

ITEM 632 INTERCONNECT MISC.: SLACK INSTALLATION

WHERE DESIGNATED IN THE PLANS, THE CONTRACTOR SHALL PROVIDE AN AERIAL MOUNTED SLACK CABLE INSTALLATION CONFORMING TO THE PLAN DETAILS. WHERE AN UNDERGROUND INSTALLATION IS REQUIRED, THE CONTRACTOR SHALL PROVIDE 50 FEET (15 M) OF SLACK CABLE INSIDE OF THE DESIGNATED PULL BOX. ALL COSTS INCLUDING MATERIALS, EQUIPMENT AND LABOR TO PROVIDE A SLACK INSTALLATION SHALL BE AT THE BID PRICE OF ITEM 632 INTERCONNECT MISC.: SLACK INSTALLATION.

ITEM 632 INTERCONNECT, MISC.: FIBER OPTIC CABLE TESTING GENERAL

- 1. OTDR'S USED AS PART OF THESE TESTING SPECIFICATIONS SHALL BE CALIBRATED TO SHEATH (JACKET) LENGTH, NOT OPTICAL LENGTH BY ADJUSTING THE UNIT'S INDEX OF REFRACTION.
2. ALL OTDR TRACES SHALL MAXIMIZE BOTH THE VERTICAL AND HORIZONTAL SCALES TO THE GREATEST EXTENT POSSIBLE AND STILL FIT THE ENTIRE TRACE ON THE SCREEN.
3. TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS. FAILURE OF A LINK AT ANY PART OF THE TESTING SHALL RESULT IN THE CONTRACTOR HAVING TO REPAIR THE PROBLEM AND RETEST THE INSTALLATION. COST FOR ANY REQUIRED REPAIRS AND RETESTING SHALL BE BOURNE SOLELY BY THE CONTRACTOR.

PRE-INSTALLATION CABLE ACCEPTANCE (TESTED WITH OTDR IN ONE DIRECTION)

THE CONTRACTOR SHALL UTILIZE BARE FIBER ADAPTORS OR OTHER APPROVED MEANS TO TEST ALL FIBERS FOR ATTENUATION LOSS USING AND OTDR SET TO 2-POINT LOSS MEASUREMENT PARAMETERS PRIOR TO INSTALLATION (ON THE REEL). MARKER POINTS SHALL BE PLACED AT THE BEGINNING AND END OF EACH BACKSCATTER SIGNATURE RECORDED BY THE OTDR. THE MANUFACTURER INSTRUCTIONAL GUIDE CAN DETERMINE PROPER PLACEMENT OF THESE MARKERS. THE OTDR DISPLAY SHALL BE RECORDED ON COMPUTER DISKETTES WITH IDENTIFICATION AND NUMBERING SEQUENCES TO BE PRE-APPROVED BY THE ENGINEER. EACH TRACE MUST CONTAIN AS A MINIMUM: CABLE/SHEATH LENGTH (NOT OPTICAL FIBER LENGTH), 2-POINT DB LOSS, ATTENUATION IN DB/FEET (DB/KM), FIBER TYPE, WAVELENGTH USED, PULSE WIDTH SELECTION, AND FIBER/CABLE IDENTIFICATION. THE STORED TRACE SHALL ALLOW FULL MANIPULATION OF THE TRACE WHEN VIEWED WITH THE PC EMULATION SOFTWARE. WORST CASE WAVELENGTH TESTING WILL BE APPLIED TO ALL FIBERS. PROPER PULSE WIDTH SELECTION IS REQUIRED TO MINIMIZE ATTENUATION DEAD ZONE EFFECT (10NS PULSE : MM DEAD ZONE=23 FEET (7 M), SM DEAD ZONE = 33 FEET (10 M)) FIBER LENGTHS IN EXCESS OF 3280 FEET (1000 M) WORST CASE WAVELENGTH IS: MM=850NM/SM=1550NM FIBER LENGTHS LESS THAN 3280 FEET (1000 M) WORST CASE WAVELENGTH IS: MM=850NM/SM=1310NM

THERE SHALL BE NO ATTENUATED ANOMALIES IN THE BACKSCATTER TRACE AS VIEWED BY THE OTDR. ANY ATTENUATED ANOMALY SHALL BE CONSIDERED A FIBER DEFECT AND WILL BE GROUNDS FOR REJECTING THE CABLES USE ON THE PROJECT.

