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| Illinois Tollway Standard Drawings Revisions |
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| Section L Fiber Optic | |
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| Standard | Modification Summary |
| | Effective: 03-01-2024 |
| L1-06 | Fiber Optic System Typicals and Drawings |
| Sheet 2 | Removed note "Top casing shall be a min of 120" below lowest Illinois Tollway road surface". |
| | Modified profile view to include tracer wire. |
| | Removed "DAM" call out from profile view. |
| | Added Note 12. |
| Sheet 3 | Modified side view to include a reference to Note 2. |
| | Removed note "HDPE shall be a minimum of 48" below pavement elevation to top of HDPE, may be greater than 48" as required by city, village, twp/county, and/or governing agency". |
| Sheet 4 | Removed note "HDPE shall be a minimum of 48" below pavement elevation to top of HDPE, may be greater than 48" as required by city, village, twp/county, and/or governing agency". |
| Sheet 4 | Modified detail to include locate wire. |
| Sheet 5 | Updated the General Note section. |
| Sheet 6 | Removed note "No marking on lid". |
| | Removed "Standard Marking" call out. |
| | Removed the 2-section split lid from the 48"x72" detail. |
| Sheet 8 | Replaced "Pea Gravel" callout with "Coarse Aggregate". |
| | Adjusted "42" Min" measurement call out. |
| | Removed note "Fiber coil bundle shall be labeled with owner, end locations, fiber type, and fiber count". |
| Sheet 9 | Removed Handhole - Plan View. |
| | Modified Note 1. |
| | Modified Note 2. |
| | Modified Note 7. |
| | Added detail label "Warning Post". |
| | Removed note "Place HDPE over fiber optic cable to provide crush protection extend HDPE 1' inside handhole". |
| Removed note "Handhole shall not be installed on steep banks or slopes where the cover cannot be leveled within a tolerance of one inch (1") of drop to twelve inches (12") of grade and remain buried. | |
| Sheet 10 | Modified warning locate post in detail. |
| | Modified Note 2. |
| Sheet 11 | Modified Detail B. Changed from stainless steel to rigid galvanized steel. |
| Sheet 12 | Removed the "SS" call out from Manhole Penetration Detail. |
| | Removed the "SS" call out from Below Grade Penetration Building. |
| | Removed the "SS" call out from Concrete Through Penetration. |
| Sheet 13 | Modified Note 2. |
| Sheet 14 | Modified Note 4. |
| L2-04 | Fiber Optic Splicing Detail |
| Sheet 1 | Modified drawing. |
| Sheet 2 | Modified Note 1. |
| | Modified Note 2. |

 New Sheet

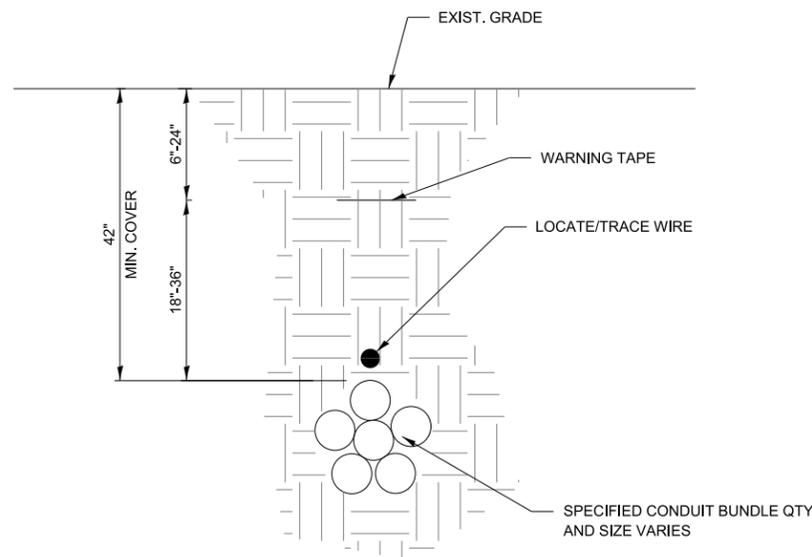
 Retired Standard

TYPES OF BURY
CABLE AND CONDUIT
BORED, TRENCHED, AND PLOWED

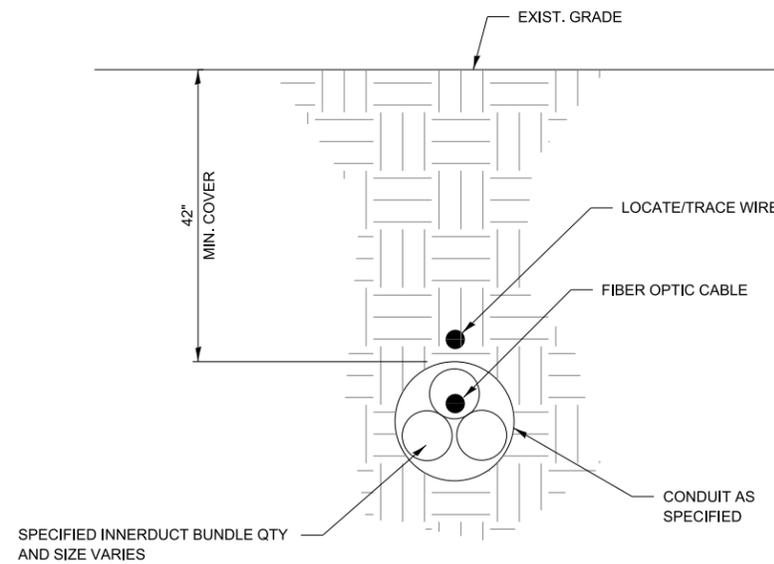
GENERAL NOTES:

1. UNDERGROUND CONDUIT SHALL BE PLACED AT 42" MINIMUM COVER UNLESS OTHERWISE SPECIFIED ON THE PLANS.
2. UNDERGROUND CONDUIT SHALL BE PLACED AT 48" MINIMUM COVER UNDER STREAM, CREEK AND DRAINAGE DITCHES UNLESS OTHERWISE SPECIFIED ON THE PLANS.
3. IF WHILE LOWERING THE CONDUIT THERE IS NOT ENOUGH SLACK, ADDITIONAL CONDUIT SHALL BE ADDED. EMPTY CONDUITS CAN BE CUT AND HAVE NEW CONDUIT FUSED OR COMPRESSION COUPLED ON. CONDUITS WITH FIBER INSTALLED SHALL BE RING CUT WITH A TUBE CUTTER SO AS NOT TO DAMAGE THE FIBER.
4. CONDUIT USED ABOVE GROUND SHALL BE STAINLESS STEEL OR FIBERGLASS REINFORCED EPOXY (FRE) CONDUIT. UNDERGROUND CASINGS SHALL BE FRE PER THE SPECIAL PROVISIONS OR HDPE.

5. LOCATE/TRACE WIRE SHALL BE DIRECT BURIED WITH EVERY CONDUIT BUNDLE PATH AS CLOSE TO THE CENTER OF THE CONDUITS AS POSSIBLE. LOCATE/TRACE WIRE SHALL NOT BE INSTALLED IN A CONDUIT WITHOUT APPROVAL OF THE ENGINEER.
6. WHEN AN OPTIC FIBER CONDUIT SEPARATES FROM A CONDUIT BUNDLE OR DUCT BANK, AN ADDITIONAL LOCATE WIRE SHALL BE INSTALLED WITH THAT SEPARATE CONDUIT PATH GOING BACK TO THE PREVIOUS HANDHOLE.
7. ALL LOCATE/TRACE WIRE WILL BE TESTED PER SPECIFICATIONS PRIOR TO ANY FIBER BEING INSTALLED.
8. ALL UNUSED CONDUIT SHALL HAVE 1200 LB MULE TAPE INSTALLED FOR FUTURE USE.



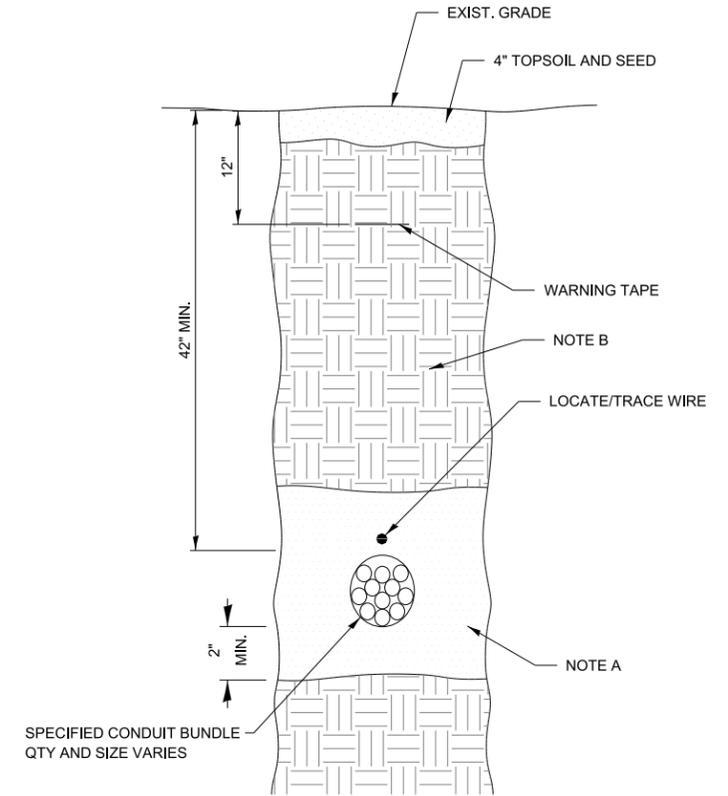
PLOWED CONDUIT BUNDLES
QTY VARIES



BORED CONDUIT WITH FIBER OPTIC CABLE AND/OR MULTIPLE INNERDUCTS
AS REQUIRED

NOTE:

THE PICTURE ABOVE IS A CONCEPT LAYOUT.



CONSTRUCTION NOTES TRENCHED CONDUIT BUNDLES

- A. A MINIMUM OF 2" OF SAND SHALL BE PLACED UNDER THE CONDUIT. SAND SHALL TRANSITION TO BACKFILL ACCORDING TO NOTE B 4" ABOVE CONDUIT.
- B. BACKFILL SHALL BE ACCORDING TO ARTICLE 810.04 OF THE STANDARD SPECIFICATIONS.

TRENCHED CONDUIT BUNDLES

APPROVED BY: *Manar Nashif*
 CHIEF ENGINEERING OFFICER
 DATE: 03/01/2024

| REVISIONS | |
|------------|--|
| DATE | DESCRIPTION |
| 03-01-2024 | MODIFIED PROFILE VIEW TO INCLUDE TRACER WIRE. MODIFIED SIDE VIEW TO INCLUDE A REFERENCE TO NOTE 2. REMOVED AND MODIFIED NOTES. |
| | UPDATED THE GENERAL NOTES SECTION. MODIFIED DETAILS. |



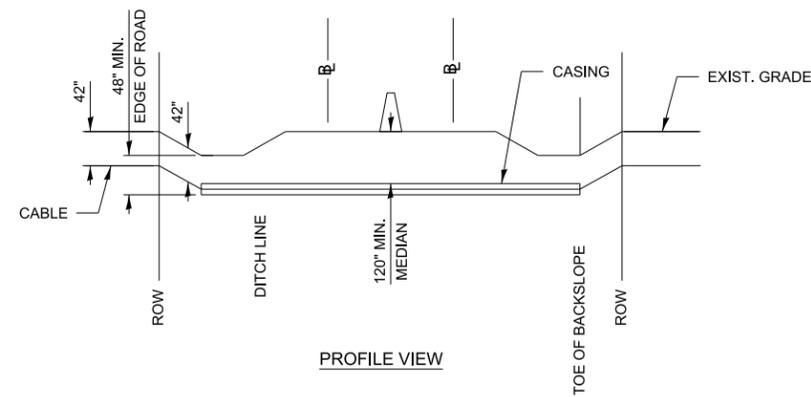
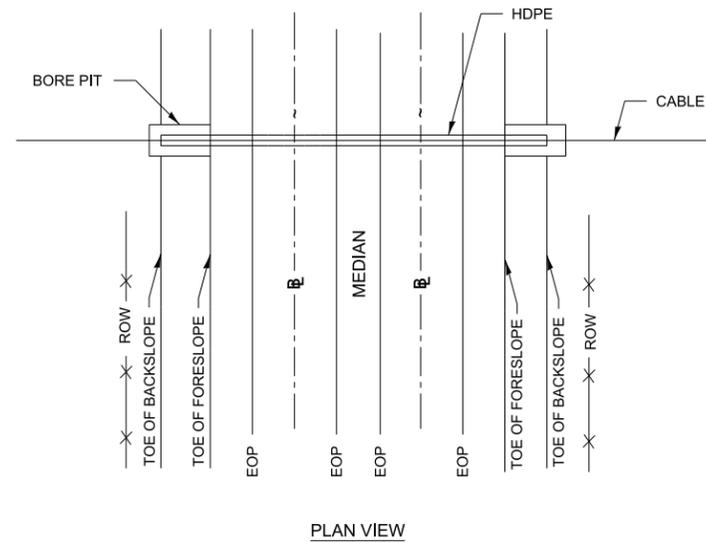
FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS

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| VERSION: 2024-03 | STANDARD: L1-06 | SHEET: 1 OF 15 |
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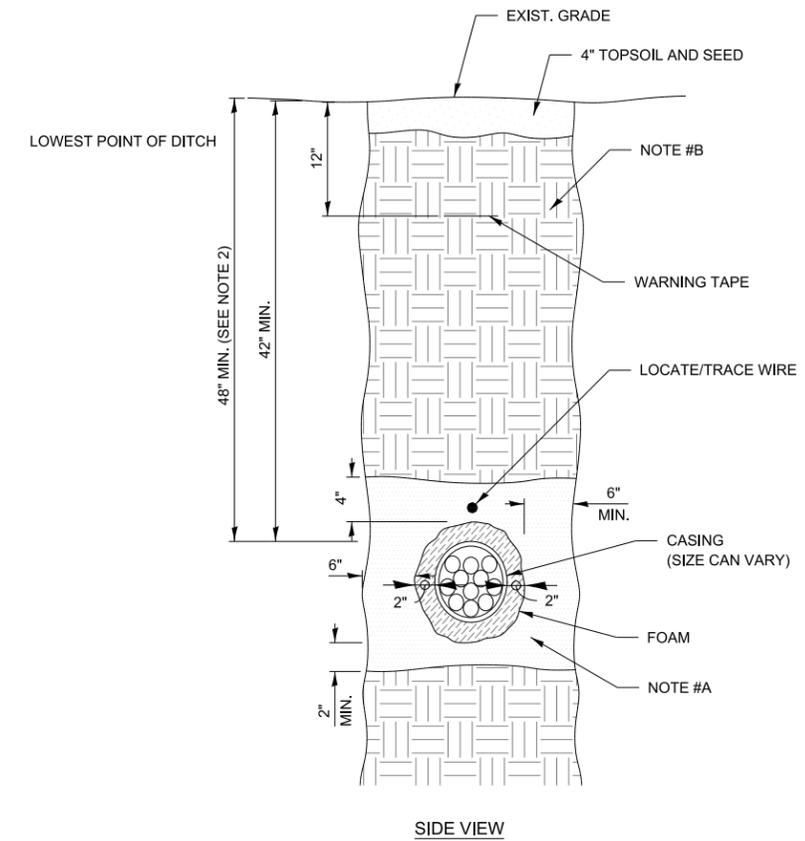
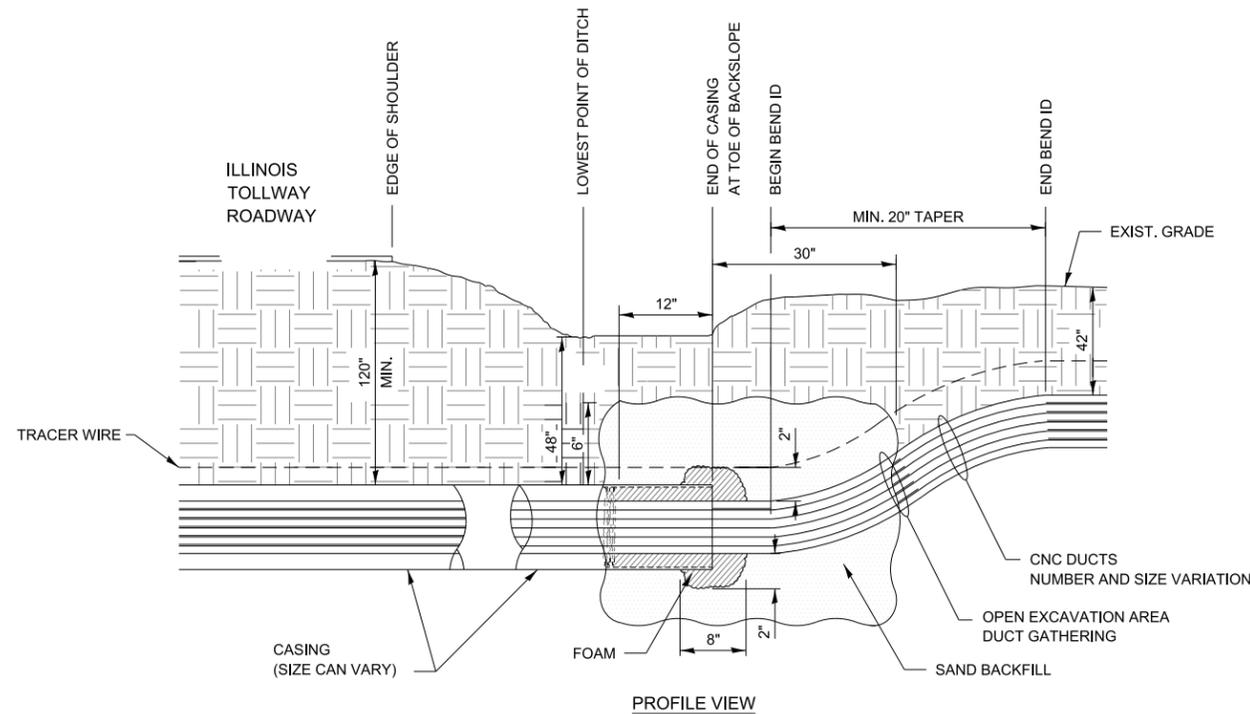
TYPICAL ROAD CROSSINGS

