

SECTION P
STANDARD DETAILS

SECTION P STANDARD DETAILS

Water Details

1 Inch Air Release Valve Assembly
2 and 3 Inch Combination Air and Vacuum Release Valve Plan
2 and 3 Inch Combination Air and Vacuum Release Valve Section
Blow Off Valve and Vault
Gate Valve and Box
Gate Valve and Vault
Vault Detail for 16 Inch and Larger Gate Valve
Large Diameter Valve Vault with Bypass
16 Inch Pipe and Smaller Horizontal Blocking
Typical Ring Connection
Concrete Cradle at Vertical Bends
Vertical Tie-Down Block
Standard Fire Hydrant Detail - Type 'A'
Standard Fire Hydrant Detail - Type 'B'
Concrete Meter Box for $\frac{3}{4}$ " and 1" Diameter
Water Service Details
Cleaning Wye for Non-Looped Water System

Sewer Details

Standard Manhole Frame and Cover
Shallow Sanitary Sewer Manhole
Pre-Cast Manhole
Drop Manhole
Sewer Cleanout
Sewer Crossing at Water Main
Service Connection
Sanitary Sewer Creek Crossing

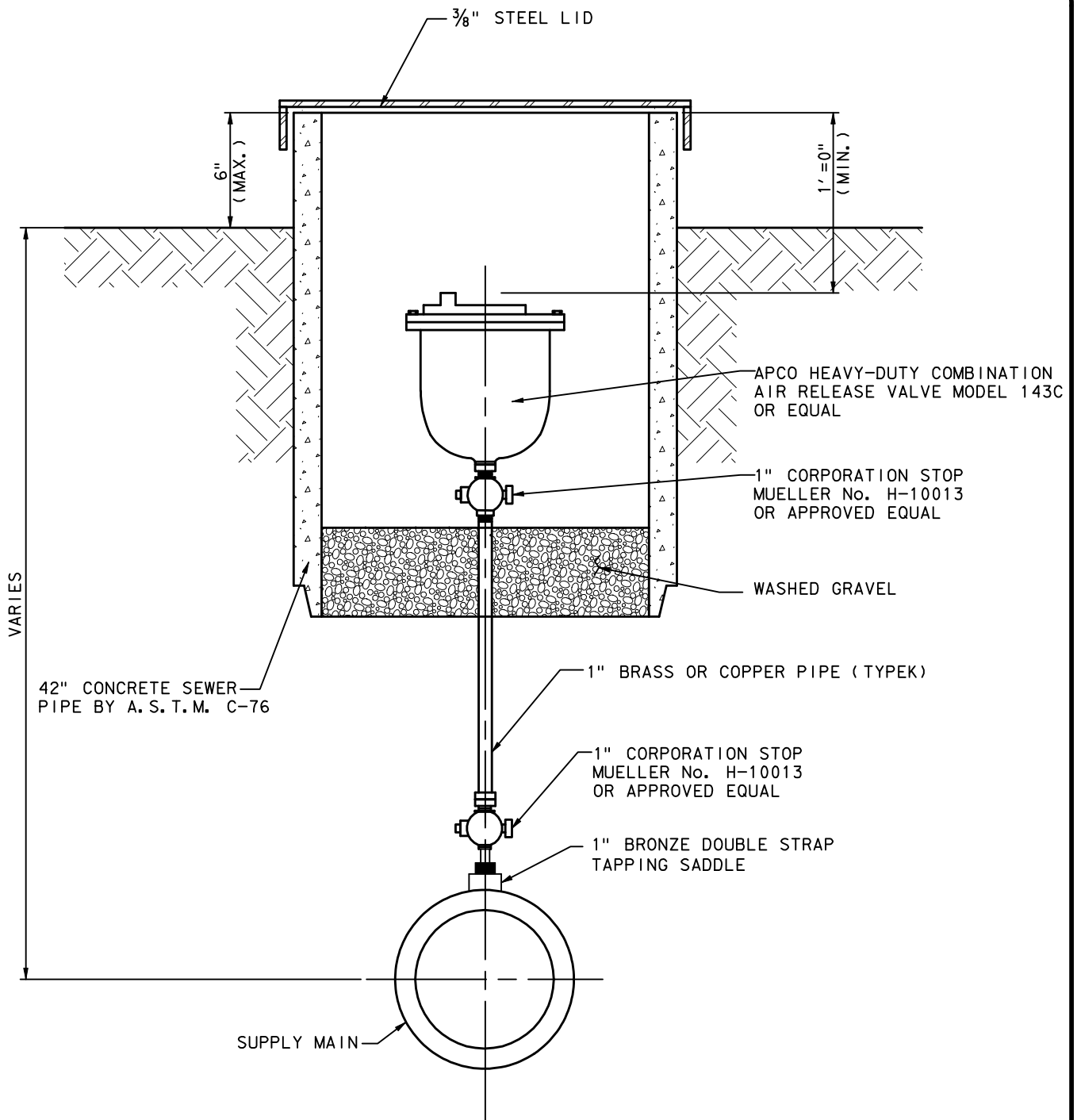
Water & Sewer Details

Typical Backfill and Embedment Detail
Bored Crossing
Concrete Creek Crossing Ditch Check

Miscellaneous Details

Drive Approach Plan and Section (City of Benbrook)
Standard Utility Locations

WATER DETAILS



AIR RELEASE VALVE ASSEMBLY

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

REF FILE NAME:

11NAIRRELEASE.DGN

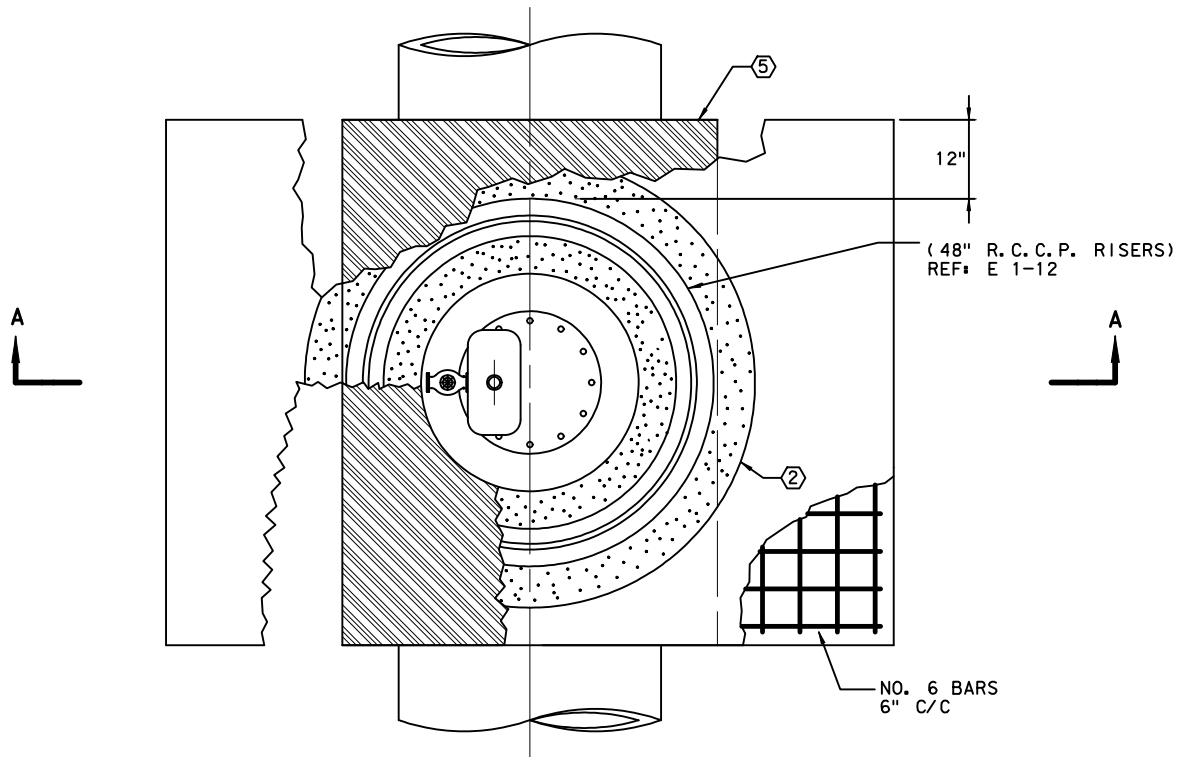
BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER

1" AIR RELEASE VALVE ASSEMBLY

STANDARD DETAIL



(CONTINUED FROM FIG. 16)

SECTION B-B

- DIMENSIONS -

- ① WHEN EXHAUST PIPING IS REQUIRED, MIN. DIM. SHALL BE LENGTH OF VAULT RISER TONGUE PLUS 1".
- ② WHEN EXHAUST PIPING IS NOT REQUIRED, MIN. DIM. SHALL BE LENGTH OF VAULT RISER TONGUE PLUS 1", (APPROX. 5")
- ③ 2" FITTINGS, USING CLOSE NIPPLES, MIN. DIM. SHALL BE 1' 8-³/₁₆"; 3" FITTINGS, USING CLOSE NIPPLES, MIN. DIM. SHALL BE 2' ⁷/₈".

MINIMUM DIMENSIONS

NOMINAL SIZE	INSTALLATION ON BLIND FLANGE	INSTALLATION ON C/L PIPE TO SURFACE OF PIPE COLLAR
2"	* 1/2"	** 7- ¹ / ₁₆ "
3"	* 5/8"	** 7- ⁵ / ₈ "

* MINIMUM DIMENSION BASED ON RECOMMENDED INSTALLATION OF CLOSE NIPPLE
 ** MINIMUM DIMENSION BASED ON RECOMMENDED INSTALLATION OF CLOSE NIPPLE ON FLANGED OUTLET WITH INSULATED FLANGE TO THREAD KIT.

- ⑤ OFF-SET TO BE 6" FROM C/L OPPOSITE MANHOLE STEP LOCATION WHEN INSTALLATION IS REQUIRED ON BLIND FLANGE OF ACCESS OUTLET. OTHER INSTALLATIONS SHALL BE ON TOP C/L OF MAIN.

2" & 3" COMBINATION AIR AND VACUUM RELEASE VALVE DETAIL

REVISED 12-28-04

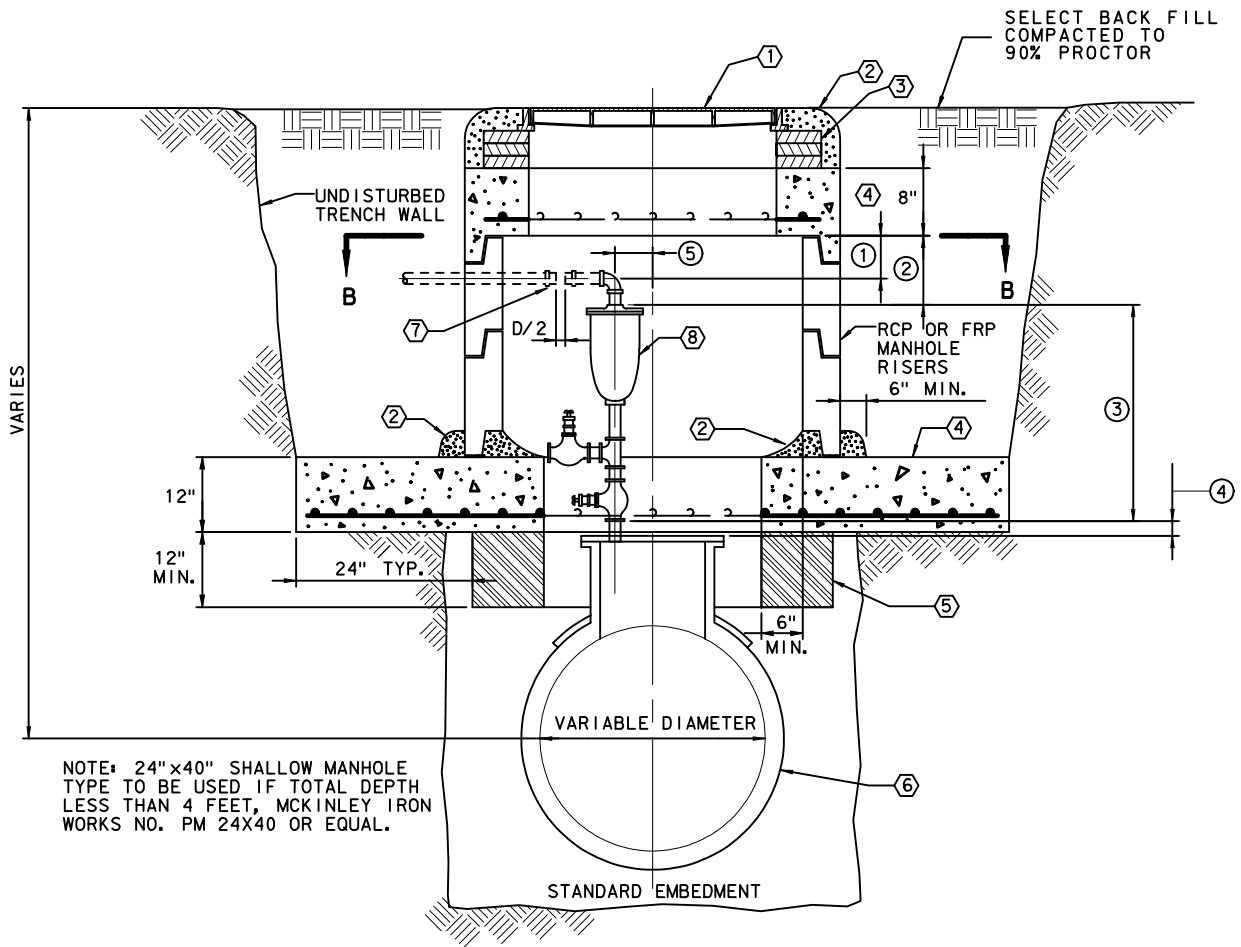
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REF FILE NAME:
21N&31NCOMBOA1RR. DGN

BENBROOK WATER & SEWER AUTHORITY



WATER SEWER
**2" & 3" COMB.
 AIR AND VACUUM
 RELEASE VALVE PLAN**
 STANDARD DETAIL



SECTION A-A

- MATERIALS -

- | | |
|--|---|
| <p>① 24" STD. MANHOLE COVER EQUAL TO MCKINLEY I.W. NO. A24AM, W/ 'WATER' CAST IN LID.</p> <p>② MORTAR, SHAPE TO SLAB EDGE</p> <p>③ GRADE ADJUSTMENT, 8" IN. ST. ROW OR UNDER PVMT.</p> <p>④ TOP & BOTTOM SLABS, CLASS 'F' (4000*) CONCRETE W/ #6 ST. BARS SPACED 6" C/C EACH WAY. STEEL BAR COVER $2\frac{1}{2}" + \frac{1}{2}"$ FROM BOTTOM OF EACH SLAB.</p> <p>⑤ POLYURETHANE CUSHION PAD AS SUPPLIED BY TEJAS PLASTICS MATERIALS, SUPPLY CO., FT. WORTH, TEXAS, OR EQUAL.</p> | <p>⑥ WATER MAIN WITH FLANGE ACCESS AS APPLICABLE.</p> <p>⑦ EXHAUST PIPING, FITTED WITH DRESSER COUPLING, WHEN REQUIRED. PIPE GAP IN COUPLING SHALL BE MIN D/2.</p> <p>⑧ COMBINATION AIR & VAC. RELEASE VALVE, CLOSE NIPPLES, TEE, 2 EA. GATE VALVE.</p> |
|--|---|

2" & 3" COMBINATION AIR AND VACUUM RELEASE VALVE DETAIL

REVISED 12-28-04

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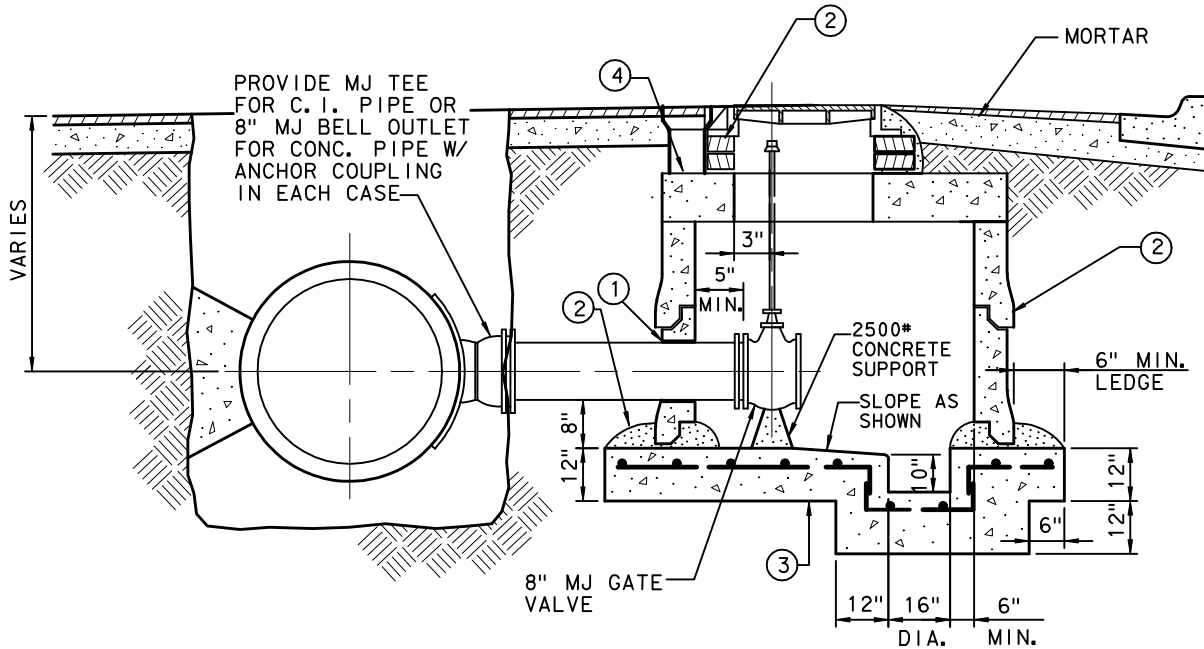
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WATER SEWER
**2" & 3" COMB.
AIR AND VACUUM
RELEASE VALVE SECT.
STANDARD DETAIL**

3/2" R CUTOUT IN
GRADE RINGS



PROVIDE MJ TEE
FOR C. I. PIPE OR
8" MJ BELL OUTLET
FOR CONC. PIPE W/
ANCHOR COUPLING
IN EACH CASE

VARIES

MORTAR

2500*
CONCRETE
SUPPORT

SLOPE AS
SHOWN

6" MIN.
LEDGE

8" MJ GATE
VALVE

DIA. MIN.

