

WATER MAIN NOTES

- A.** ALL 8"-12" WATER MAIN SHALL BE AWWA C-900 DR-18, UNLESS OTHERWISE SPECIFIED IN THE PLANS. ALL WATER MAIN SHALL HAVE RESTRAINED JOINTS. TRACER WIRE IS REQUIRED OVER ALL WATER MAIN REGARDLESS OF PIPE TYPE. SEE TRACER WIRE DETAIL.
- B.** ALL FITTINGS OR SPECIALS SHALL CONFORM TO ALL REQUIREMENTS OF AWWA C-153. FITTINGS SHALL BE DUCTILE IRON, COMPACT AND HAVE MECHANICAL JOINTS.
- C.** MECHANICAL JOINT RESTRAINTS FOR C-900 AND C-909 SHALL BE FORD UNI-FLANGE STYLE 1500-CA-U, OR APPROVED EQUAL, CONFORMING TO AWWA A-536.
- D.** BELL RESTRAINTS FOR C-909 PIPE SHALL BE EBAA IRON SERIES 1900 BELL RESTRAINTS OR APPROVED EQUIVALENT. FOR C-900 PIPE, BELL RESTRAINTS SHALL BE AN INTERNAL BELL RESTRAINT SYSTEM, RIEBERLOK GASKETS, DPC PIPE DIAMOND LOK-21 INTERNAL RESTRAINT SYSTEM, OR APPROVED EQUAL.
- E.** ALL GATE VALVES SHALL MEET OR EXCEED THE REQUIREMENTS OF AWWA C-515 AND SHALL BE RESILIENT WEDGE DESIGN, RATED FOR 250 PSI. ALL VALVES SHALL OPEN RIGHT BY TURNING IN THE CLOCKWISE DIRECTION. MAINLINE GATE VALVES SHALL BE AMERICAN SERIES 2500 VALVE, OR APPROVED EQUAL. VALVES SHALL BE SUPPLIED WITH 316 STAINLESS STEEL BODY FLANGE BOLTING AND SUPPLIED WITH A 316 STAINLESS STEEL NON-RISING STEM. ALL BOLTS AND NUTS SHALL ALSO BE EPOXY COATED.
- F.** WHERE INDICATED ON PLANS, VALVES SHALL HAVE ALPHA-XL INLET DESIGN, OR APPROVED EQUAL. ALPHA-XL VALVES MAY BE SUBSTITUTED FOR STANDARD MJ VALVES, EXCEPT WHEN UTILIZED WITH TAPPING SLEEVES OR ANCHOR TEES.
- G.** ALL MATERIALS MUST BE AMERICAN MADE, UNLESS OTHERWISE SPECIFIED. ALL NUTS AND BOLTS ARE TO BE STAINLESS STEEL AND EPOXY COATED.
- H.** ALL FITTINGS, TAPPINGS SADDLES, BELL RESTRAINTS, OR OTHER METAL COMPONENTS SHALL BE POLYWRAPPED. POLYWRAP SHALL CONFORM TO AWWA C-105, AND HAVE A MINIMUM THICKNESS OF 8 MIL.

DISINFECTION

A. DISINFECTION OR STERILIZATION OF NEW MAINS AND SERVICES, AS REQUIRED BY THE OEPA, SHALL BE COORDINATED THROUGH THE CITY ENGINEER OR CITY ENGINEER'S REPRESENTATIVE. THE CITY ENGINEER OR CITY ENGINEER'S REPRESENTATIVE RESERVES THE RIGHT TO REQUIRE STRICTER CHLORINE RESIDUAL REQUIREMENTS ON A CASE-BY-CASE BASIS.

B. MAINTAIN PIPES FREE OF DIRT AND FOREIGN MATTER DURING CONSTRUCTION BY DEWATERING TRENCH AND SEALING OPEN PIPE BARRELS. SWAB EACH LENGTH OF PIPE AS IT IS INSTALLED.

C. DISINFECTION TESTING SHALL BE PERFORMED PRIOR TO HYDROSTATIC TESTING. DISINFECTION SHALL BE COMPLETED IN ACCORDANCE WITH AWWA C-651. SAMPLE WATER AT EACH HYDRANT OR IF NO HYDRANT IS AVAILABLE, A SAMPLE TAP SHALL BE INSTALLED BY CONTRACTOR EVERY 1200 FT. ANALYZE SAMPLE USING ORTHOTOLIDINE REAGENT TO VERIFY FREE CHLORINE CONCENTRATION. MAINTAIN CONCENTRATION IN MAIN FOR 24 HOURS. SAMPLE HYDRANTS AT COMPLETION OF STERILIZATION VERIFYING MINIMUM CHLORINE RESIDUAL OF 20 MG PER LITER.

