

STORM DRAIN STANDARD PLANS

DESCRIPTION

400 SERIES – STORM DRAIN

400	Storm Drain Manhole
401	Standard Manhole Frame and Cover
402	Standard Precast Concrete Storm Drain Manhole Reducer Slab
403	Precast Catch Basin Hood
404	Curb Opening Catch Basin
405	Catch Basin for Pipes Larger Than 24"
406	Storm Drain Gallery
407	Temporary Redwood Box Field Inlet
408	Typical Storm Drain Outfall Detail
409	Sidewalk Drain
410	Sidewalk Cross Drain
411	Sidewalk Underdrain With Cover Plate
412	Sidewalk Corner Cross Drain
413	Typical Lot Drainage
414	Storm Drain Message Layout
415	Down Drain Energy Dissipater
416	Intensity-Duration-Frequency Curves
417	Runoff Coefficients for Rational Formula, Vegetated Area

Images: Willits Logo.jpg Xrefs: Path: \\erosvr1.corp.w-and-k.com\PROJECTS\01064 - City of Willits\01064-09-001 Willits City Standards\CAD 01064-09-001.dwg\Willits400-417.dwg Layout Name: 400 Plot Date: Sep 29, 2009 at 10:25

MANHOLE COVER AND FRAME
SOUTH BAY FOUNDRY SBF 1900,
OR EQUAL; CITY STD. 401

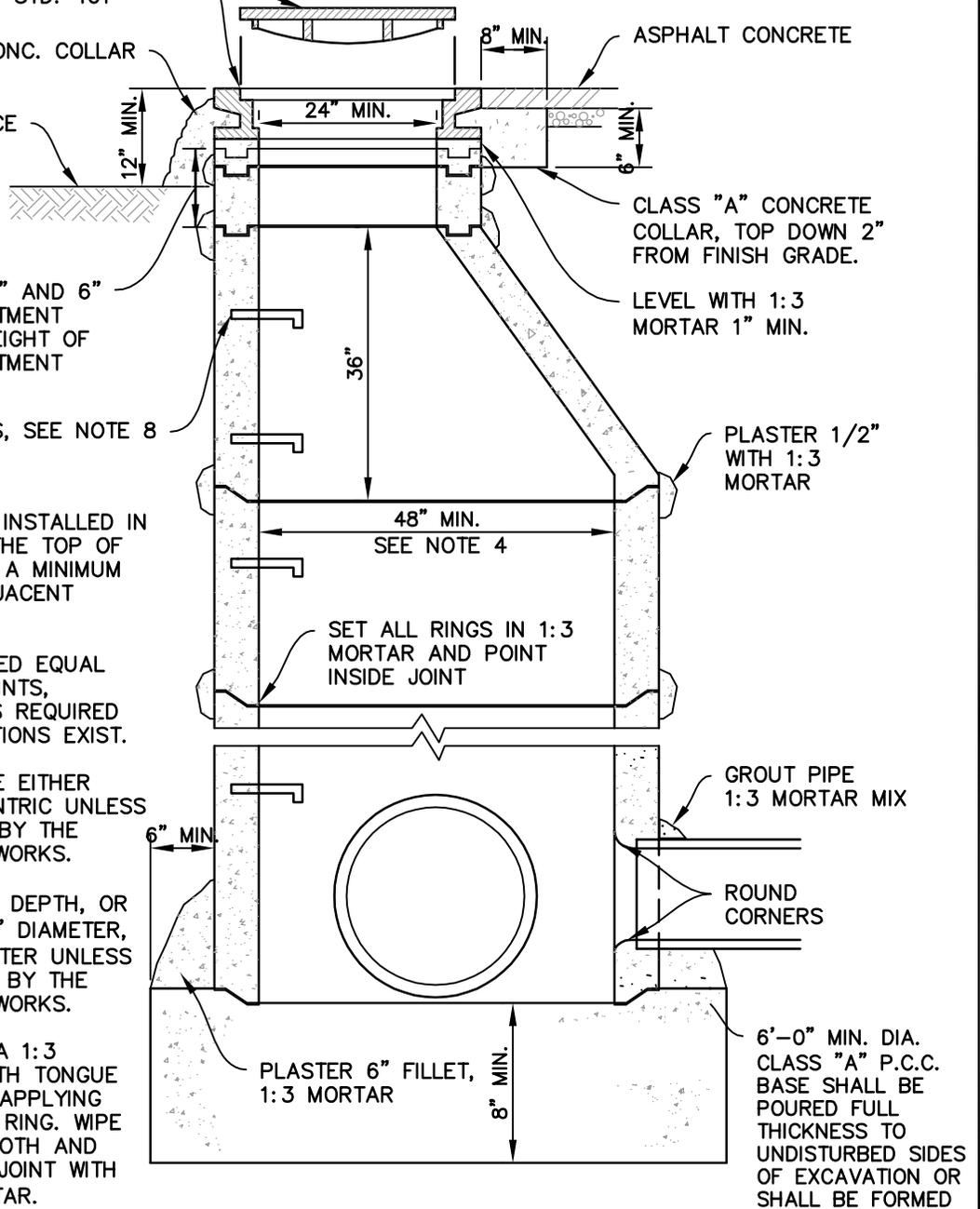
CONC. COLLAR
UNIMPROVED SURFACE

MIN. IF ONE 3" AND 6"
GRADE ADJUSTMENT
RING, MAX. HEIGHT OF
GRADE ADJUSTMENT
RINGS = 20"

STEPS, SEE NOTE 8

NOTES:

1. WHEN MANHOLES ARE INSTALLED IN UNIMPROVED AREAS, THE TOP OF THE COVER SHALL BE A MINIMUM OF 1 FOOT ABOVE ADJACENT GRADE.
2. RAM-NEK OR APPROVED EQUAL SHALL BE USED IN JOINTS, PLASTERING OF JOINTS REQUIRED IF HIGH WATER CONDITIONS EXIST.
3. CONE SECTION MAY BE EITHER CONCENTRIC OR ECCENTRIC UNLESS OTHERWISE SPECIFIED BY THE DIRECTOR OF PUBLIC WORKS.
4. MANHOLES OVER 7' IN DEPTH, OR WITH A PIPE OVER 36" DIAMETER, SHALL BE 5' IN DIAMETER UNLESS OTHERWISE PERMITTED BY THE DIRECTOR OF PUBLIC WORKS.
5. SET ALL RINGS IN A 1:3 MORTAR BED. WET BOTH TONGUE AND GROOVE BEFORE APPLYING MORTAR AND SETTING RING. WIPE INSIDE OF JOINTS SMOOTH AND PLASTER OUTSIDE OF JOINT WITH 1/2" LAYER OF MORTAR.
6. CONSTRUCT ALL FLOW CHANNELS OF PIPE WHEREVER POSSIBLE. AFTER BASE IS POURED, BREAK OUT TOP HALF OF PIPE FLUSH WITH INSIDE FACE OF M.H. WALL AND CONSTRUCT U-SHAPED CHANNEL. MAKE ELEVATION CHANGES GRADUALLY AND DIRECTIONAL CHANGES WITH SMOOTH CURVES. SET RING BASE IN MORTAR.
7. ALL SECTIONS OF MANHOLE MUST BE OF IDENTICAL MAKE AND MANUFACTURER.
8. STEPS SHALL BE INCLUDED IF MANHOLE DEPTH EXCEEDS 4'. STEPS SHALL BE PLACED 12" O.C. AND SHALL BE STEEL-REINFORCED POLYPROPYLENE M-A INDUSTRIES PS2-PFS, OR EQUAL.



STORM DRAIN MANHOLE

STD. NO.
400

SCALE: NONE

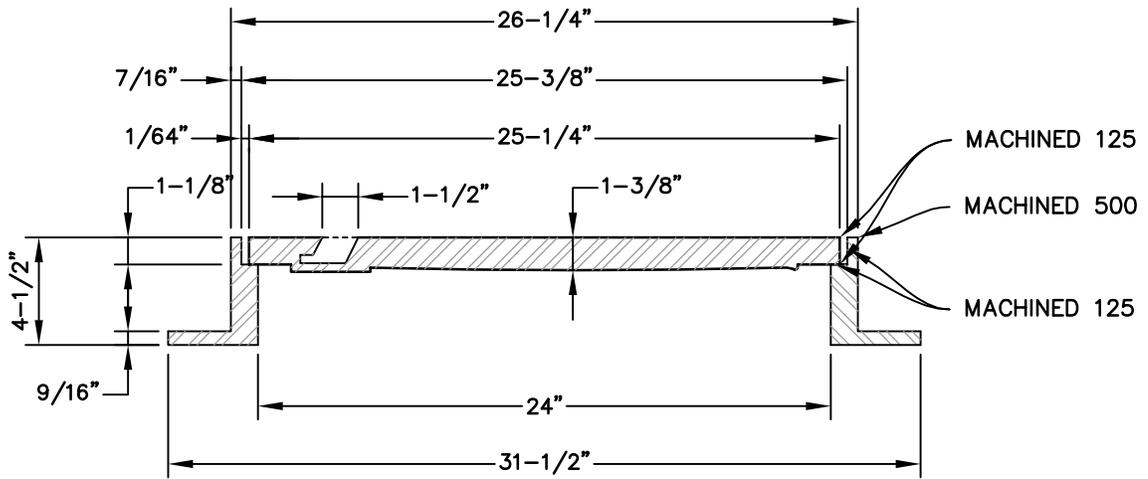
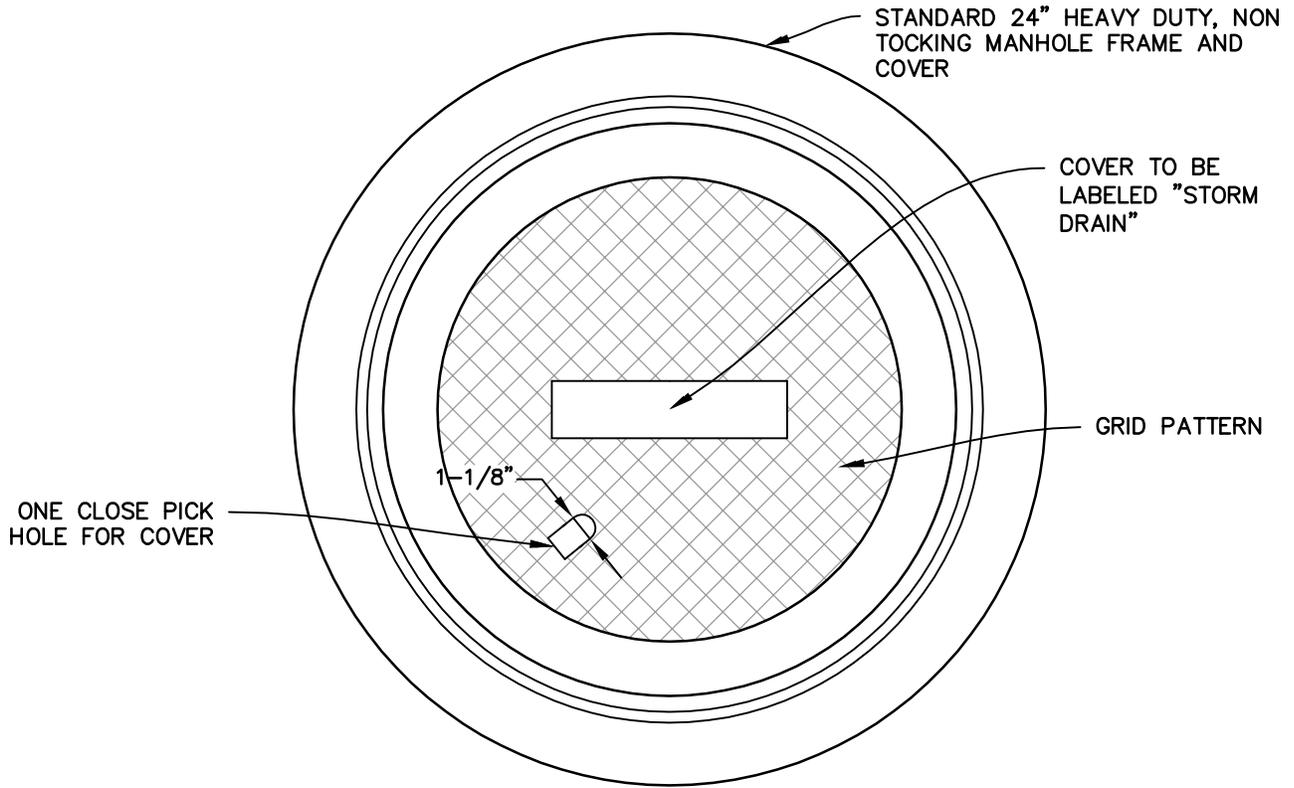
DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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NOTES:

