WATER LINE CONSTRUCTION CROSSING INSTALLATION GENERAL WATER AND SEWER SPECIFICATIONS A. Normal conditions — water lines crossing over sewers shall be laid to provide a separation of at least eighteen inches (18") between the bottom of the water line and the Except as specifically modified below, water line construction shall meet requirements of AWWA C600 latest edition Standards. B. Unusual conditions — when local conditions prevent a vertical separation as described above, the following construction shall be used: 2. All pipes shall be laid to a minimum depth of thirty—six inches (36") from established final grade to the top of the pipe. All valve and hydrant stems shall be set Contractor shall provide all labor, equipment and material and perform all work required for installation of sewer and/or water lines, manholes and appurtenances as outlined on plumb. Whenever obstructions not shown on the plans are encountered during progress of the work and interfere to such an extent that alteration in plans is required, the Authority approval shall be given before such alterations are put into effect. Any such alternative design shall be designed or approved by the Engineer of record for a. Sewers passing over or under water lines shall be constructed of AWWA approved water pipe, hydrostatically pressure tested in place without leakage prior to backfill. If any deviation is contemplated in location or line grade of any sewer, water line, structure or appurtenance as shown on the Contract Drawings, a revision of the Drawings C. Water lines passing under sewers shall, in addition, be protected by providing: showing the proposed deviation shall be submitted to the Engineer for review and approval before any changes are constructed. Engineer must concur in any revision of drawings. a. Vertical separation of at least eighteen inches (18") between invert of sewer and crown of water line. Sewer shall be encased along its length where it is within 10' of Installation of Pipe and Fittings: Pipe and fittings shall be inspected for defects, and while suspended above grade, be rung with a light hammer to detect cracks. All lumps, blisters and excess coal tar coatings shall be removed from ends of ductile iron pipe, and outside of the spigot and inside of the bell shall be wiped clean and dry and free from oil and greases before the pipe is laid. Every precaution shall be taken to prevent foreign material including non-potable water from entering the pipe while it is being placed in the line. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into it, a heavy tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other materials shall be placed in the end of all pipe opening. Adequate structural support for sewers to prevent excessive deflection of joints and settling on and breaking of the water line. All water and/or sewer construction to conform to the requirements of "Western Virginia Water Authority Water and Sewer Design & Construction Standards", latest revision. c. Length of water line shall be centered at the point of the crossing so that joints shall be equidistant and as far as possible from sewer. Sewers or Sewer Manholes. No water pipes shall pass through or come in contact with any part of a sewer manhole. A preconstruction conference shall be held at least one day prior to the start of construction. The contractor's superintendent or foreman shall attend this meeting. If superintendent or foreman cannot attend, then the developer or contractor's representative shall submit a letter to the Authority stating that the superintendent or foreman has a. When other underground utilities (storm drains, gas, electrical, etc.) cross within six inches (6") above or below water lines, adequate structural support of the utilities been informed of items discussed at this meeting. Prior to the start of construction, contractor must have an approved set of plans on-site. pipe. At the end of each day a watertight plug shall be placed in the end of all pipe opening. After placing a length of pipe in the trench, the spigot end shall be centered in the open bell of the pipe line and the pipe pushed home so that the face of the spigot is in close contact with the shoulder of the bell. Water pipe shall be laid with the bell facing the direction of the laying. Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining and so as b. Water lines shall be placed over storm drains wherever practical. Construction can only be performed by contractors licensed by the State of Virginia. c. Parallel installations shall have a minimum clearance of two (2) feet from edge of pipe to edge of other utility. CARE, RESTORATION, AND PROTECTION OF EXISTING STRUCTURES, PRIVATE PROPERTY, AND RIGHTS-OF-WAY GENERAL CONDITIONS - Any reference to General Conditions refers to EJCDC C-700 Standard General Conditions of the Construction Contract (latest edition). All existing structures, pipes, poles, wires, fences, curbing, property—line markers, and other structures which, in the opinion of the OWNER must be preserved in place withou being temporarily or permanently relocated, shall be carefully supported and protected from injury by CONTRACTOR, and in case of injury, CONTRACTOR shall notify the to leave a smooth end at right angles to axis of the pipe. When machine cutting is not available for cutting metal pipe twenty inches (20") in diameter or larger, the electric—arc cutting method will be permitted using a carbon or steel rod. Only qualified and experienced workmen shall be used for this work. Flame cutting of metal pipe by means of oxyacetylene torch will not be allowed. AUTHORITY - Refers to Western Virginia Water Authority. ENGINEER - Refers to Engineer of Record who signed the Plans. 0 appropriate party so that proper steps may be taken to repair any and all damage done. When owners do not wish to make the repairs themselves, all damage shall be repaired by CONTRACTOR, or, if not promptly done by him, OWNER may have repairs made at expense of CONTRACTOR. PLANS - Refers to information submitted to the Contractor directing construction Whenever it is necessary to deflect pipe from a straight line, either in vertical or horizontal plane, to avoid obstructions or plumb stems, or where long radius curves are approved, the amount of deflection allowed shall not exceed the maximum required, for satisfactory joining of the pipe, as specified in this manual. Maximum deflection permitted per joint shall be in accordance AWWA C600 Table 4 for push—on joint and Table 5 for mechanical joint pipe. C900 PVC pipe deflection may not DRAWINGS - Refers to information submitted to the Contractor directing construction. CONTRACTOR shall not be compensated for any additional work involved if utilities or underground structures cross trench line transversely above or below the sewer line. SPECIFICATIONS - Refers to information submitted to the Contractor directing construction. All utility services shall be supported by suitable means so that the services shall not fail when tamping and settling occurs. The CONTRACTOR must cover same in the unit price bid for sewer line construction. CONTRACTOR shall consult OWNER or his representatives prior to removing or disturbing any tree, shrub, bush, fence, sidewalk, building structure, or improvement that may be exceed 75% of manufacturer's recommendation. QUALIFICATIONS OF MANUFACTURERS Products used shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of quality production acceptable to the OWNER. encountered in the line of the sewer line or in path of the easement, or right—of—way secured by the OWNER. Immediately upon completion of laying of necessary pipe, fittings, and appurtenances through each piece of private property, CONTRACTOR shall backfill the trench, tamping same in a careful and workmanlike manner, replacing sod, INSTALLATION OF DUCTILE-IRON WATER MAINS RE Maximum Joint Deflection Full-Length Pipe - Push-On Type Joint lawns, bushes, shrubs, or whatever else may have been removed, disturbed or altered during progress of the work. The locations of the proposed WORK are shown on the Drawings. The OWNER/ENGINEER reserves the right to make changes in lines and grades of pipe lines, and in locations of Approximate Radius of CONTRACTOR shall replace and repair all lawns, terraces, shrubs, trees, plants, fences, sidewalks, curbs, cross walks, gutters, driveways, ditches, steps, mail boxes or pipes and/or appurtenances when such changes may be necessary or advantageous. pavements, and repair and make good all other damage, that may occur during construction work. CONTRACTOR will be held responsible for all damage that may occur after pipeline is constructed and which may be directly or indirectly attributed to operations as they are carried out. CONTRACTOR shall not operate equipment or store materials on Curve - R* Produced I Succession of Joints private property without first having obtained written consent of property owner. On paved surfaces, the CONTRACTOR shall not use or operate tractors, bulldozers, or other power—operated equipment and treads or wheels which are so shaped as to cut Joint Length Joint Length Joint Length Contractor shall provide field stakeout including adequate line and grade stakes in order that sanitary sewer and appurtenances may be constructed in accordance with Contract Pipe Size All surfaces, which have been damaged by CONTRACTOR'S operations, shall be restored to a condition at least equal to that in which they were found immediately prior to beginning of operations. Suitable materials and methods shall be used for such restoration. COMPENSATION FOR REPLACEMENT OF LAWNS, ORNAMENTAL SHRUBS,ETC., AND ANY ADDITIONAL WORK ARISING BY REASON OF CONSTRUCTION OF SEWER ON PRIVATE PROPERTY Pipes shall be laid true to the lines and grades as shown on