D. CONTRACTOR SHALL ACCOMMODATE FLUSHING AND SAMPLE LOCATIONS

E. THE CONTRACTOR SHALL DISINFECT ALL WATER MAIN AND WATER SERVICE LINES IN ACCORDANCE WITH AWWA C-651, LATEST REVISION. THE DISINFECTION MAY BE PERFORMED BY USING EITHER THE CONTINUOUS FEED METHOD OR THE TABLET METHOD.

F. THE REQUIRED PROCEDURES FOR THE TWO APPROVED DISINFECTION METHODS ARE AS FOLLOWS. ANY REVISIONS TO THESE SEQUENCES OR DISINFECTION METHOD MUST BE IN ACCORDANCE WITH AWWA C-651 AND APPROVED BY THE CITY OF GREENVILLE.

CONTINUOUS FEED METHOD:

- INSTALL WATER MAIN AND PERFORM ALL SERVICE CONNECTIONS.
- FLUSH MAIN AT MINIMUM VELOCITY OF 3 FT/SEC. (BY CITY)
- PERFORM HYDROSTATIC TEST ON WATER MAIN AND SERVICE LINES. (SEE HYDROSTATIC TESTING NOTES)
- PERFORM DISINFECTION. WATER SHALL BE SUPPLIED, FROM EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCE, AT A CONSTANT, MEASURED RATE (NOT TO EXCEED 1 FT/SEC) TO THE NEW MAIN. AT A POINT NOT MORE THAN TEN (10) FEET DOWNSTREAM FROM THE BEGINNING OF THE NEW MAIN, WATER ENTERING THE MAIN SHALL RECEIVE A DOSE OF CHLORINE FED AT A CONSTANT RATE SUCH THAT THE WATER WILL HAVE NOT LESS THAN 25 MG/L FREE CHLORINE, AS MEASURED IN REGULAR INTERVALS. CONTINUE CHLORINE APPLICATION UNTIL THE ENTIRE NEW MAIN IS FILLED WITH HEAVILY CHORINATED WATER.
- FLUSH MAIN AT MINIMUM VELOCITY OF 3 FT/SEC, TO LOWER CHLORINE LEVEL TO THE SYSTEM LEVEL. (BY CITY)
- PERFORM BACTERIOLOGICAL TEST ON ALL MAIN AND WATER SERVICE LINES, IN ACCORDANCE WITH AWWA C-651. (BY CITY)
- PERFORM FINAL WATER MAIN TIE-INS.
- PERFORM FINAL FLUSH, AT MINIMUM VELOCITY OF 3 FT/SEC, TO REMOVE ANY EXCESS DEBRIS AND AIR FROM THE LINE. (BY CITY)
- FOR REPLACEMENT PROJECTS, CONNECT ALL NEW WATER SERVICE BRANCHES TO EXISTING SERVICES. PRIOR TO CONNECTION, WATER SERVICES SHALL BE FLUSHED FOR 2-5 MINUTES TO REDUCE CHLORINE RESIDUAL TO SYSTEM LEVEL AND TO REMOVE EXCESS DEBRIS AND AIR.

TABLET METHOD:

- INSTALL WATER MAIN. DURING CONSTRUCTION, PLACE CALCIUM HYPOCHLORITE GRANULES AT UPSTREAM END OF FIRST SECTION OF PIPE, AT UPSTREAM END OF EACH BRANCH MAIN, AND AT 500 FT. INTERVALS. AMOUNT OF GRANULES TO BE PLACED SHALL BE IN ACCORDANCE WITH AWWA C-651. PLACE (1) 5-G CALCIUM HYPOCHLORITE TABLETS IN EACH SECTION OF PIPE, IN EACH HYDRANT AND EACH HYDRANT BRANCH.
- PERFORM ALL SERVICE CONNECTIONS.
- FILL AND FLUSH WATER MAIN AT VELOCITY OF NO MORE THAN 1 FT/SEC. (BY CITY)
- FLUSH FOR A MINIMUM OF 24 HOURS. IF THE WATER TEMPERATURE IS BELOW 41°F, THE WATER SHALL REMAIN IN THE MAIN FOR A MINIMUM OF 48 HOURS. CHLORINE RESIDUAL LEVELS ARE TO BE MEASURED BY THE CITY AFTER THIS PERIOD PASSES. FLUSHING SHALL CONTINUE UNTIL AN ACCEPTABLE CHLORINE LEVEL IS OBTAINED.
- PERFORM HYDROSTATIC TEST ON WATER MAIN AND SERVICE LINES. (SEE HYDROSTATIC TESTING NOTES)
- FLUSH MAIN AT MINIMUM VELOCITY OF 3 FT/SEC, TO LOWER CHLORINE LEVEL TO THE SYSTEM LEVEL. (BY CITY)
- PERFORM BACTERIOLOGICAL TEST ON ALL MAIN AND WATER SERVICE LINES, IN ACCORDANCE WITH AWWA C-651. (BY CITY)
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HYDROSTATIC TEST