1. ALL CASTINGS SHALL BE DIPPED IN APPROVED ASPHALT PAINT.
2. ALL MATERIAL USED IN MANUFACTURING SHALL CONFORM TO A.S.T.M. DESIGNATION 48-30, OR TO UNITED STATES GOVERNMENT SPECIFICATIONS QQI-652B.
3. MINIMUM WEIGHT COMPONENTS:
 COVER - 130 POUNDS
 FRAME - 135 POUNDS



**STANDARD MANHOLE
FRAME AND COVER**

STD. NO.
401

SCALE: NONE

DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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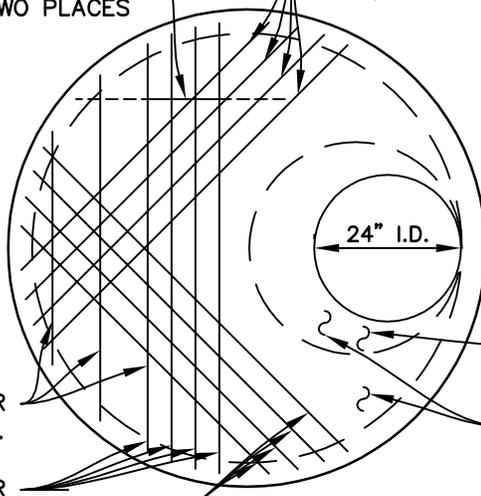
LIFTING EYES AT BALANCE POINT, TWO PLACES

#6 REBAR @ 3-1/2" O.C.

#6 REBAR @ 6" O.C.

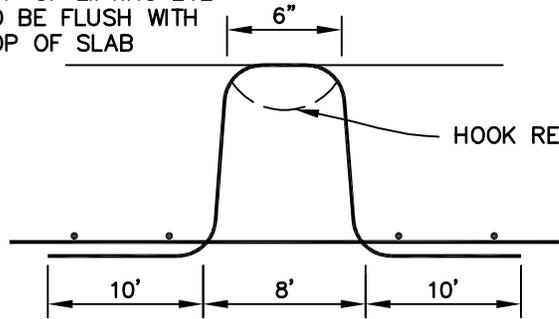
#6 REBAR @ 6" O.C.

#6 REBAR @ 3-1/2" O.C.



SLAB PLAN

TOP OF LIFTING EYE TO BE FLUSH WITH TOP OF SLAB



LIFTING EYE DETAIL

4 - #4 HOOPS AROUND ACCESS OF OPENINGS

#2 REBAR @ 6" O.C. AROUND OPENING, SEE NOTE 2

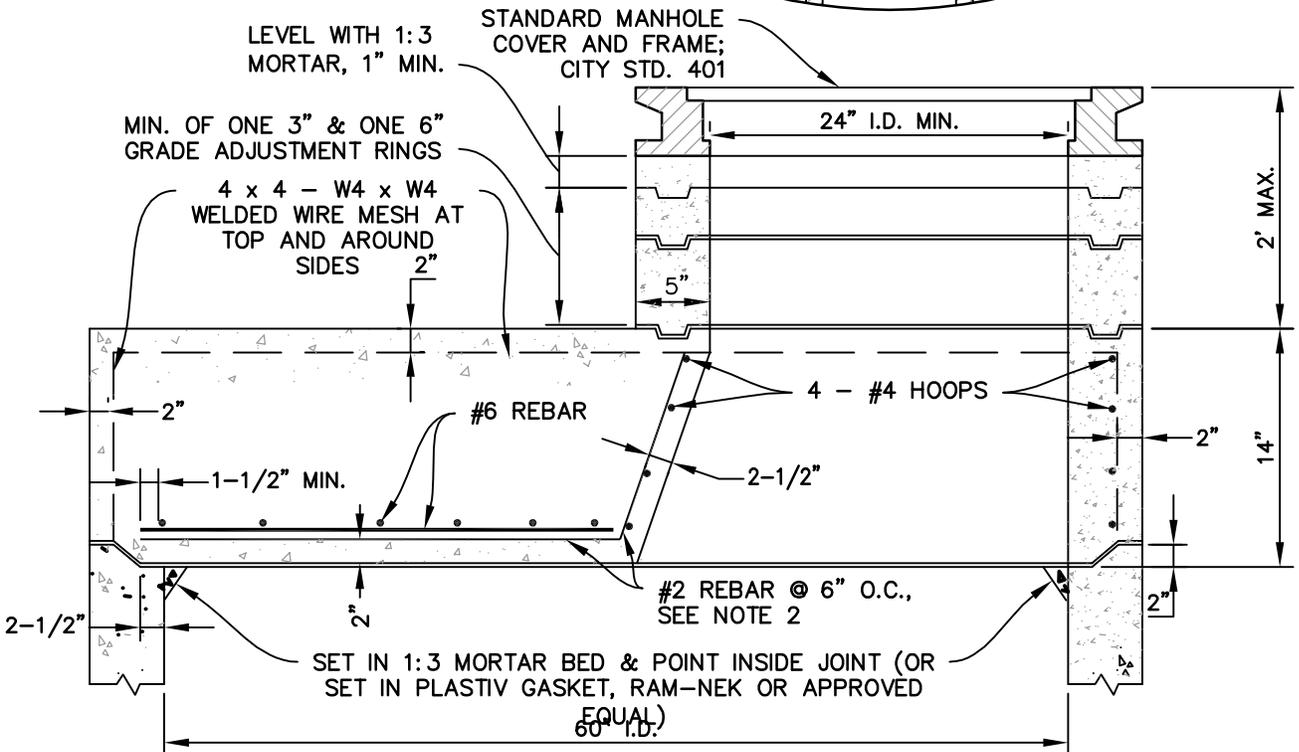


LEVEL WITH 1:3 MORTAR, 1" MIN.

STANDARD MANHOLE COVER AND FRAME; CITY STD. 401

MIN. OF ONE 3" & ONE 6" GRADE ADJUSTMENT RINGS

4 x 4 - W4 x W4 WELDED WIRE MESH AT TOP AND AROUND SIDES



NOTES:

- FOR DETAILS OF BASE AND BARREL SECTIONS, SEE CITY STD 400.
- #2 BARS BENT UP AND SPACED 6" O.C. AROUND 24" OPENING. HORIZONTAL LEGS TO FAN OUT EQUALLY SPACED, TO 2-1/2" CLEAR AT EDGE OF SLAB.



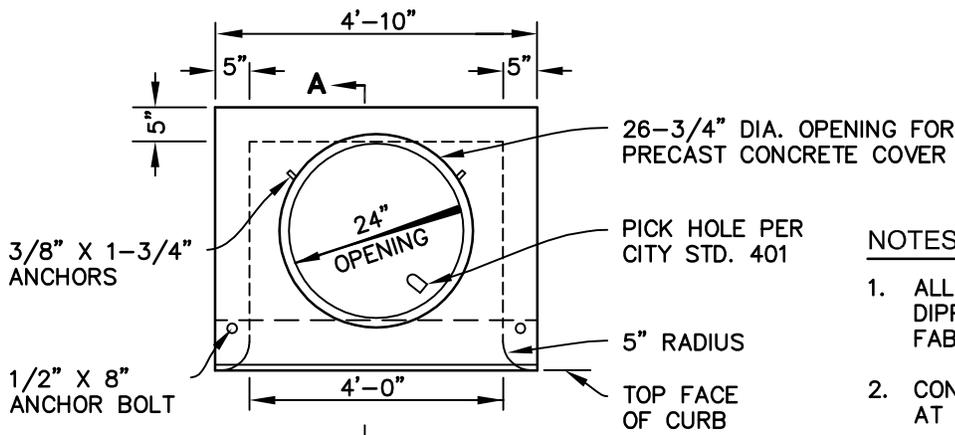
**STANDARD PRECAST CONCRETE
STORM DRAIN MANHOLE
REDUCER SLAB**

STD. NO.
402

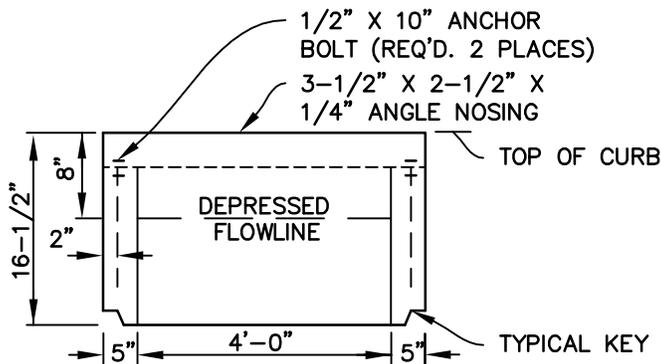
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DATE: OCT 2009

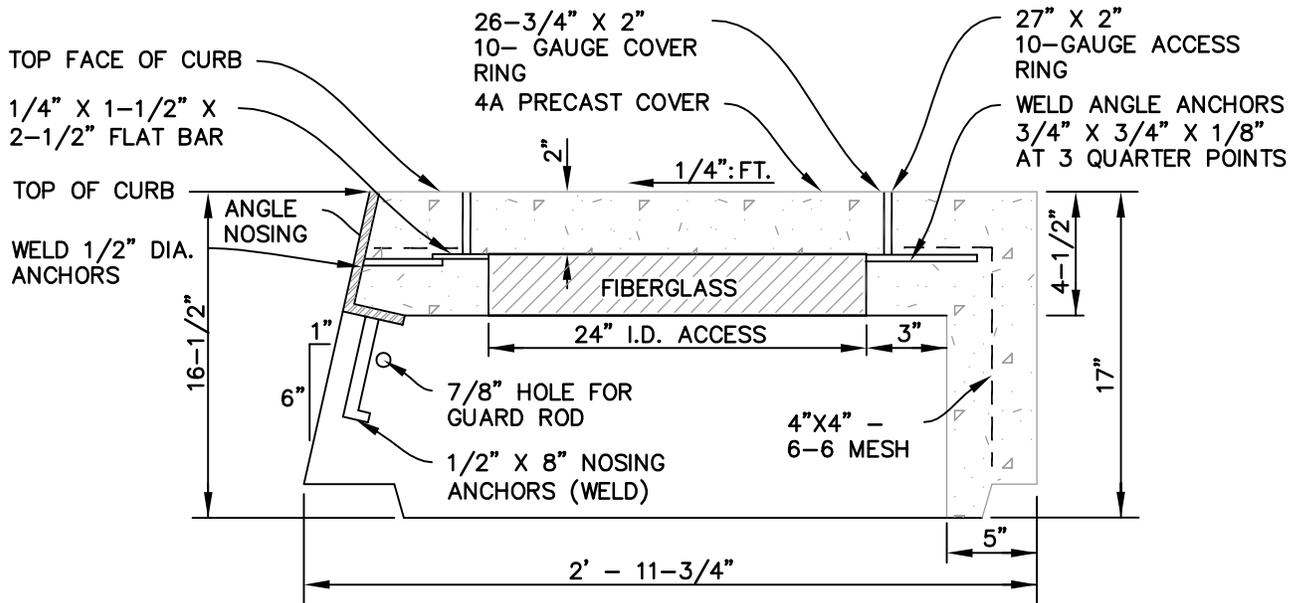
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PLAN



ELEVATION



SECTION A-A

APPROVED ALTERNATES:
 CENTRAL PRE-CAST PRODUCTS MODEL 4AC
 PHEONIX PRECAST CONC. PRODUCTS MODEL P-2448-C

NOTES:

1. ALL METAL PARTS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION PER ASTM A123.
2. CONCRETE SHALL TEST 3000 PSI AT 28 DAYS.
3. ALL REINFORCING SHALL BE 4"X4" - 6-6 MESH.
4. WEIGHT OF UNIT COMPLETE = 1500± LBS. COVER ONLY = 100± LBS.
5. 3/4" GALVANIZED STEEL GUARD ROD FOR OPENINGS IN EXCESS OF 9".
6. BASE MAY BE PRECAST OR CAST IN PLACE TO SUIT.



