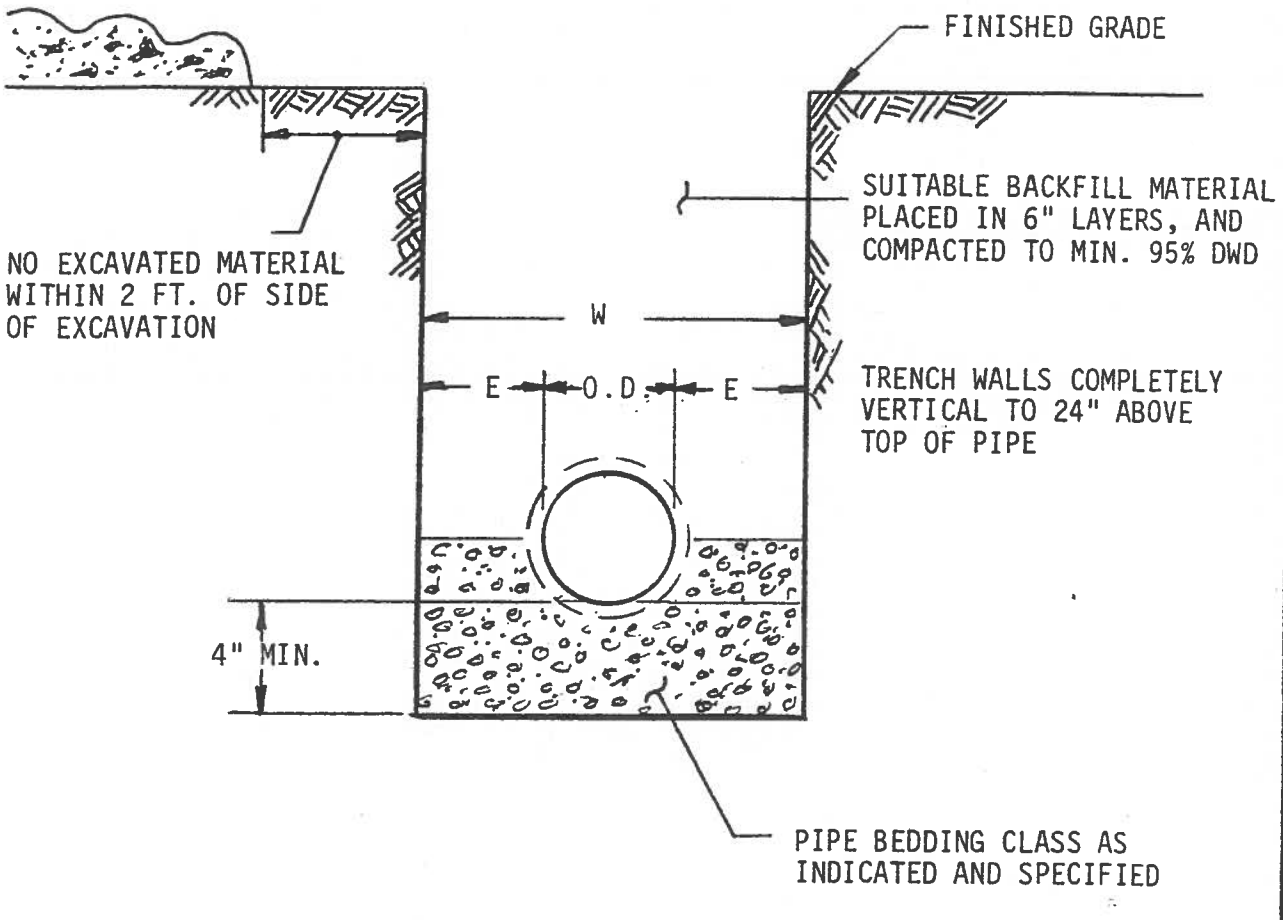
APPENDIX A
WATER SYSTEMS STANDARD DETAILS

W 1.0	Pipe Trench Detail
W 2.0	Typical Highway Crossing
W 3.0	Railroad Crossing
W 4.0	Concrete Cradle and Encasement Details
W 5.0	Buttresses for Tees
W 6.0	Buttresses for Horizontal Bends
W 7.0	Buttresses for Vertical Bends
W 8.0	Anchorages for Vertical Bends
W 9.0	Curvature of Ductile Iron Pipeline
W 10.0	Typical Valve and Valve Box
W 11.0	Typical Meter Setting - 5/8" x 3/4", and 1"
W 12.0	Typical Meter Setting - 1-1/2" and 2" Single Meter
W 12.1	Typical Meter Setting - 1-1/2" and 2" Dual Meters
W 13.0	Meter Vault, Detector Check with Domestic Disc Meter, 2" & Less
W 13.1	Meter Vault, Detector Check with Domestic Compound Meter, 2" & Greater
W 14.0	Typical Fire Hydrant Setting - MJ x FL Tee and Valve w/Retainer Glands
W 15.0	Automatic Air Release Valve
W 16.0	Manual Air Release Valve
W 17.0	Dead End Blow-off
W 18.0	Standard Paving Restoration Details



MAXIMUM TRENCH WIDTH – "W"

	"E"	"W"
3/4" THRU 6":	VARIABLE	30"
8" THRU 42":	12"	32" TO 66" (REFER TO 3.2.1)