A. AFTER THE PIPE HAS BEEN LAID AND BACKFILLED, ALL NEWLY LAID PIPE OR VALVED SECTION SHALL BE SUBJECTED TO HYDROSTATIC PRESSURE AND LEAKAGE TEST. ALL WATER MAINS MUST BE HYDROSTATICALLY TESTED (AWWA C-605). THE TESTS MUST BE PERFORMED IN THE PRESENCE OF A REPRESENTATIVE OF THE CITY OF GREENVILLE.

THE MINIMUM LEAKAGE TEST PRESSURE FOR ALL WATER MAIN SHALL BE 150 PSI, OR 1.5 TIMES THE ANTICIPATED AVERAGE STATIC PRESSURE, WHICHEVER IS GREATER. THE MINIMUM TEST PRESSURE SHALL BE HELD FOR A MINIMUM OF TWO (2) HOURS FOR ALL WATER MAIN. HYDROSTATIC PRESSURE SHALL BE APPLIED BY MEANS OF A PUMP TAKING WATER FROM AN AUXILIARY SUPPLY. ALL PIPING MUST BE PROPERLY FILLED AND FLUSHED TO DISPEL ALL AIR BEFORE THE TEST IS MADE USING POTABLE WATER.

B. HYDROSTATIC TESTING MUST BE PERFORMED ON ALL NEW WATER MAIN AND SERVICE LINES (FROM WATER MAIN TO CURB STOP). THE CITY OF GREENVILLE WILL APPROVE OF THE TESTING OF SERVICES BY TWO (2) METHODS. THE PROCEDURES FOR EACH TESTING METHOD ARE AS FOLLOWS:

METHOD 1:

- INSTALL WATER MAIN AND PERFORM ALL SERVICE TAPS ON A DRY MAIN. THE HYDROSTATIC TEST IS PERFORMED ON WATER MAIN AND SERVICE CONNECTIONS. THE TEST IS TO BE PERFORMED AGAINST CLOSED CORPORATION STOPS.
- INSTALL EACH WATER SERVICE LINE TO THE CURB STOP. HYDROSTATIC TESTS ARE TO BE PERFORMED ON EACH SERVICE LINE INDIVIDUALLY, FROM THE CORP STOP TO THE CURB STOP.
- A MINIMUM TEST PRESSURE OF 150 PSI SHALL BE HELD FOR FIFTEEN (15) MINUTES FOR EACH SERVICE.
- ALL SERVICE TRENCHES (INCLUDING SERVICE TAPS) MUST BE LEFT OPEN UNTIL HYDROSTATIC TEST IS PERFORMED, IN ORDER TO VISUALLY INSPECT THE SERVICE DURING TESTING.
- AFTER PERFORMING THE HYDROSTATIC TEST, OPEN THE CORPORATION STOP AND FLUSH THE SERVICE LINE AT A MIN. VELOCITY OF 3 FT/SEC. FOR 2-5 MINUTES.

METHOD 2:

- INSTALL WATER MAIN AND ALL SERVICE LINES, UP TO THE CURB STOP. THE HYDROSTATIC TEST IS TO BE PERFORMED ON THE WATER MAIN, AND ALL WATER SERVICES CONNECTED THE SECTION OF MAIN BEING TESTED, AT ONE TIME.
- THE MINIMUM TEST PRESSURE SHALL BE HELD FOR A MINIMUM OF TWO (2) HOURS. THE ALLOWABLE LEAKAGE WILL BE DETERMINED BASED ON THE DIAMETER AND LENGTH OF WATER MAIN TESTED ONLY. NO ADDITIONAL LEAKAGE WILL BE ALLOWED FOR THE WATER SERVICE LINES.
- ALL SERVICE CONNECTIONS MUST BE KEPT UNCOVERED DURING THE TEST, TO ALLOW FOR A VISUAL INSPECTION OF THE TAP.
- AFTER PERFORMING THE HYDROSTATIC TEST, OPEN THE CORPORATION STOP AND FLUSH THE SERVICE LINE AT A MIN. VELOCITY OF 3 FT/SEC. FOR 2-5 MINUTES.