GENERAL NOTES:

1. UNDERGROUND CONDUIT SHALL BE PLACED AT 42" MINIMUM COVER UNLESS OTHERWISE SPECIFIED ON THE PLANS.
2. UNDERGROUND CONDUIT SHALL BE PLACED AT 48" MINIMUM COVER UNDER STREAM, CREEK AND DRAINAGE DITCHES UNLESS OTHERWISE SPECIFIED ON THE PLANS.
3. THE MINIMUM COVER UNDER A PUBLIC ROADWAY, ILLINOIS TOLLWAY HIGHWAY AND RAMPS SHALL BE 120" OR SUCH GREATER DEPTH AS MAY BE REQUIRED TO CLEAR THE PAVEMENT STRUCTURE.
4. IF WHILE LOWERING THE DUCTS, THERE IS NOT ENOUGH SLACK IN THE DUCTS, ADDITIONAL DUCT SHALL BE ADDED. EMPTY DUCTS CAN BE CUT AND HAVE NEW DUCT FUSED OR COMPRESSION COUPLED ON. DUCTS WITH FIBER INSTALLED SHALL BE RING CUT WITH A TUBE CUTTER SO AS NOT TO DAMAGE THE FIBER.
5. HDPE CASING SHALL EXTEND FROM TOE OF BACK SLOPE TO TOE OF BACK SLOPE UNLESS OTHERWISE APPROVED.
6. BORE AND RECEIVING PITS SHALL BE A MINIMUM OF 30 FEET FROM THE EDGE OF SHOULDER ON TOLL HIGHWAYS UNLESS OTHERWISE APPROVED.
7. TOP OF CASING SHALL BE A MINIMUM OF 48" BELOW THE DESIGNED DITCH GRADES ON EACH SIDE OF HIGHWAY.
8. ENDS OF ALL CASING SHALL BE FOAM PLUGGED. (ARNCO HYDRA-SEAL S-60 OR ENGINEER APPROVED EQUAL).
9. PITS FOR BORING ARE NOT PERMITTED IN THE HIGHWAY MEDIAN.
10. CONDUIT USED ABOVE GROUND SHALL BE STAINLESS STEEL OR FIBERGLASS REINFORCED EPOXY (FRE) CONDUIT. UNDERGROUND CASINGS SHALL BE FRE PER THE SPECIAL PROVISIONS OR HDPE.
11. HANDHOLES SHALL BE INSTALLED ON BOTH SIDES OF ANY STREAM, CREEK, OR RAILROAD CROSSING.
12. BORE HOLES SHALL BE LIMITED TO THE MINIMUM DIAMETER NECESSARY FOR INSTALLATION OF THE DUCT BUNDLE OR CASING.



TYPICAL ROAD CROSSING



CONSTRUCTION NOTES TRENCHED HDPE BUNDLES

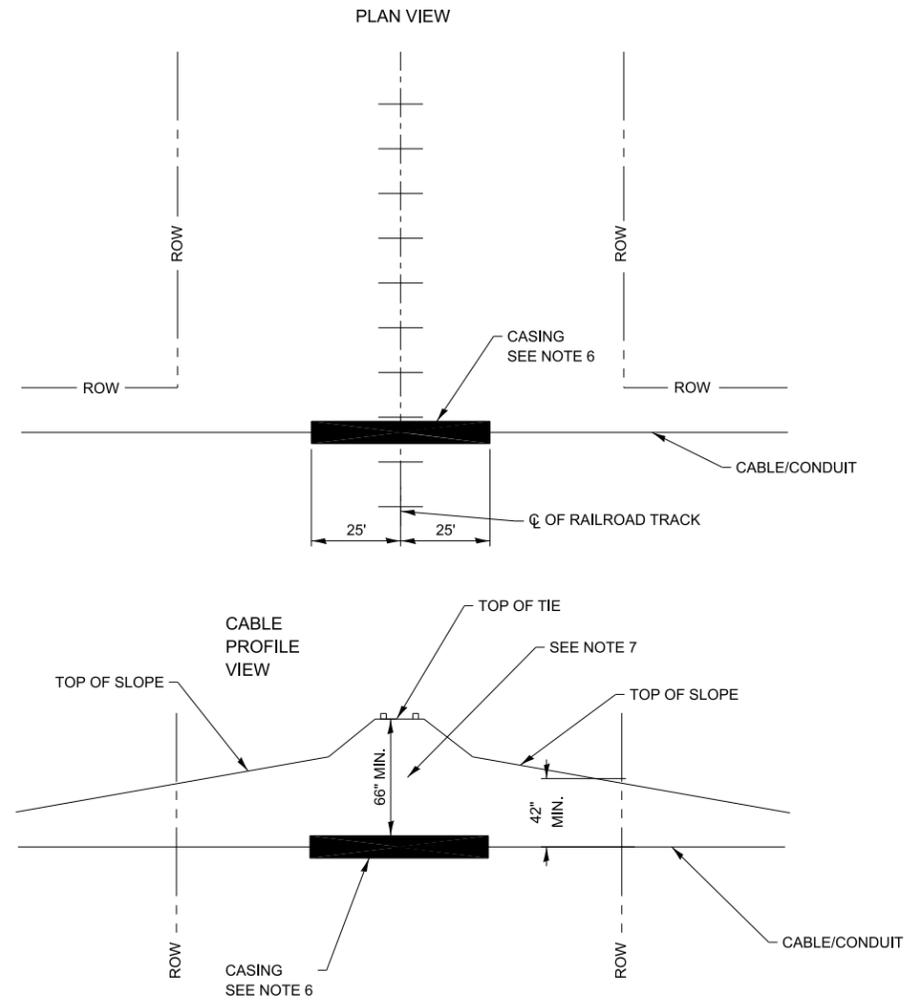
- A. A MINIMUM OF 2" OF SAND SHALL BE PLACED UNDER THE CONDUIT. SAND SHALL TRANSITION TO BACKFILL ACCORDING TO NOTE B 4" ABOVE CONDUIT.
- B. BACKFILL SHALL BE ACCORDING TO ARTICLE 810.04 OF THE STANDARD SPECIFICATIONS.

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OUTSIDE PLANT TYPICAL BORES

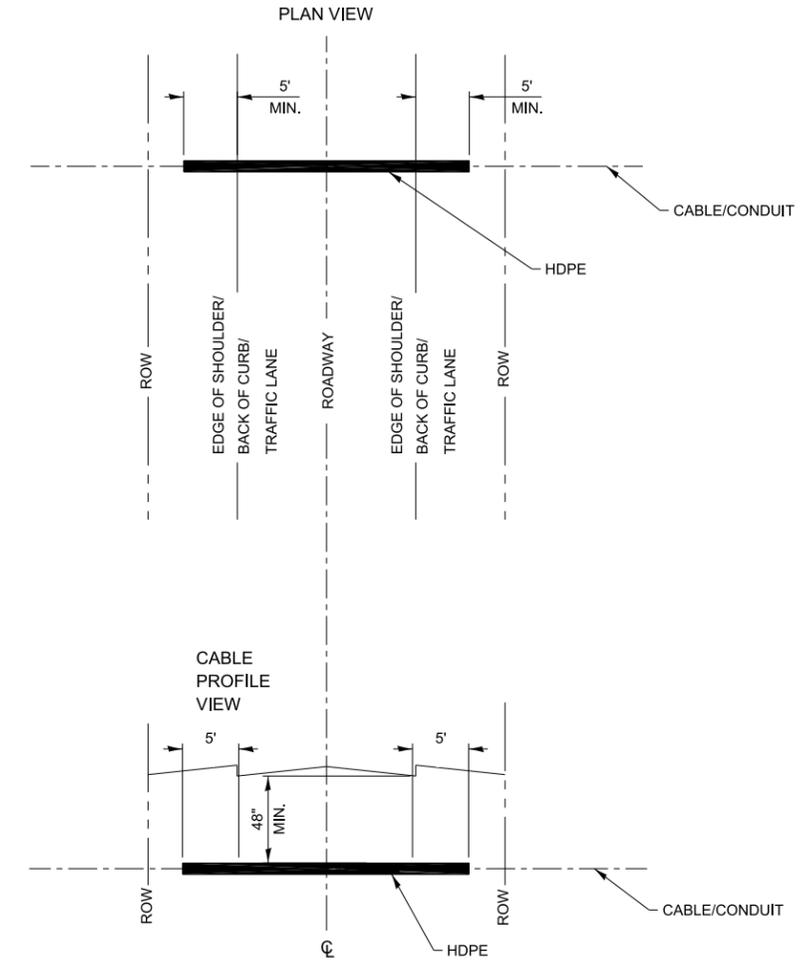
TYPICAL RAILROAD BORE OR JACK



NOTES FOR RAILROAD BORE OR JACK

1. CASING SHALL EXTEND 25 FT. EACH SIDE OF ☉ OF OUTERMOST TRACK OR AS DICTATED BY RAILROAD PERMIT.
2. R.R. BALLAST SHALL NOT BE DISTURBED.
3. BORE AND RECEIVING PITS SHALL NOT BE EXCAVATED CLOSER THAN 10 FT. FROM THE TOE OF SLOPE ON EACH SIDE OF TRACK.
4. ENDS OF ALL CASING SHALL BE FOAM PLUGGED (ARNCO HYDRA-SEAL S-60 OR ENGINEER APPROVAL EQUAL). SEE SHEET 2 OF THIS SERIES.
5. ALL OPERATIONS SHALL MEET REGULATING AGENCY REQUIREMENTS.
6. CASING AS REQUIRED BY CUSTOMER OR RAILROAD OWNER.
7. DEPTH FROM TOP OF CASING TO TOP OF RR TIE MAY BE GREATER THAN 66" AS REQUIRED BY RAILROAD OWNER, NEVER LESS THAN 66".

TYPICAL CITY ST. AND DRIVEWAY BORE OR JACK



NOTES FOR CITY STREET AND DRIVEWAY BORE OR JACK

1. HDPE SHALL EXTEND 5 FT. EACH SIDE OF EDGE OF SHOULDER/BACK OF CURB.
2. BORE AND RECEIVING PITS SHALL NOT BE EXCAVATED WITHIN 5 FT. OF EDGE OF SHOULDER/BACK OF CURB.
3. ENDS OF ALL HDPE SHALL BE FOAM PLUGGED. (ARNCO HYDRA-SEAL S-60 OR ENGINEER APPROVED EQUAL). SEE SHEET 2 OF THIS SERIES.
4. ALL OPERATIONS SHALL MEET REGULATING AGENCY REQUIREMENTS.

APPROVED BY: *Manar Nashif* DATE: 03/01/2024
 CHIEF ENGINEERING OFFICER

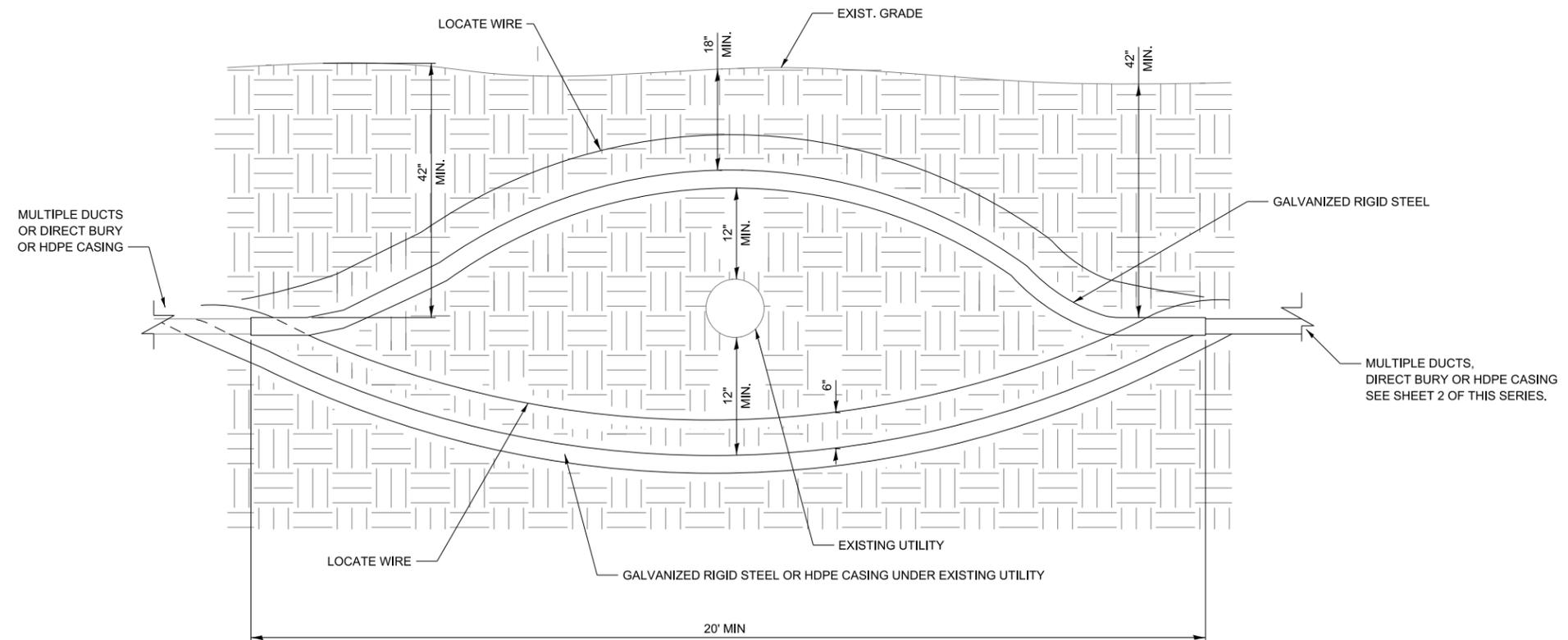


**FIBER OPTIC SYSTEM
 TYPICALS AND DRAWINGS**

UTILITY AVOIDANCE DETAIL

NOTES:

1. IF 18" MIN COVER CANNOT BE ACHIEVED, HDPE(S) MUST BE PLACED UNDER EXISTING UTILITY.
2. 12" MIN SEPARATION MUST BE ADHERED TO BETWEEN GALVANIZED RIGID STEEL/CASING HDPE AND EXISTING UTILITY.
3. NO DIRECT BURY UNDER ANY EXISTING UTILITY. ALL CROSSINGS SHALL BE VISUALLY VERIFIED.
4. MINIMUM 18" TO 24" SEPARATION FOR OIL, GAS UTILITY BETWEEN PIPE AND CONDUIT (OR AS REQUIRED BY UTILITY OWNER).
5. IF CROSSING AN EXISTING UTILITY, SHOULD BE CONSTRUCTED AS CLOSE TO 90° AS POSSIBLE.



