

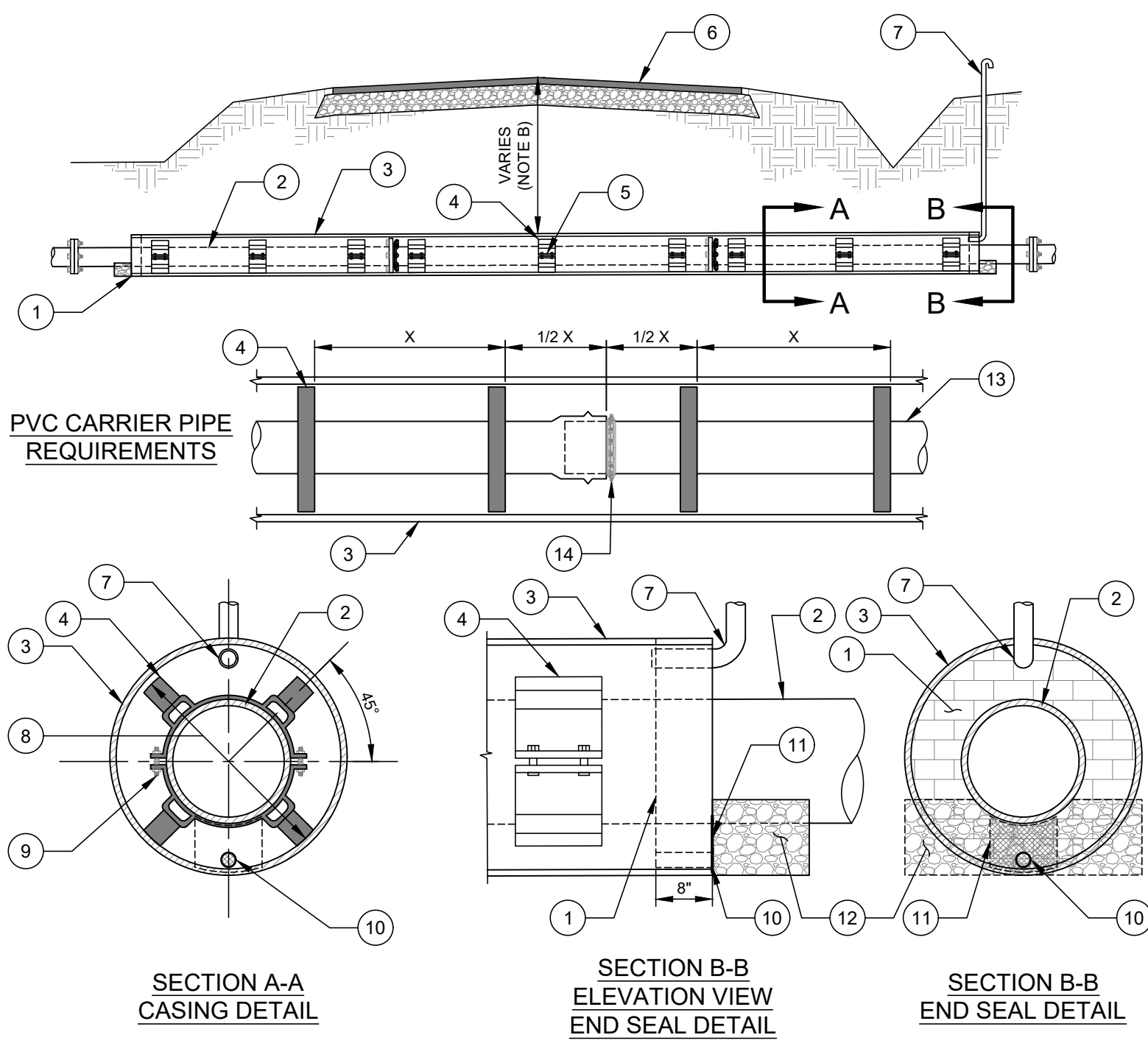
## **TUNNELING AND ENCASEMENT DETAILS**

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PVC CARRIER PIPE  
REQUIREMENTS