**PRECAST
CATCH BASIN HOOD**

STD. NO.
403

SCALE: NONE

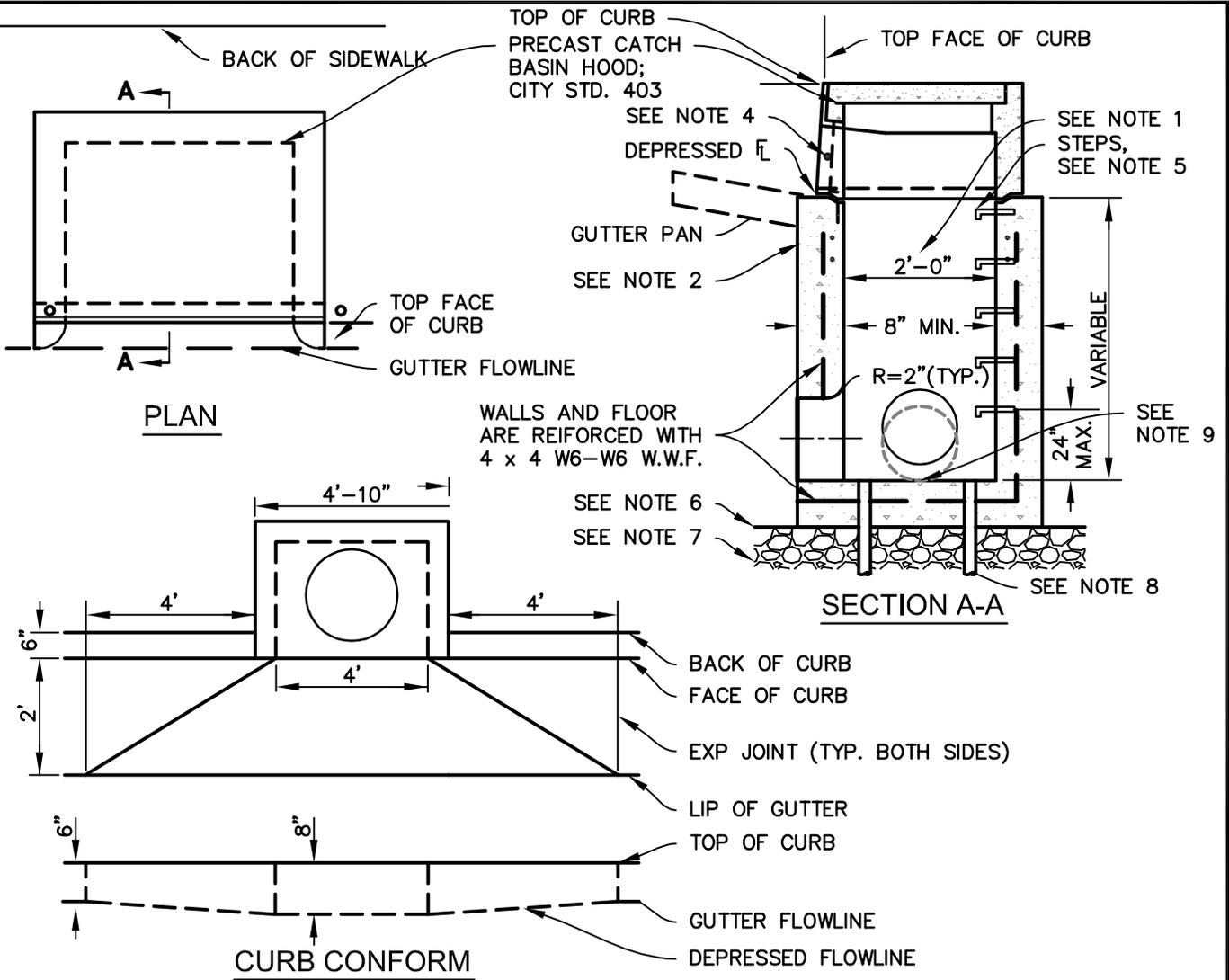
DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mennett*

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NOTES:

1. IF PIPE INTO OR OUT OF THE CATCH BASIN IS LARGER THAN 24", UNIT SHALL BE TAILOR MADE BY SUPPLIER, OR FIELD FABRICATED PER CITY STD. 405.
2. APPROVED ALTERNATES FOR CURB INLET BASE SECTIONS: CENTRAL PRE-CAST PRODUCTS BASE SECTION MODEL 4A; PHOENIX PRECAST CONC. PRODUCTS BASE SECTION MODEL D14,2.
3. ALL HOOD, BASE, AND PIPE CONNECTIONS SHALL BE GROUTED.
4. 3/4" GALVANIZED STEEL GUARD ROD MUST BE INSTALLED AT CENTER OF OPENINGS IN EXCESS OF 9" INCHES IN LENGTH.
5. STEPS ARE REQUIRED WHEN DEPTH EXCEEDS 4'. STEPS SHALL BE PLACED 12" O.C. AND SHALL BE STEEL REINFORCED POLYPROPYLENE M-A INDUSTRIES PS2-PFS, OR EQUAL.
6. POLYETHYLENE BARRIER VISQUEEN 1/4" SHEETING, OR APPROVED EQUAL. OVERLAP JOINTS 6".
7. 6" DRAIN ROCK IF WEEP HOLES ARE USED, OR 6" CLII A.B. @ 95% R.C. IF NO WEEP HOLES USED.
8. 3" P.V.C. WEEP HOLES EXTEND 1" INTO GRAVEL 20" O.C., E.W. TO BE ELIMINATED AT ENGINEER'S
9. INVERT OF INLET AND OUTLET PIPE(S) SHALL MATCH BASIN INVERT IF SUMP WITH WEEP HOLES IS NOT REQUIRED.



**CURB OPENING
CATCH BASIN**

STD. NO.
404

SCALE: NONE

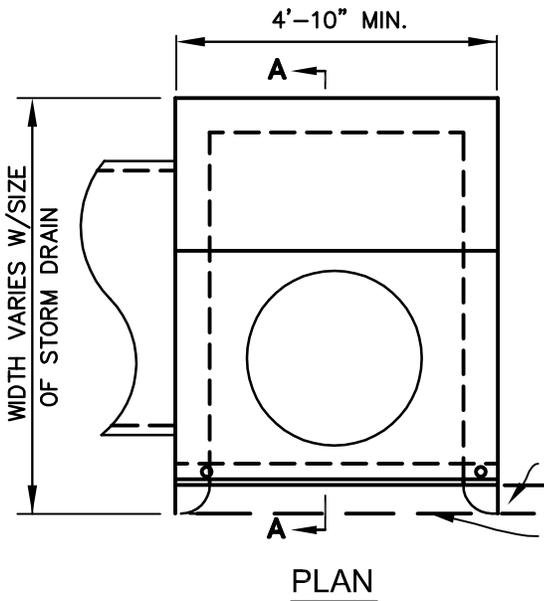
DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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 Layout Name: 405 Plot Date: Sep 29, 2009 at 10:25



PLAN

TEMPORARY REINFORCING #3
 REBAR @ 12" O.C., E.W.
 (NOT SHOWN IN SECTION A-A)

PRECAST CATCH
 BASIN HOOD;
 CITY STD. 403

TOP OF CURB

DEPRESSED

GUTTER PAN

TOP FACE STEPS,
 OF CURB SEE NOTE 1

GUTTER
 FLOWLINE
 WALLS AND FLOOR
 ARE REINFORCED
 WITH 4 x 4 W6-W6
 W.W.F.

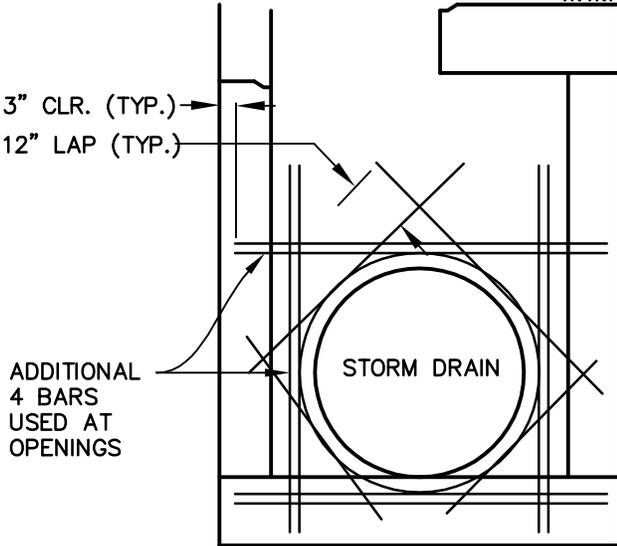
SEE NOTE 3

SEE NOTE 4

12" LAP @
 ALL COR. (TYP.)

SEE NOTE 5

SECTION A-A



REINFORCING USED @ OPENINGS

NOTES:

1. STEPS ARE REQUIRED AS PER CITY STD. NO. 404.
2. INLET AND OUTLET PIPES MAY BE PLACED IN ANY WALL.
3. POLYETHYLENE BARRIER VISQUEEN 1/4" SHEETING, OR APPROVED EQUAL. OVERLAP JOINTS 6".
4. 6" DRAIN ROCK IF WEEP HOLES ARE USED, OR 6" CLASS II A.B. @ 95% R.C. IF NO WEEP HOLES USED.
5. 3" P.V.C. WEEP HOLES EXTEND 1" INTO GRAVEL 20" O.C., E.W. TO BE ELIMINATED AT ENGINEER'S DISCRETION IF HIGH GROUNDWATER.
6. INVERT OF INLET AND OUTLET PIPE(S) SHALL MATCH BASIN INVERT IF SUMP WITH WEEP HOLES ARE NOT REQUIRED.