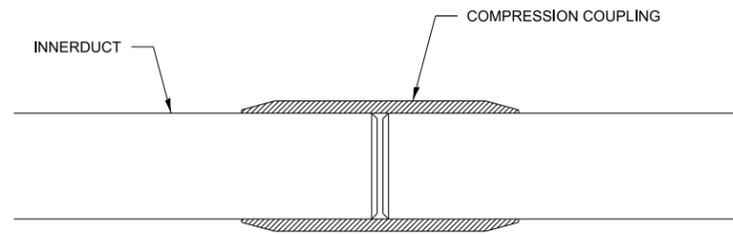
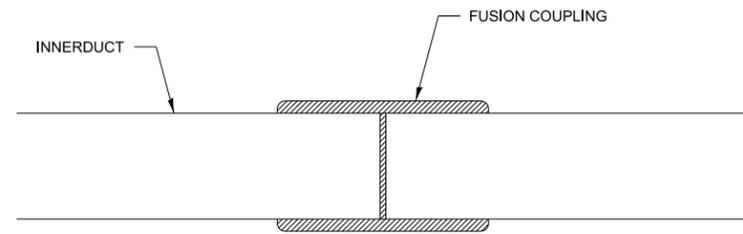
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 CHIEF ENGINEERING OFFICER
 DATE: 03/01/2024



**FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS**

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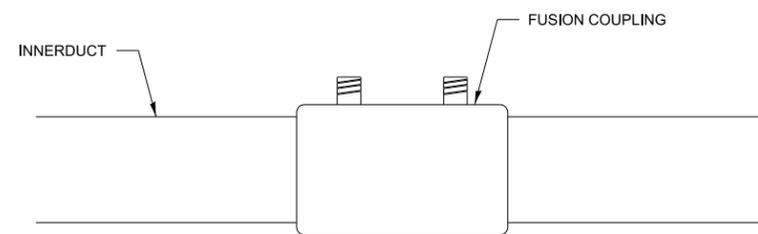
COUPLINGS DETAILS



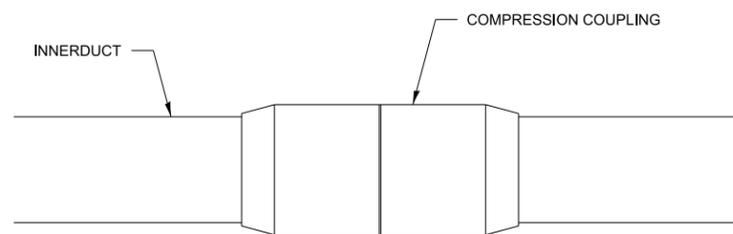
NOTE:

IN A PROPER ELECTROFUSION JOINT, MOLTEN MATERIAL FLOWS TO THE COLD ZONE WHERE IT SOLIDIFIES AND FREEZES OFF THE ESCAPE PATH. WITH THE MOLTEN MATERIAL CONTAINED, MELT PENETRATION WILL BUILD INTERFACE PRESSURE. WIRE WINDINGS WILL FLOW IN A DESIGNED AND CONTROLLED PATTERN AND A PROPER BONDING OF MATERIALS CAN BE OBTAINED.

PROPER FUSION DETAIL



COMPRESSION COUPLING DETAIL



GENERAL NOTES

1. FUSION COUPLING SHALL BE USED FOR ALL NEW INSTALLATION OF DUCT.
2. COMPRESSION COUPLING SHALL BE RESTRICTED TO THE USE ON EXISTING DUCT FOR ACTIONS AS REPAIRS AND DUCT INTERCEPTIONS. INSTALL COMPRESSION COUPLINGS PER MANUFACTURER RECOMMENDATIONS.

FUSION STANDARD JOINING PROCEDURES

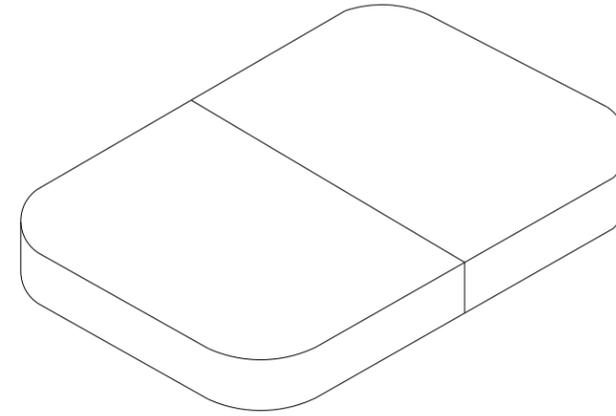
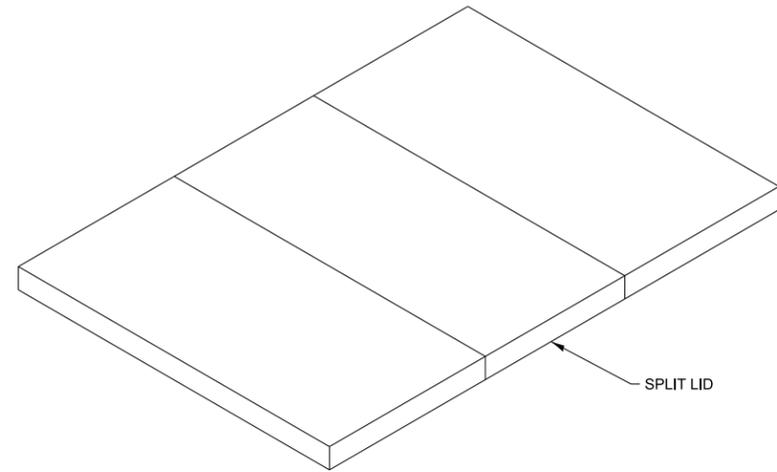
1. SHALL INSTALL PER FUSION COUPLING MANUFACTURER RECOMMENDATIONS.
2. THE PIPE SHALL HAVE A SQUARE EVEN CUT.
3. REMOVE ANY BURRS OR SHAVING FROM THE PIPE ENDS THAT MAY HAVE DEVELOPED DURING THE CUTTING PROCESS.
4. CLEAN PIPE ENDS INSIDE AND OUT WITH A CLEAN CLOTH TO REMOVE ANY DIRT OR CONTAMINANTS.
5. PIPE PREPARATION AND CONTAMINATION ARE VERY IMPORTANT CONSIDERATIONS IN THE ELECTROFUSION PROCESS. THEREFORE, CAREFUL ATTENTION SHALL BE GIVEN TO PROPER SCRAPING AND CLEANING PROCEDURES.
6. SCRAPE PIPE ENDS TO REMOVE ANY OXIDATION OR SURFACE CONTAMINATION. FOR BEST RESULTS, SECURE TOOL ON PIPE AND MAKE TWO REVOLUTIONS.
7. DISCONNECT LEADS FROM FITTING. CLAMPING DEVICE SHALL REMAIN IN PLACE TO SECURE PIPE AND FITTING DURING THE RECOMMENDED COOLING TIME. AFTER REMOVING CLAMP, ADDITIONAL COOLING TIME SHALL BE ALLOWED BEFORE SUBJECTING THE JOINT TO BENDING, BURYING, PRESSURE TESTING, OR SIMILAR HANDLING AND BACKFILL STRESS.

NOTE: IN THE EVENT OF OUT-OF-ROUND PIPE, IT IS IMPORTANT TO ASSURE AN ADEQUATE AND EVEN SCRAPE IS ACHIEVED AROUND THE ENTIRE CIRCUMFERENCE OF THE PIPE. A RUBBER PIPE STOPPER CAN BE PLACED IN THE END OF THE PIPE TO AID IN ROUNDING THE AREA TO BE SCRAPED.

8. MULTIPLE DUCTS FUSION SHALL BE STAGGERED AND AFTER COMPLETION SHALL BE BOUND TOGETHER WITH TY-STRAPS (AT 5' SPACING) SO TO OCCUPY MINIMUM POSSIBLE SPACE AND THEN BACKFILLED.

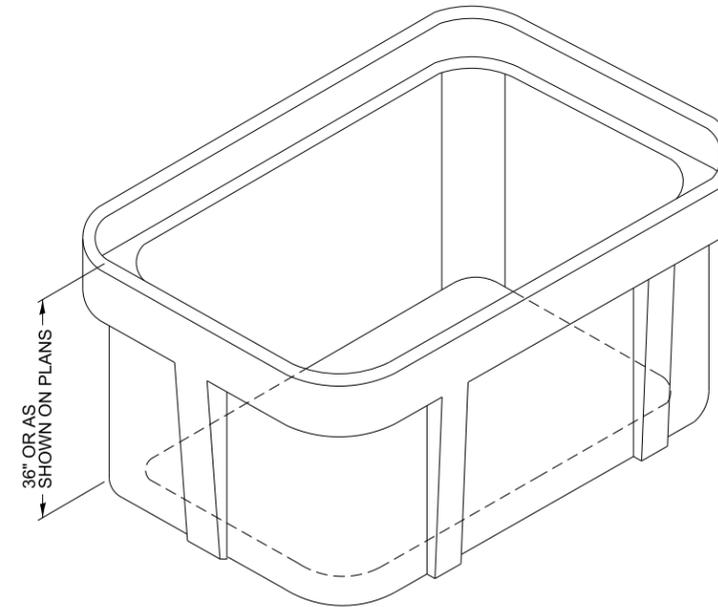
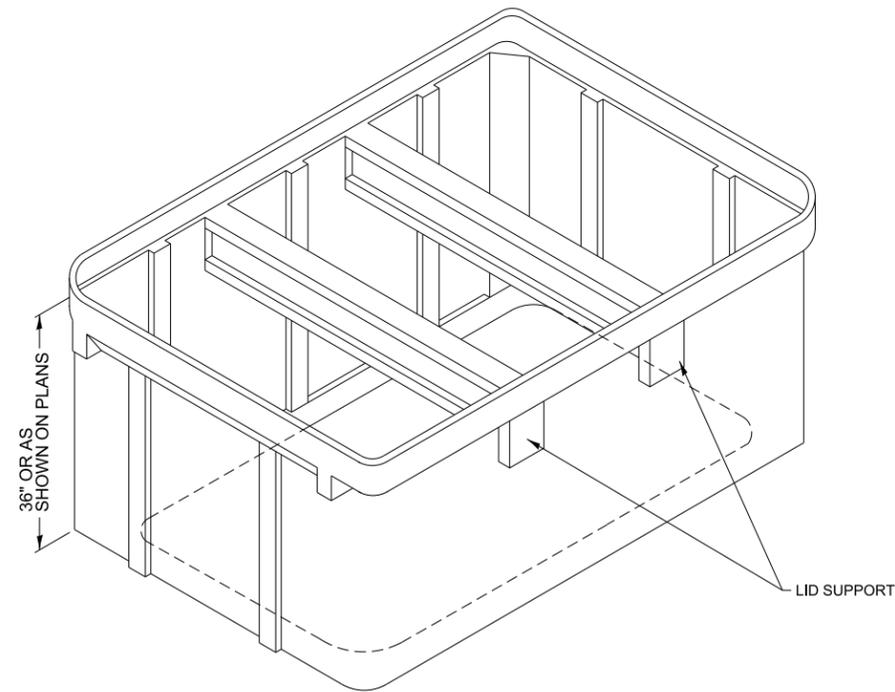
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 CHIEF ENGINEERING OFFICER
 DATE: 03/01/2024

HANDHOLE



NOTE:

1. NO CORING/DRILLING OR ALTERATION OF HANDHOLE SHALL BE ALLOWED.



48"x72" HANDHOLE
3 SECTION SPLIT LID
(PG STYLE LARGE BOX)
5 OR MORE DUCTS

36"x60" HANDHOLE
2 SECTION SPLIT LID
LESS THAN 5 DUCTS

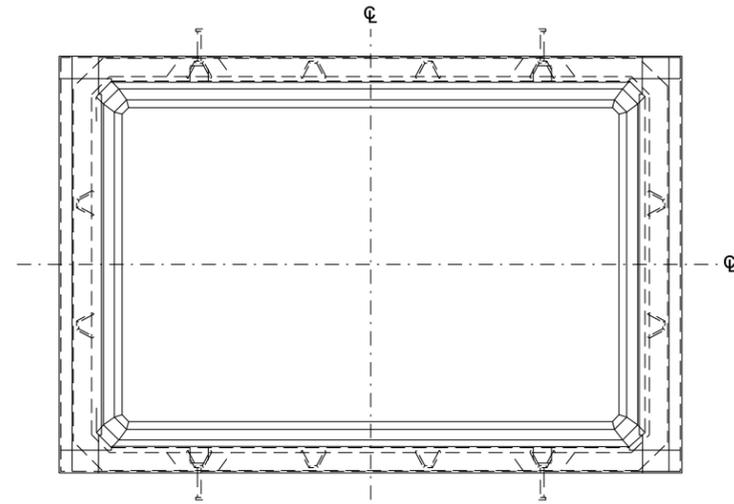
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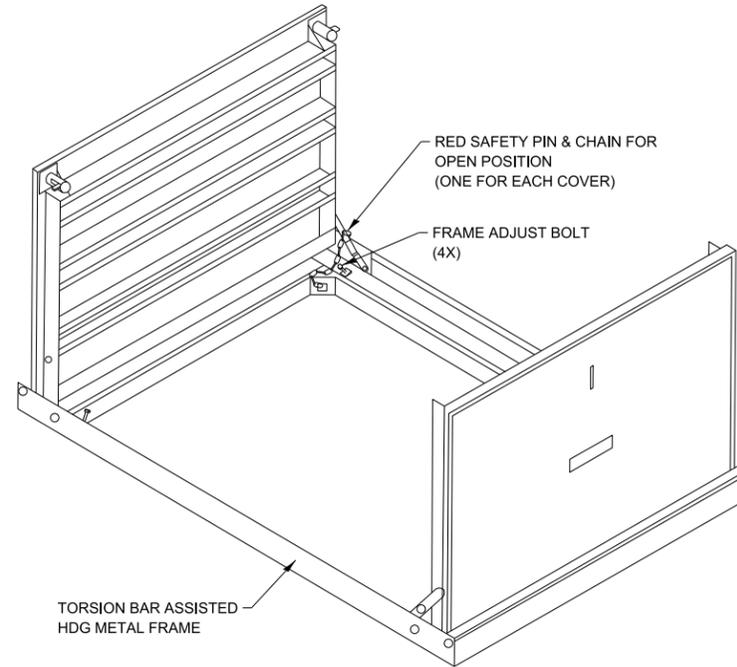
FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS

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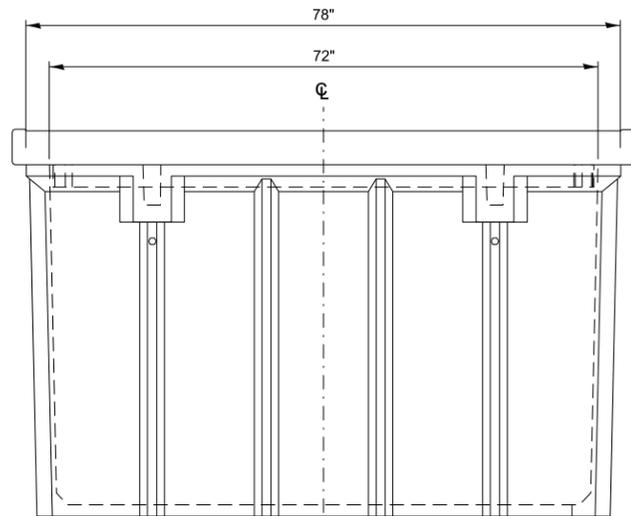
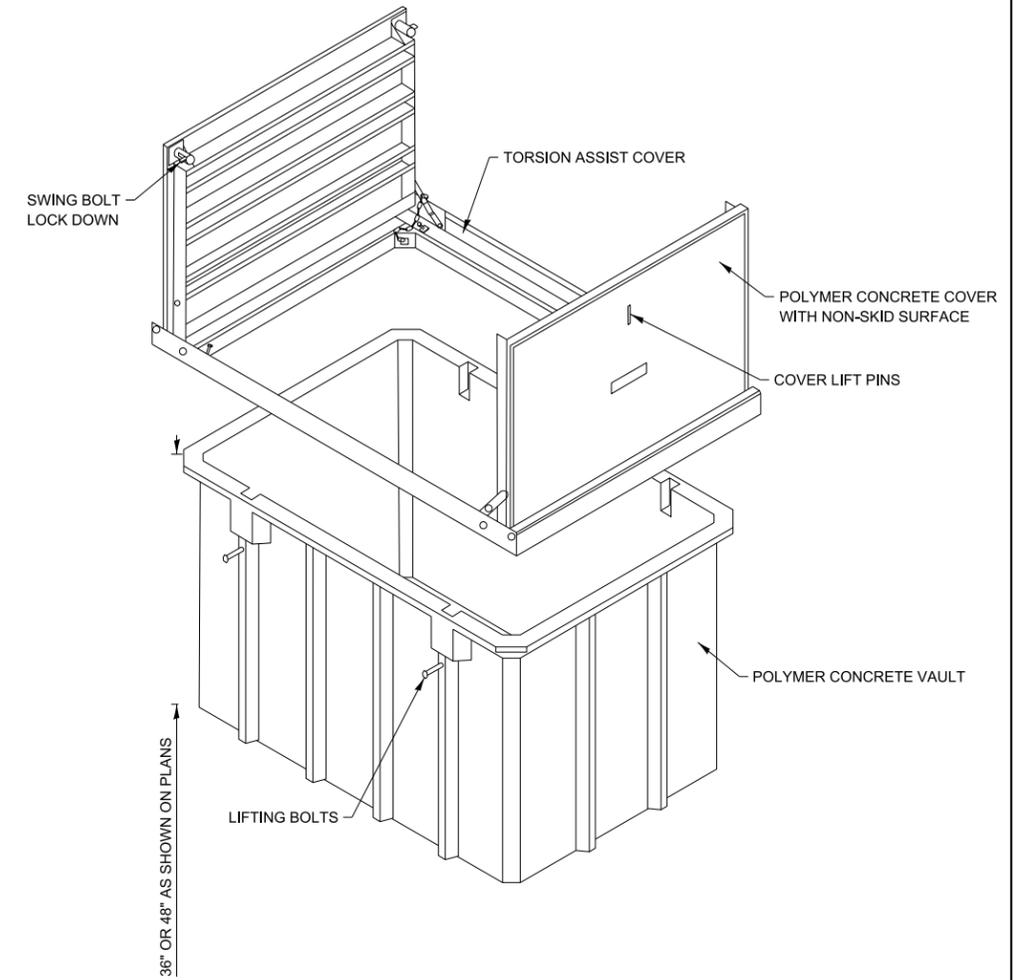
HANDHOLE