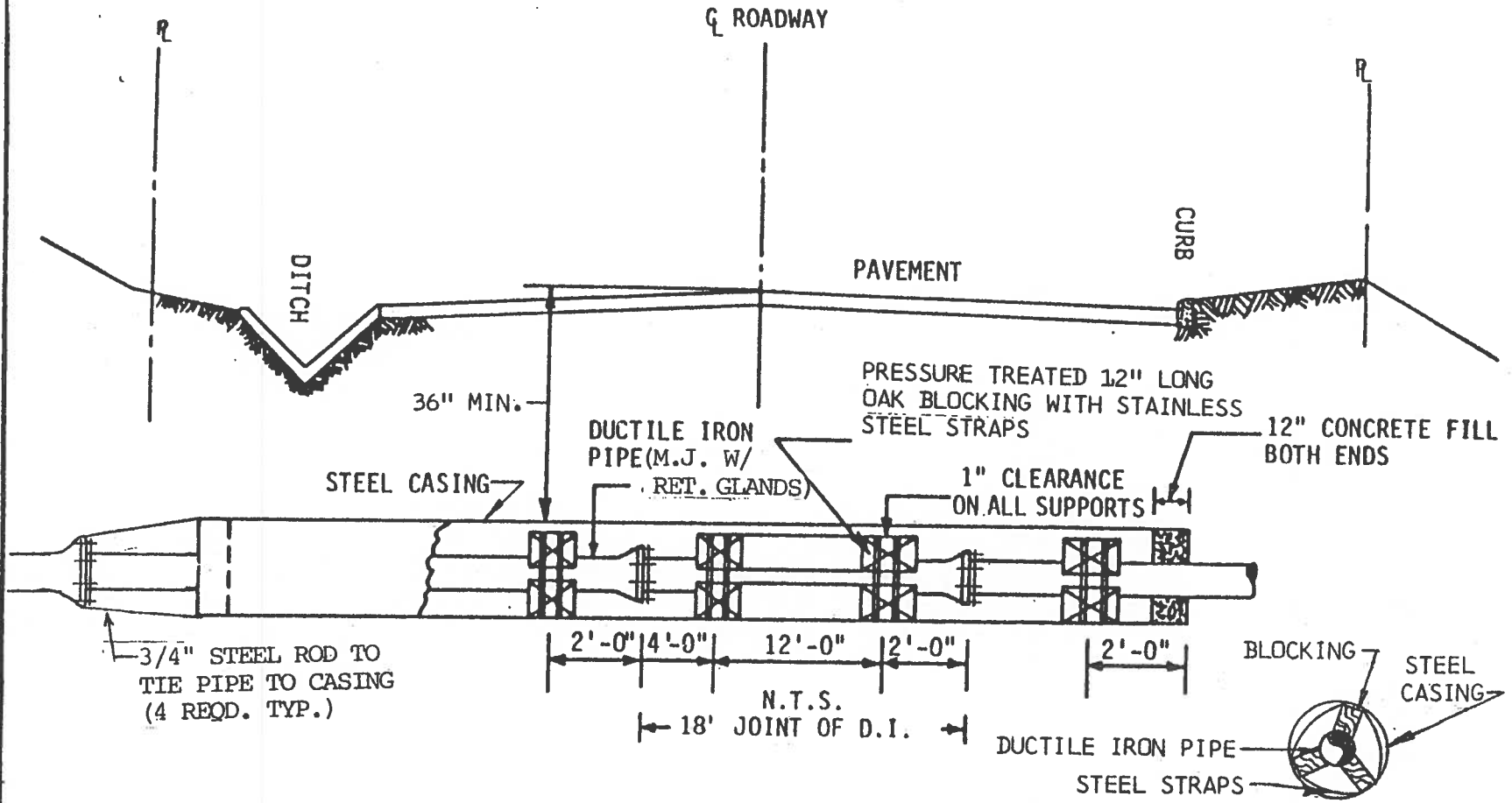
City of Williamsburg, Virginia

PIPE TRENCH DETAIL

Drwn.	-
Scale	nts
Date	9/84
Dwg.	W1.0

TYPICAL HIGHWAY CROSSING

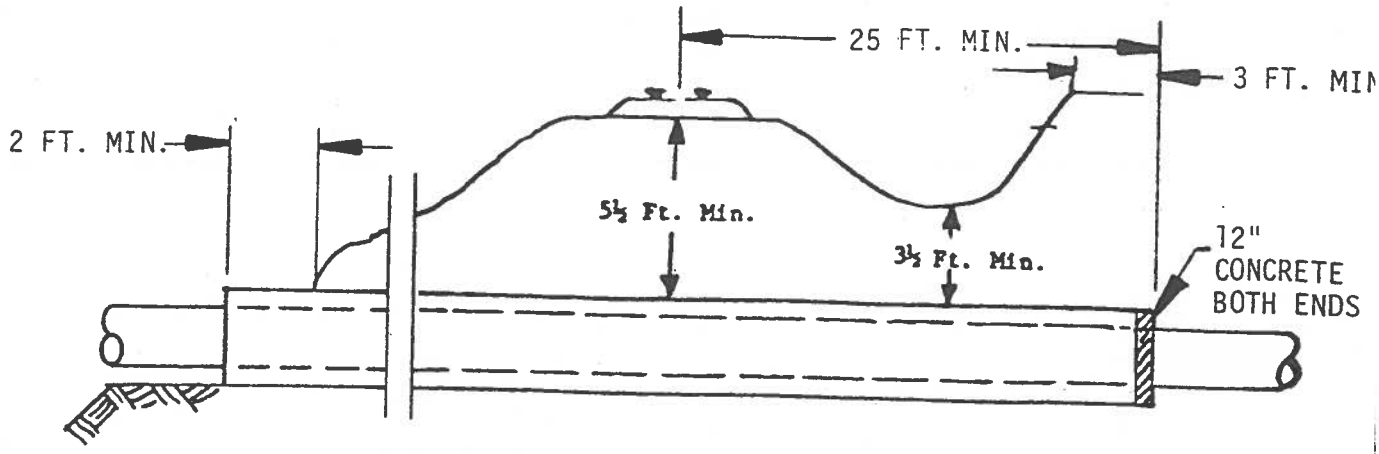
City of Williamsburg, Virginia



NOTE: STEEL CASING TO EXTEND TO BACK OF CURB, DITCH, SIDEWALK, ETC. OR A MINIMUM OF 3' BEYOND THE EDGE OF PAVEMENT.

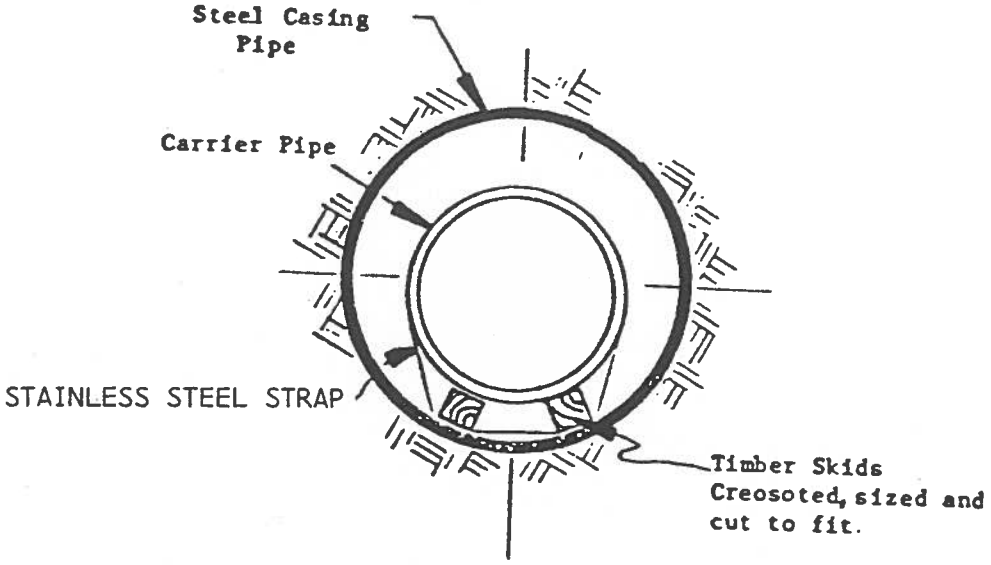
Dwg.	Date	Scale	Drwn.
W2.0	9/84	nts	-

Rev. 3-20-90

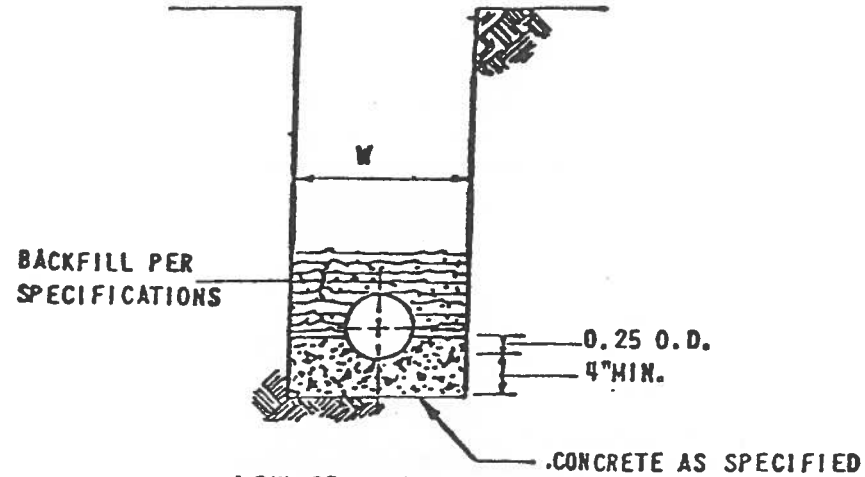


NOTES:

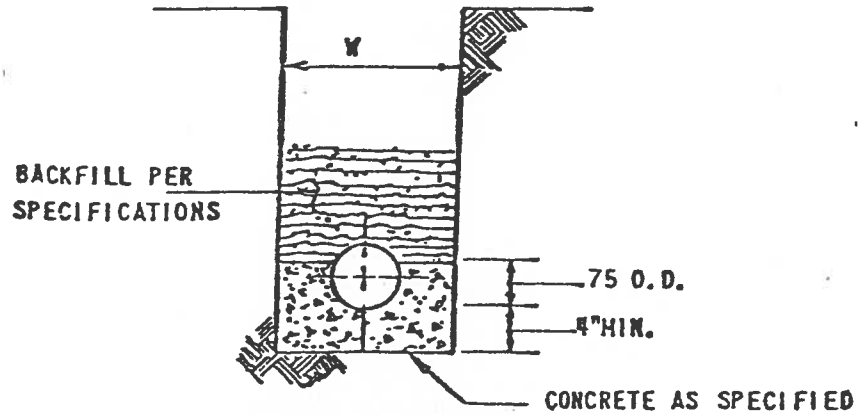
1. If installed by open-cut method, backfill trench full width and depth with select material backfill, compacted to 100% dry weight density.
2. If installed by boring and jacking, pressure grout space between casing and boring excavation.



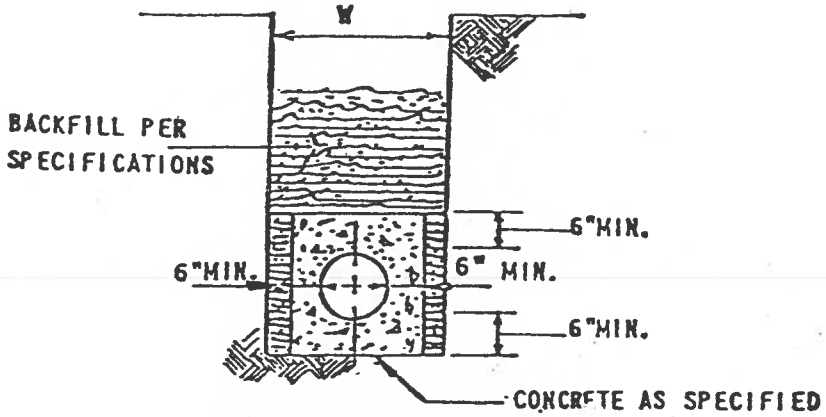
City of Williamsburg, Virginia	Drwn.	
	Scale	nts
RAILROAD CROSSING	Date	9/84
	Dwg.	W3.0



LOW CONCRETE CRADLE

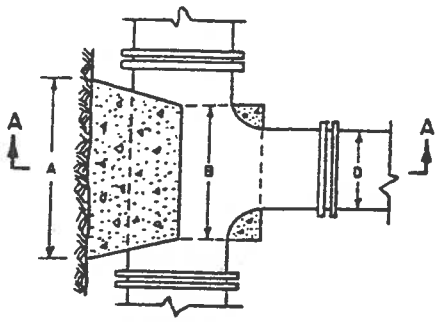


HIGH CONCRETE CRADLE

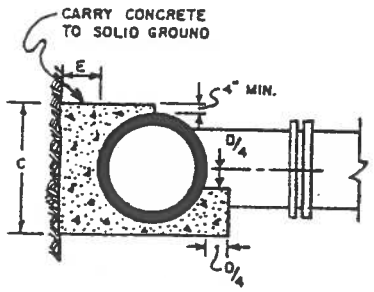


CONCRETE ENCASEMENT

City of Williamsburg, Virginia	Drwn. -
	Scale nts
CONCRETE CRADLE AND ENCASEMENT	Date 9/84
	Dwg. W4.0



