

ITEM 625 PULLBOX MISC.: PULLBOX, 24" (600MM) X 36" (900MM) X 24" (600MM) DEEP

PULLBOXES SHALL HAVE NOMINAL OPENING DIMENSIONS OF 24 INCHES (600MM) X 36 INCHES (900MM) AS MANUFACTURED BY: OLD CASTLE SYNTECH WITH A 20,000 LB LID MODEL # S2436B24FA, BOX # S2436HCB0A WITH INSERTS FOR BOLTS MODEL #1001, OR QUAZITE, LID, MODEL PG2436HA00, BOX PG2436BA24. THE WORD "TRAFFIC SIGNAL" SHALL BE INTEGRALLY CAST AS PART OF THE COVER OR SECURELY FASTENED WITH CORROSION RESISTANT HARDWARE. THE SUPPLIED PULLBOXES SHALL BE ABLE TO SUPPORT A 20,000 LB. MINIMUM VERTICAL LOADING WITHOUT PERMANENT DAMAGE OR DEFLECTION TO THE UNIT. THIS ITEM SHALL INCLUDE BUT IS NOT LIMITED TO THE DISPOSAL OF SURPLUS MATERIAL AND THE RESTORATION OF DISTURBED FACILITIES AND SURFACES.

THE LARGEST BEND RADIUS POSSIBLE SHALL BE MAINTAINED FOR THE FIBER OPTIC CABLE AS SPECIFIED BY THIS SPECIFICATION. ALL COSTS RESULTING FROM THE ABOVE REQUIREMENT SHALL BE INCLUDED IN THE PRICE BID OF ITEM 625 PULLBOX, 24" (600MM) X 36" (900MM) X 24" (600MM)

ITEM 625 PULLBOX MISC.: PULLBOX, 713.081, 30" (750MM) X 48" (1200MM) X 24" (600MM) DEEP

PULLBOXES SHALL HAVE NOMINAL OPENING DIMENSIONS OF 30 INCHES (750MM) X 48 INCHES (1200MM) AS MANUFACTURED BY: OLD CASTLE SYNTECH WITH A 20,000 LB LID MODEL # S3048B24FA, BOX # S3048HCB0A WITH INSERTS FOR BOLTS MODEL #1001, OR QUAZITE, LID, MODEL PG3048HA00, BOX PG3048BA24. THE WORD "TRAFFIC SIGNAL" SHALL BE INTEGRALLY CAST AS PART OF THE COVER OR SECURELY FASTENED WITH CORROSION RESISTANT HARDWARE. THE SUPPLIED PULLBOXES SHALL BE ABLE TO SUPPORT A 20,000 LB. MINIMUM VERTICAL LOADING WITHOUT PERMANENT DAMAGE OR DEFLECTION TO THE UNIT. THIS ITEM SHALL INCLUDE BUT IS NOT LIMITED TO THE DISPOSAL OF SURPLUS MATERIAL AND THE RESTORATION OF DISTURBED FACILITIES AND SURFACES.

THE LARGEST BEND RADIUS POSSIBLE SHALL BE MAINTAINED FOR THE FIBER OPTIC CABLE AS SPECIFIED BY THIS SPECIFICATION. ALL COSTS RESULTING FROM THE ABOVE REQUIREMENT SHALL BE INCLUDED IN THE PRICE BID OF ITEM 625 PULLBOX 30" (750MM) X 48" (1200MM) X 24" (600MM)

ITEM 625 TRENCH FOR FIBER OPTIC CABLE

IN ADDITION TO ITEM 625.12, THE CONTRACTOR SHALL PLACE WARNING TAPE DIRECTLY ABOVE ALL NEW CONDUIT CONTAINING FIBER OPTIC CABLE. THE WARNING TAPE SHALL BE PLACED BETWEEN 6" (150MM) AND 12" (300MM) BELOW FINISHED GRADE WITH A TAPE LENGTH EQUAL TO THE LENGTH OF THE CONDUIT OR CABLE. THE TAPE SHALL BE DIELECTRIC POLYOLEFIN FILM TAPE, 0.1MM THICK, 3" (76MM) WIDE, ORANGE IN COLOR. MATERIALS AND INK COLORS SHALL BE USED THAT WILL NOT CHANGE WHEN EXPOSED TO ACIDS AND OTHER DESTRUCTIVE SUBSTANCES COMMONLY FOUND IN SOIL.