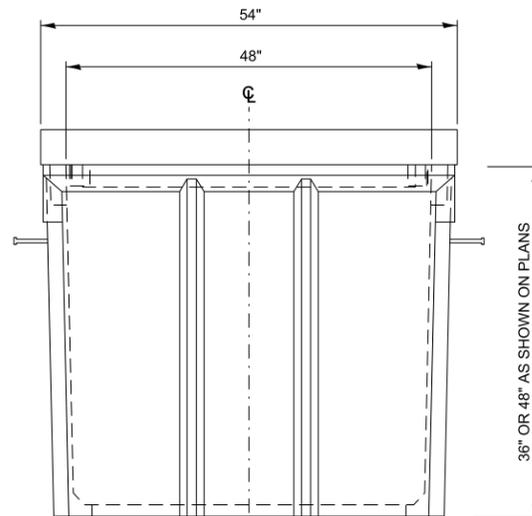
TOP VIEW



TORSION ASSIST COVER



SIDE VIEW



END VIEW

48"X 72" TORSION ASSIST
FOR FIBER OPTIC CABLE SPLICE LOCATIONS
AND SLOPES GREATER THAN OR EQUAL TO 1:4

NOTE:

1. NO CORING/DRILLING OR ALTERATION OF HANDHOLE SHALL BE ALLOWED

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CHIEF ENGINEERING OFFICER
DATE: 03/01/2024



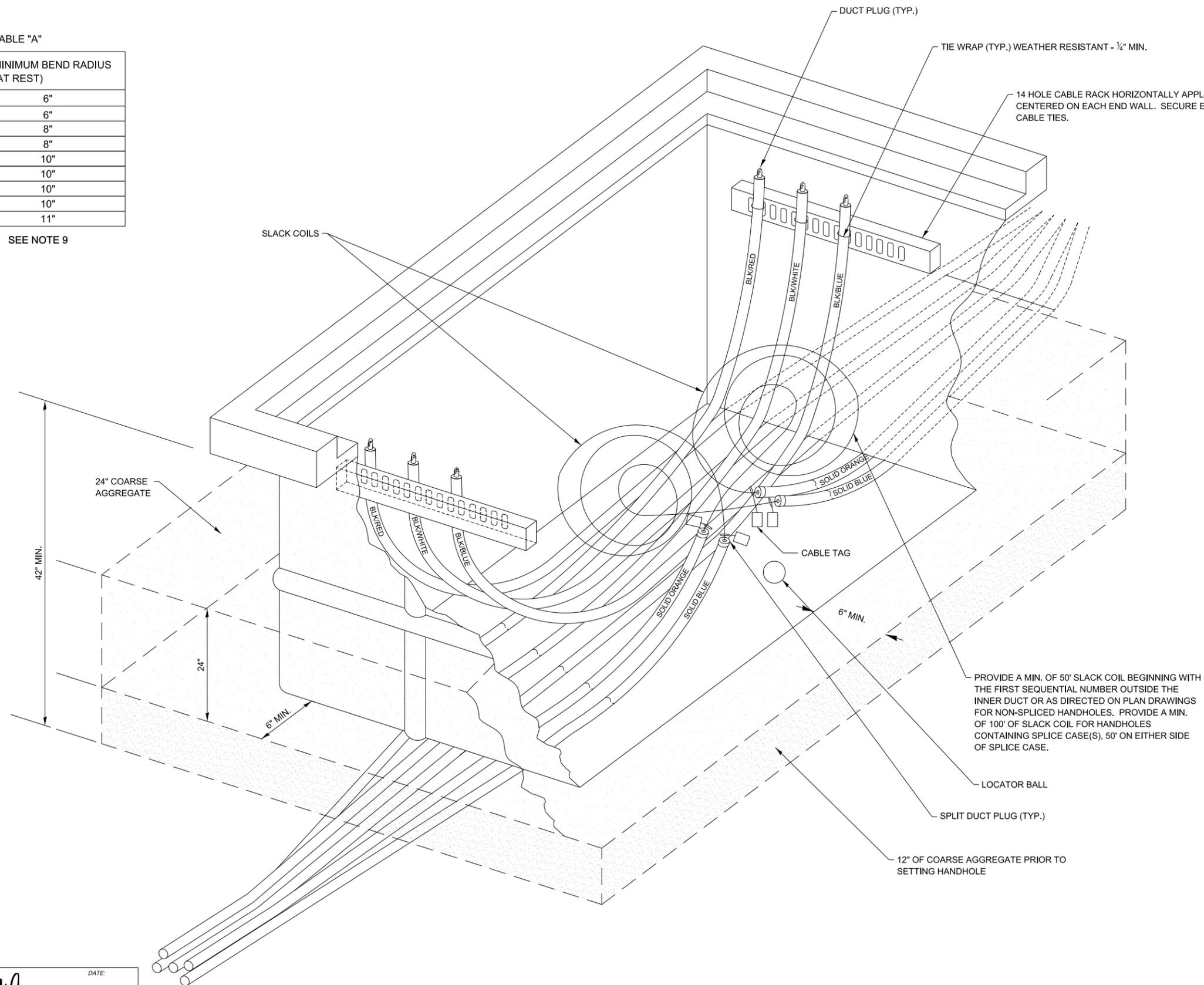
FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS

HDPE AND FIBER OPTIC CABLE PLACEMENT IN HANDHOLE

TABLE "A"

| FIBER COUNT | MINIMUM BEND RADIUS (AT REST) |
|-------------|-------------------------------|
| 24F | 6" |
| 48F | 6" |
| 72F | 8" |
| 96F | 8" |
| 144F | 10" |
| 188F | 10" |
| 288F | 10" |
| 432F | 10" |
| 864F | 11" |

SEE NOTE 9



NOTES:

1. FIBER OPTIC CABLES SHALL HAVE A CABLE I.D. TAG ON BOTH SIDES OF THE SLACK COIL IDENTIFYING THE OWNER, DUCT COLOR, CABLE COUNT, AND DIRECTION.
2. COLOR NOTED ON INNERDUCTS IS FOR REFERENCE ONLY.
3. COIL FIBER CABLE IN HANDHOLE ENSURING THAT THE BEND RADIUS MEETS THE VALUES IN TABLE "A".
4. EACH FIBER CABLE COIL SHALL BE TIED TOGETHER IN A SINGLE TIGHT BUNDLE.
5. EACH FIBER COIL BUNDLE SHALL BE COILED TIGHTLY ENOUGH THAT IT IS NOT COMPRESSED WHEN THE HANDHOLE LID IS CLOSED.
6. FIBER SPLICE CONTAINER SHALL BE PLACED IN THE HANDHOLE ALLOWING FOR EASY ACCESS AND LABELED WITH OWNER, END LOCATIONS, FIBER TYPE, AND FIBER COUNT.
7. FIBER CONDUIT SHALL EXTEND INTO THE HANDHOLE 12 TO 18 INCHES WITH THE END TURNED UP AND SEALED TO MINIMIZE WATER ENTERING THE CONDUIT. SPARE CONDUITS SHALL EXTEND TO CABLE RACK ON OPPOSITE WALL.
8. MANUFACTURER'S SPECIFICATIONS OF MINIMUM BEND RADIUS SUPERCEDE TABLE "A".
9. LOCATOR BALL SHALL BE PLACES IN HANDHOLES CONTAINING A SPLICE ENCLOSURE. PLACE LOCATOR BALL IN THE MIDDLE OF HANDHOLE.

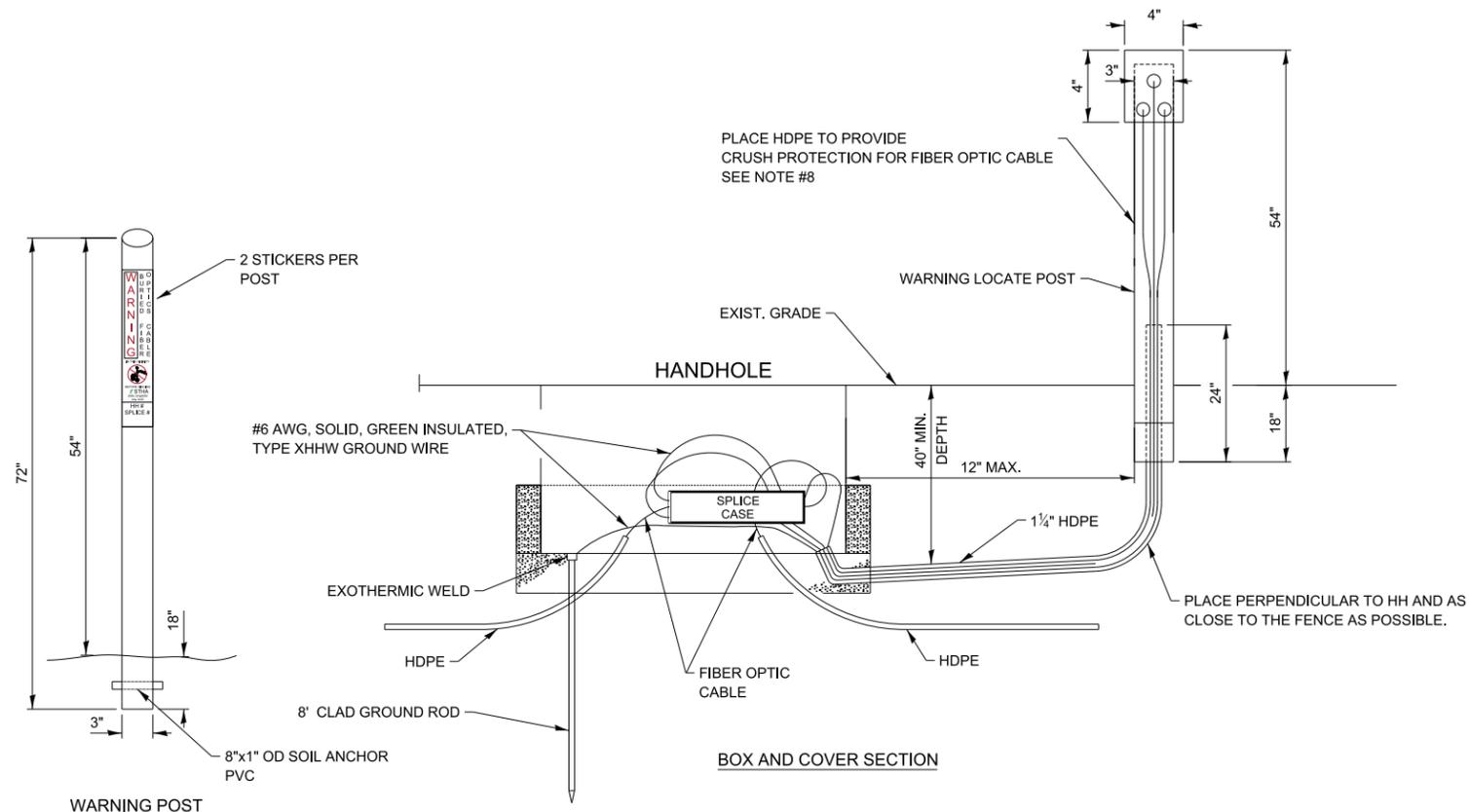
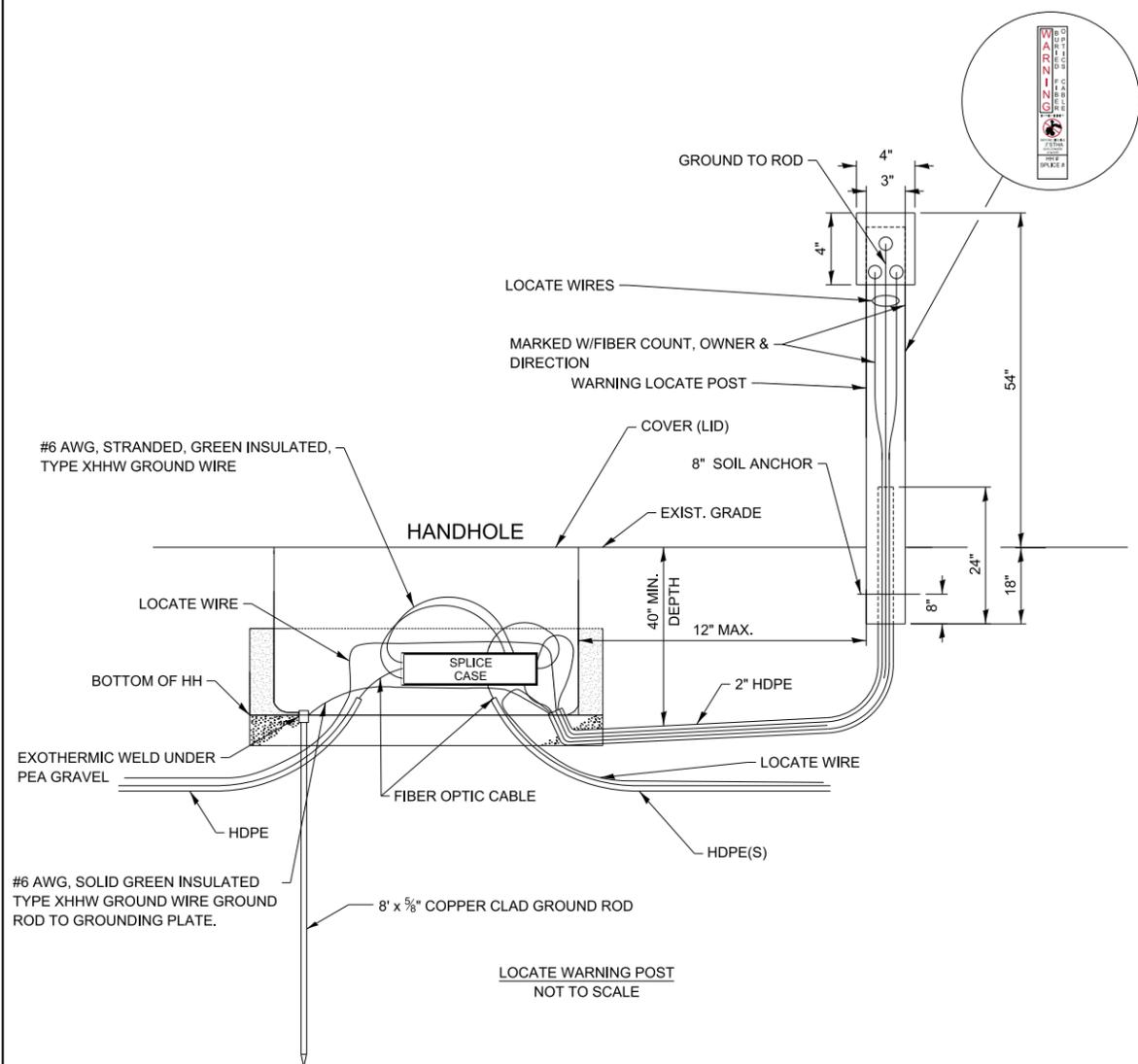
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**FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS**

VERSION: 2024-03 STANDARD: L1-06 SHEET: 8 OF 15

FIBER HANDHOLE SITE DETAIL AND GROUNDING



GENERAL NOTES

- LOCATE WARNING POST SHALL BE PLACED 1 FOOT FROM HANDHOLE OR AT FENCE LINE OR RIGHT-OF-WAY LINE IF POSSIBLE.
- AREA AROUND THE HANDHOLE SHALL BE BACKFILLED ONLY TO THE TOP OF THE BOX. FLUSH TO EXISTING GRADE.
- COIL FIBER CABLE IN HANDHOLE ENSURING THAT THE BEND RADIUS SHALL NOT EXCEED VALUES LISTED IN TABLE A ON SHEET 8.
- INSTALL GROUND ROD & EXOTHERMIC WELD AS PER MANUFACTURER'S INSTRUCTIONS. PLACE THE #6 GROUND WIRE (TYPE XHHW, SOLID, GREEN INSULATED) THAT HAS BEEN ATTACHED TO THE GROUND ROD AND TO THE CENTER LUG OF THE LOCATE POST.
- BACKFILL MATERIAL SHALL BE COMPACTED TO THE SATISFACTION OF THE ENGINEER.
- GROUND WIRE SHALL BE BONDED TO BOTH SHEATHS OF ARMORED FIBER OPTIC CABLE IN THE SPLICE ENCLOSURE USING #6 GROUND STRANDED, GREEN INSULATED WIRE. EACH GROUND SHALL BE ISOLATED WITHIN THE ENCLOSURE.
- INSTALL 2" HDPE CONDUIT FROM HANDHOLE TO WARNING POST TO ALLOW GROUNDING CABLE AND LOCATE TRACE WIRES TO BE INSTALLED.
- NO HANDHOLES WILL BE ALLOWED IN PAVED ROADWAYS OR SHOULDERS.
- THE TOPS OF ALL HANDHOLES SHALL BE FLUSH WITH THE EXISTING GRADE.
- A WATER PROOF SEALING SIMPLEX DUCT PLUG SHALL BE INSTALLED AROUND THE FIBER OPTIC TO SEAL AROUND THE CONDUIT. A WATER PROOF SEALING PLUG SHALL BE INSTALLED IN ALL VACANT CONDUIT.
- ANY WORK IN AN EXISTING SINGLE MODE HANDHOLE OR INVOLVING AN EXISTING SINGLE MODE DUCT AND FIBER SHALL BE COORDINATED WITH THE TOLLWAY FIBER OPTIC CONTRACTOR. USING A-36 PROCESS.
- FOR ALL SPLICE AND HANDHOLE, NUMBER DECALS SHALL BE APPLIED AFTER INSTALLATION IS COMPLETED.
- PLACEMENT OF SIGNS IS PREFERRED OVER POSTS. SIGNS SHALL BE USED ON LOCATIONS WHERE FENCE IS VISIBLE FROM ROAD. POSTS SHALL ONLY BE USED WHERE SIGN WOULD NOT BE VISIBLE FROM ROAD.