PLAN



SECTION A - A

SIZE	A	B	C	E	CY
4" X 4"	13"	9"	13"	5"	.03
6" X 4"	12"	8"	14"	9"	.04
6"	19"	12"	18"	9"	.10
8" X 4"	10"	7"	16"	9"	.05
6"	19"	13"	18"	9"	.11
8"	25"	13"	24"	9"	.20
12" X 4"	8"	6"	20"	9"	.05
6"	17"	11"	20"	9"	.12
8"	25"	16"	24"	9"	.22
12"	37"	18"	34"	9"	.51
14" X 6"	15"	10"	22"	9"	.12
8"	25"	16"	23"	9"	.23
12"	37"	21"	34"	9"	.53
14"	43"	21"	39"	9"	.74
16" X 6"	13"	9"	24"	9"	.13
8"	23"	15"	25"	9"	.24
12"	37"	22"	34"	9"	.55
14"	43"	22"	40"	9"	.78
16"	49"	22"	45"	9"	1.04
CY = CUBIC YARDS					

SIZE	A	B	C	E	CY
18" X 6"	12"	9"	26"	9"	.13
8"	22"	14"	26"	9"	.25
12"	37"	19"	34"	9"	.59
14"	43"	25"	39"	9"	.80
16"	49"	25"	45"	9"	1.08
18"	55"	25"	50"	9"	1.40
20" X 6"	11"	8"	28"	9"	.14
8"	20"	13"	28"	9"	.26
12"	37"	21"	33"	9"	.60
14"	43"	21"	39"	9"	.87
16"	49"	27"	44"	9"	1.12
18"	55"	27"	50"	9"	1.45
20"	61"	27"	55"	9"	1.83
24" X 6"	9"	7"	32"	9"	.14
8"	17"	11"	32"	9"	.27
12"	37"	22"	33"	9"	.64
14"	43"	22"	39"	9"	.92
16"	49"	22"	44"	9"	1.26
18"	54"	31"	49"	9"	1.53
20"	60"	33"	55"	9"	1.93
24"	72"	33"	65"	9"	2.90

SIZE	A	B	C	E	CY
36" X 6"	7"	5"	38"	12"	.15
8"	13"	9"	38"	12"	.31
12"	30"	19"	38"	12"	.76
14"	37"	23"	42"	12"	1.07
16"	48"	27"	43"	12"	1.43
18"	54"	27"	48"	12"	1.89
20"	60"	27"	53"	12"	2.40
24"	72"	37"	63"	12"	3.41
30"	90"	37"	78"	12"	5.56
36" X 8"	10"	7"	44"	12"	.31
12"	25"	16"	44"	12"	.80
14"	34"	21"	44"	12"	1.12
16"	42"	25"	48"	12"	1.51
18"	54"	30"	47"	12"	1.95
20"	59"	30"	52"	12"	2.51
24"	72"	30"	62"	12"	3.85
30"	90"	42"	77"	12"	5.99
36"	107"	42"	92"	12"	8.93
ALL TEES ARE M.J. X M.J. OR M.J. X FL. AS SHOWN ON PLANS.					

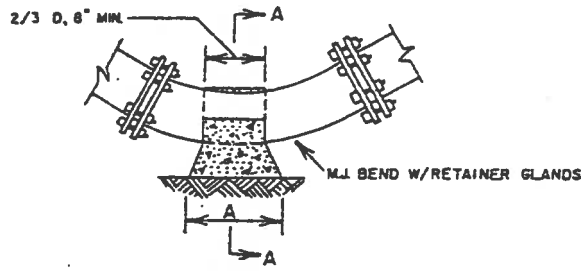
NOTES

1. ALL CONCRETE TO BE 2500 P.S.I.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3000 P.S.F. AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE IS LESS THAN 3000 P.S.F. SPECIAL BUTTRESS DESIGN IS REQUIRED.

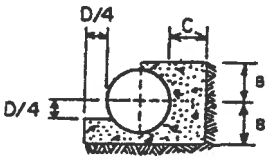
City of Williamsburg, Virginia

BUTTRESSES FOR TEES

Drwn.	-
Scale	nts
Date	9/84
Dwg.	W5.0



BUTTRESS
FOR
HORIZONTAL BENDS



SECTION A–A

BUTTRESS FOR HORIZONTAL BENDS

BEND		4"	6"	8"	12"	14"	16"	18"	20"	24"	30"	36"
11¼°	A	4"	6"	8"	12"	14"	15"	16"	20"	24"	30"	36"
	B	6"	7"	8"	10"	11"	12"	12"	14"	16"	19"	23"
	C	6"	7"	7"	8"	8"	9"	9"	10"	12"	13"	14"
	CY	.0045	.0098	.017	.041	.058	.082	.102	.149	.253	.452	.745
22½°	A	7"	9"	12"	21"	23"	25"	27"	36"	42"	50"	64"
	B	6"	7"	8"	10"	11"	12"	12"	14"	16"	19"	24"
	C	7"	8"	9"	11"	12"	13"	14"	16"	18"	21"	24"
	CY	.0059	.012	.023	.063	.091	.124	.158	.245	.392	.704	1.26
45°	A	12"	15"	20"	30"	33"	36"	40"	50"	60"	75"	90"
	B	6"	7"	8"	11"	13"	14"	15"	18"	20"	24"	30"
	C	7"	8"	9"	11"	12"	13"	14"	16"	21"	27"	32"
	CY	.0072	.015	.028	.08	.121	.164	.219	.343	.586	1.13	2.21
90°	A	19"	22"	27"	36"	42"	48"	54"	60"	72"	90"	108"
	B	7"	8"	9"	12"	14"	16"	18"	21"	24"	28"	34"
	C	7"	8"	9"	12"	13"	14"	16"	18"	24"	31"	36"
	CY	.01	.021	.037	.099	.152	.221	.317	.455	.796	1.49	2.57

CY = CUBIC YDS.

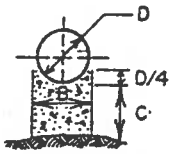
NOTES

1. ALL CONCRETE TO BE 2500 P.S.I.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3000 P.S.F. AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE IS LESS THAN 3000 P.S.F. SPECIAL BUTTRESS DESIGN IS REQUIRED.

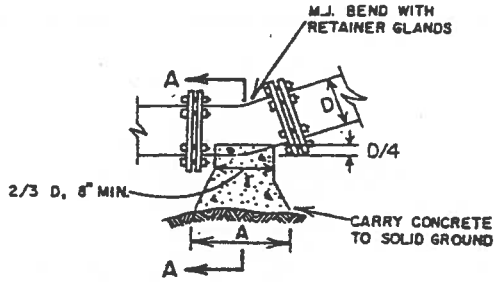
City of Williamsburg, Virginia

BUTTRESSES FOR HORIZONTAL BENDS

Drawn.	
Scale	nts
Date	9/84
Dwg.	W6.0



SECTION A-A



ELEVATION

BUTTRESSES FOR VERTICAL BENDS

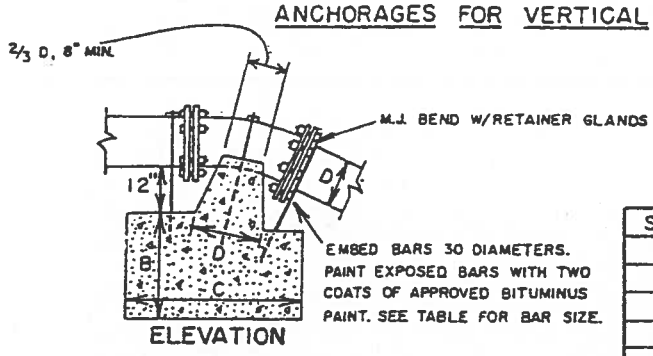
BEND		4"	6"	8"	12"	14"	16"	18"	20"	24"	30"	36"
11¼°	A	7"	10"	13"	19"	22"	25"	27"	30"	36"	45"	53"
	B	5"	7"	9"	13"	15"	17"	18"	20"	24"	30"	36"
	C	3"	4"	5"	7"	8"	9"	9"	10"	12"	15"	18"
	CY	.002	.006	.01	.02	.04	.06	.07	.10	.17	.35	.60
22½°	A	10"	14"	18"	26"	30"	34"	39"	43"	51"	63"	75"
	B	7"	9"	12"	18"	20"	23"	26"	29"	34"	42"	50"
	C	4"	5"	6"	9"	10"	12"	13"	15"	17"	21"	25"
	CY	.006	.01	.02	.06	.09	.14"	.20	.28	.45	.86	1.45
45°	A	14"	19"	25"	37"	42"	48"	54"	60"	71"	88"	105"
	B	11"	13"	17"	25"	28"	32"	36"	40"	47"	59"	70"
	C	6"	7"	9"	13"	14"	16"	18"	20"	24"	30"	35"
	CY	.02	.02	.05	.16	.22	.34	.48	.66	1.11	2.17	3.60

NOTES

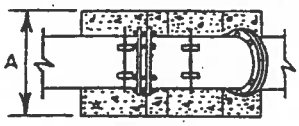
1. ALL CONCRETE TO BE 2500 P.S.I.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3000 P.S.F AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I. OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3000 P.S.F SPECIAL BUTTRESS DESIGN IS REQUIRED.

