WATER LINE GENERAL NOTES

1. PARALLEL INSTALLATION

a. Normal conditions: Water lines shall be laid at least ten (10) feet horizontally from all sewers or sewer manholes whenever possible. The distance shall be measured edge to edge.

b. Unusual conditions: When local conditions prevent a horizontal separation of ten (10) feet, the water line may be laid closer to a sewer line or sewer manhole provided that the following occurs:

1. The bottom (invert) of the water main shall be at least eighteen inches above the top (crown) of the sewer pipe.

2. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place without leakage prior to backfilling.

3. The sewer manhole shall be of water-tight construction and tested in place.

2. CROSSING INSTALLATION

a. Normal conditions: Water lines crossing sewers shall be laid to provided a separation of at least eighteen inches between the bottom of the water line and the top of the sewer line whenever possible.

b. Unusual conditions: When local conditions prevent a vertical separation described in normal conditions, the following construction shall be used:

1. Sewers passing over or under waterlines shall be constructed of the materials described above.

2. Water lines passing under sewers shall, in addition, be protected by providing:

(a) A vertical separation of at least eighteen inches between the bottom of the sewer and the top of the water line.

(b) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line.

(c) That the length of the waterline be centered at the point of crossing so that the joints shall be equidistant and as far as possible from the sewer.

* No water lines shall pass through or come in contact with with either sewer lines or sewer manholes.

* Water mains shall have a minimum cover of three (3) feet.

3. TESTING OF WATER LINES

* After placing all harnessing and all valve support concrete, sufficient backfill shall be placed prior to filling the pipe with water and field tested to prevent lifting of the pipe. When local conditions require that the trenches be backfilled immediately after the pipe has been laid, the testing shall be carried out after backfilling has been completed but prior to placement of the permanent surface. At lease seven (7) days shall elapse after the last valve support or hydrant block has been cast (Type I Portland Cement) prior to testing, unless high early strength concrete (Type III) is used, in which case three (3) days shall elapse.

* All testing will be performed in accordance with the AWWA C600, latest revision.

* After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing.

Test pressures shall:

* not be less than 1.25 times the working pressure at the highest point along the test section;
* not exceed pipe or thrust restraint design pressures;
* be of at least 2-hour duration
* not vary by more than 5 psi
* not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants;
* not exceed the rated pressure of the valve.

* Each valved section of pipe shall be filled slowly with properly disinfected water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer.

* Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants.

* All exposed pipe, fittings, valves, hydrants and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Engineer.

* A leakage test shall be conducted concurrently with the pressure test. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{0.5}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. When testing against closed metal-seated valves, an additional leakage per enclosed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed. When hydrants are in the test section, the test shall be made on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than the allowable amount, the Contractor shall, at his own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

* A continuous and uniform bedding shall be provided in the trench for all pipe. Stones and rocks found within the trench shall be removed for a depth of at least 6" below the bottom of the pipe and tamped select bedding be provided. After the pipe has been placed in the trench, the trench shall be backfilled with select material and compacted so as not to damage the pipe.

* All disinfection of water lines, valves, sample taps and appurtenances shall be performed using either if the following two methods:

Continuous Feed Method:
Potable water shall be introduced into the pipe line at a constant flow rate. Chlorine shall be added at a constant rate to this flow so that the chlorine concentration in the water in the pipe shall me at least 50 mg/l. The chlorinated water shall remain in the pipe for at least 24 hours after which the chlorine concentration shall be at least 10 mg/l. All valves and appurtenances shall be operated while the chlorinated water remains in the pipeline.

Tablet Method:
This method shall not be used if non-potable water or foreign materials have entered the lines or if the water temperature is below 5 C (41 F).

The tablets shall be placed in each section of pipe and all appurtenances. Enough tablets shall be placed to insure that a chlorine concentration of 25 mg/l is provided in the water. They shall be attached to the top of the pipe sections and crushed or rubbed in the appurtenances. The adhesives shall be acceptable to the Bureau. The velocity of the potable water in the lines shall be less than 1 ft/sec. The water shall remain in contact with the pipe for 24 hours. All valves and appurtenances shall be operated while the chlorinated water is in the pipeline.

* After the required detention period, the heavily chlorinated water shall be flushed from the pipe using potable water.