PRE-INSTALLATION MAXIMUM ACCEPTABLE ATTENUATION LOSS: MM @ 850NM = 5.6 DB/MILE (3.5 DB/KM)
SM @ 1310NM = 0.64 DB/MILE (0.4 DB/KM)
SM @ 1550NM = 0.48 DB/MILE (0.3 DB/KM)

LINK TESTING WITH OLTS (POWER METER) AND OTDR (AFTER SPLICING AND TERMINATING) OLTS (POWER METER)

ALL LINKS SHALL BE TESTED WITH THE OLTS AFTER SPLICING AND TERMINATION WORK IS COMPLETED. LINK TESTING WILL BE BI-DIRECTIONAL FOR ATTENUATION LOSS WITH WORST CASE WAVELENGTHS. TEST PROCEDURE SHALL COMPLY WITH EIA-568-A REQUIREMENTS. WORST CASE WAVELENGTHS ARE DEFINED AS: MM = 850 NM SM = 1310 NM (LINK LENGTH LESS THAN 3280 FT (1 KM)) SM = 1550 NM (LINK LENGTH GREATER THAN 3280 FT(1KM)) MAXIMUM ACCEPTABLE LINK ATTENUATION SHALL BE CALCULATED AS FOLLOWS:

MAXIMUM ACCEPTABLE LINK ATTENUATION = SPLICE LOSS + CONNECTOR LOSS + CABLE ATTENUATION

MAXIMUM ACCEPTABLE LINK ATTENUATION = 0.2 DB + 0.2 DB + (LINK LENGTH X ATTENUATION*)

* ATTENUATION FOR SM AND MM ARE:

ATTENUATION: MM @ 850NM = 5.6 DB/MILE (3.5 DB/KM)
SM @ 1310NM = 0.64 DB/MILE (0.4 DB/KM)
SM @ 1550NM = 0.48 DB/MILE (0.3 DB/KM)

OPTICAL FIBER TEST RESULTS SUBMITTED SHALL SHOW THE LOSS MEASURED ON EACH INDIVIDUAL FIBER AS COMPARED TO THE REFERENCE LAUNCH POWER. THE LINK ATTENUATION AS CALCULATED ABOVE IS A NOT TO EXCEED VALUE. LINK MEASUREMENTS, WHICH EXCEED THIS BUDGET WILL NOT BE ACCEPTED AND SHALL BE BROUGHT TO WITHIN ACCEPTED MAXIMUM VALUES AT THE CONTRACTORS EXPENSE. FAILURE TO DO SO, MAY REQUIRE THE CONTRACTOR TO REPLACE CONNECTORS, SPLICES OR THE ENTIRE LINK.

OTDR

ALL LINKS SHALL BE TESTED WITH AN OTDR THAT ARE 1000 FEET (300 M) OR LONGER FOR THE 850NM AND 1310NM WAVELENGTHS. LINKS WHICH ARE IN EXCESS OF 3280 FEET (1 KM) SHALL INCLUDE 1550NM TESTING ON SM FIBERS. OTDR TESTING SHALL BE IN ONE DIRECTION FOLLOWING WORST CASE WAVELENGTH SELECTION WHEN THERE ARE NO SPLICE POINTS OR INTERCONNECT POINTS IN THE LINK.

ANY LINK, WHICH IS LONGER THAN 1000 FEET (300 M) AND HAS SPLICE POINTS OR INTERCONNECT POINTS IN SAID LINK, SHALL BE TESTED BI-DIRECTIONALLY USING WORST CASE WAVELENGTHS. LINKS THAT ARE LONGER THAN 3280 FEET (1 KM) SHALL INCLUDE TESTING AT THE 1550NM WAVELENGTH FOR SM FIBERS.

ALL FIBER SHALL BE TESTED FOR ATTENUATION LOSS USING AN OTDR SET TO 2-POINT LOSS MEASUREMENT PARAMETERS. MARKER POINTS SHALL BE PLACED AT THE BEGINNING AND END OF EACH BACKSCATTER SIGNATURE RECORDED BY THE OTDR. THE MANUFACTURER'S INSTRUCTIONAL GUIDE CAN BE USED TO DETERMINE PROPER PLACEMENT OF THESE MARKERS. THE OTDR DISPLAY SHALL BE RECORDED ON COMPUTER DISKETTES WITH IDENTIFICATION AND NUMBERING, SEQUENCES TO BE PRE-APPROVED BY THE ENGINEER. EACH TRACE MUST CONTAIN AS A MINIMUM: CABLE/SHEATH LENGTH(NOT OPTICAL FIBER LENGTH), 2-POINT DB LOSS, ATTENUATION IN DB/MILE (DB/KM), FIBER TYPE, WAVELENGTH USED, PULSE WIDTH SELECTION, AND FIBER/CABLE IDENTIFICATION. THE STORED FIBER TRACE SHALL ALLOW FULL MANIPULATION OF THE TRACE WHEN VIEWED WITH THE PC EMULATION SOFTWARE. BOTH A HARD COPY PRINT OUT AND DISKETTE COPY OF EACH TRACE SHALL BE SUBMITTED TO THE ENGINEER FOR HIS APPROVAL.