City of Williamsburg, Virginia	Drwn.	-
	Scale	nts
BUTTRESSES FOR VERTICAL BENDS	Date	9/84
	Dwg.	W7.0

ANCHORAGES FOR VERTICAL BENDS



ELEVATION



PLAN

REINFORCING BARS

SIZE	11¼°	22½°	45°
4"	3-No.6	3-No.6	3-No.6
6"	3-No.6	3-No.6	3-No.6
8"	3-No.6	3-No.6	3-No.6
12"	3-No.6	3-No.6	3-No.6
14"	3-No.6	3-No.6	3-No.6
16"	3-No.6	3-No.6	3-No.6
18"	3-No.6	3-No.6	4-No.6
20"	3-No.6	3-No.6	4-No.6
24"	3-No.6	3-No.6	5-No.6
30"	3-No.6	5-No.6	5-No.7
36"	4-No.6	5-No.7	6-No.7

ANCHORAGES FOR VERTICAL BENDS

BEND		4"	6"	8"	12"	14"	16"	18"	20"	24"	30"	36"
11¼°	A	18"	23"	27"	35"	39"	42"	45"	49"	55"	64"	72"
	B	14"	17"	21"	27"	30"	32"	35"	38"	42"	49"	55"
	C	23"	29"	35"	46"	50"	55"	59"	64"	72"	83"	94"
	CY	.14	.27	.48	1.03	1.39	1.75	2.20	2.8	3.9	6.07	8.64
22½°	A	23"	29"	35"	45"	49"	54"	58"	62"	70"	81"	92"
	B	17"	22"	27"	34"	38"	41"	45"	47"	54"	62"	70"
	C	29"	37"	45"	58"	64"	70"	76"	81"	92"	106"	120"
	CY	.26	.55	.98	2.04	2.73	3.54	4.52	5.37	7.88	12.03	17.41
45°	A	29"	36"	44"	57"	62"	68"	73"	79"	89"	102"	115"
	B	22"	28"	34"	43"	47"	52"	56"	60"	68"	78"	88"
	C	37"	47"	57"	74"	81"	89"	96"	103"	116"	134"	151"
	CY	.53	1.07	1.91	4.06	5.28	7.02	8.74	10.87	15.60	23.63	33.81

CY = CUBIC YARDS

NOTES

1. ALL CONCRETE TO BE 2500 P.S.I.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3000 P.S.F AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3000 P.S.I. SPECIAL BUTTRESS DESIGN IS REQUIRED.

City of Williamsburg, Virginia

ANCHORAGES FOR VERTICAL BENDS

Drwn.	
Scale	nts
Date	9/84
Dwg.	W8.0

PUSH-ON JOINTS

PIPE SIZE	MAXIMUM DEFLECTION ANGLE DEGREES	MAXIMUM DEFLECTION INCHES LENGTH		MINIMUM RADIUS FEET LENGTH	
		18'	20'	18'	20'
4"	5	19	21	205	230
6"	5	19	21	205	230
8"	5	19	21	205	230
10"	5	19	21	205	230
12"	5	19	21	205	230
14"	3	11	12	340	380
16"	3	11	12	340	380
18"	3	11	12	340	380
20"	3	11	12	340	380
24"	3	11	12	340	380
30"	3	11	12	340	380
36"	3	11	12	340	380

MECHANICAL JOINTS

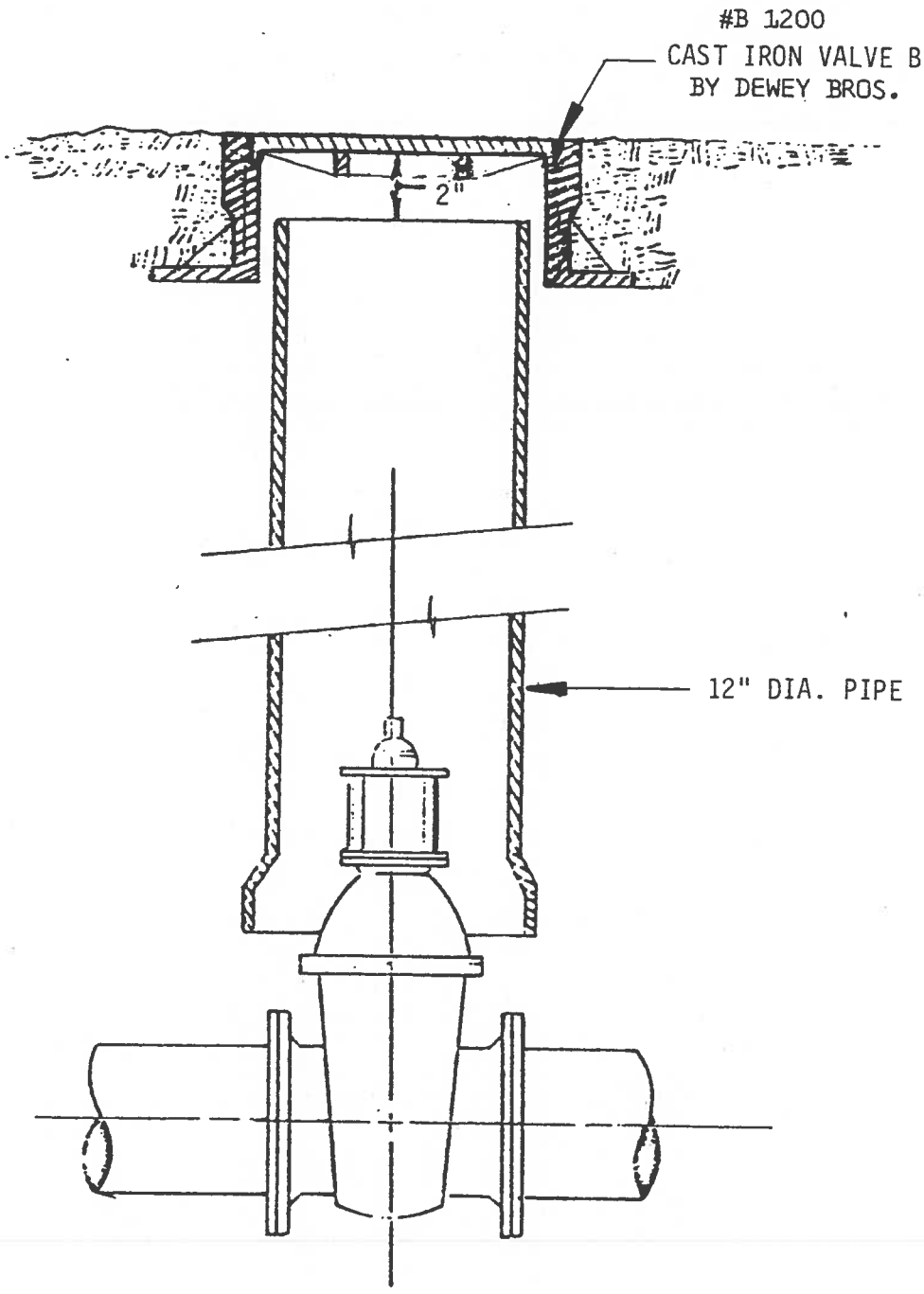
PIPE SIZE	MAXIMUM DEFLECTION ANGLE DEG-MIN	MAXIMUM DEFLECTION INCHES LENGTH		MINIMUM RADIUS FEET LENGTH	
		18'	20'	18'	20'
4"	8 - 18	31	35	125	140
6"	7 - 7	27	30	145	160
8"	5 - 21	20	22	195	220
10"	5 - 21	20	22	195	220
12"	5 - 21	20	22	195	220
14"	3 - 35	13.5	15	285	320
16"	3 - 35	13.5	15	285	320
18"	3 - 0	11	12	340	380
20"	3 - 0	11	12	340	380
24"	2 - 23	9	10	450	500
30"	2 - 23	9	10	450	500
36"	2 - 5	8	9	500	550