APPROVED BY: *Manar Nashif*
 CHIEF ENGINEERING OFFICER
 DATE: 03/01/2024



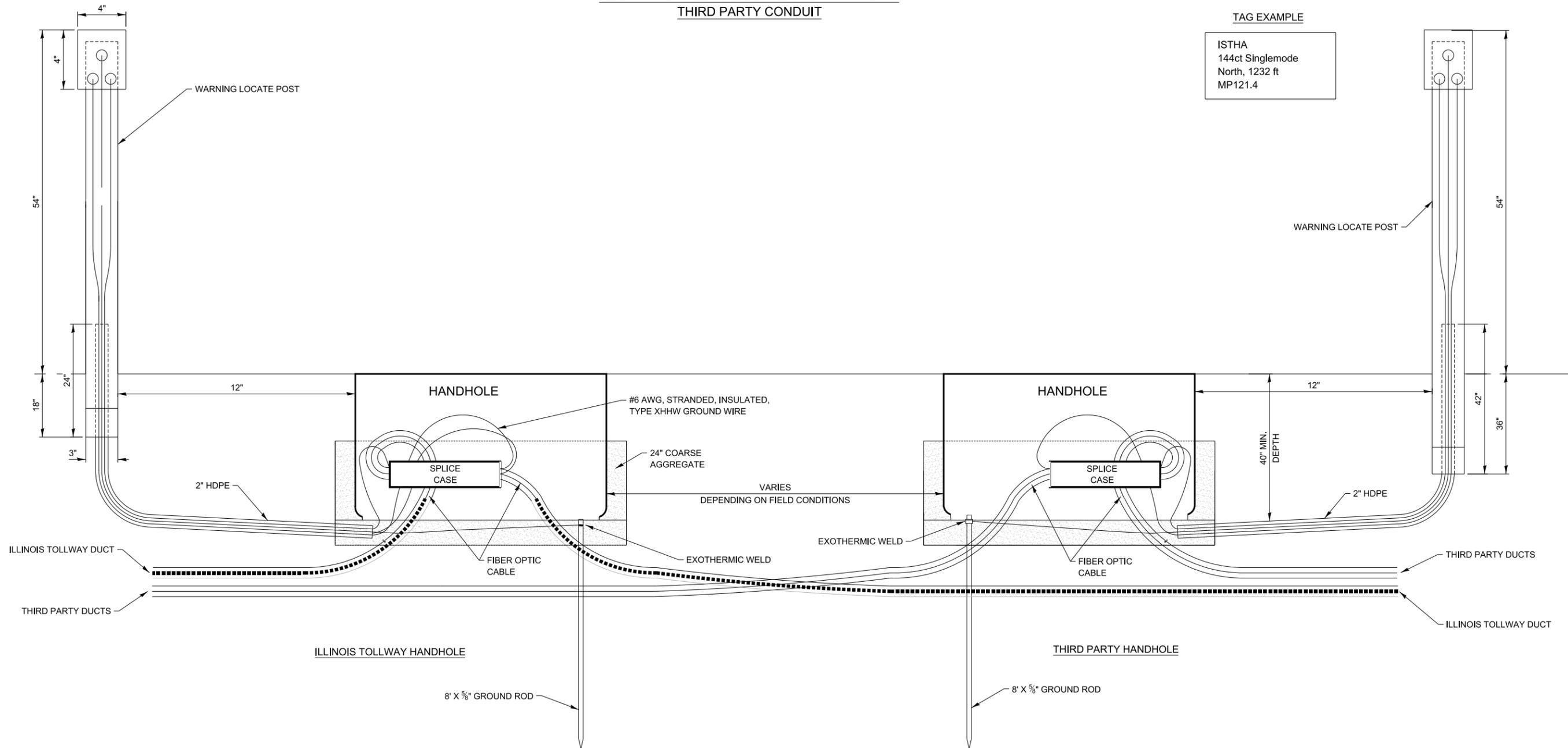
**FIBER OPTIC SYSTEM
 TYPICALS AND DRAWINGS**

VERSION: 2024-03 STANDARD: L1-06 SHEET: 9 OF 15

FIBER HANDHOLE SITE DETAIL AND GROUNDING
THIRD PARTY CONDUIT

TAG EXAMPLE

ISTHA
144ct Singlemode
North, 1232 ft
MP121.4



NOTES:

1. WARNING LOCATE POST SHALL BE PLACED 1 FOOT FROM HANDHOLE OR AT FENCE LINE IF POSSIBLE.
2. AREA AROUND HANDHOLE SHALL BE BACKFILLED ONLY TO THE TOP OF THE BOX FLUSH TO EXISTING GRADE.
3. INSTALL GROUND ROD & EXOTHERMIC WELD AS PER MANUFACTURER'S INSTRUCTIONS. PLACE THE #6 GROUND WIRE (TYPE XHHW, SOLID, GREEN INSULATED) THAT HAS BEEN ATTACHED TO THE GROUND ROD ON THE CENTER LUG OF THE WARNING LOCATE POST.
4. GROUND WIRE SHALL BE BONDED TO BOTH SHEATHS OF ARMORED FIBER OPTIC CABLE IN THE SPLICE ENCLOSURE USING #6 STRANDED GREEN INSULATED TYPE XHHW GROUND WIRE. EACH GROUND SHALL BE ISOLATED WITHIN THE ENCLOSURE.
5. PLACE HDPE OVER FIBER OPTIC CABLE TO PROVIDE CRUSH PROTECTION EXTEND HDPE 1' INSIDE HANDHOLE.
6. NO HANDHOLES SHALL BE ALLOWED IN PAVED ROADWAYS OR SHOULDERS.
7. THE TOPS OF ALL HANDHOLES SHALL BE FLUSH WITH THE EXISTING GRADE UNLESS THE SLOPE IS GREATER THEN 1:4. IF SO, THE HANDHOLE SHALL BE PLACED LEVEL WITH THE EARTH GRADED AROUND IT SO NO PART OF THE SIDES OF THE HANDHOLE IS EXPOSED.
8. A WARNING LOCATE POST SHALL BE INSTALLED AT ALL HANDHOLES.
9. LOCATE WIRE SHALL BE TESTED FROM HANDHOLE TO HANDHOLE PRIOR TO ANY FIBER BEING INSTALLED IN CONDUIT.
10. LOCATE WIRES SHALL BE TAGGED INSIDE LOCATE POST. THE TAG SHALL SHOW THE FIBER OWNER, FIBER COUNT, FIBER TYPE, DIRECTION (N,S,E,W), DISTANCE TO NEXT LOCATE POST, AND MILE POST AT THAT LOCATION.

APPROVED BY:
Manar Nashif
CHIEF ENGINEERING OFFICER

DATE:
03/01/2024



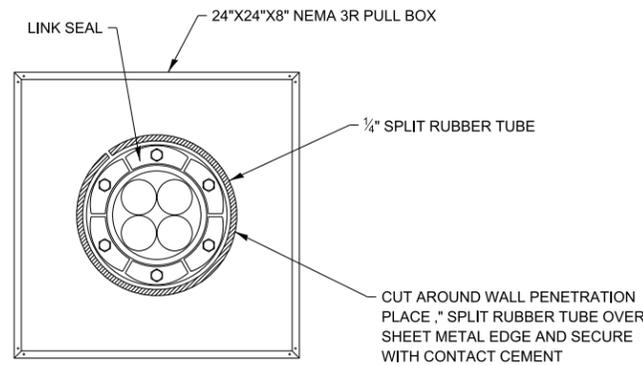
FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS

| | | |
|---------------------|--------------------|--------------------|
| VERSION: 2024-03 | STANDARD: L1-06 | SHEET: 10 OF 15 |
|---------------------|--------------------|--------------------|

NOTE:

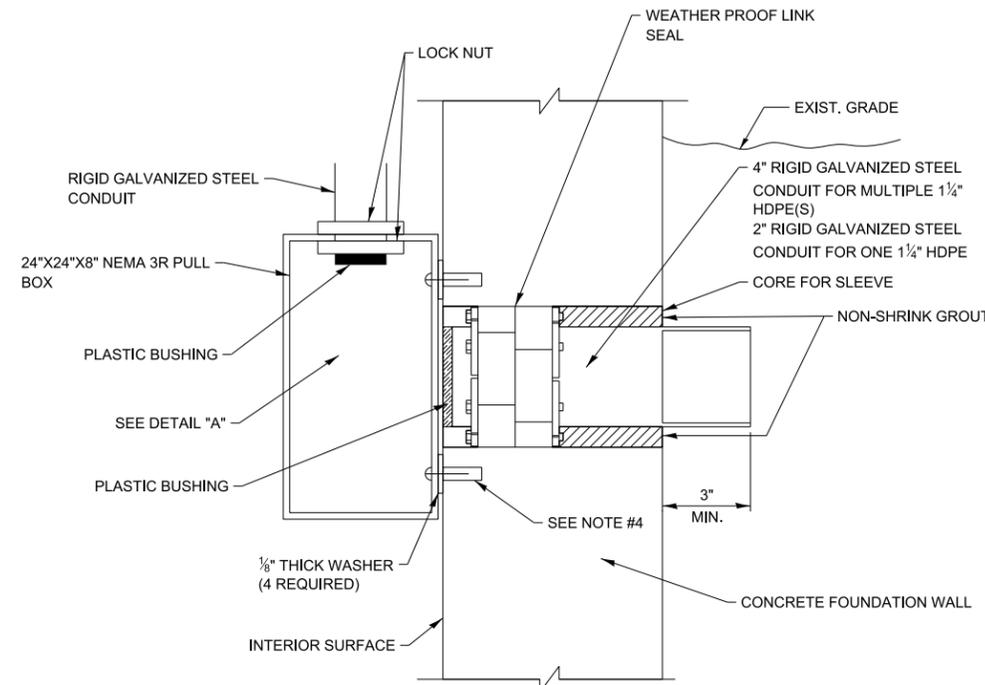
THE MAXIMUM PIPE STRAP SPACING SHALL BE 30" MAX. VERTICAL AND 18" HORIZONTAL MAXIMUM DISTANCE. A MINIMUM OF TWO PIPE STRAPS SHALL BE PLACED FOR ANY CONDUIT PLACED HIGHER THAN 4' ABOVE GRADE.

WALL PENETRATION DETAIL



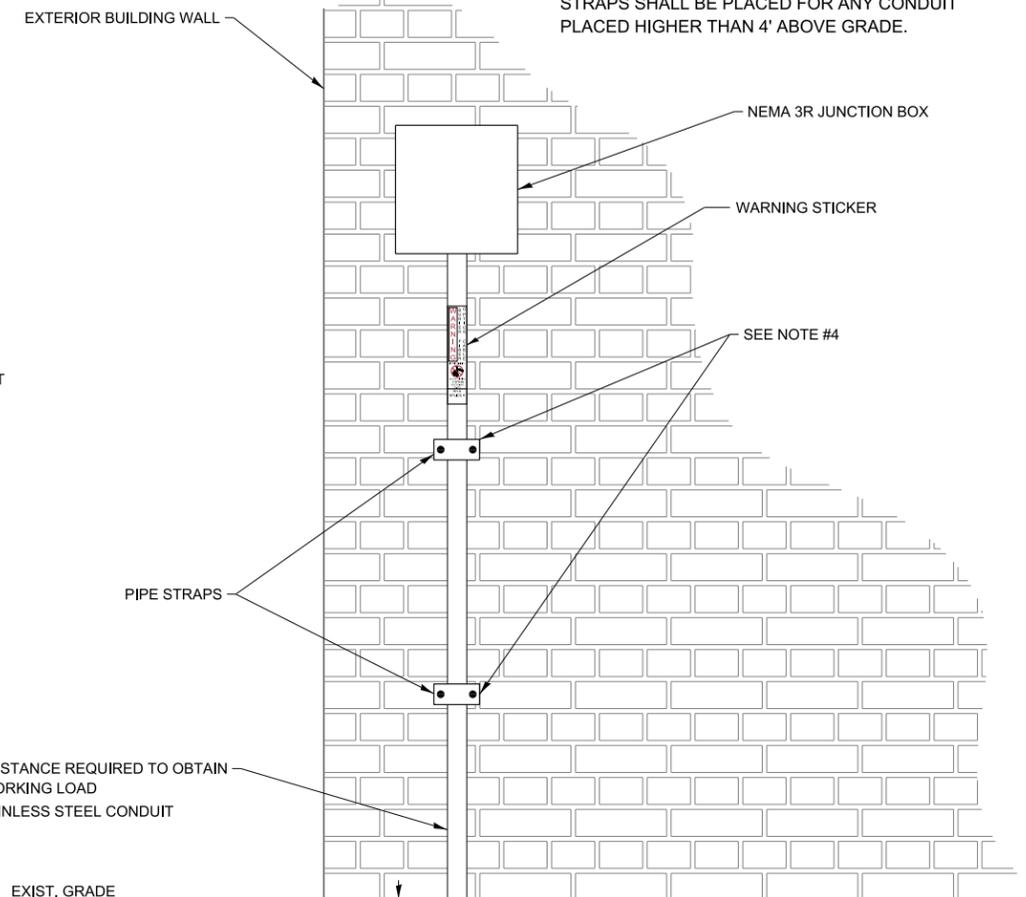
DETAIL A

FRONT VIEW
BELOW GRADE
BUILDING ENTRANCE PULL BOX



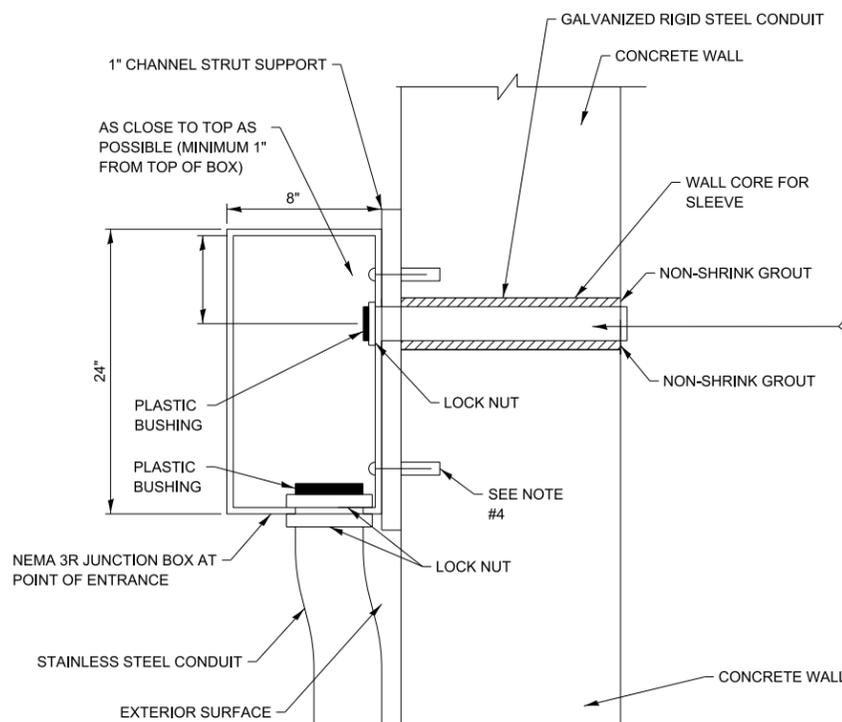
DETAIL B

SIDE VIEW
BELOW GRADE
BUILDING ENTRANCE PULL BOX



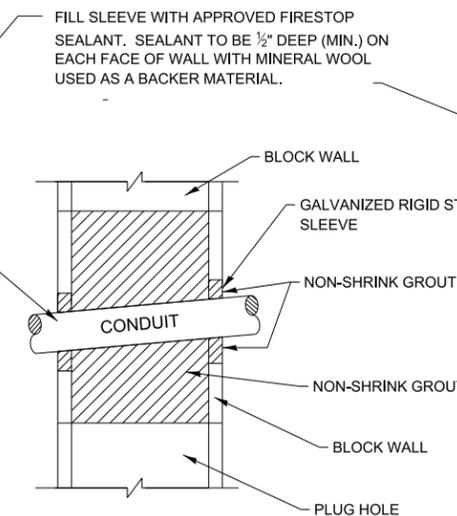
DETAIL C

ABOVE GRADE
BUILDING ENTRANCE
CONDUIT



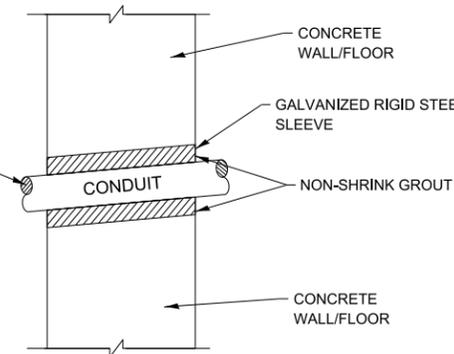
DETAIL D

ABOVE GRADE
BUILDING ENTRANCE PULL BOX



DETAIL E

BLOCK WALL PENETRATION



DETAIL F

CONCRETE WALL/FLOOR PENETRATION BUILDING PENETRATIONS SPECIFIED AS DETAIL F MAY BE A COMBINATION OF POURED OR HOLLOW CONCRETE BLOCK WITH A BRICK EXTERIOR. IF HOLLOW BLOCK IS ENCOUNTERED COMPLETE INSTALLATION PER DETAIL E THIS SHEET.