**CATCH BASIN FOR PIPES
 LARGER THAN 24"**

STD. NO.
405

SCALE: NONE

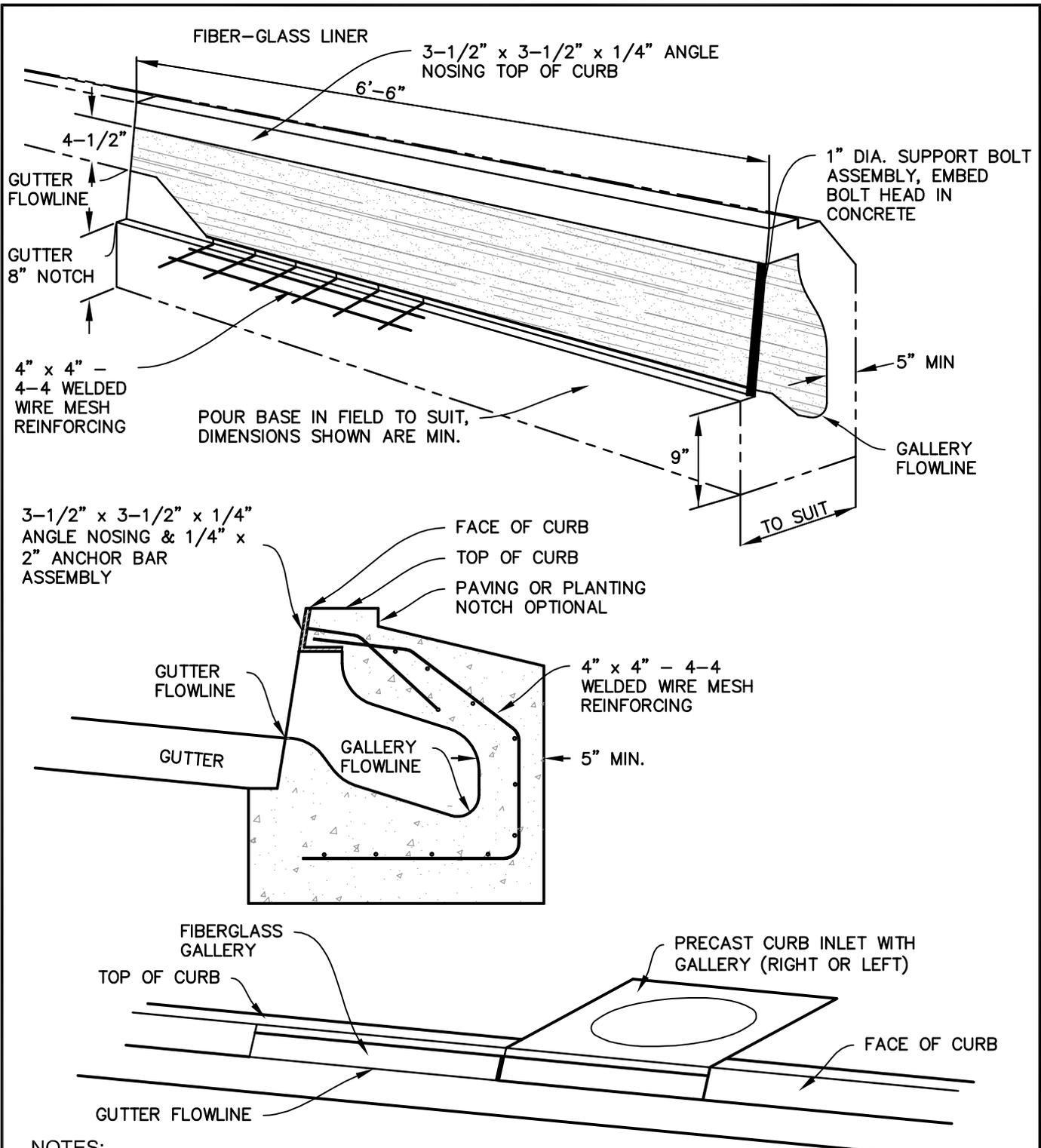
DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mannett*

DATE: OCT 2009

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NOTES:

1. CONCRETE SHALL BE 3000 PSI AT 28 DAYS.
2. NOSING ASSEMBLY (ANGLED & WELDED ANCHOR BARS) SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION PER ASTM SPEC. A123-59.
3. EITHER CAST-IN-PLACE OR PRECAST UNITS ARE ACCEPTABLE.



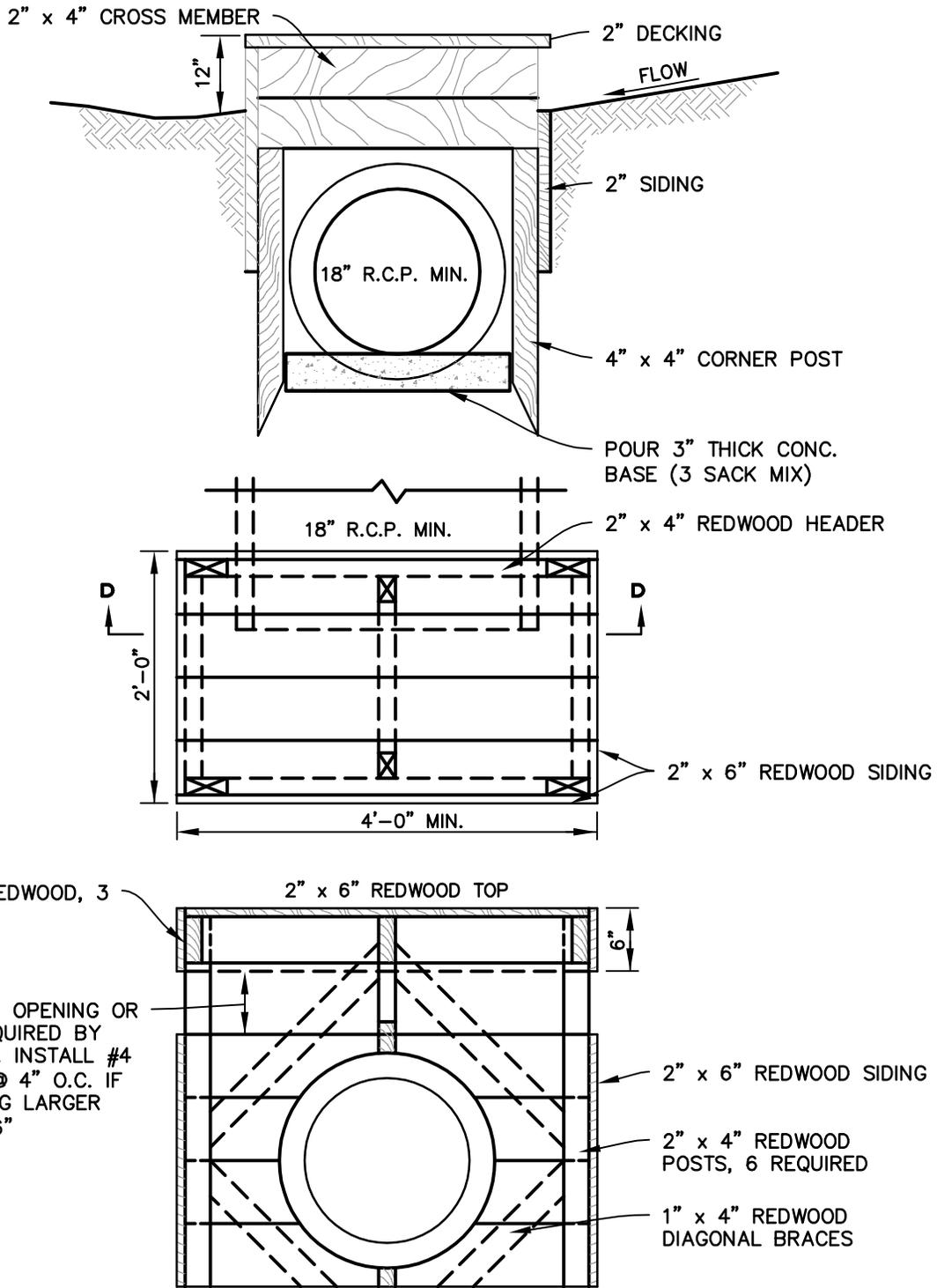
STORM DRAIN GALLERY

STD. NO.
406

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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SECTION D-D

NOTES:

1. ALL WOOD SHALL BE CONSTRUCTION HEART REDWOOD OR BETTER.
2. HOT DIPPED GALVANIZED NAILS SHALL BE USED THROUGHOUT.
3. THIS DETAIL IS TO BE USED IF THE DURATION OF USE IS LESS THAN 2 YEARS. USE A CONCRETE STRUCTURE IF LONGER DURATION.