SECTION A-A  
CASING DETAIL

SECTION B-B  
ELEVATION VIEW  
END SEAL DETAIL

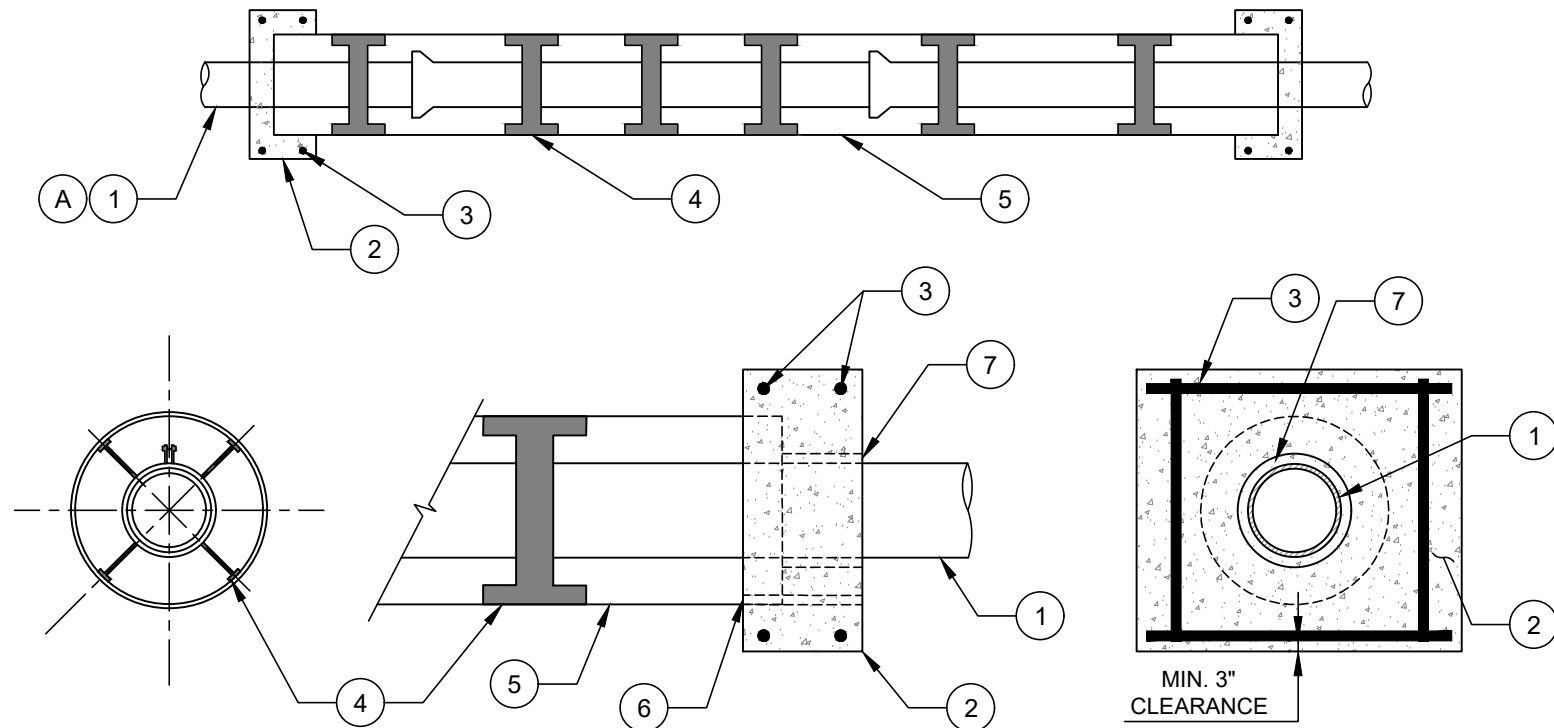
SECTION B-B  
END SEAL DETAIL

NO. DESCRIPTION:

