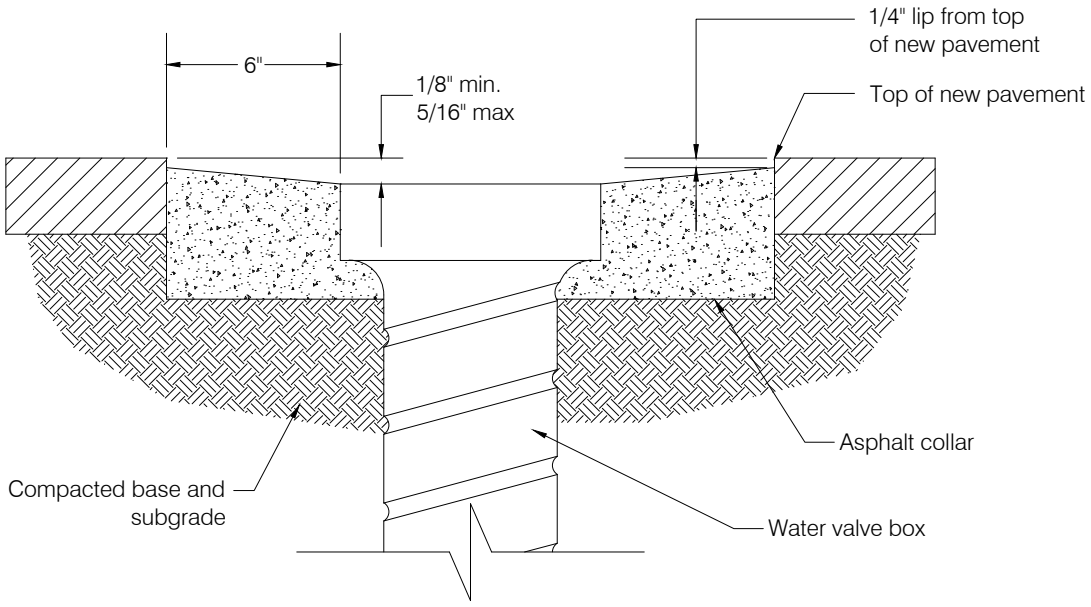
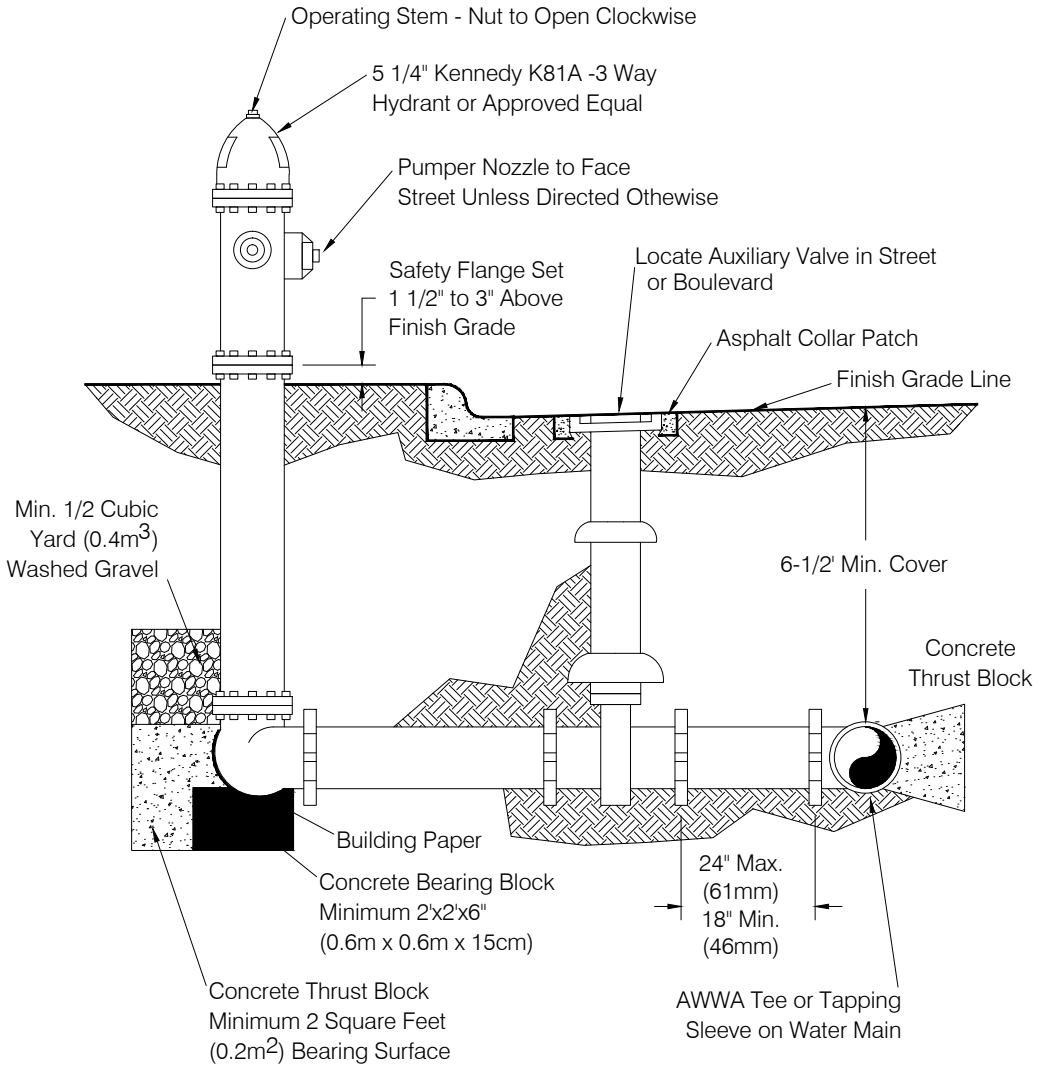


Notes:
1. Adjust water valve boxes upward or downward as required.
2. Final adjustment shall be made after paving.
3. Valve cover shall not be located in curb or gutter.

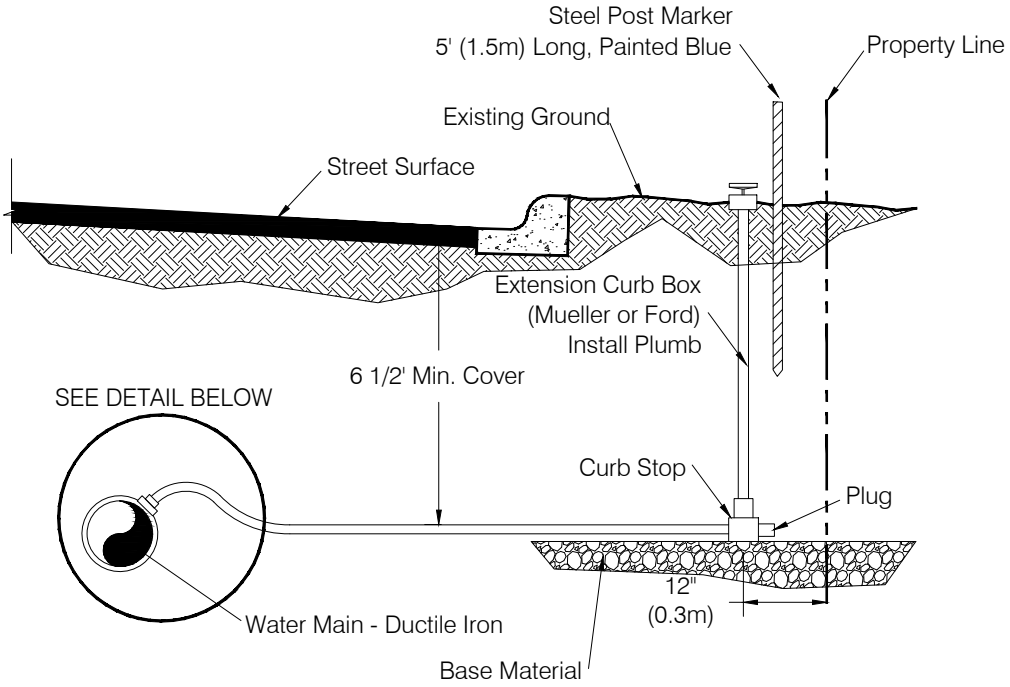
CITY OF HELENA ENGINEERING STANDARDS		**Water Valve Cover Adjustment**	***STANDARD DRAWING:*** **2-1**
REVISED: 2/12/13	***SCALE:*** NONE		

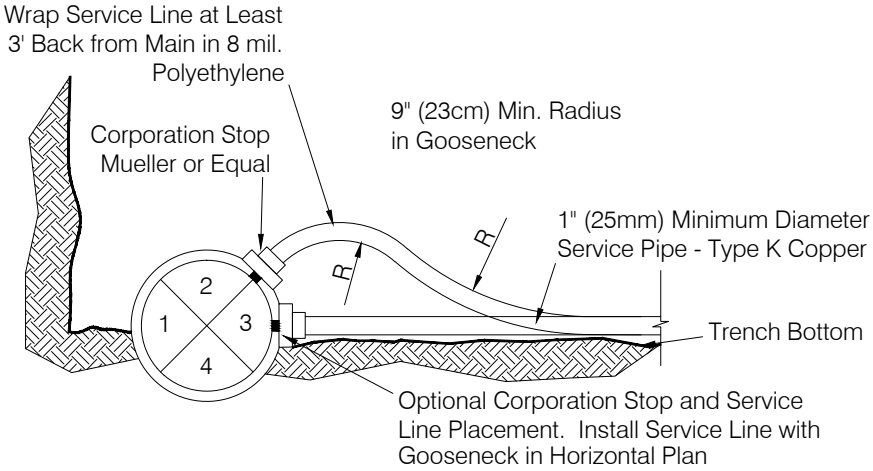


Notes:

1. Thrust blocking to be in conformance with MPW standard drawing 02660-1.
2. For bolted fittings, blocking shall not obstruct bolts.
3. Hydrant weep holes to remain unobstructed.
4. Thrust block shall bear horizontally against undisturbed soil.

CITY OF HELENA ENGINEERING STANDARDS		**Fire Hydrant Setting**	***STANDARD DRAWING:*** **2-2**
REVISED: 2/12/13	***SCALE:*** NONE		





DETAIL OF A PROPERLY INSTALLED CORPORATION STOP. SHOWING GOOSENECK IN SERVICE PIPE

Notes:

1. Minimum cover for service lines shall be measured from existing ground line when ground is level or falling away from street, and measured from top of street curb when ground is rising from street.
2. Water service lines shall be installed where shown on the drawings or as specified.
3. Bedding shall be 1 inch (25mm) diameter maximum within 6" (15cm) of service pipe.

CITY OF HELENA ENGINEERING STANDARDS		**Water Service Line**	***STANDARD DRAWING:*** **2-3**
REVISED: 2/12/13	***SCALE:*** NONE		

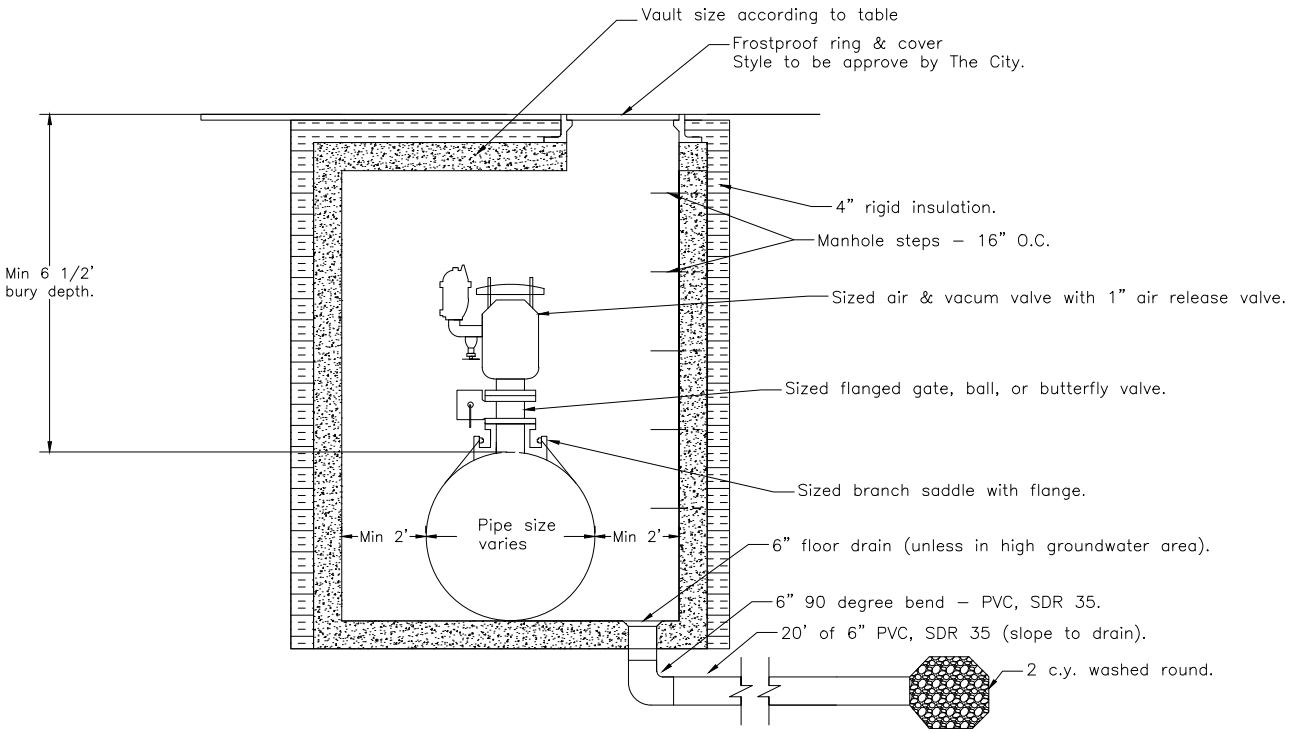


TABLE OF VAULT SIZE		
PIPE SIZE	INSIDE ID	ACCESS OPENING
8", 12", & 16"	VAULT=72"	24"
16" TO 24"	VAULT=84"	30"
30" TO 36"	VAULT=96"	36"

Notes:

1. Minimum inside working height of 6 1/2 feet.
2. Minimum 2' of work space on either side of pipe.
3. Minimum access of 24", offset over pipe.
4. Minimum bury depth to top of pipe = 6 1/2 feet + pipe diameter + floor.

