

FIBER OPTICS

GENERAL REQUIREMENTS

THE FOLLOWING PROVIDES THE MINIMUM STANDARDS AND QUALIFICATIONS NECESSARY TO PROVIDE A DAISY CHAINED FIBER OPTIC COMMUNICATION LINK BETWEEN INTERSECTIONS IN AN INTERCONNECTED TRAFFIC SIGNAL SYSTEM.

MATERIALS AND EQUIPMENT SHALL BE THE STANDARD PRODUCTS OF A MANUFACTURER REGULARLY ENGAGED IN THE MANUFACTURING OF PRODUCTS USED FOR OUTDOOR FIBER OPTIC SYSTEM INSTALLATIONS. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW, OF FIRST QUALITY, OF LATEST DESIGN AND BE COMPLETELY FREE FROM DEFECTS IN MATERIAL AND POOR WORKMANSHIP. ALL LIKE PIECES OF EQUIPMENT SHALL BE OF THE SAME TYPE AND MANUFACTURER TO ASSURE UNIFORMITY, INTERCHANGEABILITY OF COMPONENTS, SINGLE RESPONSIBILITY, AND MOST SATISFACTORY SERVICE.

EACH MAJOR COMPONENT OF EQUIPMENT SHALL HAVE THE MANUFACTURER'S NAME, ADDRESS, TYPE OR STYLE, MODEL OR SERIAL NUMBER AND CATALOG NUMBER ON A PLATE SECURED TO THE EQUIPMENT.

THE FIBER OPTIC INSTALLATION SHALL BE IN ACCORDANCE WITH OR EXCEED ALL MINIMAL REQUIREMENTS OF STATE CODES, NATIONAL CODES AND MANUFACTURER CODES AS APPLICABLE. CONSTRUCTION TECHNICIANS SHALL CONFORM TO THE FOLLOWING IN ORDER OF PRECEDENCE: (1) THE STANDARDS AND SPECIFICATIONS; (2) CABLE MANUFACTURER; (3) ACCEPTED INDUSTRY PRACTICES.

THE CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY MISCELLANEOUS EQUIPMENT TO MAKE A COMPLETE AND OPERATING SYSTEM. THE COST FOR ALL MATERIALS AND LABOR NOT SPECIFICALLY ITEMIZED SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS ITEMS OF WORK.

APPLICABLE STANDARDS MATERIALS AND EQUIPMENT SUPPLIED AS PART OF THE FIBER OPTIC SYSTEM SHALL COMPLY WITH THE LATEST ISSUE OF THE FOLLOWING DOCUMENTS:

- IMSA GENERAL SINGLE AND MULTI-MODE FIBER OPTIC CABLES SPEC 70-0 THRU 70-5
- EIA-STD-RS-455 STANDARD TEST PROCEDURES FOR FIBER OPTIC FIBERS, CABLES, TRANSDUCERS, CONNECTING AND TERMINATING DEVICES
- MIL-STD-202 TEST METHODS FOR ELECTRONIC AND ELECTRICAL COMPONENT PARTS
- MIL-STD-454 STANDARD GENERAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT
- MIL-STD-810 ENVIRONMENTAL TEST METHODS AND ENGINEERING GUIDELINES
- UL-SUBJECT-1666 STANDARD FLAME TEST FOR FLAME PROPAGATION HEIGHT OF ELECTRICAL AND OPTICAL CABLE INSTALLED VERTICALLY IN SHAFTS
- NFPA-70-1993 NATIONAL ELECTRICAL CODE ARTICLE 770, OPTICAL FIBER CABLE

CONTRACTOR QUALIFICATIONS

IN ADDITION TO THE PRE-QUALIFICATION REQUIREMENTS SET FORTH IN THE STATE OF OHIO CONSTRUCTION MATERIAL SPECIFICATIONS (CMS), SECTION 102.01, THE FOLLOWING QUALIFICATION REQUIREMENTS SHALL APPLY TO THE FIBER OPTIC AND SIGNAL SYSTEM CONTRACT WORK. ALL BIDDERS SHALL SUBMIT DOCUMENTATION WITH THEIR BIDS SHOWING THEIR ABILITY TO COMPLY WITH THE FOLLOWING PERSONNEL REQUIREMENTS INCLUDING IMSA CERTIFICATIONS. FAILURE TO SUBMIT PROPER DOCUMENTATION WITH BIDS WILL RESULT IN THE BIDDER BEING CONSIDERED NON-RESPONSIVE AND MAY BE GROUNDS FOR THE BIDDER BEING DISQUALIFIED AT THE DISCRETION OF THE DEPARTMENT.