PAYMENT SHALL BE MADE AT THE PRICE BID OF ITEM 625, TRENCH FOR FIBER OPTIC CABLE AND SHALL INCLUDE ALL COSTS FOR TRENCHING, THE WARNING TAPE, BACKFILLING AND RESTORATION.

ITEM 632 INTERCONNECT MISC.: FIBER OPTIC PATCH CORD, 4 FIBER

A FOUR FIBER PATCH CORD SHALL BE PROVIDED BETWEEN EACH FIBER OPTIC TRANSCEIVER AND EACH TERMINATION PANEL. THE FIBERS SHALL BE EITHER MULTI-MODE OR SINGLE MODE AS REQUIRED TO MATCH THE TRUNK CABLE AND TRANSCEIVER. PATCH CORDS SHALL BE FITTED WITH SC/PC TYPE CONNECTORS UNLESS THE PROPOSED/EXISTING EQUIPMENT REQUIRES A DIFFERENT CONNECTOR. CONNECTORS SHALL BE ATTACHED TO THE PATCH CORDS USING AN EPOXY CRIMPED METHODOLOGY WHERE THE KEVLAR IS CRIMPED TO THE CONNECTOR. COST FOR SUPPLYING AND INSTALLING CONNECTORS ON ALL ENDS OF THE PATCH CORD SHALL BE INCIDENTAL TO THE BID ITEM PRICE OF THE PATCH CORD. THE CONTRACTOR AT HIS OPTION MAY SUPPLY FOUR SEPARATE ONE FIBER PATCH CORDS, HOWEVER, ONLY ONE 4 FIBER PATCH CORD QUANTITY WILL BE PROVIDED AT EACH CONTROLLER. COST FOR THE PATCH CORD SHALL BE PAID AT THE BID ITEM PRICE OF ITEM 632 INTERCONNECT MISC.: FIBER OPTIC PATCH CORD, 4 FIBER.

ITEM 632 INTERCONNECT MISC.: TERMINATION PANEL, CONTROLLER CABINET

TERMINATION PANELS USED IN NEMA CABINETS SHALL BE A MODEL WCH-02P AS MANUFACTURED BY SIECOR. THE NEMA CABINET TERMINATION PANEL SHALL BE ATTACHED TO THE SIDE OF THE CABINET IN A PLACE THAT PROVIDES MOST ROOM FOR MAKING CONNECTIONS. AFTER ATTACHING THE TERMINATION PANEL ON THE WALL OF THE CABINET OR SUPPORT MEMBER, NO SHARP OBJECTS SUCH AS SCREWS SHALL PROTRUDE OUTSIDE OF THE CABINET THAT MIGHT CAUSE INJURY TO PEDESTRIANS. TERMINATION PANELS USED IN 170/ITS CABINETS SHALL BE MOUNTED WITHIN THE 19" (483 MM) CAGE AND SHALL BE MODEL CCH02U AS MANUFACTURED BY SIECOR. ALL COSTS INCLUDING MATERIALS, TOOLS AND LABOR TO PROVIDE AND INSTALL A TERMINATION PANEL SHALL BE INCLUDED IN THE BID ITEM PRICE OF ITEM 632 INTERCONNECT MISC.: TERMINATION PANEL.