REF: AWWA C600 Tables 5 and 6

City of Williamsburg, Virginia

CURVATURE OF DUCTILE IRON PIPELINE

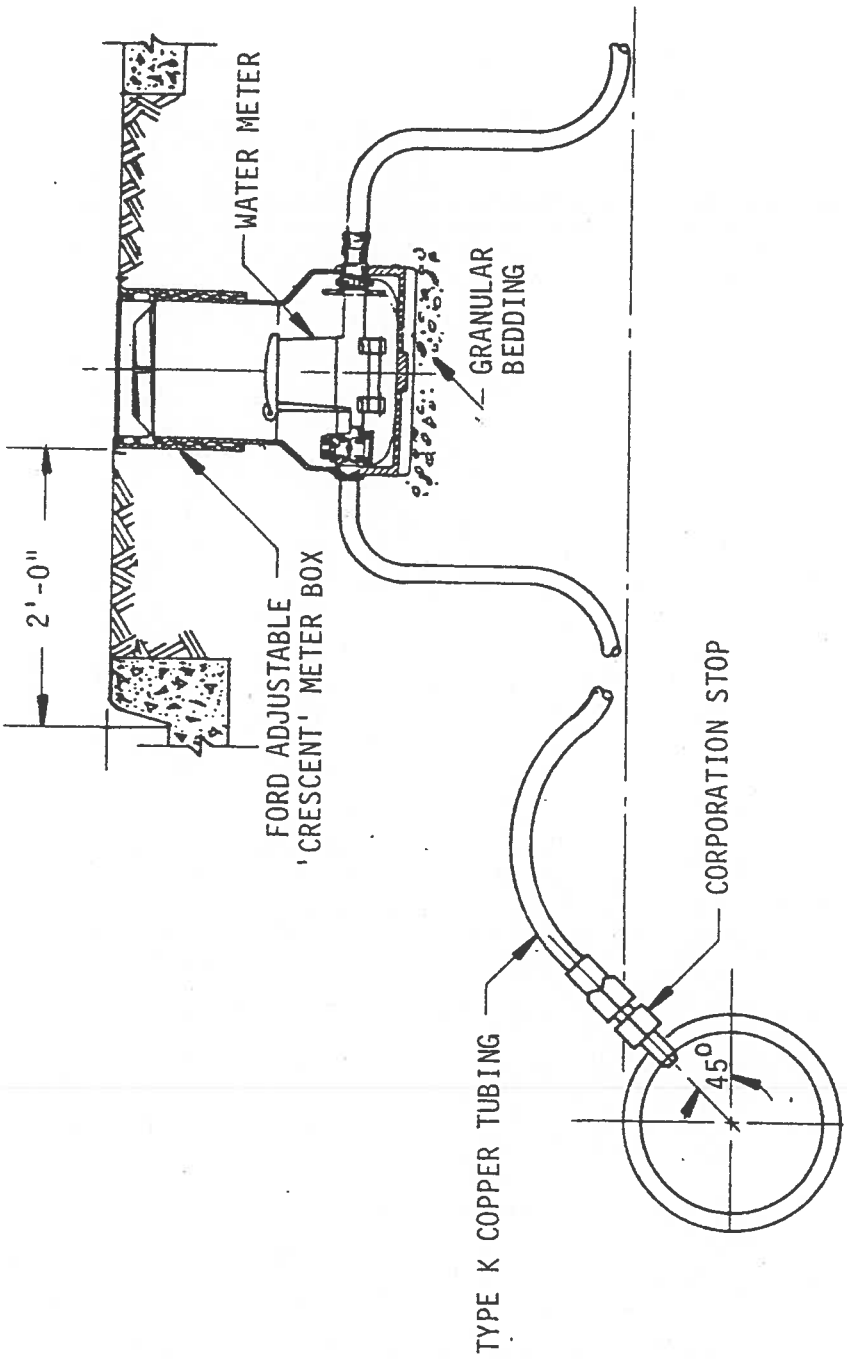
Drwn.	
Scale	nts
Date	9/84
Dwg.	W9.0



City of Williamsburg, Virginia

TYPICAL VALVE AND VALVE BOX

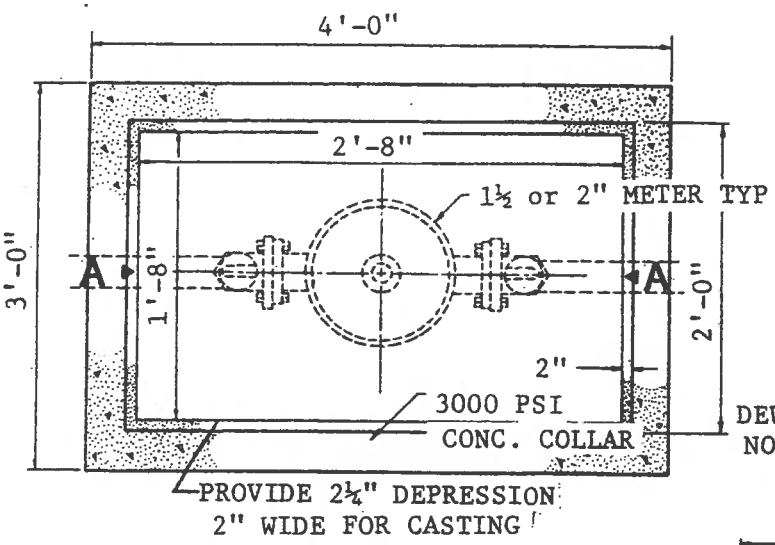
Drwn.	
Scale	nts
Date	9/84
Dwg.	W10.0



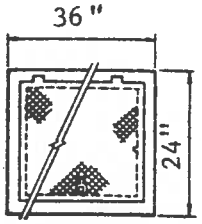
City of Williamsburg, Virginia

TYPICAL METER SETTING 5/8"x3/4" and 1"

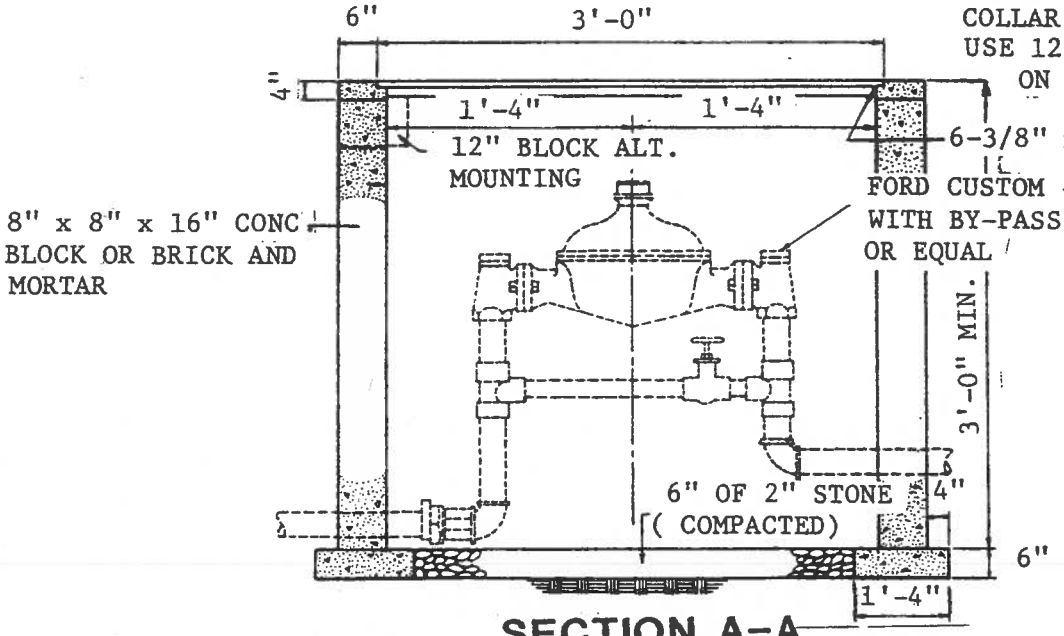
Drwn.	
Scale	nts
Date	9/84
Dwg.	W11.0



PLAN



BOLT CASTING TO CONC. COLLAR FROM INSIDE OR USE 12" SOLID CONC BLK ON TOP CRS. & GROUT

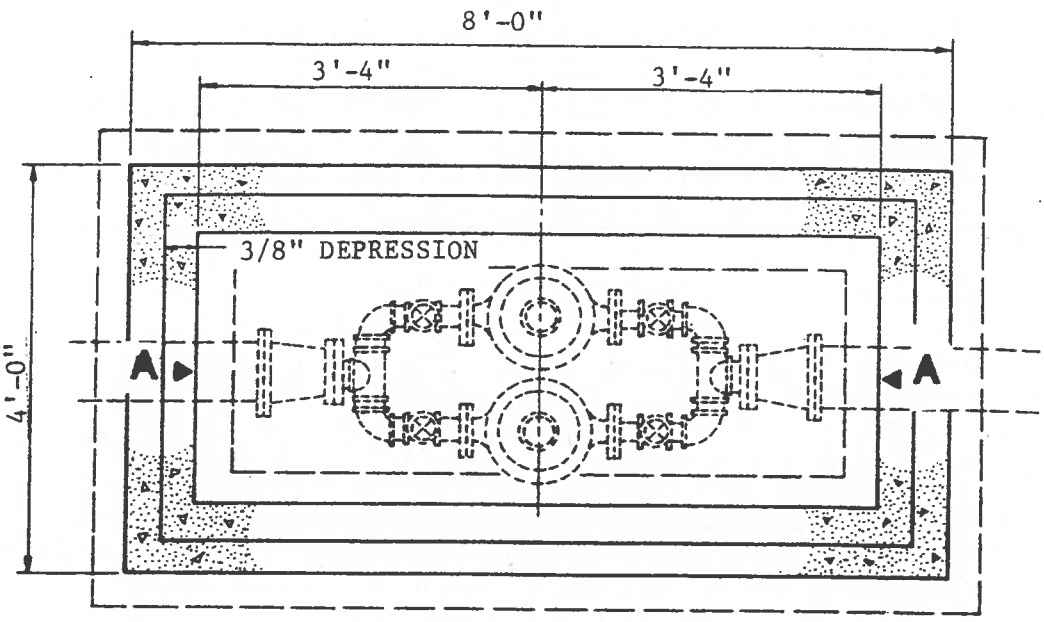


SECTION A-A

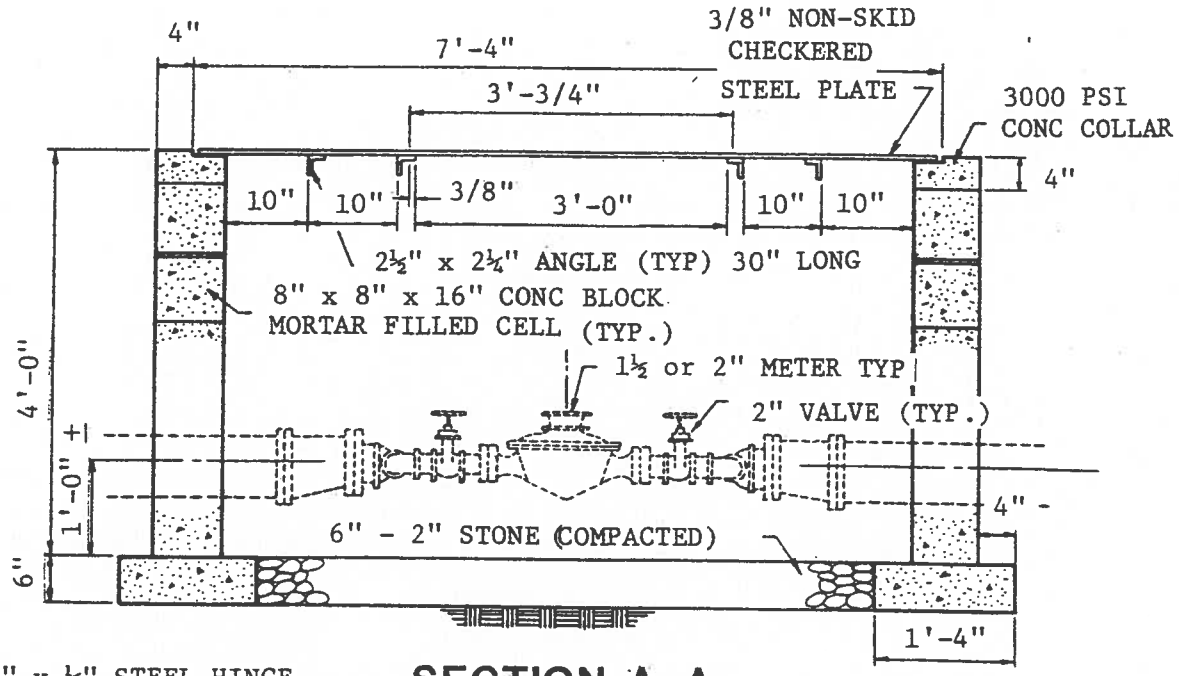
NOTE:

ALL PIPE UNDER 3" DIA. TO BE TYPE K COPPER OR BRASS
GATE VALVES TO BE NIBCO - N.R.S. OPENING C.C. OR EQUAL.
WATER METER TO BE NEPTUNE S.R. - GAL.
STEEL BOX MAY BE USED WITH APPROVAL OF CITY

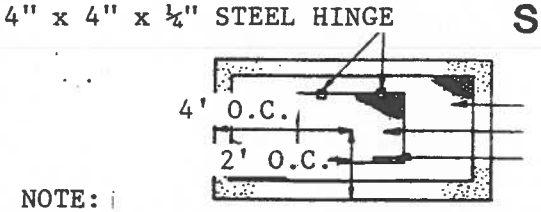
City of Williamsburg, Virginia		
TYPICAL METER SETTING 11/2"&2" SINGLE METER	Drwn.	-
	Scale	nts
	Date	9/84
	Dwg.	12.0



PLAN



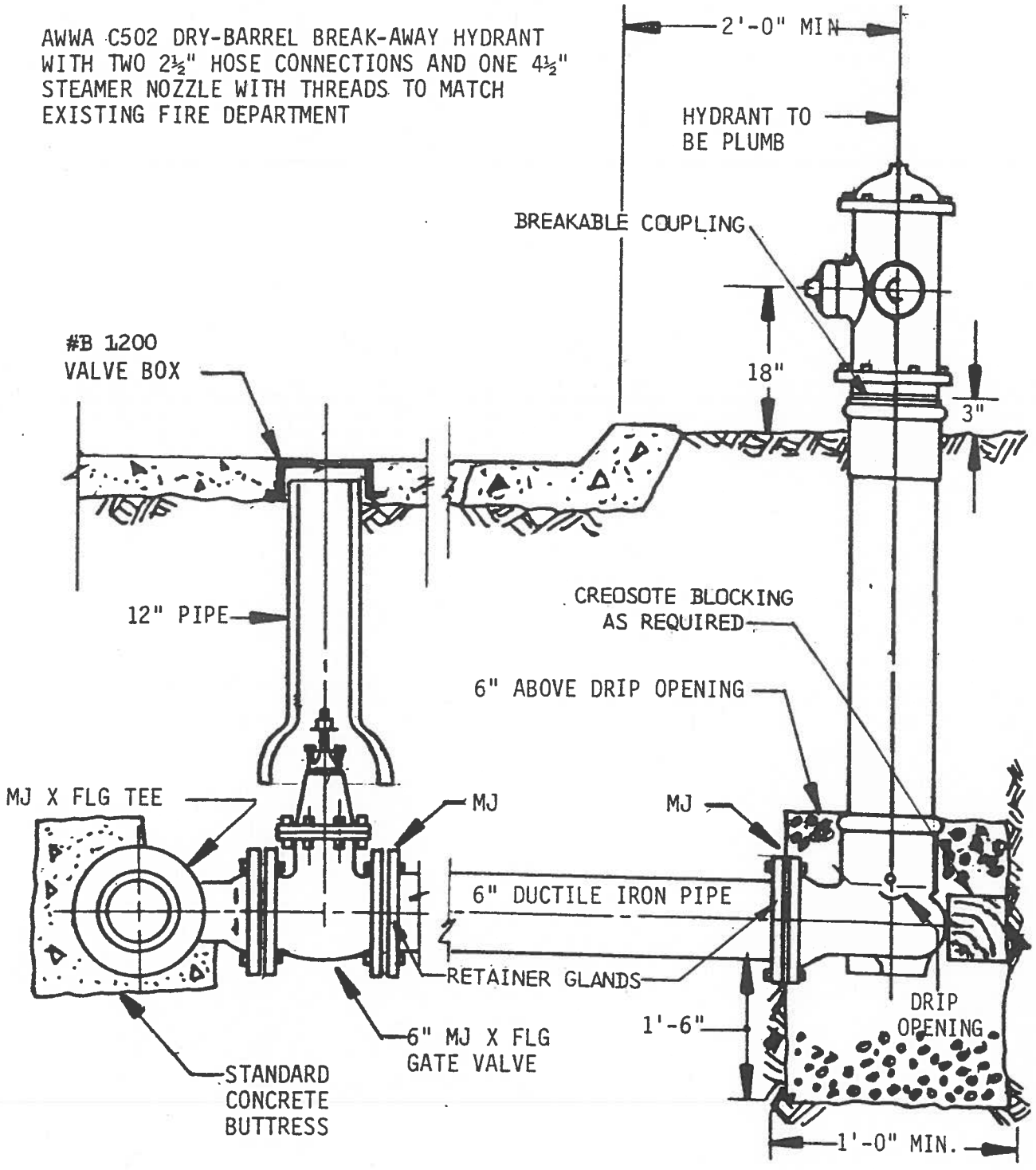
SECTION A-A



NOTE:
ALL PIPE 3" DIA. AND OVER TO BE D.I. - CL. 52 BELL OR M.J. CEM. LINED AND S.C. GATE VALVES 3" DIA. AND OVER TO BE DARLING M.J. OPENING C.C. OR EQUAL
WATER METER TO BE NEPTUNE S.R. - GAL.

City of Williamsburg, Virginia	Drwn.
TYPICAL METER SETTING 11/2" & 2" DUAL METERS	Scale nts
	Date 9/84
	Dwg. 12.1

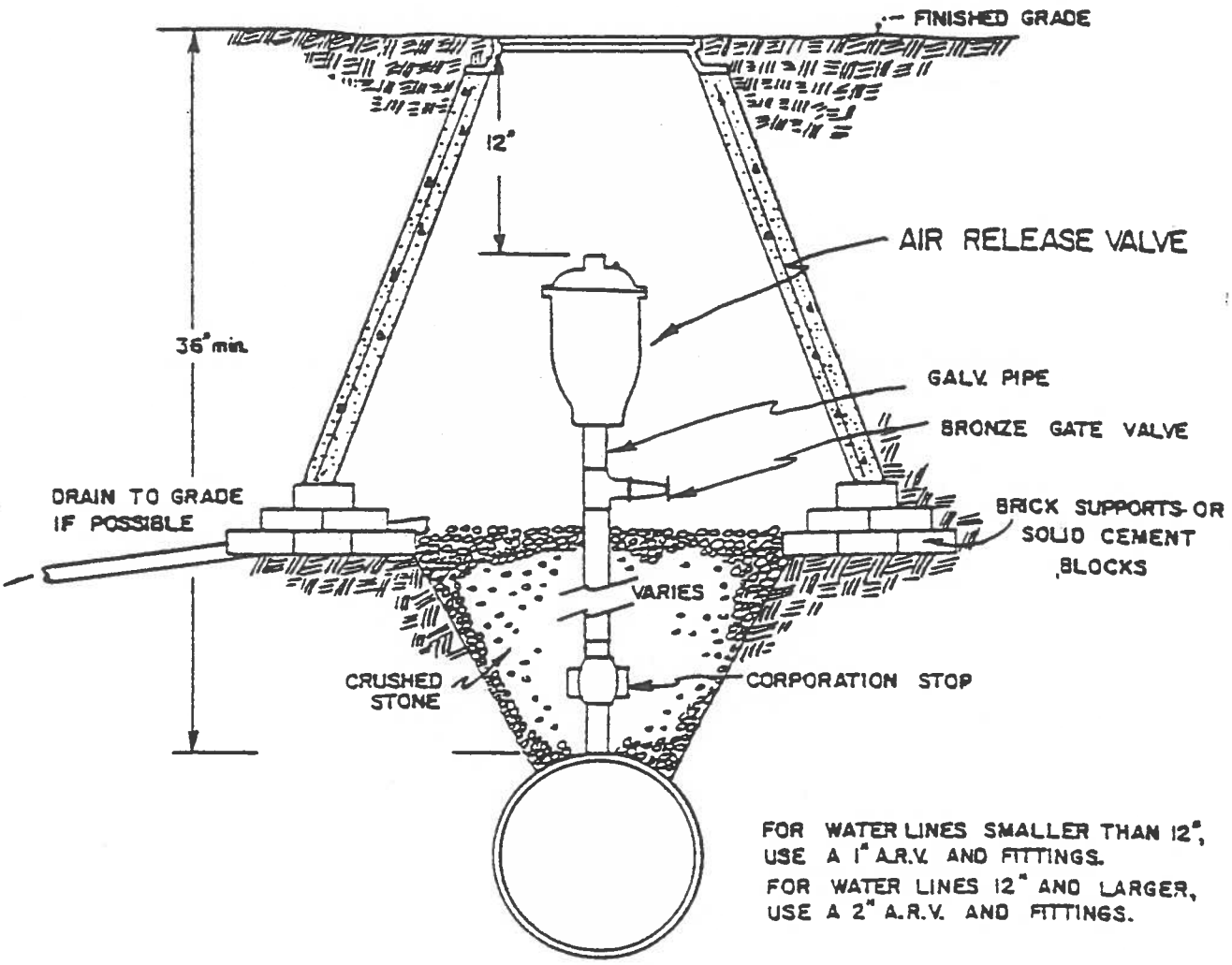
AWWA C502 DRY-BARREL BREAK-AWAY HYDRANT WITH TWO 2½" HOSE CONNECTIONS AND ONE 4½" STEAMER NOZZLE WITH THREADS TO MATCH EXISTING FIRE DEPARTMENT