1. 8" BRICK AND MORTAR, OR OTHER APPROVED MATERIALS, END SEAL WITH 1 INCH DIAMETER WEEP HOLE AT BOTTOM OF END SEAL (ON BOTH ENDS OF ENCASEMENT).
2. DIP, FRP, OR RJ PVC CARRIER PIPE.
3. CASING PIPE WITH WALL THICKNESS PER PLANS. (OR JACKING PIPE WHICH MAY ALSO BE THE CASING PIPE FOR A PERMANENT PRODUCT PIPE).
4. CASING SPACER. SEE TECHNICAL SPECIFICATIONS.
5. NORMAL SPACING FOR CASING SPACERS IS 3 PER 18' LENGTH OF PIPE, ONE SUPPORT AT EACH END AND A SUPPORT AT THE CENTER (UNLESS THE MANUFACTURER REQUIRES MORE DUE TO LOAD LIMITATIONS OF THE CASING SPACER).
6. STREET.
7. 2" GALVANIZED VENT PIPE AT HIGH END OF SEWER MAINS ONLY (ONLY WHEN DIRECTED BY CLTW ENGINEER).
8. CASING SPACER DIAMETER SHALL EQUAL THE INSIDE DIAMETER OF ENCASEMENT PIPE LESS 1 INCH.
9. 3/4" DIAMETER STAINLESS STEEL BOLTS.
10. 1" DIAMETER WEEP HOLE.
11. NON-WOVEN FILTER FABRIC OVER WEEP HOLE.
12. #57 STONE IN NON-WOVEN FILTER FABRIC BAG PLACED SNUG OVER THE WEEP HOLE.
13. RESTRAINED JOINT IN BELL (RJIB) DR14 PVC PIPE.
14. BELL STOP AT THE PIPE BELL HOME MARK. MEGA-STOP SERIES 5000 OR APPROVED EQUAL.

NOTES:

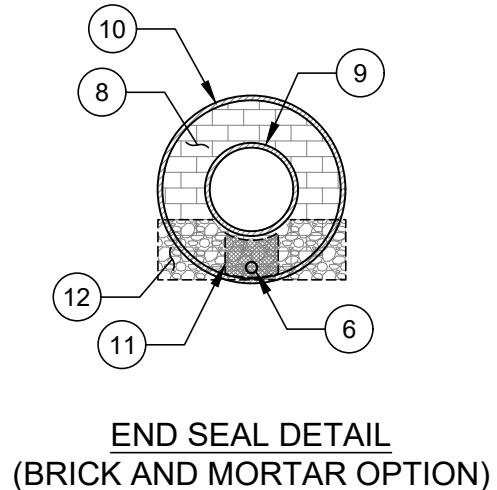
- A. FIELD MODIFY AS REQUIRED TO PROVIDE DESIGN SLOPE IN CARRIER PIPE.
- B. DEPTH AS NECESSARY TO MEET MINIMUM COVER AND/OR MINIMUM UTILITY SEPARATION REQUIREMENTS.
- C. TRACER WIRE SHALL BE INSTALLED PER CLTW TRACER WIRE DETAILS AND SPECIFICATIONS AS APPLICABLE.
- D. REFER TO SPECIFICATIONS FOR CORROSION PROTECTION MEASURES.
- E. REFER TO SPECIFICATIONS AND APPROPRIATE STANDARD DETAILS FOR CATHODIC PROTECTION.



