BORE OPERATIONS

A. Description

1. This Section covers pushing, boring, or simultaneously boring and pushing casing pipes and conduit under roads, exit ramps, driveways, sidewalks, trees, environmentally sensitive areas and other features as indicated on the drawings or as directed by the employer.
2. This Section specifies conventional horizontal boring, directional/guided bores, rock bores, and long directional bores with use of drilling mud.
3. All boring work performed shall be in accordance with laws, permits and the requirements of governing authorities and ROW owner.

B. Conduit Placement - Bore Method

1. Acceptable boring installation methods include:
    - Jack Boring (jacking the casing through the sub-grade)
    - Dry Auger boring
    - Dry directional boring
2. Casing pipes shall be pushed or bored in place at locations as indicated on the drawings as directed by employer.
3. All rock bores shall be cased in one of three alternatives:
    - Galvanized steel conduit
    - SDR 11 HDPE
    - SDR 9 HDPE
4. Adequate barricades shall be erected to limit access to the boring machine to operating personnel only.
5. Contractor shall calibrate the boring head locator at the start of the day and at each new boring operation. A daily calibration log shall be established and maintained for employer review and submitted for final record.
6. Before boring, all clearances shall be checked by contractor. All existing facilities shall be located and marked or exposed as necessary by the contractor for safety and for protection of the existing facility.
7. Boring machines shall be grounded at all times during operation. The grounding method and operator=s safety practices shall comply with the manufacturer=s guidelines and requirements.
8. Casing pipe shall be placed through an augured hole or shall be advanced by jacking as the soil is removed by the auger or by jacking directly through soil. The installation shall be performed in a manner that will not disrupt traffic nor damage the subgrade, and will provide accurate alignment and grade of the casing pipe. Removal of material from an augured hole by washing will not be permitted. Small amounts of water may be used as a lubricant in the boring or jacking operation.
9. The boring operator shall have full control of the direction of the boring tool at all times. Shallow, misdirected or other unsuccessful bores shall be abandoned and filled at contractor=s expense. If a bore cannot be completed but has to be abandoned, any void shall be completely filled. Governing authorities and ROW owners may require abandoning the casing.
10. Under no circumstances will contractor be allowed to cut or disturb pavement, asphalt, or other existing facilities, or excavate within the relative limits of any roadway to retrieve any lot boring apparatus.
11. Bore pull back reamers shall be a minimum of two inches (2") greater than the diameter of the casing.
12. Bore pits shall be no less than five feet (5') from the edge of a driveway and will conform to the requirements of governing authorities and ROW owners or as required by the drawings.
13. If the bore exists below the prescribed depth, the employer shall take measures to gradually return the bore depth to the prescribed depth.

14. All bore pits shall be backfilled and compacted in eight inch (8") lifts, or in accordance with governing Authority or ROW owner. Surfaces shall be restored to original or better condition and to the satisfaction of employer, governing authorities, and ROW owners.
15. When trenching is required from a bore pit to the end of trenching operations, prior to conduit placement in the trench, the conduit shall be bundled, tied and/or bound by an accepted method to eliminate the possibility of the conduit twisting and/or waving in the trench.
16. The boring contractor shall be responsible for proofing the bored conduit installed. Tie-ins are the responsibility of the contractor making the tie-in.
17. Contractor shall provide adequate support for the conduits during pullback into the pre-drilled bore holes. The supports shall be placed to prevent overstressing damage to the conduits due to sagging.
18. Conduit shall be pulled back in one continuous section with a swivel to minimize rotation of the conduits.
19. Employer shall have access at all times to measuring or gauging devices sued for directional drilling, as well as drilling logs maintained by contractor.
20. Prior to beginning construction, contractor shall submit a detailed drilling procedure, a drill site layout, and a bar chart schedule for the operation.
21. In the event that the contractor must abandon the drill hole, the contractor shall scale the bore hole and redrill at no expense to employer.
22. Ground entry and exit angles should be approximately 12 degrees.
23. Minimum bending radius of the installed line shall be no more than 100 times the O.D. of the steel casing pipe, 25 times the O.D. of the HDPE pipe.
24. The actual exit point shall be no more than ten feet (10') left or right of the alignment for the proposed exit point.
25. The actual exit point shall be no more than ten feet (10') short of or thirty feet (30') beyond the proposed exit point.
26. The vertical profile as shown on the drawings is the minimum depth to which the product line shall be installed. Contractor may, at his option and with the permission of employer, elect to install the product at a greater depth than shown on the drawings.
27. Contractor shall limit the longitudinal pull on the conduit or casing so as not to exceed 72% of the specified minimum yield strength of the product. Contractor will continuously monitor the longitudinal pulling forces during pullback.
28. Variation from the above parameters shall not be permitted without authorization of the employer.

C. Rock Identification - Bores

1. If, after two (2) unsuccessful attempts by contractor to bore with soil boring machines due to the possibility of rocks, then the employer shall determine if rock conditions exist by:
    - Prior to additional boring, excavations indicate the existence of ledge rock.
    - Determining that AHard Rock@ exists if the rock is ten thousand (10,000) p.s.i. and higher and where a minimum of fifty thousand (50,000) pound rock-boring machines are used in combination with mud motors or special rock bits. If employer and contractor cannot agree on the hardness of the rock, contractor shall provide a core sample and shall have the sample tested. If the test shows that the sample rock has a compressive strength of less than 10,000 p.s.i., contractor shall pay for the coring and testing costs. If the test shows that the sample rock has a compressive strength of 10,000 p.s.i. or more, employer shall pay for the coring and testing costs.
    - Determining that ARock@ exists if it is greater than three thousand (3,000) p.s.i. but less than ten thousand (10,000) p.s.i. rock, including shot rock and concrete roadway fill, where a minimum of fifty thousand (50,000) pound rock-boring machines are used in combination with mud motors or special rock bits.
2. All other bores shall be considered soil bores.

D. Long Directional Bores

1. When long boring requires the use of drilling mud, such as bentonite, no discharge or runoff will be allowed into waterways or ocean. Mud tank capacities shall be sized to hold excess material without spillage. The casing pipe entry point shall be appropriately enclosed and equipped with a sump pump to reclaim or discharge excess mud to a reuse or disposal tank. Earth spoiled by drilling mud shall be removed and disposed of by contractor and the site refilled with clean material. The site shall be restored to a condition equal to or better than its original condition.
2. Sufficient personnel, equipment, and materials to contain drilling fluid that upwells to the surface or is discharged into a body of water shall be on site during all drilling operations.
3. Contractor shall maintain a record of the drilling pressures maintained and the quantities of drilling fluid used during the entire boring operation. This record shall be tied to both time of day and station of the bore head. These records shall be made available to the employer at all times during the drilling operation and submitted as record at the conclusion of the operation.
4. Contractor shall maintain continuous visual inspection of the bore alignment at all times when the bore operation is proceeding without return of drilling fluid to the drill site. When the bore alignment is beneath a body of water, a visual inspection shall be made at the most accessible point immediately downstream of the bore alignment for changes in turbidity or color, which may indicate a fluid discharge into the waterway. Unusual conditions, including excessive loss of drilling fluid, shall be reported promptly to the employer.
5. Drilling fluids shall be disposed of in an acceptable manner.