City of Williamsburg, Virginia

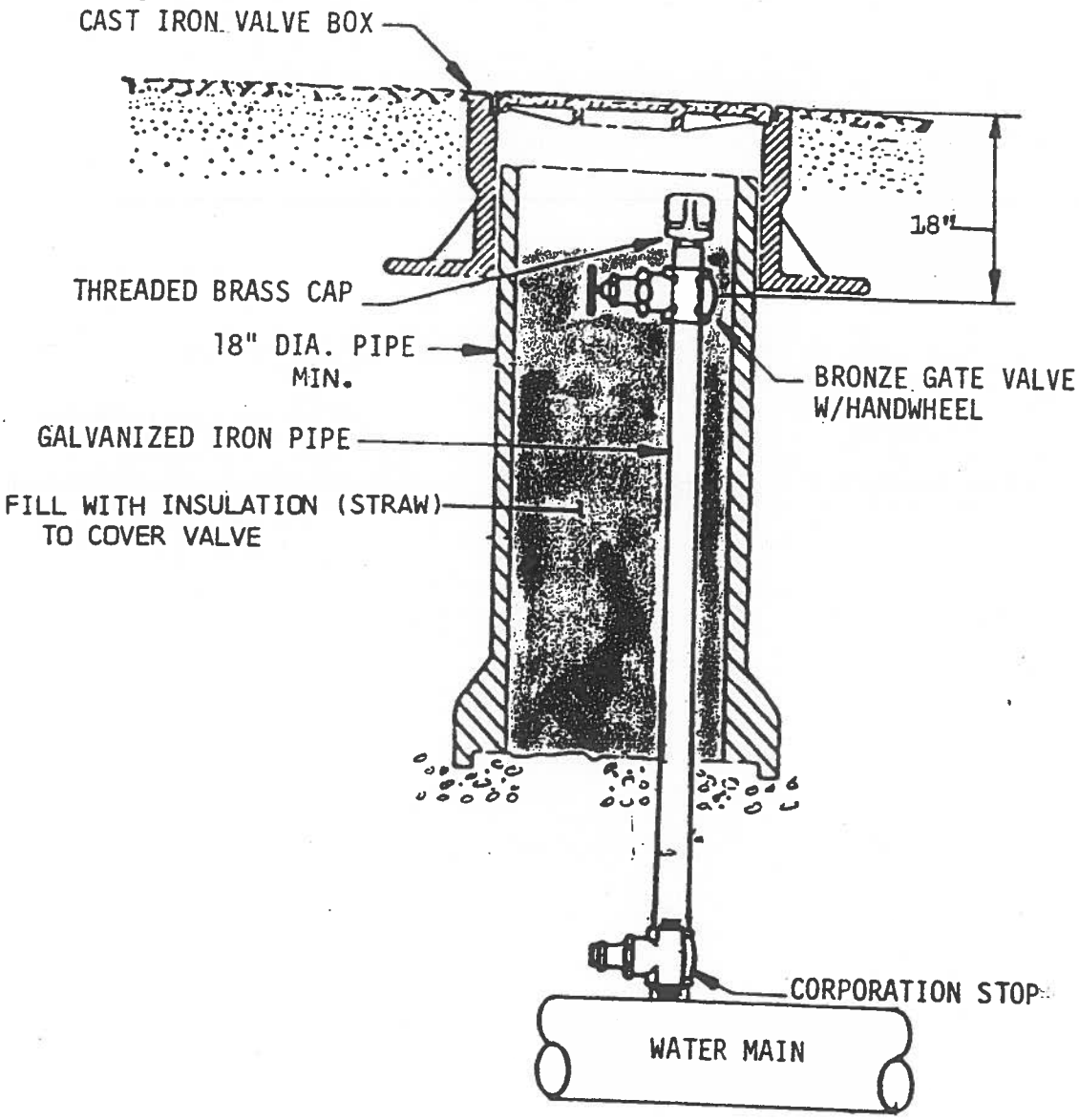
TYPICAL FIRE HYDRANT SETTING MJxFL TEE AND VALVE w/ RETAINER GLANDS

Drwn.	
Scale	nts
Date	9/84
Dwg.	W14.0



A PRECAST MANHOLE CONE OR RISER WITH FLAT TOP AND COVER WITH "WATER" CAST ON LID SHALL BE USED. AN ADEQUATE FOUNDATION SHALL BE INSTALLED SO THE WATER LINE DOESN'T SUPPORT THE MANHOLE CONE.

City of Williamsburg, Virginia	Drwn.	
	Scale	nts
AUTOMATIC AIR RELEASE VALVE	Date	9/84
	Dwg.	W15.0

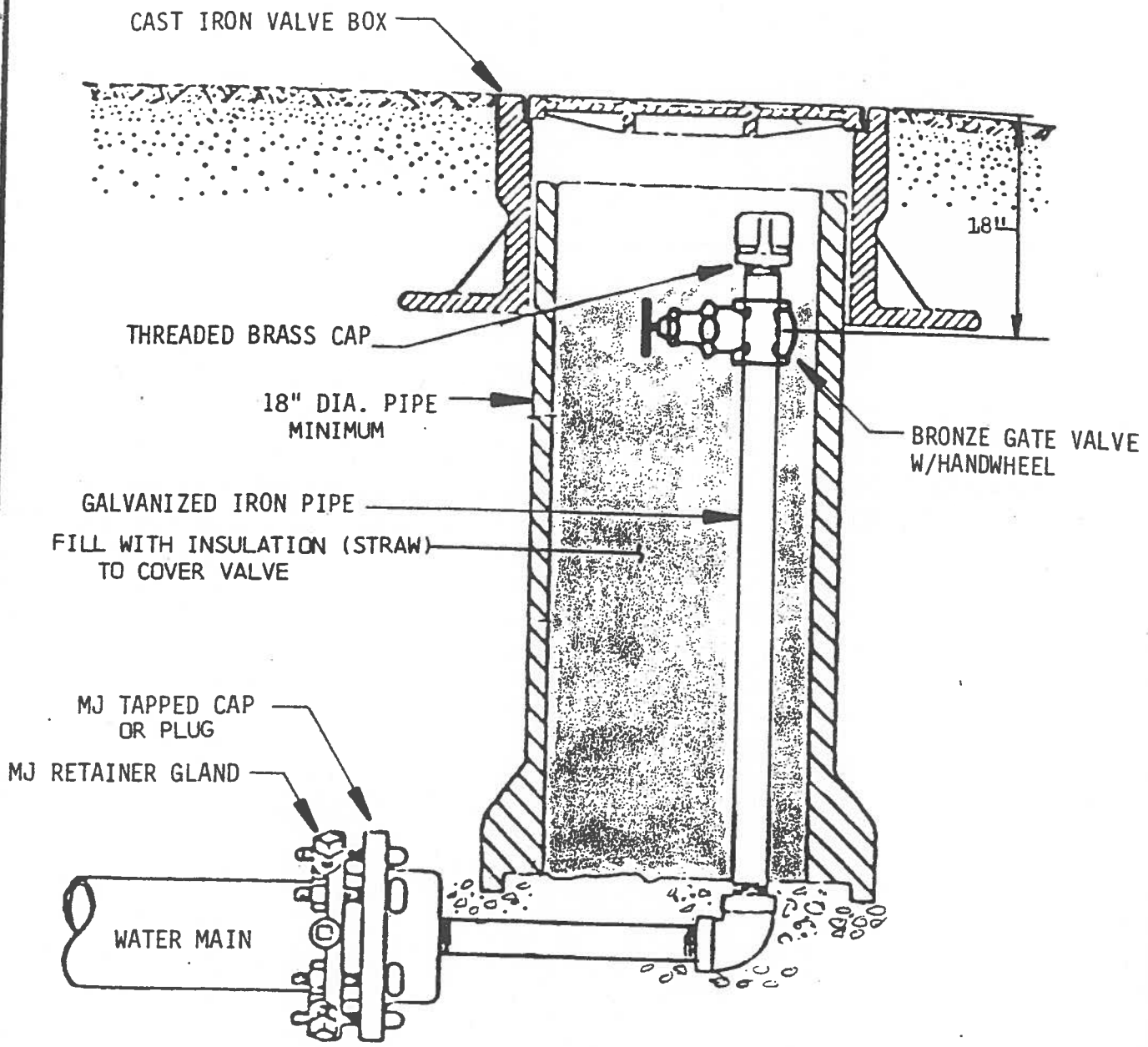


NOTES:

1-1/2" PIPE, VALVES AND FITTINGS TO BE USED ON 8" MAINS OR SMALLER.

2" PIPE, VALVES AND FITTINGS TO BE USED ON 12" MAINS AND LARGER.