LINKS THAT CONTAIN SPLICE POINTS OR INTERCONNECT POINTS SHALL ALSO CONTAIN AN ADDITIONAL "EVENTS DISPLAY TABLE" TO ACCOMPANY THE OTDR TRACE. THIS DISPLAY SHALL SHOW THE DISTANCE TO THE EVENTS, DISTANCE BETWEEN MULTIPLE EVENTS, EACH EVENTS LOSS IN DB, AND A DESCRIPTION OF THE EVENT (REFLECTIVE EVENT, NON-REFLECTIVE EVENT, GAINS AND CABLE END). ALL ATTENUATION EVENT LOSS READINGS SHALL BE IN THE LSA (LEAST SQUARE AVERAGE) MODE OF THE OTDR. 2-POINT ATTENUATION MEASUREMENTS AT EVENTS ARE NOT ACCEPTABLE. PROPER PULSE WIDTH SELECTION IS REQUIRED TO MINIMIZE ATTENUATION DEAD ZONE EFFECT (10NS PULSE : MM DEAD ZONE=23 FEET (7 M), SM DEAD ZONE = 33 FEET (10 M)).

ALL COSTS TO PERFORM THE ABOVE TESTING SHALL BE INCLUDED IN THE BID PRICE OF ITEM 632 INTERCONNECT MISC.: FIBER OPTIC CABLE TESTING. ANY LINK THAT FAILS THE ABOVE TESTS SHALL BE REPLACED AND RETESTED AT THE CONTRACTOR'S EXPENSE.

ITEM 633 CONTROLLER MISC. UNINTERRUPTABLE POWER SUPPLY (UPS).1000W.

THIS ITEM OF WORK SHALL CONSIST OF FURNISHING A BATTERY BACKUP UPS SYSTEM UPS SYSTEM (BBS) TO PROVIDE UNINTERRUPTABLE, RELIABLE, EMERGENCY BACKUP POWER TO A TRAFFIC SIGNAL INTERSECTION IN THE EVENT OF A POWER FAILURE OR INTERRUPTION. THE TRANSFER FROM UTILITY POWER TO BATTERY POWER SHALL NOT INTERFERE WITH THE NORMAL OPERATIONS OF THE TRAFFIC CONTROLLER, CONFLICT MONITOR OR ANY OTHER PERIPHERAL DEVICES WITHIN THE TRAFFIC CONTROL SYSTEM. THE SYSTEM SHALL BE SELF-CONTAINED INCLUDING ALL UPS HARDWARE, THE REQUIRED NUMBER OF BATTERIES AND IT'S OWN SEPARATE VENTILATED ENCLOSURE.

THE UPS UNIT PROVIDED SHALL BE AIRPAX-DIMENSIONS MODEL AUI-24J11 OR APPROVED EQUAL FOR BATTERY BACK P SYSTEMS. EXTERNAL OPTION ONLY. AND HAVE THE FOLLOWING FEATURES AND CAPABILITIES:

I. OPERATION

- 1. THE BBS SHALL PROVIDE A MINIMUM TWO AND ONE HALF (2.5) HOURS OF FULL RUN-TIME OPERATION FOR AN "LED-ONLY" INTERSECTION WITH 1000 WATTS OF ACTIVE OUTPUT POWER.
2. BBS SHALL BE COMPATIBLE WITH ALL OF THE FOLLOWING TRAFFIC SIGNAL EQUIPMENT: TYPE TS1 AND P44 CABINETS, TYPE TS2/A2 CONTROLLERS AND ELECTRICAL SERVICE PEDESTALS.
3. INCLUDE AN AUTOMATIC TRANSFER SWITCH (ATS) SEPARATE FROM THE UPS TO CONNECT UPS POWER WHEN THE UTILITY LINE IS UNQUALIFIED. THE ATS WILL ALSO ALLOW FOR HOT LINE SWAPPING OF THE UPS.
4. INCLUDE A MEANS TO SWITCH THE INTERSECTION FROM FULL OPERATION TO FLASHING OPERATION AFTER TWO (2) HOURS OF RUN TIME. THIS TO CONSERVE BATTERY OPERATION DURING AN EXTENDED UTILITY POWER OUTAGE.
5. INCLUDE STANDARD FORM C RELAY CONTACTS TO TRIGGER AN ALARM WITHIN THE CONTROLLER ASSEMBLY. INFORMING A TECHNICIAN THE SYSTEM IS OPERATING ON BATTERY BACK UP.
6. OPERATING TEMPERATURE FOR BOTH THE INVERTER MODULE AND THE COMBINED 30A AUTOMATIC TRANSFER RELAY MANUAL BYPASS SWITCH SHALL BE -37°C TO +74°C.
7. THE 30A AUTOMATIC TRANSFER RELAY AND MANUAL BYPASS SWITCH SHALL BE RATED AT 240VAC/30 AMPS, MINIMUM