the Drawings except as authorized by the ENGINEER. Work not conforming to the grade shall be corrected by the CONTRACTOR at his own expense in a manner acceptable to the ENGINEER AND RIGHTS-OF-WAY SHALL BE INCLUDED IN RESPECTIVE UNIT PRICES BID FOR VARIOUS DEPTHS AND SIZES OF PIPE AND APPURTENANCES INSTALLED. UNLESS RESTORATION IS A SEPARATE BID ITEM. NO ADDITIONAL PAYMENT WILL BE MADE FOR REPAIRING PROPERTIES TO THEIR ORIGINAL STATE. A. General: All submittals shall be made in accordance with Section 6.17 of the General Conditions. CONTRACTOR shall furnish engineering data covering design and installation. Restoration of existing property or structures shall be done as promptly as practicable and shall not be left until the end of the construction period. Property corners, monuments, etc that are disturbed during construction shall be replaced by a surveyor licensed in the state of Virginia. UNLESS REPLACING PROPERTY CORNERS/MONUMENTS IS A SEPARATE BID ITEM, NO ADDITIONAL PAYMENT WILL BE MADE FOR REPLACING SURVEY REFERENCES. Submittal shall be made in a timely manner so that the project schedule can be met. Shop drawings: As a minimum, the following shop drawing information shall be submitted to the OWNER for review and approval: Complete bill of materials to be provided for * For 14—in. and larger push—on joints, maximum deflection angle may be larger than shown above Consult manufacture the work described; Manufacturer's catalog cuts for all materials to be provided. Inspection and test results. See water or sewer notes for specific requirements. Contractor shall provide accurate installation information and notes to OWNER for use in creation of AS-BUILT plans. Maximum Joint Deflection Full-Length Pipe -- Mechanical Joint Pipe Curve - R* Produced b PRODUCT HANDLING Pipe, structures, fittings, appurtenances, etc., shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such Succession of Joints Joint Length Joint Length 18-Feet 20-Feet materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Pipe Size Angle Pipe shall be stored in accordance with manufacturer's recommendations on flat, even surfaces and shall remain racked on the pallets as delivered to the job site until such time <u>5</u> as the trench is ready for placement of the pipe. Pipe shall not be strung out on the job site in excess of one day's work. 7'-07" In distributing the material at the site of work, each piece shall be unloaded opposite or near the place where it is to be laid in the trend 5'-21" Pipe shall be so handled that any joints, coating and lining shall not be damaged. If, however, any part of joint, coating or lining is damaged, repair shall be made by CONTRACTOR at his expense in a manner satisfactory to the OWNER. 5'--21" Stc. Engine WATER DISTRIBUTION SYSTEM Storage of Materials: CONTRACTOR shall be responsible for safe storage of material furnished by or to him, and accepted by him, and intended for the Work, until it has been 9. All tees, bends, plugs, caps, and fire hydrants shall be substantially braced, blocked and/or strapped to prevent any movements by providing adequate reaction backing incorporated in completed Project. Interiors of all pipes, fittings and other accessories shall be kept free from dirt and foreign matter at all times. and/or tie rods. Reaction backing shall be designed and installed as indicated in the Detail Drawings. APPLICABLE AWWA STANDARDS The following AWWA Standards (latest revision) are hereby incorporated by reference. Where a conflict exists between these written standards, and the standards incorporated by COMPLIANCE WITH UNDERGROUND UTILITY DAMAGE PROTECTION ACT. CONTRACTOR shall be responsible for notifying "Miss Utility" a minimum of 48 hours prior to any excavating Installation of Valves, Air Relief Assemblies and Blow-Off Chambers reference, the Engineer will determine which standard shall apply operations. CONTRACTOR shall be aware of and comply with all provisions of the Virginia Underground Utility Damage Protection Act as enforced by the State Corporation Applicant shall provide the Authority with manufacturer's certification that materials meet these standards: A100, C104, C110, C111, C115, C150, C151, C502, C504, C506, C508, C509, C550, C600, C651, C602, C652, C900, D100, D102, D103. . During construction, air and sediment accumulations may be removed through a standard fire hydrant. Compressed air and/or pumping may be used for dewatering 2. Chambers or pits containing valves, blow—offs, meters or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow—offs or air relief valves be connected directly to any sewer. Connection shall be rotated downward to facilitate removal of accumulated COMPLIANCE WITH VA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR shall be aware of and comply with all provisions of the locality and Virginia Department of WATER PIPE AND APPURTENANCES Transportation (VDOT) as contained in the latest editions of the VDOT Road and Bridge Specifications, VDOT Road and Bridge Standards, VA Work Area Protection Manual and VDOT 3. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground in ALTERNATIVES. Type of pipe material used in construction of the specified water or sewer pipeline shall be at CONTRACTOR'S option unless a specific type of pipe is required by All ductile cast iron standard mechanical joint water pipe shall conform to ANSI Specification A21.51/AWWA C151. Thickness class shall be minimum of Class 350 for all pipe HYDROSTATIC TESTS FOR LEAKAGE twelve inches (12") in diameter or less. Water mains larger than 12" diameter in size, shall have thickness class as determined by thickness design of ductile—iron pipe All new water mains shall be tested, after backfilling to a hydrostatic pressure of not less than 100 psi above design water pressure for the system or 150 psi, whichever is greater. Allowable leakage shall be calculated by the following formula and is shown in columnar form in Table 6: AWWA C150. All waterline shall be lined with cement mortar and have a protective exterior coating. Linings and protective coatings equal to "Enameline" with tar coating in WARRANTY. All Work performed, including equipment and materials, shall be warranted to be free from defects in materials and workmanship for a minimum of one (1) year prior the exterior will be considered as a satisfactory lining for water pipe, however, any substitution in pipe lining and/or coating from ANSI A21.4 shall be specifically approved by the Utility Engineer. Joints of standard mechanical joint pipe shall conform to ANSI Specifications A21.11. High strength cast iron tee head bolts, hex nuts, cast or ductile iron glands and rubber gaskets shall be as furnished by the pipe manufacturer. All tee bolts and nuts shall to Final Acceptance of any water and/or sewer facility by the OWNER. $L = (SD(P)^{(0.5)})/133,200$ constructed of same size and type material as head bolts and hex nuts. In making connections of ductile cast iron pipe using standard mechanical joint, the gland followed by the rubber gasket shall be placed over plain end of the pipe, which shall be carefully inserted and aligned into socket end of pipe line. Gasket shall then be pushed into position so that it is evenly seated in the socket. Gland shall then be nondetectable warning tape above all pipe, as shown on Details and Specifications. Tape will be continuously marked indicating he type of utility L = allowable leakage in gallons per hour S = length of pipe tested in feet moved into position against face of the gasket, bolts inserted and made finger tight. Bolts shall then be tightened in accordance with AWWA C600 Table 3 (75-90 FT-LB Contractor shall install detectable wire below all non-metallic water main and sanitary force main, as shown on Details and Specification D = nomingl digmeter of pipe in inches Torque for pipe size 4-12"). All other requirements concerning bedding, alignment, and cleaning of pipe before making joint shall be followed. P= average test pressure during leakage test in psi Cleaning, disinfection of water main, and testing will be the responsibility of the contractor. Water for these operations will be furnished by the CONTRACTOR. The CONTRACTOR shall include in his bid the cost of the water, loading, hauling, and discharging the water. Ductile Cast from Pipe — "Push—On Joint". All "push—on" or "slip" joint pipe shall conform to requirements of standard mechanical joint pipe in regard to strength, class, protective coatings, etc. Allowable Leakage per 1,000 ft. (305 m) of Pipeline*---aph^ Testing and disinfection of the completed sections shall not relieve the CONTRACTOR of his responsibility to repair and replace any damaged or defective Work. Restrained Joint Pipe Systems: 1. Approved restrained joint pipe systems shall include the following: Mechanical joint pipe with use of joint restraint gland such as EBAA Iron "Mega-Lug", Ford "Uni-Flange", Romac Industries "Grip Ring" or other restraint gland as approved by Contractor shall be responsible for determining exact location and depth of all underground utilities, which are shown on the Drawings or marked on the ground. Contractor shall NOMINAL PIPE DIAMETER - Inches exercise care in determining the location of any underground utility to avoid damaging or disrupting utility service. If Contractor inadvertently damages any utility line or cable, he shall be responsible for immediately contacting the affected utility company and repair, or have repaired, the damage at the CONTRACTORS expense. PSI (Bars) b. Ductile iron pipe push-on joint with use of U. S. Pipe "Field LOK" gaskets or American Ductile Iron Pipe "Fast Grip." 0.75 1.00 1.74 Utility Engineer. Should Contractor discover and/or damage any underground utility facilities, which are not shown on Drawings and/or marked on the