ITEM 632 INTERCONNECT MISC.: FUSION SPLICE

TYPICALLY THE ONLY PLACE SPLICES WILL BE PERMITTED IS TO CONNECT THE LOOSE TUBE DROP CABLE TO THE LOOSE TUBE TRUNK CABLE UNLESS NOTED IN THE PLAN. FUSION SPLICE SHALL CONFORM TO THE FOLLOWING:

(A) SPLICE LOSS (FUSION SPLICING). THE AVERAGE SPLICE LOSS OF EACH MULTI-MODE FIBER SHALL NOT EXCEED 0.2 DB (PER EIA-568-A) FOR BOTH SINGLE AND MULTI-MODE FIBERS. THE AVERAGE SPLICE LOSS IS DEFINED AS THE SUMMATION OF THE LOSS AS MEASURED IN BOTH DIRECTIONS USING AN OPTICAL TIME DOMAIN REFLECTOMETER (OTDR) THROUGH THE FUSION SPLICE, DIVIDED BY TWO.

(B) SPLICE PROTECTION. FUSION SPLICES REQUIRE ADEQUATE SPLICE PROTECTION. WHEN SPLICING OUTDOORS, THE SPLICED AND STRIPPED CABLE SHALL BE PROTECTED BY A SPLICE CLOSURE. ALL FIBER SPLICES ARE HOUSED IN SPLICE TRAYS OR ORGANIZERS INSIDE A CLOSURE. THE PROPER SPLICE TRAY SHALL BE SELECTED BASED ON THE TYPE OF PROTECTION REQUIRED BY THE SPLICE. FUSION SPLICES, REQUIRE ADDITIONAL PROTECTION AND STRAIN RELIEF WHICH CAN BE PROVIDED BY GLASS CAPILLARIES, HEAT SHRINK TUBING, OR SILICONE SEALANT (COMMONLY REFERRED TO AS RTV).

FUSION SPLICES SHALL BE PAID AT THE BID PRICE OF ITEM 632 INTERCONNECT MISC.: FUSION SPLICE AND SHALL INCLUDE ALL COSTS FOR EQUIPMENT, MATERIAL AND LABOR TO PROVIDE A PERMANENT FUSED SPLICE INCLUDING SPLICE PROTECTION. A QUANTITY OF ONE SPLICE WILL BE PROVIDED FOR EACH PAIR OF FIBERS THAT REQUIRE SPLICING.

ITEM 632 INTERCONNECT MISC.: MECHANICAL SPLICE

TYPICALLY THE ONLY PLACE SPLICES WILL BE PERMITTED IS TO CONNECT THE LOOSE TUBE DROP CABLE TO THE LOOSE TUBE TRUNK CABLE UNLESS SPECIFICALLY NOTED IN THE PLAN. MECHANICAL SPLICES SHALL CONFORM TO THE FOLLOWING:

- (A) SPLICE LOSS (MECHANICAL SPLICING). A MAXIMUM SPLICE LOSS OF 0.20 DB IS ALLOWED FOR SINGLE-MODE AND MULTIMODE FIBER CONNECTIONS.
- (B) SPLICE PROTECTION. WHEN MECHANICAL SPLICES REQUIRE STORING, A MECHANICAL SPLICE TRAY ORGANIZER SHALL BE USED.

MECHANICAL SPLICES SHALL BE MADE USING 3M FIBERLOK SPLICING KITS.

MECHANICAL SPLICES SHALL BE PAID AT THE BID PRICE OF ITEM 632 INTERCONNECT MISC.: MECHANICAL SPLICE AND SHALL INCLUDE ALL COSTS FOR EQUIPMENT, MATERIAL AND LABOR TO PROVIDE A PERMANENT SPLICE INCLUDING SPLICE PROTECTION. A QUANTITY OF ONE SPLICE WILL BE PROVIDED FOR EACH PAIR OF FIBERS THAT REQUIRE SPLICING.

