POLYETHYLENE ENCASEMENT INSTALLATION (Cont.)

Bends, reducers, offsets, and other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe. When valves, tees, crosses, and other odd-shaped pieces cannot be wrapped practically in a tube, they shall be wrapped with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bring it up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Width and overlaps at joints shall be handled as described for Method A. Polyethylene shall be taped securely in place at valve stem and other penetrations.

Where encountered, the Contractor shall provide openings for branches, service taps, blow-offs, air valves, and similar appurtenances by making an X-shaped cut in the polyethylene and temporarily folding back the film. After the appurtenance is installed, the slack shall be securely taped at the appurtenance and the cut repaired, as well as any other damaged areas in the polyethylene, with tape.

Where polyethylene-wrapped pipe joins an adjacent pipe that is not wrapped, the Contractor shall extend the polyethylene wrap to cover the adjacent pipe for a distance of at least two (2) feet. The end shall be secured with circumferential turns of tape.

The Contractor shall use the same backfill material as that specified for pipe without polyethylene wrapping, exercising care to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones, or other materials that could damage the polyethylene.

12. WATER MAIN TRACER TAPE INSTALLATION

The Contractor shall furnish all materials and install the water main tracer tape as specified in the previous Section of these specifications. The three (3) inch wide detectable tape shall be installed directly above the water main locations as the trench backfill progresses, to permit an earth or granular cover of 12 to 18 inches over the tape. The tape material shall be installed in accordance with the manufacturer's recommendations. The tape is to be placed in a manner such that trench backfill settlement will not place an excessive tensile stress on the material.

13. WATER MAIN LOCATER WIRE INSTALLATION

The Contractor shall furnish all materials and install the water main locater wire as specified under the previous Section of theses specifications. The No. 12 insulated wire shall be placed along the top of the water main and taped in place with duct tape or electrical tape at a maximum of 6' intervals.

WATER MAIN LOCATER WIRE INSTALLATION (Cont.)

For ductile iron pipe the locator wire shall be placed outside the polyethylene encasement. Caution must be exercised in the initial backfilling not to move or damage the locater wire. The wire shall be brought up the outside of each valve box from each direction and then both wires are to be threaded into the valve box through the 1/2" diameter hole near the top in the initial installation.

The two wires shall be spliced inside the valve box with a standard plastic or rubberized wire connector. After testing for continuity, the splices inside the box shall be made with a 3 M splice kits. Where splices become necessary outside of valve boxes, the splices shall be made initially with a 3 M splice kit.

Where water mains are dead end with a cap installed for a future extension, a 6' long steel "I post" extending 3' into the ground, with 3' exposed shall be provided as shown on Detail G of these specifications. In these cases the locater wire shall be brought up out of the ground and securely wrapped around the "I post" and secured with electrical tape.

14. VALVE INSTALLATION

Prior to installation, all valves shall be checked for bolt tightness and operation. All foreign matter, dirt, and debris, shall be removed from inside the valve body. The valve gate and guide shall be cleaned free of grease and dirt. After thoroughly cleaning and checking the valve for operation, the valve gate shall be closed, and the valve shall be installed in place. All valves shall have pre-cast concrete block supports, the same as for fittings as shown on Detail C of these Specifications.

Valve boxes shall be set plumb and earth or ground fill shall be tamped around the box to maintain the plumb position and the lid or cover to correspond with finished grade based on the "height" indicated on the stakes for the valves.

In general, valves shall be provided at intervals of not greater than 500 feet. Additionally, at all tee intersections, a minimum of two (2) valves shall be provided, and at cross intersections, a minimum of three (3) valves shall be provided.

15. FIRE HYDRANT INSTALLATION

Fire hydrants shall be installed where shown on the plans and as shown on Detail B of these Specifications. Care shall be taken to set the hydrant plumb and the 4-1/2" pumper nozzle shall face the street. Care shall also be exercised to set the fire hydrants to meet the final finished grade as indicated by the "height" given on the stake for the hydrant. After installation and backfill, the exposed barrel and top shall be given a finish coat of "Chrome yellow" paint. The operating nuts on the top of fire hydrant shall not be painted.

FIRE HYDRANT INSTALLATION (Cont.)

In general, fire hydrants will not require thrust blocks when they are restrained by "Anchor Loks" or "Megalug" follower glands as shown on Detail B of these specifications. However, if they are installed at a dead end, a thrust block, same as for a 6" x 6" tee shall be provided to restrain the fire hydrant and care shall be taken not to encase the drain hole in the fire hydrant.