ground, Contractor shall promptly notify utility **DESIGN** CDS 1.19 1.13 d. Ductile iron, PE, or PVC pipe push-on joints, valves or hydrants with use of Mueller Company "AquaGrip" system. owner and Owner's project representative. Relocation of any utilities shall be approved and coordinated with the appropriate utility owner. Repairs shall be at the expense of the 1.35 225 (16 0.45 0.68 0.90 1.58 CDS 1.28 0.64 1.48 PVC pipe meeting the AWWA Specification C900 for dimension ratio (DR) 14, pressure Class 200, may be used for water lines. Water mains larger than 12—inch diameter in 175 (12 0.30 0.40 0.59 0.80 0.99 1.19 1.39 RDS CHECK size shall meet requirements, Uni-Bell-B-11 for DR-18, PR235 and have integral bell with bonded in ring and spigot joint. On specific authorization of the Authority, 150 (1 0.55 0.74 0.92 1.10 1.29 A. Excavation shall conform to the lines and grades shown on the plans. Trench shall be dug so that pipe can be laid to the alignment and depth required. Excavation shall not be carried below the established grades and any excavation below the required level shall be backfilled with suitable, thoroughly compacted granular bedding material. transmission lines may be PVC meeting Uni-Bell-B-11 with DR-25, PR-165 rating. 0.50 PVC pipe shall be installed, embedded and backfilled according to the manufacturer's written instructions. To facilitate future locating of PVC water pipe, a 12 gauge solid copper wire shall be laid with pipe using manholes, valve vaults or boxes, water meters and fire hydrants as access points. Wire splices shall be made with a 3M Direct Bury Contractor shall install all sheeting, bracing, shoring, sloping or benching necessary to perform the work, to protect existing structures and all excavations as required for safety, in conformance with all local, state and federal safety regulations. Contractor shall comply with OSHA Subpart P, Excavations 29 CFR 1926.650, .651 and .652. Compliance with provisions of the Overhead High Voltage Line Safety Act is required. 100 (7) 0.45 0.60 1.05 Splice Kit (DBY) or equivalent. Where water lines are greater than six (6) feet in depth, wire shall be brought to the surface every one hundred (100) feet and placed in a * If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size. Trenches are not to be left open overnight unless adequate safety precautions are taken. The width of excavation for trenches shall be a minimum of 24" plus the outside standard water meter box or approved junction box. ^ To obtain leakage in liters/hour, multiply the values in the table by 3.785. All service line connections to PVC pipe shall be made using a stainless steel service saddle and full port, Teflon coated ball valve corporation stop. Service saddle shall be liameter of the pipe. Where consistent with safety and space considerations, excavated material is to be placed on uphill side of trenches. Pipe shall not be strung along of the extra wide or double-band type and manufactured specifically for PVC pipe. No direct tap to PVC pipe shall be permitted. B. No water line shall be placed in service until the leakage is less than the allowable leakage as indicated above. Testing of water mains shall only be done after installation of all valves, taps and service laterals are complete. All portions of the water system, including hydrants and service lines, shall be subject to hydrostatic pressure during the trench in excess of that which can be installed each day. 4. Only bell and spigot with electrometric gasket joints shall be used Not more than one hundred fifty feet (150') of trench shall be opened in advance of the completed pipe laying. Wherever foundation material is unsuitable, it shall be excavated until a stable foundation is achieved. Granular material, VDOT stone type 21A, shall then be placed in six leakage test. Testing of water mains shall be observed and documented by an Authority Inspector/Engineer. All high points and service lines in portion of system under test shall be vented and all air expelled from system prior to beginning test. All fittings and hydrants shall be properly braced or blocked before applying pressure. Where concrete thrust blocks are used, they shall have attained their final set prior to testing. inch (6") layers and compacted until the trench bottom has been stabilized. Trench shall be excavated to depth required so as to provide a uniform and continuous bearing support for pipe on solid and undisturbed ground at every point between bell Ductile iron water pipe fittings shall conform with ANSI/AWWA C-153/A-21.53 or ANSI/AWWA C-110/A-21.10, A21.11 for flange fittings. Specification for ductile iron compact fittings shall be considered as meeting the requirements of this Specification. After section of system under test has reached required pressure as stated above, said pressure shall be maintained for two (2) hours. At conclusion of pressure