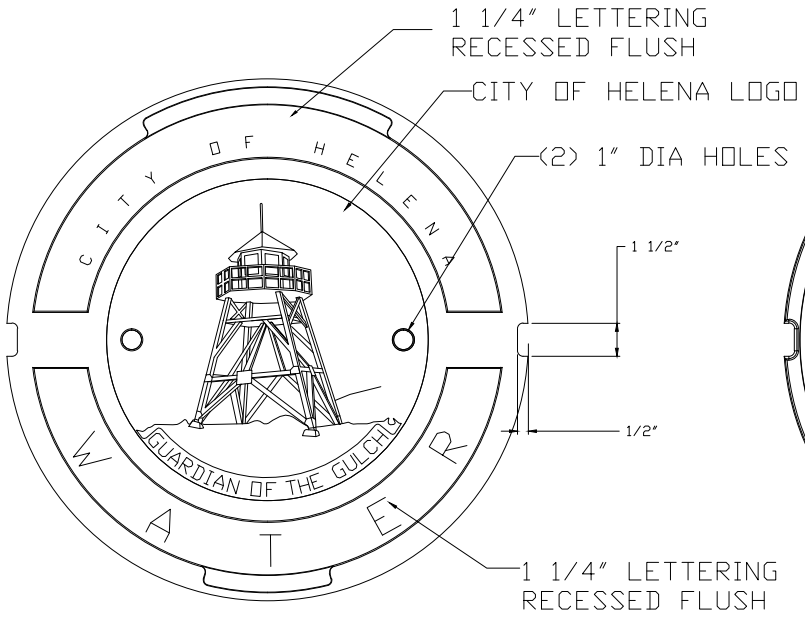
CITY OF HELENA
ENGINEERING STANDARDS

Combination Air and Vacuum Valve and Manhole Vault

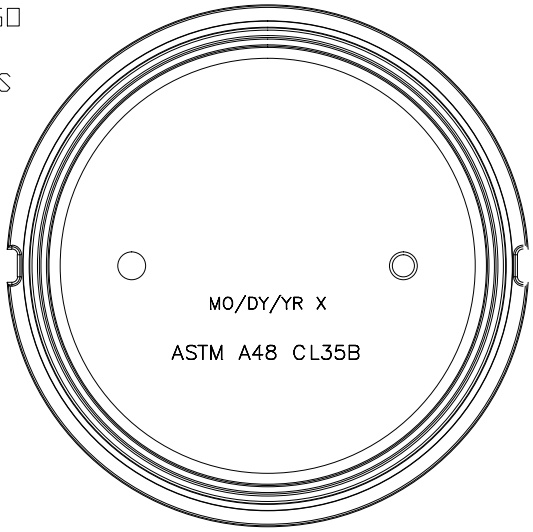
STANDARD DRAWING:

2-4

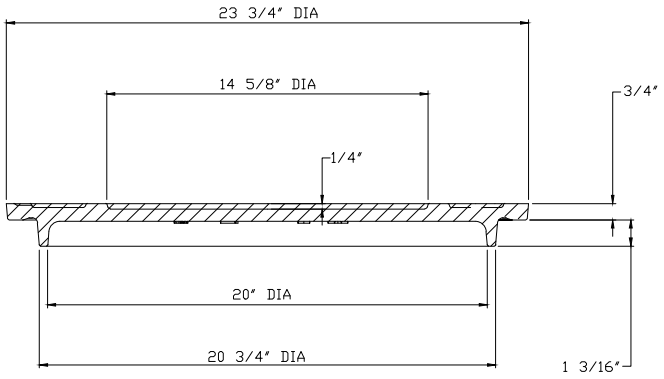
REVISED:	***SCALE:***
2/12/13	NONE



PLAN VIEW

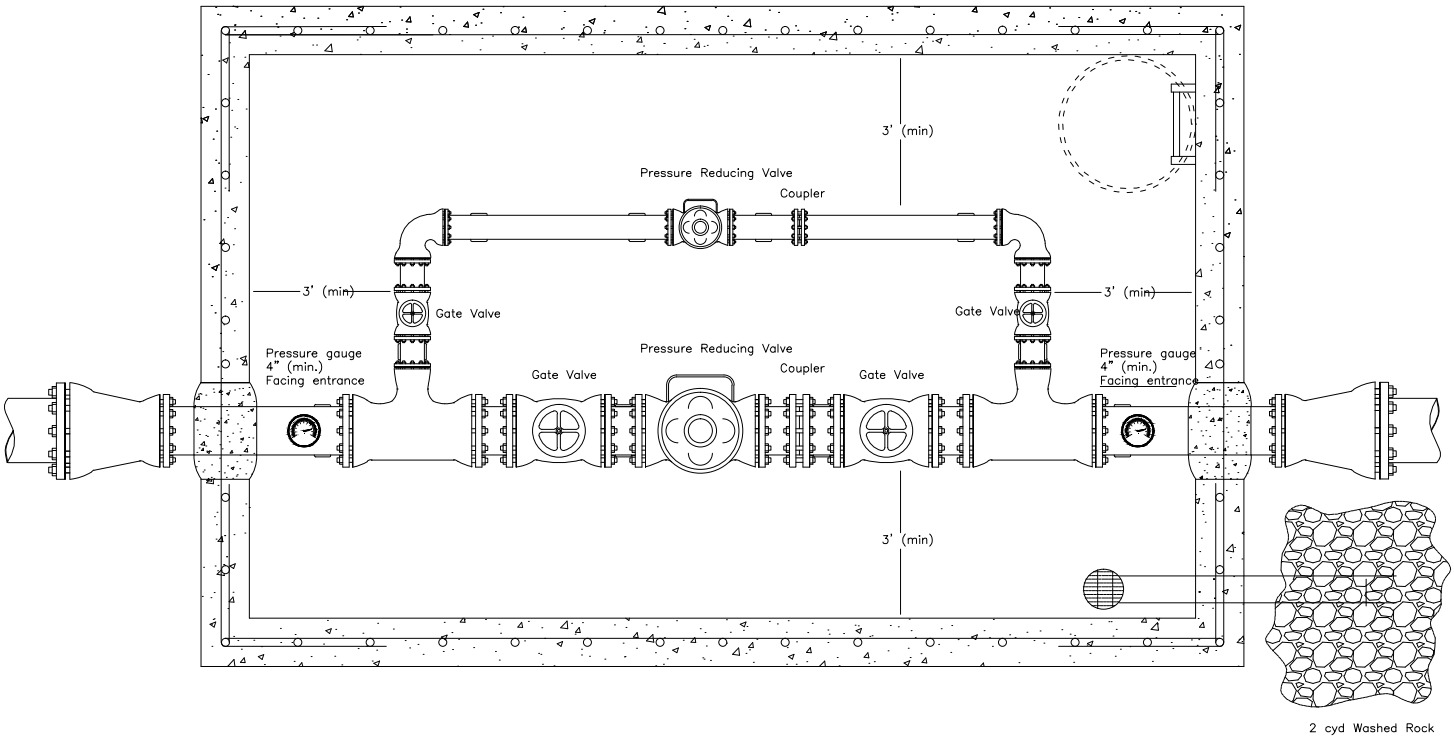


BOTTOM VIEW



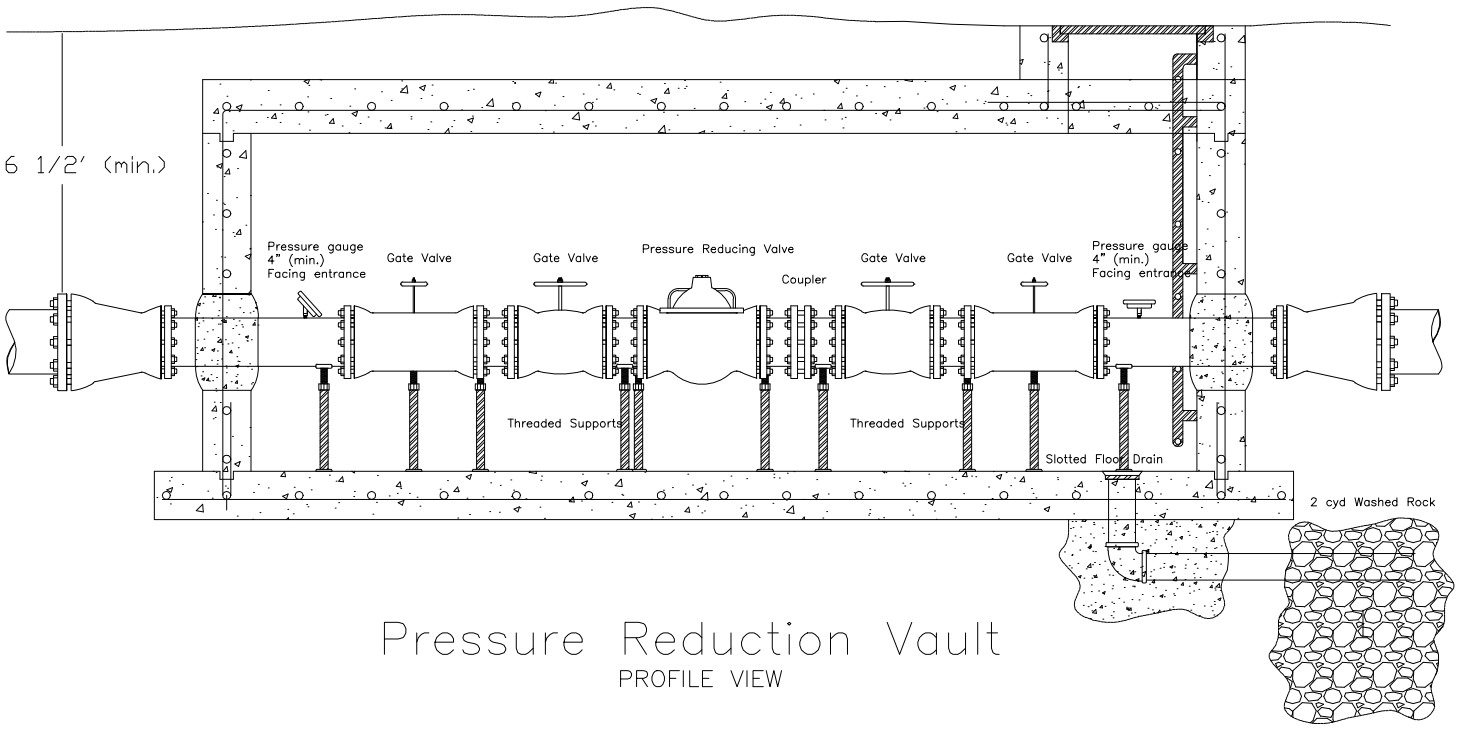
SECTION

CITY OF HELENA ENGINEERING STANDARDS		**Approved City Logo Manhole Lid "Water" Lettering**	***STANDARD DRAWING:*** **2-5**
REVISED: 2/12/13	***SCALE:*** NONE		



Pressure Reduction Vault

PLAN VIEW

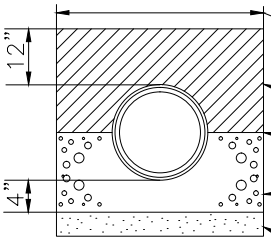


Pressure Reduction Vault

PROFILE VIEW

CITY OF HELENA ENGINEERING STANDARDS	**Pressure Reducing Vault**	***STANDARD DRAWING:*** **2-6**
REVISED: 2/12/13	***SCALE:*** NONE	

RIGID PIPE BEDDING



30" MAXIMUM FOR PIPE UP TO AND INCLUDING 12"
FOR PIPE LARGER THAN 12", O.D. OF PIPE PLUS 16".

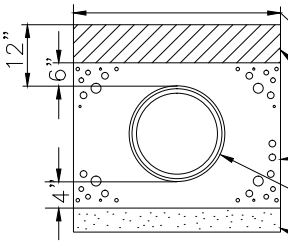
HAND COMPACTED BACKFILL

SPRING LINE

COMPACTED BEDDING GRAVEL
"GRAVEL BACKFILL FOR PIPE ZONE BEDDING", OF THE STANDARD SPECIFICATIONS, OR CONCRETE IF SPECIFIED.

FOUNDATION GRAVEL, IF REQUIRED (SEE NOTE 2.)

FLEXIBLE PIPE BEDDING



SEE ABOVE FOR TRENCH WIDTH

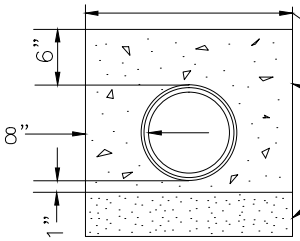
HAND COMPACT BACKFILL

COMPACTED BEDDING GRAVEL
"BEDDING MATERIAL FOR THERMOPLASTIC PIPE" OF STANDARD SPECIFICATIONS, OR CONCRETE IF SPECIFIED.

PVC PIPE

FOUNDATION GRAVEL, IF REQUIRED (SEE NOTE 2.)

CONCRETE ENCASEMENT

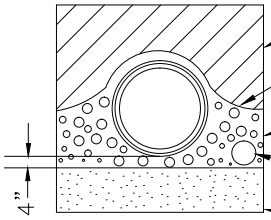


SEE ABOVE FOR TRENCH WIDTH

CONCRETE, 2000 PSI (SEE NOTE 3.)

FOUNDATION GRAVEL, IF REQUIRED (SEE NOTE 2.)

DETENTION PIPES WITH UNDERDRAINS (SEE NOTE 4.)



RIGID OR FLEXIBLE PIPE BEDDING (PER ABOVE).

FILTER FABRIC ABOVE 1 1/2" OR 7/8" WASHED ROCK. PROVIDE 12" MIN. OVERLAP AT SEAMS.

GRAVEL BACKFILL FOR DRAINS PER SECTION 9-03. 12(4) OF THE STANDARD SPECIFICATIONS FROM BOTTOM OF UNDERDRAIN PIPE TO SPRINGLINE OF DETENTION PIPE.