CASING DETAIL

ELEVATION VIEW  
END SEAL DETAIL

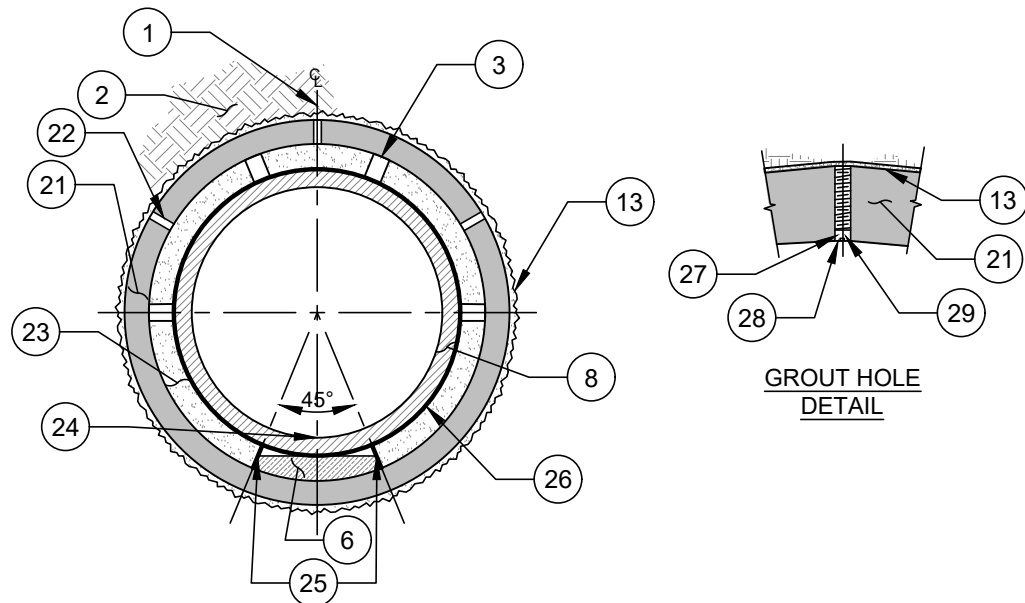
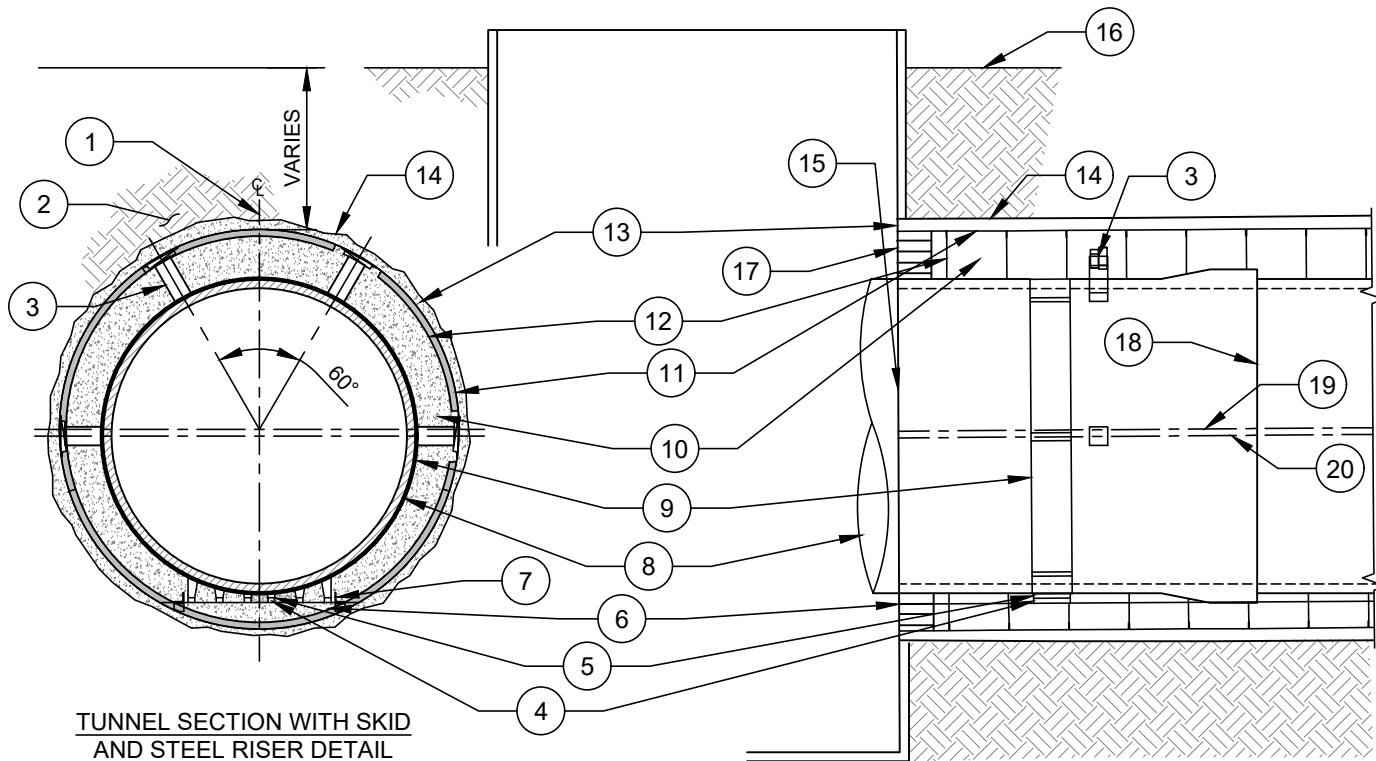
END SEAL DETAIL