GENERAL NOTES:

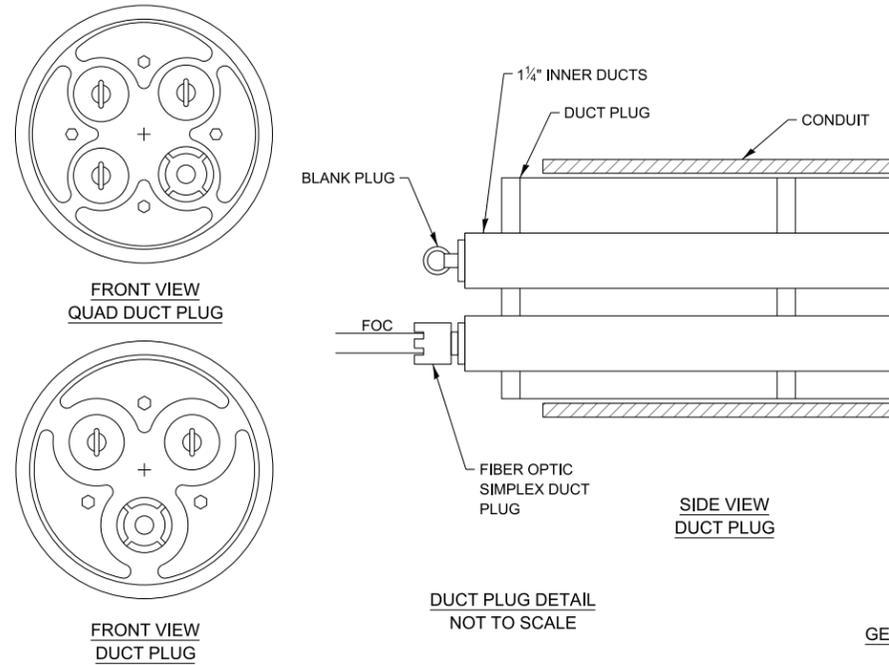
1. ALL PENETRATIONS SHALL UTILIZE EXISTING UNUSED BUILDING PENETRATIONS TO THE MAXIMUM EXTENT POSSIBLE.
2. ALL EXTERIOR MATERIALS SHALL BE STAINLESS STEEL UNLESS OTHERWISE NOTED.
3. ALL ANCHORS SHALL BE INSTALLED IN SOUND CONCRETE OR MASONRY.
4. USE APPROVED MASONRY ANCHOR.
5. ALL CONDUITS ENTERING THE BUILDING SHALL BE PITCHED AWAY FROM BUILDING.

APPROVED BY: *Manar Nashif*
CHIEF ENGINEERING OFFICER
DATE: 03/01/2024



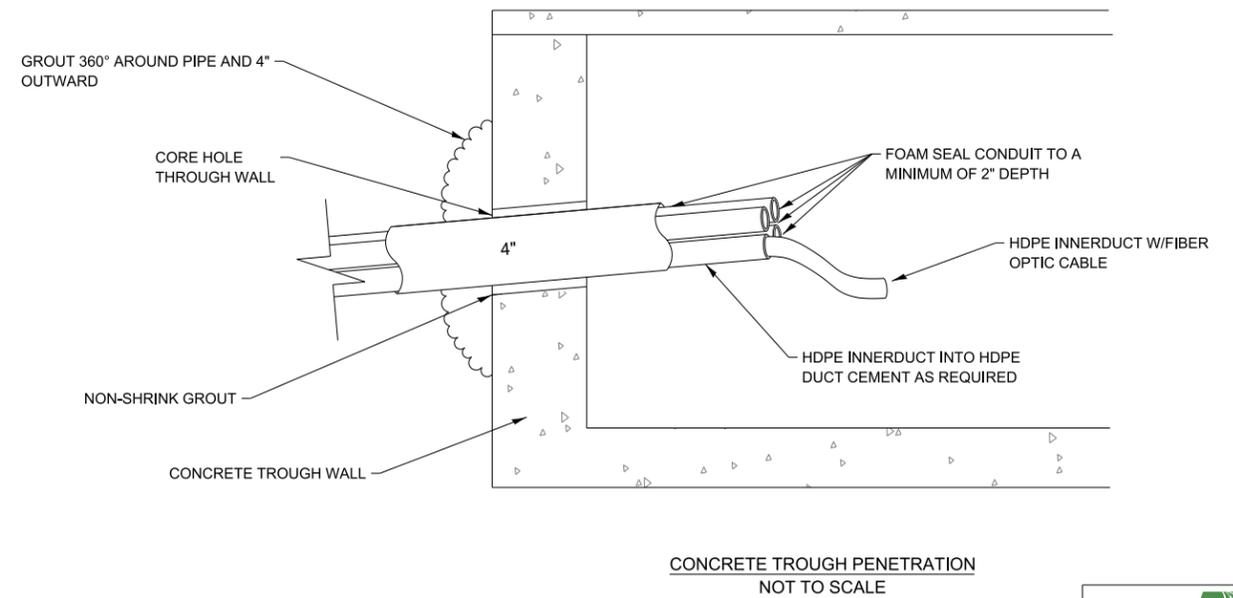
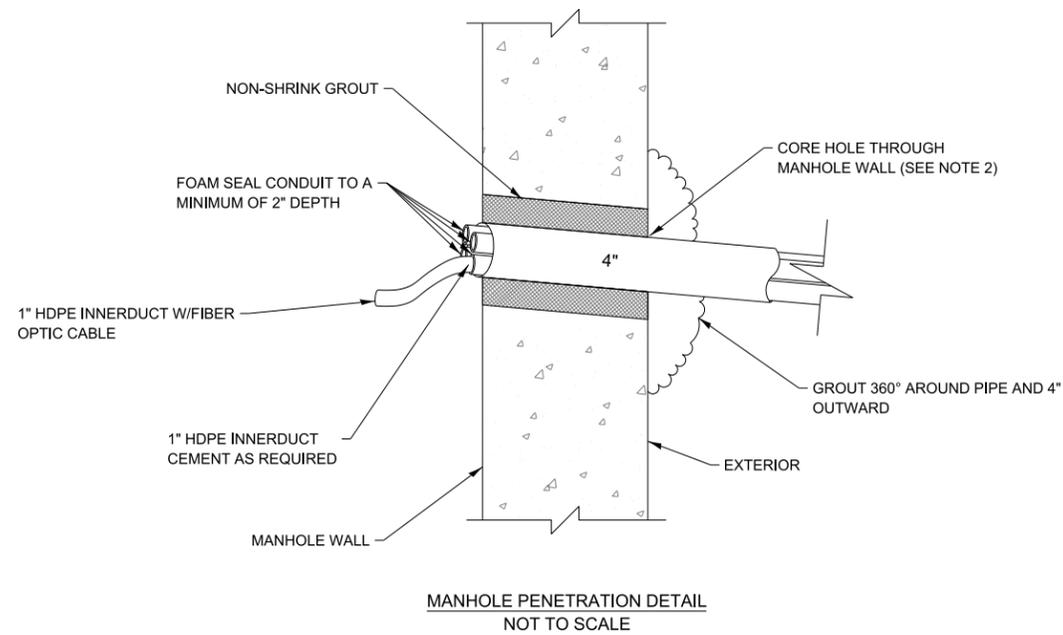
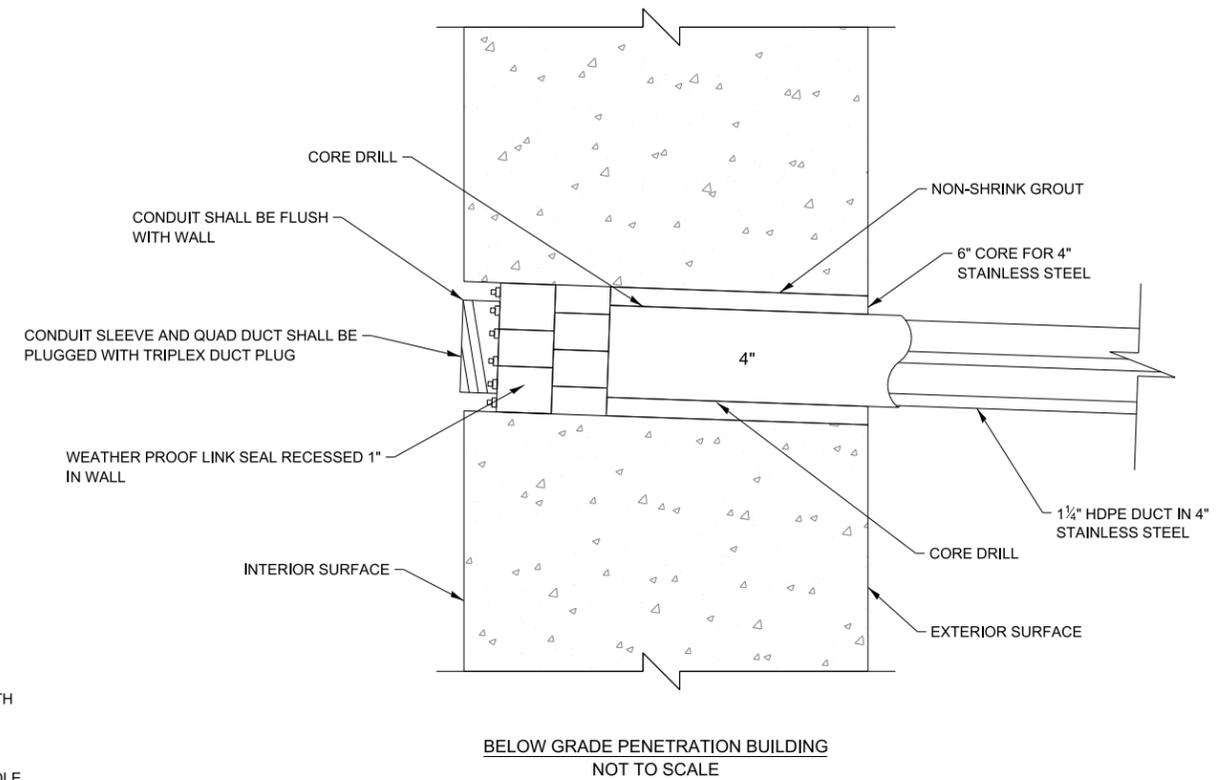
**FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS**

UNDERGROUND PENETRATION DETAIL



GENERAL NOTES:

1. STAINLESS STEEL CONDUIT EXTENDING THROUGH FOUNDATION WALL SHALL BE ONE CONTINUOUS PIECE (NO COUPLINGS), SQUARE WITH BUILDING AT A SLIGHT ANGLE TO THE EXTERIOR TO PREVENT WATER SEEPAGE.
2. MANHOLE CORES SHALL NOT BE THROUGH MANHOLE CONE.



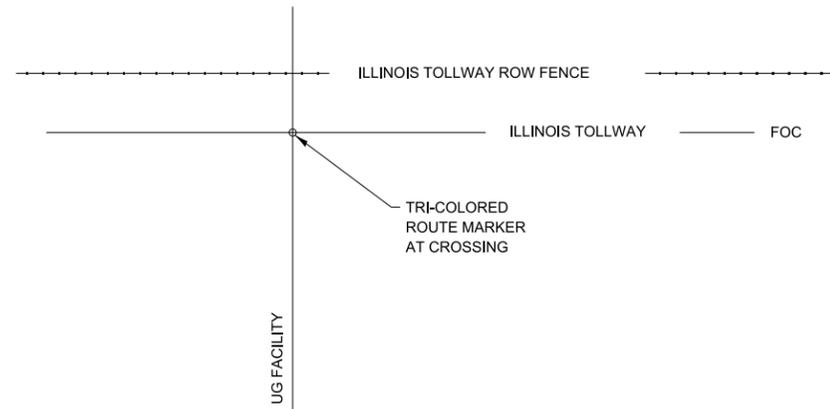
APPROVED BY: *Manar Nashif*
CHIEF ENGINEERING OFFICER

DATE: 03/01/2024



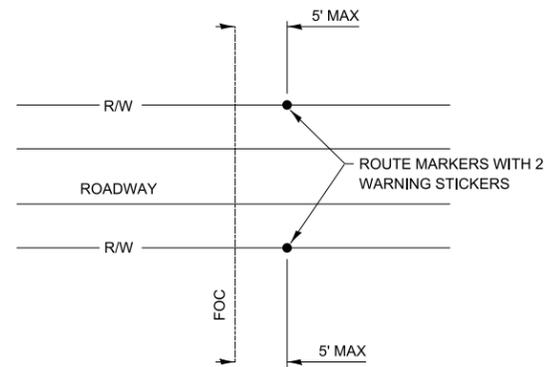
**FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS**

GAS, TELE, POWER, WATER, PIPELINE,
SEWER, CATV, ETC.