City of Williamsburg, Virginia	Drwn.	
	Scale	nts
MANUAL AIR RELEASE VALVE	Date	9/84
	Dwg.	W16.0

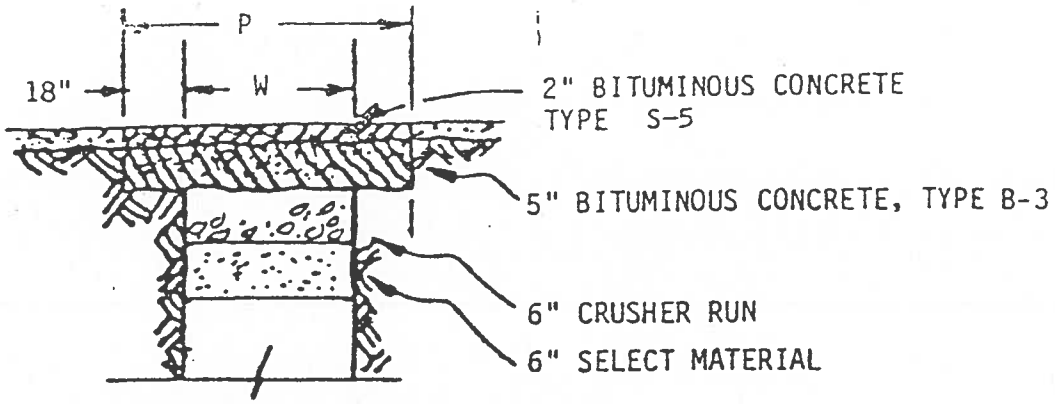


NOTES:

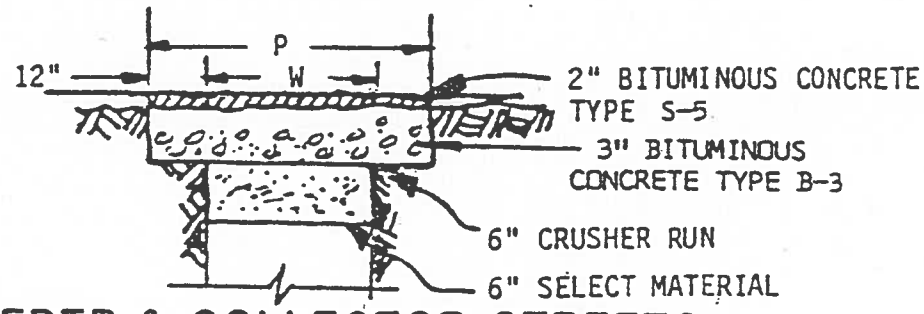
1-1/2" PIPE, VALVES AND FITTINGS TO BE USED ON 4" MAINS OR SMALLER.

2" PIPE, VALVES AND FITTINGS TO BE USED ON 6" MAINS AND LARGER.

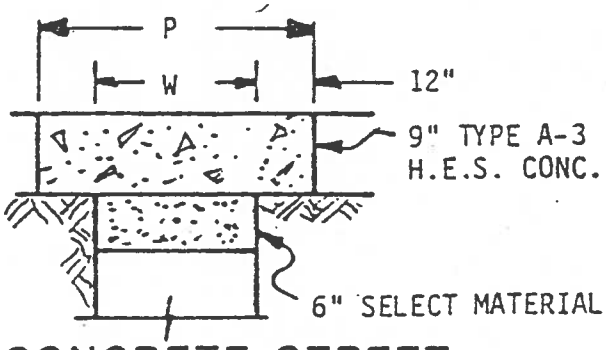
City of Williamsburg, Virginia	Drwn.	
	Scale	nts
DEAD END BLOWOFF	Date	9/84
	Dwg.	W17.0



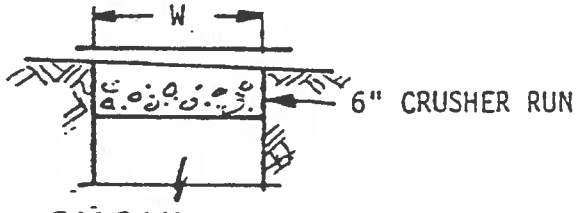
MAJOR STREET/STATE ROAD



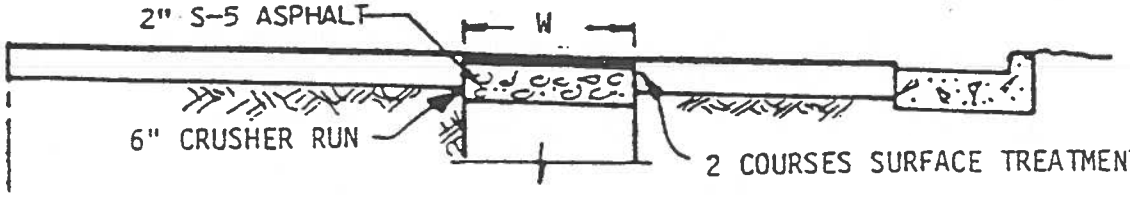
FEEDER & COLLECTOR STREETS



CONCRETE STREET



SHOULDER



SURFACE TREATMENT

City of Williamsburg, Virginia	DWN.	
	SCALE	nts
STANDARD PAVING RESTORATION DETAILS	DATE	9/84
	DWG	W18.0

APPENDIX B

WATER SYSTEM DATA SHEET

DATE _____

I. PROJECT NAME _____

II. PROJECT LOCATION _____

III. ENGINEER _____

IV. SOURCE OF WATER _____

V. DESIGN POPULATION (NUMBER AND TYPE OF DWELLINGS) _____

VI. HYDRAULIC CAPACITY _____

VII. PIPE MATERIAL _____

VIII. PIPE DIAMETER

(INCHES)	LENGTH (FEET)
4"	_____
6"	_____
8"	_____
10"	_____
12"	_____

IX. FIRE HYDRANT ASSEMBLIES _____ (NUMBER)

X. VALVES (A) GATE _____ (NUMBER)
(B) AIR RELIEF _____ (NUMBER)

XI. FITTINGS
(A) CROSS _____ (NUMBER)
(B) TEE _____ (NUMBER)
(C) 90° ELL _____ (NUMBER)
(D) 45° ELL _____ (NUMBER)
(E) 22½° ELL _____ (NUMBER)
(F) REDUCER _____ (NUMBER)
(G) BLOW-OFF ASSEMBLIES _____ (NUMBER)

XII. WATER METER ASSEMBLIES _____ (NUMBER)

XIII. SERVICE CONNECTION PIPE

DIAMETER _____ (INCHES)
TYPE _____
LENGTH _____ (FEET)

APPENDIX C

EROSION AND SEDIMENT CONTROL

All erosion and sediment control measures and materials shall be in accordance with the specifications contained within the Virginia Erosion and Sediment Control Handbook, Second Edition, 1980.

A. Temporary Structural Measures - The Contractor shall install any or all of the following measures immediately after installation of pipe:

- Straw Bale Barrier - A temporary sediment barrier consisting of a row of entrenched and anchored straw bales. Straw bale barriers shall be installed at 200' intervals complete across the disturbed portion of the easement for slopes exceeding 2% (400' for slopes of 2% and less) and at 100' intervals in all drainage ditches.

- Silt Fence - A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched. Silt fence shall be installed at 200' intervals complete across the disturbed portion of the easement for slopes exceeding 2% (400' for slopes of 2% and less) and at 100' intervals in all drainage ditches.

- Right-of-Way Diversion - A ridge of compacted solid or loose rock or gravel constructed across disturbed rights-of-way and similar sloping areas. The diversion shall be constructed completely across the disturbed portion of the easement. The following table will be used to determine the spacing of right-of-way diversions:

% Slope	Spacing (ft)
Less than 7%	100
Between 7% and 25%	75
Between 25% and 40%	50
Greater than 40%	25

B. Permanent Seeding - Disturbed areas shall be seeded within 30 days of the land disturbing activity in accordance with the following specifications:

1. Preparation of Ground Surface:

a. Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The surface shall be cleared of stumps, stones larger than 1/2" in diameter, and other materials that might hinder the work or subsequent maintenance.

b. Previously established grades shall be maintained on the areas to be treated in a true and even condition. Necessary repairs shall be made on previously graded areas.

c. Soil shall be raked until the condition of the soil is acceptable; undulations or irregularities shall be leveled.

d. Topsoil for repairs and for filling depressions shall be provided from off-site sources.

e. 10-10-10 fertilizer shall be distributed uniformly at a rate of 25 pounds per 1,000 square feet.

f. Pulverized agricultural dolomite lime shall be distributed uniformly at a rate of 65 pounds per 1,000 square feet. Lime and fertilizer shall be incorporated into the top 4-6 inches of the soil by discing or other means. When applying lime and fertilizer with a hydroseeder, apply to a rough, loose surface.

2. Seeding:

a. Seed labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act shall be furnished. Seed mixture and sowing rate shall be as follows:

Tall Fescue	50%
Serica Lespedeza	30%
Annual Rye Grass	20%

Seed shall be applied at the rate of 2 pounds per 1,000 square feet.

b. Seeded areas shall be mulched with threshed straw of cereal grains such as oats, wheat, barley, rye, etc.; grass hay; wood chips; or wood fiber. Materials that contain objectionable weed seeds or other species that might be detrimental to the planting being established or to adjacent lawns, will not be acceptable. Straw mulch shall be applied at a rate of 70 pounds per 1,000 square feet by blower or by hand. Straw mulch shall be anchored immediately after spreading to prevent windblow. Accepted methods of anchoring include a mulch anchoring tool, liquid mulch binders, mulch nettings, and peg and twine. Wood fiber mulch, used in hydroseeding operations, are applied as part of the slurry, and do not require anchoring. Wood fiber mulch shall be applied at a rate of 35 pounds per 1,000 square feet.

c. The Contractor shall maintain all seeded areas until final acceptance of the project and shall restore or replace any portion of the seeding work that is found defective or which becomes damaged prior to final acceptance. Restoration or replacement work shall include the reestablishment of the grade or profile of the area, replacement of topsoil, refertilization, reseeding or remulching as directed by the Director of Public Utilities.