ITEM 632 INTERCONNECT MISC.: FAN-OUT KIT, 6 FIBER

FAN-OUT KITS SHALL BE PROVIDED FOR LOOSE TUBE DROP CABLE TERMINAL ENDS THAT NEED TO BE FITTED WITH CONNECTORS. THE FAN-OUT KIT CAN BE AN INDIVIDUAL BUFFER TUBE KIT, MULTIPLE BUFFER TUBE KIT OR SPIDER DESIGN KIT. ALL FAN-OUT KITS SHALL HAVE A MINIMUM OF 24" (610 MM) OF TUBING COVERING EACH FIBER WHEN INSTALLATION IS COMPLETE. PRIOR TO ANY WORK THE CONTRACTOR SHALL SUBMIT FOR APPROVAL; CATALOG CUT SHEETS, GENERAL SPECIFICATIONS, AND STANDARD OPERATING PROCEDURES FOR THE KIT THAT IS TO BE UTILIZED ON THE PROJECT. ONLY ONE TYPE OF FAN-OUT KIT MAY BE USED THROUGHOUT THE PROJECT. FAN-OUT KITS SHALL BE RATED FOR OUTDOOR USE (-40C TO 70 C). SINCE ONLY 4 DROP CABLE FIBERS ARE REQUIRED FOR DAISY CHAIN COMMUNICATION, ALL EXTRA DROP CABLE FIBERS AT THE CABINET END SHALL BE INSERTED INTO THE FAN-OUT KIT, CONNECTORIZED AND TERMINATED IN THE TERMINATION PANEL FOR FUTURE USE. COST FOR THE CONNECTORS USED WITH THE FAN-OUT KIT WILL BE ITEMIZED SEPARATELY. COST FOR LOOSE TUBE FAN-OUT KITS SHALL BE PAID AT THE BID ITEM PRICE FOR EACH ITEM 632 INTERCONNECT MISC.: FAN-OUT KIT, 6 FIBER AND SHALL INCLUDE ALL COSTS FOR MATERIAL, EQUIPMENT, TOOLS AND LABOR TO PROVIDE AND INSTALL THE FAN-OUT KIT.

ITEM 632 INTERCONNECT MISC.: DROP CABLE, 6 FIBER

DROP CABLES FOR LOOSE TUBE FIBER OPTIC CABLES SHALL BE PAID ON A LINEAR MEASUREMENT BASIS AND SHALL BE MADE FROM THE SAME GLASS AND CABLE MANUFACTURER THAT PROVIDES THE TRUNK CABLE. SINCE ONLY 4 FIBERS ARE REQUIRED FOR DAISY CHAIN COMMUNICATION, UNUSED DROP CABLE FIBERS (2 FIBERS) SHALL BE LEFT FOR FUTURE USE. SPARE DROP CABLE FIBERS AT THE SPLICE ENCLOSURE END SHALL BE PLACED INSIDE OF THE ENCLOSURE WITH SUFFICIENT EXCESS TO PROVIDE 2 SERVICE LOOPS. SPARE DROP CABLE FIBERS AT THE CONTROLLER END SHALL BE INSERTED INTO THE FAN-OUT KIT, CONNECTORIZED AND TERMINATED IN THE CABINET TERMINATION PANEL. COST FOR FIBER OPTIC DROP CABLES SHALL BE PAID AT THE BID ITEM PRICE OF ITEM 632 INTERCONNECT MISC.: DROP CABLE, 6 FIBER AND SHALL INCLUDE ALL COSTS FOR MATERIAL, EQUIPMENT, TOOLS AND LABOR TO PROVIDE AND INSTALL THE DROP CABLE. NOTE: DROP CABLES ROUTED DOWN THROUGH A POLE FROM AERIAL INTERCONNECT SHALL BE PROVIDED WITH STRAIN RELIEF (CABLE SUPPORT ASSEMBLY) PER THE INSTALLATION DETAILS. COST OF THE CABLE SUPPORT ASSEMBLY SHALL BE INCIDENTAL TO THE BID ITEM PRICE OF THE DROP CABLE. A MINIMUM OF 10 FEET (3 METERS) SLACK DROP CABLE SHALL BE PROVIDED IN THE EACH CONTROLLER CABINET. SLACK DROP CABLE SHALL BE COILED AND BOUND TO THE CABINET VIA TIE WRAP OR OTHER APPROVED MEANS.