C. LEAKAGE IS DEFINED AS THE QUANTITY OF WATER TO BE SUPPLIED INTO THE NEWLY LAID PIPE, OR ANY VALVED SECTION THEREOF, NECESSARY TO MAINTAIN THE SPECIFIED LEAKAGE TEST PRESSURE AFTER THE PIPE HAS BEEN FILLED WITH WATER AND THE AIR EXPELLED.

D. NO PIPE INSTALLATION WILL BE ACCEPTED IF THE LEAKAGE EXCEEDS THE LEAKAGE DETERMINED BY THE CHART BELOW:

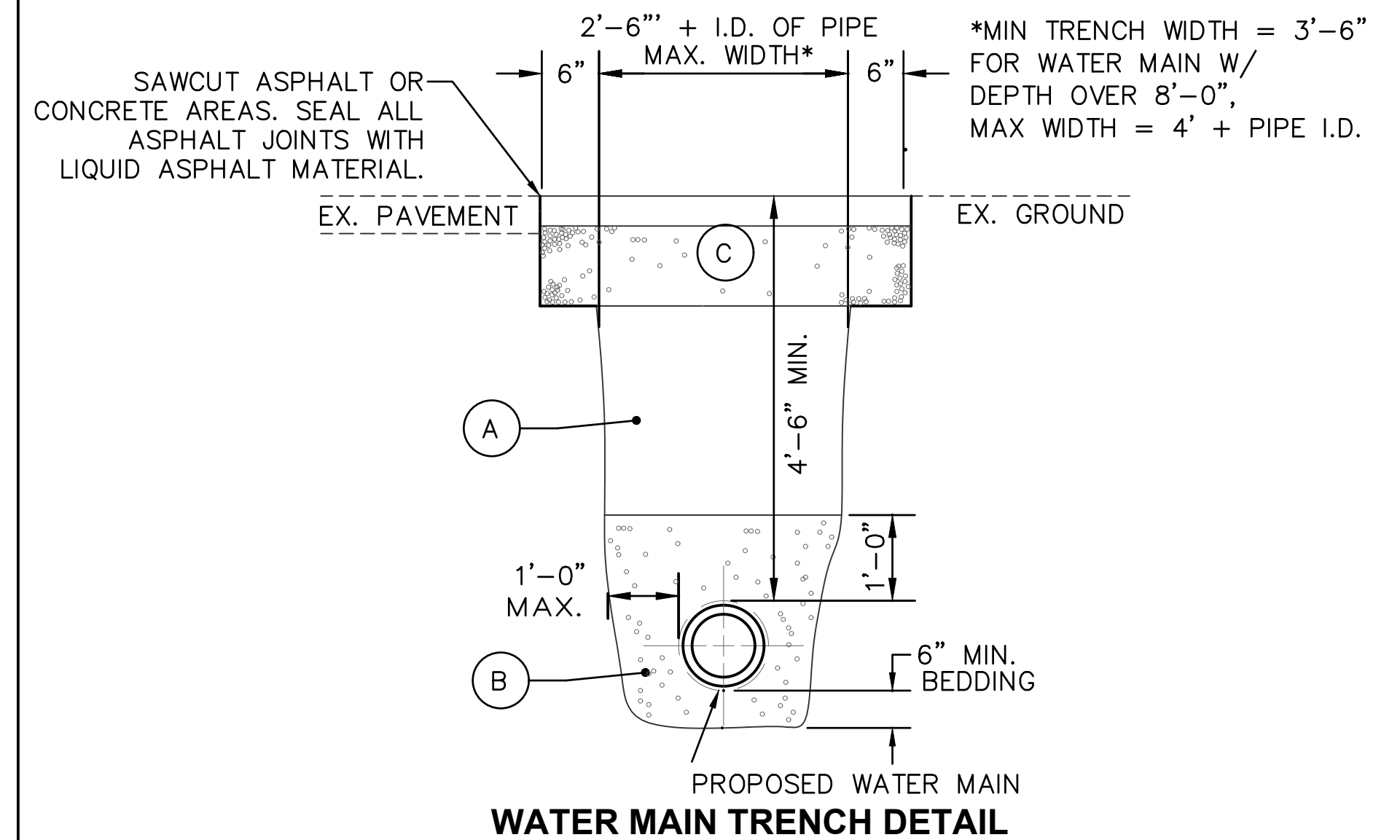
PVC Where: L = length of pipe tested, in ft. $Q = \frac{L * D * \sqrt{P}}{148,000}$
 D = pipe diameter, in inches
 P = average test pressure
 Q = allowable leakage per hour