- ① SEAL PIPE TO WALL HOLE CUTOUT WITH NON-SHRINK MORTAR EQUAL TO 1 PART ALCRETE 1 PART CEMENT, 6 PARTS SAND.
- ② DETAILS OF CONSTRUCTION SHALL CONFORM TO FIGURE BWSA STANDARD MANHOLE DETAILS
- ③ CLASS 'F' 4000* CONCRETE WITH NO. 6 STEEL BARS SPACED 6" C/C EACH WAY. STEEL BAR COVER TO BE 2" MIN., 3" MAX. FROM BOTTOM OF TOP SLAB AND FROM TOP OF FLOOR SLAB.
- ④ FLAT SLAB TOP MANHOLE COVER.

**STANDARD BLOW-OFF INTO 4'
DIAMETER SUMP MANHOLE DETAIL**

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

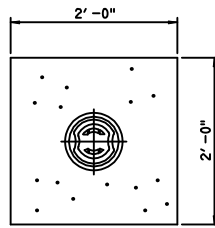
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BENBROOK WATER & SEWER AUTHORITY

WATER SEWER

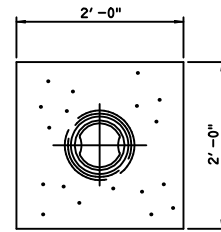
**BLOW OFF
VALVE AND VAULT**

STANDARD DETAIL



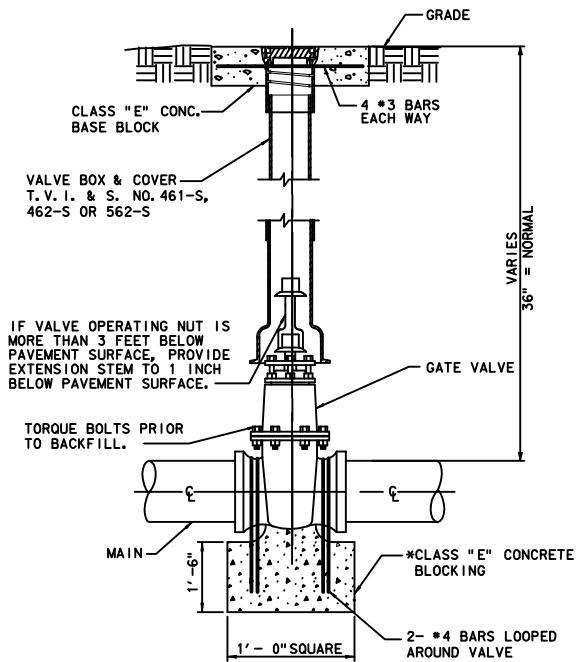
NOTE:
2' x 2' x 6" SLAB
TO BE INSTALLED
AROUND VALVE
BOXES.

PLAN



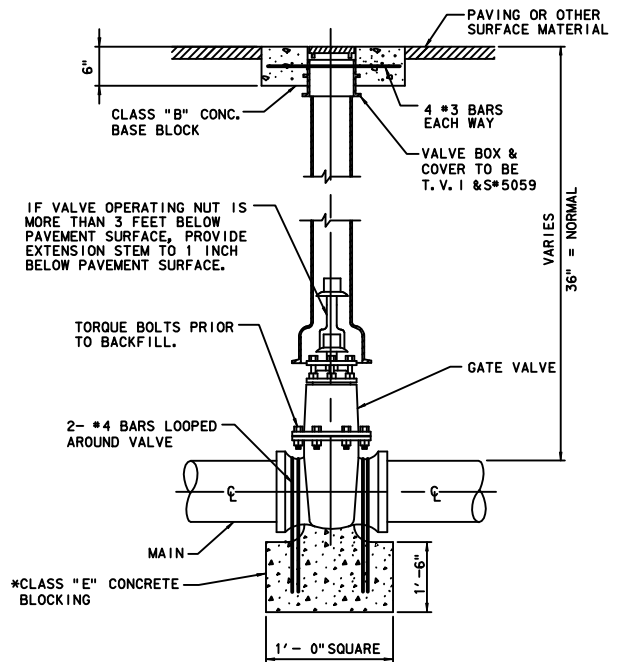
NOTE:
2' x 2' x 6" SLAB
TO BE INSTALLED
AROUND VALVE
BOXES.

PLAN



VALVES IN YARDS OR OTHER
AREAS NOT SUBJECT TO TRAFFIC

*BLOCK GATE VALVES WITH COMPRESSION
JOINT FITTINGS ON 8" & LARGER LINES.



IF VALVE OPERATING NUT IS
MORE THAN 3 FEET BELOW
PAVEMENT SURFACE, PROVIDE
EXTENSION STEM TO 1 INCH
BELOW PAVEMENT SURFACE.

VALVES WITHIN ROADWAYS OR
OTHER PAVED OR SURFACED AREAS

**ELEVATION
GATE VALVE SIZES 4" THRU 12"**

NOT TO SCALE

REVISED 12-29-04

APPROVED _____

REF FILE NAME:

WGVB1.DGN

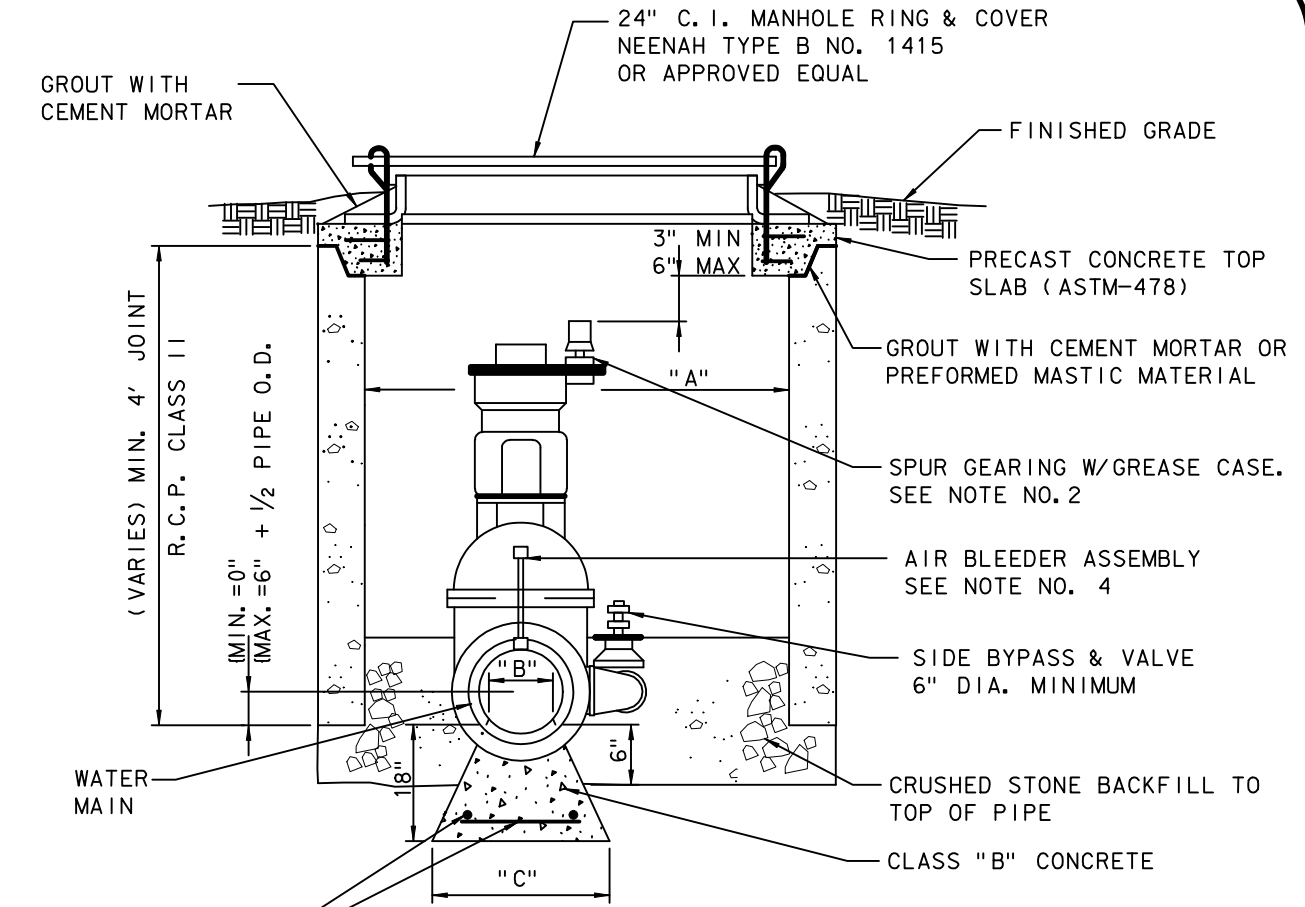
BENBROOK WATER & SEWER AUTHORITY



WATER SEWER

**GATE VALVE
AND BOX**

STANDARD DETAIL



TWO #4 BARS
EACH WAY

PIPE SIZE	"A"	"B"	"C"
20"	54"	12" SQ.	20" SQ.
24"	60"	14" SQ.	24" SQ.

NOTES:

1. PLACE 1/2" EXPANSION JOINT MATERIAL AROUND WATER PIPE WHERE IT PASSES THROUGH CONCRETE VAULT.
2. VALVES 18" AND LARGER SHALL HAVE SPUR GEARING WITH GREASE CASE.
3. NOTE: LARGER DIAMETER R.C.P. MAY BE REQUIRED DEPENDENT UPON MANUFACTURER'S STANDARD SIZE FOR GATE VALVE.
4. PROVIDE CORPORATION WITH COPPER RISER AND CURB STOP AT A MAXIMUM OF 12" FROM EACH END OF GATE VALVE AS SHOWN. CORPORATION AND CURB STOP SIZES SHALL BE 1". EXTEND RISER TO WITHIN 24" OF THE TOP OF THE MANHOLE.
5. VALVES, BYPASS, CORPORATION STOP AND PIPING SHALL BE DESIGNED TO OPERATE AT THE MAXIMUM PRESSURES AS DESCRIBED IN THE SPECIFICATIONS.

GATE VALVE & VAULT INSTALLATION

NOT TO SCALE

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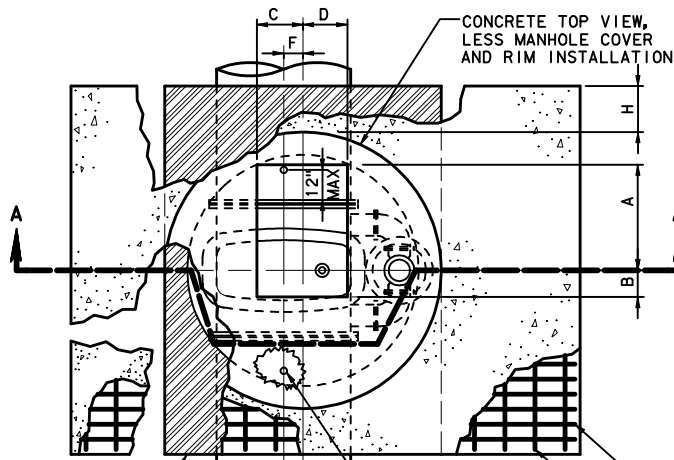
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BWSA

WATER SEWER

**GATE VALVE
AND VAULT**

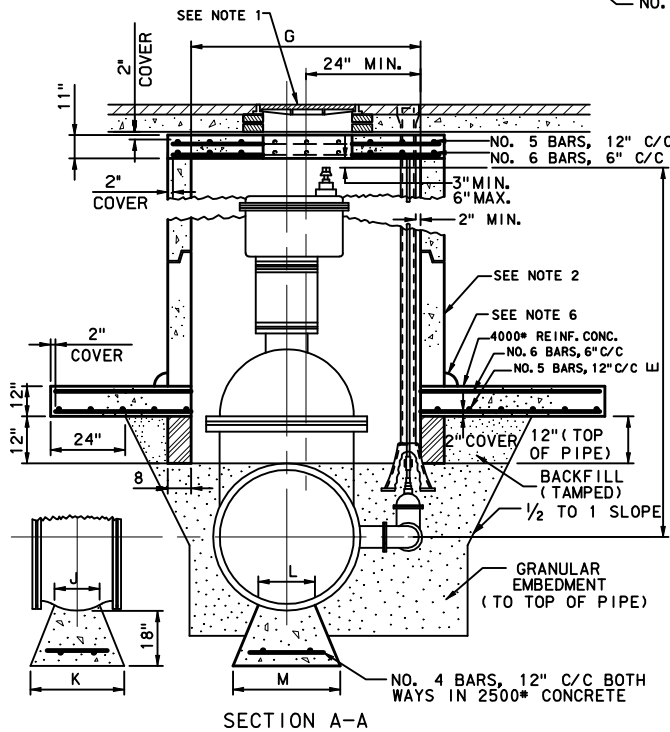
STANDARD DETAIL



GATE VALVE SIZE	DIMENSION TABLE											
	A	B	C	D	E	F	G	H	J	K	L	M
16"	26"	28"	12"	12"	44 1/2"	1"	48"	12"	18"	24"	12"	16"
18"	28"	30"	12"	12"	51 3/8"	2"	48"	12"	18"	24"	12"	18"
20"	22"	18"	12"	12"	56 5/8"	1"	54"	12"	12"	24"	16"	20"
24"	26"	14"	12"	12"	64 3/8"	1"	60"	18"	14"	30"	18"	24"
30"	28"	12"	12"	12"	80 5/8"	3"	66"	18"	18"	30"	20"	30"
36"	32"	8"	12"	12"	90 1/8"	4"	72"	18"	18"	36"	24"	36"
42"	34"	6"	15"	9"	107 3/4"	5"	78"	24"	20"	36"	30"	42"
48"	36"	4"	14"	10"	121 5/8"	4"	90"	24"	26"	42"	36"	48"
54"	36"	4"	9"	15"	142 1/2"	3"	102"	24"	32"	46"	40"	54"

DIMENSIONS ARE BASED ON AMERICAN DARLING VALVE AND MFG. CO. DRAWING NO. 6397, DATED 3-2-59, REVISED 5-11-70. 16" GATE VALVE DIMENSIONS ARE BASED ON CATALOG NO. 10, PAGES 20 AND 22. 54" GATE VALVE DIMENSIONS ARE BASED ON DRAWING NO. 92-12158, DATED 12-13-70.

SEE NOTE 4
 SEE NOTE 4
 NO. 6 BARS, 6" C/C (TYP)
 NO. 5 BARS, 12" C/C (TYP)



**VAULT DETAIL
 FOR 16" AND LARGER GATE VALVE**

NOT TO SCALE

NOTES:

- 24"x40" BENBROOK STANDARD 336 LB. MANHOLE COVER WITH THE WORD "WATER" CAST IN 2-INCH LETTERS.
- VALVE VAULT SIDE WALLS SHALL BE PRECAST REINFORCED CONCRETE PIPE OF THE TONGUE AND GROOVE DESIGN, MEETING THE REQUIREMENTS FOR A. S. T. M. C-76, CLASS III, OR EQUAL, USING RAM-NEK PLASTIC SEAL, OR POURED-IN-PLACE 2500* REINFORCED CONCRETE WITH 8" WALLS. CONCRETE WALLS SHALL BE REINFORCED WITH #4 CIRCULAR BARS, SPACED 6" C/C HORIZONTALLY AND 6" C/C VERTICALLY. POURED-IN-PLACE CONCRETE MUST HAVE "FIRST SURFACE RUBBING" AS SPECIFIED IN THE GENERAL CONTRACT DOCUMENTS AND SPECIFICATIONS.
- PROVIDE CORPORATION AND CURB STOPS A MAXIMUM OF 12" FROM EACH END OF GATE VALVE, AS SHOWN. CORPORATION AND CURB STOPS SIZES SHALL BE 1" FOR 16", 20" AND 24" NOMINAL PIPE DIAMETERS; 2" FOR 30", AND LARGER DIAMETERS. 2" TAPS SHALL BE MADE AS A 2" FLANGED OUTLET, WITH INSULATED ADAPTOR KIT. COPPER RISERS SHALL BE PROVIDED BETWEEN THE CORPORATION AND CURB STOPS. CURB STOPS SHALL BE INSTALLED AT AN ELEVATION 12" ABOVE THE TOP SURFACE OF VAULT BOTTOM SLAB.
- POLYURETHANE CUSHION PAD, AS SUPPLIED BY TEXAS PLASTICS MATERIALS SUPPLY COMPANY, FORT WORTH, TEXAS, OR EQUAL.
- GROUT WITH MORTAR.