END SEAL DETAIL  
(BRICK AND MORTAR OPTION)

- NO. DESCRIPTION:**
- CARRIER PIPE.
  - 3,600 PSI CONCRETE SQUARE PLUG (EACH END).
  - (2) - #4 REBAR RINGS.
  - CASING SPACERS (MIN. 3 PER PIPE SEGMENT) OR APPROVED EQUALS. REFER TO TECHNICAL SPECIFICATIONS FOR SPECIFIC CASING SPACERS.
  - STEEL ENCASEMENT PIPE.
  - 1" DIAMETER WEEP HOLE.
  - WRAP PIPE W/ 1" THICK INSULATION.
  - 8" BRICK AND MORTAR, OR OTHER APPROVED MATERIALS, END SEAL WITH 1" DIAMETER WEEP HOLE AT BOTTOM OF END SEAL (ON BOTH ENDS OF ENCASEMENT).
  - DIP, FRP, PVC, OR HDPE RJ CARRIER PIPE. HDPE USED ONLY IF SMALL DIAMETER AND WHERE ANNULAR GROUTING IS NOT REQUIRED.
  - CASING PIPE WITH WALL THICKNESS PER PLANS. (OR JACKING PIPE WHICH MAY ALSO BE THE CASING PIPE FOR A PERMANENT PRODUCT PIPE).
  - NON-WOVEN FILTER FABRIC OVER WEEP HOLE.
  - #57 STONE IN NON-WOVEN FILTER FABRIC BAG PLACED SNUG OVER THE WEEP HOLE.

- NOTES:**
- ALL PIPE SHALL BE RESTRAINED JOINT.
  - DEPENDING ON TYPE OF ROADWAY CROSSED, CELLULAR CONCRETE FILL MAY BE REQUIRED IN THE ANNULAR SPACE BETWEEN THE CARRIER PIPE AND THE TUNNEL/CASING PIPE (PERMIT DEPENDENT).



GROUT HOLE  
DETAIL

NOTES FOR TUNNEL CONSTRUCTION:

- ALL ALTERNATE CONSTRUCTION MEANS AND METHODS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO INITIATING CONSTRUCTION.
- STRICTLY ADHERE TO SPECIFICATION FOR GROUTING BEHIND TUNNEL LINER PLATES. CAUTION: NO GROUTING SHALL BE PERFORMED WITHOUT NOTIFYING ENGINEER AT LEAST FOUR (4) HOURS IN ADVANCE. FOLLOWING NOTIFICATION, GROUTING MAY PROCEED.
- A MINIMUM OF THREE (3) CASING SPACERS PER JOINT OF PIPE SHALL BE PROVIDED.
- REFER TO TECHNICAL SPECIFICATIONS FOR SPECIFIC CASING SPACER.
- EACH PIPE JOINT INSIDE TUNNEL CASING SHALL BE TESTED WITH JOINT TESTER PRIOR TO GROUTING. DEFECTIVE JOINTS SHALL BE REPAIRED AS APPROVED BY THE ENGINEER.
- FOR SEWER PROJECTS, CONTRACTOR SHALL ESTABLISH, RECORD, AND SUBMIT TO ENGINEER FOR APPROVAL PRIOR TO FINAL GROUTING DATA SHOWING HORIZONTAL ALIGNMENT AND GRADE OF CARRIER PIPE WITHIN TUNNEL.
- ONCE THE INTERNAL CELLULAR GROUTING BEGINS, WORK SHALL BE CONTINUOUS UNTIL COMPLETED. CARRIER PIPE MAY BE INSTALLED FROM EITHER END OF TUNNEL EXCEPT:
  - JOINTS (BELLS AND SPIGOTS) SHALL BE ORIENTED BELLS UPSTREAM.
  - JOINTS SHALL BE PULLED/PUSHED IN PLACE ONE JOINT AT A TIME TO ALLOW PROPER BLOCKING.
- CELLULAR GROUTING OF VOID BETWEEN TUNNEL AND CARRIER PIPE SHALL BE DONE FROM UPSTREAM END OF TUNNEL.