- 8. BBS SHALL BYPASS THE UTILITY LINE POWER WHENEVER THE UTILITY LINE VOLTAGE IS OUTSIDE OF THE FOLLOWING VOLTAGE RANGE; 100VAC TO 130 (+/-2VAC).
9. WHEN UTILIZING BATTERY POWER, THE BBS OUTPUT VOLTAGE SHALL BE BETWEEN 110 VAC AND 125 VAC, PURE SINE WAVE OUTPUT, 60HZ +/-3HZ.
10. WHEN THE UTILITY LINE POWER HAS BEEN RESTORED BETWEEN 100 VAC AND 130 VAC FOR MORE THAN 30 SECONDS, THE BBS SHALL DROPOUT OF BATTERY BACKUP MODE AND RETURN TO UTILITY LINE MODE.
11. IN THE EVENT OF INVERTER FAILURE, BATTERY FAILURE OR COMPLETE BATTERY DISCHARGE, THE 30A AUTOMATIC TRANSFER RELAY SHALL REVERT TO THE NC STATE, WHERE UTILITY LINE POWER IS RECONNECTED TO THE CABINET.
12. RECHARGE TIME FOR THE BATTERY, FORM "PROTECTIVE LOW-CUTOFF" TO 80% OR MORE OF FULL BATTERY CHARGE CAPACITY, SHALL NOT EXCEED 10 HOURS.
13. ALL NECESSARY WIRING AND HARDWARE FOR MOUNTING (SHELF ANGLES, RACK, ETC) SHALL BE INCLUDED.

II MAINTENANCE, DISPLAYS, CONTROLS AND DIAGNOSTICS

- 1. THE BBS SHALL INCLUDE A DISPLAY AND/OR METER TO INDICATE CURRENT BATTERY CHARGE STATUS AND CONDITIONS.
2. THE BBS SHALL HAVE LIGHTNING SURGE PROTECTION COMPLIANT WITH IEEE/ANSI C.62.41.
3. THE BBS SHALL INCLUDE A RESETTABLE FRONT PANEL EVENT COUNTER DISPLAY TO COUNT THE NUMBER OF TIMES THE BBS WAS ACTIVATED AND A FRONT PANEL HOUR METER TO DISPLAY THE TOTAL NUMBER OF HOURS THE UNIT HAS OPERATED ON BATTERY POWER. BOTH METERS SHOULD BE RESETTABLE.
4. MANUFACTURER SHALL INCLUDE TWO (2) SETS OF EQUIPMENT LISTS, OPERATION AND MAINTENANCE MANUALS, AND BOARD-LEVEL SCHEMATIC AND WIRING DIAGRAMS OF THE BBS, AND THE BATTERY DATA SHEETS. MANUAL SHALL CONFORM TO TEES 1999, CHAPTER 1 SECTION 1.2.4.2.

III BATTERY SYSTEM

- 1. MINIMUM FOUR (4) BATTERIES SHALL BE SUPPLIED WITH UPS SYSTEM. EACH BATTERY SHALL BE 12VDC AND RATED AT 105 AHRS. BATTERIES SHOULD BE EASILY REPLACED AND COMMERCIALY AVAILABLE OFF THE SHELF.
2. BATTERIES SHALL BE DEEP CYCLE, SEALED PRISMATIC LEAD-CALCIUM BASED AGM/VRLA (ABSORBED GLASS MAT/VALVE REGULATED LEAD ACID).
3. BATTERIES SHALL BE CERTIFIED BY THE MANUFACTURER TO OPERATE OVER A TEMPERATURE RANGE OF -25°C TO +74°C.
4. ALL BATTERIES SHALL BE PLACED ON BATTERY HEATER MATS IN THE ENCLOSURE. THE BATTERY HEATER MATS ARE DESIGNED TO EXTEND THE LIFE OF THE BATTERIES.
5. AN INTEGRAL SYSTEM SHALL PREVENT THE BATTERY FROM DESTRUCTIVE DISCHARGE AND OVERCHARGE. BATTERY SHALL NOT BE RECHARGED WHEN TEMPERATURE EXCEEDS 50°C.
6. SLIDE OUT BATTERY TRAYS SHALL BE PROVIDED FOR EASY REMOVAL AND REPLACEMENT OF BATTERIES.

Vertical sidebar containing: DATE 08-2007, CHECKED NKS, REDWAIN RAC, SCALE, AMEND FIBER SPECIFICATIONS, REVISIONS, FIBER OPTIC SPECIFICATION NOTES, CITY OF AKRON TYPICALS, CITY OF AKRON DEPARTMENT OF PUBLIC SAFETY/SERVICE TRAFFIC ENGINEERING DIVISION, 5/11, FIBER-3

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