REVISED 12-27-04

APPROVED _____

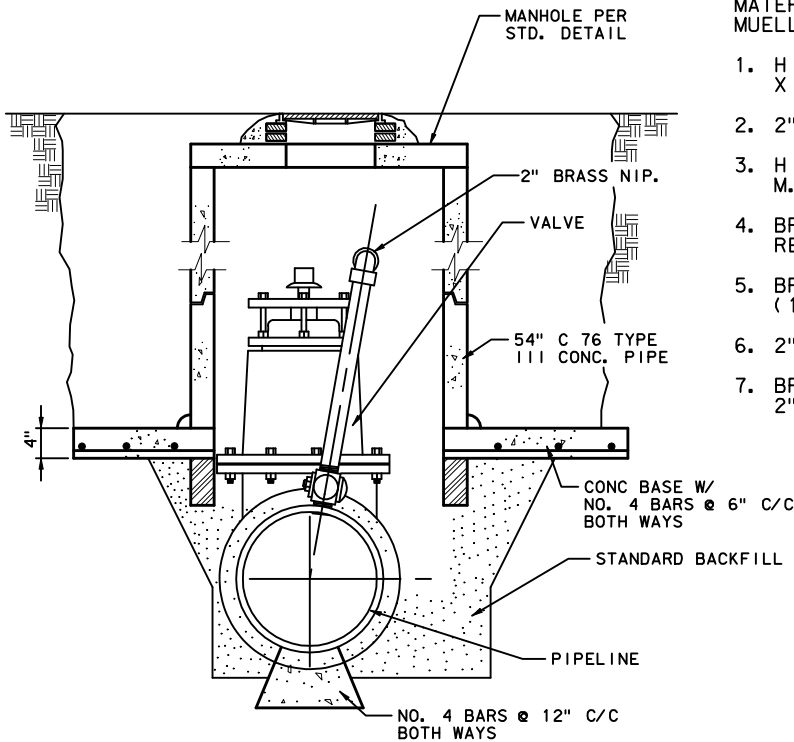
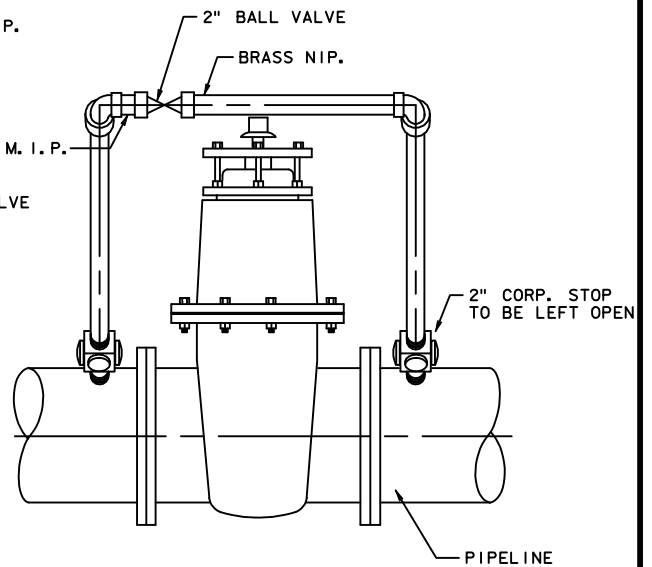
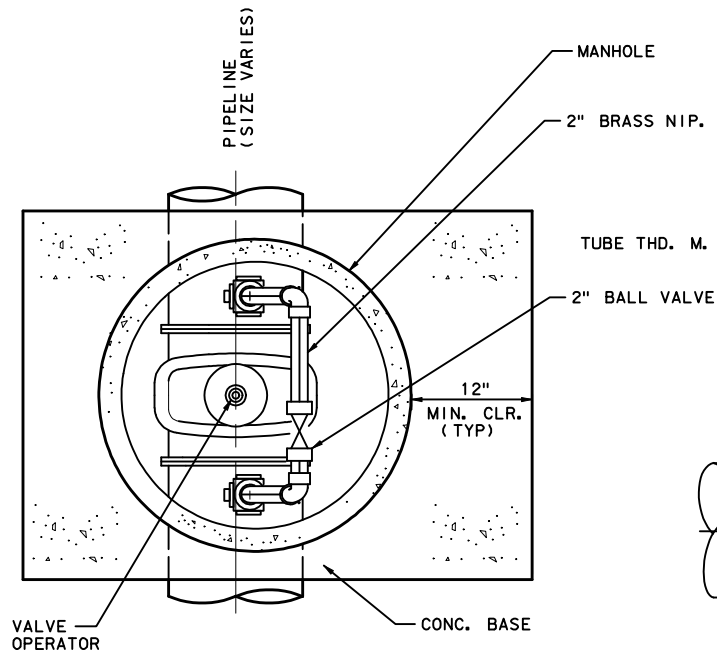
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 LGVLVAULT.DGN

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WATER SEWER

**VAULT DETAIL
 F/16" AND LARGER
 GATE VALVE
 STANDARD DETAIL**



NOTES:
MATERIALS FOR VALVE BYPASS
MUELLER PARTS AS LISTED OR EQUAL

1. H 15025 CORP. STOP 2" MUELLER THD. X 2" COP. (2) REQUIRED
2. 2" TYPE K COPPER TUBING AS REQUIRED
3. H 15425 STRAIGHT COUPLING 2" COP X 2" M. I. P (2) REQUIRED
4. BRASS TEE 2" F. I. P. X 2" F. I. P. X 2" F. I. P (2) REQUIRED
5. BRASS NIPPLE 6" LONG 2" M. I. P. X 2" M. I. P. (1) REQUIRED BALL
6. 2" VALVE (1) REQUIRED
7. BRASS NIPPLE, LENGTH AS REQUIRED 2" M. I. P. X 2" M. I. P. (1) REQUIRED

**VALVE WITH BYPASS
FOR 16" AND LARGER GATE VALVE**

NOT TO SCALE

REVISED 12-27-04

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REF FILE NAME:
LGVLV_WBYP. DGN

BENBROOK WATER & SEWER AUTHORITY

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WATER SEWER

**LARGE DIA. VALVE
VAULT W/BYPASS**

STANDARD DETAIL

HORIZONTAL BLOCKING TABLE

MEDIUM PRESSURE LINES, PROCESS LINES,
PUMP DISCHARGE LINES, ETC.
WORKING PRESSURES OF 15 PSIG TO 50 PSIG

PIPE SIZE	"X" DIM. FT.	1'-15'	22'-30'	45°	90°	TEE & PLUG
		MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA
2"-4"	0.75	0.23	0.46	0.91	1.68	1.19
6"	1.00	0.51	1.02	2.00	3.69	2.61
8"	1.00	0.89	1.77	3.46	6.40	4.52
10"	1.00	1.35	2.69	5.28	9.75	6.90
12"	1.25	1.90	3.78	7.42	13.71	9.69
16"	1.50	3.22	6.42	12.59	23.26	16.45
24"	2.00	6.65	13.24	25.97	47.98	33.93
30"	2.25	9.78	19.47	38.19	70.56	49.90
36"	2.75	13.30	26.48	51.94	95.97	67.86

PLANT WATER, FIRE WATER &
POTABLE WATER SYSTEMS
WORKING PRESSURES OF 50 PSIG TO 100 PSIG

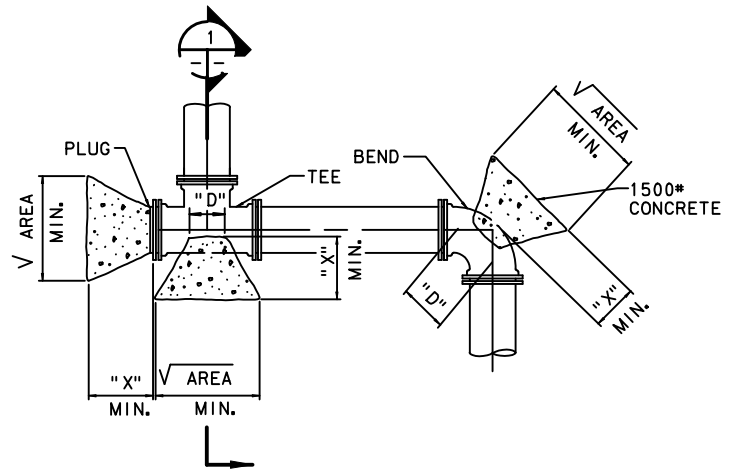
PIPE SIZE	"X" DIM. FT.	1'-15'	22'-30'	45°	90°	TEE & PLUG
		MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA
2"-4"	0.75	0.47	0.93	1.82	3.37	2.38
6"	1.00	1.02	2.04	4.00	7.38	5.22
8"	1.00	1.77	3.53	6.92	12.80	9.05
10"	1.00	2.70	5.38	10.56	19.51	13.79
12"	1.25	3.80	7.56	14.84	27.42	19.39
16"	1.50	6.45	12.84	25.18	46.53	32.90
24"	2.00	13.30	26.48	51.94	95.97	67.86
30"	2.25	19.56	38.94	76.38	141.13	99.79
36"	2.75	26.61	52.95	103.87	191.93	135.72

LOW PRESSURE LINES, GRAVITY LINES,
DRAINS, ETC., (WITH STATIC HEAD ONLY)
WORKING PRESSURES OF 5 PSIG TO 15 PSIG

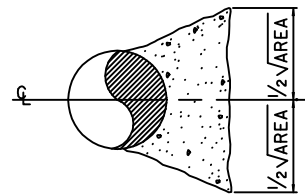
PIPE SIZE	"X" DIM. FT.	1'-15'	22'-30'	45°	90°	TEE & PLUG
		MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA	MIN. AREA
2"-4"	0.75	0.08	0.15	0.30	0.56	0.40
6"	1.00	0.17	0.34	0.67	1.23	0.87
8"	1.00	0.30	0.59	1.15	2.13	1.51
10"	1.00	0.45	0.90	1.76	3.25	2.30
12"	1.25	0.63	1.26	2.47	4.57	3.23
16"	1.50	1.07	2.14	4.20	7.75	5.48
24"	2.00	2.22	4.41	8.66	15.99	11.31
30"	2.25	3.26	6.49	12.73	23.52	16.63
36"	2.75	4.43	8.83	17.31	31.99	22.62

NOTES:

1. THRUST BLOCK AREAS SHOWN ARE BASED ON TEST PRESSURES OF 150 P.S.I.G. FOR PLANT WATER, ETC., 75 P.S.I.G. FOR PROCESS LINES AND 25 P.S.I.G. FOR GRAVITY LINE AND 3000 P.S.F. PER VERTICAL FOOT OF SOIL COVER MEASURED TO CENTERLINE OF PIPE.
2. MINIMUM AREAS SHOWN ARE IN SQUARE FEET AND ARE BASED UPON MIN. 3.0 FEET OF COVER.
3. BEARING MUST BE ON UNDISTURBED EARTH.
4. ADJUST THRUST BLOCK AREAS ACCORDINGLY IF PRESSURES, DEPTH OF COVER AND/OR SOIL BEARING VALUE VARIES.



"X" DIMENSION MAY VARY TO PROVIDE REQ'D. BEARING AGAINST UNDISTURBED EARTH.



SECTION
NOT TO SCALE

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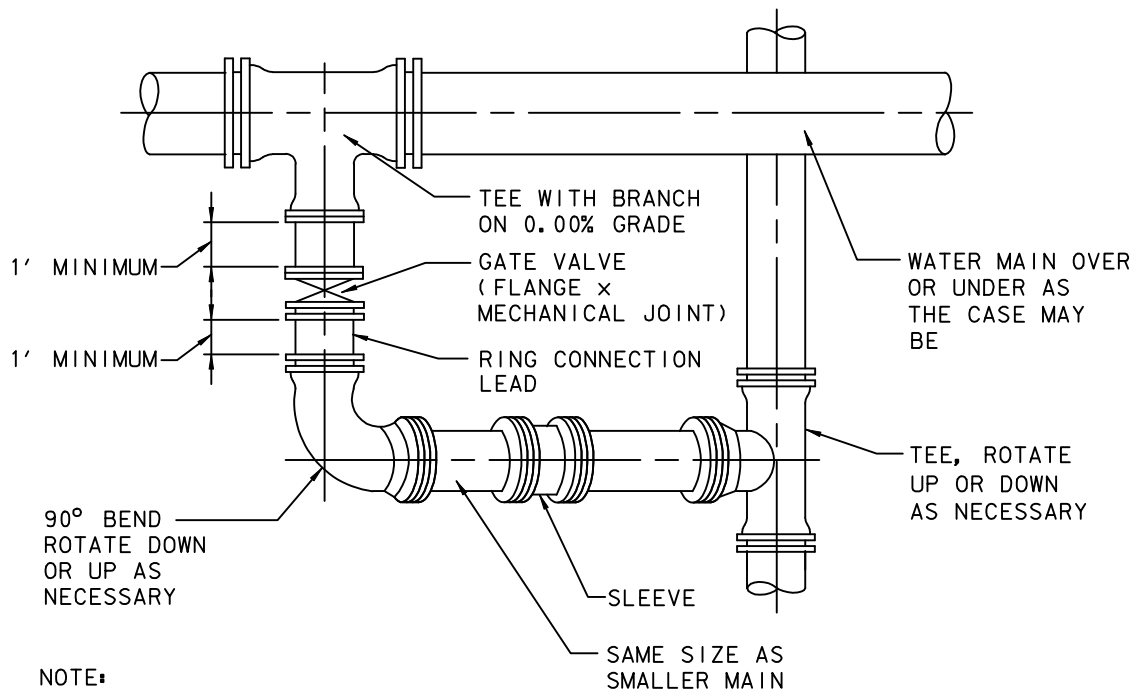
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BWSA

WATER SEWER

**16" PIPE & SMALLER
HORIZ. BLOCKING**

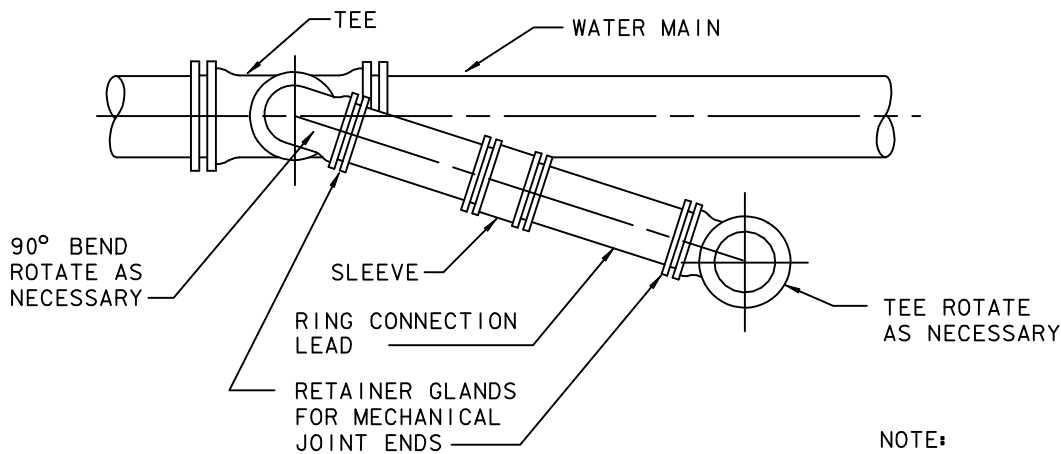
STANDARD DETAIL



NOTE:
 PROVIDE VERTICAL
 TIE DOWN BLOCK
 AS NECESSARY

PLAN

N. T. S.



NOTE:
 PROVIDE TIE DOWN
 BLOCK AS NECESSARY

SECTION

N. T. S.

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REF FILE NAME:
 WTRC1.DGN

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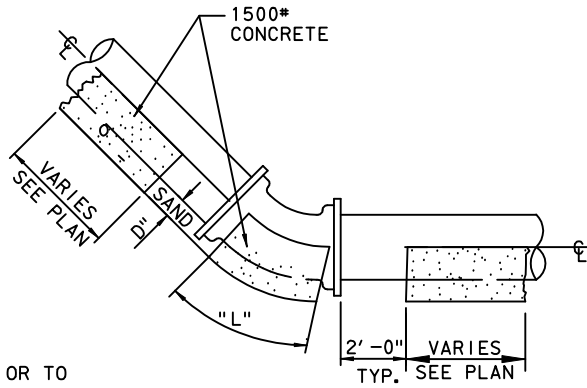
WATER SEWER

**TYPICAL RING
 CONNECTION**

STANDARD DETAIL

NOTE: TRENCH WIDTH:

1. PIPE 24" I.D. AND SMALLER = 24" OR O.D. + 12" WHICHEVER IS GREATER.
2. PIPE LARGER THAN 24" = O.D. OF PIPE + 18".
3. CRADLE SHALL EXTEND A MINIMUM OF 6" BEYOND EACH SIDE OF PIPE.



"D" = 6" MINIMUM OR TO UNDISTURBED SOIL

NOTE:

WHEN CRADLE IS SHOWN OR SPECIFIED FOR INSTALLATION ON CONCRETE PIPE. THE FULL JOINT LENGTH OF THE PIPE OR FITTING SHALL BE CRADLED.

KEEP A MINIMUM OF 1'-0" CLEARANCE BETWEEN CONCRETE AND JOINTS OR BOLTS ON DUCTILE IRON PIPE OR IN EXCESS OF 1'-0" AS DETAILED.