test, holes, except that it will be permissible to disturb and otherwise damage finished surface over a maximum length of eighteen inches (18") near middle of each length of 601 One Bolt, Incorporated "One Bolt" fittings may be used for ductile iron and PVC pipe. volume of makeup water required to refill pipeline shall be determined by measurement with displacement meter or by pumping from vessel of known volume. pipe by withdrawal of pipe slings or other lifting tackle. Damaged area shall be refinished as near as possible. Any part of bottom of trench excavated below specified grade, Infact Corporation's "Foster Adaptor" may be used to connect between mechanical joint fittings, valves and hydrant connections. All joints or fittings at which leakage occurs shall be reworked to insure tightness. All visible leaks shall be repaired regardless of amount of leakage. If measured amount of shall be backfilled with approved materials, and be thoroughly compacted. Finished subgrade shall be prepared accurately by means of hand tools. leakage exceeds values for the appropriate size as found in AWWA Specification C600, Hydrostatic Testing (Table 6), pipeline shall be repaired and retested until leakage is Bedding shall be placed as required by the pipe manufacturer's written installation instructions. Above ground galvanized steel piping shall be Schedule 40 threaded pipe and shall meet the following requirements: dimensions, ANSI B36.10; material, ASTM A 53; and galvanizing, ASTM A 153. Screwed fittings for galvanized piping shall be 150—pound standard, malleable iron meeting the following requirements: dimensions, ANSI B16.3; threads, ANSI B2.1; material, ASTM A 47; and galvanizing, ASTM A 153. ION NOTES AN CATIONS FOR EWATCH CLUB ANDS ROAD - S.R. MAGISTERIAL DISTRICT COUNTY, VIRGINIA within limit set by the referenced specification. Methods of repair prior to retesting will be done with the Authority's approval and inspection. Repairs of new construction will be by adjustment or replacement of material only. The use of repair clamps or bell clamps will not be acceptable. Bell holes shall be provided at each joint to permit the jointing to be made properly and to permit maximum bedding length. Ledge rock, boulders, and large stones shall be removed to provide a clearance of at least six inches (6") below and on each side of pipe and appurtenances being laid and any part or projection of such rock, or stone. Subgrade shall be made by backfilling with compacted gravel or clean selected soil (if approved by governing locality). No pipe shall be laid in water or when, in the opinion of the Authority, trench conditions are unsuitable. If the Owner is of the opinion that trench bottom consists of wet, washable material or is otherwise incapable of properly supporting the pipe or structures, such material shall be removed and replaced with proper bedding material in DISINFFCTION OF WATER MAINS A. General — After testing and before final inspection of the completed systems, water mains and service laterals shall be flushed and disinfected in accordance with AWWA Specification C651 latest revision. Flushing shall be accomplished at a flow velocity of not less than 2.5 feet per second. B. Disinfection Procedures: All gate valves shall be of superior quality ductile iron body with resilient seat and full bronze mount or stainless steel stem. All gate valves shall withstand a working pressure of B. All bedding and backfill placed from bottom of trench to one foot above the pipe shall be placed in 6" lifts; backfill in this area shall not contain stones or earth clods 250 psi and shall be in strict conformance to applicable AWWA Standards. Wrench nut shall turn to the left (counterclockwise) to open valve. Valves shall be so arranged to fit Disinfection as described in AWWA C651 — "Placing of granular calcium hypochlorite tablets" shall be used. Five—gram (5g) calcium hypochlorite tablets with 3.25 gram available chlorine per tablet shall be attached at the inside top of the pipe by an adhesive such as Permatex No. 2 or equal. The following number of tablets for the greater than one inch in diameter. No stone, rock, or earth clod larger than five (5) inches in its greatest dimension shall be used in the backfilling one foot above the pipe to the finished grade on any water or sewer facility. All bedding and backfill outside traffic areas shall be compacted to at least 90% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be placed in 10" lifts. All bedding and backfill located within traffic areas shall be compacted to at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be placed in 10" lifts. All bedding and backfill be fore at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be compacted to at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be placed in 10" lifts. All bedding and backfill shall be compacted to