16. TEMPORARY BLOWOFF INSTALLATION

In general, blowoffs will not be allowed at dead ends of the system, but fire hydrants will be required at the ends of dead end mains. Where it is expected that a main will be extended in the near future, a temporary manual blowoff device, as shown on Detail G of these Specifications shall be provided.

17. WORK ADJACENT TO AND/OR CROSSING STATE OR COUNTY HIGHWAYS

All work to be performed within the right-of-way limits of the State and/or County Highways shall be performed in strict accordance with the Highway Department requirements. The Contractor shall obtain the necessary permits for all work prior to starting any construction. All permits must be displayed as required.

The Contractor shall comply with all requirements such as; signals, flagmen, and watchmen; performance of work in such a manner so as not to interfere with traffic, highway entrances, highway maintenance, highway drainage, etc., and methods of placing materials, backfill compaction, and all such other requirements, which may differ from or may be in addition to those specified for work other than that within the highway right-of-way limits.

Highway crossing shall be constructed in accordance with all permit requirements. The Contractor will be held responsible for any and all expense incurred by the Highway Department in protecting the highway while construction is in progress, or as a result of said construction.

The Contractor will also be held responsible for all damages to the highway due to operations during construction including replacement of damaged pavement.

The crossings shall be machine bored with simultaneous installation of the encasement. Boring without the concurrent installation of the encasement tube will not be permitted. All joints of the encasement tube shall be welded as specified and the encasement tube shall extend to the required dimensions.

WORK ADJACENT TO AND/OR CROSSING STATE OR COUNTY HIGHWAYS (Cont.)

Following completion of the machine bored crossing, all bore pit or other required excavation shall be suitably backfilled to grade. All debris, of whatever nature, shall be picked up and removed from the site. After clean-up, the disturbed area shall be smoothed to grade, seeded, and covered with straw. The entire work area shall be left in an orderly and acceptable condition.

18. INSTALLATION OF TAPPING SLEEVES AND VALVES

The tapping sleeves shall be carefully installed on existing pipes with tightening of bolts done carefully to avoid stresses on the existing water mains. If "Power Seal" tapping sleeves are used, particular care shall be used to follow the bolt tightening sequence as recommended by the manufacturer. The tapping valve shall then be attached to the tapping sleeve with support blocks provided as called for in Section II-14 of these Specifications. The pit for the tapping machine shall be adequate in size.

Prior to the tap being made, with the tapping valve closed, the assembly shall be air tested to a pressure of 150 PSI, using the port provided on the tapping sleeve. After the tap is completed, the "coupon" removed shall be given to the District's representative for examination. When the tap is complete, concrete thrust blocking with the same dimensions as for a tee of the same size shall be poured behind the tapping sleeve. If the pit is to be temporarily backfilled, before pipe laying continues, a mechanical joint plug shall be installed in the outlet of the tapping valve to prevent dirt or debris from entering the valve. The tapping valve shall have a valve box as specified herein for gate valves.

19. CREEK OR DITCH CROSSINGS

Where water mains cross creeks, all piping shall be ductile iron piping. Proper fittings shall be provided and all piping (except at the joints) shall be encased in concrete, all as shown on Detail F of these Specifications. The determination of what constitutes a creek and the requirements for concrete encasement shall be made by the District Engineer. Specifically, surface water crossings shall be in accordance with Missouri Department of Natural Resources requirements as given in Appendix B of these Specifications.

20. MANUAL AIR RELEASE DEVICES

Where there are pronounced high spots in water mains and no fire hydrants are located at said high spots, a manual air release device as detailed on Detail F of these Specifications shall be installed. The purpose of this facility is to allow air to escape during the water main filling process and the curb stop will then shut off. These facilities are to be permanent.

21. INSTALLATION OF MAIN LINE PRESSURE REDUCING STATIONS

The station shall be installed at locations shown on the plans and shall be as specified in Section I of these Specifications. Prior to installation the concrete support pad, 12" thick reinforced with #4 bars at 12" each way, each face shall be poured. The concrete shall be as specified in Section I for thrust blocking. The pad shall have hooked all thread ¾" steel rods carefully spaced for anchoring the station in place. The pad shall be poured level and all details shall be submitted to, and approved by the District Engineer before the pad is poured. Pressure settings for the two pressure reducing valves in the station will be provided by the District Engineer.