CRADLE DETAIL

NOT TO SCALE

PIPE CLASS	PIPE SIZE	11° - 15'		22° - 30'		45°		90°	
		L	MAX VOL	L	MAX VOL	L	MAX VOL	L	MAX VOL
150	6"	.42	.02	.45	0.02	.50	.02	1.00	.04
150	8"	.42	.02	.45	0.02	.80	.04	1.40	.06
150	10"	.42	.03	.58	0.03	1.15	.06	2.03	.11
150	12"	.42	.04	.73	0.05	1.43	.09	2.53	.17
150	16"	.42	.08	.74	0.14	1.48	.27	2.61	.48
150	18"	.66	.14	1.30	0.28	SEE PLAN SHEETS FOR BLOCKING		SEE PLAN SHEETS FOR BLOCKING	
150	20"	.77	.18	1.53	0.36				
200	18"	.88	.18	1.74	0.37	SEE PLAN SHEETS FOR BLOCKING		SEE PLAN SHEETS FOR BLOCKING	
200	20"	1.03	.24	2.04	0.48				
250	18"	1.05	.22	2.03	0.43	SEE PLAN SHEETS FOR BLOCKING		SEE PLAN SHEETS FOR BLOCKING	
250	20"	1.20	.28	2.38	0.56				

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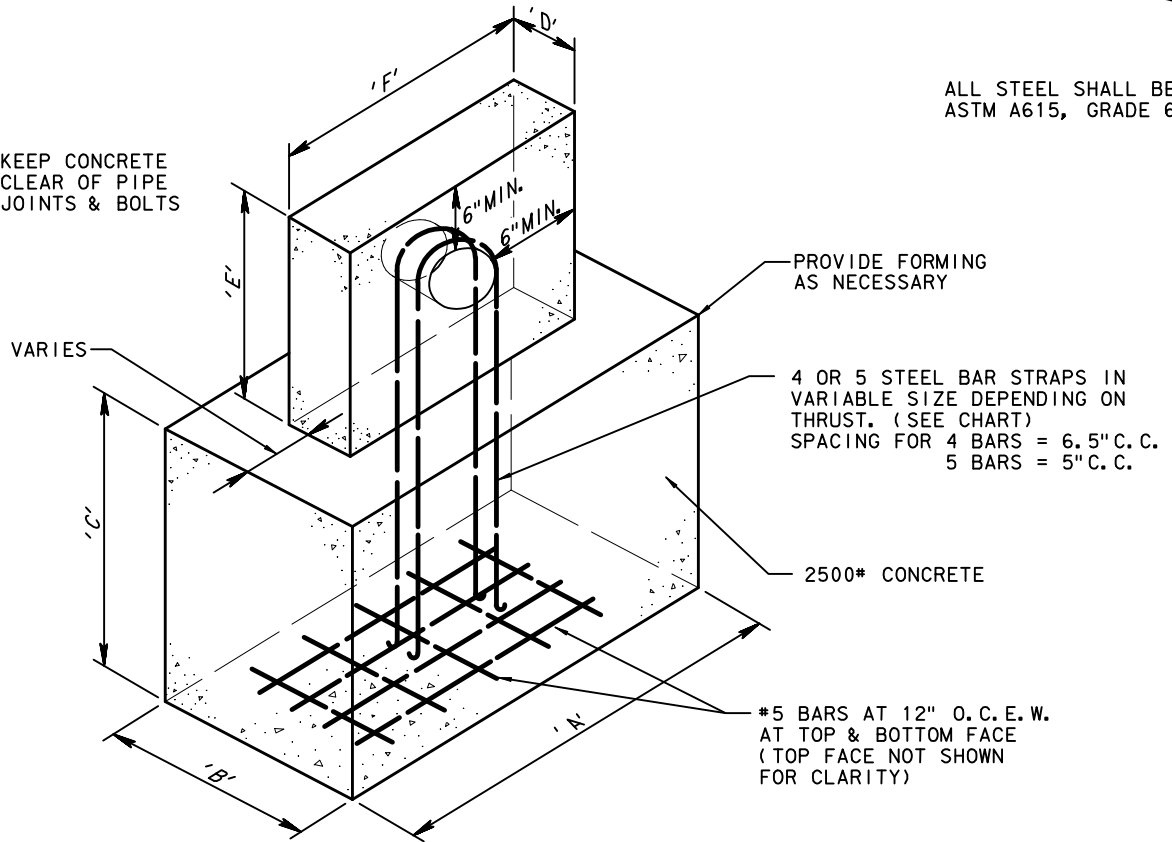
WATER SEWER

**CONCRETE CRADLE
@ VERT. BENDS**

STANDARD DETAIL

ALL STEEL SHALL BE
ASTM A615, GRADE 60

KEEP CONCRETE
CLEAR OF PIPE
JOINTS & BOLTS



BENDS			45°	22 1/2°	11 1/4°	
PIPE NOMINAL DIA. (IN.)	*VOL.	REQ' D.	C. F.	38.48	20.11	10.05
	8"	A	FT.	1.67	1.50	1.00
		B	FT.	4.80	3.66	3.20
		C	FT.	4.80	3.66	3.20
	*VOL.	REQ' D.	C. F.	61.21	31.41	15.71
	10"	A	FT.	1.92	1.75	1.50
		B	FT.	5.60	4.25	3.25
		C	FT.	5.60	4.25	3.25
	*VOL.	REQ' D.	C. F.	87.12	44.13	22.17
	12"	A	FT.	2.42	1.42	1.25
		B	FT.	6.00	5.54	4.20
		C	FT.	6.00	5.54	4.20
*VOL.	REQ' D.	C. F.	121.87	78.45	39.45	
16"	A	FT.	3.10	2.00	1.75	
	B	FT.	6.27	6.27	4.75	
	C	FT.	6.27	6.27	4.75	
*VOL.	REQ' D.	C. F.	169.06	114.78	63.20	
20"	A	FT.	3.80	2.58	2.25	
	B	FT.	6.67	6.67	5.30	
	C	FT.	6.67	6.67	5.30	

*VOLUME CALCULATED ON THE BASIS OF CONCRETE REACTING THRUST ON THE RESPECTIVE BENDS UNDER AN INTERNAL PRESSURE OF 150 PSIG AT THE RATE OF 150 LB. WT. PER CU. FT. OF CONCRETE

BENDS			90°	45°	22 1/2°	11 1/4°	
PIPE NOMINAL DIA. (IN.)	* VOL.	REQ' D.	C. F.	28.27	22.61	11.33	5.65
	6	D	FT.	1.75	1.5	1.0	0.75
		E	FT.	4.0	3.88	3.36	2.75
		F	FT.	4.0	3.88	3.36	2.75
	* VOL.	REQ' D.	C. F.	50.27	40.21	20.11	10.05
	8	D	FT.	2.0	1.75	1.5	1.0
		E	FT.	5.0	4.8	3.66	3.2
		F	FT.	5.0	4.8	3.66	3.2
	* VOL.	REQ' D.	C. F.	78.54	62.83	31.41	15.71
	10	D	FT.	2.25	2.0	1.75	1.5
		E	FT.	5.9	5.6	4.25	3.25
		F	FT.	5.9	5.6	4.25	3.25
* VOL.	REQ' D.	C. F.	153.94	123.15	61.57	30.79	
12	D	FT.	4.0	3.5	2.0	1.75	
	E	FT.	6.2	6.0	5.54	4.2	
	F	FT.	6.2	6.0	5.54	4.2	

* VOLUME CALCULATED ON THE BASIS OF CONCRETE REACHING THRUST ON THE RESPECTIVE BENDS UNDER AN INTERNAL PRESSURE OF 150 PSIG AT THE RATE OF 150 LB. WT. PER CU. FT. OF CONCRETE. DIMENSIONS MAY VARY FOR EQUIVALENT VOLUME OF CONCRETE.

VERTICAL TIE-DOWN BLOCK

NOT TO SCALE

REVISED 12-15-04

APPROVED _____

REF FILE NAME:
VTDB. DGN

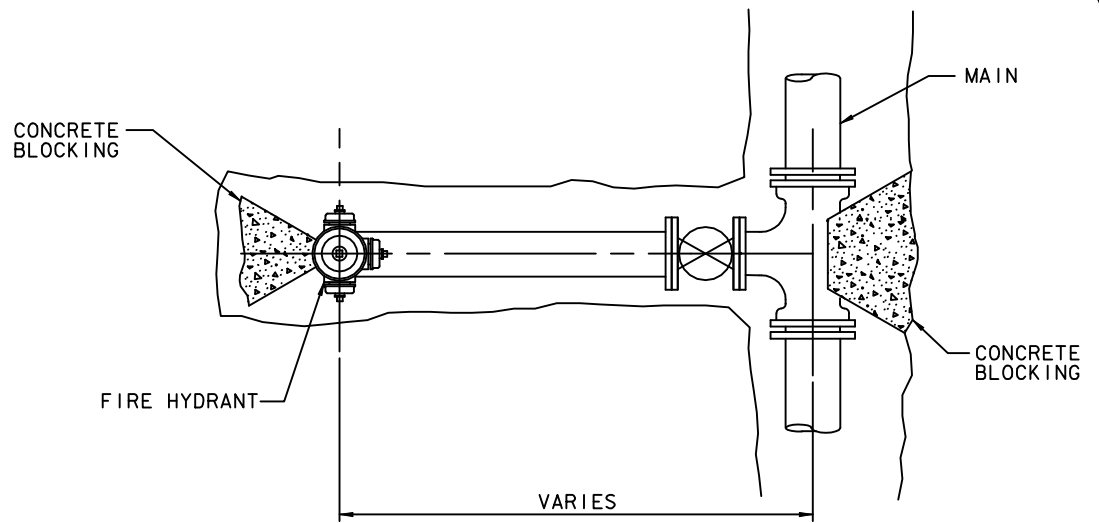
BENBROOK WATER & SEWER AUTHORITY

BWSA

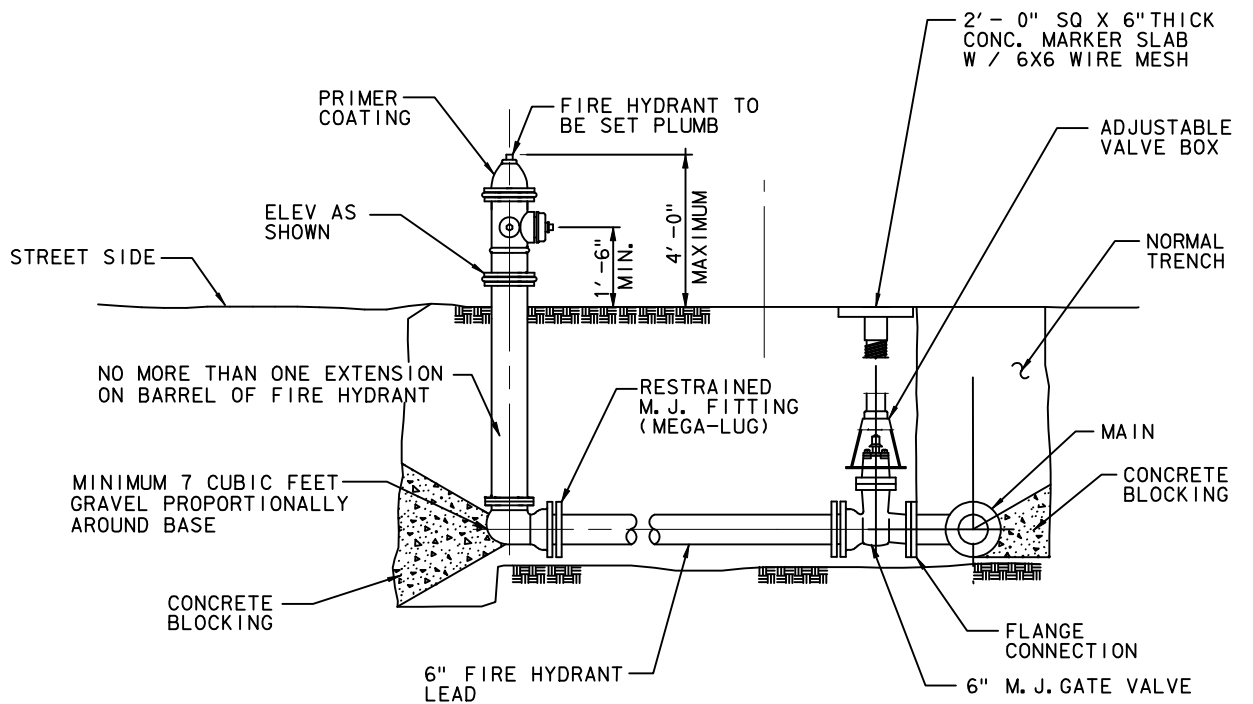
WATER SEWER

VERTICAL TIE-DOWN
BLOCK

STANDARD DETAIL



PLAN



ELEVATION
TYPE 'A' FIRE HYDRANT INSTALLATION

NOT TO SCALE

NOTE:
USE TAPPING SLEEVE
AND VALVE TO CONNECT
TO EXISTING PIPE.