at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be compacted to at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade, the backfill shall be compacted to at least 95% of maximum theoretical density as determined by ASTM D 698; beginning at one foot above the pipe to finished grade. nto pipe lines having standardized mechanical joints or slip joints. All gate valves shall be resilient seat type valves meeting AWWA C515 latest revision Standards. given pipe size shall be used for an initial dose of twenty-five (25 mg/1 (ppm) chlorine: Infact Corporation's "Foster Adaptor" may be used to connect between mechanical joint fittings, valves and hydrant connection Number Tablets Per shall be placed in 6" lifts. All backfill material shall be free of perishable material, frozen clods, sticky masses of clay and other unsuitable matter. Backfill and replacement in existing or proposed roads shall be executed in full accordance with requirements of the Virginia Department of Transportation, or other applicable Pipe Diameter 18-20 Ft. Pipe Section Hydrants shall have cast or ductile iron body with full, bronze trim, and shall withstand a hydrostatic test pressure of 300 psi. Hydrants shall have a six-inch (6") connection ocal government standards. All materials excavated, but not used in backfilling, shall be properly removed and disposed of by the Contractor in an approved location provided base for setting with a minimum of thirty-six inch (36") cover on connection pipe. Hydrants shall be equipped with hose connections as follows: Dewatering equipment shall be sized to maintain the trench in a satisfactory dewatered condition suitable for pipe laying and backfilling. Pipe laying will be permitted only where the depth of water is maintained below the bedding material. Bedding material shall not be placed on unstable trench material. Two each 2-1/2", N.S.T. hose connections One each 4-1/2", N.S.T. pumper connections Excavation at manholes and similar structures shall provide a minimum clearance of eighteen inches (18") between the outer surface of the structure and the embankment Hydrant shall be operated by a National Standard 1-1/2 inch (1-1/2") pentagon shaped, operating nut, opening counterclockwise. Direction of opening shall be clearly marked by an arrow cast on outside of hydrant. Hydrants shall be connected to the main with a six-inch (6") pipe and shall be controlled by an independent six-inch (6") gate valve. Six—inch (6") gate valve shall be located as near to service main as practical, and connected to the tee with tie rods. A gravel dry well shall be provided for hydrant drain. or the number of tablets equal to 0.0012d2L rounded to the next higher integer, where d is the inside diameter, in inches, and L is the length of the pipe section, in feet. Use of the continuous feed or slug method of disinfecting may only be used to re-chlorinate a water pipe after the initial disinfection or in other specific cases TRENCH DEWATERING DURING WATER AND/OR SEWER INSTALLATION IFICA AKEW UDLEY SEK MAG All ground water which may be found in the trenches and any water which may get into them from any cause whatsoever shall be pumped or bailed out so that the trench shall be dry during the pipe laying period. No water shall be permitted to reach concrete until it has set sufficiently. All water pumped from the trenches shall be disposed daive vaults shall be used for all main line valves. All vaults shall be precast manhole cone sections with water manhole covers as shown in the Detail Drawings. Disinfection solution shall remain in pipe line for not less than twenty—four (24) hours, after which time a chlorine residual of 10 ppm at all parts of line shall be of in a manner satisfactory to the OWNER. CONTRACTOR shall provide at least two (2) pumps for each trench opened in wet ground and at the same time, he shall have required. Following chlorination, piping shall be thoroughly flushed. Water in the new main shall be proven comparable in quality, by testing, to the existing public water supply. The Virginia Waterworks Regulations require at least two consecutive satisfactory bacteriological samples from distribution system for every 2,000 feet of pipe before The Virginia Waterworks Regulations require at least two consecutive satisfactory bacteriological samples. Developer/Contractor shall pay all costs associ Il valve boxes, base extensions, head and cover shall be of cast or ductile iron. Valve boxes shall be of the Mueller sliding type, round head marked "Water". Shaft diameter shall one (1) pump in reserve. If, during any time that CONTRACTOR is permitted to lay pipe in a trench containing unavoidable trench water and construction is interrupted for any reason, the open ends not be less than five inches (5"). Valve boxes shall have a minimum range of extension to fit two inch (2") to twelve inch (12") valves inclusive, placed on mains at depths of of pipe