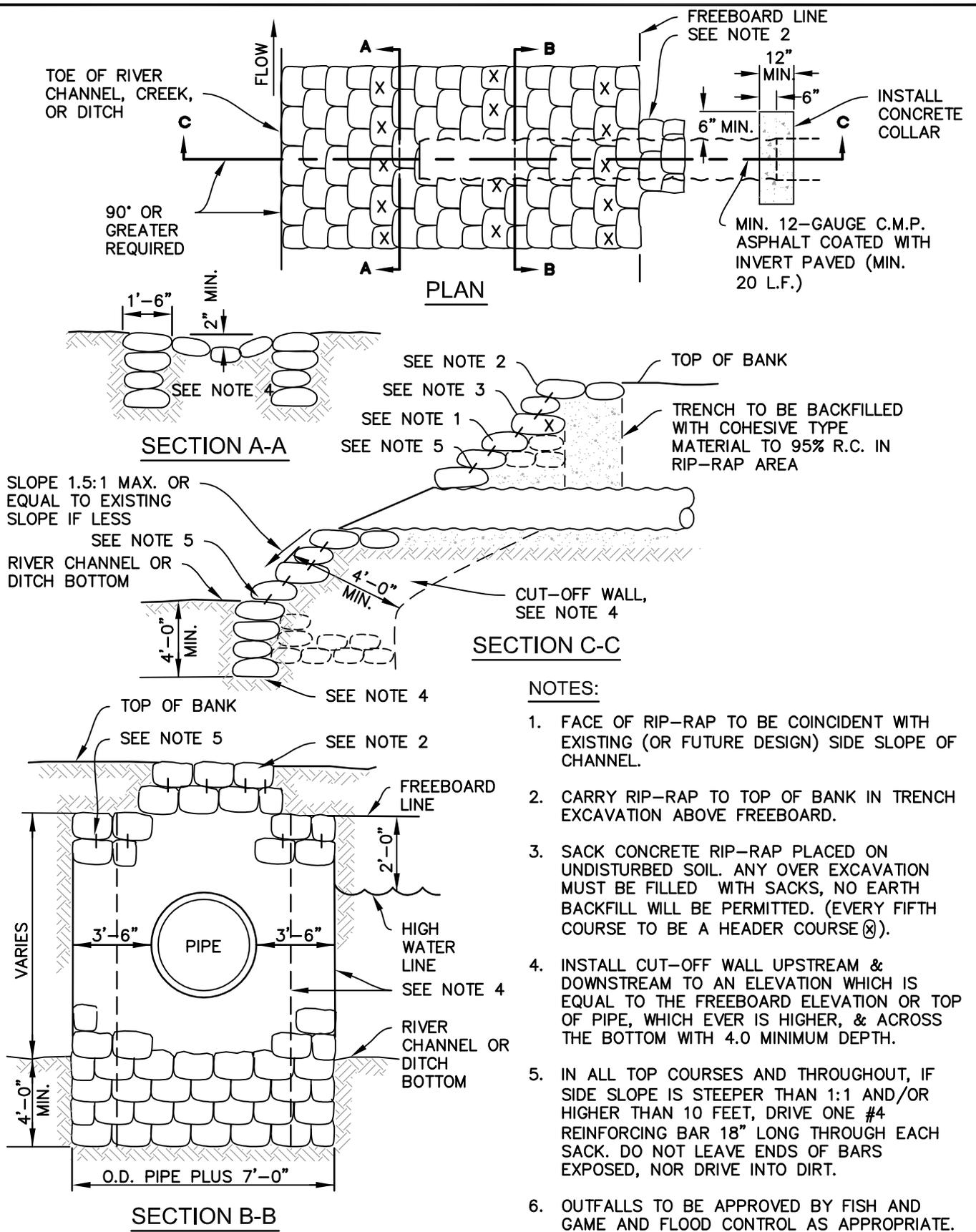


**TEMPORARY REDWOOD BOX
FIELD INLET**

STD. NO.
407

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

DATE: OCT 2009



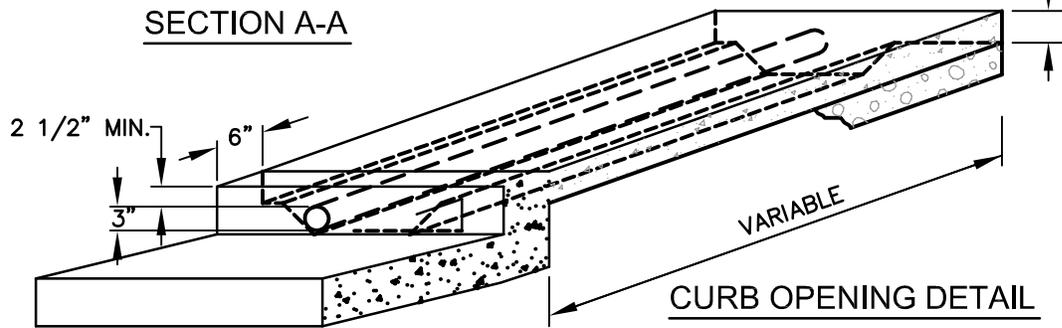
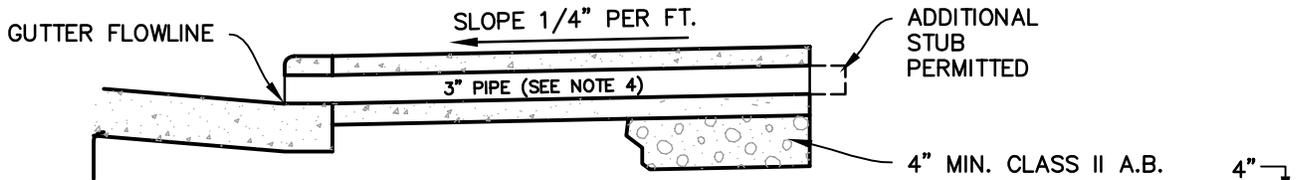
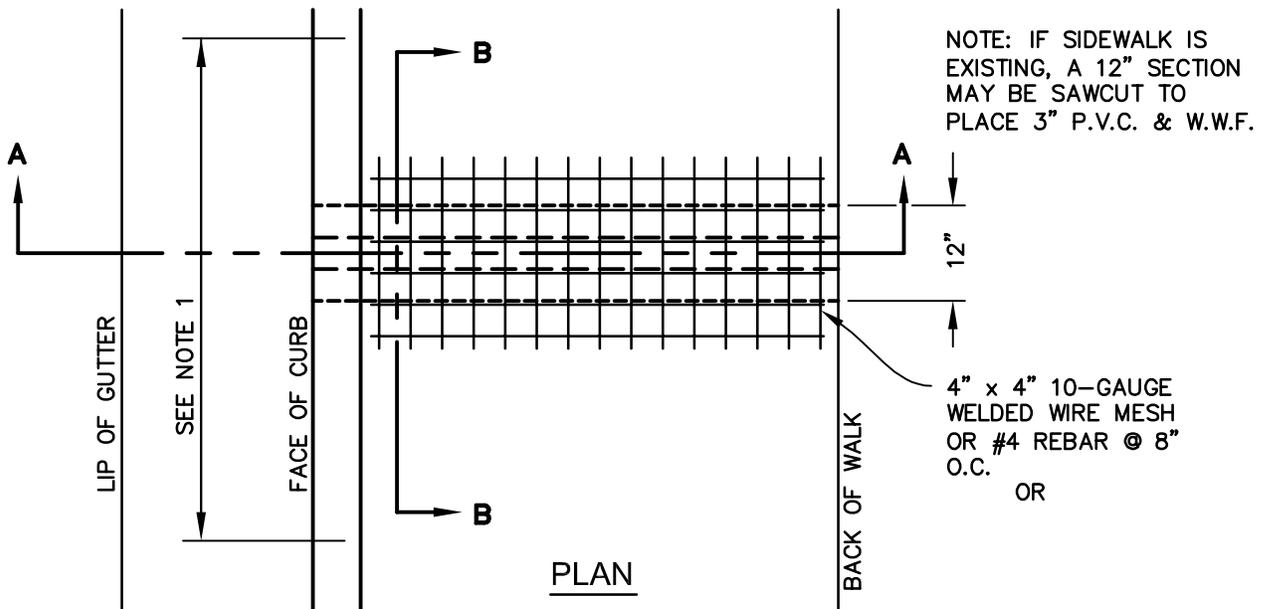
TYPICAL STORM DRAIN OUTFALL DETAIL

STD. NO.
408

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Munnell*

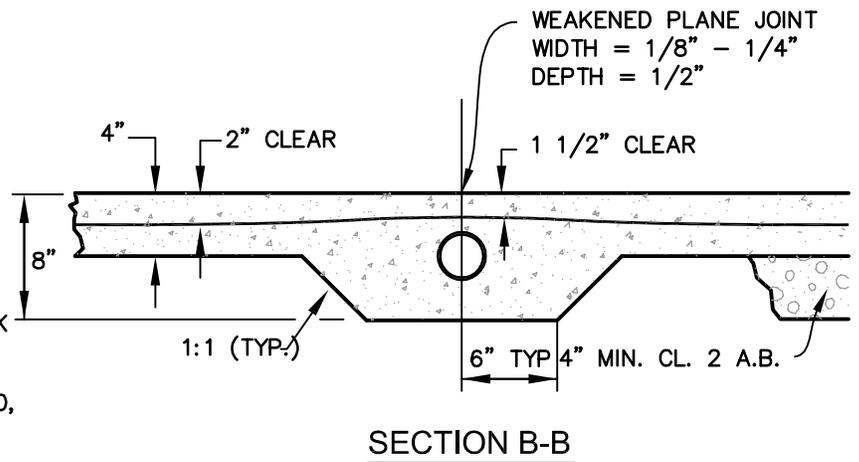
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NOTES:

1. WIRE MESH OR REBAR SHALL BE 2' WIDE. LENGTH SHALL EQUAL SIDEWALK WIDTH MINUS 4". IF SIDEWALK IS EXISTING, SEE NOTE ABOVE.
2. ON-SITE DRAINAGE AND LOCATION OF CURB OUTLETS SHALL BE BY THE OWNER TO THE SATISFACTION OF THE DIRECTOR OF PUBLIC WORKS.
3. DRAIN PIPE SHALL BE INSTALLED SO THAT TOP OF PIPE IS 2-1/2" MIN. BELOW FINISH GRADE AT BACK OF SIDEWALK.
4. SIDEWALK DRAIN TO BE 3" SCH. 40, HEAVY WALL, RIGID POLYVINYL CHLORIDE PIPE OR APPROVED SUBSTITUTE.



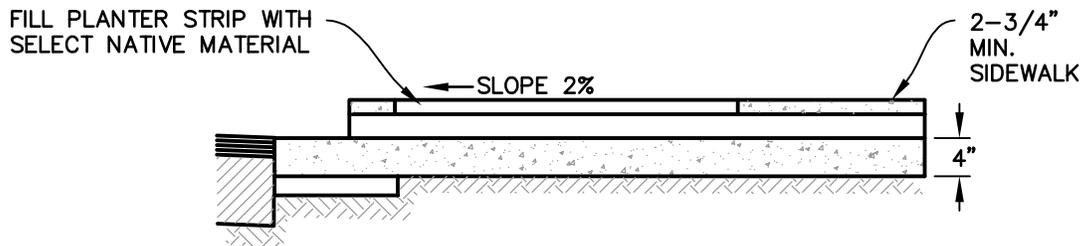
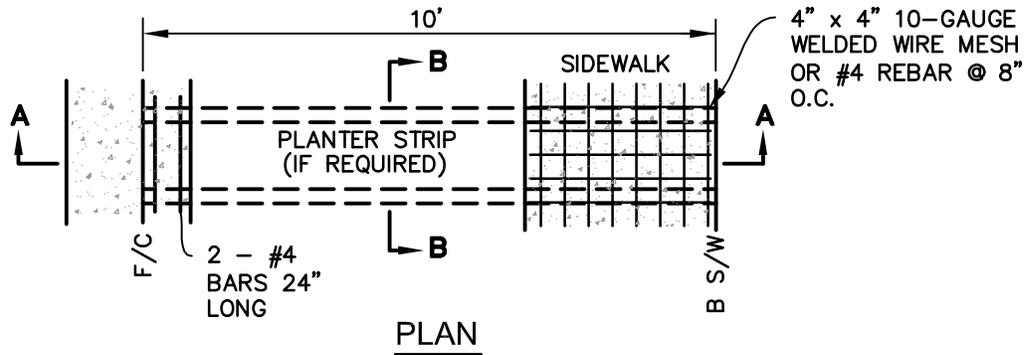
SIDEWALK DRAIN

STD. NO.
409

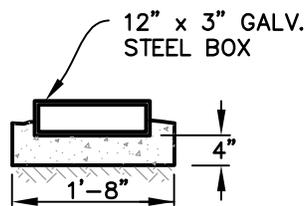
SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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SECTION A-A



SECTION B-B

NOTES:

1. WITH APPROVAL OF THE CITY ENGINEER, WIDTH OF BOX MAY VARY FROM 6" TO 12".
2. GALVANIZED STEEL TO BE 1/4" THICK.
3. ALL CONCRETE SHALL BE CLASS "A" (6 SACKS PER CUBIC YARD).