FIBER OPTIC CONTRACTOR QUALIFICATIONS (ITEM 632)

THE CONTRACTOR PERFORMING ANY TASK REQUIRING THE OPENING OF THE FIBER OPTIC CABLE JACKET, INSTALLATION OF FIBER OPTIC CONNECTORS, SPLICING FIBERS, OR THE TESTING OF ANY FIBER OPTIC CABLE, DROP CABLE, OR PATCH CORDS SHALL UTILIZE AT LEAST ONE SUPERVISING FIBER OPTIC TECHNICIAN. SUPERVISING FIBER OPTIC TECHNICIANS SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS.

- (A) SUPERVISING FIBER OPTIC TECHNICIAN SHALL HAVE ATTENDED AND SUCCESSFULLY COMPLETED AT LEAST ONE COMPREHENSIVE "INSTALLATION OF FIBER OPTIC PRODUCTS SCHOOL". THIS SCHOOL WILL BE CONDUCTED BY A MAJOR MANUFACTURER OF FIBER OPTIC PRODUCTS OR AN APPROVED INDEPENDENT SCHOOL THAT ENCOMPASSES ALL ASPECTS OF FIBER OPTIC TECHNICIAN CERTIFICATION. SUPERVISING FIBER OPTIC TECHNICIANS SHALL CARRY EVIDENCE OF THEIR QUALIFICATIONS ON THEIR PERSON AT ALL TIMES WHILE WORKING ON A PROJECT.
- (B) SUPERVISING FIBER OPTIC TECHNICIANS SHALL DEMONSTRATE A MINIMUM OF ONE CONTINUOUS YEAR OF WORK EXPERIENCE WHERE THE SPLICING, TERMINATION, AND TESTING OF FIBER OPTIC CABLE WITH AN OPTICAL TIME DOMAIN REFLECTOMETER (OTDR) WAS A PRIMARY JOB RESPONSIBILITY. SUPERVISING FIBER OPTIC TECHNICIANS SHALL CARRY EVIDENCE OF THEIR QUALIFICATIONS ON THEIR PERSON AT ALL TIMES WHILE WORKING ON A PROJECT.

SIGNAL SYSTEM QUALIFICATIONS (ITEMS 632 AND 633)

IN ADDITION TO ODOT CMS ITEM 102.01, 632.011 AND SUPPLEMENTAL SPECIFICATION 1063, THE BIDDER SHALL HAVE ALL THE RESOURCES OF PERSONNEL, EQUIPMENT AND MATERIAL TO PROVIDE THE SERVICES OUTLINED BELOW. THE CONTRACTOR SHALL HAVE SUFFICIENT RESOURCES AVAILABLE AT HIS/HER LOCAL PLACE OF BUSINESS TO PROVIDE THE REQUIREMENTS OF THIS SPECIFICATION.

- 1. PERSONNEL. PERSONNEL USED AS PART OF A PROJECT UTILIZING A FIBER OPTIC COMMUNICATION SYSTEM SHALL MEET OR EXCEED THE REQUIREMENTS OF SUPPLEMENTAL SPECIFICATION 1063. IN ADDITION TO THE ABOVE MINIMUM REQUIREMENTS NOTE CAREFULLY THAT ALL SIGNAL SYSTEM PROGRAMMING AND COMMUNICATION WORK SHALL BE PERFORMED BY INTERNATIONAL MUNICIPAL SIGNAL ASSOCIATION (IMSA) LEVEL III CERTIFIED TECHNICIANS. THE SETUP AND INSTALLATION OF A CENTRAL OFFICE MONITOR AND THE INSTALLATION OF ALL PERIPHERAL EQUIPMENT IN THE CONTROLLER CABINET REQUIRING COMMUNICATION WITH THE CENTRAL OFFICE MONITOR SHALL BE PERFORMED BY LEVEL III TECHNICIANS. ALL WORK ASSOCIATED WITH THE CONTROLLER CABINET INSTALLATION AND TRAFFIC SIGNAL CONSTRUCTION SHALL BE PERFORMED BY WORKERS MEETING OR EXCEEDING THE REQUIREMENTS OF SUPPLEMENTAL SPECIFICATION 1063.

DOCUMENTATION OF PROJECT PERSONNEL QUALIFICATIONS SHALL BE SUBMITTED WITH THE BID PROPOSAL. PROPOSALS WITHOUT QUALIFICATION CERTIFICATION WILL BE CONSIDERED INCOMPLETE AND THEREFORE NON-RESPONSIVE.