NO. DESCRIPTION:

- CENTERLINE OF LINER AND CARRIER PIPE.
- UNDISTURBED EARTH.
- BLOCKING OR TREATED WOOD BLOCKING WITH WEDGES (TYPICAL 4 RADIAL LOCATIONS EACH PIPE LENGTH). SEE NOTE C.
- GLASS REINFORCED POLYMER SKID SIZE & NUMBER TO BE DETERMINED BY SPACER MANUFACTURER. (SEE NOTE B, c).
- WELDED STEEL RISER (TYP.) (SEE NOTE B, b).
- CONCRETE INVERT.
- STEEL CONTINUOUS ANGLE GUIDE (TYP. OF 2).
- CARRIER PIPE.
- PAINTED STEEL SECTIONAL BAND WITH PVC LINING APPLIED TO THE INNER SURFACE (SEE NOTE B, a).
- FILL VOID BETWEEN TUNNEL LINER AND CARRIER PIPE WITH CELLULAR GROUT (SEE NOTE C).
- STEEL PLATE TUNNEL LINER.
- FLANGE LINE OF STEEL TUNNEL LINER PLATES.
- PRESSURE GROUT FILLED ANNULAR SPACE OUTSIDE OF TUNNEL LINER/PLATES OR CASING AFTER INSTALLATION.
- TUNNEL.
- TUNNEL ACCESS SHAFT.
- EXISTING GROUND SURFACE.
- 8" MASONRY BULKHEAD (TYP.) EACH END.
- PIPE JOINT.
- CENTERLINE OF LINER.
- CENTERLINE OF CARRIER PIPE.
- JACKING PIPE, GALVANIZED TUNNEL LINER, OR STEEL CASING.
- 2" DIAMETER MIN. GROUT PORTS. ALTERNATE 10, 12, AND 2 O'CLOCK POSITIONS.
- GROUTED ANNULAR SPACE WITH LIGHTWEIGHT CELLULAR LOW PRESSURE GROUT (CELLULAR CONCRETE ONLY) TO COMPLETELY FILL TUNNEL EXCAVATION.
- CARRIER PIPE INVERT LOCATION AS SHOWN ON PLAN SHEETS.
- SOLID RAILS OR EQUIVALENT.
- MORTAR BAND.
- AFTER GROUTING, SEAL ALL GROUT HOLES WITH RECESSED PIPE PLUG. INSTALL PLUG FLUSH WITH INSIDE OF PIPE. FILL ANY VOIDS WITH DRY PACK MORTAR AND INSTALL LINING PATCH OVER GROUT HOLE IN ACCORDANCE WITH SPECIFICATIONS.
- RECESSED 1 INCH MINIMUM.
- 2" MIN. DIAMETER THREADED NIPPLE WITH RECESSED FIBERGLASS PIPE THREAD.

NOTES:

- ALL PIPE SHALL BE RESTRAINED JOINT.
- CASING SPACERS CONSIST OF a) STEEL SECTIONAL BAND WITH FLEXIBLE PVC LINER ON THE INNER SURFACE b) STEEL RISERS WELDED TO STEEL BAND SECTIONS c) GLASS REINFORCED POLYMER SKIDS CONNECTED TO THE RISERS. CASING SPACERS TO BE SUPPLIED AS READY TO INSTALL UNITS BY THE MANUFACTURER. THE NUMBER OF SPACERS PER PIPE SECTION SHALL BE A MINIMUM OF 3 (BASED ON 18-20 FT PIPE SEGMENTS), OR AS REQUIRED BY THE MANUFACTURER BASED ON ALLOWABLE LOAD. ALL SPACERS SHALL BE EQUALLY SPACED ALONG THE PIPE.
- BLOCKING TO BE INSTALLED AS SHOWN TO PREVENT ANY MOVEMENT IN THE CARRIER PIPE DURING CELLULAR GROUTING OF THE SPACE BETWEEN THE TUNNEL LINER/CASING PIPE AND THE CARRIER PIPE.