Manual of

Standard Plans

2017

AMERICAN PUBLIC WORKS ASSOCIATION

APWA

Utah Chapter

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AGC

SKILL RESPONSIBILITY INTEGRITY

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 utility improvement districts in the State of Utah. 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, contact the Standard Specifications and Drawings Subcommittee. The Subcommittee web address is – http://utah.apwa.net/. Submit the following information.

- Identify the problem.
- Recommend how to solve the problem.
- Provide text or drawing supporting the recommendation.

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

REFERENCE

The phrase "APWA Section" 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 initially 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

PART 4 - SANITARY SEWER

PART 5 - WATER SYSTEMS

PART 8 - GENERAL FACILITIES

END OF CONTENTS

Arrow diagram for project close-out

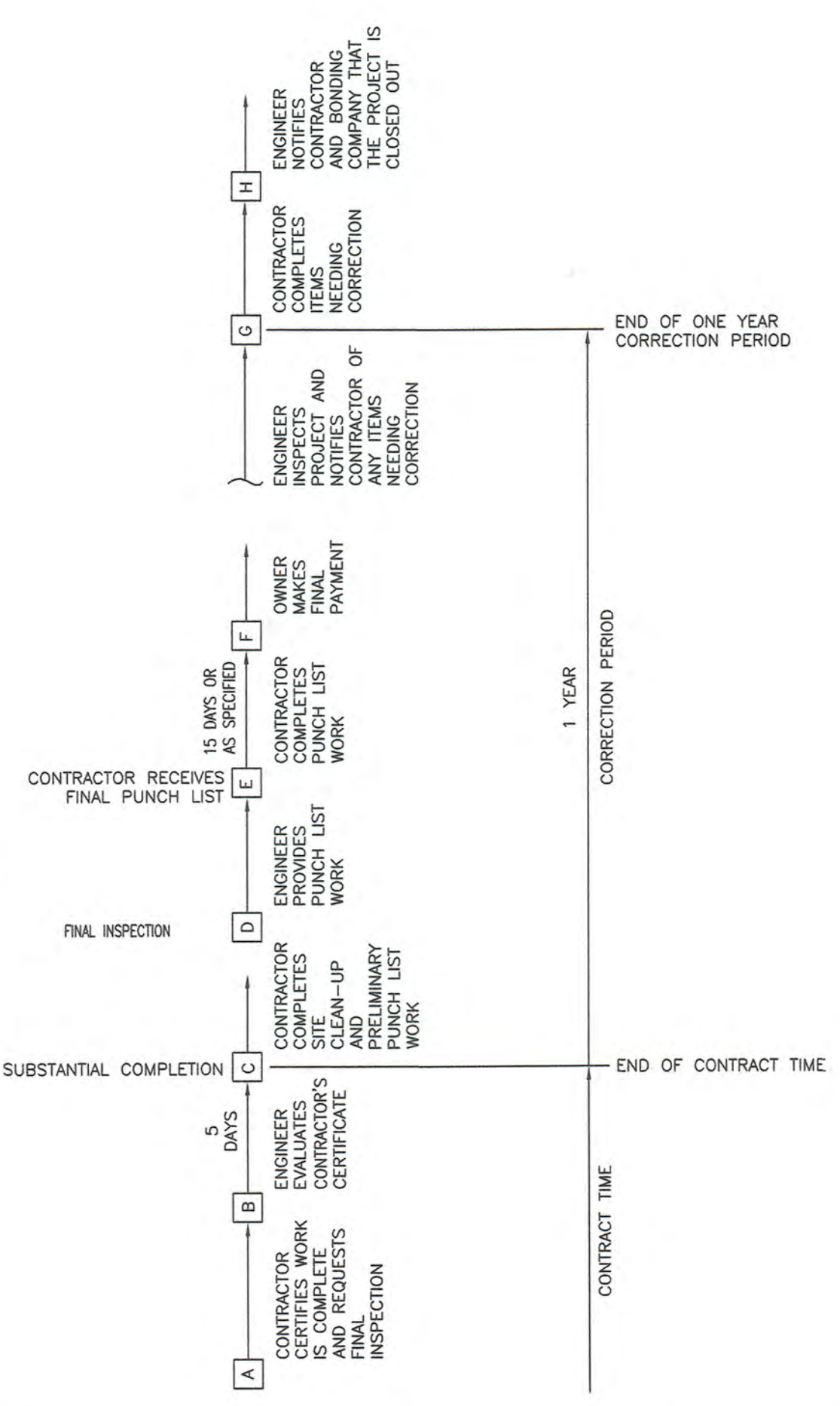
1. GENERAL

A. The arrow 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. PRODUCTS (Not used**)**

3. EXECUTION

A. Scheduling requirements, APWA Section 01 32 16.
B. Close-out procedures, APWA Section 01 78 50.



AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Arrow diagram for project close-out

Plan 110

November 2006

Straw bale barrier

1. GENERAL

A. Description. A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

B. Purpose. 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.

2. PRODUCTS (Not used)

3. EXECUTION

A. Place bales in a single row, lengthwise with ends of adjacent bales tightly abutting each other for the following conditions.
   1) Perimeter Control. Place barrier at down gradient limits of disturbance.
   2) Sediment Barrier. Place barrier at toe of slope or soil stockpile.
   3) Protection of Existing Waterways. Place barrier at top of stream bank.
   4) Inlet Protection.

B. Wire-bound or string-tie all bales. Install so straw bale bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).

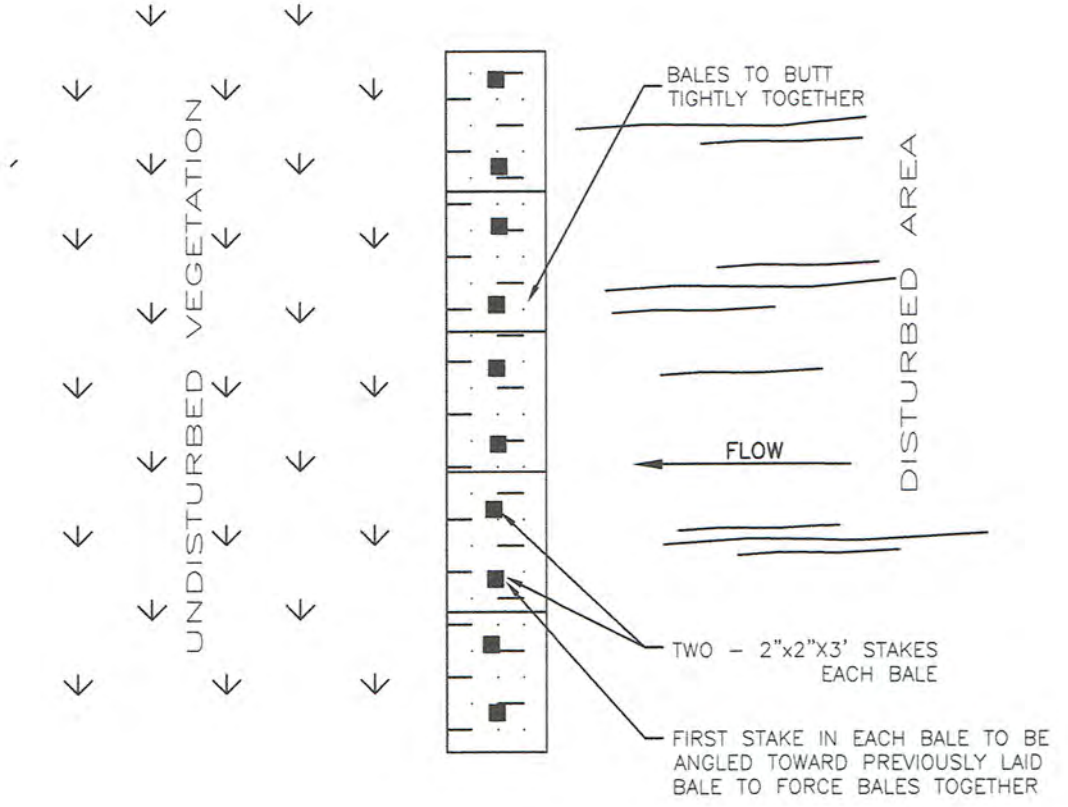
C. Chink the gaps between bales (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.

D. When bales are installed at the toe of a slope, place the bales away from the slope for increased storage capacity.

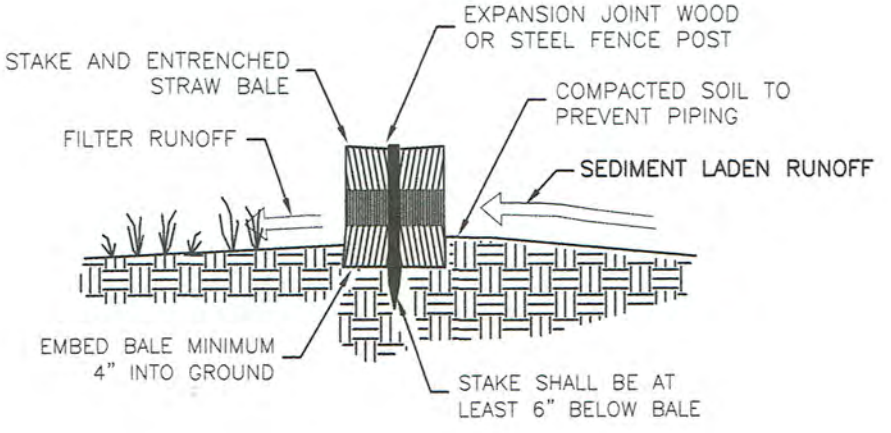
E. Remove straw bale barriers when they have served their usefulness, but not before the up-slope areas have been permanently stabilized.

F. Maintenance.
   1) Inspect immediately after any rainfall and at least daily during prolonged rainfall.
   2) Pay close attention to the repair of damaged bales, end runs and undercutting beneath bales.
   3) Necessary repairs or replacement of bales must be accomplished promptly.
   4) Remove sediment deposits after each rainfall. It must be removed when the level of deposition reaches approximately one-half the height of the bale(s).
   5) Realign bales to provide a continuous barrier and to fill gaps.
   6) 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

Silt fence

1. GENERAL

A. Description. A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched.
B. Application. To intercept sediment from disturbed areas of limited extent.
C. Perimeter Control: Place barrier at down gradient limits of disturbance.
D. Sediment Barrier: Place barrier at toe of slope or soil stockpile.
E. Protection of Existing Waterways: Place barrier at top of stream bank.
F. Inlet Protection.

2. PRODUCTS

A. Fabric. 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. 10 ounces per square yard of fabric.
C. Posts. Either 2" x 4" diameter wood, or 1.33 pounds per linear foot steel with a minimum length of 5 feet, or steel posts with projections for fastening wire to them.

3. EXECUTION

A. Cut the fabric on site to desired width, unroll, and drape over the barrier. Secure the fabric toe with rocks or dirt and secure the fabric to the mesh with twin, staples or similar devices.
B. 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.
C. When used to control sediments from a steep slope, place silt fences away from the toe of the slope for increased holding capacity.
D. Maintenance.
    1) Inspect immediately after each rainfall and at least daily during prolonged rainfall.
    2) 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, replace the fabric promptly.
    3) Remove sediment deposits after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
    4) Re-anchor fence as necessary to prevent shortcutting.
    5) Inspect for runoff bypassing ends of barriers or undercutting barriers.

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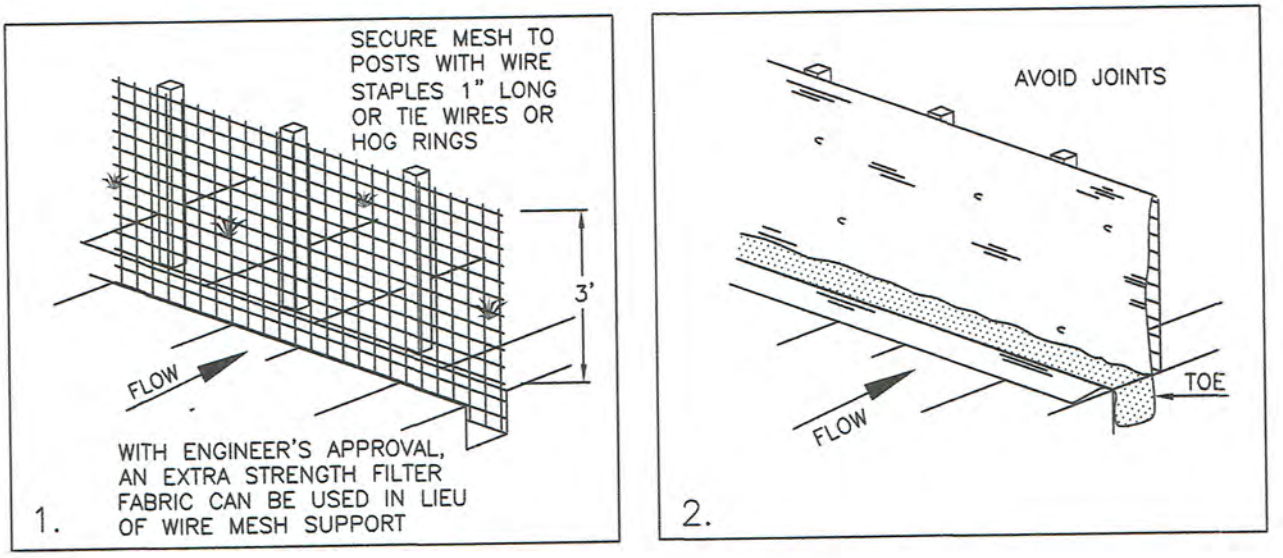
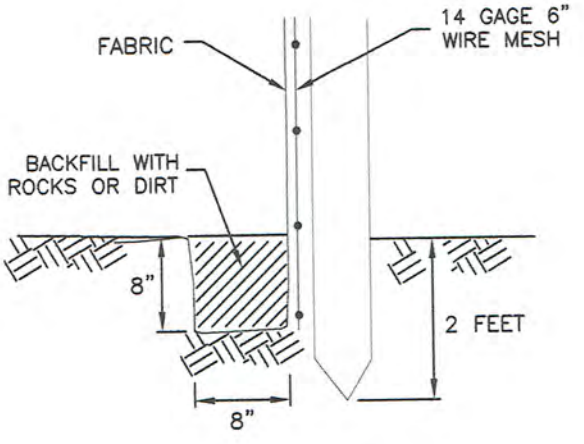


INSTALLATION SEQUENCE



TOE DETAIL

Diversion dike

1. GENERAL

A. Description: A temporary ridge of compacted soil located at the top or base of a sloping disturbed area.

B. Purpose. To intercept up gradient runoff and convey around construction site and to divert sediment laden runoff.

2. PRODUCT (Not used)

3. EXECUTION

A. Construct.
   1) Along midpoint of construction slope to intercept runoff and channel to controlled discharge point.
   2) Around base of soil stockpiles to capture sediment.
   3) Around perimeter of disturbed areas to capture sediment.

B. Locate the dike to minimize damages by construction operations and traffic.

C. Clear and grub area for dike construction. Build the dike before construction begins.

D. Excavate channel and place soil on down gradient side.

E. Shape and machine compact excavated soil to form ridge.

F. 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.

G. Maintenance.
   1) Inspect immediately after each rainfall and at least daily during prolonged rainfall.
   2) Look for runoff breaching dike or eroding channel or side slopes.
   3) Check discharge point for erosion or bypassing of flows.
   4) Repair and stabilize as necessary.
   5) Inspect daily during vehicular activity on slope, check for and repair any traffic damage.

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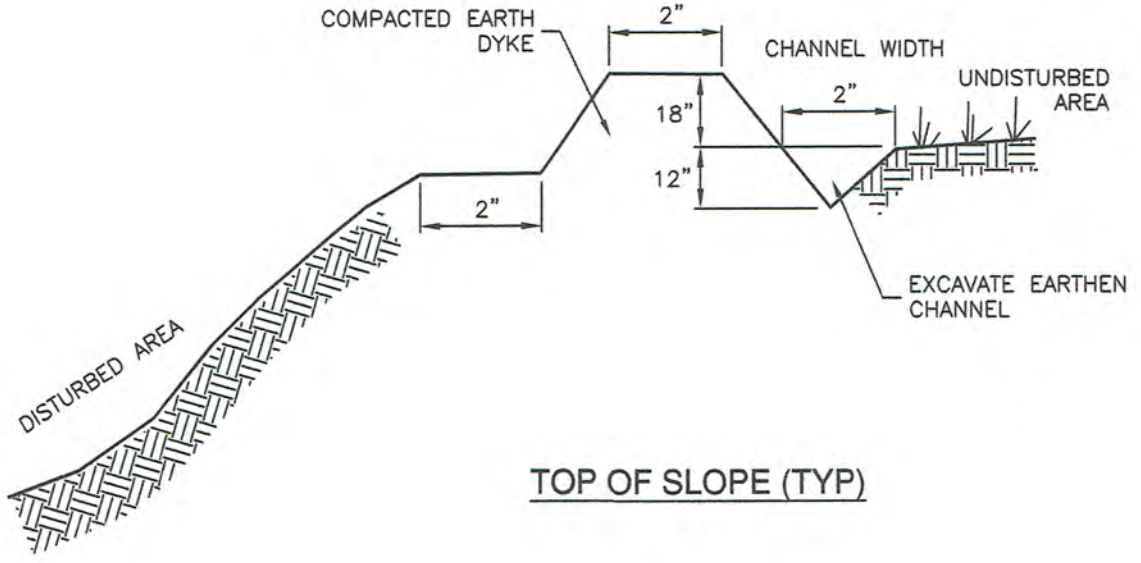
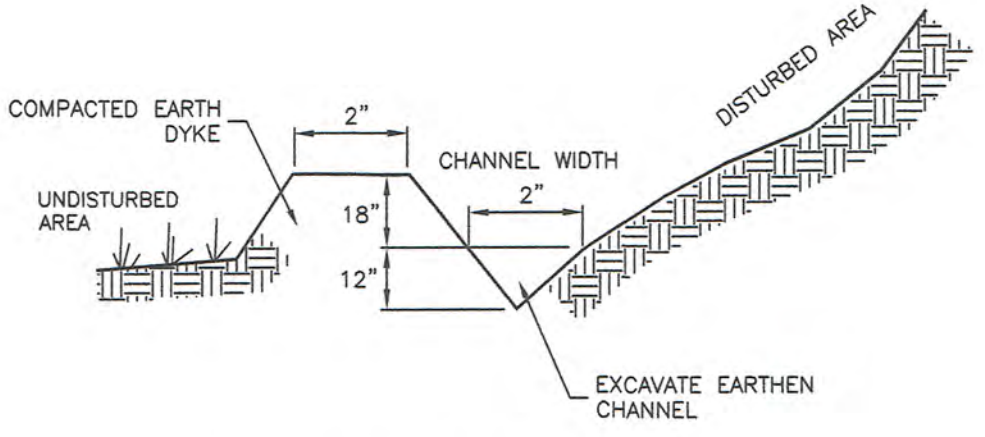


TOP OF SLOPE (TYP)



BASE OF SLOPE (TYP)

Inlet protection – gravel sock

1. GENERAL

A. Description. Placement of gravel sock on grade.
   1) Upstream of, or in front of storm drain inlets to filter or pond water runoff.
   2) At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

2. PRODUCTS (Not used)

3. EXECUTION

A. On-grade inlet protection:
   1) Provide on-grade inlet protection 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) Use drop inlet protection 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.

C. Maintenance
   1) Inspect inlet protection after every large storm event and at a minimum of once monthly.
   2) Remove sediment accumulated when it reaches 2-inches in depth.
   3) Replace filter medium when damage has occurred or when medium is no longer functioning as intended.

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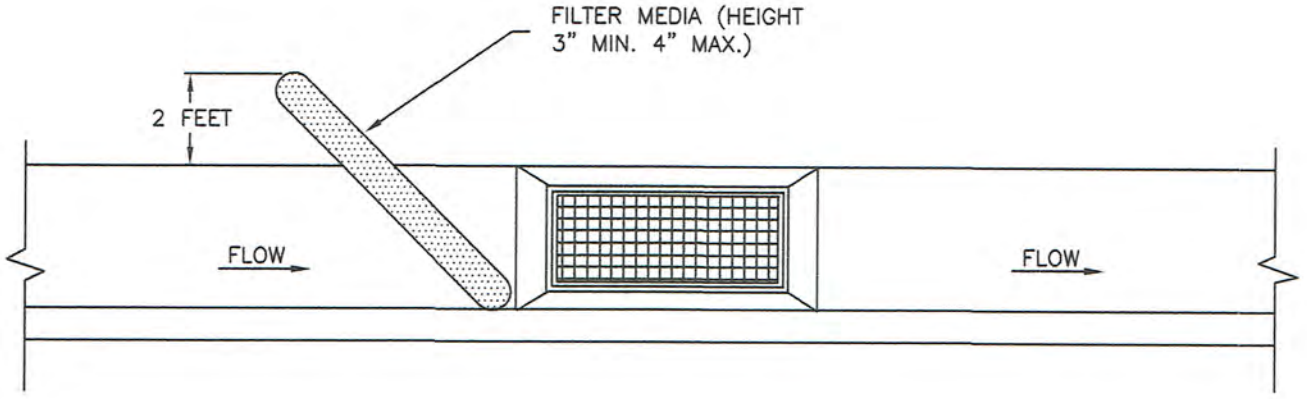
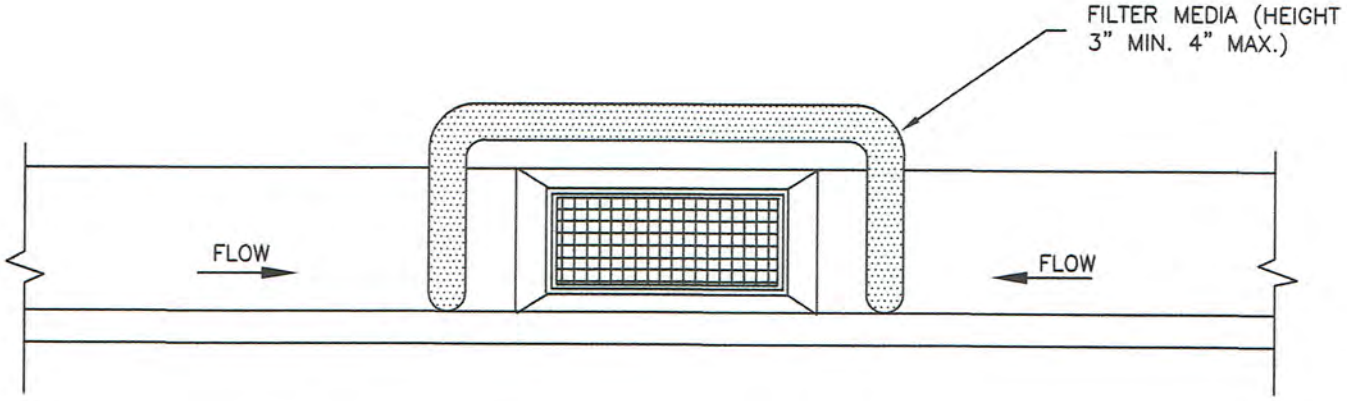


ON-GRADE INLET PROTECTION DETAIL



SUMP INLET PROTECTION DETAIL

Inlet protection - gravel

1. GENERAL

A. Description. Placement of gravel filter over storm drain inlet to filter water runoff.

B. Application. Used at inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

2. PRODUCT (Not used)

3. EXECUTION

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. Select filter fabric 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. Slope 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.

F. Maintenance.

1) Inspect inlet protection after every large storm event and at a minimum of once monthly.
2) Remove sediment accumulated when it reaches 4-inches in depth.
3) Replace filter fabric and clean or replace gravel if clogging is apparent.

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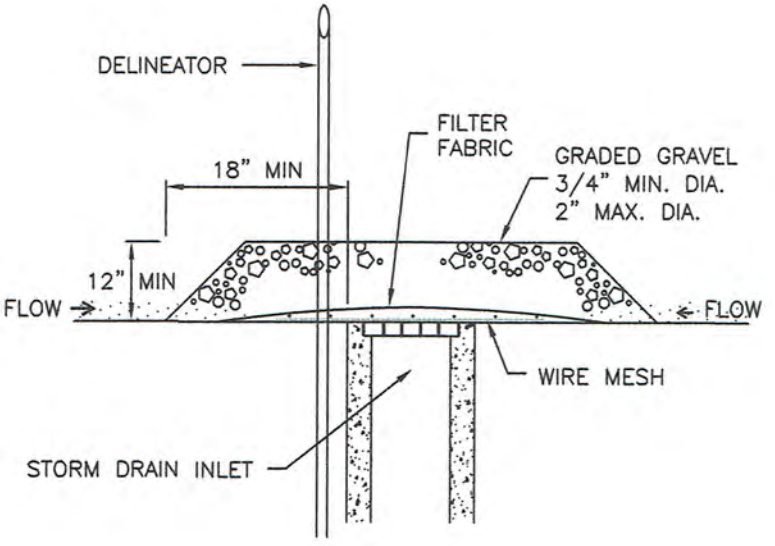
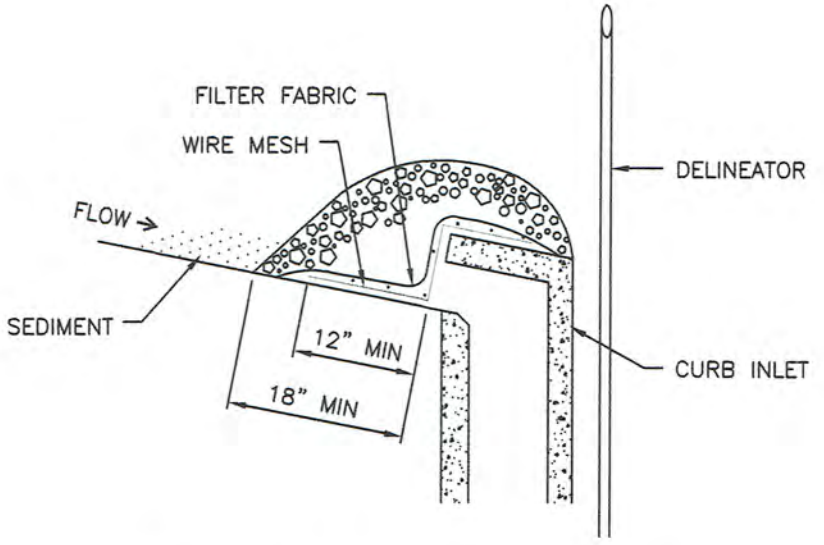


DROP INLET PROTECTION



CURB INLET PROTECTION

Inlet protection – fence or straw bale

1. GENERAL

A. Description. A temporary sediment barrier around storm drain inlet.

B. Application. At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

2. PRODUCT (Not used)

3. EXECUTION

A. Installation and application criteria.

1) Provide up gradient sediment controls, such as silt fence during construction of inlet.
2) When construction of inlet is complete erect straw bale barrier, silt fence or other approved sediment barrier surrounding perimeter of inlet.
3) Install filter fabric completely around grate.

B. Maintenance.

1) Inspect inlet protection after every large storm event and at a minimum of once monthly.
2) Remove sediment accumulated when it reaches 4-inches in depth.
3) Repair or re-align barrier or fence as needed.
4) Look for bypassing or undercutting and re-compact soil around barrier or fence as required.

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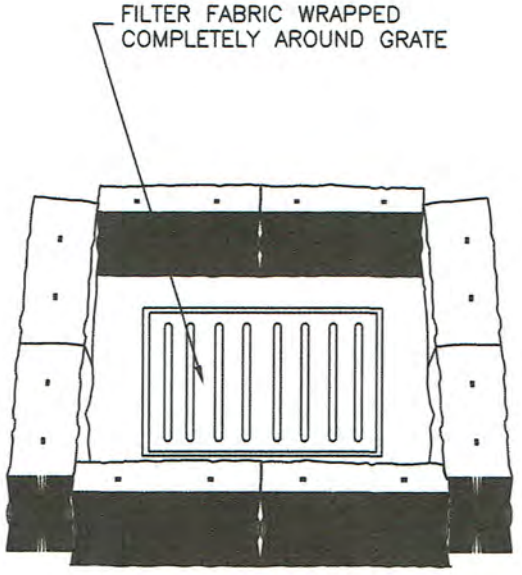
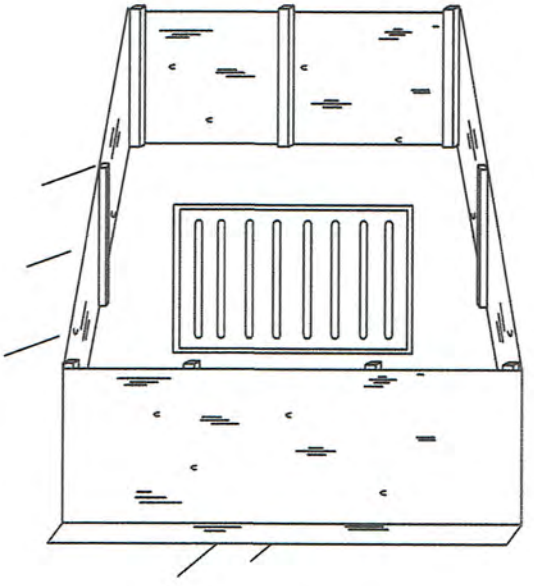


STRAW BALE BARRIER
(Plan No. 121)



SILT FENCE
(Plan No. 121)

Equipment and vehicle wash down area

1. GENERAL

A. Description. A temporary stabilized pad of gravel for general washing of equipment and construction vehicles.

B. Application.

1) At any site where regular washing of vehicles and equipment will occur.
2) May also be used as a filling point for water trucks limiting erosion caused by overflow or spillage of water.

2. PRODUCT (Not used)

3. EXECUTION

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 122)

E. Maintenance.

1) Requires periodic top dressing with additional stones.
2) 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).
3) Keep the wash area in a condition which will prevent tracking or flow of mud onto public rights-of-way.
4) Periodically dress the top with 2-inch stone may be required, as conditions demand, and repair any structures used to trap sediments.
5) Inspect daily for loss of gravel or sediment buildup.
6) Inspect adjacent area for sediment deposit and install additional controls as necessary.
7) Expand stabilized area as required to accommodate activities.
8) Maintain silt fence as outlined in Plan 122.

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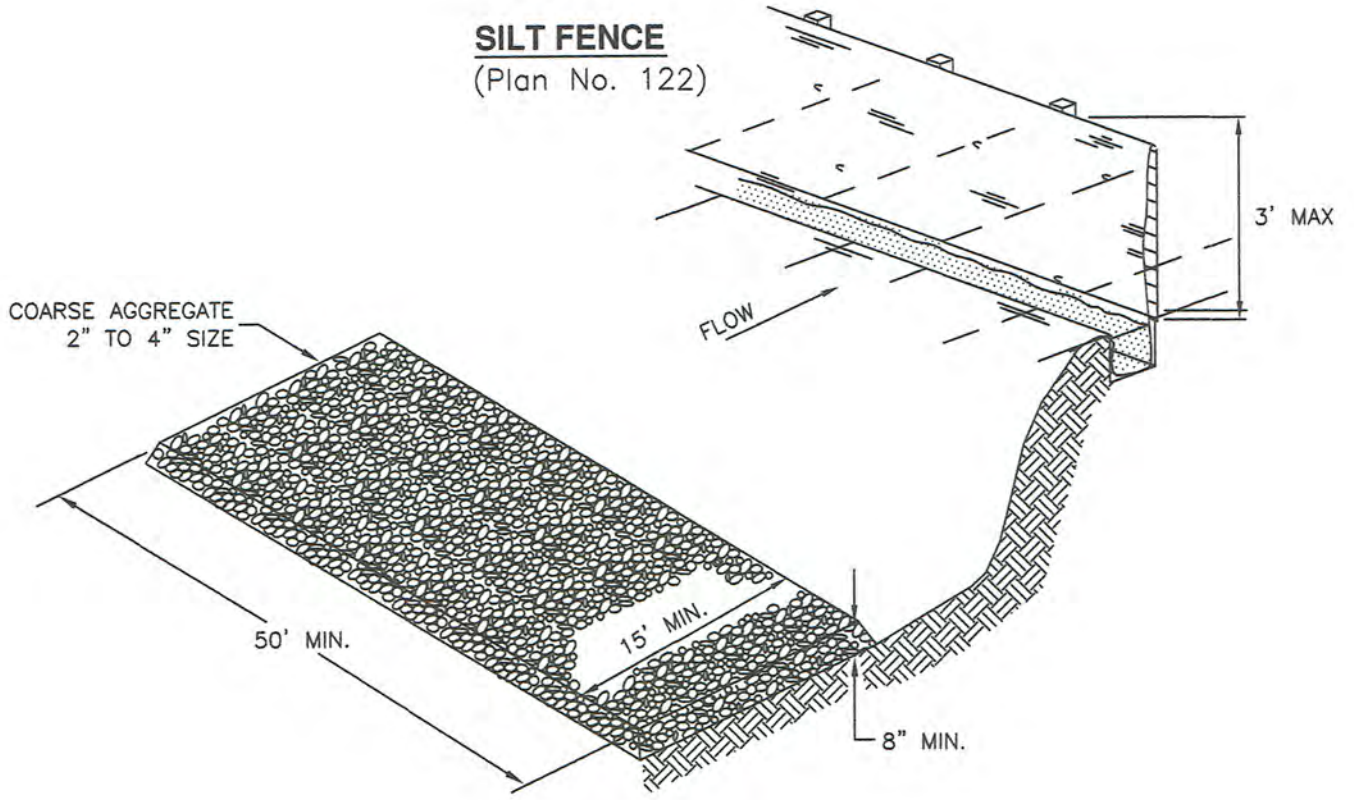
1. SECURE MESH TO POSTS WITH WIRE STAPLES 1" LONG OR TIE WIRES OR HOG RINGS
2. SECURE FABRIC TO MESH WITH TWINE, STAPLES OR SIMILAR

SILT FENCE
(Plan No. 122)



WASH DOWN AREA

Stabilized roadway entrance

1. GENERAL

A. Description. A temporary stabilized pad of gravel for controlling equipment and construction vehicle access to the site.

B. Application. At any site where vehicles and equipment enter the public right of way.

2. PRODUCT (Not used)

3 EXECUTION

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).

D. Maintenance.

1) Prevent tracking or flow of mud into the public right-of-way.
2) Periodic top dressing with 2-inch stone may be required, as conditions demand, and repair any structures used to trap sediments.
3) Inspect daily for loss of gravel or sediment buildup.
4) Inspect adjacent area for sediment deposit and install additional controls as necessary.
5) Expand stabilized area as required to accommodate activities.

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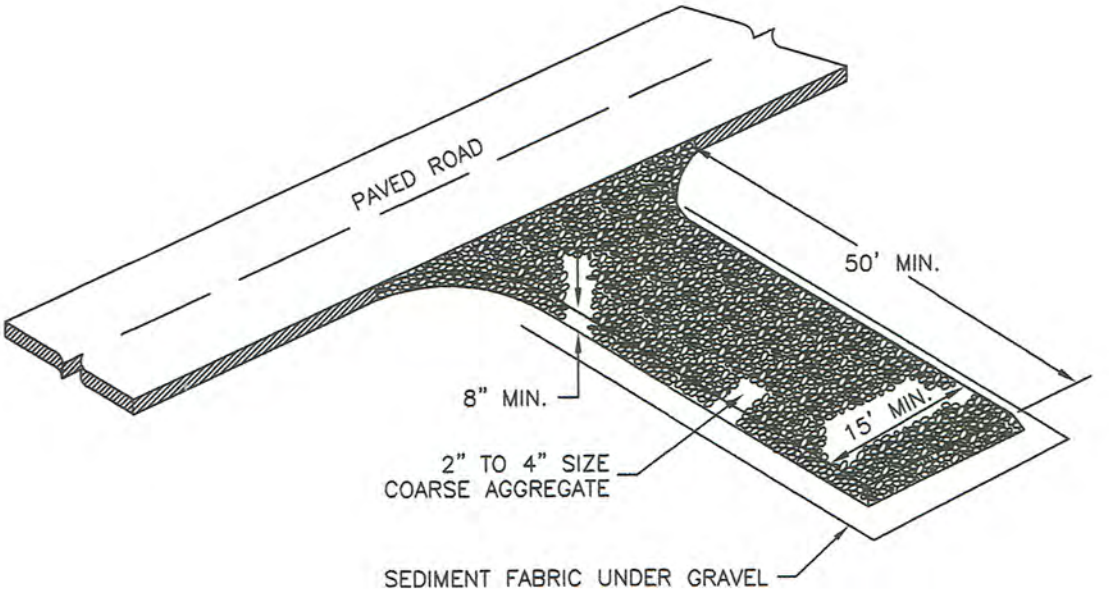


Abbreviations and symbols for roadway drawings

1. GENERAL

A. Lettering Size: 10 point at final production.
B. Lettering Style. Capital letters preferred.
C. Existing Improvements. Shown in light shaded (screened) or dashed line.
D. New Improvements. Shown in solid continuous line.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOLS	DEFINITIONS
	CENTER LINE
15+00	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
X X	FENCE
4250	CONTOUR LINE
4250.0	CONTOUR ELEVATION
	BANK SLOPES
SD	STORM DRAIN LINE
W	WATER LINE
G	GAS LINE
T	TELEPHONE CABLE
E	ELECTRIC CABLE
SS	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
WM	WATER METER
MH	MANHOLE
CB	CATCH BASIN
COB	CLEANOUT BOX
	POLE AND ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
BM NO. 46 ELEV. 4256.50	BENCH MARK
	SIGN
PP	POWER POLE
TP	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.

	PROFILE
	GROUND PROFILE
ROUND ARCH BOX	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUND WATER ELEVATION

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

Curb and gutter

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

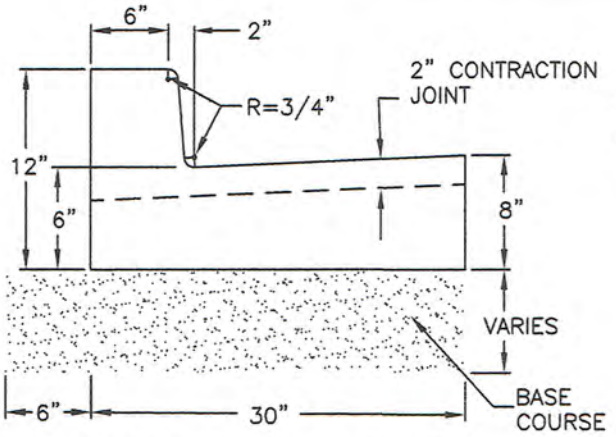
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

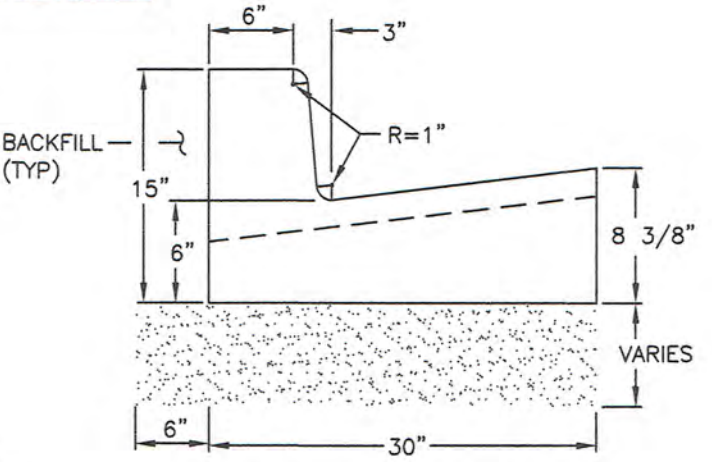
A. Base Course Placement: APWA Section 32 05 10. Thickness is 6-inches if flow-line grade is 0.5 percent (s=0.005) or greater. If slope is less, provide 8-inches. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install at the start or end of a street intersection curb return. Expansion joints are not required in concrete placement using slip-form construction.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

BACKFILL BEHIND CURB BEFORE PAVING AGAINST LIP OF GUTTER



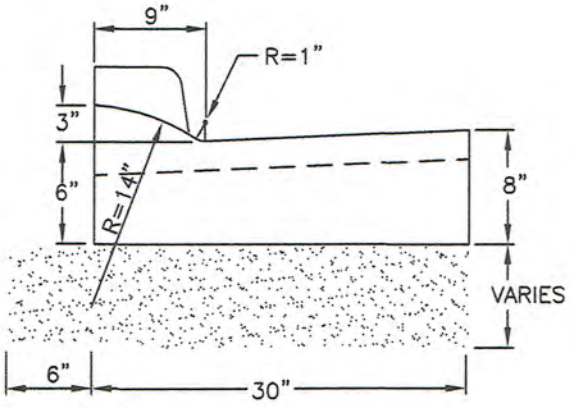
CONCRETE AREA = 1.665 SQ. FT.

Type A



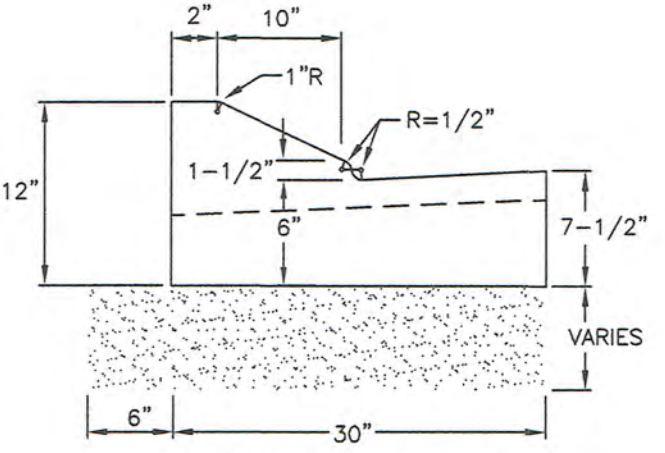
CONCRETE AREA = 1.926 SQ. FT.

Type B



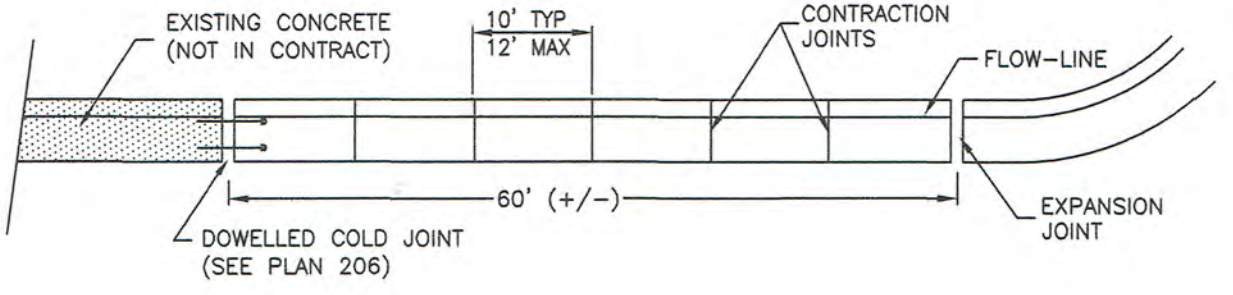
CONCRETE AREA = 1.517 SQ. FT.

Type C



CONCRETE AREA = 1.674 SQ. FT.

Type D



JOINT DETAIL

Curb and gutter

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

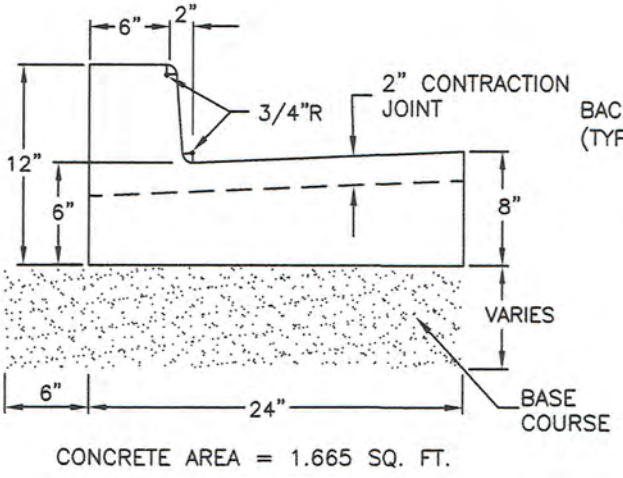
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

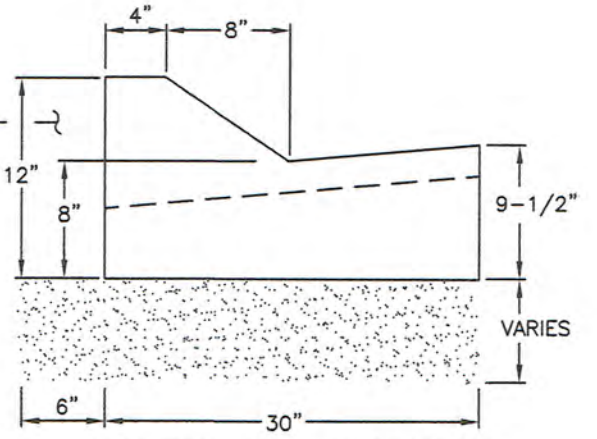
A. Base Course Placement: APWA Section 32 05 10. Thickness is 6-inches if flow-line grade is 0.5 percent (s=0.005) or greater. If slope is less, provide 8-inches. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install at the start or end of a street intersection curb return. Expansion joints are not required in concrete placement using slip-form construction.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

BACKFILL BEHIND CURB BEFORE PAVING AGAINST LIP OF GUTTER



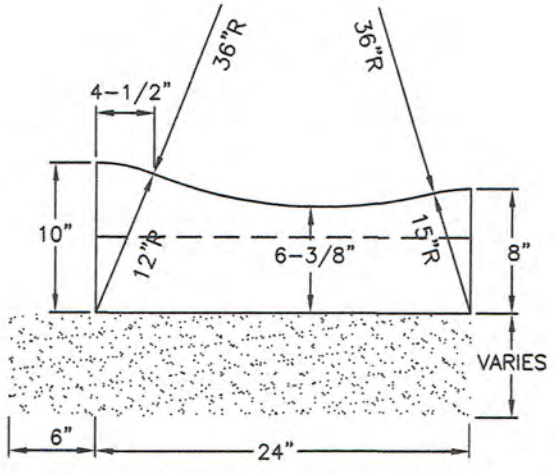
CONCRETE AREA = 1.665 SQ. FT.

Type E



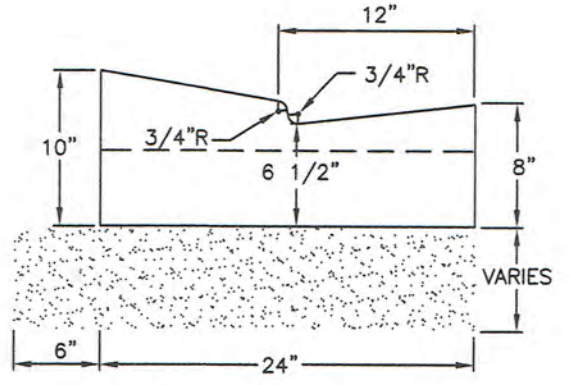
CONCRETE AREA = 1.539 SQ. FT.

Type F



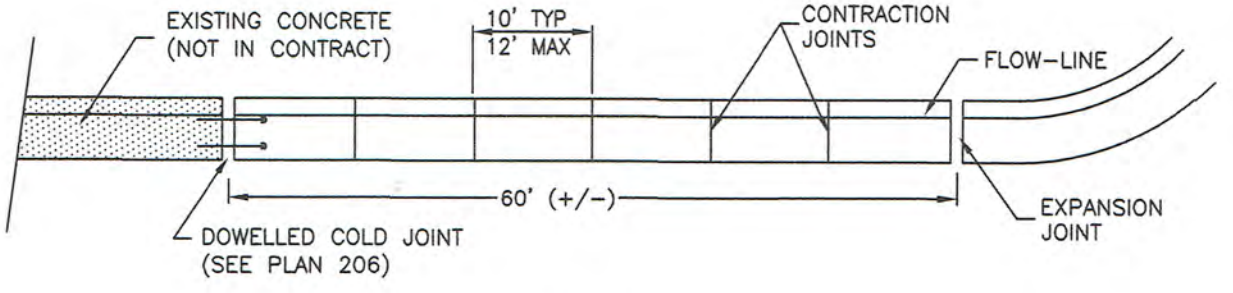
CONCRETE AREA = 1.989 SQ. FT.

Type G



CONCRETE AREA = 1.970 SQ. FT.

Type H



JOINT DETAIL

Curb and gutter

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

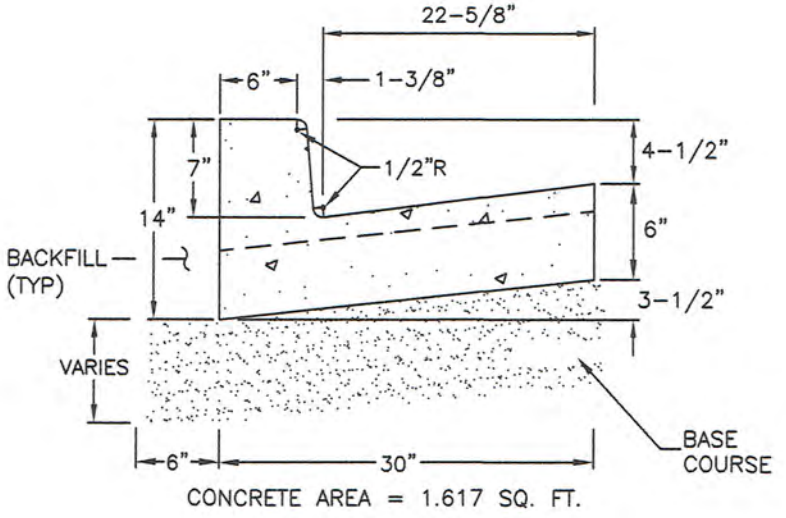
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

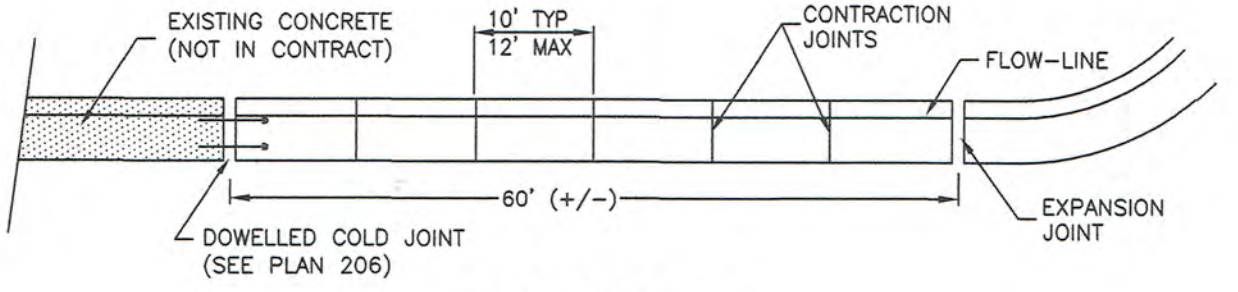
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Thickness is 6-inches if flow-line grade is 0.5 percent (s=0.005) or greater. If slope is less, provide 8-inches. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install at the start or end of a street intersection curb return. Expansion joints are not required in concrete placement using slip-form construction.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

BACKFILL BEHIND CURB BEFORE PAVING AGAINST LIP OF GUTTER



Type HB30-7



JOINT DETAIL

Curb and gutter connection

1. GENERAL

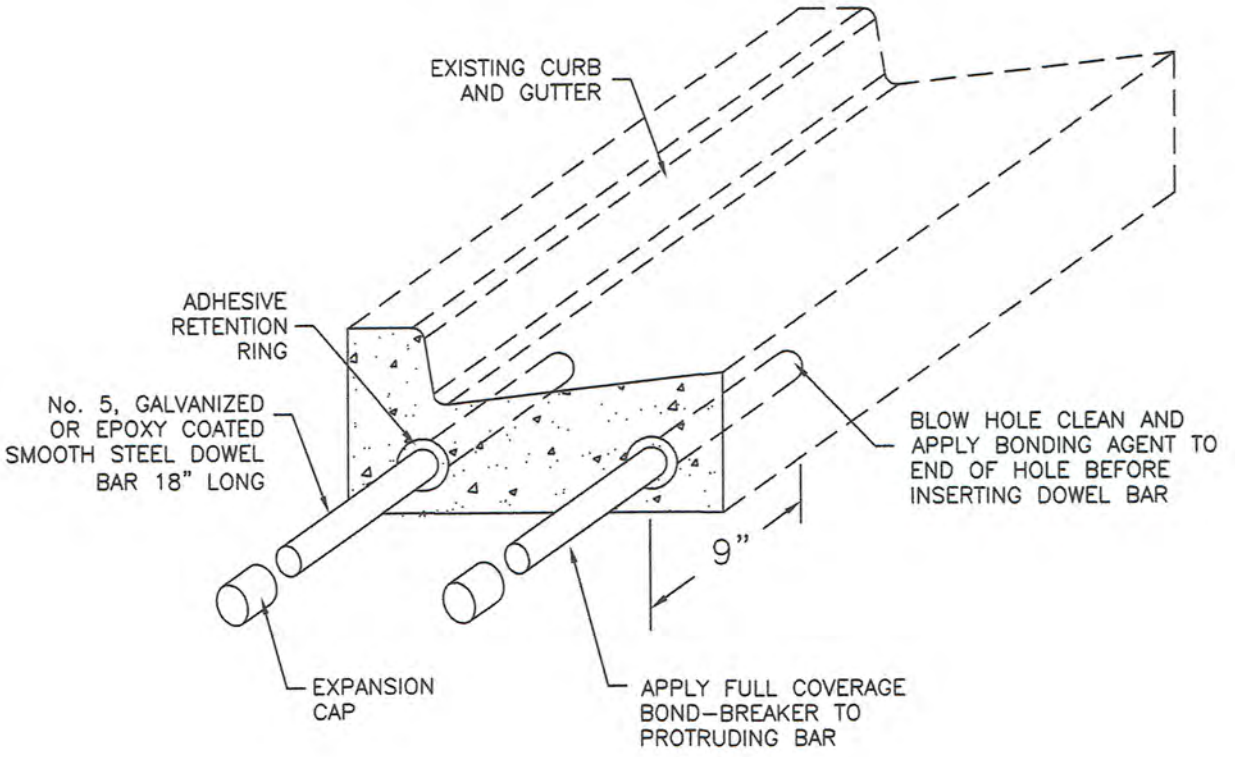
A. Connect new curb and gutter to existing curb and gutter that has not been placed by CONTRACTOR.

2. PRODUCTS

A. Reinforcement: Galvanized or epoxy coated, 60 ksi yield grade steel, ASTM A615.
B. Adhesive: Epoxy adhesive grout, APWA Section 03 61 00.
C. Bond Breaker: Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
D. Expansion Cap: Plastic, with bar movement allowance of 1/2-inch.

3. EXECUTION

A. Ensure drill rigs (or jigs) are set at mid-depth of the gutter and horizontal to the surface. Make hole size large enough to account for dowel bar and adhesive.
B. Clean holes and dowel bars of dirt, dust and particles. Ensure coating on bars have no surface defects.
C. Place bonding agent in the back of each hole so adhesive flows out around each bar fully encasing it. DO NOT apply adhesive to end of the bar and then insert the bar into the hole.
D. Insert dowels with at least one full turning motion and if necessary, place a grout retention disk on the dowel after insertion to contain adhesive.
E. Apply complete coverage of bond-breaker on the protruding end of each dowel.
F. Install expansion caps on protruding dowel bar ends.


EXISTING CURB
AND GUTTER
ADHESIVE
RETENTION
RING
No. 5, GALVANIZED
OR EPOXY COATED
SMOOTH STEEL DOWEL
BAR 18" LONG
BLOW HOLE CLEAN AND
APPLY BONDING AGENT TO
END OF HOLE BEFORE
INSERTING DOWEL BAR
9"
EXPANSION
CAP
APPLY FULL COVERAGE
BOND-BREAKER TO
PROTRUDING BAR

Curbs

1. GENERAL

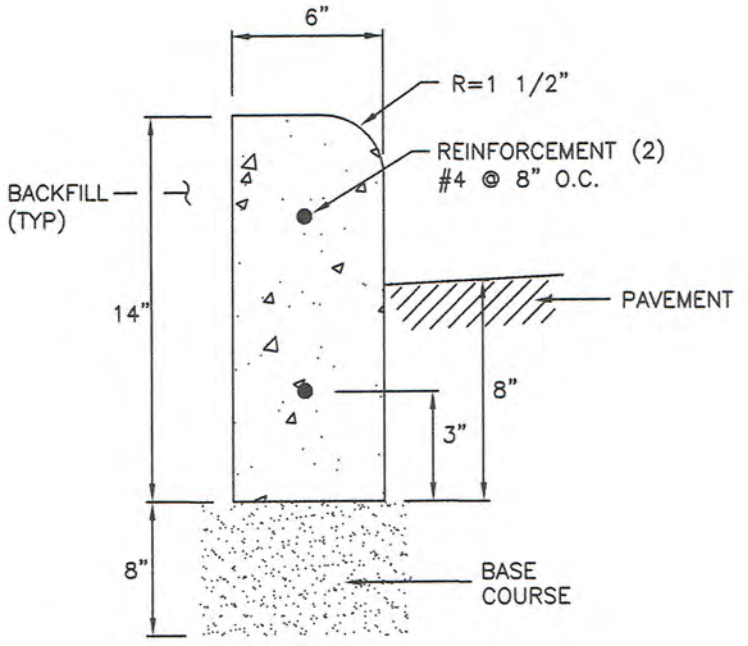
A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

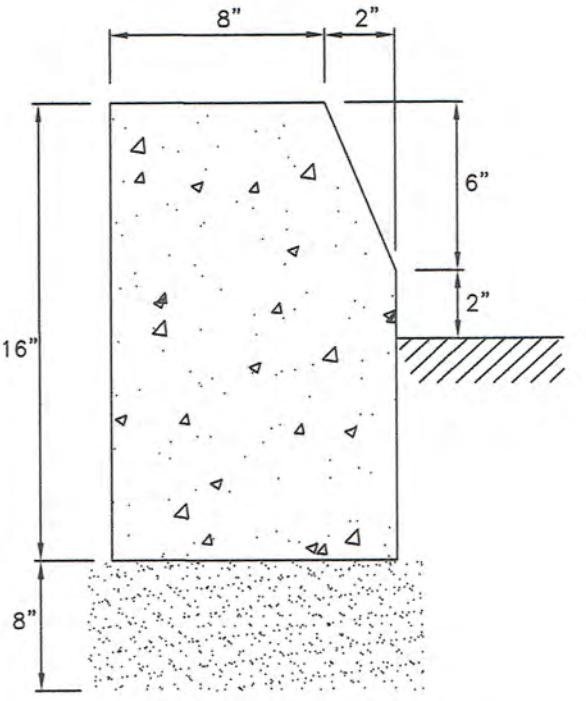
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install at the start or end of a street intersection curb return. Expansion joints are not required in concrete placement using slip-form construction.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.



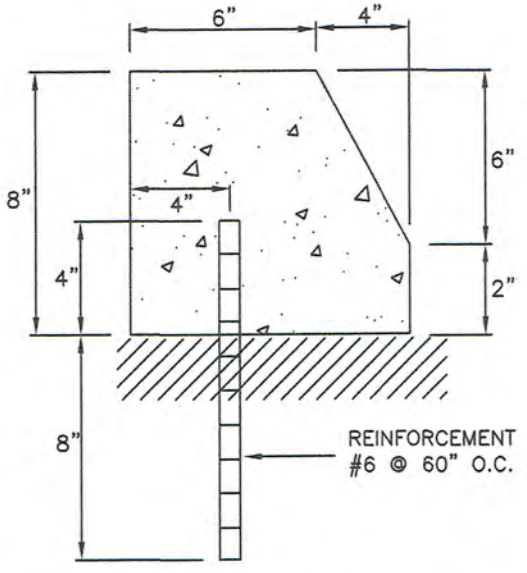
CONCRETE AREA = 0.58 SQ. FT.

Type P



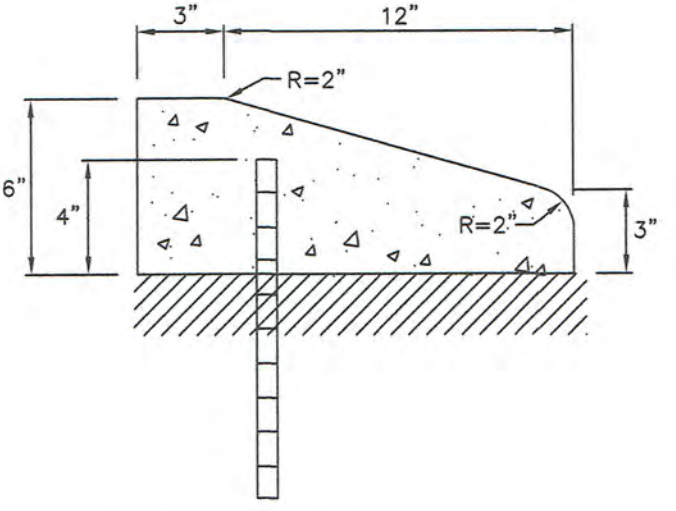
CONCRETE AREA = 1.0278 SQ. FT.

Type Q



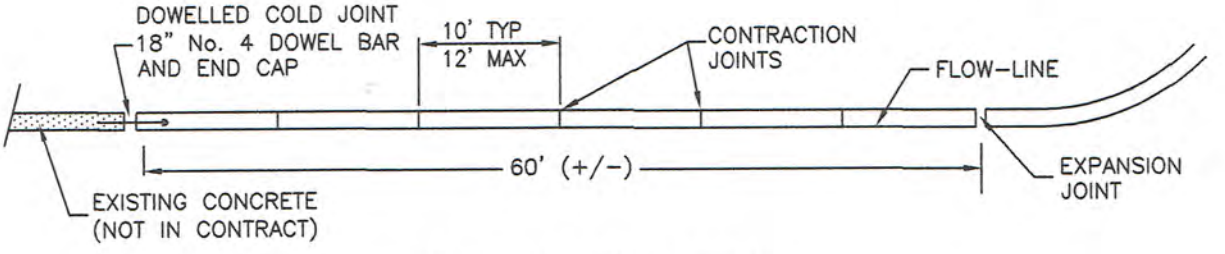
CONCRETE AREA = 0.472 SQ. FT.

Type R



CONCRETE AREA = 0.487 SQ. FT.

Type S



JOINT SPACING DETAIL

Waterway

1. GENERAL

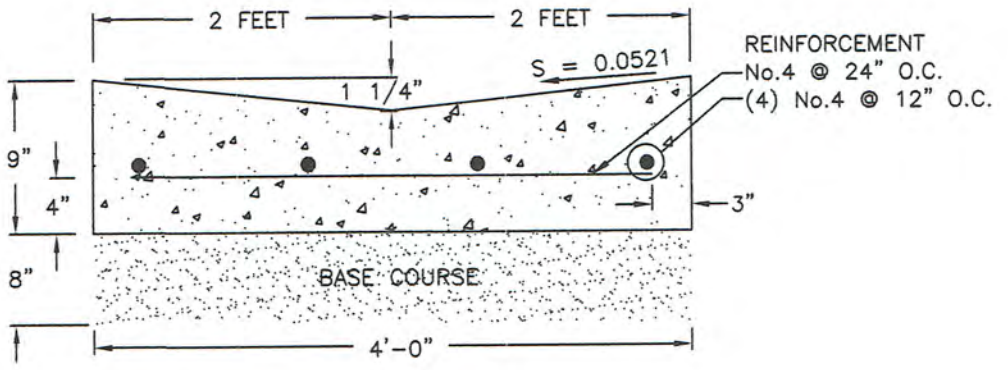
A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Unless indicated otherwise, width of waterway as follows.
   1) 4 feet for a residential street.
   2) 6 feet for a non-residential street.
   3) If wider than 6 feet, offset the flow line in the waterway to match (line up with) the curb and gutter flow line. Adjust cross slopes to match existing slopes.
C. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

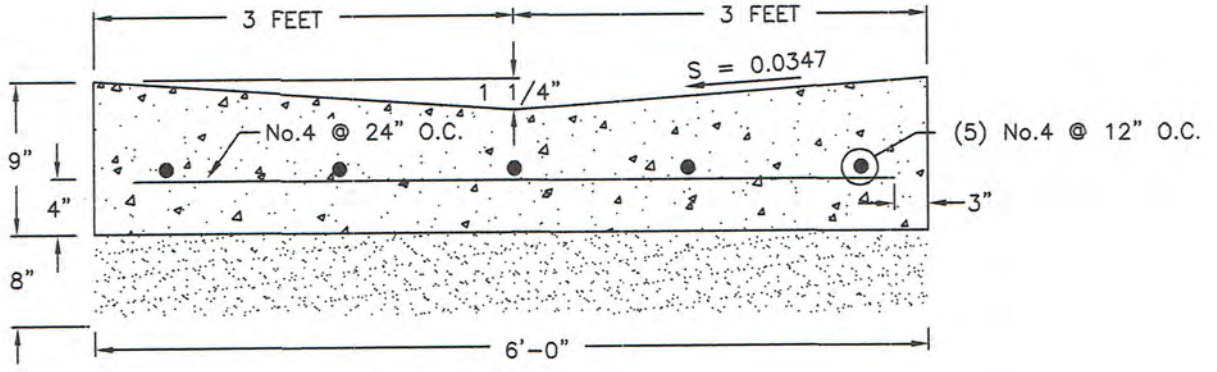
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Thickness is 6-inches if flow-line grade is 0.5 percent (s=0.005) or greater. If slope is less, provide 8-inches. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
   1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Expansion joints are not required in concrete placement using slip-form construction.
   2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
   3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.



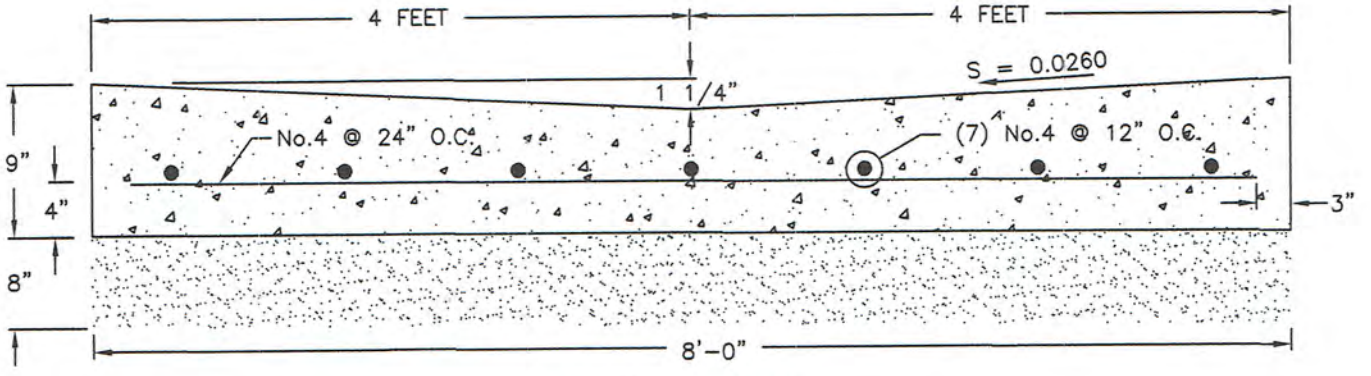
4'-0" WATERWAY

CONCRETE AREA = 2.583 SQ. FT.



6'-0" WATERWAY

CONCRETE AREA = 3.875 SQ. FT.



8'-0" WATERWAY

CONCRETE AREA = 5.166 SQ. FT.

Waterway transition structure

1. GENERAL

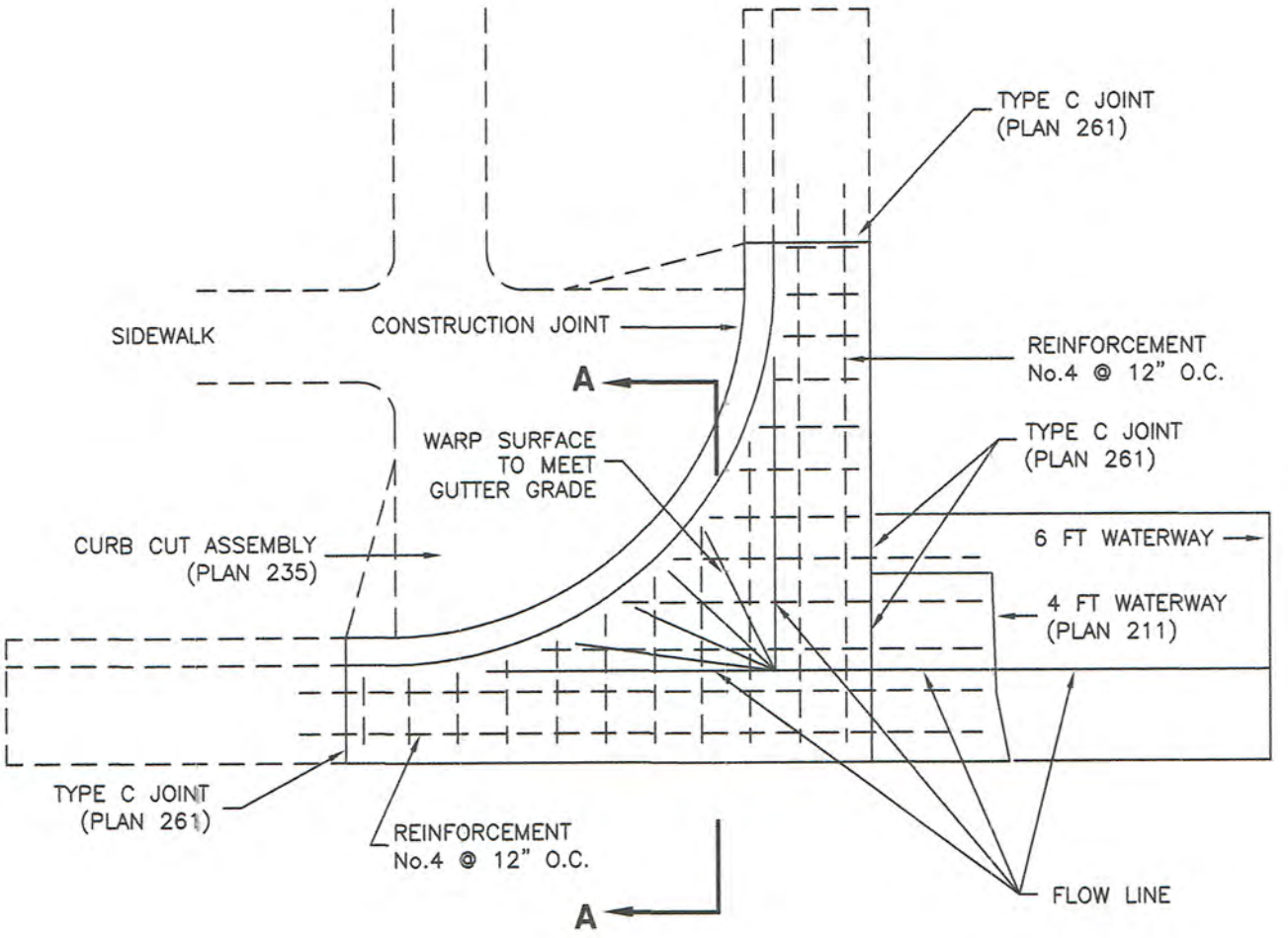
A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13..

2. PRODUCTS

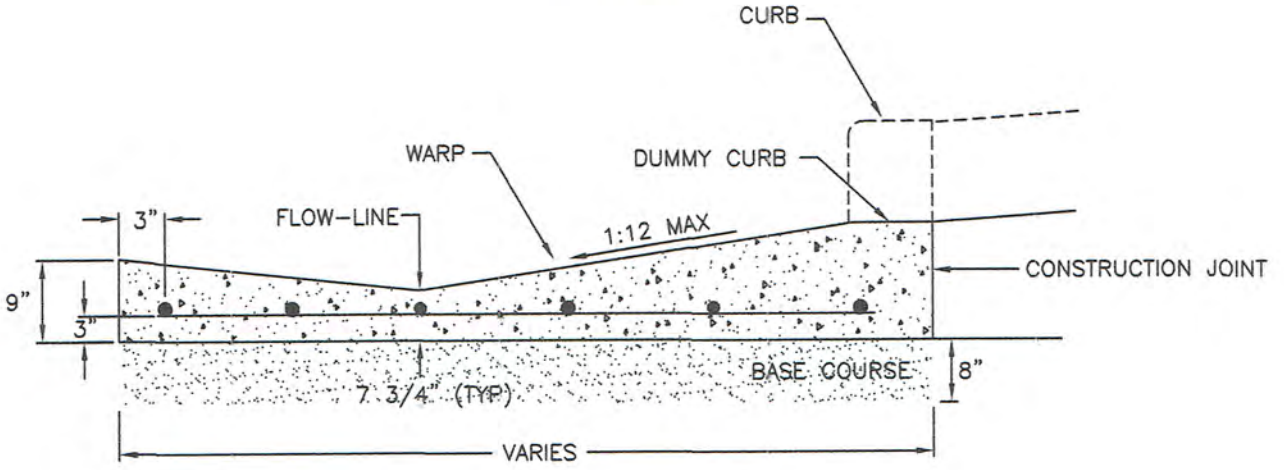
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Concrete. Class 4000, APWA Section 03 30 04. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
D. Reinforcement. Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install at the start or end of a street intersection curb return. Expansion joints are not required in concrete placement using slip-form construction.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Match joint location in adjacent Portland-cement concrete roadway pavement.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and repair. Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.



PLAN



SECTION A-A

Dip driveway approach

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

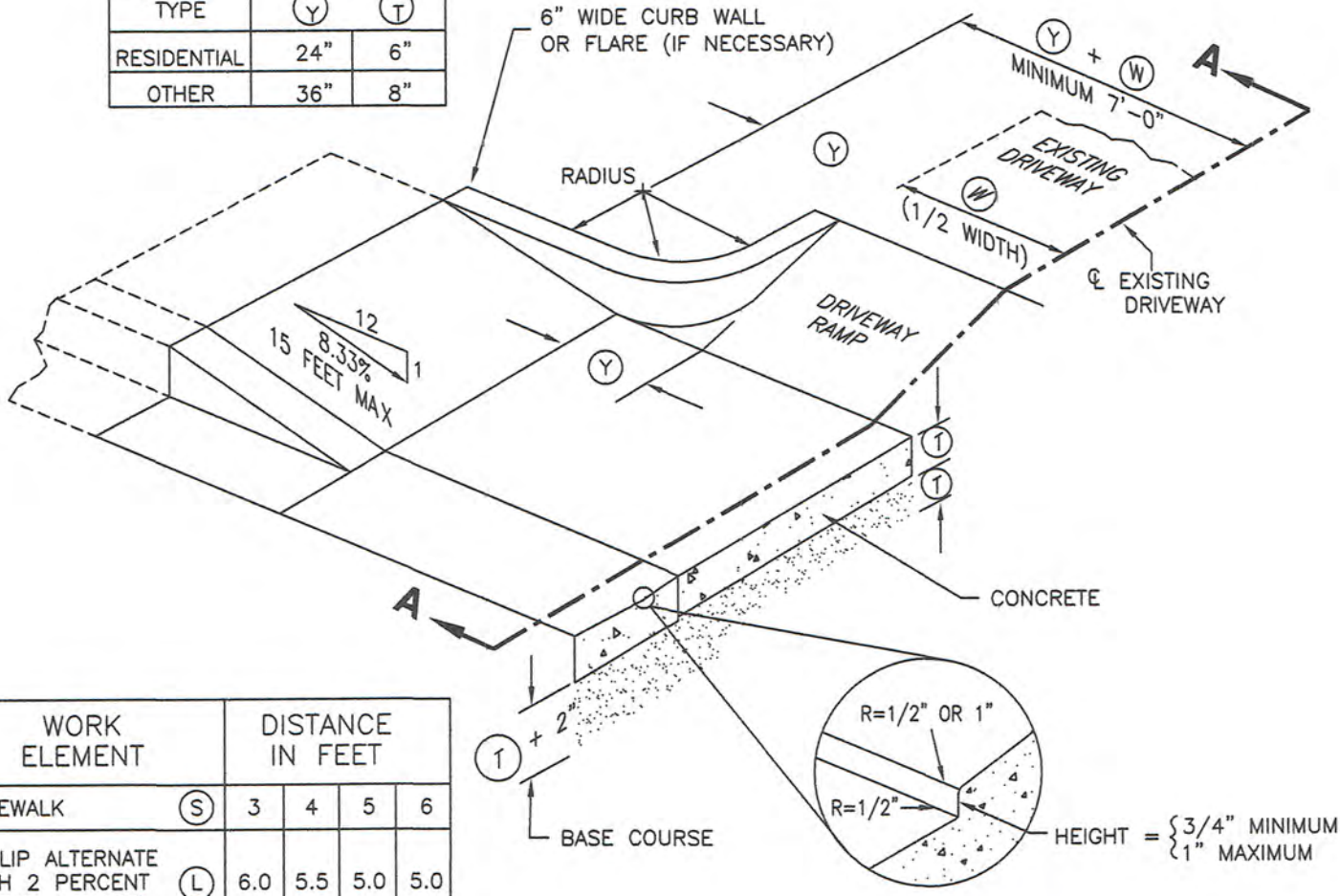
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair. Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

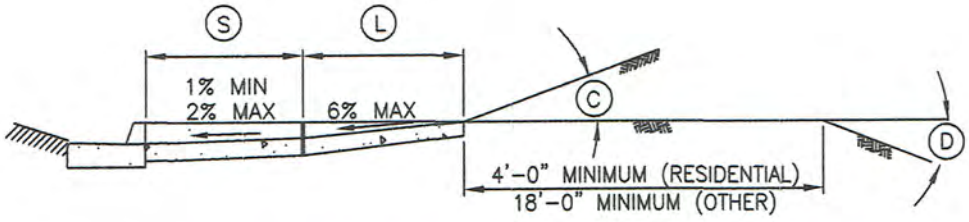
STREET TYPE	LENGTH (Y)	(T)
RESIDENTIAL	24"	6"
OTHER	36"	8"



LIP ALTERNATE

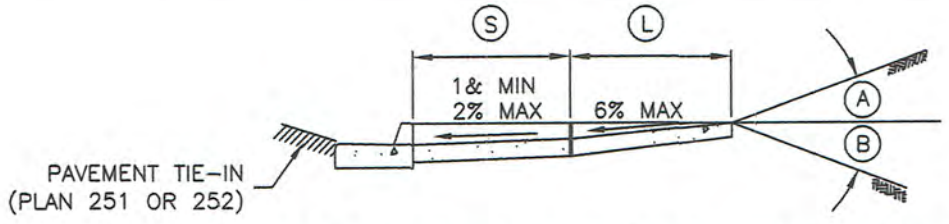
WORK ELEMENT	DISTANCE IN FEET			
SIDEWALK (S)	3	4	5	6
1" LIP ALTERNATE WITH 2 PERCENT SIDEWALK SLOPE (L)	6.0	5.5	5.0	5.0
NO LIP DRIVEWAY WITH 2 PERCENT SIDEWALK SLOPE (L)	7.0	7.0	6.5	6.0

OBLIQUE



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

SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS



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

SECTION A-A - TYPICAL DRIVEWAY APPROACH

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Dip driveway approach

Plan **215**

December 2009

Mountable curb driveway approach

1. GENERAL

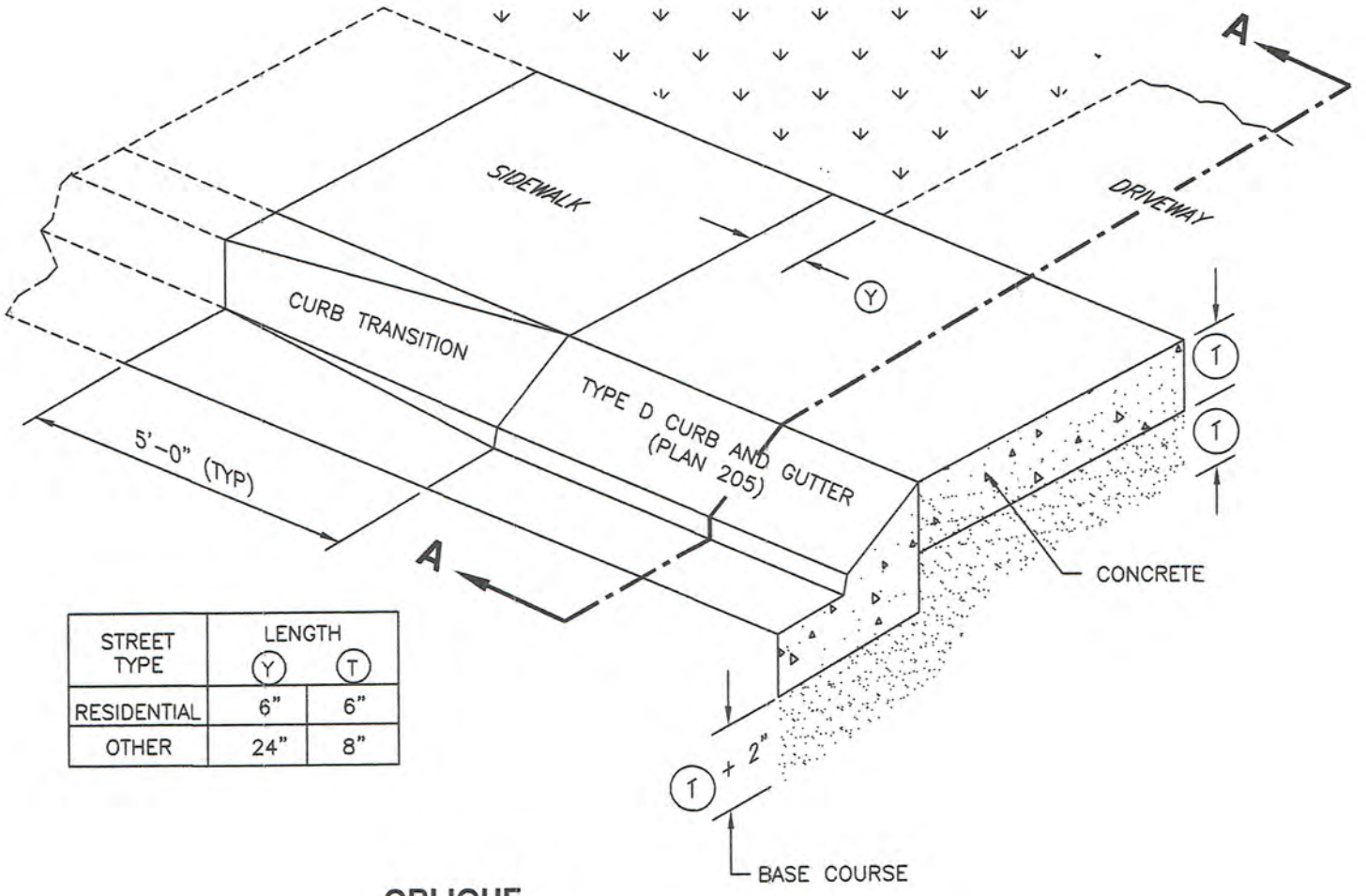
A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Concrete: Class 4000, APWA Section 03 30 04. 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.
D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

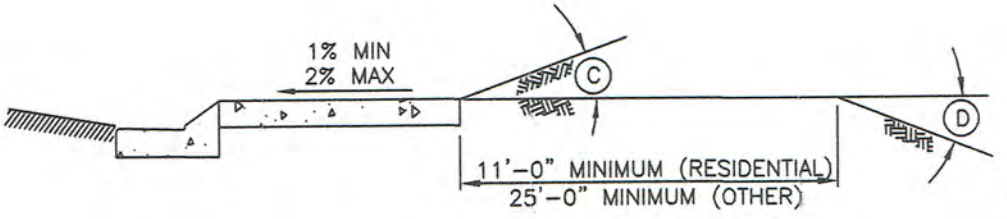
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.



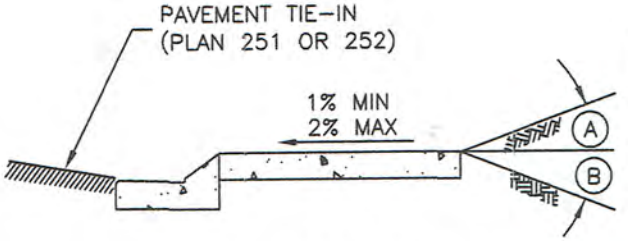
STREET TYPE	LENGTH (Y)	LENGTH (T)
RESIDENTIAL	6"	6"
OTHER	24"	8"

OBLIQUE



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

SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS



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

SECTION A-A - TYPICAL DRIVEWAY APPROACH

Flare driveway approach

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.

B. Field Changes to Slope Requirements:

1) Grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.

2) Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.

3) Specific uses or site conditions may require profile design submittal for review and acceptance.

C. Additional requirements are specified in APWA Section 32 16 13..

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

C. Concrete: Class 4000, APWA Section 03 30 04. 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.

D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Reinforcement: Not required if driveway apron is constructed without a cold joint.

C. Concrete Placement: APWA Section 03 30 10.

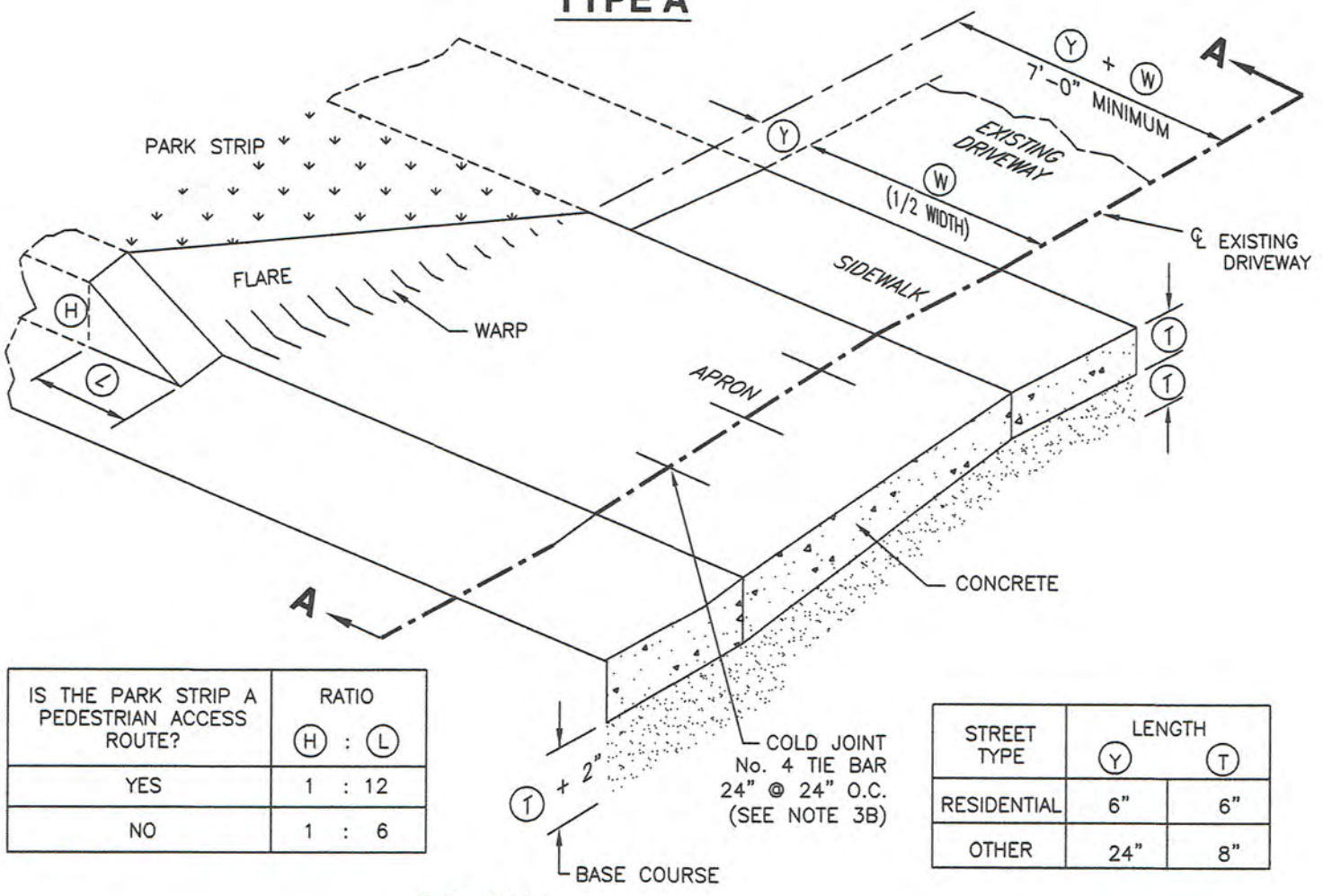
1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.

2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).

3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

D. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

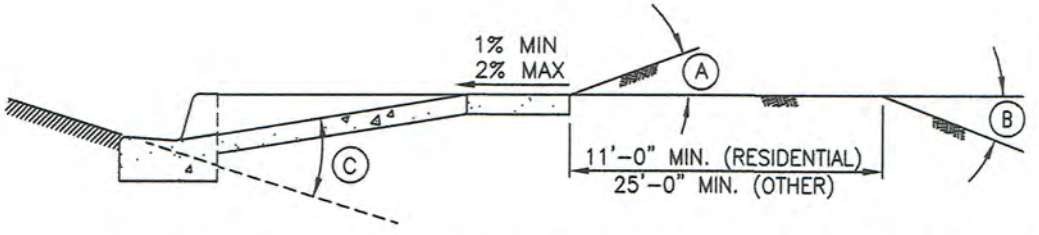
TYPE A



IS THE PARK STRIP A PEDESTRIAN ACCESS ROUTE?	RATIO (H) : (L)
YES	1 : 12
NO	1 : 6

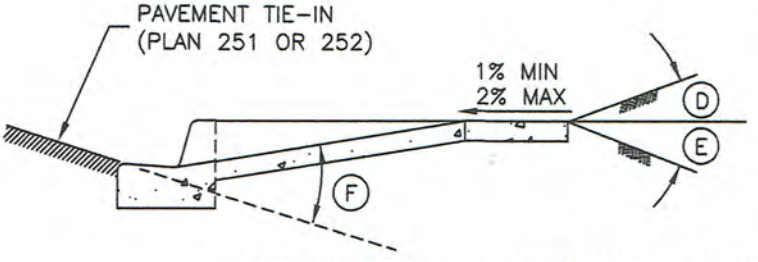
STREET TYPE	LENGTH (Y)	LENGTH (T)
RESIDENTIAL	6"	6"
OTHER	24"	8"

OBLIQUE



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

SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS



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

SECTION A-A - TYPICAL DRIVEWAY APPROACH

Flare driveway approach

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.

B. Field Changes to Slope Requirements:
   1) Grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   2) Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
   3) Specific uses or site conditions may require profile design submittal for review and acceptance.

C. Additional requirements are specified in APWA Section 32 16 13..

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

C. Concrete: Class 4000, APWA Section 03 30 04. 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.

D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

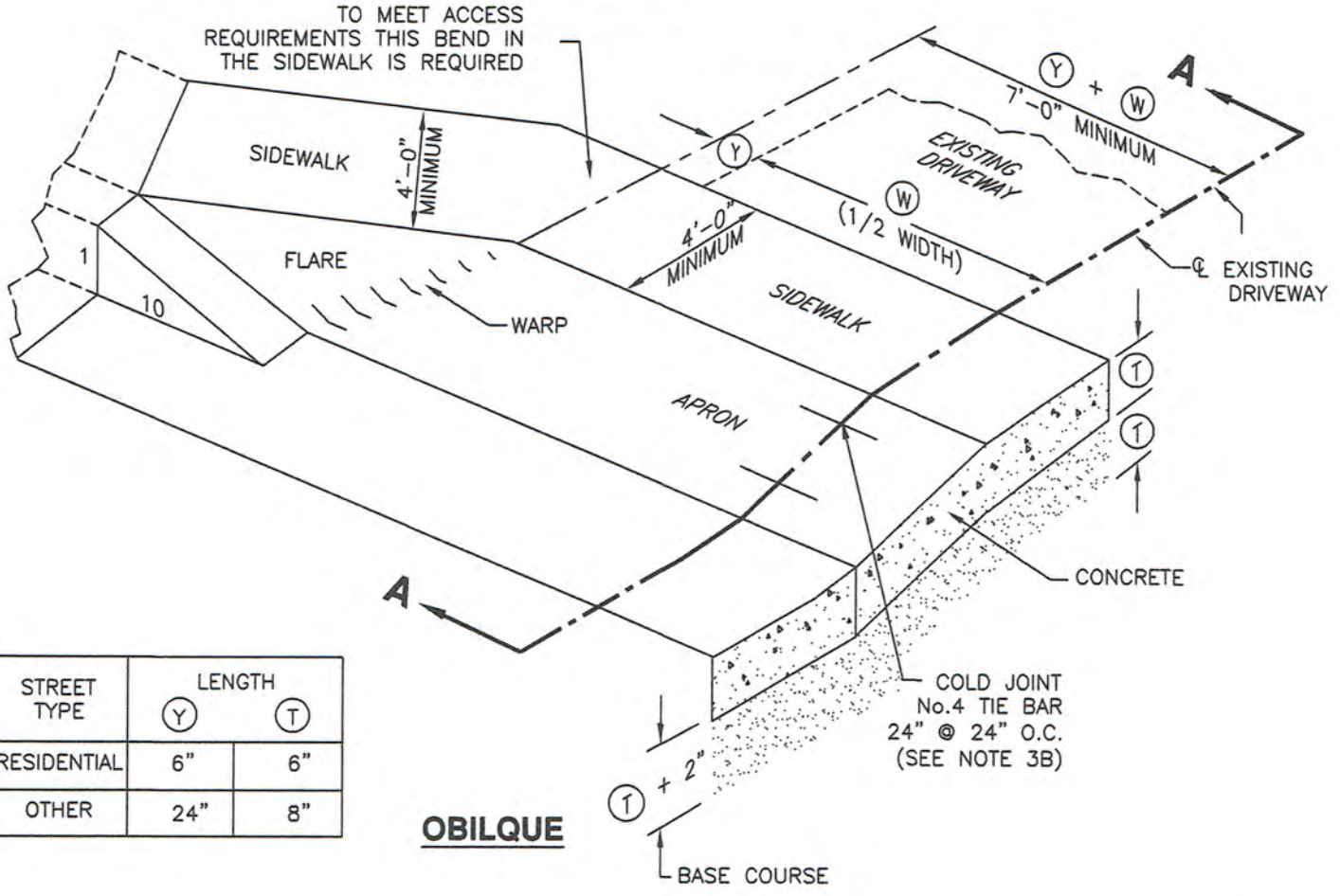
A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Reinforcement: Not required if driveway apron is constructed without a cold joint.

C. Concrete Placement: APWA Section 03 30 10.
   1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
   2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).
   3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

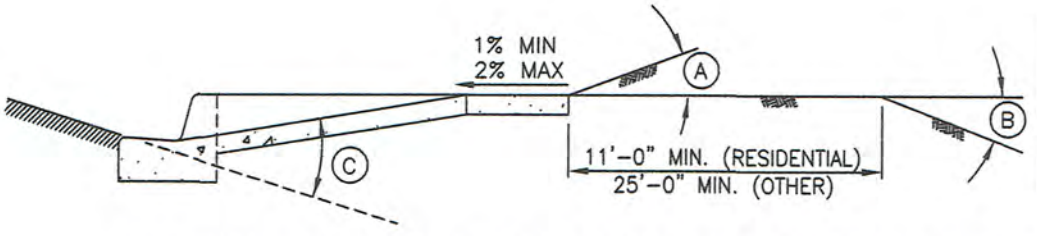
D. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

TYPE B



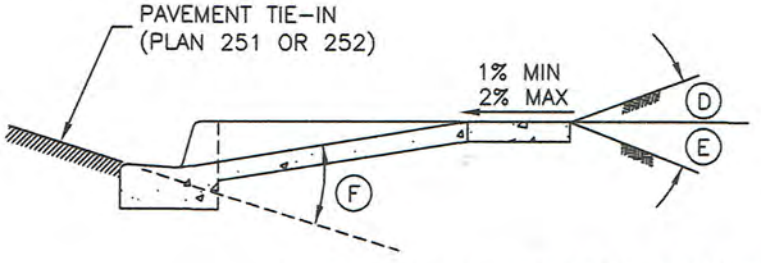
STREET TYPE	LENGTH Y	LENGTH T
RESIDENTIAL	6"	6"
OTHER	24"	8"

OBILQUE



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

SECTION A-A APPROACH REQUIRING SERVICE TRUCK ACCESS



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

SECTION A-A TYPICAL DRIVEWAY APPROACH

Saw-cut driveway approach

1. GENERAL

A. The drawing shows sawing off and removing a curb for the construction of a new driveway approach. Additional requirements are specified in Plan 215 or Plan 221 for constructing driveway approach after curb is removed.

B. The slope of the right flare is required if a pedestrian access route abuts the curb. The slope of the left flare is required if a pedestrian access rout DOES NOT abut the curb.

C. Variance from specified slopes must be acceptable to the ENGINEER.

2. PRODUCT

A. Water repellant: Penetrating compound, APWA Section 07 19 00.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

3. EXECUTION

A. At the apron, cut the curb off so the slope of the curb cut as measured perpendicular to the flow line is 16.67 percent (1:6). Unless specified otherwise, make the curb cut intersect the flow line.

B. At the flare, cut the curb off so the slope of curb cut as measured parallel to the flow line is as follows.

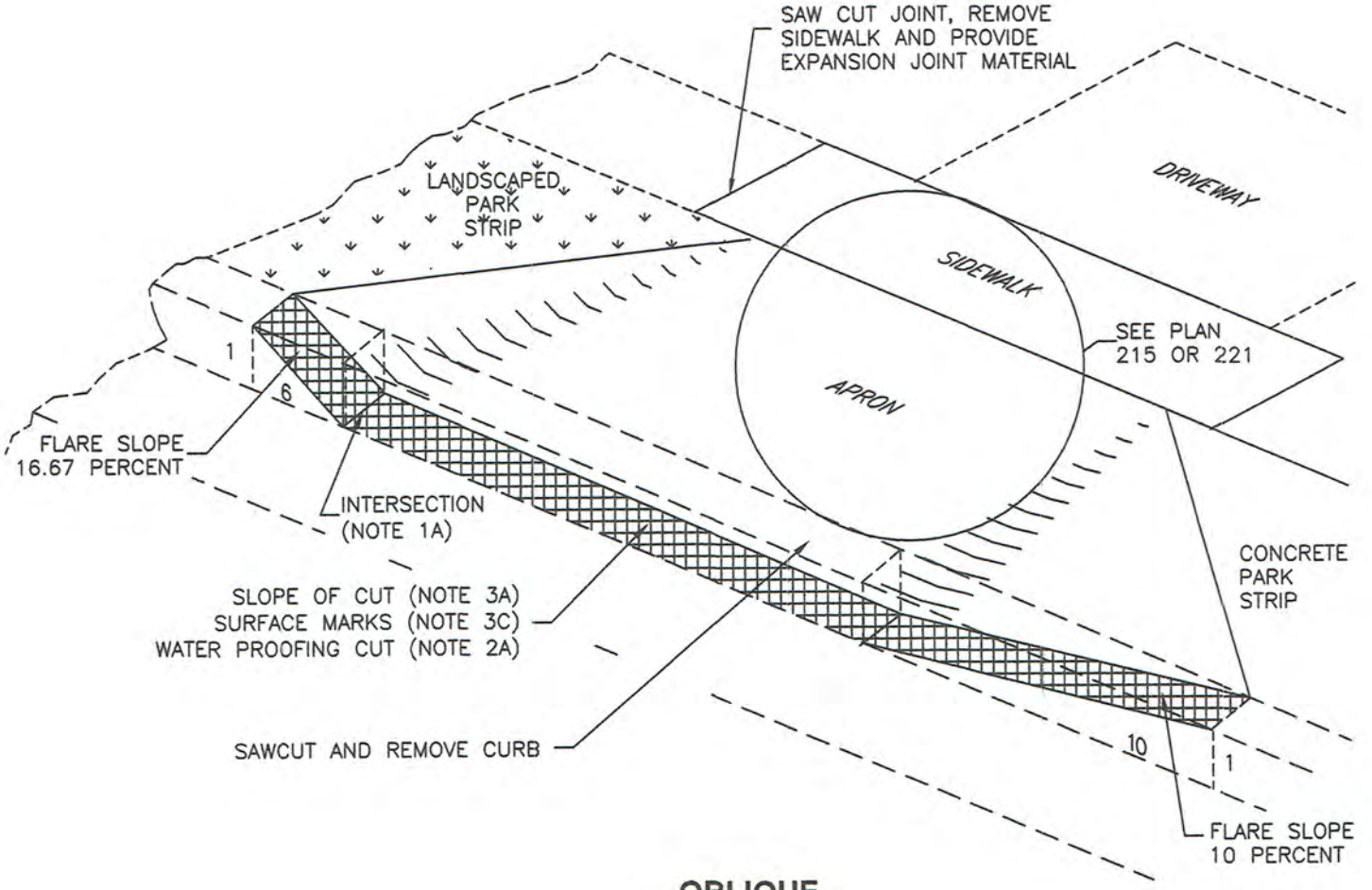
   1) 8.33 percent (1:12) if curb borders a surface used by pedestrians.
   2) 16.67 percent (1:6) if curb does not border a surface used by pedestrians.

C. No over-cutting where cuts merge. Grind sawed surface so no blade marks remain.

D. Water proofing. Apply full coverage water repellant over cut concrete.

E. Expansion Joint: Vertical, full depth, with top of filler set flush with concrete surface.

NARRATIVE: THIS PLAN IS USED IF AN EXISTING CURB MUST BE CUT TO INSTALL A DRIVEWAY APPROACH. THE SLOPE OF THE CURB FLARE DEPENDS UPON WHETHER THE PARK STRIP IS LANDSCAPED OR IF THE PARK STRIP IS CONCRETE.



OBLIQUE

Open driveway approach

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.

B. Field Changes to Slope Requirements:

1) Grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.

2) Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.

3) Specific uses or site conditions may require profile design submittal for review and acceptance.

C. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

C. Concrete: Class 4000, APWA Section 03 30 04. 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.

D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Reinforcement: Not required if driveway apron is constructed without a cold joint.

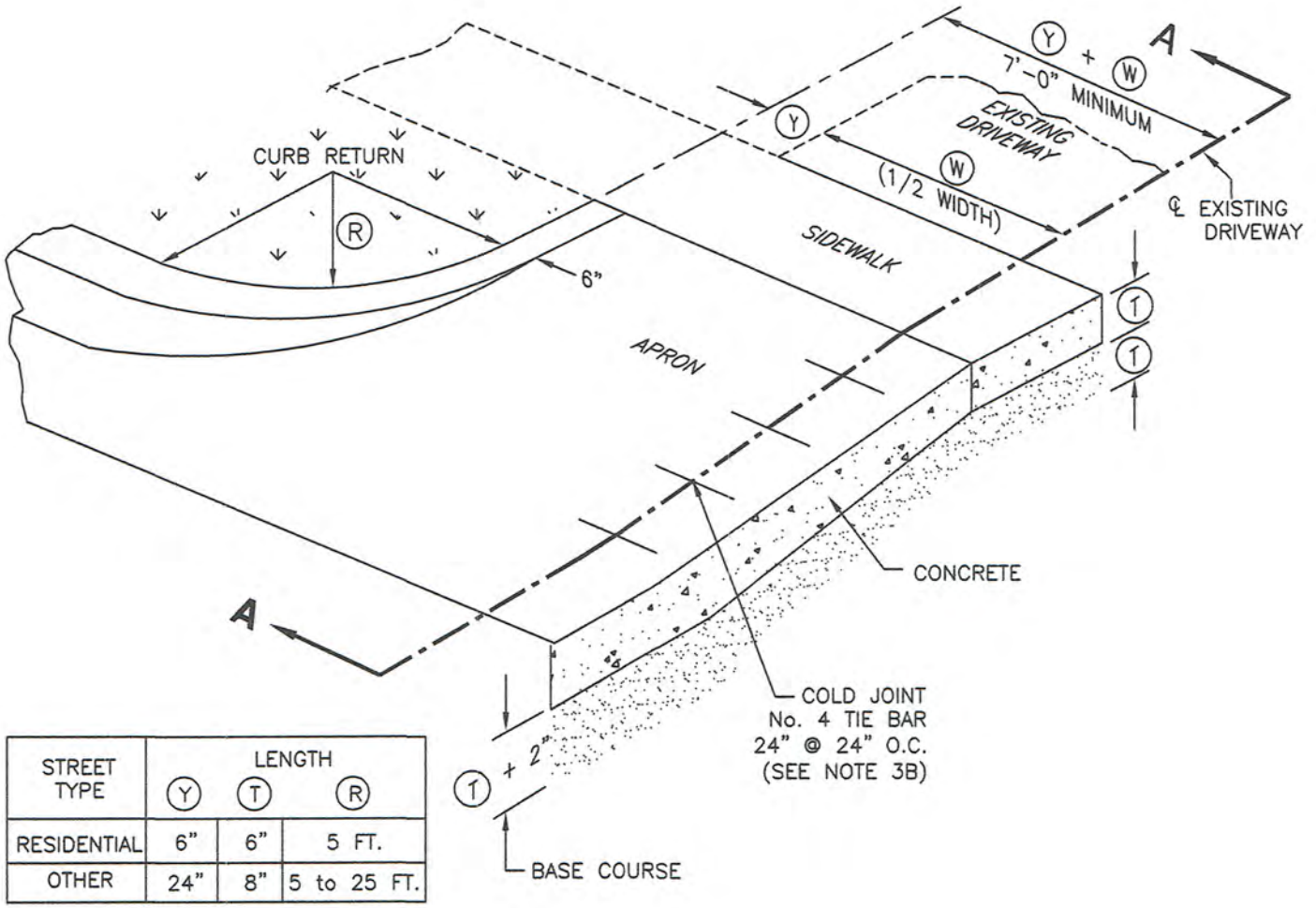
C. Concrete Placement: APWA Section 03 30 10.

1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.

2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).

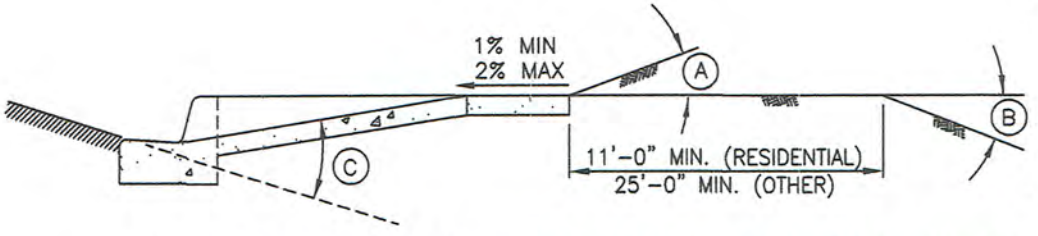
3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

D. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.



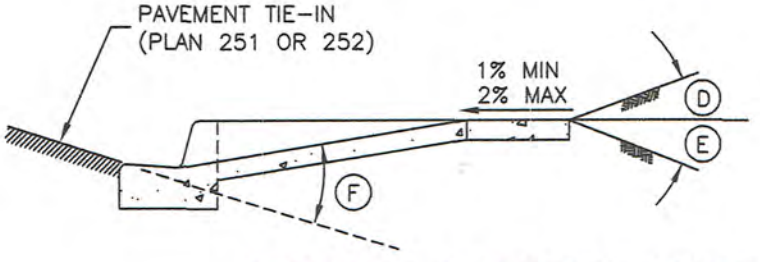
STREET TYPE	LENGTH Y	T	R
RESIDENTIAL	6"	6"	5 FT.
OTHER	24"	8"	5 to 25 FT.

OBLIQUE



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

SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS



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

SECTION A-A - TYPICAL DRIVEWAY APPROACH

Bridge driveway approach

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.

B. Field Changes to Slope Requirements:
   1) Grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   2) Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
   3) Specific uses or site conditions may require profile design submittal for review and acceptance.

C. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

C. Concrete: Class 4000, APWA Section 03 30 04. 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.

D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

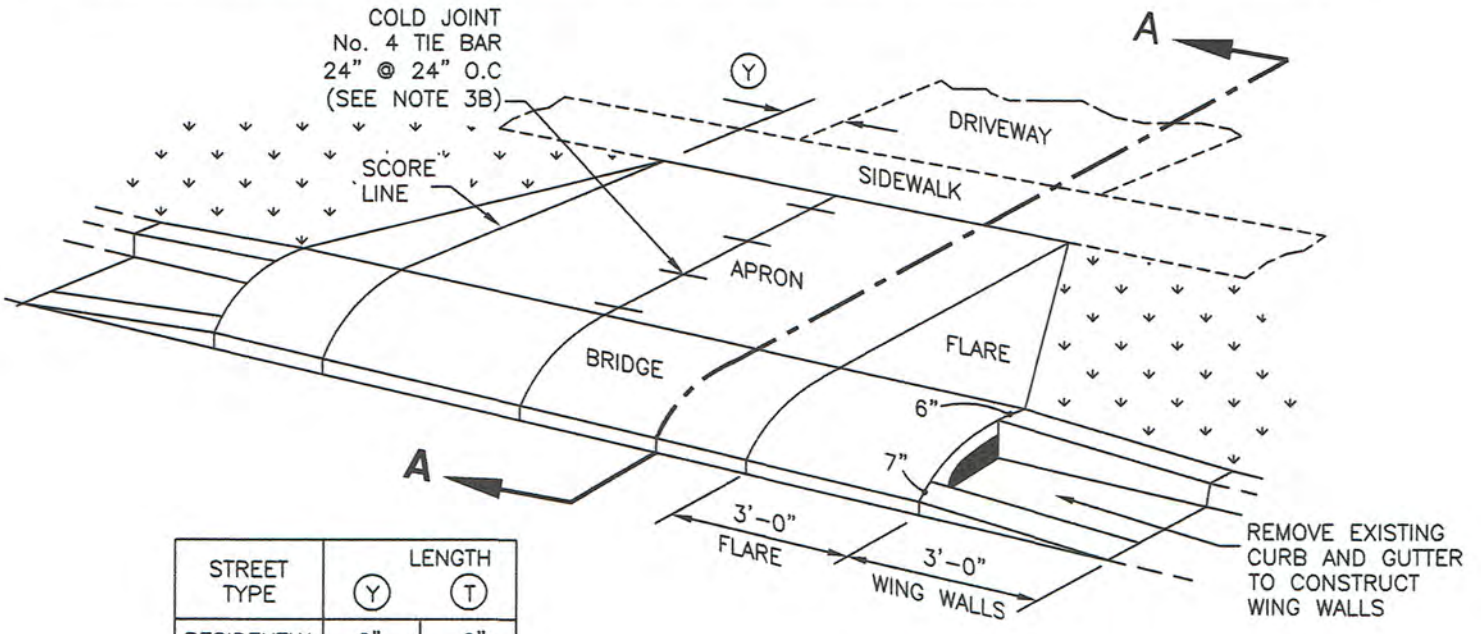
A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Reinforcement: Not required if driveway apron is constructed without a cold joint.

C. Concrete Placement: APWA Section 03 30 10.
   1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
   2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).
   3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

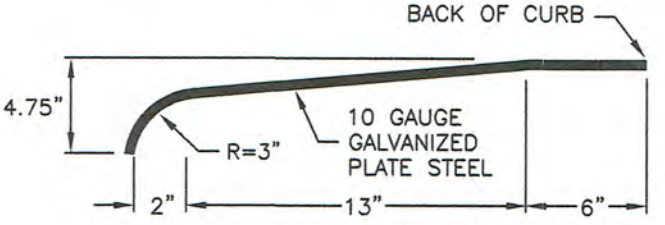
D. Protection and Repair: Protect concrete from deicing chemicals during cure. Repair construction that does not drain. If necessary, fill flow-line with water to verify.

DO NOT CONSTRUCT THIS APPROACH WITHOUT ENGINEER'S WRITTEN APPROVAL

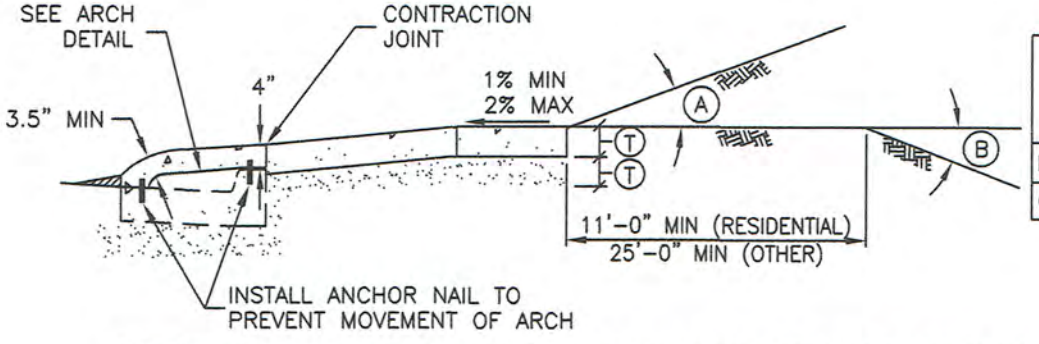


STREET TYPE	LENGTH Y	LENGTH T
RESIDENTIAL	6"	6"
OTHER	24"	8"

OBLIQUE

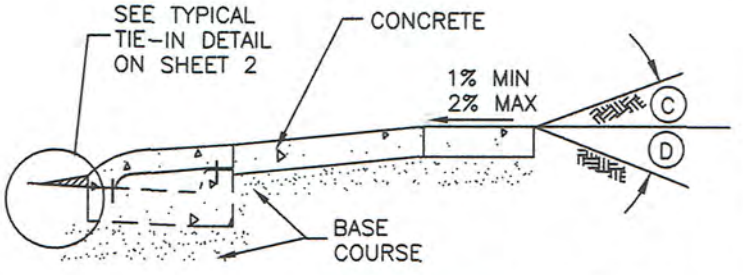


ARCH DETAIL



STREET TYPE	MAXIMUM GRADE BREAK A	MAXIMUM GRADE BREAK B
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS



STREET TYPE	MAXIMUM GRADE BREAK C	MAXIMUM GRADE BREAK D
RESIDENTIAL	16%	12%
OTHER	6%	8%

SECTION A-A - TYPICAL DRIVEWAY APPROACH

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Bridge driveway approach

Plan
229.1
Janurary 2009

Bridge driveway approach

1. GENERAL

A. This drawing shows bituminous concrete or Portland cement concrete tie-in to the existing roadway surface.

2. PRODUCTS

A. Bituminous Concrete Tie in: APWA Section 32 12 05.
   1) Warm weather patch – AC-20-DM-1/2, unless indicated otherwise.
   2) Cold weather patch – modified MC-250-FM-1,APWA Section 33 05 25.

B. Portland Cement Concrete Tie in: APWA Section 03 30 04.
   1) Class 4000.
   2) 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.

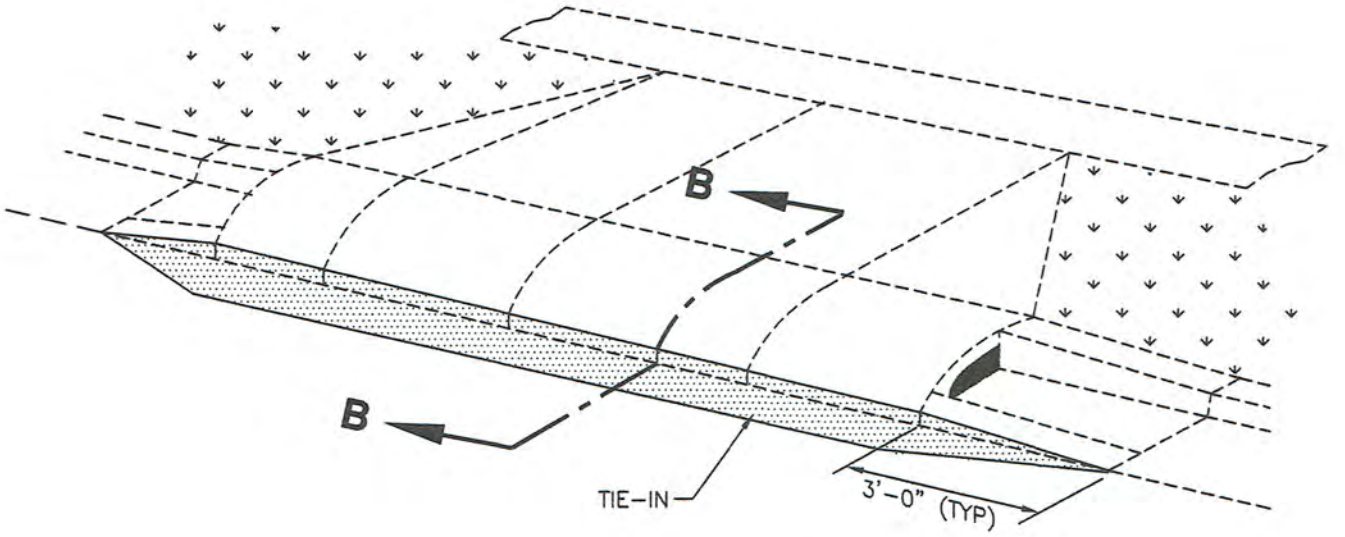
C. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

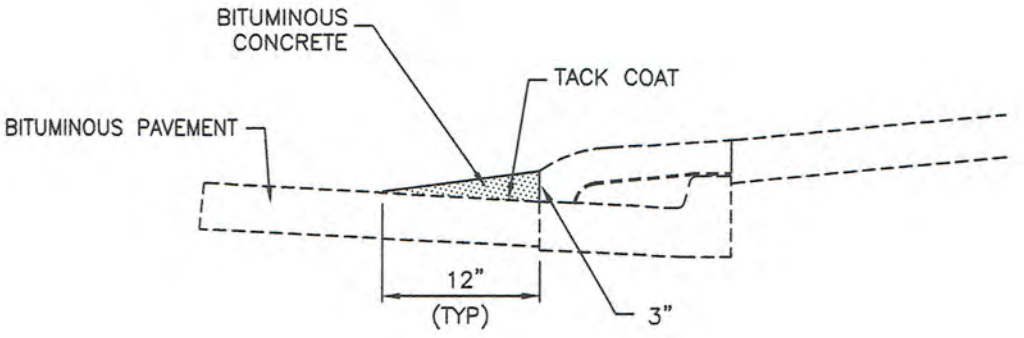
3. EXECUTION

A. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

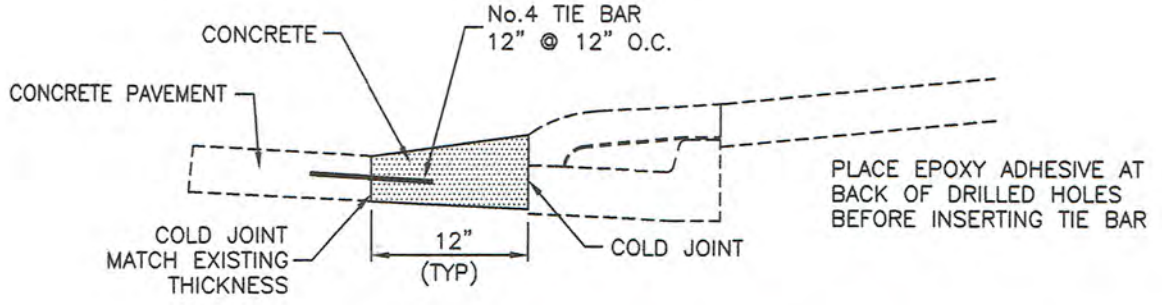
B. Bituminous Concrete Placement: Compact to 94 percent of ASTM D2041 (Rice density) plus or minus 2 percent.



OBLIQUE



SECTION B-B - BITUMINOUS PAVEMENT TIE-IN



SECTION B-B - CONCRETE PAVEMENT TIE-IN

Sidewalk

1. GENERAL

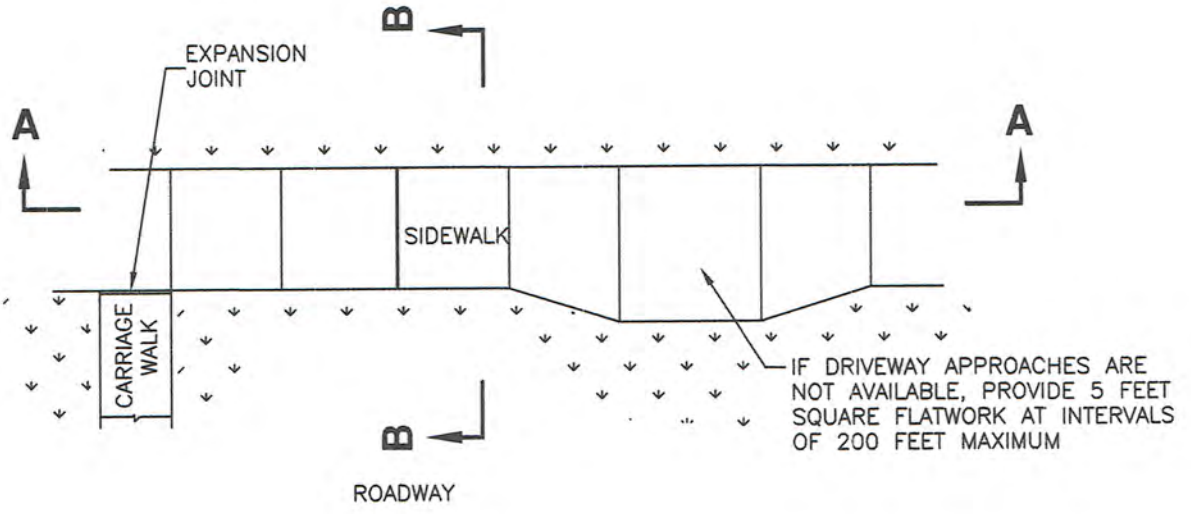
A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 32 16 13.

2. PRODUCTS

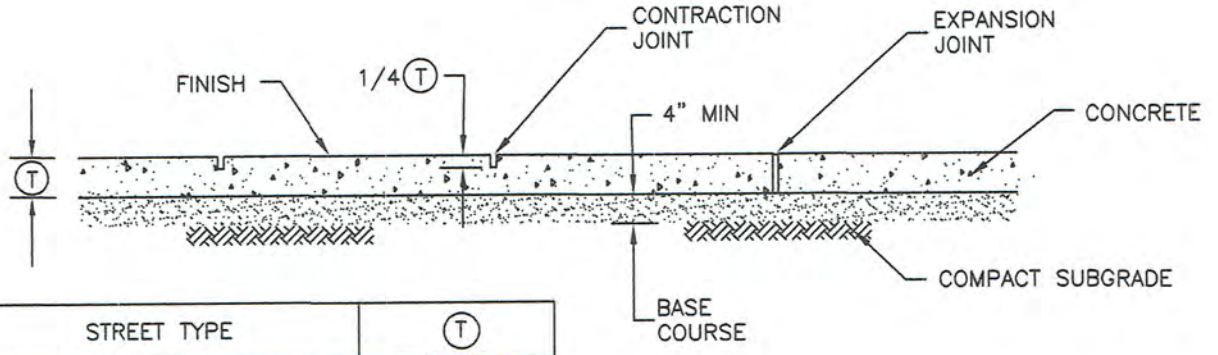
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Concrete: Class 4000, APWA Section 03 30 04. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches).
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.



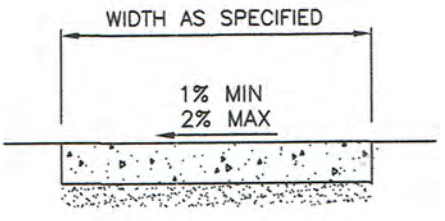
PLAN



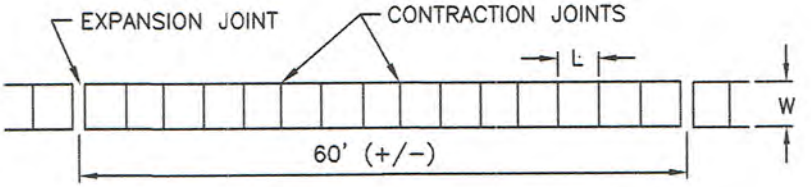
STREET TYPE	T
RESIDENTIAL (WITH PARK STRIP)	4"
RESIDENTIAL (NO PARK STRIP)	6"
OTHER	
REPLACING EXISTING SIDEWALK	MATCH EXISTING (4" MIN.)

SEE DRIVEWAY APPROACH PLANS FOR SIDEWALK THICKNESS AT DRIVEWAYS

SECTION A-A



SECTION B-B



$L_{MIN} = W$

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

OR

$= 15$ FEET MAX

SIDEWALK JOINT DETAIL

Patterned concrete

1. GENERAL

A. Variance from specified dimensions and slopes must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Color and Pattern: As specified or as selected by ENGINEER.
C. Additional sidewalk, curb and gutter requirements are in APWA Section 32 16 13.

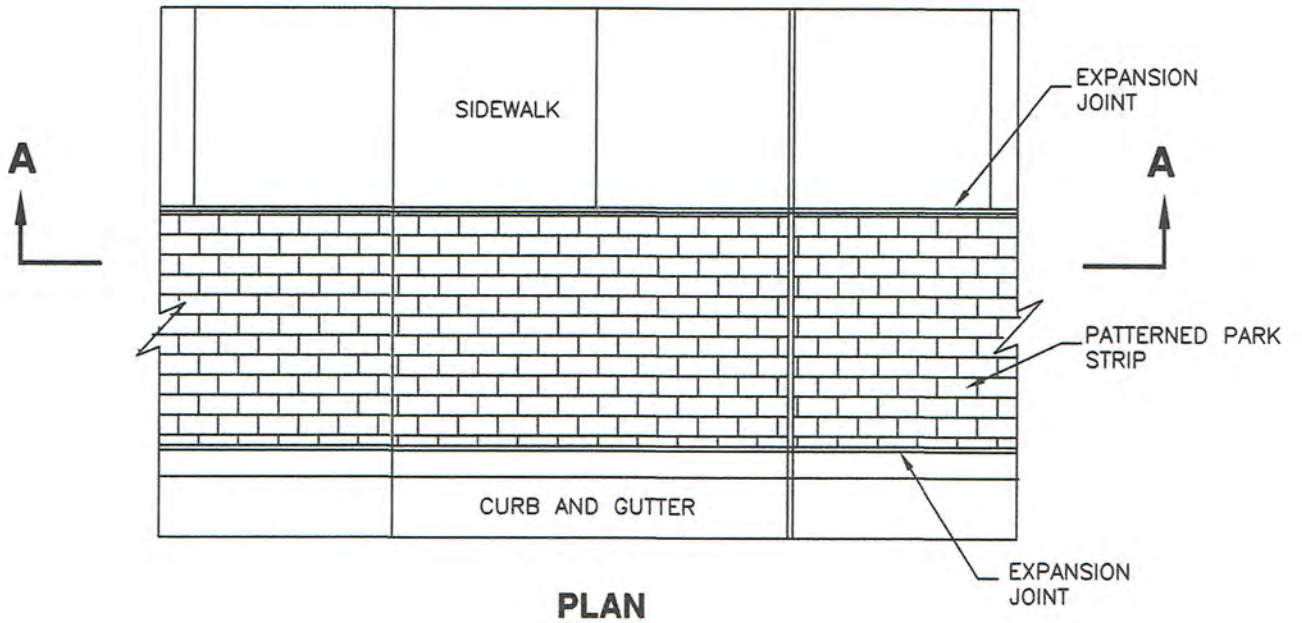
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

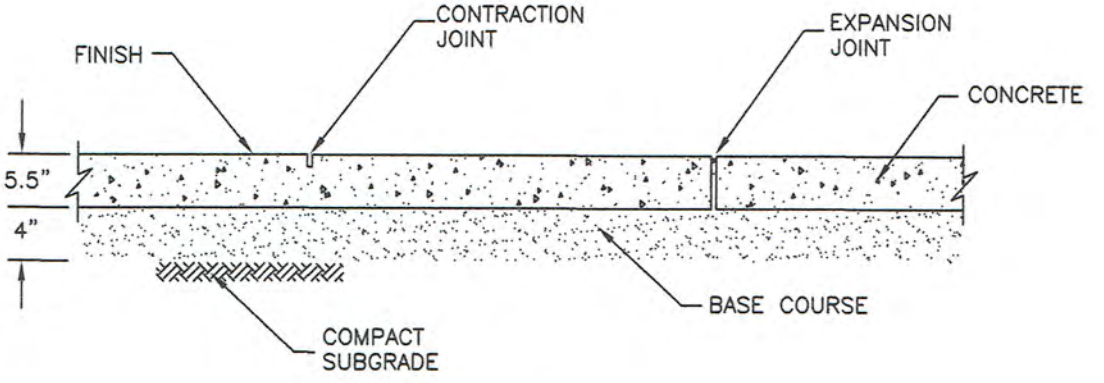
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2) Install contraction joints vertical, 1/8-inch wide or 1/4 slab thickness if the slab is greater than 8-inches thick. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches). Match joint location in adjacent sidewalk.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

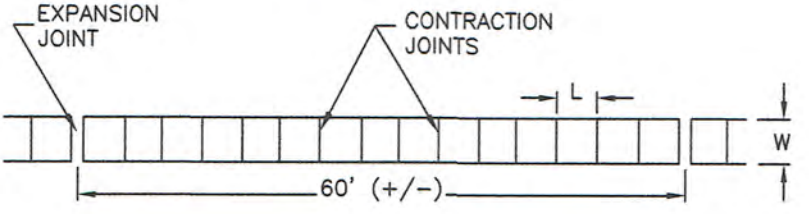
PARK STRIP



PLAN



SECTION A-A



$L_{MIN} = W$

$L_{MAX} = 1.5W$

PARK STRIP JOINT DETAIL

Patterned concrete

1. GENERAL

A. If necessary provide a 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 deg. F.
B. Additional flat work requirements are specified in APWA Section 32 16 13 and Section 32 16 14.

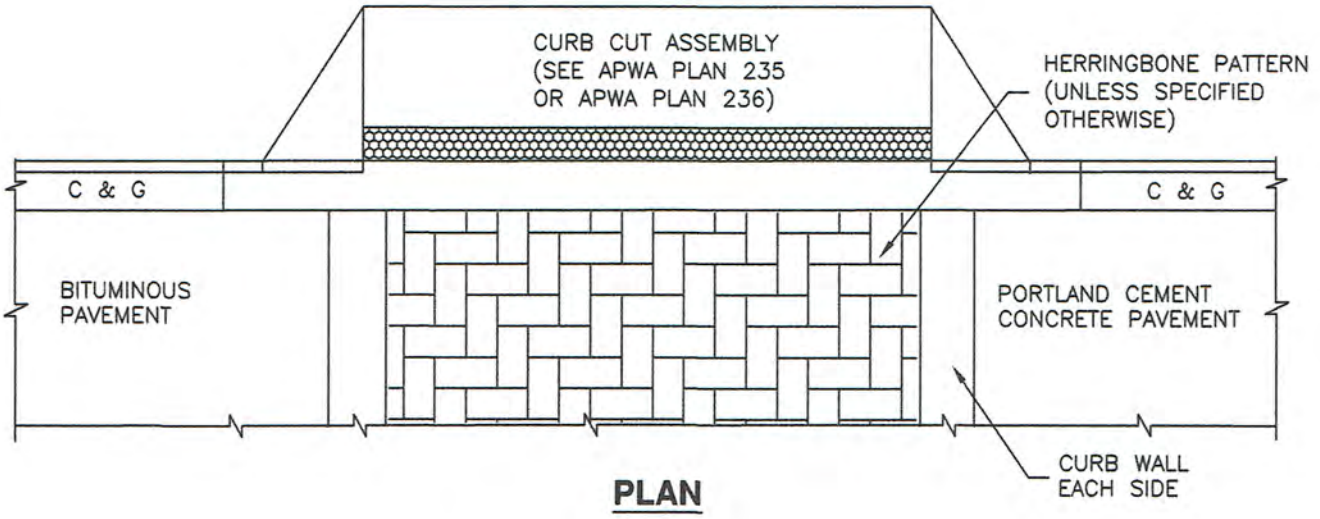
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Concrete (first pour): Class 4000, APWA Section 03 30 04.
C. Concrete (second pour): 6 percent air minimum, class 4000, severe weather exposure.
D. Reinforcement: Galvanized or epoxy coated (smooth for dowels) 60 ksi yield grade steel, ASTM A615.
E. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
F. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

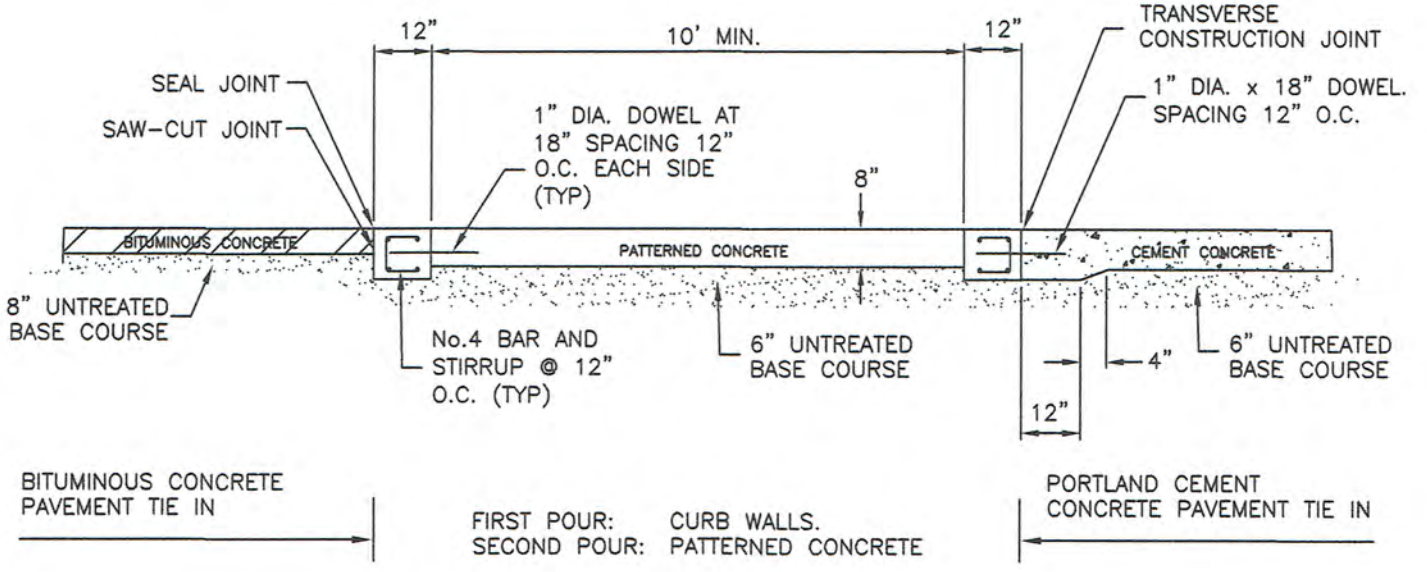
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2) Install contraction joints vertical, 1/8-inch wide and 1/3 slab thickness. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches). Match joint location in flat work.
    3) Pattern texture at least 1/8 inch deep minimum.
    4) Provide 1/2-inch radius edges. Apply a broom finish over patterned concrete and flatwork. Apply a curing agent.
C. Joint Repair: If a crack or separation occurs at a connection to existing pavement during the one year correction period, blow the crack or separation clean and seal the crack using joint sealant per Plan 265 and specification APWA Section 32 01 17.

CROSSWALK (AT GRADE)



PLAN



SECTION

Corner curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown. Where physical constraints (e.g. utility covers, poles, vaults, etc.) prevent compliance, a single diagonal curb cut assembly may serve both pedestrian street crossings.
B. Installation of flares or curb returns is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

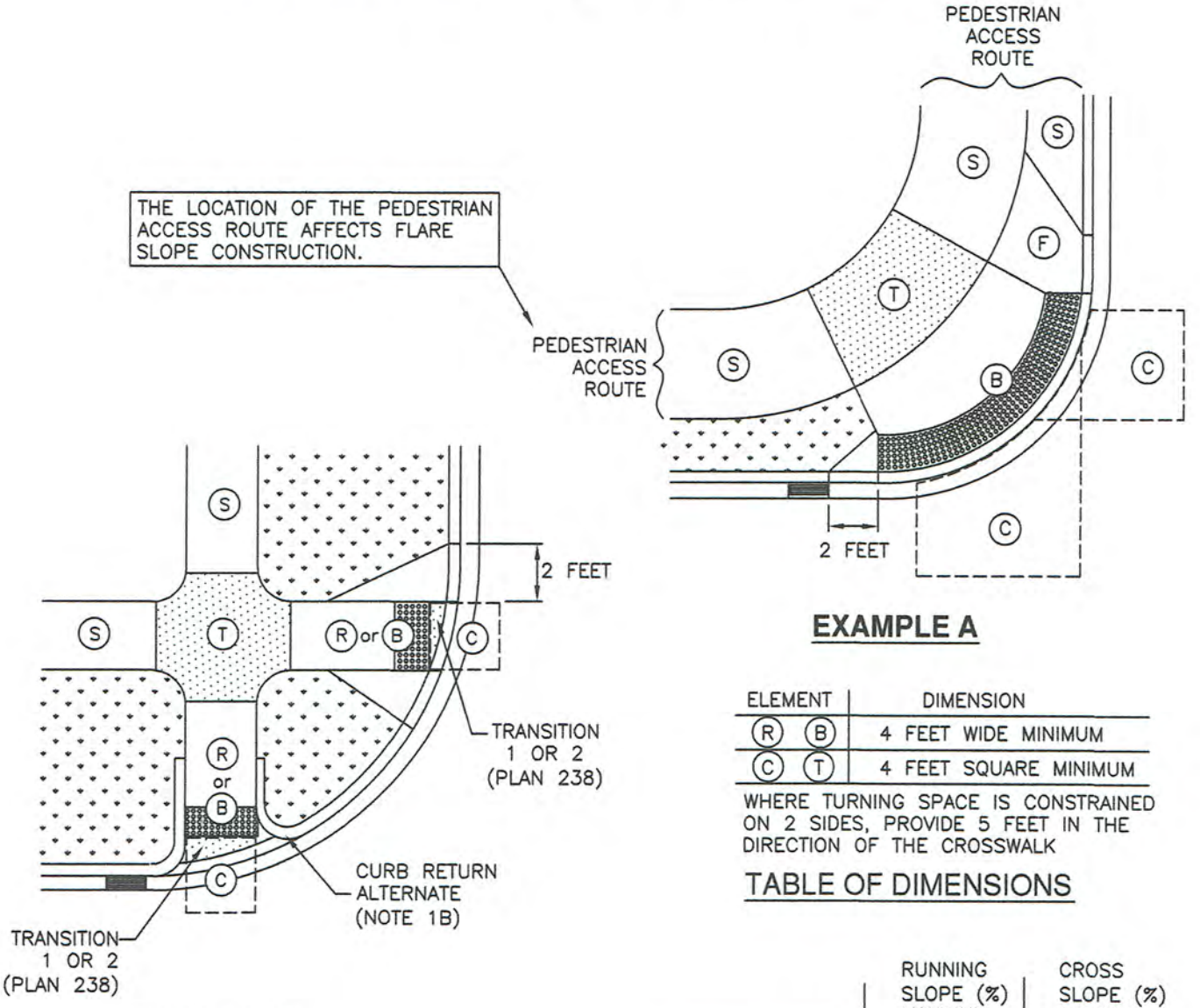
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Modifications:
    1) The sloped surface created to accommodate a flare area shall be perpendicular to the back of curb.
    2) No grade break shall exist between the flow-line and the foot of the curb ramp or blended transition. Length of the curb modification abutting the curb ramp or transition is 4 feet minimum for each crosswalk served.
C. Curb Ramp: Length not required to exceed 15 feet. Grade breaks are perpendicular to the direction of ramp run and are not permitted on ramp or turning space surface. Sides are parallel to each other and perpendicular to the ends. At the bottom grade break it may be necessary to install a transition zone, (APWA Plan 238).
D. Concrete Placement: APWA Section 03 30 10.
    1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.
    2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Clear Space: No trip hazards in the clear space.

TURNING SPACE AT SIDEWALK LEVEL



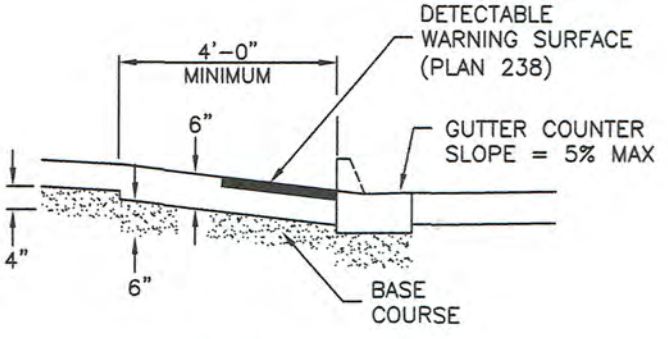
EXAMPLE A

EXAMPLE B

ELEMENT	DIMENSION
(R) (B)	4 FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE	(T)	2	2
CURB RAMP	(R)	8.33	2 (c)
BLENDED TRANSITION	(B)	5	2 (c)
CLEAR SPACE	(C)	5	2 (c)
SIDEWALK	(S)	STREET GRADE	2
FLARE	(F)	10	--

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

(c) SLOPE MAY EQUAL STREET OR HIGHWAY GRADE AT CROSSWALKS THAT ARE WITHOUT VEHICULAR YIELD OR STOP CONTROL

SLOPE TABLE

Corner curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown. Where physical constraints (e.g. utility covers, poles, vaults, etc.) prevent compliance, a single diagonal curb cut assembly may serve both pedestrian street crossings.
B. Installation of a curb wall, flares, or curb returns is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

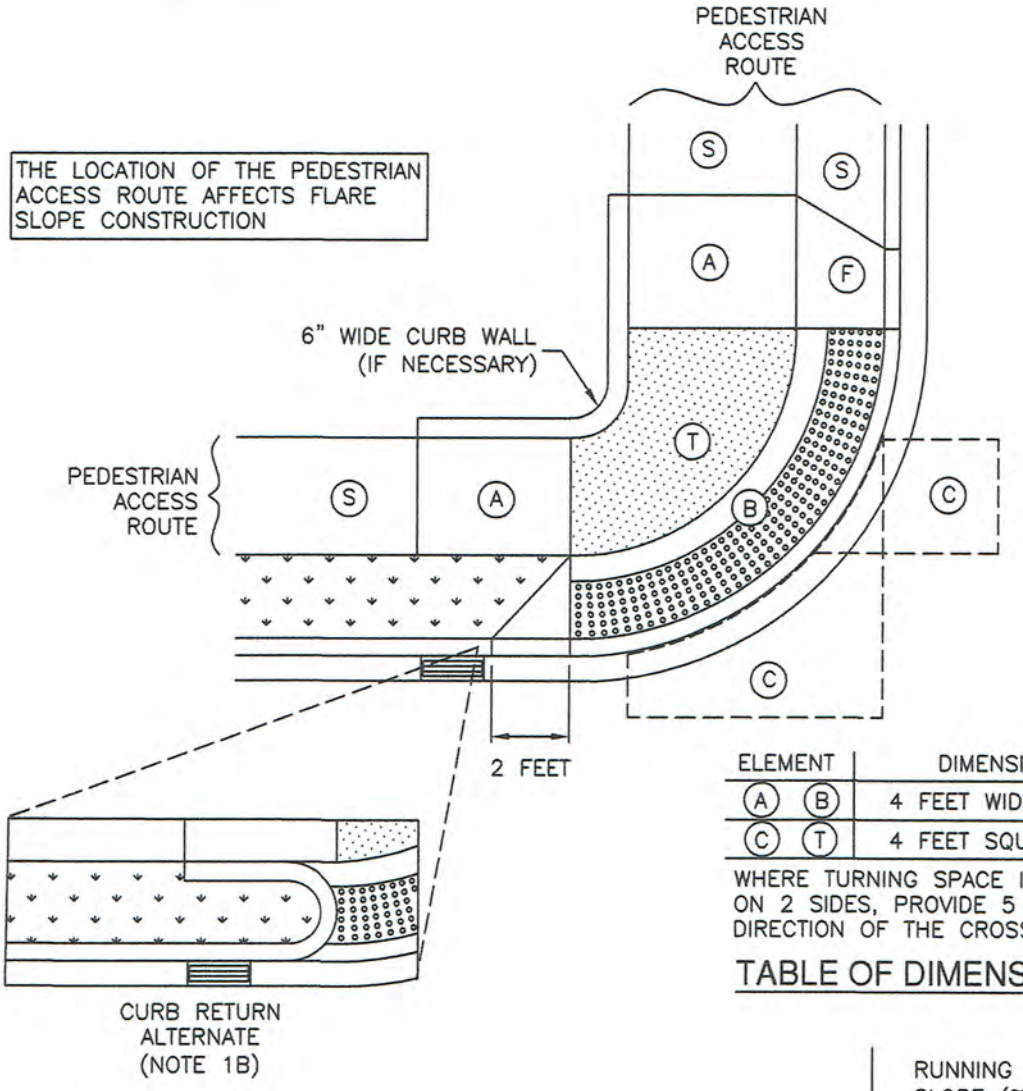
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Modifications:
    1) The sloped surface created to accommodate a flare area shall be perpendicular to the back of curb.
    2) No grade break shall exist between the flow-line and the foot of the curb ramp, or blended transition. Length of the curb modification abutting the curb ramp or transition is 4 feet minimum for each crosswalk served.
C. Blended Transition: Determine turning space position and elevation so that flatwork sloping to and from the turning space meets slope requirements.
D. Curb Wall: Set top of curb wall equal to elevation of extended lateral lines of sidewalk.
E. Concrete Placement: APWA Section 03 30 10.
    1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.
    2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
F. Clear Space: No trip hazards in the clear space.

TURNING SPACE BETWEEN SIDEWALK AND STREET LEVELS

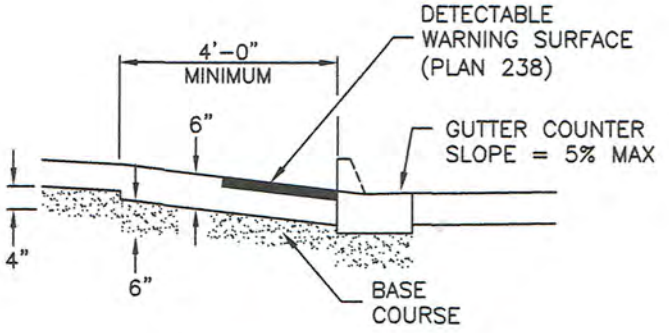


EXAMPLE C

ELEMENT	DIMENSION
(A) (B)	4 FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE	(T)	2	2
BLENDED TRANSITION	(B)	5	2 (c)
CLEAR SPACE	(C)	5	2 (c)
SIDEWALK	(S)	STREET GRADE	2
FLARE	(F)	10	--
APPROACH	(A)	8.33	2

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

(c) SLOPE MAY EQUAL STREET OR HIGHWAY GRADE AT CROSSWALKS THAT ARE WITHOUT VEHICULAR YIELD OR STOP CONTROL

SLOPE TABLE

Corner curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown. Where physical constraints (e.g. utility covers, poles, vaults, etc.) prevent compliance, a single diagonal curb cut assembly may serve both pedestrian street crossings.

B. Installation of a curb wall, flares, or curb returns is ENGINEER's choice.

C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73.

C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.

D. Concrete: Class 4000, APWA Section 03 30 04.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Curb Modifications:

1) The sloped surface created to accommodate a flare or an approach area shall be perpendicular to the back of curb.

2) No grade break shall exist between the flow-line and the turning space. Length of the curb modification abutting the turning space is 4 feet minimum for each crosswalk served.

C. Curb Wall: Set top of curb wall equal to elevation of extended lateral lines of sidewalk.

D. Concrete Placement: APWA Section 03 30 10.

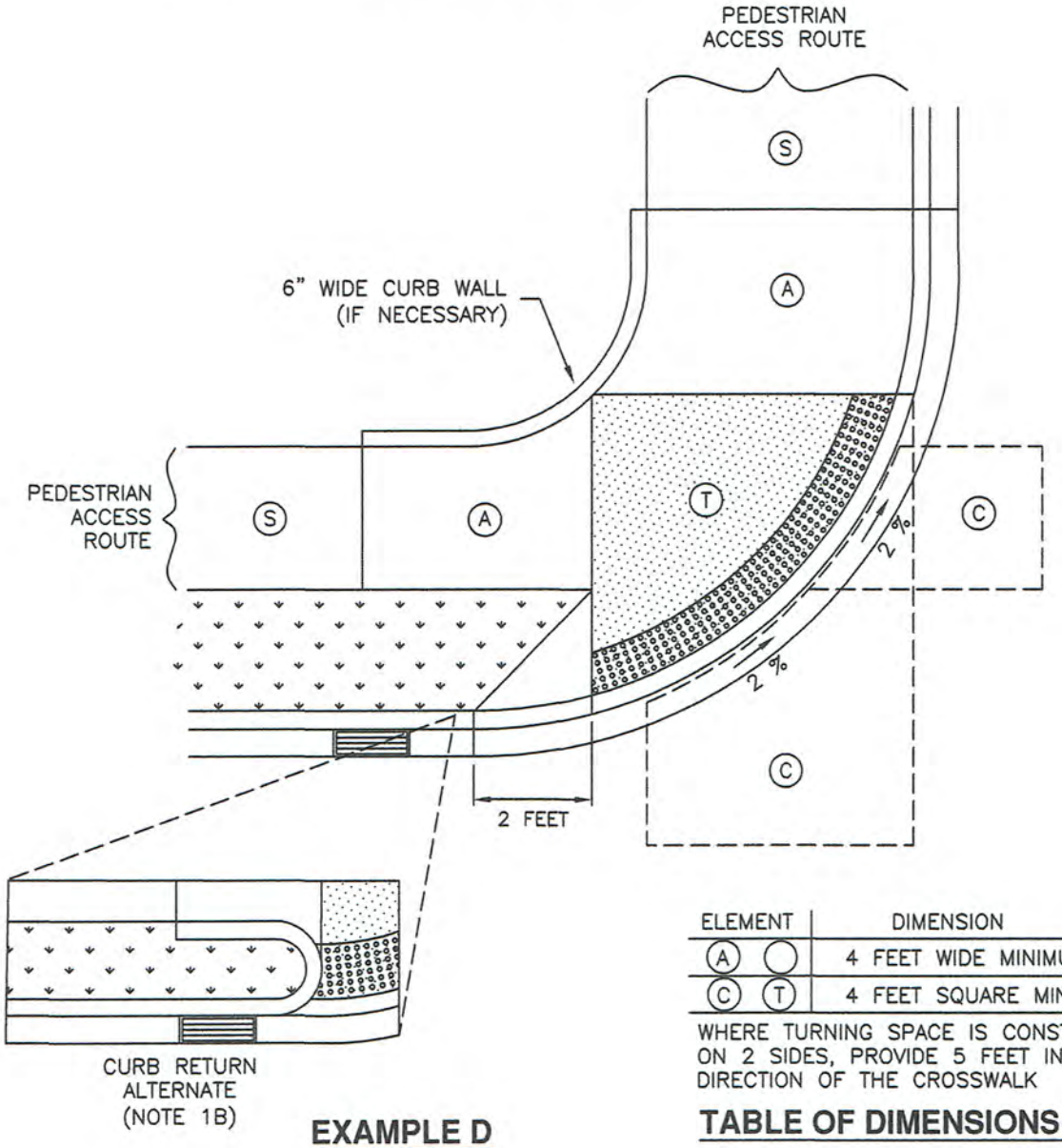
1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.

2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.

3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

E. Clear Space: No hazards in the clear space.

TURNING SPACE AT STREET LEVEL

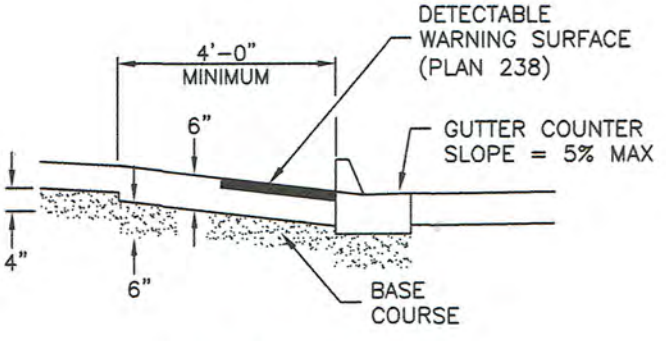


EXAMPLE D

ELEMENT	DIMENSION
(A) ( )	4 FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

	RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE (T)	2	2
CLEAR SPACE (C)	5	2 (c)
SIDEWALK (S)	STREET GRADE	2
APPROACH (A)	8.33	2

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

SLOPE TABLE

Corner curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown. Where physical constraints (e.g. utility covers, poles, vaults, etc.) prevent compliance, a single diagonal curb cut assembly may serve both pedestrian street crossings.

B. Installation of a curb wall, flares, or curb returns is ENGINEER's choice.

C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..

C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.

D. Concrete: Class 4000, APWA Section 03 30 04.

E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Curb Modifications:

1) The sloped surface created to accommodate a flare area shall be perpendicular to the back of curb.

2) No grade break shall exist between the flow-line and the foot of the blended transition. Length of the curb modification abutting the blended transition is 4 feet minimum for each crosswalk served.

C. Blended Transition: Determine blended transition position and elevation so that flatwork sloping to and from the blended transition meets slope requirements.

D. Curb Wall: Set top of curb wall equal to elevation of extended lateral lines of sidewalk.

E. Concrete Placement: APWA Section 03 30 10.

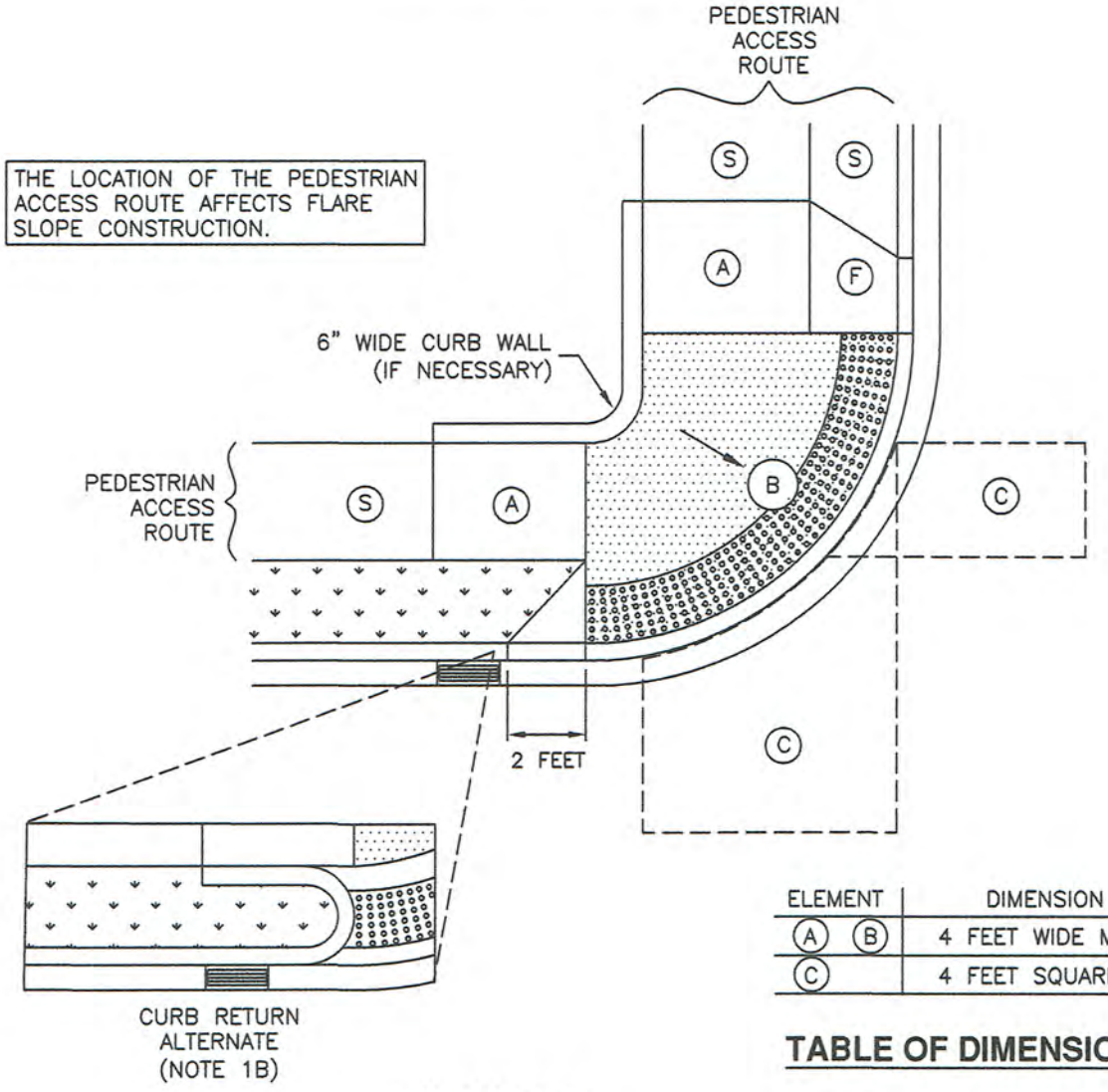
1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.

2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.

3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

F. Clear Space: No trip hazards in the clear space.

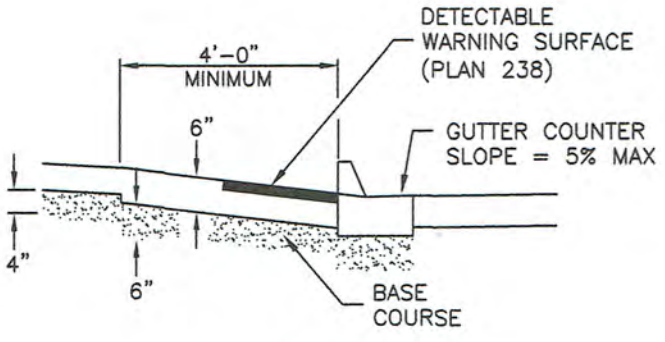
NO TURNING SPACE



EXAMPLE E

ELEMENT	DIMENSION
(A) (B)	4 FEET WIDE MINIMUM
(C)	4 FEET SQUARE MINIMUM

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
BLENDED TRANSITION	(B)	5	2 (c)
CLEAR SPACE	(C)	5	2 (c)
SIDEWALK	(S)	STREET GRADE	2
FLARE	(F)	10	--
APPROACH	(A)	8.33	5

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

(c) SLOPE MAY EQUAL STREET OR HIGHWAY GRADE AT CROSSWALKS THAT ARE WITHOUT VEHICULAR YIELD OR STOP CONTROL

SLOPE TABLE

Midblock curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown.
B. Installation of flares or curb returns is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

.

2. PRODUCTS

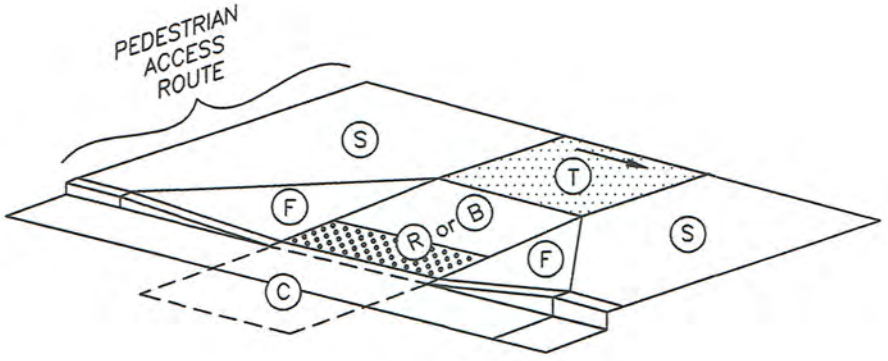
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

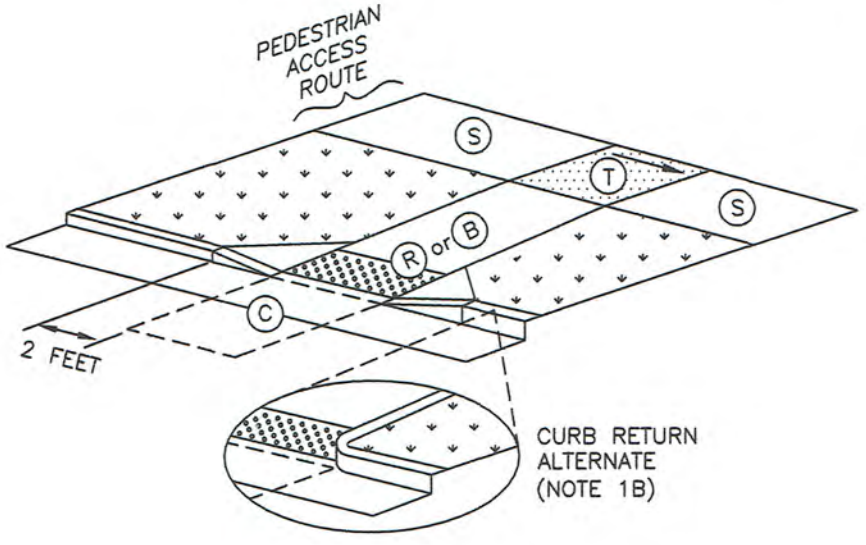
A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Modifications:
   1) The sloped surface created to accommodate a flare area shall be perpendicular to the back of curb.
   2) No grade break shall exist between the flow-line and the foot of the curb ramp or blended transition. Length of the curb modification abutting the curb ramp or transition is 4 feet minimum.
C. Curb Ramp: Length not required to exceed 15 feet. Grade breaks are perpendicular to the direction of ramp run and are not permitted on the ramp or turning space surface. Sides are parallel to each other and perpendicular to the ends.
D. Concrete Placement: APWA Section 03 30 10.
   1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.
   2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.
   3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Clear Space: No trip hazards in the clear space.

TURNING SPACE AT SIDEWALK LEVEL

THE LOCATION OF THE PEDESTRIAN ACCESS ROUTE AFFECTS FLARE SLOPE CONSTRUCTION



EXAMPLE 1

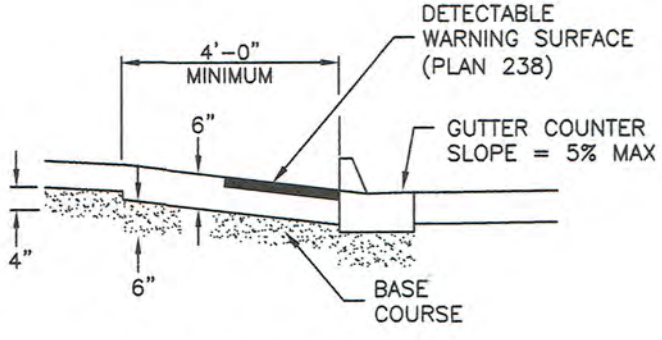


EXAMPLE 2

ELEMENT	DIMENSION
(R) (B)	4 FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE	(T)	STREET GRADE	2
CURB RAMP	(R)	8.33	2 (c)
BLENDED TRANSITION	(B)	5	2 (c)
CLEAR SPACE	(C)	5	2 (c)
SIDEWALK	(S)	STREET GRADE	2
FLARE	(F)	10	--

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

SLOPE TABLE

Mid-block curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown.
B. Installation of a curb wall, flares, or curb returns is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

2. PRODUCTS

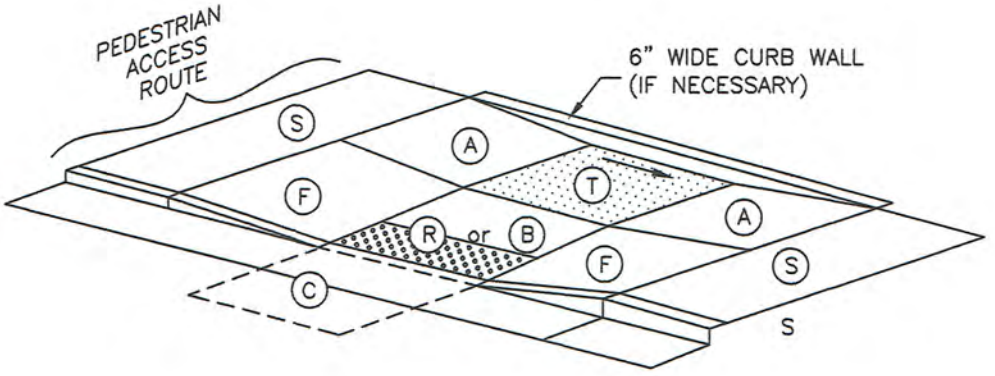
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

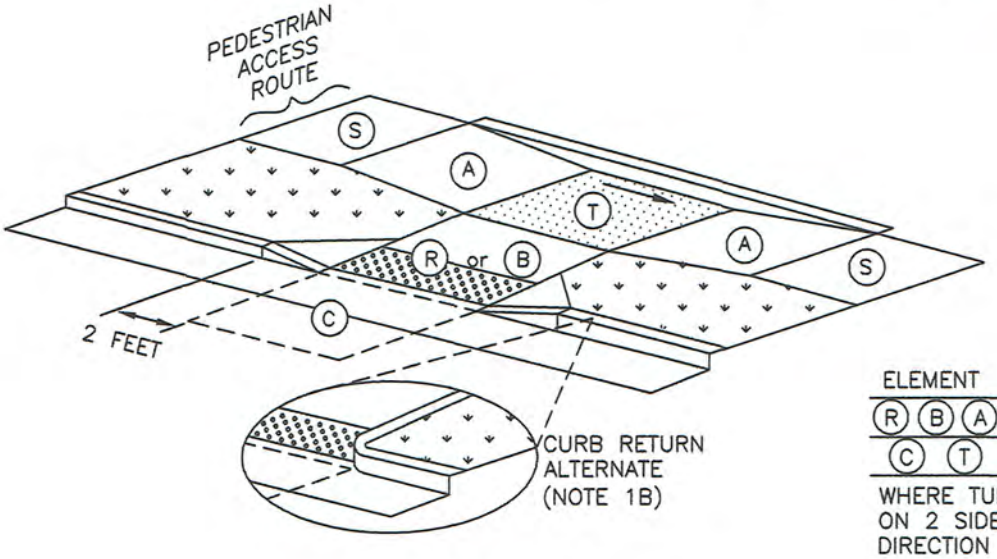
A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Modifications:
   1) The sloped surface created to accommodate a flare area shall be perpendicular to the back of curb.
   2) No grade break shall exist between the flow-line and the foot of the curb ramp, or blended transition. Length of the curb modification abutting the curb ramp or transition is 4 feet minimum.
C. Curb Ramp: Length not required to exceed 15 feet. Grade breaks are perpendicular to the direction of ramp run, and are not permitted on the ramp, blended transition, or turning space surface. Sides are parallel to each other and perpendicular to the ends. Determine turning space elevation and position so that ramps sloping to and from the turning space meets slope requirements.
D. Curb Wall: Set top of curb wall equal to elevation of extended lateral lines of sidewalk.
E. Concrete Placement: APWA Section 03 30 10.
   1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.
   2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.
   3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
F. Clear Space: No trip hazards in the clear space.

TURNING SPACE BETWEEN SIDEWALK AND STREET LEVELS

THE LOCATION OF THE PEDESTRIAN ACCESS ROUTE AFFECTS FLARE SLOPE CONSTRUCTION



EXAMPLE 3

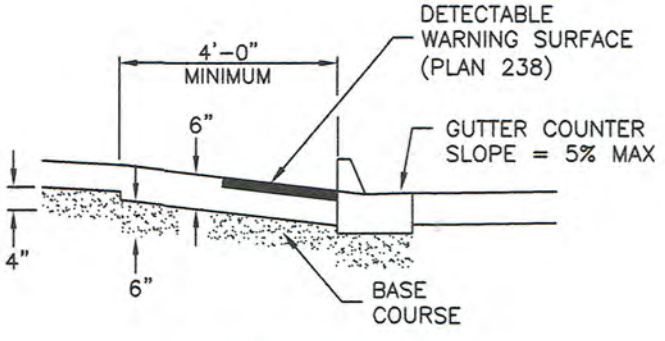


EXAMPLE 4

ELEMENT	DIMENSION
(R) (B) (A)	FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE	(T)	STREET GRADE	2
CURB RAMP	(R)	8.33	STREET GRADE
BLENDED TRANSITION	(B)	5	STREET GRADE
CLEAR SPACE	(C)	5	STREET GRADE
SIDEWALK	(S)	STREET GRADE	2
FLARE	(F)	10	--
APPROACH	(A)	8.33	2

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

SLOPE TABLE

Mid-block curb cut assembly

1. GENERAL

A. Where existing elements or spaces are altered to receive an assembly; slopes and dimensions shall comply with slopes and dimensions shown on the drawing, or to the maximum extent feasible permitted by the ENGINEER. Final configuration of the assembly may be different than shown.
B. Installation of a curb wall is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

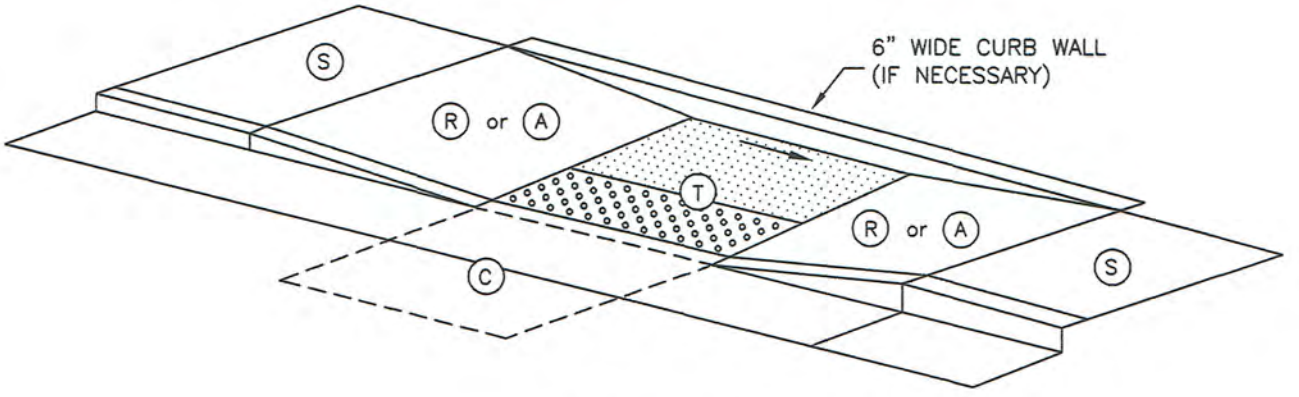
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Modifications:
    1) The sloped surface created to accommodate the ramp or approach areas shall be perpendicular to the back of curb.
    2) No grade break shall exist between the flow-line and the turning space. Length of the curb modification abutting the turning space is 4 feet minimum.
C. Curb Ramp: Length not required to exceed 15 feet. Grade breaks are perpendicular to the direction of ramp run and are not permitted on the ramp or turning space surface. Sides are parallel to each other and perpendicular to the ends.
D. Curb Wall: Set top of curb wall equal to elevation of extended lateral lines of sidewalk.
E. Concrete Placement: APWA Section 03 30 10.
    1) Maximum length to width ratio for rectangular panel joints is 1.5 to 1. Joint spacing measured in feet not to exceed twice slab thickness measured in inches or a maximum of 15 feet.
    2) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide, and 1/4 of the depth of the concrete flatwork.
    3) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
F. Clear Space: No trip hazards in the clear space.

TURNING SPACE AT STREET LEVEL

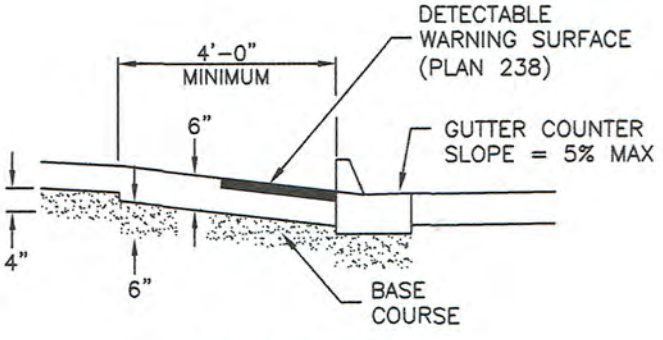


EXAMPLE 5

ELEMENT	DIMENSION
(R) (A)	4 FEET WIDE MINIMUM
(C) (T)	4 FEET SQUARE MINIMUM

WHERE TURNING SPACE IS CONSTRAINED ON 2 SIDES, PROVIDE 5 FEET IN THE DIRECTION OF THE CROSSWALK

TABLE OF DIMENSIONS



MATERIALS

		RUNNING SLOPE (%) MAXIMUM	CROSS SLOPE (%) MAXIMUM
TURNING SPACE	(T)	STREET GRADE	2
CURB RAMP	(R)	8.33	2
CLEAR SPACE	(C)	5	STREET GRADE
SIDEWALK	(S)	STREET GRADE	2
APPROACHE	(A)	8.33	2

(a) RUNNING SLOPE IS IN THE DIRECTION OF PEDESTRIAN TRAVEL. RUNNING SLOPE OF FLARE IS PARALLEL TO BACK OF CURB

(b) CROSS SLOPE IS PERPENDICULAR TO DIRECTION OF PEDESTRIAN TRAVEL

SLOPE TABLE

Islands and median

1. GENERAL

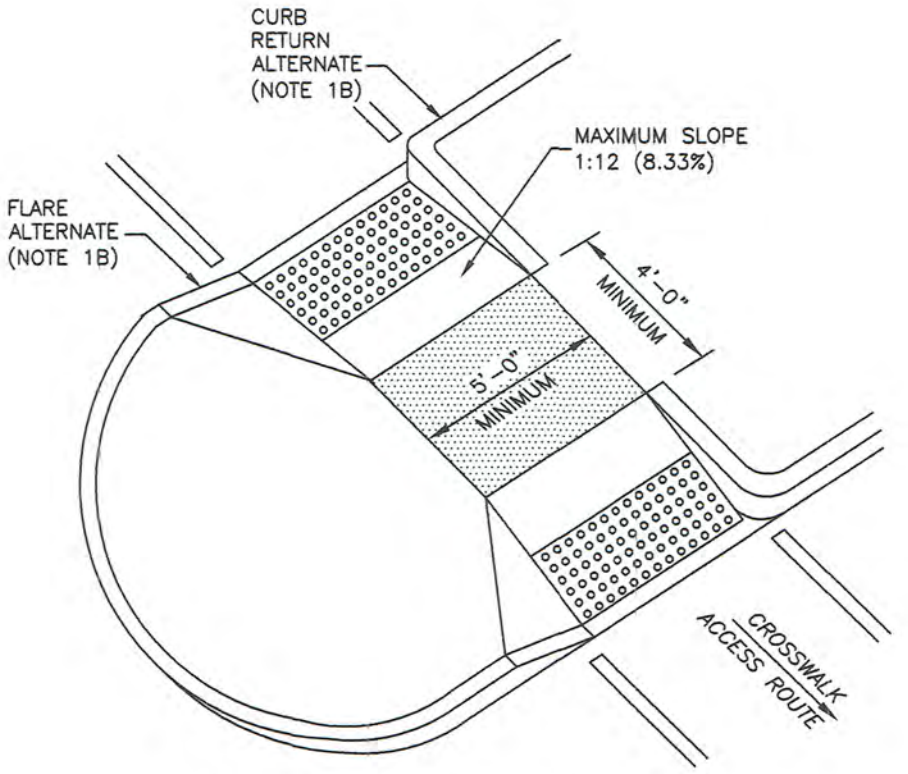
A. Access through islands and medians can add difficulty to the crossing for some users. There are many factors to consider when placing the detectable warning surface. The edges of the warning surface can be useful as cues to the direction of a crossing.
B. Installation of flares or curb returns is ENGINEER's choice.
C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

2. PRODUCTS

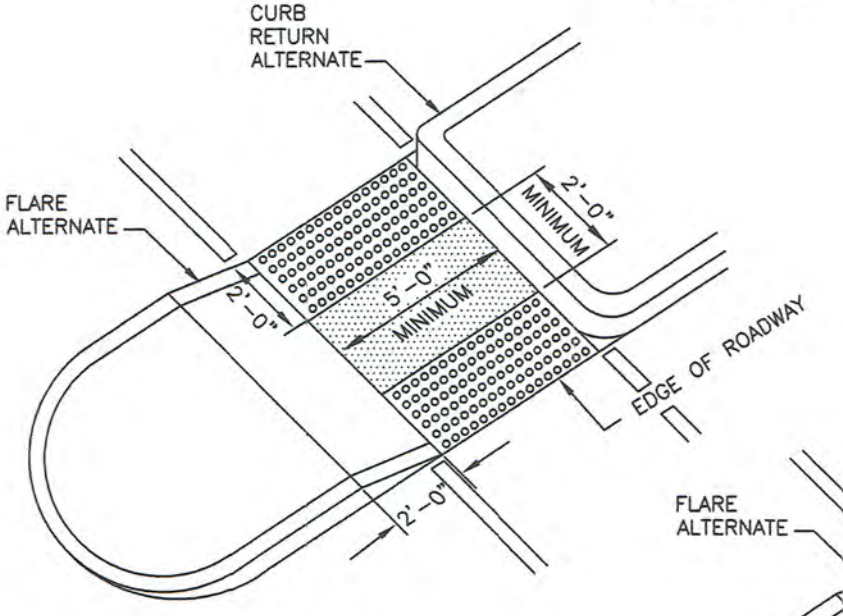
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
C. Detectable Warning Surface: Paver, ribbed composite panel, or tile. Provide a color that contrasts with adjacent walking surface, either light-on-dark or dark-on-light. ENGINEER to select type and color unless indicated elsewhere.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

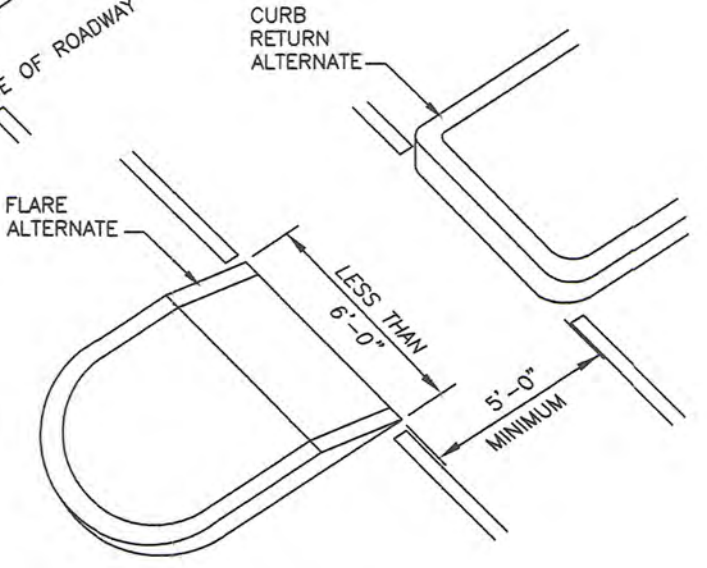
A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Detectable Warning Surface: Provide detectable warnings in refuge islands as shown.
C. Concrete Placement: APWA Section 03 30 10.
    1) Install expansion joints vertical, full depth, with top of filler set flush with concrete surface. Install contraction joints vertical, 1/8-inch wide and 1/4 depth of the concrete flatwork.
    2) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.



ELEVATED REFUGE ISLAND



CUT-THROUGH REFUGE ISLAND



MEDIAN

Detectable warning surface

1. GENERAL

A. Detectable warnings consist of a surface of truncated domes aligned in a square or radial grid pattern with dome size, dome spacing, contrast and panel size as indicated.

C. Definitions and supplemental requirements are specified in APWA Section 32 16 14.

2. PRODUCTS

A. Pavers:
   1) Concrete, APWA Section 32 14 13.
   2) Brick and Mortar, APWA Section 32 14 16.

B. Tile: Unless indicated elsewhere, selection is by CONTRACTOR as allowed by ENGINEER.

C. Ribbed Composite Panel: Unless indicated elsewhere, selection is by CONTRACTOR as allowed by ENGINEER.

D. Bedding Sand, Joint Sand, Geotextile: APWA Section 32 14 13.

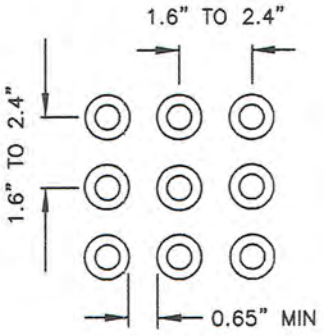
3. EXECUTION

A. Layout:
   1) Joints Between Units: 3/16 inch maximum or manufacturer's recommendation.
   2) Flares: Do not install detectable warning units on flared surfaces.
   3) Alignment: Where a ramp, turning space, or blended transition provides access to the street continuously around a corner, align the vertical rows of truncated domes to be perpendicular or radial to the grade break between the ramp and the street for a 4 feet minimum width for each crosswalk served.
   4) Transition 1 or 2: Selection is by ENGINEER unless indicated elsewhere.
   5) At Rail Crossings: The edge of the detectable warning surface nearest the rail crossing is 6 feet minimum and 15 feet maximum from the centerline of the nearest rail.

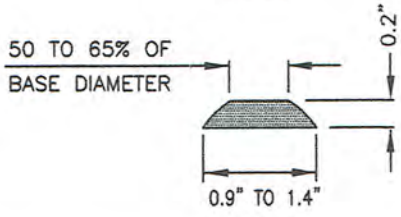
B. Paver Installation: APWA Section 32 14 13. If paver must be cut, minimum paver cut length is 3/4 paver, or 1/2 paver length providing the adjacent paver is also reduced no more than 1/2 its original length. Do not cut pavers longitudinally. Remove domes that were cut.

C. Tile Installation: Install according to manufacturer's recommendations. Remove domes that were cut.

D. Ribbed Composite Panel Installation: Install according to manufacturer's recommendation. Remove domes that were cut. Seal cuts to prevent water intrusion.

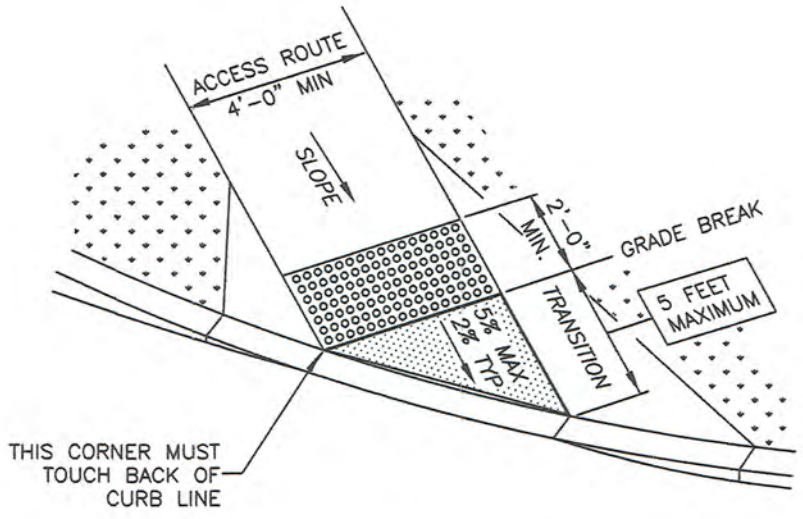


PLAN

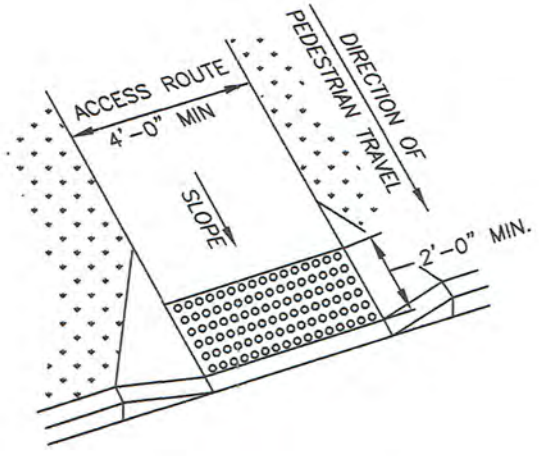


SECTION

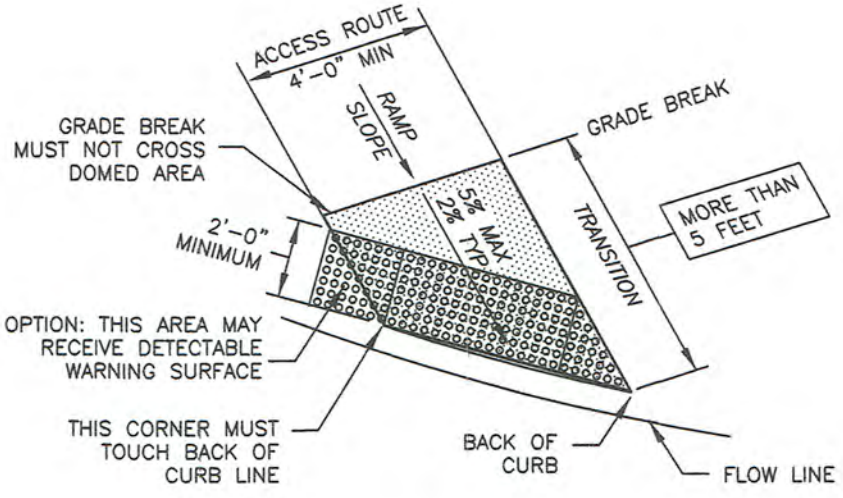
TRUNCATED DOME DETAIL



TRANSITION 1

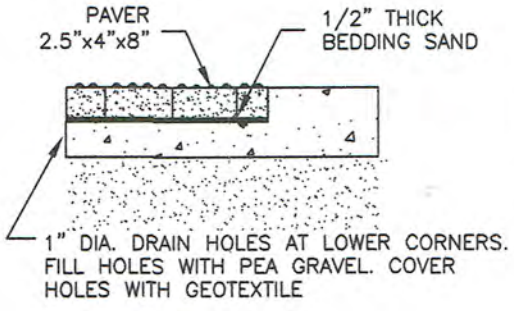


PERPENDICULAR ASSEMBLY

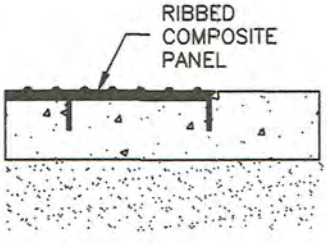


TRANSITION 2

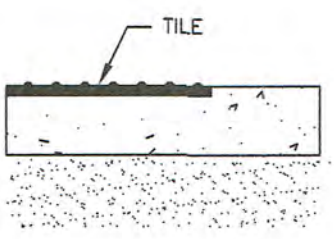
NON-PERPENDICULAR ASSEMBLY



STYLE P



STYLE R



STYLE T

Parking meter post

1. GENERAL

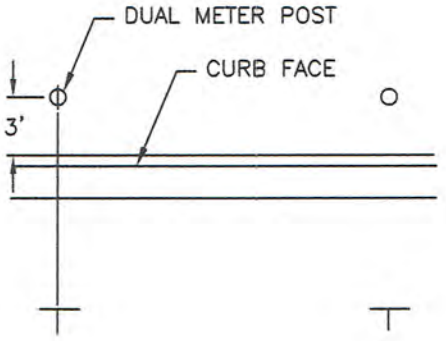
A. Meter head selection by ENGINEER.

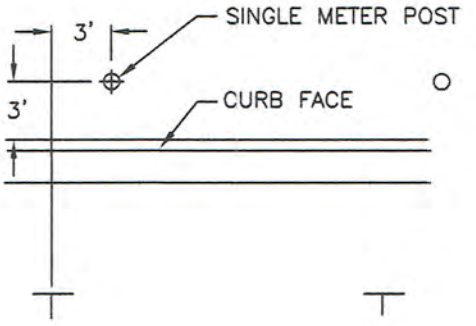
2. PRODUCTS

A. Concrete: Class 2000 minimum, APWA Section 03 30 04.
B. Grout: Cement epoxy adhesive, APWA Section 03 61 00.

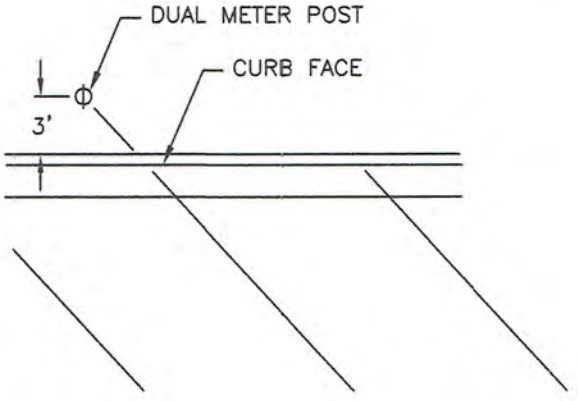
3. EXECUTION

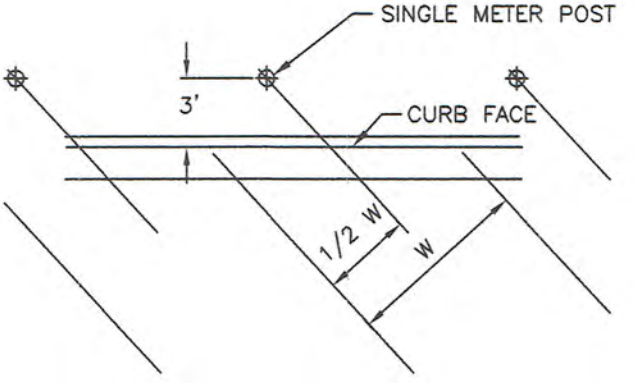
A. Install post plumb.



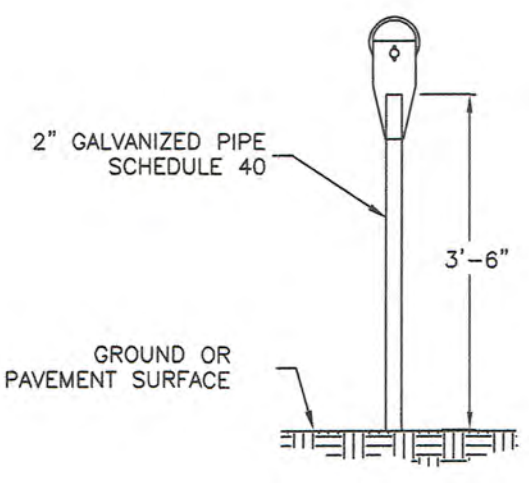


PARALLEL PARKING

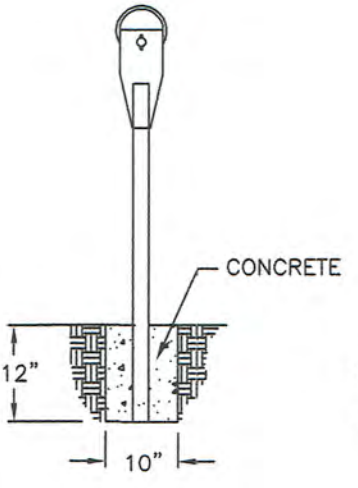




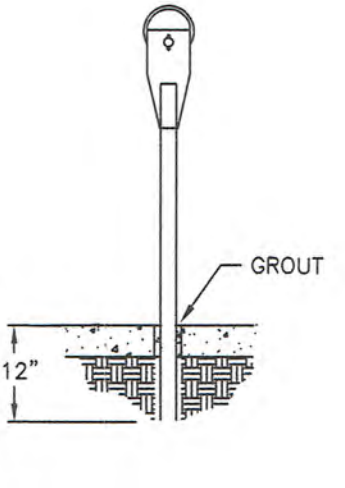
ANGLE PARKING



TYPICAL
ELEVATION



SOIL
INSTALLATION



NON-SOIL
INSTALLATION

DEAILS

Form strip filler

1. GENERAL

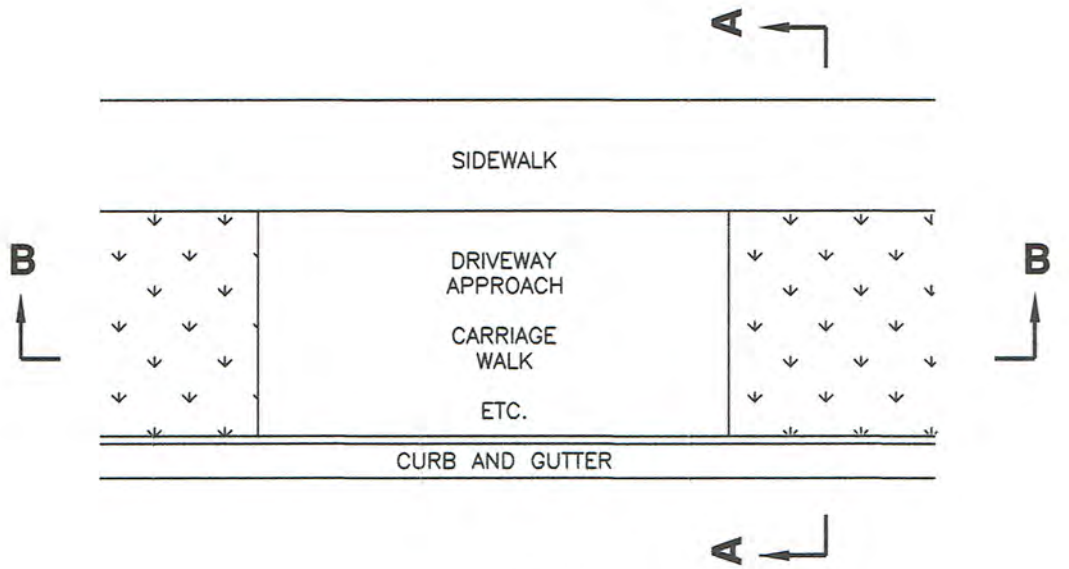
A. ENGINEER must authorize form strips wider than 1 foot.

2. PRODUCTS

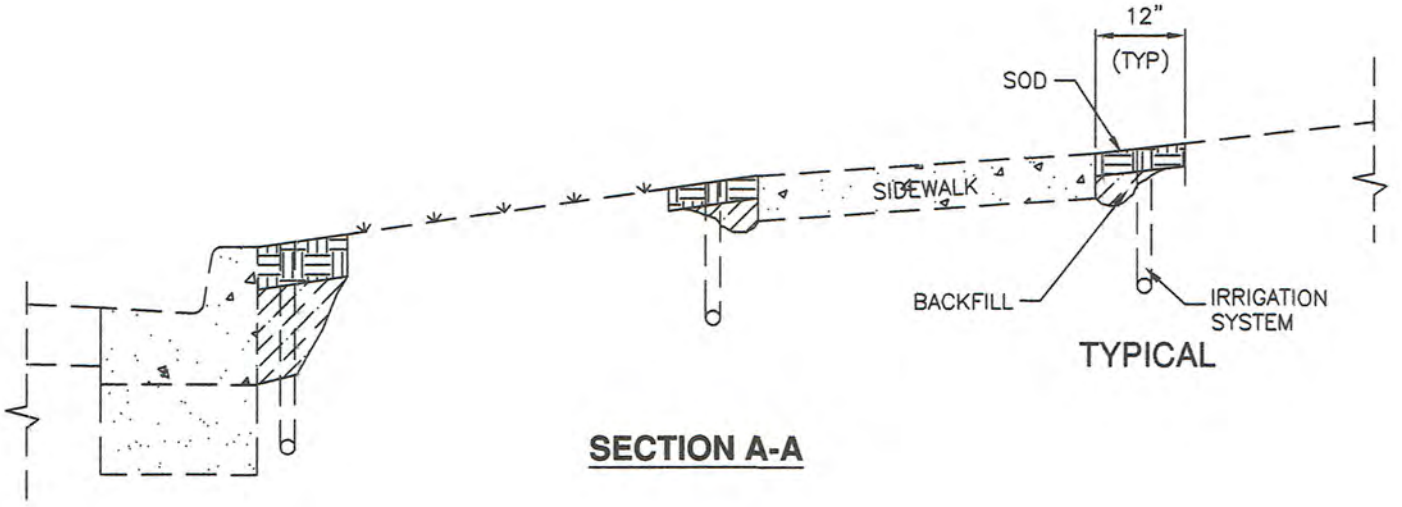
A. Backfill: Native soil and top soil, APWA Section 31 05 13.
B. Sod: APWA Section 32 92 00.

3. EXECUTION

A. Protect existing irrigation systems. Repair damage.
B. Place and compact native soil in the form strip.
C. Supply and install top soil and sod.



PLAN



SECTION A-A

SECTION B-B

Subgrade stabilization

1. GENERAL

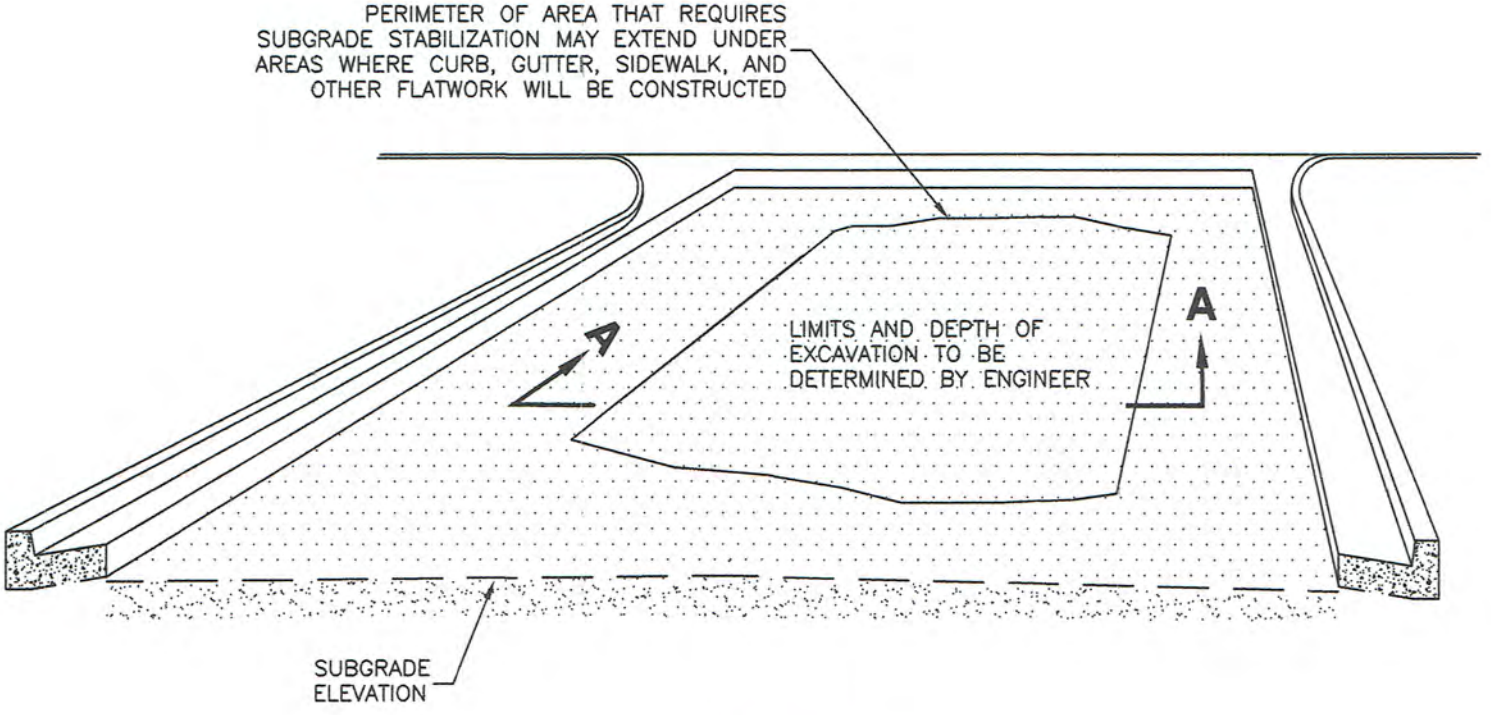
A. This subgrade stabilization procedure may not apply if the California Bearing Ratio (CBR) of the undisturbed subgrade material is less than 1 CBR. If so, receive direction from ENGINEER for revised procedure.
B. Stabilization excavation limits may be changed at ENGINEER's discretion.