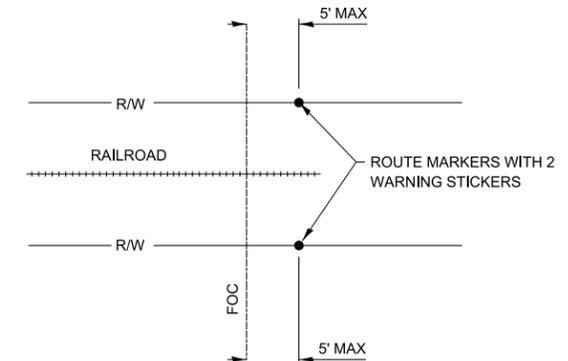


FACILITY CROSSING
FIG. 1

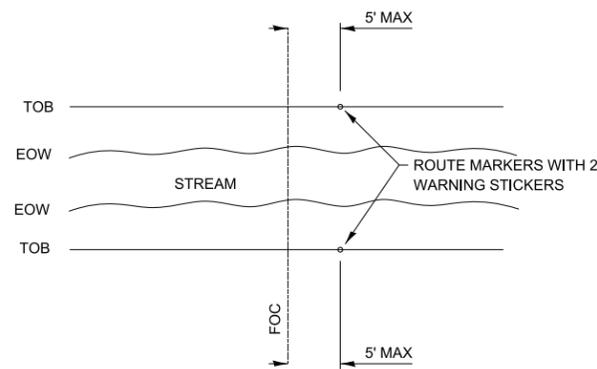
BURIED CABLE SIGNAGE



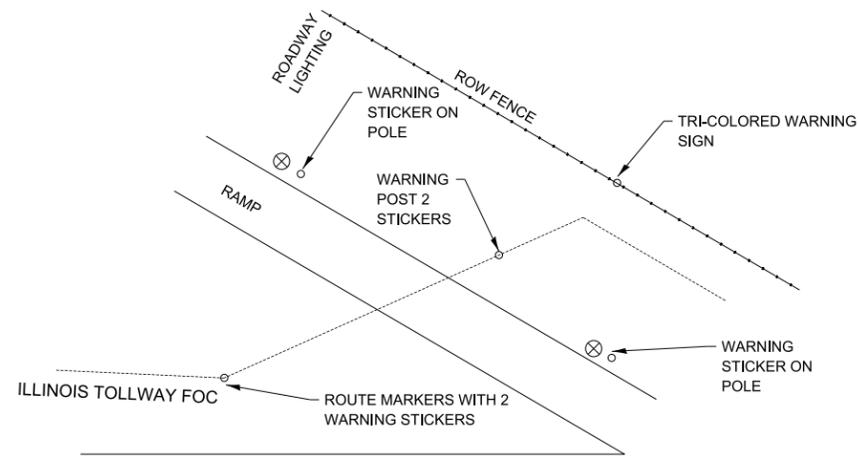
TYPICAL MARKER PLACEMENT AT ROAD AND BRIDGE CROSSING
FIG. 2



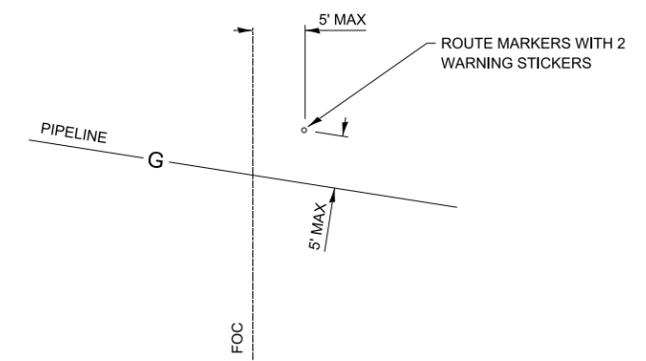
TYPICAL MARKER PLACEMENT AT RAILROAD CROSSING
FIG. 3



TYPICAL MARKER PLACEMENT AT RIVER,
CREEK & DRAINAGE DITCH CROSSING
FIG. 4



MAIN LINE
ON/OFF RAMP CROSSING
FIG. 5



TYPICAL MARKER PLACEMENT AT PIPELINE CROSSING
FIG. 6

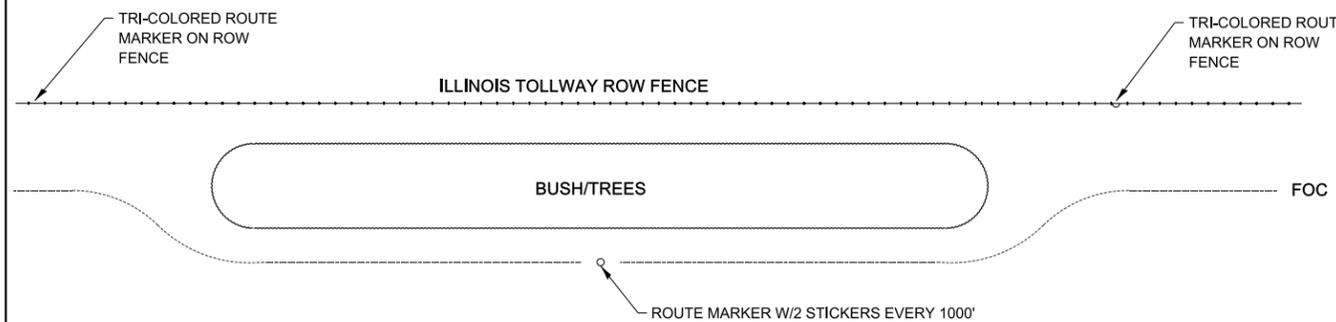
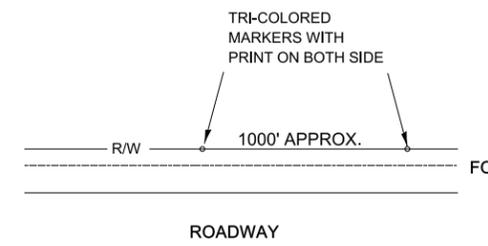


FIG. 7



TYPICAL MARKER PLACEMENT
TO BE PLACED NEXT TO R.O.W. FENCE LINE
FIG. 8

GENERAL NOTES:

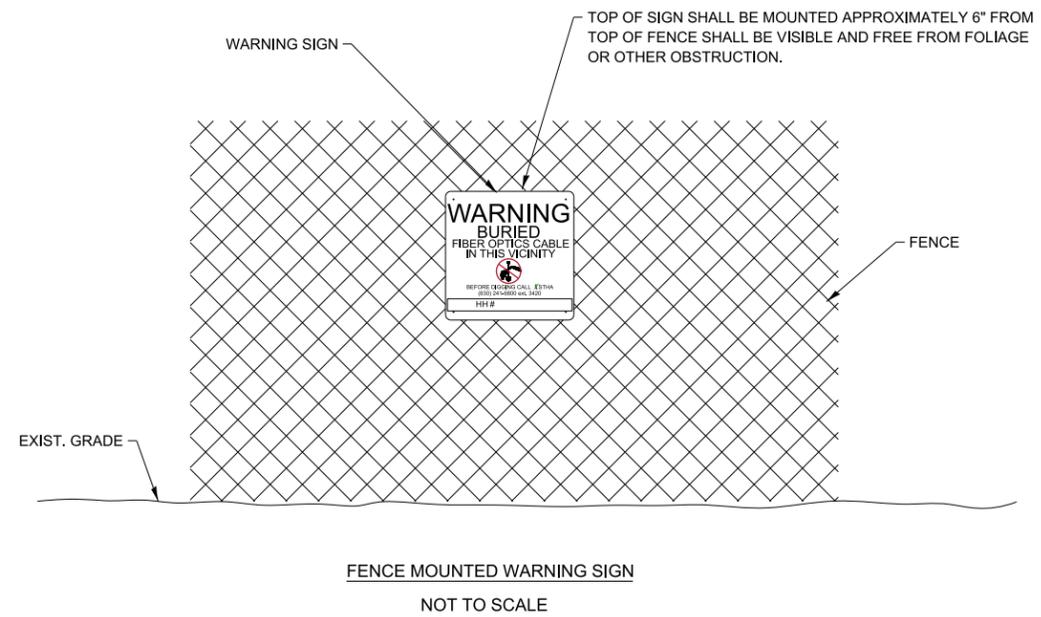
1. MAINTAIN A MINIMUM DISTANCE OF 5' FROM ANY UTILITY POLE OR PEDESTAL SIGN, MARKER POLE, OR ANY OTHER STRUCTURE.
2. WARNING MARKERS SHALL BE PLACED AT 1000' INTERVALS AND AT CHANGES IN CABLE LOCATION/DIRECTION OR AT CROSSING POINT OF OTHER UNDERGROUND FACILITIES. THE CONTRACTOR SHALL ADJUST EXCAVATION AS NECESSARY TO AVOID HIDDEN OBSTACLES AND TO MAINTAIN MAXIMUM DISTANCE FROM THE EDGE OF PAVEMENT. ALL DEVIATIONS SHALL BE APPROVED BY THE ENGINEER.

APPROVED BY:
Manar Nashif
CHIEF ENGINEERING OFFICER
DATE:
03/01/2024



FIBER OPTIC SYSTEM
TYPICALS AND DRAWINGS

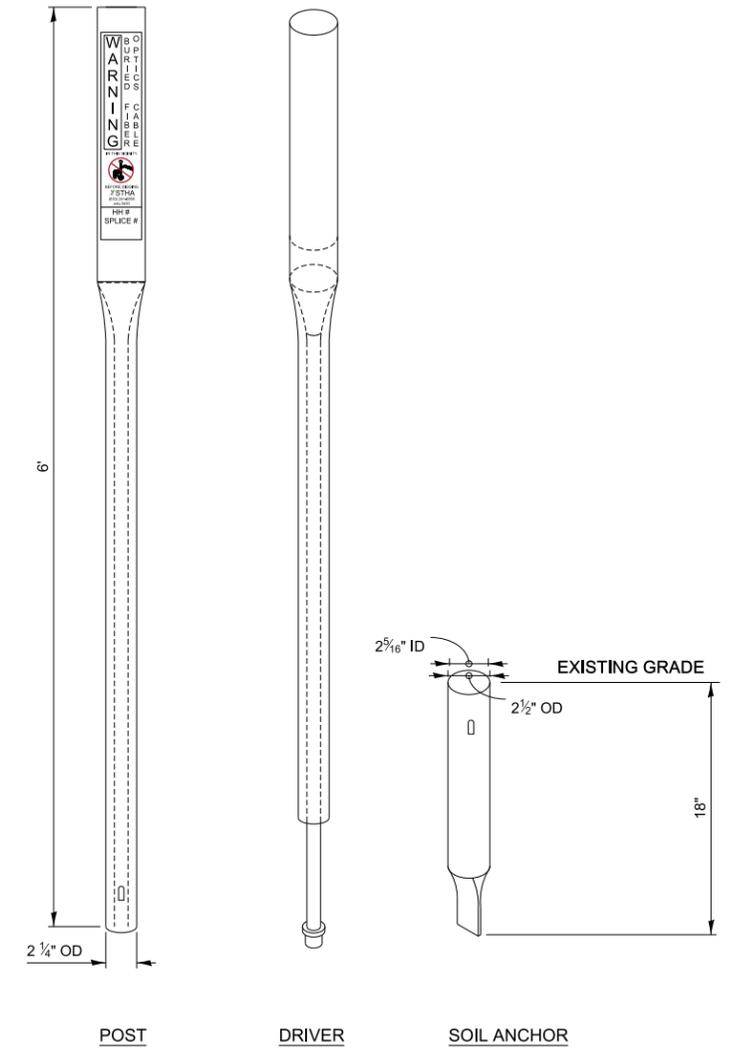
ROUTE MARKER INSTALLATION PROCEDURE



FENCE MOUNTED WARNING SIGN
NOT TO SCALE

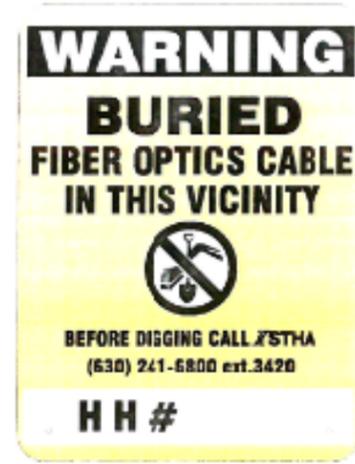
INSTALLATION OF WARNING POST:

1. INSTALL WARNING POST ACCORDING TO MANUFACTURERS INSTRUCTIONS AND RECOMMENDATIONS.
2. PLACEMENT OF POST SHALL NOT INTERFERE WITH THE REMOVAL OF HANDHOLE LIDS
3. WARNING SIGN SHALL BE ATTACHED TO ROW FENCE WHEREVER POSSIBLE. UV STABILIZED BLACK NYLON CABLE TIES (14" LENGTH, .30" WIDTH, 120 LBS TENSILE STRENGTH), (4 EA.) 3 WRAPS EACH TIE, SHALL BE USED TO ATTACH WARNING SIGN TO FENCE.
4. SEE SHEET 15 OF THIS SERIES FOR FIBER WARNING LABEL AND WARNING SIGN DETAILS.



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DATE: 03/01/2024

FIBER WARNING LABEL & WARNING SIGN DETAILS



FENCE SIGN

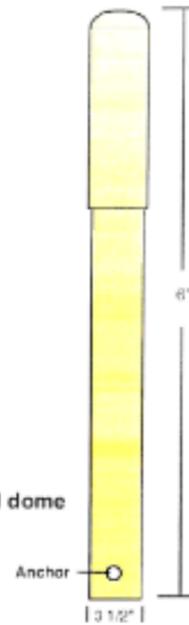


Products provided by:



Part #: SA-ISTHA
 Size: 12" T X 9" W
 Material: Polyethylene
 Color: Black text with Orange bkgd. with white
 Holes: 4 - 3/16"

Part #: PP6-ISTHA
 Size: 6"
 Material: Polydome
 Color: Orange Post and dome



ROUTE MARKER POST

ROUTE MARKER POST DECAL

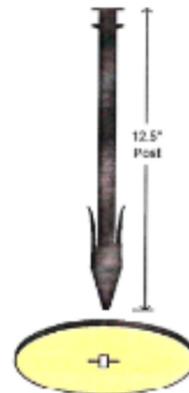


Part #: PTP466000-ISTHA - 4" X 6,000', 6MIL Orange with black text
 WARNING TAPE



FLUSH DISC MARKER

Part #: FMM-6-ISTHA
 Size: 6"
 Material: Clear .125 Lexan
 Color: Black text with Orange bkgd
 Holes: center for 12.5 plastic anchor



Part #: D-314-ISTHA
 Size: 14" x 3"
 Material: Decal
 Color: Orange with black text, Black "Warning" panel with white text, White no dig
 Scale: Shown @ 50%

NOTE:

SIGN AND LABEL SHOWN IS AVAILABLE THROUGH ACP INTERNATIONAL. ALTERNATE SIGN LABELS SHALL BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

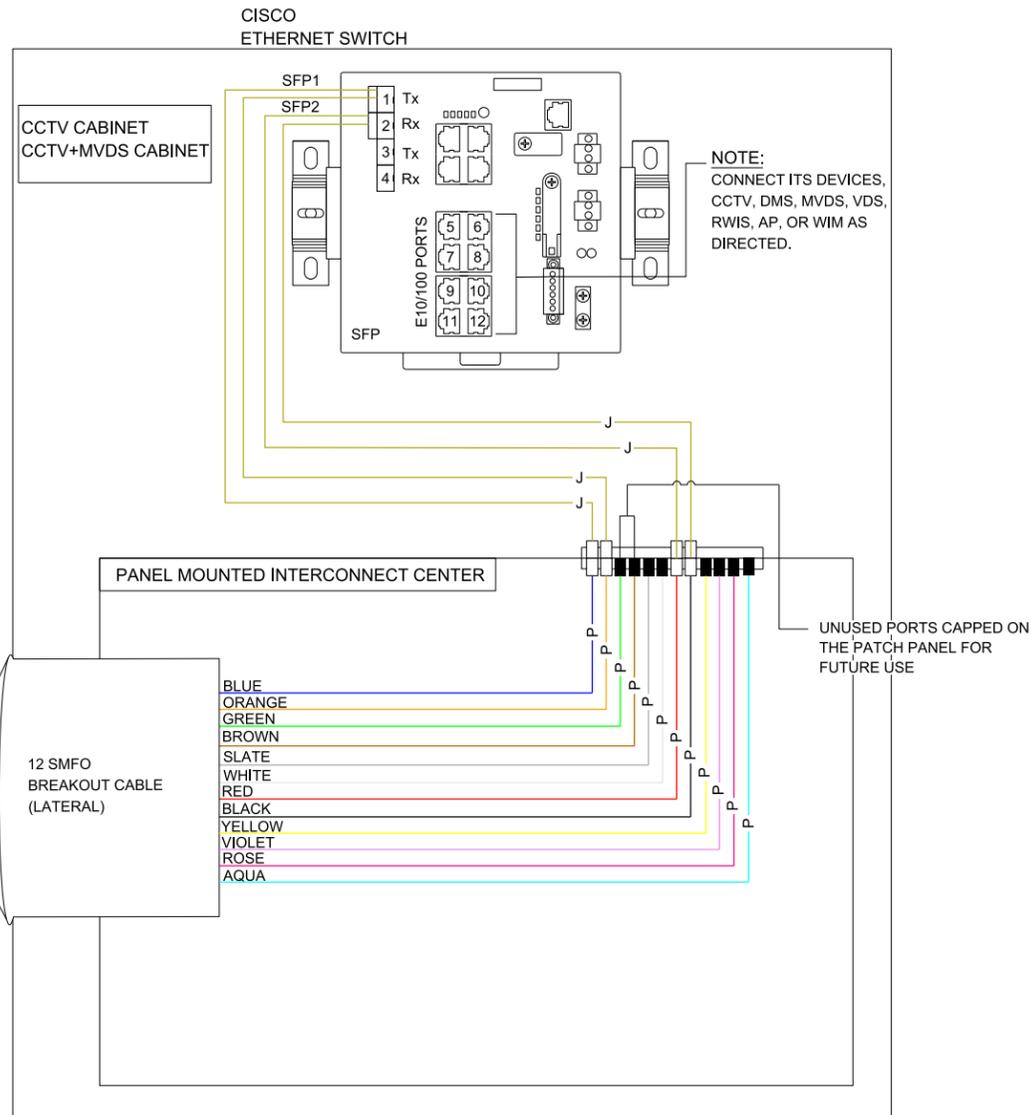
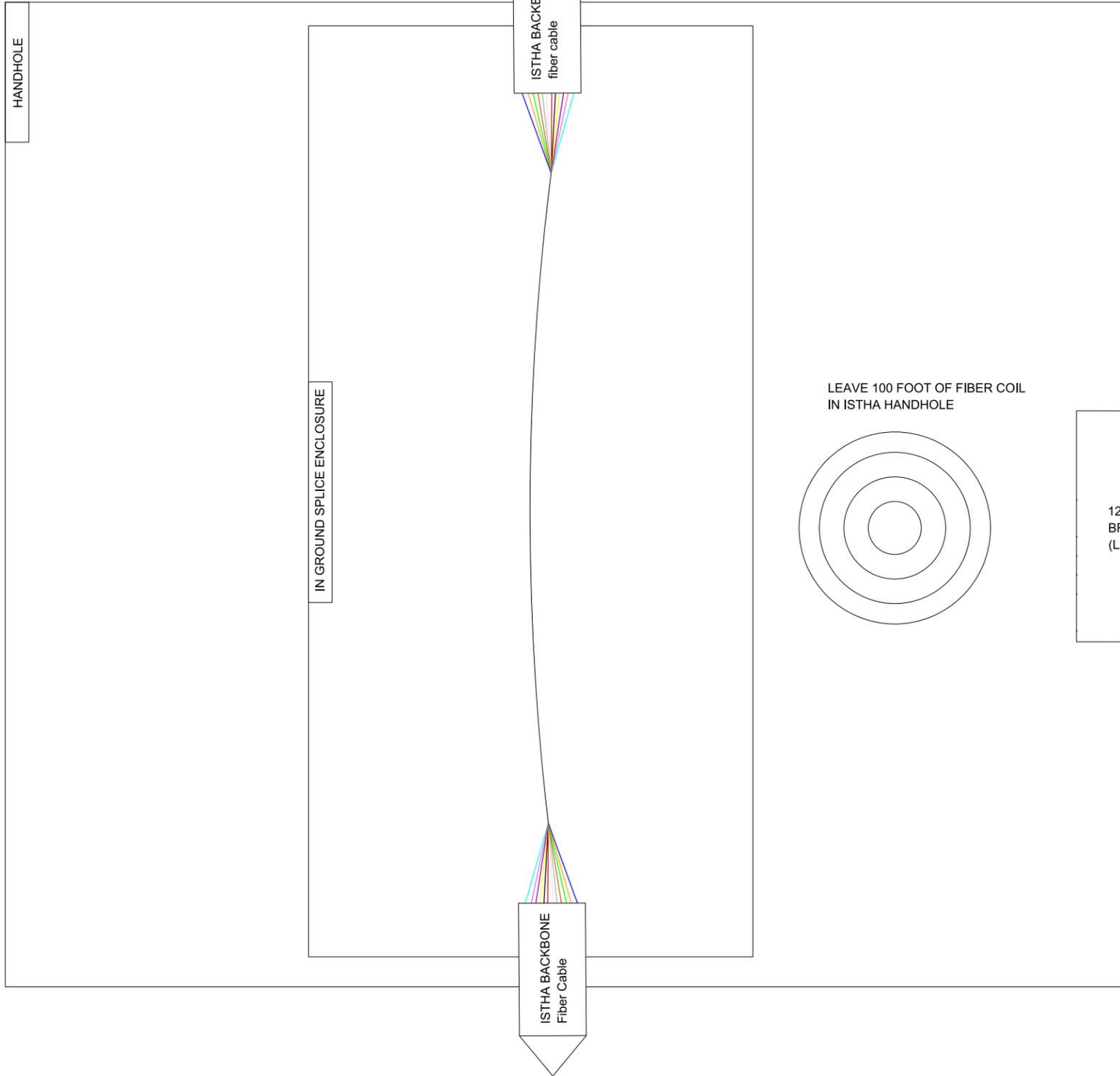
APPROVED BY: *Manar Nashif*
 CHIEF ENGINEERING OFFICER
 DATE: 03/01/2024