* After the lines have been flushed, the water lines shall be tested in accordance with Section 3.58 (VR 355-18-012.00) of the Virginia Waterworks Regulations outlined below.

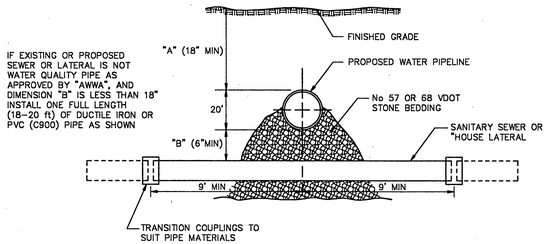
* Virginia Waterworks Regulations, Section 3.58 (VR 355-18-012.00) states the following test procedure following disinfection of the waterlines:

(a) Two water samples for bacteriorlogical analysis must be collected 24 hours apart and analyized by a certified laboratory. The results of these samples must indicate no coliform contamination before the pipe, tanks or equipment can be utilized as part of the waterworks. If contamination is indicated, the disinfection procedure must be repeated.

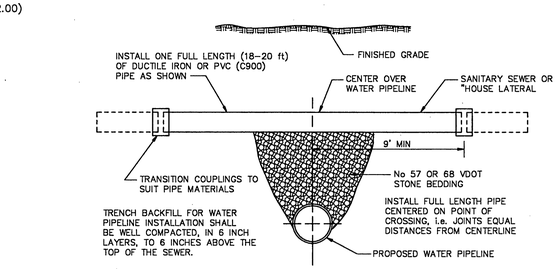
(b) All chlorine residual determinations shall be made using only those methods approved by the Bureau.

* All waterlines shall be a minimum standard of C900 PVC, DR-18 "Blue Brut" or equal with NSF-PW seal and fittings for solvent joints. Ductile Iron Pipe, Class 51 is an approved alternate.

* The contractor shall install electronically detectable location tape above all proposed waterlines, except in the case where ductile iron pipe is used. The location tape shall be installed continuously between valves, tees and other fittings, in the trench backfill, 6" above the pipe crown or where directed by the owner or engineer.

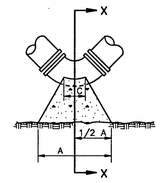


WATER PIPELINE CROSSING
ABOVE SEWER OR LATERAL

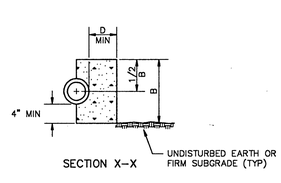


WATER PIPELINE CROSSING
BELOW SEWER OR LATERAL

WATER PIPELINE CROSSING
SANITARY SEWER OR "HOUSE" LATERAL
N.T.S.



PLAN



SECTION X-X

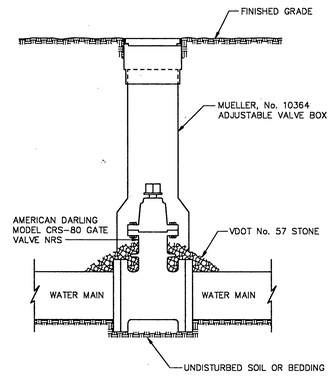
NOTE: INSTALL TWO LAYERS OF 15 LB BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE BETWEEN CONCRETE AND FITTING

PIPE DIA	45° BEND					90° BEND				
	A	B	C	D	E	A	B	C	D	E
3"	9"	12"	6"	6"	4"	12"	12"	6"	12"	6"
4"	9"	12"	6"	6"	4"	16"	12"	6"	12"	6"
6"	12"	14"	6"	8"	4"	21"	14"	6"	18"	6"
8"	18"	16"	8"	9"	6"	30"	16"	8"	18"	9"
10"	24"	16"	8"	10"	6"	36"	24"	10"	18"	9"
12"	30"	20"	12"	12"	9"	48"	24"	12"	18"	12"
16"	42"	30"	12"	15"	9"	60"	30"	16"	21"	12"
20"	56"	30"	12"	16'	16"	72"	40"	20"	21"	24"
24"	60"	36"	12"	21"	24"	84"	48"	24"	24"	30"
30"	72"	48"	16"	27"	24"	108"	60"	30"	24"	36"

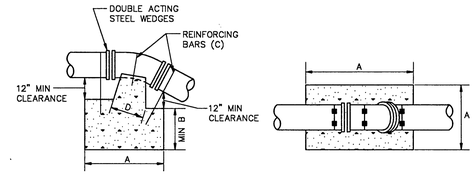
BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi

E = ADDITIONAL LENGTH TO BE ADDED TO DIMENSION A FOR EACH ADDITIONAL 50 PSI PRESSURE UP TO 300 PSI

THRUST BLOCK DETAIL
45° - 90° BENDS
N.T.S.