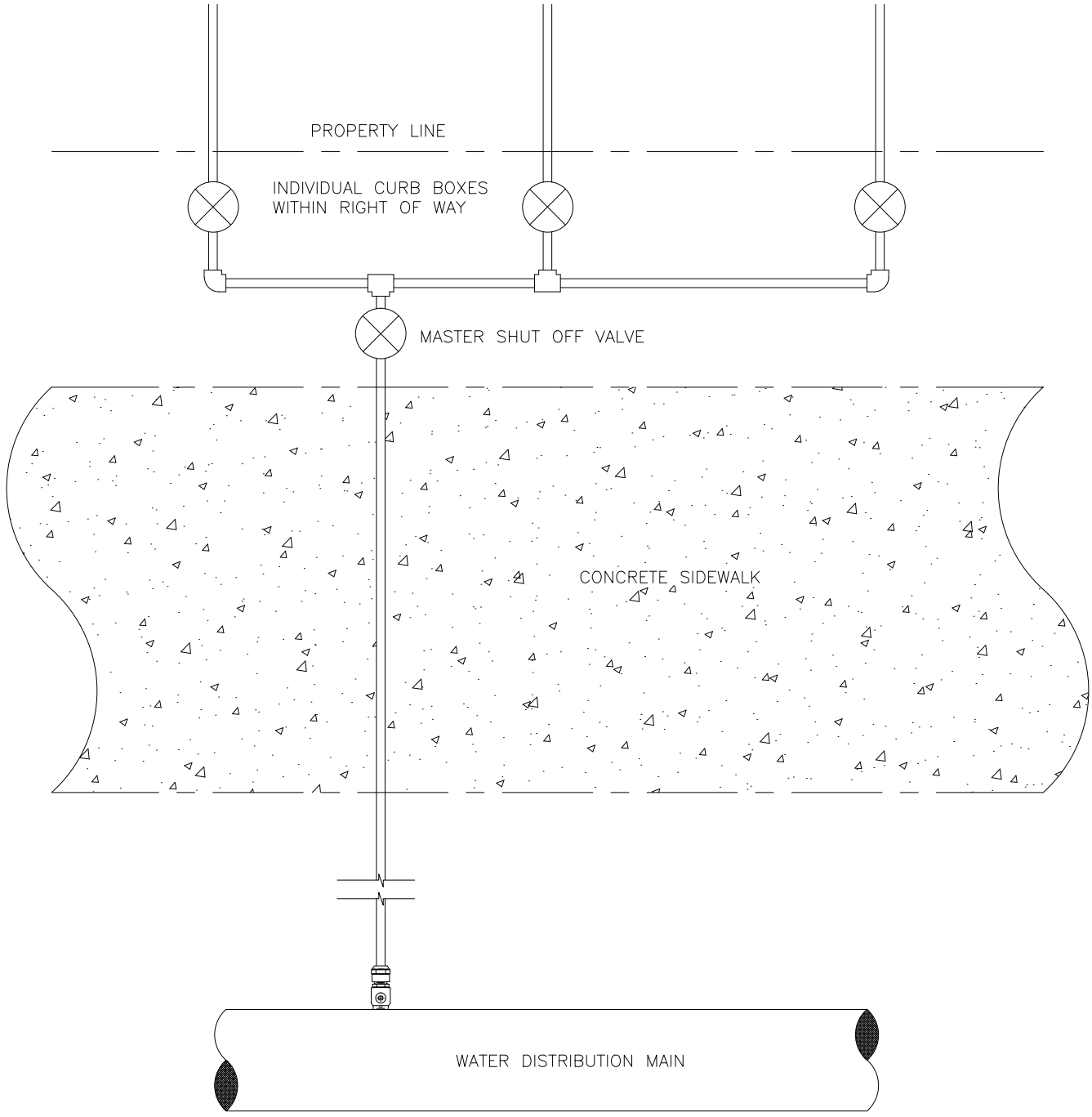
UNDERDRAIN PIPE (TYP.) 6" MIN. PERF. PER STANDARDS (SEE NOTE 5.).

FOUNDATION GRAVEL, IF REQUIRED (SEE NOTE 2.)

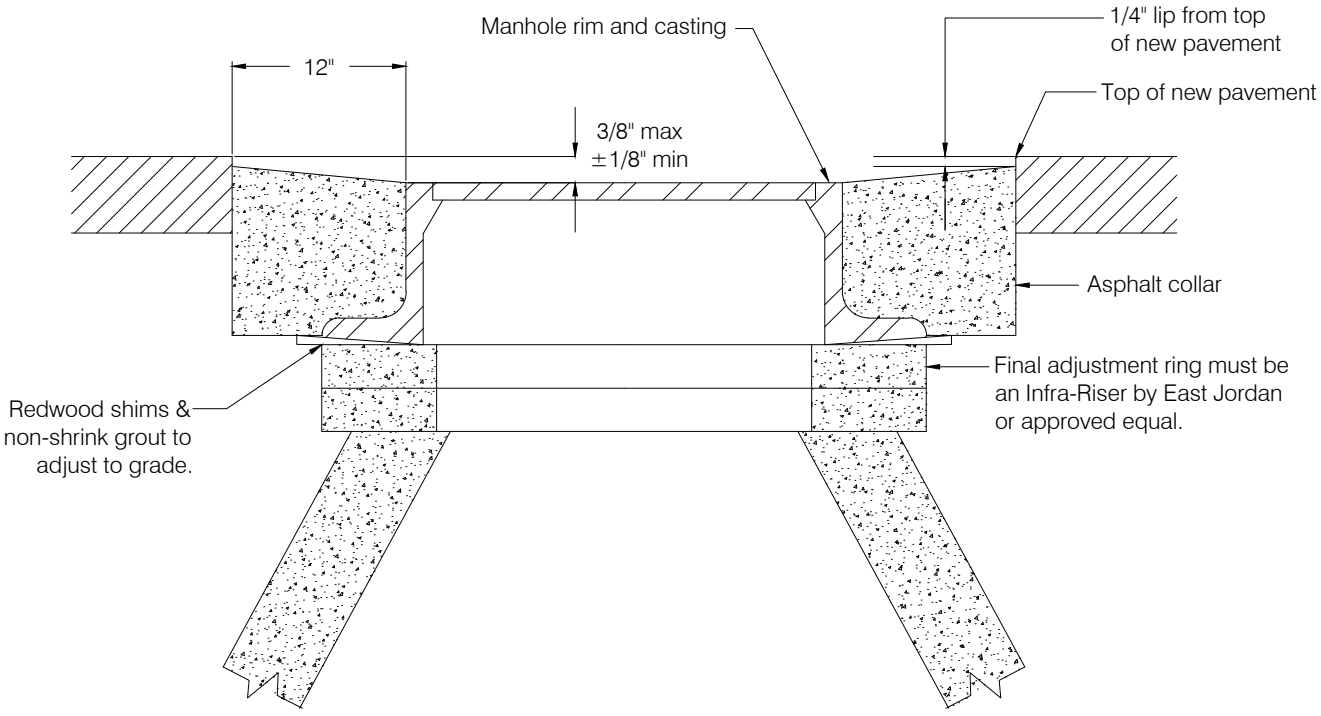
NOTES:

1. COMPACTED CRUSHED SURFACING TOP COURSE, CRUSHED SURFACING, CAN ALSO BE USED AS BEDDING GRAVEL.
2. EXCAVATE UNSTABLE MATERIAL DOWN TO FIRM SOIL AND REPLACE WITH FOUNDATION GRAVEL BALLAST.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANCHORING PIPE TO PREVENT FLOTATION DURING CONCRETE PLACEMENT.
4. WHEN THE DESIGN OF TANKS OR PIPES DOES NOT TAKE INTO ACCOUNT BOUYANCY, UNDERDRAINS SHALL BE PROVIDED.
5. PROVIDE CLEANOUTS ON UNDERDRAIN PIPE, EVERY 100 FEET, AND AT BENDS OR JUNCTIONS.

CITY OF HELENA ENGINEERING STANDARDS		# Pipe Bedding	STANDARD DRAWING: 2-7
REVISED: 2/12/13	**SCALE:** NONE		



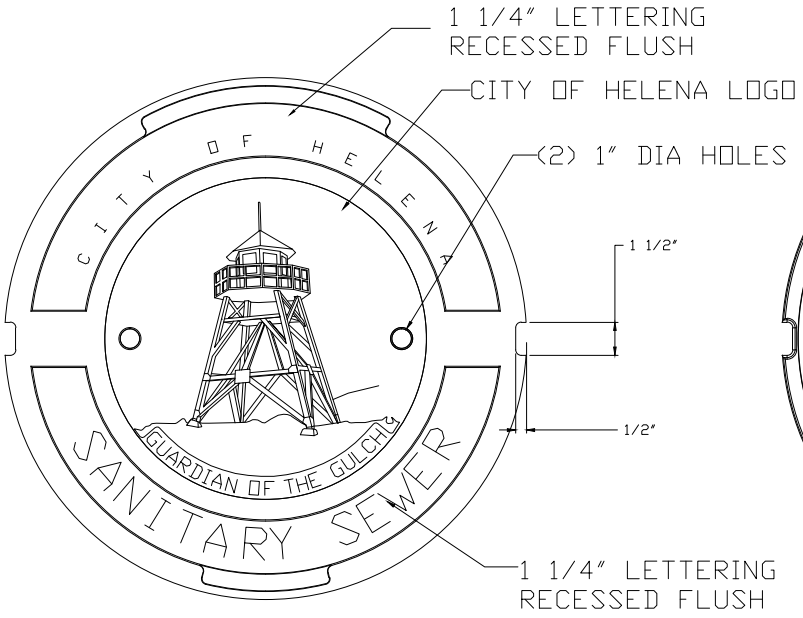
CITY OF HELENA ENGINEERING STANDARDS		**Water Service Condominium Manifold For Street Less Than 10 Years Old**	***STANDARD DRAWING:*** **2-8**
REVISED: 2/12/13	***SCALE:*** NONE		



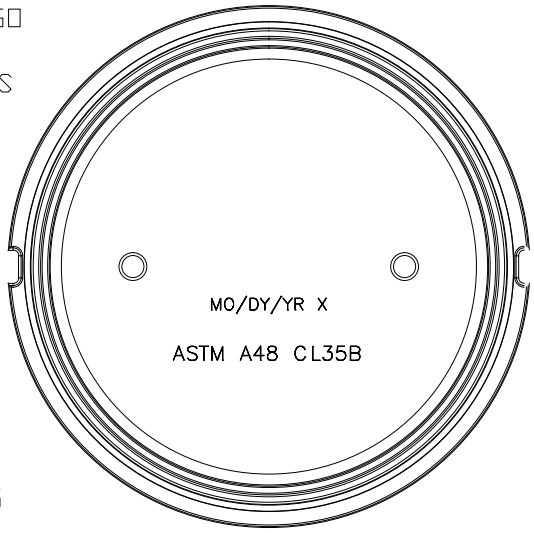
Notes:

1. Adjust manholes upward with adjusting rings under frame.
2. Adjust manhole downward by removing cone and barrel sections as necessary and replacing with sections of length required to match grade.
3. Slope manhole frame as required to match slope of street.
4. Final manhole adjustment shall be made after paving.

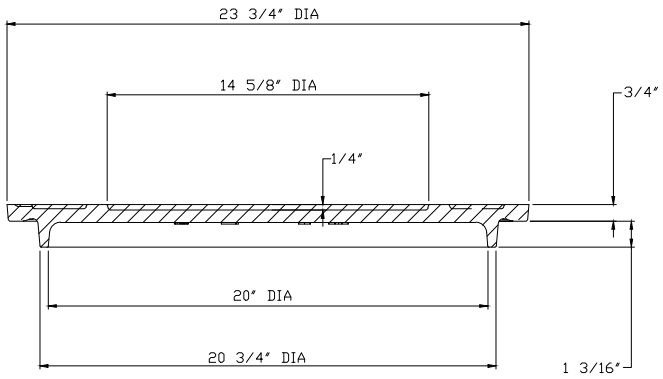
CITY OF HELENA ENGINEERING STANDARDS		**Manhole Casting Adjustment**	***STANDARD DRAWING:*** **3-1**
REVISED: 2/12/13	***SCALE:*** NONE		