- 2. TEST EQUIPMENT. THE BIDDER SHALL BE ABLE TO TEST ALL ELEMENTS OF THE TRAFFIC CONTROLLERS AND THE COMMUNICATION SYSTEM INCLUDING ALL PERIPHERAL EQUIPMENT, FIELD WIRING AND INTERCONNECT LINES. THE BIDDER SHALL OWN AND HAVE AVAILABLE IN GOOD OPERATING CONDITION SPECIALIZED CONTROLLER TEST EQUIPMENT, VOMS, TRANSISTOR TESTERS, LOW IMPEDANCE METERS, GROUND FAULT METERS, OSCILLOSCOPES, TRAFFIC SIGNAL CONTROLLER TESTERS, POWER LINE ANALYZERS, COMMUNICATION LINE TEST EQUIPMENT AND RECORDING CONFLICT MONITOR TESTERS TO PERFORM REPAIR AND THE INSTALLATION TESTING SERVICES REQUIRED BY THIS SPECIFICATION.
- 3. EQUIPMENT. THE BIDDER SHALL HAVE AVAILABLE ALL OF THE CONSTRUCTION EQUIPMENT INCLUDING FIBER OPTIC CLEAVE TOOLS, A FUSION SPLICER UNIT, MISCELLANEOUS FIBER OPTIC TERMINATION AND SPLICING EQUIPMENT, OPTICAL POWER METER AND BUCKET/LINE TRUCKS TO PERFORM THE REQUIRED CONSTRUCTION. THE EQUIPMENT, ALONG WITH SKILLED OPERATORS, SHALL BE AVAILABLE ON 2 HOURS NOTICE FOR EMERGENCY MAINTENANCE AND CAPABLE OF COMPLETING THE WORK REQUIRED THROUGHOUT THE DURATION OF THE PROJECT.
- 4. AT THE DISCRETION OF THE ENGINEER, THE BIDDER SHALL DEMONSTRATE THE ABILITY AND PRODUCE EQUIPMENT NEEDED TO PROVIDE THE SERVICES REQUIRED BY THIS SPECIFICATION.

ITEM 632 INTERCONNECT CABLE, MISC.: 12 FIBER, TIGHT BUFFERED, HYBRID

- 1. THE FIBER OPTIC CABLE SUPPLIED SHALL BE SINGLE MODE, MULTI-MODE, OR A HYBRID CABLE CONTAINING BOTH AS SPECIFIED. MULTI-MODE CABLE SHALL HAVE A 62.5 MICROMETER NOMINAL CORE DIAMETER. SINGLE-MODE CABLE SHALL HAVE A 8.3 MICROMETER NOMINAL CORE DIAMETER. HYBRID CABLES, WHEN SPECIFIED, SHALL BE COMPRISED OF 8 MULTI MODE FIBERS AND 4 SINGLE MODE FIBERS.
- 2. ALL REFERENCES TO IMSA SPECIFICATIONS SHALL BE INTERPRETED TO MEAN THE LATEST PUBLISHED VERSION.
- 3. ALL FIBER OPTIC CABLE SHALL BE EITHER LOOSE TUBE OR TIGHT BUFFERED AS SPECIFIED AND SHALL CONFORM TO IMSA GENERAL SPECIFICATION 70.
- 4. WHERE ARMORED CABLE IS SPECIFIED IT SHALL CONFORM TO IMSA GENERAL SPECIFICATION 70-5.
- 5. WHERE SELF SUPPORTING CABLE IS SPECIFIED IT SHALL CONFORM TO IMSA GENERAL SPECIFICATION 70-3. MESSENGER WIRE SHALL COMPLY WITH IMSA GENERAL SPECIFICATION 70, SECTION 5.1.2.1 AND SHALL BE 25 INCH (6MM).
- 6. DOCUMENTATION SHALL BE PROVIDED SHOWING CABLE COMPLIANCE WITH IMSA SPECIFICATIONS.
- 7. ALL COSTS TO INSTALL FIBER OPTIC CABLE, EITHER AERIALY OR UNDERGROUND, SHALL INCLUDE ALL COSTS FOR EQUIPMENT, LABOR, AND MISCELLANEOUS MATERIALS IN THE BID ITEM PRICE PER METER OF THE SPECIFIED FIBER OPTIC CABLE UNLESS SEPARATELY ITEMIZED.

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TRAFFIC SIGNAL
GENERAL NOTES

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