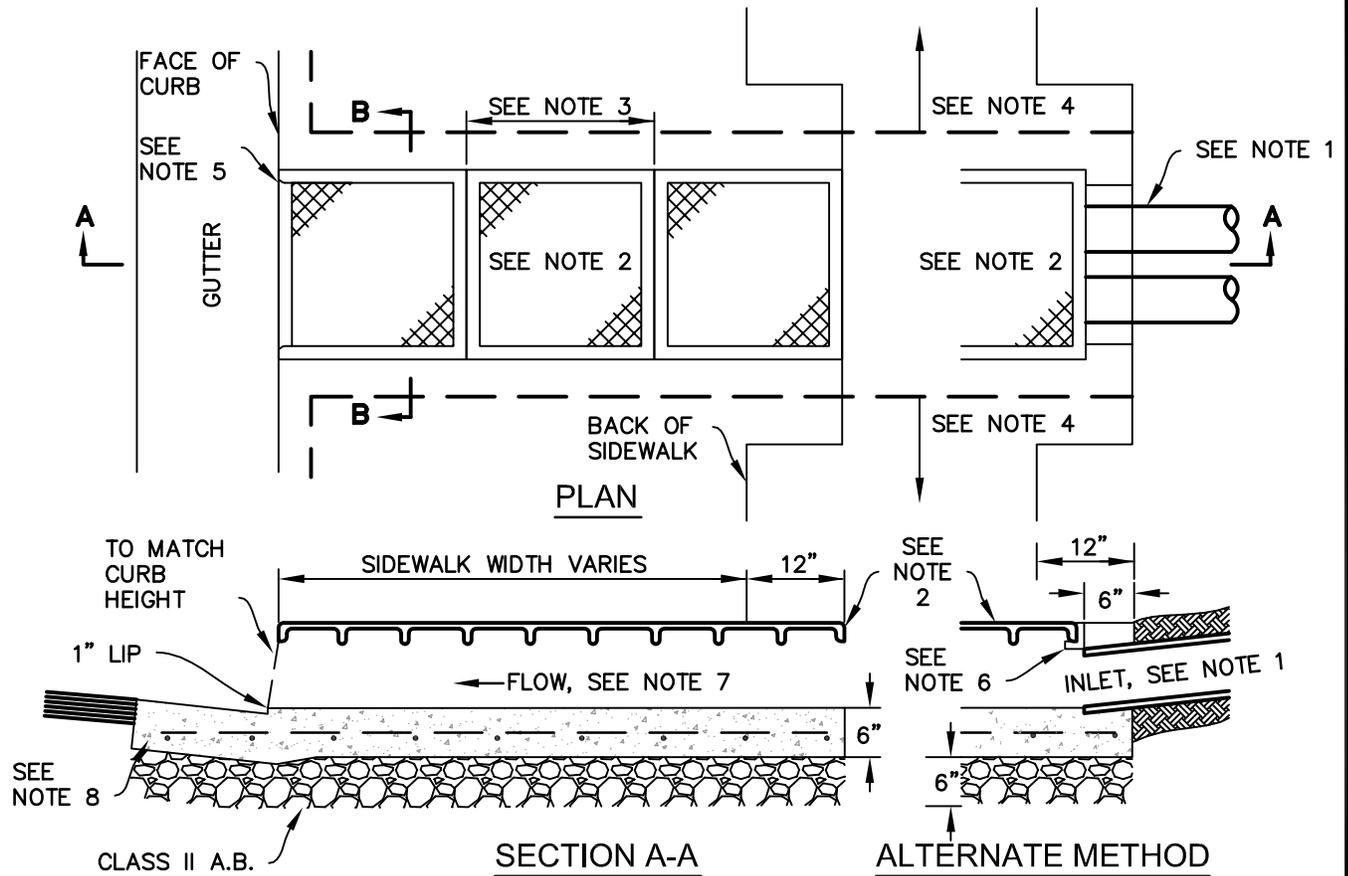
SIDEWALK CROSS DRAIN

STD. NO.
410

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

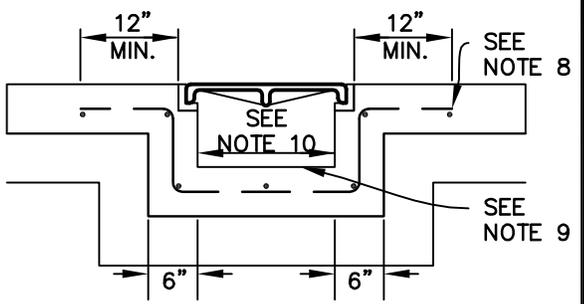
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NOTES:

1. INLET SHALL BE PAVED SWALE, RECTANGULAR CONDUIT, OR PIPE(S). MAX. INLET DIAMETER/HEIGHT SHALL BE CURB HEIGHT MINUS 2". A JUNCTION BOX SHALL HAVE ACCESS/CLEANOUT. INLET TYPE SHALL HAVE APPROVAL OF CITY ENGINEER.
2. FRAME AND COVERS: NEEHAH R-4900, TYPE D, SOLID TOP WITH PERMA-GRIP SURFACE, OR APPROVED EQUAL. THERE SHALL BE A 1/8" SPACE BETWEEN THE FRAME AND THE LID. COVERS SHALL BE COATED WITH EPOXY PAINT COLORED TO MATCH SIDEWALK COLOR.
3. COVER LENGTH SHALL MAINTAIN A COVER WEIGHT OF AT LEAST 100 LBS EACH.
4. UNDERDRAIN SHALL NOT BE CLOSER THAN 5' FROM DRIVEWAY OR CURB RETURN.
5. 1" RADIUS AT END OF CHANNEL, EACH SIDE OF OUTLET.
6. FRAME END PIECE, REQUIRED FOR ALTERNATE METHOD.
7. CHANNEL SLOPE SHALL BE NO LESS THAN 2% AND SHALL BE PARALLEL WITH SIDEWALK SURFACE.
8. #4 REBAR @ 12" O.C., E.W.
9. CONCRETE SHALL BE CLASS "A" P.C.C.
10. CHANNEL WIDTH VARIES, 18" MIN. AND 3' MAX.



SECTION B-B



**SIDEWALK UNDERDRAIN
WITH COVER PLATE**

STD. NO.
411

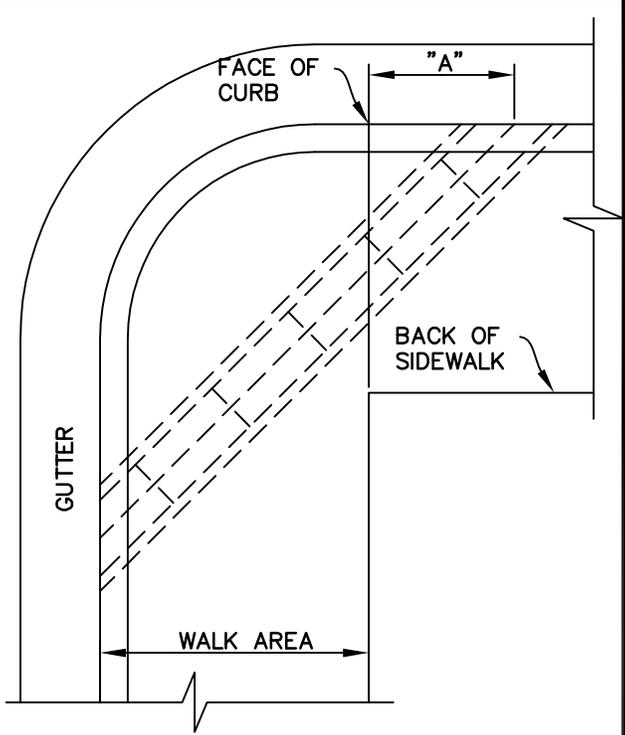
SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

DATE: OCT 2009

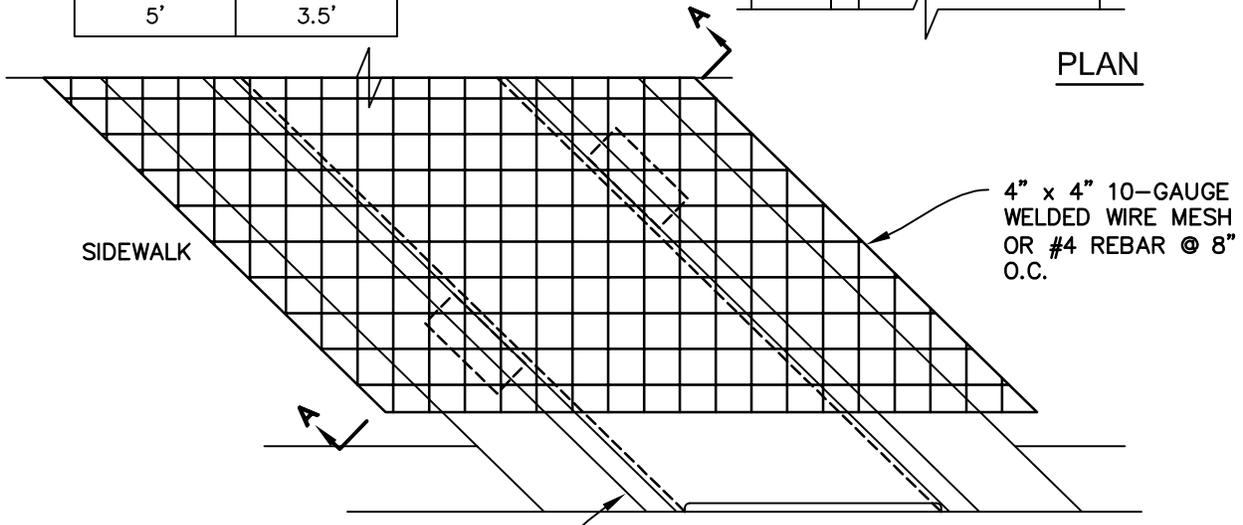
NOTES:

1. BOTTOM OF DRAIN TO BE SMOOTHED PRIOR TO SETTING CHANNEL IN WET CONCRETE.
2. DRAIN TO SLOPE A MINIMUM OF 2% TOWARDS GUTTER.
3. AFTER SETTING CHANNEL, THICKENED AREA SHALL BE ALLOWED TO SET UP ENOUGH TO PREVENT FURTHER SINKING OF CHANNEL. A COLD JOINT IS ACCEPTABLE.
4. WIRE FABRIC SHALL BE 4' LONG (MIN.). WIDTH SHALL BE EQUAL SIDEWALK WIDTH MINUS 4".

WALK AREA	"A"
12'	2'
10'	4'
9'	5'
8'	6'
6'	4'
5'	3.5'



PLAN



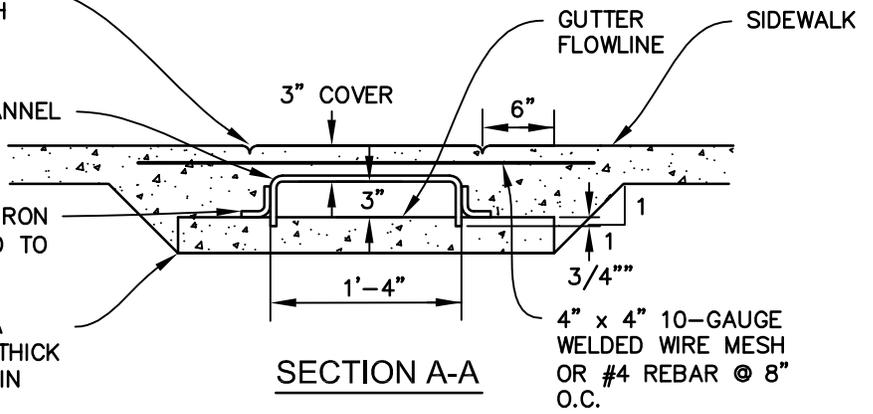
PLAN

DEEP JOINTS
1/2" MAX. WIDTH

3/8" STEEL CHANNEL

2" x 2" ANGLE IRON
6" LONG WELDED TO
DRAIN

THICKENED AREA
2'-6" WIDE 3" THICK
MIN. BELOW DRAIN
FLOWLINE



SECTION A-A

4" x 4" 10-GAUGE
WELDED WIRE MESH
OR #4 REBAR @ 8"
O.C.

4" x 4" 10-GAUGE
WELDED WIRE MESH
OR #4 REBAR @ 8"
O.C.