FIBER OPTIC SYSTEM
 TYPICALS AND DRAWINGS

SMFO ISTHA COMMUNICATIONS CABLE TO NEXT UP-STREAM NODE LOCATION

ITS CABINET FIBER CONNECTION DETAILS



NOTES:

1. CONTRACTOR SHALL COORDINATE WITH THE ENGINEER AND THE ILLINOIS TOLLWAY FIBER OPTIC MANAGER FOR FINAL PORT ASSIGNMENTS DURING INSTALLATION AND INTEGRATION.
2. CONTRACTOR SHALL LABEL ALL NETWORK SWITCHES, DATA CABLES, FIBER OPTIC CABLES AND JUMPERS AS PER THE LATEST ILLINOIS TOLLWAY "ITS LABELING GUIDELINE".
3. CONTRACTOR SHALL MAKE ALL NETWORK SWITCH CONNECTIONS, UNLESS OTHERWISE NOTED.
4. THE COLOR VERSION OF THE L2 STANDARD DRAWINGS ARE AVAILABLE ON THE ILLINOIS TOLLWAY WEBSITE.
5. CONTRACTOR SHALL COMPLETE AND SUBMIT AN A-36 WATCH AND PROTECT REQUEST WHEN ACCESSING A FIBER HANDHOLE WITHIN ILLINOIS TOLLWAY RIGHT-OF-WAY FOR ANY PURPOSE.

LEGEND

- FIBER OPTIC JUMPER, SINGLE MODE
- FIBER OPTIC PIGTAIL, SINGLE MODE
- BARE FIBER LEFT COILED IN SPLICE TRAY
- FIBER OPTIC FUSION SPLICE
- FIBER PATCH PANEL, SC CONNECTORS

| REVISIONS | |
|------------|---|
| DATE | DESCRIPTION |
| 03-01-2024 | MODIFIED DRAWING, MODIFIED NOTE 1, MODIFIED NOTE 2. |
| 03-01-2022 | CHANGED TO 12 FIBER LATERAL. |
| 03-01-2021 | UPDATED ETHERNET SWITCH AND PANELS. |

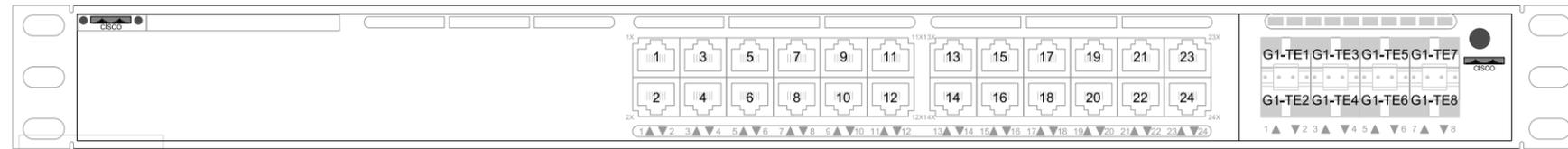
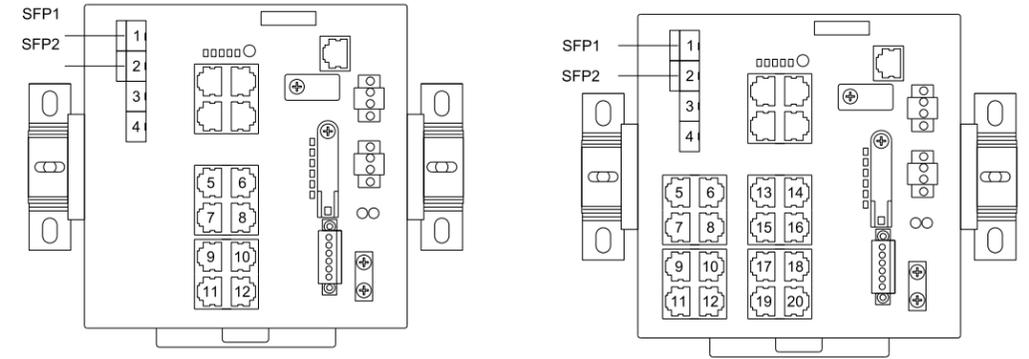
FIBER OPTIC SPLICING DETAILS

VERSION: 2024-03 STANDARD: L2-04 SHEET: 1 OF 2

APPROVED BY: *Manar Nashif* DATE: 03/01/2024
 CHIEF ENGINEERING OFFICER

SMFO ISTHA COMMUNICATIONS CABLE TO NEXT DOWNSTREAM NODE LOCATION

PROPOSED NETWORK SWITCH PORT ASSIGNMENT SCHEMATIC

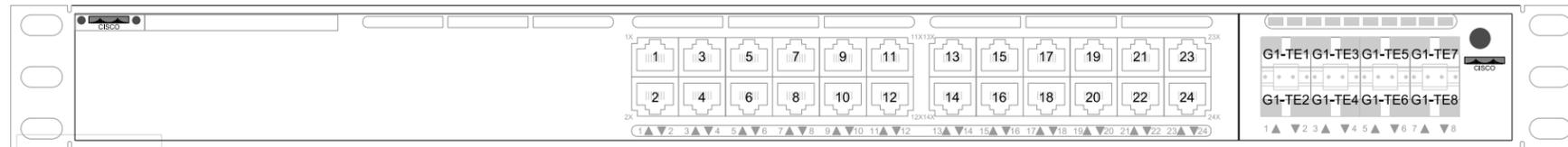


CISCO ETHERNET SWITCH
10/100/1000 ETHERNET AND 10G SFP PORT ARRANGEMENT

| PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT |
|-------------------------|-------------------------------------|-------------|----------------------------|-------------|----------------------------|-------------|-----------------|
| TENGIGABITETHERNET1/1/1 | PRIMARY N/E LAYER 3 UPLINK | G11/0/1 | TECH ACCESS | G11/0/9 | RESERVED - IT DEVICE - TBD | G11/0/17 | OPEN |
| TENGIGABITETHERNET1/1/2 | SECONDARY N/E LAYER 2 UPLINK | G11/0/2 | RESERVED - IT DEVICE - TBD | G11/0/10 | RESERVED - IT DEVICE - TBD | G11/0/18 | OPEN |
| TENGIGABITETHERNET1/1/3 | N/E LAYER 2 - CAMERA AND VDS | G11/0/3 | RESERVED - IT DEVICE - TBD | G11/0/11 | OPEN | G11/0/19 | OPEN |
| TENGIGABITETHERNET1/1/4 | N/E LAYER 2 - ATM/DMS | G11/0/4 | RESERVED - IT DEVICE - TBD | G11/0/12 | OPEN | G11/0/20 | OPEN |
| TENGIGABITETHERNET1/1/5 | N/E LAYER 2 - VWIM | G11/0/5 | RESERVED - IT DEVICE - TBD | G11/0/13 | OPEN | G11/0/21 | OPEN |
| TENGIGABITETHERNET1/1/6 | FUTURE/TBD | G11/0/6 | RESERVED - IT DEVICE - TBD | G11/0/14 | OPEN | G11/0/22 | OPEN |
| TENGIGABITETHERNET1/1/7 | FUTURE/TBD | G11/0/7 | RESERVED - IT DEVICE - TBD | G11/0/15 | OPEN | G11/0/23 | OPEN |
| TENGIGABITETHERNET1/1/8 | SECONDARY N/E TO S/W LAYER 3 UPLINK | G11/0/8 | RESERVED - IT DEVICE - TBD | G11/0/16 | OPEN | G11/0/24 | OPEN |

CISCO ETHERNET SWITCH
10/100/1000 SFP PORT ARRANGEMENT

| PORT NUMBER | 12 PORT SWITCH (CCTV/VDS/DMS) PORT ASSIGNMENT | 12 PORT SWITCH (VWIM) PORT ASSIGNMENT | 20 PORT SWITCH (CCTV/VDS/DMS) PORT ASSIGNMENT (SEE NOTE 3) | 20 PORT SWITCH (FULL ATM/GANTRY) PORT ASSIGNMENT |
|-------------|---|---------------------------------------|--|--|
| G11/1 | UPLINK/DOWNLINK | UPLINK/DOWNLINK | UPLINK/DOWNLINK | UPLINK/DOWNLINK |
| G11/2 | UPLINK/DOWNLINK | UPLINK/DOWNLINK | UPLINK/DOWNLINK | UPLINK/DOWNLINK |
| G11/3 | RESERVED | RESERVED | RESERVED | RESERVED |
| G11/4 | RESERVED | RESERVED | RESERVED | RESERVED |
| G11/5 | TECH ACCESS | VWIM CONTROLLER | TECH ACCESS | TECH ACCESS |
| G11/6 | CAMERA #1 | VWIM VIRTUAL WEB SERVER | MODEM (IF INSTALLED) | WEST/SOUTH - ATM LCS CONTROLLER #1 |
| G11/7 | CAMERA #2 | CAMERA #1 | DMS | WEST/SOUTH - ATM LCS CONTROLLER #2 |
| G11/8 | SENSYS AP | CAMERA #2 | VWIM | WEST/SOUTH - ATM LCS CONTROLLER #3 |
| G11/9 | DMS CONTROLLER | IP RELAY | RESERVED | WEST/SOUTH - ATM LCS CONTROLLER #4 |
| G11/10 | MVDS #1 | UPS | RESERVED | WEST/SOUTH - ATM LCS CONTROLLER #5 |
| G11/11 | MVDS #2/UPS | TECH ACCESS | UPS | WEST/SOUTH - ATM LCS CONTROLLER #6 |
| G11/12 | IP RELAY | TECH ACCESS | IP RELAY | SHOULDER |
| G11/13 | N/A | N/A | CAMERA #1 | IP RELAY |
| G11/14 | N/A | N/A | CAMERA #2 | EAST/NORTH - ATM LCS CONTROLLER #1 |
| G11/15 | N/A | N/A | RESERVED | EAST/NORTH - ATM LCS CONTROLLER #2 |
| G11/16 | N/A | N/A | RESERVED | EAST/NORTH - ATM LCS CONTROLLER #3 |
| G11/17 | N/A | N/A | MVDS #1 | EAST/NORTH - ATM LCS CONTROLLER #4 |
| G11/18 | N/A | N/A | MVDS #2 | EAST/NORTH - ATM LCS CONTROLLER #5 |
| G11/19 | N/A | N/A | MVDS #3 | EAST/NORTH - ATM LCS CONTROLLER #6 |
| G11/20 | N/A | N/A | SENSYS AP | EAST/NORTH - ATM LCS CONTROLLER SHOULDER |



CISCO EXPANSION SWITCH
10/100/1000 ETHERNET AND 10G SFP PORT ARRANGEMENT

| PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT | PORT NUMBER | PORT ASSIGNMENT |
|-------------------------|-------------------------------------|-------------|-----------------------------|-------------|-----------------------------|-------------|-----------------|
| TENGIGABITETHERNET1/1/1 | PRIMARY S/W LAYER 3 UPLINK | G11/0/1 | TECH ACCESS | G11/0/9 | RESERVED - ITS DEVICE - TBD | G11/0/17 | OPEN |
| TENGIGABITETHERNET1/1/2 | SECONDARY S/W LAYER 2 UPLINK | G11/0/2 | RESERVED - ITS DEVICE - TBD | G11/0/10 | RESERVED - ITS DEVICE - TBD | G11/0/18 | OPEN |
| TENGIGABITETHERNET1/1/3 | S/W LAYER 2 - CAMERA AND VDS | G11/0/3 | RESERVED - ITS DEVICE - TBD | G11/0/11 | OPEN | G11/0/19 | OPEN |
| TENGIGABITETHERNET1/1/4 | S/W LAYER 2 - ATM/DMS | G11/0/4 | RESERVED - ITS DEVICE - TBD | G11/0/12 | OPEN | G11/0/20 | OPEN |
| TENGIGABITETHERNET1/1/5 | S/W LAYER 2 - VWIM | G11/0/5 | RESERVED - ITS DEVICE - TBD | G11/0/13 | OPEN | G11/0/21 | OPEN |
| TENGIGABITETHERNET1/1/6 | FUTURE/TBD | G11/0/6 | RESERVED - ITS DEVICE - TBD | G11/0/14 | OPEN | G11/0/22 | OPEN |
| TENGIGABITETHERNET1/1/7 | FUTURE/TBD | G11/0/7 | RESERVED - ITS DEVICE - TBD | G11/0/15 | OPEN | G11/0/23 | OPEN |
| TENGIGABITETHERNET1/1/8 | SECONDARY S/W TO N/E LAYER 3 UPLINK | G11/0/8 | RESERVED - ITS DEVICE - TBD | G11/0/16 | OPEN | G11/0/24 | OPEN |

NOTES:

- SEE SHEET 1 OF 2 FOR NOTES.
- ALL NETWORK SWITCH FIBER CONNECTIONS SHOWN ON THIS SHEET SHALL BE PERFORMED BY THE TOLLWAY MAINTENANCE TEAM, IN COORDINATION WITH THE ENGINEER.
- PORT ASSIGNMENT INCLUDED FOR REFERENCE FOR EXISTING ITS SITES WITH 20 PORT SWITCH.
- THE CONTRACTOR SHALL MAKE LOCAL/COPPER CAT-6 CONNECTIONS PER THE PORT ASSIGNMENTS SHOWN ON THIS SHEET, OR AS DIRECTED BY THE ENGINEER. THE ENGINEER SHALL VERIFY CORRECT PORT CONNECTIONS HAVE BEEN MADE DURING SITE TESTING.



FIBER OPTIC SPLICING DETAILS