REVISED 12-28-04

APPROVED _____

REF FILE NAME:
HYF11.DGN

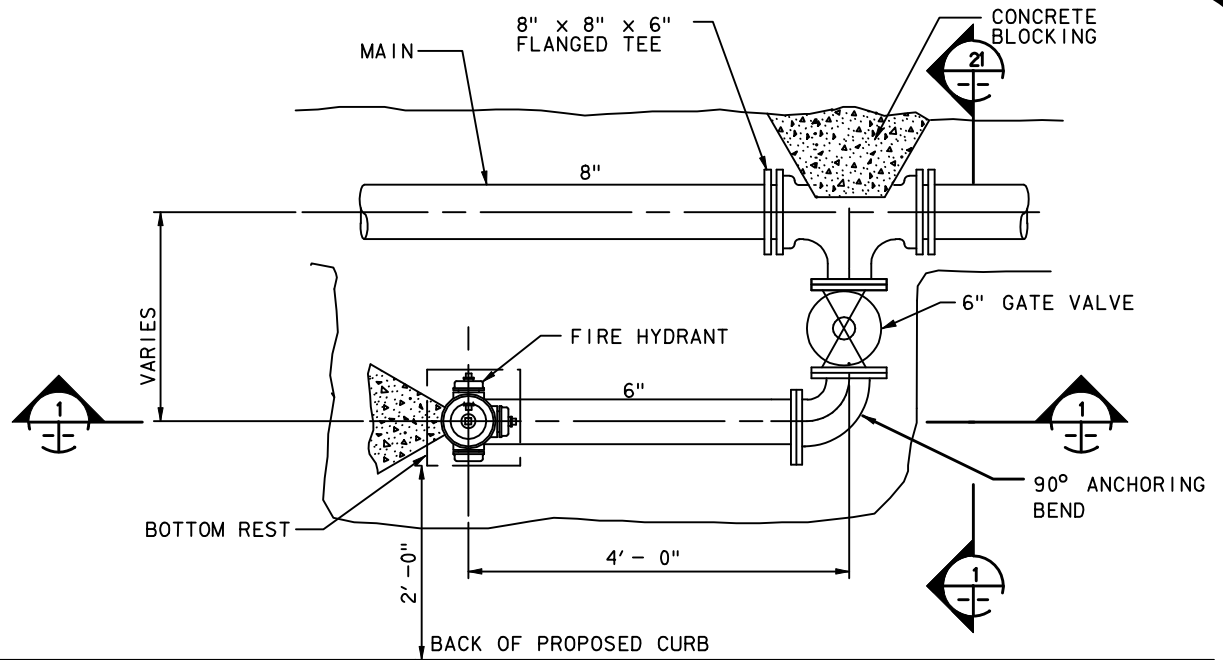
BENBROOK WATER & SEWER AUTHORITY

BWSA

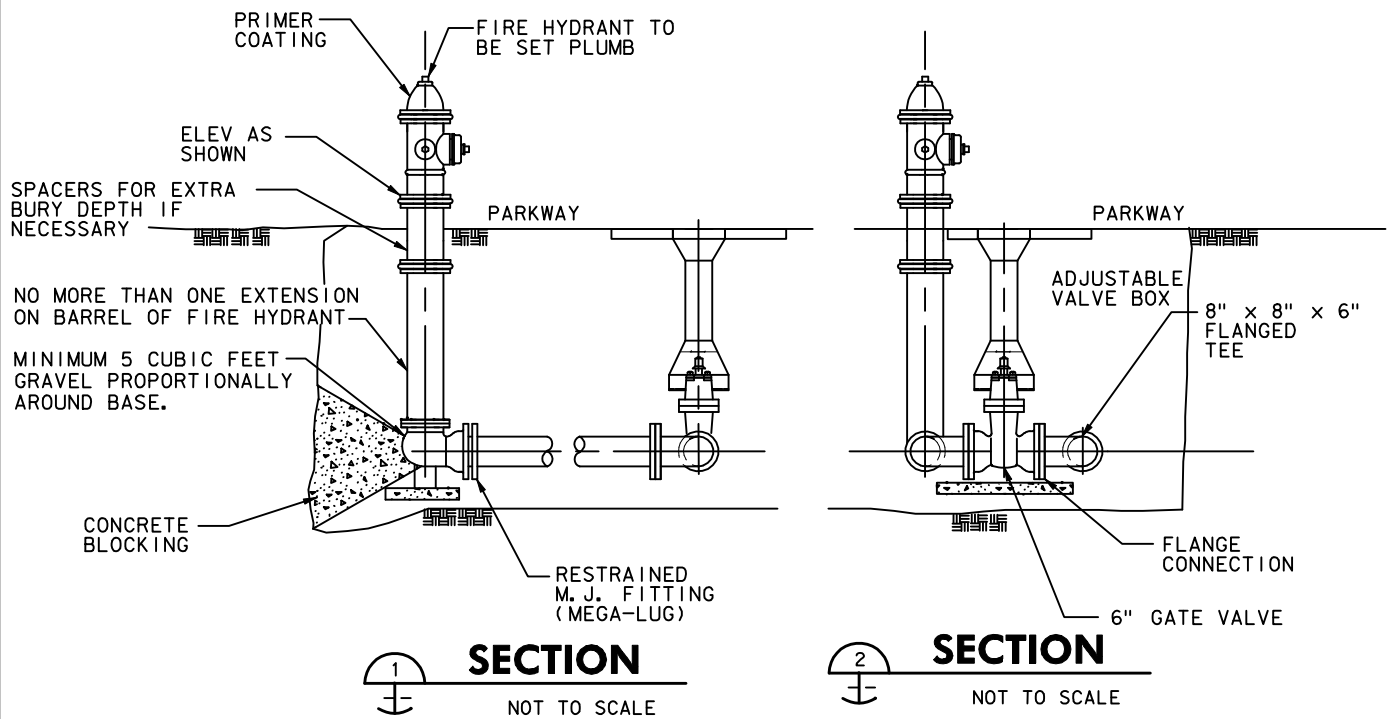
WATER SEWER

**TYPE "A"
FIRE HYDRANT**

STANDARD DETAIL



PLAN



SECTION

SECTION

NOTE:
USE TAPPING SLEEVE
AND VALVE TO CONNECT
TO EXISTING PIPE

TYPE 'B' FIRE HYDRANT INSTALLATION

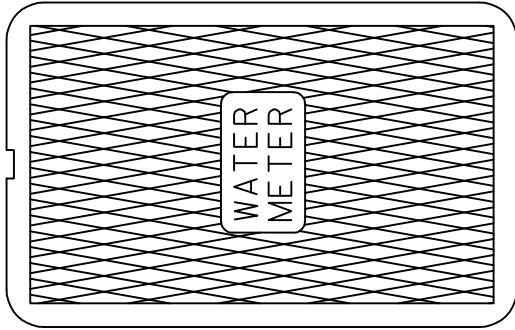
NOT TO SCALE

REVISED 12-28-04
APPROVED _____
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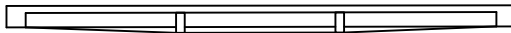
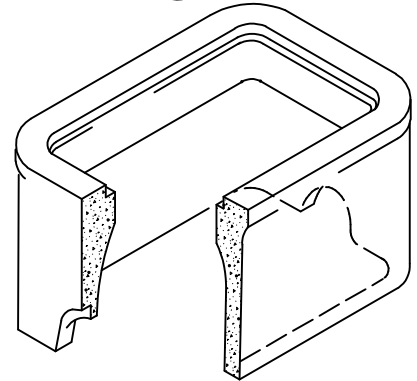
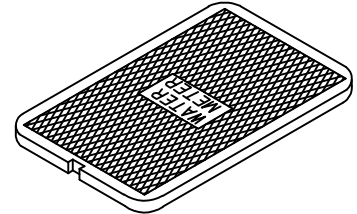
BENBROOK WATER & SEWER AUTHORITY

WATER SEWER
**TYPE "B"
FIRE HYDRANT**
STANDARD DETAIL

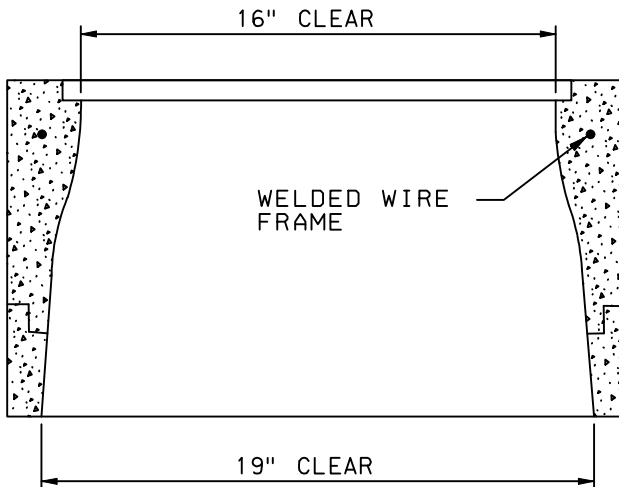
NOTE: METER BOX SHALL BE
 STYLE T-37 FOR UP
 TO 1" DIA. 1 1/2" DIA.
 AND GREATER SHALL
 BE STYLE A-55.



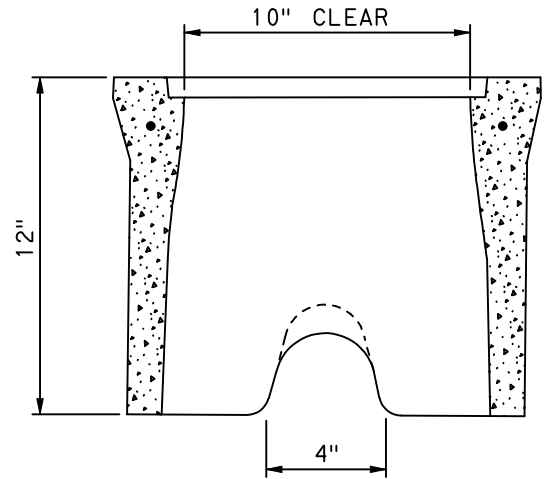
LID TOP VIEW



LID SIDE ELEVATION



LONGITUDINAL SECTION



END SECTION

REVISED 12-29-04

APPROVED _____

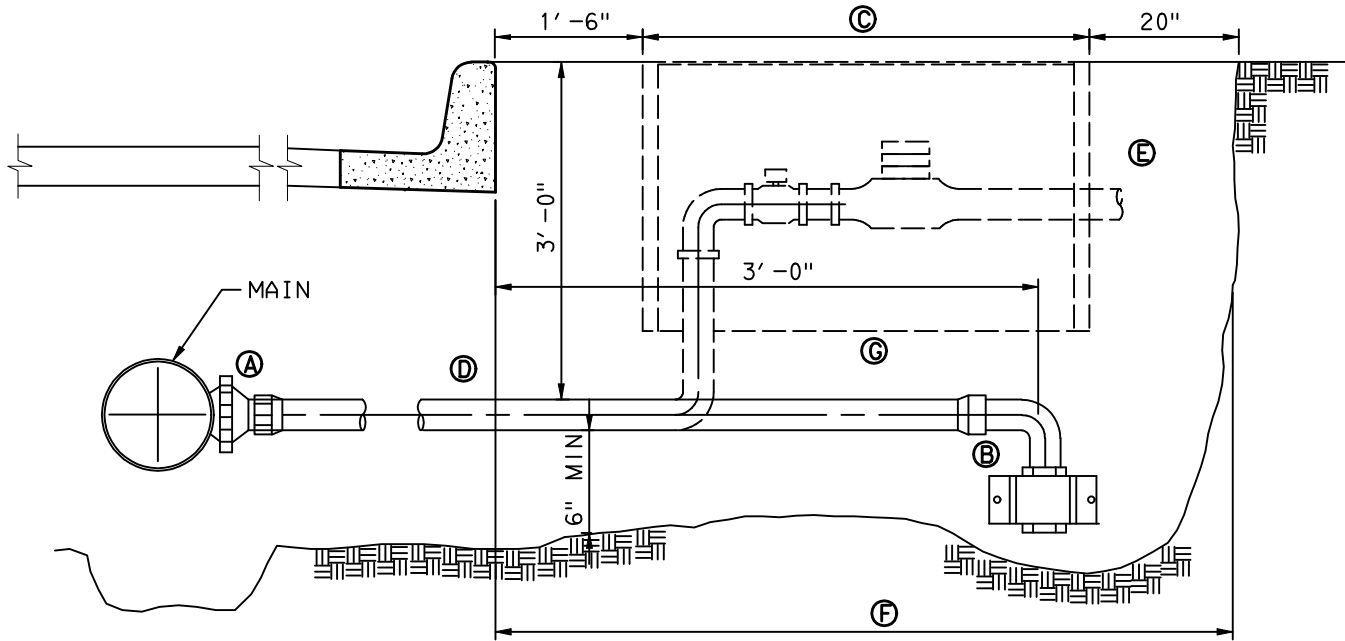
REF FILE NAME:
 MTRBOX1.DGN

BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER
CONC. METER BOX
FOR
3/4" AND 1" DIA.
STANDARD DETAIL

NOTE : 1" COPPER SERVICE PIPE FOR SINGLE SERVICE TO BE INCLUDED AS SEPARATE BID ITEM AS SPECIFIED



- (A) STANDARD CORPORATION STOP COMPRESSION
- (B) STANDARD CURB STOP & 90° ELBOW COMPRESSION
- (C) METER TO BE INSTALLED BY OTHERS
- (D) SERVICE LINE
- (E) BLUE VINYL TAPE 3" WIDE, 6" ABOVE GROUND
- (F) AREA TO BE BACK FILLED WITH SAND
- (G) METER BOX TO BE INSTALLED BY CONTRACTOR IN CONJUNCTION WITH 1" SERVICE

NEW WATER SERVICE CONNECTION

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

REF FILE NAME:

NWSD. DGN

BENBROOK WATER & SEWER AUTHORITY

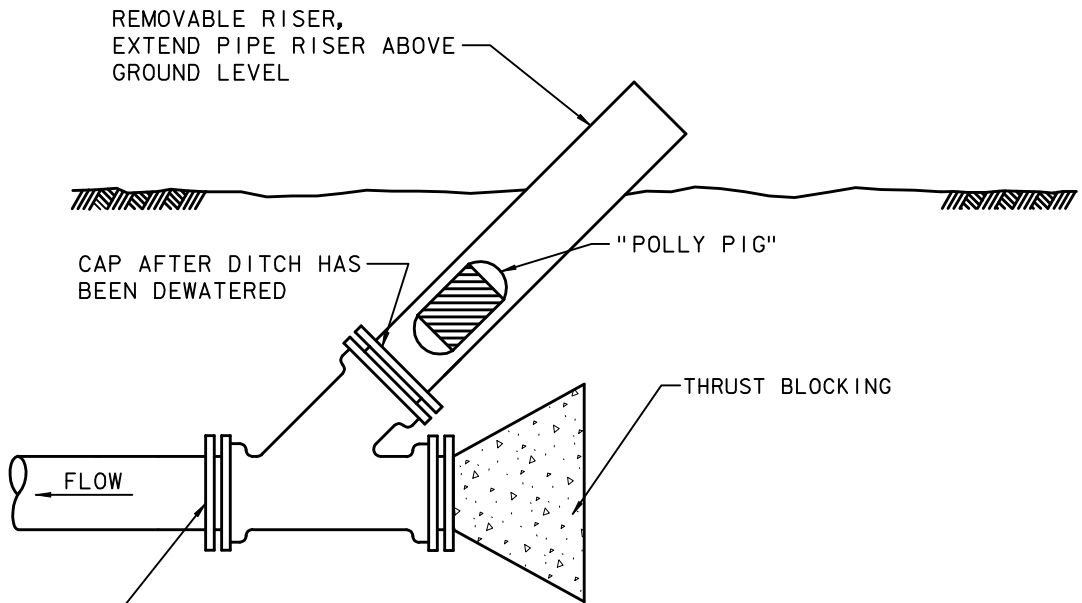
BWSA

WATER SEWER

NEW WATER SERVICE DETAILS

STANDARD DETAIL

WHEN FIRE HYDRANT IS LOCATED AT END OF
 MAINS 8" IN DIAMETER, WYE MAY BE OMITTED
 CONTRACTOR WILL MAKE A REASONABLE EFFORT TO
 PREVENT BACK-FLOW OF PURGED WATER



1. INSTALL MJ WYE AT TERMINAL END OF MAIN
2. CLOSURE ON A-C PIPE WILL REQUIRE "RIGHT-TIGHT" TO PLAIN END ADAPTER IN ADDITION TO MJ WYE
3. BLOCK WYE STRAIGHT RUN END PLUG
4. AFTER CLEANING WITH "POLY-PIG" INSTALL BRANCH END PLUG.

**CLEANING WYE DETAIL
 FOR NON-LOOPED SYSTEM
 12" AND UNDER**

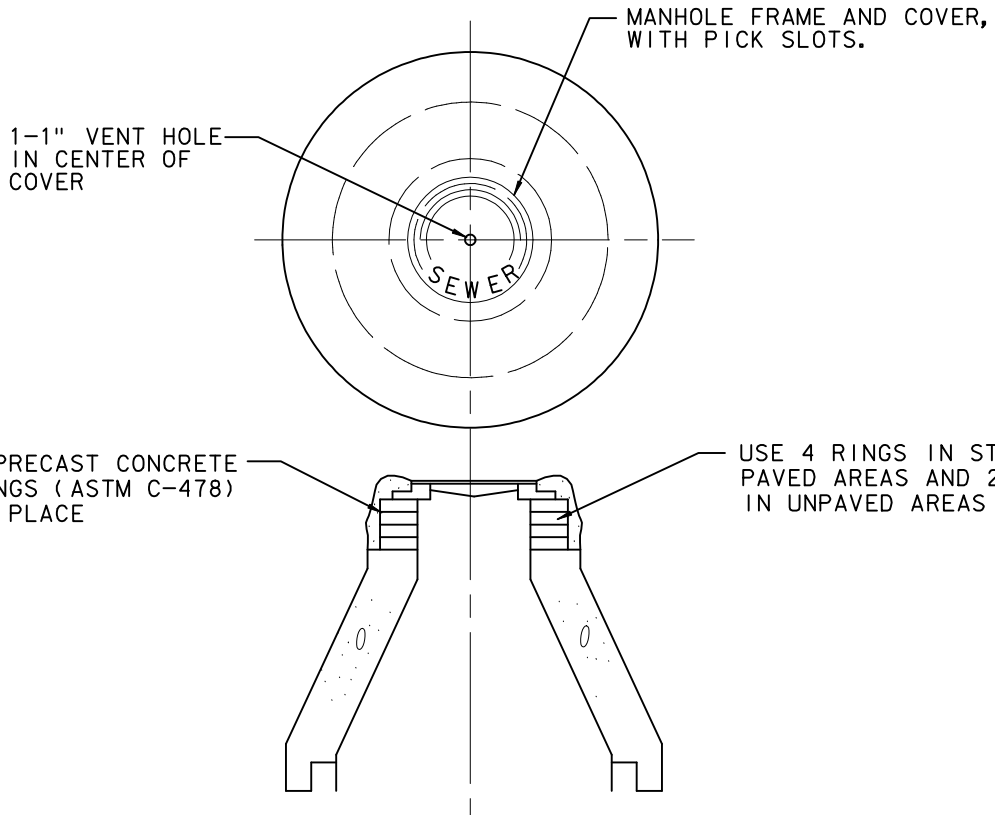
NOT TO SCALE

REVISED 12-27-04
 APPROVED _____
 REF FILE NAME:
 CLEANINGWYE.DGN

BENBROOK WATER & SEWER AUTHORITY

WATER SEWER
**CLEANING WYE
 DETIAL FOR
 NON-LOOPED SYSTEM**
 STANDARD DETAIL

SEWER DETAILS



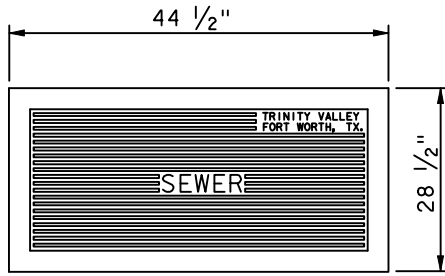
STANDARD MANHOLE FRAME & COVER

(PRECAST SHOWN)
NOT TO SCALE

REVISED _____
 APPROVED _____
 REF FILE NAME: _____
 STD MH. DGN _____

BENBROOK WATER & SEWER AUTHORITY

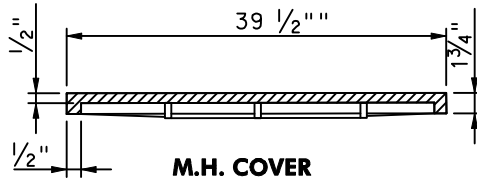
WATER SEWER
**STANDARD
 MANHOLE
 FRAME & COVER**
 STANDARD DETAIL



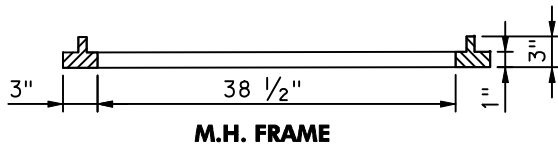
**FRAME AND COVER
T.V.I. & S PATTERN NO. 101
OR EQUAL**

NOTES

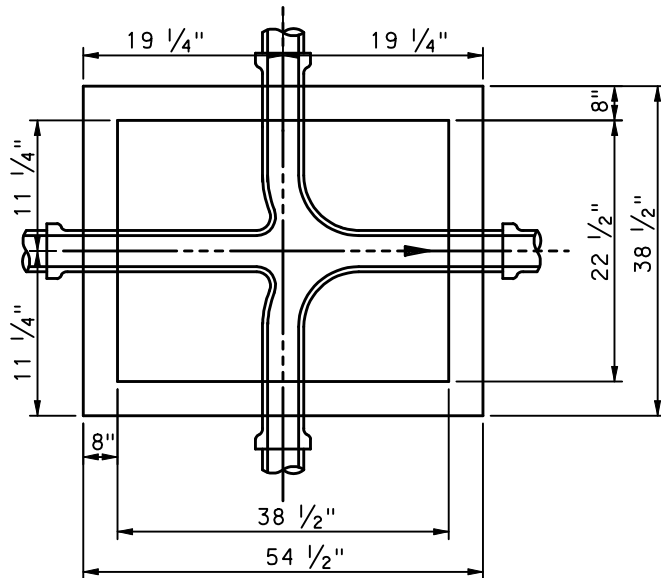
1. SHALLOW MANHOLE TO BE CONSTRUCTED OF CLASS "F" (4000*) CONCRETE OR OF PRECAST CONE WITH STANDARD 300# MANHOLE RING AND COVER.
2. FRAME AND COVER AS MANUFACTURED BY MCKINLEY IRON WORKS, NO. PM 24x40 OR EQUAL, MAY BE ADJUSTED, FOR ELEVATION ON A MAXIMUM OF FOUR (4) COURSES BRICK IN PAVED STREETS, OR AREAS TO BE PAVED, MINIMUM OF TWO COURSES IN OTHER AREAS.