ITEM 632 INTERCONNECT, MISC.: FIBER OPTIC CONNECTOR

UNLESS A DIFFERENT CONNECTOR IS REQUIRED FOR COMPATIBILITY WITH EXISTING OR PROPOSED ACTIVE COMPONENTS, FIBER OPTIC CONNECTORS SHALL BE FIELD INSTALLABLE SC/PC COMPATIBLE, CERAMIC FERRULE, WITH THE FIBER PERMANENTLY SECURED WITHIN THE FERRULE BY EPOXY (HEAT SET), CHEMICALLY CURED OR A HOT MELT ADHESIVE IN ACCORDANCE WITH THE CONNECTOR AND/OR THE EPOXY MANUFACTURER. WHEN CONNECTORS ARE INSTALLED OUTSIDE OF A CONTROLLED ENVIRONMENTAL LOCATION, THE CONNECTOR OPERATING TEMPERATURE SHALL BE MINIMUM -40°C TO +70°C. FOR THOSE APPLICATIONS WITHIN A CONTROLLED ENVIRONMENTAL LOCATION, THE OPERATING TEMPERATURE SHALL BE MINIMUM -20°C TO +60°C.

THE PROCEDURE FOR THE TERMINATION OF CONNECTORS USED ON THIS PROJECT SHALL MEET THAT PROCESS SET OUT IN THE CONNECTOR MANUFACTURER'S STANDARD OPERATING PROCEDURE (SOP) FOR FIELD INSTALLATION. THIS SOP SHALL BE SUBMITTED FOR APPROVAL TO THE ENGINEER. UNLESS RECOMMENDED OTHERWISE BY THE CONNECTOR MANUFACTURER, EACH FIBER SHALL BE CLEAVED, CLEANED AND RECEIVE MULTIPLE POLISHINGS WITH INCREASINGLY FINE GRIT POLISHING PADS. THE APPROVED SOP WILL BE THE BASIS FOR INSPECTION.

THE AVERAGE LOSS FOR MATED PAIRS OF CONNECTORS SHALL NOT EXCEED 0.4 DB FOR BOTH SINGLE AND MULTI-MODE FIBERS.

PAYMENT SHALL BE MADE AT THE PRICE BID OF ITEM 632, INTERCONNECT, MISC.: FIBER OPTIC CONNECTOR.

ITEM 632 INTERCONNECT, MISC.: SPLICE ENCLOSURE (UNDER GRADE OR AERIAL)

SPLICE ENCLOSURES SHALL BE A SIECOR MODEL UCA0, 3M 2178 OR APPROVED EQUAL. INCLUDED WITH THE EACH ENCLOSURE SHALL BE AERIAL OR PULL BOX WALL MOUNTING BRACKETS AS REQUIRED BY THE PARTICULAR SPLICE LOCATION. WHERE ARMORED CABLE IS SPECIFIED, THE ARMOR SHALL BE GROUNDED IN THE GROUNDING SYSTEM PROVIDED WITH THE ENCLOSURE. AS A MINIMUM A 12 FIBER SPLICE TRAY SHALL BE PROVIDED WITH THE ENCLOSURE. WHERE MORE THAN 12 FIBERS ARE SPECIFIED, ADDITIONAL SPLICE TRAYS SHALL BE INCLUDED AS NECESSARY TO ACCOMMODATE THE FIBER COUNT. THE SPLICE ENCLOSURE SHALL FEATURE A MOISTURE TIGHT SEALING ARRANGEMENT WHICH IS RE-ENTERABLE FOR SYSTEM EXPANSION AND REPAIR. NO STRESS SHALL BE PLACED ON FINISHED SPLICES WITHIN THE SPLICE ENCLOSURE.