PLAN VIEW

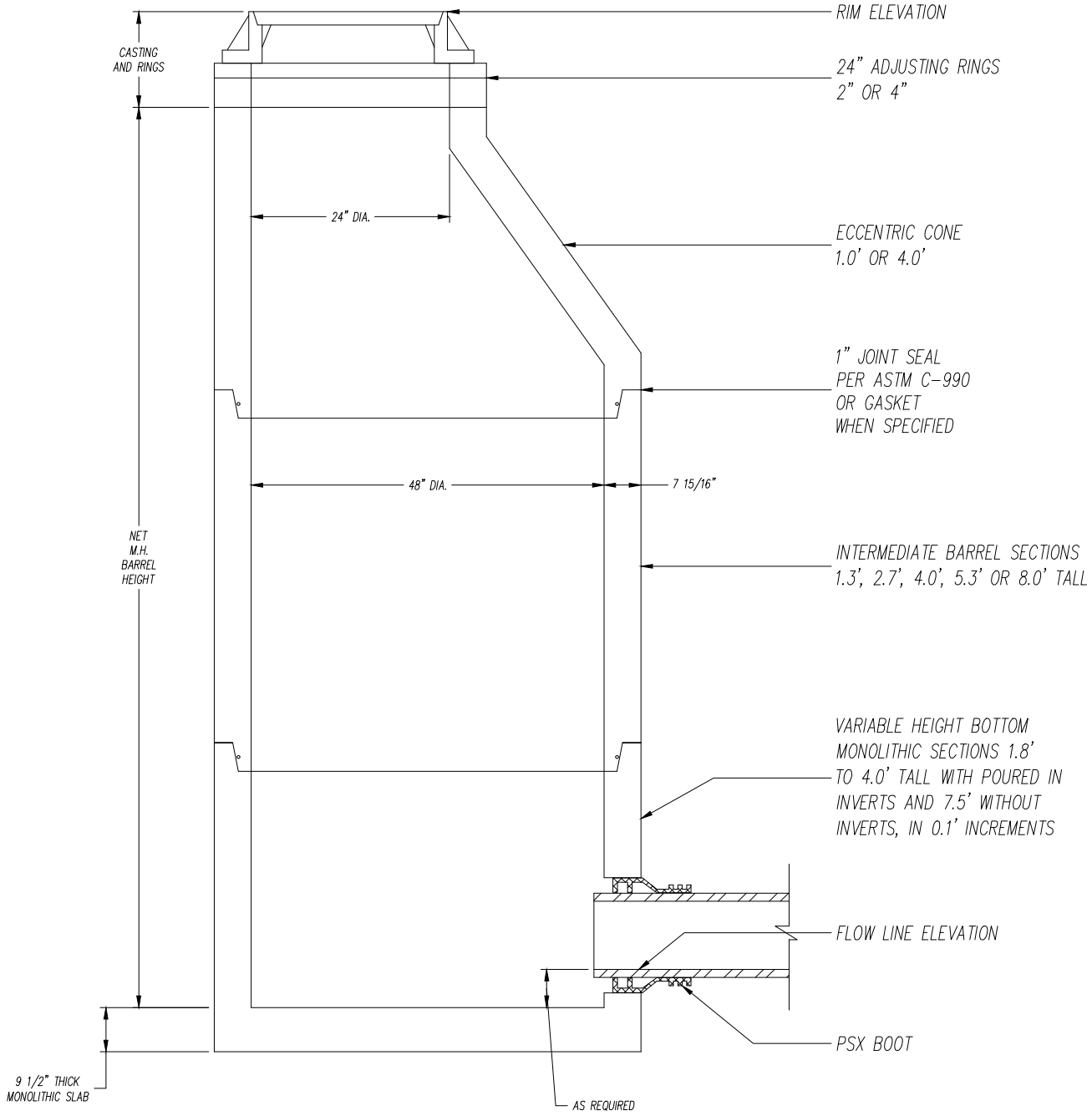


BOTTOM VIEW



SECTION

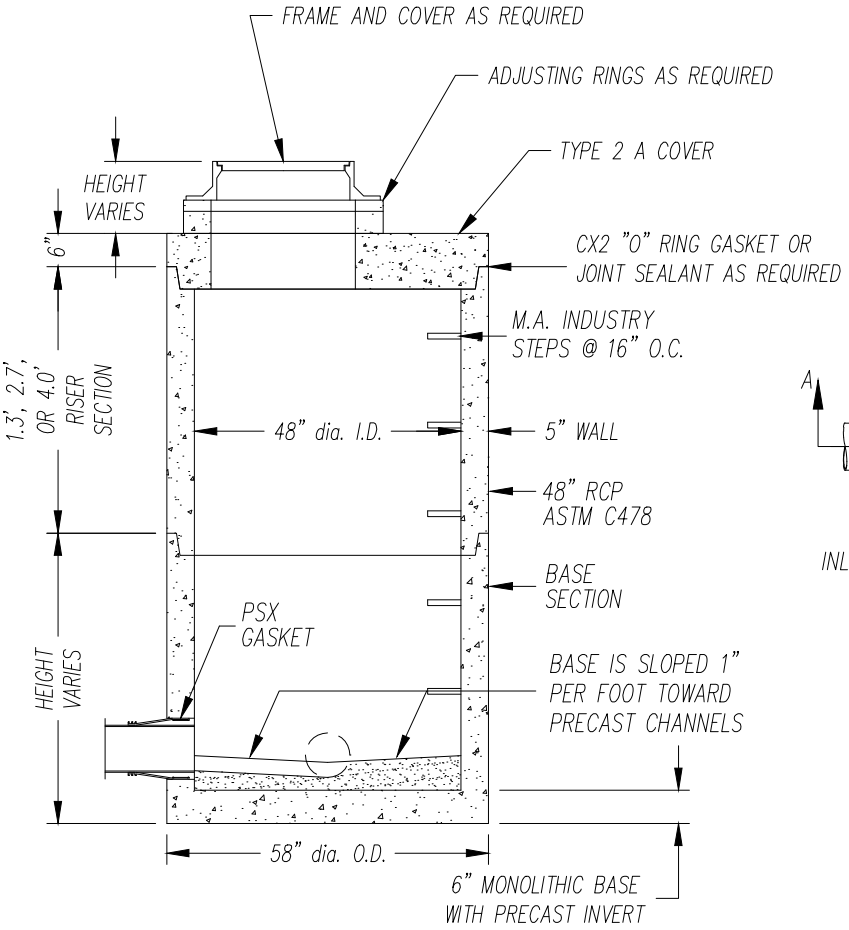
CITY OF HELENA ENGINEERING STANDARDS		**Approved City Logo Manhole Lid "Sanitary Sewer" Lettering**	***STANDARD DRAWING:*** **3-2**
REVISED: 2/12/13	***SCALE:*** NONE		



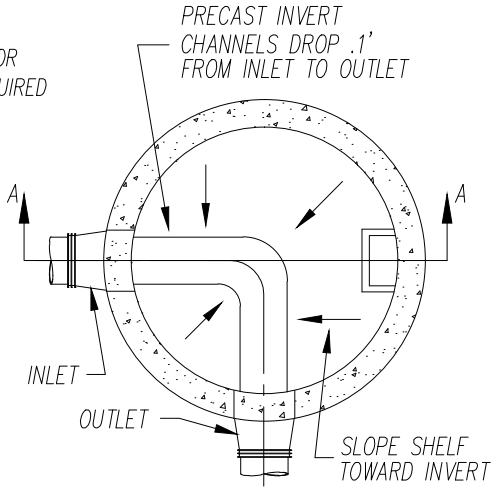
SECTION

1. All components are manufactured per ASTM C478.
2. Steps provided and located as required.
3. Poured-in inverts available as required.

CITY OF HELENA ENGINEERING STANDARDS		Standard 48" Diameter Sanitary Manhole with Monolithic Base	STANDARD DRAWING: 3-3
REVISED: 2/12/13	SCALE: NONE		



SECTION VIEW

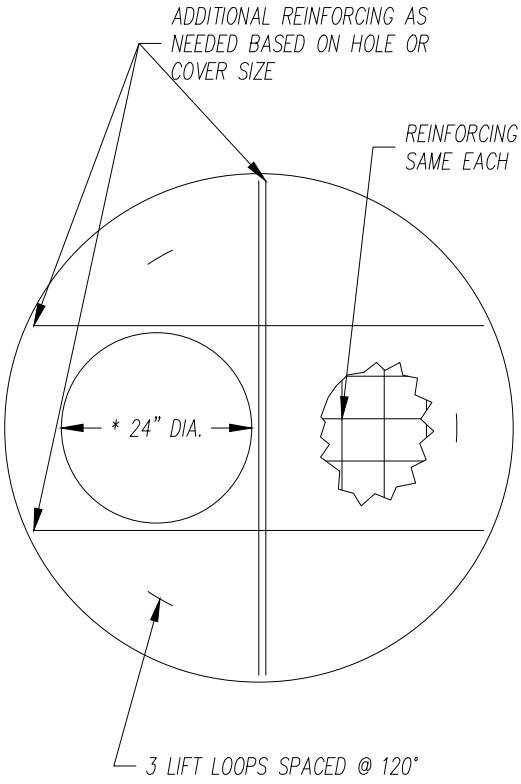


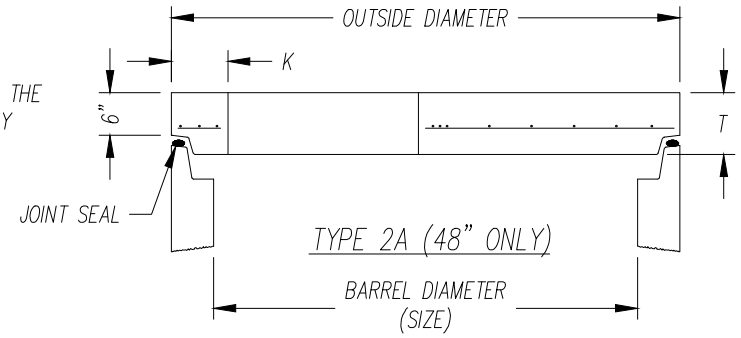
PLAN VIEW

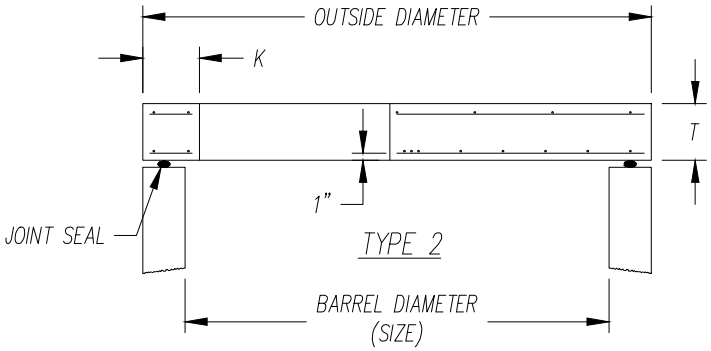
NOTE:
SANITARY SEWER MANHOLE WITH PRECAST PAN INVERT SYSTEM IS ONLY AVAILABLE WITH 8" CHANNELS AND FOR USE WITH 48" MANHOLES.

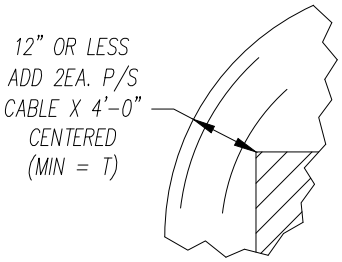
ALL COMPONENTS ARE MANUFACTURED PER ASTM C 478 & C 443. STRUCTURE CAN BE FURNISHED WITH OR WITHOUT STANDARD PLASTIC COATED STEEL STEPS THAT MEET ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		# 48" Diameter Straight Manhole with Cover	STANDARD DRAWING: 3-4
REVISED: 2/12/13	**SCALE:** NONE		









DETAIL FOR COVERS WITH RECTANGULAR OPENINGS

0.60 PS CABLE MAY BE SUBSTITUTED FOR #4 REBAR @ SAME SPACING

TYPE 2A (48" ONLY)

SIZE	DIMENSIONS OD x T	WEIGHT	K	BOTTOM BARS	TOP BARS
in	in	lbs	in	in	in
48	58 X 8	1,450	6	#4 @ 6	– –

TYPE 2

SIZE	DIMENSIONS OD x T	WEIGHT	K	BOTTOM BARS	TOP BARS
in	in	lbs	in	in	in
36	44 X 6	520	6	#4 @ 6	– –
42	51 X 6	800	6	#4 @ 6	– –
48	58 X 6	1,110	6	#4 @ 6	– –
60	72 X 8	2,470	7	#4 @ 6	#4 @ 11
72	86 X 8	3,680	8	#4 @ 6	#4 @ 11
84	100 X 8	5,100	9	#4 @ 4	#4 @ 7
90	107 X 8	6,250	9	#4 @ 4	#4 @ 7
96	114 X 8	6,730	9	#4 @ 4	#4 @ 7
120	142 X 12	16,500	12	#4 @ 4	#4 @ 7

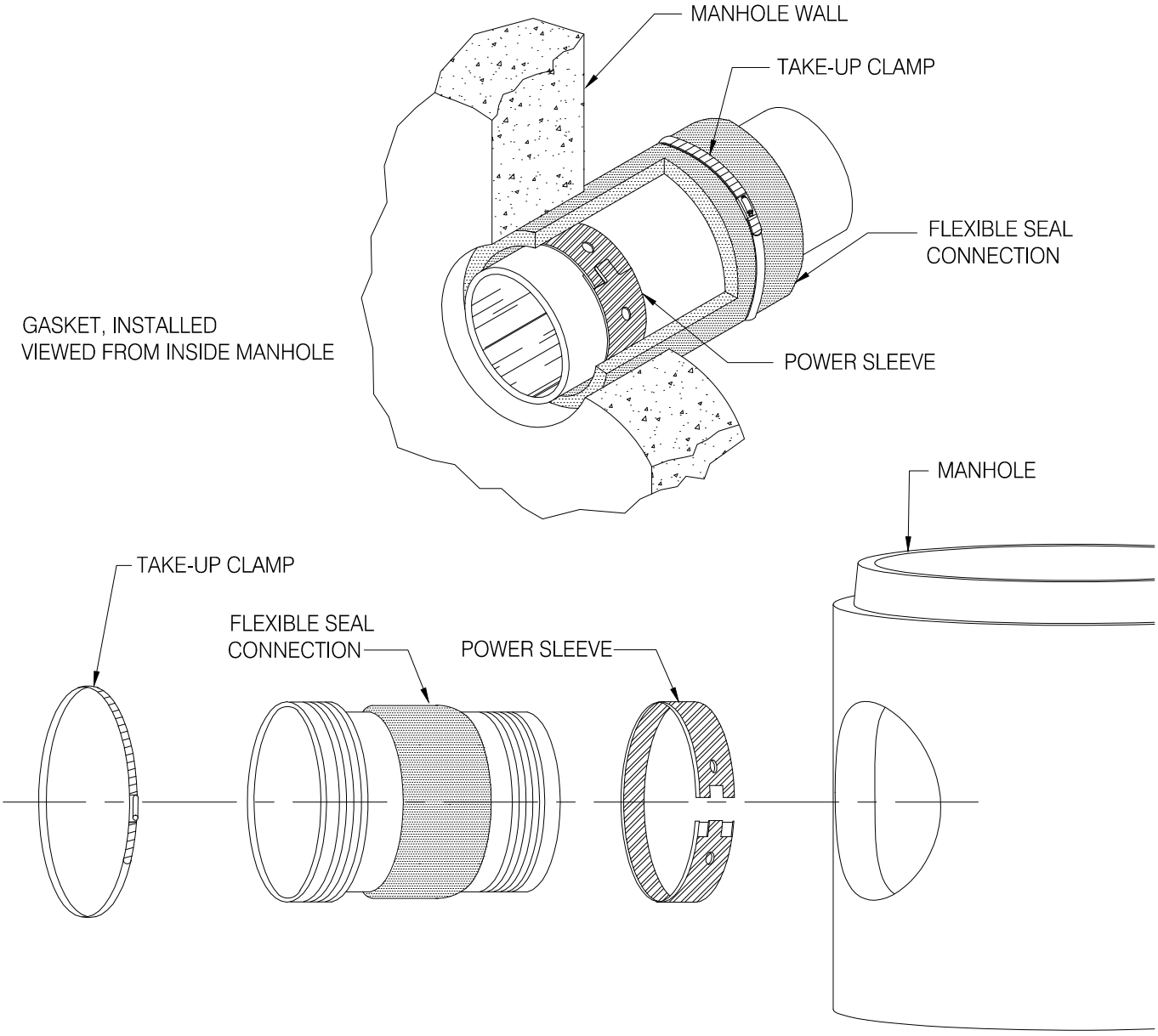
1. Slabs are manufactured per ASTM C478.
* 2. Various sizes of round or rectangular openings are available. Cover designed for HS20 Load regardless of opening size.
3. Various sizes of round or rectangular castings can be embedded.
4. Special sizes are available upon request.

CITY OF HELENA ENGINEERING STANDARDS

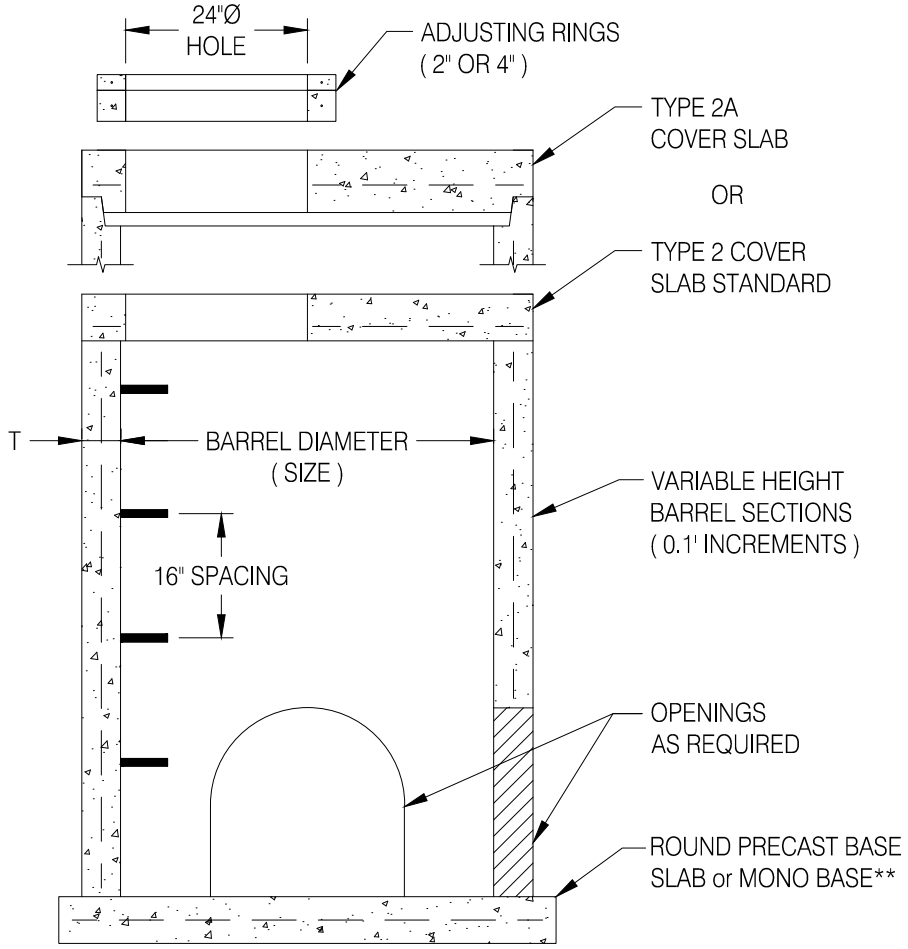
Standard Type 2 & Type 2A Cover Slabs

STANDARD DRAWING: **3-5**

REVISED:	**SCALE:**
2/12/13	NONE



CITY OF HELENA ENGINEERING STANDARDS		**Watertight Pipe To Manhole Connection**	***STANDARD DRAWING:*** **3-6**
REVISED: 2/12/13	***SCALE:*** NONE		



SIZE (IN)	WEIGHT (LBS. / VF)	T (IN.)	BASE (IN.)
36	540	4	50 x 6
42	700	4.5	58 x 6
* 48	880	5	64 x 6
60	1320	6	78 x 6
72	1840	7	92 x 8
84	2450	8	106 x 8
96	3160	9	120 x 10
108	3950	10	134 x 10
120	4800	11	148 x 12

* TYPE 2A COVER SLAB AVAILABLE
** MONO BASE AVAILABLE IN 48",60" or 72"

ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

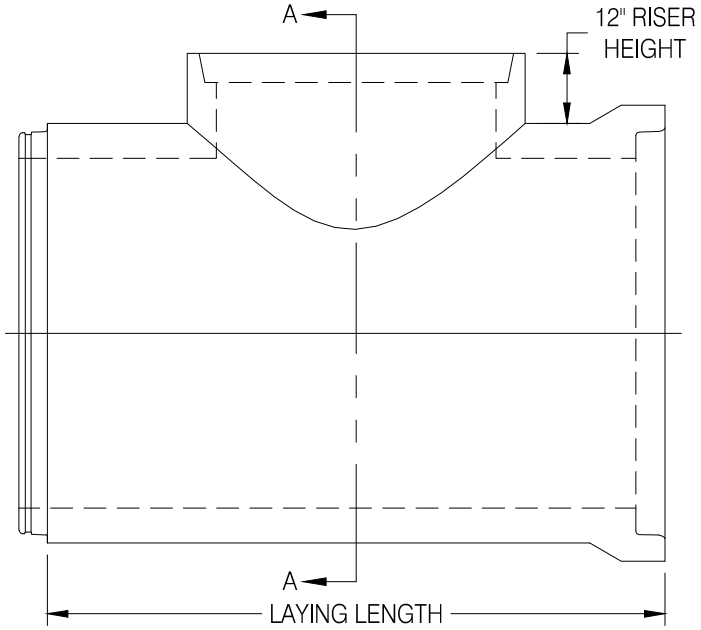
CITY OF HELENA
ENGINEERING STANDARDS

Standard Straight Manhole

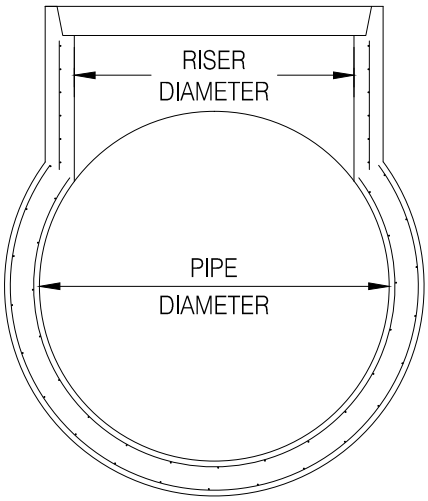
STANDARD DRAWING:

3-7

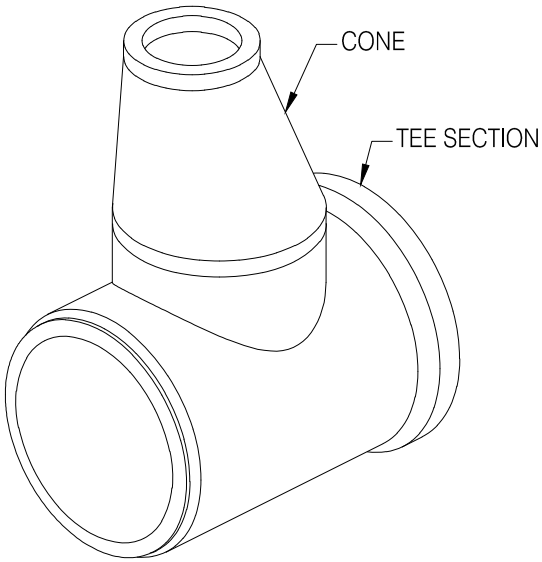
REVISED:	***SCALE:***
2/12/13	NONE



ELEVATION VIEW



SECTION A-A

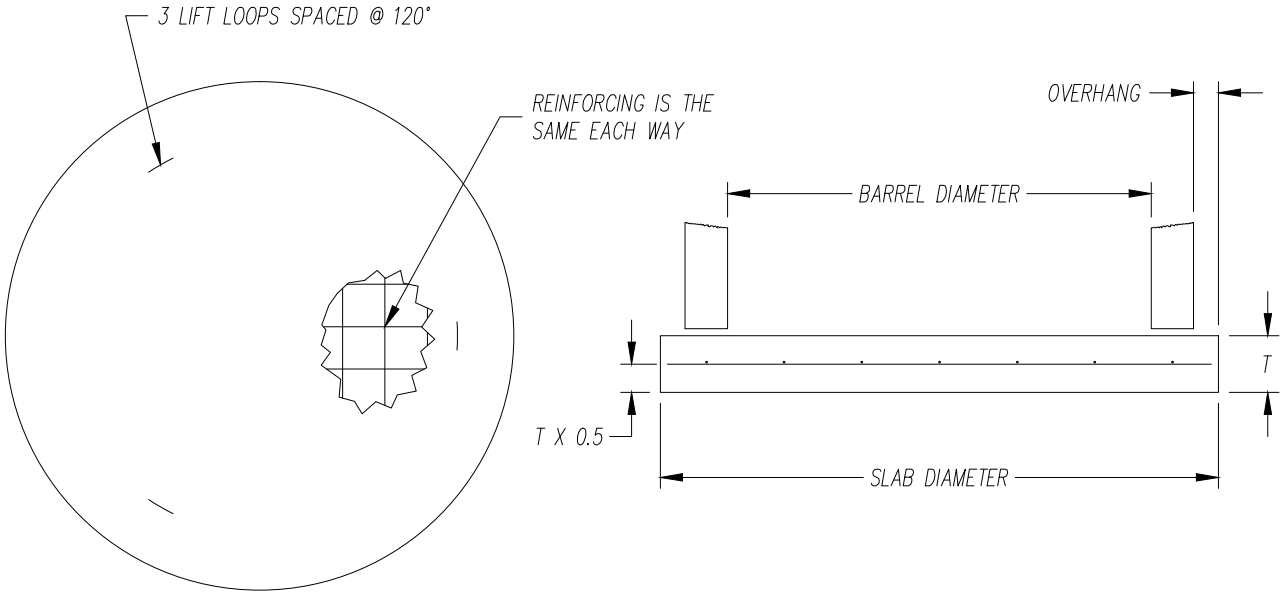


PERSPECTIVE VIEW

DIAMETER OF RISER INCHES	DIAMETER OF BARREL INCHES
42	42
42	48
42	60
48	42
48	48
48	54
48	60
48	66
48	72
48	78
48	84

ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		RCP Manhole Tee	STANDARD DRAWING: 3-8
REVISED: 2/12/13	SCALE: NONE		



STANDARD BASE SLABS				
SIZE	DIMENSIONS OD x T	WEIGHT	OVERHANG	REINFORCING BARS
in	in	lbs	in	in
30	44 X 6	790	3.5	#4 @ 11
36	51 X 6	1,065	3.5	#4 @ 11
42	58 X 6	1,380	3.5	#4 @ 11
48	64 X 6	1,680	3.0	#4 @ 11
60	79 X 8	3,400	3.5	#4 @ 11
72	93 X 8	4,720	3.5	#4 @ 11
84	107 X 8	6,250	3.5	#4 @ 11
96	121 X 8	7,990	3.5	#4 @ 11
120	146 X 12	17,450	2.0	#4 @ 6

NON-STANDARD BASE SLABS				
SIZE	DIMENSIONS OD x T	WEIGHT	OVERHANG	REINFORCING BARS
in	in	lbs	in	in
48	72 X 8	2,830	7.0	#4 @ 11
60	86 X 8	4,030	7.0	#4 @ 11
72	100 X 8	5,460	7.0	#4 @ 11
84	114 X 8	7,090	7.0	#4 @ 11

1. Slabs are manufactured per ASTM C478.
2. Various sizes of drain holes can be provided.
3. Special sizes are available upon request.
4. Base slabs can be cast as monolithic with barrel section for an additional charge.

0.60 PS CABLE MAY BE SUBSTITUTED FOR #4 REBAR @ SAME SPACING

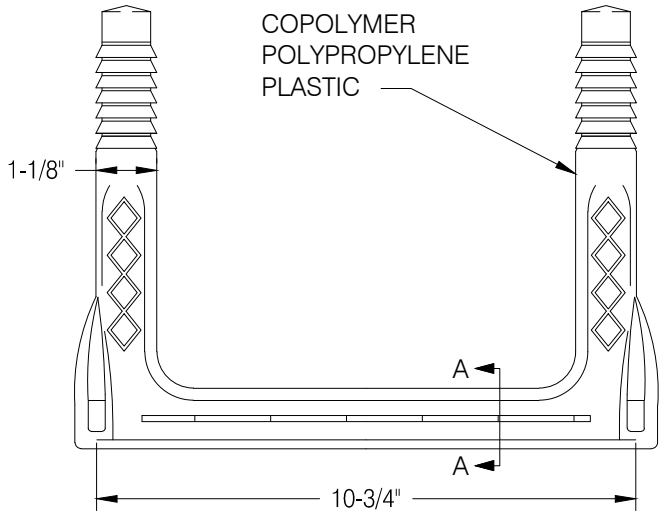
CITY OF HELENA
ENGINEERING STANDARDS

Separate Base Slabs

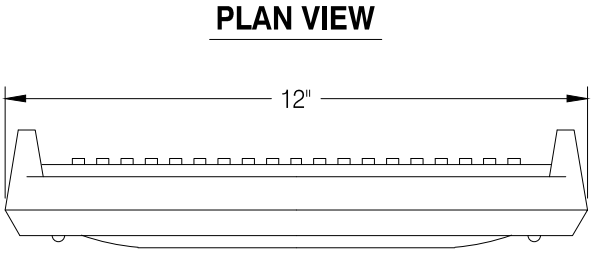
STANDARD DRAWING:

3-9

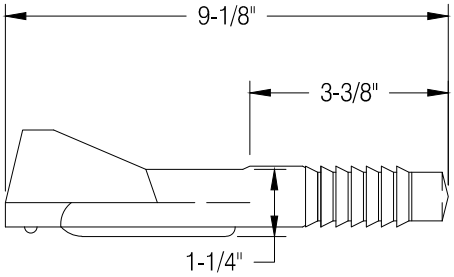
REVISED:	***SCALE:***
2/12/13	NONE



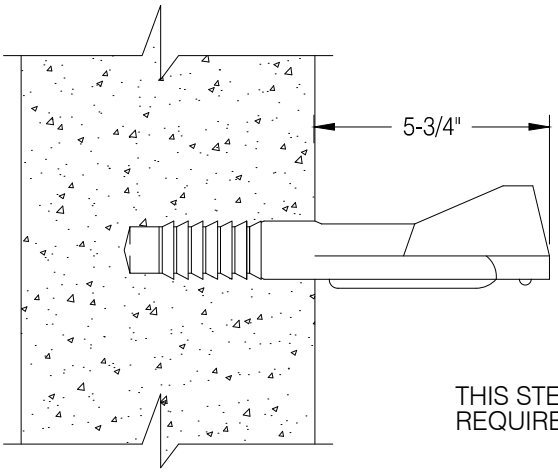
PLAN VIEW



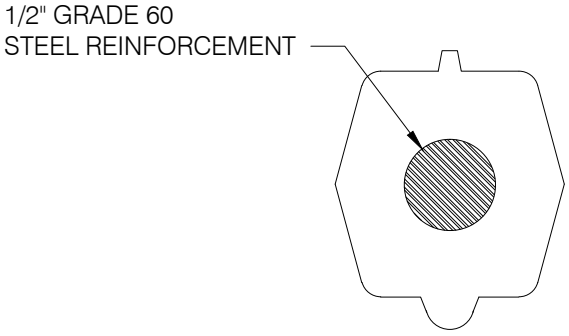
FRONT VIEW



SIDE VIEW



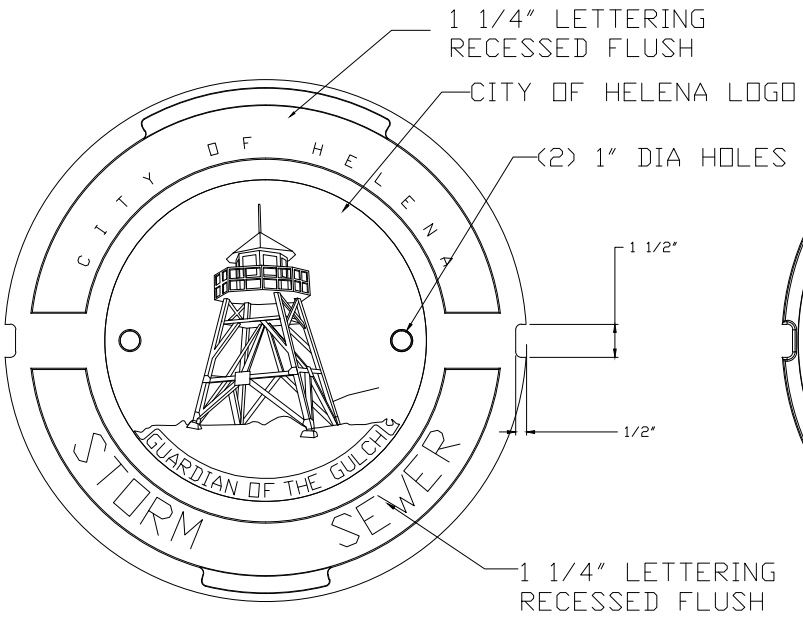
TYPICAL INSTALLATION



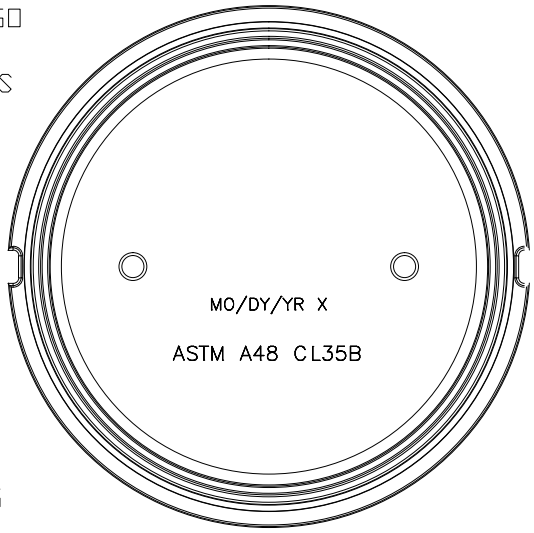
SECTION A-A

THIS STEP MUST MEET THE
REQUIREMENTS OF ASTM C 478

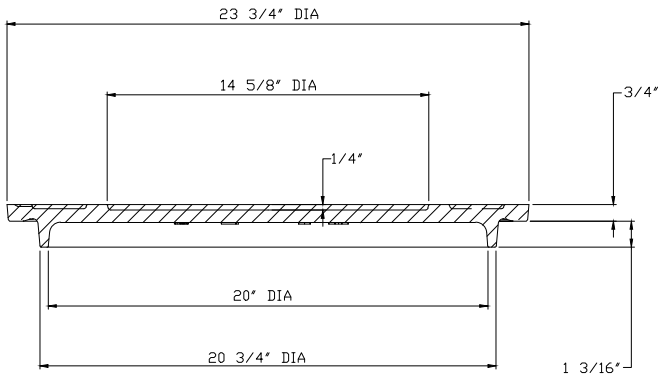
CITY OF HELENA ENGINEERING STANDARDS		**Manhole Step**	***STANDARD DRAWING:*** **3-10**
REVISED: 2/12/13	***SCALE:*** NONE		



PLAN VIEW

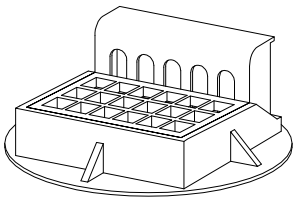


BOTTOM VIEW



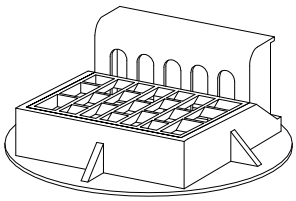
SECTION

CITY OF HELENA ENGINEERING STANDARDS		**Approved City Logo Manhole Lid "Storm Sewer" Lettering**	***STANDARD DRAWING:*** **3-11**
REVISED: 2/12/13	***SCALE:*** NONE		



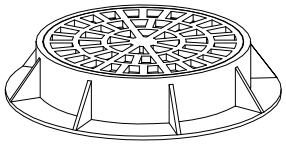
TYPE II

APPROVED GRATE
AND CURB BOX
30"Ø CURB INLET



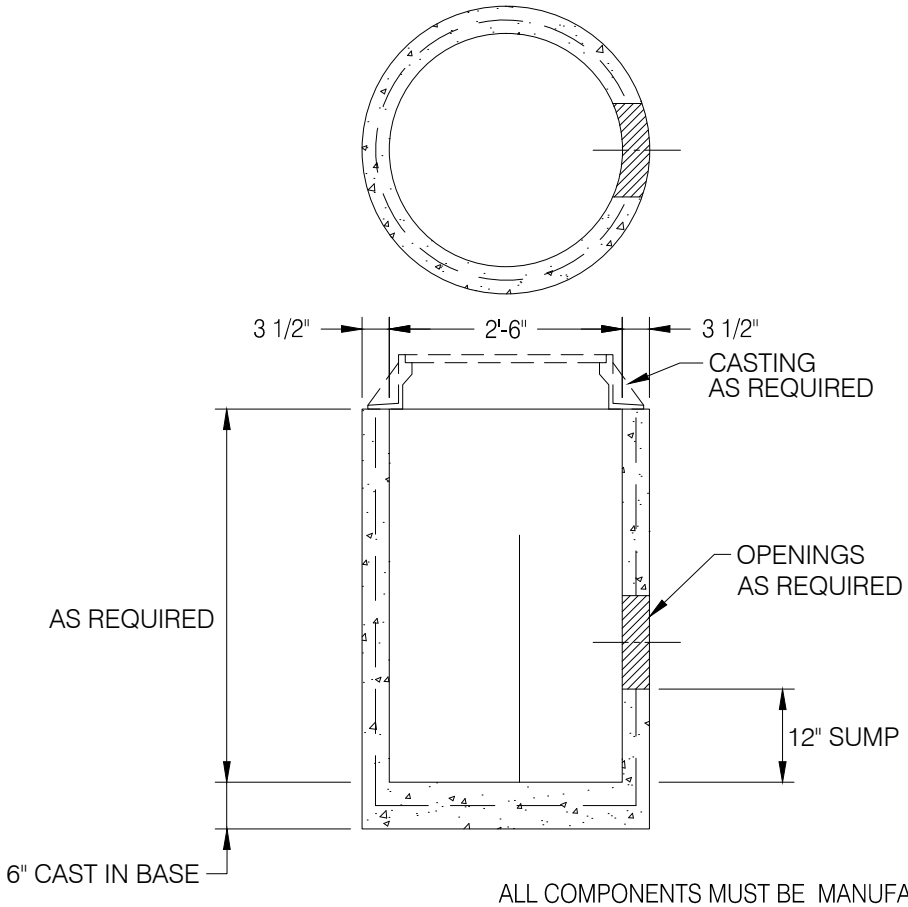
TYPE III

APPROVED GRATE
AND CURB BOX
30"Ø CURB INLET



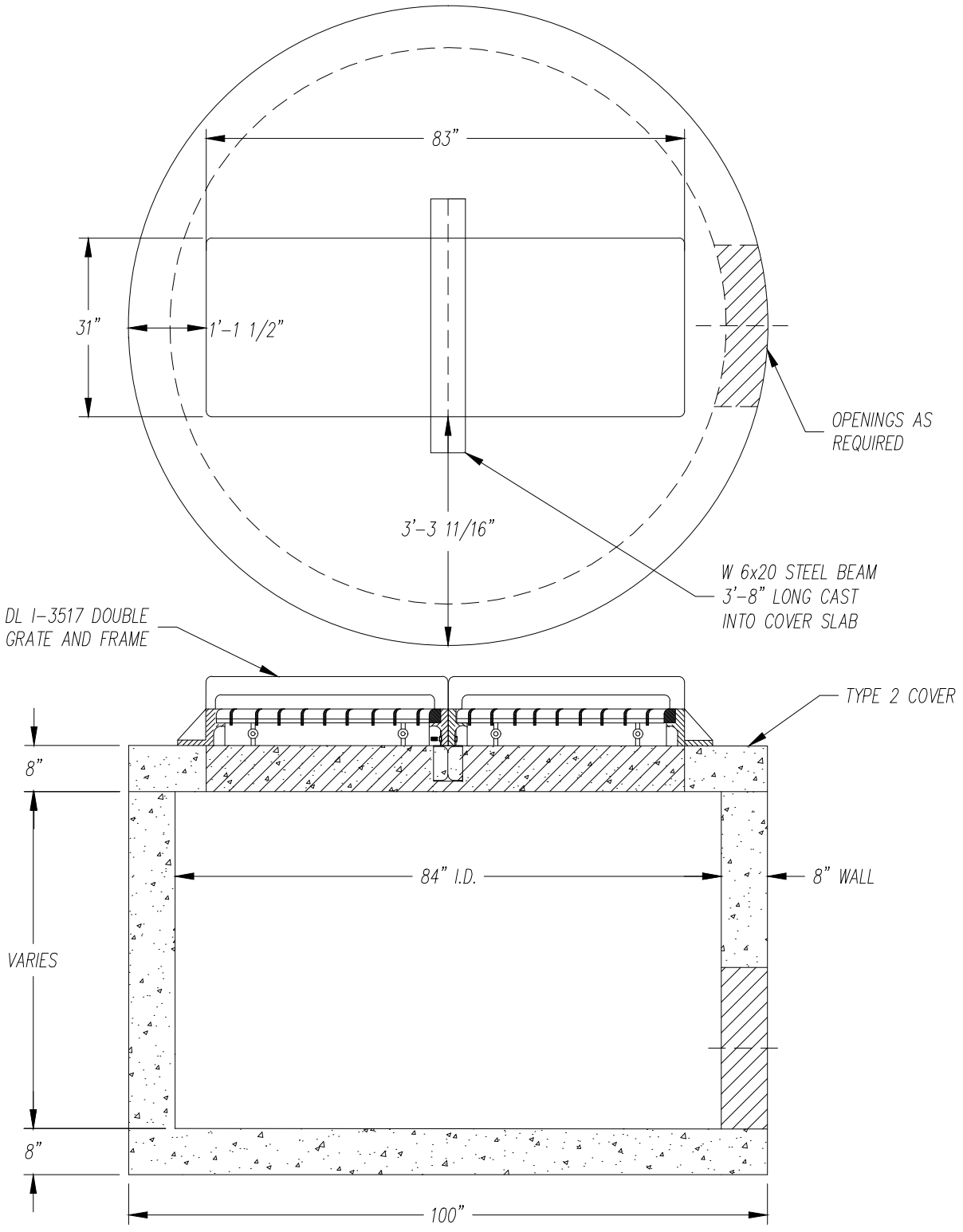
TYPE IV

APPROVED GRATE
30"Ø AREA DRAIN



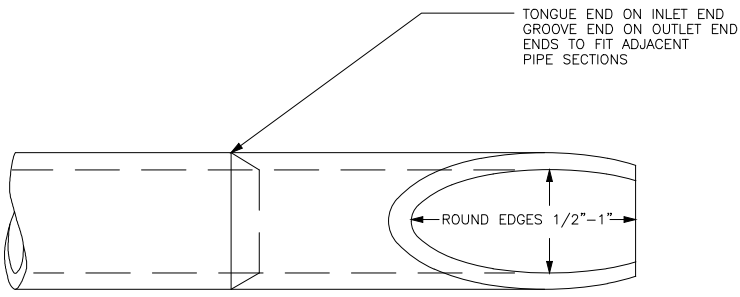
ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		# *Standard Specification Inlets*	***STANDARD DRAWING:*** **4-1**
REVISED: 2/12/13	***SCALE:*** NONE		

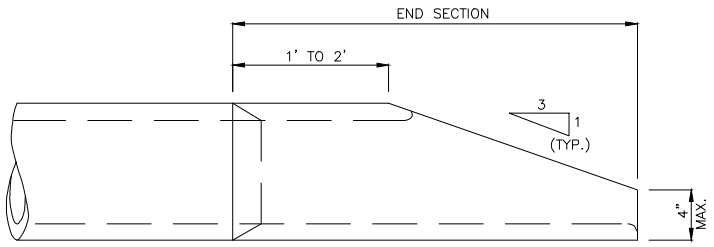


ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		**Combo Manhole Double Curb Inlet**	***STANDARD DRAWING:*** **4-2**
REVISED: 2/12/13	***SCALE:*** NONE		

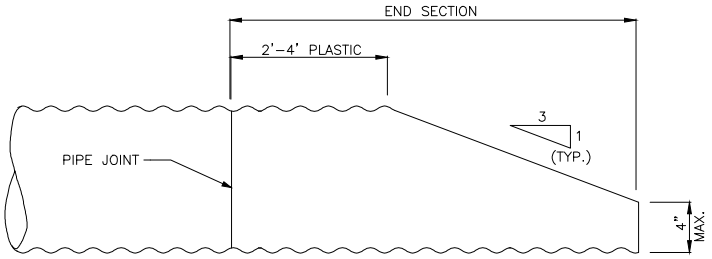


PLAN



ELEVATION

CONCRETE PIPE

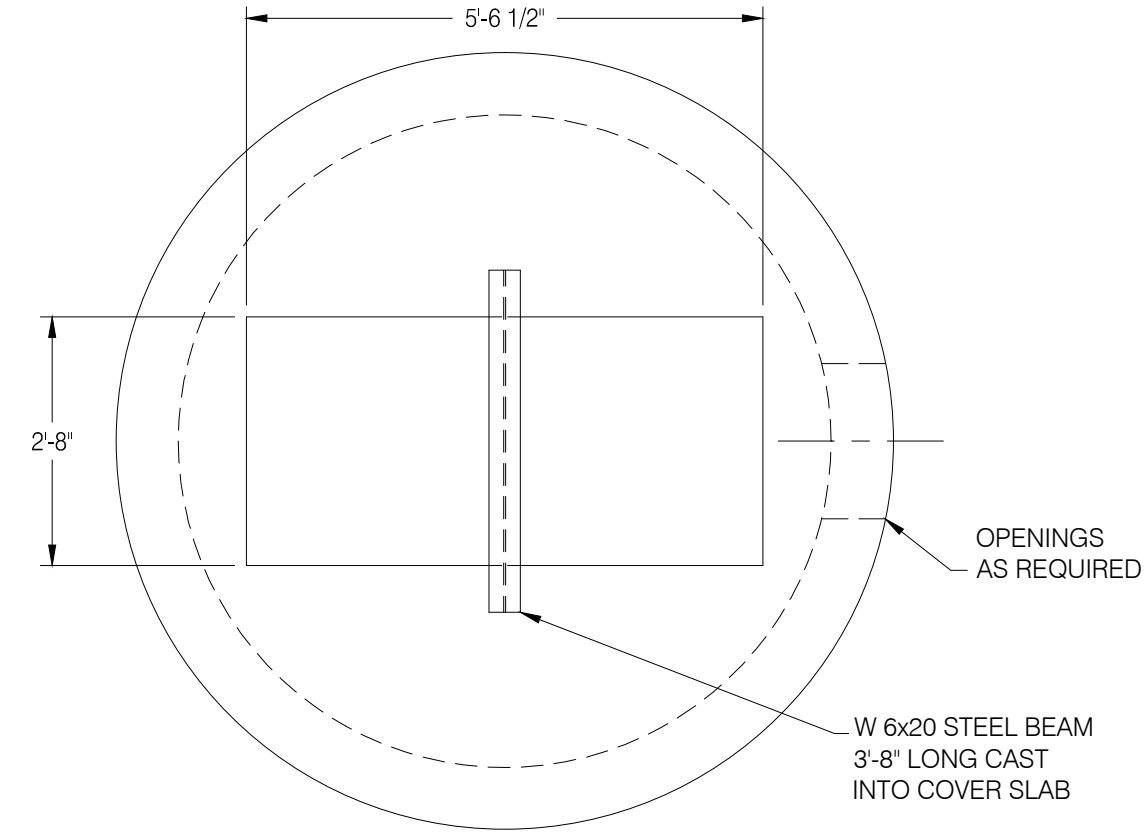


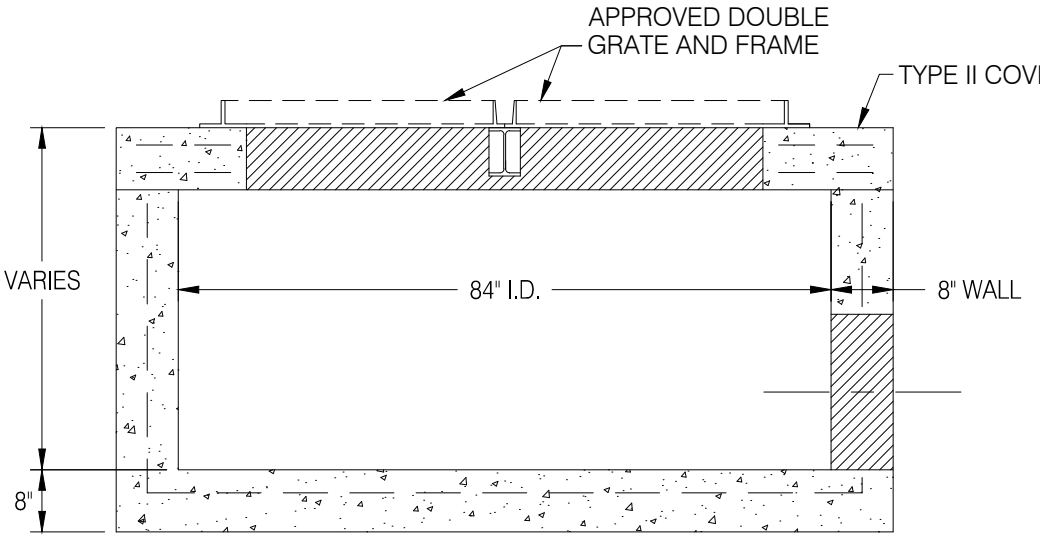
THERMO–PLASTIC PIPE

NOTE:

SIDE SLOPE SHALL BE WARPED TO MATCH THE BEVELED PIPE END. WHEN CULVERT IS ON SKEW, BEVELED END SHALL BE ROTATED TO CONFORM TO SLOPE. IF SLOPE DIFFERS FROM 3:1, PIPE SHALL BE BEVELED TO MATCH SLOPE.