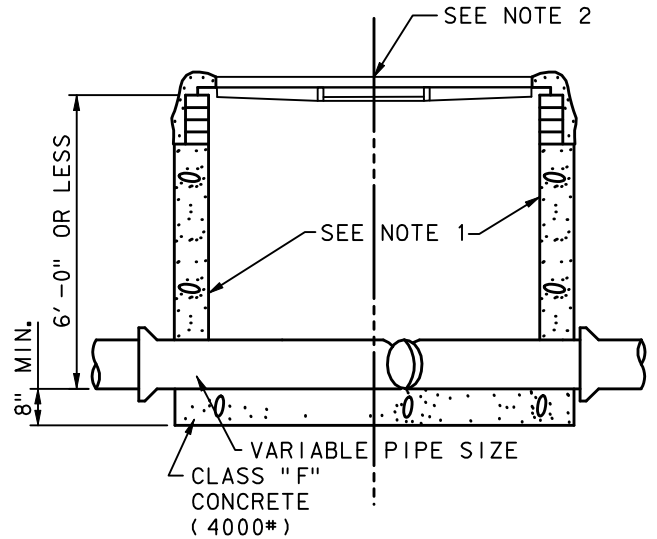
M.H. COVER



M.H. FRAME



**TOP PLAN VIEW
OF 24" x 40" M.H.**



**SECTION - A OF
24" x 40" M.H.**

MANHOLE TO BE USED WHERE SEWER LINES ARE LESS THAN 6'-0" DEEP.

REVISED 6-21-04

APPROVED _____

REF FILE NAME:
SHLLWMH. DGN

BENBROOK WATER & SEWER AUTHORITY

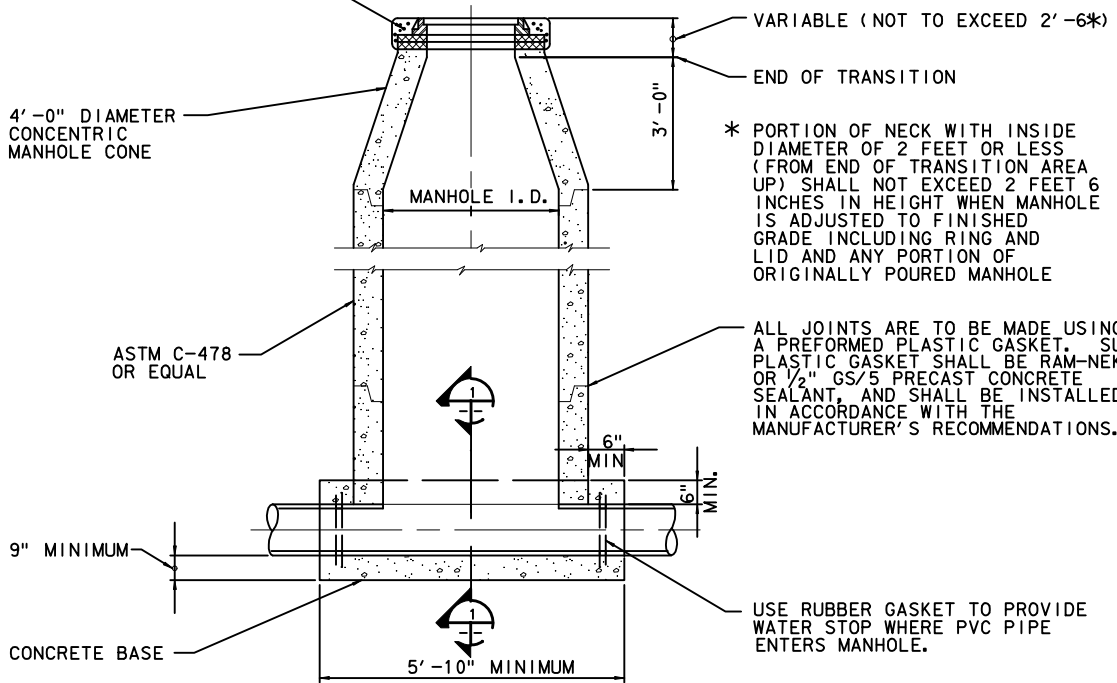
BWSA

WATER SEWER

**SHALLOW SANITARY
SEWER MANHOLE**

STANDARD DETAIL

USE DOUBLE RING OF 1/2" GS/5 PRECAST CONCRETE SEALANT, AS MANUFACTURED BY GENERAL SEALANTS, INC., TO SEAL RING TO CONCRETE AND BETWEEN GRADE RINGS



* PORTION OF NECK WITH INSIDE DIAMETER OF 2 FEET OR LESS (FROM END OF TRANSITION AREA UP) SHALL NOT EXCEED 2 FEET 6 INCHES IN HEIGHT WHEN MANHOLE IS ADJUSTED TO FINISHED GRADE INCLUDING RING AND LID AND ANY PORTION OF ORIGINALLY POURED MANHOLE

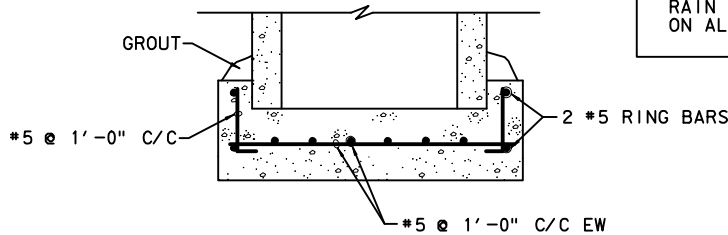
ALL JOINTS ARE TO BE MADE USING A PREFORMED PLASTIC GASKET. SUCH PLASTIC GASKET SHALL BE RAM-NEK OR 1/2" GS/5 PRECAST CONCRETE SEALANT, AND SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

PRECAST CONCRETE MANHOLE

NOT TO SCALE

NOTE:

4' DIA MH FOR SEWER UP TO 21" DIA
 5' DIA MH FOR SEWER UP TO 39" DIA
 RAIN GUARD MANHOLE INSERT REQUIRED ON ALL SUBDIVISION MANHOLES.



SECTION

NOT TO SCALE

REVISED _____

APPROVED _____

REF FILE NAME: _____

PRECMH. DGN _____

BENBROOK WATER & SEWER AUTHORITY

BWSA

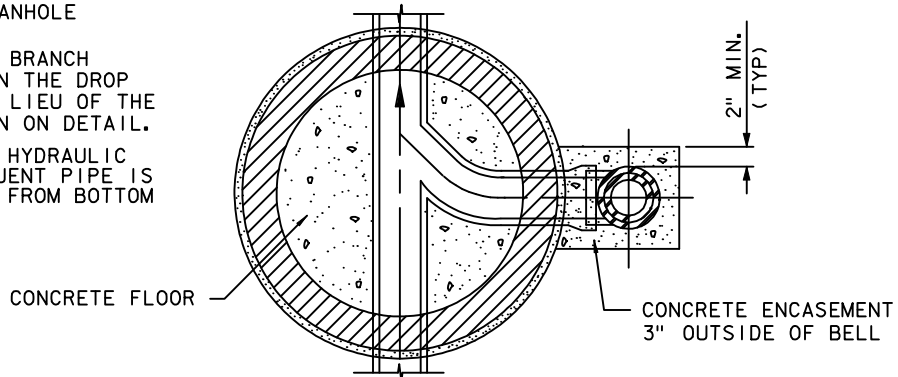
WATER SEWER

**PRECAST
 MANHOLE**

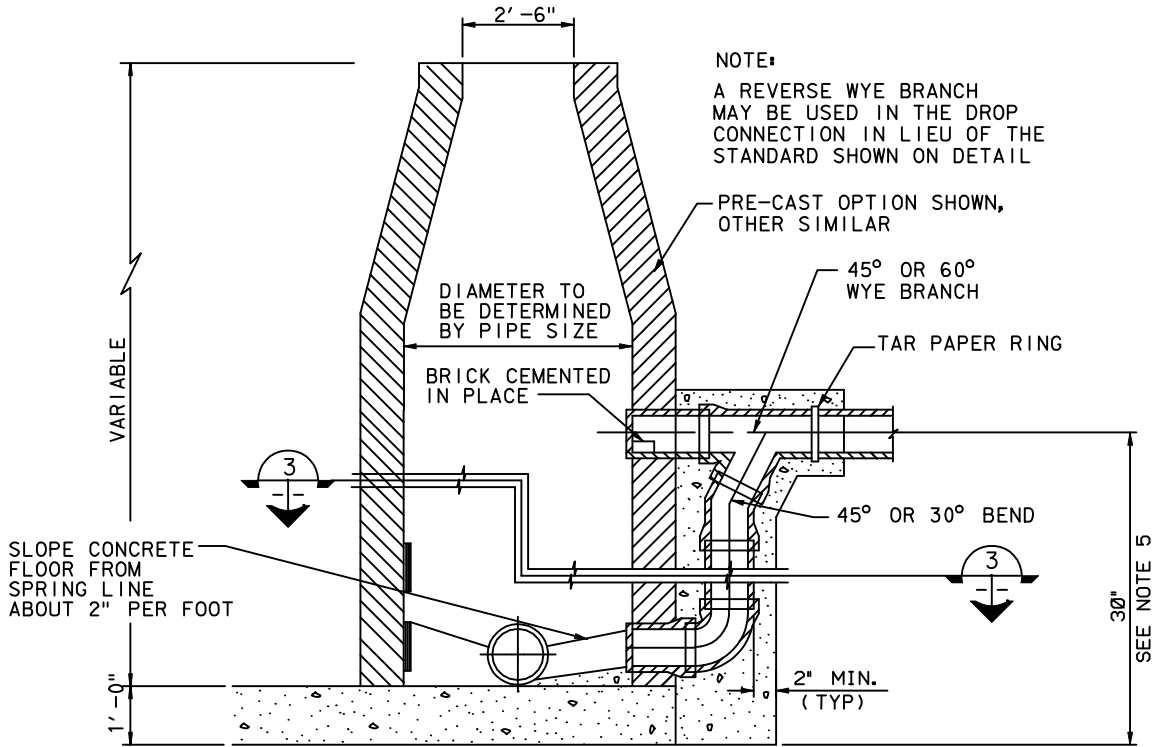
STANDARD DETAIL

NOTE:

1. FOR MANHOLE FRAME AND COVER SEE STANDARD MANHOLE DETAIL.
2. SHOWN IS ECCENTRIC CONE SECTION, CONCENTRIC CONE SECTION ALSO ACCEPTABLE.
3. MANHOLE TO CONFORM TO STD PRECAST MANHOLE DETAIL
4. A REVERSE WYE BRANCH MAY BE USED IN THE DROP CONNECTION IN LIEU OF THE STANDARD SHOWN ON DETAIL.
5. CONSTRUCT STD HYDRAULIC SLIDE IF INFLUENT PIPE IS LESS THAN 30" FROM BOTTOM OF MANHOLE.



SECTION
NOT TO SCALE



DROP TYPE SEWER CONNECTION

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

REF FILE NAME:
DROPMH. DGN

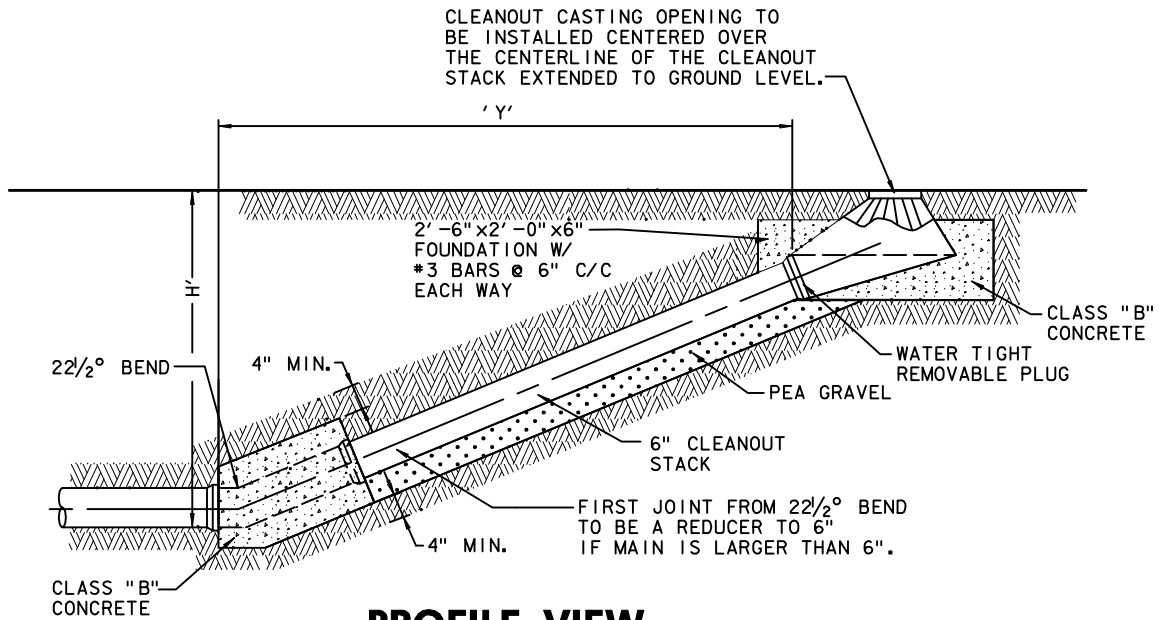
BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER

**DROP
MANHOLE**

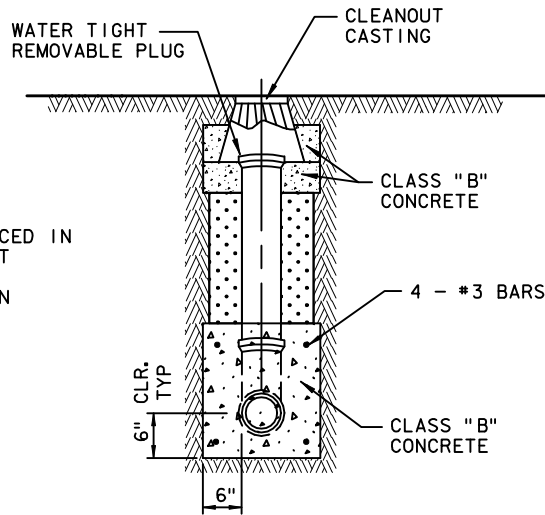
STANDARD DETAIL



PROFILE VIEW

H'	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	H'
Y'	10	12	14	17	19	22	24	27	29	31	34	36	39	41	43	46	48	Y'

NOTE:
IF CLEANOUT IS PLACED IN ADVANCE OF PAVEMENT PLACE SAND AROUND CLEANOUT CASTING IN LIEU OF CLASS "B" CONCRETE.



SECTION

SEWER CLEANOUT

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

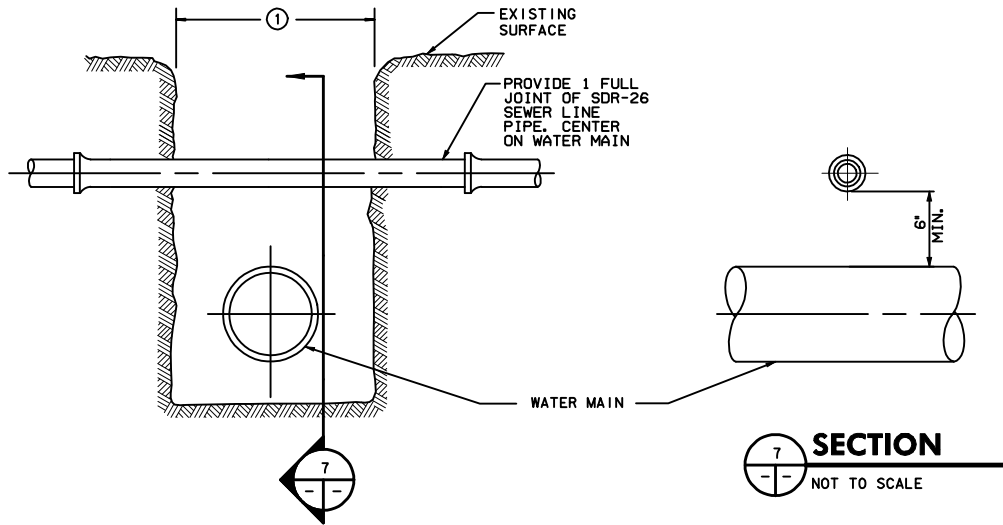
REF FILE NAME:
CLEANOUT. DGN

BENBROOK WATER & SEWER AUTHORITY

WATER SEWER

SEWER
CLEANOUT

STANDARD DETAIL



① VARIABLE TRENCH WIDTH. CLASS "B" 2500# REINFORCED CONCRETE SUPPORT BEAM AND ENCASEMENT LENGTH SHALL BE MEASURED AS THE STANDARD TRENCH WIDTH, PLUS FOUR FEET (4'). A MINIMUM BEARING OF 24" ON UNDISTURBED EARTH SHALL BE REQUIRED ON EACH SIDE OF THE TRENCH.

