineering techniques and installation practices shall be incorporated to eliminate the effects of such interference on the performance of the systems, equipment, and devices furnished or installed by the Contractor, and those provided by others for use within or outside of the Metrorail System.
- A. Some sources of interference are: 60 Hz ac system, dc traction power system, propulsion power contact shoe and third rail arcing, rotating machinery, lightning discharges and high energy level, chopper-controlled propulsion systems. The arcing between the transit car contact shoe and the third rail which is supplying up to 780 volts dc is a major source of electrical noise. The noise spectrum includes harmonics which vary in amplitude with the change in loading of the section. Relatively high amplitude noise impulses occur throughout the spectrum.

1.08 INTERCHANGEABILITY

- A. Standard commercial products shall be furnished whenever such equipment and materials will satisfy the stated Specifications. Suitable modified standard commercial devices shall be furnished when required to satisfy Specification requirements. Custom developed and fabricated equipment units and devices shall be confined to those items for which suitable off-the-shelf commercial products are not available to guarantee compliance with the Specifications. When custom design, fabrication, or assembly is required, every effort shall be made to minimize the number of different modules, solid-state devices, etc. used.
- B. With each system, subsystem and facility, two or more like functions shall be performed by identical units. In no case shall the equipment or hardware used in one portion of a system, subsystem or facility be different from that used in another portion to perform the same function under similar operating and environmental conditions.
- C. Insofar as possible equipment shall be physically and plug compatible with recent versions of existing Authority equipment performing similar functions and used for comparable applications elsewhere in similar WMATA facilities. The use of adapter plugs, interface boxes, and replacement mounting brackets or enclosures that fit available space and mounting holes may be allowed by the Engineer to maintain interchangeability, when competitive products that do not require such devices are determined to be unavailable (applicable to off-the-shelf major equipment items only). Custom designed and custom fabricated equipment must be fully interchangeable without requiring the use of such devices. If a determination is made to allow use of such devices, the Contractor shall provide all necessary adapters and interface devices with each item of equipment furnished, at no additional cost to the Authority.

- D. Major items of equipment furnished by the Contractor shall be within the physical size and configuration limitations specified in provisions of this Contract. If such specifications are not included in the provisions of this Contract, major items of equipment shall be of a physical size and configuration closely comparable to equipment currently in use for comparable applications elsewhere in similar WMATA facilities.
- E. Exception: Lighter weight and smaller sized, more modern versions of equipment are sought by the Authority where their use presents significant advantages. The use of new generations of equipment that differ in size and are not fully interchangeable will be considered for approval by the Engineer, in order to take advantage of significant technological improvements developed by industry.

1.09 MAINTAINABILITY AND RELIABILITY

- A. The physical and mechanical configurations of equipment and rack assemblies shall give a high priority to the ease with which units may be inspected and removed.
- B. Except as otherwise specified, rack mounted equipment shall be mounted on standard equipment racks or in standard equipment cabinets. Each rack and cabinet configuration shall present a neat and orderly appearance and shall be uniform for like systems/facilities at all Communications Equipment Rooms.
- C. Equipment units or subassemblies shall be easily removable from rack, cabinet, or equipment cases without the need to disturb unit rack/cabinet/case wiring.
- D. Equipment units shall utilize plug-in printed circuit cards or plug-in assemblies whenever the quantity, equipment, size and weight of the components lend themselves to this technique
- E. Printed circuit cards in rack mounting equipment units shall plug into either card files or card drawers, whenever feasible and practical.
- F. Printed circuit cards shall be keyed to prevent incorrect interchange of cards. However, cards performing a given function in a subsystem or subsystem element shall be interchangeable with cards of another subsystem element performing the same function whenever practical.
- G. The replacement of a printed circuit card plug-in subassembly, or component by a new unit shall not require compensating adjustments of devices other than the circuit card or component replaced.
- H. Equipment and installation engineering services and designs shall incorporate accepted industry standards and good engineering practices selected to enhance maintainability and reliability.
- I. Test points shall be provided for printed circuit cards to permit detection of a failure without removal of wiring. Go/No-Go techniques shall be used to localize failures where possible. Card extenders may be used for this purpose.
- J. Test points shall be readily accessible and clearly designated, and shall be capable of accepting probes and connectors furnished with standard test equipment. All testing shall be performed at the front of racks whenever practical.
- K. Appropriate equipment, electrical test points, fuses, and adjustment controls shall be available at the front panel.

- L. Equipment units shall be of ample capacity and of proper arrangement to perform the functions specified, under the conditions specified, and shall operate in accordance with the specified reliability criteria.

1.10 CUSTOM DEVELOPED AND CONTRACTOR MODIFIED OFF-THE-SHELF EQUIPMENT

- A. The construction, panel and chassis layouts, circuit arrangements, components, graphics, and component layouts of custom-developed equipment shall be approved by the Engineer. Drawings detailing all aspects of the developed equipment shall be submitted for preliminary review and comment. The submitted drawings shall include details of the required external connections. After incorporating the comments and obtaining acceptance by the Engineer, the Contractor shall fabricate prototypes of the custom-developed equipment (one for each custom-developed item) in accordance with the approved configurations. The prototypes shall be submitted for evaluation, inspection, testing, and acceptance or rejection by the Authority. Production models shall not be manufactured until the acceptance of the corresponding prototype by the Engineer (including incorporating any additional comments). Only production models shall be furnished to fulfill the requirements of these Specifications.
- B. Contractor modified "off-the-shelf" commercial product major items shall be subject to the same review, and all prototype requirements specified above for custom developed equipment, except as otherwise directed by the Engineer. Relief from these requirements will be considered in instances where only minor modifications are proposed.
- C. At the discretion of the Engineer, equipment developed and manufactured specifically to fulfill a WMATA requirement, although considered by the manufacturer as "off-the-shelf," shall be considered as developed equipment and shall comply with the requirements specified herein.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION