

Manual of Standard Plans

2007
EDITION



A Manual for General Contractors and the Construction Industry

Manual of Standard Plans

2007
EDITION

Published by
Utah LTAP Center
Utah State University
8205 Old Main Hill
Logan UT 84322-8205
(800) 822-8878 or (435) 797-2931

A Manual for General Contractors and the Construction Industry

Copyright © 1997

**UTAH CHAPTER
AMERICAN PUBLIC WORKS ASSOCIATION**

**UTAH CHAPTER
THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA**

Non-commercial, educational and scientific use of this document by regulatory agencies is regarded as a fair use and not a violation of copyright. Regulatory agencies may make additional copies of any part of this document for their own internal use. Copies may also be made available to the public by regulatory agencies as required by law.

Printed in the United States of America

First printing July, 1997 - 600 copies
Second Printing, January 2002 - 1,200 copies
Third Printing, January 2007, 2,000 copies

PREFACE

With the help of the Utah Chapter of the Associated General Contractors of America, the Standard Plans Committee worked under the jurisdiction of the Utah Chapter of the American Public Works Association and first published this manual in 1997.

This manual was developed from standard plans published by Cities, Counties and various improvement districts along the Wasatch front. Representatives from various municipalities and utility districts participated in the review of this document.

The original edition contained compromises where divergent views had to be reconciled. Generally these views had to do with differences in established local practice with no clear-cut superiority of one method over another. This edition is a result of various changes and improvements approved by the Standard Plans Committee.

This Manual is published as a service to cities, counties and public agencies in the State of Utah. It is intended as a useful guide, rather than as a codification of the best standards that exclude other standards. Certainly, in many instances, there are other ways of accomplishing the desired construction utilizing alternate methods and materials.

The construction industry has embraced this manual because it provides construction uniformity among contracting agencies that have adopted the use of this manual.

To recommend an improvement to this document, submit the following information to the chairman of the Standard Specifications and Drawings Subcommittee. The web site is (<http://utah.apwa.net>).

- Identification of the problem.
- Recommendation of how to solve the problem.
- Provision of recommended text or drawing supporting the recommendation.

Construction experts and design professionals will carefully review the proposed changes in open meetings.

REFERENCE

The term "APWA Section" which is used on the plans refers to specification sections published by the Utah Chapter of the American Public Works Association in the document entitled "Manual of Standard Specifications". The Manual of Standard Specifications has been in existence since 1991 and was originally entitled "Utah Public Works General Conditions and Standard Specifications for Construction".

ENGLISH EQUIVALENT

Metric	Recommended English Equivalent
2.36 mm	1/8 in.
4.75 mm	1/4 in.
9.5 mm	3/8 in.
12.5 mm	1/2 in.
19.0 mm	3/4 in.
25.0 mm	1 in.
37.5 mm	1-1/2 in.
75 mm	3 in.
150 mm	6 in.
200 mm	8 in.
250 mm	10 in.
300 mm	12 in.

Metric	Recommended English Equivalent
400 mm	15 in.
500 mm	18 in.
600 mm	2 ft.
800 mm	2 ½ ft.
900 mm	3 ft.
1.00m	3 ½ ft.
1.25 m	4 ft.
1.50 m	5 ft.
1.75 m	6 ft.
2.00 m	7 ft.
2.50 m	8 ft.

The “Recommended English Equivalents” are rounded for use in interpreting metric sizes

SLOPE

Rise : length	Percent	Degrees
1 : 6.25	16.00	9.0903
1 : 8	12.50	7.1250
1 : 8.33	12.00	6.8455
1 : 10	10.00	5.7106
1 : 12	8.33	4.7636
1 : 13	7.69	4.3987
1 : 14	7.14	4.0856
1 : 15	6.67	3.8241
1 : 16	6.25	3.5763
1 : 17	5.88	3.3665
1 : 18	5.55	3.1798
1 : 19	5.26	3.0128
1 : 20	5.00	2.8624
1 : 30	3.33	1.9092
1 : 50	2.00	1.1458
1 : 100	1.00	0.5729

CONTENTS

Preface	i
Reference	i
English equivalent	ii
Slope	ii
Contents	iii

PART 1 – GENERAL REQUIREMENTS

Contract Closeout

110	Arrow diagram for project close-out	3
-----	---	---

Erosion Control

121	Straw bale barrier	5
122	Silt fence	7
123	Diversion dike	9
124	Inlet protection	11
125	Equipment and vehicle wash down area	17
126	Stabilized roadway entrance	19

PART 2 - ROADWAY

Abbreviations and Symbols

201	Abbreviations and symbols for roadway drawings	23
-----	--	----

Curb, Gutter, Driveway, Sidewalk

205	Curb and gutter	25
209	Curbs	29
211	Waterway	31
213	Waterway transition structure	33
215	Dip driveway approach	35
216	Mountable curb driveway approach	37
221	Flare driveway approach	39
222	Saw-cut driveway approach	43
225	Open driveway approach	45
229	Piped driveway approach	47
231	Concrete sidewalk	51
232	Patterned concrete park strip	53
235	Corner curb cut assembly	55
236	Tangent curb cut assembly	61
237	Islands and median	67
238	Detectable warning surface	69
241	Parking meter post	71
242	Form strip filler	73

Roadways

251	Asphalt concrete pavement tie in	75
-----	--	----

PART 2 - ROADWAY (Continued)

252	Curb and gutter replacement without pavement tie in	77
253	Asphalt concrete pavement overlay	79
255	Asphalt concrete "T" patch	83
256	Concrete pavement patch	87
261	Concrete pavement joints	89
265	Crack sealing – asphalt pavement	93
266	Crack filling – asphalt pavement	95

Survey Monument

271	Corner and boundary markers	97
272	Monument cap and base	99
273	Frame and cover for monument	101
274	Survey monument placement under pavements	103
275	Cover collar for survey monuments	105

General

291	Defective concrete	107
292	Street name sign (typical)	109

PART 3 - STORM DRAIN

Abbreviations and Symbols

301	Abbreviations and symbols for storm drains	113
-----	--	-----

Catch Basins, Inlets, Outlets and Hardware

302	30" Frame and cover	115
303	44" Frame and cover	119
304	48" Cover and frame	121
305	51" Cover and frame	123
308	35 1/2" Grate and frame with adjustable curb box	129
309	47 3/4" Grate and frame	131
310	48" Grate and frame	135
315	Catch basin	137
316	Combination inlet/cleanout box	141
317	Curb inlet/outlet	143
320	Debris grate inlet	147
321	Automatic flap gate (pressurized storm drains)	149
322	Curb outlet	151
323	Pipe outfall access control rack	153

Cleanout Box and Hardware

330	Cleanout box	155
331	Cleanout box	157
332	Cast in-place manhole	159
335	Adjust reinforced concrete deck to grade	161

PART 3 – STORM DRAIN (Continued)

Manhole and Hardware	
341	Precast manhole 163
345	Concrete deck 167
360	Raise frame to grade – plastic form 169
361	Raise frame to grade – grade ring 171
362	Cover collar for storm drains 173
Piping	
372	Area drain 175
373	Concrete pier 177
Trenching	
381	Trench Backfill 179
382	Pipe zone backfill 181

PART 4 - SANITARY SEWER

Abbreviations and Symbols	
401	Abbreviations and symbols for sewer 185
Manholes and Hardware	
402	30" Frame and cover 187
411	Sanitary sewer manhole 189
412	Invert cover 191
413	Cover collar for sanitary sewer manhole 193
Piping	
431	Sewer lateral connection 195
432	Sewer lateral relocation 197
433	Pipe drop 199
Liquid Separation Systems	
441	Grease trap 201

Trenching - See Trenching requirements under Section 3

PART 5 - WATER SYSTEMS

Abbreviations and Symbols	
501	Abbreviations and symbols for water 205

PART 5 – WATER SYSTEMS (Continued)

Concrete Boxes and Hardware

502	27" Frame and cover	207
503	38" Frame and cover	209
505	Concrete boxes	211

Fire Hydrants

511	Fire hydrant with valve.....	213
-----	------------------------------	-----

Meters

521	3/4" and 1" meter.....	215
522	1 1/2" and 2" meter.....	217
523	3" & 4" Compound meter with 2" bypass	219
525	6" Compound meter with 2" bypass	221
527	8" Compound meter with 2" bypass	223
529	10" Turbo meter with 6" turbo meter and 2" bypass	225

Monitoring Systems

535	Electrolysis monitoring station details	227
-----	---	-----

Piping

541	Water service line.....	229
542	Waterline loop	231
543	Fire hydrant relocation.....	233
551	3/4" and 1" Service taps	235
552	1 1/2" and 2" Service taps	237

Trust Blocks

561	Direct bearing thrust block.....	239
562	Tie-down thrust restraints.....	241

Trenching - See Trenching requirements under Section 3

Valves

571	2" Washout valve	243
572	Detector check valve with 3/4" bypass meter	245
573	6" Pressure reducing valve with 2" bypass	247
574	Cover collar for water valve boxes	249
575	Air release assembly	251

General

593	Pressurized irrigation water and potable water interface	253
-----	--	-----

PART 6 - IRRIGATION AND LANDSCAPING

Abbreviations and Symbols

601	Abbreviations and symbols for irrigation and landscaping.....	259
-----	---	-----

Gravity Flow System

611	Curb inlet box for irrigation	261
613	Irrigation diversion box	263
614	Irrigation diversion box	265

Heads

621	Stationary head	267
622	Pop-up head	269

Valves

631	Backflow preventer	271
632	Drain valve.....	273
633	Control valve.....	275
635	Isolation shut-off valve.....	277

Electrical

651	Wire runs for landscape irrigation	279
-----	--	-----

Trees and Plants

681	Tree	281
683	Shrubs and bushes	283

PART 7 - COMMUNICATIONS, LIGHTING, TRAFFIC CONTROL

COMMUNICATIONS

LIGHTING

Street Lighting

710	Riser	287
730	Collar for street light pole	289
731	Pull box.....	291
732	Trench for street light conduit.....	293
733	Joint use trench – street lighting.....	297
736	Street light pole terminal	299
737	Street light meter pedestal	301
741	Screw-in base street light pole	303
742	Direct burial street light pole	305

PART 7 – COMMUNICATIONS, LIGHTING, TRAFFIC CONTROL (Continued)

TRAFFIC CONTROL

Light Pole Standards

751	Signal pole foundation.....	307
752	Signal pole wiring	309

Speed Humps

761	Speed Bump.....	311
762	Speed Table	313

PART 8 - GENERAL FACILITIES

Design Standards

805	Design vehicle – type A.....	317
805	Design vehicle – type B.....	319

Security Fencing

831	Chain link fence.....	321
-----	-----------------------	-----

Miscellaneous

880	Bus stop pad	323
-----	--------------------	-----

TOPICAL INDEX	325
----------------------------	------------

END OF CONTENTS

PART 1

GENERAL REQUIREMENTS

Contract Closeout

Plan 110 Arrow diagram for project close-out.....3

Erosion Control

121 Straw bale barrier 5

122 Silt fence 7

123 Diversion dike 9

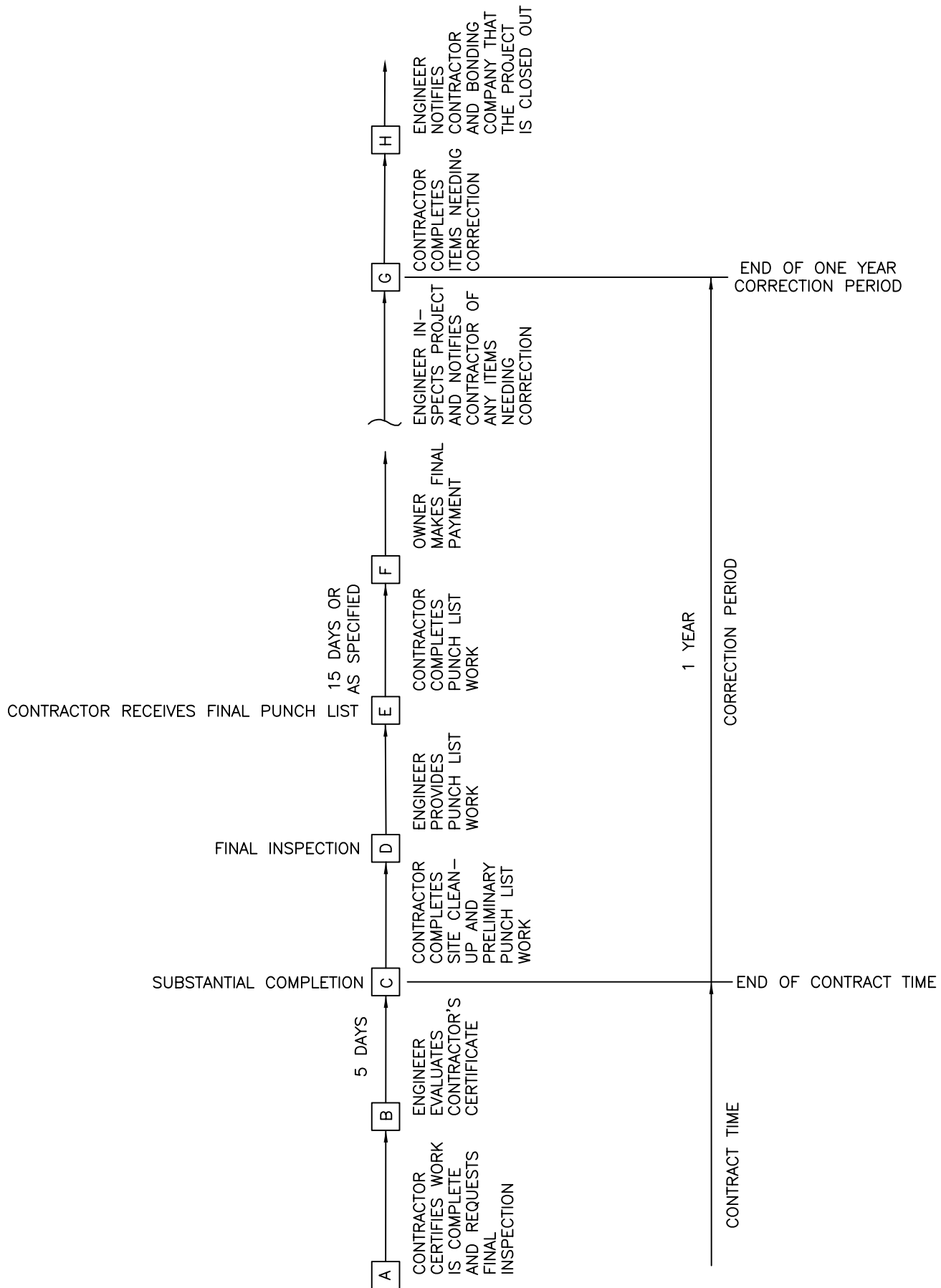
124 Inlet protection 11

125 Equipment and vehicle wash down area..... 17

126 Stabilized roadway entrance 19

Arrow diagram for project close-out

1. PROJECT CLOSE-OUT: The diagram shows sequence of activities for project completion up to the end of the Contract Time, during the one year correction period, and after the end of the one year correction period.
2. REFERENCE:
 - A. Progress Schedule, APWA Section 01 32 16.
 - B. Project Record Documents, APWA Section 01 78 50.



Arrow diagram for project close-out

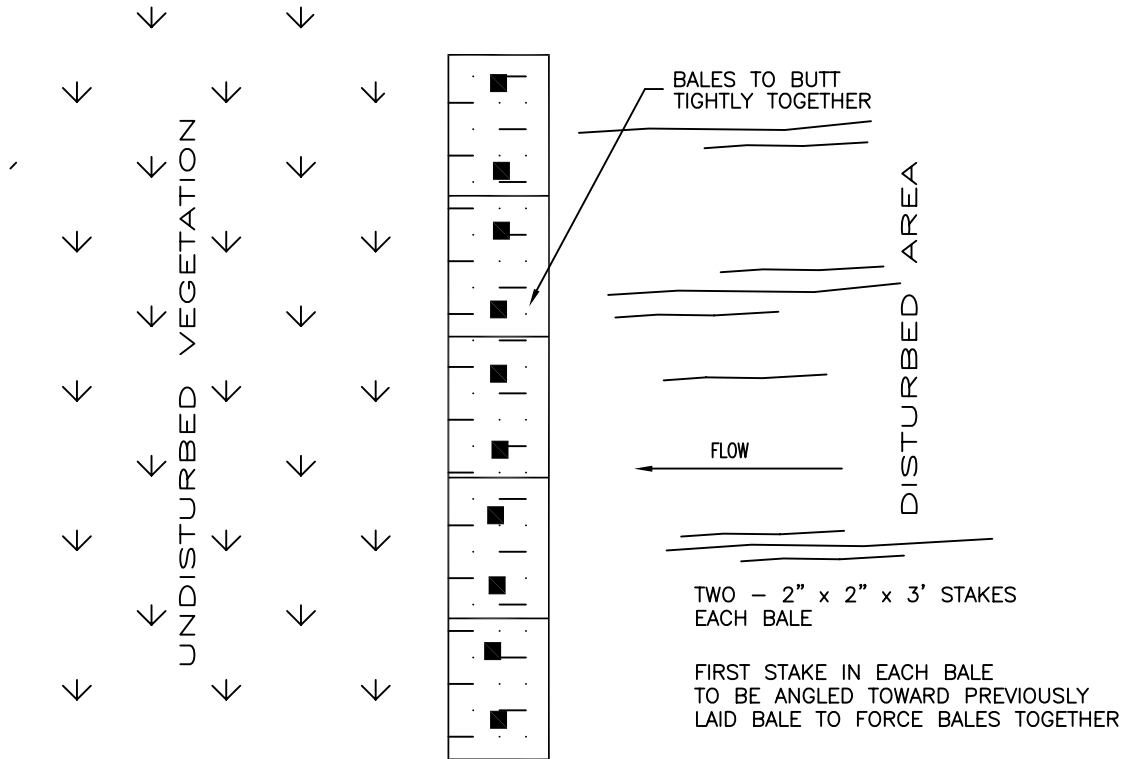
Plan No.

110

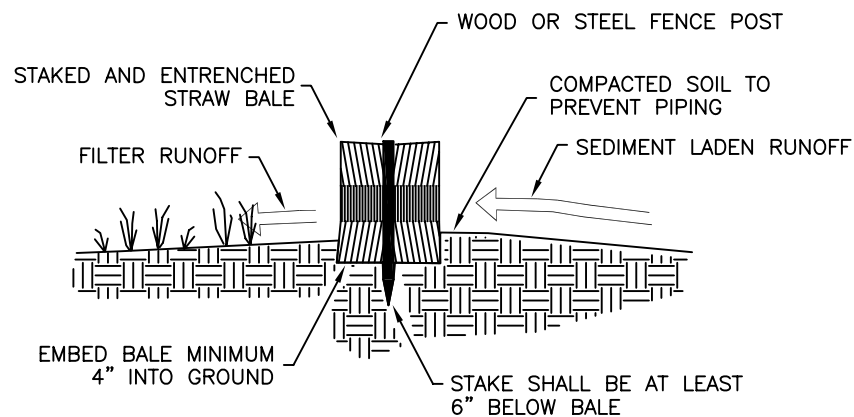
Straw bale barrier

1. DESCRIPTION: A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.
2. APPLICATION: To intercept and detain small amounts of sediment from disturbed areas of limited extent. To decrease the velocity of sheet flows and low-to-moderate level channel flows.
 - A. Perimeter Control. Place barrier at down gradient limits of disturbance.
 - B. Sediment Barrier. Place barrier at toe of slope or soil stockpile.
 - C. Protection of Existing Waterways. Place barrier at top of stream bank.
 - D. Inlet Protection.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting each other.
 - B. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).
 - C. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.
 - D. When bales are installed at the toe of a slope, they should be placed away from the slope for increased storage capacity.
 - E. Straw bale barriers shall be removed when they have served their usefulness, but not before the up-slope areas have been permanently stabilized.
4. MAINTENANCE:
 - A. Inspect immediately after any rainfall and at least daily during prolonged rainfall.
 - B. Close attention must be paid to the repair of damaged bales, end runs and undercutting beneath bales.
 - C. Necessary repairs or replacement of bales must be accomplished promptly.
 - D. Remove sediment deposits after each rainfall. The must be removed when the level of deposition reaches approximately one-half the height of the bale(s).
 - E. Realign bales to provide a continuous barrier and to fill gaps.
 - F. Recompact soil around bales as necessary to prevent piping.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



PLAN



SECTION

Straw bale barrier

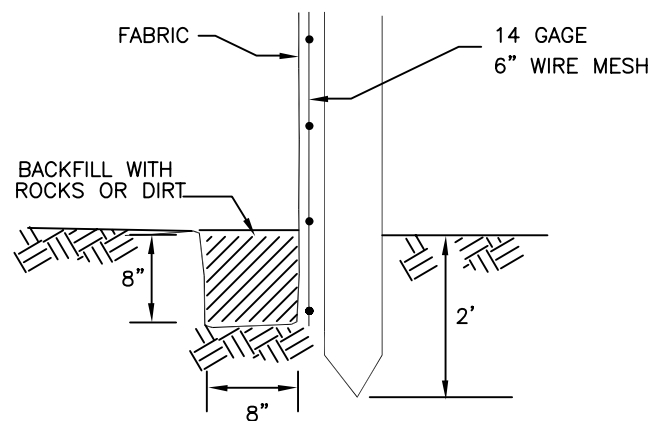
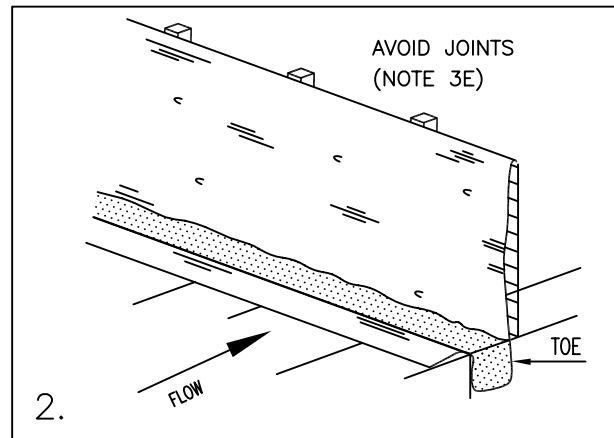
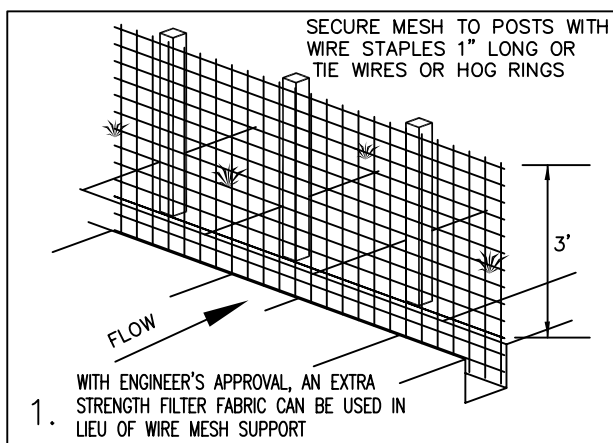
Plan No.

121

Silt fence

1. DESCRIPTION: A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched.
2. APPLICATION: To intercept sediment from disturbed areas of limited extent.
 - A. Perimeter Control: Place barrier at down gradient limits of disturbance.
 - B. Sediment Barrier: Place barrier at toe of slope or soil stockpile.
 - C. Protection of Existing Waterways: Place barrier at top of stream bank.
 - D. Inlet Protection.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester, or polyethylene yarn. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 deg. F. to 120 deg. F.
 - B. Burlap shall be 10 ounces per square yard of fabric.
 - C. Posts for silt fences shall be either 2" x 4" diameter wood, or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.
 - D. The fabric is cut on site to desired width, unrolled, and draped over the barrier. The fabric toe is secured with rocks or dirt. The fabric is secured to the mesh with twin, staples or similar devices.
 - E. When attaching two silt fences together, place the end post of the second fence inside the end post of the first fence. Rotate both posts at least 180 degrees on a clockwise direction to create a tight seal with the filter fabric. Drive both posts into the ground and bury the flap.
 - F. When used to control sediments from a steep slope, silt fences should be placed away from the toe of the slope for increased holding capacity.
4. MAINTENANCE:
 - A. Inspected immediately after each rainfall and at least daily during prolonged rainfall.
 - B. Should the fabric on a silt fence or filter barrier decompose or become ineffective before the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.
 - C. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
 - D. Re-anchor fence as necessary to prevent shortcutting.
 - E. Inspect for runoff bypassing ends of barriers or undercutting barriers.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

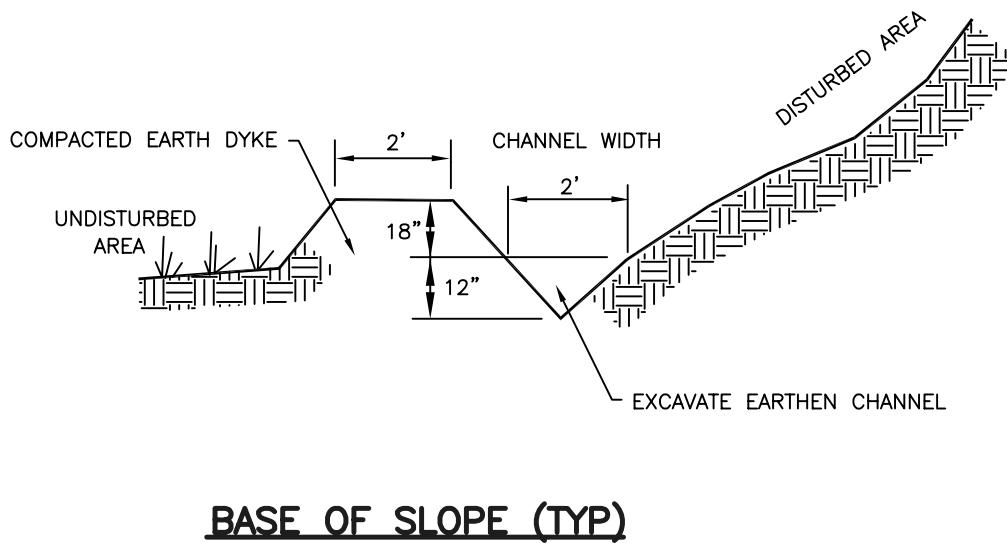
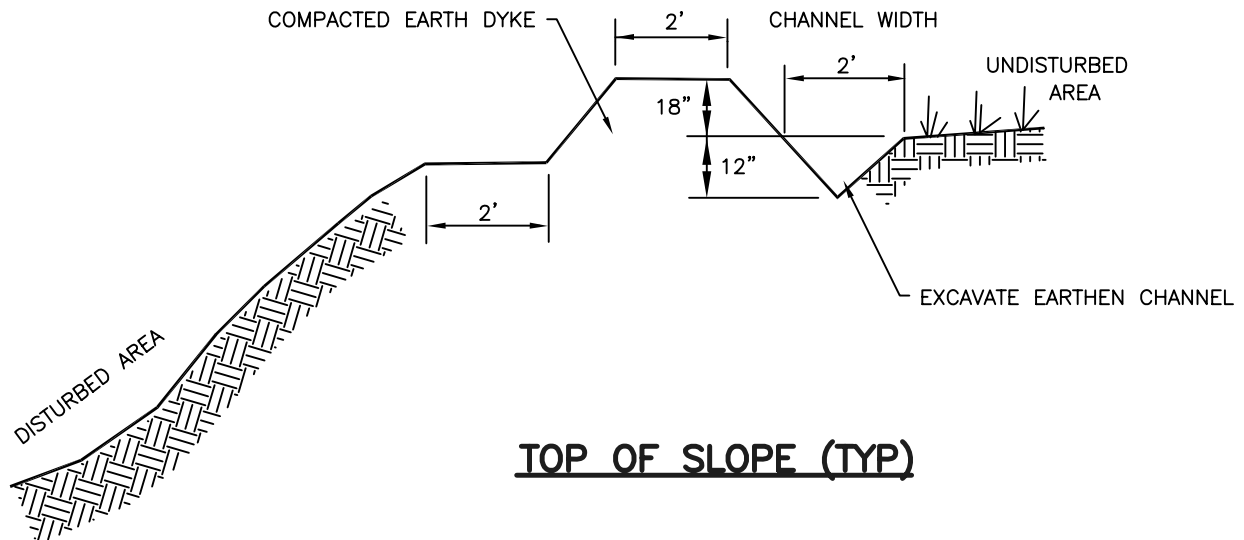


TOE DETAIL

Diversion dike

1. DESCRIPTION: A temporary ridge of compacted soil located at the top or base of a sloping disturbed area.
2. APPLICATION: To intercept up gradient runoff and convey around construction site. To divert sediment laden runoff.
 - A. Construct along midpoint of construction slope to intercept runoff and channel to controlled discharge point.
 - B. Construct around base of soil stockpiles to capture sediment.
 - C. Construct around perimeter of disturbed areas to capture sediment.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. The dike should be built before construction begins.
 - B. Clear and grub area for dike construction.
 - C. Excavate channel and place soil on down gradient side.
 - D. Shape and machine compact excavated soil to form ridge.
 - E. Place erosion protection (rip rap, mulch) at outlet. Stabilize channel and ridge as required with mulch, gravel or vegetative cover. Temporary or permanent seeding and mulch shall be applied to the dike within 15 days of construction.
 - F. The dike should be located to minimize damages by construction operations and traffic.
4. MAINTENANCE:
 - A. Inspect immediately after each rainfall and at least daily during prolonged rainfall.
 - B. Look for runoff breaching dike or eroding channel or side slopes.
 - C. Check discharge point for erosion or bypassing of flows.
 - D. Repair and stabilize as necessary.
 - E. Inspect daily during vehicular activity on slope, check for and repair any traffic damage.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



Diversion dike

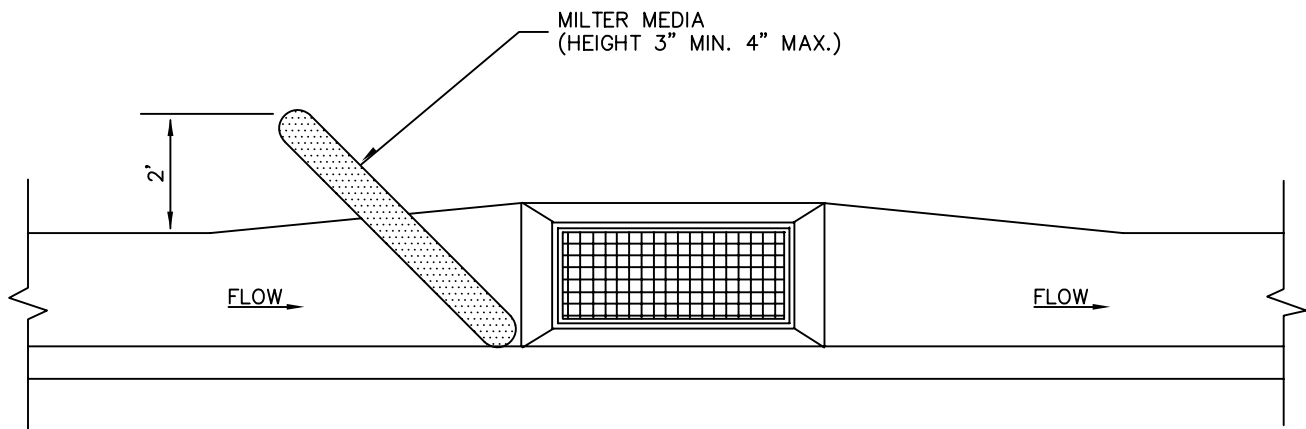
Plan No.

123

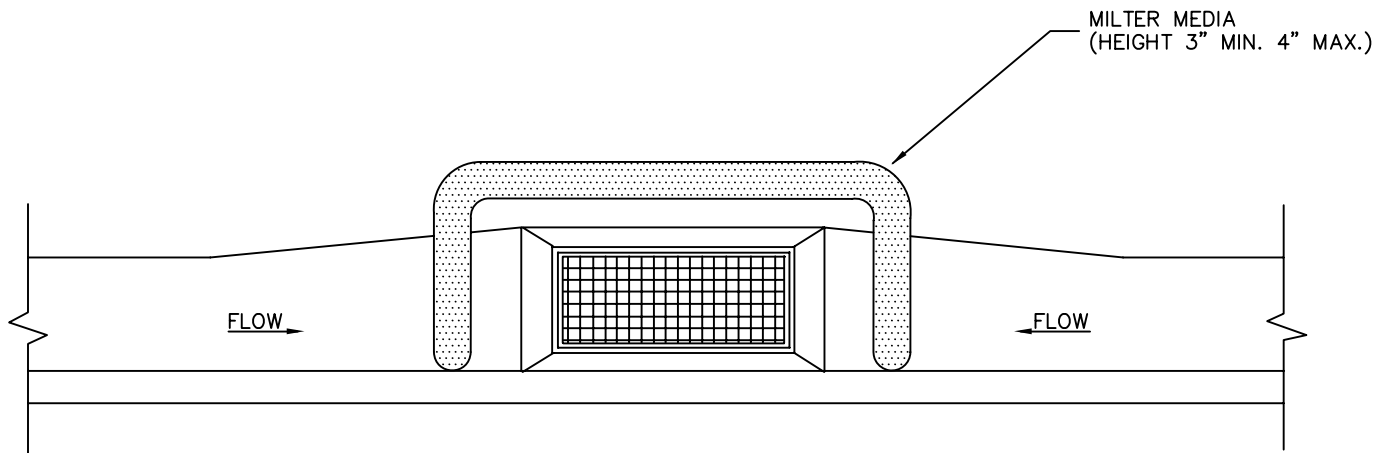
Inlet protection – gravel sock

1. DESCRIPTION: Placement of gravel sock on grade upstream of, or in front of storm drain inlets to filter or pond water runoff
2. APPLICATION: At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. On-grade inlet protection:
 1. On-grade inlet protection should be used when completely blocking a storm drain inlet box would result in forcing water further downstream would cause flooding or other undesirable results.
 2. Prepare filter media (gravel sock, straw waddle, or other approved media) in accordance with manufacturer's recommendations.
 3. Install filter media just upstream of the inlet box.
 4. Filter media shall butt tightly against the face of the curb and angle at approximately a 45 degree angle away from the curb to trap runoff between the media and the curb.
 5. Excessive flows will flow either over or around the filter media and into the inlet box.
 6. Expect ponding behind the filter media.
 - B. Drop inlet protection:
 1. Drop inlet protection should be used at low points in the curb and when diverting flows further downstream will not cause undesirable results.
 2. Prepare filter media (gravel sock, straw waddle, or other approved media) in accordance with manufacturer's recommendations.
 3. Install filter media around the entire perimeter of the inlet grate.
 4. Filter media shall butt tightly against the face of the curb on both sides of the inlet grate.
 5. Excessive flows will either flow around the media or over the top and into the inlet box.
 6. Expect ponding around the inlet box.
4. MAINTENANCE:
 - A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
 - B. Remove sediment accumulated when it reaches 2 inches in depth.
 - C. Replace filter medium when damage has occurred or when medium is no longer functioning as intended.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



ON-GRADE INLET PROTECTION DETAIL



DROP INLET PROTECTION DETAIL

Inlet protection - gravel sock

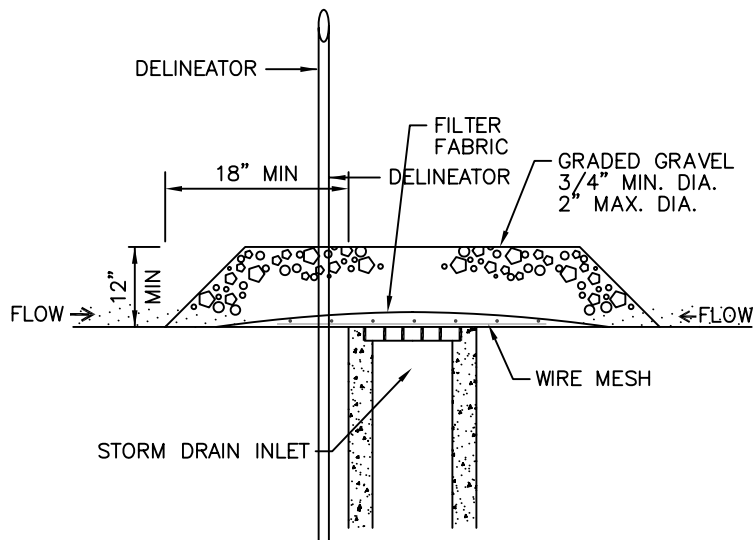
Plan No.

124

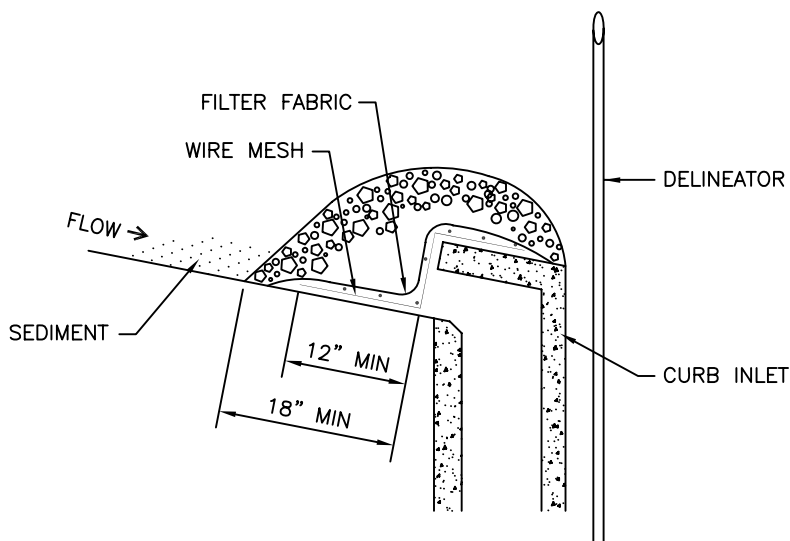
Inlet protection – gravel

1. DESCRIPTION: Placement of gravel filter over storm drain inlet to filter water runoff.
2. APPLICATION: At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Place 1/2 inch opening wire mesh over the inlet grate extending one foot past the grate in all directions.
 - B. Place filter fabric over the mesh. Filter fabric should be selected based on soil type.
 - C. Place graded gravel (2 inch to 4 inch in size), to a minimum depth of 12 inches, forming a wall around the grate on all sides. The wall shall have side slopes so that gravel does not spill over the grate.
 - D. The filter fabric immediately over the grate needs to remain exposed so that the grate can be visually inspected.
 - E. Place a delineator at the inlet grate so that the gravel surrounding it will not inadvertently be graded or moved and to protect the inlet from damage.
4. MAINTENANCE:
 - A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
 - B. Remove sediment accumulated when it reaches 4 inches in depth.
 - C. Replace filter fabric and clean or replace gravel if clogging is apparent.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



DROP INLET PROTECTION



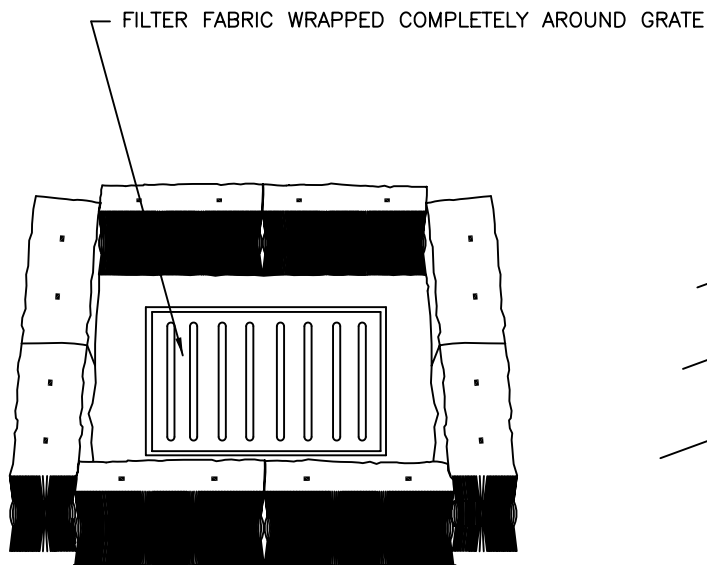
CURB INLET PROTECTION

Inlet protection - gravel

Inlet protection – fence or straw bale

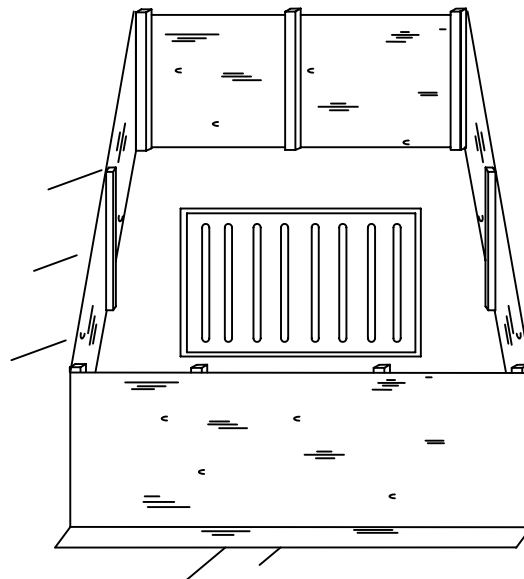
1. DESCRIPTION: A temporary sediment barrier around storm drain inlet.
2. APPLICATION: At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Provide up gradient sediment controls, such as silt fence during construction of inlet.
 - B. When construction of inlet is complete erect straw bale barrier, silt fence or other approved sediment barrier to surround perimeter of inlet.
 - C. Install filter fabric completely around grate.
4. MAINTENANCE:
 - A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
 - B. Remove sediment accumulated when it reaches 4 inches in depth.
 - C. Repair or re-align barrier or fence as needed.
 - D. Look for bypassing or undercutting and re-compact soil around barrier or fence as required.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



STRAW BALE BARRIER

(PLAN No. 121)



SILT FENCE

(PLAN No. 122)

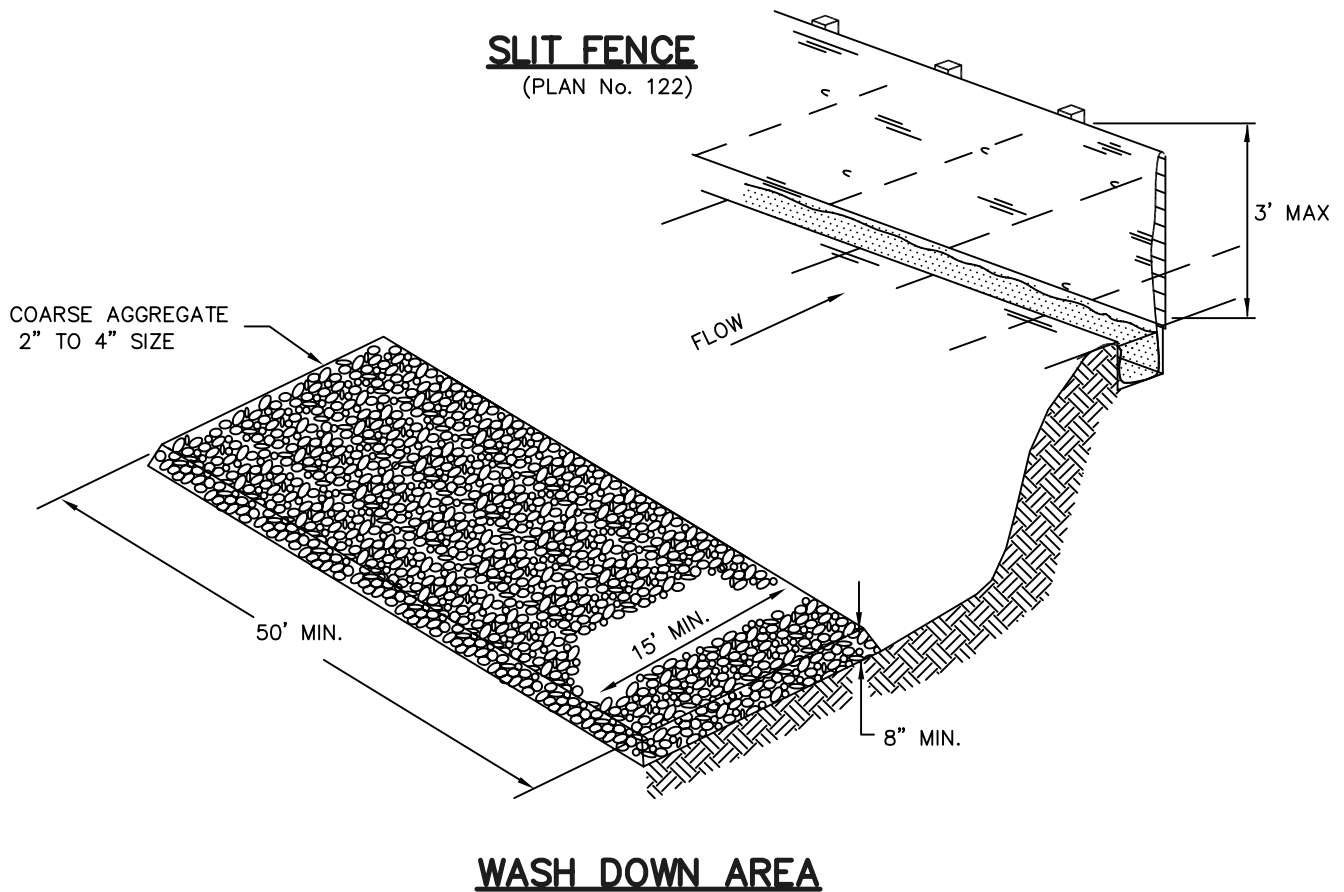
Inlet protection - fence or straw bale

Equipment and vehicle wash down area

1. DESCRIPTION: A temporary stabilized pad of gravel for general washing of equipment and construction vehicles.
2. APPLICATION: At any site where regular washing of vehicles and equipment will occur. May also be used as a filling point for water trucks limiting erosion caused by overflow or spillage of water.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Clear and grub area and grade to provide maximum slope of 1 percent away from paved roadway.
 - B. Compact subgrade.
 - C. Place filter fabric under wash down area if desired (recommended for wash area that remains more than 3 months).
 - D. Install silt fence down gradient (see Plan No. 122)
4. MAINTENANCE:
 - A. Requires periodic top dressing with additional stones.
 - B. Solely used to control sediment in wash water. Cannot be utilized for washing equipment or vehicles that may cause contamination of runoff (such as fertilizer equipment or concrete equipment).
 - C. The wash area shall be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way.
 - D. Periodic top dressing with 2 inch stone may be required, as conditions demand, and repair any structures used to trap sediments.
 - E. Inspect daily for loss of gravel or sediment buildup.
 - F. Inspect adjacent area for sediment deposit and install additional controls as necessary.
 - G. Expand stabilized area as required to accommodate activities.
 - H. Maintain silt fence as outlined in Plan No. 122.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

1. SECURE MESH TO POSTS WITH WIRE STAPLES 1" LONG OR TIE WIRES OR HOG RINGS
2. SECURE FABRIC TO MESH WITH TWINE, STAPLES OR SIMILAR



Equipment and vehicle wash down area

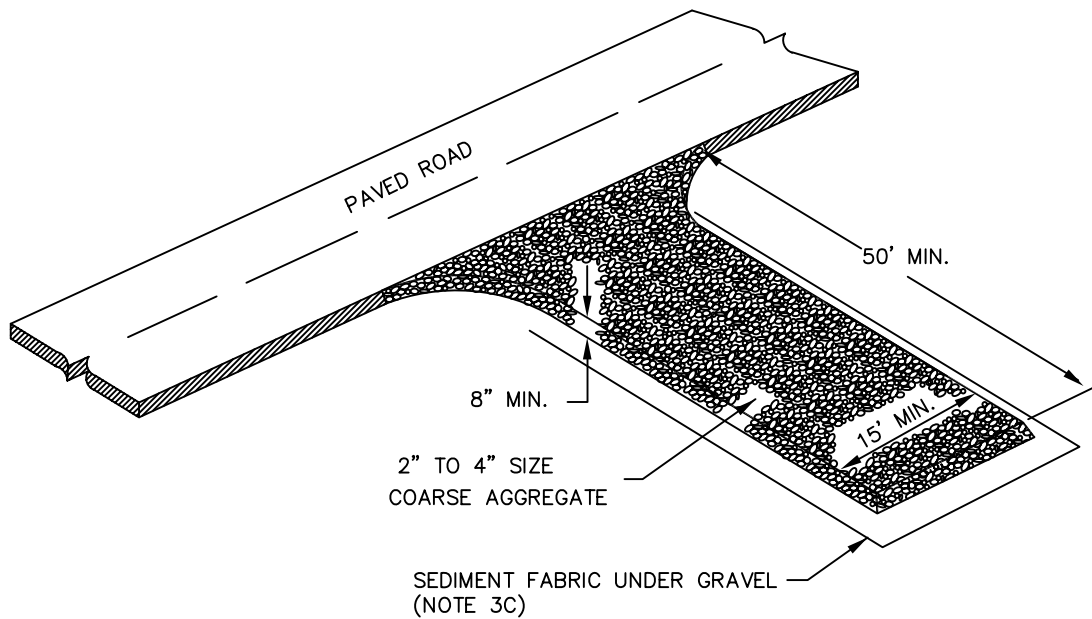
Plan No.

125

Stabilized roadway entrance

1. DESCRIPTION: A temporary stabilized pad of gravel for controlling equipment and construction vehicle access to the site.
2. APPLICATION: At any site where vehicles and equipment enter the public right of way.
3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
 - A. Clear and grub area and grade to provide maximum slope of 1 percent away from paved roadway.
 - B. Compact subgrade.
 - C. Place filter fabric under stone if desired (recommended for entrance area that remains more than 3 months).
4. MAINTENANCE:
 - A. Requires periodic top dressing with additional stones.
 - B. Prevent tracking or flow of mud into the public right-of-way.
 - C. Periodic top dressing with 2 inches stone may be required, as conditions demand, and repair any structures used to trap sediments.
 - D. Inspect daily for loss of gravel or sediment buildup.
 - E. Inspect adjacent areas for sediment deposit and install additional controls as necessary.
 - F. Expand stabilized area as required to accommodate activities.

NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.



Stabilized roadway entrance

Plan No.

126

PART 2

ROADWAYS

Abbreviations and Symbols

Plan 201	Abbreviations and symbols for roadway drawings.....	23
----------	---	----

Curb, Gutter, Driveway, Sidewalk

205	Curb and gutter.....	25
209	Curbs	29
211	Waterway.....	31
213	Waterway transition structure	33
215	Dip driveway approach	35
216	Mountable curb driveway approach.....	37
221	Flare driveway approach.....	39
222	Saw-cut driveway approach.....	43
225	Open driveway approach.....	45
229	Piped driveway approach.....	47
231	Concrete sidewalk	51
232	Patterned concrete park strip.....	53
235	Corner curb cut assembly.....	55
236	Tangent curb cut assembly	61
237	Islands and median.....	67
238	Detectable warning surface	69
241	Parking meter post	71
242	Form strip filler	73

Roadways

251	Asphalt concrete pavement tie in.....	75
252	Curb and gutter replacement without pavement tie in	77
253	Asphalt concrete pavement overlay.....	79
255	Asphalt concrete "T" patch	83
256	Concrete pavement patch.....	87
261	Concrete pavement joints.....	89
265	Crack sealing – asphalt pavement.....	93
266	Crack filling – asphalt pavement.....	95

Survey Monument

271	Corner and boundary markers.....	97
272	Monument cap and base	99
273	Frame and cover for monument	101
274	Survey monument placement under pavements	103
275	Cover collar for survey monuments	105

General

291	Defective concrete	107
292	Street name sign (typical)	109

Abbreviations and symbols for roadway drawings

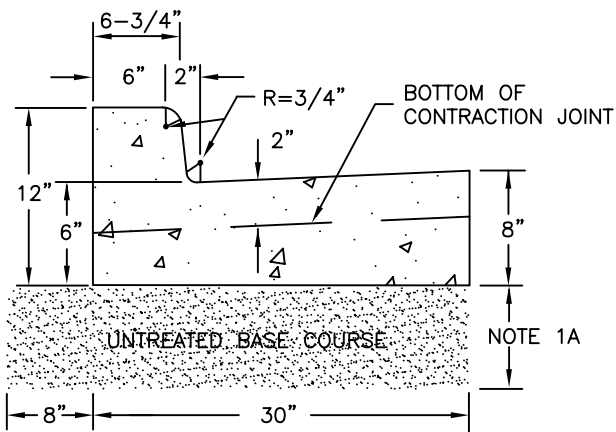
1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.
2. LETTERING STYLE: Capital letters preferred.
3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.
4. NEW IMPROVEMENTS: Shown in solid continuous line.

SYMBOLS	DEFINITIONS
	CENTER LINE
	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
	FENCE
	CONTOUR LINE
	CONTOUR ELEVATION
	BANK SLOPES
	STORM DRAIN LINE
	WATER LINE
	GAS LINE
	TELEPHONE CABLE
	ELECTRIC CABLE
	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
	WATER METER
	MANHOLE
	CATCH BASIN
	CLEAN OUT BOX
	POLE & ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
	BENCH MARK
	SIGN
	POWER POLE
	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.
	PROFILE
	GROUND PROFILE
	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUNDWATER ELEVATION

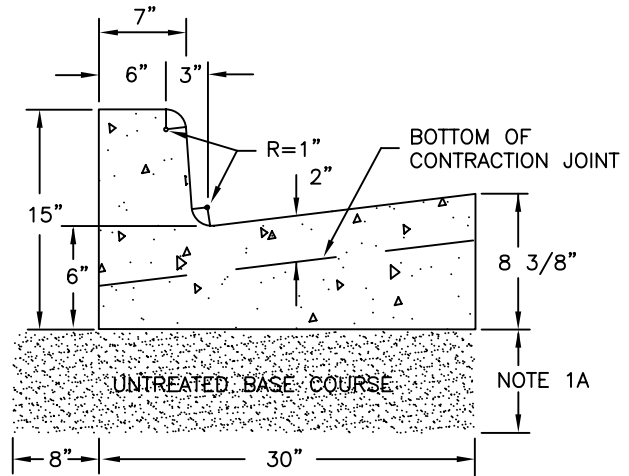
Curb and gutter

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. If flow line grade is greater than 0.5 percent ($s=0.005$), provide 6 inches uncompacted thickness. If less, provide 8 inches uncompacted thickness.
 - C. Place material per APWA Section 32 05 10.
 - D. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
 - A. Set top of filler flush with surface of concrete.
 - B. Expansion joints are required at the start or end of a street intersection curb return.
 - C. Expansion joints are not required in slip form work.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - B. If necessary, match location of contraction joints in portland cement concrete roadway pavements.
5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
6. FINISH: Broomed.
7. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that does not drain.
 - B. Protect concrete from deicing chemicals during cure.



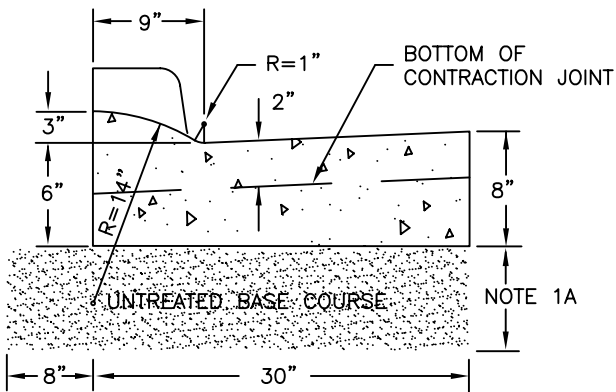
CONCRETE AREA = 1.665 SQ. FT.

TYPE A



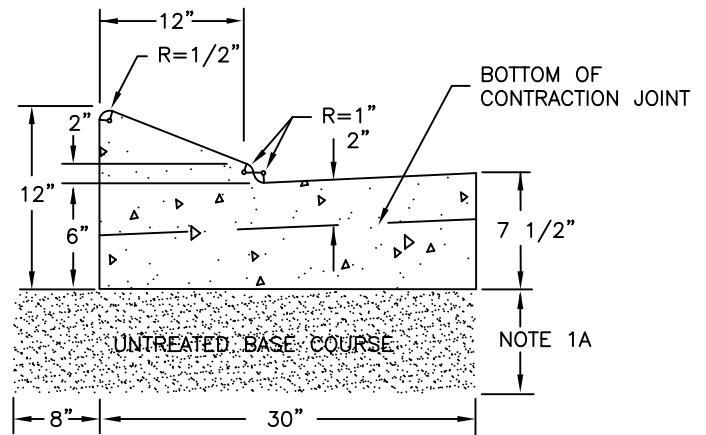
CONCRETE AREA = 1.926 SQ. FT.

TYPE B



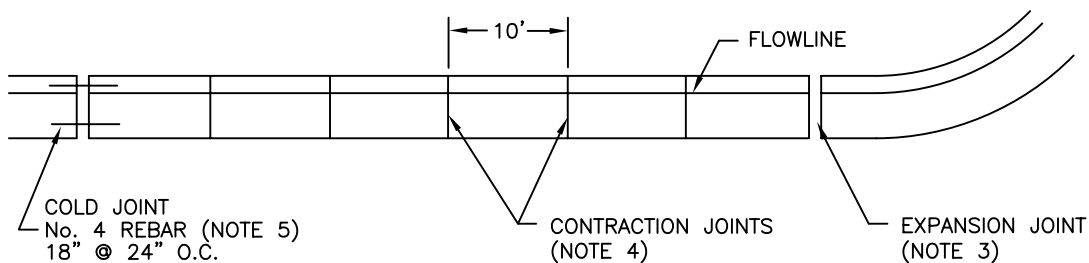
CONCRETE AREA = 1.517 SQ. FT.

TYPE C



CONCRETE AREA = 1.680 SQ. FT.

TYPE D

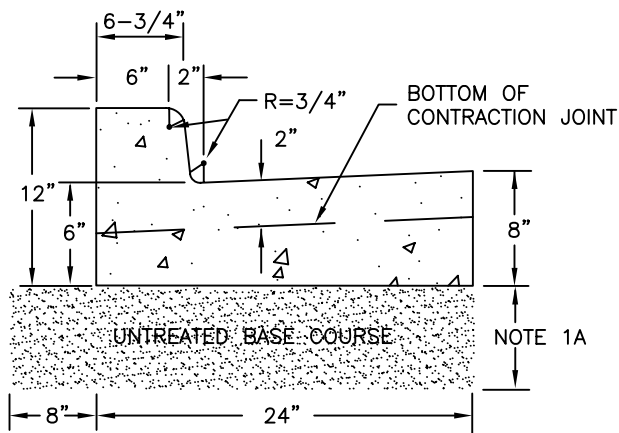


CURB AND GUTTER JOINT DETAIL

Curb and gutter

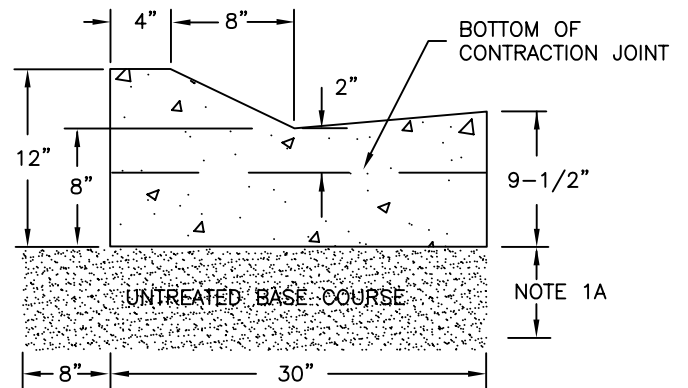
Curb and gutter

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. If flow line grade is greater than 0.5 percent ($s=0.005$), provide 6 inches uncompacted thickness. If less, provide 8 inches uncompacted thickness.
 - C. Place material per APWA Section 32 05 10.
 - D. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 wide with type F1 joint filler material per APWA Section 32 13 73.
 - A. Set top of filler flush with surface of concrete.
 - B. Expansion joints are required at the start or end of a street intersection curb return.
 - C. Expansion joints are not required in slip form work.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - B. If necessary, match location of contraction joints in portland cement concrete roadway pavements.
5. **REINFORCEMENT:** ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
6. **FINISH:** Broomed.
7. **PROTECTION AND REPAIR:**
 - A. Fill flow-line with water. Repair construction that does not drain.
 - B. Protect concrete from deicing chemicals during cure.



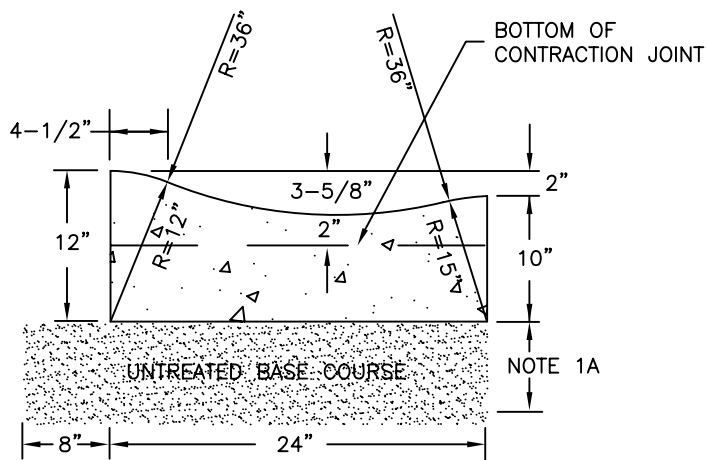
CONCRETE AREA = 1.347 SQ. FT.

TYPE E



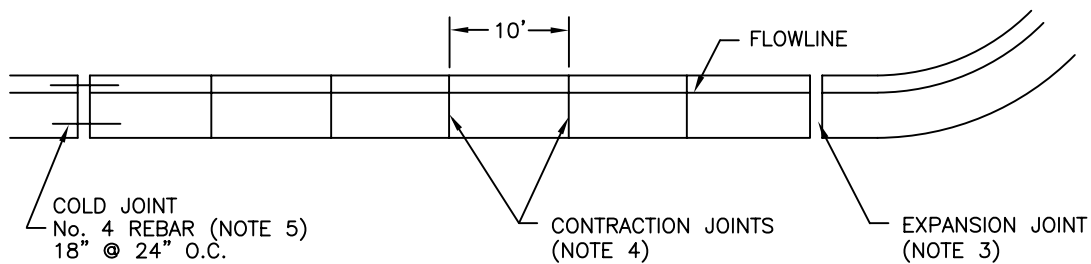
CONCRETE AREA = 1.539 SQ. FT.

TYPE F



CONCRETE AREA = 1.989 SQ. FT.

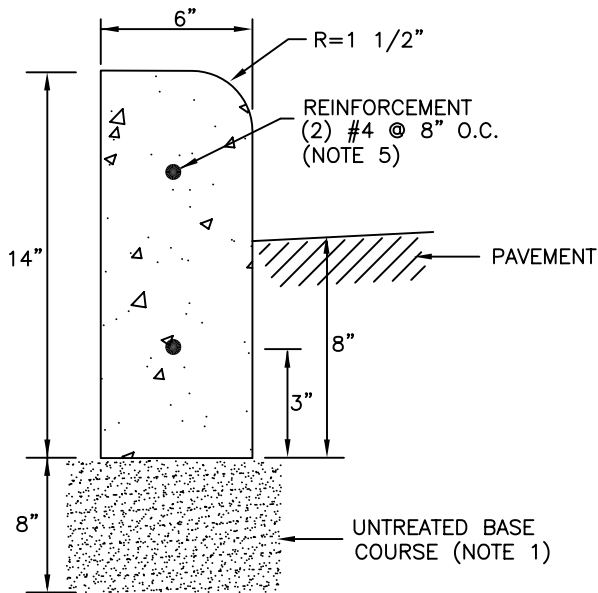
TYPE G



CURB AND GUTTER JOINT DETAIL

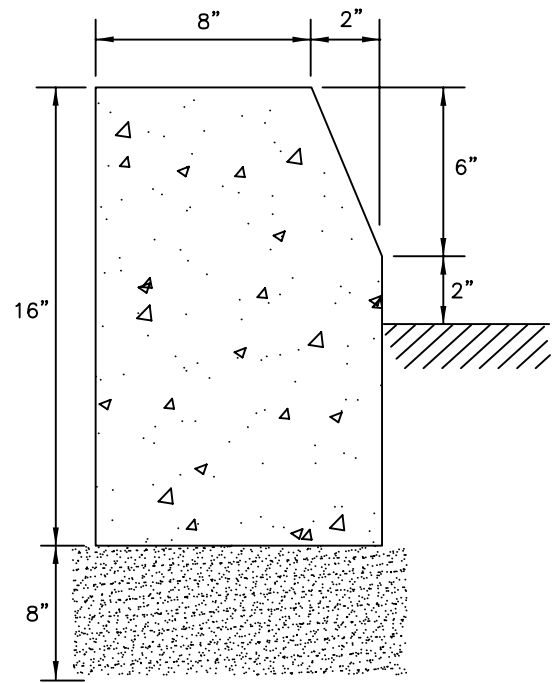
Curbs

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical., full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
 - A. Set top of filler flush with surface of concrete.
 - B. Expansion joints are required at the start or end of a street intersection curb return.
 - C. Expansion joints are not required in curb tangents or slip form work.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - B. If necessary, match location of contraction joints in adjacent concrete flatwork.
5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
6. FINISH: Broomed.

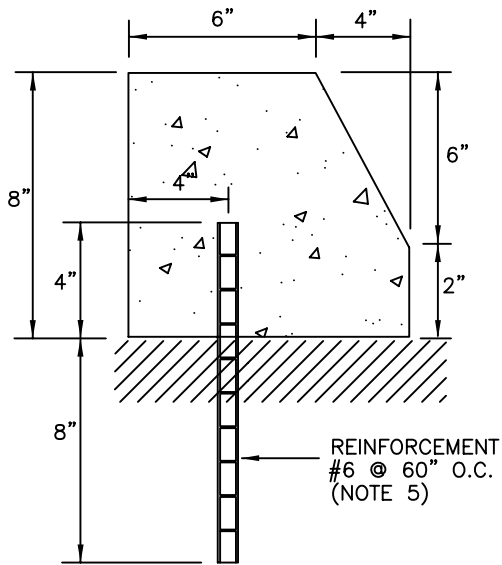


CONCRETE AREA = 0.58 SQ. FT.

TYPE P

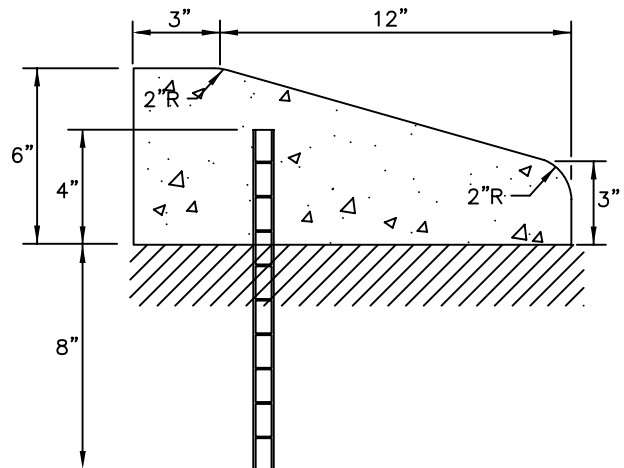


TYPE Q

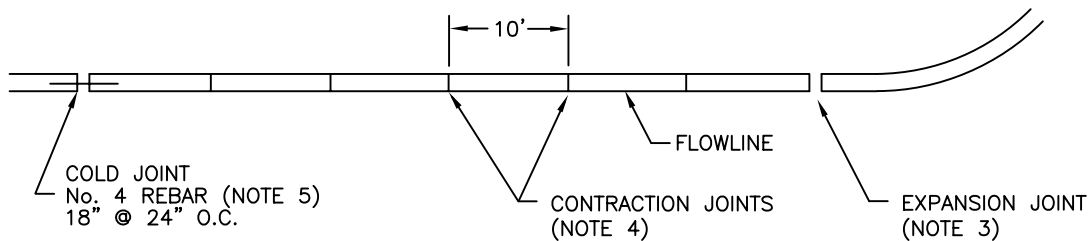


CONCRETE AREA = 0.472 SQ. FT.

TYPE R



TYPE S



JOINT SPACING DETAIL

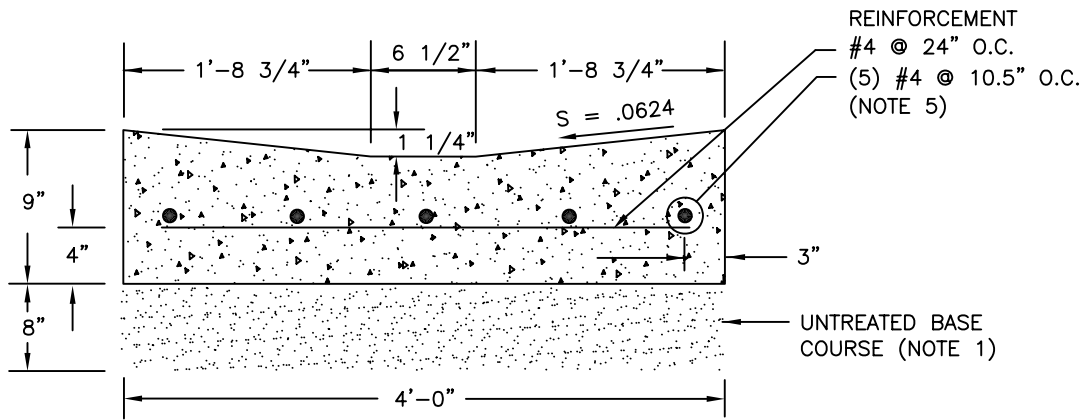
Curbs

Plan No.

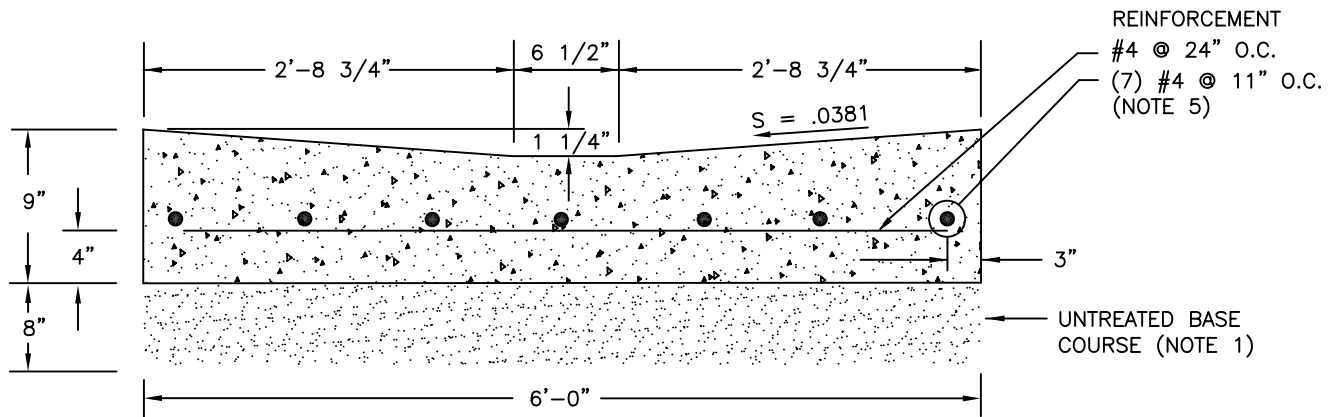
209

Waterway

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical, at least 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
6. FINISH: Broomed.
7. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure.



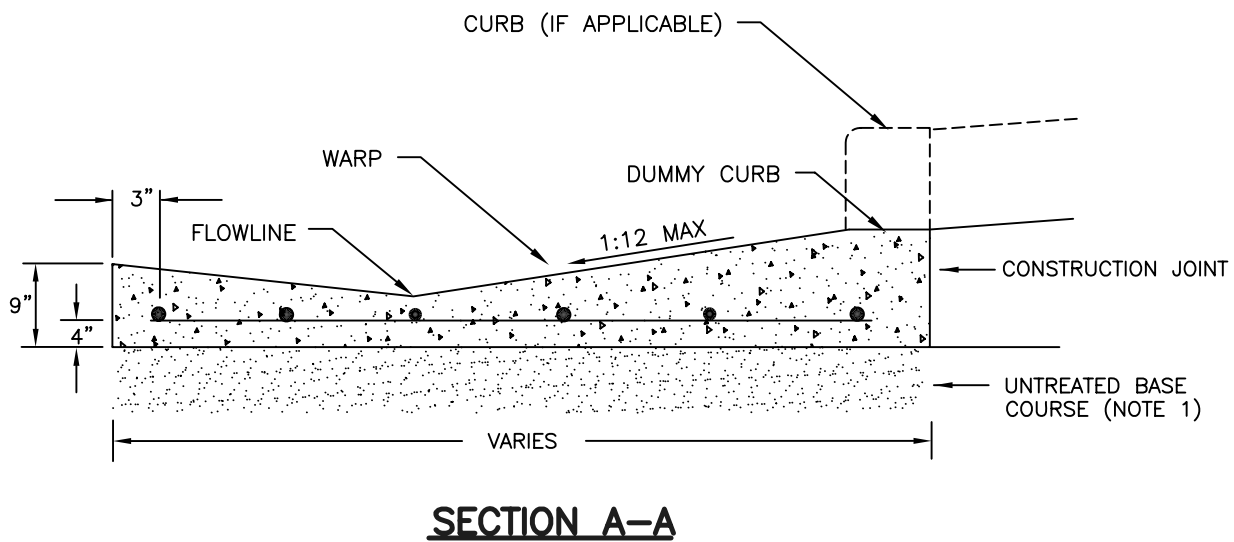
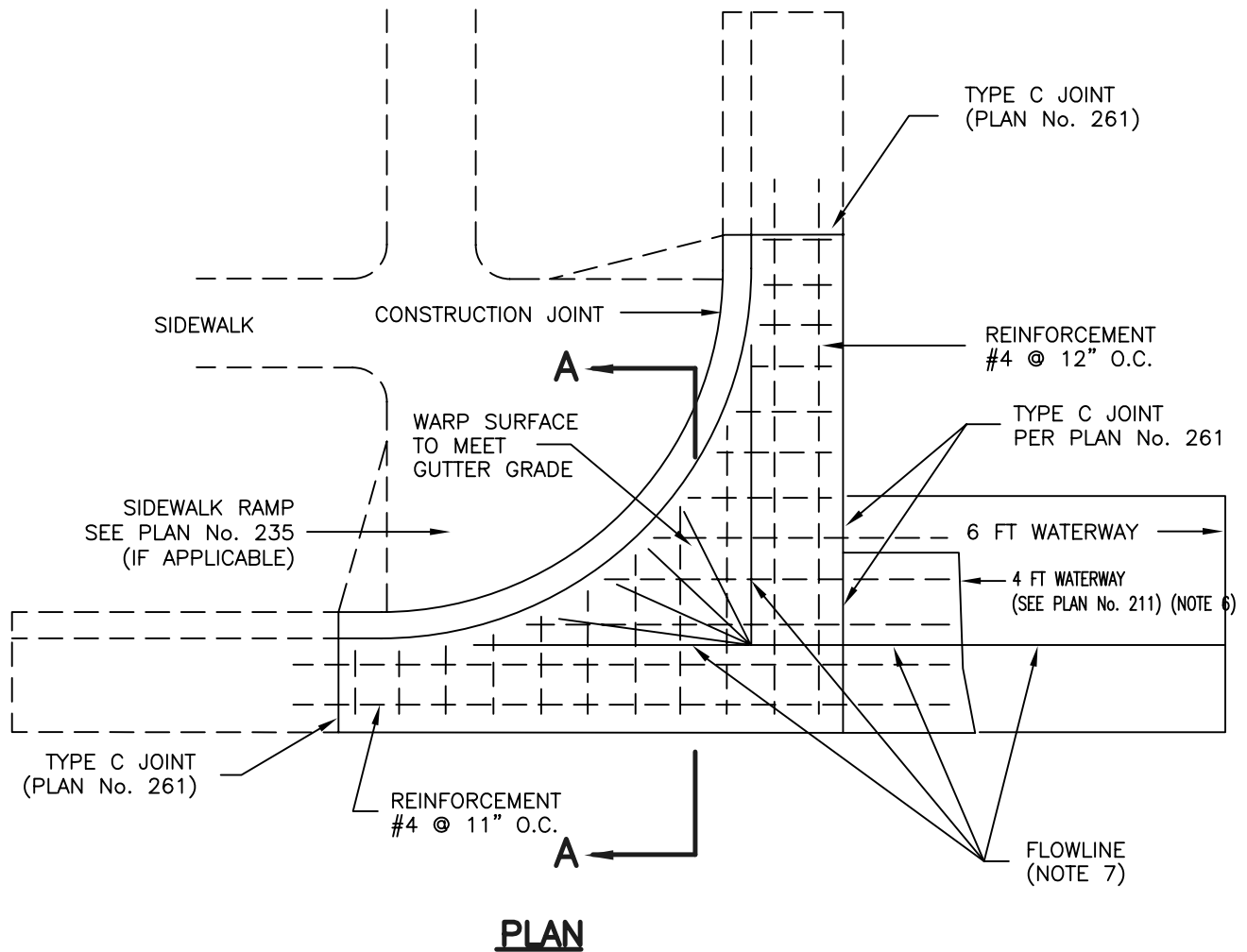
4'-0" WATERWAY



6'-0" WATERWAY

Waterway transition structure

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
6. WATERWAY: Use width shown on the Drawings. If not shown then 4 feet for a residential street and 6 feet for a non-residential street.
7. FLOW-LINE: A 4 feet wide waterway and a 6 feet wide waterway are shown on Plan No. 213. If a wider waterway is specified or required, offset the flow line in the waterway to match (lines up with) the curb and gutter flow line. Adjust cross slope grades to match existing slopes.
8. FINISH: Broomed.
9. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure.



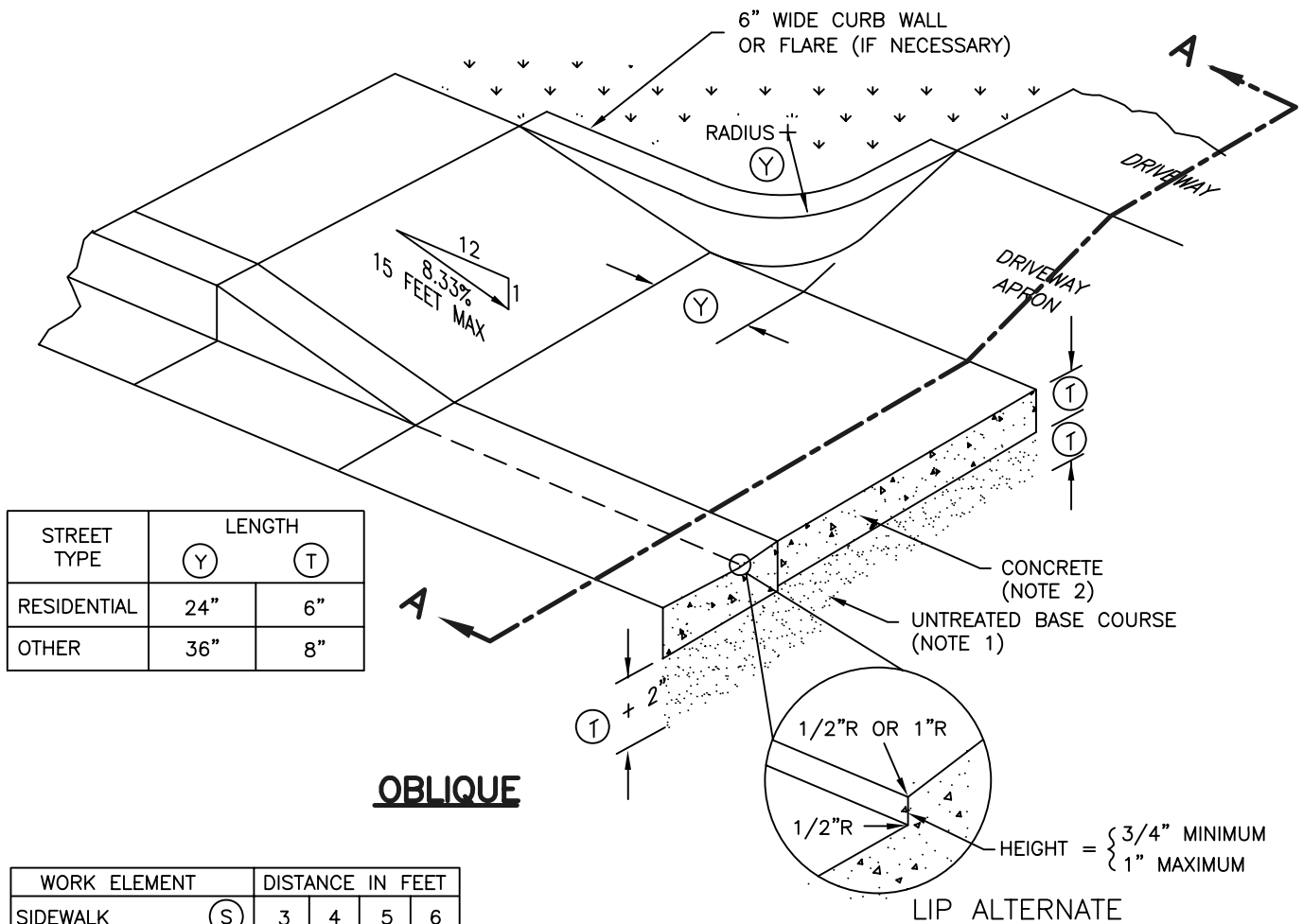
Waterway transition structure

Plan No.

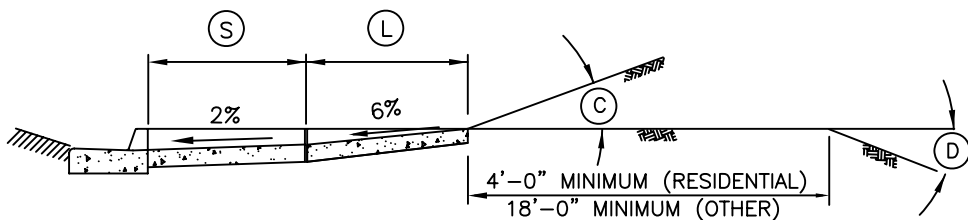
213

Dip driveway approach

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FINISH: Broomed.
6. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.

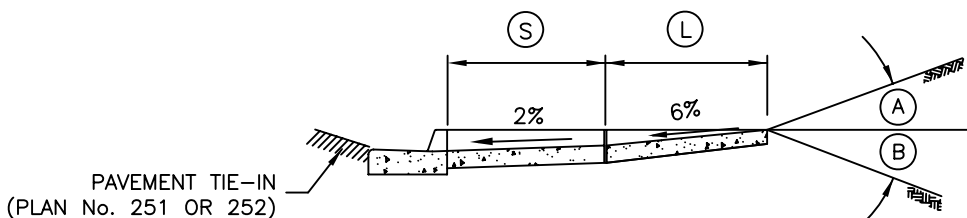


WORK ELEMENT	DISTANCE IN FEET				
SIDEWALK (S)	3	4	5	6	
1" LIP ALTERNATE WITH 2 PERCENT SIDEWALK SLOPE (L)	6.0	5.5	5.0	5.0	
NO LIP DRIVEWAY WITH 2 PERCENT SIDEWALK SLOPE (L)	7.0	7.0	6.5	6.0	



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(C)	(D)
RESIDENTIAL	16%	6%
OTHER	6%	2%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(A)	(B)
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

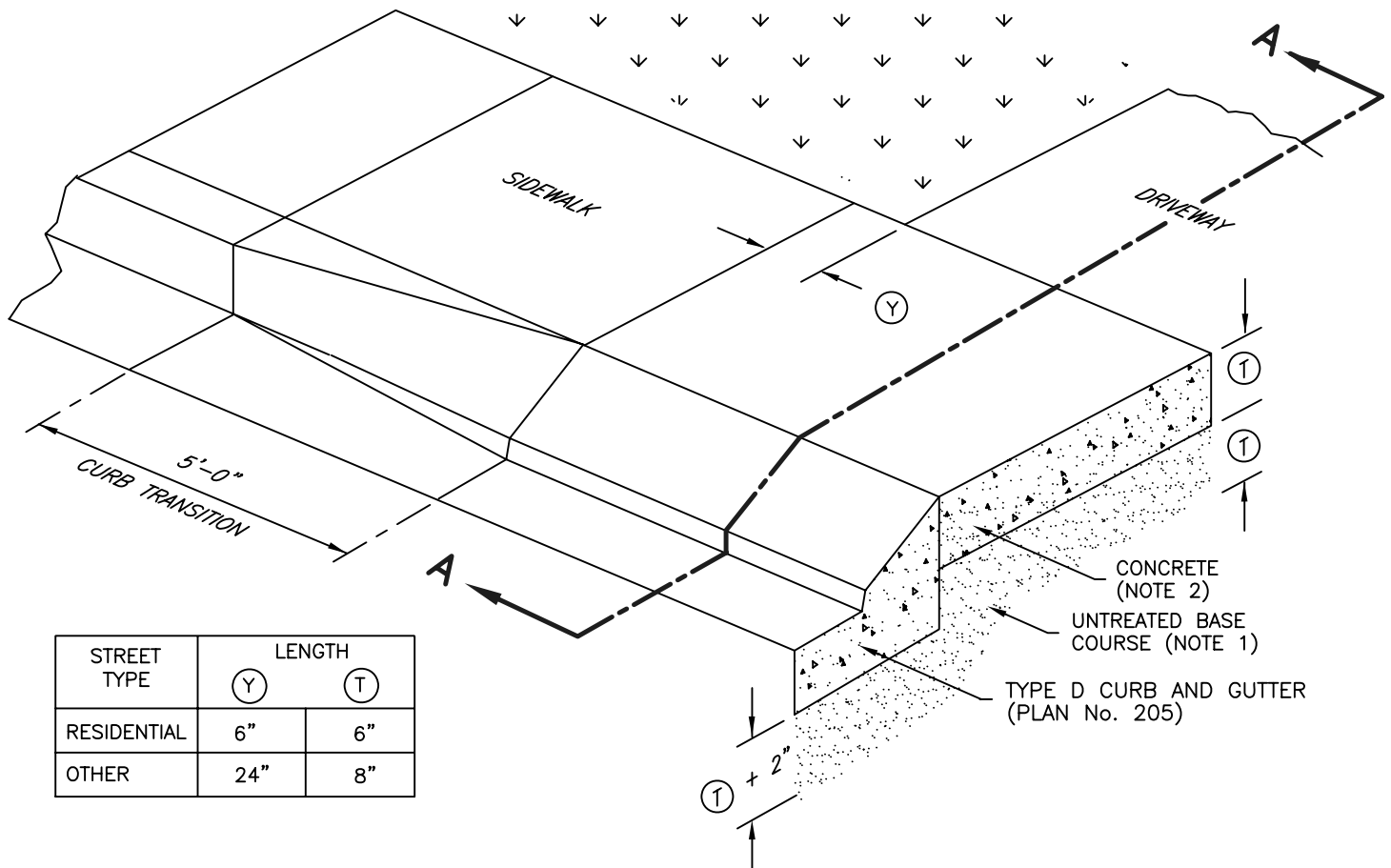
Dip driveway approach

Plan No.

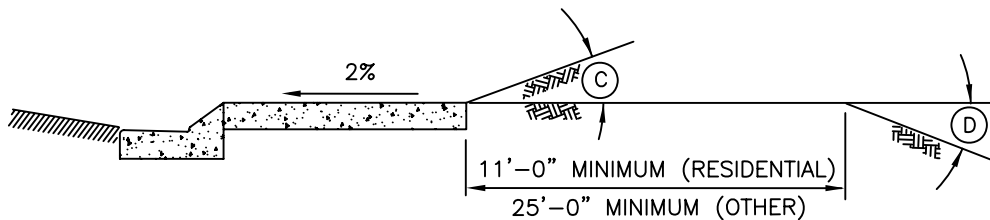
215

Mountable curb driveway approach

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FINISH: Broomed.
6. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.

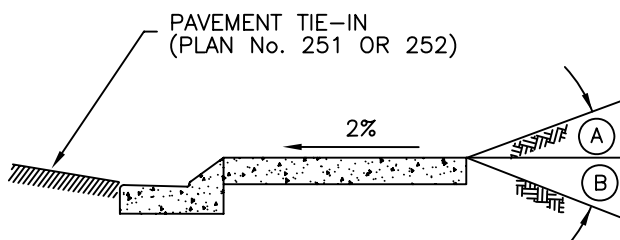


OBLIQUE



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(C)	(D)
RESIDENTIAL	16%	13%
OTHER	6%	10%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(A)	(B)
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

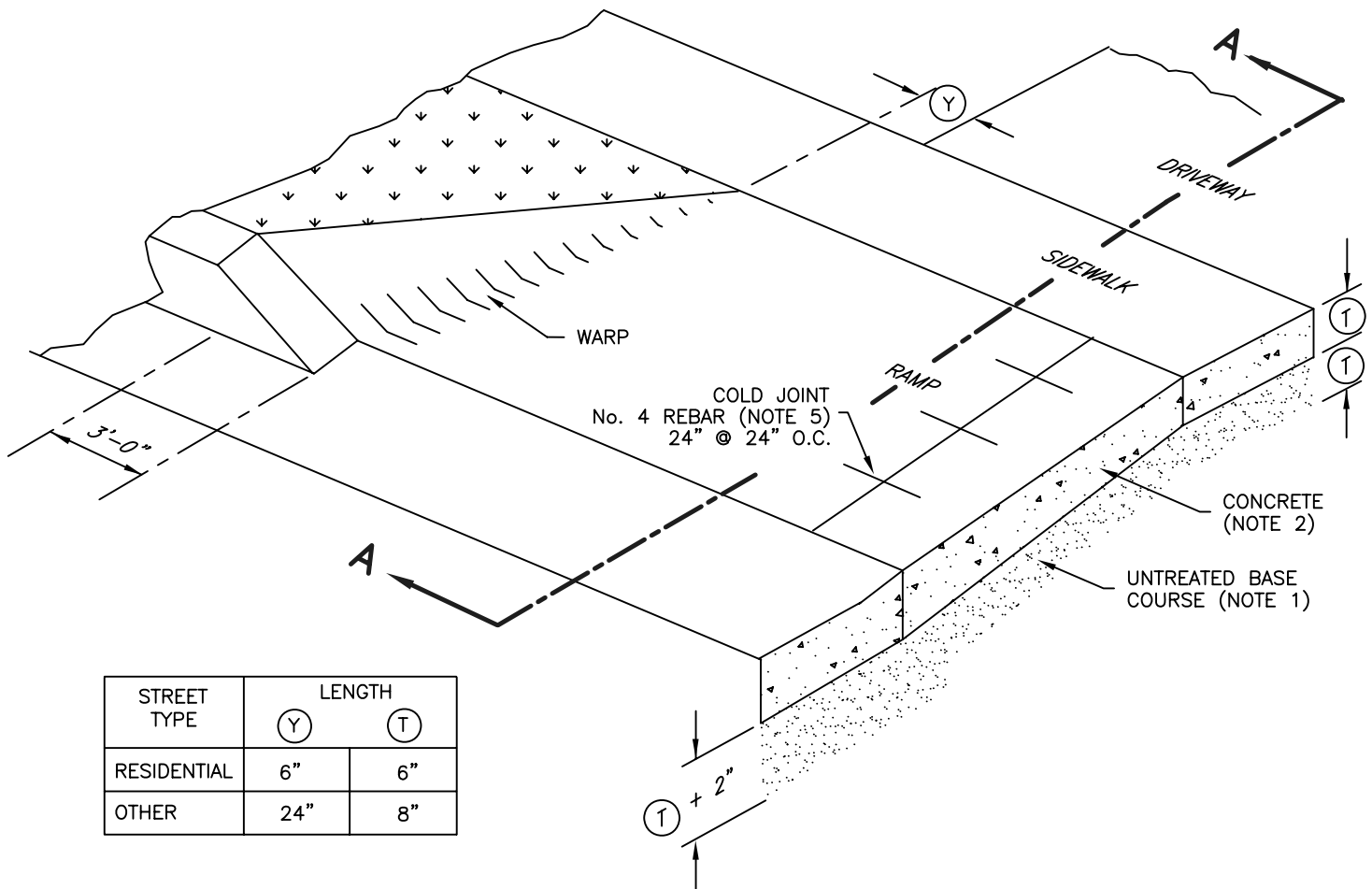
Mountable curb driveway approach

Plan No.

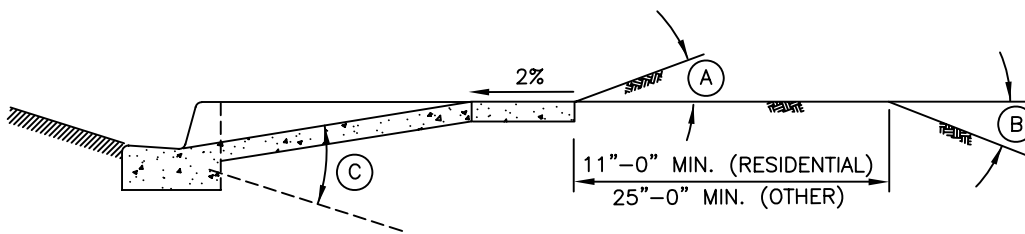
216

Flare driveway approach – type A

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **REINFORCEMENT:** ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements . Not required if driveway ramp is constructed without a cold joint.
6. **FIELD CHANGES TO SLOPE REQUIREMENTS:** The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
 - A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
 - B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
7. **FINISH:** Broomed.
8. **PROTECTION AND REPAIR:**
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.

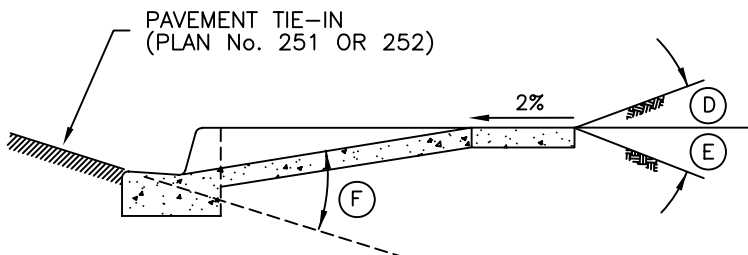


OBLIQUE



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	(A)	(B)	(C)
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	(D)	(E)	(F)
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

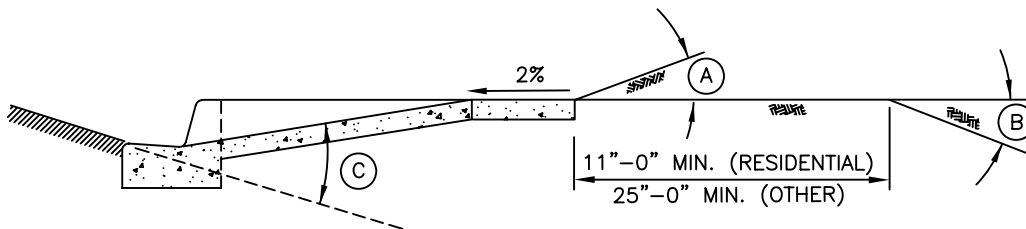
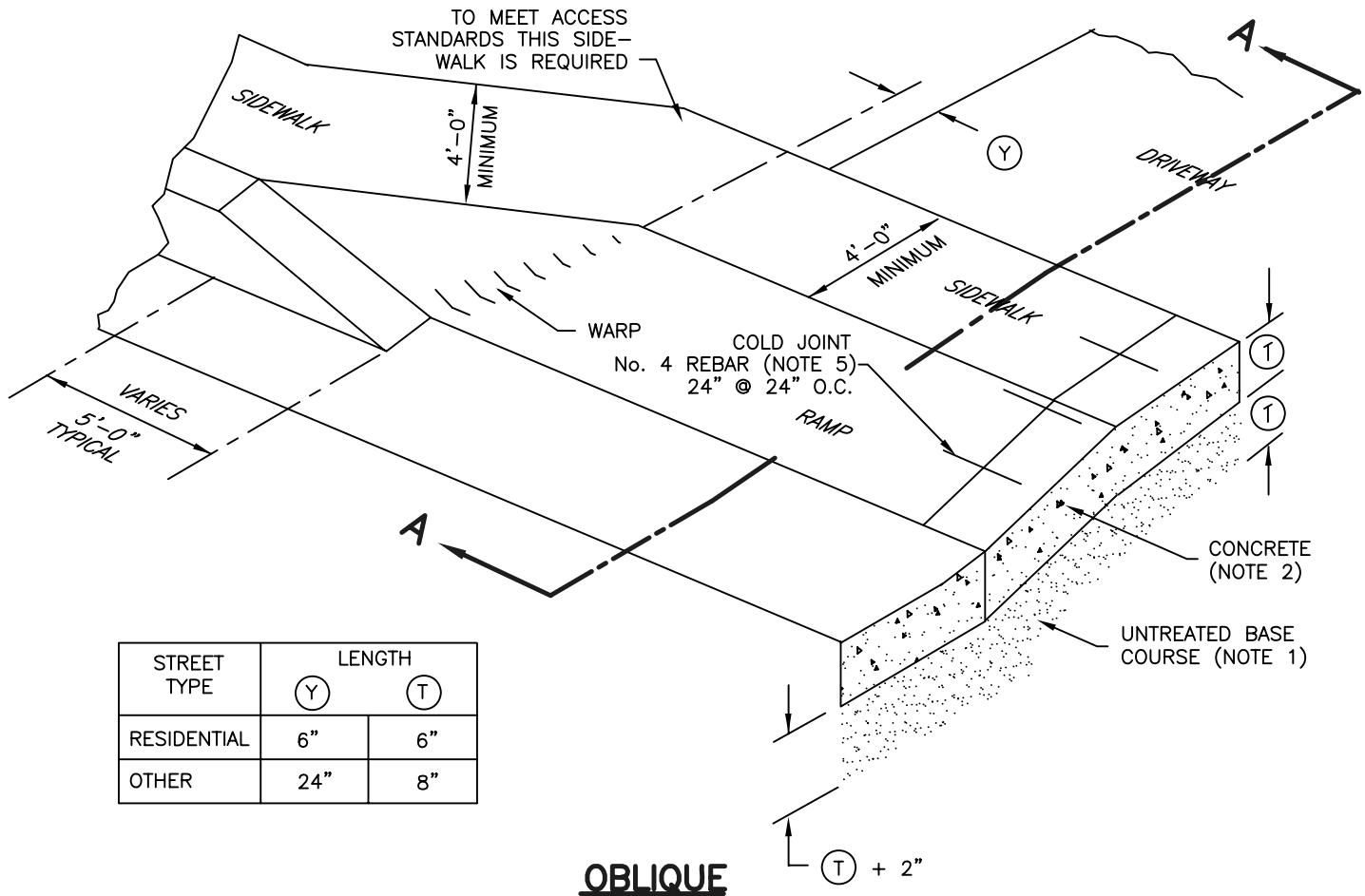
Flare driveway approach - type A

Plan No.

221

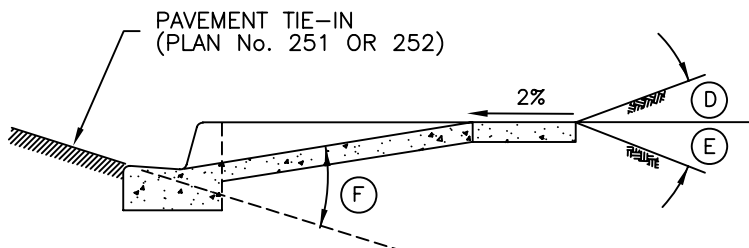
Flare driveway approach – type B

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **REINFORCEMENT:** ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements . Not required if driveway ramp is constructed without a cold joint.
6. **FIELD CHANGES TO SLOPE REQUIREMENTS:** The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
 - A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
 - B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
7. **FINISH:** Broomed.
8. **PROTECTION AND REPAIR:**
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	A	B	C
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	D	E	F
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

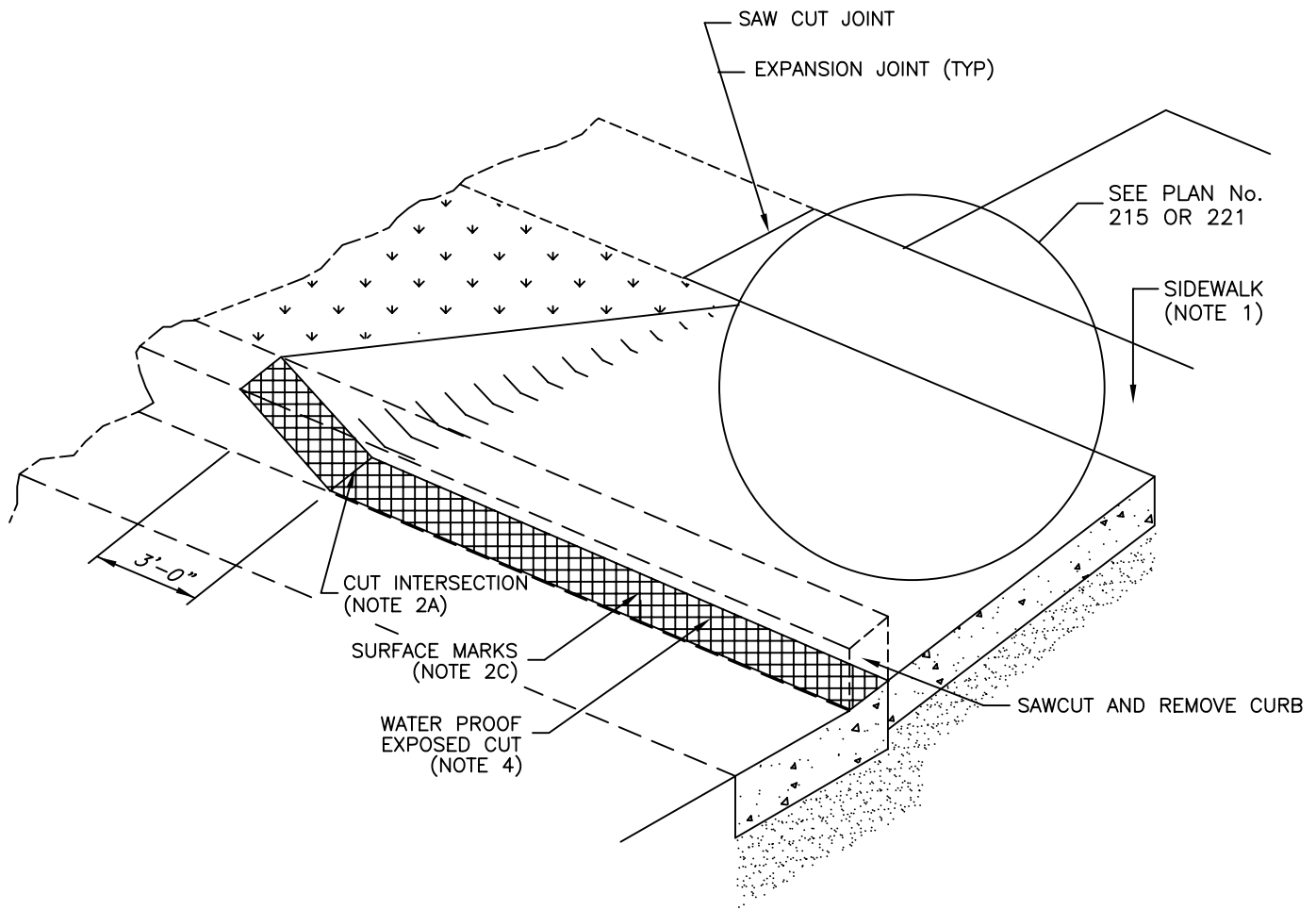
Flare driveway approach - type B

Plan No.

221

Saw-cut driveway approach

1. SIDEWALK:
 - A. Remove and replace all deteriorated, weak, or unsound concrete.
 - B. Thickness of sidewalk at driveway ramp to match thickness of driveway ramp.
 - C. Match elevation of driveway walk to the nearest joint beyond the width of the driveway.
2. CURB CUTTING:
 - A. No over-cutting where cuts merge.
 - B. Bevel front edge at flow-line or have saw-cut match flow-line.
 - C. Grind sawed surface so that no blade marks appear.
3. EXPANSION JOINT: Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. WATER PROOFING: Follow APWA Section 07 19 00 requirements.



OBLIQUE

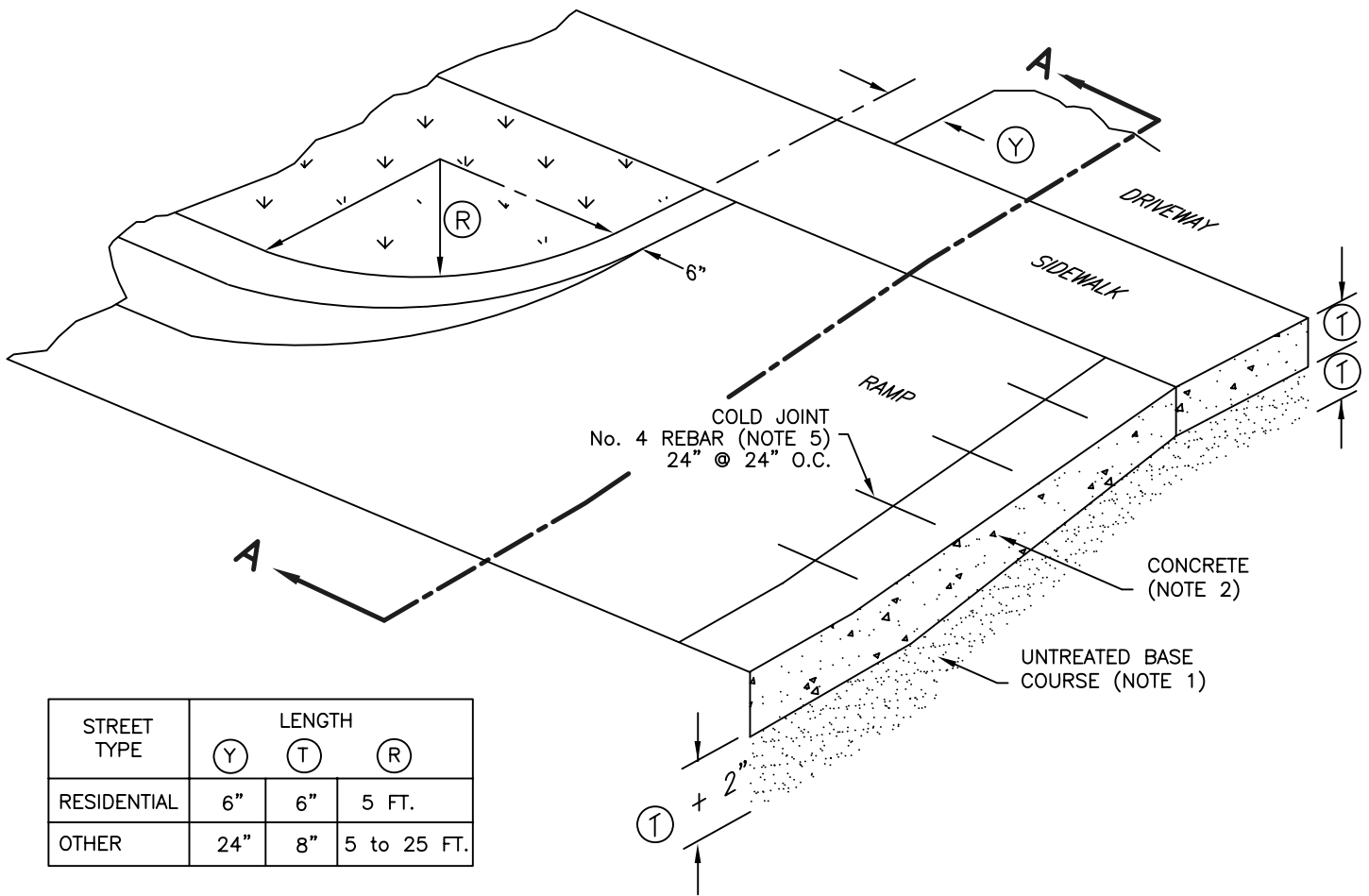
Saw-cut driveway approach

Plan No.

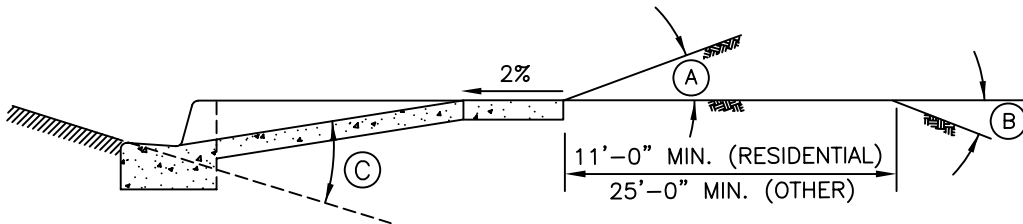
222

Open driveway approach

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **REINFORCEMENT:** ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements . Not required if driveway ramp is constructed without a cold joint.
6. **FIELD CHANGES TO SLOPE REQUIREMENTS:** The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
 - A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
 - B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
7. **FINISH:** Broomed.
8. **PROTECTION AND REPAIR:**
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.

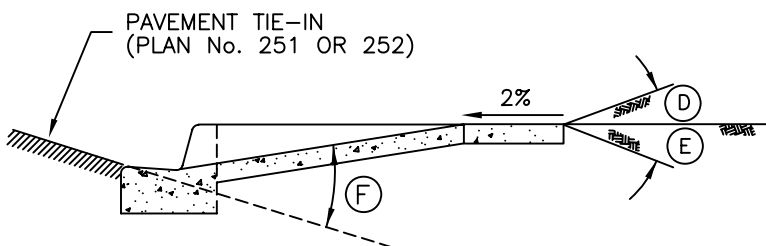


OBLIQUE



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	(A)	(B)	(C)
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)		
	(D)	(E)	(F)
RESIDENTIAL	16%	12%	16%
OTHER	6%	8%	10%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

Open driveway approach

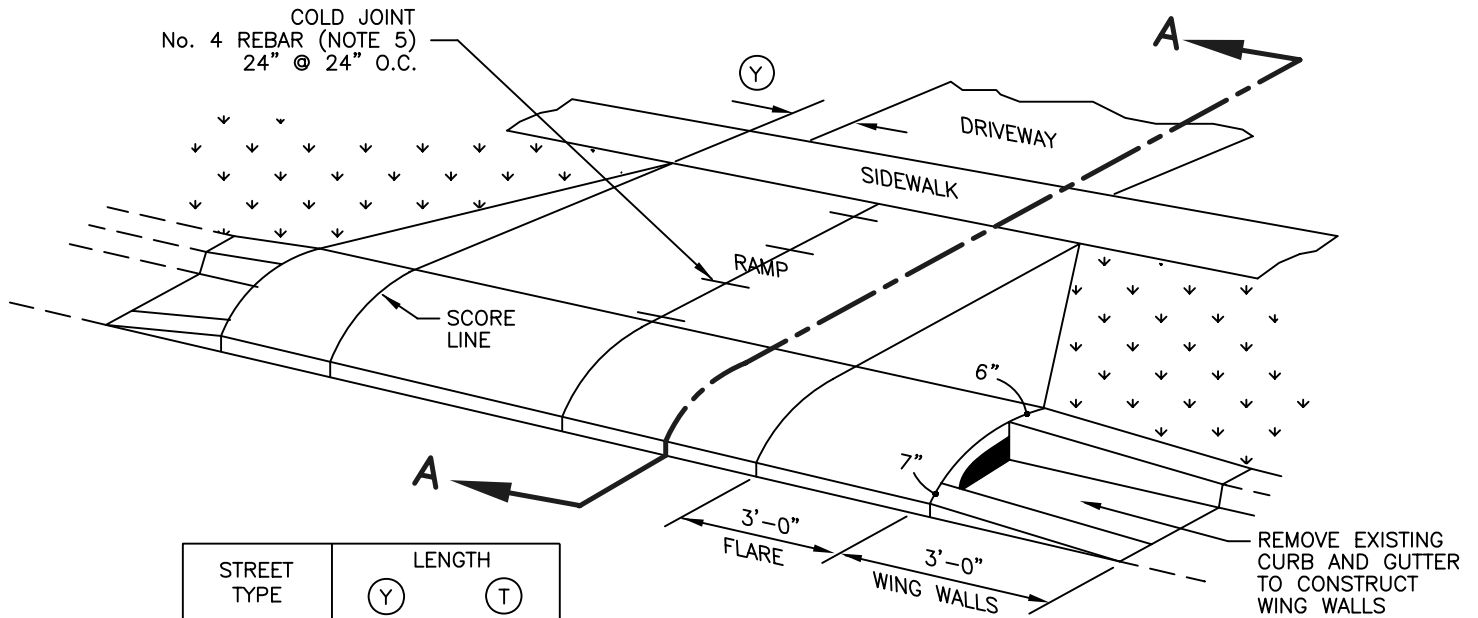
Plan No.

225

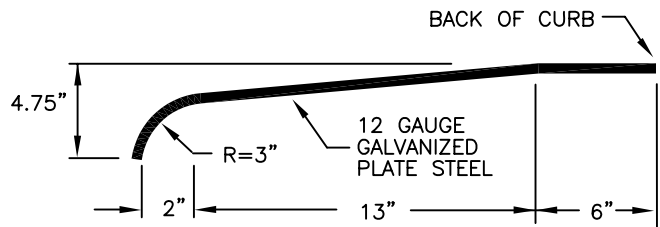
Piped driveway approach

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is .25 times the slab thickness (in inches) to a maximum of 15 feet.
5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements . Not required if driveway ramp is constructed without a cold joint.
6. FIELD CHANGES TO SLOPE REQUIREMENTS: The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
 - A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
 - B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
 - C. Grades subject to roadway crown and gutter span to be reviewed by ENGINEER for high centering and vehicle approach speed.
7. FINISH: Broomed.
8. PROTECTION AND REPAIR:
 - A. Fill flow-line with water. Repair construction that doesn't drain.
 - B. Protect concrete from deicing chemicals during cure period.

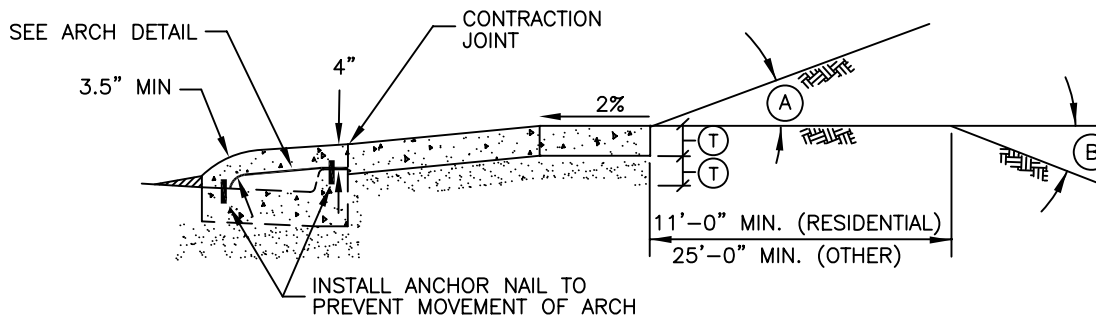
DO NOT CONSTRUCT THIS APPROACH WITHOUT ENGINEER'S WRITTEN APPROVAL



OBLIQUE

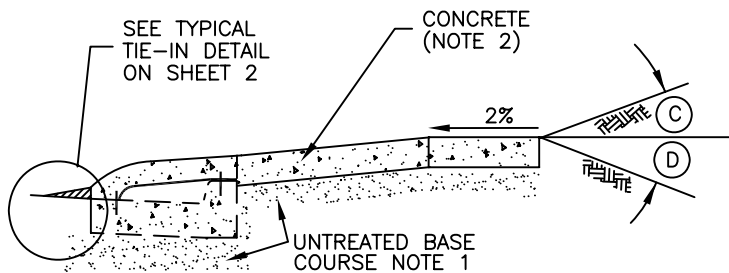


ARCH DETAIL



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(A)	(B)
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A – APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	BREAKOVER ANGLE (MAXIMUM)	
	(C)	(D)
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A – TYPICAL DRIVEWAY APPROACH

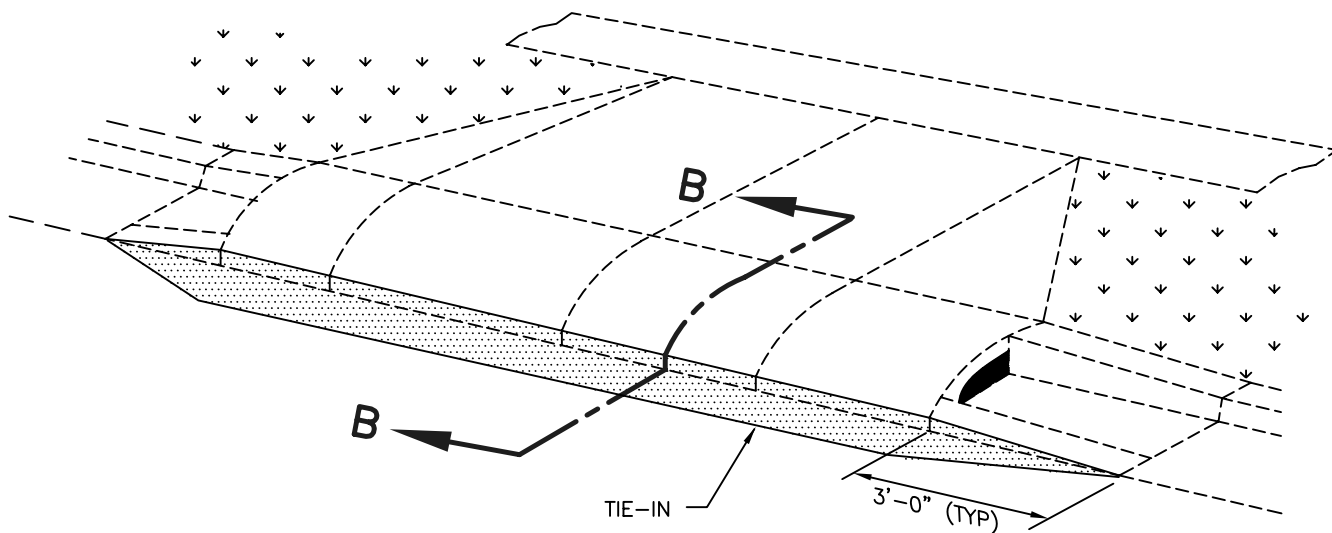
Piped driveway approach

Plan No.

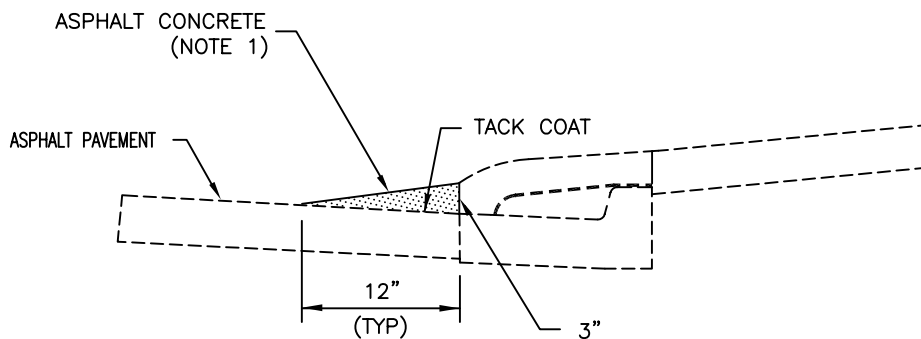
229

Piped driveway approach

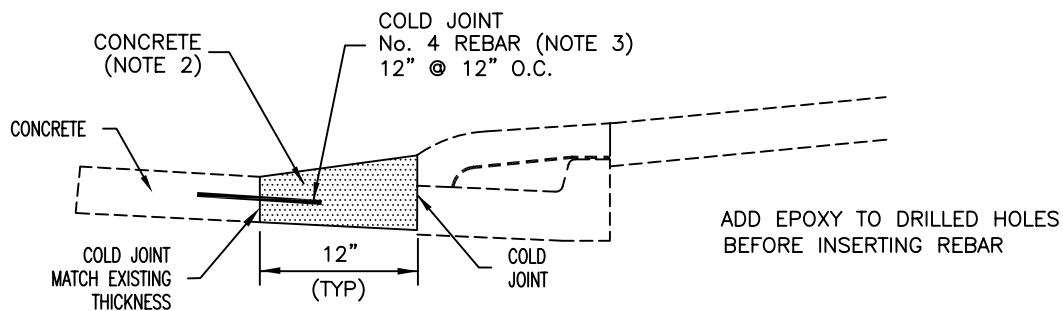
1. ASPHALT CONCRETE: As specified in APWA Section 32 12 05. Compaction to be within range of 92 to 96 percent relative to ASTM D 2041 (Rice Method).
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.



OBLIQUE



SECTION B-B - ASPHALT TIE-IN

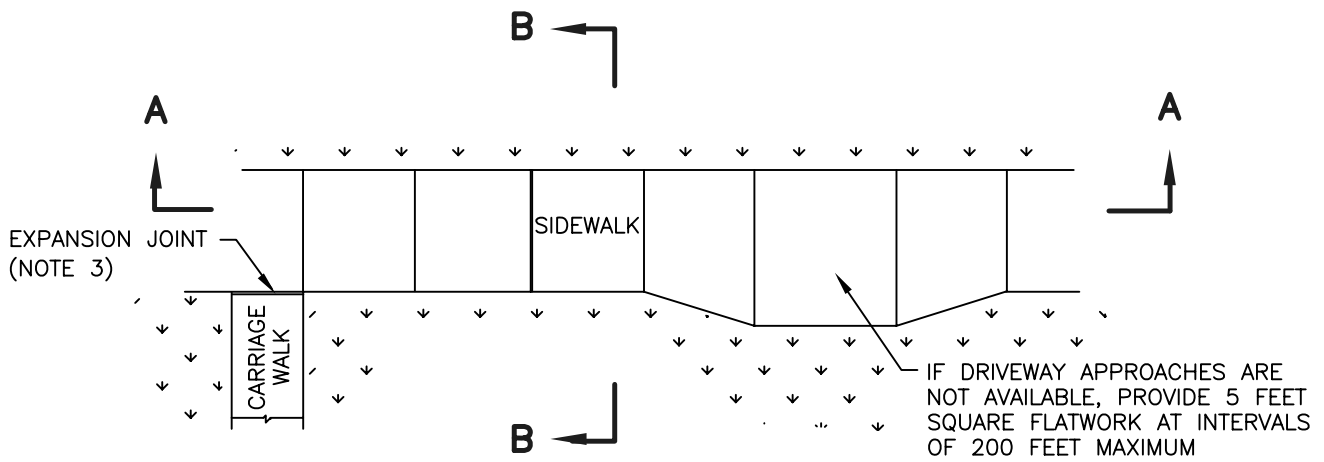


SECTION B-B - CONCRETE TIE-IN

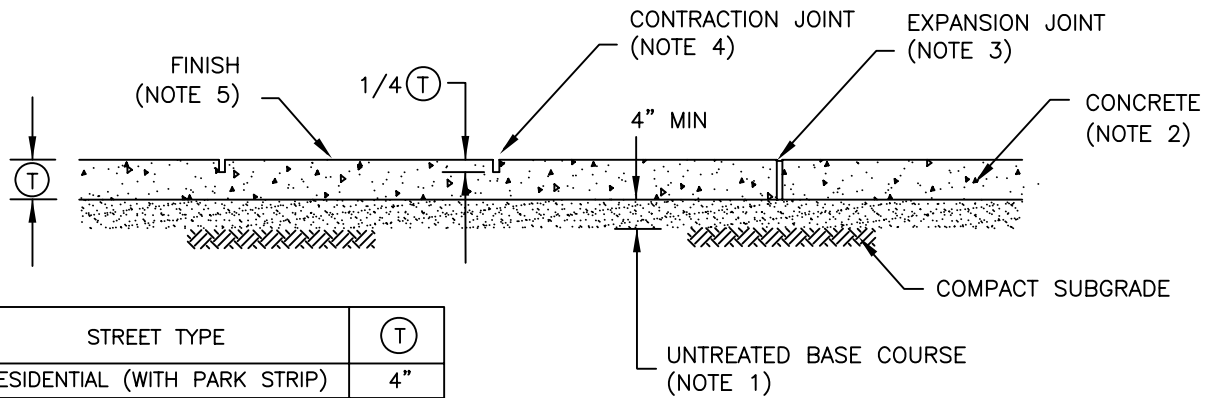
Piped driveway approach

Concrete sidewalk

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
 - A. Set top of filler flush with surface of concrete.
 - B. Expansion joints are not required in slip formwork except at the start or end of the installation activity.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
5. FINISH: Broomed.



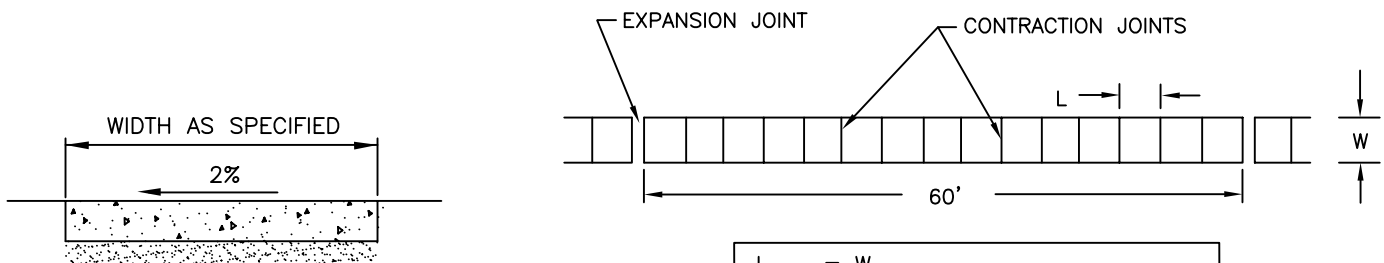
PLAN



STREET TYPE		(T)
RESIDENTIAL (WITH PARK STRIP)		4"
RESIDENTIAL (NO PARK STRIP)		6"
OTHER		
REPLACEMENTS	MATCH EXISTING, 4" MIN.	

SEE DRIVEWAY APPROACH PLANS FOR SIDEWALK THICKNESS AT DRIVEWAYS

SECTION A-A



$$L_{\text{MIN}} = W$$

$$L_{\text{MAX}} \text{ (in feet)} = 2.5 \times (T) \text{ (in inches)}$$

OR

$$= 15 \text{ FEET MAX.}$$

SECTION B-B

SIDEWALK JOINT DETAIL

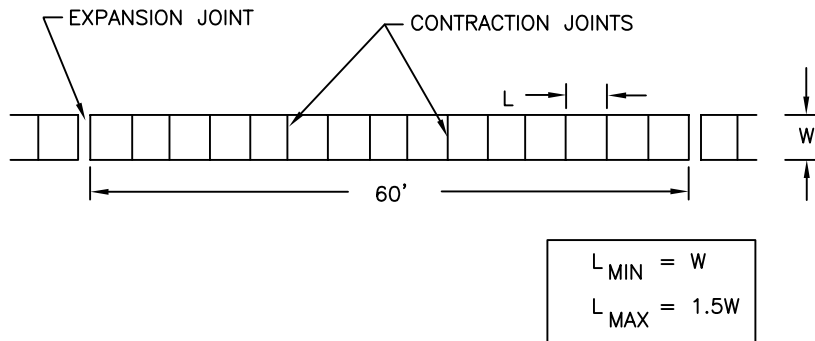
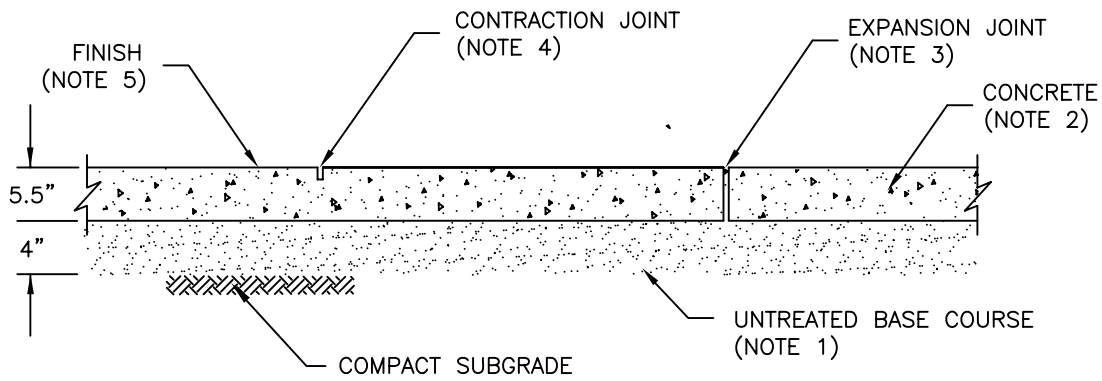
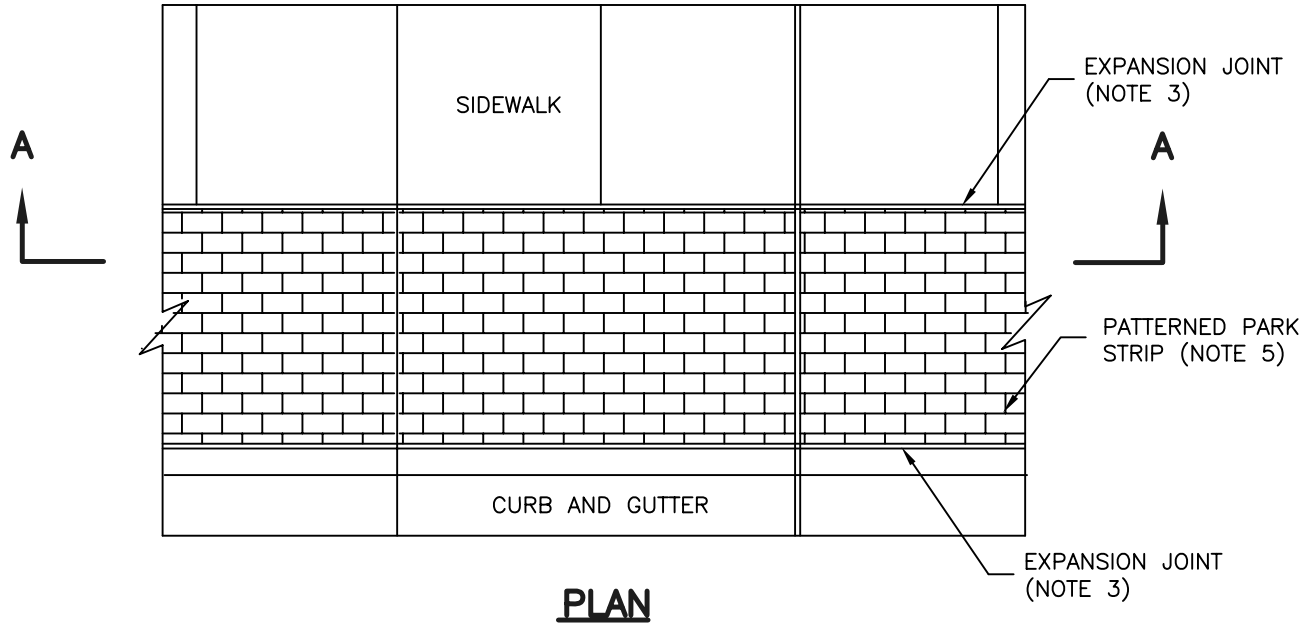
Concrete sidewalk

Plan No.

231

Patterned concrete park strip

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
 - A. Set top of filler flush with surface of concrete.
 - B. Place joints to match expansion joint locations in sidewalk.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. For non-square panels, maximum length to width ratio is 1.5 to 1.
5. PATTERN: Place pattern uniformly over surface to a depth of 1/2 inch.
6. COLOR: As specified or as selected by ENGINEER.



Patterned concrete park strip

Plan No.
232

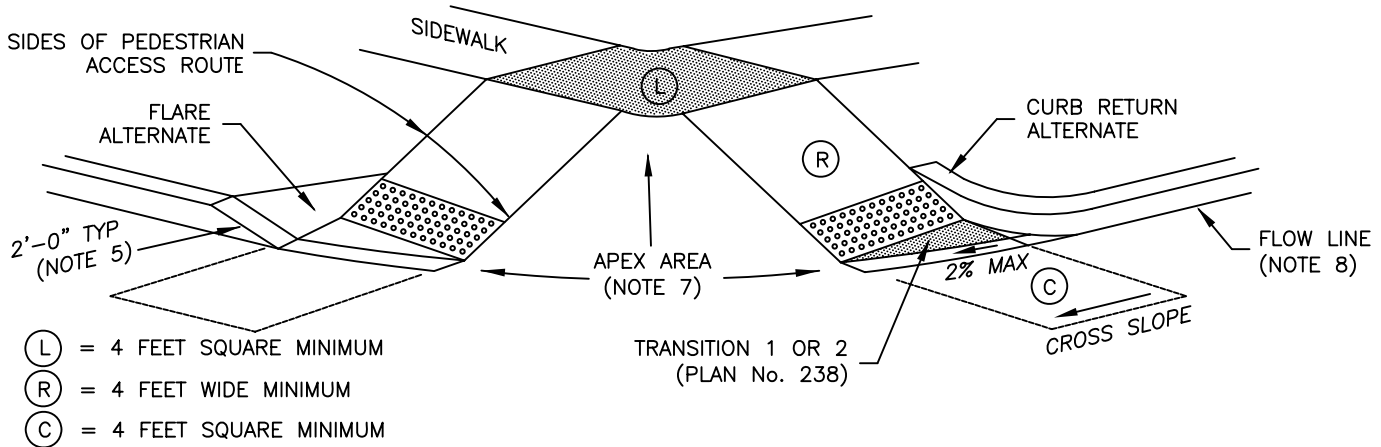
Corner curb cut assembly

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **FLARE:** If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. **DETECTABLE WARNING SURFACE:** A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. **APEX AREA:** The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.
8. **PROTECTION AND REPAIR:**
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

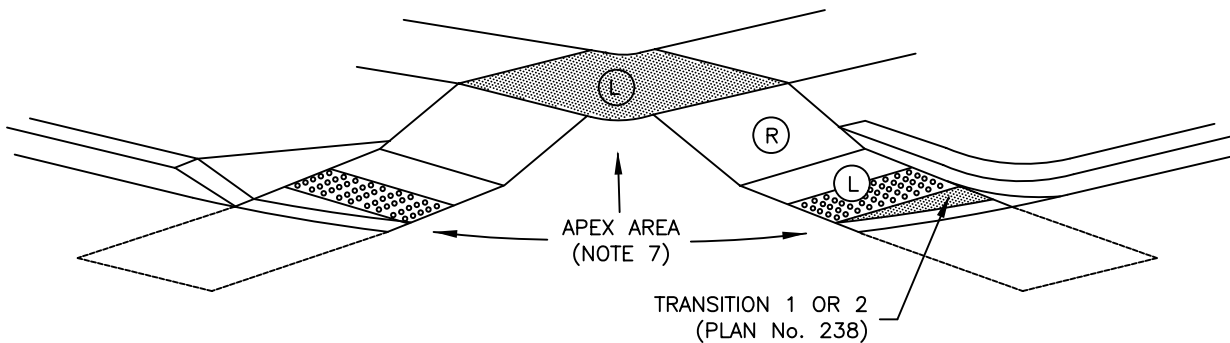
LANDING AT SIDEWALK LEVEL

NARRATIVE:

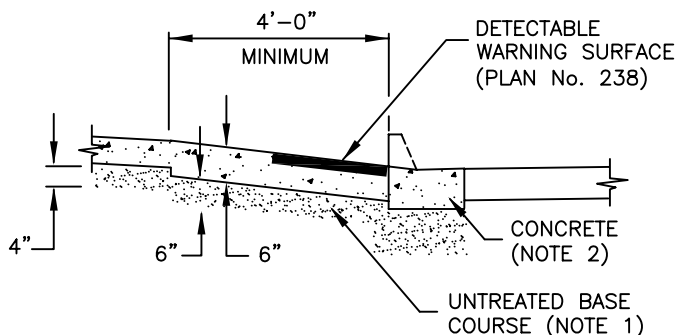
- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP, LANDING, AND TRANSITION MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- IF THE SIDES OF A PEDESTRIAN ACCESS ROUTE OR THE EXTENSION OF A LATERAL LINE OF THE SIDEWALK INTERSECTS A FLOW-LINE RADIUS, THEN A CORNER CURB CUT ASSEMBLY MUST BE CONSTRUCTED.
- GRADE BREAKS AT ENDS OF RAMPS MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.
- USE OF FLARES, CURB RETURNS, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.



EXAMPLE A



EXAMPLE B



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	1:48 (2%)	1:48 (2%)
RAMP	(R)	1:12 (8.33%)	1:48 (2%)
CLEAR SPACE	(C)	1:20 (5%)	1:48 (2%)

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL

MAXIMUM SLOPES

Corner curb cut assembly

Plan No.

235

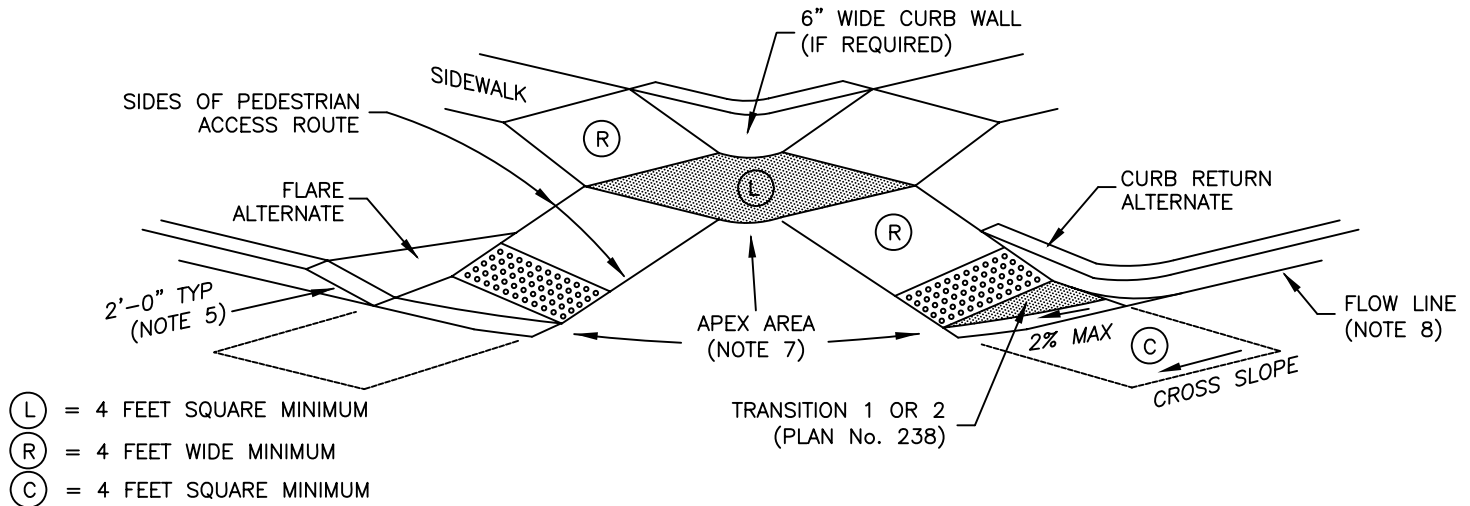
Corner curb cut assembly

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **FLARE:** If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. **DETECTABLE WARNING SURFACE:** A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. **APEX AREA:** The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.
8. **PROTECTION AND REPAIR:**
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

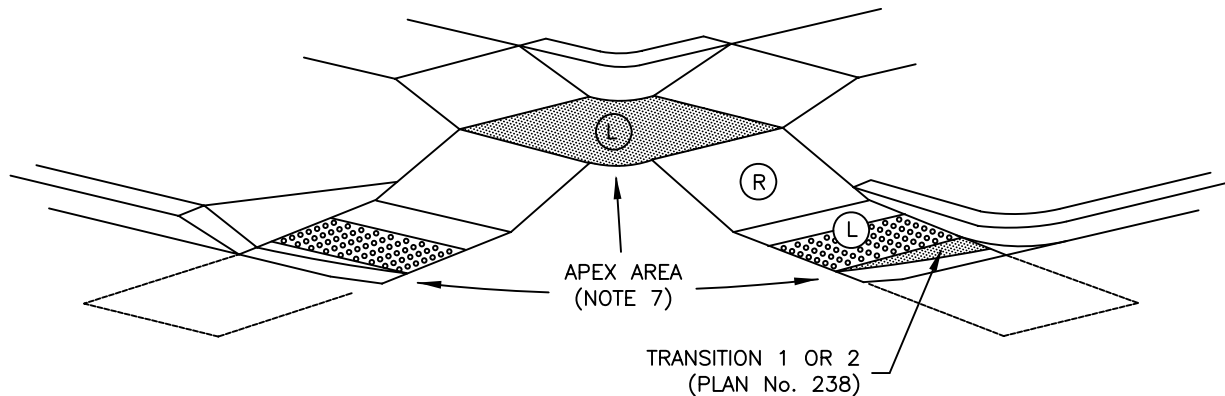
LANDING BETWEEN SIDEWALK AND STREET LEVELS

NARRATIVE:

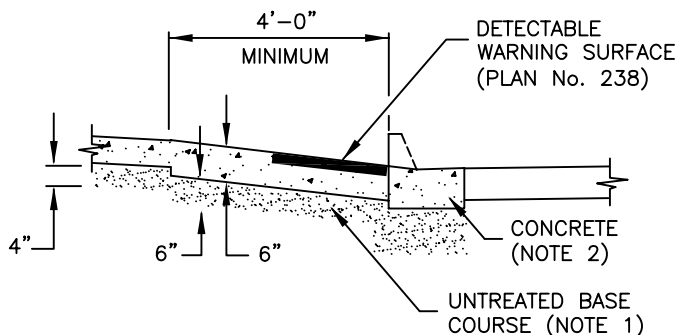
- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP, LANDING, AND TRANSITION MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- IF THE SIDES OF A PEDESTRIAN ACCESS ROUTE OR THE EXTENSION OF A LATERAL LINE OF THE SIDEWALK INTERSECTS A FLOW-LINE RADIUS, THEN A CORNER CURB CUT ASSEMBLY MUST BE CONSTRUCTED.
- GRADE BREAKS AT ENDS OF RAMPS MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL
- USE OF FLARES, CURB RETURNS, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.



EXAMPLE C



EXAMPLE D



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	1:48 (2%)	1:48 (2%)
RAMP	(R)	1:12 (8.33%)	1:48 (2%)
CLEAR SPACE	(C)	1:20 (5%)	1:48 (2%)

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL

MAXIMUM SLOPES

Corner curb cut assembly

Plan No.

235

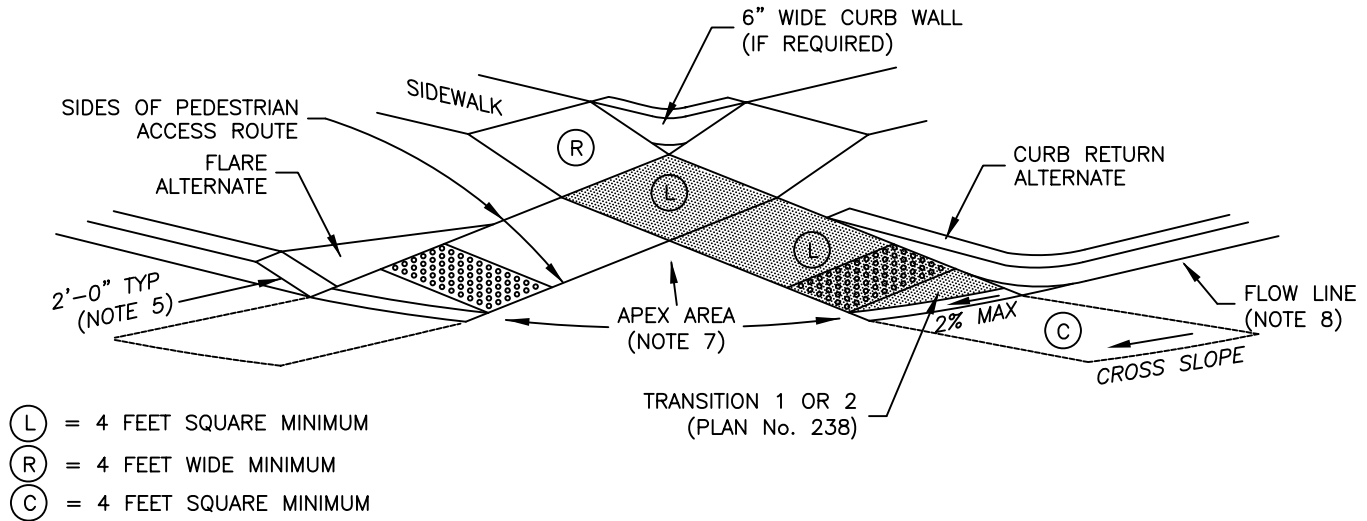
Corner curb cut assembly

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. **EXPANSION JOINT:** Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. **CONTRACTION JOINT:** Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. **FLARE:** If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. **DETECTABLE WARNING SURFACE:** A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. **APEX AREA:** The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.
8. **PROTECTION AND REPAIR:**
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

LANDING AT STREET LEVEL

NARRATIVE:

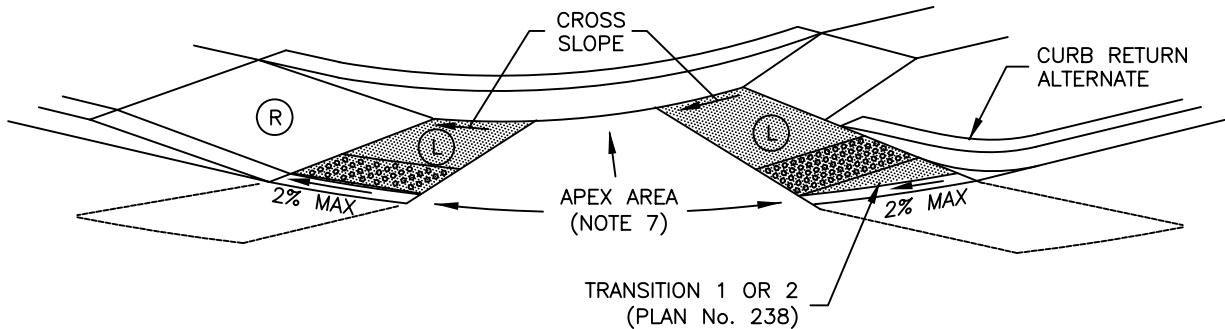
- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP, LANDING, AND TRANSITION MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- IF THE SIDES OF A PEDESTRAIN ACCESS ROUTE OR THE EXTENSION OF A LATERAL LINE OF THE SIDEWALK INTERSECTS A FLOW-LINE RADIUS, THEN A CORNER CURB CUT ASSEMBLY MUST BE CONSTRUCTED.
- GRADE BREAKS AT ENDS OF RAMP MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.
- USE OF FLARES, CURB RETURNS, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.



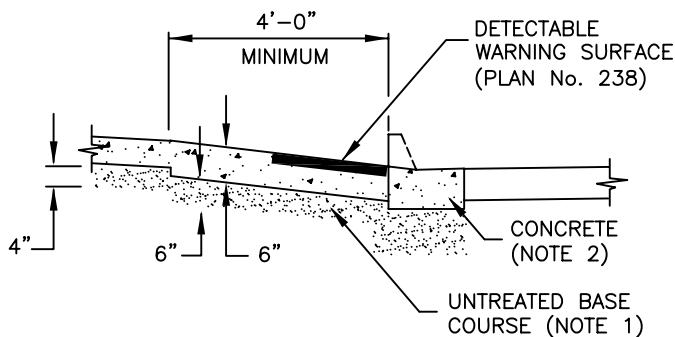
EXAMPLE E

(WITH NO PARK STRIP)

(WITH PARK STRIP)



EXAMPLE F



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	1:48 (2%)	1:48 (2%)
RAMP	(R)	1:12 (8.33%)	1:48 (2%)
CLEAR SPACE	(C)	1:20 (5%)	1:48 (2%)

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL

MAXIMUM SLOPES

Corner curb cut assembly

Plan No.

235

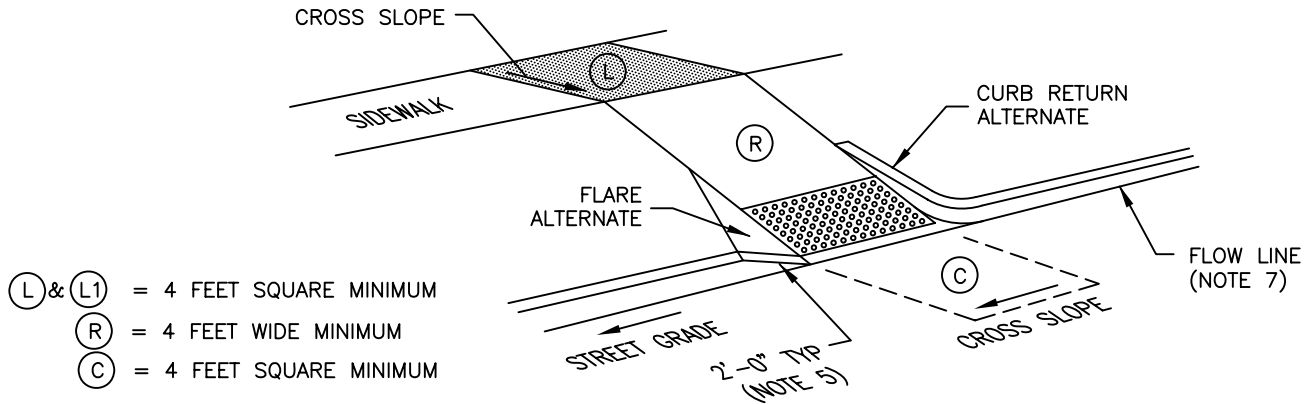
Tangent curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. PROTECTION AND REPAIR:
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

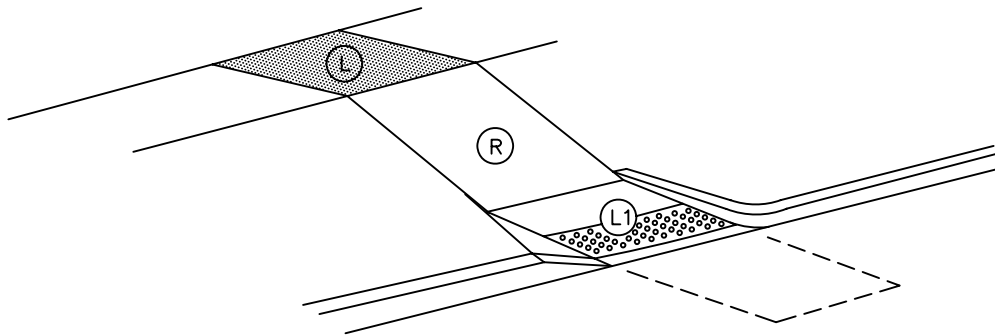
LANDING AT SIDEWALK LEVEL

NARRATIVE:

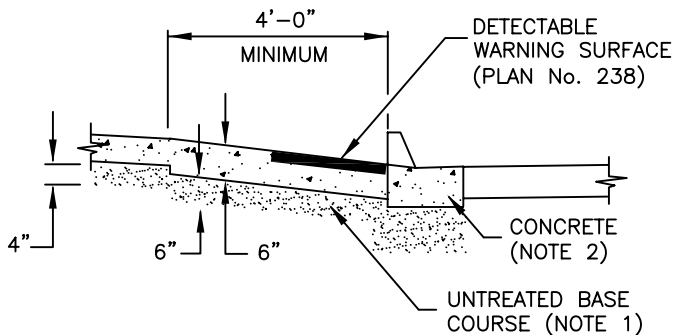
- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP AND LANDING MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- GRADE BREAKS AT ENDS OF RAMPS MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.
- USE OF FLARES, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.



EXAMPLE 1



EXAMPLE 2



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	STREET GRADE	1:48 (2%)
	(L1)	1:48 (2%)	STREET GRADE
RAMP	(R)	1:12 (8.33%)	STREET GRADE
CLEAR SPACE	(C)	1:20 (5%)	STREET GRADE

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL

MAXIMUM SLOPES

Tangent curb cut assembly

Plan No.

236

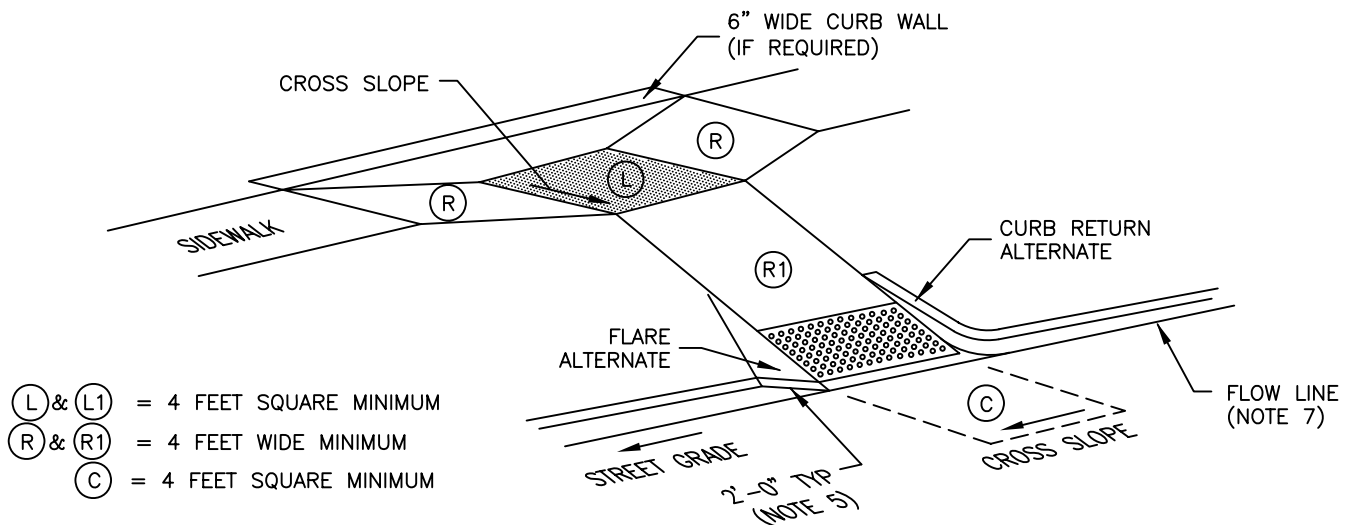
Tangent curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. PROTECTION AND REPAIR:
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

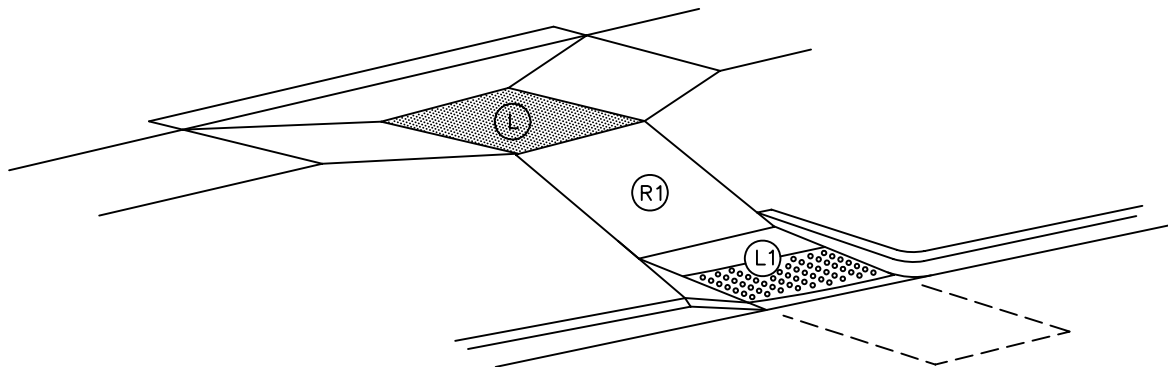
LANDING BETWEEN SIDEWALK AND STREET LEVELS

NARRATIVE:

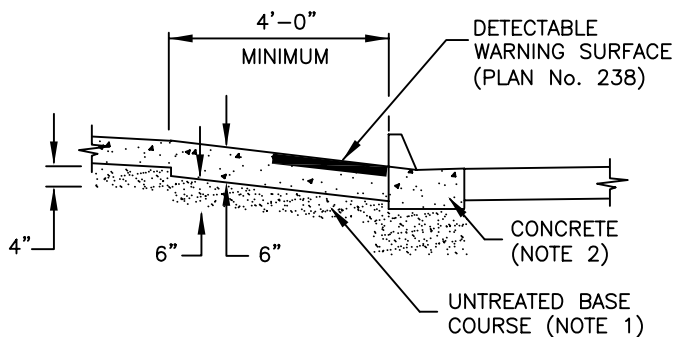
- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP AND LANDING MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- GRADE BREAKS AT ENDS OF RAMP MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.
- USE OF FLARES, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.



EXAMPLE 3



EXAMPLE 4



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	STREET GRADE	1:48 (2%)
	(L1)	1:48 (2%)	STREET GRADE
RAMP	(R)	1:12 (8.33%)	1:48 (2%)
	(R1)	1:12 (8.33%)	STREET GRADE
CLEAR SPACE	(C)	1:20 (5%)	STREET GRADE

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL.

MAXIMUM SLOPES

Tangent curb cut assembly

Plan No.

236

Tangent curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINT: Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
7. PROTECTION AND REPAIR:
 - A. Protect concrete from deicing chemicals during cure.
 - B. Fill flow line with water. Repair construction that doesn't drain.

LANDING AT STREET LEVEL

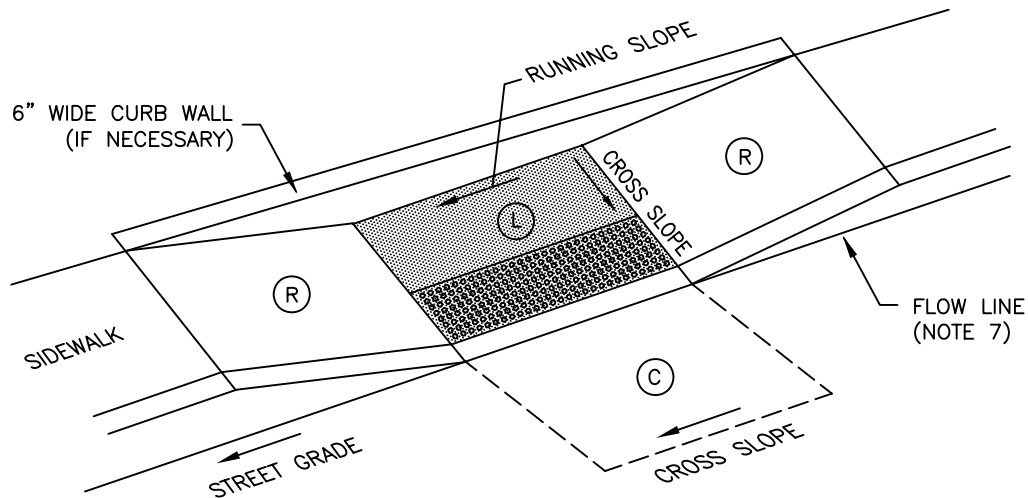
NARRATIVE:

- SITE CONDITIONS WILL VARY. CONFIGURATION OF RAMP AND LANDING MAY BE CHANGED, BUT THEY MUST MEET DIMENSIONS AND SLOPES SHOWN HERE.
- GRADE BREAKS MUST BE PERPENDICULAR TO THE DIRECTION OF PEDESTRIAN TRAVEL.
- USE OF FLARES, CURB WALLS, ETC., ARE AT ENGINEER'S DISCRETION.
- LENGTH OF ANY RAMP NOT REQUIRED TO EXCEED 15 FEET.

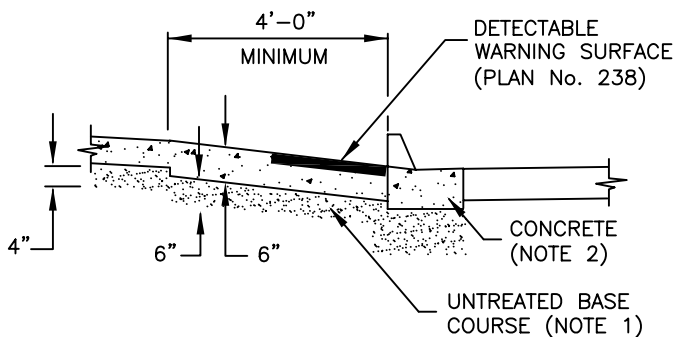
(L) = 4 FEET SQUARE MINIMUM

(R) = 4 FEET WIDE MINIMUM

(C) = 4 FEET SQUARE MINIMUM



EXAMPLE 5



MATERIALS

		RUNNING SLOPE	CROSS SLOPE
LANDING	(L)	STREET GRADE	1:48 (2%)
RAMP	(R)	1:12 (8.33%)	1:48 (2%)
CLEAR SPACE	(C)	1:20 (5%)	STREET GRADE

CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL.

MAXIMUM SLOPES

Tangent curb cut assembly

Plan No.

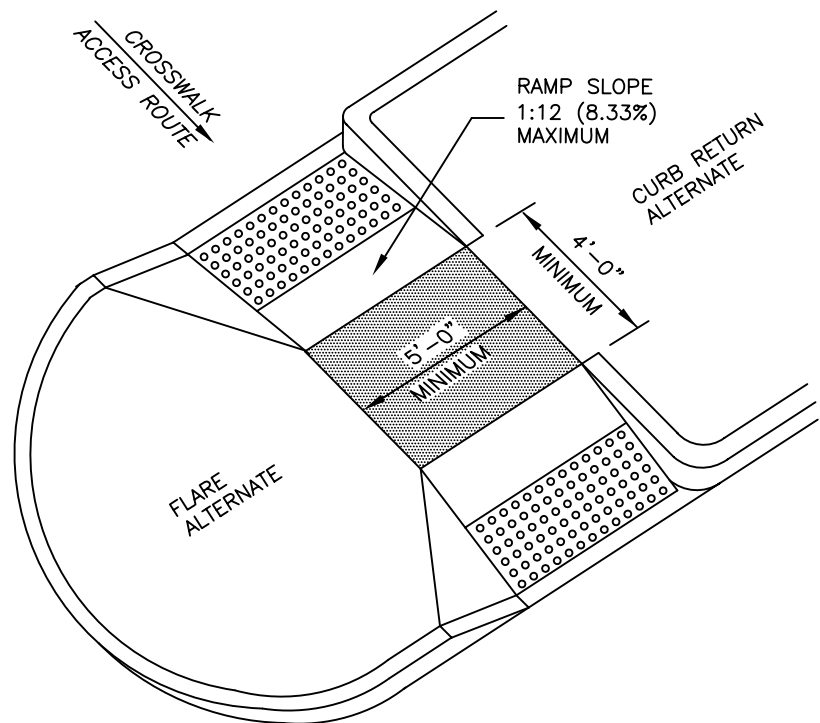
236

Islands and median

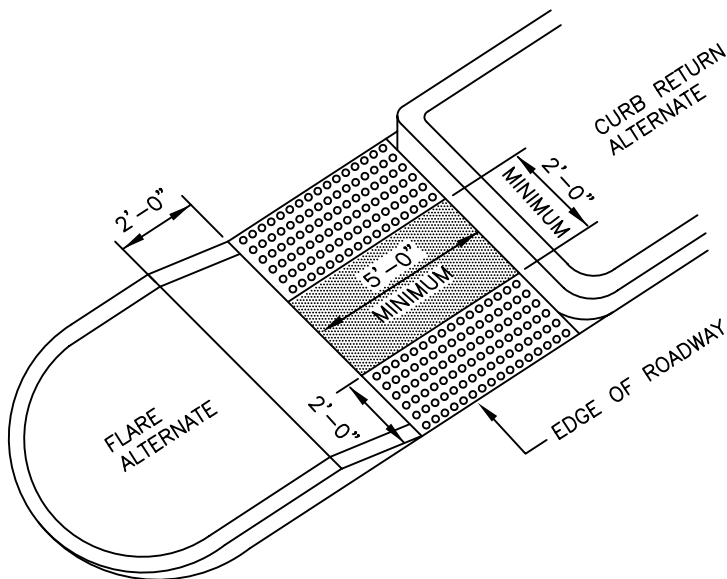
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
3. EXPANSION JOINT: Make expansion joints vertical.
 - A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical.
 - A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
 - B. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.
6. DETECTABLE WARNING SURFACE: Access through islands and medians can add difficulty to the crossing for some users. There are many factors to consider when placing the detectable warning surface. The edges of the warning surface can be useful as cues to the direction of a crossing. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

NARRATIVE:

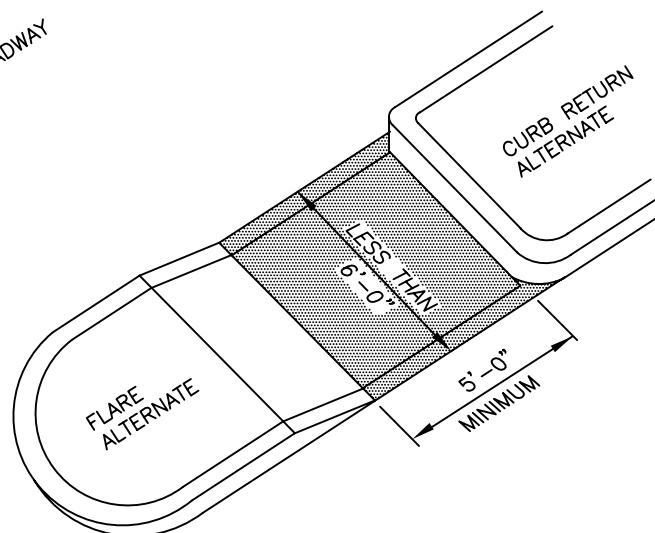
- WHEN DECIDING TO CUT-THROUGH A MEDIAN OR ISLAND, OR TO RAMP AN ISLAND, CONSIDER SLOPE AND CROSS SLOPE OF ROAD, DRAINAGE, AND WIDTH OF MEDIAN OR ISLAND.
- WHERE THERE IS NO ISLAND CURB, LOCATE THE DETECTABLE WARNING AT EDGE OF ROADWAY.



REFUGE ISLAND



CUT-THROUGH ISLAND



MEDIAN

Detectable warning surface

1. DETECTABLE WARNING SURFACE:

A. Dome Size:

1. Base diameter – 0.9 inches minimum, 1.4 inches maximum.
2. Top diameter – 50 percent of the base diameter minimum to 65 percent of the base diameter maximum.
3. Height: - 0.2 inches.

B. Dome Spacing:

1. Center to center spacing – 1.6 inches minimum, 2.4 inches maximum.
2. Base-to base spacing of 0.65 inches minimum measured between the most adjacent domes.

C. Dome Row Alignment:

1. Perpendicular Assembly: Perpendicular to the bottom grade break
2. Non-perpendicular Assembly Transition 1: Perpendicular to grade break at the bottom of the ramp.
3. Non-perpendicular Assembly Transition 2: Perpendicular or radial to the flow line.

D. Contrast: Provide a surface that contrasts visually with adjacent walking surface either light-on-dark, or dark-on-light.

E. Size:

1. 2 feet minimum in the direction of pedestrian travel.
2. Full width of area where a ramp, transition, or landing provides a flush connection to the street. Minimum width of flush connection is 4 feet.

2. PAVER

A. Material: ENGINEER's choice of

1. Geotextile filter fabric, bedding and joint sand, and solid interlocking concrete paver units per APWA Section 32 14 13.
2. Brick and mortar (not shown) per APWA Section 32 14 16.

B. Layout: All cut pavers are half pavers or larger.

3. RIBBED PANEL

A. Material: CONTRACTOR's choice with ENGINEER's acceptance.

B. Layout: Trim panel, as required matching required geometries.

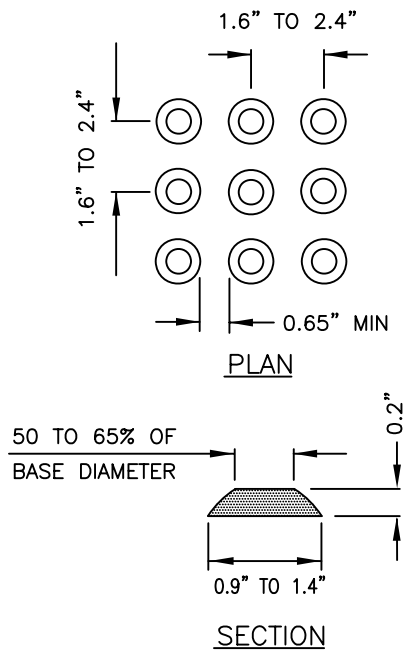
C. Installation: Per manufacturer's recommendations.

4. TILE

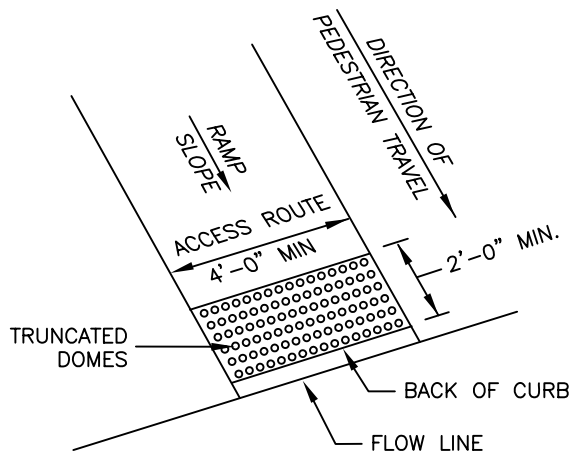
A. Material: CONTRACTOR's choice with ENGINEER's acceptance.

B. Layout: Trim panel, as required matching required geometries.

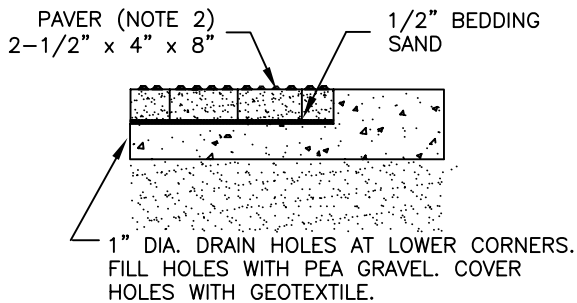
C. Installation: Per manufacturer's recommendations.



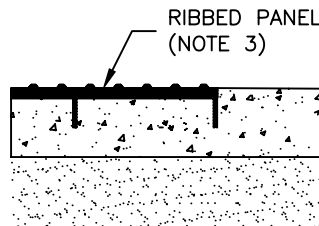
TRUNCATED DOME DETAIL



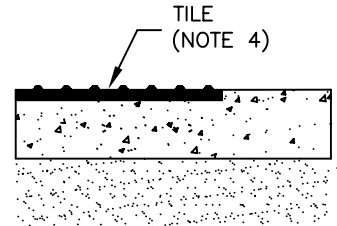
PERPENDICULAR ASSEMBLY



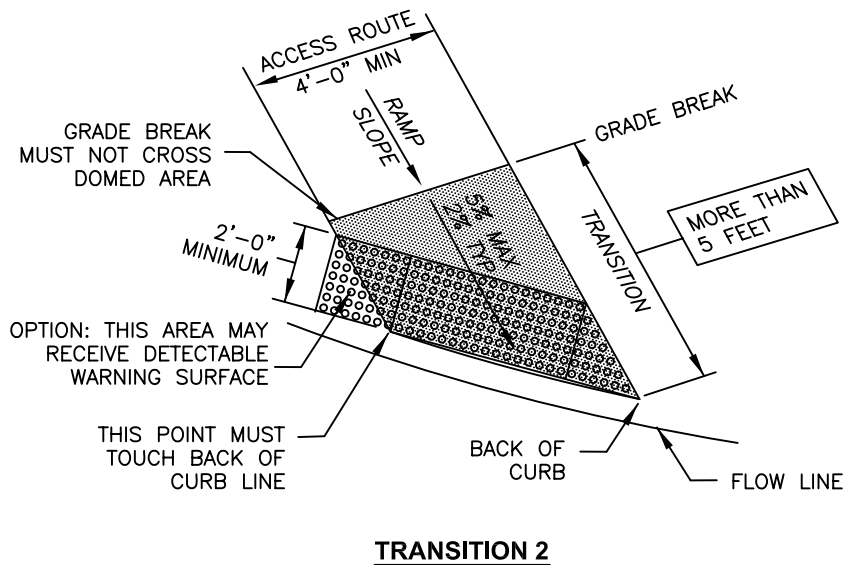
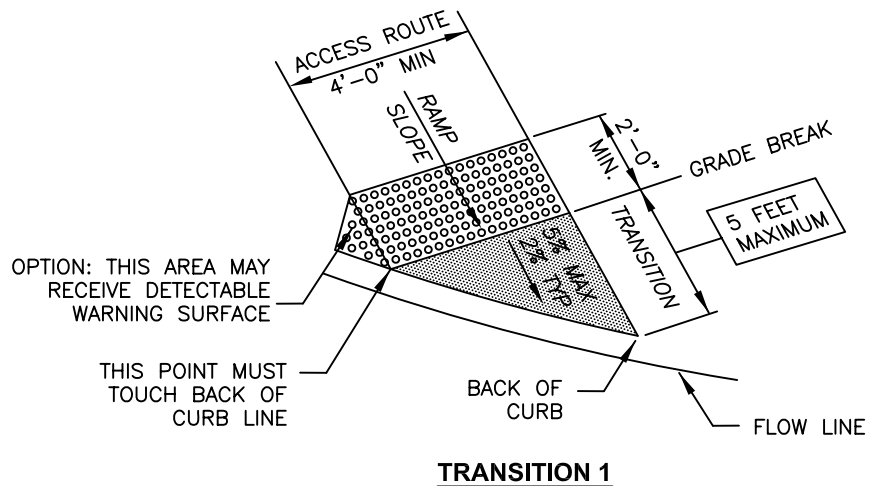
DETAIL-P



DETAIL-R



DETAIL-T



NON-PERPENDICULAR ASSEMBLY

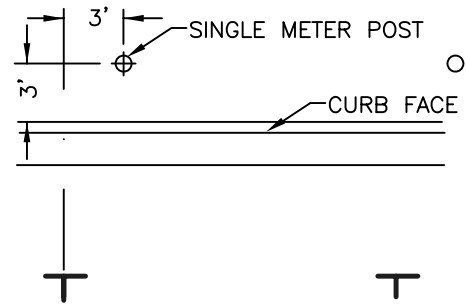
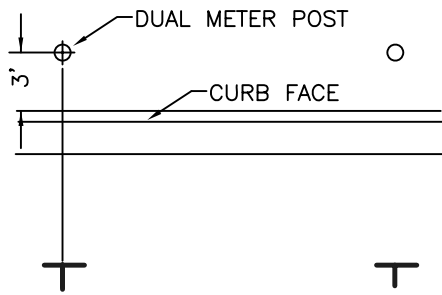
Detectable warning surface

Plan No.

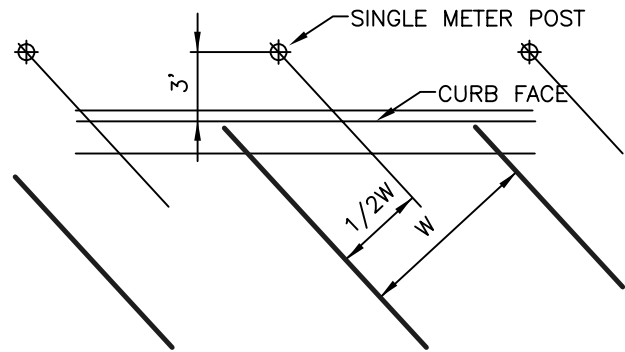
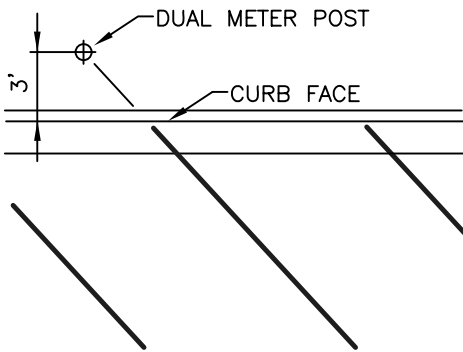
238

Parking meter post

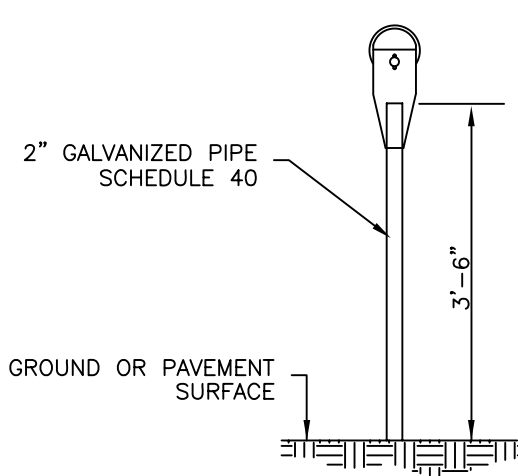
1. CONCRETE: Class 2000 minimum per APWA Section 03 30 04.



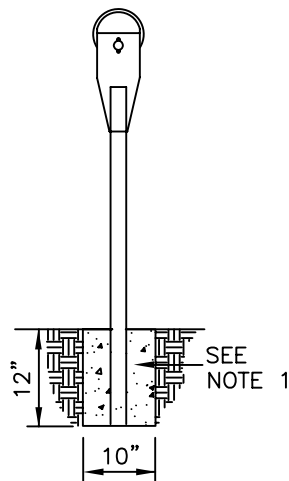
PARALLEL PARKING



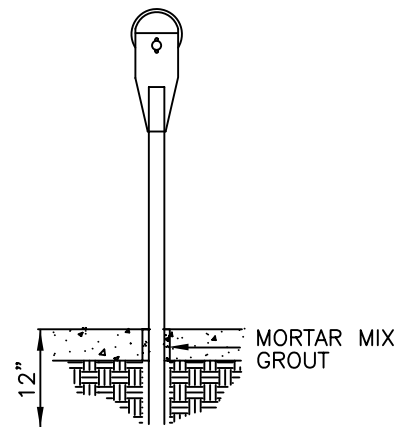
ANGLE PARKING



**TYPICAL
ELEVATION**



**SOIL
INSTALLATION**



**NON-SOIL
INSTALLATION**

DETAILS

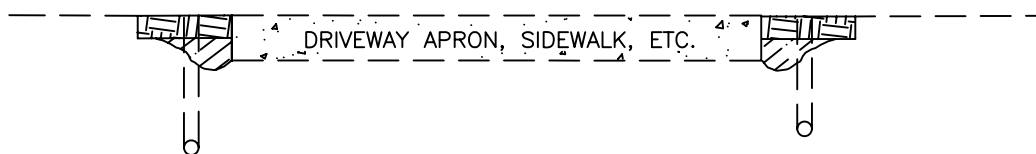
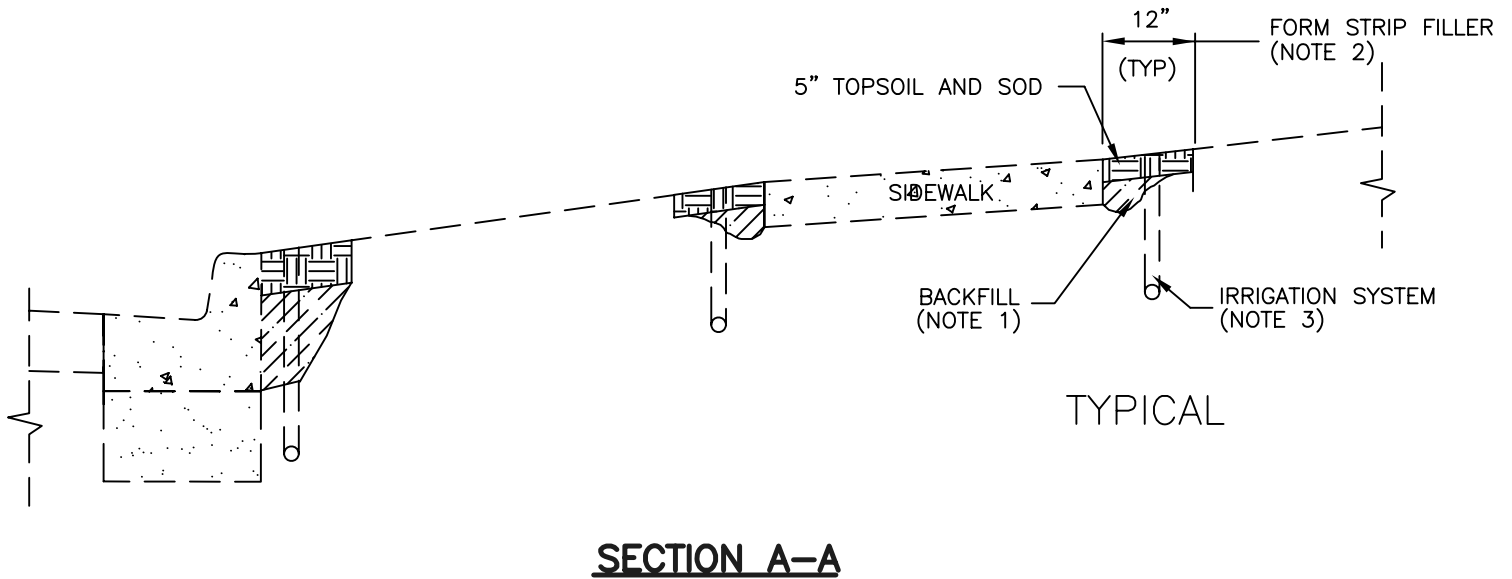
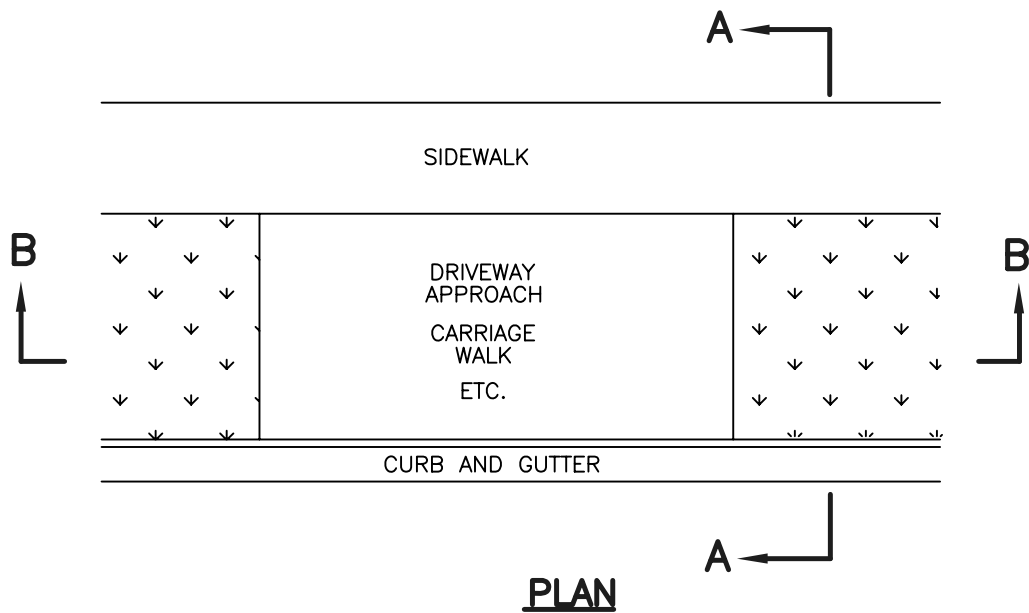
Parking meter post

Plan No.

241

Form strip filler

1. BACKFILL: Use native materials. Compact to prevent settling.
2. WIDTH OF REPLACEMENT: Any sod placed wider than 1 foot must be authorized by the ENGINEER.
3. IRRIGATION SYSTEM: Retain and protect existing irrigation systems. Repair damage caused by construction operation.
4. TOPSOIL AND SOD: Supply and install topsoil and sod per APWA Section 31 05 13 and APWA Section 32 92 00 respectively.



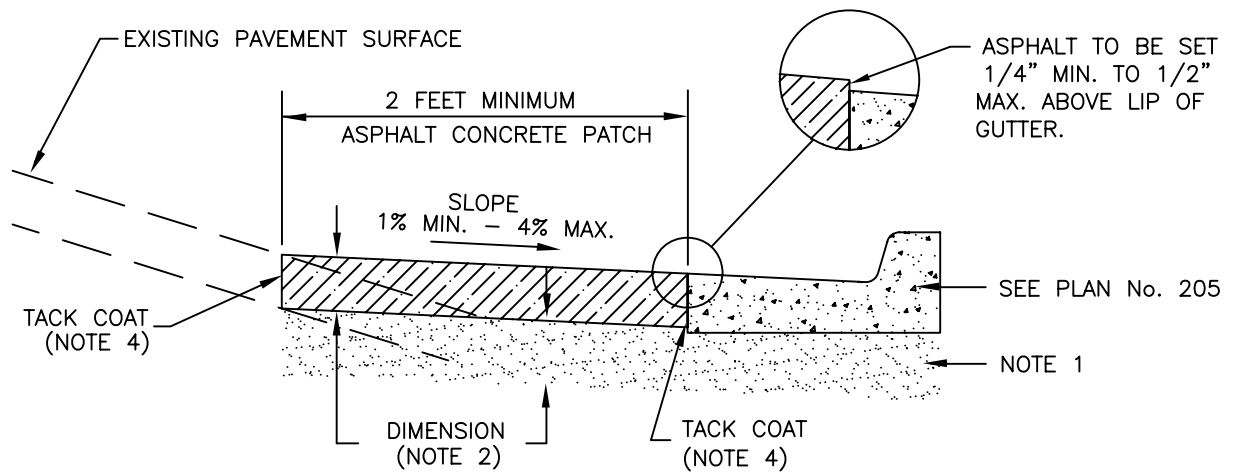
Form strip filler

Plan No.

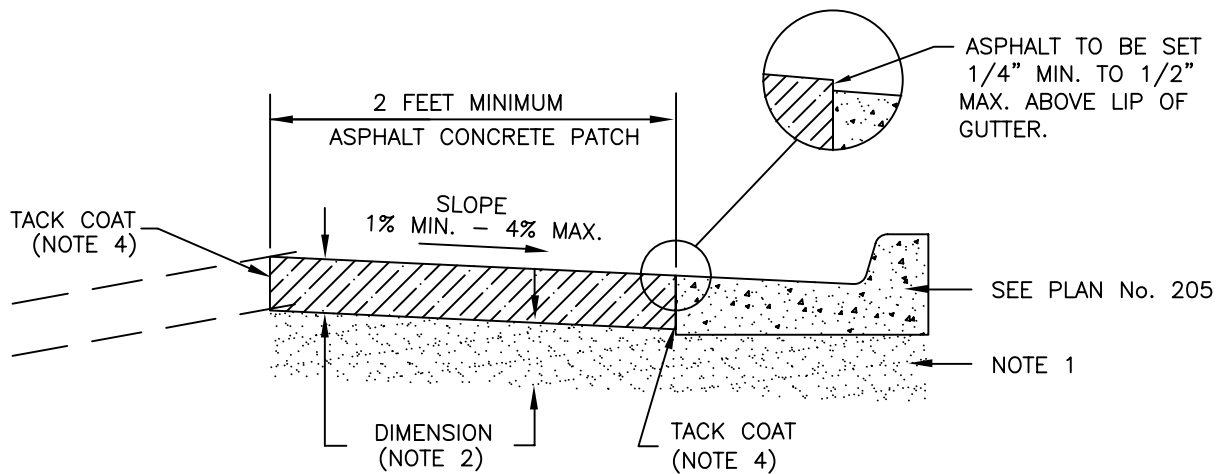
242

Asphalt concrete pavement tie in

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. DIMENSION:
 - A. Aggregate Base: Match existing thickness or 8 inches minimum.
 - B. Asphalt Pavement: Match thickness plus 1 inch, or
 - 1) 6 inches maximum in residential streets
 - 2) 8 inches maximum in non-residential streets.
3. ASPHALT CONCRETE PAVEMENT JOINTS: Provide a neat straight joint between existing and new asphalt concrete. Saw-cut joint if existing pavement exceeds 2 inches in thickness or if portland cement concrete underlies asphalt concrete pavement.
4. TACK COAT: APWA Section 32 12 14. Clean all vertical surfaces adjacent to the patch. Apply full coverage tack coat.
5. ASPHALT PAVEMENT: Use hot weather or cold weather asphalt concrete patch material specified in APWA Section 33 05 25.
 - A. Install in lifts no greater than 3 inches after compaction.
 - B. Compact each lift to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.



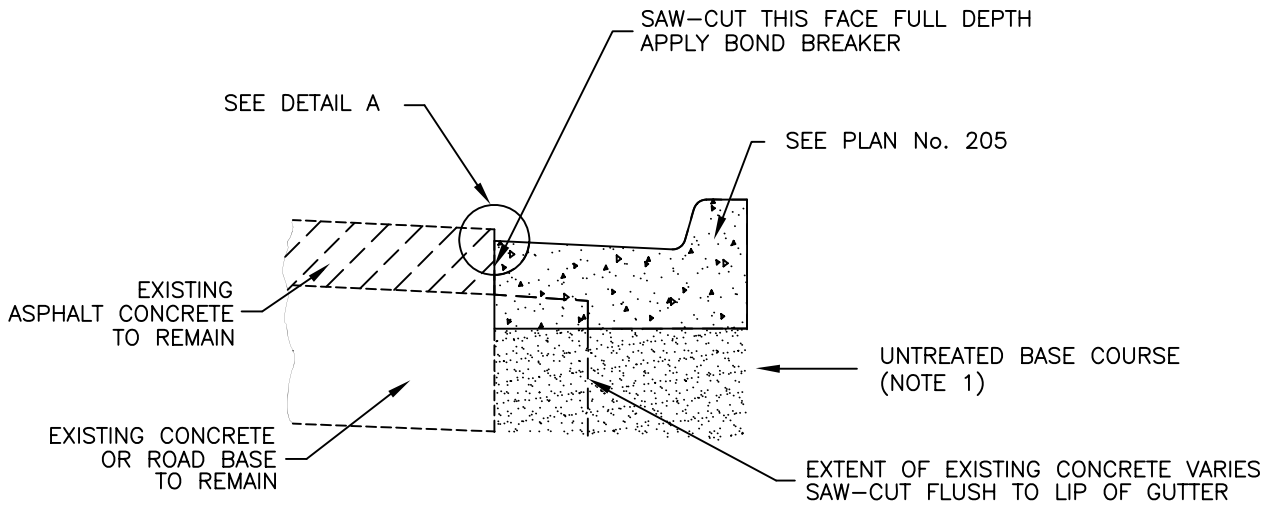
CASE 1 – POSITIVE STREET SLOPE TIE-IN



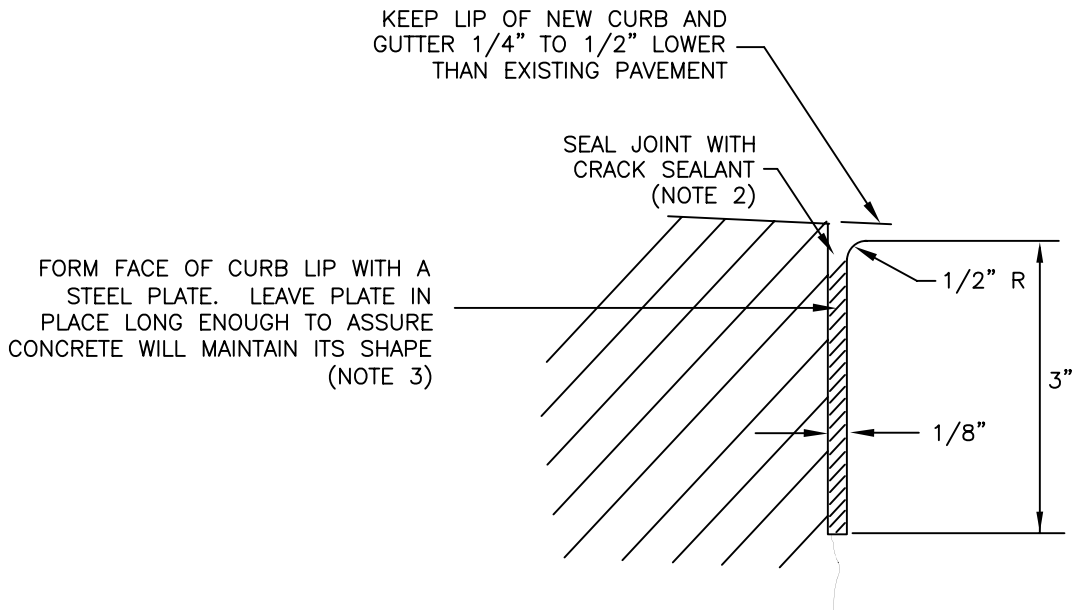
CASE 2 – NEGATIVE STREET SLOPE TIE-IN

Curb and gutter replacement without pavement tie in

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CRACK SEALANT: CAS1 per APWA Section 32 13 73.
3. STEEL PLATE: Plate provides a clean straight edge allowing asphalt concrete be milled out in the future for rehabilitation without damaging the curb and gutter. If straight edge between portland cement concrete and asphalt concrete cannot be provided, remove and replace curb and gutter per Plan No. 251.



SECTION

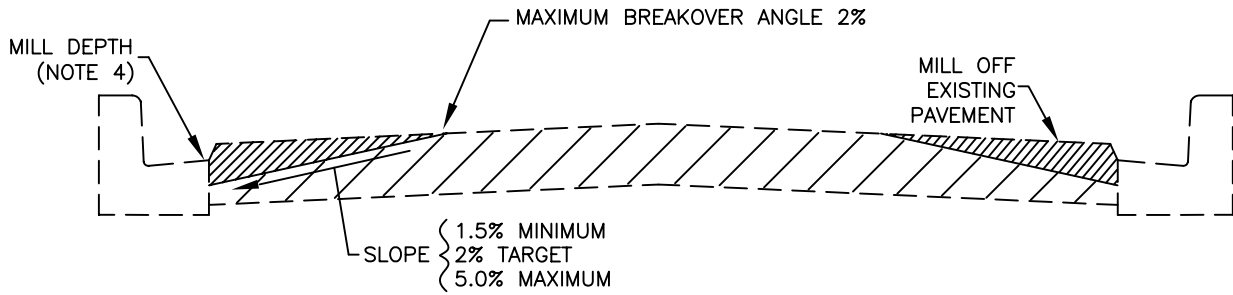


DETAIL A

Asphalt concrete pavement overlay

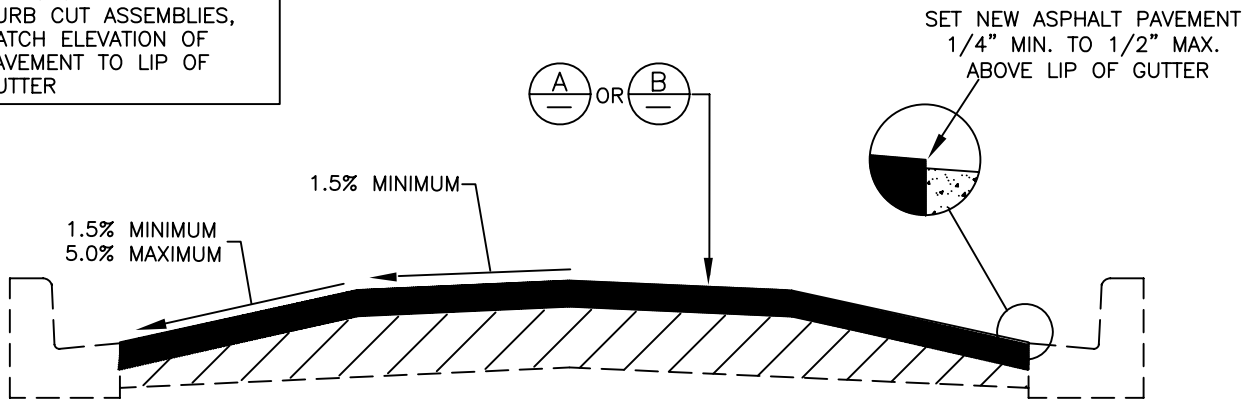
1. MILLING: APWA Section 02 41 14.
 - A. Remove compacted millings on prepared surfaces.
 - B. Mill around gutter lip radii to specified depth prior to paving.
2. TACK COAT: APWA Section 32 12 14.
 - A. Clean all horizontal and vertical surfaces in or adjacent to milled areas.
 - B. Apply full coverage.
3. PAVING GEOTEXTILE FABRIC: APWA Section 31 05 19.
 - A. Place fabric no closer than 1.5 feet from edge of new overlay pavement.
 - B. Do not use fabric on grades greater than 3 percent or in travel lanes within the following distances from a signalized intersection or stop sign.
 - 1) 100 feet where speeds are less than 30 mph.
 - 2) 150 feet where speeds are greater than 30 mph.
4. MINIMUM PAVEMENT OVERLAY THICKNESS:
 - A. 2 times maximum aggregate particle size for asphalt concrete mixes.
 - B. 4 times nominal maximum aggregate particle size for SUPERPAVE mixes.
5. PAVEMENT OVERLAY: APWA Section 32 12 16. Make pavement flush with the lip of gutter in bicycle lane and sidewalk curb cuts.

EDGE MILL



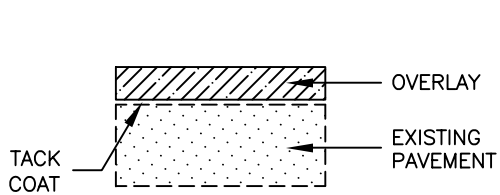
MILL

IN BICYCLE LANES AND CURB CUT ASSEMBLIES, MATCH ELEVATION OF PAVEMENT TO LIP OF GUTTER

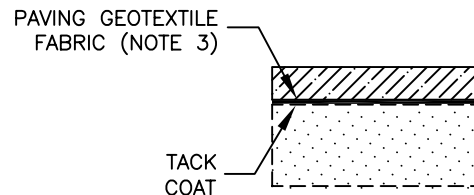


OVERLAY

SECTION



A NO FABRIC



B WITH FABRIC

Asphalt concrete pavement overlay

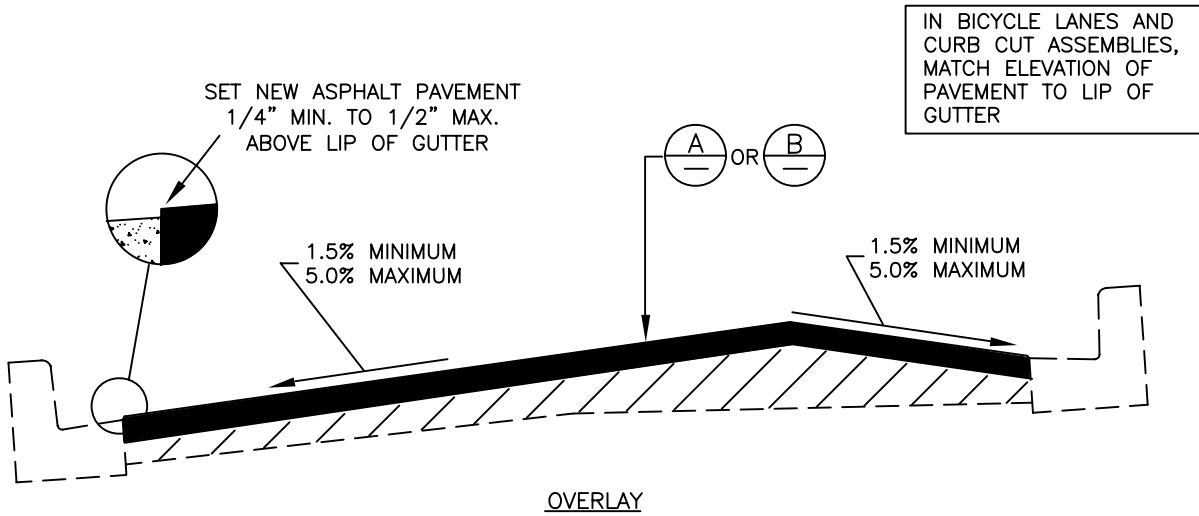
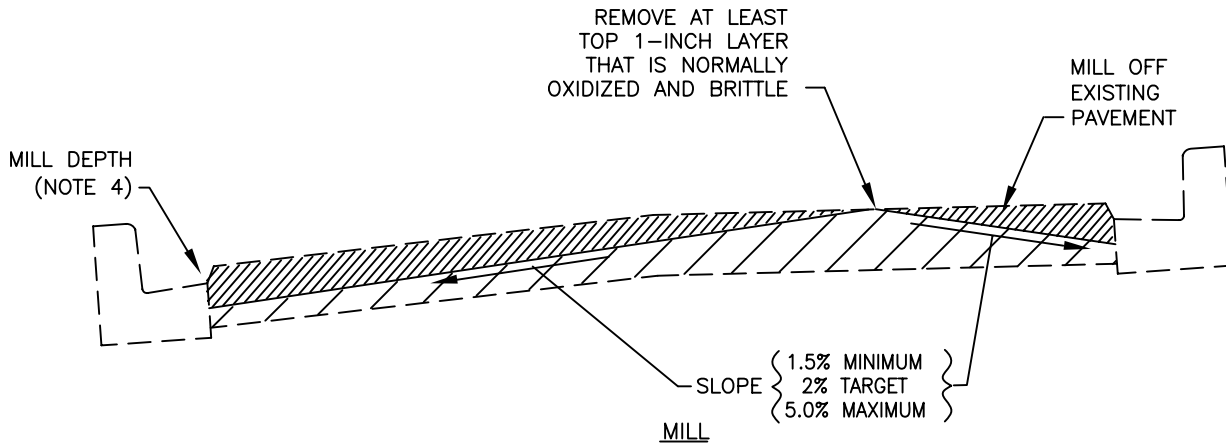
Plan No.

253

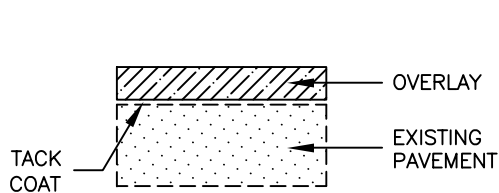
Asphalt concrete pavement overlay

1. MILLING: APWA Section 02 41 14.
 - A. Remove compacted millings on prepared surfaces.
 - B. Mill around gutter lip radii to specified depth prior to paving.
2. TACK COAT: APWA Section 32 12 14.
 - A. Clean all horizontal and vertical surfaces in or adjacent to milled areas.
 - B. Apply full coverage.
3. PAVING GEOTEXTILE FABRIC: APWA Section 31 05 19.
 - A. Place fabric no closer than 1.5 feet from edge of new overlay pavement.
 - B. Do not use fabric on grades greater than 3 percent or in travel lanes within the following distances from a signalized intersection or stop sign.
 - 1) 100 feet where speeds are less than 30 mph.
 - 2) 150 feet where speeds are greater than 30 mph.
4. MINIMUM PAVEMENT OVERLAY THICKNESS:
 - A. 2 times maximum aggregate particle size for asphalt concrete mixes.
 - B. 4 times nominal maximum aggregate particle size for SUPERPAVE mixes.
5. PAVEMENT OVERLAY: APWA Section 32 12 16. Make pavement flush with the lip of gutter in bicycle lane and sidewalk curb cuts.

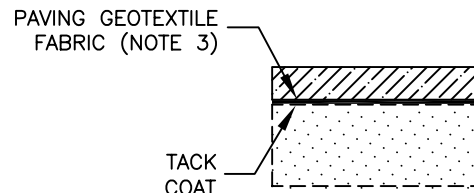
FULL WIDTH MILL



SECTION



A NO FABRIC



B WITH FABRIC

Asphalt concrete pavement overlay

Plan No.

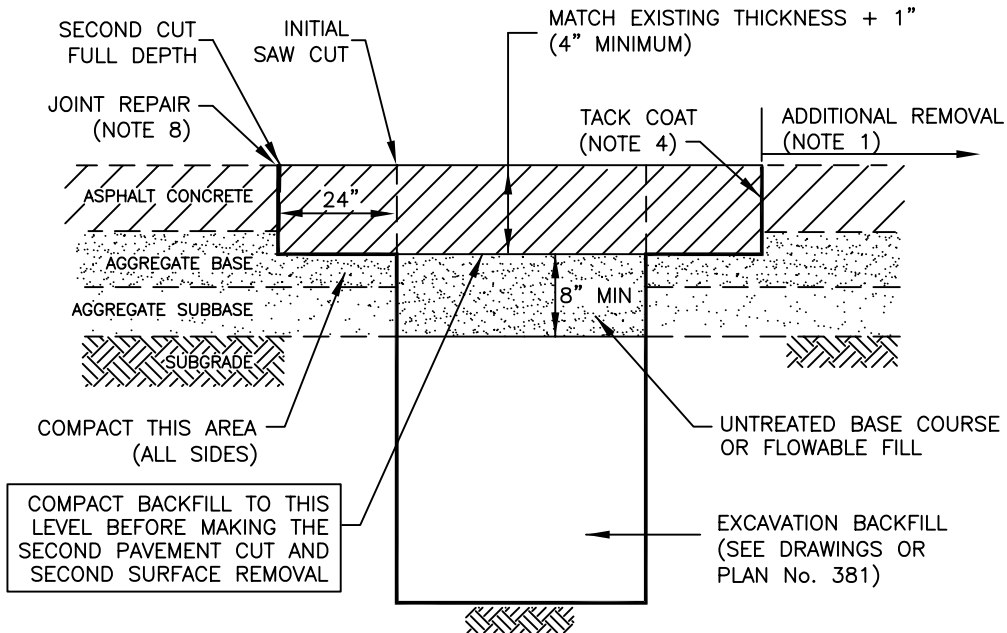
253

Asphalt concrete "T" patch

1. **ADDITIONAL PAVEMENT REMOVAL:** Remove additional pavement to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement if such street feature is within 2 feet of the second saw-cut.
2. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
3. **FLOWABLE FILL:** Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material which flows easily and vibration is not required. Cure to initial set before placing aggregate base or asphalt pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.
4. **TACK COAT:** APWA Section 32 12 14. Full tack coat coverage on all vertical surfaces.
5. **ASPHALT PAVEMENT:** Use asphalt concrete specified in APWA Section 33 05 25.
 - A. Install in lifts no greater than 3 inches after compaction.
 - B. Compact to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.
6. **REINFORCEMENT:** ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 12 inches on center.
 - A. Required if existing concrete thickness is 6 inches or greater.
 - B. Not required if (1) existing concrete is less than 6 inches thick, (2) existing concrete is deteriorating, (3) excavation is less than 3 feet square, (4) asphalt pavement is substituted for concrete substrate.
7. **CONCRETE SUBSTRATE:** Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure to initial set before placing new asphalt concrete patch.
8. **JOINT REPAIR:** If a crack occurs at the "T" patch connection to existing pavement or at any street fixture, seal the crack per APWA Section 32 01 17.
9. **PATCH REPAIR:** Repair the asphalt pavement patch if any of the following conditions within the patch occur.
 - A. Pavement surface distortion exceeds 1/4 inch deviation in 10 feet. Repair option: Plane off surface distortions. Coat planed surfaces with a cationic or anionic emulsion that complies with APWA Section 32 12 03 and provide sand blotter.
 - B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
 - C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay.

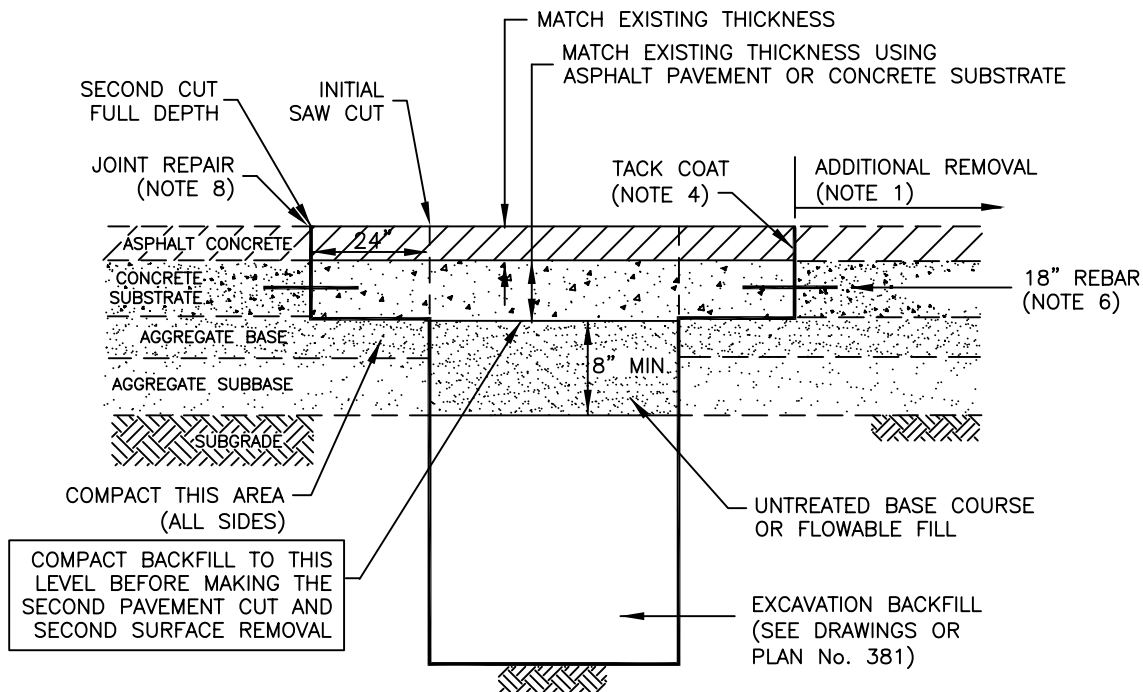
SHALLOW EXCAVATION

(LESS THAN 48 INCHES FROM PAVEMENT SURFACE TO BOTTOM OF EXCAVATION)



EXAMPLE 1

(ASPHALT RESTORATION)



EXAMPLE 2

(COMPOSITE RESTORATION)

Plan No.

255

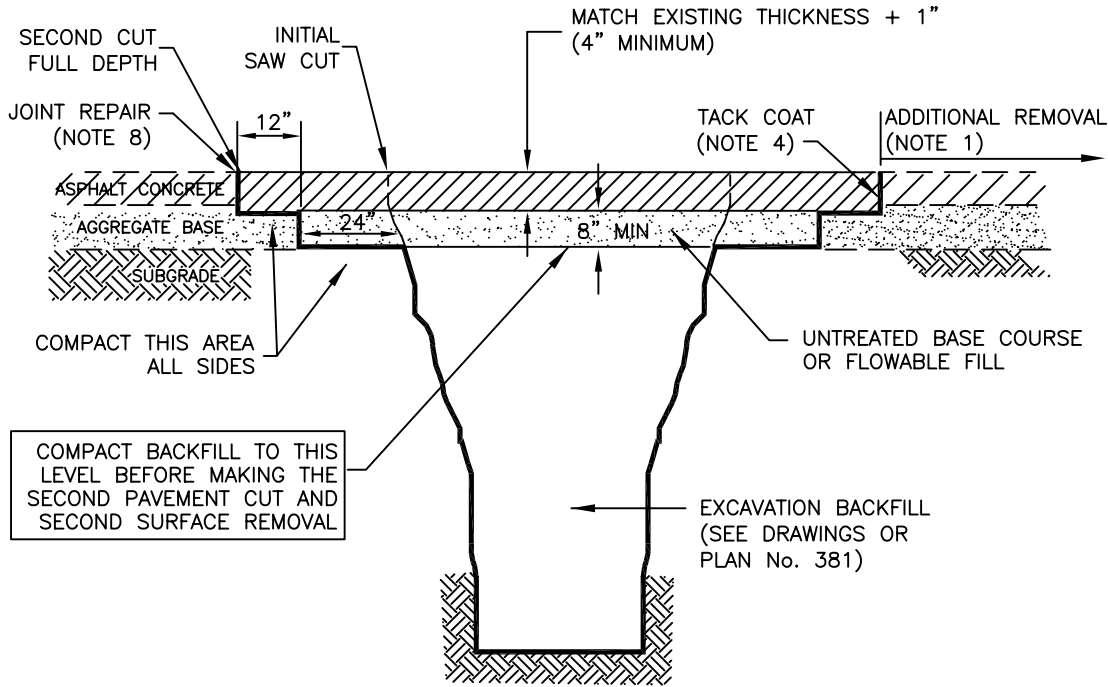
March 2006

Asphalt concrete "T" patch

1. **ADDITIONAL PAVEMENT REMOVAL:** Remove additional pavement to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement if such street feature is within 2 feet of the second saw-cut.
2. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
3. **FLOWABLE FILL:** Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material which flows easily and vibration is not required. Cure to initial set before placing aggregate base or asphalt pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.
4. **TACK COAT:** APWA Section 32 12 14. Full tack coat coverage on all vertical surfaces.
5. **ASPHALT PAVEMENT:** Use asphalt concrete specified in APWA Section 33 05 25.
 - A. Install in lifts no greater than 3 inches after compaction.
 - B. Compact to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.
6. **REINFORCEMENT:** ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 24 inches on center.
 - A. Required if existing concrete thickness is 6 inches or greater.
 - B. Not required if (1) existing concrete is less than 6 inches thick, (2) existing concrete is deteriorating, (3) excavation is less than 3 feet square, (4) asphalt pavement is substituted for concrete substrate.
7. **CONCRETE SUBSTRATE:** Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure to initial set before placing new asphalt concrete patch.
8. **JOINT REPAIR:** If a crack occurs at the "T" patch connection to existing pavement or at any street fixture, seal the crack per APWA Section 32 01 17.
9. **PATCH REPAIR:** Repair the asphalt pavement patch if any of the following conditions occur within the patch.
 - A. Pavement surface distortion exceeds 1/4 inch deviation in 10 feet. Repair option: Plane off surface distortions. Coat planed surfaces with a cationic or anionic emulsion that complies with APWA Section 32 12 03 and provide sand blotter.
 - B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
 - C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay.

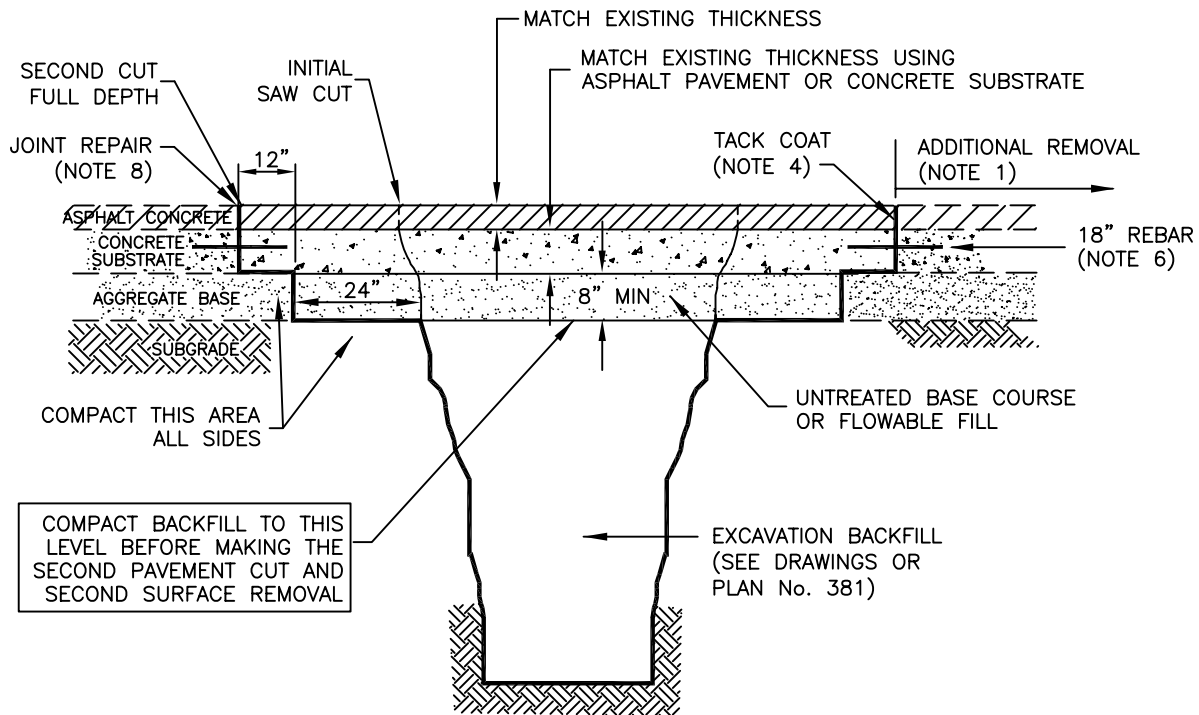
DEEP EXCAVATION

(MORE THAN 48 INCHES FROM PAVEMENT SURFACE TO BOTTOM OF EXCAVATION)



EXAMPLE A

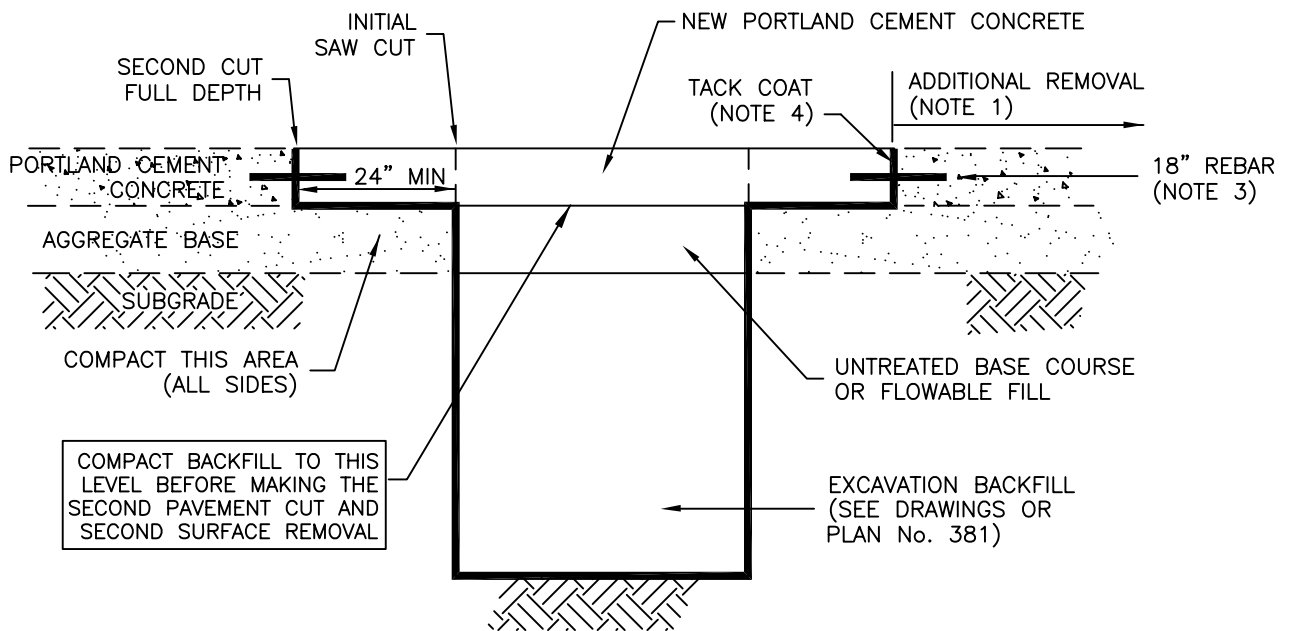
(ASPHALT RESTORATION)



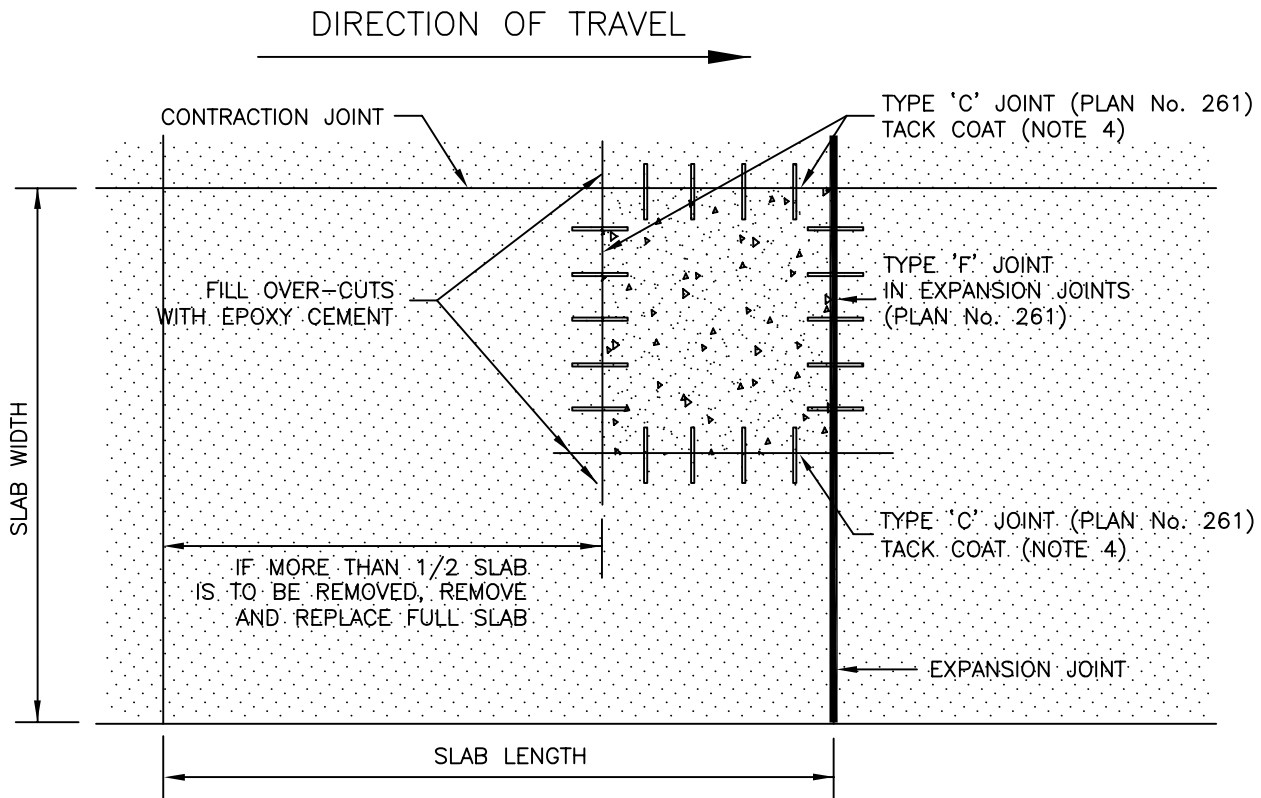
EXAMPLE B
(COMPOSITE RESTORATION)

Concrete pavement patch

1. **ADDITIONAL PAVEMENT REMOVAL:** Remove additional pavement to an existing joint in the concrete slab. If greater than 1/2 slab, remove full slab.
2. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 32 05 10.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
3. **FLOWABLE FILL:** Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material, which flows easily, and vibration is not required. Cure to initial set before placing new concrete pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.
4. **REINFORCEMENT:** ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 24 inches on center.
5. **TACK COAT:** Type II (non-redispersible) polyvinyl acetate base or acrylic base latex per ASTM C 1059. Do not apply tack coat to expansion joints.
6. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
 - A. If curb and gutter was poured monolithic to the pavement slab then such curb and gutter must also be removed and replaced or the patch slab thickness must be increased by 3 inches from the lip of gutter for 5 feet.
 - B. Clean all edges of dirt, oil and loose debris prior to concrete placement. Apply a concrete bonding compound as tack coat. Place concrete per APWA Section 03 30 10.
 - C. Match existing concrete thickness.
 - D. Plane off surface distortions that exceed 1/4 inch deviation in 10 feet. Coat planed surfaces with a water repellant product that complies with APWA Section 07 19 00.
 - E. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
7. **JOINTS:** Saw cut the surface of the new cement concrete to match existing concrete pavement joint patterns. Use the appropriate joint types shown in Plan No. 261.



**ROADWAY TRENCH
(Section)**



**ROADWAY POTHOLE
(Plan View)**

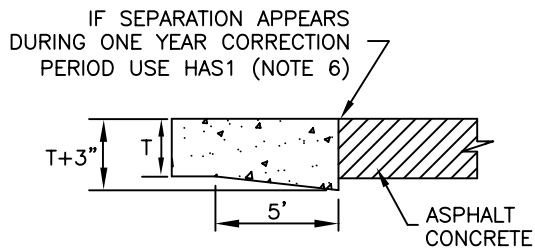
Concrete pavement patch

Plan No.

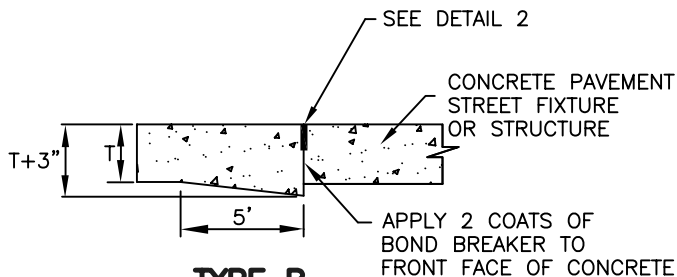
256

Concrete pavement joints

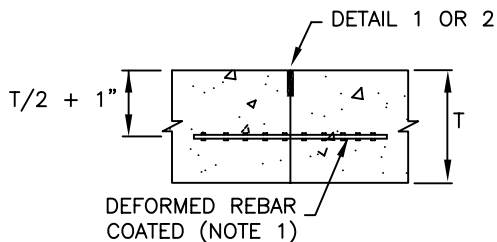
1. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel rebar or smooth steel dowels with diameter and length as indicated.
 - A. Space rebar and dowels at 12 to 15 inches on center.
 - B. Grease dowels to provide movement in expansion joints.
 - C. Keep tie bars in the vertical center of the concrete slab and perpendicular to the joint during concrete placement.
2. SAWING: Keep at least 3 working power saws on-site when concrete is being placed. Saw crack control joints (contraction joints) before shrinkage cracking takes place. Do not tear or ravel concrete during sawing. In cool weather, the joint sawing may be delayed only for the time required to prevent tearing and raveling the concrete. Cut joint to dimensions recommended by sealant manufacturer and approved by ENGINEER.
3. JOINTS: Lay out joints to aid construction and control random cracking.
 - A. Longitudinal joint spacing is 12 feet for concrete pavement less than 9 inches thick and 15 feet for concrete pavement 9 inches thick and thicker.
 - B. Transverse joints spacing is $30 \times T$ (slab thickness in feet) where the maximum slab length to slab width ratio is 1.5 to 1.
 - C. Extend transverse contraction joints continuously across the full width of the concrete. Make the joints coincide with curb and gutter joints.
 - D. Make adjustments in joint locations to meet inlet or manhole locations.
4. JOINT FILLER: Type F1 per APWA Section 32 13 73, extending to the bottom of the concrete slab.
5. BACKER ROD: Type 1 (round rod) APWA Section 32 13 73. It must be oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant.
6. JOINT SEALANT: Hot applied, APWA Section 32 13 73. Remove dirt, oil and curing compounds from joint reservoir. Seal joints immediately after cleaning.



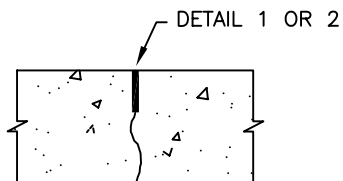
TYPE A



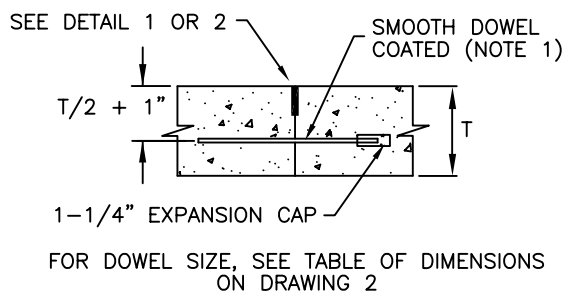
TYPE B



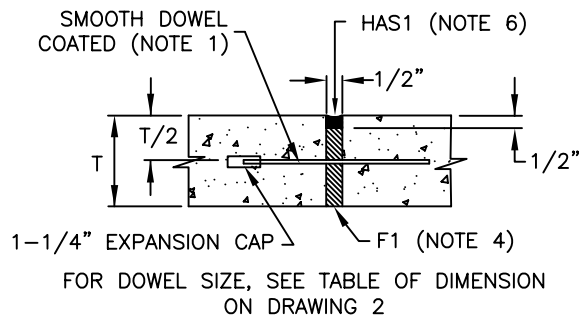
TYPE C



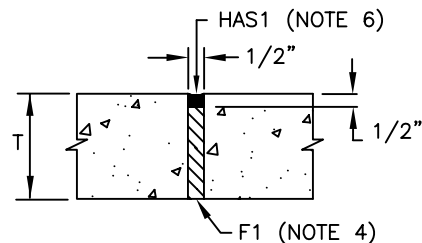
TYPE D



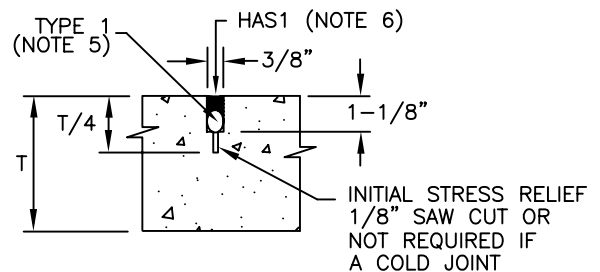
TYPE E



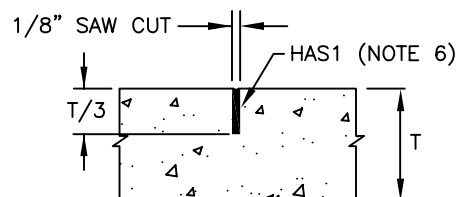
TYPE F



TYPE G



DETAIL 1



DETAIL 2

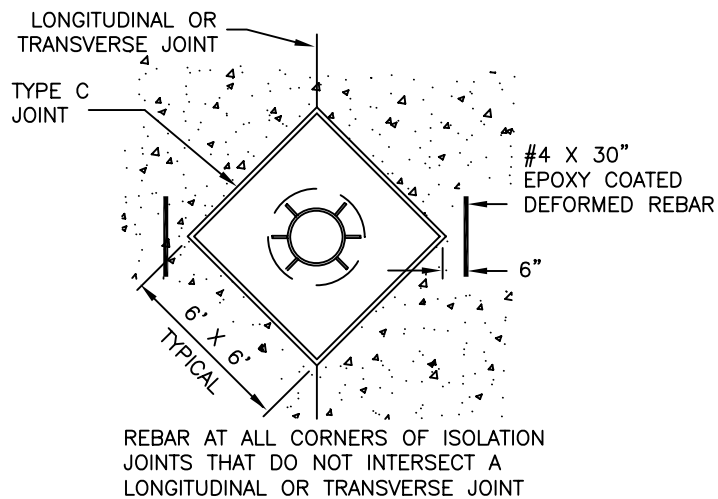
Concrete pavement joints

Plan No.

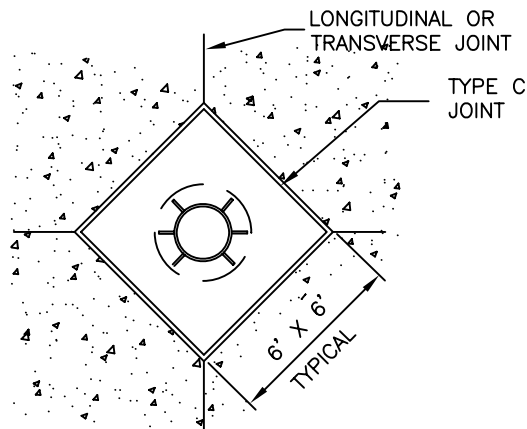
261

Concrete pavement joints

1. BASKET ASSEMBLY:
 - A. Attach basket assembly firmly to existing or new base. Secure dowels and tie bars firmly in the basket assembly. All wire sizes shown are minimum.
 - B. During concrete placement, keep the dowels in vertical center of the concrete, perpendicular to the joint, and parallel to the direction of concrete slab expansion.

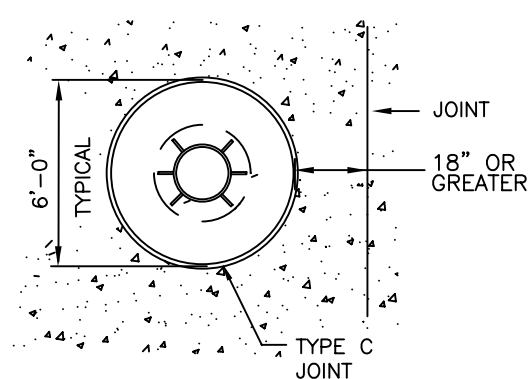


EXAMPLE 1

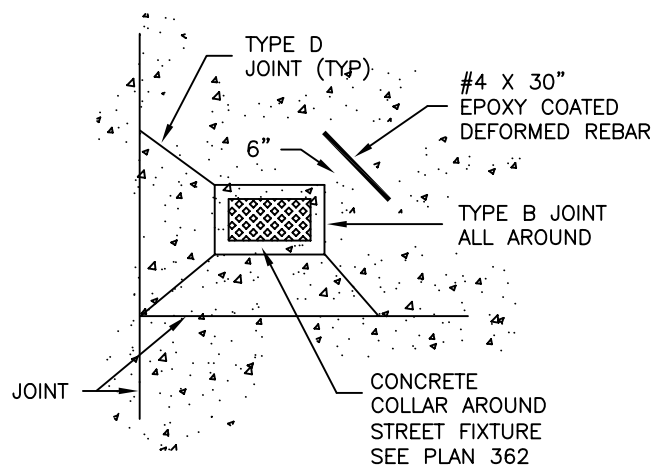


EXAMPLE 2

USE ROUND TYPE 'G' JOINT WHEN DISTANCE BETWEEN EXPANSION JOINT AND SLAB JOINT IS LESS THAN 18"



EXAMPLE 3

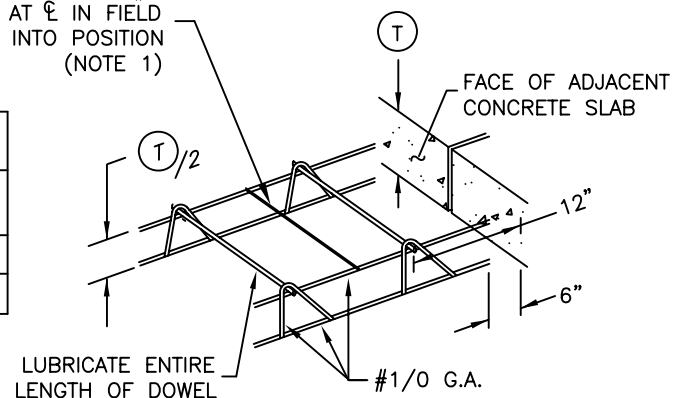


EXAMPLE 4

TYPICAL STREET FIXTURE ISOLATION JOINTS

DOWEL OR REBAR SIZE CHART			
(T)	DIAMETER (inches)	TOTAL LENGTH (inches)	SPACING
5"-8"	5/8	14	12" O.C.
9"-12"	1	18	12" O.C.

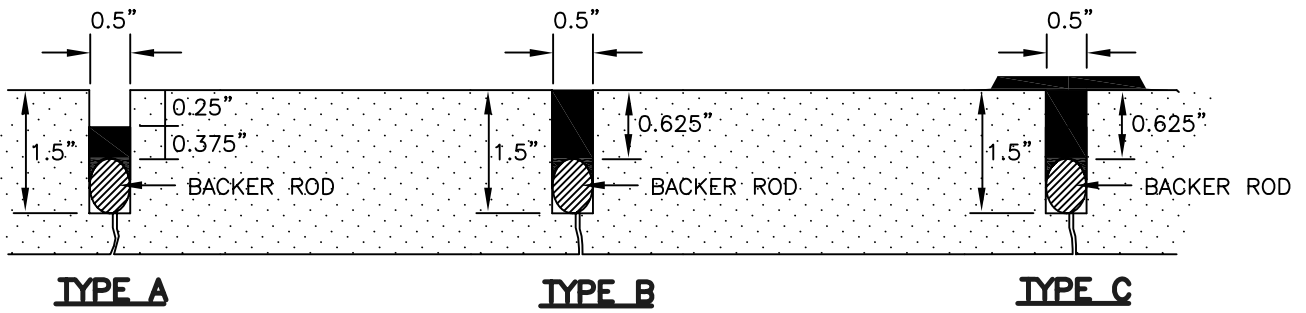
SPACER 4-#7 WIRES UNIT CUT AT $\frac{1}{2}$ IN FIELD AFTER STAKING INTO POSITION (NOTE 1)



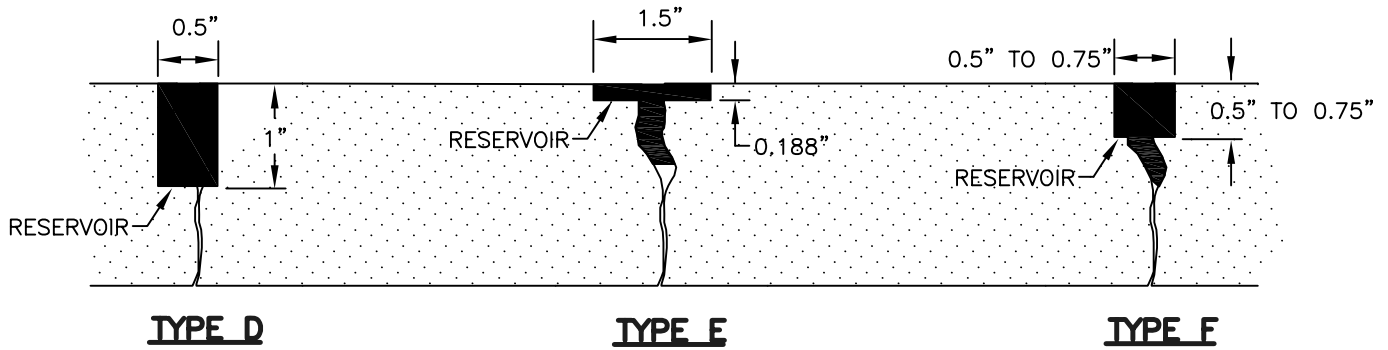
DOWEL OR TIE-BAR BASKET ASSEMBLY

Crack sealing – asphalt pavement

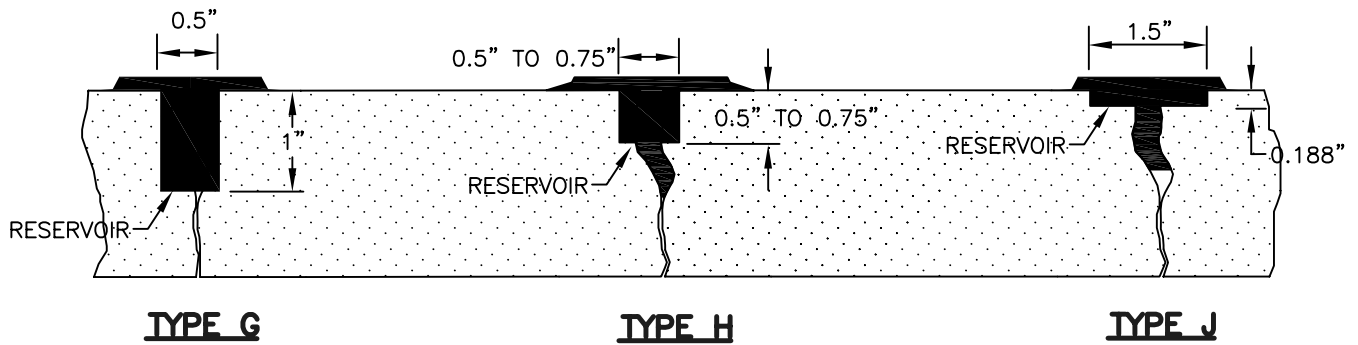
1. SEALER: Asphalt rubber or rubberized asphalt per APWA Section 32 01 17.
2. BACKER ROD: Type 1 round, closed cell per ASTM D 5249, (APWA Section 32 13 73).



BACKER ROD SEAL



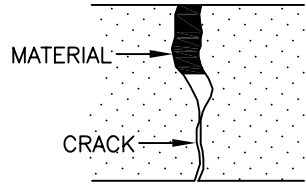
RESERVOIR SEAL



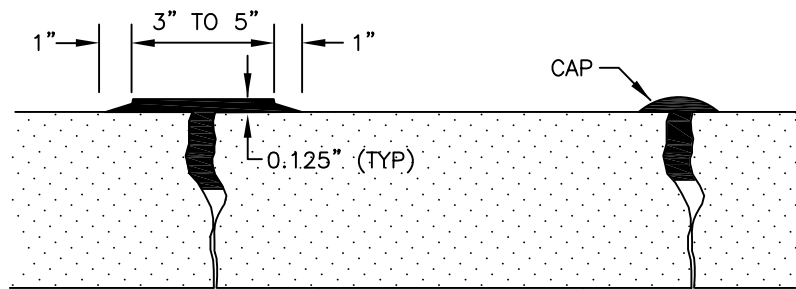
CAP AND RESERVOIR SEAL

Crack filling – asphalt pavement

1. FILLER: Asphalt rubber or rubberized asphalt per APWA Section 32 01 17.



TYPE A
FLUSH FILL



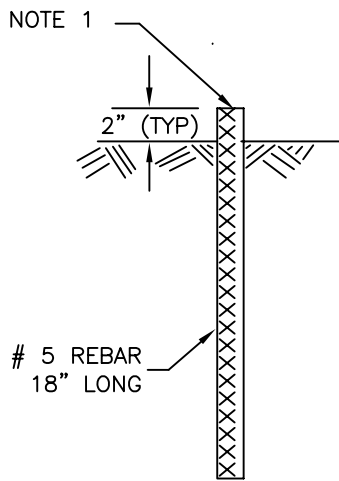
TYPE A

TYPE B

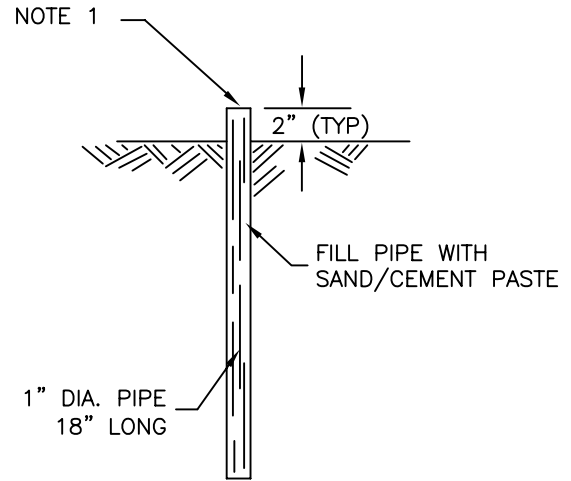
CAP FILL

Corner and boundary markers

1. SURVEYOR'S TAG: Show surveyor's professional license number.
2. SUBDIVISIONS: Mark boundaries with type `D' marker. Mark all angle and curve points with type `D' markers, or reference them to an adjacent block or lot corner, which is also marked with a type `D' marker.

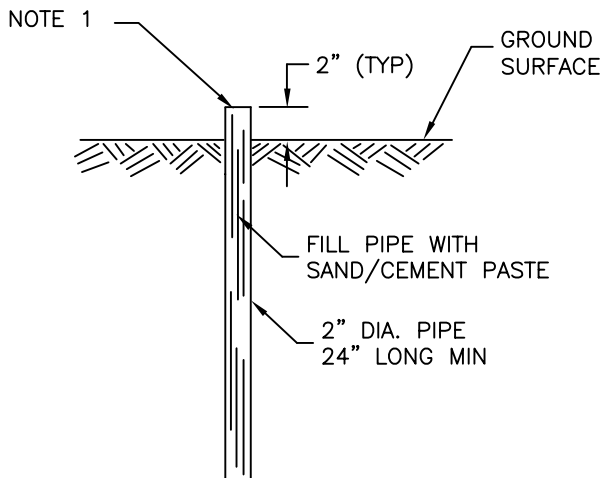


TYPE A

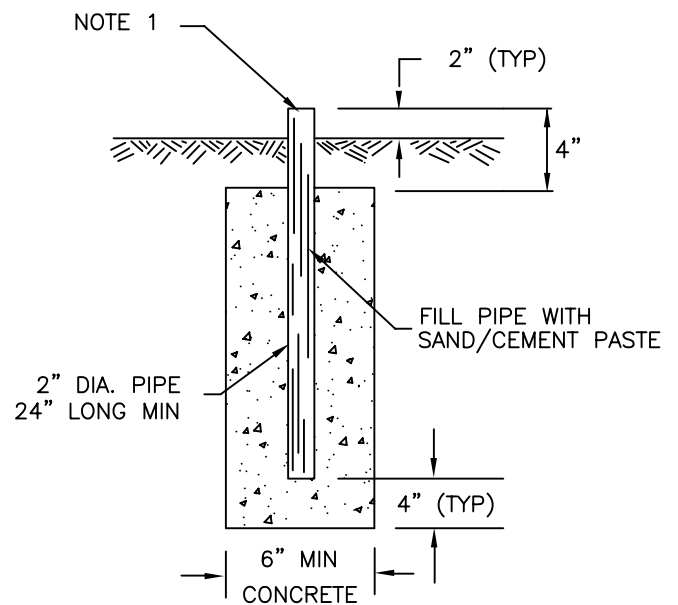


TYPE B

CORNER MARKERS



TYPE C



TYPE D

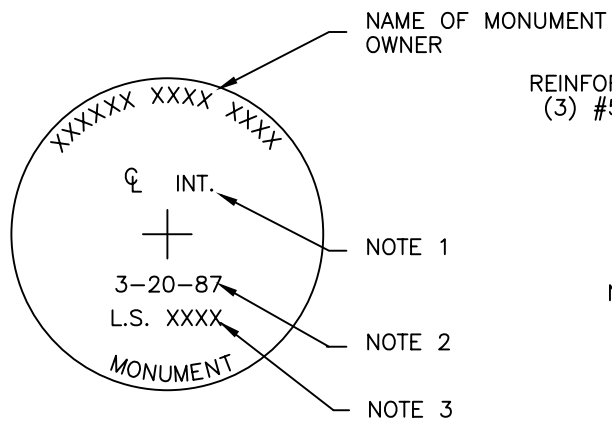
BOUNDARY MARKER

Monument cap and base

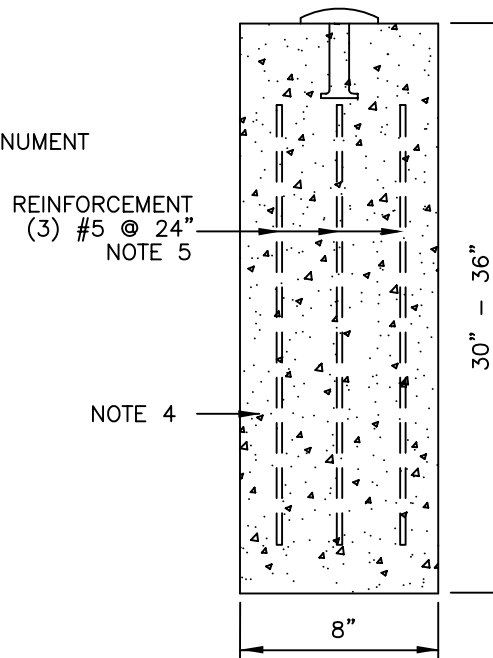
1. ABBREVIATIONS: The following is a list of commonly used abbreviations used on the monument cap. Apply other marks and abbreviations as applicable.

INT	Intersection
ML INT	Monument line intersection
P.C.	Point of curvature
P.C.C.	Point of compound curve
P.I.	Point of intersection
P.O.C.	Point on curve
P.O.T.	Point on Tangent
P.R.C.	Point of reverse curve
P.T.	Point of tangency
S.C.	Section Corner
W.C.	Witness corner

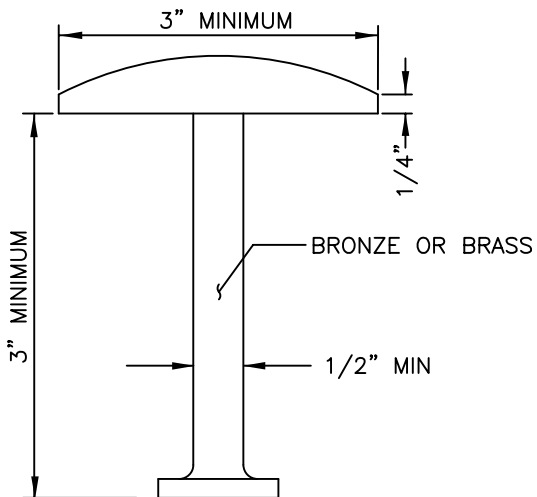
2. DATE: Show month, day, and year when cap was marked.
3. LICENSE: Show license number of land surveyor who marked the cap.
4. CONCRETE: Class 4000 per APWA Section 03 30 04 for precast and cast in-place monuments.
5. REINFORCEMENT: ASTM A 615, grade 60, deformed steel rebar.



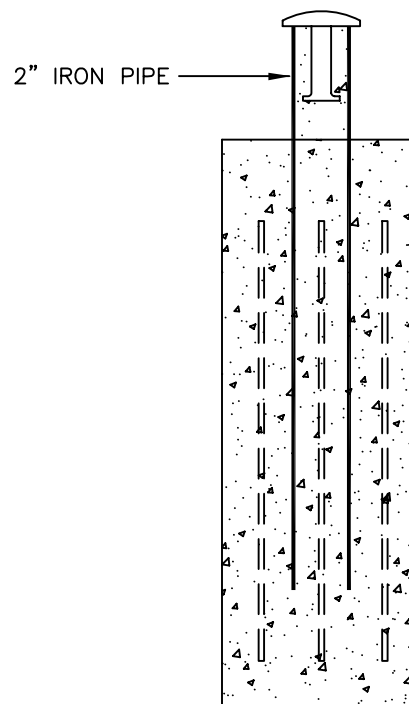
CAP PLAN



SECTION OF BASE
TYPICAL SETTING



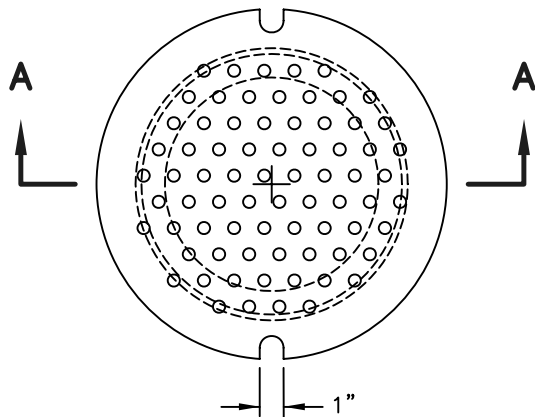
CAP SECTION



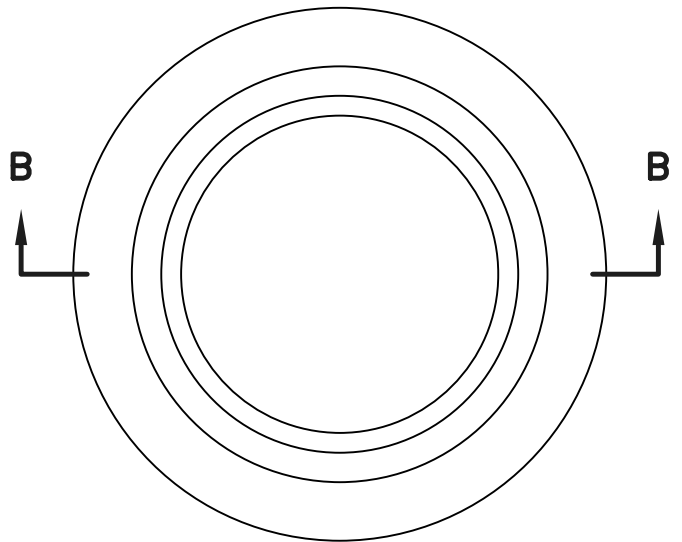
SECTION OF BASE
ALTERNATE SETTING

Frame and cover for monument

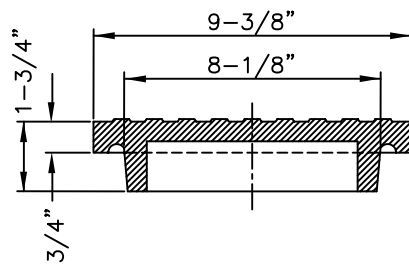
1. CASTINGS: Grey iron class 20 minimum per ASTM A 48.
2. COATINGS: Coat all metal parts with asphaltum paint.
3. SETTING: Set frame independent of monument base.



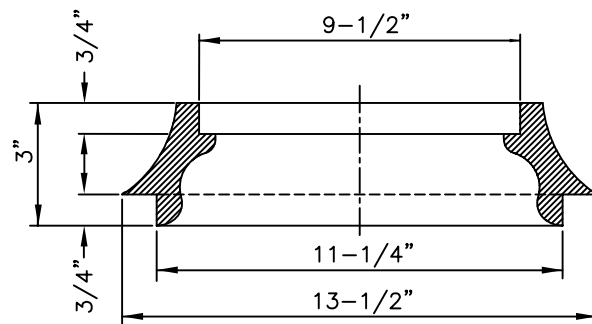
COVER



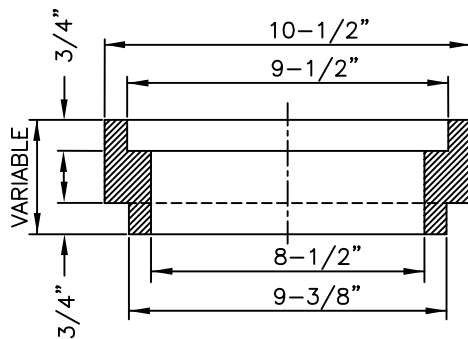
FRAME



SECTION A-A



SECTION B-B

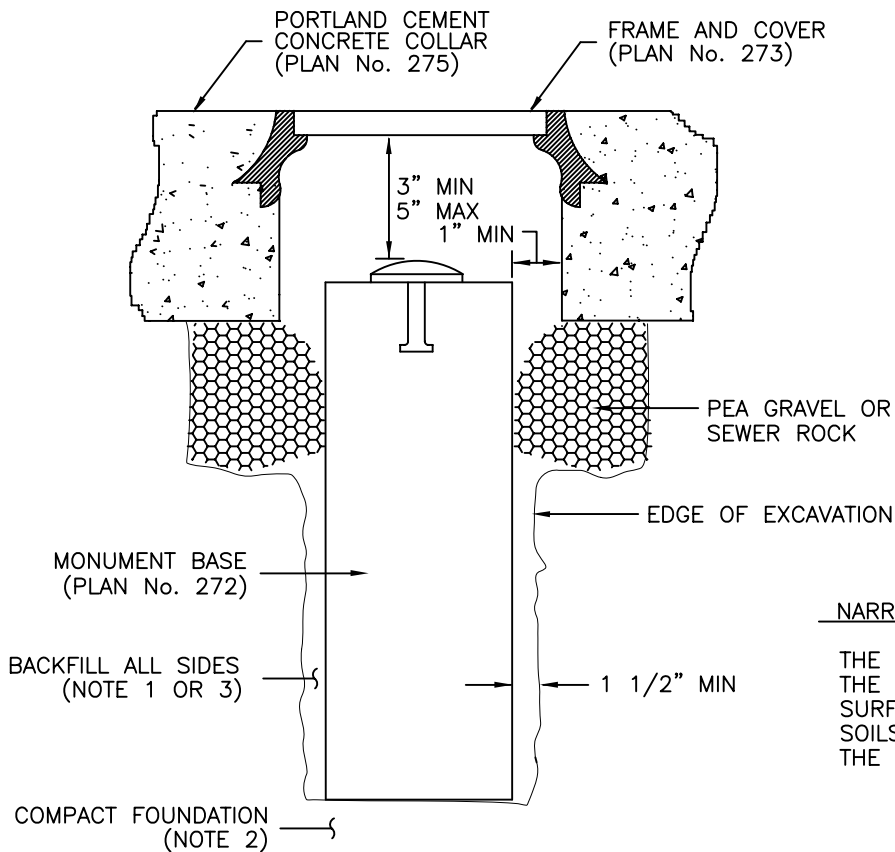


EXTENSION

NOTE: USE EXTENSION IN PORTLAND CEMENT CONCRETE PAVEMENTS. USE FRAME IN ASPHALT CONCRETE PAVEMENTS

Survey monument placement under pavements

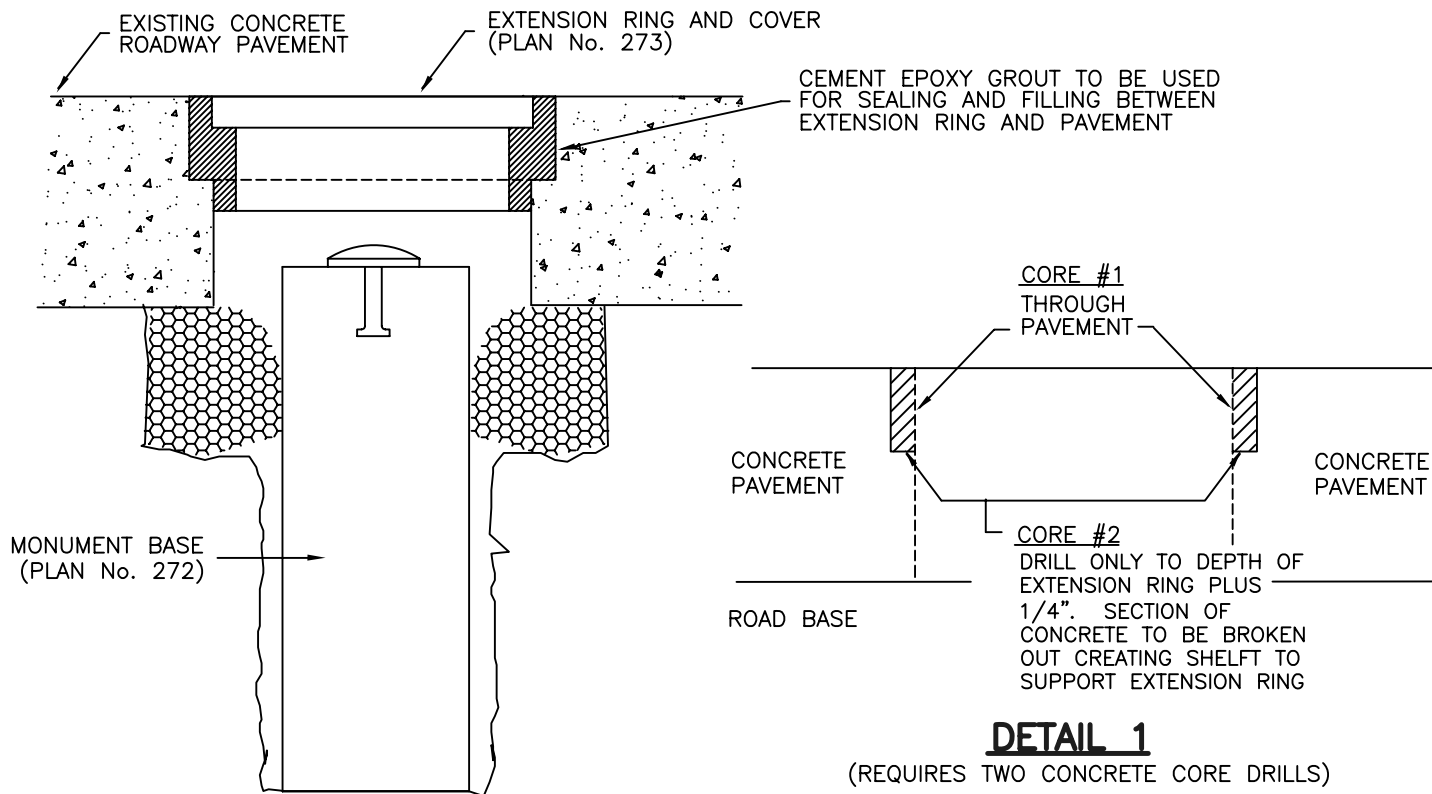
1. BACKFILL: Install and compact all backfill material per APWA Section 32 05 10.
2. FOUNDATION: Compact bottom of excavated hole before placement of precast or cast in-place monument post.
3. CONCRETE: Class 4000 per APWA Section 03 30 04.



NARRATIVE

THE INSTALLED MONUMENT MUST BE INDEPENDENT OF THE ROADWAY PAVEMENT. VIBRATIONS OF THE PAVEMENT SURFACE MUST BE TRANSMITTED TO THE UNDERLYING SOILS AND NOT TO THE MONUMENT. THIS WILL ASSURE THE MONUMENT REMAINS UNDISTURBED

A ASPHALT CONCRETE PAVEMENTS



B CEMENT CONCRETE PAVEMENTS

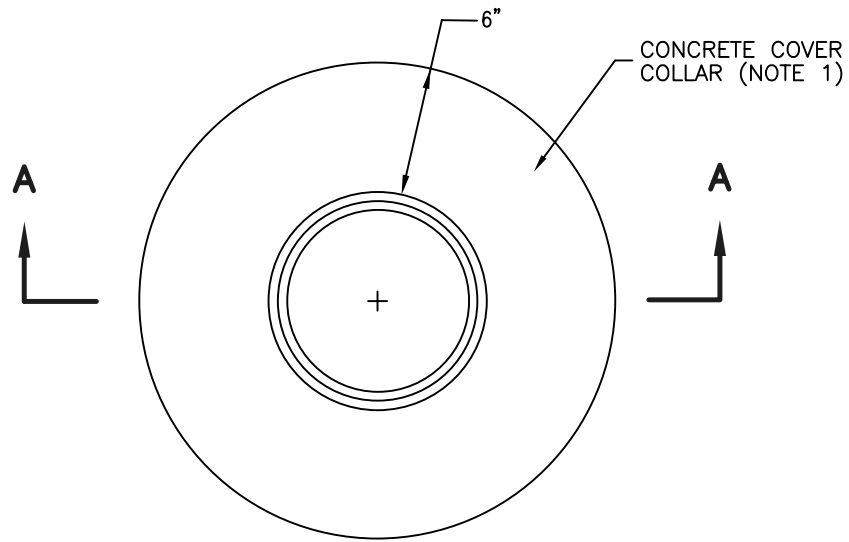
Survey monument placement under pavements

Plan No.

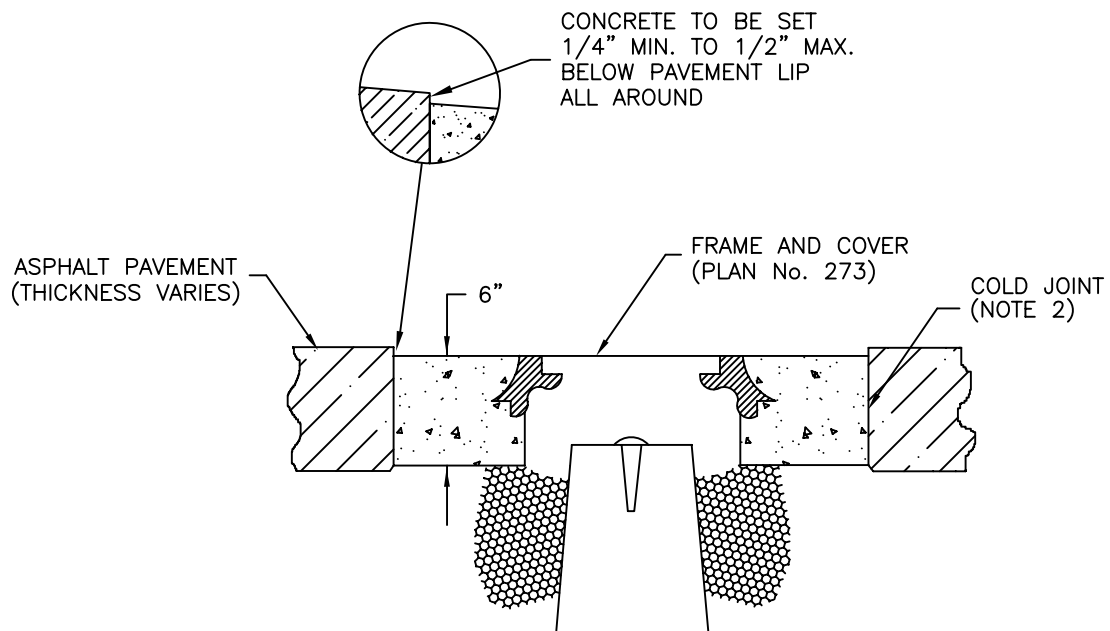
274

Cover collar for survey monuments

1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
2. JOINTS: Provide a neat vertical joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.



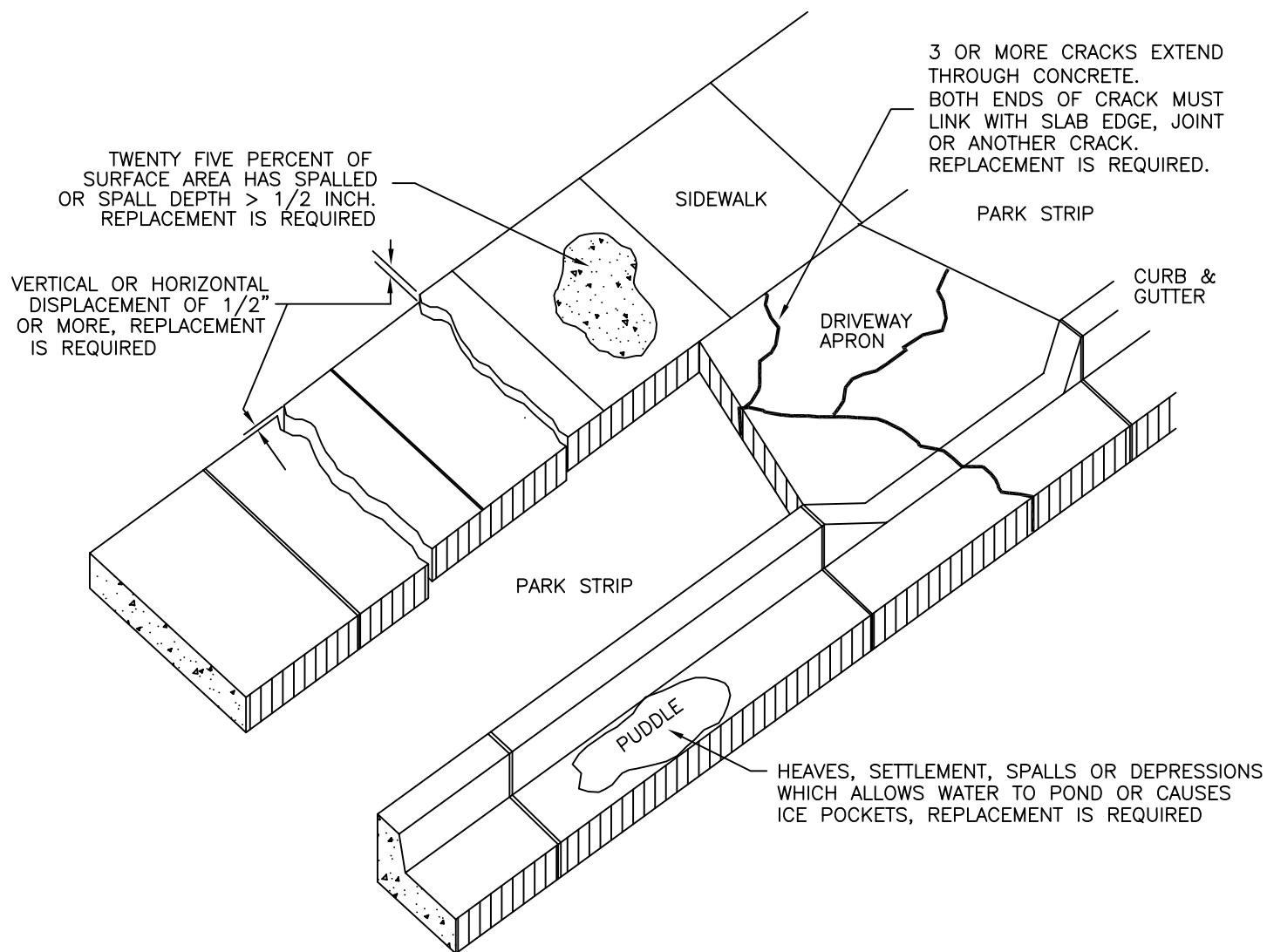
PLAN



SECTION A-A

Defective concrete

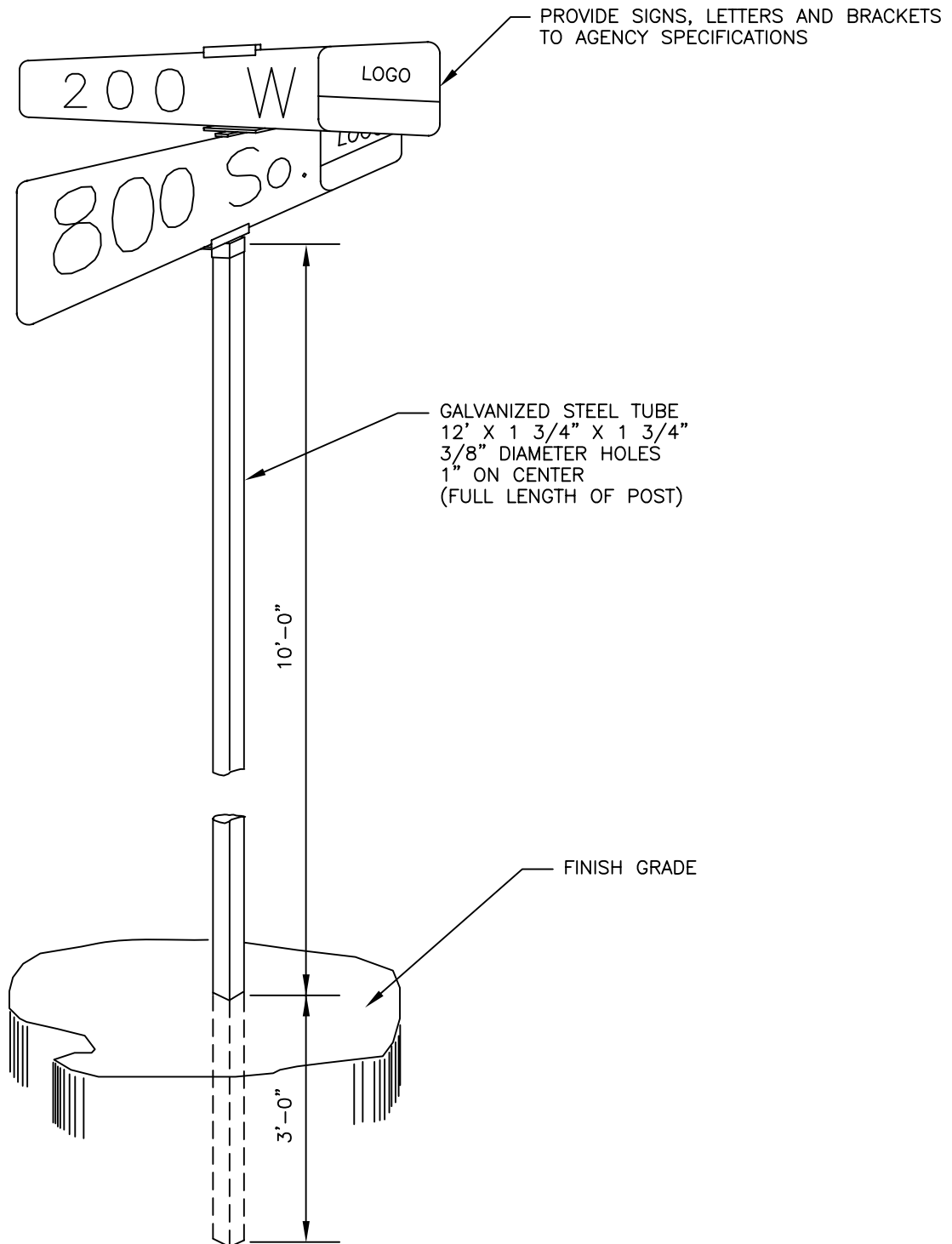
1. NARRATIVE: This drawing defines parameters for determining whether new or existing concrete is defective. Replacement is required if any component has one or more of the conditions shown.



OBLIQUE

Street name sign (typical)

1. FORMAT: Secure ENGINEER's approval of sign format and installation.
2. INSTALLATION:
 - A. Install signs on the northwest and southeast corners of the intersection.
 - B. Install the edge of the sign 2 feet from the vertical extension of the back of curb as near as possible to the approach curb P.C. (point of curvature).



Street name sign (typical)

Plan No.

292

PART 3

STORM DRAINS

Abbreviations and Symbols

Plan 301	Abbreviations and symbols for storm drains	113
----------	--	-----

Catch Basins, Inlets, Outlets and Hardware

302	30" Frame and cover	115
303	44" Frame and cover	119
304	48" Cover and frame.....	121
305	51" Cover and frame.....	123
308	35 1/2" Grate and frame with adjustable curb box	129
309	47 3/4" Grate and frame	131
310	48" Grate and frame	135
315	Catch basin.....	137
316	Combination inlet/cleanout box	141
317	Curb inlet/outlet.....	143
320	Debris grate inlet.....	147
321	Automatic flap gate (pressurized storm drains).....	149
322	Curb outlet	151
323	Pipe outfall access control rack.....	153

Cleanout Box and Hardware

330	Cleanout box.....	155
331	Cleanout box.....	157
332	Cast in-place manhole.....	159
335	Adjust reinforced concrete deck to grade	161

Manhole and Hardware

341	Precast manhole	163
345	Concrete deck.....	167
360	Raise frame to grade – plastic form	169
361	Raise frame to grade – grade ring.....	171
362	Cover collar for storm drains	173

Piping

372	Area drain	175
373	Concrete pier	177

Trenching

381	Trench Backfill	179
382	Pipe zone backfill.....	181

Abbreviations and symbols for storm drains

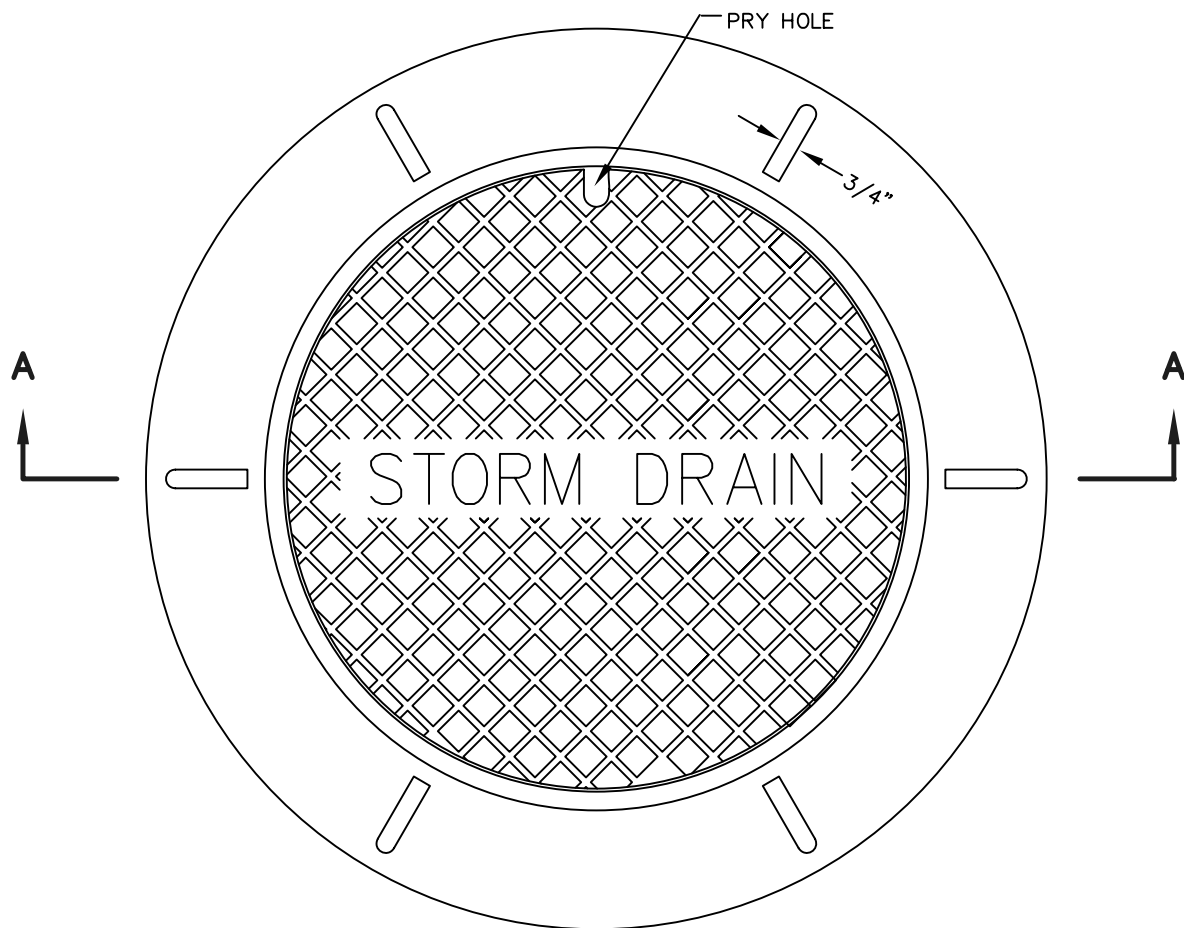
1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.
2. LETTERING STYLE: Capital letters preferred.
3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.
4. NEW IMPROVEMENTS: Shown in solid continuous line.

SYMBOLS	DEFINITIONS
	CENTER LINE
	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
	FENCE
	CONTOUR LINE
	CONTOUR ELEVATION
	BANK SLOPES
	STORM DRAIN LINE
	WATER LINE
	GAS LINE
	TELEPHONE CABLE
	ELECTRIC CABLE
	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
	WATER METER
	MANHOLE
	CATCH BASIN
	CLEAN OUT BOX
	POLE & ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

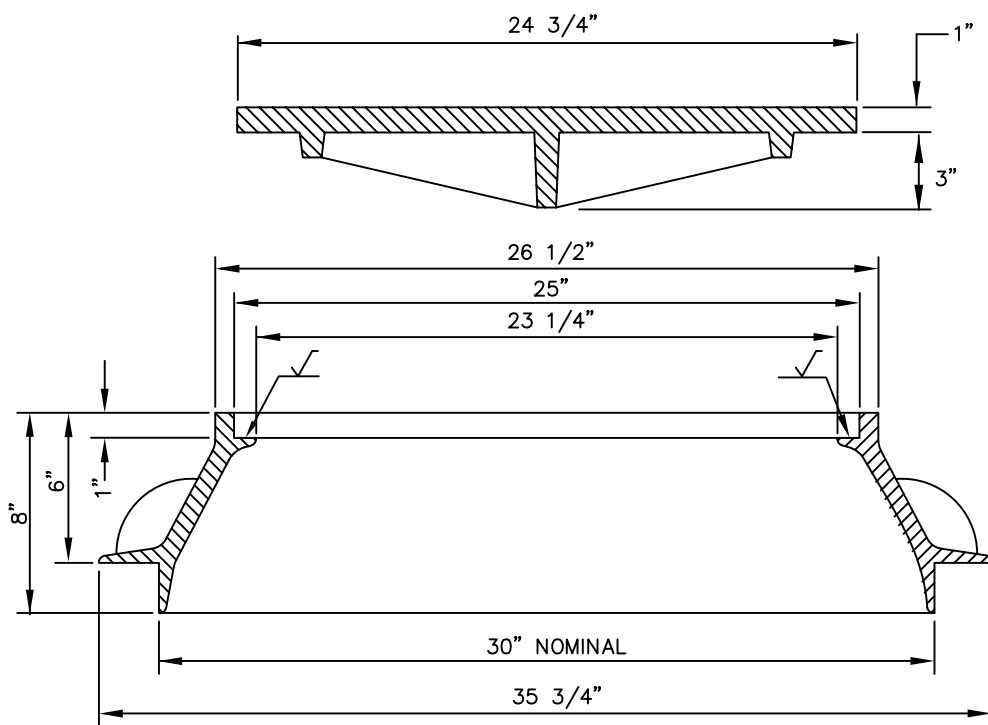
SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
	BENCH MARK
	SIGN
	POWER POLE
	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.
<u>PROFILE</u>	
	GROUND PROFILE
	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUNDWATER ELEVATION

30" Frame and cover – type A

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the words "STORM DRAIN" on the cover flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. LOCKING: Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.
7. CLEANOUT STRUCTURE: See Plan No. 330.
8. MANHOLE STRUCTURES: See Plan No. 341.



TYPE A



SECTION A-A

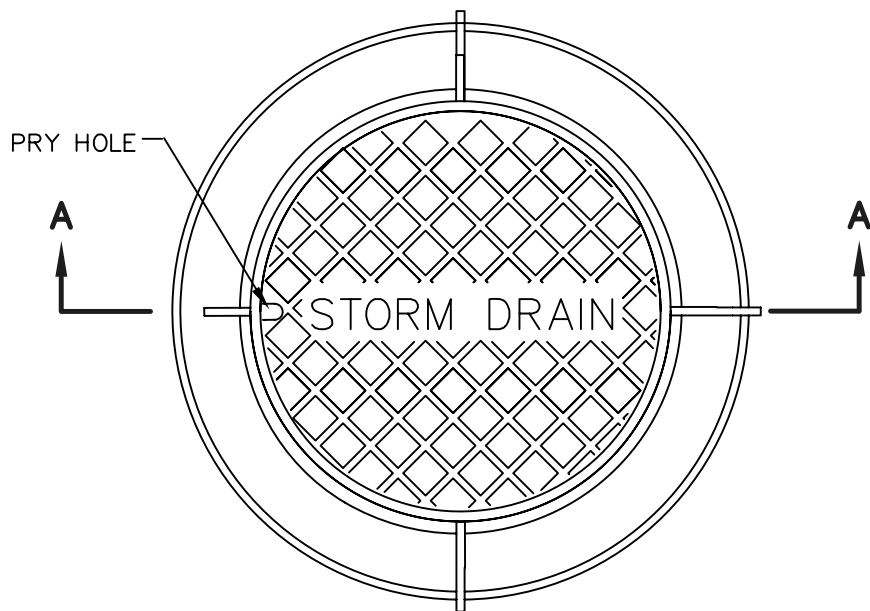
30" Frame and cover

Plan No.

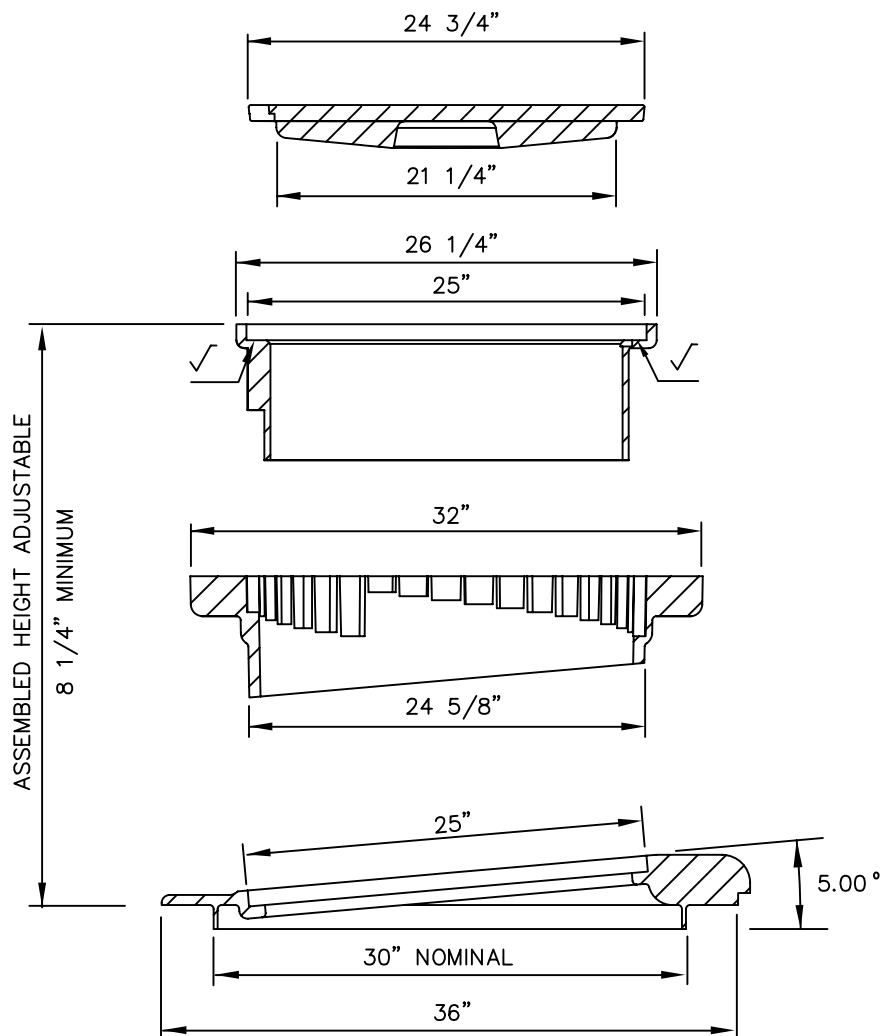
302

30" Frame and cover – type B

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the words "STORM DRAIN" on the cover flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. LOCKING: Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.
7. CLEANOUT STRUCTURE: See Plan No. 330.
8. MANHOLE STRUCTURES: See Plan No. 341.



TYPE B



SECTION A-A

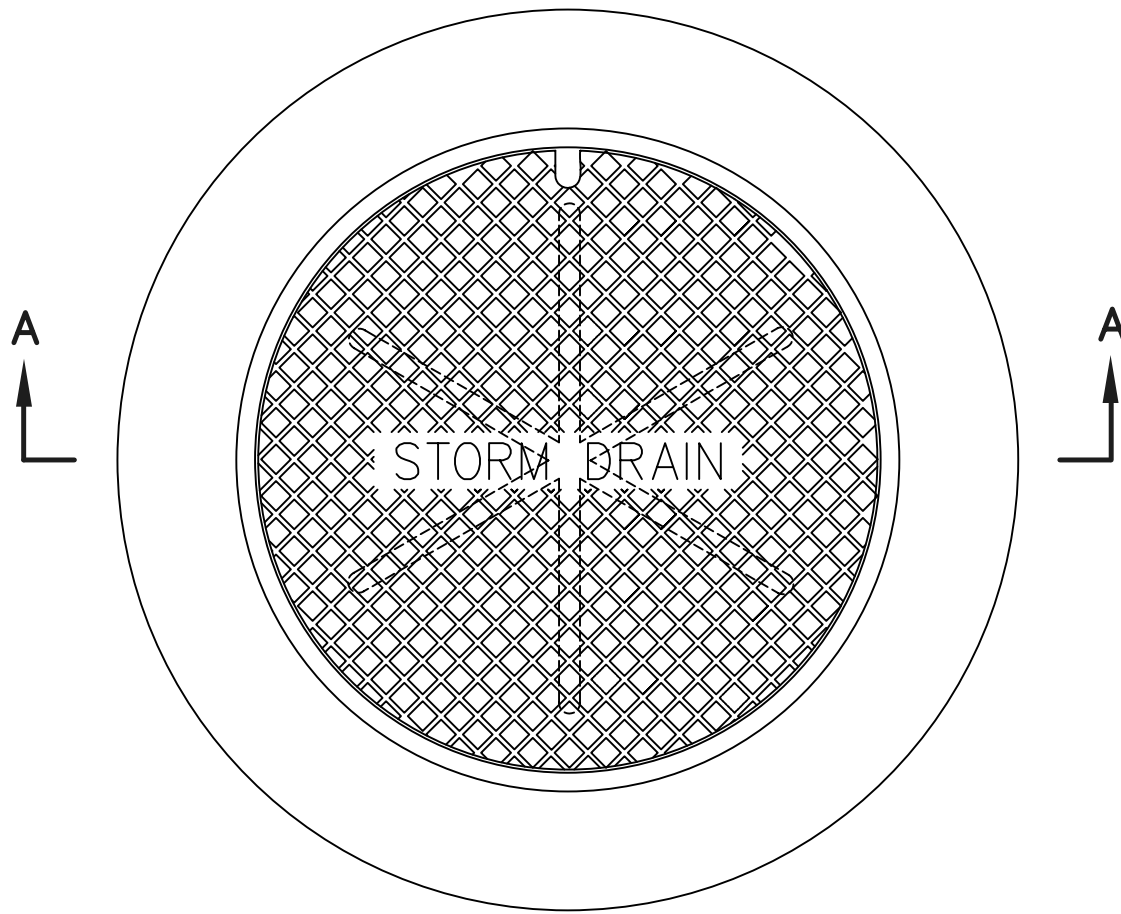
30" Frame and cover

Plan No.

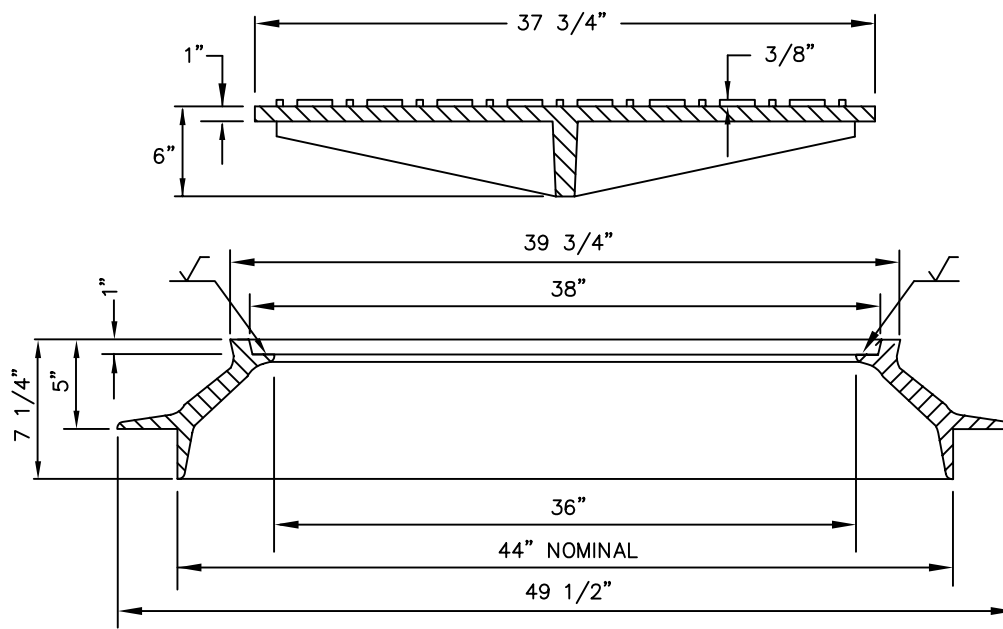
302

44" Frame and cover

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the words "STORM DRAIN" on the cover flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. LOCKING: Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.
7. CLEANOUT STRUCTURE: See Plan No. 330.
8. MANHOLE STRUCTURES: See Plan No. 341.



PLAN



SECTION A-A

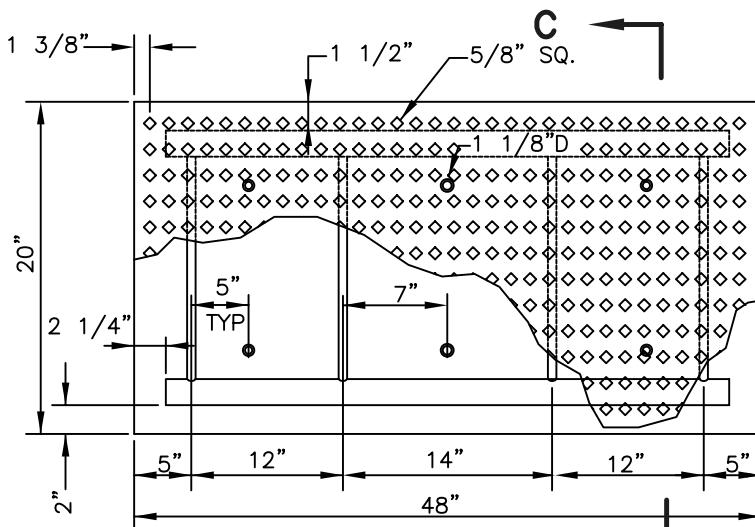
44" Frame and cover

Plan No.

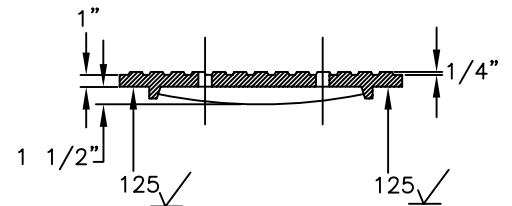
303

48" Cover and frame

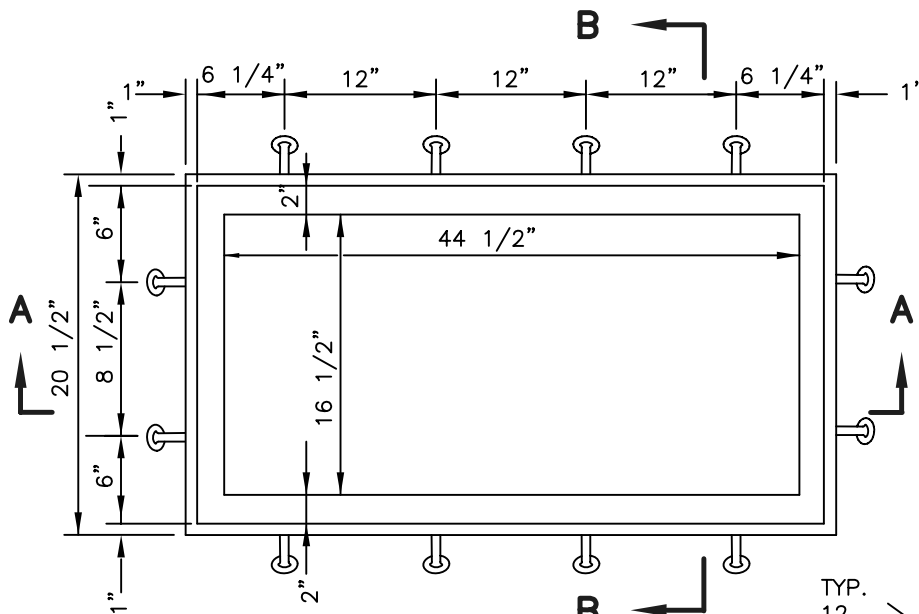
1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. CONCRETE BOX: See Plan No. 331.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.



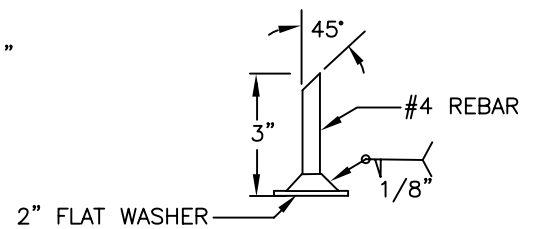
PLAN OF COVER



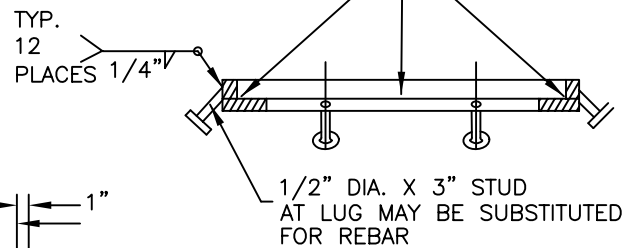
SECTION C-C



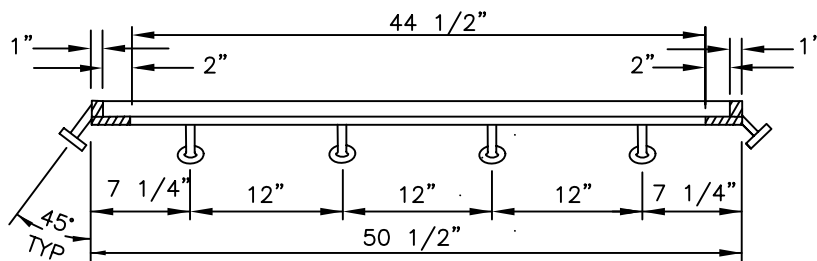
PLAN OF FRAME



DETAIL 1



SECTION B-B



SECTION A-A

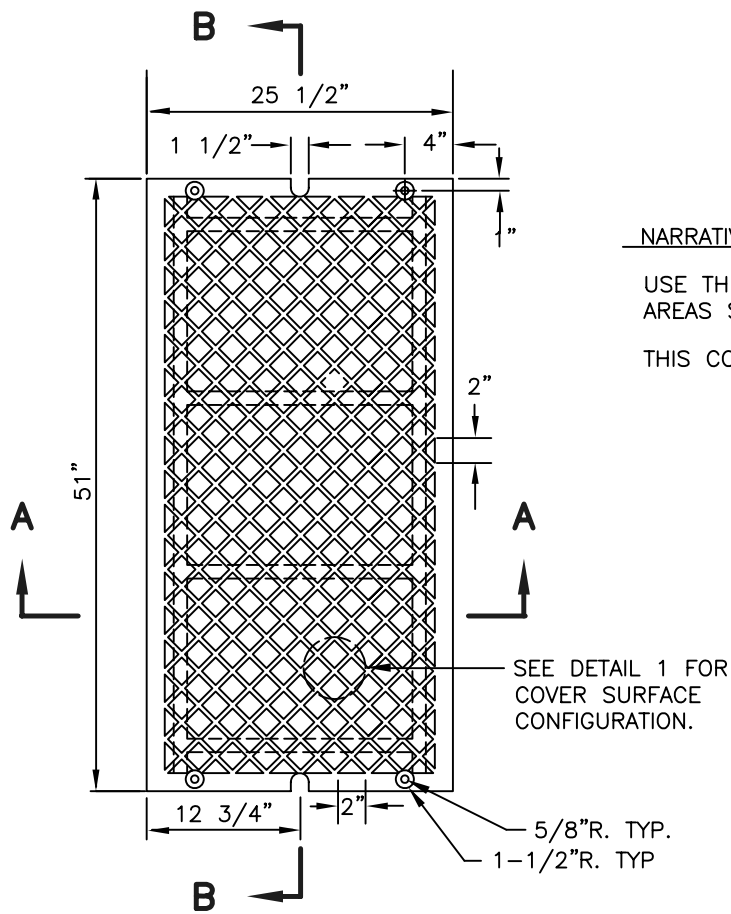
48" Cover and frame

Plan No.

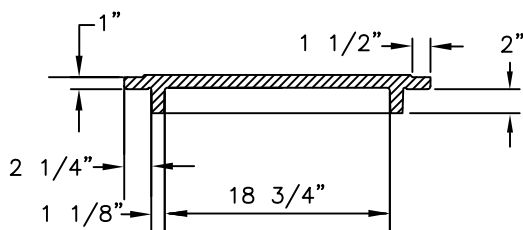
304

51" Cover and frame - cover

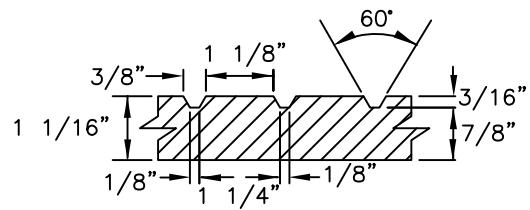
1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.
4. ACCESSORIES: Stainless steel bolts, washers, and accessories required. See APWA Section 05 05 23.
5. CONCRETE BOX: See Plan No. 332.
6. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.



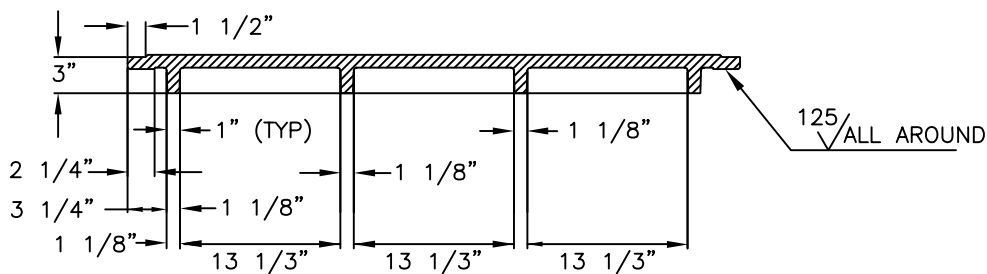
COVER PLAN VIEW



SECTION A-A



DETAIL 1



SECTION B-B

NARRATIVE

USE THIS FRAME AND COVER IN ROADWAYS AND OTHER AREAS SUBJECT TO HEAVY LOADINGS

THIS COVER FITS TYPE A, B, C, AND D FRAMES

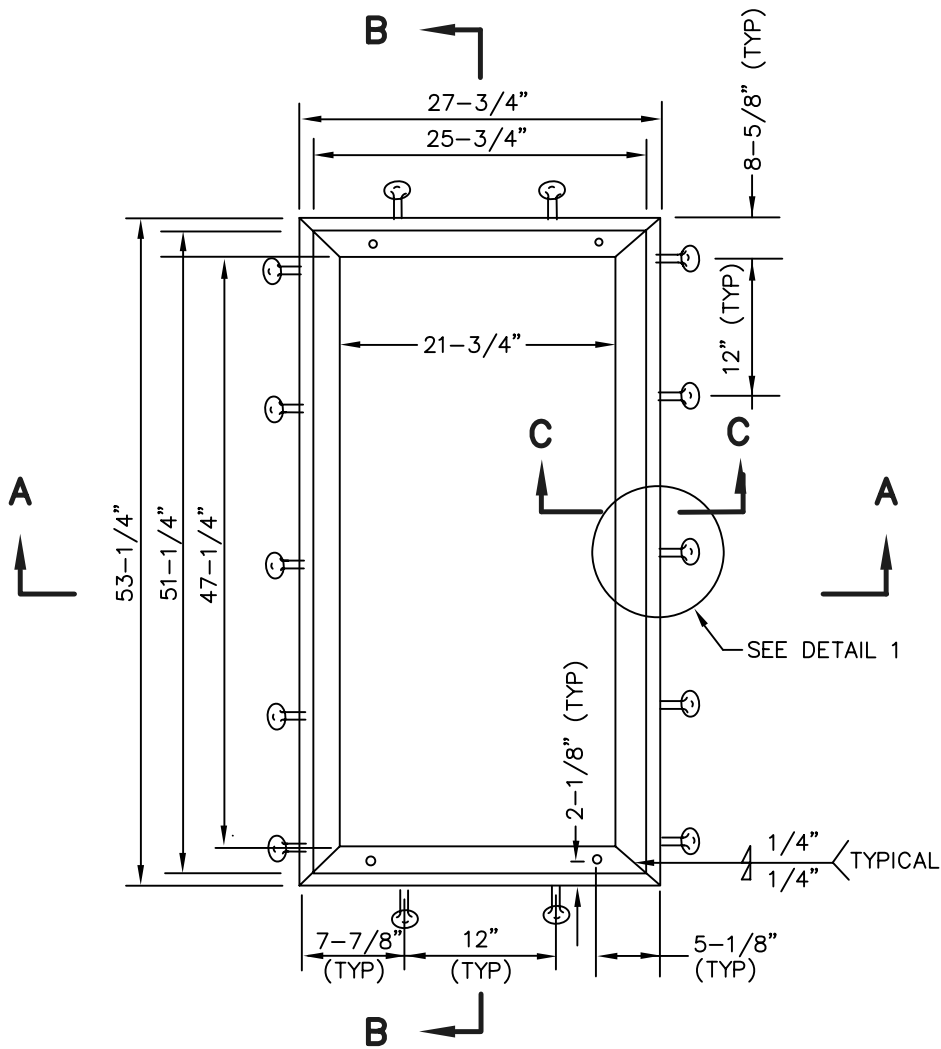
51" Cover and frame - cover

Plan No.

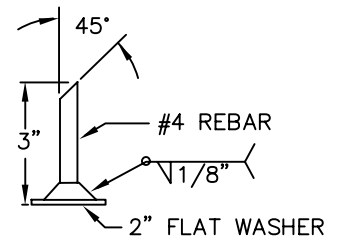
305

51" Cover and frame - type A frame

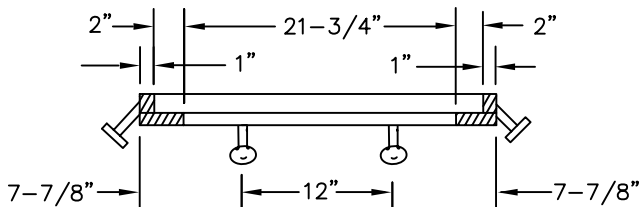
1. NARRATIVE: Use this frame and cover in roadways and other areas subject to heavy loadings. This cover fits Type A, B, C and D frames.
2. FRAME: ASTM A 36 steel, or ASTM A 48 grey iron class 35 minimum.
3. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
4. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.
5. CONCRETE BOX: See Plan No. 332.



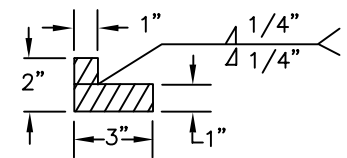
PLAN – TYPE A FRAME



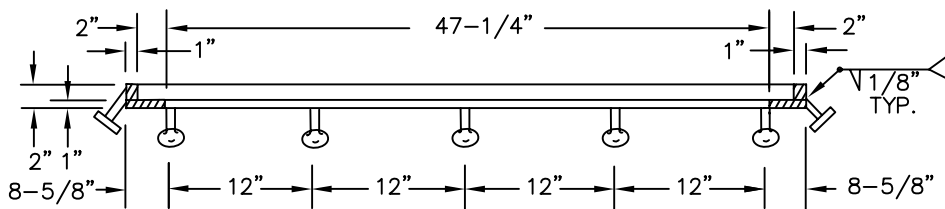
DETAIL 1



SECTION A-A



**SECTION C-C
TYP**



SECTION B-B

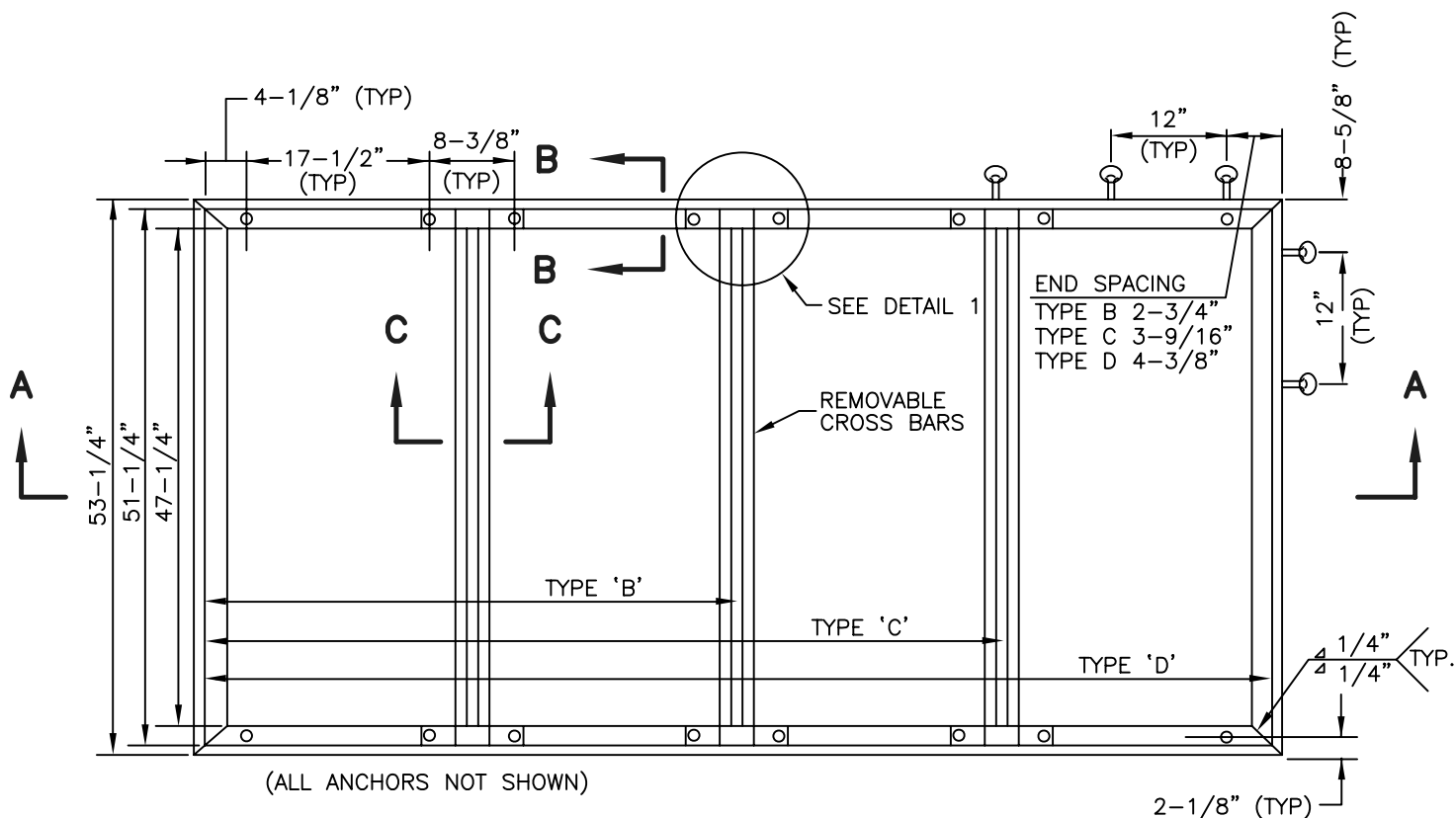
51" Cover and frame - type A frame

Plan No.

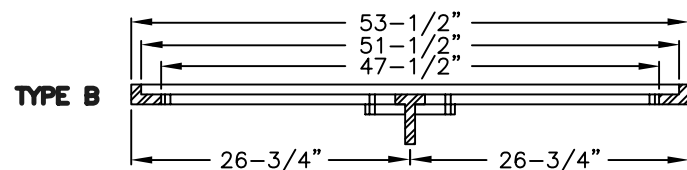
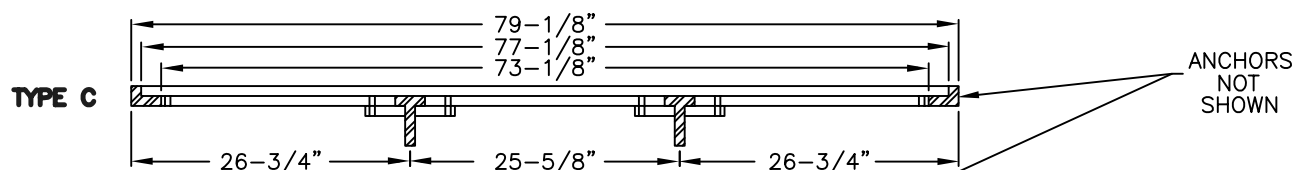
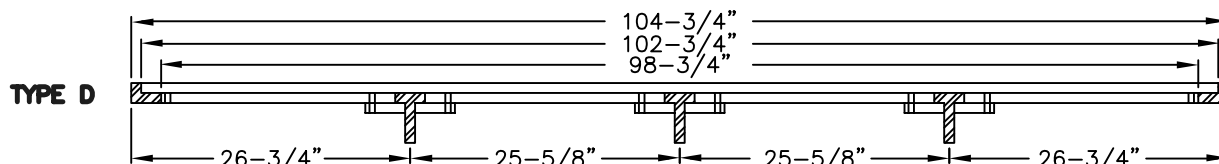
305

51" Cover and frame - type 'B', 'C', or 'D' frame

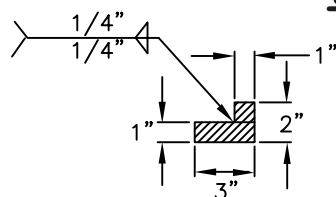
1. FRAME: ASTM A 36 steel, or ASTM A 48 grey iron class 35 minimum.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.
4. CONCRETE BOX: See Plan No. 332.



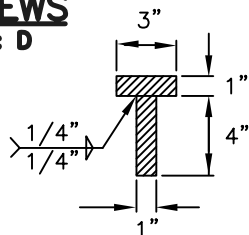
PLAN - TYPE B, C, AND D FRAMES



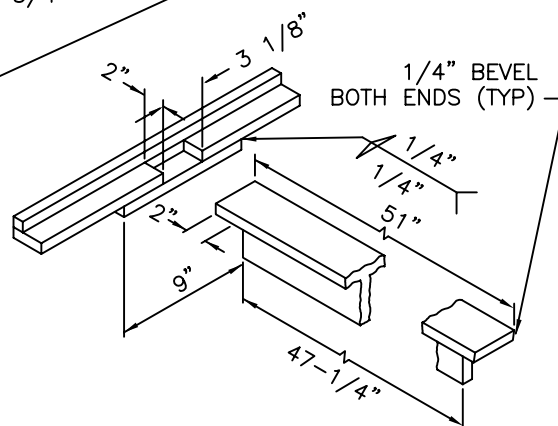
SECTION VIEWS TYPES B, C & D



SECTION B-B



SECTION C-C



DETAIL 1

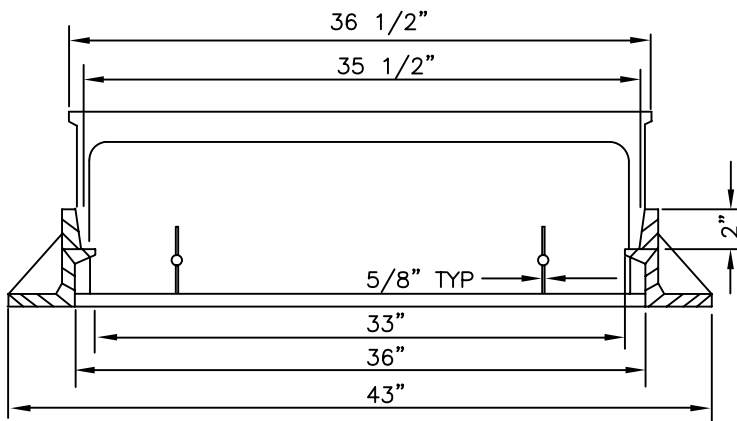
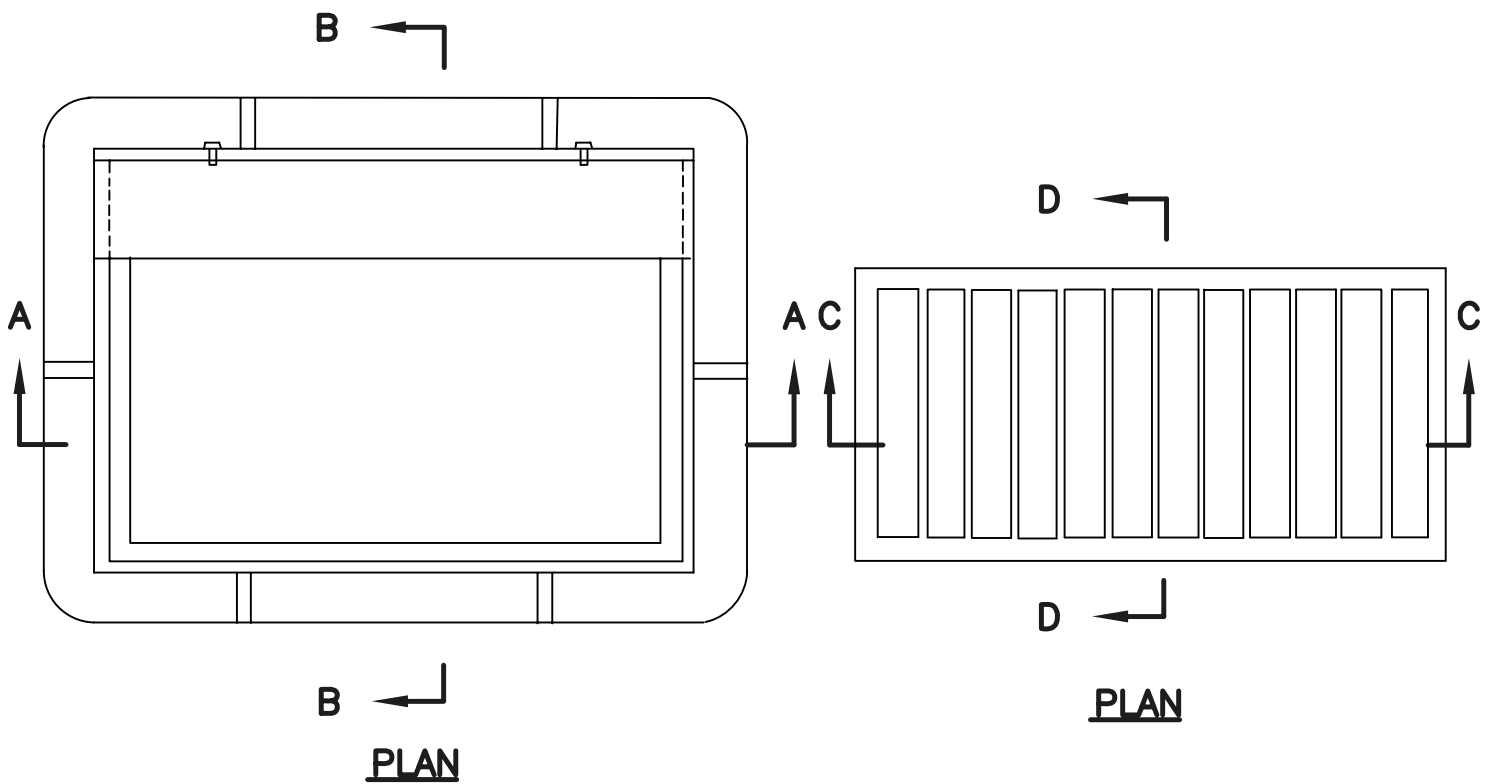
51" Cover and frame - type 'B', 'C', or 'D' frame

Plan No.

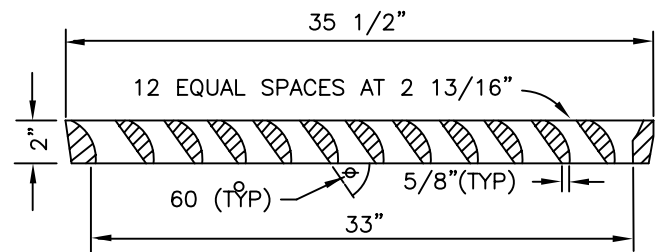
305

35 1/2" Grate and frame with adjustable curb box

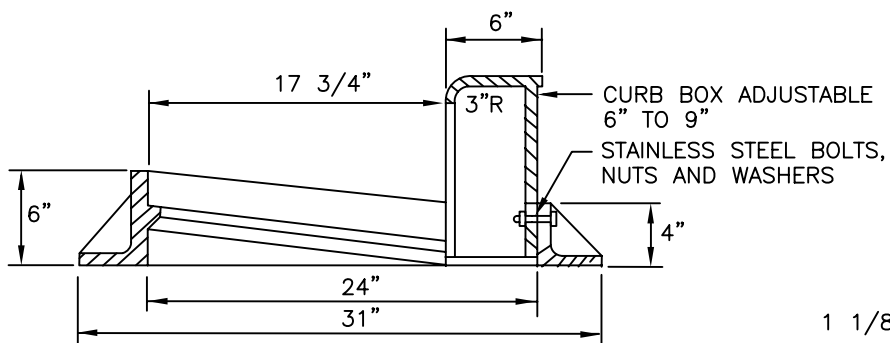
1. CASTING: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INLET BOX: See Plan No. 315.



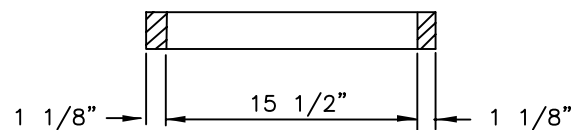
SECTION A-A



SECTION C-C



SECTION B-B



SECTION D-D

35 1/2" Grate and frame with adjustable curb box

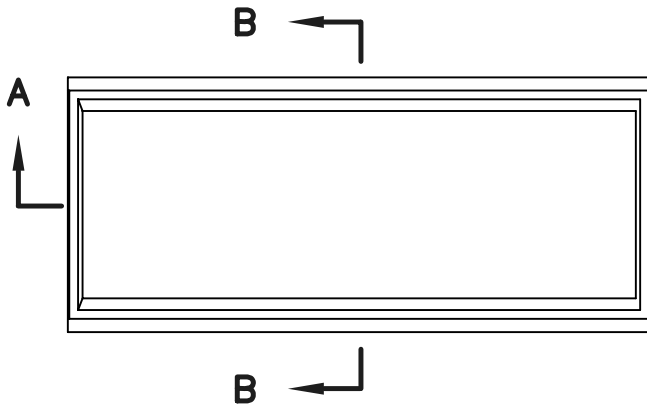
Plan No.

308

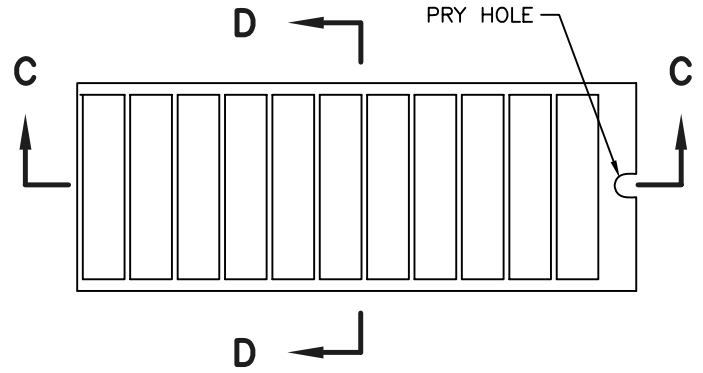
47 3/4" Grate and frame

1. CASTING: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INLET BOX: See Plan No. 331.

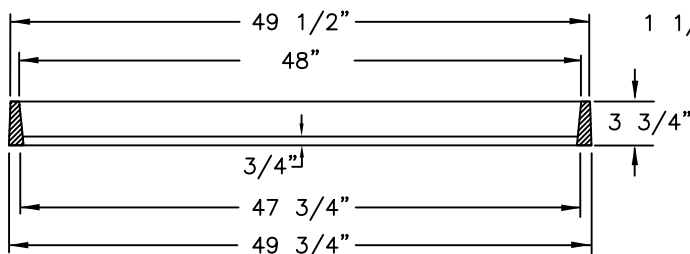
VANE GRATE



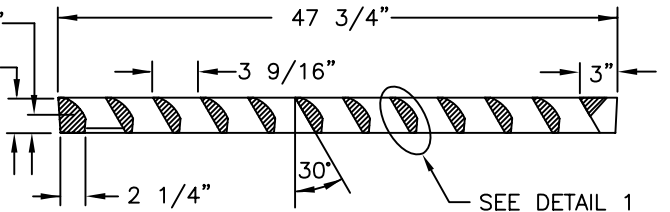
FRAME



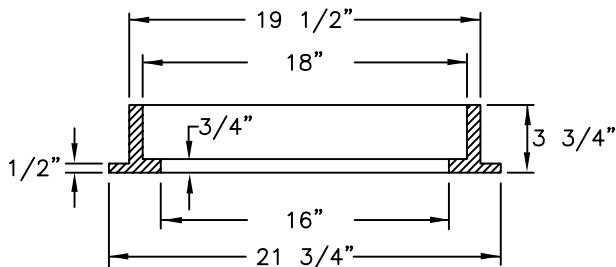
GRATE



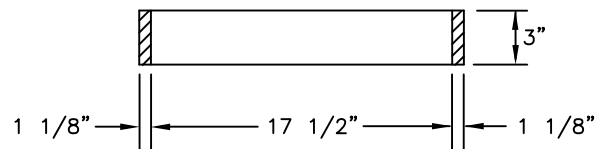
SECTION A-A



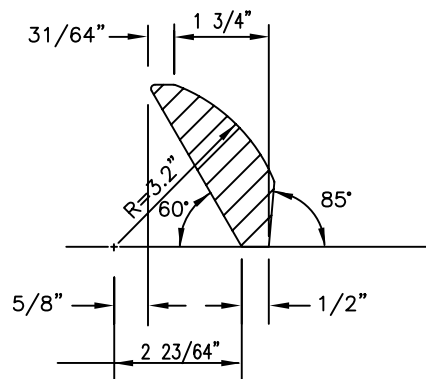
SECTION C-C



SECTION B-B



SECTION D-D



DETAIL 1

47 3/4" Grate and frame

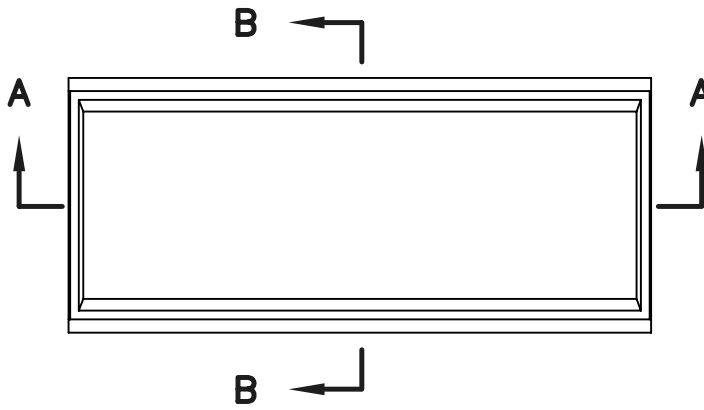
Plan No.

309

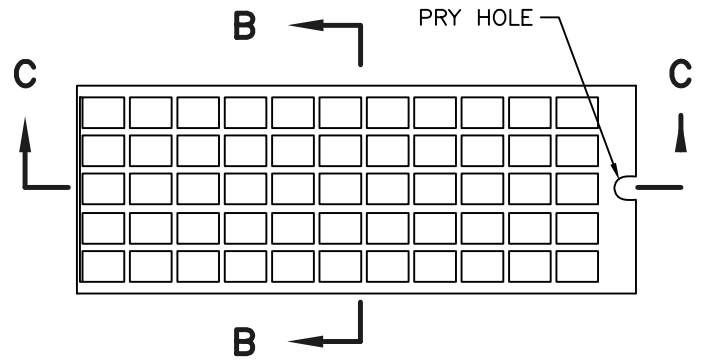
47 3/4" Grate and frame

1. CASTING: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INLET BOX: See Plan No. 331.

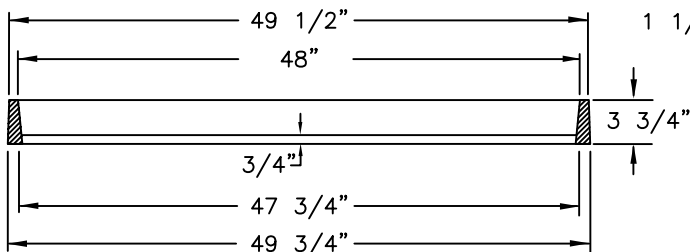
GRID GRATE



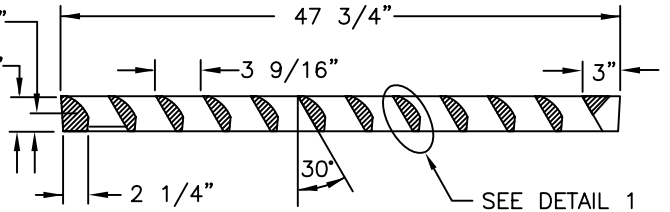
FRAME



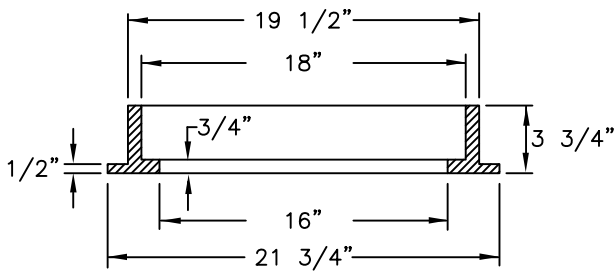
GRATE



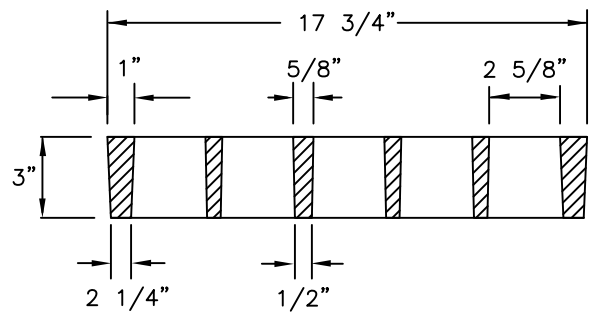
SECTION A-A



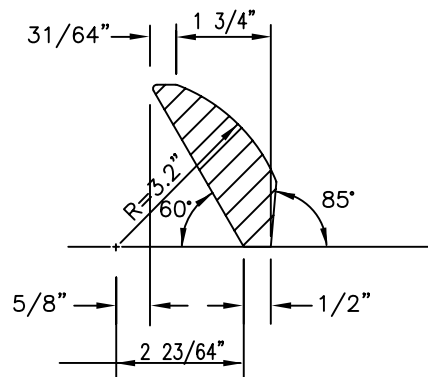
SECTION C-C



SECTION B-B



SECTION D-D

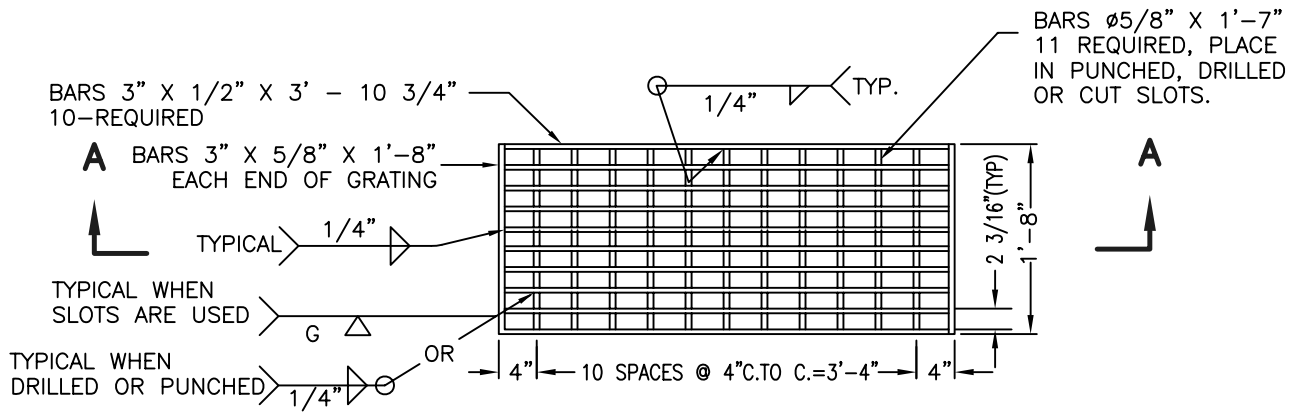


DETAIL 1

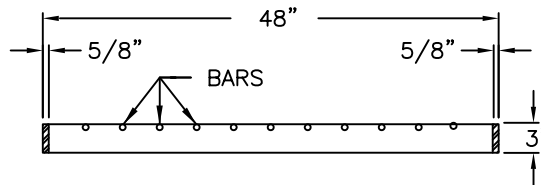
47 3/4" Grate and frame

48" Grate and frame

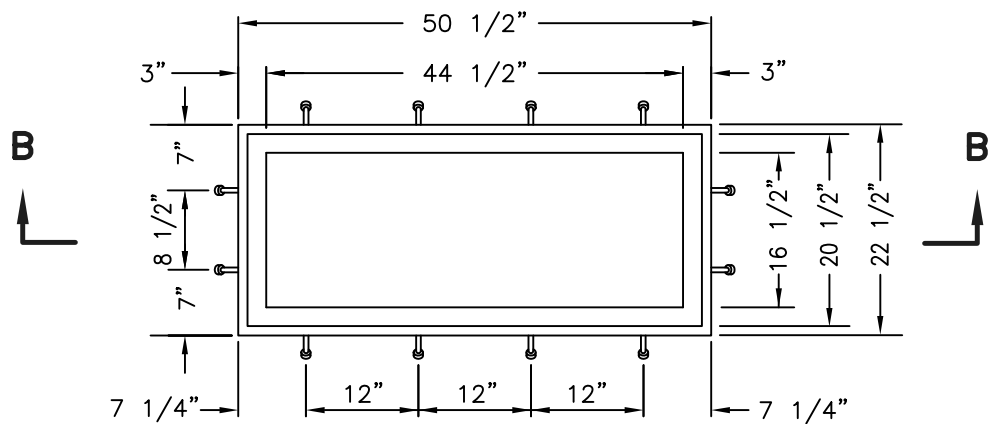
1. CAST IRON FRAMES: Grey iron class 35 minimum per ASTM A 48. Cast frame and lugs as one solid, complete unit.
2. STEEL FRAMES: Studs may be welded to the frame. Use ASTM A 36 steel.
3. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
4. INLET BOX: See Plan No. 331.



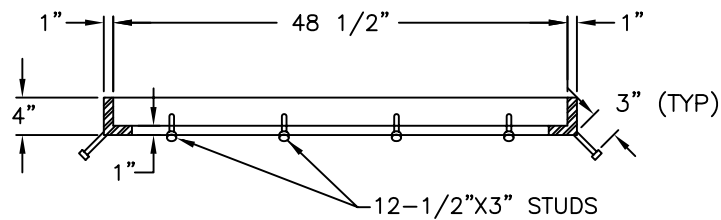
GRATE



SECTION A-A



FRAME



SECTION B-B

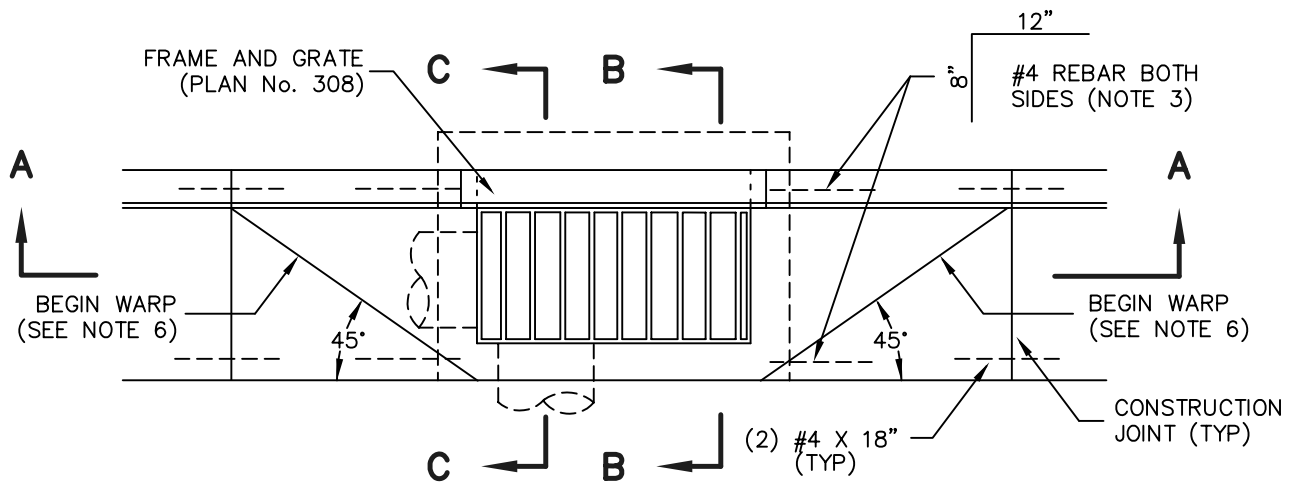
48" Grate and frame

Plan No.

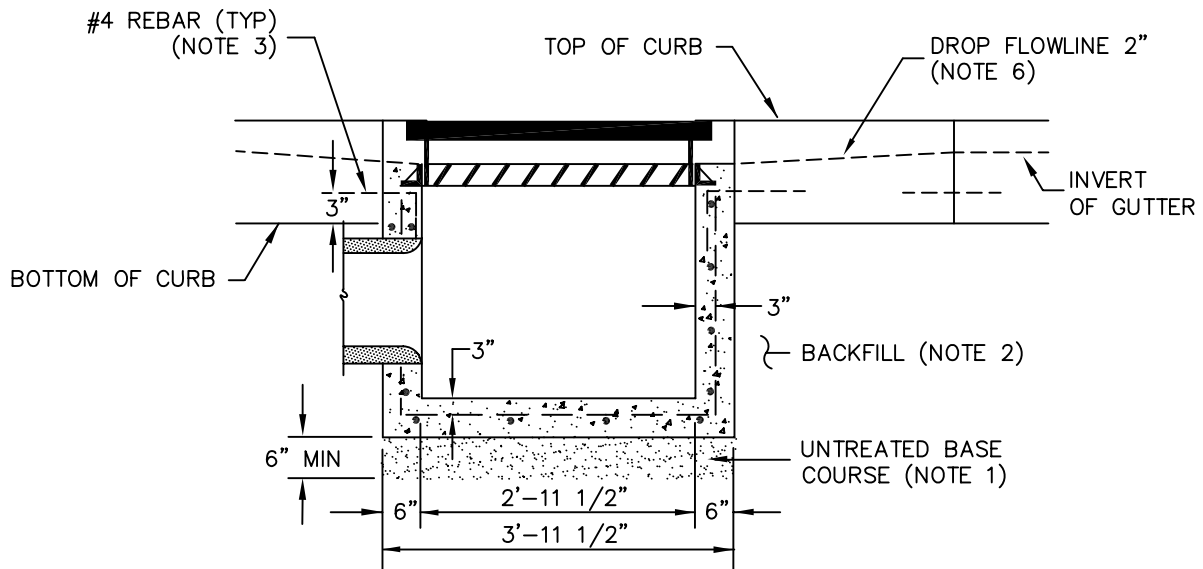
310

Catch basin

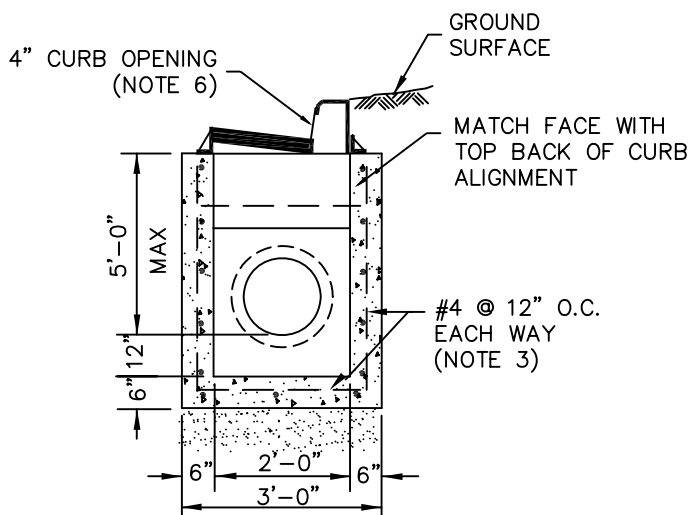
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10 Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.
6. CURB FACE OPENING: Make opening at least 4 inches high. Provide at least a 2 inch drop between the "begin warp" line in the gutter flow-line and the top of the grate at the curb face opening.



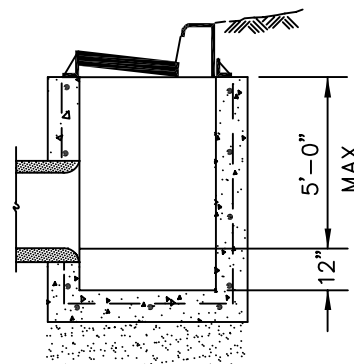
TYPE A - CURB INLET WITH SINGLE GRATE



SECTION A-A



SECTION B-B



SECTION C-C

Catch basin

Catch basin

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.
6. CURB FACE OPENING: Make opening at least 4 inches high. Provide at least a 2 inch drop between the "begin warp" line in the gutter flow-line and the top of the grate at the curb face opening.



Combination inlet / cleanout box

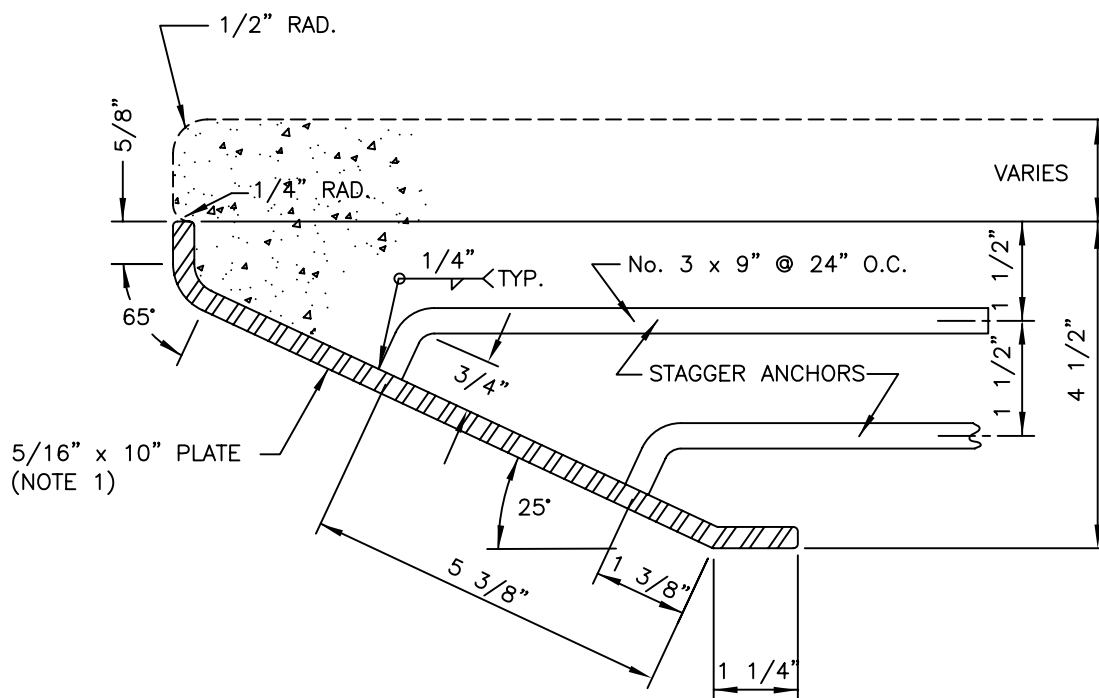
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.
6. LADDER RUNGS: Provide plastic coated steel ladder rungs in boxes over 6 feet deep. Place bottom rung 6 inches above top of pipe.
7. CURB FACE OPENING: Make opening at least 4 inches high. Provide at least a 2 inch drop from the concrete gutter flow-line to the top of the grate at the curb face opening.

Curb inlet / outlet

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.
6. FRAME AND COVER: Grey iron class 30 minimum per ASTM A 48. Coat all metal parts with asphaltum paint.
7. LADDER RUNGS: Provide plastic coated steel ladder rungs in boxes over 4 feet deep.
 - A. If V = 3 feet or less, place one step above the floor of the basin.
 - B. If V = 3 feet or more, place steps at 12 inch intervals from the floor of the basin with the top step at least 12 inches below the top of the manhole.
8. INSTALLATION:
 - A. Locate connector pipe at the downstream end of the basin unless specifically noted otherwise on the construction drawings. Trim pipe to the final shape and length before placement of concrete.
 - B. Make smooth curves at sill and sidewall at the gutter opening. Provide all exposed edges and corners with 1/2 inch radius edge finish. Match grade, slope, color and finish of adjacent curb and walkways.
 - C. Make curb opening at least 4 inches high. Provide at least a 2 inch drop from the concrete gutter flow-line to the top of the grate at the curb face opening.

Curb inlet / outlet

1. STEEL: ASTM A 36 hot dip galvanize after fabrication.

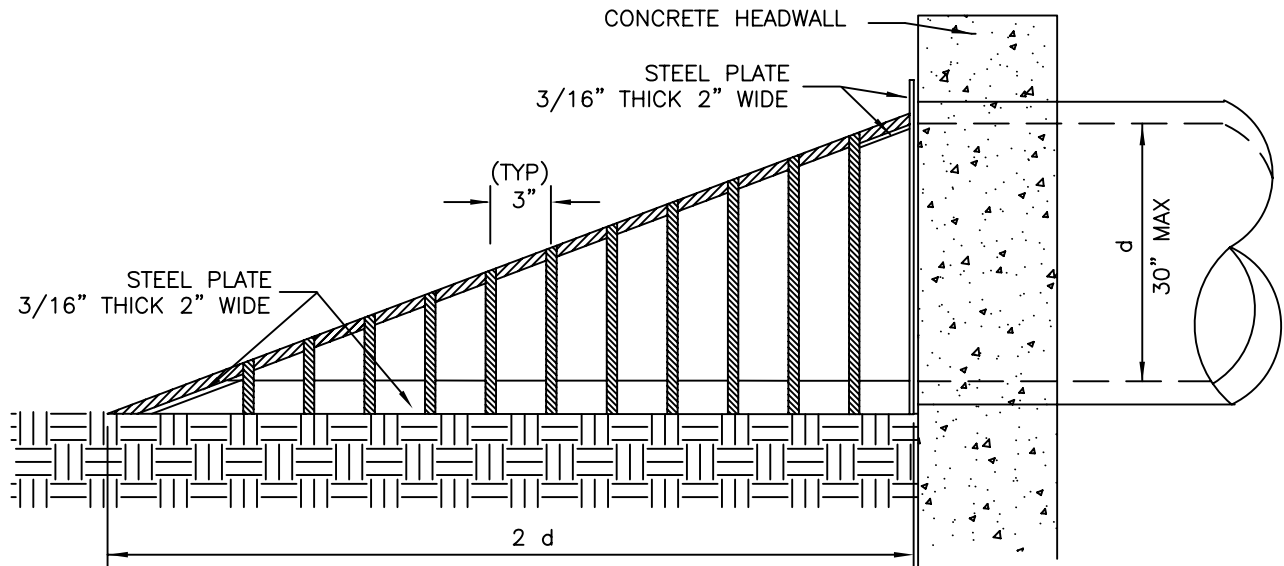
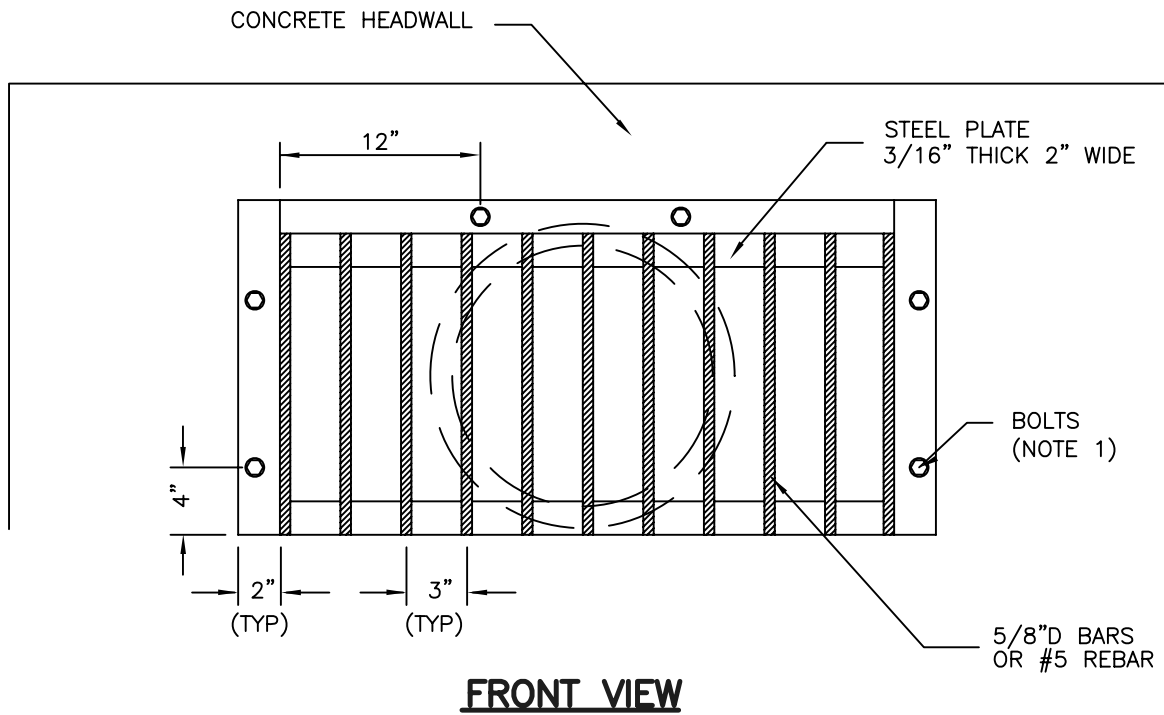


FACE PLATE DETAIL

Curb inlet / outlet

Debris grate inlet

1. BOLTS: Use 1/2 inch stainless steel bolts and 1/8 inch stainless steel washers.
2. STEEL: ASTM A 36 steel.
3. JOINTS: All joints to be welded.
4. COATING: Coat all metal parts with asphaltum paint.



Debris grate inlet

Plan No.

320

Automatic flap gate (pressurized storm drains)

1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. INSTALLATION:
 - A. Mount the automatic flap gate on a concrete collar poured in the end of a junction spur.
 - B. Use nickel copper alloy mounting bolts and embed bolts 5 inches into the collar.
 - C. Provide flap gate designed for 20 feet of seating head unless specified otherwise in the Contract Documents.
 - D. The 'Y' dimension is measured at the top of the junction structure spur for trapezoidal reinforced concrete channel.
 - E. Flap gate may be either spigot back or flat back unless specified in the Contract Documents.

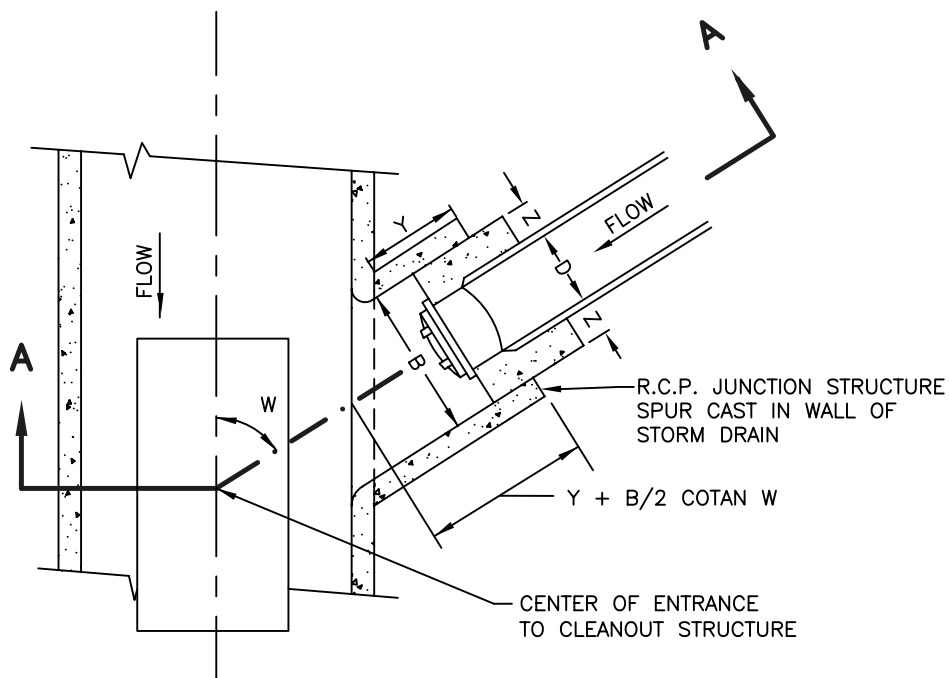
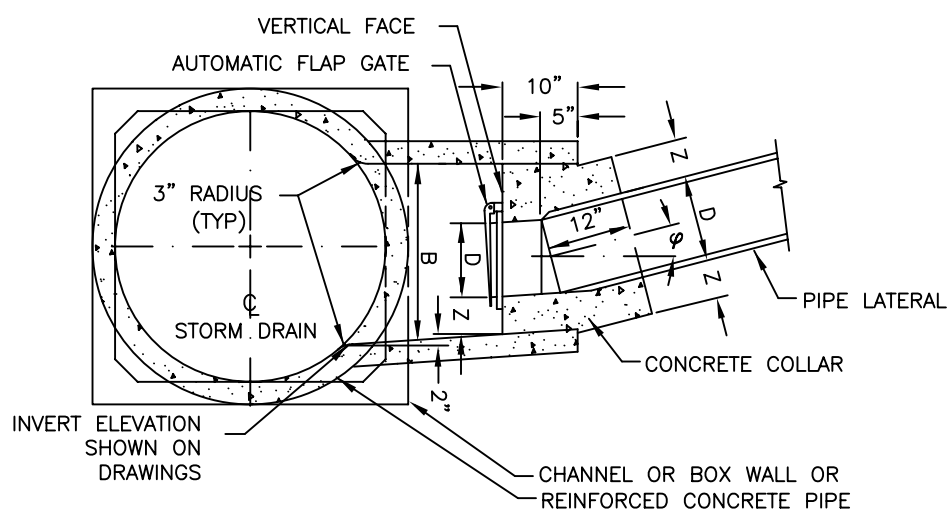
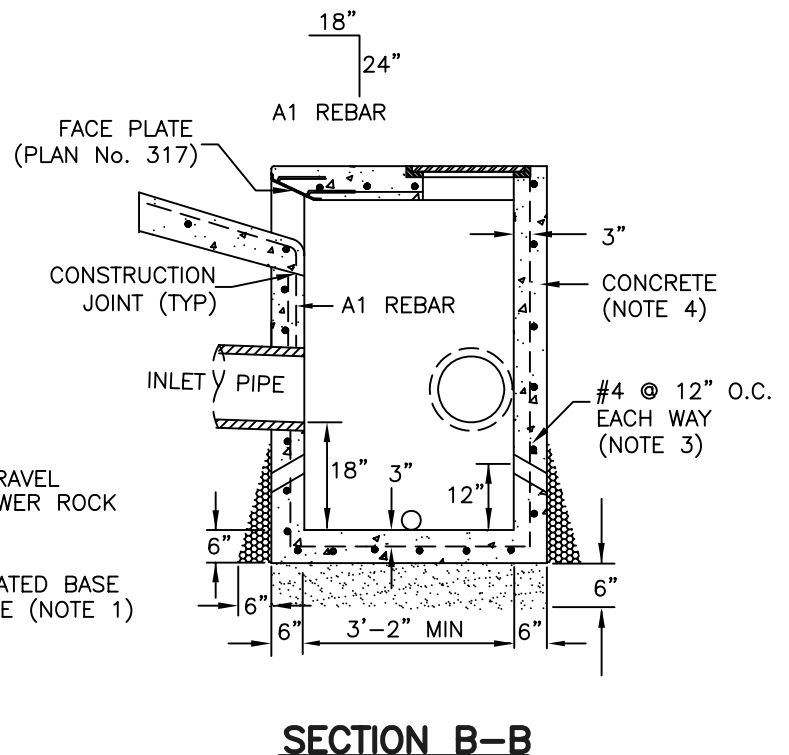
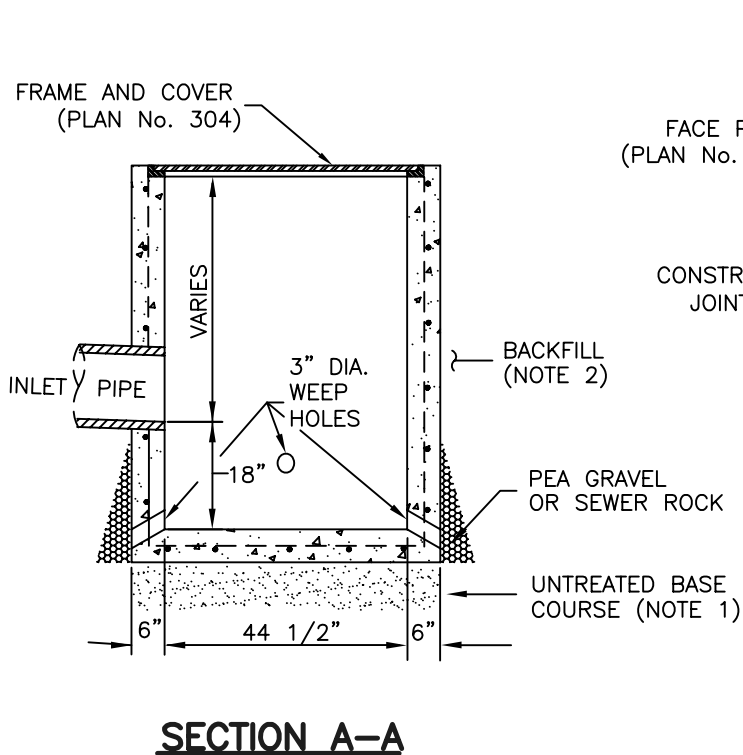
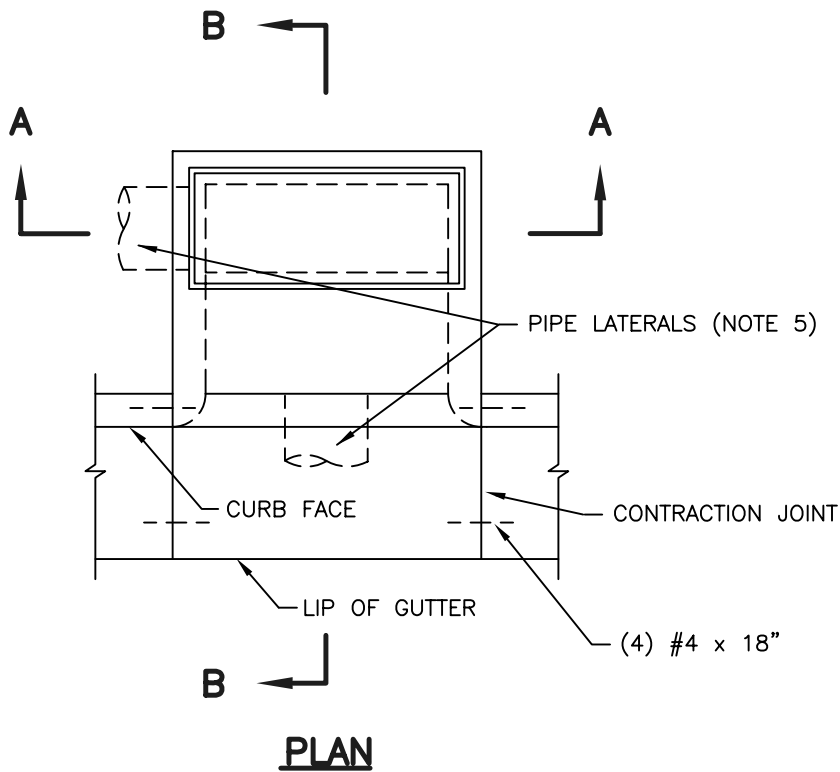


TABLE OF DIMENSIONS			
D In.	B In.	Z In.	Y In.
4	16	5.0	2.0
6	18	5.0	2.0
8	20	5.0	3.0
10	22	5.0	3.0
12	24	5.0	4.0
15	27	5.0	4.0
18	33	5.0	4.0
21	39	5.0	4.0
24	42	5.0	4.0
30	51	6.0	4.5
36	60	6.0	5.0
42	72	7.0	6.0
48	81	7.0	6.5
54	87	7.0	7.0
60	96	8.0	8.0
66	108	8.0	8.5
72	114	8.0	9.0
78	126	9.0	9.5
84	138	9.0	10.5
90	144	9.0	11.0



Curb outlet

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Center steel in walls and slabs with a minimum cover of 2 inches. Keep steel 2 inches clear around pipe and lid opening.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the curb outlet. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering connection to existing piping.



Curb outlet

Plan No.
322

Pipe outfall access control rack

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Weld rack with reinforcing steel or round bars of equal.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. STEEL: ASTM A 36.
6. INSTALLATION: Provide room to lay rack flat downstream.
 - A. Fasten latch bracket to headwall with 1/2" x 6" stainless steel bolts and hex nuts or 1/2" stainless steel expansion bolts.
 - B. When rack is in the closed position, the bottom rack bar must be tight against the top of the hinge bracket so that the rack cannot be lifted off of the latch.
 - C. Fabricate hinge bracket from #4 rebar.

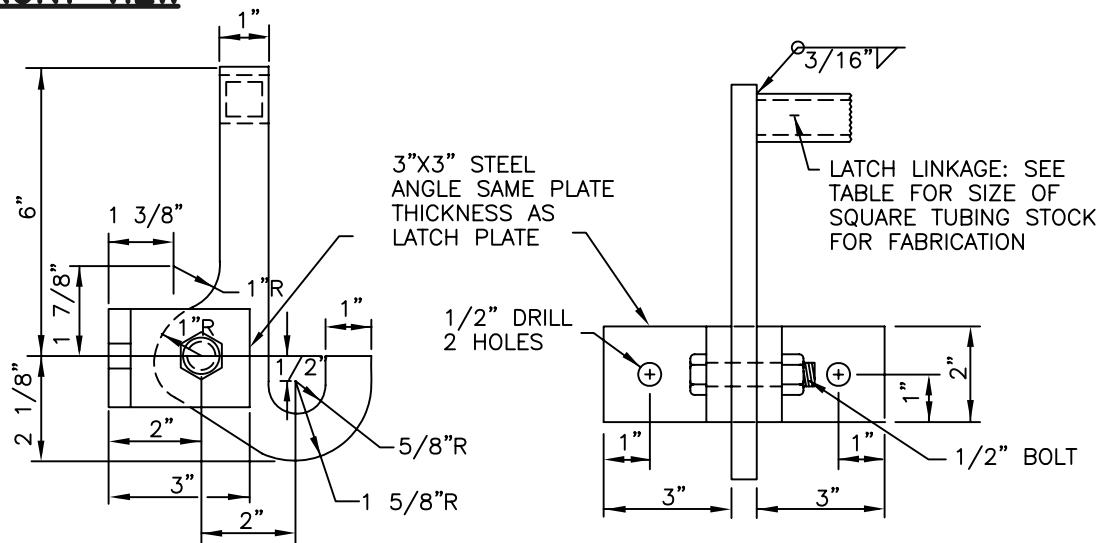
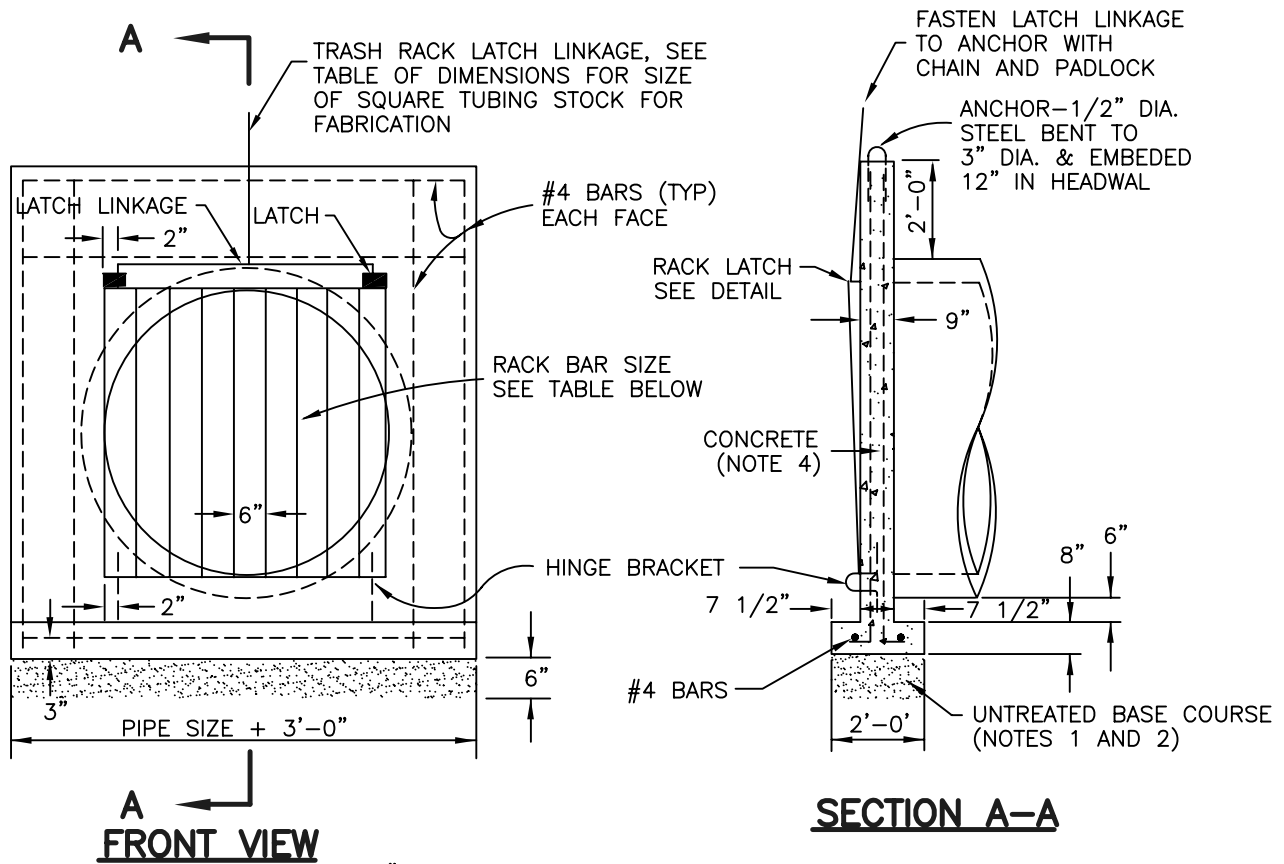


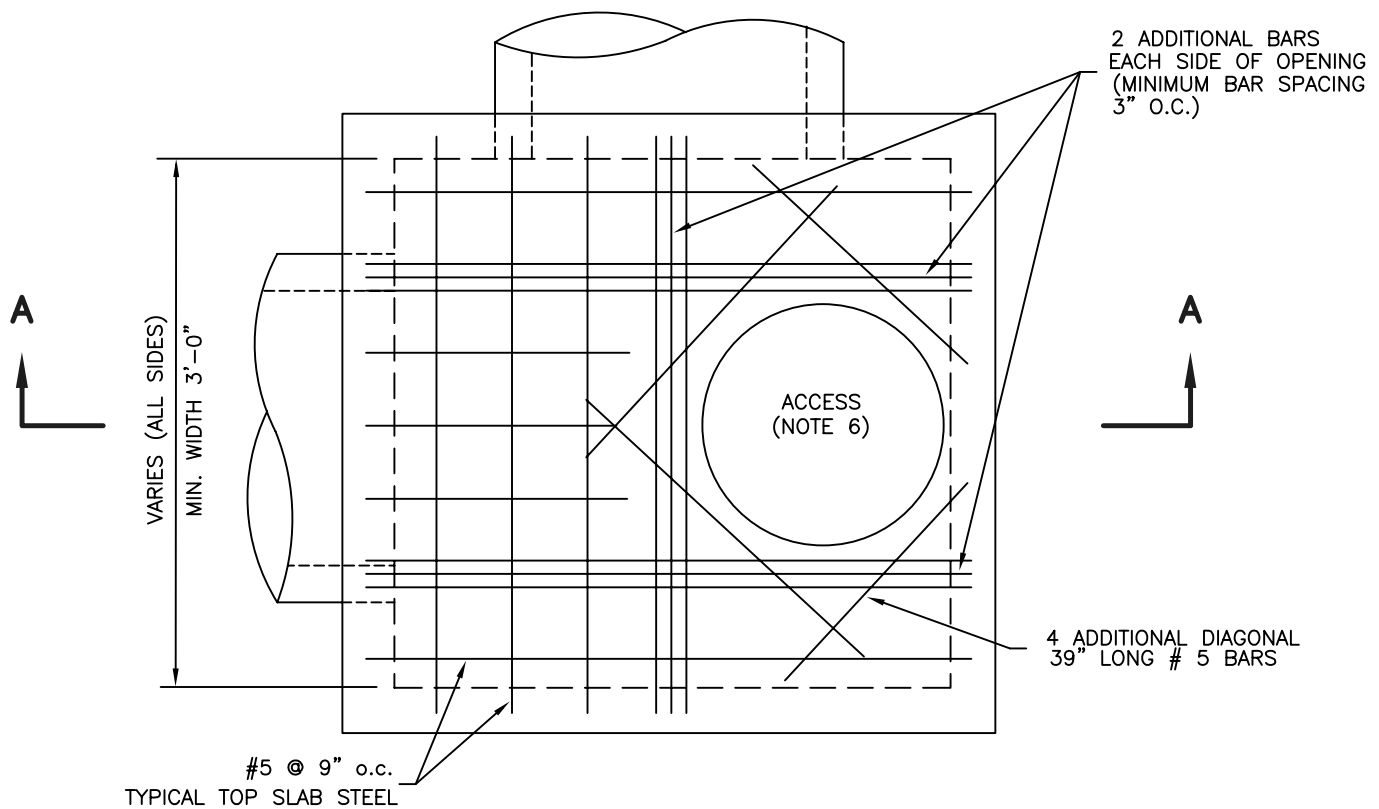
TABLE OF DIMENSIONS							
PIPE SIZE	RACK BAR SIZE	LATCH PLATE THICKNESS	LATCH LINKAGE SIZE	PIPE SIZE	RACK BAR SIZE	LATCH PLATE THICKNESS	LATCH LINKAGE SIZE
18"	#4	1/4"	1", .095" THICK	42"	#7	1/2"	1", .133" THICK
21"	"	"	"	48"	"	"	"
24"	#5	"	"	54"	#8	"	"
27"	"	3/8"	"	60"	"	"	"
30"	#6	"	"	66"	"	"	"
33"	"	"	1", .133" THICK	72"	"	"	"
36"	#7	"	"	84"	"	"	"

Cleanout box

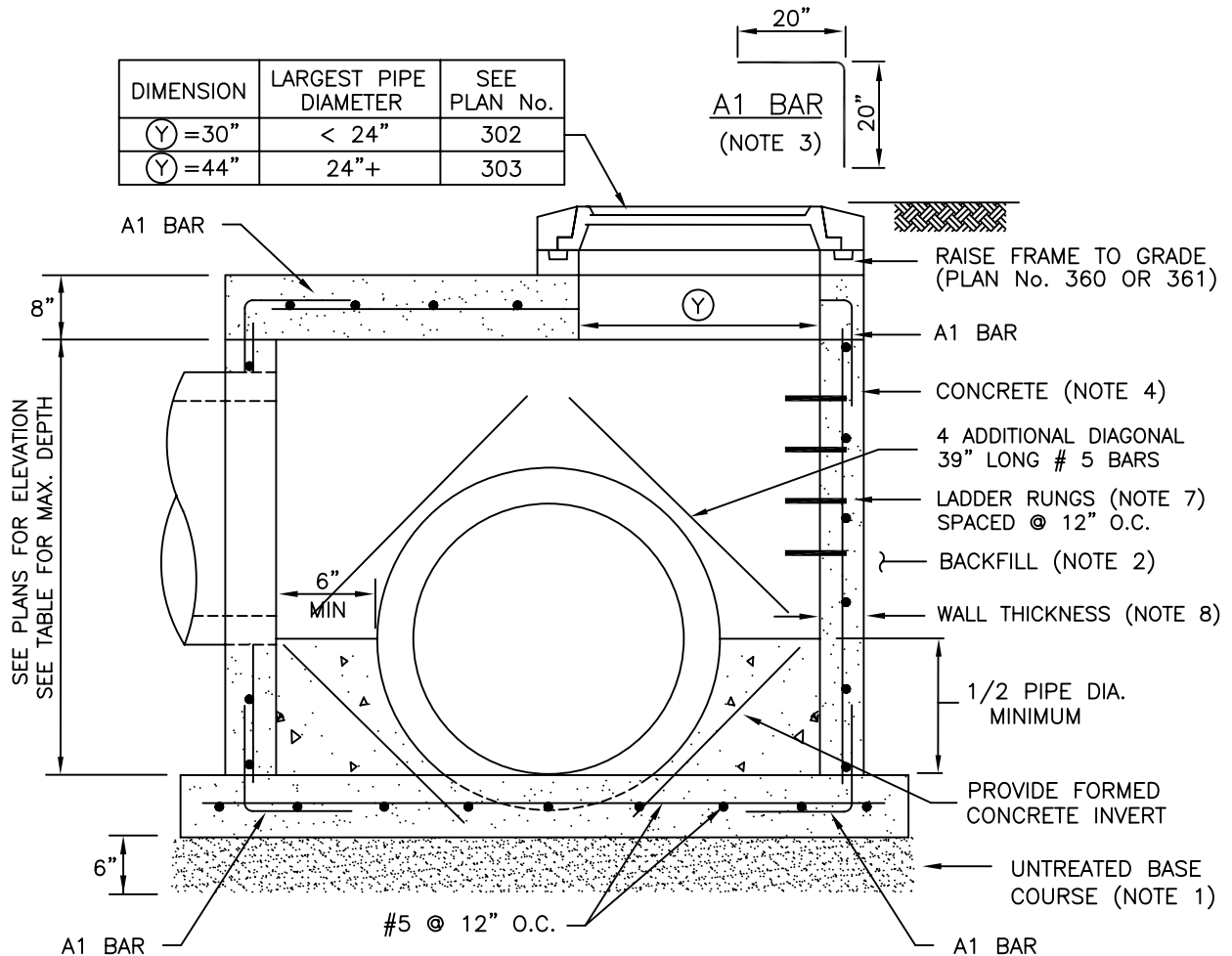
1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. **BACKFILL:** Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Center steel in walls and slabs with a minimum cover of 2 inches. Keep steel 2 inches clear around pipe and lid opening. A1 bars required at all corners, vertical and horizontal. A1 bars connecting two walls must match wall bar size and spacing. A1 bars connecting walls to top and bottom slabs must match slab steel size and spacing.
4. **CONCRETE:** Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. **PIPE LATERALS:** Refer to Drawings for connection locations.
6. **ACCESS:** Eccentric access is shown. Prior to construction, verify if concentric access is required. Adjust reinforcement accordingly.
7. **LADDER RUNGS:** Plastic. Required in boxes greater than 6 feet deep with eccentric access. Align rungs with location of access opening. Rungs not required in boxes with concentric access.

8. **WALL THICKNESS AND WALL STEEL**

Low Water Table				
Max. Box Width	6 feet	8 feet	8 feet	9 feet
Max. Box Depth	6 feet	8 feet	12 feet	12 feet
Wall Thickness	8 inches	8 inches	12 inches	12 inches
Wall Curtain Steel	#5 @ 12"	#5 @ 6"	#5 @ 6"	#7 @ 9"
Modifications for High Water Table				
Wall Thickness	8 inches	10 inches	16 inches	12 inches
Wall Curtain Steel	#5 @ 9"	#5 @ 6"	#5 @ 6"	#6 @ 6"



BASE WITHOUT SUMP



SECTION A-A

Cleanout box

Plan No.

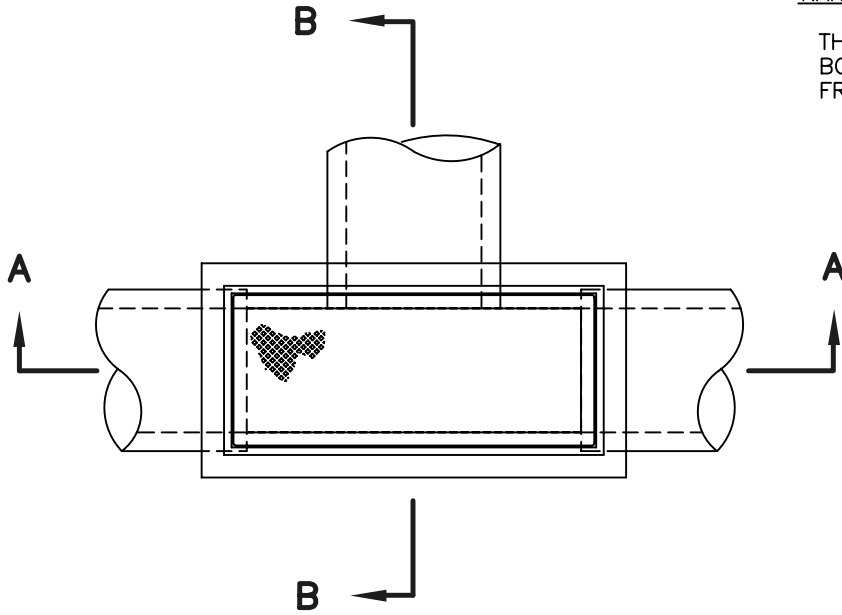
330

Cleanout box

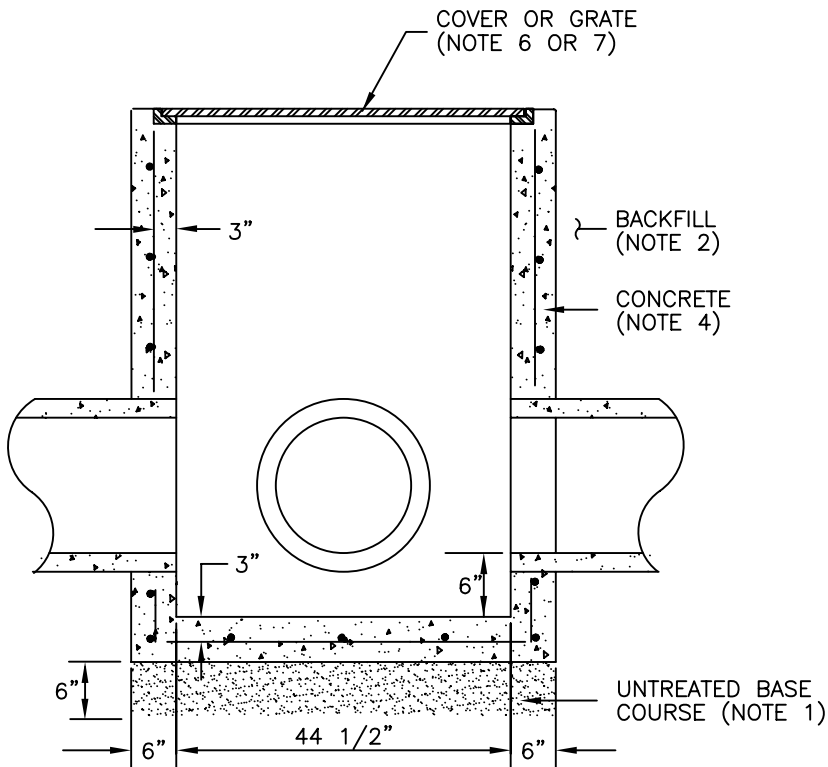
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. PIPE LATERALS: The drawing shows alternate connections to the curb outlet. Refer to Construction Drawings for connection locations.
6. COVER AND FRAME: See Plan No. 304. Adjust concrete dimensions at frame accordingly.
7. GRATE AND FRAME: See Plan No. 309 or 310. Adjust concrete dimensions at frame accordingly.

NARRATIVE

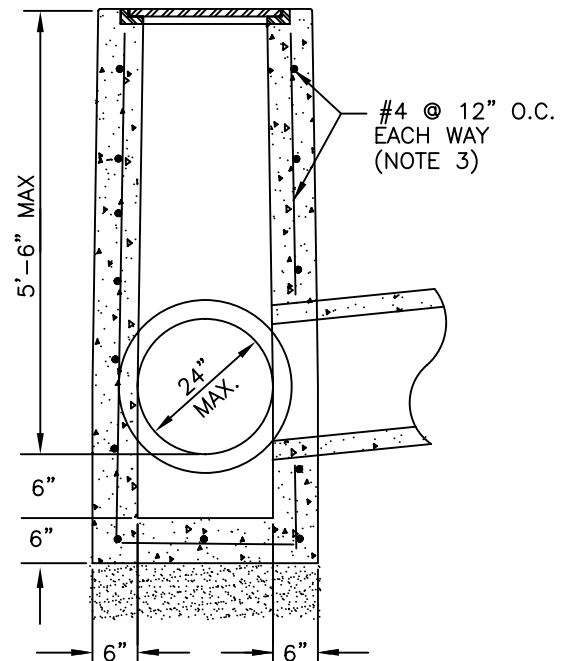
THIS CONCRETE BOX MAY BE USED AS A CLEANOUT BOX OR AN INLET BOX. INSTALL THE APPROPRIATE FRAME AND COVER, OR FRAME AND GRATE.



PLAN VIEW



SECTION A-A



SECTION B-B

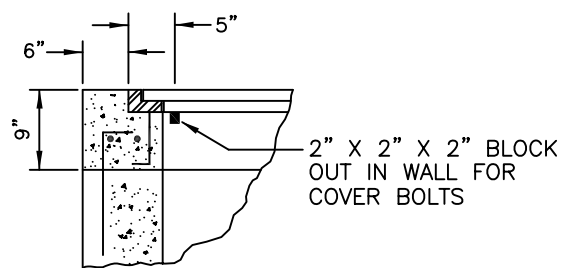
Cleanout box

Plan No.

331

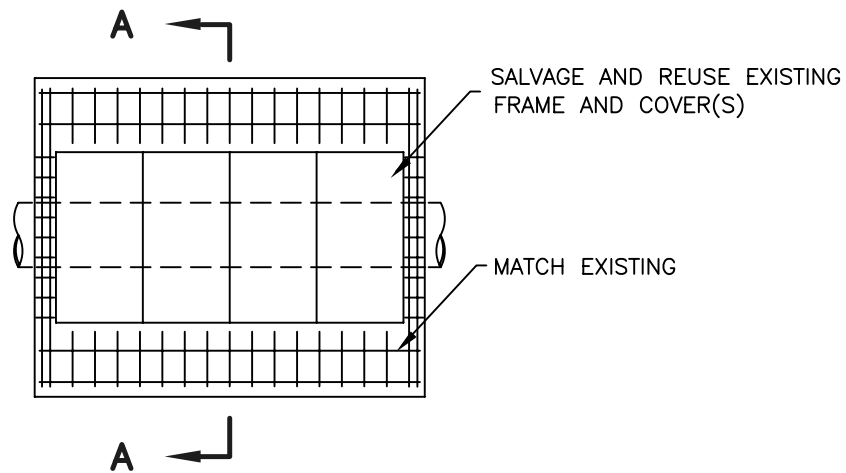
Cast in-place manhole

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of manhole. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. COVER AND FRAME: See Plan No. 305. Adjust concrete dimensions at frame accordingly.

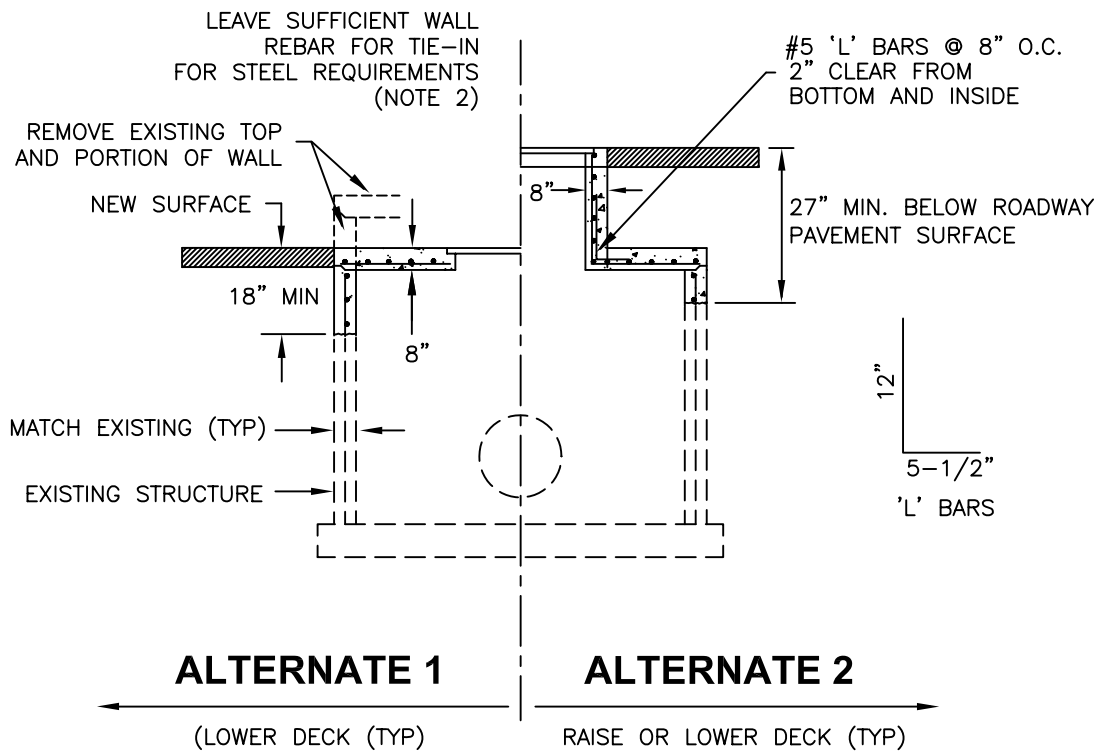


Adjust reinforced concrete deck to grade

1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. COVER AND FRAME: For storm drain application see Plan No. 305. Adjust concrete dimensions at frame accordingly.



PLAN



NOTE : FIELD MEASURE AND VERIFY DIMENSIONS OF EACH STRUCTURE PRIOR TO CONSTRUCTION OF DECK LID

SECTION A-A

Adjust reinforced concrete deck to grade

Plan No.

335

Precast manhole

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. STATIONING AND ELEVATIONS:
 - A. Stations of manholes shown on the Drawings apply to the centerline of the shaft.
 - B. Elevations shown at the shaft's center refer to the prolonged (or extended) invert grade of the pipe.
 - C. Inlet pipe elevation applies to a point of intersection of the inlet pipe invert to the manhole wall.
5. CONCRETE DECK OR REDUCING RISER: When depth of manhole from pipe invert to finish grade exceeds 6'-7", use an ASTM C 478 reducing riser cone.
6. DISTANCE "P": "P" varies as per size of pipes, such that the horizontal inside diameter of the pipe intersects the inside face of the riser.
7. JOINTS: Place flexible gasket-type sealant in all manhole joints.
8. BASE OF MANHOLE: Pour in one continuous operation.
9. FINISH: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.

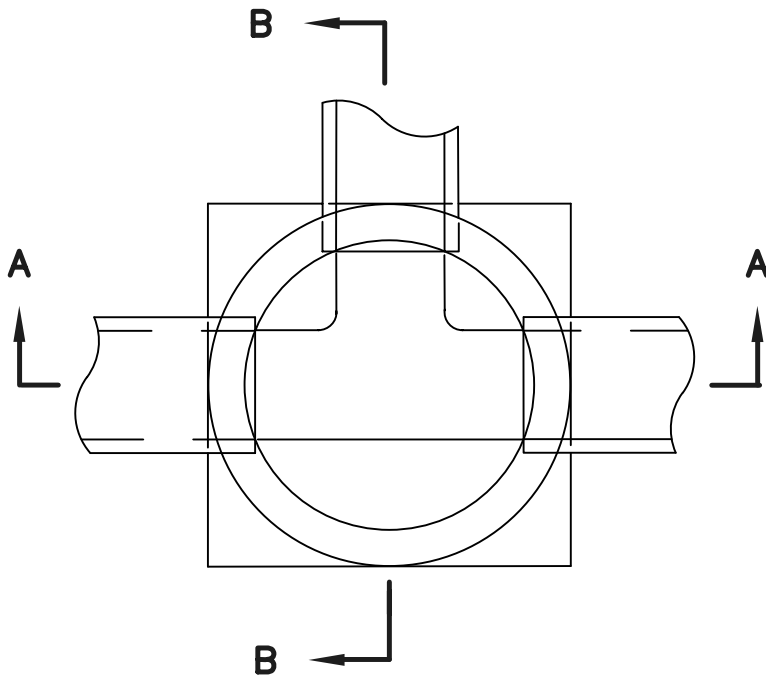
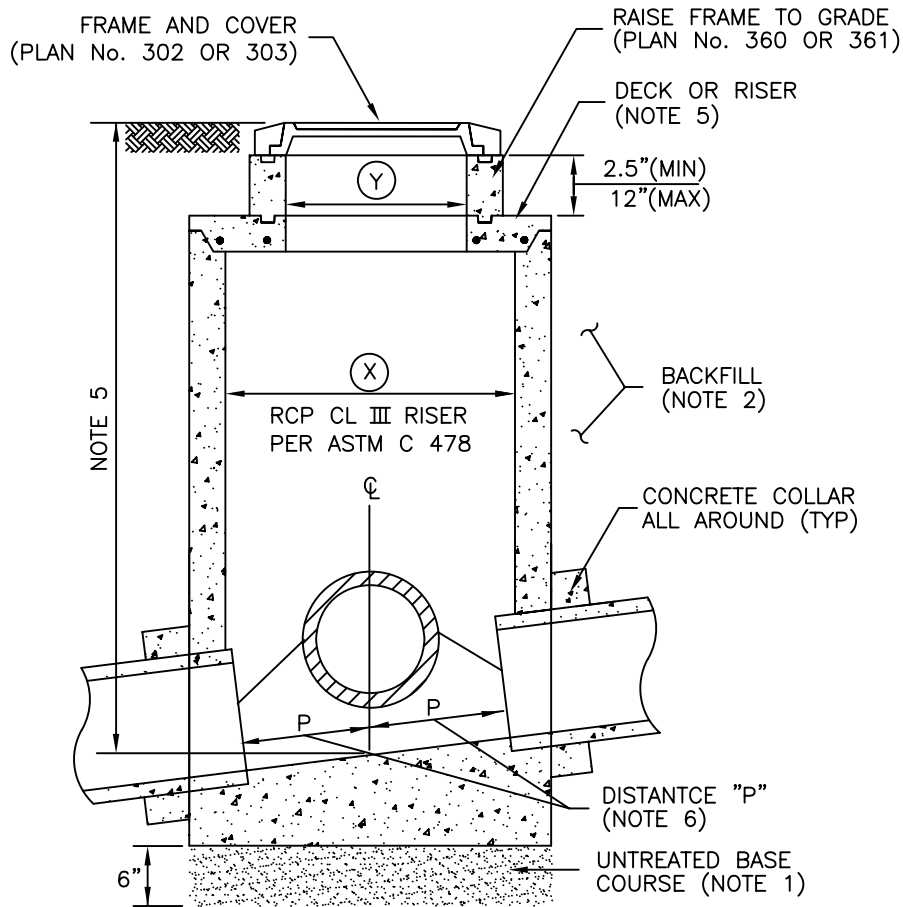
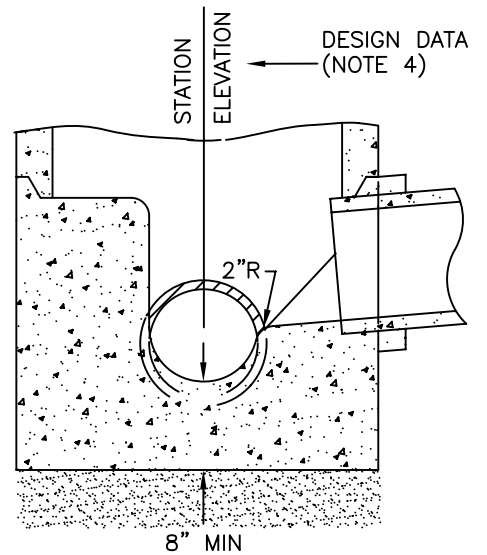


TABLE OF DIMENSIONS	
MANHOLE TYPE	DIMENSION
A	(X) = 48" (Y) = 30"
B	(X) = 60" (Y) = 44"
C	(X) = 60" (Y) = 30"

CAST-IN-PLACE BASE



SECTION A-A



SECTION B-B

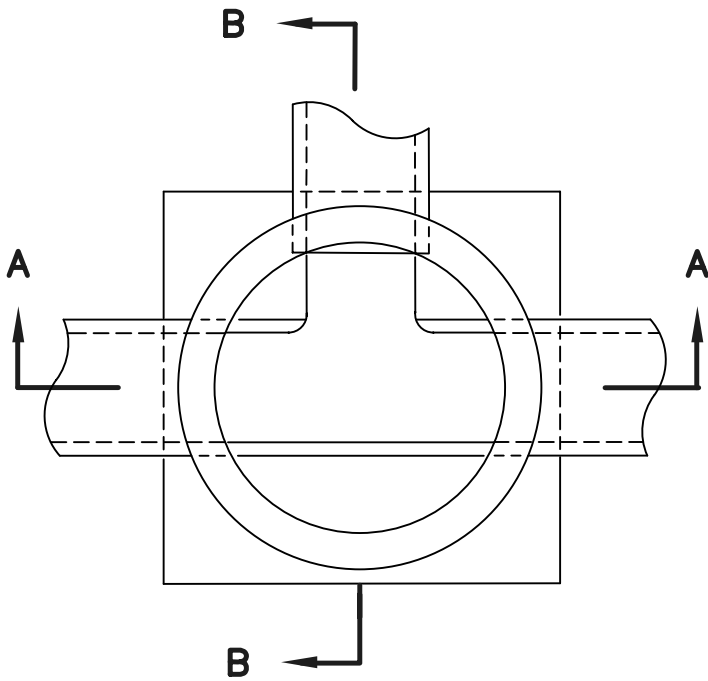
Precast manhole

Plan No.

341

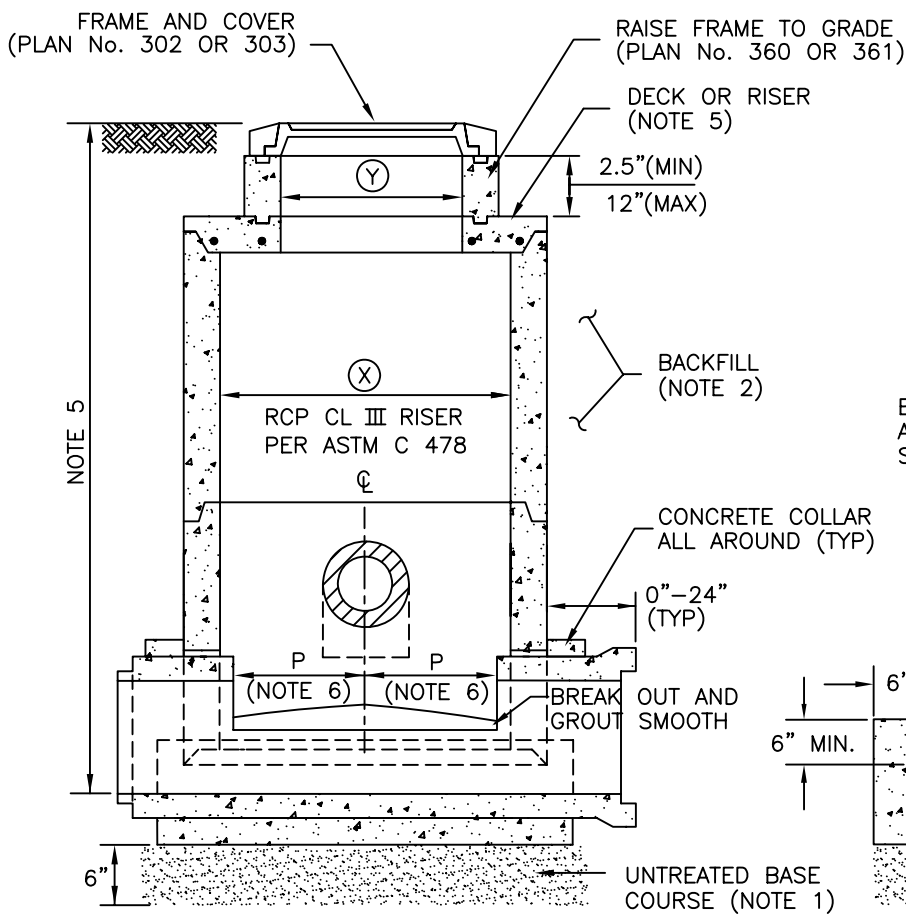
Precast manhole

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. STATIONING AND ELEVATIONS:
 - A. Stations of manholes shown on the Drawings apply to the centerline of the shaft.
 - B. Elevations shown at the shaft's center refer to the prolonged (or extended) invert grade of the pipe.
 - C. Inlet pipe elevation applies to a point of intersection of the inlet pipe invert to the manhole wall.
5. CONCRETE DECK OR REDUCING RISER: When depth of manhole from pipe invert to finish grade exceeds 6'-7", use a reducing riser section.
6. DISTANCE "P": "P" varies as per size of pipes, such that the horizontal inside diameter of the pipe intersects the inside face of the riser.
7. JOINTS: Place flexible gasket-type sealant in all manhole joints.
8. BASE OF MANHOLE: Pour in one continuous operation.
9. FINISH: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.

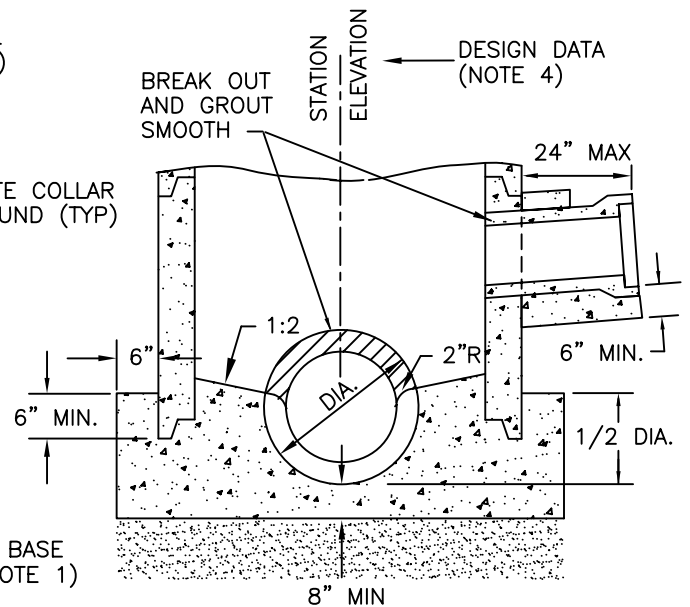


PIPE PASS-THROUGH BASE

TABLE OF DIMENSIONS	
MANHOLE TYPE	DIMENSION
A	(X) = 48" (Y) = 30"
B	(X) = 60" (Y) = 44"
C	(X) = 60" (Y) = 30"



SECTION A-A



SECTION B-B

Precast manhole

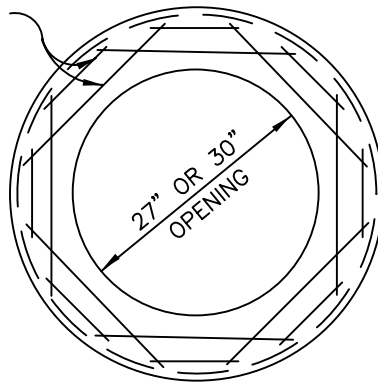
Plan No.

341

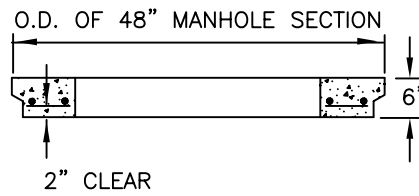
Concrete Deck

1. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
2. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.

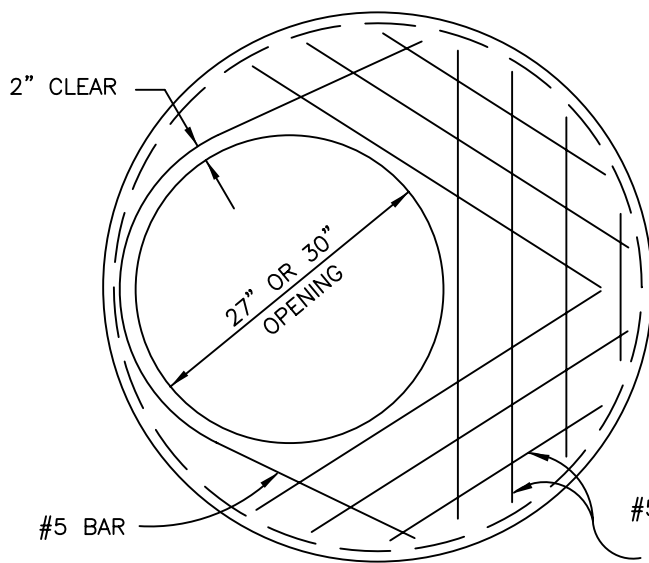
#5 BARS @ 6" O.C.
BOTH DIRECTIONS BOTTOM FACE



48" DECK PLAN

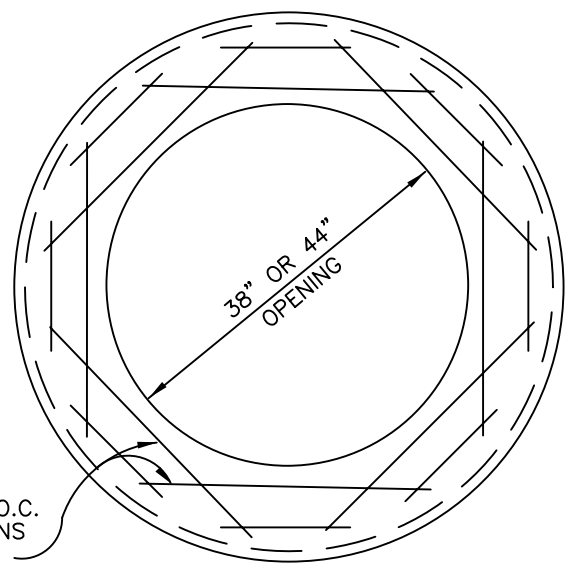


SECTION

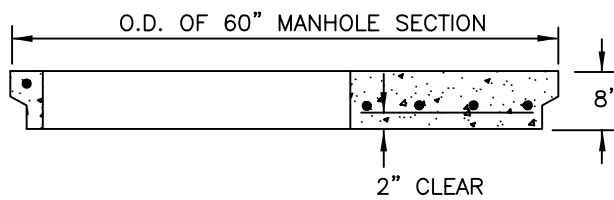


60" DECK PLAN

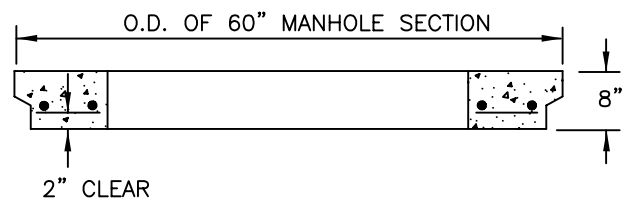
#5 BARS @ 6" O.C.
BOTH DIRECTIONS
BOTTOM FACE



60" DECK PLAN



SECTION



SECTION

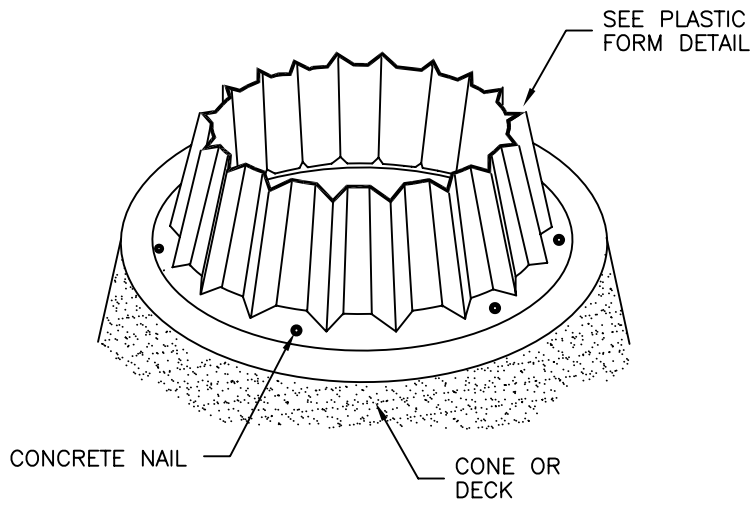
Concrete deck

Plan No.

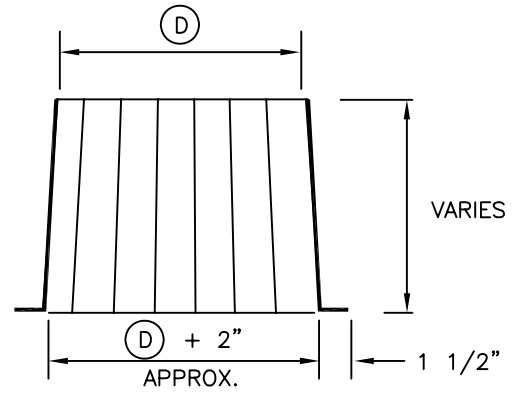
345

Raise frame to grade – plastic form

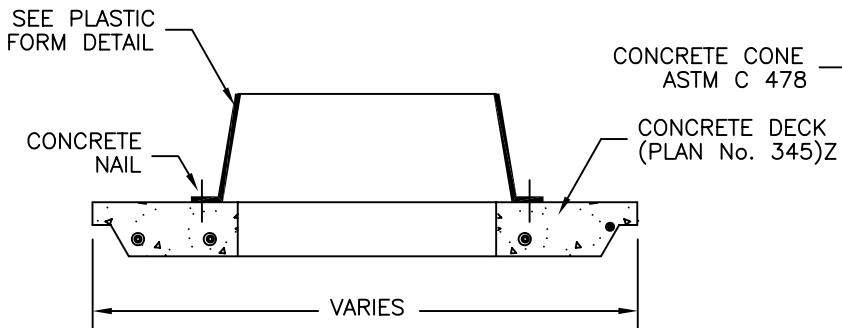
1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.



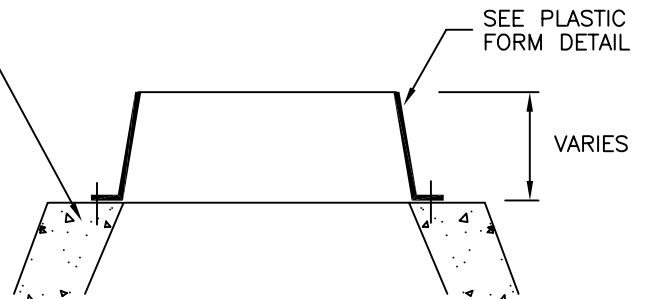
PLASTIC FORM OBLIQUE



PLASTIC FORM DETAIL



DECK SECTION



CONE SECTION

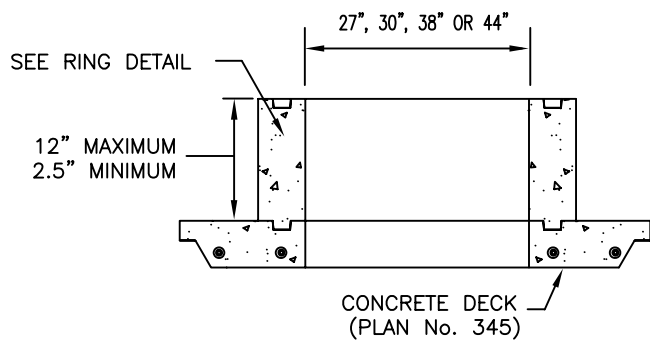
Raise frame to grade - plastic form

Plan No.

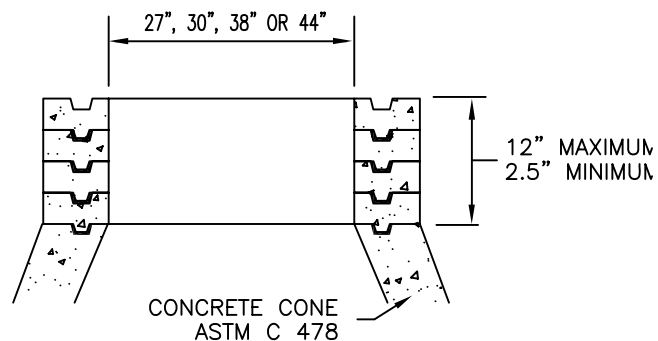
360

Raise frame to grade – grade ring

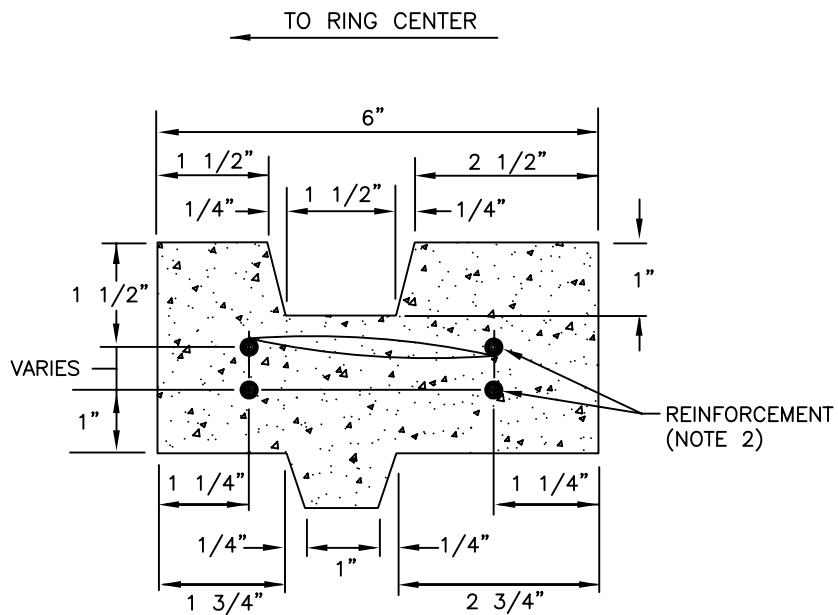
1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
2. REINFORCEMENT: ASTM A 615, grade 60 steel per APWA Section 03 20 00.
 - A. 2 1/2" High Rings: Provide two 1/4" diameter steel hoops tied with No. 14 AWS gage wire, 8" on center.
 - B. 6" and 8" High Rings: Provide four 1/4" diameter steel hoops, tied with No. 14 AWS gage wire, 8" on center.
3. JOINTS: Seat rings with a compressible gasket for non-pressurized applications.



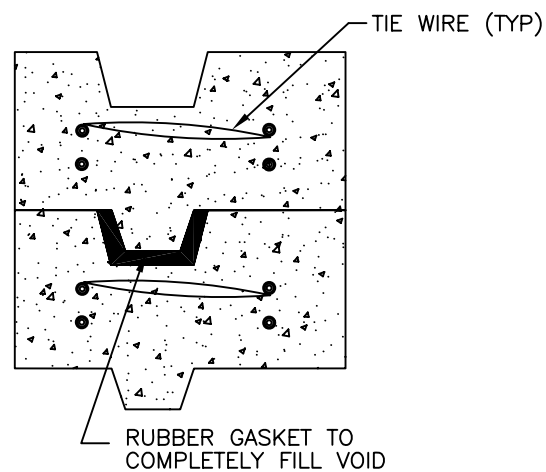
DECK SECTION



CONE SECTION



RING DETAIL



GASKET DETAIL

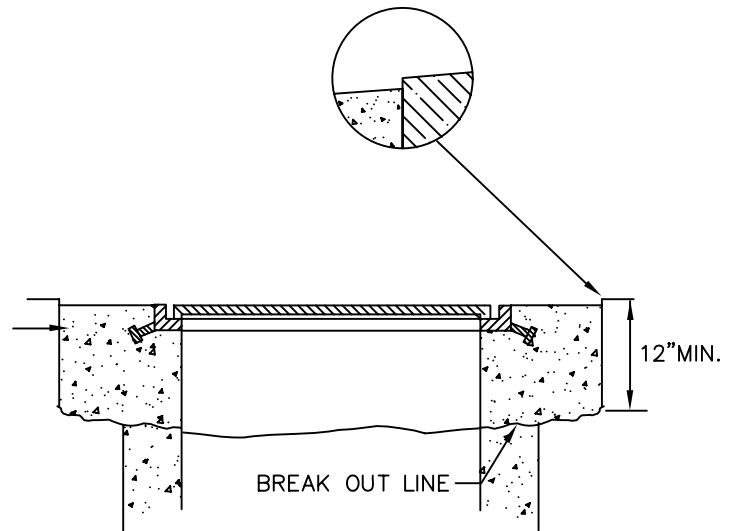
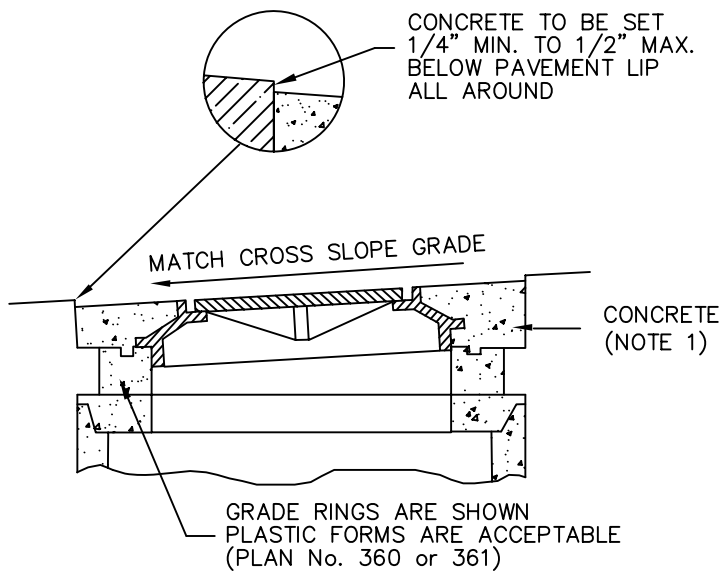
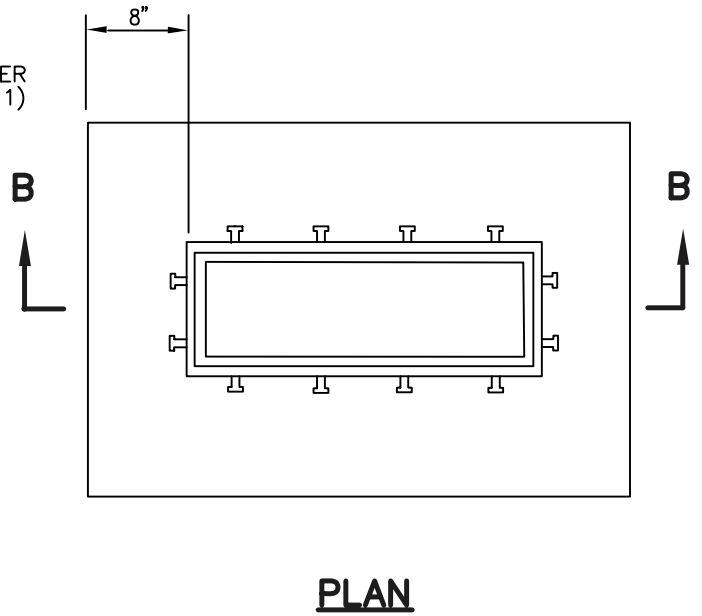
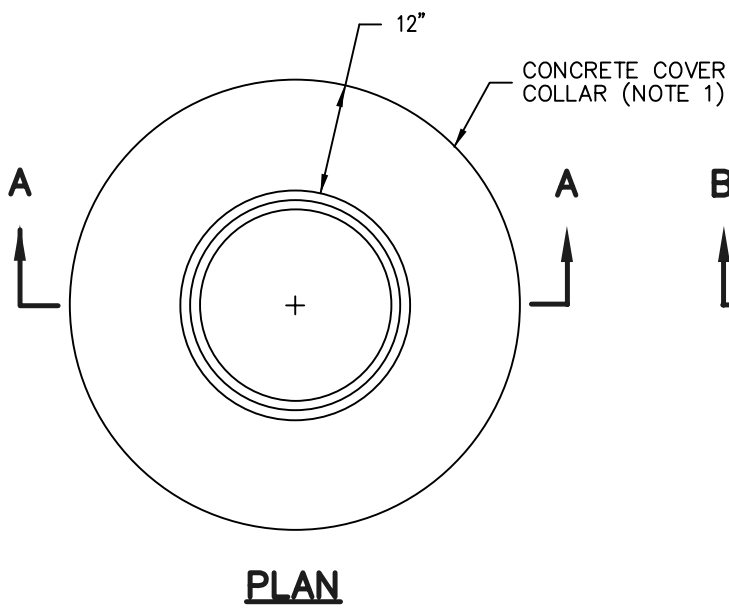
Raise frame to grade - grade ring

Plan No.

361

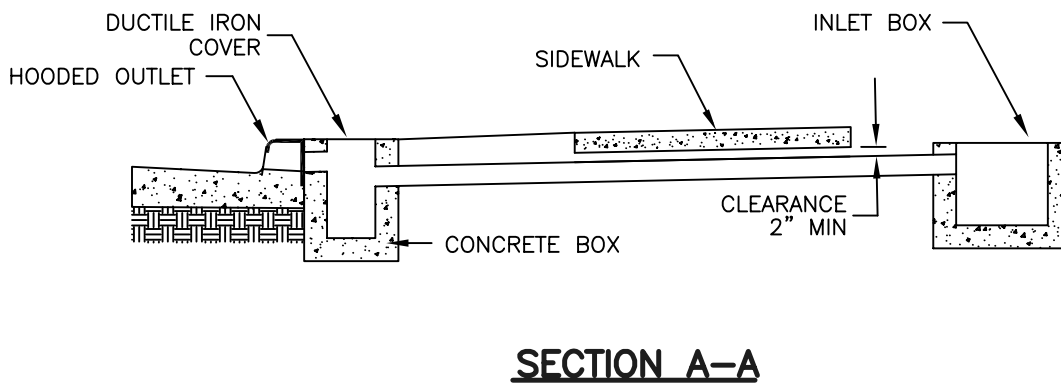
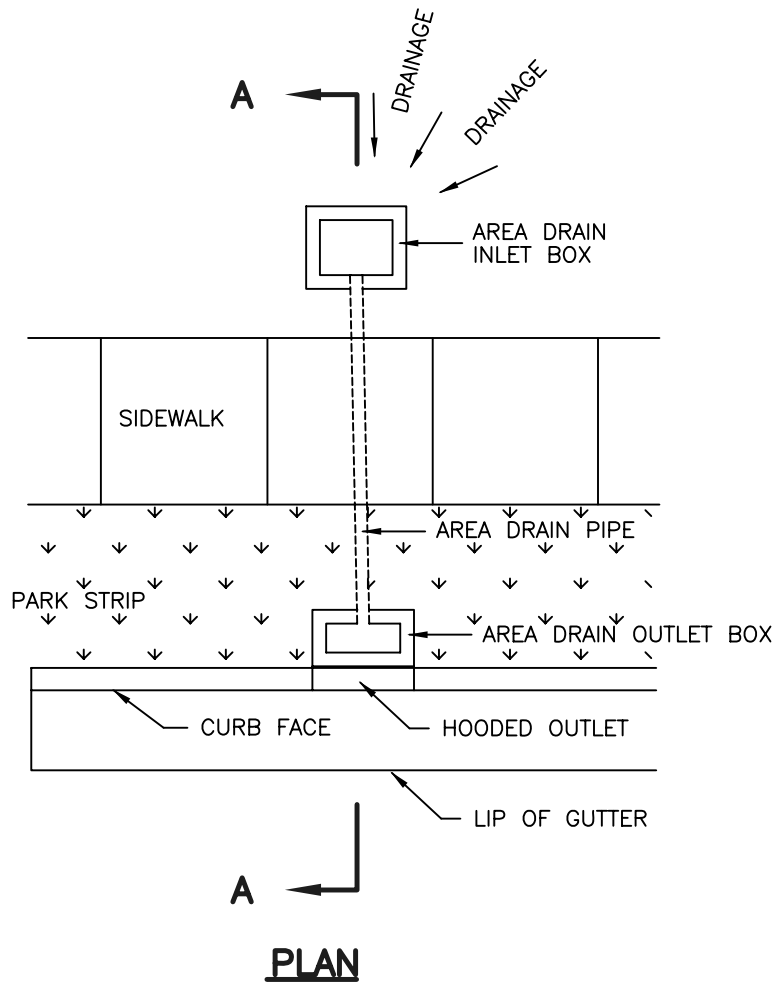
Cover collar for storm drains

1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
2. JOINTS: Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle or straight edge cut. Clean edges of all dirt, oil and loose debris.



Area drain pipe

1. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



Area drain pipe

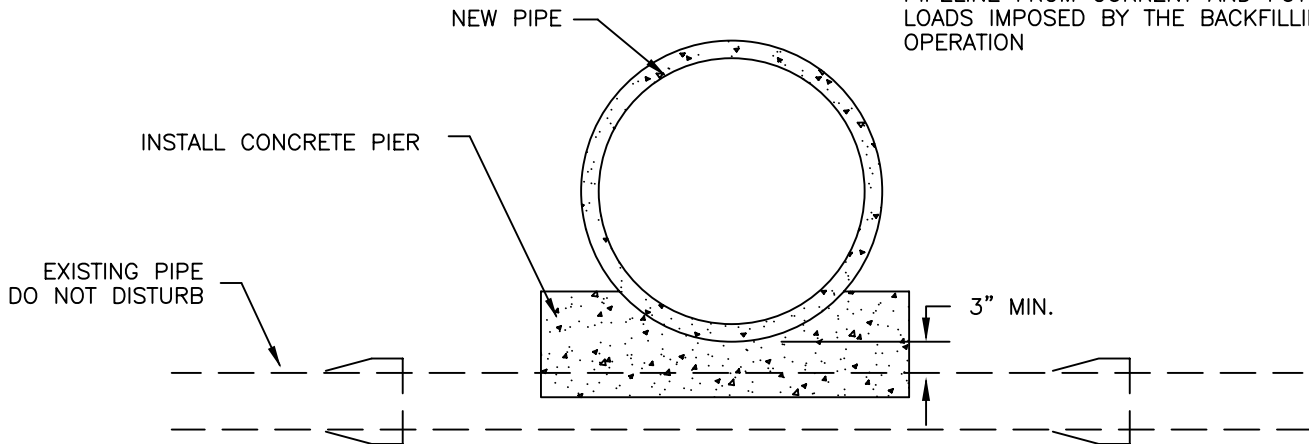
Plan No.
372

Concrete pier

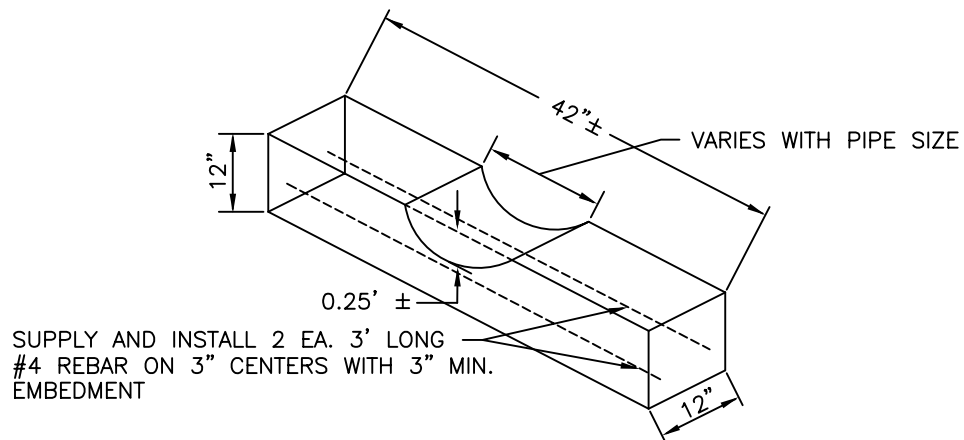
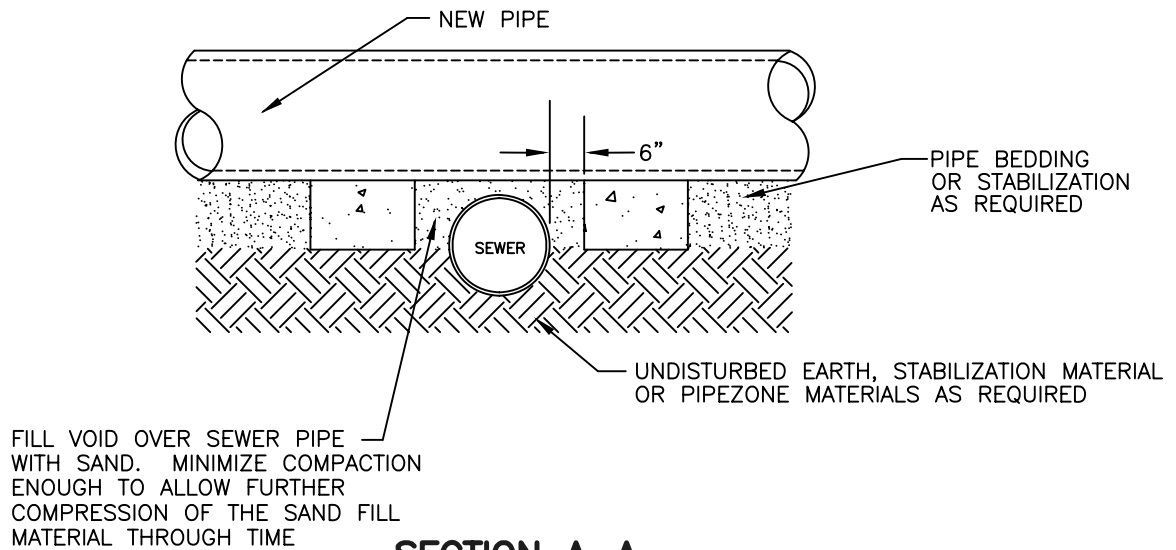
1. BACKFILL: Install and compact all backfill material per APWA Section 33 05 20.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.

NARRATIVE

USE CAUTION WHEN CROSSING OVER BURIED PIPELINE. THE PURPOSE FOR PROVIDING THE PIERS SHOWN IN THIS DRAWING IS TO PROTECT THE UNDERLYING PIPELINE FROM CURRENT AND FUTURE LOADS IMPOSED BY THE BACKFILLING OPERATION



CONCRETE PIER DETAILS



OBLIQUE

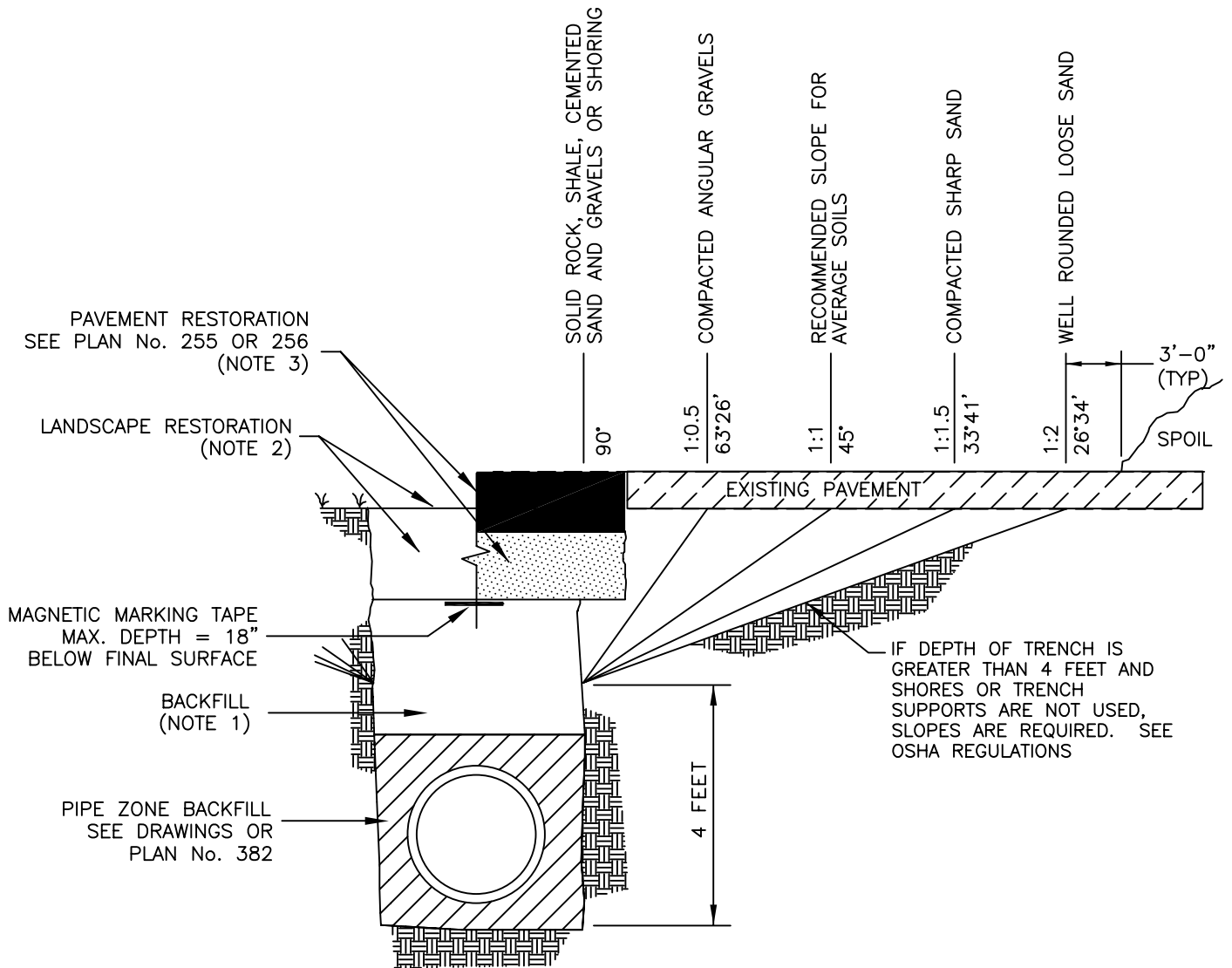
Concrete pier

Plan No.

373

Trench backfill

1. BACKFILL: Above the pipe zone.
 - A. Granular Fill. Limit maximum particle size to 6 inches. Place fill per APWA Section 33 05 20. Compact to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction. Do not use clay without ENGINEER's review and acceptance. Water jetting is NOT allowed in backfilling operation.
 - B. Flowable Fill. Provide and place controlled low strength material per APWA Section 31 05 15. Cure the fill before placing surface restorations.
2. LANDSCAPED RESTORATION: Provide landscaped surfaces with topsoil. Rake to match existing grade. Replace vegetation to match pre-construction conditions. See APWA Section 32 92 00 or APWA Section 32 93 13 requirements.
3. PAVEMENT RESTORATION: Do not install asphalt or concrete surfacing until trench compaction is accepted by ENGINEER.
4. PEA GRAVEL: Pea gravel is not allowed in any part of the trench.



SECTION

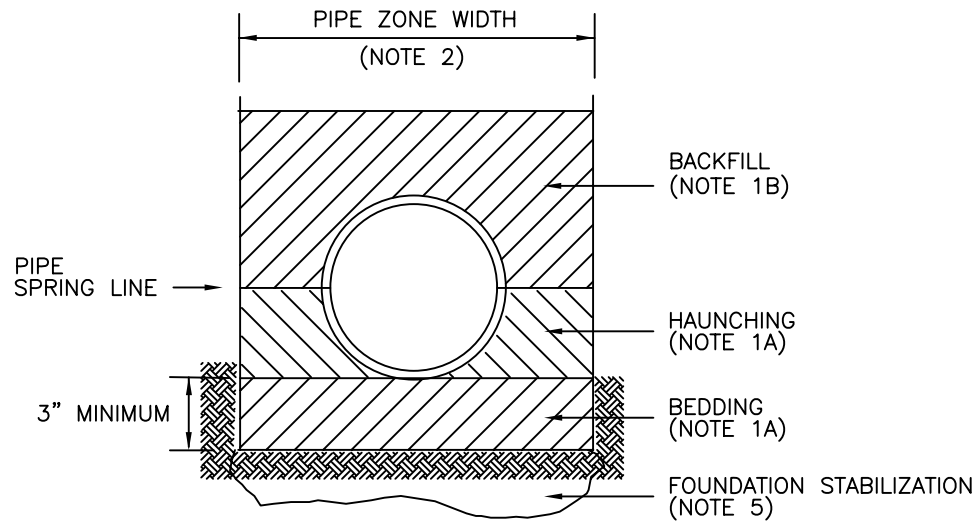
Trench backfill

Plan No.

381

Pipe zone backfill

1. **BACKFILL:** Do not use sewer rock or recycled RAP aggregate in the pipe zone without ENGINEER's written approval.
 - A. Granular Fill Below Pipe Spring Line.
 - 1) Furnish 3/4 inch crushed aggregate base material, unless specified otherwise by pipe manufacturer. When using concrete, provide at least Class 2,000 per APWA Section 03 30 04.
 - 2) Install and compact backfill material per pipe manufacturer' recommendations.
 - 3) Water jetting is not allowed in backfilling operation.
 - 4) Submission of quality control compaction test result data developed for haunching areas may be requested by ENGINEER at any time.
CONTRACTOR is to provide results of tests immediately upon request.
 - B. Granular Fill Above Pipe Spring Line.
 - 1) Furnish 3/4 inch crushed aggregate base material, unless specified otherwise by pipe manufacturer. Place in lifts not exceeding 8 inches before compaction.
 - 2) Water jetting is not allowed in backfilling operation.
 - 3) Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater unless pipe manufacturer requires more stringent installation.
 - C. Flowable Fill.
 - 1) Provide and place controlled low strength material per APWA Section 31 05 15 if allowed by pipe manufacturer.
 - 2) Prevent pipe flotation by installing in lifts and providing pipe restraints as required by pipe manufacturer.
 - 3) Reset pipe to line and grade if pipe "floats" out of position.
2. **PIPE ZONE WIDTH:** Provide width recommended by pipe manufacturer. Width of pipe zone is measured at the pipe spring line and includes any necessary sheathing. In trench box applications, follow manufacturer's recommendations.
3. **PIPE LOCATION:** Install pipe in center of trench or no closer than 6 inches from wall of pipe to wall of trench.
4. **PEA GRAVEL:** Pea gravel is not allowed in any part of the pipe zone.
5. **FOUNDATION STABILIZATION:** Use sewer rock of APWA Section 31 05 13. Installation of stabilization-separation geotextile per APWA Section 31 05 19 will be required to separate backfill material and native subgrade materials if sewer rock cannot provide a working surface or to prevent soils migration.



INSTALLATION

CONCRETE PIPE: FOLLOW ASTM C 1479

"STANDARD PRACTICE FOR INSTALLATION OF PRECAST CONCRETE SEWER, STORM DRAIN, AND CULVERT PIPE USING STANDARD INSTALLATIONS.

PVC AND HDPE PIPE: FOLLOW ASTM D 2321

"STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY-FLOW APPLICATIONS"

CORRUGATED METAL PIPE: FOLLOW ASTM A 798

"STANDARD PRACTICE FOR INSTALLING FACOTRY-MADE CORRUGATED STEEL PIPE FOR SEWERS AND OTHER APPLICATIONS.

VITRIFIED CLAY PIPE: FOLLOW ASTM C 12.

"STANDARD RECOMMENDED PRACTICE FOR INSTALLING VITRIFIED CLAY PIPE LINES.

PART 4

SANITARY SEWER

Abbreviations and Symbols

Plan 401	Abbreviations and symbols for sewer.....	185
----------	--	-----

Manholes and Hardware

402	30" Frame and cover	187
411	Sanitary sewer manhole	189
412	Invert cover	191
413	Cover collar for sanitary sewer manhole	193

Piping

431	Sewer lateral connection	195
432	Sewer lateral relocation	197
433	Pipe drop	199

Liquid Separation Systems

441	Grease trap.....	201
-----	------------------	-----

Trenching

See Trenching requirements under Section 3

Abbreviations and symbols for sewer

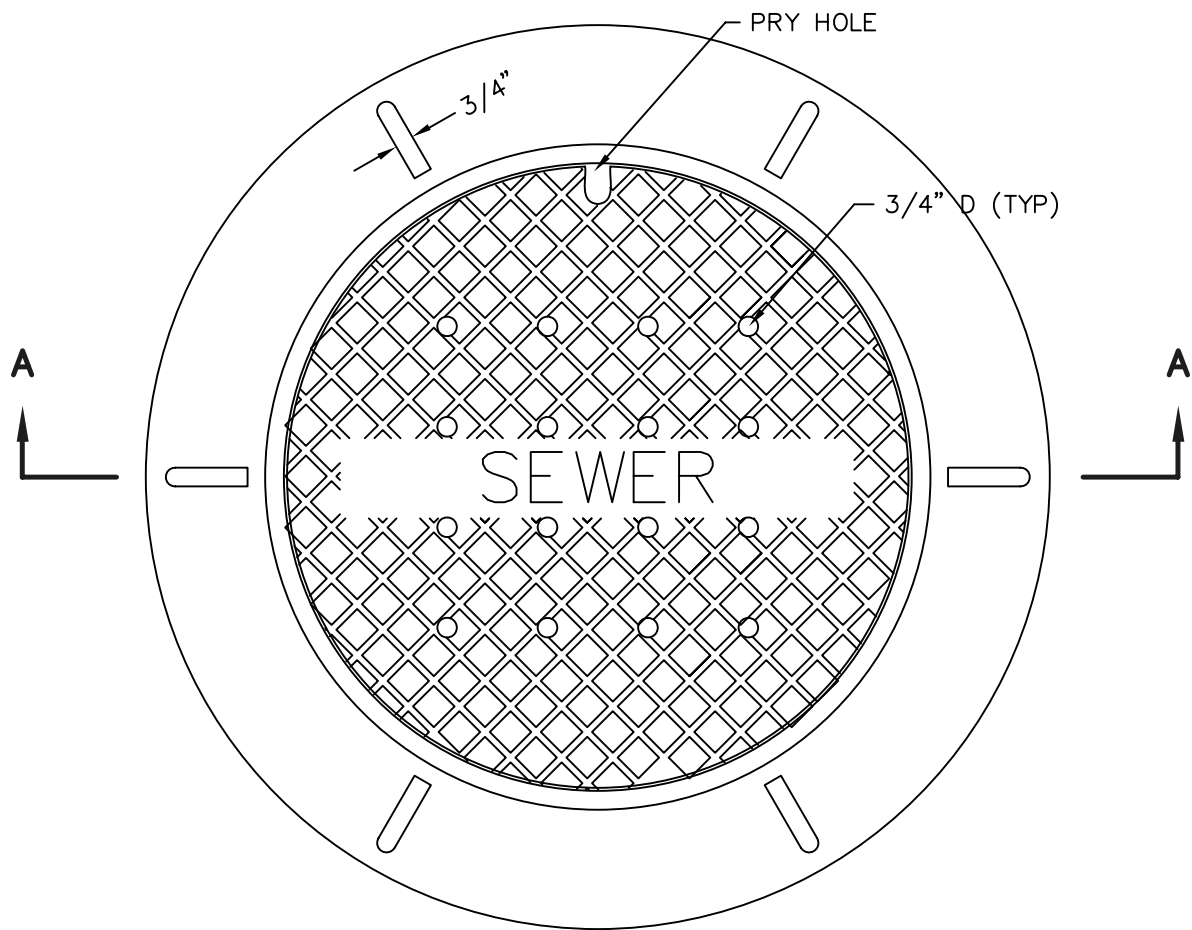
1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.
2. LETTERING STYLE: Capital letters preferred.
3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.
4. NEW IMPROVEMENTS: Shown in solid continuous line.

SYMBOLS	DEFINITIONS
	CENTER LINE
	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
	FENCE
	CONTOUR LINE
	CONTOUR ELEVATION
	BANK SLOPES
	STORM DRAIN LINE
	WATER LINE
	GAS LINE
	TELEPHONE CABLE
	ELECTRIC CABLE
	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
	WATER METER
	MANHOLE
	CATCH BASIN
	CLEAN OUT BOX
	POLE & ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

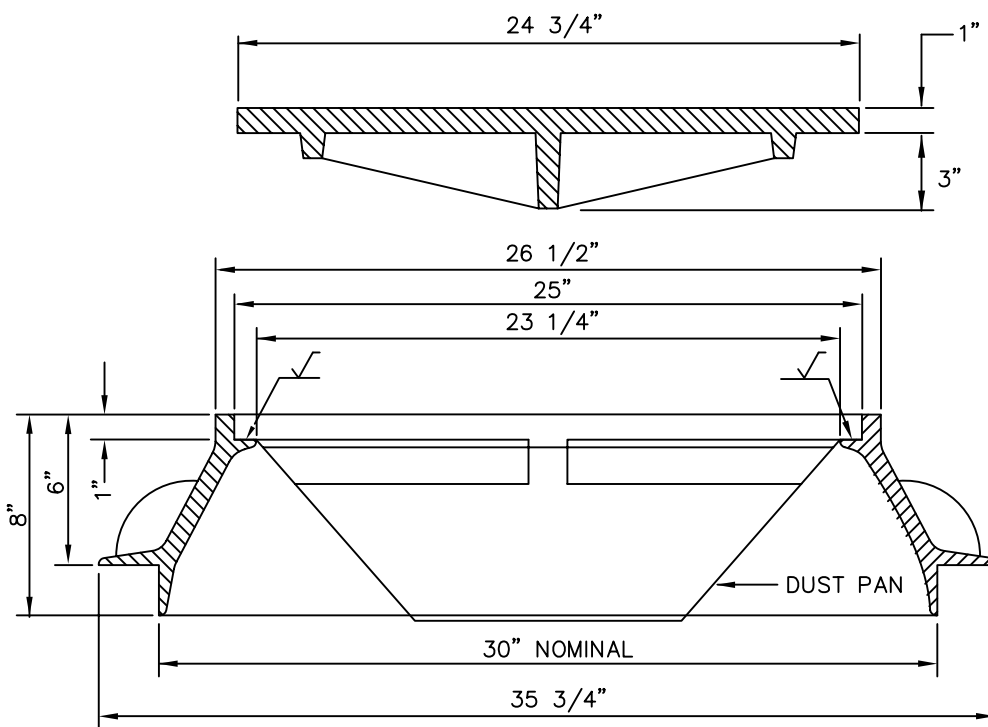
SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
	BENCH MARK
	SIGN
	POWER POLE
	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.
<u>PROFILE</u>	
	GROUND PROFILE
	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUNDWATER ELEVATION

30" Frame and cover

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the words "SEWER" on the cover flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. LOCKING: Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.
7. MANHOLE STRUCTURE: See Plan No. 411.



PLAN



SECTION A-A

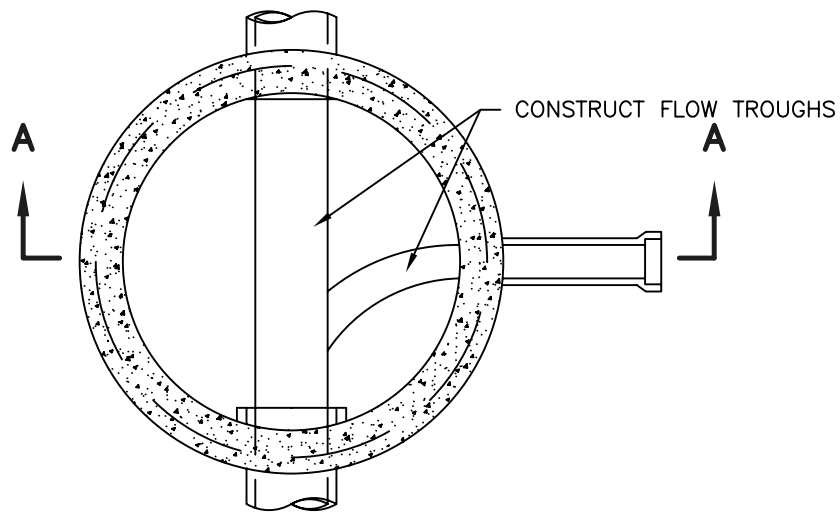
30" Frame and cover

Plan No.

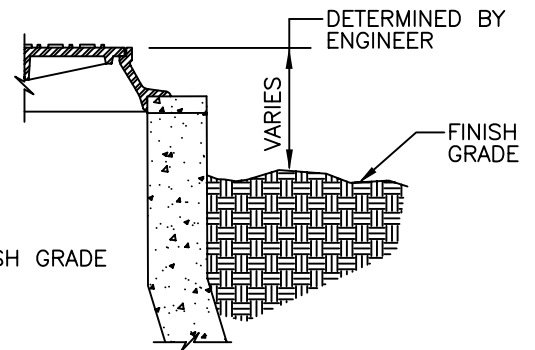
402

Sanitary sewer manhole

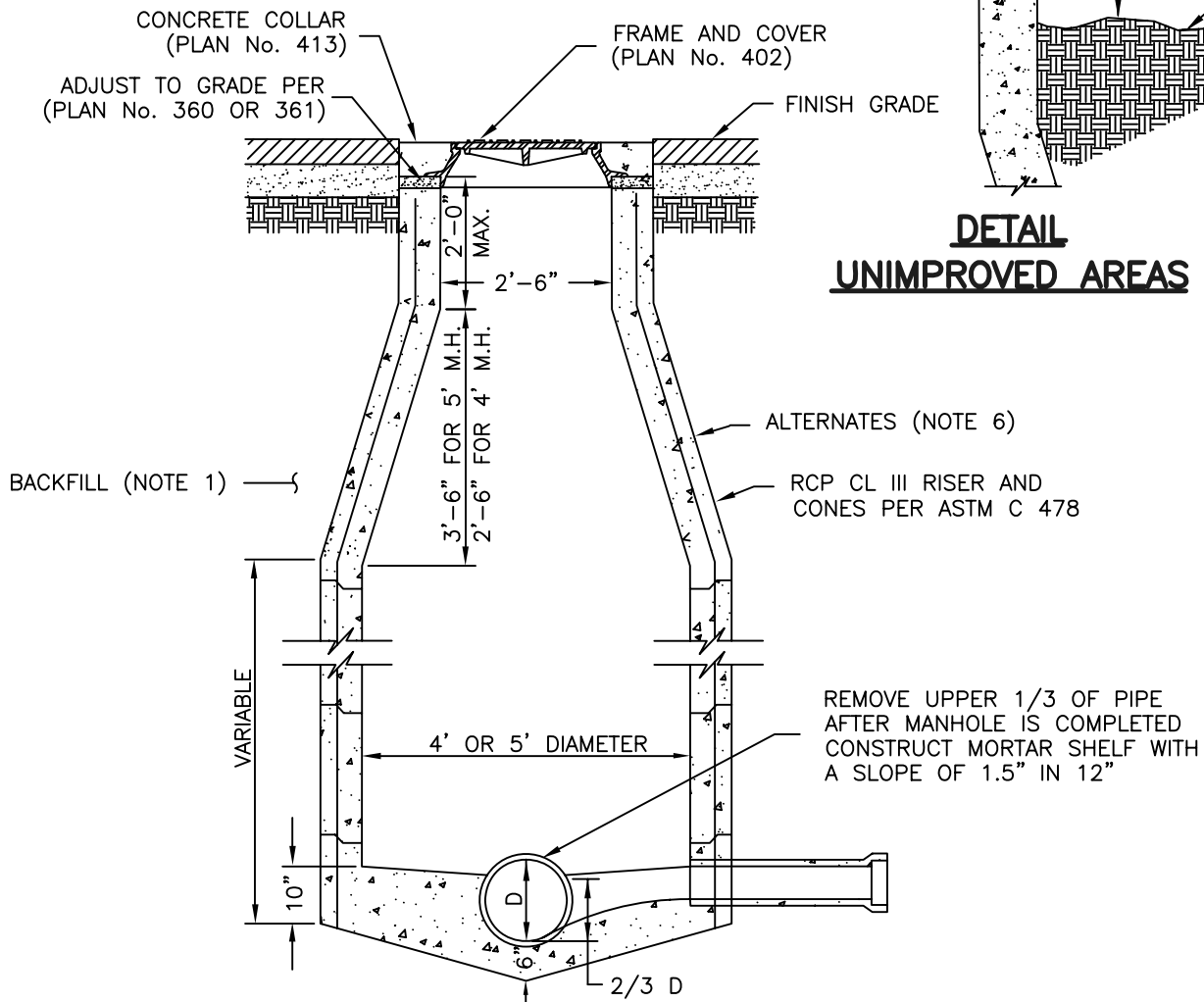
1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
3. MANHOLE SIZE: For sewers under 12" diameter, build a 4 feet diameter manhole. For sewers 12" and larger, and when 3 or more pipes intersect in the manhole, build a 5 feet diameter manhole.
4. GROUT: Grout around all pipe openings with 2:1 sand/cement mortar.
5. JOINTS: Place flexible gasket-type sealant in all manhole joints.
6. ALTERNATES:
 - A. Precast reinforced concrete walls 5 inches thick (to be acceptable to the ENGINEER.
 - B. Cast in-place concrete to be 8 inches thick minimum.
7. INVERT COVERS: Place invert covers over the top of pipe in all manholes during construction. See Plan No. 412.
8. WATER STOPS: Install rubber water-stop on all plastic pipes when connecting plastic pipes to manholes. Hold water-stop in place with stainless steel bands.



PLAN



**DETAIL
UNIMPROVED AREAS**



SECTION A-A

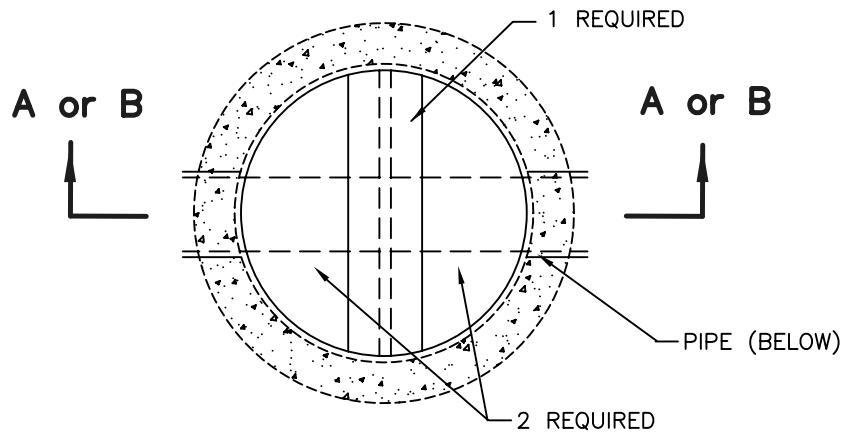
Sanitary sewer manhole

Plan No.

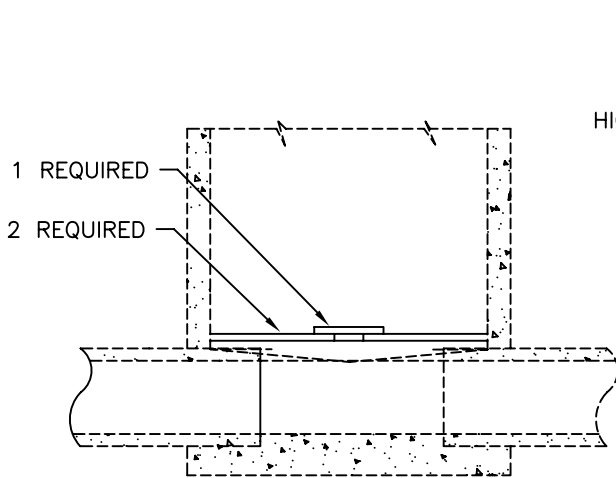
411

Invert cover

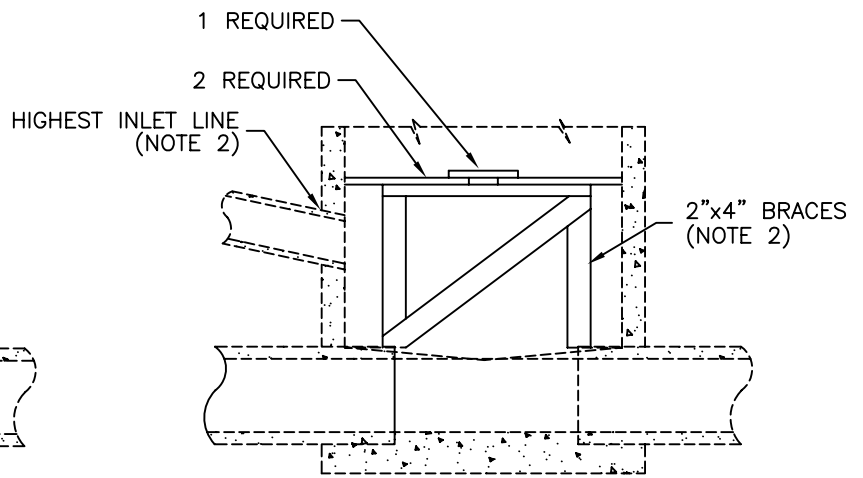
1. MATERIAL: 5/8" thick exterior grade plywood.
2. INSTALLATION:
 - A. Install invert cover over manhole shelf. With pipe entering above the mainline pipe, install 2' x 4" bracing to raise invert cover above top of the highest pipe inlet. If necessary, install solid bracing attached to wall.
 - B. If manhole is not round, cut invert cover to match shape.
 - C. Install so no debris can enter the pipe.
 - D. Do not interfere with flow in pipeline.
 - E. Nail all three pieces of each invert cover securely together.



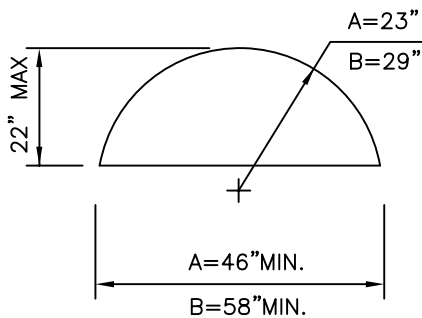
PLAN
(INVERT COVER IN PLACE)



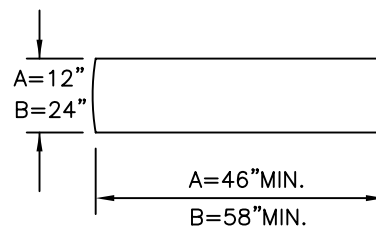
SECTION A-A
OPTION 1



SECTION B-B
OPTION 2



2 REQUIRED



1 REQUIRED

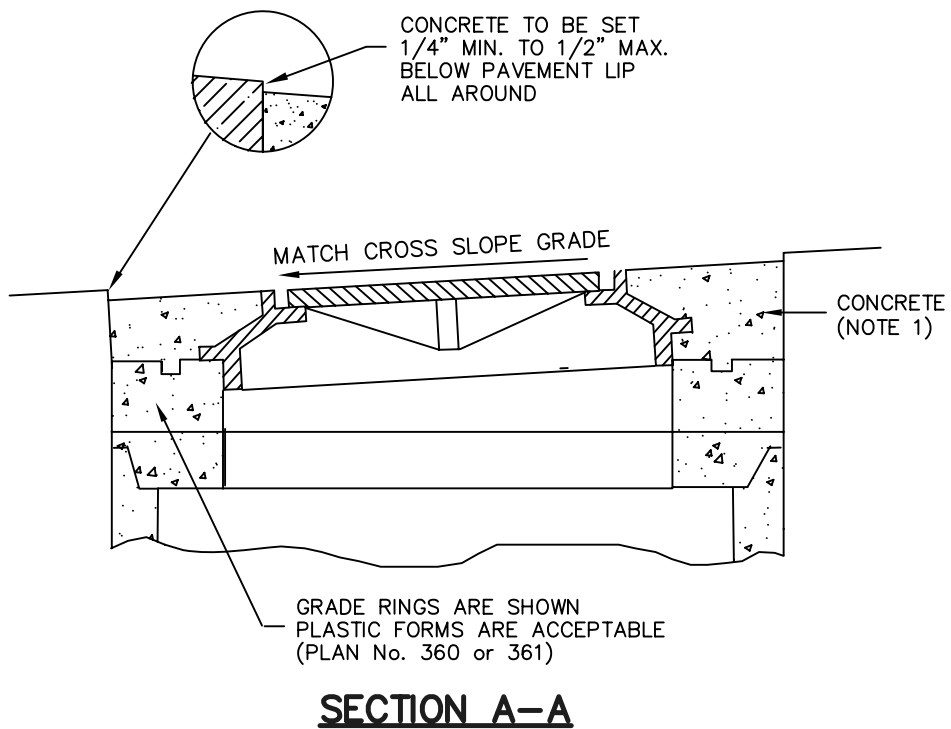
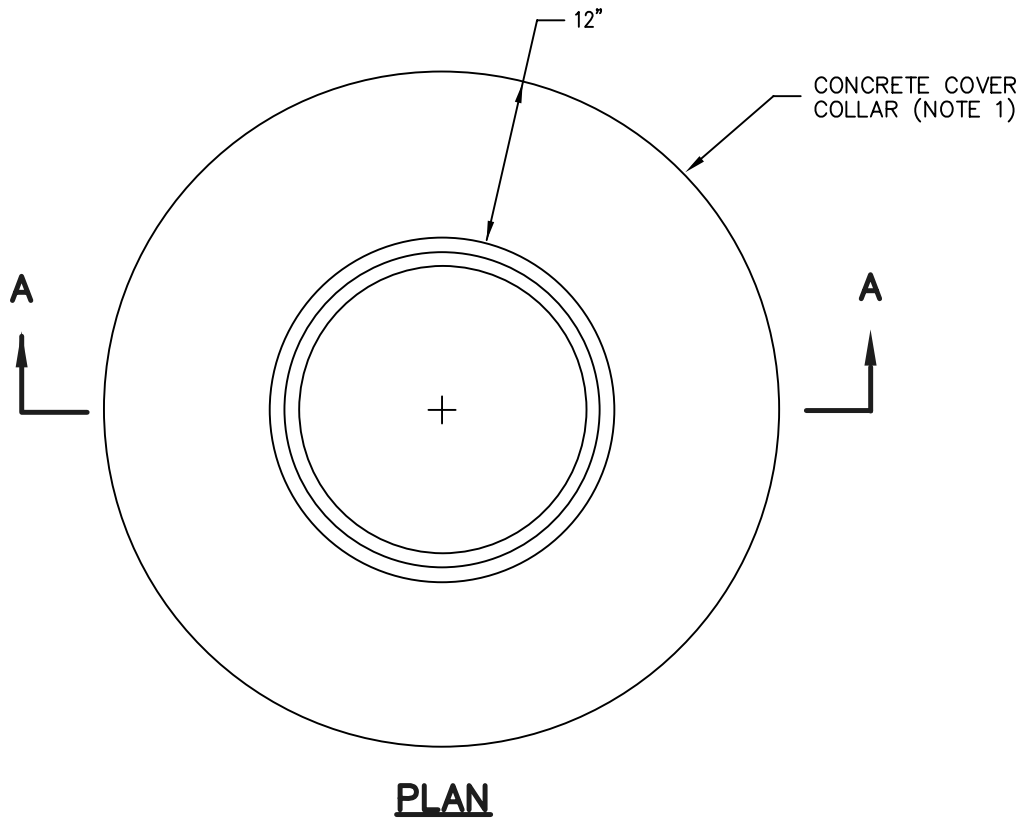
USE DIMENSION A FOR 48" MANHOLES
USE DIMENSION B FOR 60" MANHOLES

Invert cover

Plan No.
412

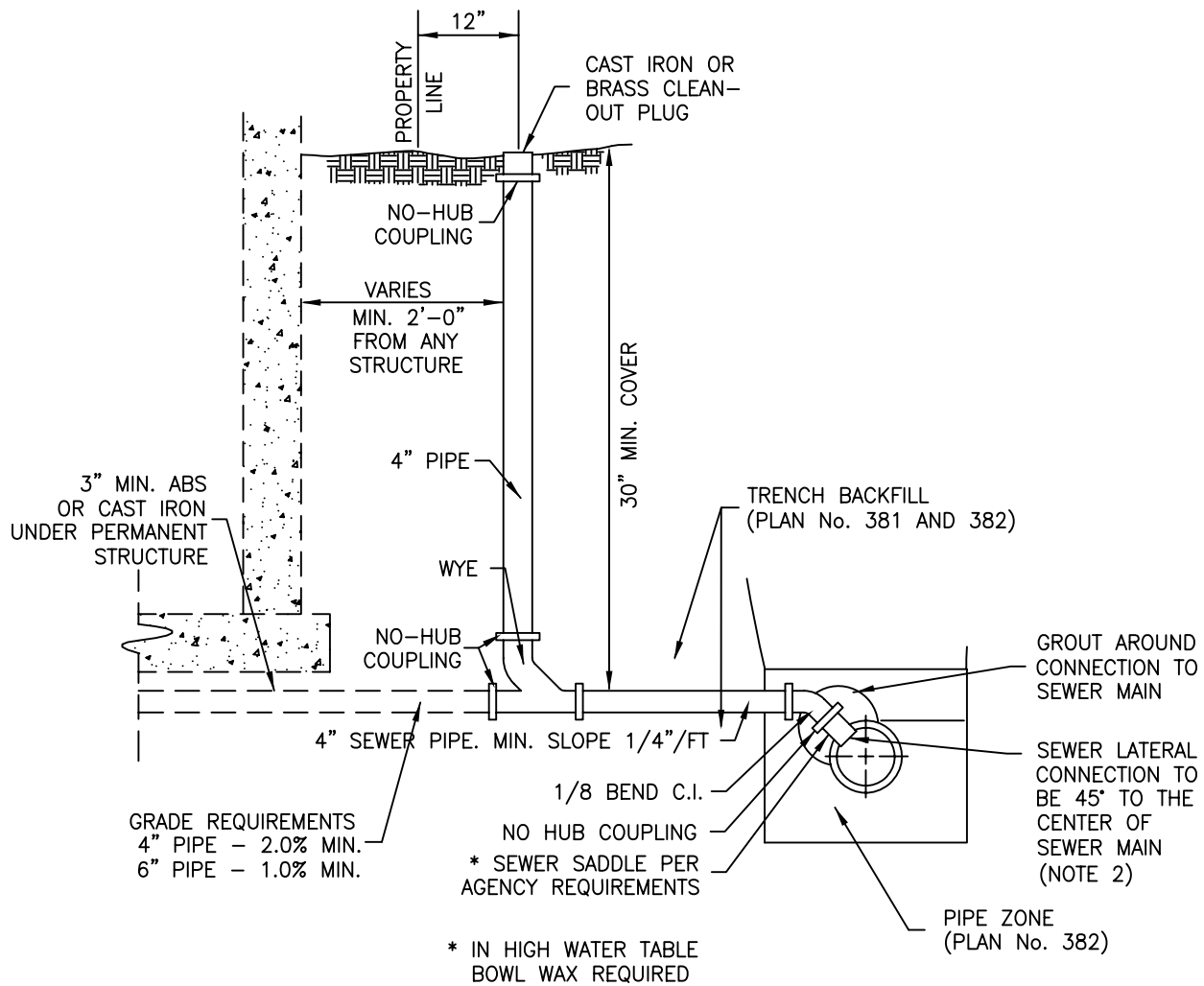
Cover collar for sanitary sewer manhole

1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
2. JOINTS: Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.



Sewer lateral connection

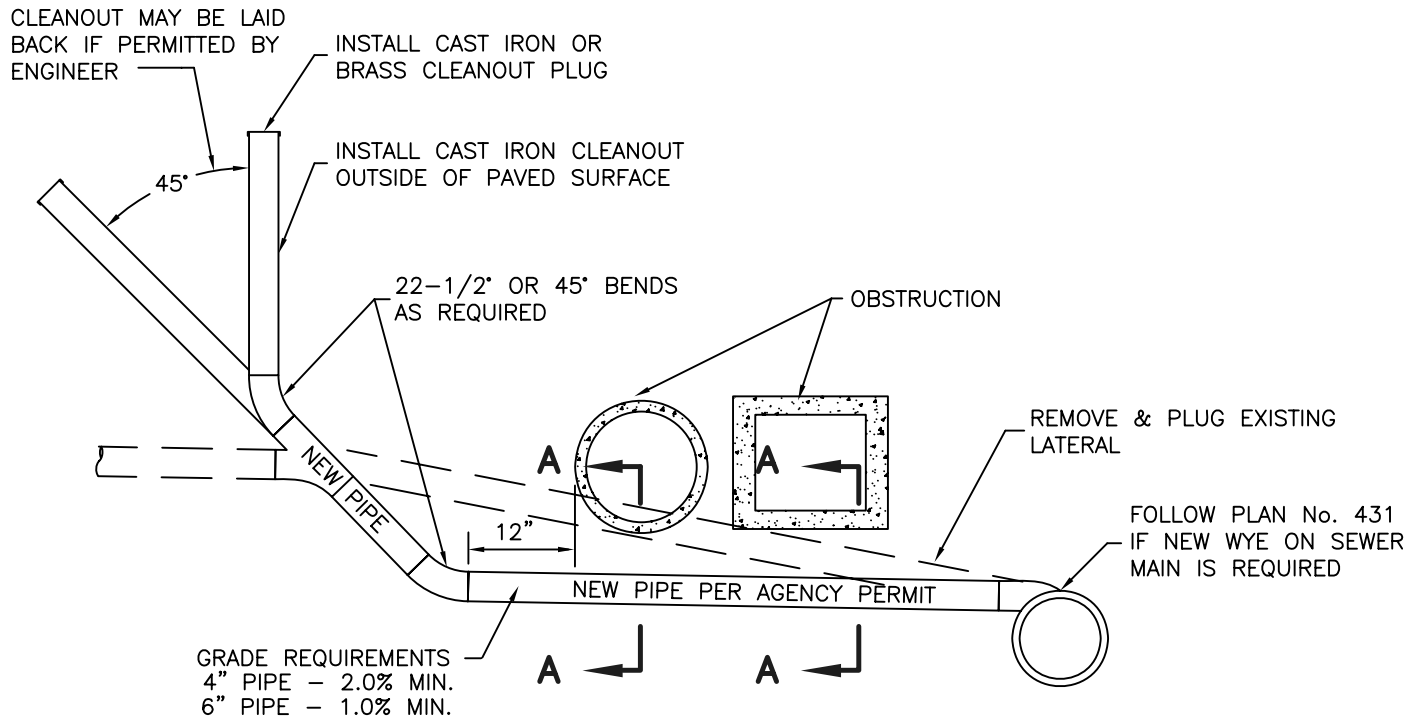
1. INSPECTION:
 - A. Prior to installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
 - B. Prior to backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.
2. INSTALLATION:
 - A. Provide agency approved wye or tee with appropriate donut. Verify whether CONTRACTOR or agency is to install the wye.
 - B. Tape wrap pipe as required by soil conditions.
 - C. Remove core plug from sewer main. Do not break into sewer main to make connection.
 - D. Stainless steel straps required.
3. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



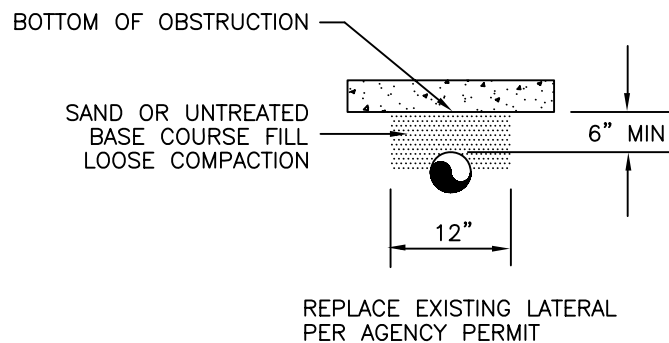
SECTION

Sewer lateral relocation

1. INSPECTION:
 - A. Prior to installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
 - B. Prior to backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.
2. INSTALLATION:
 - A. Provide agency approved wye or tee with appropriate donut. Verify whether CONTRACTOR or agency is to install the wye.
 - B. Tape wrap pipe as required by soil conditions.
 - C. Do not install couplings under the obstruction.
 - D. Under the obstruction, loosely compact granular material or sand. Flowable fill not allowed.
3. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



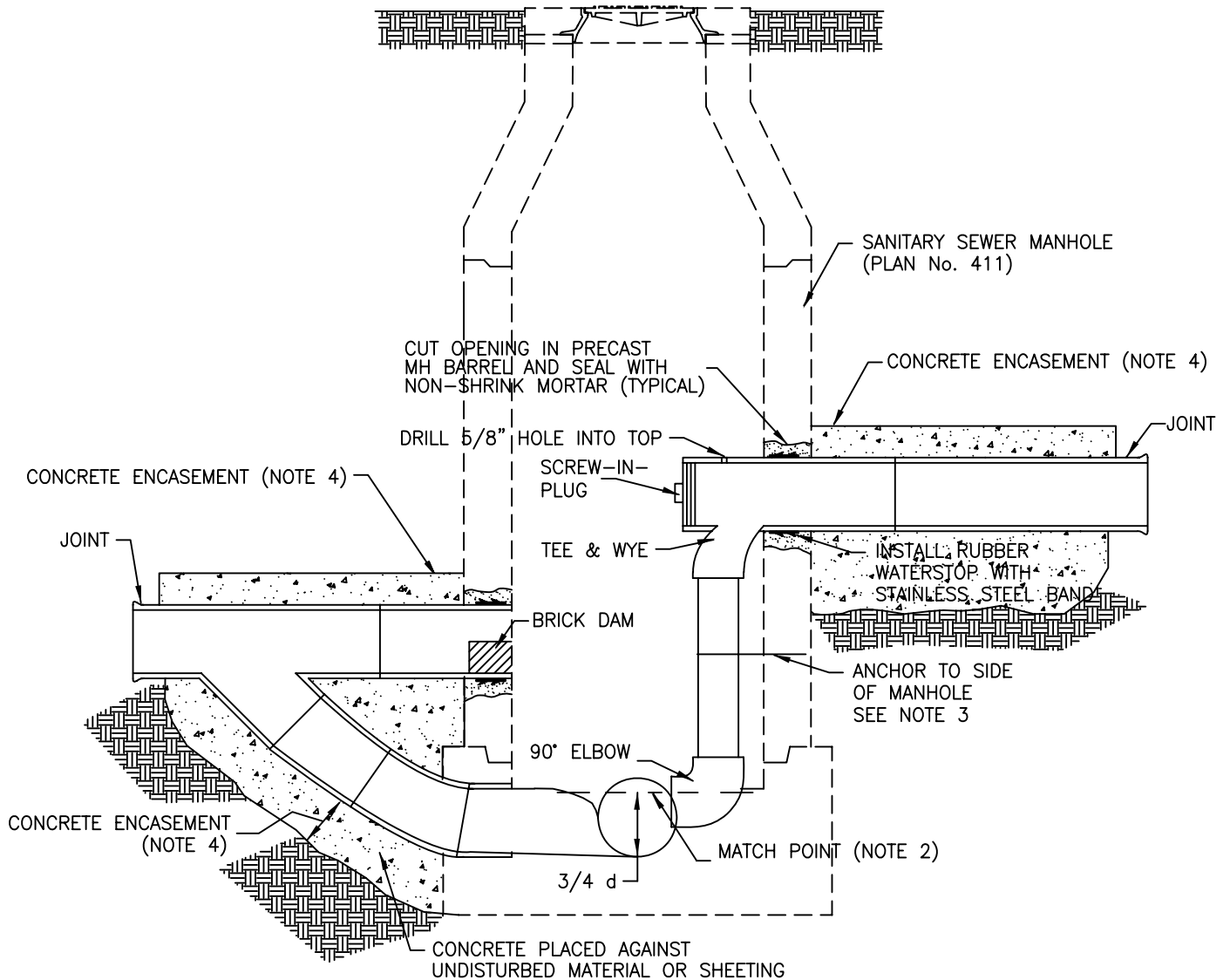
SECTION



SECTION A-A

Pipe drop

1. PIPE DROPS: Only one drop pipe is allowed inside the manhole. Size the drop pipe to be same diameter as sewer pipe discharging into manhole.
2. MATCH POINT: Match the 3/4 diameter points of the pipes.
3. ANCHOR: If the drop is more than 18 inches, anchor the riser to the wall every 12 inches. Use stainless steel anchors which are acceptable to ENGINEER.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Extend encasement to first joint beyond excavation for drop connection.



SECTION

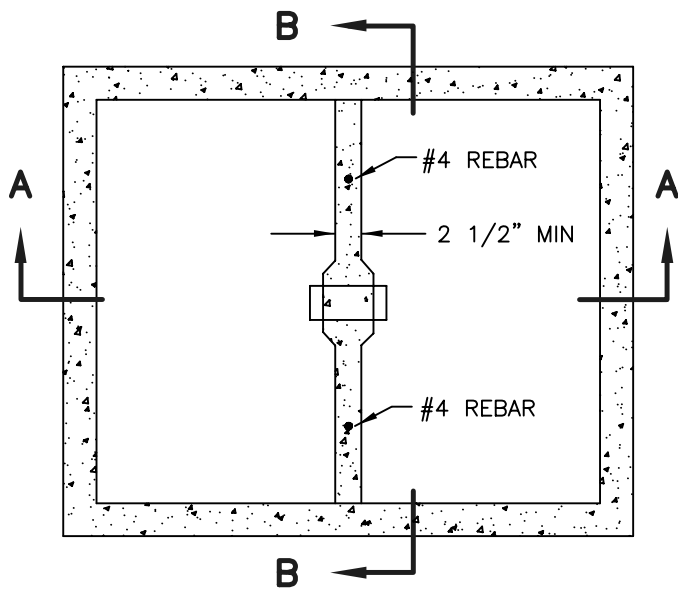
Pipe drop

Plan No.

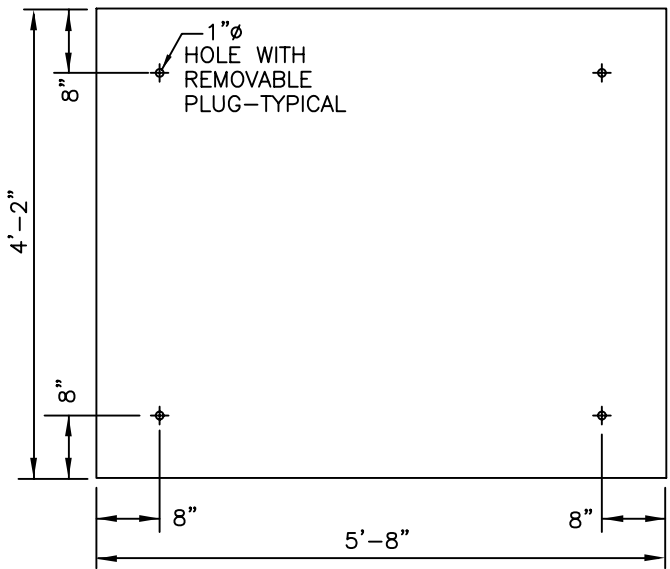
433

Grease trap

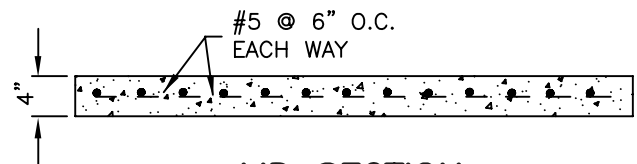
1. INSPECTION: Prior to backfilling around concrete box, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. WALL PENETRATIONS: Fill annular space around piping with waterproof sealer.



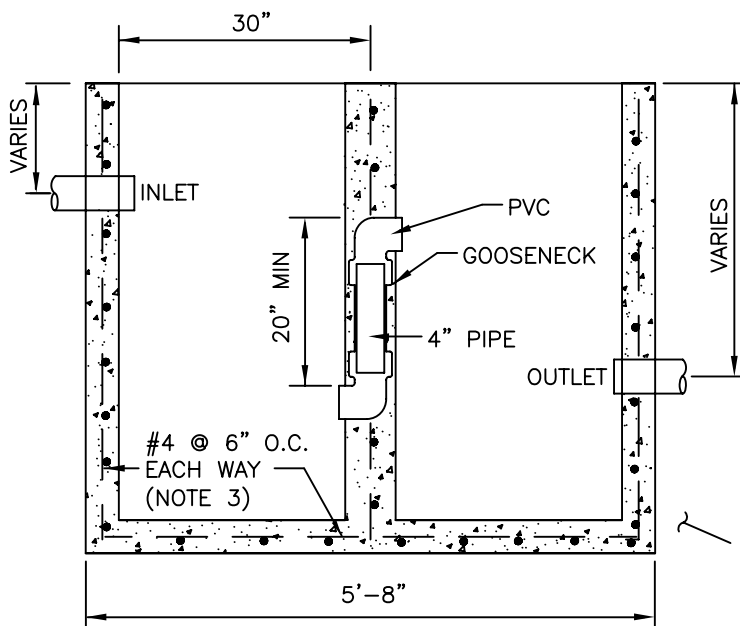
BOX PLAN



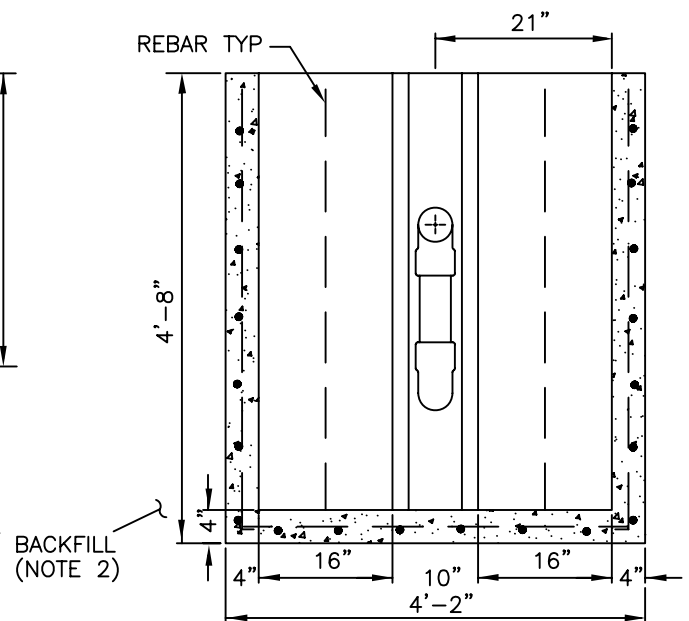
LID PLAN



LID SECTION



SECTION A-A



SECTION B-B

Grease trap

Plan No.

441

PART 5

WATER SYSTEMS

Abbreviations and Symbols

Plan 501	Abbreviations and symbols for water	205
----------	---	-----

Concrete Boxes and Hardware

502	27" Frame and cover	207
503	38" Frame and cover	209
505	Concrete boxes.....	211

Fire Hydrants

511	Fire hydrant with valve	213
-----	-------------------------------	-----

Meters

521	3/4" and 1" meter	215
522	1 1/2" and 2" meter	217
523	3" & 4" Compound meter with 2" bypass	219
525	6" Compound meter with 2" bypass	221
527	8" Compound meter with 2" bypass	223
529	10" Turbo meter with 6" turbo meter and 2" bypass	225

Monitoring Systems

535	Electrolysis monitoring station details.....	227
-----	--	-----

Piping

541	Water service line	229
542	Waterline loop.....	231
543	Fire hydrant relocation	233
551	3/4" and 1" Service taps	235
552	1 1/2" and 2" Service taps	237

Trust Blocks

561	Direct bearing thrust block	239
562	Tie-down thrust restraints	241

Trenching

See Trenching requirements under Section 3

Valves

571	2" Washout valve	243
572	Detector check valve with 3/4" bypass meter	245
573	6" Pressure reducing valve with 2" bypass	247
574	Cover collar for water valve boxes.....	249
575	Air release assembly	251

General

593	Pressurized irrigation water and potable water interface	253
-----	--	-----

Abbreviations and symbols for water

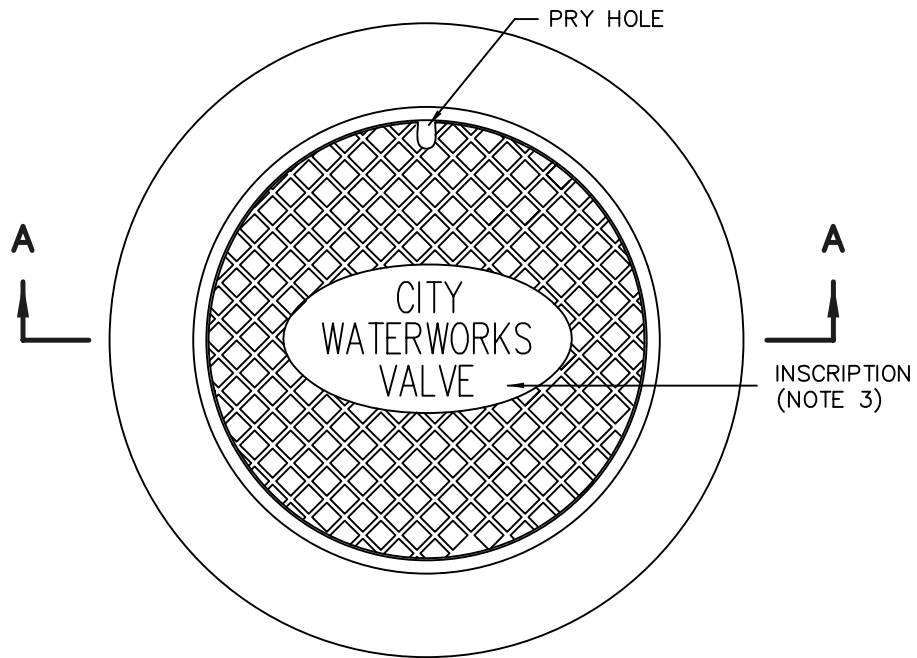
1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.
2. LETTERING STYLE: Capital letters preferred.
3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.
4. NEW IMPROVEMENTS: Shown in solid continuous line.

SYMBOLS	DEFINITIONS
	CENTER LINE
	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
	FENCE
	CONTOUR LINE
	CONTOUR ELEVATION
	BANK SLOPES
	STORM DRAIN LINE
	WATER LINE
	GAS LINE
	TELEPHONE CABLE
	ELECTRIC CABLE
	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
	WATER METER
	MANHOLE
	CATCH BASIN
	CLEAN OUT BOX
	POLE & ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

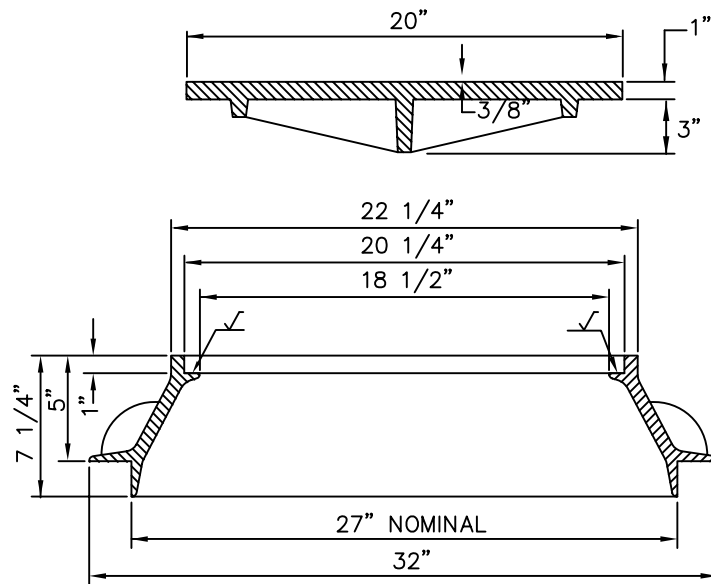
SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
	BENCH MARK
	SIGN
	POWER POLE
	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.
	PROFILE
	GROUND PROFILE
	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUNDWATER ELEVATION

27" Frame and cover

1. CASTINGS: Grey iron class 30 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the name of the agency or it's acronym as the first line. Cast the word `WATERWORKS' as the second line. Cast the word `VALVE' (or applicable word) as the third line. Cast all letters on the cover in upper case flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. MANHOLE STRUCTURE: See Plan No. 505.



PLAN



SECTION A-A

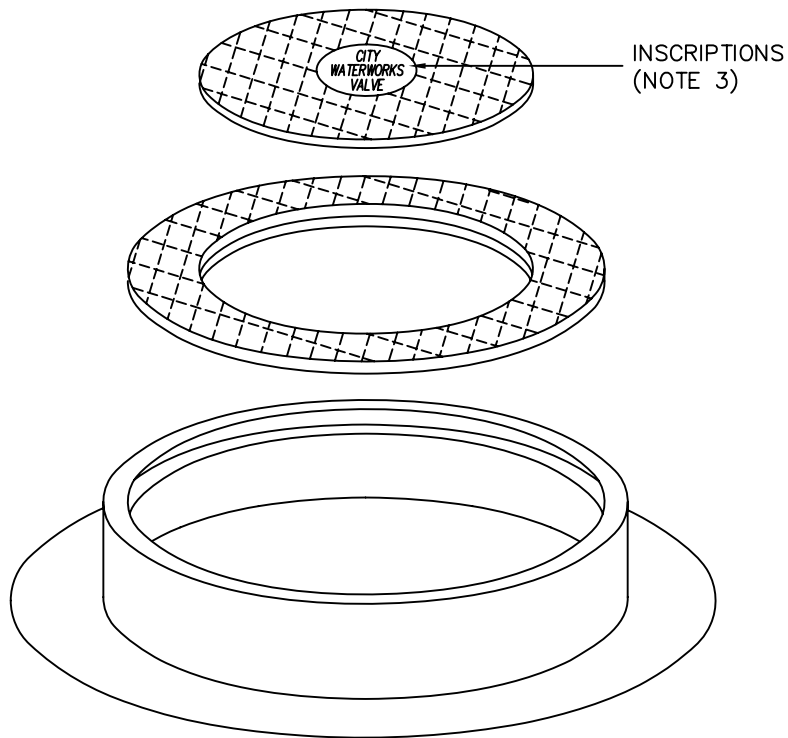
27" Frame and cover

Plan No.

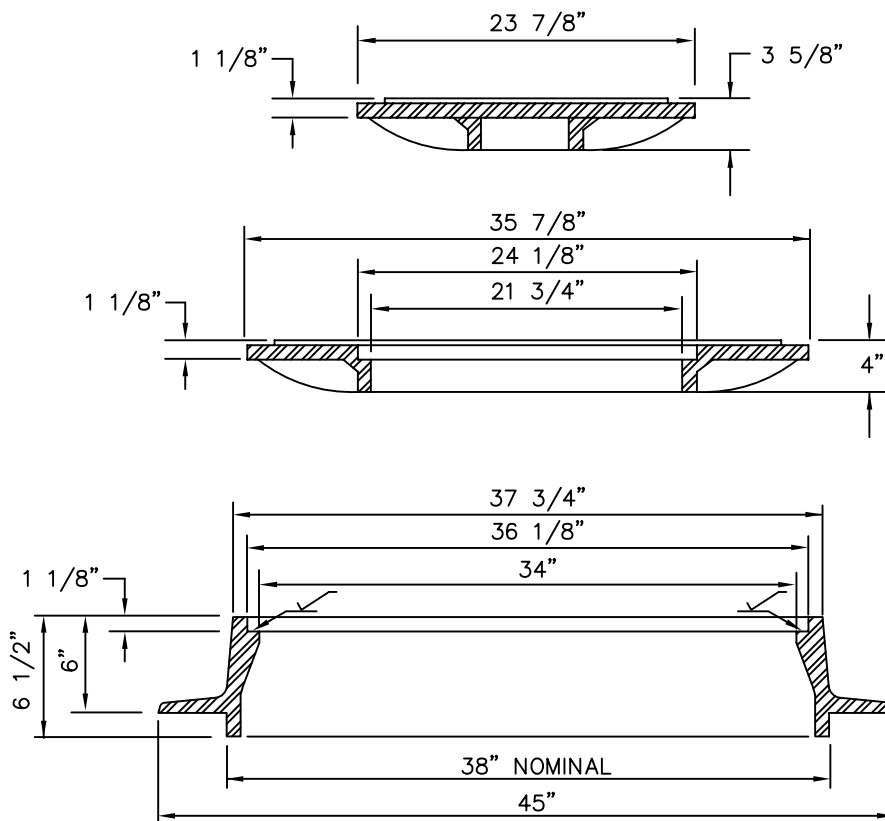
502

38" Frame and double cover

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.
2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.
3. INSCRIPTIONS: Cast the name of the agency or it's acronym as the first line. Cast the word `WATERWORKS' as the second line. Cast the word `VALVE' (or applicable word) as the third line. Cast all letters on the cover in upper case flush with the surface finish.
4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
5. FIT: ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.
6. MANHOLE STRUCTURE: See Plan No. 505.



OBLIQUE



SECTION

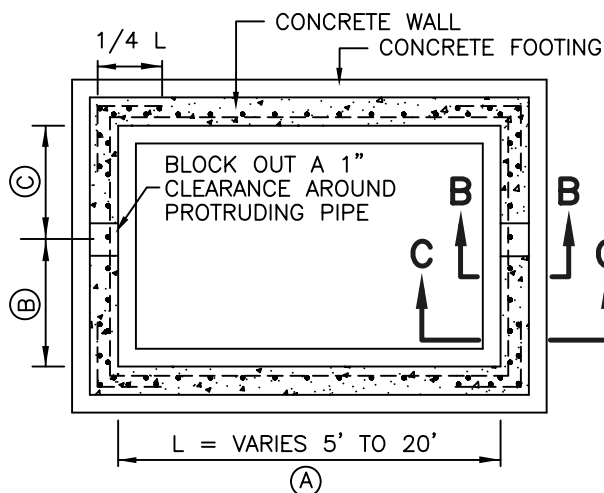
38" Frame and double cover

Plan No.

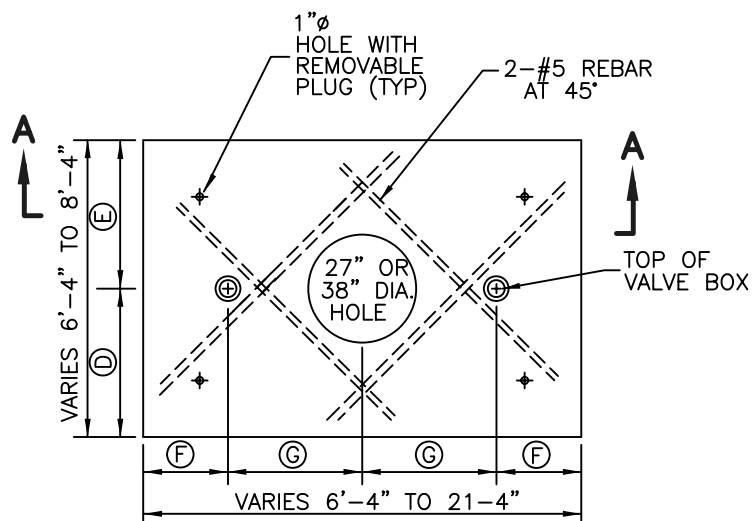
503

Concrete boxes

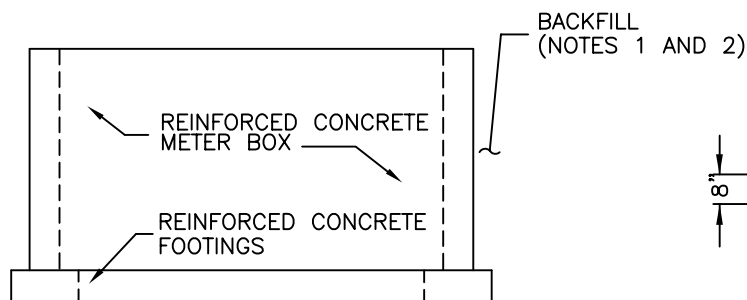
1. INSPECTION: Prior to backfilling around concrete box, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. WALL PENETRATIONS: Fill annular space around piping with waterproof sealer.
6. COVER PLACEMENT: Place frame and cover directly over valve or meter location.



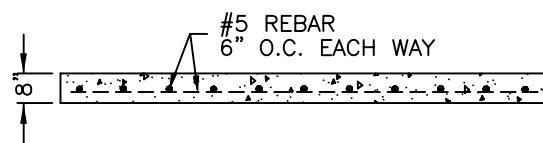
BOX PLAN



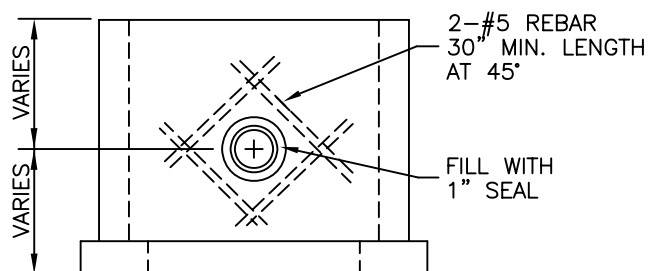
LID PLAN



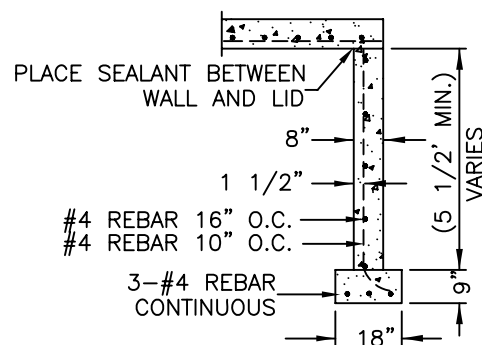
FRONT ELEVATION



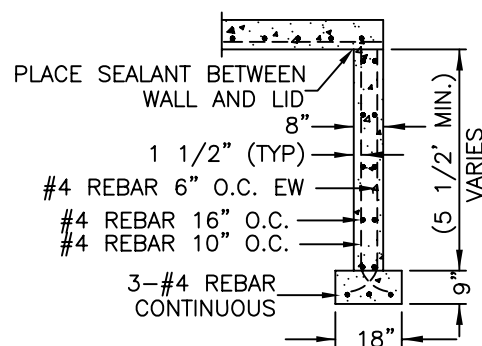
SECTION A-A



SIDE ELEVATION



SECTION B-B

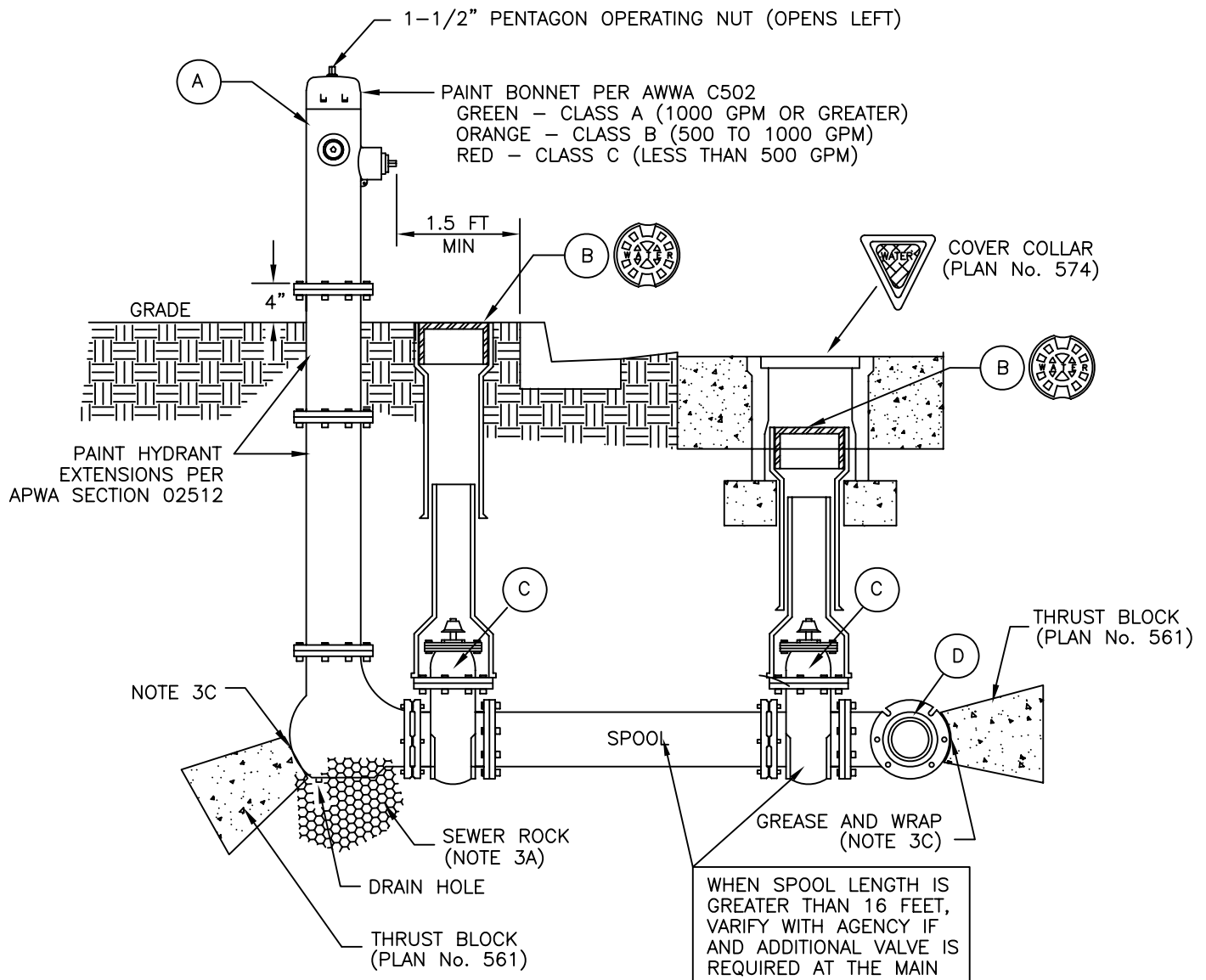


SECTION C-C

TABLE OF DIMENSIONS					
No.	METER SIZES				
	10"	8"	6"	3" & 4"	1 1/2" & 2"
(A)	20'-0"	11'-0"	11'-0"	9'-0"	5'-0"
(B)	3'-10"	3'-5"	3'-5"	3'-0"	2'-6"
(C)	6'-2"	3'-5"	3'-5"	2'-0"	2'-6"
(D)	4'-6"	4'-1"	4'-1"	3'-8"	2'-6"
(E)	6'-10"	4'-1"	4'-1"	2'-8"	2'-6"
(F)	4'-8"	3'-5 3/4"	3'-10 1/4"	3'-5 1/2"	CENTER
(G)	5'-4"	2'-8 1/4"	2'-3 3/4"	1'-8 1/2"	

Fire hydrant with valve

1. INSPECTION: Prior to backfilling, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. HYDRANT: Dry barrel per AWWA C502. Additional water system requirements are specified in APWA Section 33 11 00.
 - A. Provide at least 1 cubic yard of APWA Section 31 05 13 sewer rock around drain hole at base of hydrant. Wrap plastic over sewer rock to prevent silting.
 - B. Paint fire hydrant to agency's fire hydrant paint code.
 - C. Apply non-oxide grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.
 - D. Notify fire department as soon as hydrant is placed in service.
4. THRUST BLOCKS:
 - A. Prior to pouring concrete, wrap pipe system with 8 mil thick plastic sheet to prevent bonding of concrete to pipe system.
 - B. Not required for flange or welded pipe systems.



LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		FIRE HYDRANT	AWWA C502
(B)		VALVE BOX WITH LID	2 PIECE CAST IRON
(C)		GATE VALVE WITH 2"x2" NUT	AWWA C509
(D)		TEE WITH 125 # FLANGE	AWWA C110

* FURNISHED BY UTILITY AGENCY

SECTION

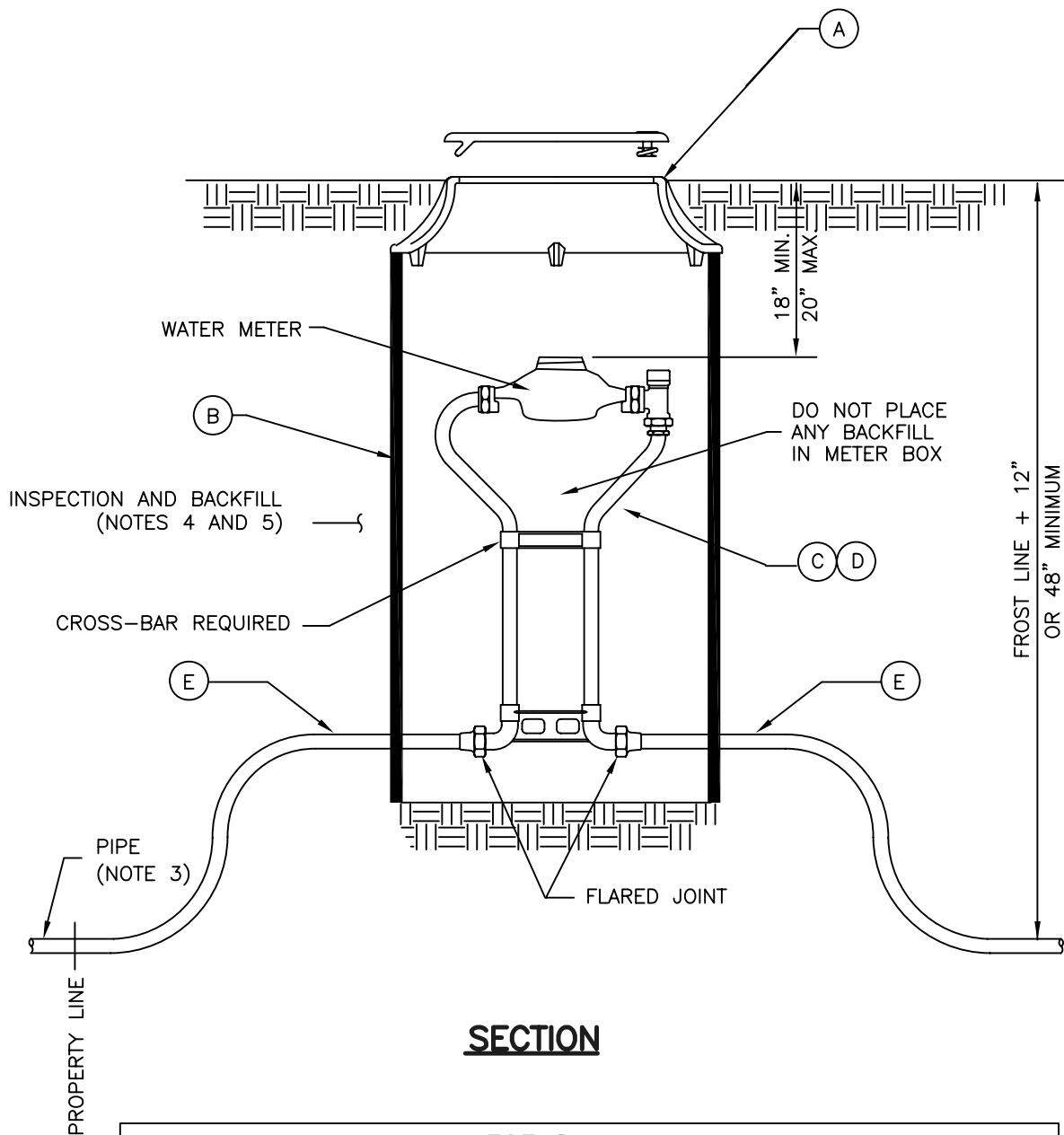
Fire hydrant with valve

Plan No.

511

3/4" and 1" meter

1. METER PLACEMENT:
 - A. In new construction, install meter at center of lot or per agency requirements.
 - B. All meters are to be installed in the park strip or within 7 feet of the property line (street side).
 - C. Do not install meters under driveway approaches, sidewalks, or curb and gutter.
2. METER BOX:
 - A. In landscaped areas and driveway approaches, set box so grade of the frame and cover matches the grade of the surrounding surface.
 - B. In street surfaces or other vehicular traffic areas, provide the same type of meter box as required for 1 1/2" and 2" service meters. See Plan 522.
3. PIPE: Coordinate with utility agency or property owner for type of pipe to be used outside of right-of-way.
4. INSPECTION: Prior to backfilling around meter box, secure inspection of installation by ENGINEER.
5. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
6. CASTING: Grey iron class 35 minimum per ASTM A 48.



LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		FRAME AND COVER	CAST IRON COVER (grass) DUCTILE IRON COVER (driveway)
(B)		METER BOX (18" TO 21" DIAMETER) (30" TO 36" DEEP)	CORRUGATED PE, PVC, CMP OR MATERIAL ACCEPTABLE TO AGENCY
(C)		3/4" METER YOKE	OPTIONAL BACKFLOW PROTECTION PER AGENCY REQUIREMENTS
(D)		1" METER YOKE	OPTIONAL BACKFLOW PROTECTION PER AGENCY REQUIREMENTS
(E)		COPPER PIPE	TYPE K (SOFT)

* FURNISHED BY UTILITY AGENCY

3/4" and 1" meter

Plan No.

521

1 1/2" and 2" meter

1. METER PLACEMENT:
 - A. In new construction, install meter at center of lot or per agency requirements.
 - B. All meters are to be installed in the park strip or within 7 feet of the property line (street side).
 - C. Do not install meters under driveway approaches, sidewalks, or curb and gutter.
2. PIPE: Install type 'K' copper pipe to property line. Coordinate with utility agency for type of pipe to be used outside of right-of-way.
3. ALTERNATE: Turbine meters are required on all systems used exclusively for irrigation or fire protection. Where domestic use is applicable, use a standard meter.
4. BYPASS VALVE: Lock in off position.
5. BLOCKING: Use clay brick or concrete block.
6. CONCRETE BOX:
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
7. INSPECTION: Prior to backfilling around the meter box, secure inspection of installation by ENGINEER.
8. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

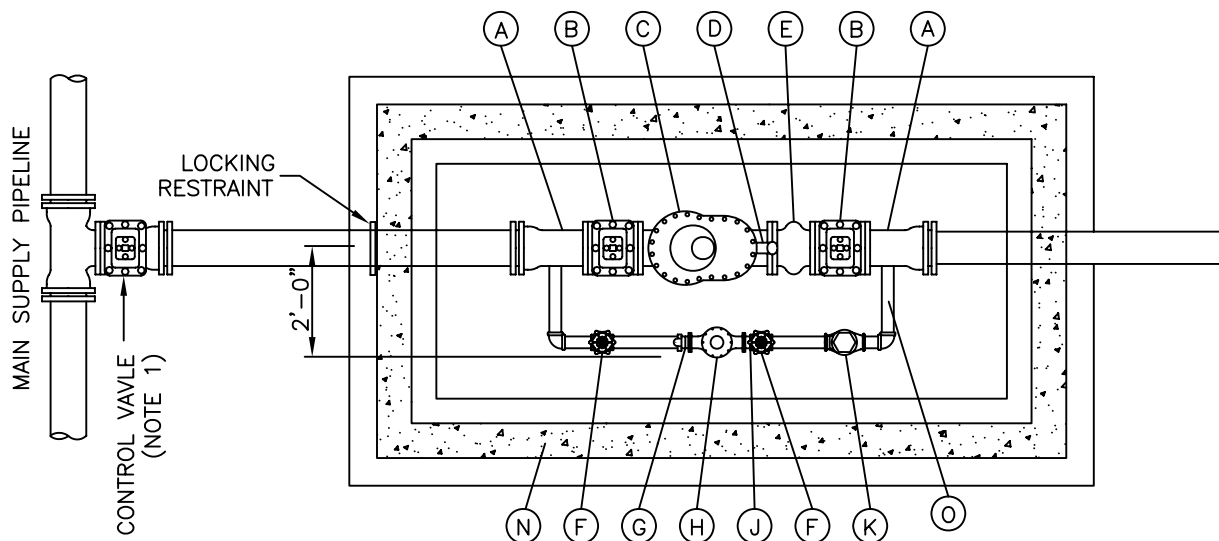


LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		27" FRAME AND COVER	PLAN No. 502
(B)		CONCRETE BOX	PLAN No. 505
(C)		METER BOLTS	5/8" x 2 3/4" BRASS
(D)		1 1/2" CUSTOM SETTER WITH BYPASS	
(E)		2" CUSTOM SETTER WITH BYPASS	

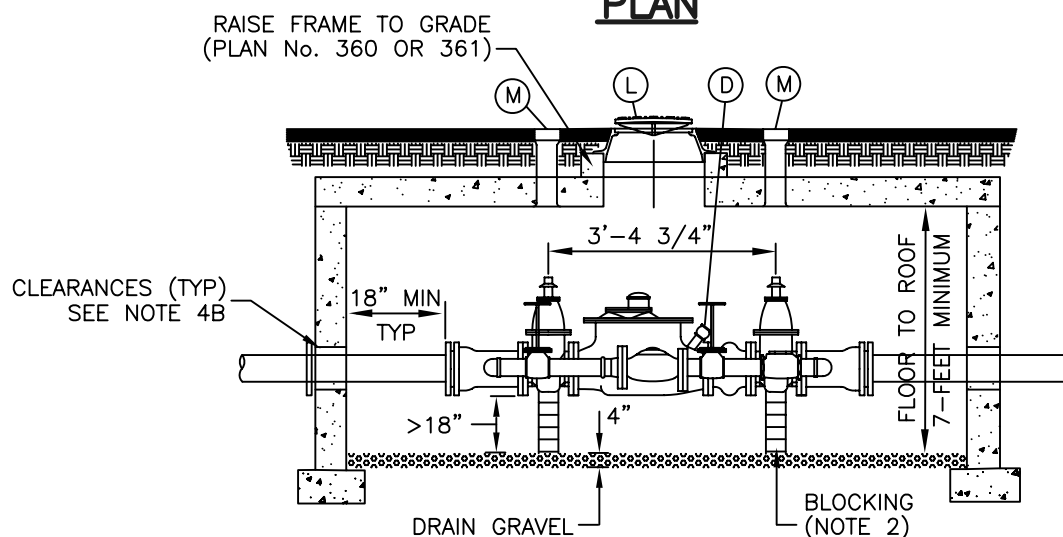
1 1/2" and 2" meter

3" and 4" Compound meter with 2" bypass

1. CONTROL VALVE: Install valve with valve box adjacent to main.
2. BLOCKING: Clay brick or concrete block.
3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
4. CONCRETE BOX: Plan No. 505
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		3" OR 4" FLANGE x M.J. ADAPTER	
(B)		3" OR 4" GATE VALVE WITH 2"x2" OPERATING NUT	
(C)		3" OR 4" COMPOUND METER	
(D)		2" TEST ASSEMBLY	
(E)		3" OR 4" CHECK VALVE	
(F)		2" GATE VALVE	
(G)		2" METER FLANGE	
(H)		2" DISPLACEMENT METER	
(J)		2" MALE METER FLANGE	
(K)		2" CHECK VALVE	
(L)		27" FRAME AND COVER	PLAN No. 502
(M)		TOP SECTION OF VALVE BOX WITH LID	PLAN No. 574
(N)		CONCRETE BOX	PLAN No. 505
(O)		COPPER PIPING	

* FURNISHED BY AGENCY

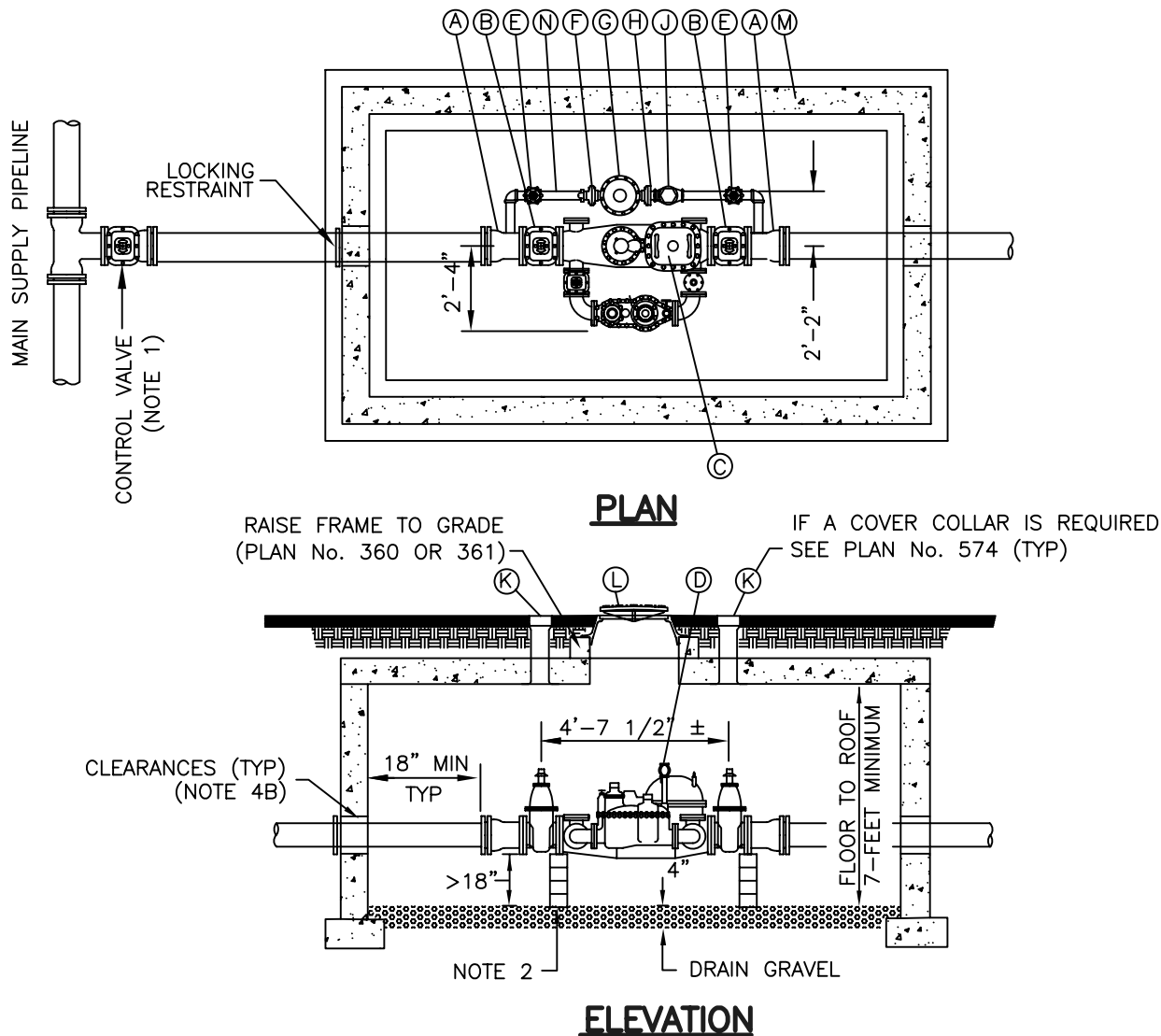
3" and 4" Compound meter with 2" bypass

Plan No.

523

6" Compound meter with 2" bypass

1. CONTROL VALVE: Install valve with valve box adjacent to main.
2. BLOCKING: Clay brick or concrete block.
3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
4. CONCRETE BOX: Plan No. 505.
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.



LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		6" FLANGE x M.J. ADAPTER	
(B)		6" GATE VALVE WITH 2"x2" OPERATING NUT	
(C)		6"x3" METER	
(D)		2" TEST ASSEMBLY	
(E)		2" GATE VALVE	
(F)		2" METER FLANGE	
(G)		2" DISPLACEMENT METER	
(H)		2" MALE METER FLANGE	
(J)		2" CHECK VALVE	
(K)		TOP SECTION OF VALVE BOX WITH LID	PLAN No. 574
(L)		27" FRAME AND COVER	PLAN No. 502
(M)		CONCRETE BOX	PLAN No. 505
(N)		COPPER PIPING	

* FURNISHED BY AGENCY

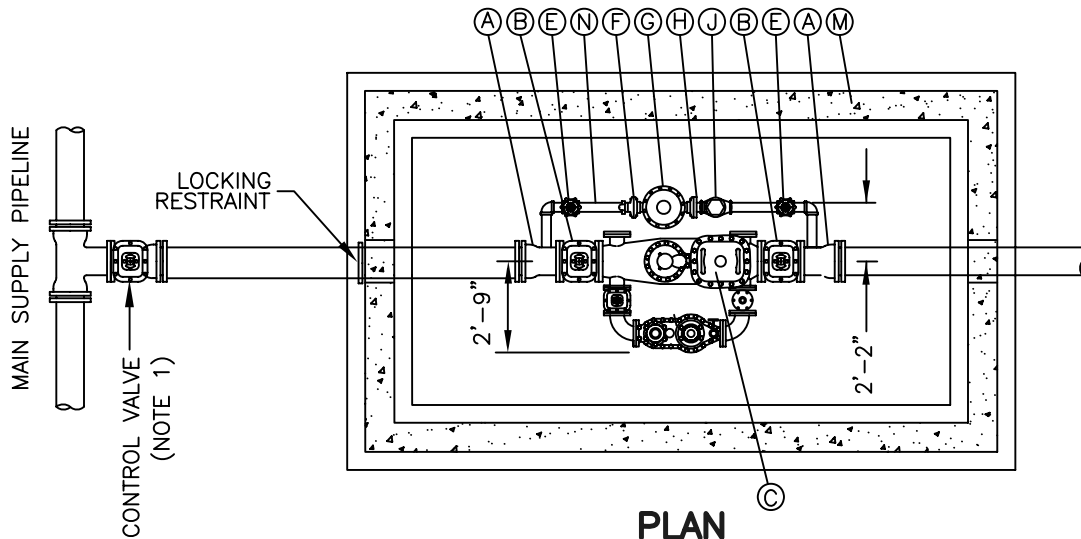
6" Compound meter with 2" bypass

Plan No.

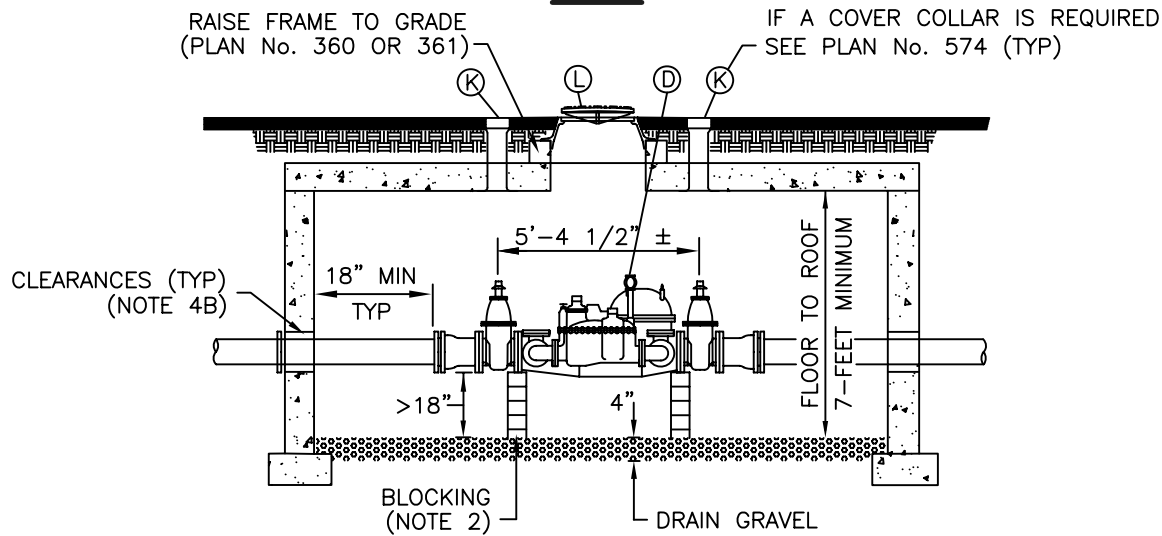
525

8" Compound meter with 2" bypass

1. CONTROL VALVE: Install valve with valve box adjacent to main.
2. BLOCKING: Clay brick or concrete block.
3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
4. CONCRETE BOX: Plan No. 505.
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		8" FLANGE x M.J. ADAPTER	
(B)		8" GATE VALVE WITH 2"x2" OPERATING NUT	
(C)		8"x4" METER	
(D)		2" TEST ASSEMBLY	
(E)		2" GATE VALVE	
(F)		2" METER FLANGE	
(G)		2" DISPLACEMENT METER	
(H)		2" MALE METER FLANGE	
(J)		2" CHECK VALVE	
(K)		TOP SECTION OF VALVE BOX WITH LID	PLAN No. 574
(L)		27" FRAME AND COVER	PLAN No. 502
(M)		CONCRETE BOX	PLAN No. 505
(N)		COPPER PIPING	

* FURNISHED BY AGENCY

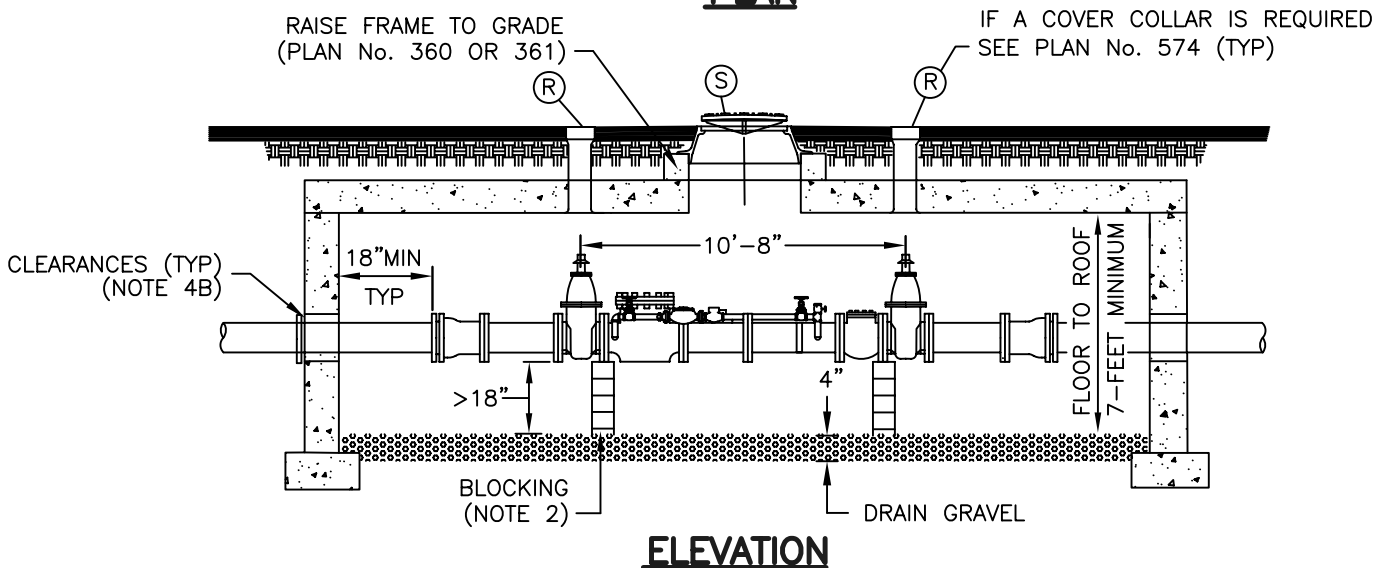
8" Compound meter with 2" bypass

Plan No.

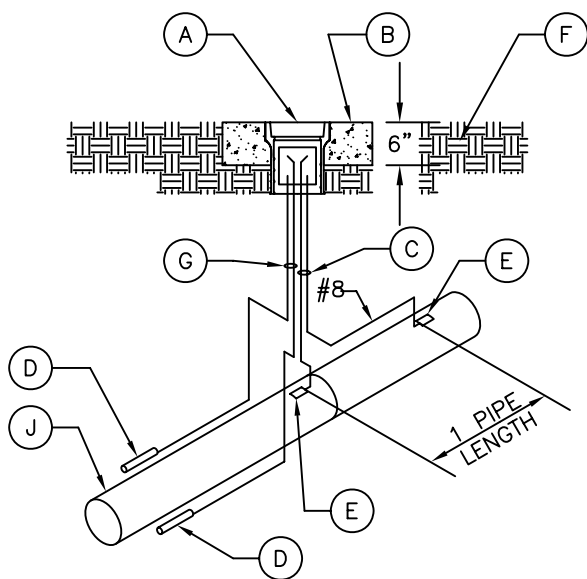
527

10" Turbo meter with 6" turbo meter and 2" bypass

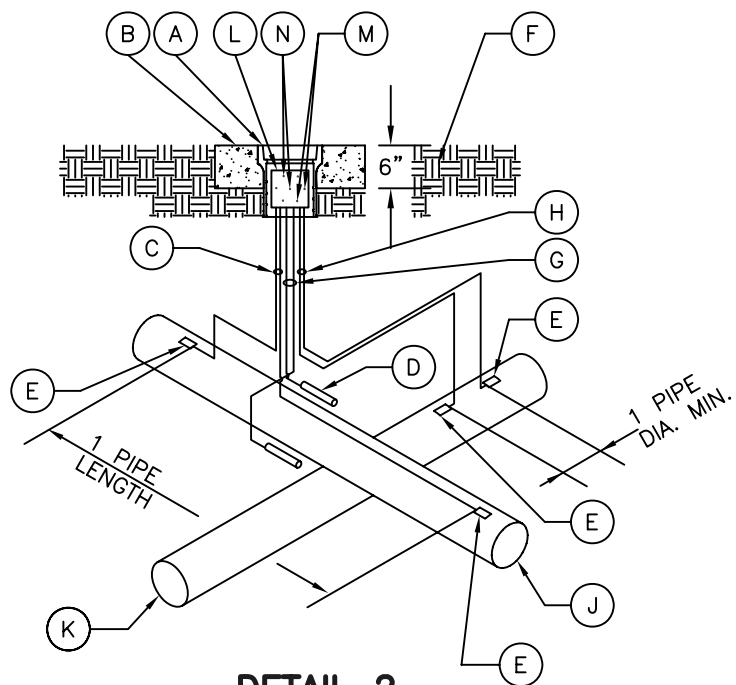
1. CONTROL VALVE: Install valve with valve box adjacent to main.
2. BLOCKING: Clay brick or concrete block.
3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
4. CONCRETE BOX: Plan No. 505.
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.

* FURNISHED BY AGENCYPlan No.
529

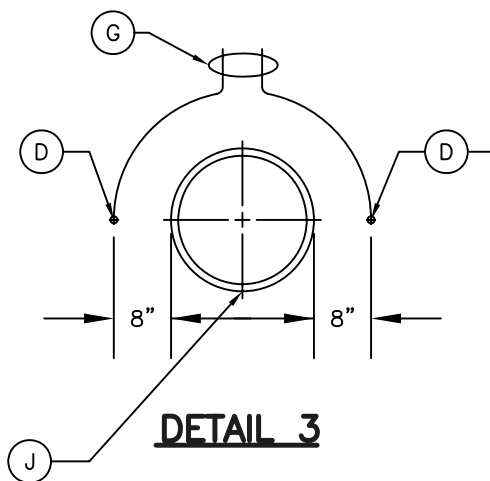
Electrolysis monitoring station details



DETAIL 1



DETAIL 2



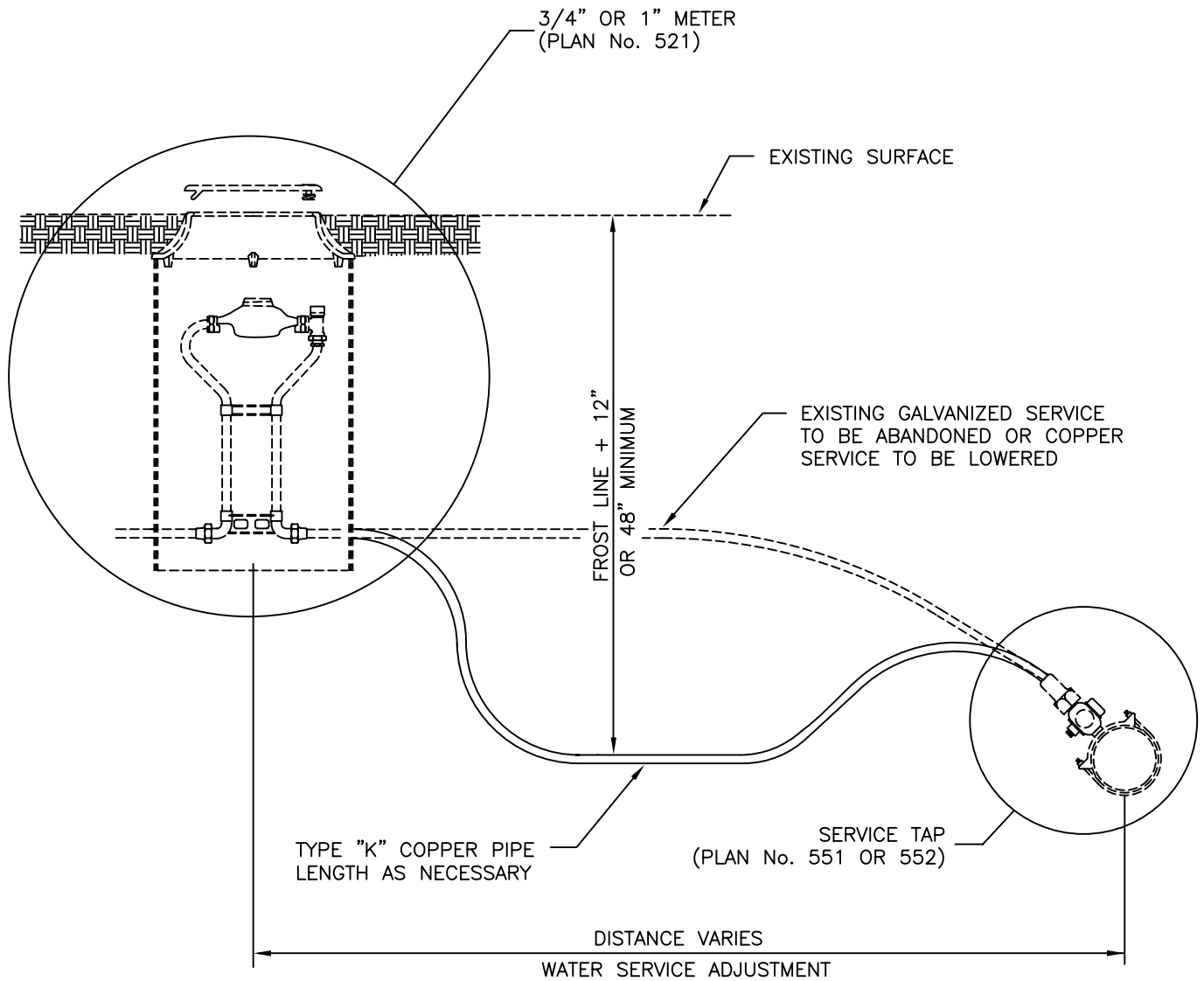
DETAIL 3

TYPICAL REFERENCE ELECTRODE—
1/2" ROUND BY 9" ZINC WITH NO. 12
STEEL WIRE CORE TO WHICH IS
ATTACHED, BY A COMPRESSION FIT
COPPER SLEEVE, A LENGTH OF PVC
COATED NO. 12 COPPER WIRE THE
SLEEVE JOINT IS WRAPPED WITH
2 MILS OF PVC TAPE.

LEGEND	
No.	DESCRIPTION
(A)	FLUSH MOUNTED VALVE BOX AND LID
(B)	CONCRETE SLAB (6"x18"x18")
(C)	1-#8 & 1-#12 AWG COPPER WIRE WITH WHITE TW INSULATION
(D)	REFERENCE ELECTRODE
(E)	THERMITE WELD WIRE CONNECTION (TYPICAL)
(F)	EXISTING SOIL
(G)	2-#12 AWG COPPER WIRE WITH YELLOW TW INSULATION
(H)	1-#8 & 1#12 AWG COPPER WIRE WITH BLUE TW INSULATION
(J)	NEW WATERMAIN
(K)	FOREIGN PIPELINE
(L)	PENSTOCK TERMINALS
(M)	FOREIGN PIPELINE TERMINALS
(N)	REFERENCE ELECTRODE AND ELECTRODE TERMINAL TERMINATED ON A PHEONOLIC PLATE

Water service line

1. INSPECTION: Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.



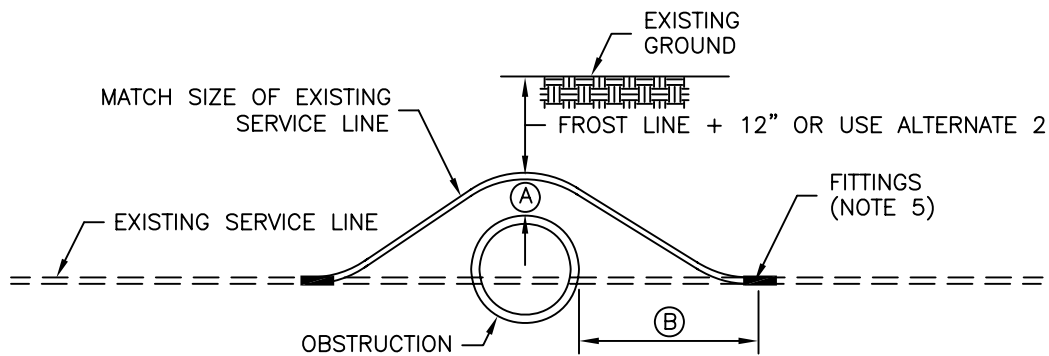
Water service line

Plan No.

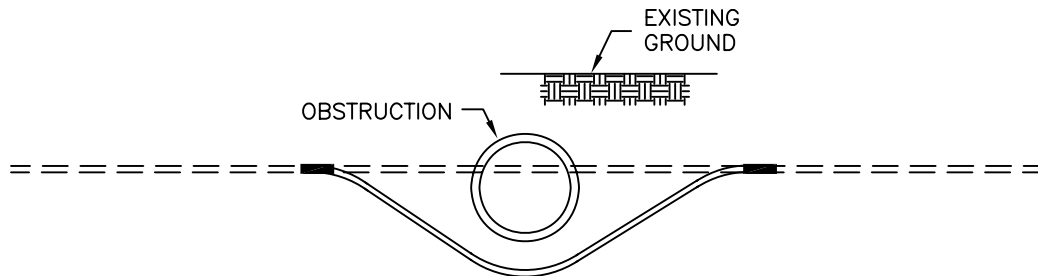
541

Waterline loop

1. INSPECTION: Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. PIPE: Match existing service. Bend pipe around obstruction.
4. THRUST BLOCKS: Not required for flange or welded pipe systems.
5. FITTINGS: Use copper to copper flare fittings or copper to iron pack joint coupling with locking split clamp on iron pipe side and flare on copper side. All couplings to be brass.
6. GREASE: Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.
7. STEEL SPOOL: Weld in place and provide slip on flange except when fitting in pipe system could move. Epoxy line per AWWA C210, AWWA C213, and coated per AWWA C208, or AWWA C214.
8. LOCATION: Loop water mains over top of sewer lines.

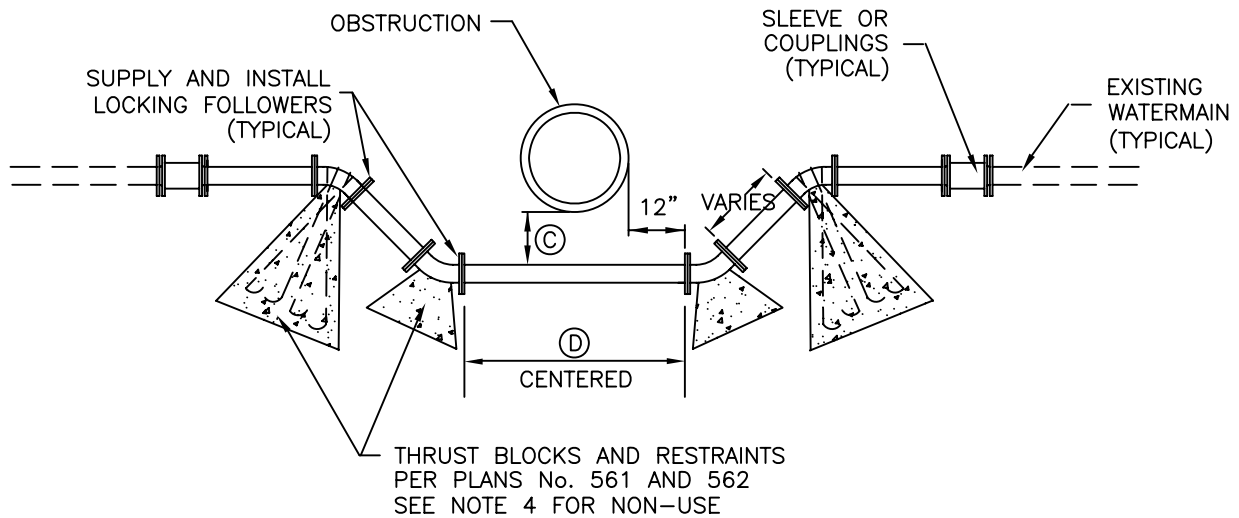


ALTERNATE 1



ALTERNATE 2

TYPE A – WATER SERVICE LINE

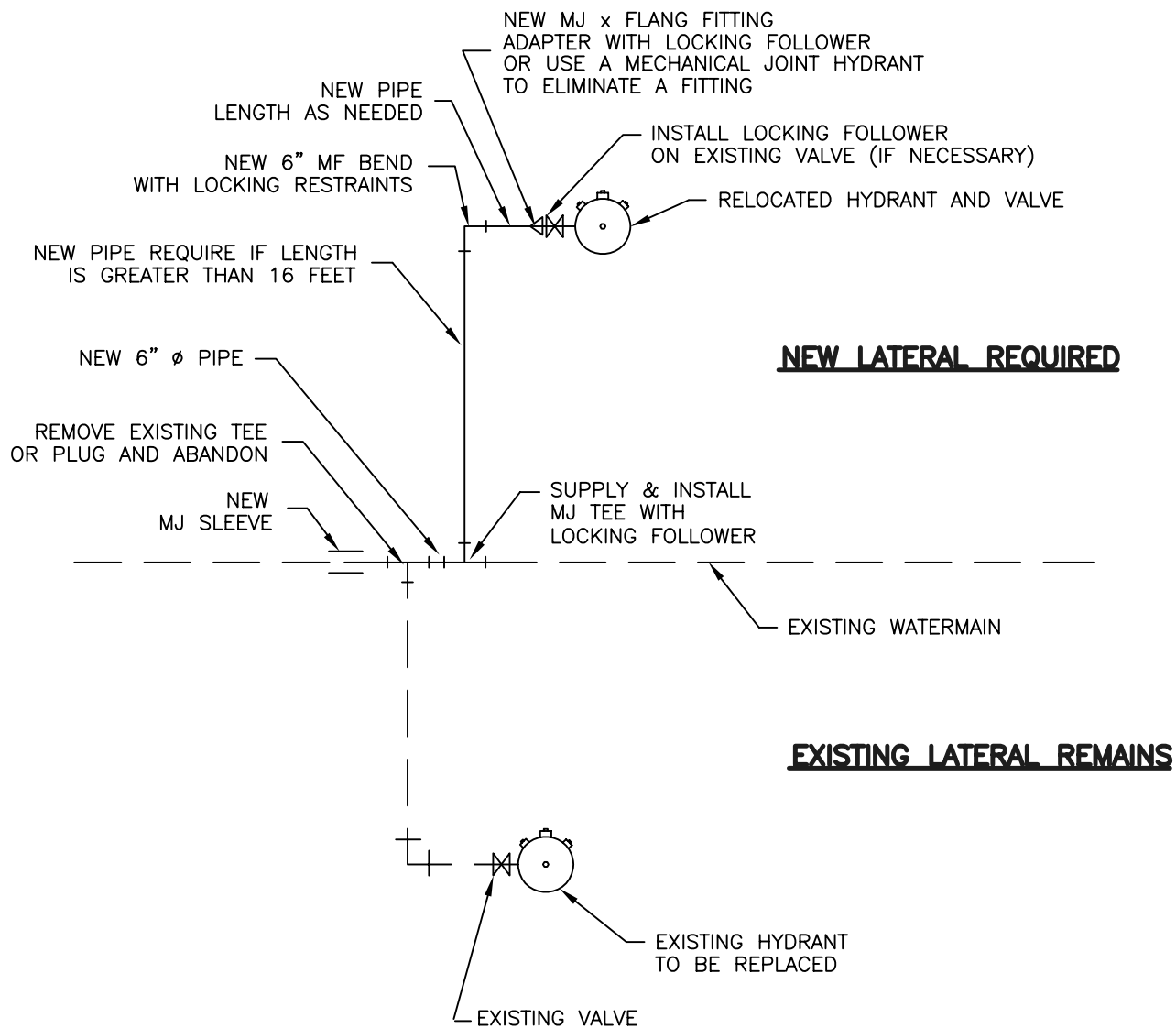


TYPE B – WATER MAIN

TABLE OF DIMENSIONS		
No.	OBSTRUCTION	
	SEWER MAIN	OTHER
(A)	18"	2"
(B)	10'-0"	6"
(C)	18"	12" MIN.
(D)	FULL PIPE LENGTH	O.D. + 12"

Fire hydrant replacement or relocation

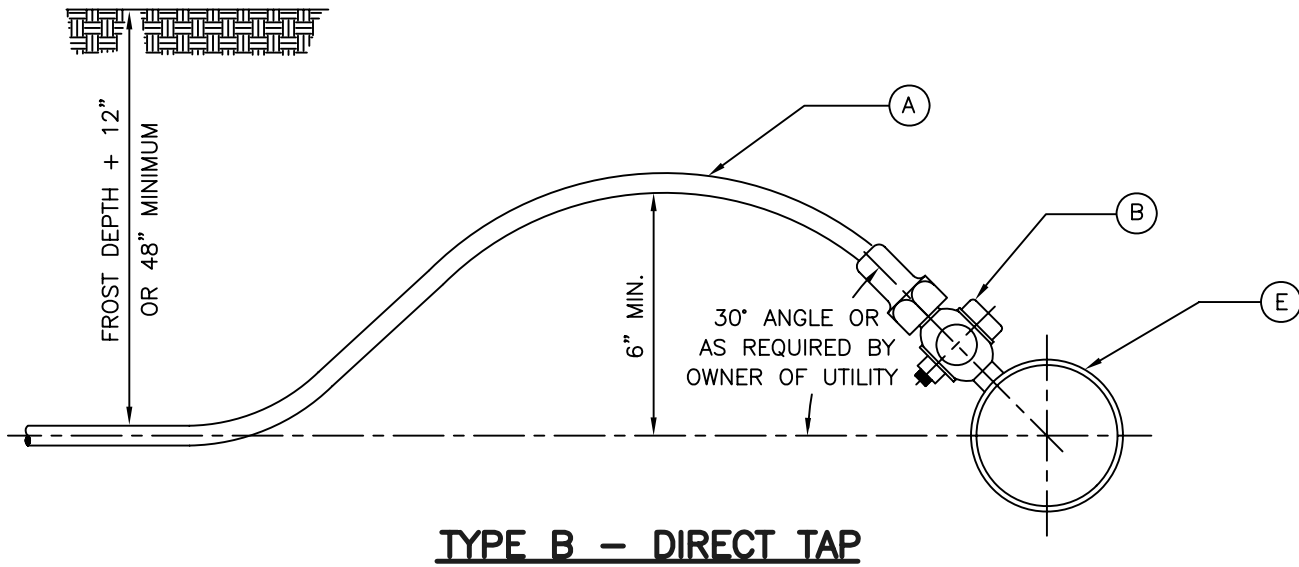
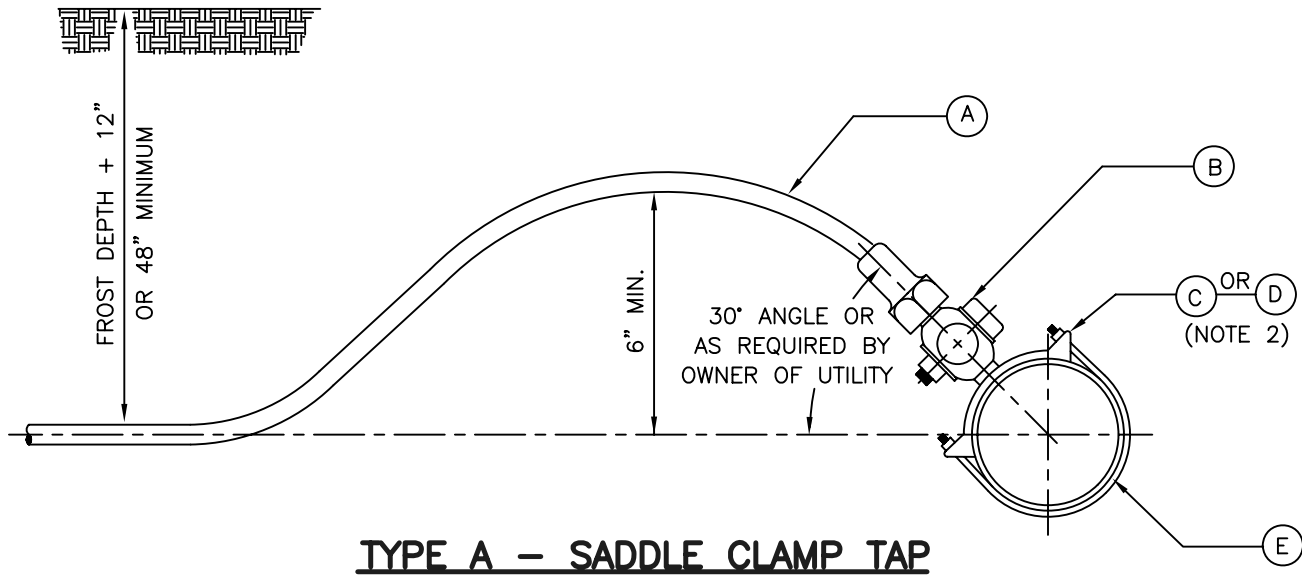
1. INSPECTION: Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.
2. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
3. TEMPORARY THRUST BLOCKING: Use wood.
4. VALVE BOXES: Salvage any C.I.S.T. valve boxes and reuse. Adjust to grade as necessary on relocated hydrant.
5. PIPING: Match existing pipe, fittings and coupling sizes and materials.
6. ADJUSTMENTS: Adjust hydrant to grade with hydrant extensions if necessary.
7. CONNECTIONS: If existing valve and hydrant have O.B. connections, delete MJ x Flange adapter and install 6 inch MJ sleeve.



NOTE: THRUST BLOCKS REQUIRED
(PLANS No. 561 AND 562)

3/4" and 1" service taps

1. TAPPING: Place taps a minimum of 24 inches apart. Use a tapping tool that is sized corresponding to the size of the service line to be installed. No taps within 24 inches of end of pipe.
2. PVC OR AC PIPE: A service saddle clamp is required on all PVC and AC pipe taps unless specified otherwise.
3. TAPE: Teflon tape is required on all taps.
4. INSPECTION: Prior to backfilling around taps, secure inspection of installation by ENGINEER.
5. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		COPPER PIPE	TYPE K – SOFT
(B)		CORPORATION STOP	BRASS
(C)		SERVICE SADDLE CLAMP	(D.I., C.I., A.C.) **
(D)		SERVICE SADDLE CLAMP	(P.V.C.)
(E)		WATER MAIN PIPE	(D.I., C.I., A.C., P.V.C.)

* FURNISHED BY UTILITY AGENCY

** DI & CI PIPE MAY BE DIRECT TAPPED

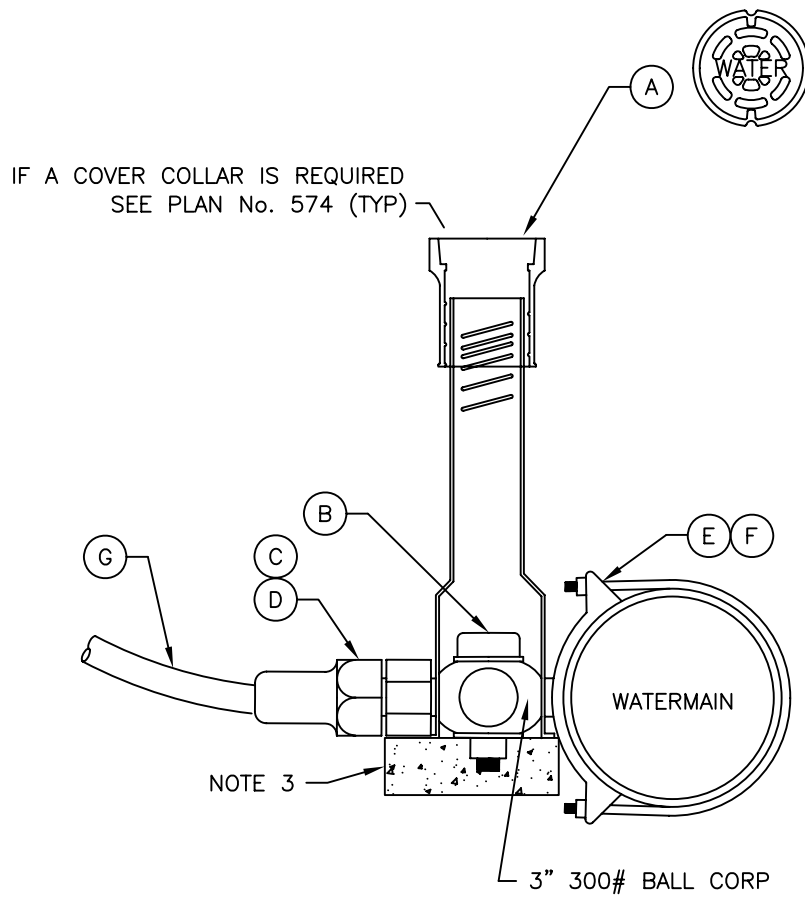
3/4" and 1" service taps

Plan No.

551

1 1/2" and 2" service taps

1. TAPPING: Place taps a minimum of 24 inches apart. Use a tapping tool that is sized corresponding to the size of the service line to be installed. No taps within 24 inches of end of pipe.
2. TAPE: Teflon tape is required on all taps.
3. BLOCKS: Clay brick or concrete block required under valve box to assure a 1" space before bearing on a corporation stop.
4. SADDLE CLAMP: Required on all taps.
5. INSPECTION: Prior to backfilling around taps, secure inspection of installation by ENGINEER.
6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



SECTION

LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		VALVE BOX WITH LID	2 PIECE CAST IRON
(B)		CORPORATION STOP	BRASS
(C)		COPPER ADAPTER	
(D)		FLARE OR PACK JOINT COPPER ADAPTER	
(E)		SERVICE SADDLE CLAMP	D.I., A.C., C.I.
(F)		SERVICE SADDLE CLAMP	PVC
(G)		COPPER PIPE (SERVICE LINE)	TYPE K (SOFT)

* FURNISHED BY UTILITY AGENCY

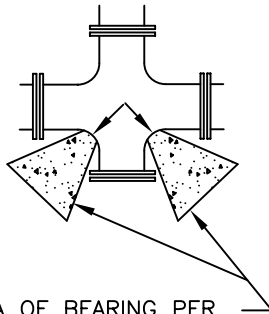
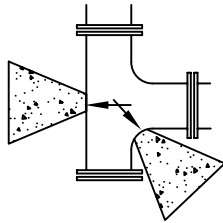
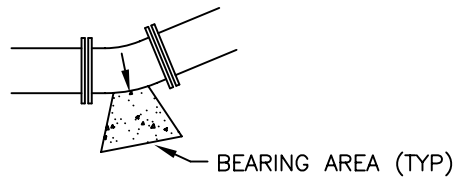
1 1/2" and 2" service taps

Plan No.

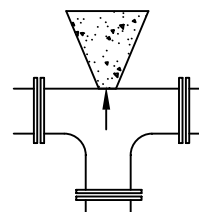
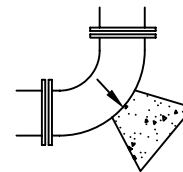
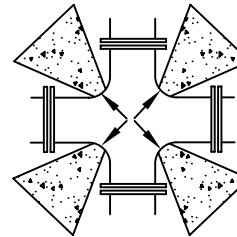
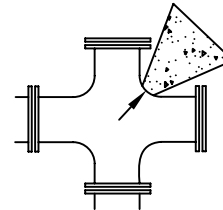
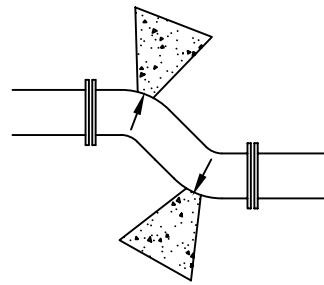
552

Direct bearing thrust block

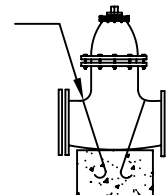
1. CONCRETE: Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.
2. PIPE JOINTS: Do not cover with concrete. Leave completely accessible.
3. GREASE: Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.
4. SPECIAL CONSTRUCTION REQUIREMENTS:
 - A. Thrust design for pipe sizes or configurations not shown require special design.
 - B. Bearing areas, volumes, and special thrust blocking details shown on Drawings take precedence over this plan.
 - C. Reinforcing steel bars to be epoxy coated at least 15 mils thick. Minimum stress yield strength of tie down bars is 70,000 psi.
 - D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at option of ENGINEER).
5. INSPECTION: Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.
6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



THE AREA OF BEARING PER THRUST BLOCK TO EQUAL 1/2 THE AREA SPECIFIED FOR THE LARGEST PIPE OR FITTING SIZE.



#4 EPOXY COATED REBAR WITH 12" MIN. EMBEDMENT



INSTALL THRUST RESTRAINT SEE PLAN No. 562 (TYP) (MJ AND PUSH-ON JOINTS)

MINIMUM BEARING AREA IN SQ. FT.					
SIZE OF PIPE	TEES, VALVES DEAD ENDS	90° BENDS	45° BENDS	22 1/2° BENDS	11 1/4° BENDS
4"	2	3	2	2	2
6"	4	5.5	3	1.5	1
8"	6.5	9.5	5	2.75	1.5
12"	14	20	11	5.5	3
14"	19	26.5	14.5	7.5	4
16"	24	34	18.5	9.5	6
20"	27	52	28.5	14.5	16
24"	53	74	41	21	53
30"	81	114	62	32	16

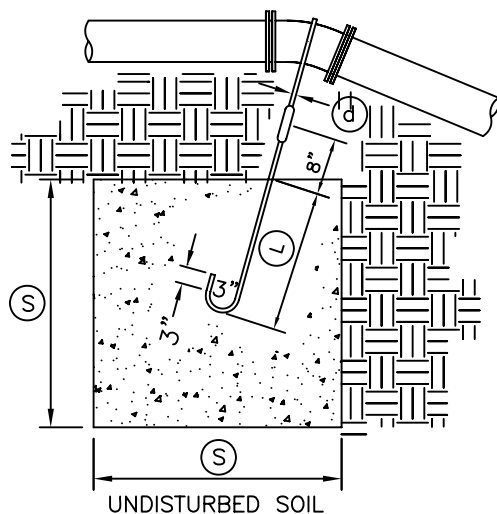
Direct bearing thrust block

Plan No.

561

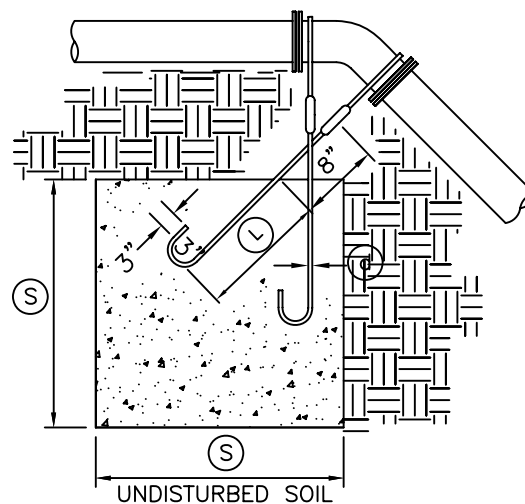
Tie-down thrust restraints

1. CONCRETE: Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.
2. PIPE JOINTS: Do not cover with concrete. Leave completely accessible.
3. GREASE: Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.
4. SPECIAL CONSTRUCTION REQUIREMENTS:
 - A. Thrust design for pipe sizes or configurations not shown require special design.
 - B. Bearing areas, volumes, and special thrust blocking details shown on drawings take precedence over this plan.
 - C. Reinforcing steel bars to be epoxy coated at least 15 mils thick. Minimum stress yield strength of tie down bars is 70,000 psi.
 - D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at option of ENGINEER).
 - E. Restraint sizing is based upon a maximum operating pressure of 150 psi and a test pressure of 200 psi, and a minimum soil bearing stress of 2,000 psf. Operating pressures in excess of 150 psi or soils with less than 2,000 pound bearing strength will require special design.
 - F. Concrete must be allowed to cure in thrust restraints for 5 days prior to pressurizing water lines or have additional approved thrust restraints installed prior to pressurizing the water line.
5. INSPECTION: Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.
6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



TYPE A RESTRAINT
FOR 11 1/4° – 22 1/2° VERTICAL BENDS

TABLE OF DIMENSIONS					
	VB		(S)	(d)	(L)
PIPE SIZE NOMIN. DIAMETER – INCH	VERTICAL BEND DEGREES	NO. OF CU FT. OF CONCRETE BLOCKING	SIDE OF CUBE FEET	DIAMETER OF SHACK OR REBAR RODS – INCH	DEPTH OF RODS IN CONCRETE FT.
4"	11 1/4°	8	2.0	5/8"	1.5
	22 1/2°	15.6	2.5	5/8"	2.0
6"	11 1/4°	15.6	2.5	5/8"	2.0
	22 1/2°	34.3	3.25	5/8"	2.0
8"	11 1/4°	27	3.0	5/8"	2.0
	22 1/2°	64	4.0	5/8"	2.0
12"	11 1/4°	64	4.0	3/4"	2.0
	22 1/2°	125	5.0	3/4"	3.0
16"	11 1/4°	107	4.25	7/8"	3.0
	22 1/2°	216	6.0	7/8"	4.0
20"	11 1/4°	138	5.17	1"	3.5
	22 1/2°	334	6.94	1"	4.0
24"	11 1/4°	240	6.22	1"	4.0
	22 1/2°	476	7.81	1"	4.0
30"	11 1/4°	369	7.17	1"	4.0
	22 1/2°	733	9.02	1"	4.0



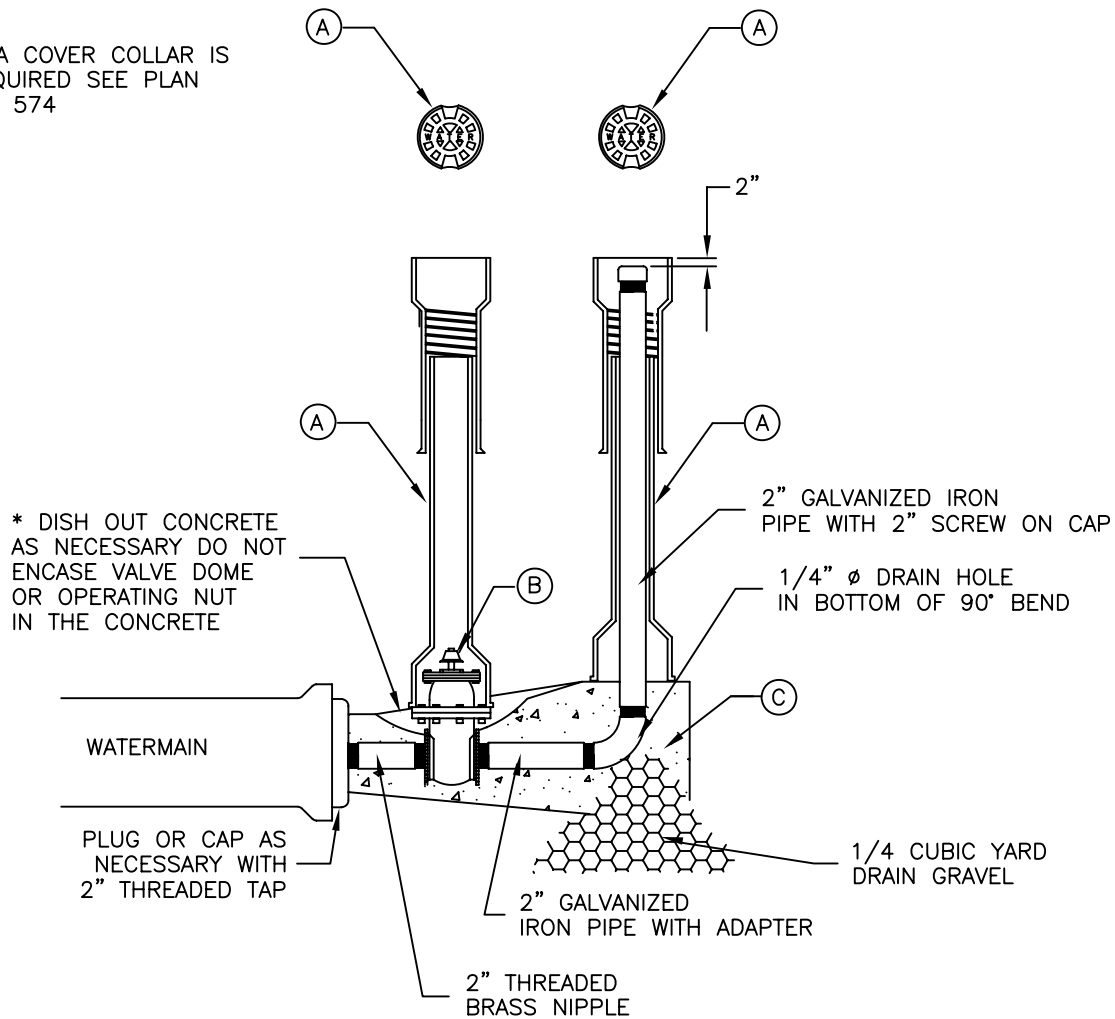
TYPE B RESTRAINT
FOR 45° VERTICAL BENDS

TABLE OF DIMENSIONS					
	VB		(S)	(d)	(L)
PIPE SIZE NOMIN. DIAMETER – INCH	VERTICAL BEND DEGREES	NO. OF CU YD. OF CONCRETE BLOCKING	SIDE OF CUBE FEET	DIAMETER OF SHACK OR REBAR RODS – INCH	DEPTH OF RODS IN CONCRETE IN FEET
4"	45°	1	3.0	5/8" 5/8"	2.0
6"		2.37	4.0	5/8" 5/8"	2.5
8"		3.97	4.75	5/8" 5/8"	2.0
12"		9.04	6.25	5/8" 5/8"	4.0
16"		17.24	7.75	3/4" 3/4"	4.0
20"		26.52	92.17	3/4" 3/4"	4.0
24"		37.82	10.07	3/4" 3/4"	4.0
30"		58.26	11.63	3/4" 3/4"	4.0

2" washout valve

1. CONCRETE: Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.
2. TAPE: Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.
3. SPECIAL DESIGN: Watermains 12" and larger will require special washout assembly design.
4. DRAINAGE: After installation of washout valve assembly, verify the washout valve riser drains to gravel.
5. INSPECTION: Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.
6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

IF A COVER COLLAR IS
REQUIRED SEE PLAN
No. 574



SECTION

LEGEND		
No.	ITEM	DESCRIPTION
(A)	VALVE BOX WITH LID	2 PIECE CAST IRON
(B)	4" GATE VALVE WITH SCREW ENDS	2"x 2" OPERATING NUT
(C)	CONCRETE THRUST BLOCK	SEE PLAN No. 561

2" Washout valve

Plan No.

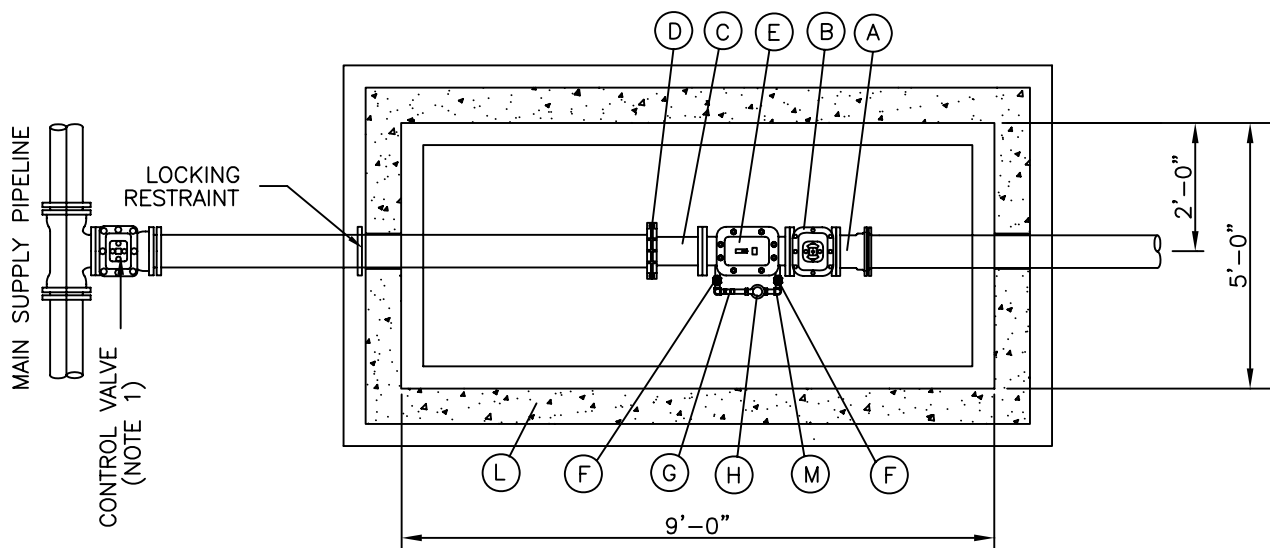
571

Detector check valve with 3/4" bypass meter

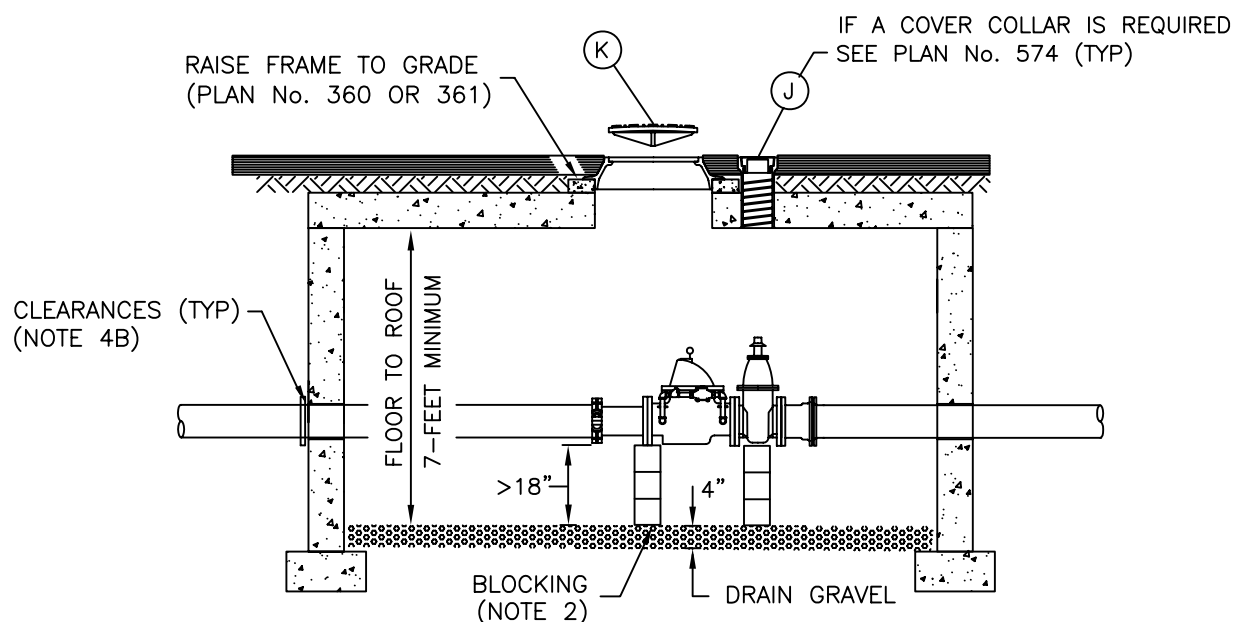
1. CONTROL VALVE: Install valve with valve box adjacent to main.
2. BLOCKING: Clay brick or concrete block.
3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
4. CONCRETE BOX:
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
5. GRADE RING: 6 inch concrete grade ring required in roadways. See Plan No. 361.
6. SPOOLS: Length of flange x plain end spool varies.

SPOOLS	
<u>Pipe size</u>	<u>Pipe length</u>
6"	10"
8"	8 1/4"
10"	6"

7. VALVE OPTION: The valve in the box (item B legend) closest to the main, and the top section of the valve box (item J legend) may be eliminated at the option of the ENGINEER



PLAN



ELEVATION

LEGEND		
No.	*	DESCRIPTION
(A)		FLANGE AND M.J. ADAPTER
(B)		GATE VALVE WITH 2"x2" OPERATOR NUT
(C)		FLANGE x P.E. SPOOL
(D)		MECHANICAL JOINT AND FLANGE
(E)		DETECTOR CHECK VALVE
(F)		3/4" VALVE
(G)		3/4" CHECK VALVE
(H)		3/4" METER
(J)		TOP SECTION OF VALVE BOX WITH LID
(K)		27" FRAME AND COVER
(L)		CONCRETE BOX
(M)		COPPER PIPING

* FURNISHED BY AGENCY

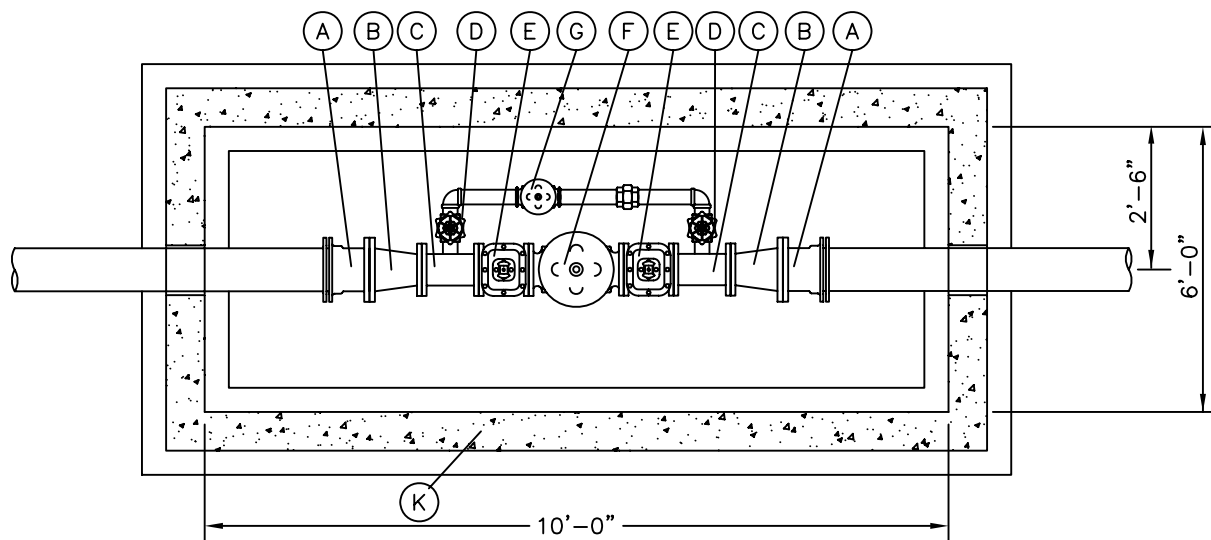
Detector check valve with 3/4" bypass meter

Plan No.

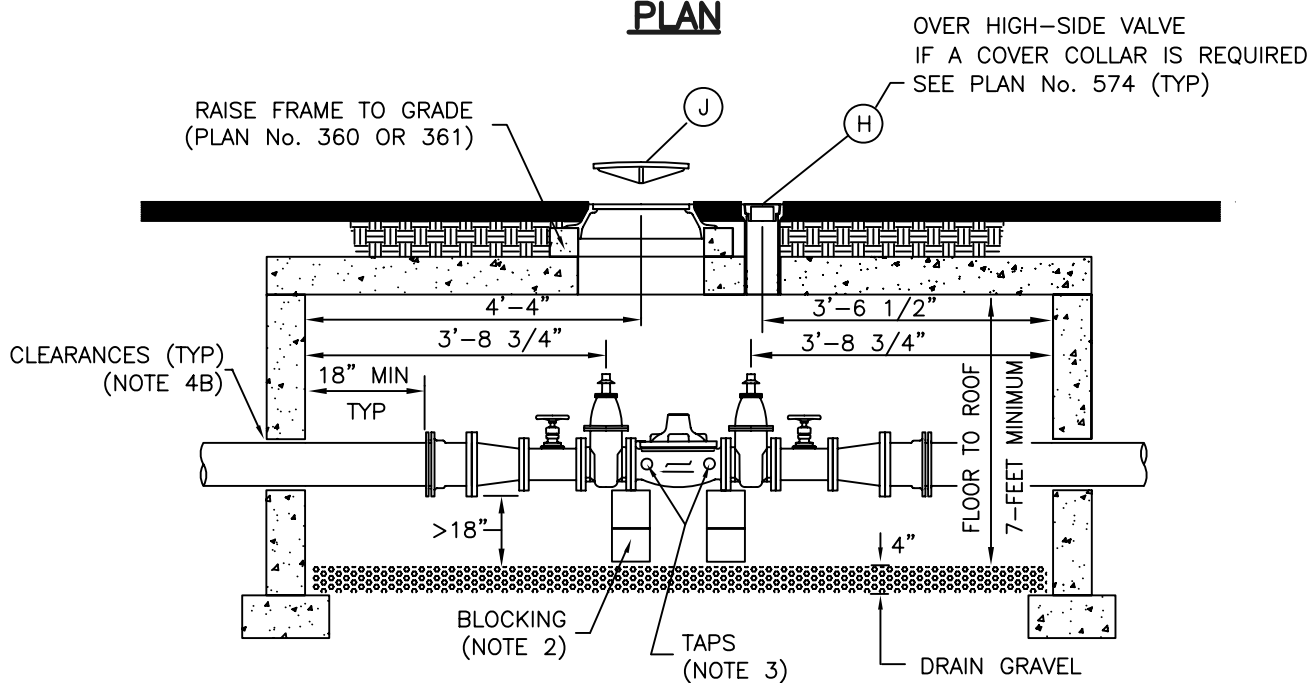
572

6" Pressure reducing valve with 2" bypass

1. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.
2. BLOCKING: Clay brick or concrete block.
3. TAPS: Provide two 3/4" I.P. taps with plugs for pressure gages.
4. CONCRETE BOX:
 - A. Center frame and cover over water meter.
 - B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND		
No.	*	DESCRIPTION
(A)		8" M.J. X FLANGE ADAPTOR
(B)		8" x 6" FLANGED REDUCER
(C)		8" FLANGED STEEL SPOOL WITH 2" OUTLET
(D)		2" GATE VALVE
(E)		6" GATE VALVE WITH 2"x2" OPERATING NUT
(F)		6" PRESSURE REDUCING VALVE
(G)		2" PRESSURE REDUCING VALVE
(J)		27" FRAME AND COVER
(H)		TOP SECTION OF VALVE BOX WITH LID
(K)		CONCRETE BOX

* FURNISHED BY AGENCY

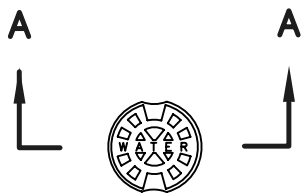
6" Pressure reducing valve with 2" bypass

Plan No.

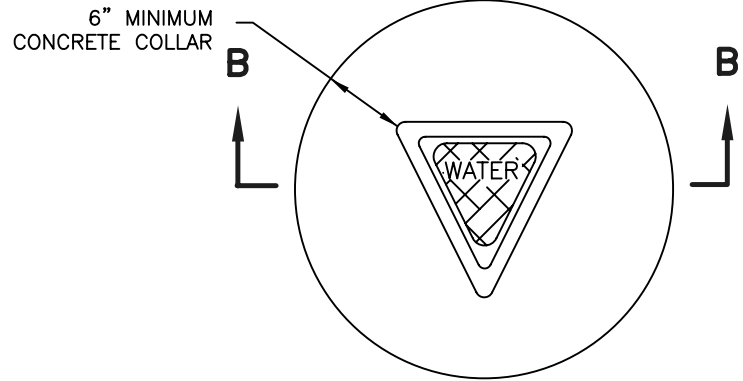
573

Cover collar for water valve boxes

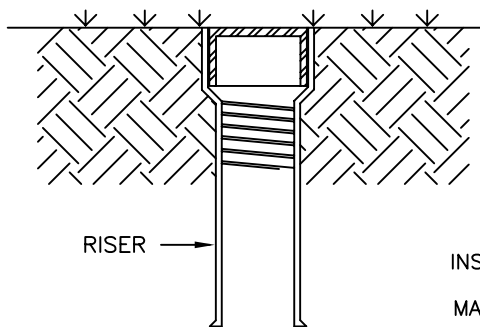
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23. Do not use pea gravel or sewer rock. Place per APWA Section 32 05 10. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
3. JOINTS: Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.



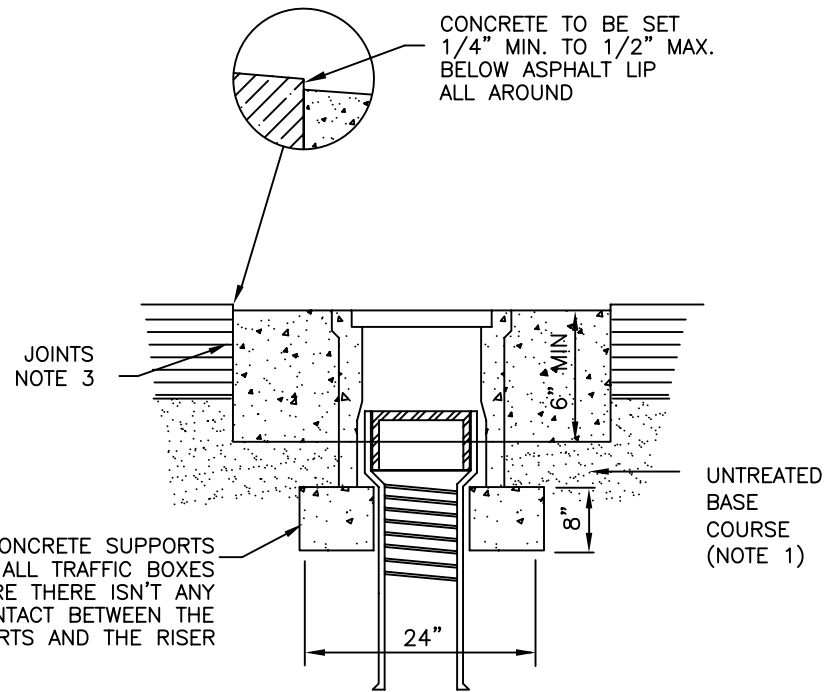
PLAN



PLAN



SECTION A-A



SECTION B-B

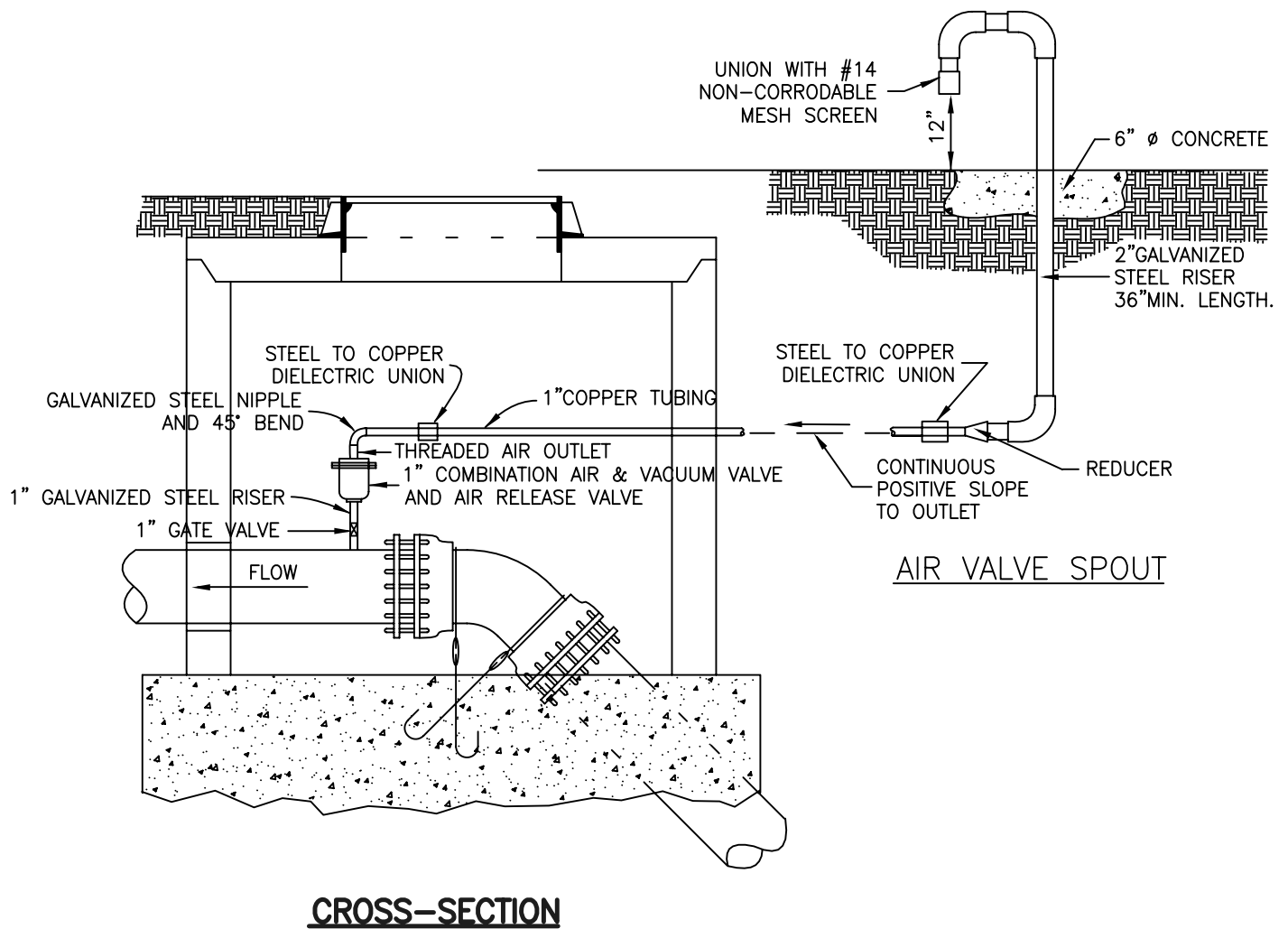
Cover collar for water valve boxes

Plan No.

574

Air release assembly

1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
2. SMALL FITTINGS: Provide brass fittings and nipples if not specified otherwise. Do not use galvanized materials.
3. INSPECTION: Prior to backfilling around the assembly, secure inspection of installation by ENGINEER.
4. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.



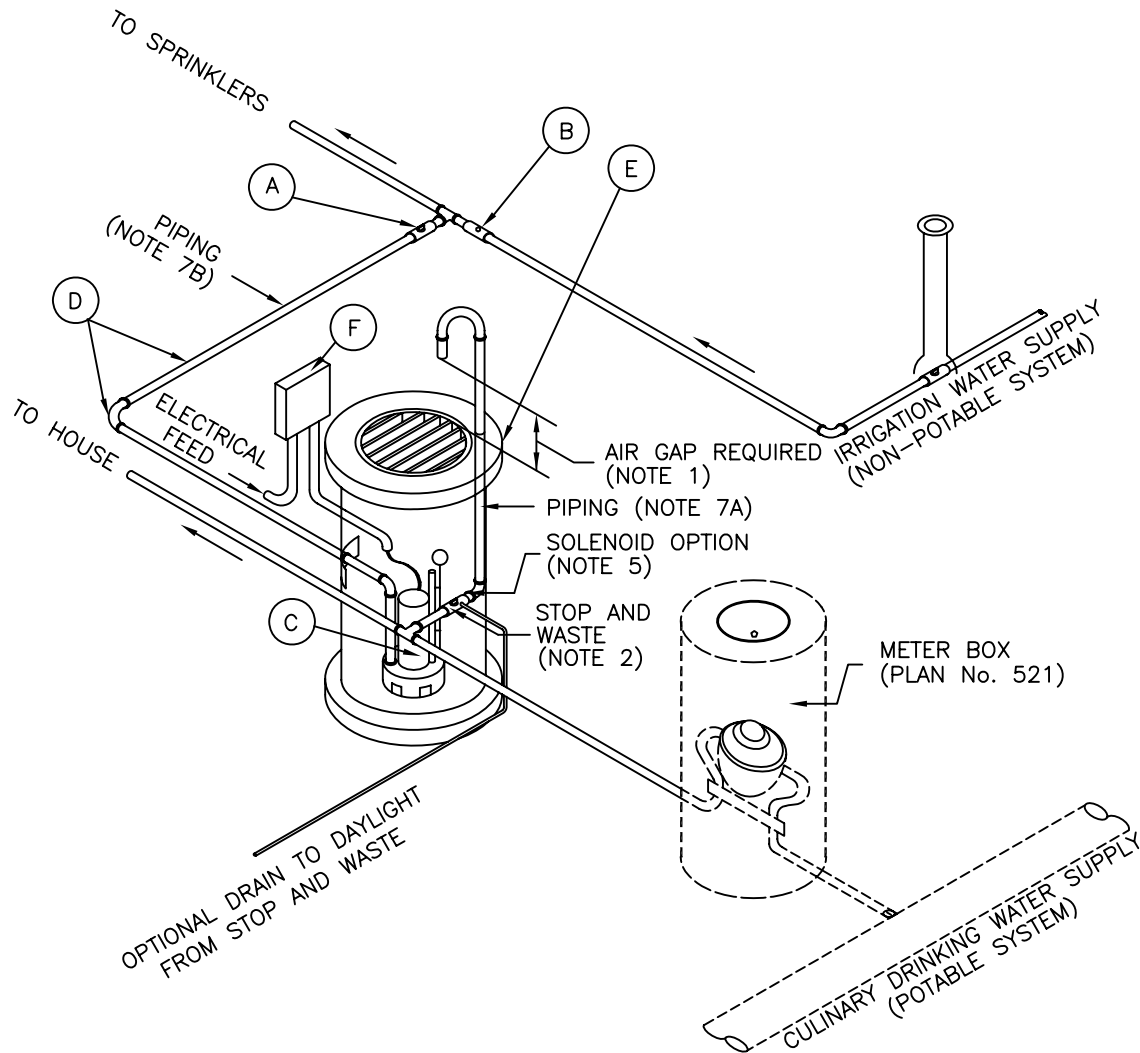
Air release assembly

Plan No.

575

Pressurized irrigation water and potable water interface

1. AIR GAP: An air gap of at least two pipe diameters must exist between the maximum overflow lip of the catch basin and the end of the down-turned discharge pipe.
2. STOP AND WASTE VALVE: Locate the valve in an area where subsurface ground water will not accumulate or attach a drain pipe to the drain hole and drain to daylight with a non-corrodible #14 mesh screen over the end.
3. CATCH BASIN: The ground surrounding the catch basin must slope away from the catch basin (basin cannot be located where flooding could result in a water level higher than the maximum overflow lip of the catch basin).
4. STAND PIPES: Provide draining and freeze protection.
5. SOLENOID VALVE: A solenoid operated valve may be installed at this point provided the valve and housing are not constructed of plastic (must be brass or ferrous metal).
6. SYSTEM DESIGN: The catch basin valve and pump size must match the minimum discharge rate from the potable water system when indoor demands are also being expected from the system.
7. PIPING MATERIALS:
 - A. All parts of the potable water system from the stop and waste valve to the air gap drop leg above the catch basin are to be copper or galvanized iron only.
 - B. Below ground parts on the non-potable water system may be made of PVC or polyethylene at the owner's discretion.



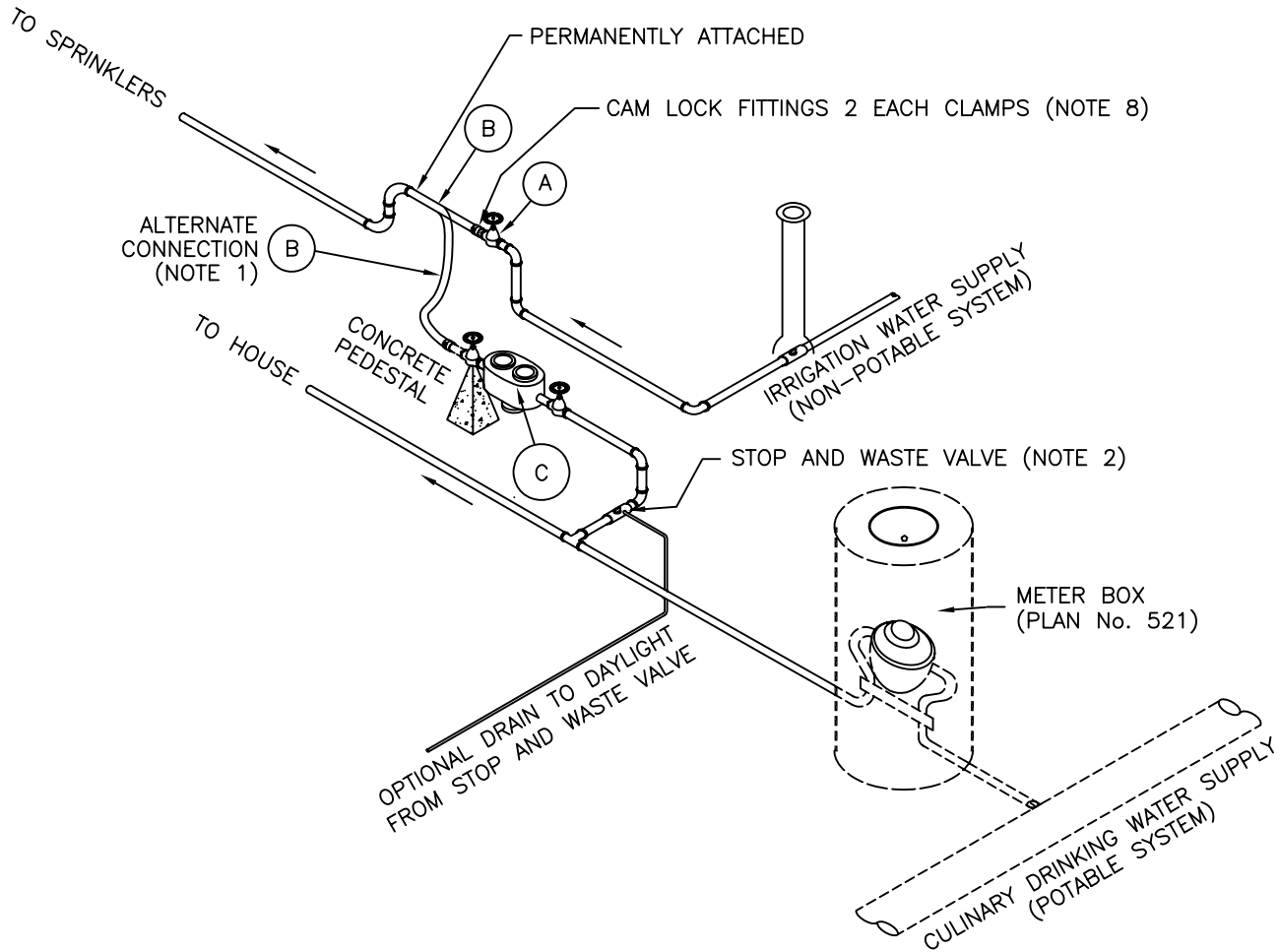
TYPE A – PUMP INTERCONNECT

LEGEND		
No.	ITEM	DESCRIPTION
(A)	CONTROL VALVE	NOTE 6
(B)	CHECK VALVE	SIZE TO MATCH EXISTING PIPE.
(C)	SUBMERSIBLE PUMP WITH FLOAT OPERATED CUT-OUT SWITCH	NOTE 6
(D)	ELBOWS, TEES & PIPE AS REQ'D	SCREWED OR FLANGED (OR BRAZED ABOVE GROUND ONLY)
(E)	CATCH BASIN	NOTE 6
(F)	ELECTRICAL BOX AND CONDUIT	PER ELECTRICAL CODE.

Pressurized irrigation water and potable water interface

1. SEPARATE SYSTEMS: Connect hose to only one system at a time. The other system is to remain separate. Do not direct connect potable and non-potable water systems with or without backflow prevention devices.
2. STOP AND WASTE VALVE: Locate the valve in an area where subsurface ground water will not accumulate, or attach a drain pipe to the drain hole and drain to daylight with a non-corrodible #14 mesh screen over the end.
3. TESTING: The reduced pressure backflow preventer (RPBP) device requires testing within 10 days of initial installation by a licensed backflow device tester and annually thereafter or more frequently at owner's option and expense.
4. BACKFLOW PREVENTER: Install the RPBP device above ground per the plumbing code. It must not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.
5. STAND PIPES: Provide draining and freeze protection.
6. SYSTEM DESIGN: There may be up to 20 psi loss of head through the RPBP device. This is normal and the owner should expect a decrease in area coverage. Owner should design or modify the system for the lower pressure.
7. PIPING MATERIALS:
 - A. All above ground parts are to be copper or galvanized iron only.
 - B. Below ground parts on the non-potable water system may be made of PVC or polyethylene at the owner's discretion.
8. CAM LOCK FITTINGS: Provide 3/4" long male insert attached to the flexible hose.

RPBP = reduced pressure backflow preventer



TYPE B – BACKFLOW PREVENTER INTERCONNECT

LEGEND		
No.	ITEM	DESCRIPTION
(A)	VALVE	BALL, RESILIENT SEAT, GATE OR ACCEPTABLE ALTERNATE
(B)	FLEXIBLE DISCHARGE HOSE	100 P.S.I. WORKING PRESSURE 400 P.S.I. BURST PRESSURE
(C)	REDUCED PRESSURE BACKFLOW PREVENTER (RPBP DEVICE)	SHUTOFF VALVES & TEST COCKS ARE INCLUDED
(D)	ELBOWS AND TEES	SCREWED, FLANGED, OR BRAZED ABOVE GROUND ONLY

PART 6

IRRIGATION AND LANDSCAPING

Abbreviations and Symbols

Plan 601	Abbreviations and symbols for irrigation and landscaping	259
----------	--	-----

Gravity Flow System

611	Curb inlet box for irrigation.....	261
613	Irrigation diversion box.....	263
614	Irrigation diversion box.....	265

Heads

621	Stationary head.....	267
622	Pop-up head	269

Valves

631	Backflow preventer	271
632	Drain valve	273
633	Control valve	275
635	Isolation shut-off valve	277

Electrical















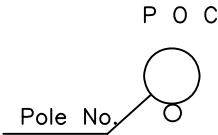
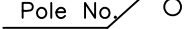



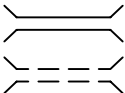


651	Wire runs for landscape irrigation.....	279
-----	---	-----

Trees and Plants

681	Tree.....	281
683	Shrubs and bushes.....	283

Abbreviations and symbols for irrigation and landscaping

1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.
2. LETTERING STYLE: Capital letters preferred.
3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.
4. NEW IMPROVEMENTS: Shown in solid continuous line.

SYMBOL	DEFINITIONS
	BACKFLOW PREVENTER ASSEMBLY
	DOUBLE CHECK
	REDUCED PRESSURE
	CONTROLLER
	DRINKING FOUNTAIN
	ELECTRICAL CONDUIT
	SPRAY HEAD
	90°
	180°
	360°
	VARIABLE
	ROTOR POP UP
	PIPE
	PRESSURE MAIN
	CIRCUIT PIPE
	POINT OF CONNECTION
	POWER SOURCE
	PULL BOX:
	HIGH VOLTAGE
	LOW VOLTAGE
	PUMP
	SLEEVE:
	NEW
	EXISTING
	STATION DESIGNATION (REMOTE CONTROL VALVE)
	THRUST BLOCK

Curb inlet box for irrigation

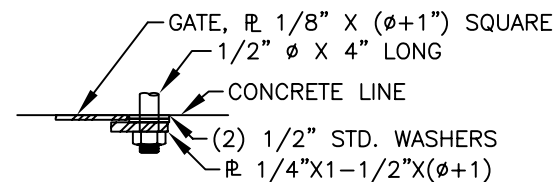
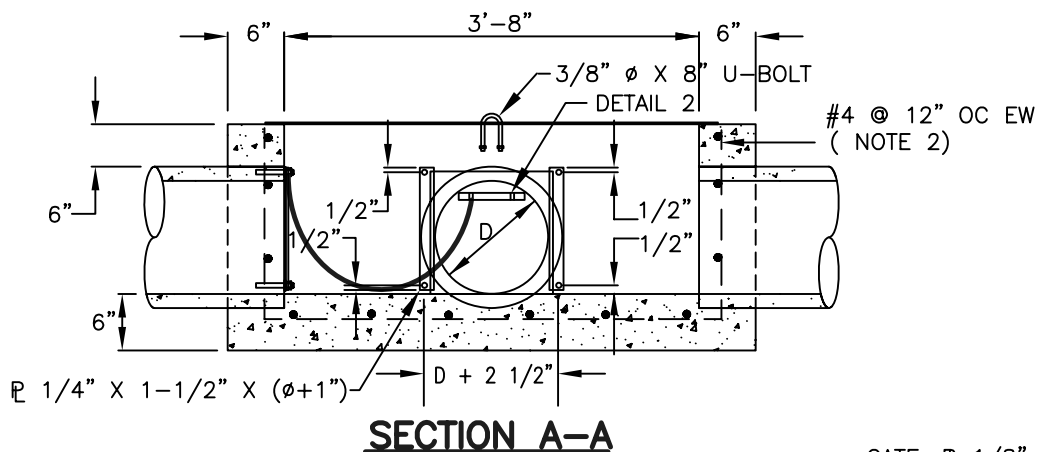
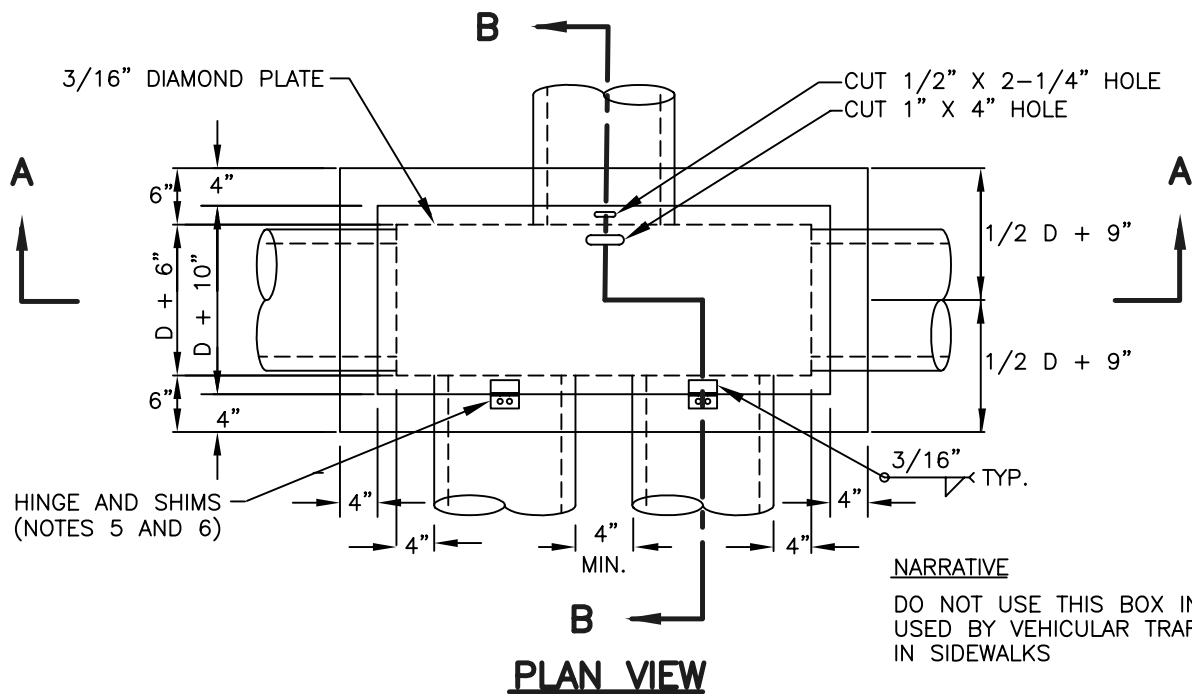
1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. GATE: The gate shall securely seal the pipe.
5. COATINGS: Coat all metal parts with asphaltum paint.
6. CASTING: Grey iron class 20 minimum per ASTM A 48.
7. STEEL: ASTM A 36.
8. ACCESSORIES: Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.

Irrigation diversion box

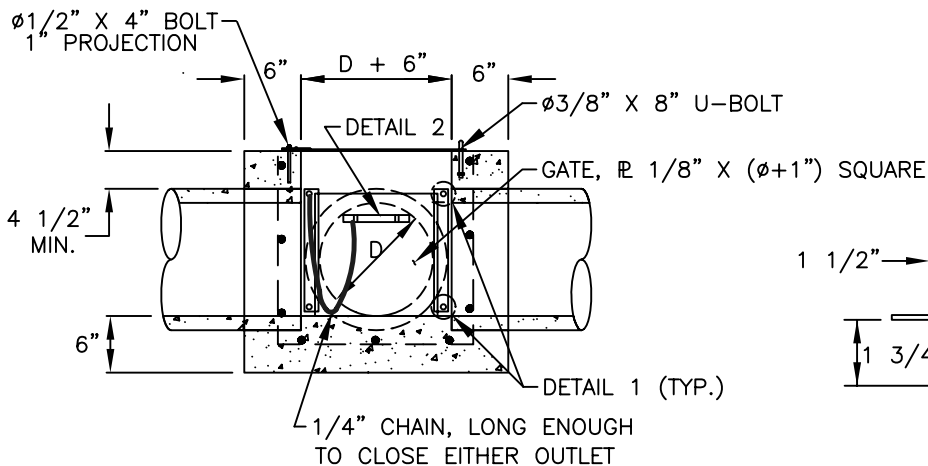
1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. GATE: The gate shall securely seal the pipe.
5. HINGE: 3" x 3" butt hinges welded to the cover plate.
6. SHIMS: Manufacture shims to match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.
7. COATINGS: Coat all metal parts with asphaltum paint.
8. STEEL: ASTM A 36.
9. ACCESSORIES: Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.

Irrigation diversion box

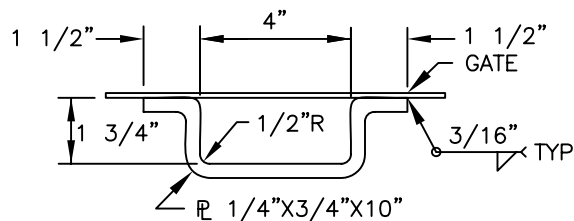
1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. GATE: The gate shall securely seal the pipe.
5. HINGE: 3" x 3" butt hinges welded to the cover plate.
6. SHIMS: Manufacture shims to match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.
7. COATINGS: Coat all metal parts with asphaltum paint.
8. STEEL: ASTM A 36.
9. ACCESSORIES: Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.



DETAIL 1



SECTION B-B



DETAIL 2

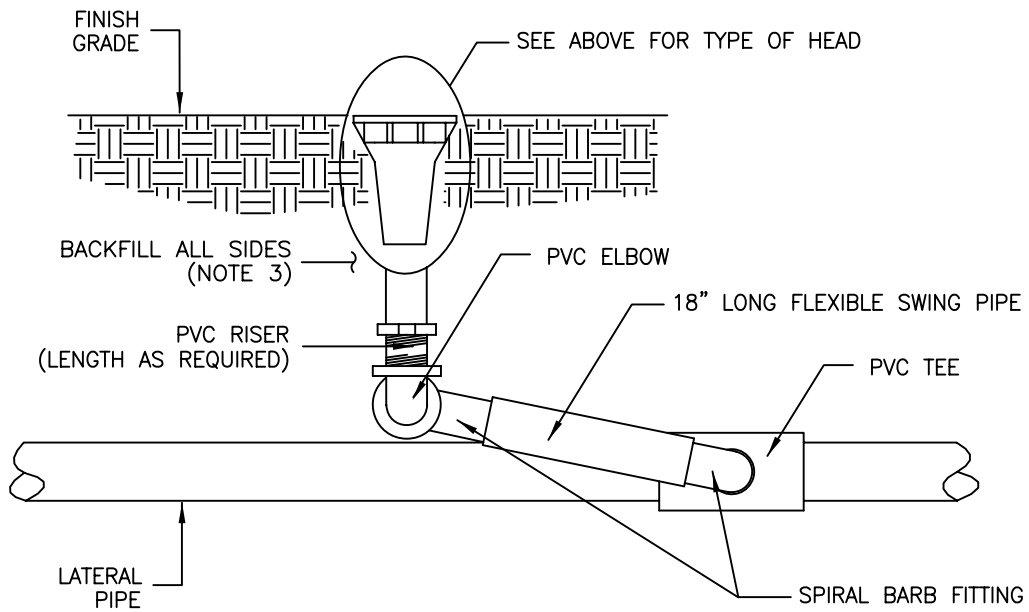
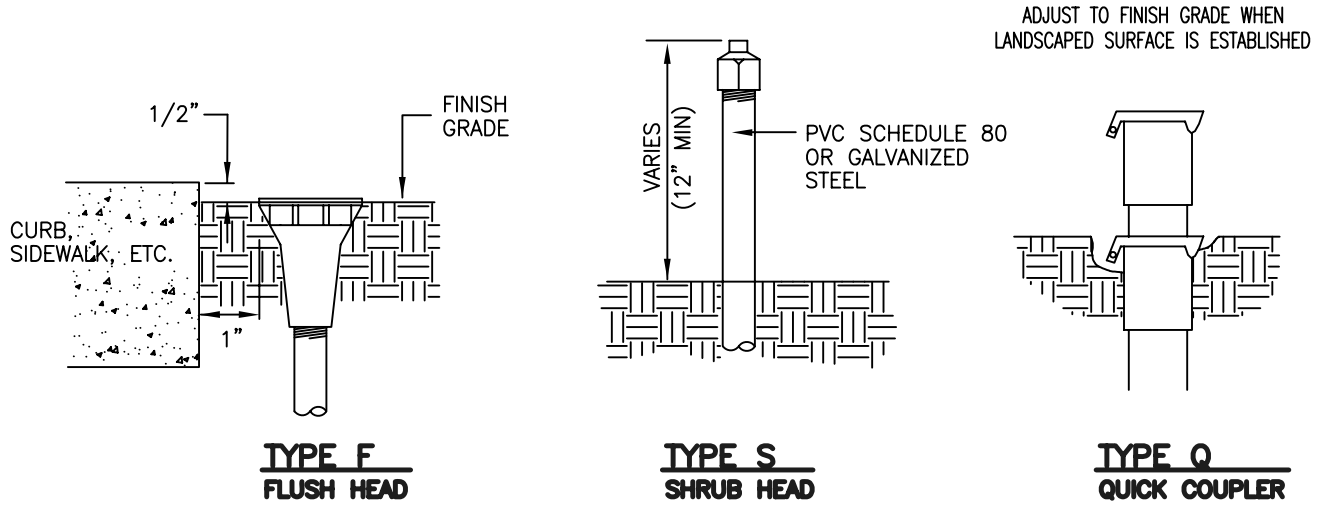
Irrigation diversion box

Plan No.

614

Stationary head

1. INSPECTION: Prior to backfilling around head, secure inspection of head installation by ENGINEER.
2. PLACEMENT:
 - A. Adjust heads to final landscape grade.
 - B. Keep heads 1/2 inch below edge of pavement surfaces.
3. BACKFILL: Install backfill material around heads and compact to prevent settling.
4. SURFACE RESTORATION: Cut sod around head to fit. Keep head flush with surrounding sod or seeded areas.
5. COVERAGE: Provide correct type of head and adjust throttle controls to obtain required coverage.



SECTION

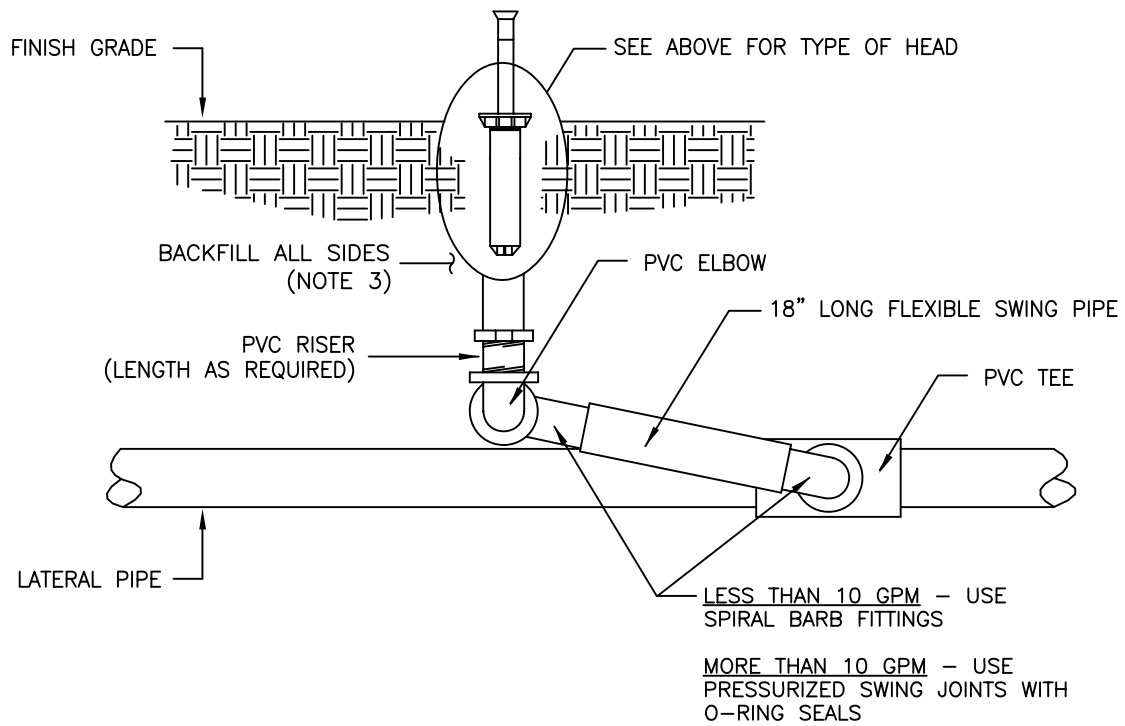
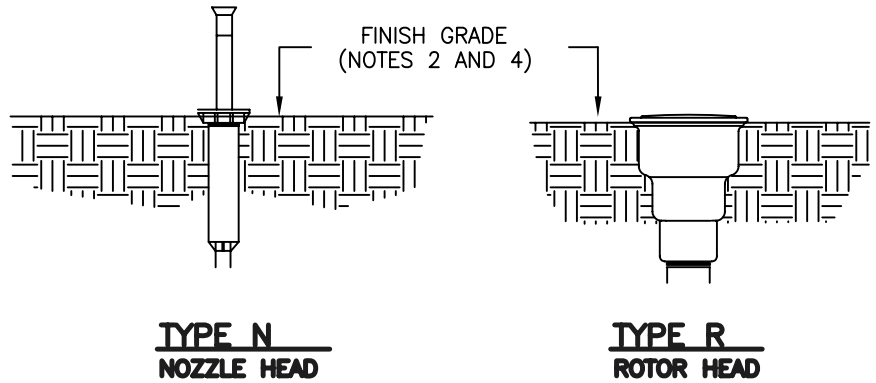
Stationary head

Plan No.

621

Pop-up head

1. INSPECTION: Prior to backfilling around head, secure inspection of head installation by ENGINEER.
2. PLACEMENT:
 - A. Adjust heads to final landscape grade.
 - B. Keep heads 1/2 inch below edge of pavement surfaces.
3. BACKFILL: Install backfill material around heads and compact to prevent settling.
4. SURFACE RESTORATION: Cut sod around head to fit. Keep head flush with surrounding sod or seeded areas.
5. COVERAGE: Provide correct type of head and adjust throttle controls to obtain required coverage.



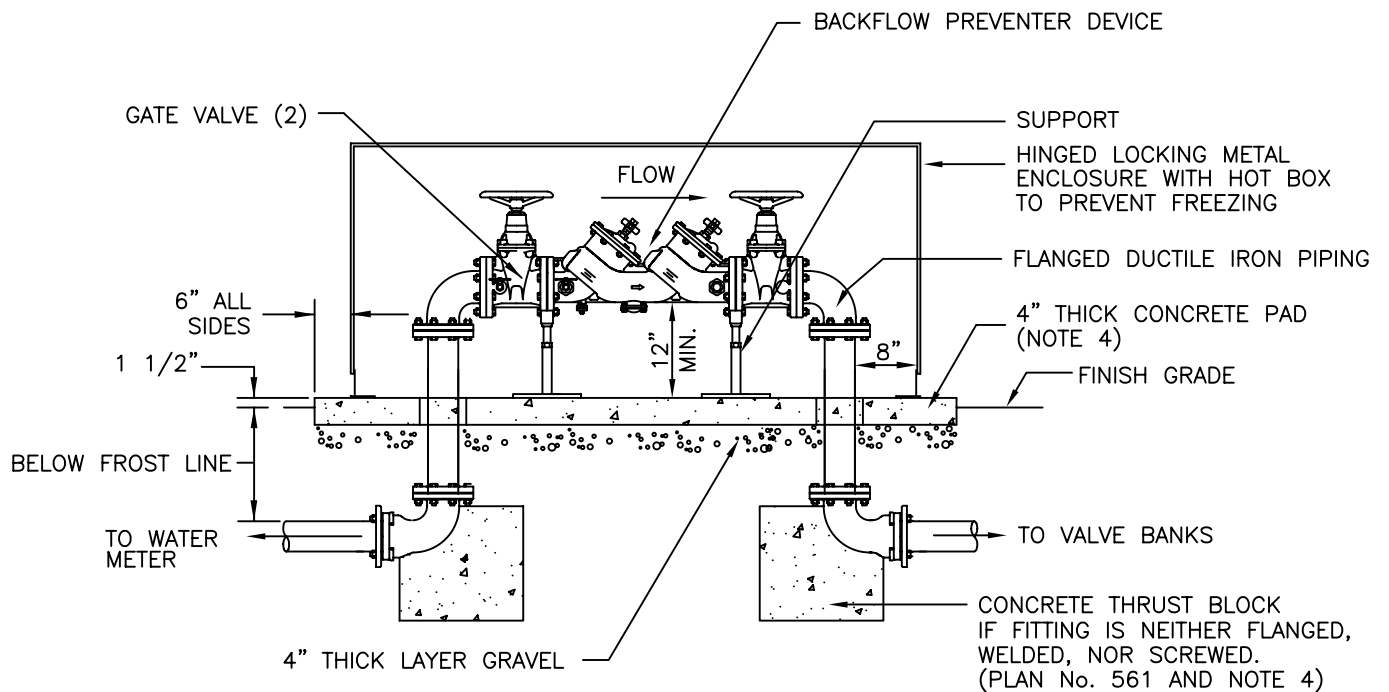
Pop-up head

Plan No.

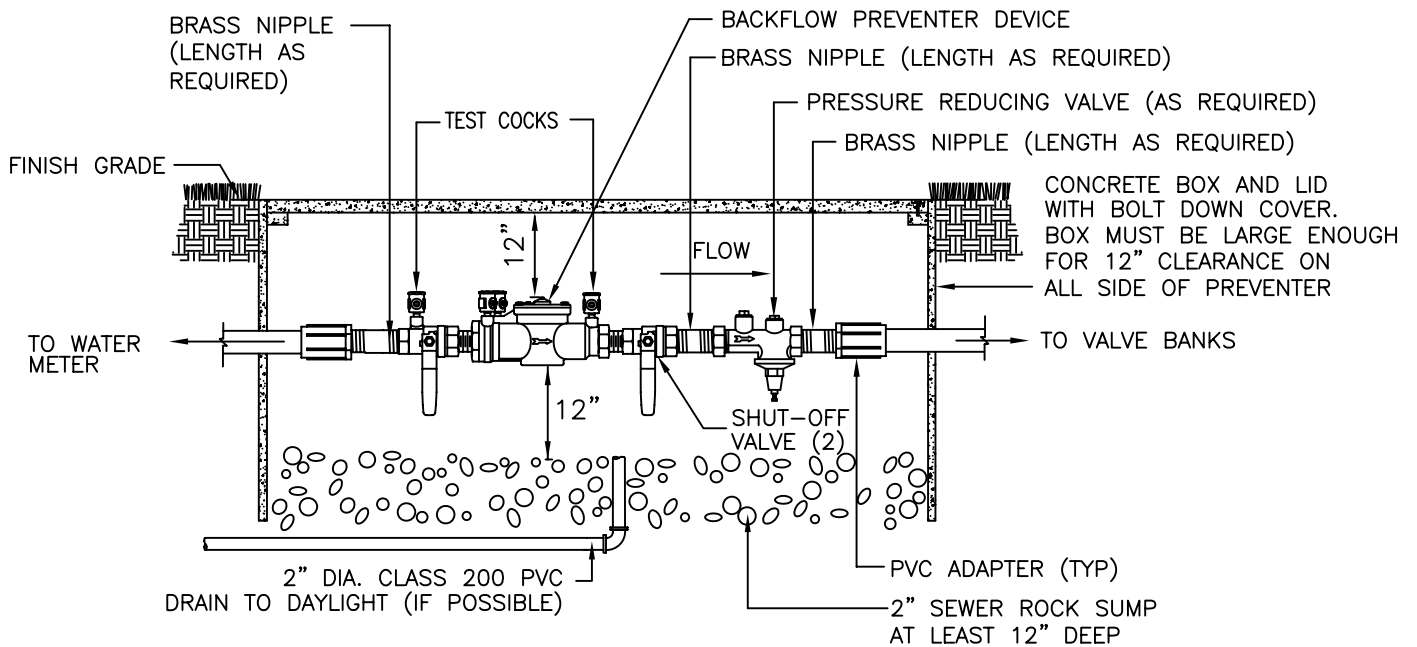
622

Backflow preventer

1. INSPECTION: Assure ENGINEER the backflow preventer system meets the Utah Safe Drinking Water Act.
2. BACKFILL: Install backfill material around valve box and compact to prevent settling.
3. COATING: Except machined surfaces, coat all items exposed to atmosphere with epoxy paint. Color to be selected by ENGINEER.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. INSTALLATION: Install per the plumbing code. It must not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.
6. TESTING Test the backflow preventer within 10 days of installation by a licensed backflow device tester and report results to ENGINEER.



ABOVE GROUND > 3 INCH



BELOW GROUND

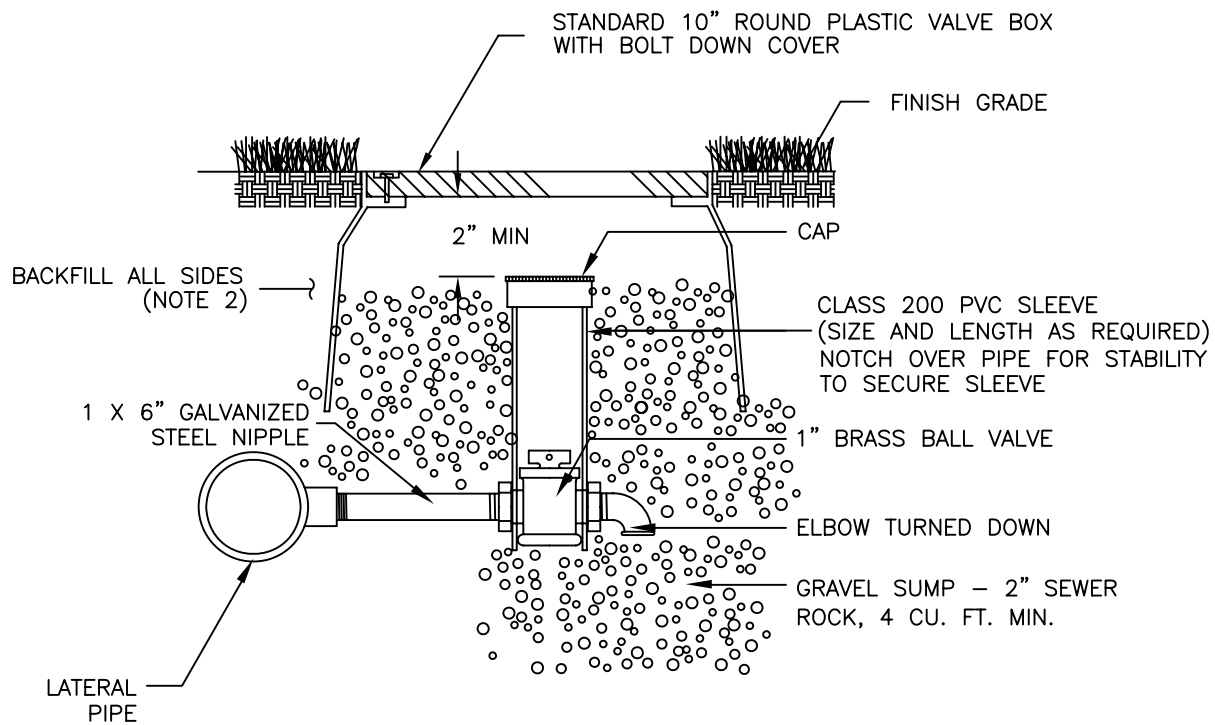
Backflow preventer

Plan No.

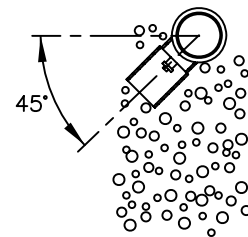
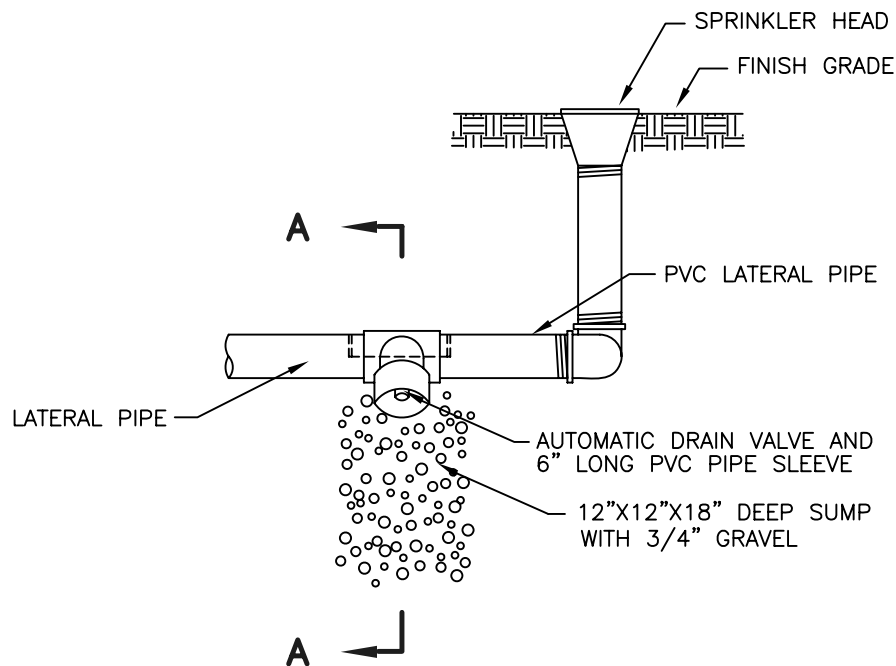
631

Drain valve

1. INSPECTION: Prior to backfilling around drain, secure inspection of drain installation by ENGINEER. System must be pressurized during inspection.
2. BACKFILL: Install backfill material around pipe and valve and compact to prevent settling.
3. PLACEMENT: Provide positive drainage in entire system. Do not install automatic drain valves on the end of lateral pipes. Install upstream of the last head or at a low point to obtain full drainage.
4. SALVAGE: Deliver salvaged valves to ENGINEER unless specified otherwise.
5. INSTALLATION: Locate all valves at all low points on circuit pipe.



TYPE A - MANUAL DRAIN VALVE



SECTION A-A

TYPE B - AUTOMATIC DRAIN VALVE

Drain valve

Plan No.

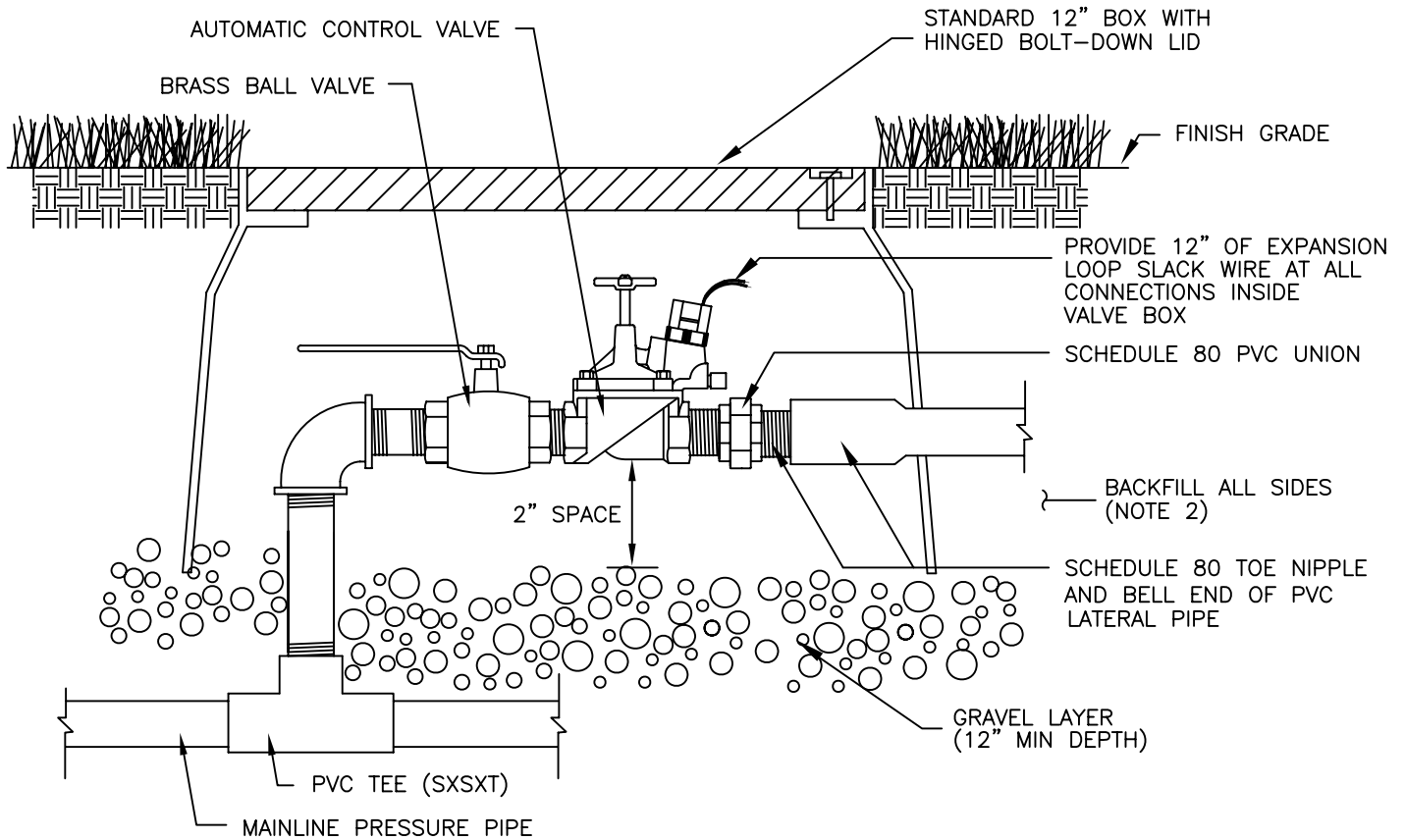
632

Control valve

1. INSPECTION: Prior to backfilling around valve box, secure inspection of installation by ENGINEER. System must be pressurized during inspection.
2. BACKFILL: Install backfill material around pipe and valve box and compact to prevent settling.
3. PLACEMENT: Install automatic controllers and wiring per manufacturer's recommendations.

NARRATIVE

USE SCHEDULE 80 THREADED PIPING



ELEVATION

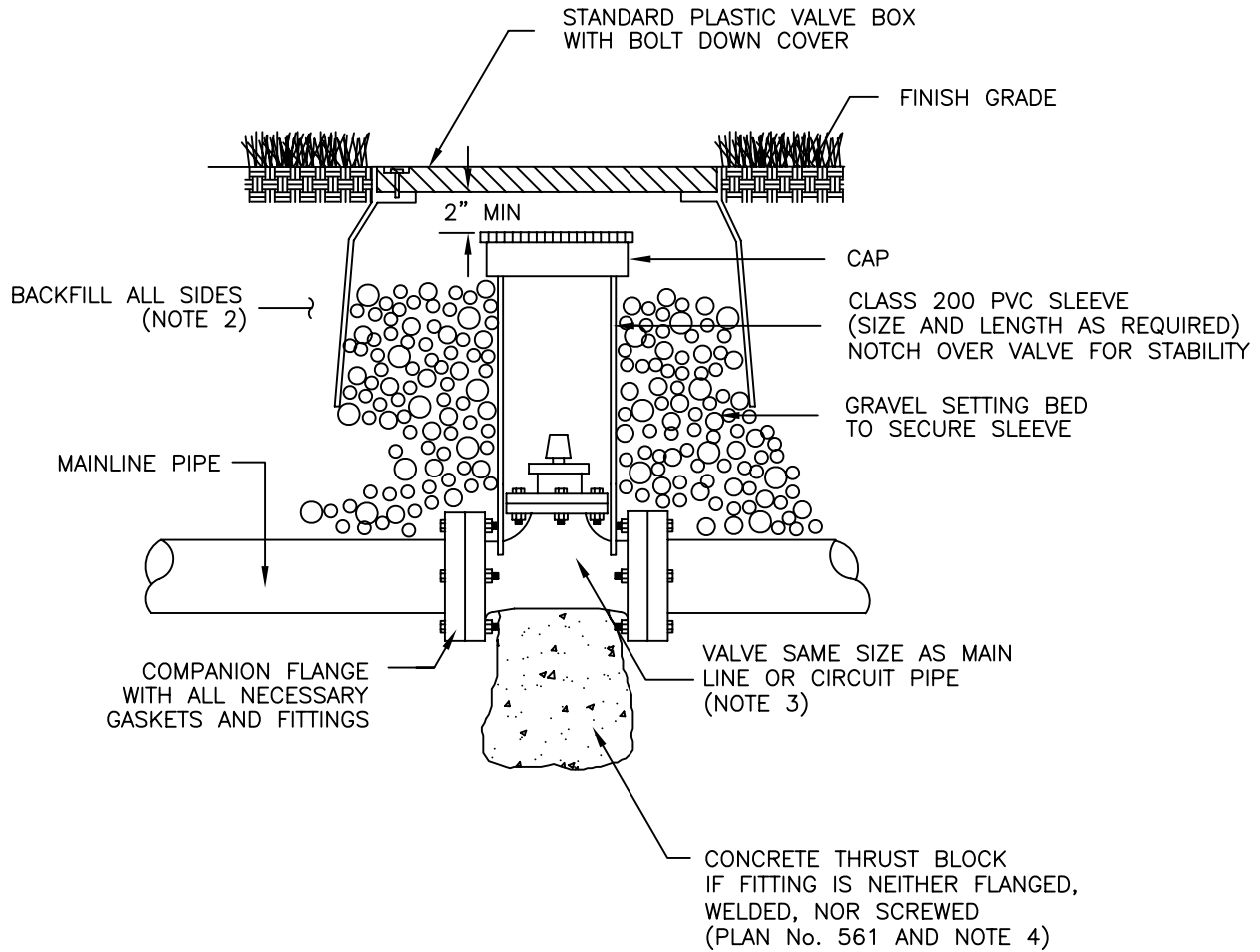
Control valve

Plan No.

633

Isolation shut-off valve

1. INSPECTION: Prior to backfilling around shut-off valve, secure inspection of valve installation by ENGINEER. System must be pressurized during inspection.
2. BACKFILL: Install backfill material around pipe and valve and compact to prevent settling.
3. GATE VALVE: Bronze, double disk wedge type with integral taper seats and non-rising stem.
4. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
5. SALVAGE: Return salvaged valves to ENGINEER unless specified otherwise.



SECTION

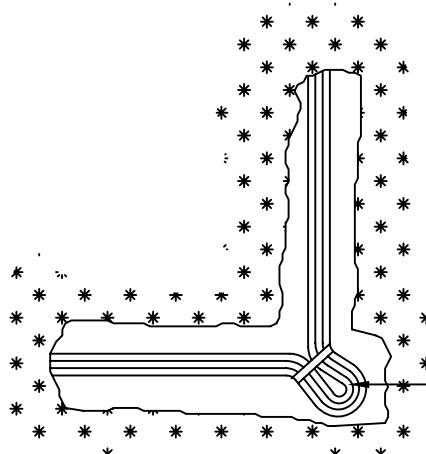
isolation shut-off valve

Plan No.

635

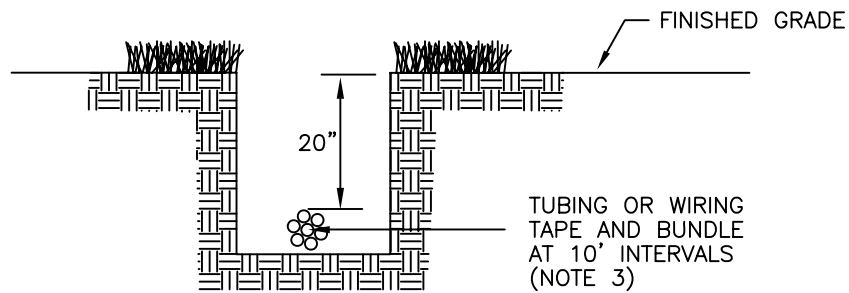
Wire runs for landscape irrigation

1. BACKFILL: Install and compact backfill material to prevent settling.
2. CIRCUIT PIPE: Where circuit pipe runs parallel to a pressure pipe, do not install over pressure pipe.
3. CONTROL WIRE: Use UF-UL listed copper control wire with PVC insulation for direct burial. Provide 12 inches of expansion loop wire at each valve and every 100 feet of wire length. Use waterproof wire connectors at all splices.

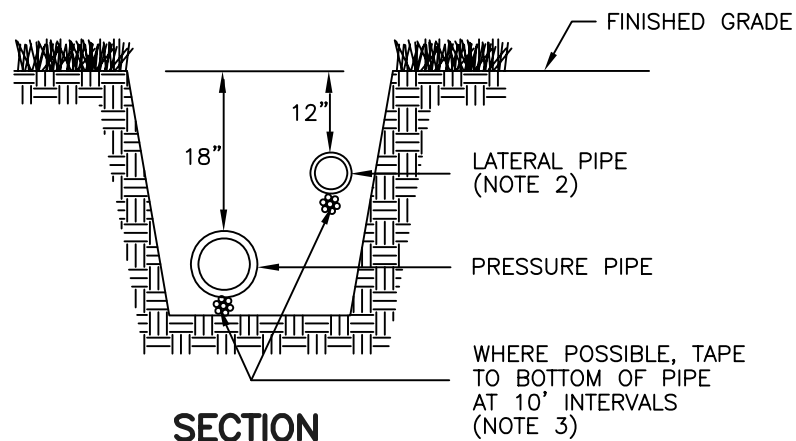


TIE A LOOSE 20" LOOP IN ALL WIRING AT CHANGES OF DIRECTION GREATER THAN 30 DEGREES. UNTIE ALL LOOPS AFTER CONNECTIONS HAVE BEEN MADE

PLAN VIEW



SECTION



SECTION

Tree

1. DEFINITIONS

- A. Large Tree: over 50 feet tall at maturity.
- B. Medium Tree: between 30 and 50 feet tall at maturity.
- C. Small Tree: up to 30 feet tall at maturity.
- D. Park Strip: area between the edge of road, (back of curb) and the sidewalk.
- E. Tree Size: average caliper diameter measured 6" above the root ball.

2. TREE SIZE FOR PARK STRIPS:

<u>Tree Size</u>	<u>Park Strip Width</u>
Large Tree	8 feet or larger
Medium Tree	5- feet or larger
Small tree	3 feet or larger

3. TREE LOCATIONS:

<u>Distance from</u>	<u>Distance</u>
Fire hydrant, water meter, utility box, residential driveway, alley, property line, mailbox, or building.....	10 feet
Non-traffic control signing (no parking, children at play, etc.).....	15 feet
Small tree, utility pole, light pole, or unregulated intersection.....	20 feet
Tree on private property	25 feet
Medium tree, commercial driveway, or traffic control signing	30 feet
Large tree, or intersection with traffic control lights	40 feet

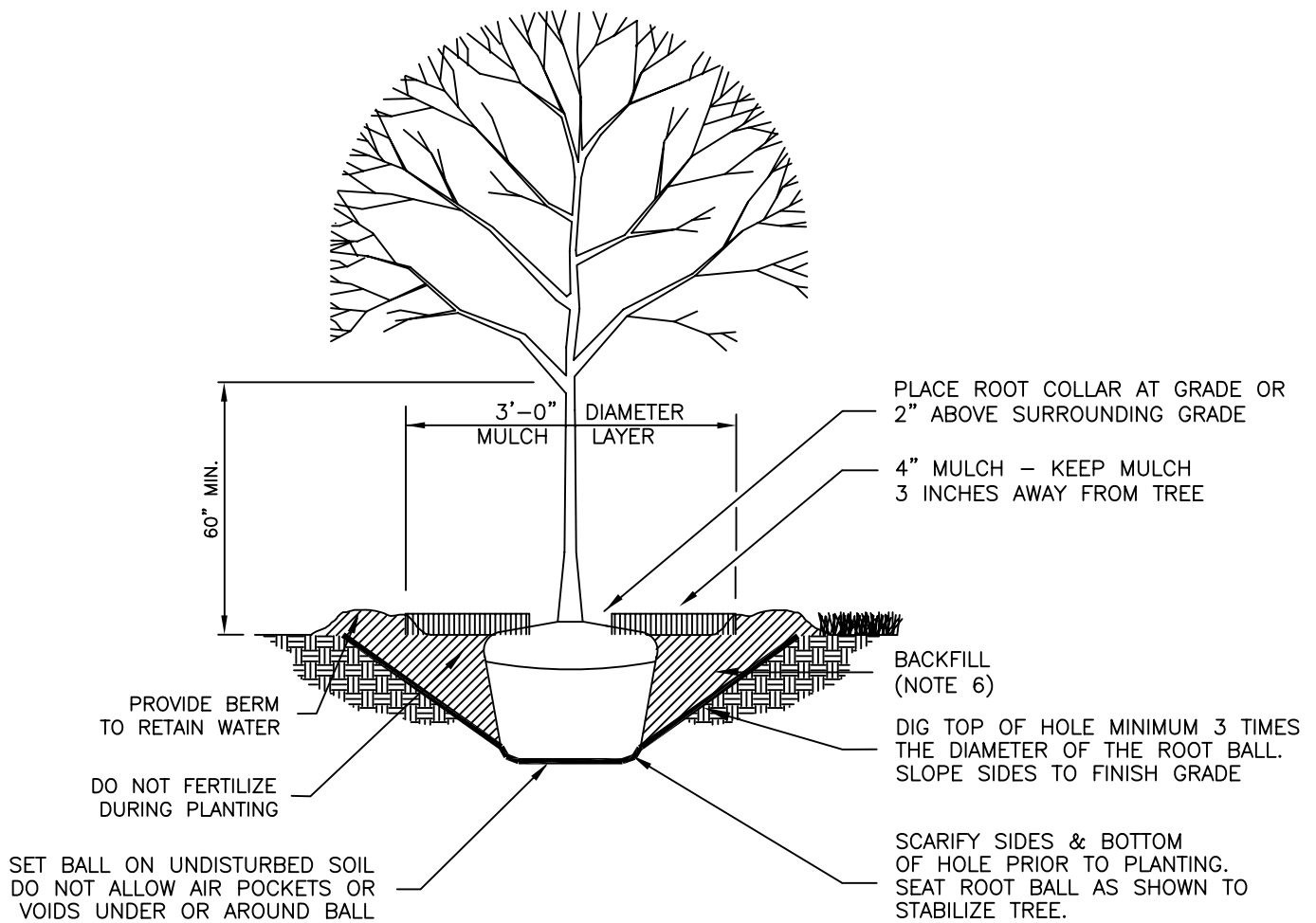
4. ROOT BALL:

- A. Prune circling roots, protruding root stubs, and fibrous matted roots flush with the root ball. Handle root ball with care. Minimize crumbling, cracking, and splitting.
- B. After placing the tree in the hole remove wire and burlap if stability of the root ball allows. If not, remove only the top one or two rows of wire and an equal amount of burlap. Leave no twine or burlap on or near the surface of the ball or around the trunk. Cut vertical slits in burlap that remains. Do not fold burlap into the hole.

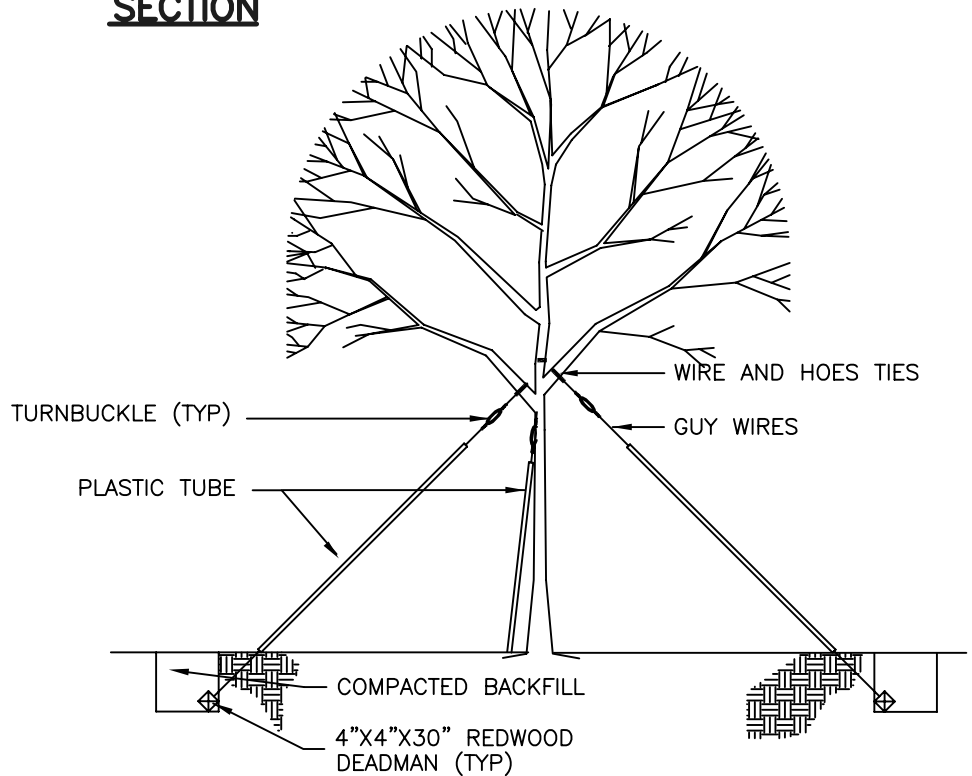
5. CONTAINERS: Slide root balls out of containers. Do not pull on the trunk. If is too large, cut the container off after the tree is placed in the planting site.

6. BACKFILL AND WATERING:

- A. Use soil removed from the hole as backfill. If soil is road base, mix with 1/3 organic mulch APWA Section 32 93 43. Mix thoroughly.
- B. Compact backfill in 6" layers. Water. Allow water to soak deeply into the soil. Make sure ball gets thoroughly wet.



SECTION



NOTICE

STAKING NOT PERMITTED EXCEPT IF AUTHORIZED IN WRITING BY ENGINEER

TYPICAL TREE STAKING DETAIL

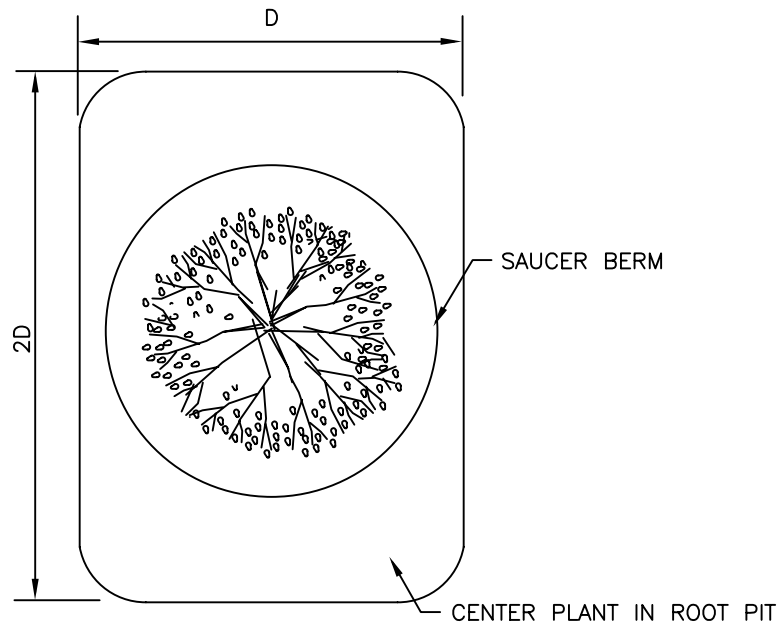
Tree

Plan No.

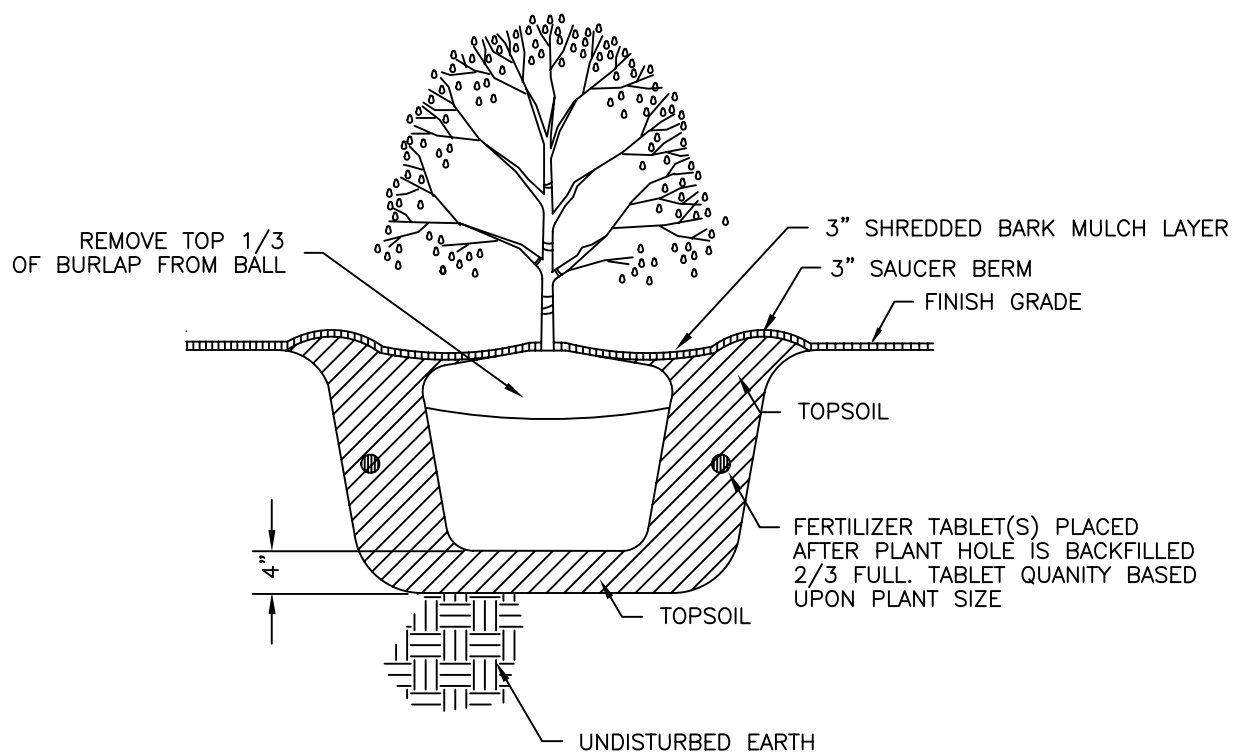
681

Shrubs and bushes

1. BACKFILL: Install and compact all backfill material to prevent settling
2. DEPTH OF PLANTING: Set shrubs and bushes at original depth.
3. FERTILIZER: Commercial fertilizer per FS O-F-241, uniform in composition.
4. ACCESSORIES: Wood or wood cellulose fiber free of growth or germination inhibiting ingredients.



PLAN



SECTION

Shrubs and bushes

Plan No.

683

PART 7

COMMUNICATIONS, LIGHTING, TRAFFIC CONTROL, POWER

COMMUNICATIONS

LIGHTING

Street Lighting

Plan 710	Riser.....	287
730	Collar for street light pole.....	289
731	Pull box	291
732	Trench for street light conduit.....	293
733	Joint use trench – street lighting.....	297
736	Street light pole terminal	299
737	Street light meter pedestal.....	301
741	Screw-in base street light pole	303
742	Direct burial street light pole	305

TRAFFIC CONTROL

Light Pole Standards

751	Signal pole foundation	307
752	Signal pole wiring.....	309

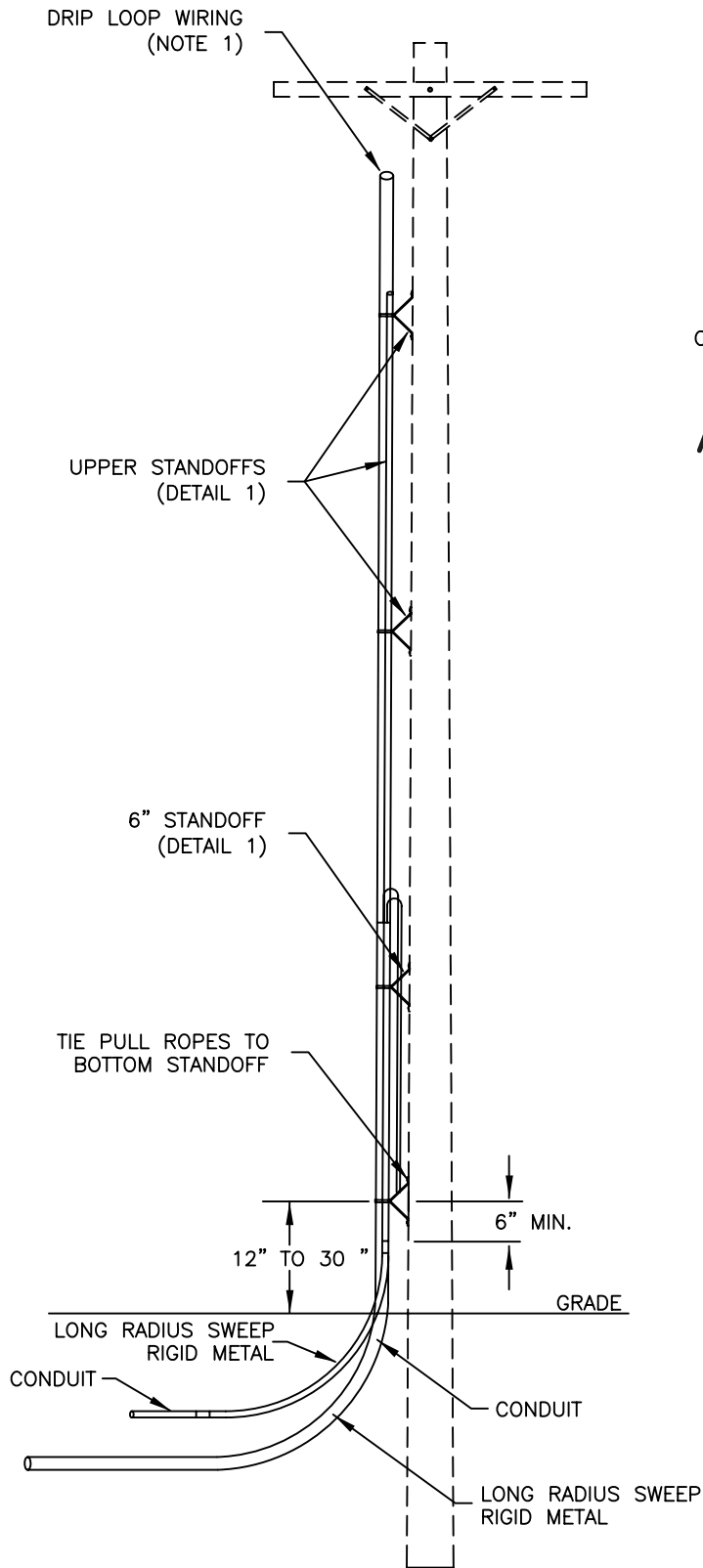
Speed Humps

761	Speed Bump.....	311
762	Speed Table	313

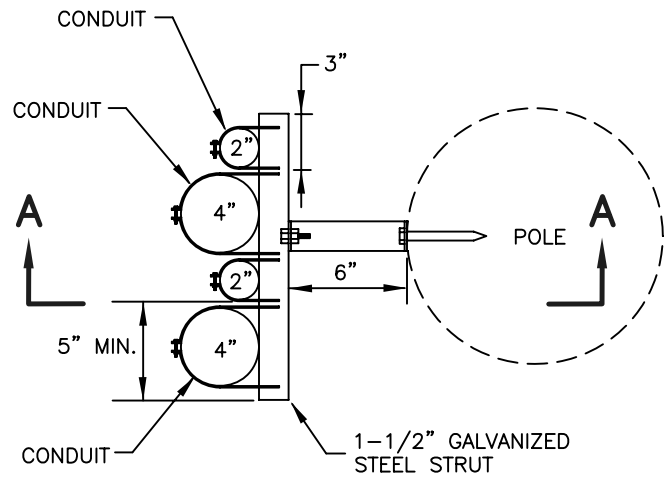
POWER

Riser

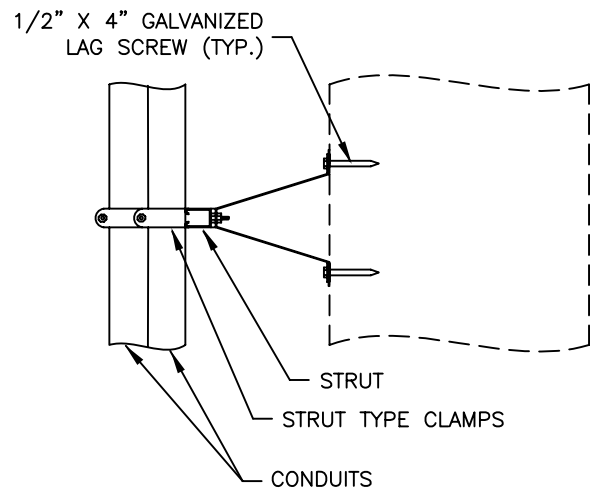
1. CONDUIT: Galvanized.
2. ACCESSORIES: Galvanized steel bolts, nuts, washers, nails, etc., APWA Section 05 05 23
3. DRIP LOOP WIRING: For risers where CONTRACTOR is required to pull low voltage cable, (120/140 volt, 3 or 4 wires) extend enough wire from the conduit so OWNER can attach it to the 2' drip loop.



ELEVATION



PLAN



SECTION A-A

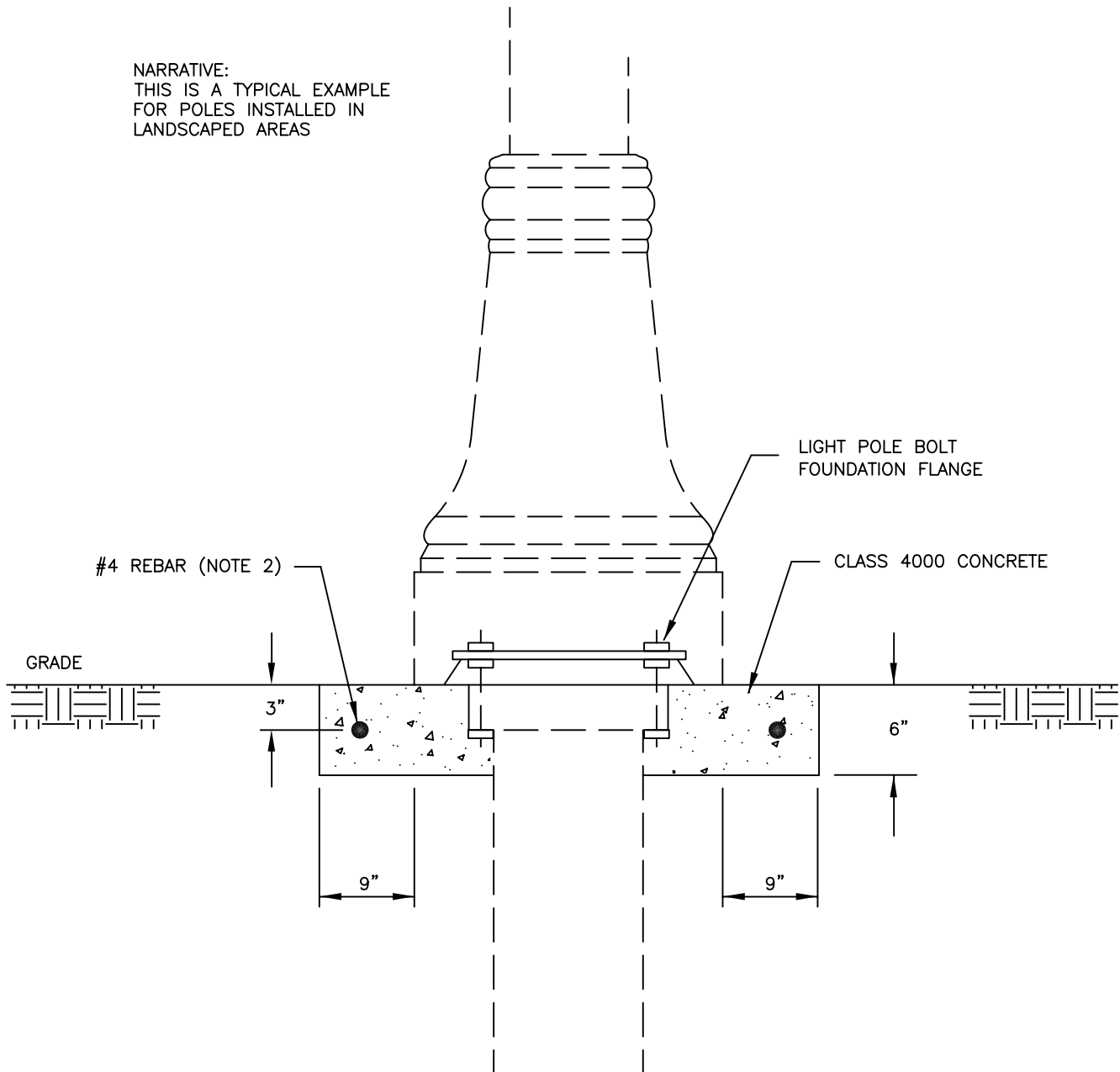
DETAIL 1

NARRATIVE:
THIS IS A TYPICAL EXAMPLE.
INSTALLATION VARIES ACCORDING
TO THE SERVICE PROVIDED

Collar for street light pole

1. BACKFILL: 95 percent or greater density.
2. REINFORCEMENT: ASTM A 615, grade 60, hoop steel.

NARRATIVE:
THIS IS A TYPICAL EXAMPLE
FOR POLES INSTALLED IN
LANDSCAPED AREAS



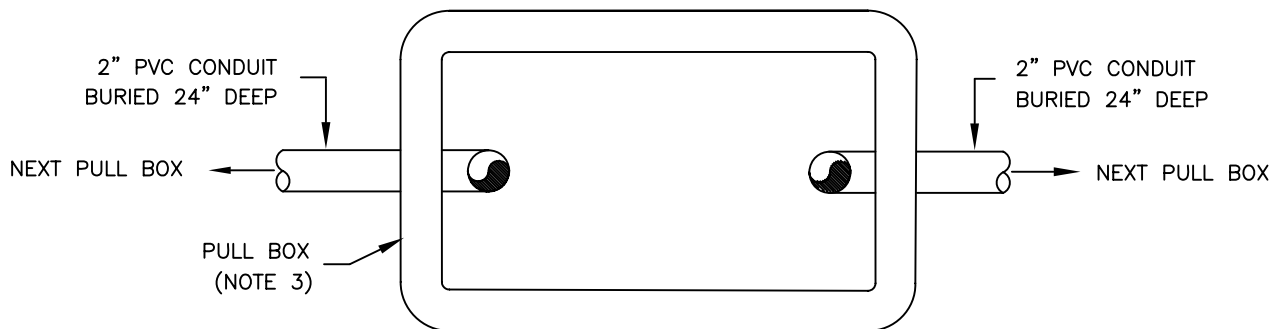
Collar for street light pole

Plan No.

730

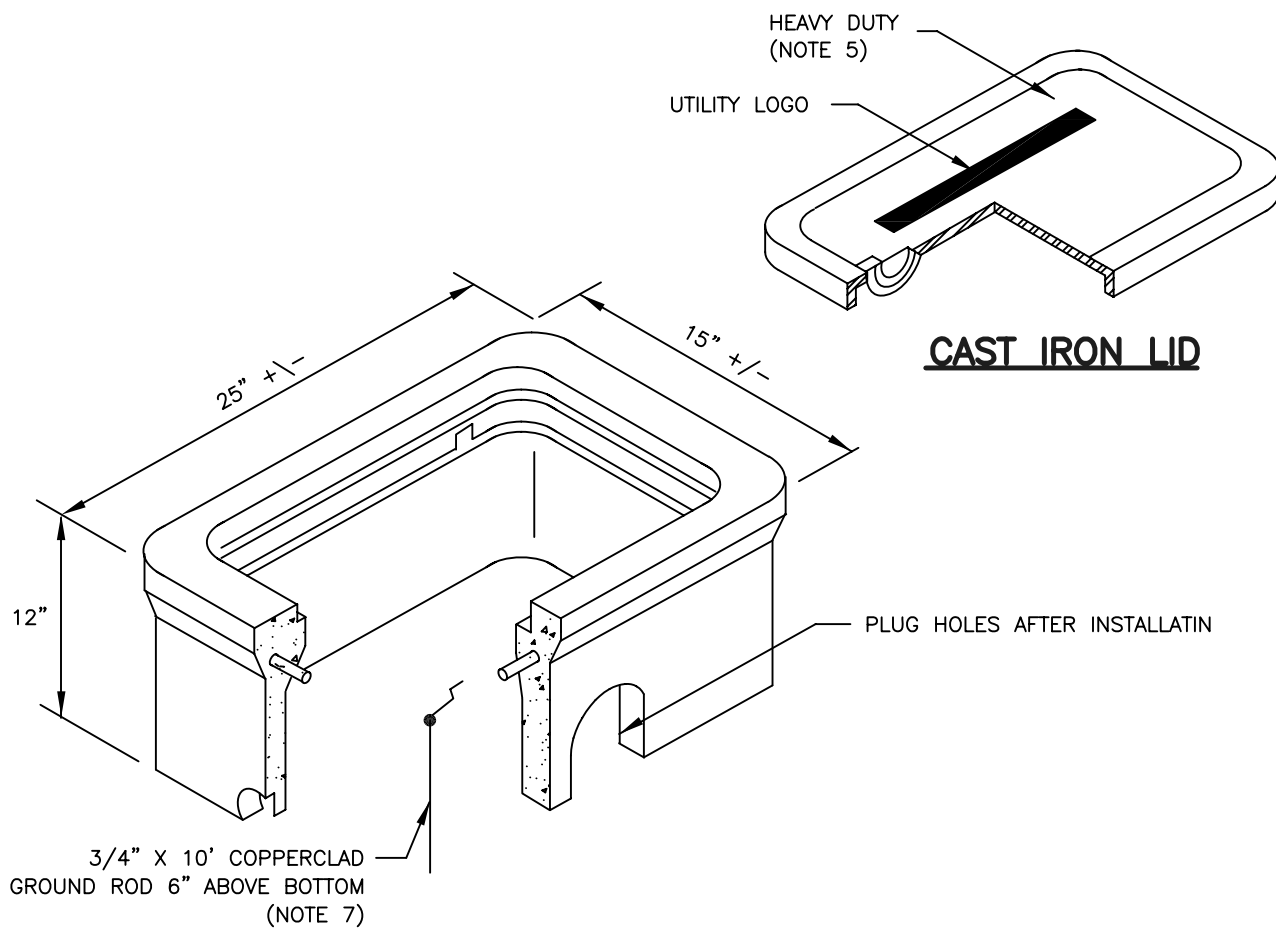
Pull box

1. BACKFILL: 95 percent or greater density.
2. REINFORCEMENT: ASTM A 615, grade 60, steel.
3. CONCRETE: Class 4000 per APWA Section 03 30 04.
4. COATINGS: Coat all metal parts with asphaltum paint.
5. CASTING: ASTM A 48, grey iron, class 20 minimum.
6. ACCESSORIES: Stainless steel bolts, nuts, washers, etc., APWA Section 05 05 23
7. GROUND: Use exothermic weld connections



INSTALL 200 # PULL CORD IN EACH
EMPTY CONDUIT AND LABEL

PLAN



OBLIQUE

Pull box

Plan No.

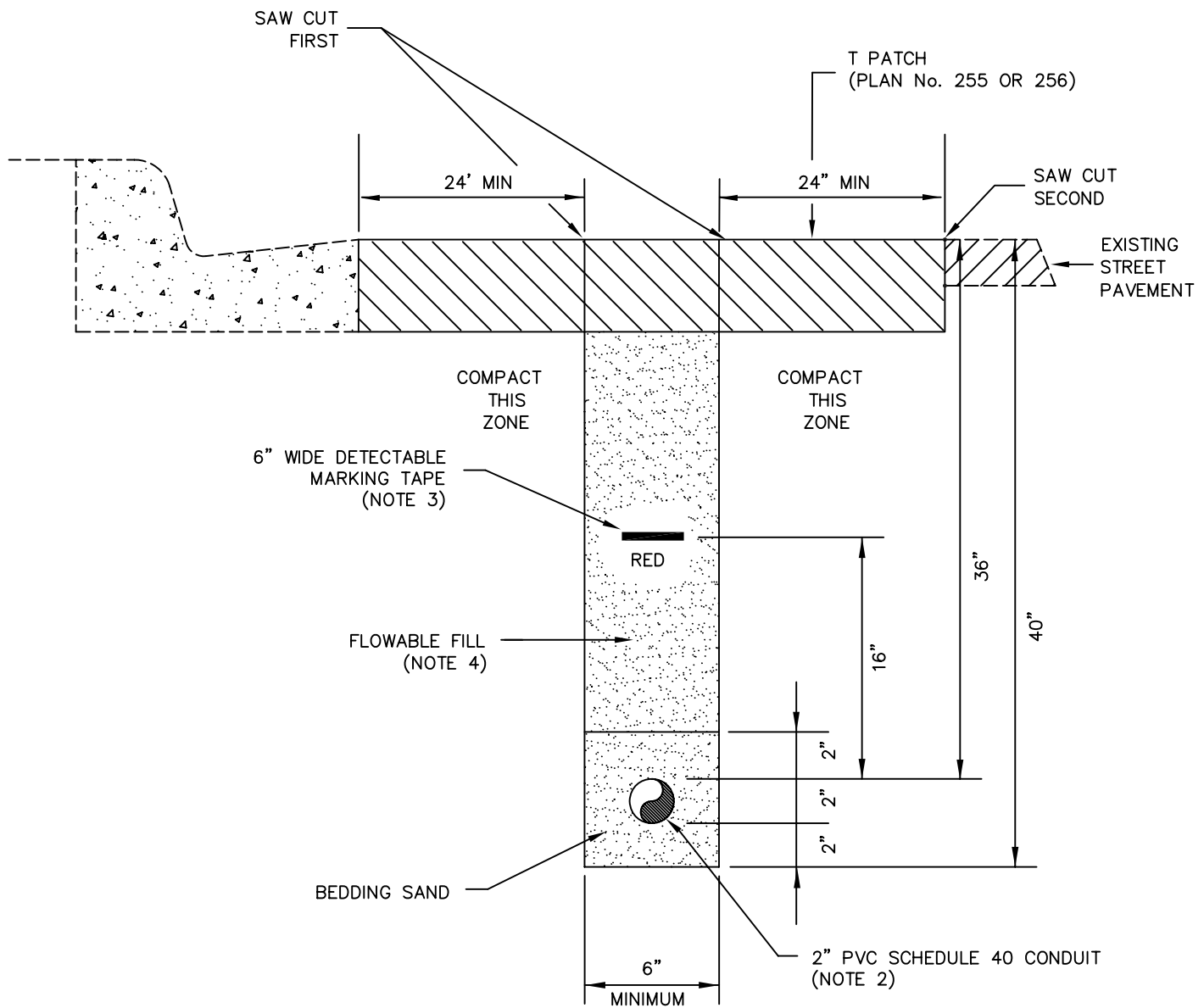
731

Trench for street light conduit

1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.
2. DETECTABLE MARKING TAPE: Permanent, red bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read "**CAUTION: BURIED INSTALLATION BELOW**".

Trench for street light conduit

1. **ADDITIONAL PAVEMENT REMOVAL:** Additional pavement removal to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement is required if such street feature is within 2 feet of the second saw-cut.
2. **PVC CONDUIT:** APWA Section 33 05 07.
3. **IDENTIFICATION TAPE:** Permanent, red bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read “**CAUTION: BURIED INSTALLATION BELOW**”.
4. **FLOWABLE FILL:** Provide 20 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use a fill that flows easily and vibration is not required. Use flowable fill in excavations that are too narrow to receive compaction equipment. Before placing aggregate or pavement, cure to initial set.
5. **TACK COAT:** Full coverage on all vertical surfaces and surface of concrete substrate.
6. **ASPHALT PAVEMENT RESTORATION:** Use asphalt concrete specified in APWA Section 33 05 25.
 - A. Match existing thickness plus 1 inch but not less than 4 inches.
 - B. Install in lifts no greater than 3 inches after compaction. Compact each lift to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.
 - C. If asphalt pavement is substituted for concrete substrate, omit rebar and provide 1.25 inches of pavement for each 1 inch of substrate.
7. **CONCRETE PAVEMENT RESTORATION:** Class 4000 per APWA Section 03 30 04.
 - A. Match existing concrete thickness.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
8. **PATCH REPAIR:** Repair patch if any of the following conditions within the patch occur.
 - A. Pavement surface distortion exceeds 1/4 inch deviation in 10 feet. Repair option: Plane off surface distortions. Coat asphalt planed surfaces with a cationic or anionic emulsion. Coat concrete planed surfaces with a water repellant product that complies with APWA Section 07 19 00.
 - B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
 - C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay



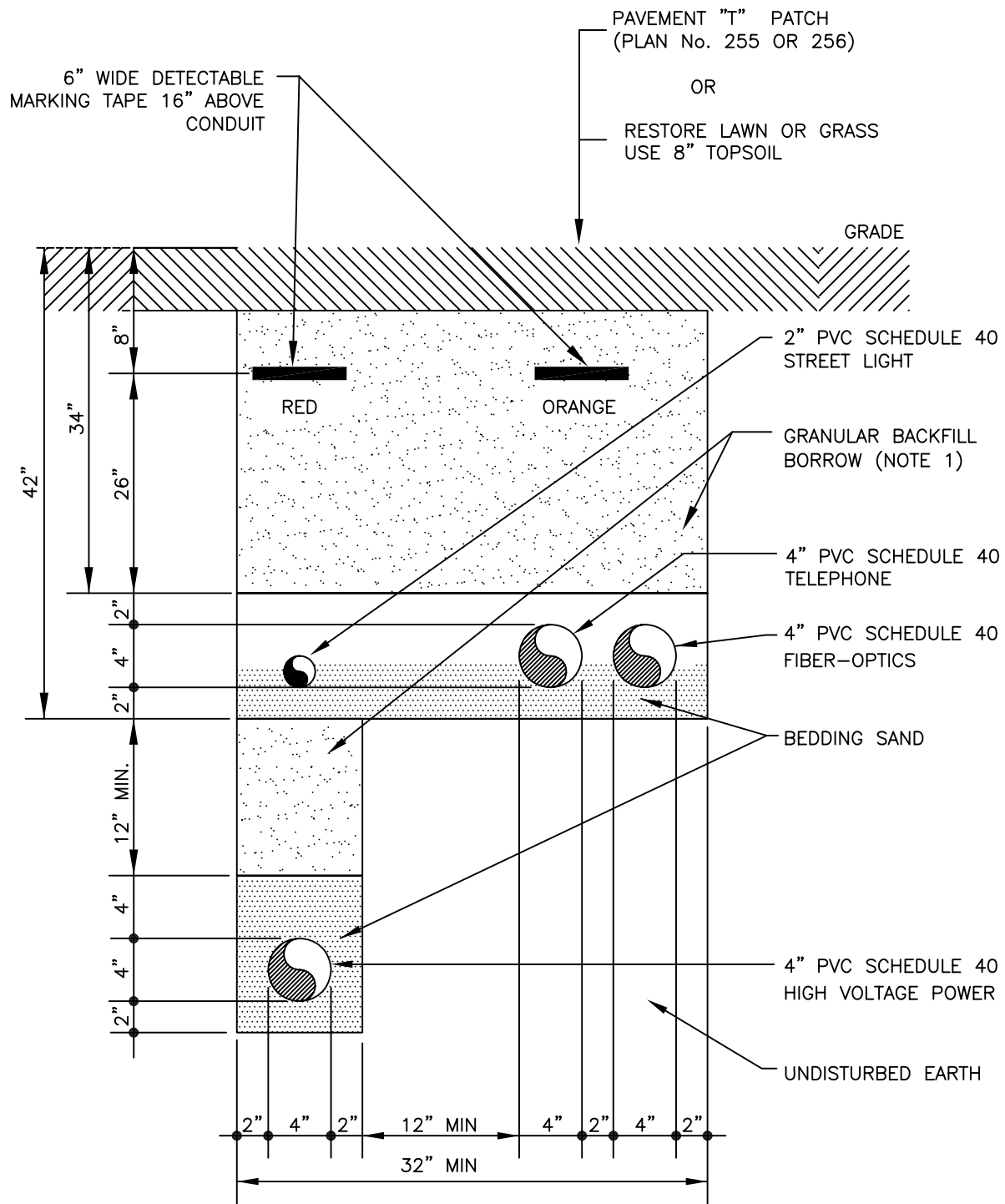
Trench for street light conduit

Plan No.

732

Joint use trench – street lighting

1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.
2. PVC CONDUIT: APWA Section 33 05 07.
3. IDENTIFICATION TAPE: Permanent, red or orange bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read “**CAUTION: BURIED INSTALLATION BELOW**”.



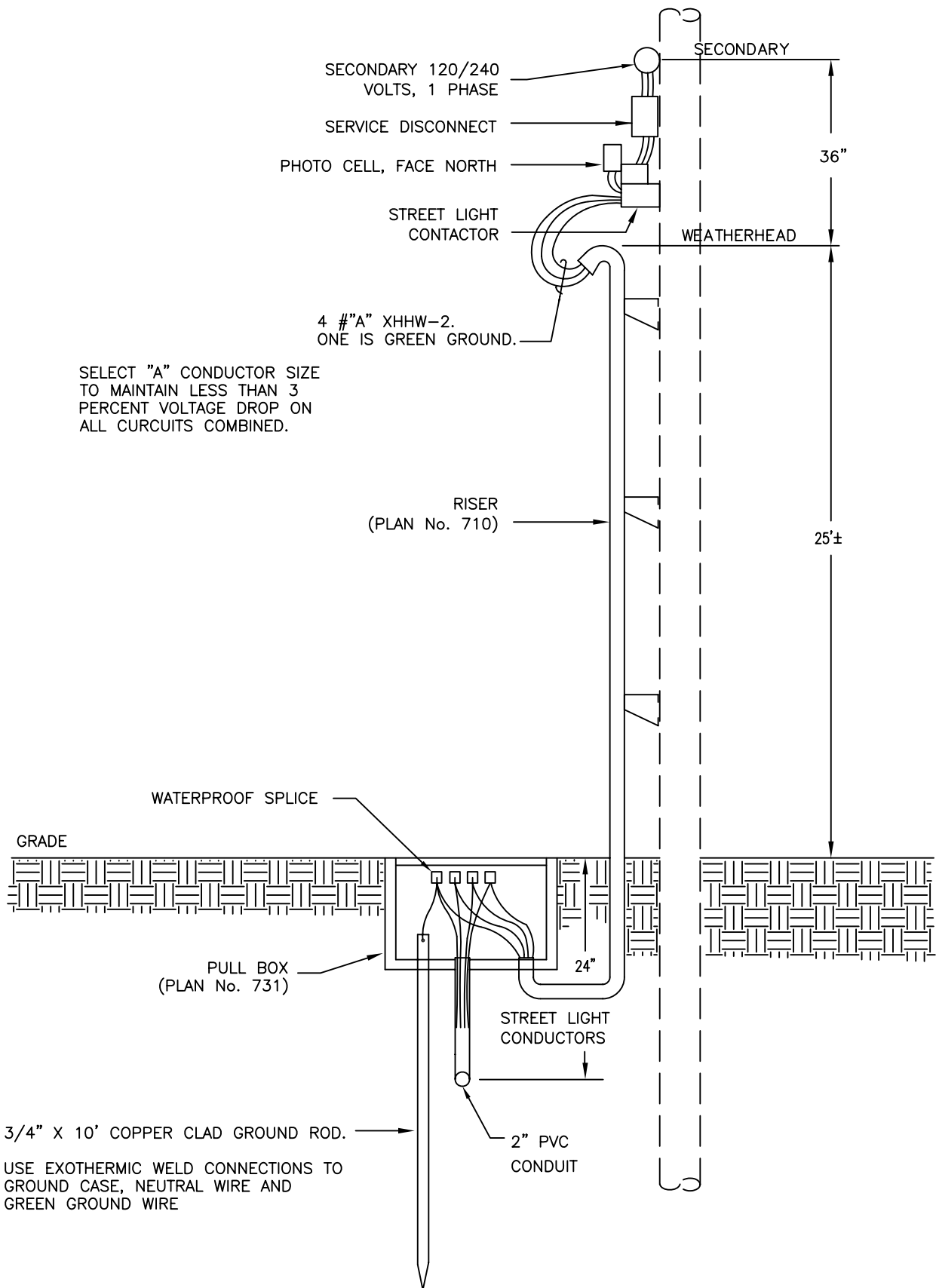
Joint use trench - street lighting

Plan No.

733

Street light pole terminal

1. SERVICE DISCONNECT: APWA Section 26 13 13.
2. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23
3. CONDUIT: Galvanized.



SELECT "A" CONDUCTOR SIZE
TO MAINTAIN LESS THAN 3
PERCENT VOLTAGE DROP ON
ALL CURCUITS COMBINED.

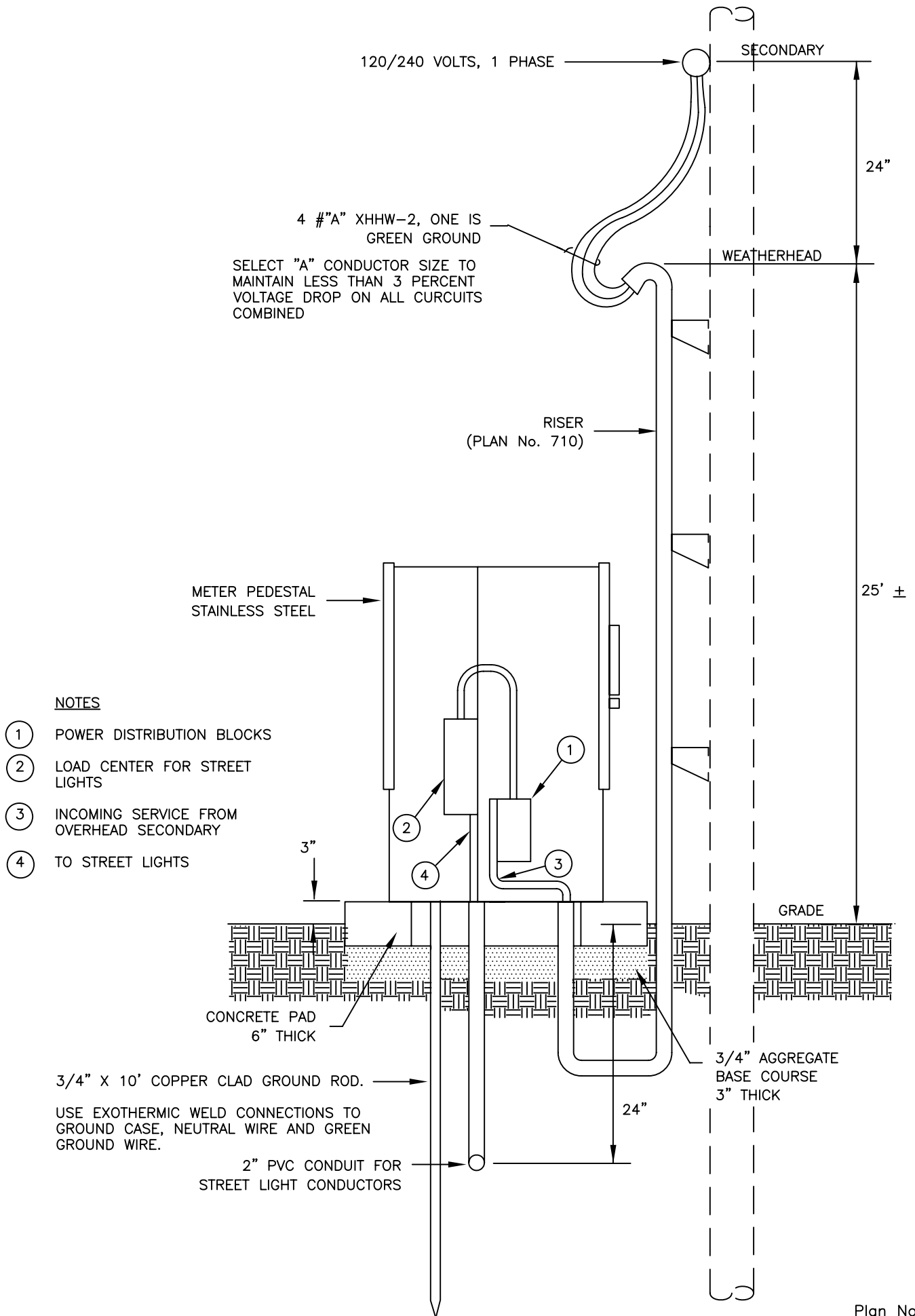
Street light pole terminal

Plan No.

736

Street light meter pedestal

1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
3. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23
4. CONDUIT: Galvanized



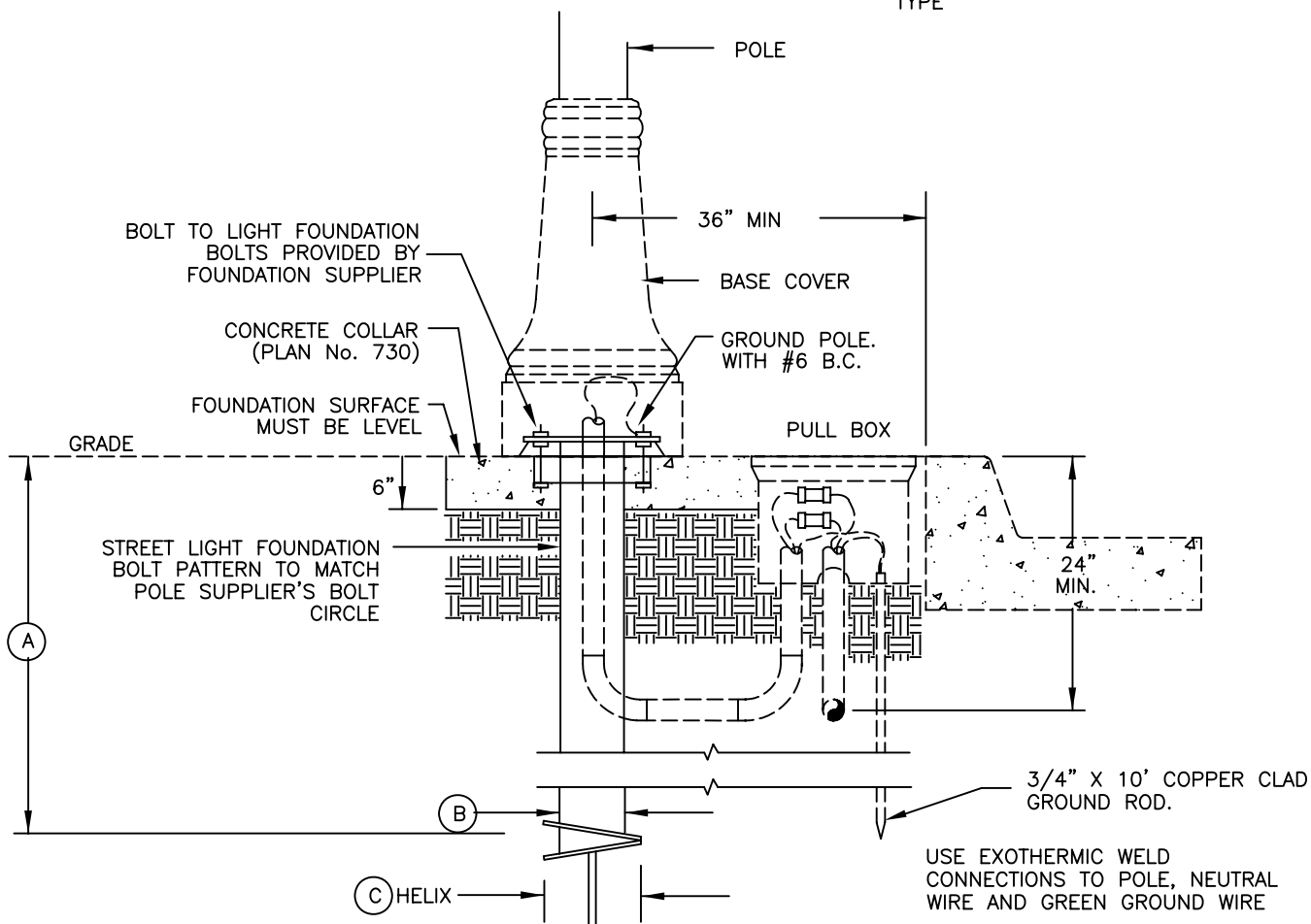
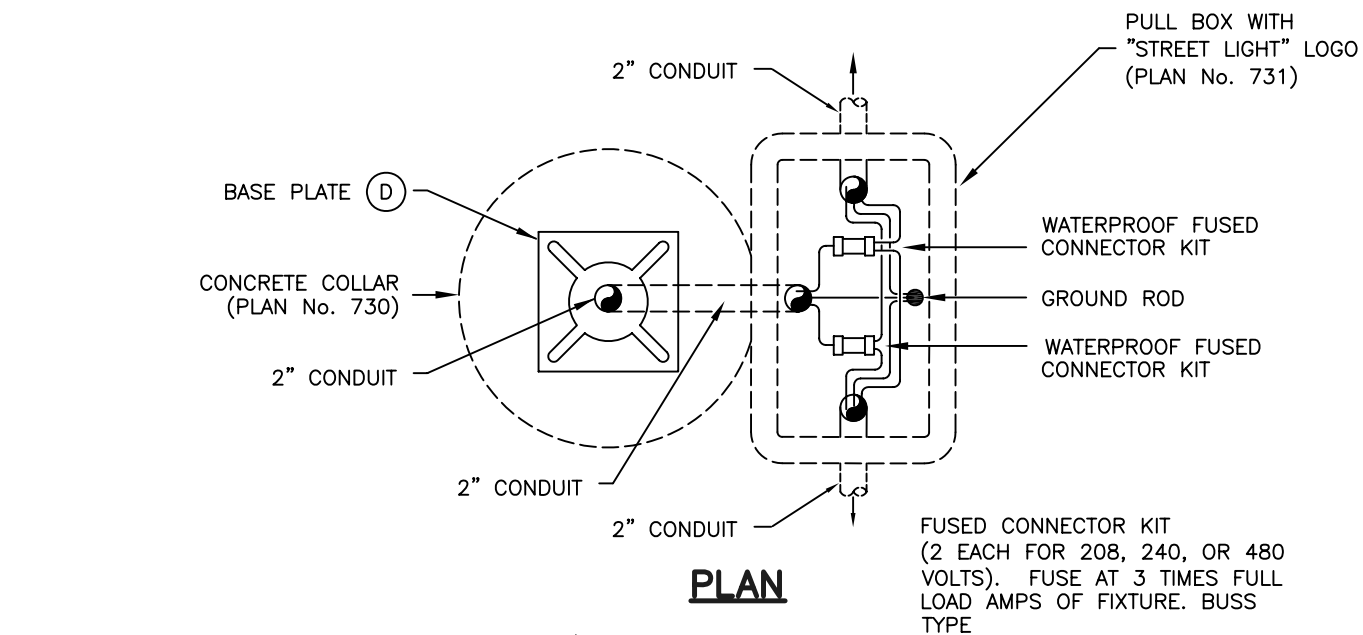
Street light meter pedestal

Plan No.

737

Screw-in base street light pole

1. CONCRETE: Class 4000 per APWA Section 03 30 04.
2. CONDUIT: Galvanized.
3. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23
4. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13.
5. GROUND COVER: APWA Section 32 93 13.
6. SCREW-IN BASE: Material and dimensions to meet or exceed manufacturer's recommendations.



POLE SIZE	LENGTH (A)	SHAFT (B)	HELIX (C)	PLATE (D)
8'-15'	60"	6.6"	12"	3/4"x12" SQ
16'-20'	60"	6.6"	12"	1"x15-3/4" SQ
21'-30'	84"	8.6"	14"	1"x15-3/4" SQ

Screw-in base street light pole

Plan No.
741

Direct burial street light pole

1. CONCRETE: Class 4000 per APWA Section 03 30 04.
2. REINFORCEMENT: ASTM A 615, grade 60, steel.
3. CONDUIT: Galvanized.
4. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23
5. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13.
6. GROUND COVER: APWA Section 32 93 13.

Signal pole foundation

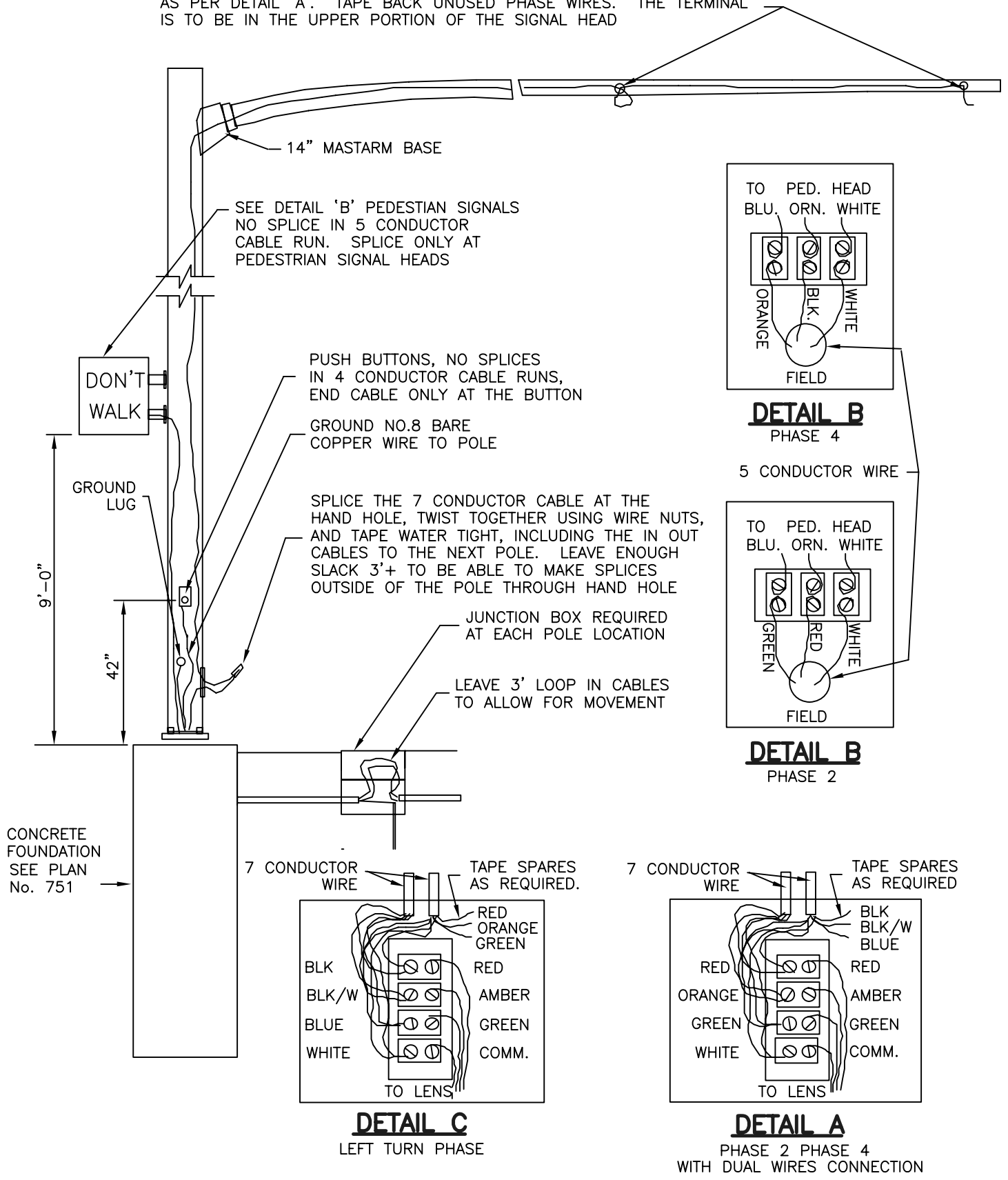
1. BACKFILL: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.
3. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
4. ANCHOR BOLTS: When footing is located in an area to be paved, the top of the footing is to be placed 4 inches below grade with bolts extending 11 1/2 inches above top of footing to accommodate paving surface.

Signal pole wiring

1. MAST ARMS: Connect mast arms as shown on the drawings.
2. SPLICES: Make splices in pole base hand holes, not in pull boxes.
3. PEDESTRIAN SIGNAL CABLE: Run pedestrian signal cable from pedestrian head to pedestrian head or cabinet. Make no splices except in the signal mounting or head.
4. CONNECTIONS: Use terminal lugs to make all cabinet connections and all signal (vehicle and pedestrian) connections.
5. CONTROL CABLES: Provide cables meeting IMSA 19-1*.
6. DETECTOR CABLES: Provide 2 conductor shielded 14 AWG stranded lead in cable. Loop to be wired with type 14 AWG THHN stranded, PVC/ nylon jacket cable. Lead in cable to be IMSA 50-2, 2 conductor, twisted pair with shield and drain, black polyethylene.
7. COMMUNICATION CABLE: Provide type BJFA, 12 pair per specification RE-PE-39, 19 AWG, solid gel filled, shielded. IMSA 19-1 with PVC jacket.
8. WIRING CODE: As follows.
 - 7 Conductor #14 - vehicular signal
 - red ϕ through phase red
 - orange ϕ through phase amber
 - green ϕ through phase green
 - black ϕ left turn red or spare
 - black/white ϕ through phase amber
 - green ϕ through phase green
 - black ϕ left turn red or spare
 - 5 Conductor #14 - pedestrian signal
 - black ϕ side street DON'T
 - orange ϕ side street WALK
 - red ϕ artery DON'T
 - green ϕ artery WALK
 - white common
 - 4 Conductor #18 - pedestrian detection
 - black ϕ phase 4 and/or 8
 - white logic
 - red ϕ phase 2 and/or 6
 - green logic
 - 2 Conductor #18 - loop runs
 - white designated ϕ loop runs
 - black logic

* IMSA = International Municipal Signal Association

PULL LENGTH AT EACH SIGNAL HEAD IS TO BE 3 FEET MINIMUM AND HAVE A 1 FOOT DRIP LOOP. SPLICE 7 CONDUCTOR IN SIGNAL HEAD AS PER DETAIL 'A'. TAPE BACK UNUSED PHASE WIRES. THE TERMINAL IS TO BE IN THE UPPER PORTION OF THE SIGNAL HEAD



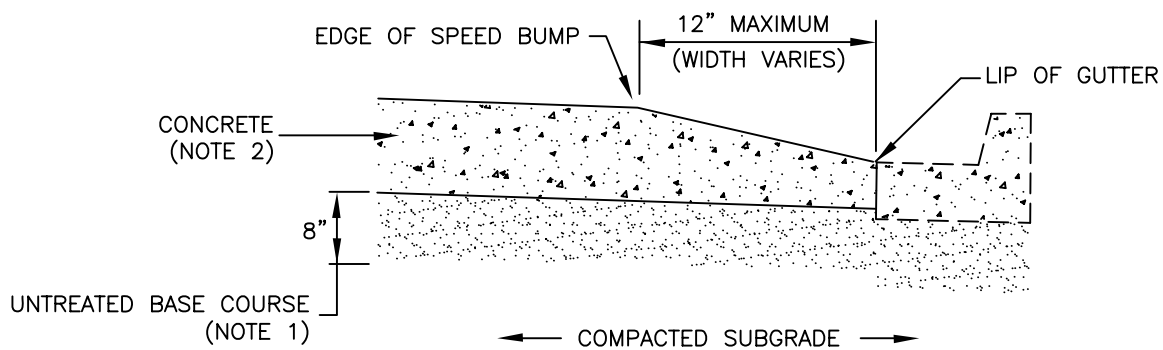
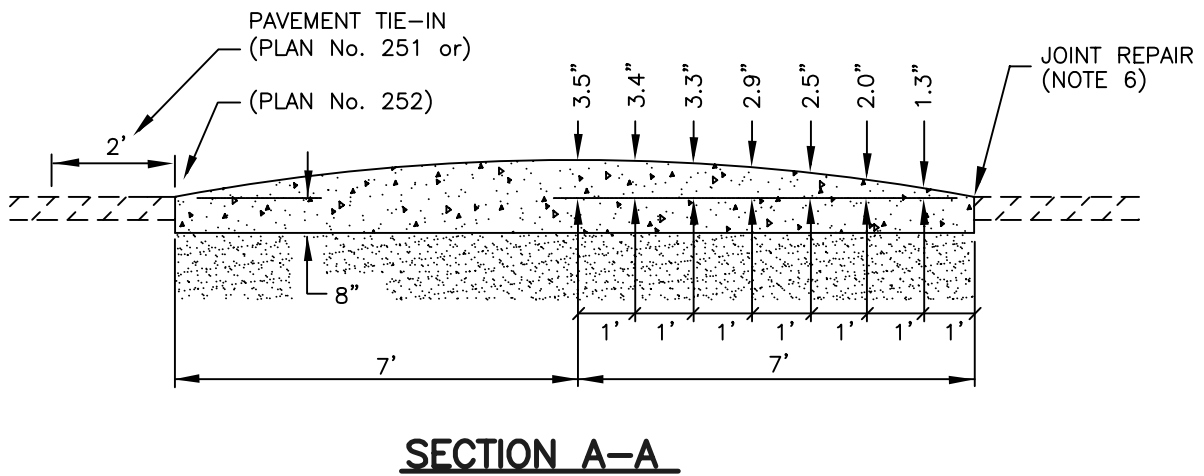
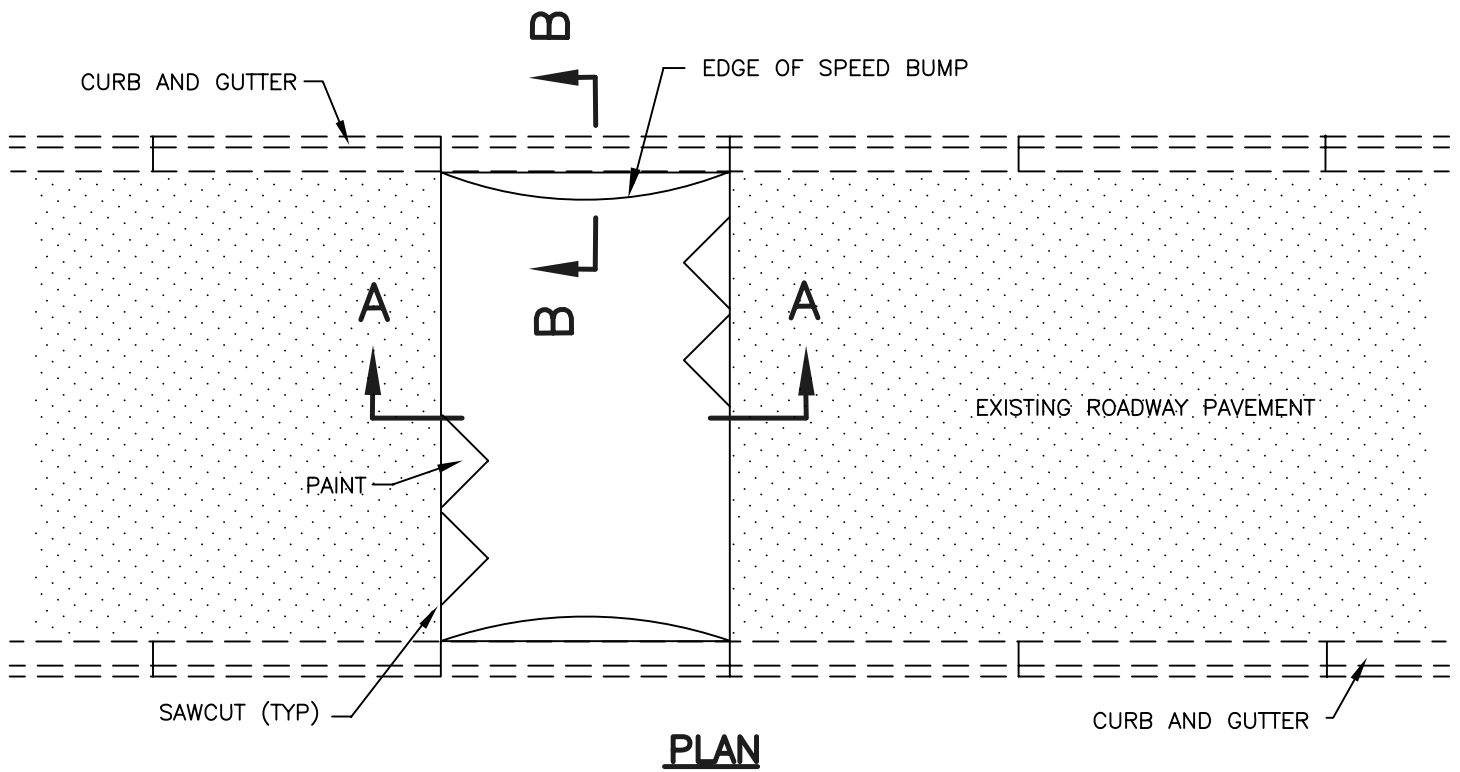
Signal pole wiring

Plan No.

752

Speed bump

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINTS:
 - A. Make expansion joints vertical, full depth.
 - B. Provide F1 joint filler material 1/2 inch wide, APWA Section 32 13 73.
 - C. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical 1/8 inch wide and 1/3 slab thickness.
5. FINISH: Broomed.
6. JOINT REPAIR: If a crack occurs at the connection to existing pavement, seal the crack per APWA Section 32 01 17.

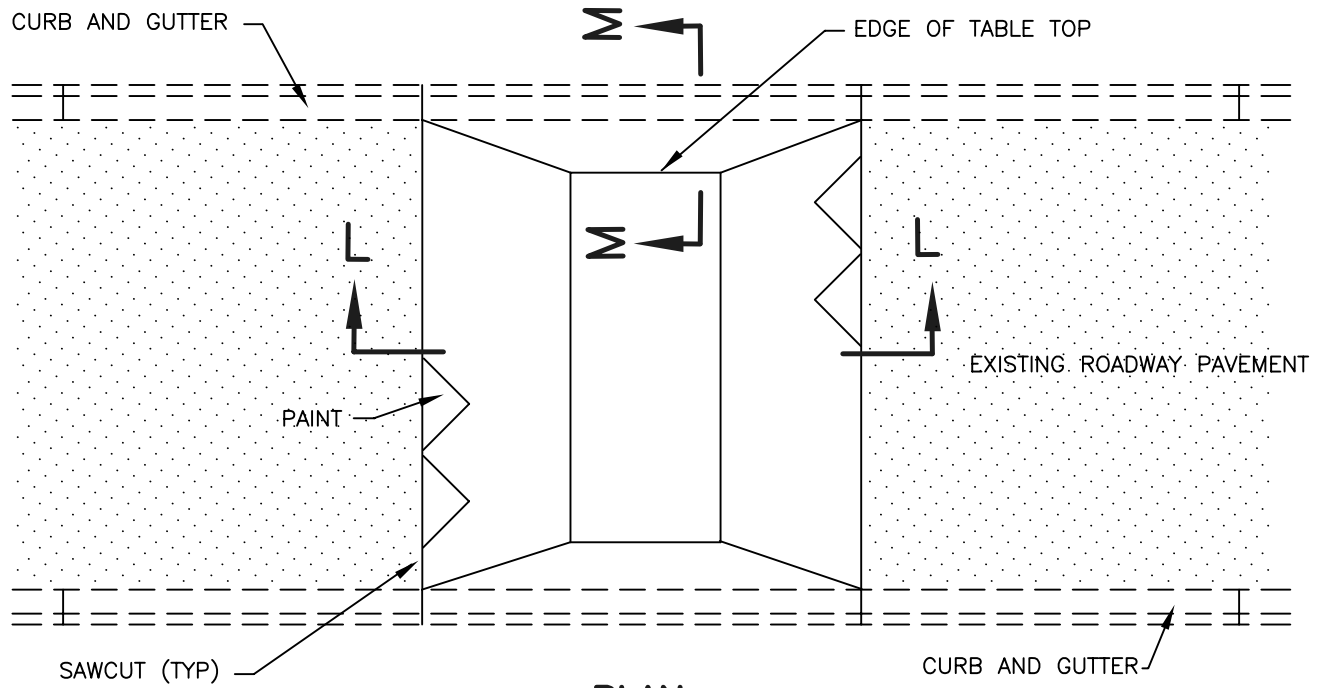


Speed bump

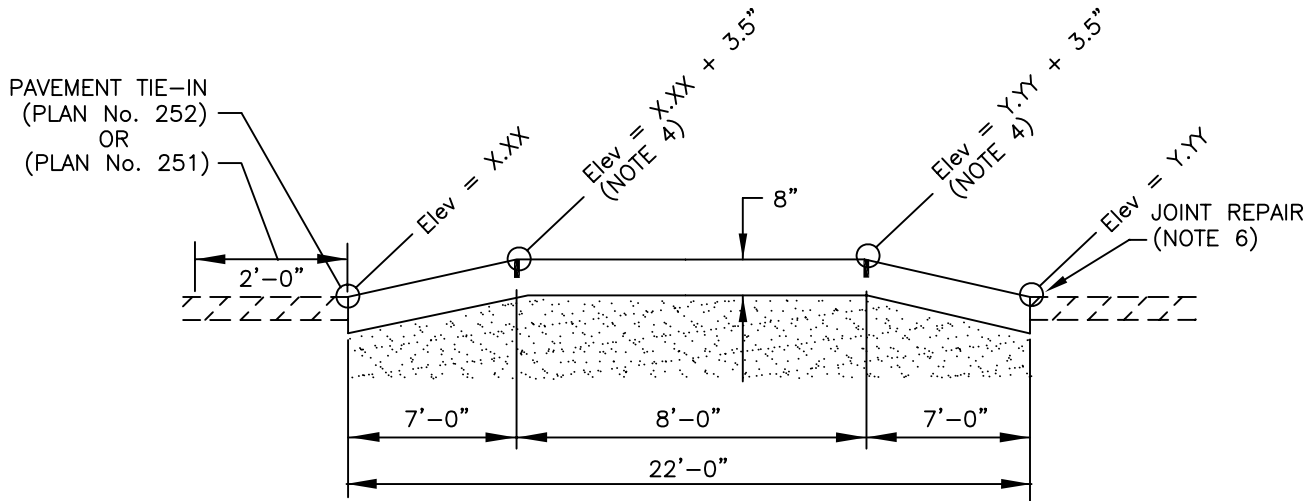
Plan No.
761

Speed table

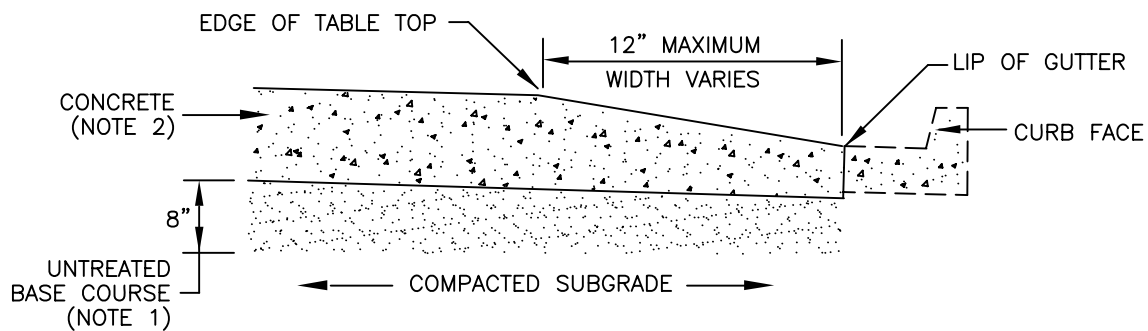
1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
 - B. Place material per APWA Section 31 23 23.
 - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per APWA Section 03 30 10.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.
3. EXPANSION JOINTS:
 - A. Make expansion joints vertical, full depth.
 - B. Provide F1 joint filler material 1/2 inch wide, APWA Section 32 13 73.
 - C. Set top of filler flush with surface of concrete.
4. CONTRACTION JOINT: Make contraction joints vertical 1/8 inch wide and 1/3 slab thickness.
5. FINISH: Broomed.
6. JOINT REPAIR: If a crack occurs at the connection to existing pavement, seal the crack per APWA Section 32 01 17.



PLAN



SECTION L-L



SECTION M-M

Speed table

Plan No.

762

PART 8

GENERAL

Design Standards

Plan 805	Design vehicle	317
----------	----------------------	-----

Security Fencing

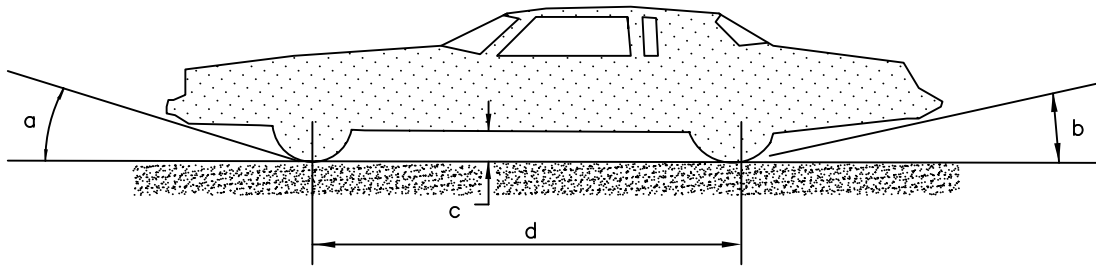
Plan 831	Chain link fence	321
----------	------------------------	-----

Miscellaneous

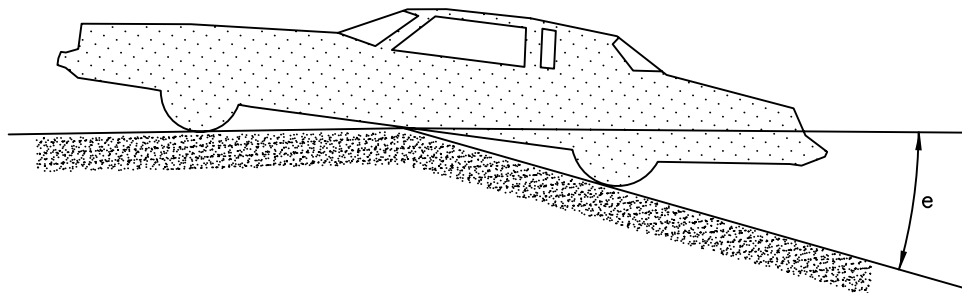
Plan 880	Bus stop pad	323
----------	--------------------	-----

Design vehicle – type A

1. NARRATIVE: The angles shown on the drawing represent maximum slopes when constructing driveway approaches. Use the following rules when Plan No.'s 215, 221, 225, or 229 cannot be used to construct driveway approaches.
 - A. Slope of driveway approach from gutter to front edge of sidewalk should not exceed 20 percent.
 - B. Slope of driveway beyond the property line should not exceed 16 percent.
 - C. For access for commercial vehicles see drawing No. 2.



VERTICAL SAG ANGLES



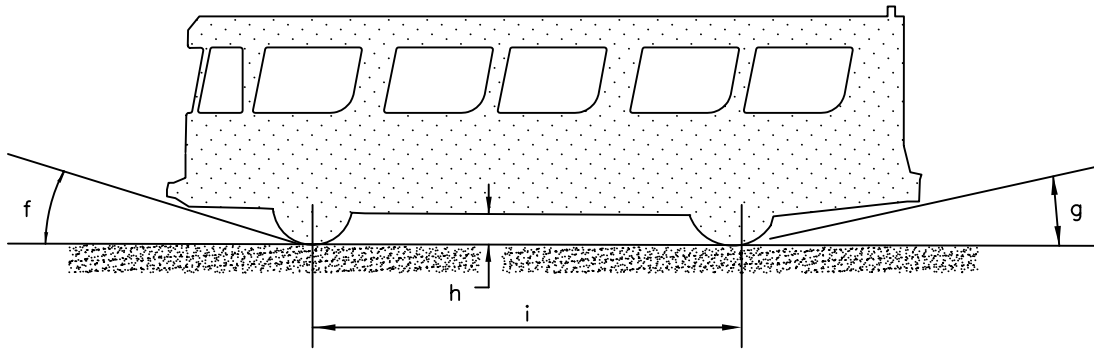
VERTICAL CREST ANGLE

- a = MAXIMUM APPROACH ANGLE = $20.2^\circ = 36.8\%$
- b = MAXIMUM DEPARTURE ANGLE = $9.2^\circ = 16.2\%$
- c = MINIMUM RUNNING GROUND CLEARANCE = 4.3"
- d = DESIGN VEHICLE WHEELBASE = 10.8'
- e = MAXIMUM RAMP BREAKOVER ANGLE = $7.6^\circ = 13.25\%$

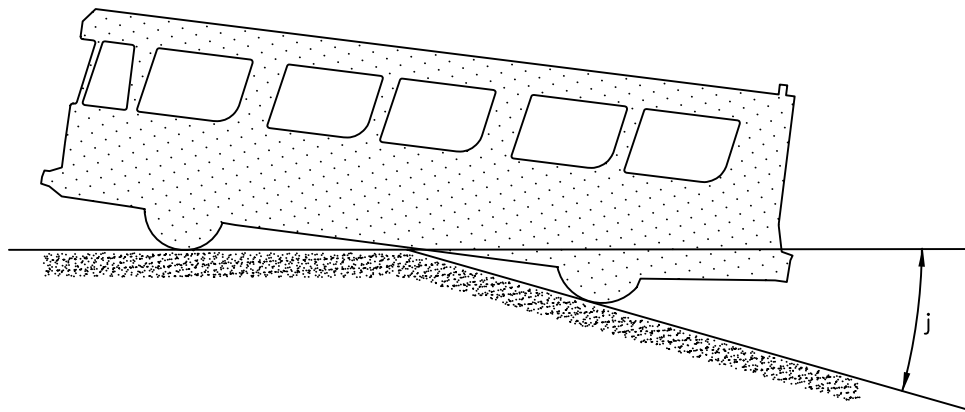
Design vehicle - type A

Design vehicle – type B

1. NARRATIVE: The angles shown on the drawing represent maximum slopes for a “standard commercial vehicle”. To construct slopes for driveway approaches, see driveway approach plans.



VERTICAL SAG ANGLES



VERTICAL CREST ANGLES

- f = MAXIMUM APPROACH ANGLE = 9.5° SLOPE = 16.1%
 g = MAXIMUM DEPARTURE ANGLE = 9.2° SLOPE = 16.2%
 h = MINIMUM RUNNING GROUND CLEARANCE = 12"
 i = DESIGN VEHICLE WHEELBASE LENGTH = 25'-0"
 j = MAXIMUM RAMP BREAKOVER ANGLE = 4.6° = 8%

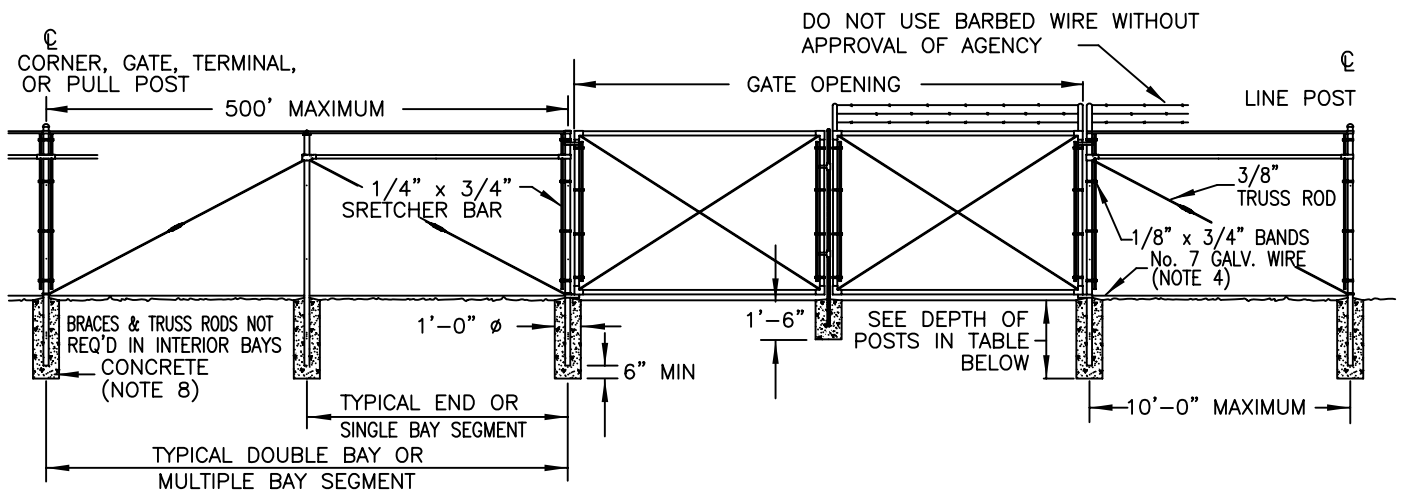
Design vehicle - type B

Plan No.

805

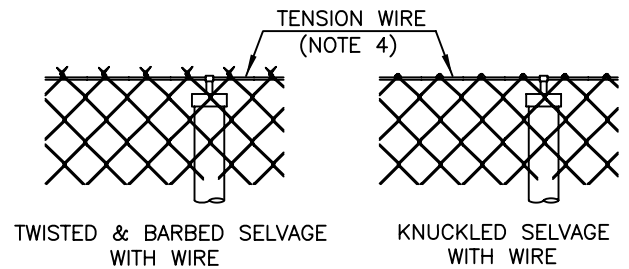
Chain link fence

1. FENCES 5 FEET HIGH OR HIGHER: Use twisted and barbed selvage, top and bottom.
2. FENCES LOWER THAN 5 FEET: Use knuckled selvage on tope, and twisted and barbed selvage on bottom.
3. TRUSS RODS AND BRACES: Not required for fabric heights less than 5 feet high.
4. TENSION WIRE: Use zinc coated, galvanized, No. 7 gage spring coil steel. Set wire at 1 inch over natural ground or 6 inches over concrete structures.
5. PIPE: Use ASTM A 120, schedule 40, hot dipped zinc coated steel.
6. POST SPACING: Locate posts at equal spacing for each segment with maximum spacing specified in standard specifications.
7. BARB WIRE ARM: Face arm towards exterior of fenced area.
8. CONCRETE: Class 4000 per APWA Section 03 30 04. Place per APWA Section 03 30 10. Cure per APWA Section 03 39 00.

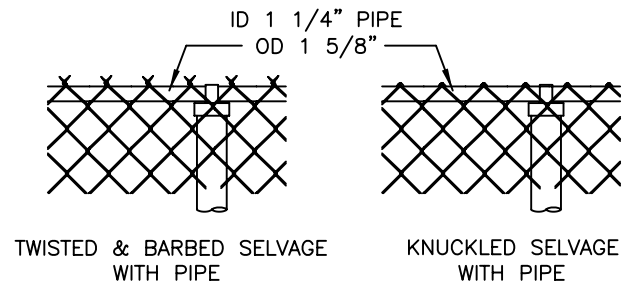


FENCE

FENCE POSTS					
HEIGHT OF FABRIC	DEPTH OF POSTS	LENGTH OF END CORNER, OR PULL POST	LENGTH OF LINE POST	MINIMUM DIAMETER	
				END, CORNER PULL POST	LINE POST
7'	3'	10'	9'-8"	2 1/2"	2"
6'	3'	9'	8'-8"	2 1/2"	2"
5'	3'	8'	7'-8"	2"	1 1/2"
4'	2'	6'	5'-8"	2"	1 1/2"

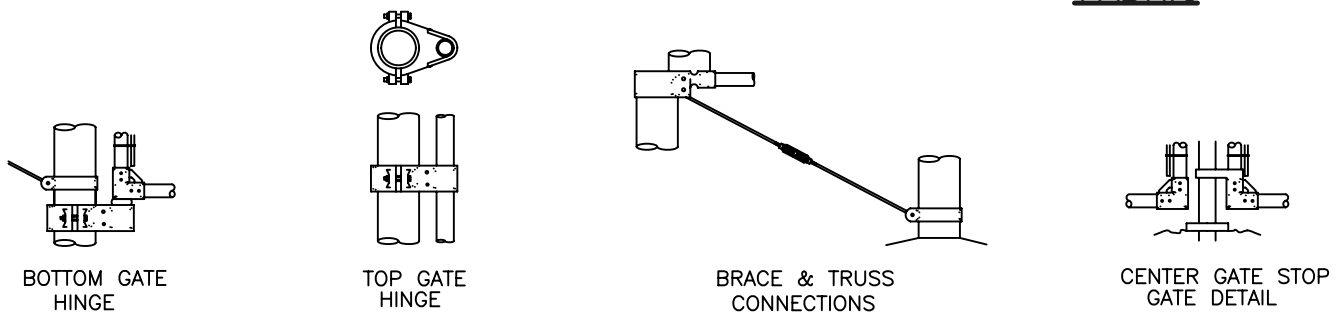


GATE POSTS AND GATE FRAMES			
HEIGHT	FRAME	GATE OPENING	POST
UNDER 6 FEET	1 1/2"	SINGLE TO 6' OR DOUBLE TO 12'	2"
	1 1/2"	SINGLE OVER 6' TO 8' OR DOUBLE OVER 12' TO 16'	2 1/2"
	1 1/2"	SINGLE OVER 8' TO 12' OR DOUBLE OVER 16' TO 24'	3 1/2"
6 FEET AND OVER	1 1/2"	SINGLE TO 6' OR DOUBLE TO 12'	2 1/2"
	1 1/2"	SINGLE OVER 6' TO 13' OR DOUBLE OVER 12' TO 26'	3 1/2"
	1 1/2"	SINGLE OVER 13' TO 18' OR DOUBLE OVER 26' TO 36'	6"
	1 1/2"	SINGLE OVER 18' OR DOUBLE OVER 36'	8"



SEE NOTES 1 AND 2 (TYP)

FABRIC



DETAILS

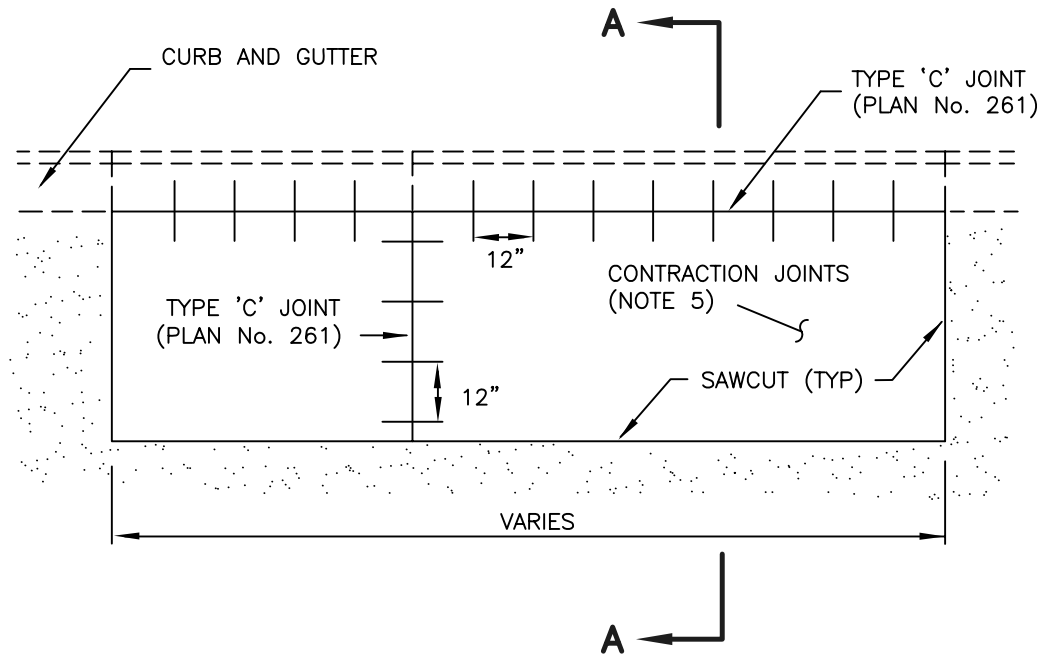
Chain link fence

Plan No.

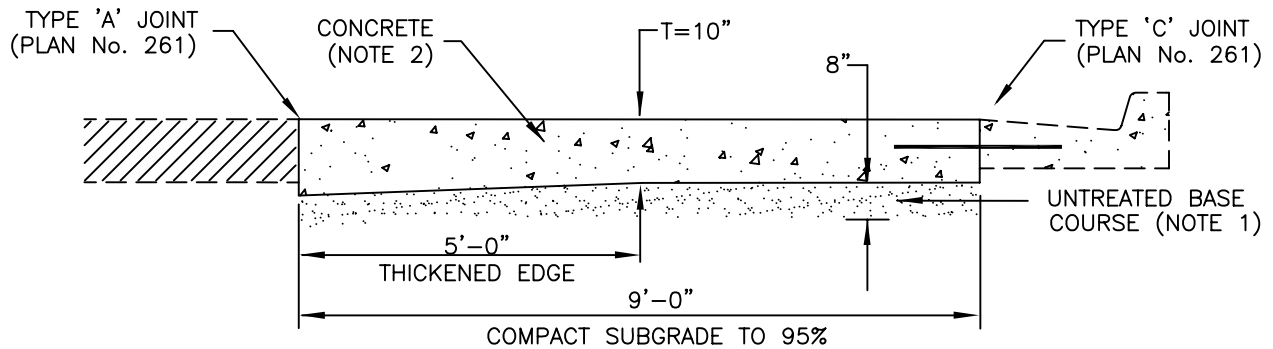
831

Bus stop pad

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
 - A. Place material per APWA Section 32 05 10. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
 - B. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater.
 - C. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
2. CONCRETE: Class 4000 per APWA Section 03 30 04.
 - A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
 - B. Place concrete per Section 32 16 13.
 - C. Provide 1/2 inch radius on concrete edges exposed to public view.
 - D. Cure concrete per APWA Section 03 39 00 with type II Class A or B (white pigmented) membrane forming compound unless specified otherwise.
3. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
4. EXPANSION JOINT:
 - A. Make joint full depth and vertical.
 - B. Provide F1 joint filler material 1/2 inch wide; APWA Section 32 13 17.
 - C. Set top flush with surface of concrete.
5. CONTRACTION JOINT:
 - A. Make joint vertical.
 - B. Make joint 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
 - C. Maximum length to width ratio for non-square panels is 1.5 to 1.
 - D. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
 - E. Match location of contraction joints in adjacent concrete roadway pavements.
6. FINISH: Broomed.



PLAN



SECTION A-A

Bus stop pad

Plan No.

880

TOPICAL INDEX

ADJUSTMENTS

Plan 335	Adjust cast in-place manhole to grade	161
543	Fire hydrant relocation	233
360	Raise frame to grade – plastic form.....	169
361	Raise frame to grade – grade ring	171
432	Sewer lateral relocation	197
542	Waterline loop	231
541	Water service line	229

ARROW DIAGRAM

Plan 110	Arrow diagram for project close-out.....	3
----------	--	---

CATCH BASINS

Plan 315	Catch basin	135
316	Combination inlet/cleanout box.....	139
317	Curb inlet/outlet	143
322	Curb outlet.....	151

CONCRETE PAVEMENT

Plan 256	Concrete pavement patch.....	87
261	Concrete pavement joints	89

CURB AND GUTTER

Plan 880	Bus stop pad	323
205	Curb and gutter	25
209	Curbs.....	29
211	Waterway	31
213	Waterway Transition Structure	33

DESIGN STANDARDS

Plan 291	Defective concrete	107
805	Design vehicle – type A	317
805	Design vehicle – type B	319

DRIVEWAY APPROACHES

Plan 215	Dip driveway approach	35
221	Flare driveway approach	39
216	Mountable curb driveway approach.....	37
225	Open driveway approach.....	45
229	Piped driveway approach	47
222	Saw-cut driveway approach.....	43

EROSION CONTROL

Plan	123	Diversion dike.....	9
	125	Equipment and vehicle wash down area.....	17
	124	Inlet protection.....	11
	126	Sabilized roadway entrance.....	19
	122	Silt fence.....	7
	121	Straw bale barrier.....	5

FENCE

Plan	831	Chain link fence.....	321
------	-----	-----------------------	-----

FIRE HYDRANTS

Plan	511	Fire hydrant with valve.....	213
------	-----	------------------------------	-----

IRRIGATION SYSTEMS (GRAVITY)

Plan	611	Curb inlet box for irrigation.....	261
	613	Irrigation diversion box.....	263
	614	Irrigation diversion box.....	265

IRRIGATION SYSTEMS (PRESSURIZED)

Plan	631	Backflow preventer	271
	633	Control valve	275
	632	Drain valve	273
	635	Isolation shut-off valve	277
	622	Pop-up head	269
	621	Stationary head.....	267
	651	Wire runs for landscape irrigation.....	279

LANDSCAPING

Plan	683	Shrubs and bushes	283
	681	Tree.....	281

LIGHTING

Plan	731	Pull box.....	291
	710	Riser.....	287
	730	Collar for street light pole	289
	740	Concrete base street light pole	303
	742	Direct burial street light pole	307
	733	Joint use trench – street lighting	297
	741	Screw-in base street light pole.....	305
	737	Street light meter pedestal	301
	736	Street light pole terminal	299
	732	Trench for street light conduit	293

MANHOLES AND BOXES

Plan	330	Cleanout box	155
	331	Cleanout box	157
	332	Cast in-place manhole	159
	505	Concrete boxes	211
	441	Grease trap	201
	341	Precast manhole	163
	411	Sanitary sewer manhole	189

METERS

522	1 1/2" and 2" Meter	217
521	3/4" and 1" Meter	215
523	3" & 4" Compound meter with 2" bypass.....	219
525	6" Compound meter with 2" bypass	221
527	8" Compound meter with 2" bypass	223
529	10" Turbo meter with 6" turbo meter and 2" bypass.....	225

PARKING METERS

Plan	241	Parking meter post.....	71
------	-----	-------------------------	----

PAVEMENT MAINTENANCE

Plan	265	Crack sealing – asphalt pavement	93
	266	Crack filling – asphalt pavement.....	95

PIPE BACKFILLING

Plan	381	Trench Backfill.....	179
	382	Pipe zone backfill	181

SANITARY SEWER SYSTEMS

Plan	402	30" Frame and cover	185
	413	Cover collar for sanitary sewer manhole	191
	412	Invert cover	189
	433	Pipe drop.....	197
	431	Sewer lateral connection	193

SIDEWALK

Plan	231	Concrete sidewalk.....	51
	242	Form strip filler	73
	232	Patterned concrete park strip.....	53
	235	Corner curb cut assembly.....	55
	236	Tangent curb cut assembly.....	61

SIGNS AND SYMBOLS

Plan	201	Abbreviations and symbols for roadway drawings	23
	301	Abbreviations and symbols for storm drains	113
	401	Abbreviations and symbols for sewer	185
	501	Abbreviations and symbols for water	205
	601	Abbreviations and symbols for irrigation and landscaping	259
	292	Street name sign (typical)	109

STORM DRAINAGE SYSTEMS

Plan	302	30" Frame and cover	115
	303	44" Frame and cover	119
	304	48" Cover and frame	121
	305	51" Cover and frame	123
	308	35 1/2" Grate and frame	129
	309	47 3/4" Grate and frame	131
	310	48" Grate and frame	133
	372	Area drain	175
	321	Automatic flap gate (pressurized storm drains)	149
	345	Concrete deck	167
	373	Concrete pier	177
	362	Cover collar for storm drains	173
	320	Debris grate inlet	147
	361	Grade rings	171
	323	Pipe outfall access control rack	153

SURFACE RESTORATION

Plan	253	Asphalt concrete pavement overlay	79
Plan	251	Asphalt pavement tie in	75
	252	Curb and gutter replacement without pavement tie in	77
	255	Asphalt concrete "T" patch	83
	256	Concrete pavement patch	87

SURVEY MONUMENT

Plan	271	Corner and boundary markers	97
	275	Cover collar for survey monuments	105
	273	Frame and cover for monument	101
	272	Monument cap and base	99
	274	Survey monument placement under pavement	103

THRUST BLOCKS

Plan	562	Tie-down thrust restraints	241
	561	Direct bearing thrust block	239

TRAFFIC CONTROL

Plan	751	Signal pole foundation	309
	752	Signal pole wiring	311
	761	Speed bump.....	313
	762	Speed table	315

WATER WORKS SYSTEM

Plan	551	3/4" and 1" Service taps.....	235
	552	1 1/2" and 2" Service taps.....	237
	502	27" Frame and cover	207
	503	38" Frame and cover	209
	574	Cover collar for water valve boxes.....	249
	535	Electrolysis monitoring station details.....	227
	593	Pressurized irrigation water and potable water interface	253

VALVE

	571	2" Washout valve	243
	573	6" Pressure reducing valve with 2" bypass.....	247
	575	Air release assembly	251
	572	Detector check valve with 3/4" bypass meter.....	245

END OF TOPICAL INDEX