SANITARY SEWER PIPE TRENCH CROSSING DETAIL

NOT TO SCALE

REVISED 12-29-04

APPROVED _____

REF FILE NAME:

SSPTC. DGN

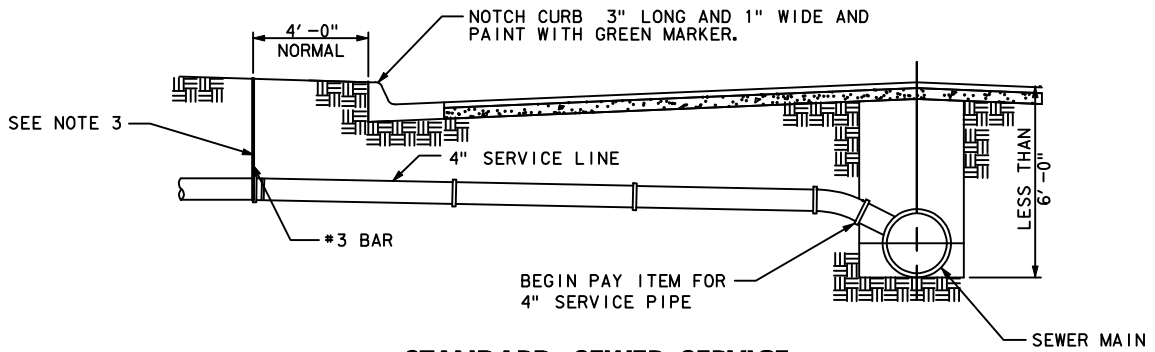
BENBROOK WATER & SEWER AUTHORITY

BWSA

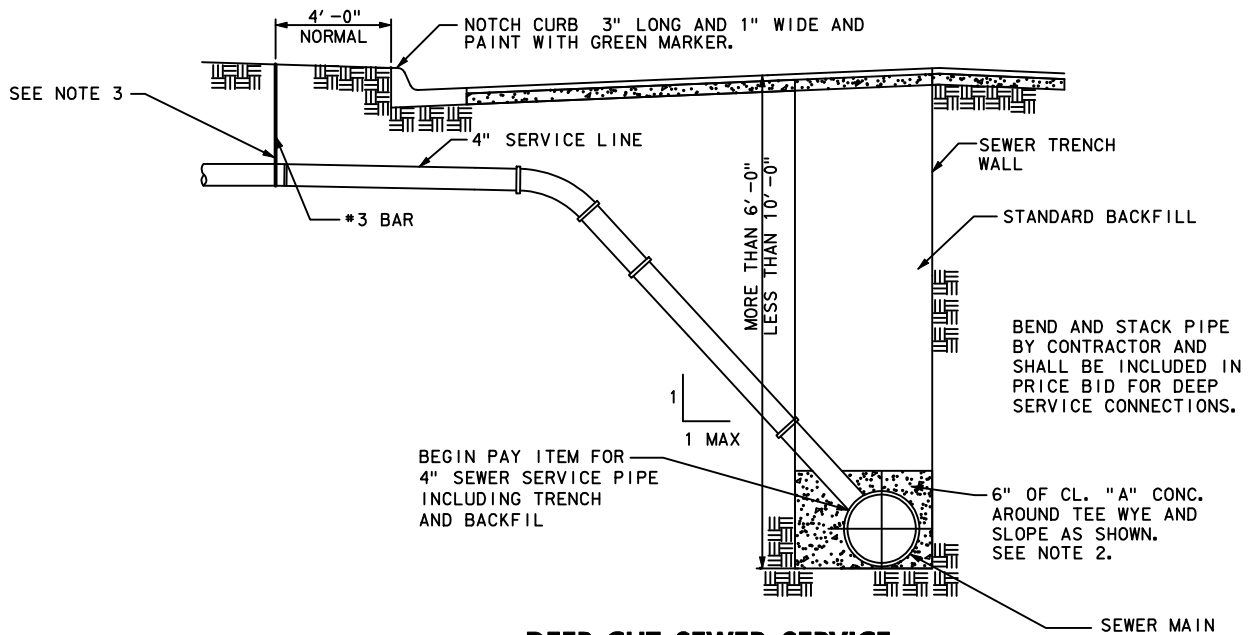
WATER SEWER

**SEWER CROSSING
AT WATER MAIN**

STANDARD DETAIL



STANDARD SEWER SERVICE STREET SECTION



DEEP-CUT SEWER SERVICE

NOTES:

1. TOP OF SERVICE SHALL BE SUFFICIENT DEPTH TO PROVIDE ADEQUATE FALL FROM THE FACILITY TO BE SERVED.
2. CLASS "A" CONCRETE SHALL HAVE 5 SACKS OF CEMENT, MAXIMUM SLUMP OF 5 INCHES, AND 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
3. CUSTOMER SERVICE FROM THIS POINT BY PROPERTY OWNER. WHERE SERVICE LINE IS NOT INSTALLED, PLUG SEWER WITH PLASTIC OR V.C. STOPPER AND DRIVE A #3 BAR A MIN. OF 6" BELOW FINISHED GRADE TO FLOW LINE OF PIPE. IN ADDITION, TIE GREEN MARKING TAPE TO THE END OF THE SERVICE PIPE AND EXTEND IT TO THE SURFACE.
4. EITHER WYE OR SADDLE MAY BE USED FOR CONNECTION, AND PRICE SHALL BE INCLUDED IN THE PRICE BID FOR "STANDARD" OR "DEEP CUT SERVICE CONNECTION". NO DEDUCTION FROM THE LENGTH OF THE SEWER MAIN WILL BE MADE FOR THE LENGTH OF THE SEWER WYE IF INSTALLED. CONNECTIONS DOWN TO 7'-0" ARE "STANDARD" SERVICE CONNECTIONS. DEEP CUT SERVICE CONNECTIONS APPLY WHEN TRENCH IS DEEPER THAN 7'-0". MINIMUM COVER OVER SEWER SERVICE PIPE IS 24" BELOW SUBGRADE OR AS REQUIRED TO SERVICE CUSTOMER.

SEWER SERVICE CONNECTION

NOT TO SCALE

REVISED 12-28-04

APPROVED _____

REF FILE NAME:

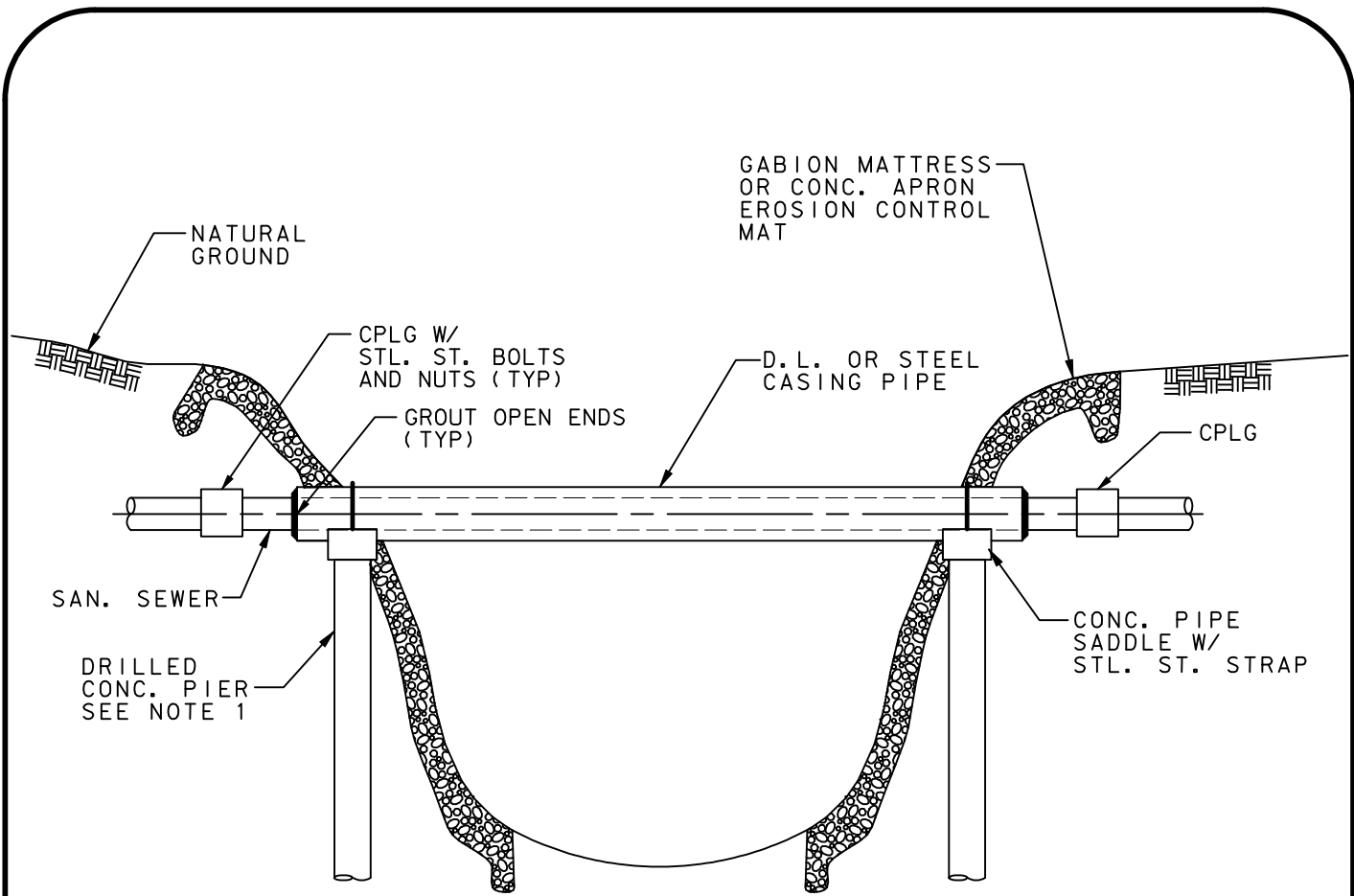
SERVCONN. DGN

BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER

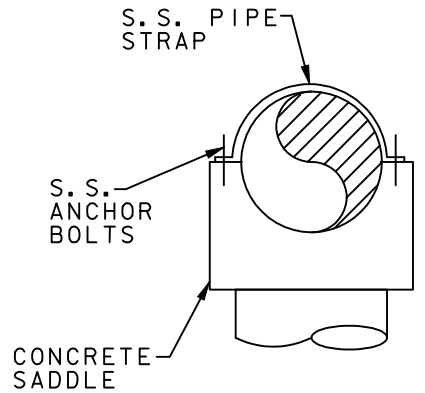
**SERVICE CONNECTION
STANDARD DETAIL**



NOTES :

1. DRILLED PIER DIAMETER, DEPTH AND REQUIRED REINFORCING SHALL BE DESIGNED BY AN ENGINEER REGISTERED AND LICENSED IN THE STATE OF TEXAS.
2. STEEL CASING PIPE SHALL BE DESIGNED TO SPAN FULL WIDTH OF CHANNEL OR CREEK.

ELEVATION



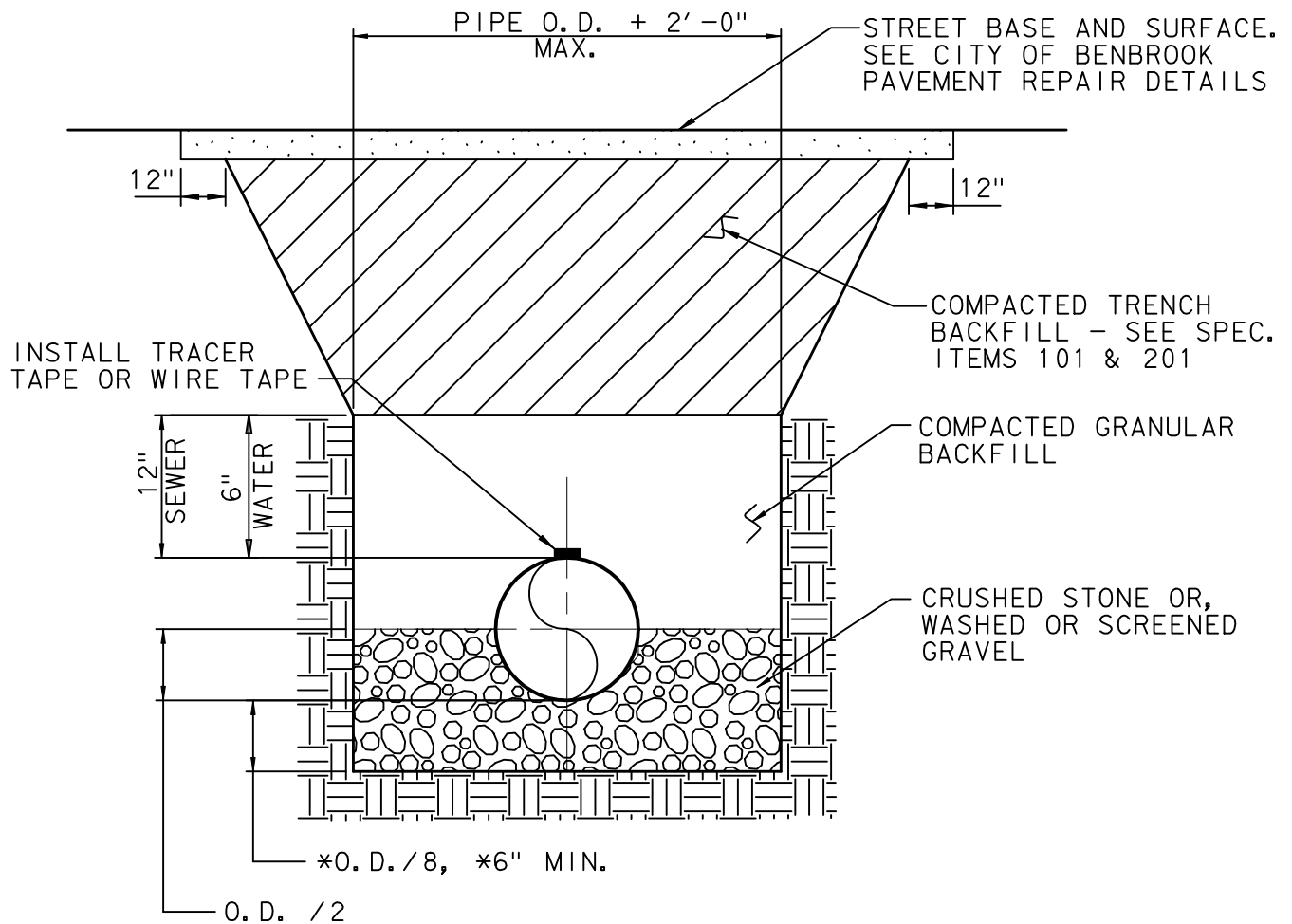
SECTION @ PIPE

SANITARY SEWER CREEK CROSSING DETAIL

NOT TO SCALE

REVISED <u>12-28-04</u> APPROVED _____ REF FILE NAME: <u>AERIALX1.DGN</u>	BENBROOK WATER & SEWER AUTHORITY	<input type="checkbox"/> WATER <input checked="" type="checkbox"/> SEWER SANITARY SEWER CREEK CROSSING STANDARD DETAIL
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WATER & SEWER DETAILS



TYPICAL BACKFILL AND EMBEDMENT

NOT TO SCALE

THE COST OF GRANULAR EMBEDMENT AND CRUSHED LIMESTONE SHALL BE INCLUDED IN THE COST OF THE PIPE.

REVISED 12-27-04

APPROVED _____

REF FILE NAME:

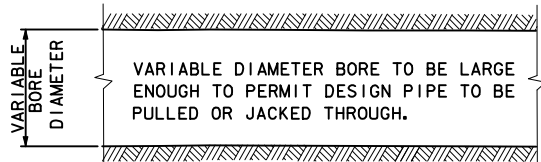
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BENBROOK WATER & SEWER AUTHORITY

BWSA

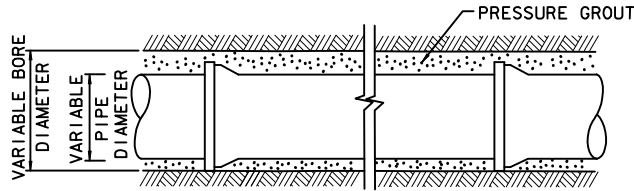
WATER SEWER

**TYPICAL
BACKFILL &
EMBEDMENT
STANDARD DETAIL**



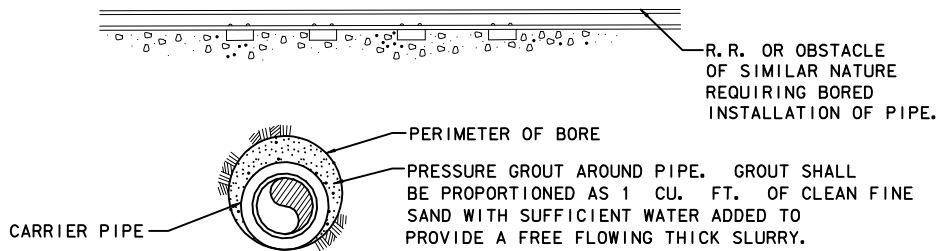
TYPICAL BORED SECTION

LONGITUDINAL VIEW



TYPICAL BORE WITH PIPE INSTALLED

LONGITUDINAL VIEW



TYPICAL END VIEW

NOTE:

1. COMPRESSION TYPE JOINTS TO BE USED IF POSSIBLE.
2. IF COMPRESSION TYPE JOINT IS NOT AVAILABLE, MJ TYPE SHALL BE USED AND JOINTS BOLTED BEFORE PULLING PIPE INTO PLACE.