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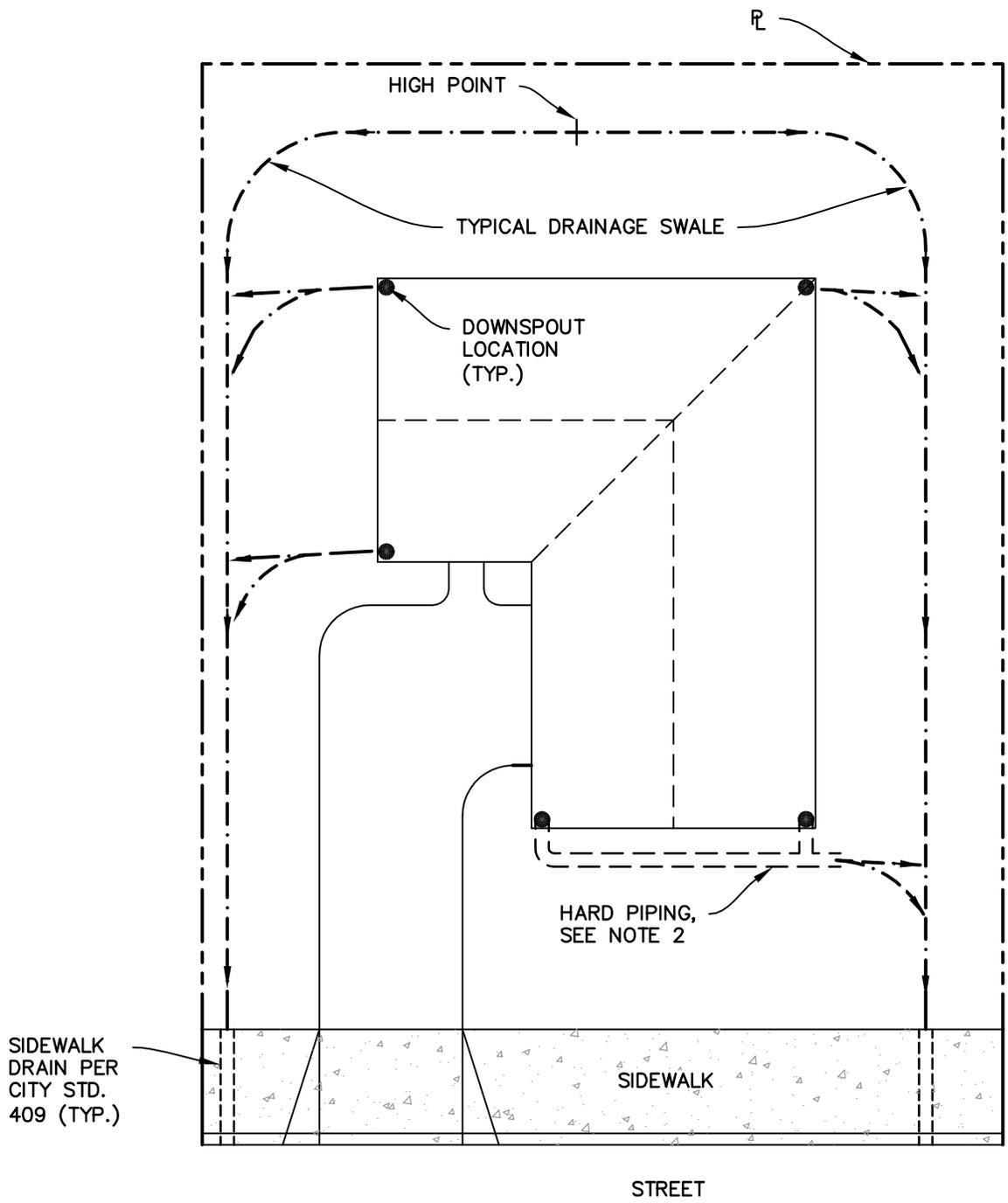
**SIDEWALK CORNER
CROSS DRAIN**

STD. NO.
412

SCALE: NONE DRAWN: ERJ CHK: MGK APPVD: *Thomas M. Mennett*

DATE: OCT 2009

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NOTES:

1. ALL ROOF DRAINAGE MUST BE ROUTED FROM EACH DOWNSPOUT THROUGH SURFACE SWALES TO SIDEWALK DRAIN OR OTHER APPROVED DRAINAGE STRUCTURE.
2. HARD PIPING SHALL BE FLEXIBLE A.D.S. PIPE WITH POSITIVE DRAINAGE TO SWALES, AS APPROVED BY THE DIRECTOR OF PUBLIC WORKS OR BUILDING OFFICIAL.
3. ALL CONCENTRATED DRAINAGE FROM A PARCEL MUST BE INTERCEPTED INTO AN UNDERGROUND SYSTEM PRIOR TO CROSSING SIDEWALKS.
4. ALL HARD PIPING SHALL BE BURIED.

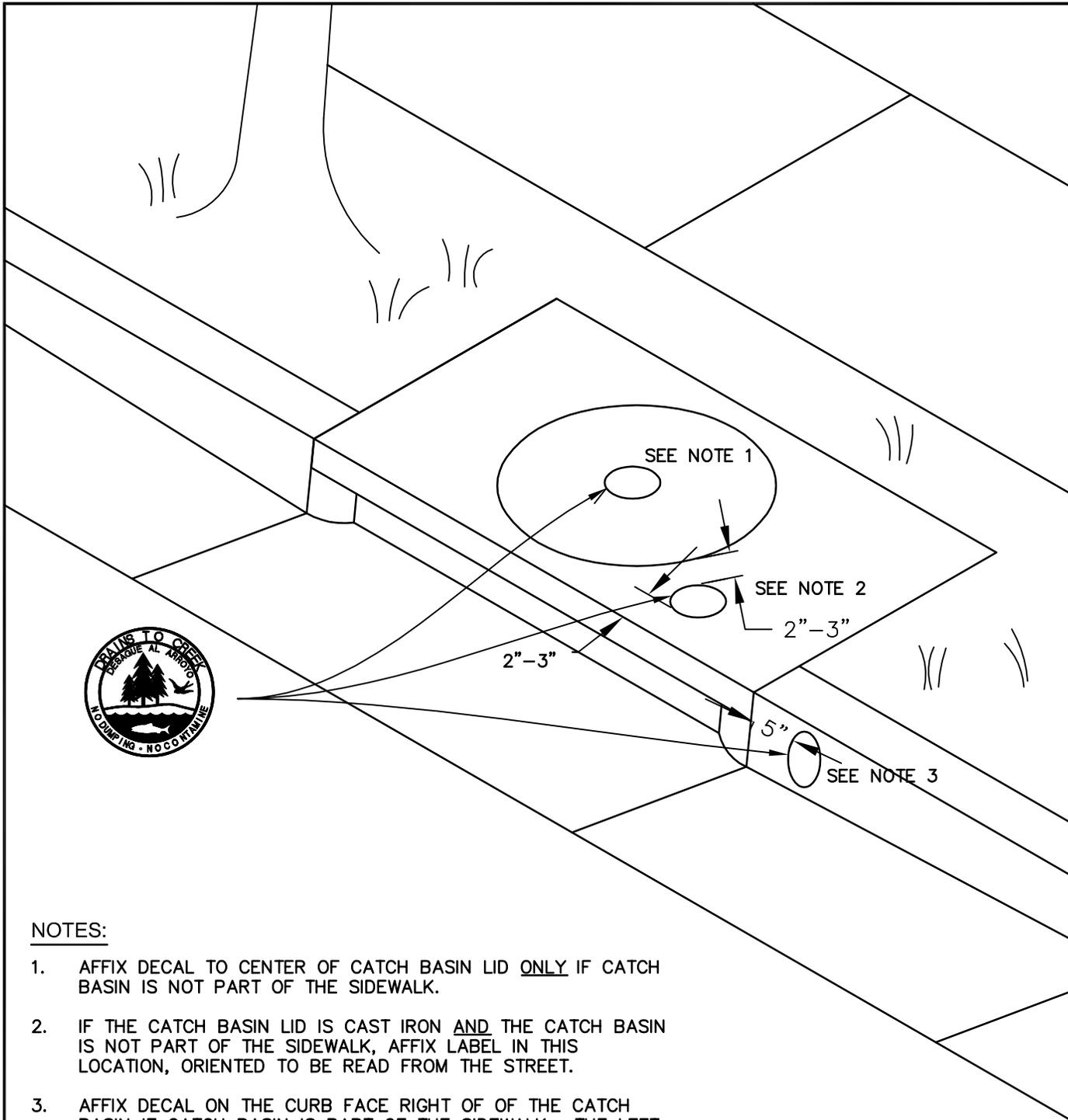


TYPICAL LOT DRAINAGE

STD. NO.
413

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

DATE: OCT 2009



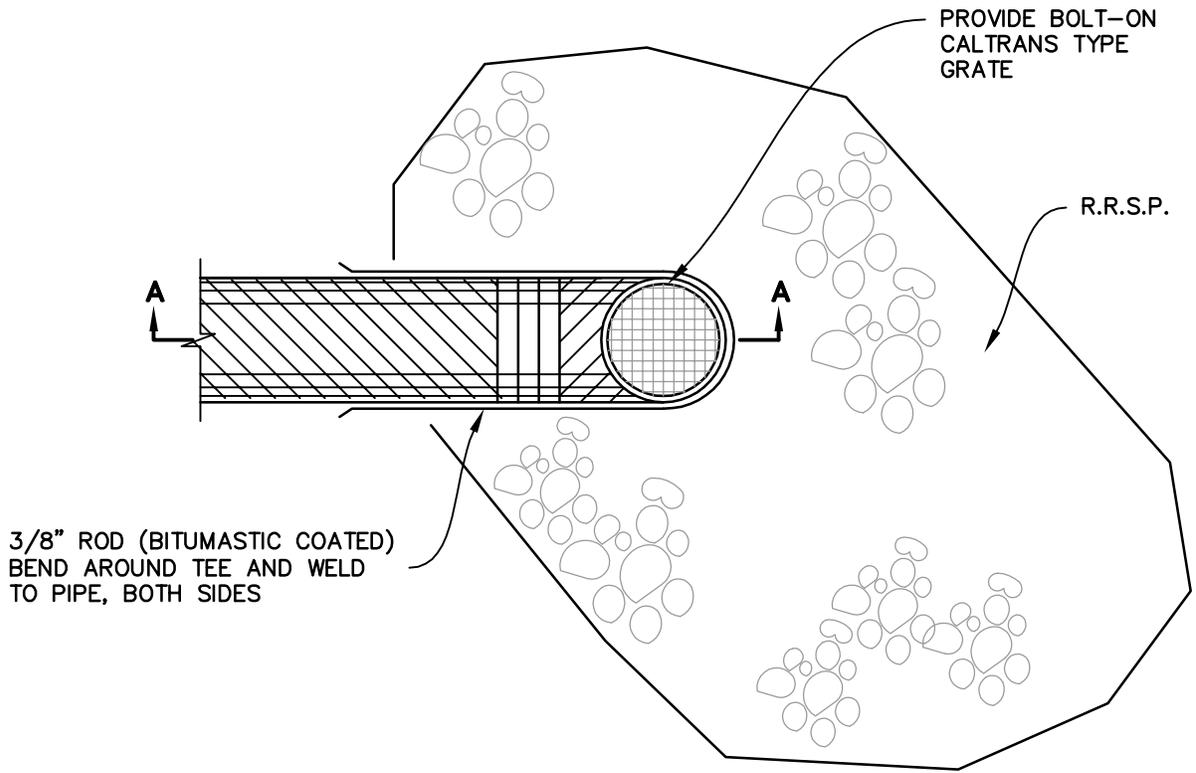
NOTES:

1. AFFIX DECAL TO CENTER OF CATCH BASIN LID ONLY IF CATCH BASIN IS NOT PART OF THE SIDEWALK.
2. IF THE CATCH BASIN LID IS CAST IRON AND THE CATCH BASIN IS NOT PART OF THE SIDEWALK, AFFIX LABEL IN THIS LOCATION, ORIENTED TO BE READ FROM THE STREET.
3. AFFIX DECAL ON THE CURB FACE RIGHT OF OF THE CATCH BASIN IF CATCH BASIN IS PART OF THE SIDEWALK. THE LEFT SIDE MAY BE USED IF THE RIGHT SIDE CURB IS DAMAGED OR PAINTED.