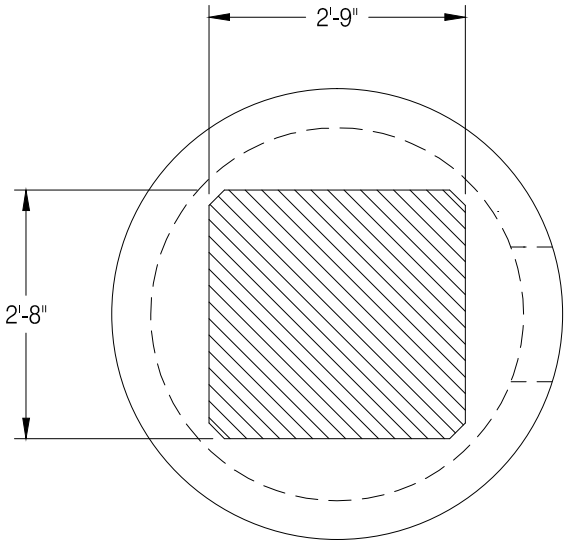
CITY OF HELENA ENGINEERING STANDARDS		**Beveled End Pipe Section**	***STANDARD DRAWING:*** **4-3**
REVISED: 2/12/13	***SCALE:*** NONE		



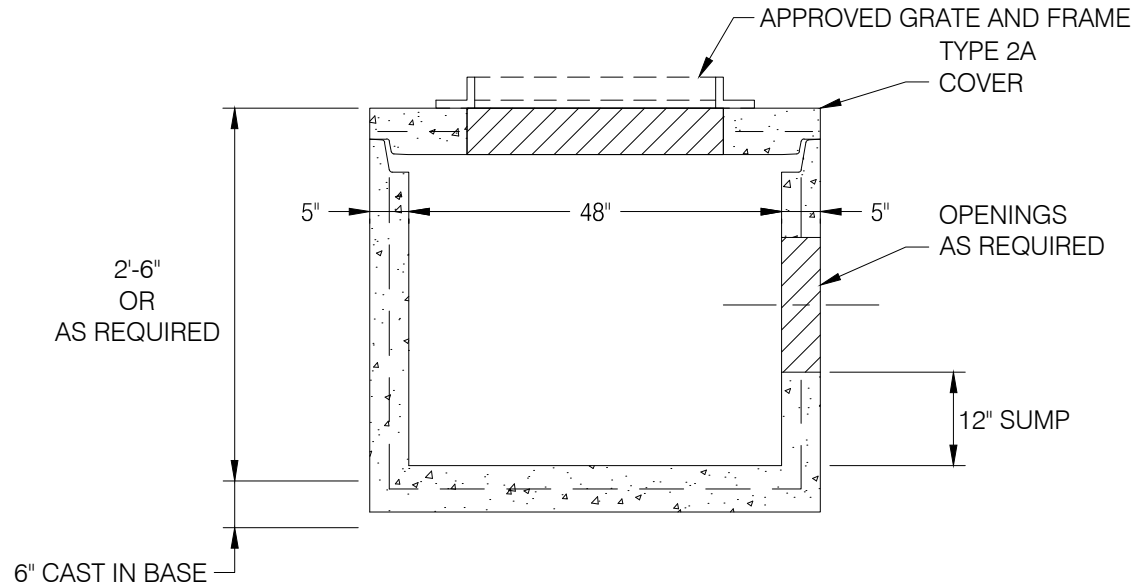


ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		**Type 2 Double Drop Inlet**	***STANDARD DRAWING:*** **4-4**
REVISED: 2/12/13	***SCALE:*** NONE		

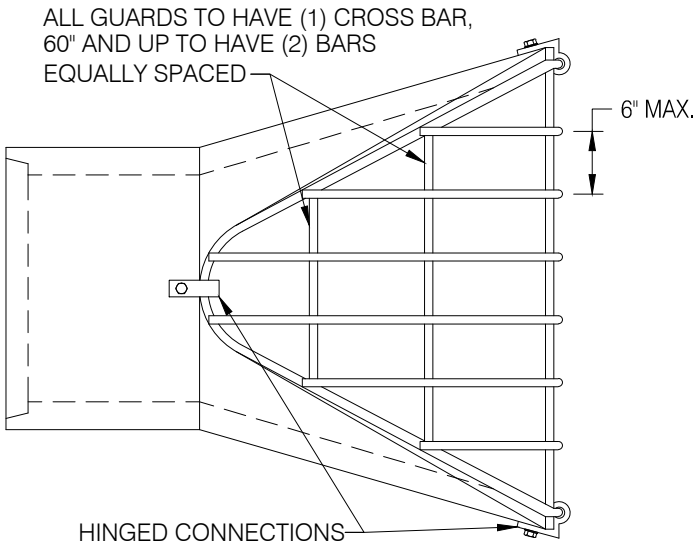


48" TYPE 2A INLET COVER

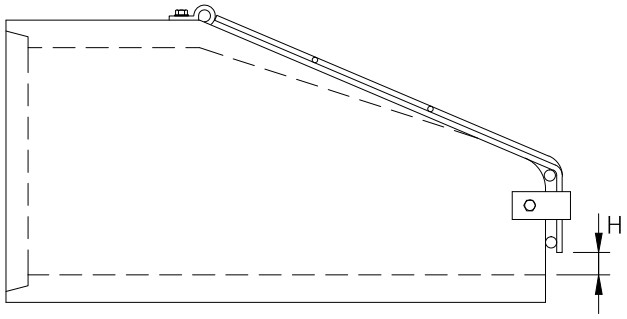


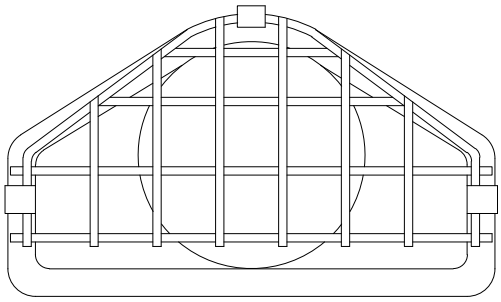
ALL COMPONENTS MUST BE MANUFACTURED PER ASTM C 478.

CITY OF HELENA ENGINEERING STANDARDS		**Type 1 Drop Inlet**	***STANDARD DRAWING:*** **4-5**
REVISED: 2/12/13	***SCALE:*** NONE		



ROUND	
PIPE SIZE	H
12"	2 1/2"
15"	3"
18"-24"	4"
27"-36"	5"
42"-54"	6"
60"-72"	7"
78"-90"	8"





BAR SIZES							
STANDARD DESIGN				HEAVY DESIGN			
PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE	PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE
12"-24"	3/4"	5/8"	5/8"	12"-18"	3/4"	5/8"	3/4"
27"-48"	7/8"	3/4"	3/4"	21"-42"	7/8"	3/4"	1"
54"-90"	1 1/8"	1"	1"	48"-90"	1 1/8"	1"	1 1/4"
BOLT LENGTH = PIPE WALL THICKNESS + 2 1/2"							

Note:
Hot dip galvanized per ASTM A153.

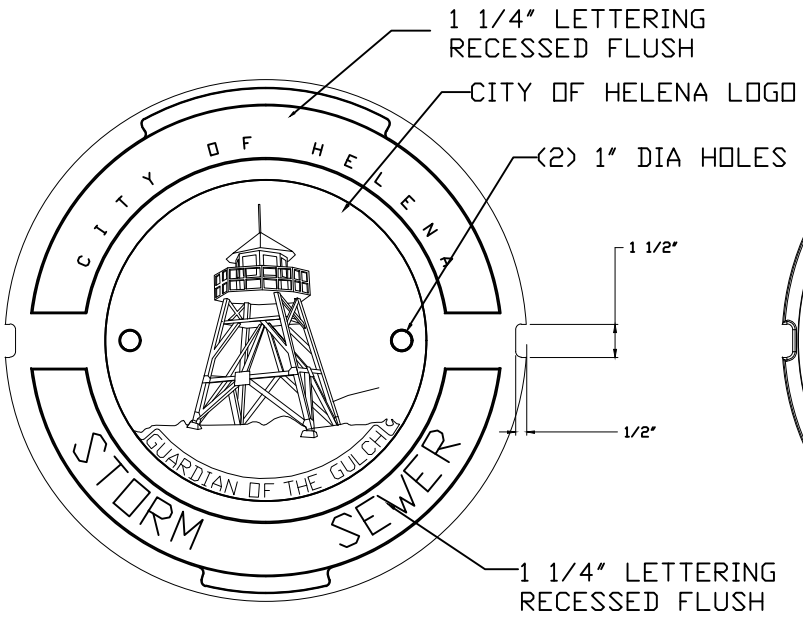
CITY OF HELENA
ENGINEERING STANDARDS

Trash Guard For Flared End Sections

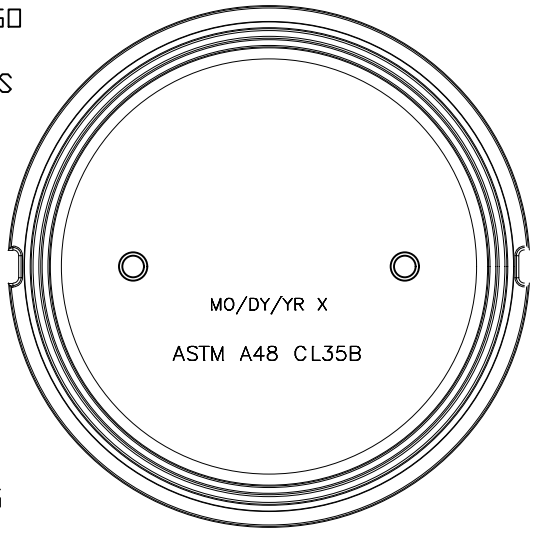
STANDARD DRAWING:

4-6

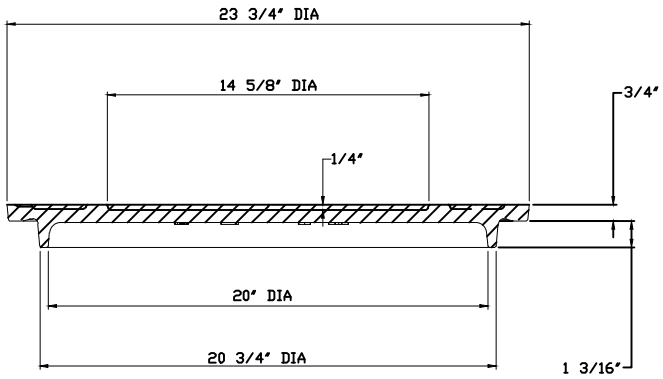
REVISED:	***SCALE:***
2/12/13	NONE



PLAN VIEW

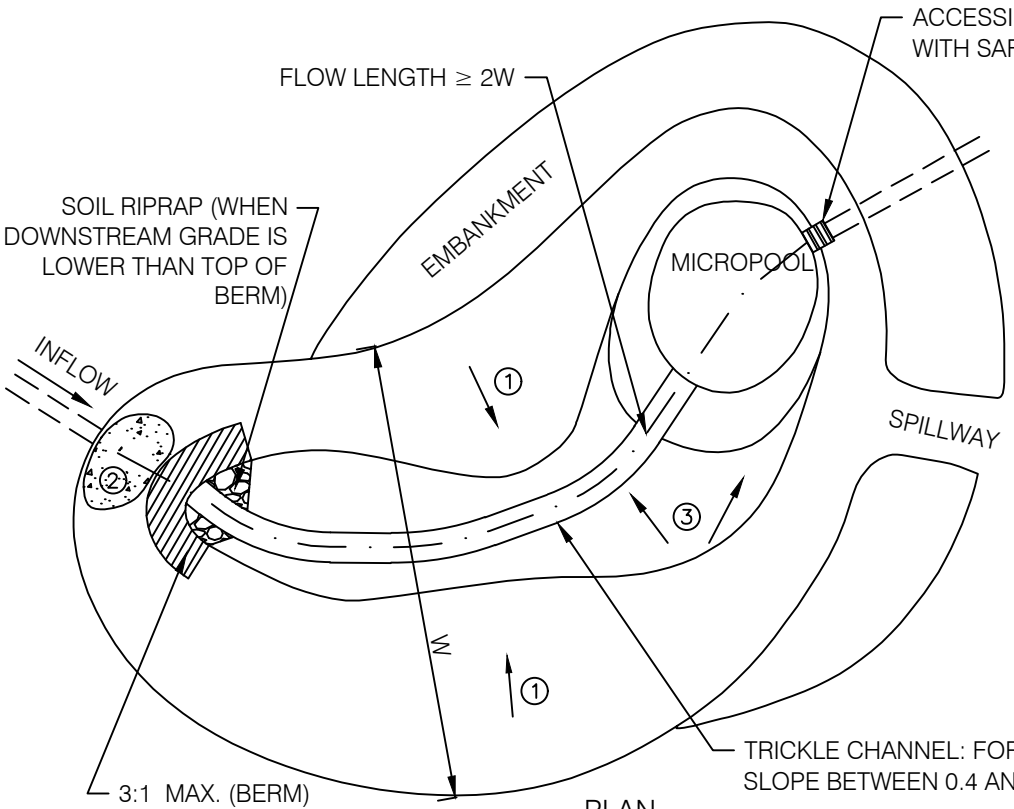


BOTTOM VIEW



SECTION

CITY OF HELENA ENGINEERING STANDARDS		**Approved City Logo Manhole Lid "Storm Sewer" Lettering**	***STANDARD DRAWING:*** **4-7**
REVISED: 2/12/13	***SCALE:*** NONE		