BORED CROSSING DETAILS

NOT TO SCALE

MINIMUM CASING PIPE			
CARRIER PIPE SIZE	REINFORCED CONCRETE PIPE	WELDED STEEL PIPE	CORRUGATED METAL PIPE
4"	12" CLASS V	12" - .188 THK.	15" - 14 GA.
6"	15" CLASS V	16" - .219 THK.	15" - 14 GA.
8"	16" CLASS V	16" - .219 THK.	18" - 12 GA.
10"	18" CLASS V	18" - .250 THK.	21" - 12 GA.
12"	21" CLASS V	22" - .312 THK.	24" - 12 GA.
14"	24" CLASS V	24" - .344 THK.	30" - 12 GA.
16"	27" CLASS V	28" - .406 THK.	30" - 12 GA.
18"	30" CLASS V	30" - .406 THK.	30" - 12 GA.
20"	33" CLASS V	34" - .469 THK.	36" - 10 GA.
24"	36" CLASS V	12" - .469 THK.	36" - 10 GA.

RAILROAD CROSSING

MINIMUM CASING PIPE			
CARRIER PIPE SIZE	REINFORCED CONCRETE PIPE	WELDED STEEL PIPE	CORRUGATED METAL PIPE
4"	12" CLASS III	12" - 1/4" THK.	12" - 14 GA. MIN
6"	15" CLASS III	15" - 1/4" THK.	15" - 14 GA. MIN
8"	15" CLASS III	15" - 1/4" THK.	15" - 14 GA. MIN
10"	18" CLASS III	18" - 1/4" THK.	18" - 14 GA. MIN
12"	21" CLASS III	21" - 1/4" THK.	21" - 14 GA. MIN
14"	24" CLASS III	24" - 1/4" THK.	24" - 14 GA. MIN
16"	27" CLASS III	27" - 5/16" THK.	27" - 14 GA. MIN
18"	30" CLASS III	30" - 5/16" THK.	30" - 14 GA. MIN
20"	33" CLASS III	33" - 5/16" THK.	33" - 14 GA. MIN
24"	36" CLASS III	36" - 5/16" THK.	36" - 14 GA. MIN

HIGHWAY CROSSING

REVISED 12-22-04

APPROVED _____

REF FILE NAME:

BORECROS. DGN

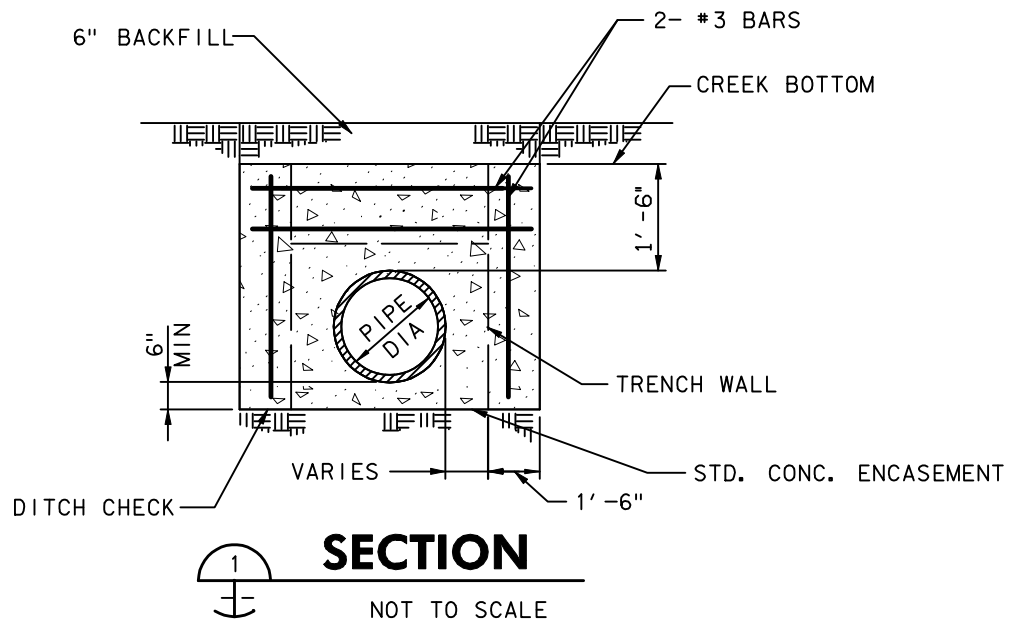
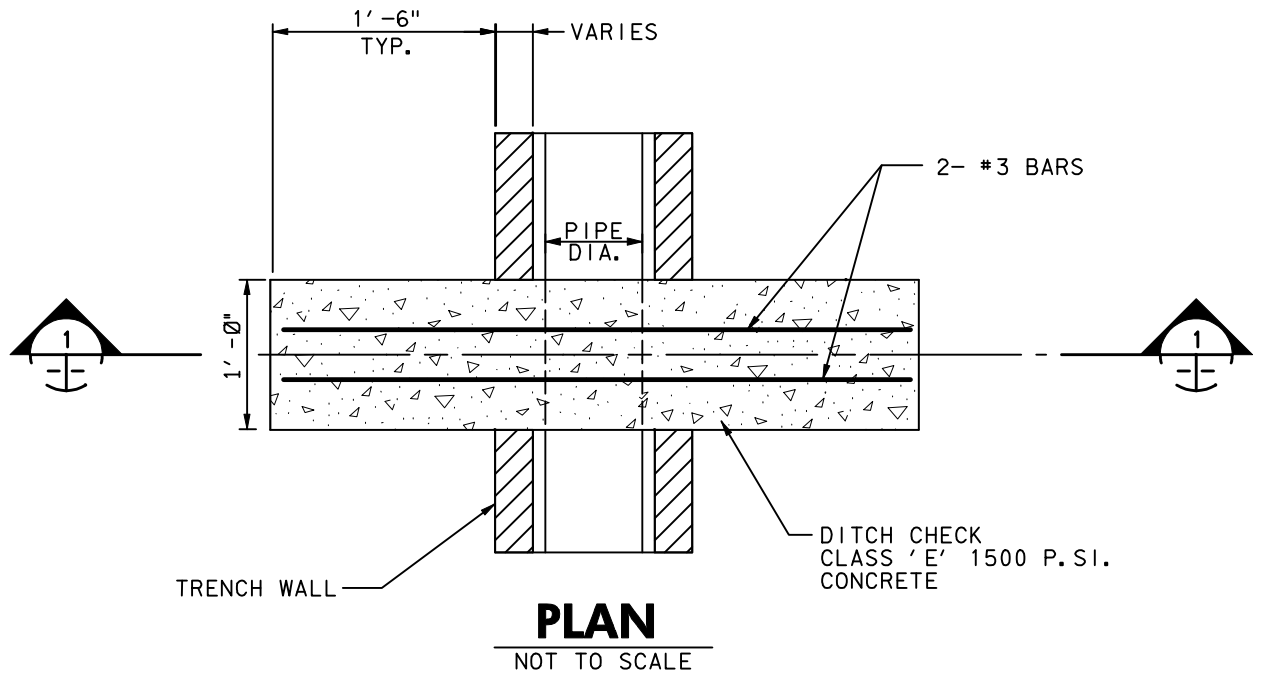
BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER

BORED CROSSING

STANDARD DETAIL



NOTE:

DITCH CHECKS SHALL BE LOCATED AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER CHECKS SHALL BE INSTALLED 25' C/C.

CONTRACTOR MAY USE A CLAY BASED CHECK DAM IN LIEU OF CONCRETE AS DIRECTED BY BWSA

REVISED 12-28-04

APPROVED _____

REF FILE NAME: CONDITCH. DGN

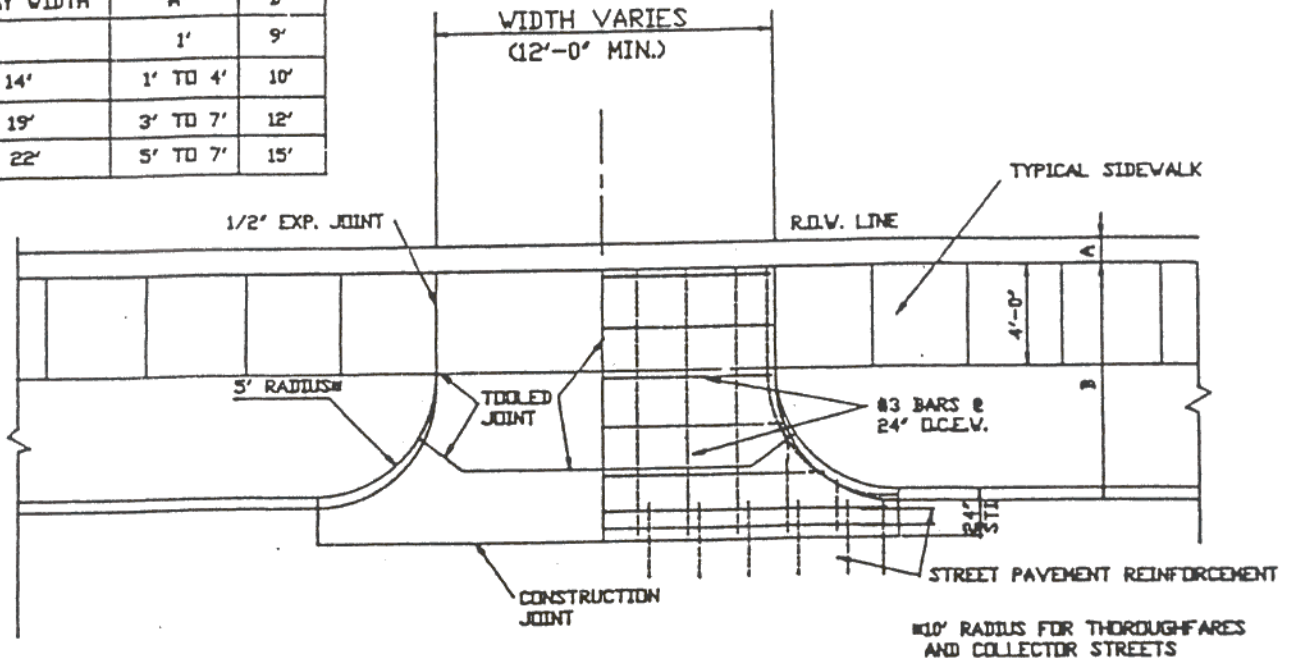
BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER
**CONCRETE
 CREEK CROSSING
 DITCH CHECK
 STANDARD DETAIL**

MISCELLANEOUS DETAILS

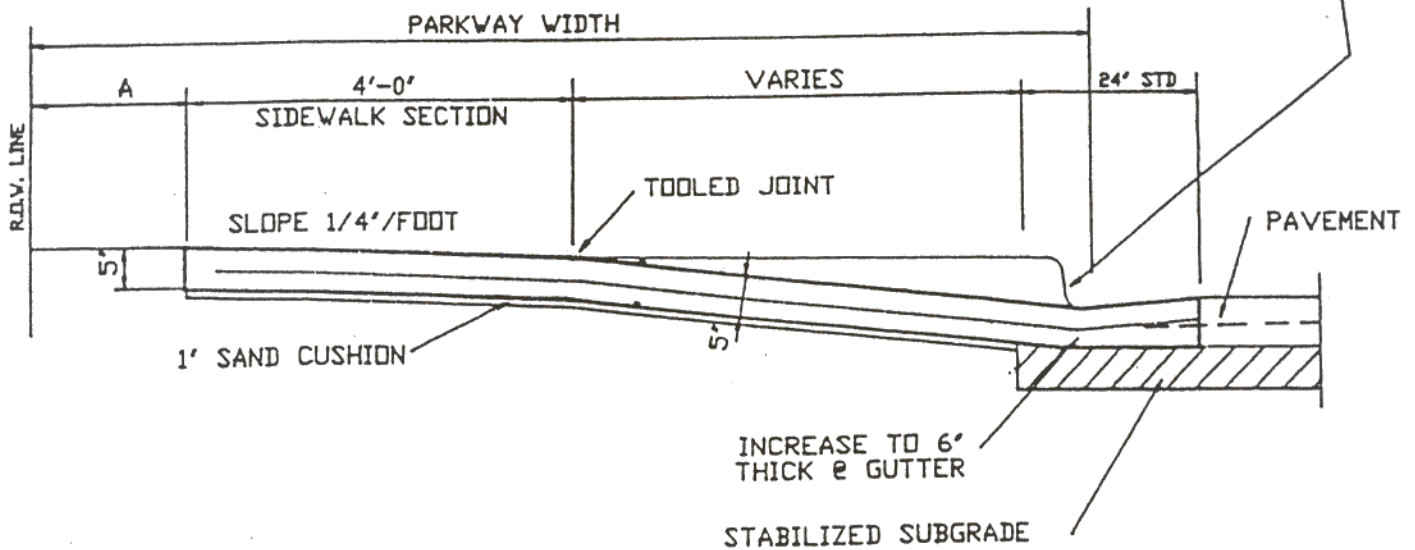
PARKWAY WIDTH	"A"	"B"
10'	1'	9'
11' TO 14'	1' TO 4'	10'
15' TO 19'	3' TO 7'	12'
20' TO 22'	5' TO 7'	15'



PLAN-DRIVE APPROACH

1/8" = 1'-0"

3/4" RISE AT EDGE OF GUTTER WHEN DIRECTED BY THE OWNERS PROJECT REPRESENTATIVE



DRIVEWAY SECTION

1/2" = 1'-0"

DETAILS: DRIVE APPROACH
PLAN/SECTION



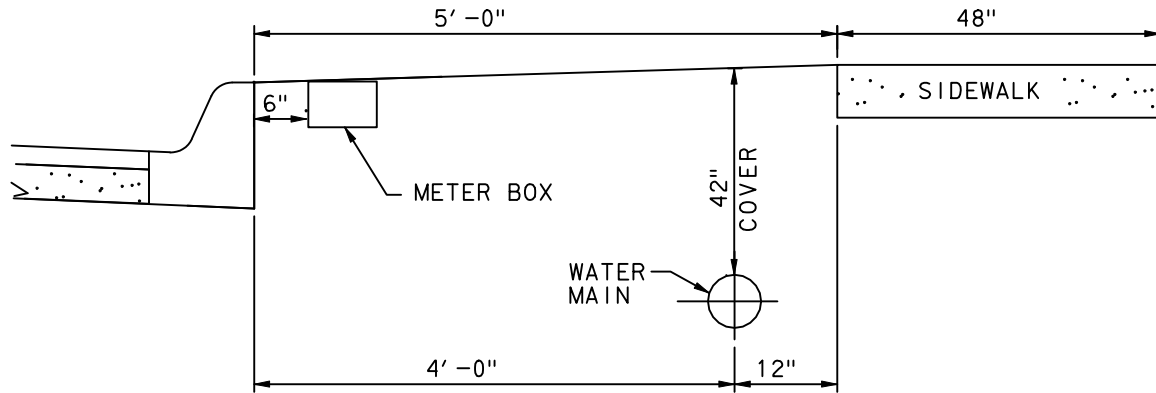
city of benbrook

Rady & Associates, Inc.
Engineers Architects Planners

DESIGN BY: FLN
DRAWN BY: RAS
CHECKED BY: FLN

REVISIONS

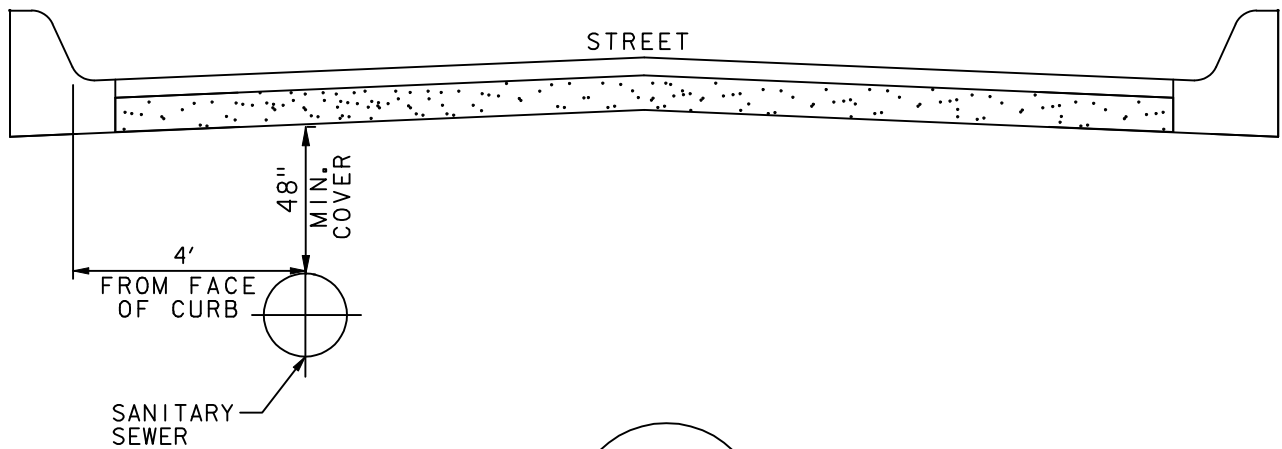
DATE: 12-30-88
JOB NO: 77018
CAD FILE: CSI-1
SCALE: AS NOTED



NOTE:

GAS & ELECTRIC TYPICALLY 12FT BEHIND CURB ON OPPOSITE SIDE OF STREET FROM WATER.

WATER



NOTE:

SANITARY SEWER MUST BE ON OPPOSITE SIDE OF STREET FROM WATER.

SEWER

STANDARD UTILITY LOCATION

NOT TO SCALE

REVISED 2-14-05

APPROVED _____

REF FILE NAME:
STDUTLOC.DGN

BENBROOK WATER & SEWER AUTHORITY

BWSA

WATER SEWER

STANDARD UTILITY LOCATIONS

STANDARD DETAIL