APPROVED STORM DRAIN LABELS
 SEE ENGINEER'S APPROVED LIST

	<h2>STORM DRAIN MESSAGE LAYOUT</h2>				STD. NO. <h1>414</h1>
	SCALE: NONE	DRAWN: ERJ	CHK: MGK	APPVD: <i>Thomas M. Mannett</i>	DATE: OCT 2009

Images: Willits Logo.ppt; Xrefs: Path: \\grosvr1.corp.w-and-k.com\PROJECTS\01064 - City of Willits\01064-09-001\Willits City Standards\CAD\01064-09-001\dwg\Willits400-417.dwg Layout Name: 415 Plot Date: Sep 29, 2009 at 10:25

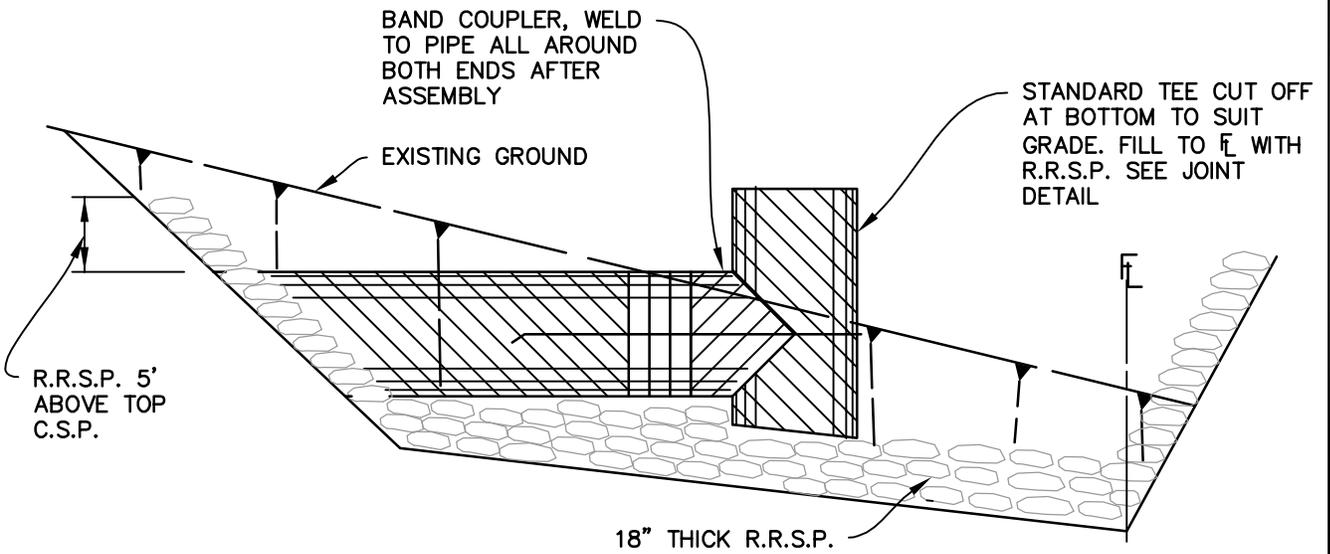


3/8" ROD (BITUMASTIC COATED)
BEND AROUND TEE AND WELD
TO PIPE, BOTH SIDES

PROVIDE BOLT-ON
CALTRANS TYPE
GRATE

R.R.S.P.

PLAN



BAND COUPLER, WELD
TO PIPE ALL AROUND
BOTH ENDS AFTER
ASSEMBLY

STANDARD TEE CUT OFF
AT BOTTOM TO SUIT
GRADE. FILL TO \bar{F} WITH
R.R.S.P. SEE JOINT
DETAIL

EXISTING GROUND

R.R.S.P. 5'
ABOVE TOP
C.S.P.

18" THICK R.R.S.P.

SECTION A-A



**DOWN DRAIN
ENERGY DISSIPATER**

STD. NO.
415

SCALE: NONE

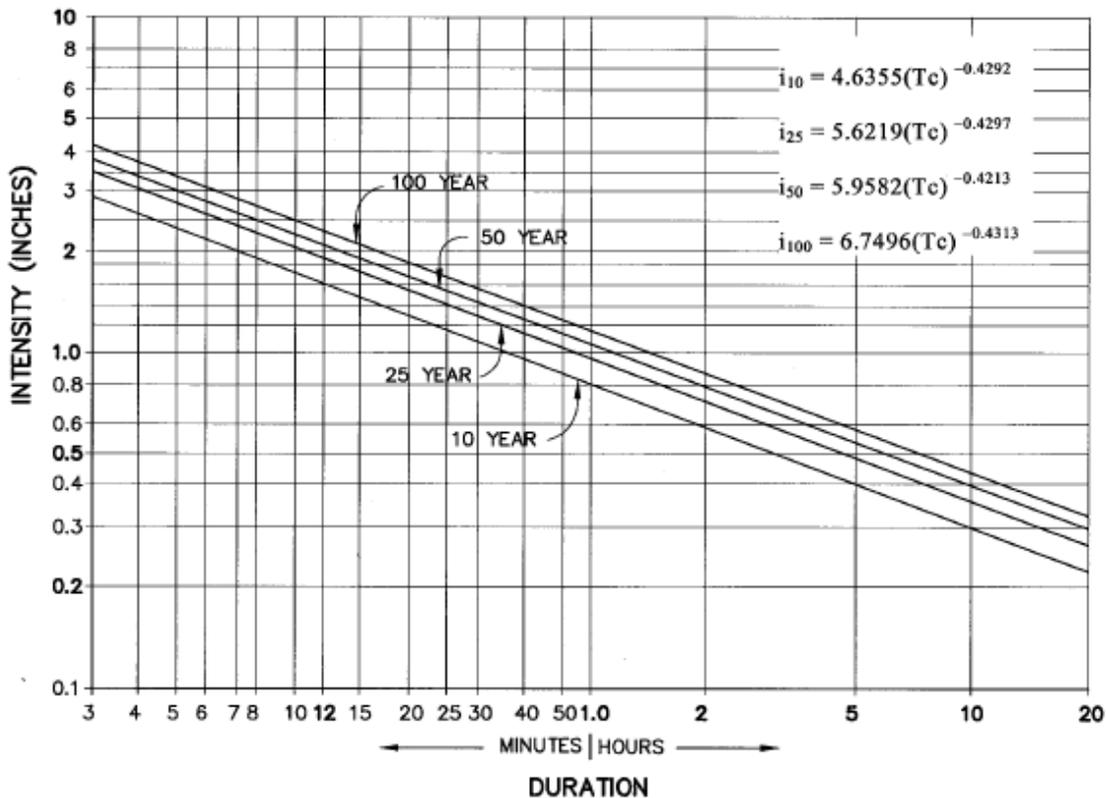
DRAWN: ERJ

CHK: MGK

APPVD: *Thomas M. Mannett*

DATE: OCT 2009

INTENSITY-DURATION-FREQUENCY CHART



STATION DATA	
LONGITUDE:	123.317
LATITUDE:	39.350
ALTITUDE:	1925
YEARS OF DATA:	1940-1986

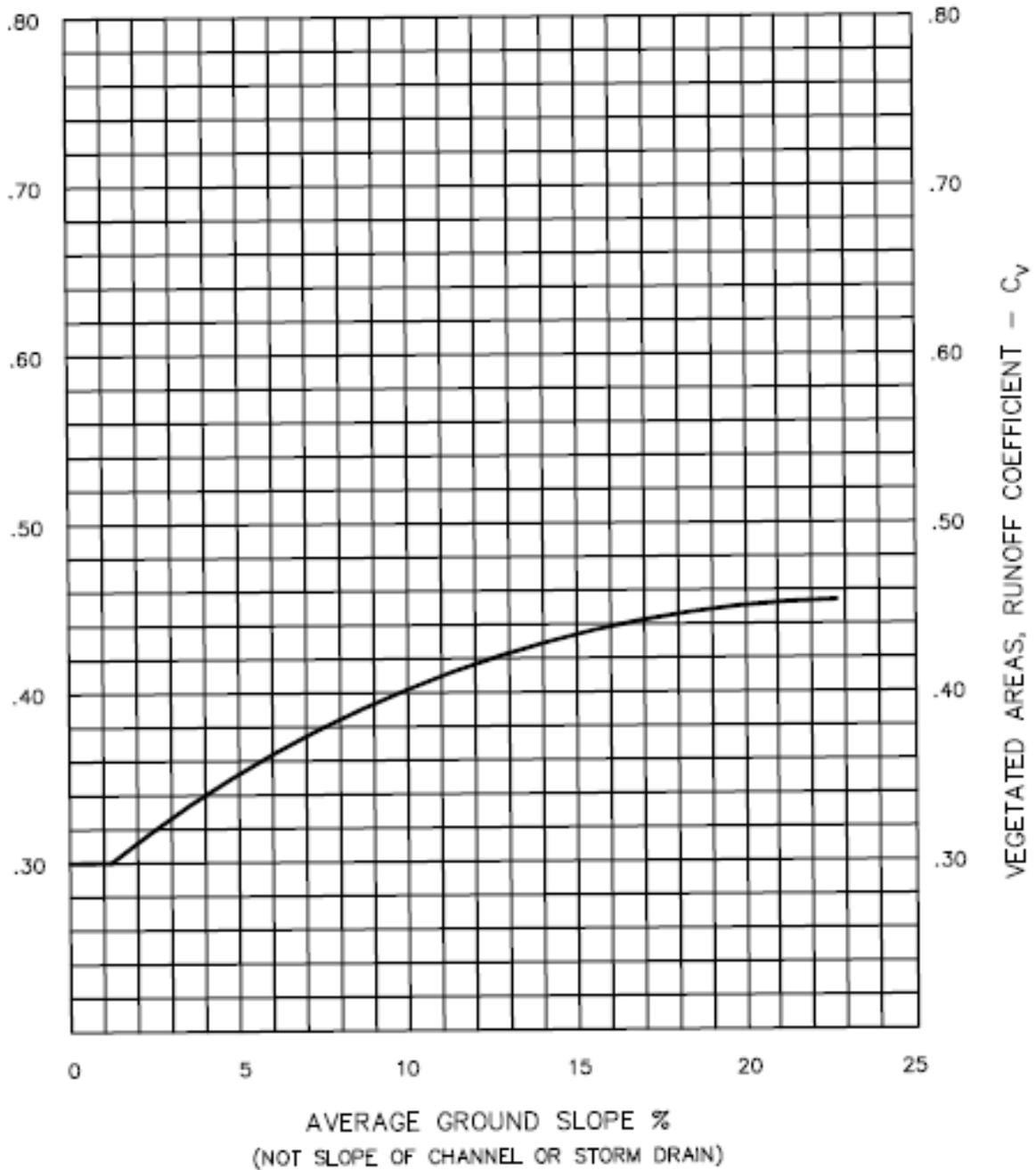


INTENSITY-DURATION-FREQUENCY CURVES

STD. NO.
416

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

DATE: OCT 2009



RUNOFF COEFFICIENTS FOR RATIONAL FORMULA, VEGETATED AREA

STD. NO.
417

SCALE: NONE | DRAWN: ERJ | CHK: MGK | APPVD: *Thomas M. Mannett*

DATE: OCT 2009