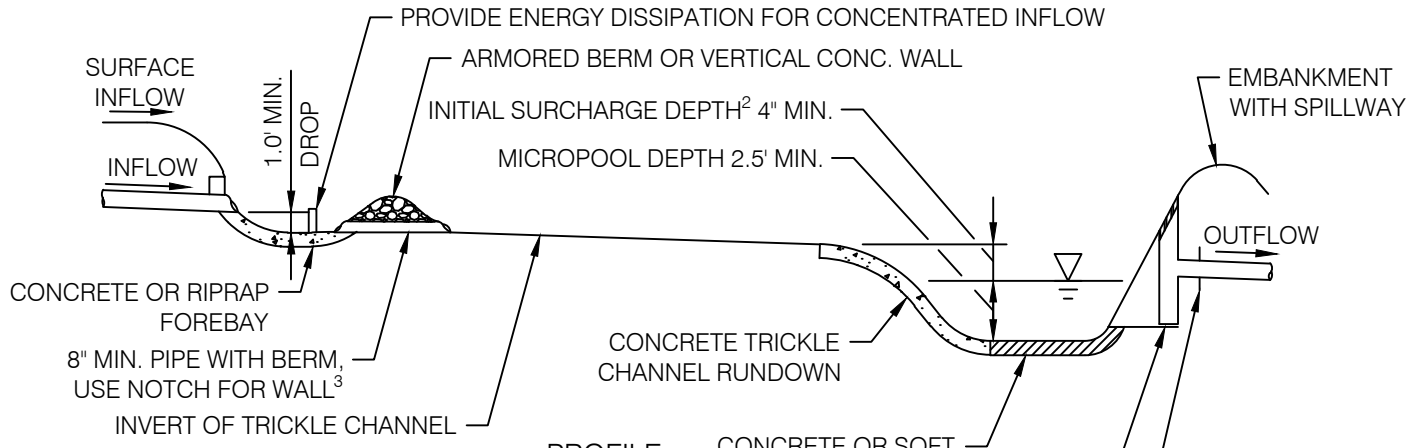


PLAN
NTS

① 4:1 SIDESLOPES WITH NO AREAS GREATER THAN 3:1. FOR AESTHETIC DESIGN, VARY SLOPES AND DESIGN ONE SIDE MILDER THAN THE OTHER.

② FOREBAY WITH CONCRETE OR RIPRAP FLOOR. PROVIDE ENERGY DISSIPATION FOR CONCENTRATED INFLOW.

③ IN THE BOTTOM OF THE BASIN PROVIDE A 3% MIN. SLOPE TO THE TRICKLE CHANNEL OR MICROPOOL.



PROFILE
NTS

[1] SOFT BOTTOM WHERE BASE FLOWS OR GROUNDWATER IS ANTICIPATED

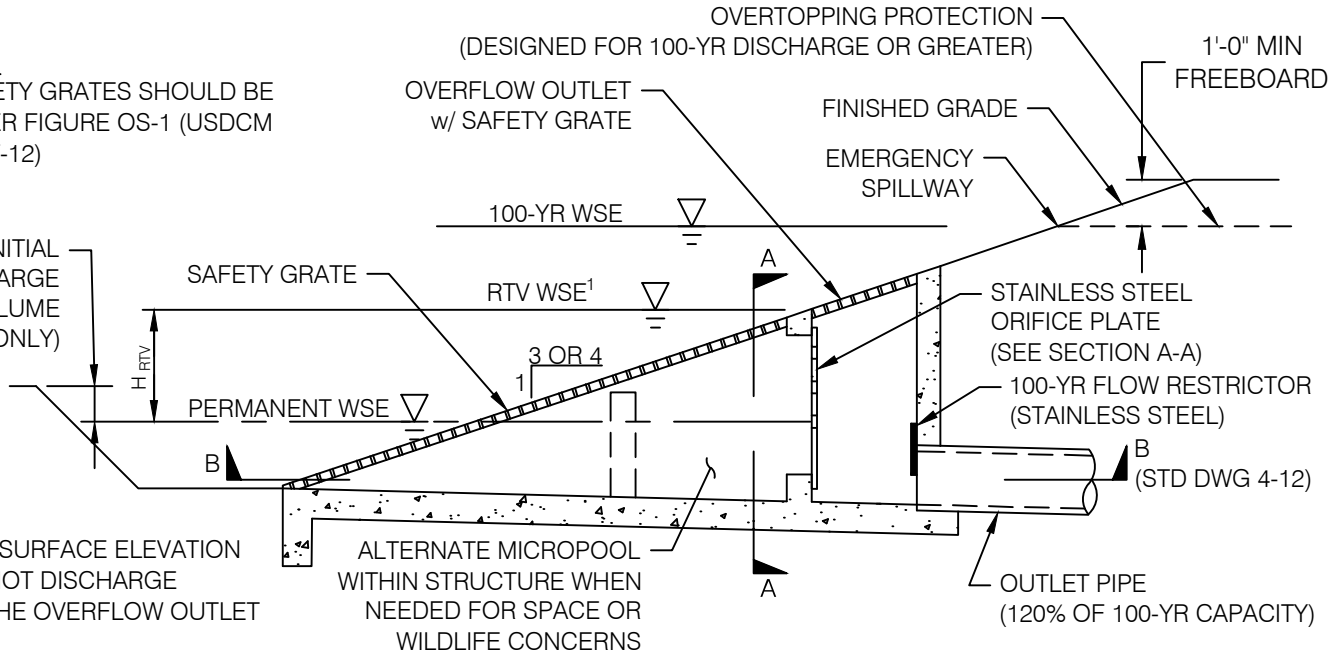
[2] INCREASE WHERE BASE FLOWS ARE ANTICIPATED

[3] SIZE FOREBAY OUTLET TO PASS 2% OF UNDETAINED 100-YEAR 24 HOUR PEAK FLOW. CONCRETE WALL w/ NOTCHED OUTLET RECOMMENDED FOR DRAINAGES TOO SMALL FOR BERM/ PIPE CONFIGURATION.

CITY OF HELENA ENGINEERING STANDARDS		# Extended Detention Basin	***STANDARD DRAWING:*** **4-8**
REVISED: 5/11/2019	***SCALE:*** NONE		

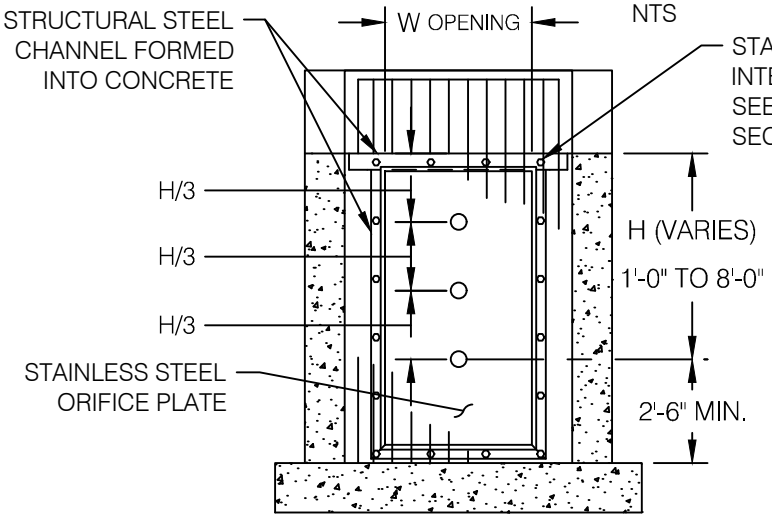
NOTES:

ALL SAFETY GRATES SHOULD BE SIZED PER FIGURE OS-1 (USDCM CHP. 4, T-12)



[1]RTV WATER SURFACE ELEVATION RTV SHALL NOT DISCHARGE THROUGH THE OVERFLOW OUTLET

PROFILE
NTS



SECTION A-A
NTS

NOTE:

RTV ELEVATION H (VARIES, TYPICALLY THE RTV DEPTH). THREE ORIFICES ARE RECOMMENDED TO MAXIMIZE THE DIAMETER. INCREASE THE TOP ORIFICE AS NEEDED TO MATCH THE DESIRED DRAIN TIMES.

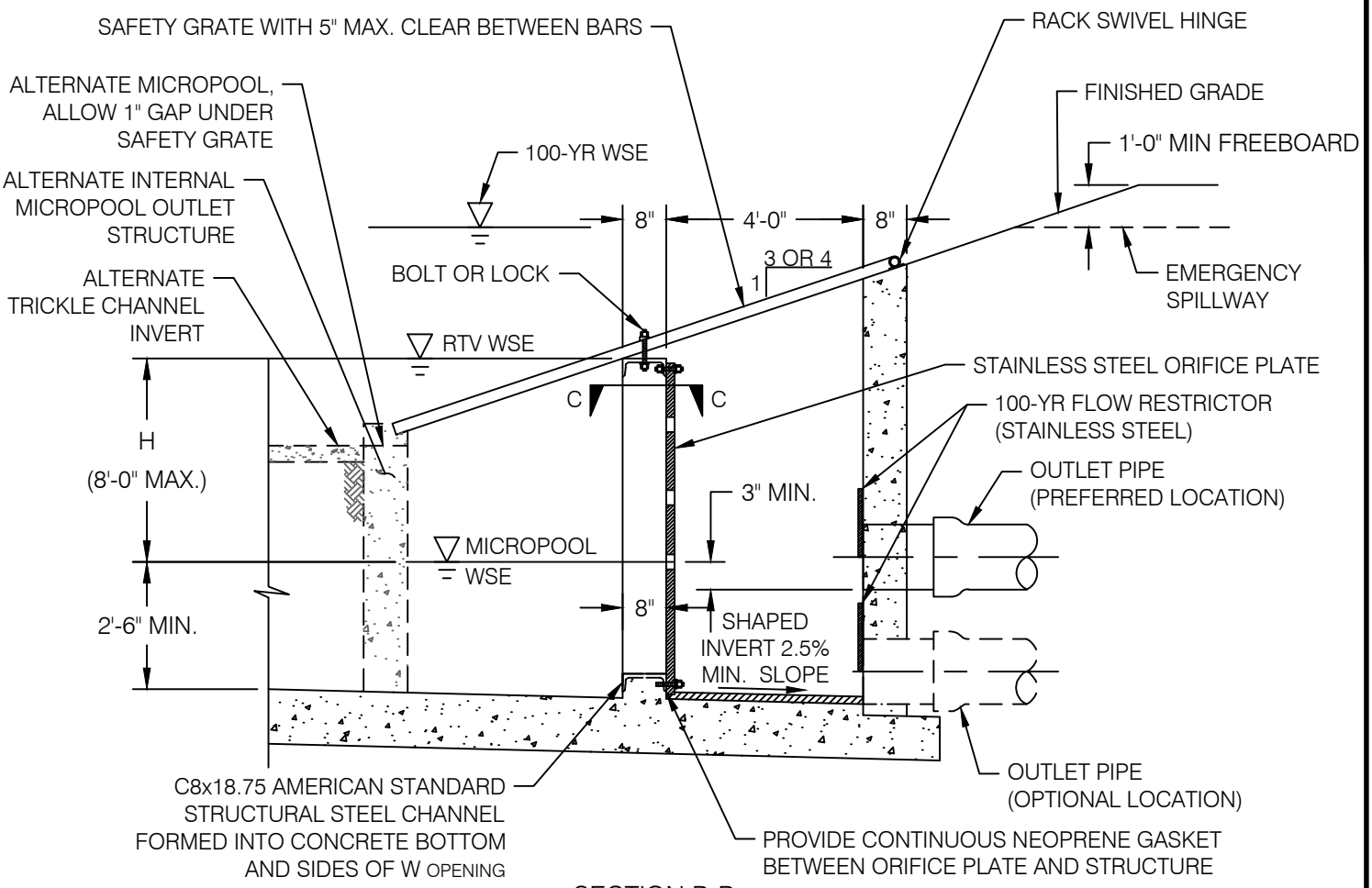
ORIFICE PLATE NOTES:

1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE.
2. BOLT PLATE TO CONCRETE 12" MAX. ON CENTER. SEE TABLE OS-2 (USDCM CHP.4, T-12) FOR PLATE THICKNESS.

SAFETY GRATES:

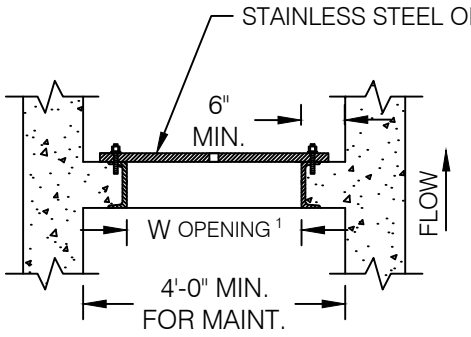
1. ALL SAFETY GRATES SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
2. SAFETY GRATES SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL GRATES SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.
3. SAFETY GRATES SHALL BE DESIGNED SUCH THAT THE DIAGONAL DIMENSION OF EACH OPENING IS SMALLER THAN THE DIAMETER OF THE OUTLET PIPE.
4. STRUCTURAL DESIGN OF SAFETY GRATES SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF THE RACK.
5. SAFETY GRATES SHALL BE 6-INCHES WIDER THAN THE OPEN SPAN BETWEEN WING WALLS.

CITY OF HELENA ENGINEERING STANDARDS		**Typical Pond Outlet Structure**	***STANDARD DRAWING:*** **4-9**
REVISED: 5/11/2019	***SCALE:*** NONE		



SECTION B-B
NTS

STEEL PLATE THICKNESS (IN INCHES) BASED ON DESIGN HEAD AND SPAN OF PLATE							
SPAN (FEET)	HEAD (FEET)						
	3		5	6	7	8	
1	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	
2	0.1875	0.2500	0.2500	0.2500	0.2500	0.2500	
3	0.2500	0.2500	0.3750	0.3750	0.3750	0.3750	
4	0.2500	0.3750	0.3750	0.3750	0.3750	0.5000	



[1] 12" MIN, INCREASE AS NEEDED TO ACCOMMODATE ORIFICE DESIGN DIAMETER

SECTION C-C
NTS

CITY OF HELENA ENGINEERING STANDARDS

Typical Pond Outlet Structure Details

STANDARD DRAWING:

4-10

REVISED:	***SCALE:***
5/11/2019	NONE