VALVE INSTALLATION
N.T.S.



ELEVATION PLAN

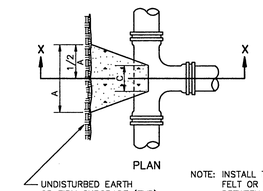
NOTES:
1. EMBED REINFORCING BARS MINIMUM OF 36" DIAMETERS INCLUDING HOOK
2. PAINT EXPOSED BARS BARS WITH TWO COATS OF BITUMINOUS PAINT
3. WHERE FOUR BARS ARE REQUIRED, PLACE TWO BARS SYMMETRICALLY AROUNG FITTING
4. INSTALL TWO LAYERS OF 15 lb BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE

C = NUMBER AND SIZE OF REINFORCING BARS
D = DIMENSION OF PIPE DIAMETER

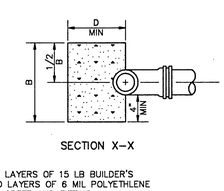
BEND		PIPE DIAMETER									
		3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
11 1/4°	A	18"	18"	24"	24"	27"	30"	39"	48"	54"	60"
	B	18"	18"	18"	24"	24"	27"	30"	30"	36"	36"
	C	3 #5	3 #5	3 #5	3 #6	3 #6	3 #6	3 #6	3 #8	3 #8	3 #8
22 1/2°	A	18"	24"	30"	33"	42"	48"	54"	66"	72"	84"
	B	18"	18"	24"	27"	27"	30"	36"	42"	48"	54"
	C	3 #5	3 #5	3 #5	3 #6	3 #6	4 #6	4 #6	3 #8	4 #8	4 #8
45°	A	24"	30"	36"	42"	48"	54"	60"	90"	98"	120"
	B	18"	24"	24"	30"	33"	36"	42"	48"	54"	60"
	C	3 #5	3 #5	3 #5	3 #6	4 #6	4 #6	4 #8	4 #8	4 #8	4 #9

BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi

THRUST BLOCK DETAIL
UPPER VERTICAL BENDS
N.T.S.



PLAN

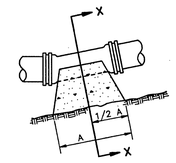


SECTION X-X

NOTE: INSTALL TWO LAYERS OF 15 LB BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE BETWEEN CONCRETE AND FITTING

TEE	PIPE DIAMETER									
	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
A	12"	12"	16"	18"	26"	30"	40"	48"	60"	80"
B	12"	16"	20"	30"	32"	42"	56"	72"	80"	96"
C	8"	8"	12"	12"	12"	12"	16"	24"	24"	24"
D	6"	6"	8"	9"	10"	12"	14"	18"	20"	24"

BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi



PLAN SECTION X-X

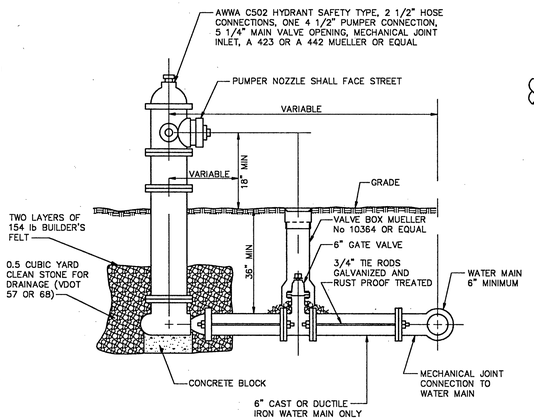
NOTE: INSTALL TWO LAYERS OF 15 LB BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE BETWEEN CONCRETE AND FITTING