22. DISINFECTION

Disinfection shall be accomplished by placing sufficient hypochlorite granules (HTH) in each section of pipe to achieve a chlorine residual in the pipeline, upon initial filling, of 50 mg/L (PPM). HTH tablets will not be allowed. Following competition of the pipeline, it shall be slowly filled with water and a sample will be taken immediately and the chlorine residual must be 50 mg/L or greater. The solution shall be allowed to stand for 24 hours and a sample shall then be taken. The chlorine residual after 24 hours shall be 10 mg/L or greater. If the piping shows insufficient chlorine residuals in either test, the piping shall be re-chlorinated by the injection of a hypochlorite solution until satisfactory results are achieved. All disinfection shall be done by the contractor. Only the chlorine residual testing will be done by the District.

23. PRESSURE TESTING

Immediately following disinfection, the piping shall be pumped to a pressure (at the lowest point in the project) of 150 PSI or higher where the working pressure is higher than 150 PSI as determined by the District. In such cases, the test pressure shall be as specified by the District and two pressure tests shall be conducted. The first test shall be with the fire hydrant auxiliary valves open and be to 150 PSI. The second test shall be with the fire hydrant auxiliary valves closed and be to the higher pressure as directed by the District. All pumping equipment and pressure gauges shall be provided by the contractor. After achieving the test pressure, the piping shall be left closed for a period of two (2) hours. At the end of this time the pressure drop shall not exceed 2 PSI. In addition, if the pressure appears, in the judgment of the District's representative, to be continuing to drop, the test shall be continued for another two (2) hours and if any further drops occur, the test shall be considered a failure. If the pressure test fails, the contractor will be required to find and correct the source of the leakage. If this requires draining of the pipeline, when the leakage is corrected, the piping must be re-disinfected and the pressure tested again until satisfactory results are achieved.

24. FLUSHING

After satisfactory disinfection is achieved, all piping shall be thoroughly flushed until all water discharged is visibly clear. A final chlorine residual test will then be taken and the chlorine residual must be between 0.5 + 2.5 mg/L. If the residual is too high, additional flushing shall be done until the desired residual is obtained. If the residual is too low, the entire disinfection and flushing procedure shall be repeated until the desired results are achieved.

25. BACTERIOLOGICAL TESTING

After satisfactory disinfection and pressure testing, a sample shall be taken by the contractor in the presence of a District representative and submitted to a laboratory approved by the Missouri Department of Natural Resources and the District for bacteriological analyses. After 24 hours, a second sample shall be taken in a like manner and submitted for analyses. The two samples taken on consecutive days must be found to be "safe" by the testing laboratory, and copies of the test results must be supplied to the District. If the samples are not found to be "safe" further flushing and /or disinfection as directed by the District shall be conducted by the contractor until "safe" samples on two consecutive days are achieved. Following successful bacteriological testing and a determination by the District that the samples are "safe", the mains may be placed into service.

26. SITE CLEAN UP AND GRADING

After work is completed, the site of all water main installation work shall be cleaned of all construction material and other debris. Grading shall be as agreed upon between the contractor and the developer, but shall consist of a minimum of rough grading to provide proper drainage and all installation sites shall be left in a neat clean and acceptable condition. All walkways, driveways, roads, streets, etc. shall be replaced to their original condition. All water mains shall be left with the proper amount of cover as hereinbefore stated.

27. FINAL INSPECTION AND LOCATER WIRE TESTING

After all work is completed and all disinfection, flushing and bacteriological testing are complete, the contractor shall conduct a locater wire test between all sections of the wire in the presence of a District representative. If the test is satisfactory, all splices in valve boxes shall be made permanent by means of 3-M splice kits. If the tests fail in a section, the contractor must find and repair any failure in the locator wires. A final inspection shall be made by a District representative and all valves and fire hydrants shall be plumb and be to proper grade and all clean up work must be satisfactorily completed. The work shall be accepted only after completion of the final inspection. Any defects found in the final inspection shall be promptly corrected by the contractor.

28. AS BUILT DRAWINGS

During the course of the work, the Contractor must have in his possession at all time a copy of the Plans, approved by the District. As work progresses, the Contractor shall note all lengths of pipe installed, all valves, fire hydrants and other appurtenances installed and record all dimensions required to locate these items. At the completion of the project, and prior to acceptance by the District, the Contractor shall furnish the copy of the plans where all "as built" dimensions and notes are endorsed. The plans must be relatively clean and totally legible with regard to all notes made thereon.

29. GUARANTEE

The contractor shall guarantee all material and workmanship for a period of a minimum of three (3) years following final acceptance of the work by the District.