AT SPLICE LOCATIONS, A RING CUT METHODOLOGY SHALL BE USED. TRUNK CABLE JACKETING SHALL BE CUT BACK A SUFFICIENT DISTANCE TO ALLOW THE TWO UNUSED TRUNK FIBER TUBES BE STORED UN CUT/UNOPENED WITH 2 SERVICE LOOPS INSIDE THE ENCLOSURE. THE TRUNK CABLE TUBE THAT CONTAINS THE INTERCONNECT FIBERS SHALL BE OPENED TO EXPOSE THE SIX INNER FIBERS. ONLY THE TWO TRUNK CABLE FIBERS THAT WILL BE SPLICED MAY BE CUT. THE REMAINING FOUR TRUNK CABLE FIBERS IN THE OPENED TUBE SHALL REMAIN UN CUT AND STORED IN THE SPLICE TRAY WITH A MINIMUM OF TWO SERVICE LOOPS. THE ONLY TRUNK CABLE FIBERS THAT ARE TO BE CUT ARE THE 2 TRUNK CABLE FIBERS BEING SPLICED INTO THE DROP CABLE. (TO DROP CABLE FIBERS R1, T1, R2, T2) NOTE: SEE "TYPICAL SYSTEM CONSTRUCTION" DETAILS.

PAYMENT SHALL BE MADE AT THE PRICE BID OF ITEM 632, INTERCONNECT, MISC.: SPLICE ENCLOSURE (UNDER GRADE & AERIAL) AND SHALL INCLUDE ALL COSTS OF MATERIALS, EQUIPMENT AND LABOR TO PROVIDE A COMPLETE INSTALLED FIBER OPTIC SPLICE ENCLOSURE. COST FOR THE SPLICES WILL BE ITEMIZED SEPARATELY.

ITEM 632 INTERCONNECT MISC.: POLE ENTRANCE FITTING

(THE MAINTAINING AGENCY MAY OPT TO HAVE THE CONTRACTOR ROUTE DROP CABLES DOWN THE OUTSIDE OF STRAIN POLES. THIS ALTERNATE METHOD OF INSTALLATION IS SHOWN IN THE CONSTRUCTION DETAILS. SHOULD THE ALTERNATE METHOD BE DESIRED, THIS NOTE SHOULD BE DELETED AND A NOTE SHOULD BE PROVIDED REQUIRING THE ALTERNATE CONSTRUCTION METHOD.)

A POLE ENTRANCE FITTING SHALL BE PROVIDED IN ACCORDANCE WITH THE ENCLOSED DETAILS TO ALLOW FIBER OPTIC CABLE ENTRANCE INTO BOTH EXISTING AND PROPOSED STEEL POLES. IN PROPOSED POLES, THE CONTRACTOR SHALL HAVE THE 2" (51 MM) ENTRANCE HOLES SHOWN IN THE DETAILS PRE-MANUFACTURED. BLIND HALF COUPLINGS SHALL BE WELDED INTO ANY NEW STRAIN POLES SUPPLIED AS PART OF THE PROJECT.

EXISTING STRAIN POLES WILL REQUIRE THE CONTRACTOR FIELD LOCATE THE POLE ENTRANCE HOLE AND DRILL TWO PILOT HOLES AND USE A HOLE SAW TO CUT THE 2" (51MM) HOLE. ALL NON-GALVANIZED POLE SURFACES EXPOSED AFTER CUTTING THE HOLE SHALL HAVE 3 COATS OF ZINC ENRICHED PAINT APPLIED. SEE CONSTRUCTION DETAILS NO POLE ENTRANCE FITTING HOLES SHALL BE LOCATED VERTICALLY WITHIN 24" (610MM) OF ANY OTHER HOLES OR BLIND HALF COUPLINGS. ALL COSTS TO PROVIDE A POLE ENTRANCE INCLUDING MATERIAL, EQUIPMENT AND LABOR SHALL BE INCLUDED IN THE BID PRICE OF ITEM 632 INTERCONNECT MISC.: POLE ENTRANCE FITTING.

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FIBER OPTIC SPECIFICATION NOTES	
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FIBER-2	