BEND		PIPE DIAMETER								
		3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
11 1/4°	A	6"	6"	6"	8"	8"	8"	13"	15"	22"	32"
	B	12"	12"	14"	16"	18"	24"	28"	32"	36"	40"
	C	8"	8"	8"	8"	8"	8"	9"	10"	12"	14"
22 1/2°	A	6"	6"	10"	11"	15"	16"	25"	33"	39"	43"
	B	12"	12"	14"	16"	18"	24"	28"	32"	36"	40"
	C	8"	8"	8"	8"	9"	9"	12"	14"	16"	18"
45°	A	10"	12"	14"	21"	29"	32"	48"	66"	72"	98"
	B	12"	12"	14"	16"	18"	24"	28"	32"	42"	48"
	C	8"	8"	8"	8"	12"	14"	18"	24"	30"	36"

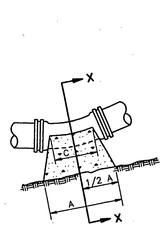
BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi

THRUST BLOCK DETAIL
LOWER VERTICAL BENDS
N.T.S.

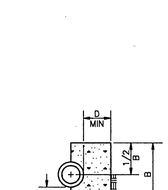
NOTE: MINIMUM DISTANCE BETWEEN HYDRANT AND FACE OF CURB SHALL BE 24 INCHES. (WHERE APPLICABLE)



FIRE HYDRANT ASSEMBLY
N.T.S.



PLAN



SECTION X-X

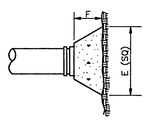
NOTE: INSTALL TWO LAYERS OF 15 LB BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE BETWEEN CONCRETE AND FITTING

PIPE DIA	11 1/4° BEND					22 1/2° BEND				
	A	B	C	D	E	A	B	C	D	E
3"	4"	12"	4"	6"	2"	6"	12"	6"	7"	2"
4"	4"	12"	4"	6"	2"	6"	12"	6"	7"	2"
6"	6"	14"	6"	7"	2"	8"	14"	6"	8"	2"
8"	8"	16"	8"	7"	2"	12"	16"	8"	8"	4"
10"	9"	18"	8"	8"	4"	15"	18"	8"	10"	4"
12"	12"	20"	12"	9"	4"	18"	20"	12"	12"	6"
16"	15"	24"	12"	9"	6"	24"	24"	12"	15"	6"
20"	30"	12"	10"	10"	6"	30"	30"	12"	18"	9"
24"	18"	36"	12"	12"	6"	36"	36"	12"	18"	9"
30"	24"	42"	16"	14"	9"	48"	42"	16"	21"	12"

BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi

E = ADDITIONAL LENGTH TO BE ADDED TO DIMENSION A FOR EACH ADDITIONAL 50 PSI PRESSURE UP TO 300 PSI

THRUST BLOCK DETAIL
11 1/4° - 22 1/2° BENDS
N.T.S.



NOTE: INSTALL TWO LAYERS OF 15 LB BUILDER'S FELT OR TWO LAYERS OF 6 MIL POLYETHLENE BETWEEN CONCRETE AND FITTING

PLUG	PIPE DIAMETER									
	3"	4"	6"	8"	10"	12"	16"	20"	24"	30"
E	14"	16"	21"	29"	36"	41"	54"	64"	75"	88"
F	8"	8"	10"	10"	12"	14"	16"	18"	20"	24"

BASED ON NORMAL OPERATING PRESSURE UP TO 150 psi

THRUST BLOCK DETAIL
TEES, TAPPING SLEEVES, PLUGS, CAPS
N.T.S.

DATE	REVISIONS
	6
	5
	4
	3
	2
	1

DATE: FEBRUARY 28, 1995
JOB No.: 950109
ACAD #: 950109D
SCALE: N.T.S.
DRAWN BY: MMB
CHKD: RGL

LANG engineering co.
Consulting Engineers · Land Planners
P.O. BOX 18062 ROANOKE, VA. 24014 (703)772-0077

POTABLE WATER DETAILS
DVW, INC. INDUSTRIAL TRACT
WITHIN JACK SMITH INDUSTRIAL PARK
BLUE RIDGE DISTRICT
BOTETOURT COUNTY, VIRGINIA

SHEET NO. 4
OF 5