shall be closed by watertight plugs or caps, or other means approved by the OWNER. In any case, such protection shall be provided when work is suspended overnight or on weekends and holidays, regardless of the condition of the trench with respect to water at the time that the work is suspended. CONTRACTOR shall be responsible for the protection of all structures, including pipes and manholes, against any tendency to float under conditions of high water, whether due to high ground water or flood conditions on the project site. It shall be the responsibility of the CONTRACTOR to take whatever steps may be required, including the installation and operation of pumps and pumping systems, well points or relief devices, to prevent any structure from floating during construction. three feet, (3') to five feet (5') of cover in order that cover of the valve box is set to finished grade. Valve boxes shall be Mueller Company 10364, or approved equal. Valve system can be placed in service. The Authority will pay the cost of lab testing for first set of bacteriological samples. Developer/Contractor shall pay all costs associated with disinfection and testing of installed facilities and any additional bacteriological samples required after first set. RU ECI LA N DI CREH boxes shall be centered over valve screw and set plumb. Valve vaults and boxes located within paved areas shall be set with the covers exposed and flush with street surface, to the satisfaction of VDOT or the local jurisdiction. E ON FRA Cost of the necessary pumps, well points or other appurtenances required to prevent flotation shall be included in the unit prices bid in the Proposal for the various bid Valve vault and boxes located in sodded or other off-street areas shall be so set with the covers exposed and flush with finished surface elevation NSTI SPE THE items, and no extra compensation shall be allowed for such work. Any damage which may occur to any part of the work as the result of the flotation effect of ground of flood waters shall be repaired in a manner fully satisfactory to the OWNER, at no additional cost to the OWNER. WATER SERVICE CONNECTIONS Type "A" meter connection shall be installed when main line pressure is less than 80 PSI. CONTRACTOR shall provide and place all necessary flumes or other channels of adequate size to carry temporarily all streams, brooks, storm water or other water, which may flow along or across the lines of the pipe line. All flumes or channels thus utilized shall be tight so as to prevent leakage into the trenches. Water pumped from trenches Type "B" meter connection shall be installed when main line pressure is 80 to 120 PSI. shall be led to natural watercourses. Existing sewers shall not be employed as a drain for the removal of dewatering wastes. Type "C" meter connection shall be installed when main line pressure is greater than 120 PSI All meter setters shall be equipped with an integral lockable valve and check valve. Fittings for service lines shall meet AWWA Specification C800. Solder connection shall not be 0 SEPARATION OF WATER LINES AND SANITARY SEWERS used for underground service. All water service pipes from 1" to 3" in diameter shall be "K" type copper. General — Follow State Health Department Standards for the separation of sewer and water. PARALLEL INSTALLATION Normal Conditions - Water lines shall be laid at least ten feet (10') horizontally from a sewer line whenever possible, distance shall be measured edge-to-edge unless determined by the ENGINEER to be unusual conditions. Unusual Conditions — When local conditions prevent a horizontal separation described above, the following construction shall be used: WET TAPS All wet taps to the Authority water system shall be made by the Authority. a. Bottom (invert) of water main shall be at least eighteen inches (18") above top (crown) of sewer. Where this vertical separation cannot be obtained, sewer shall be constructed of AWWA approved water pipe, hydrostatically pressure tested in place without leakage prior c. Sewer manhole shall be made 100% water—tight construction and tested in place by vacuum testing to top of manhole cover frame without leakage for 30 minutes. There pipeline installation requires granular bedding materials, they shall meet requirements of VDOT gradation 21—A, No. 57 or No. 68. No drinking well shall have a sanitary sewer line within 50' unless adequate protection is provided in accordance with B.2.b above. Concrete for reaction anchors shall have 3,500 psi strength at 28 days and shall meet requirements of ASTM C 94. Concrete reaction anchors shall bear against undisturbed earth. Anchors shall be the size and shape indicated on the Plans. Contractor shall provide reaction anchors at all changes in direction and at all dead ends of pressure pipelines 01/01/09 SCALE AS SHOWN 3 **OF** 13 PROJECT NUMBER

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