During the hydrostatic test, a thorough examination of all piping, fittings, valves, hydrants, etc. shall be performed. Leaking joints shall be tightened and cracked or otherwise defective material shall be removed and replaced and the test shall be repeated until satisfactory results are obtained.

Below is a table which represents the allowable leakage in gallons per hour.

ALLOWABLE LEAKAGE PER 1000FT. OF PIPELINE (GALLONS PER HOUR)

AVG. TEST PRESSURE (PSI) BAR	NOMINAL PIPE DIAMETER- INCHES							
	3	4	6	8	10	12	14	16
450(31)	0.43	0.57	0.86	1.15	1.43	1.72	2.01	2.29
400(28)	0.41	0.54	0.81	1.08	1.35	1.62	1.89	2.16
350(24)	0.38	0.51	0.76	1.01	1.26	1.52	1.77	2.02
300(21)	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87
275(19)	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79
250(17)	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71
225(16)	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62
200(14)	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53
175(12)	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43
150(10)	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32



WATER MAIN TRENCH DETAIL

TRENCH DETAIL NOTES

A. ALL TRENCH EDGES NOT UNDER OR WITHIN 5' OF PROPOSED OR EXISTING PAVEMENT, CURB, DRIVEWAYS, ALLEYS, STONE AREA OR WALKS CAN BE COMPACTED EXISTING NATIVE MATERIAL IN 12" MAXIMUM LIFTS OR AS APPROVED BY THE CITY. NO MATERIAL SHALL BE USED FOR BACKFILLING THAT CONTAINS STONE, ROCKS, ETC., GREATER THAN 4" DIAMETER.

ALL TRENCH EDGES UNDER OR WITHIN 5' OF PROPOSED OR EXISTING PAVEMENT, CURB, DRIVEWAYS, ALLEYS, STONE AREA OR WALKS SHALL EITHER BE GRANULAR BACKFILL MATERIAL ODOT 703 TYPE 3 (ANGULAR #57 STONE), OR ANGULAR ODOT #9 STONE. GRANULAR BACKFILL OF 95% OF ASTM D698 STANDARD PROCTOR CURVE MAY BE REQUIRED TO BE PERFORMED BY A COMMERCIAL TESTING LAB SATISFACTORY TO THE CITY.

B. STRUCTURAL BEDDING SHALL BE CRUSHED STONE OR GRAVEL, ODOT 703 TYPE 3 (ANGULAR #57 STONE), OR ANGULAR ODOT #9 STONE. **A**

C. OFF-PAVEMENT AREAS SHALL BE PROVIDED WITH A MINIMUM OF 6" OF TOPSOIL OVER THE COMPACTED MATERIAL AND THEN SEEDED AND MULCHED PER ODOT ITEM 659.

IN-PAVEMENT AREAS SHALL CONSIST OF THE FOLLOWING:

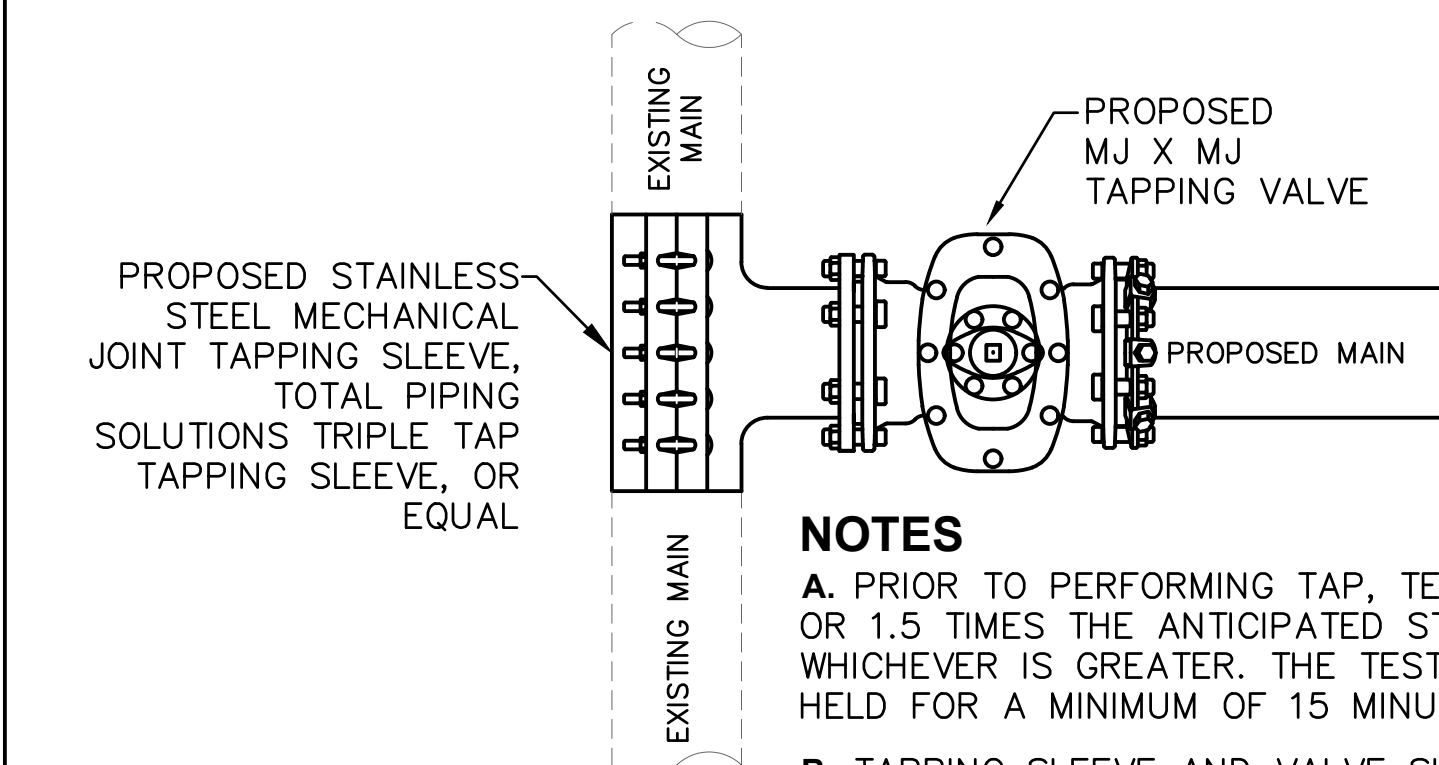
- ASPHALT PAVEMENT RESTORATION**
ITEM 441 - 1-1/2" ASPHALT SURFACE COURSE, TYPE 1, PG. 64-22 (448) ON ITEM 407 - NON-TRACKING TACK COAT, APPLIED @ 0.08 GAL/S.Y., ON ITEM 301 - 4-1/2" ASPHALT CONCRETE BASE, PG. 64-22, ITEM 304 - 6" AGGREGATE BASE, AS PER PLAN, IN LIFTS OF 3" MAXIMUM
- GRAVEL PAVEMENT RESTORATION**
ITEM 304 - 12" AGGREGATE BASE, AS PER PLAN, IN LIFTS OF 4" MAXIMUM

6" OF ODOT 304 - AGGREGATE BASE SHALL BE INSTALLED UNDER ALL REPLACED CURB

CONCRETE PAVEMENT MUST BE REPLACED IN FULL PANELS. DRIVE APRONS ARE TO BE INSTALLED PER THE CITY OF GREENVILLE'S REQUIREMENTS.

WHERE THE EXISTING PAVEMENT IS THICKER, THE CONTRACTOR SHALL INCREASE THE COURSE THICKNESS TO MATCH EXISTING.

D. THE OPEN ENDS OF ALL PIPES SHALL BE PLUGGED TO THE APPROVAL OF THE CITY BEFORE LEAVING THE WORK FOR THE NIGHT.



NOTES

- A.** PRIOR TO PERFORMING TAP, TEST SLEEVE TO 150 PSI, OR 1.5 TIMES THE ANTICIPATED STATIC PRESSURE, WHICHEVER IS GREATER. THE TEST PRESSURE SHALL BE HELD FOR A MINIMUM OF 15 MINUTES.
- B.** TAPPING SLEEVE AND VALVE SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR. THE CITY OF GREENVILLE WILL PERFORM THE TAP.

TAPPING SLEEVE FOR WATER MAINS