2. PRODUCTS

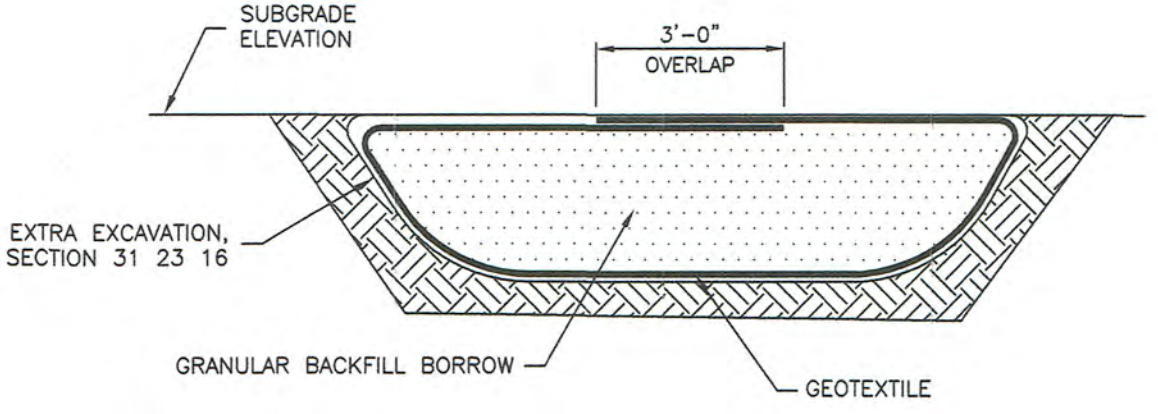
A. Geotextile: Stabilization separation fabric either woven or non-woven and high MARV, APWA Section 31 05 19.
B. Backfill: Granular backfill borrow, PWA Section 31 05 13. Limit particle size to 2-inches. Use of other common fill material requires ENGINEER's permission.

3. EXECUTION

A. Remove unstable material to required depth.
B. Verify undisturbed subgrade material is adequate to support stabilization material.
C. Place fabric and backfill. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compact to 92 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



OBLIQUE



SECTION A-A

Bituminous concrete pavement tie-in

1. GENERAL

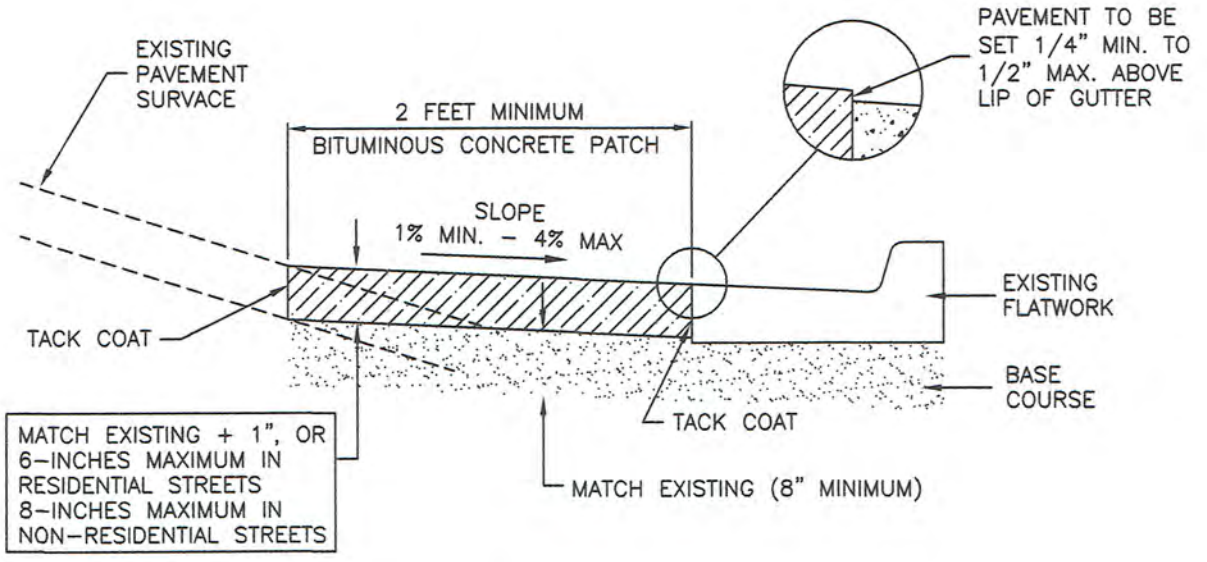
A. Site conditions vary. Configuration of tie in work may be changed to fit field conditions. Variance from dimensions and slopes shown must be acceptable to ENGINEER.

2. PRODUCTS

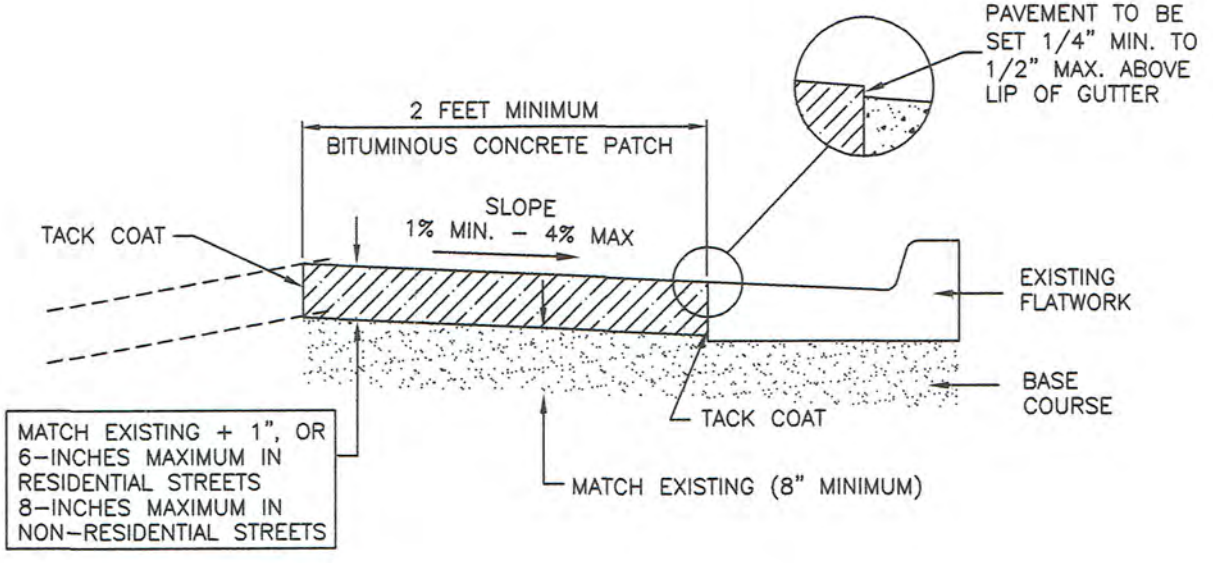
A. Base Course: Untreated base course, APWA Section 32 11 23. DO NOT USE gravel as a base course without ENGINEER's permission.
B. Tack Coat: APWA Section 32 12 13.13.
C. Bituminous Concrete: APWA Section 32 12 05.
   1) Warm weather patch – AC-20-DM-1/2, unless indicated otherwise.
   2) Cold weather patch – modified MC-250-FM-1, APWA Section 33 05 25.

3. EXECUTION

A. Pavement Removal: APWA Section 02 41 14. Provide a neat straight joint between existing and new pavement. Saw-cut joint if existing pavement exceeds 2-inches in thickness or if Portland-cement concrete underlies the bituminous concrete pavement.
B. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
C. Tack Coat: Clean and tack all vertical surfaces adjacent to the new bituminous concrete patch. Apply full coverage surface tack coat between lifts if the lower lift is left unpaved longer than 24 hours or if it becomes unclean.
D. Bituminous Concrete Pavement.
   1) Lay new bituminous pavement higher as shown. Do not create water ponds on pavement.
   2) Install in lifts no greater than 3-inches after compaction. Compact each lift is within the range of 92 to 96 percent relative to Rice density, ASTM D2041.
   3) Install final lift not less than 2 times the diameter of the maximum aggregate particle size. e.g.
      - 2" for 3/4" aggregate mix.
      - 1 1/2" for 1/2" aggregate mix, etc.



CASE 1 - POSITIVE STREET SLOPE TIE-IN



CASE 2 - NEGATIVE STREET SLOPE TIE-IN

Curb and gutter replacement without pavement tie-in

1. GENERAL

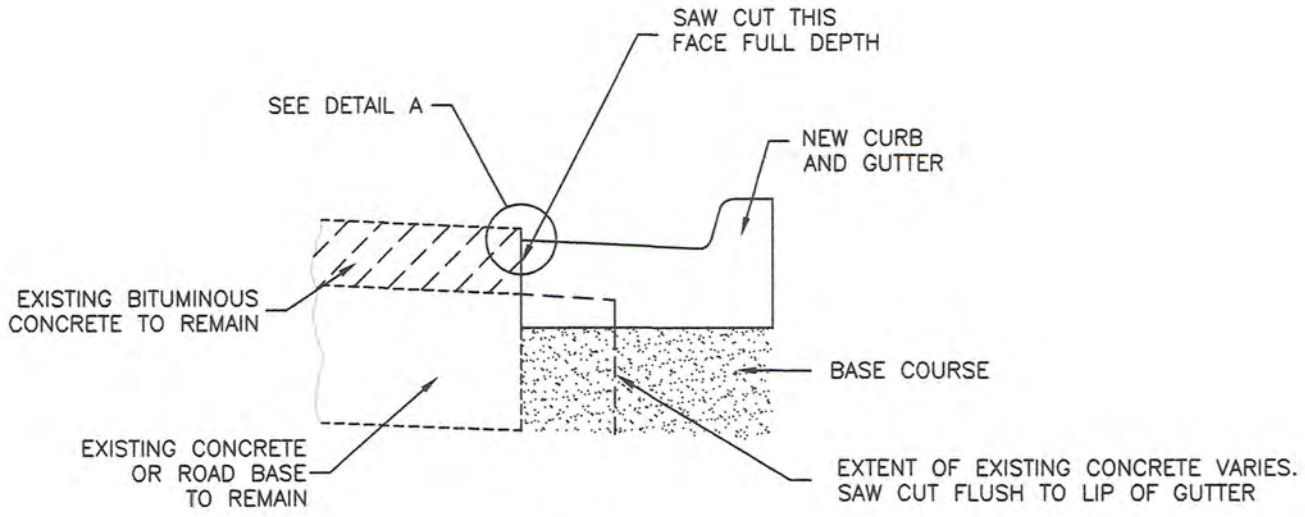
A. Place curb and gutter or other concrete flatwork against existing pavement

2. PRODUCTS

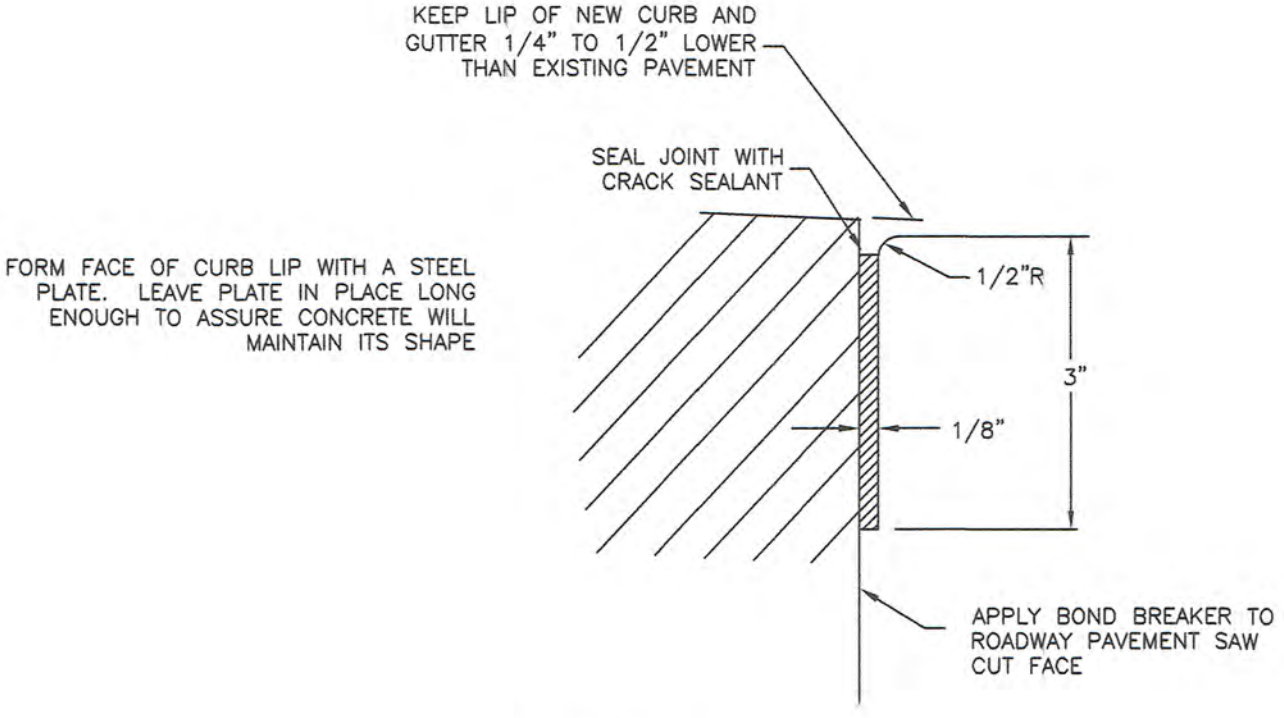
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Bond Breaker: Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
C. Crack Sealant: CAS1, APWA Section 32 13 73.

3. EXECUTION

A. Base Course Placement: Match existing thickness or 8-inches minimum. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Apply bond breaker to vertical surface of roadway pavement cut.
C. Steel Plate.
    1) A steel plate provides a clean straight edge so bituminous concrete can be milled out in the future without damaging the curb and gutter.
    2) If straight edge between Portland-cement concrete and bituminous concrete cannot be provided, remove and replace curb and gutter per Plan 251.
    3) Remove the plate after concrete has set.



SECTION



DETAIL A

Bituminous concrete pavement overlay

1. GENERAL

A. Edge mill and overlay with bituminous concrete.

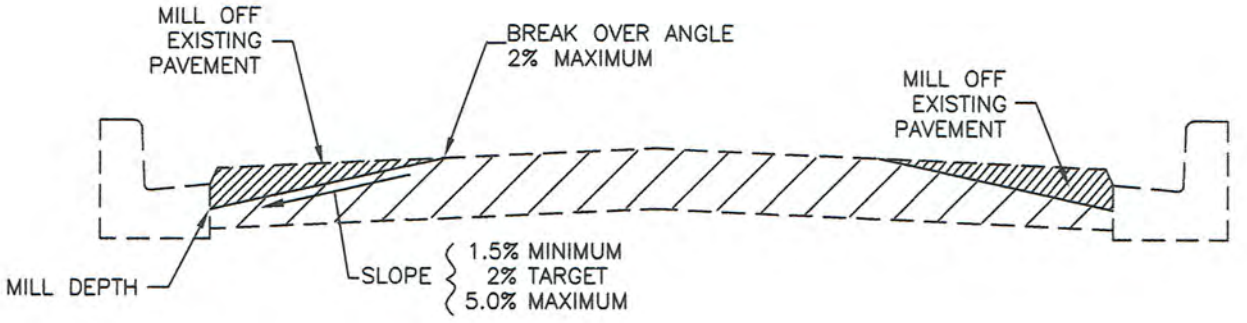
2. PRODUCTS

A. Bituminous Concrete: APWA Section 32 12 05.
B. Superpave: APWA Section 23 12 06.
C. Tack Coat: APWA Section 32 12 13.13.
D. Paving Geotextile Fabric: APWA Section 32 05 21.

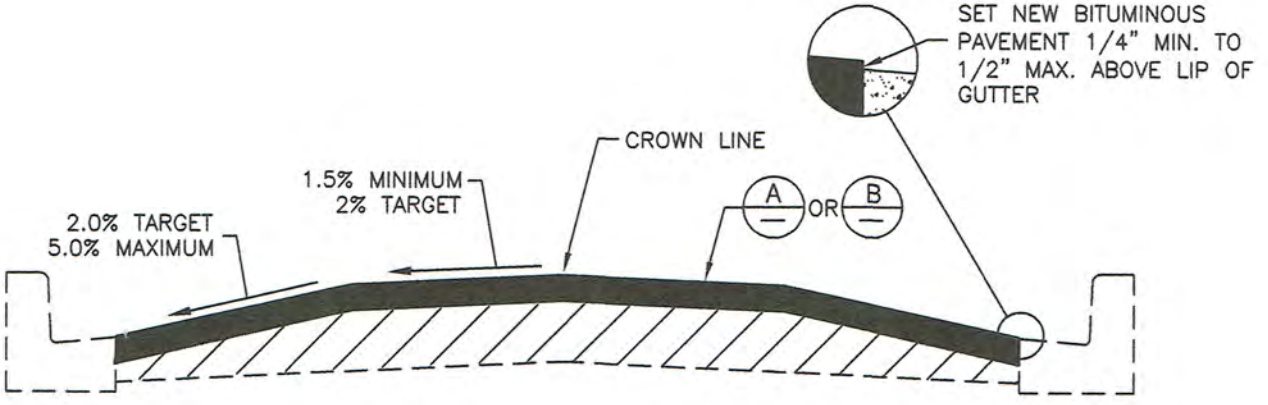
3. EXECUTION

A. Mill Depth: Measured at lip of gutter and other concrete structure edges.
   1) 2 times maximum aggregate size in bituminous concrete overlay mixes.
   2) 4 times nominal maximum aggregate size in SUPERPAVE overlay mixes.
B. Milling: APWA Section 32 01 16.71.
   1) Start milling in a longitudinal direction with the first pass adjacent to the pavement edge.
   2) Do succeeding passes parallel to the previous pass.
   3) Mill roadway pavement to specified profile and cross slope.
C. Tack coat. Clean all horizontal and vertical surfaces in or adjacent to milled areas. Apply tack coat full coverage.
D. Geotextile.
   1) Place fabric no closer than 1.5 feet from edge of new overlay pavement.
   2) 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.
      a) 100 feet where speeds are less than 30 mph.
      b) 150 feet where speeds are greater than 30 mph.
E. Pavement Placement. Follow APWA Section 32 12 16.13 requirements. Unless indicated otherwise, lift thicknes is 3-inches minimum after compaction. Compact to 94 percent of ASTM D2041 (Rice Density) plus or minus 2 percent.
F. Cleanup. Remove milling residues on curbs, gutters and surfaces that are to receive overlay.

EDGE MILL

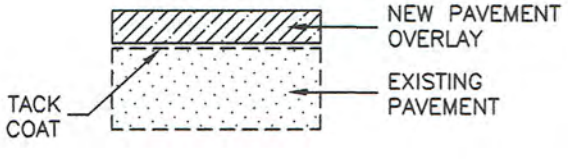


MILL

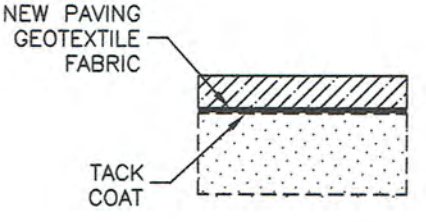


OVERLAY

SECTION



A — NO FABRIC



B — WITH FABRIC

Bituminous concrete pavement overlay

1. GENERAL

A. Full width mill and overlay with bituminous concrete.

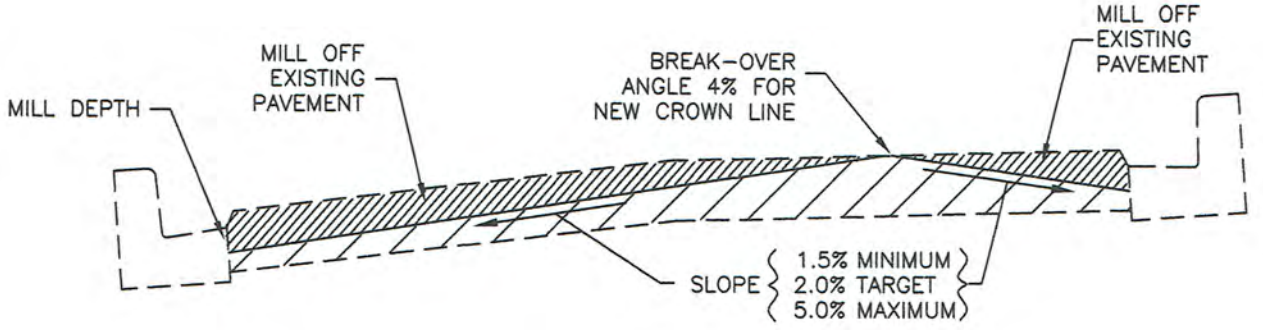
2. PRODUCTS

A. Bituminous Concrete: APWA Section 32 12 05.
B. Superpave: APWA Section 23 12 06.
C. Tack Coat: APWA Section 32 12 13.13.
D. Paving Geotextile Fabric: APWA Section 32 05 21.

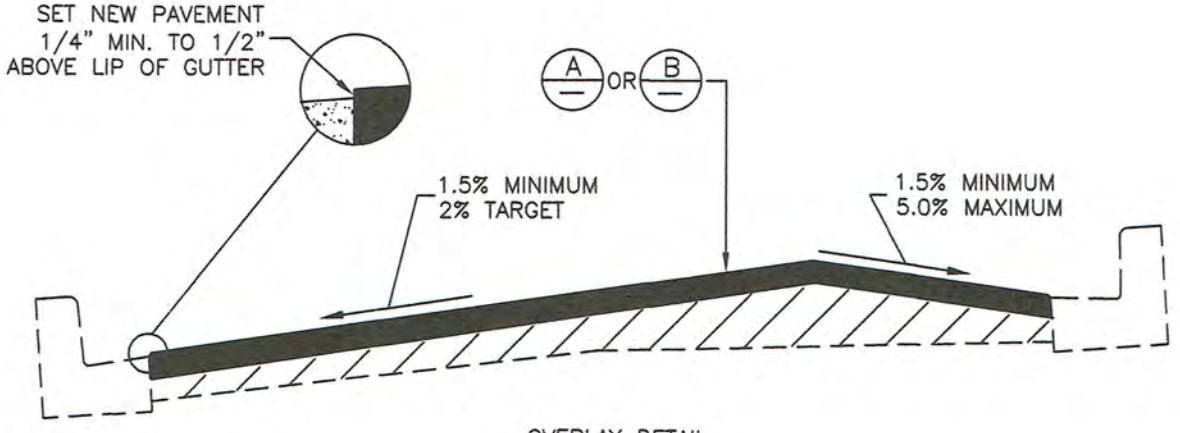
3. EXECUTION

A. Mill Depth: Measured at lip of gutter and other concrete structure edges.
   1) 2 times maximum aggregate particle size in bituminous concrete mixes.
   2) 4 times nominal maximum aggregate particle size in SUPERPAVE mixes.
B. Milling: APWA Section 32 01 16.71.
   1) Identify location of new crown line with ENGINEER.
   2) Use an automatic grade sensor to control the horizontal position and profile grade at the new crown line.
   3) Start milling in a longitudinal direction with the first pass adjacent to the new crown line.
   4) Do succeeding passes parallel to and adjacent to the previous pass.
C. Tack coat. Clean all horizontal and vertical surfaces in or adjacent to milled areas. Apply full coverage tack coat.
D. Geotextile.
   1) Place fabric no closer than 1.5 feet from edge of new overlay pavement.
   2) 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.
      a) 100 feet where speeds are less than 30 mph.
      b) 150 feet where speeds are greater than 30 mph.
E. Pavement placement. Follow Section APWA 32 12 16.13 reuirements. Place in lifts no greater than 3-inches after compaction. Compact to 94 percent of ASTM D2041 (Rice density) plus or minus 2 percent.
F. Cleanup. Remove milling residues on curbs, gutters, and surface that are to receive overlay.

FULL WIDTH MILL

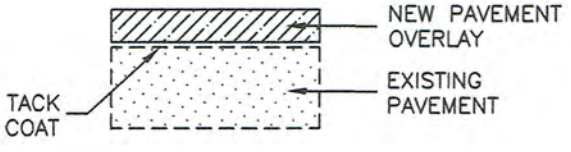


MILL DETAIL

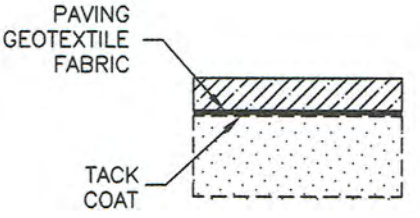


OVERLAY DETAIL

SECTION



A NO FABRIC



B WITH FABRIC

Patch repair – in place hot reused bituminous paving

1. GENERAL

A. Seamless repair of bituminous concrete by applying evenly distributed heat over the pavement surface, then mixing and compacting the heated pavement in-place.

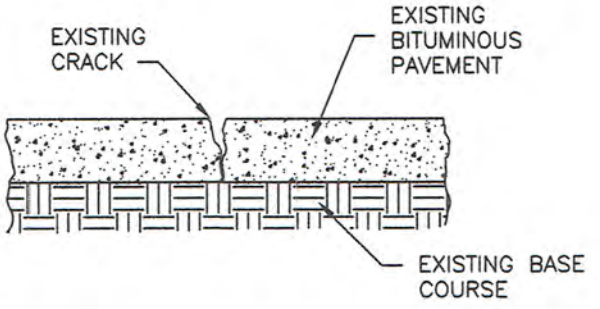
2. PRODUCTS

A. Rejuvenating agent, APWA Section 32 01 13.50.
B Bituminous concrete mix: APWA Section 32 12 05.
C. Reclaimed sphalt pavement (RAP).

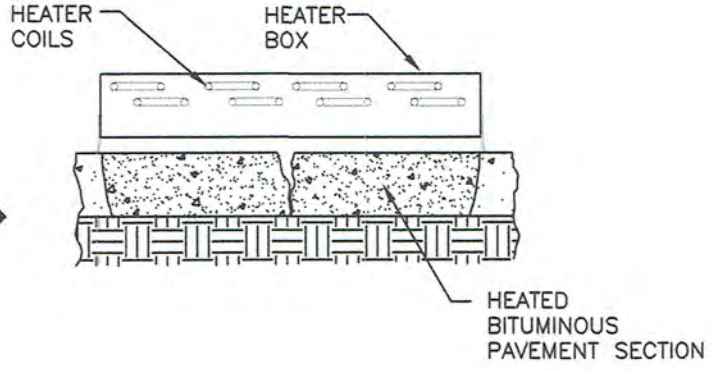
3. EXECUTION

A. Implement the traffic control plan.
B. Mark areas to be repaired.
C. Heat areas to be repaired.
D. Add and thoroughly mix additional bituminous material and rejuvenating agent as required to fill depressions, potholes, or to match grade of adjacent pavement surfaces.
E. Screed and level the repair area.
F. Compact the surface with a steel drum roller.
G. Cool patch to 150 deg. F before opening to vehicular traffic.
H. Sweep up and dispose of excess material and debris.

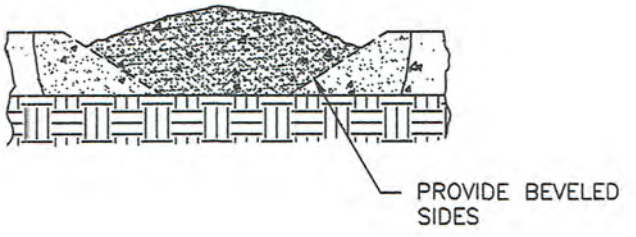
IDENTIFY AREA TO BE REPAIRED



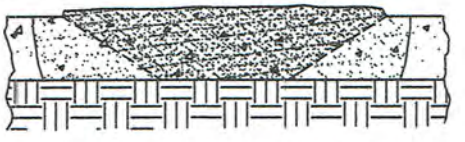
HEAT AREA TO BE REPAIRED



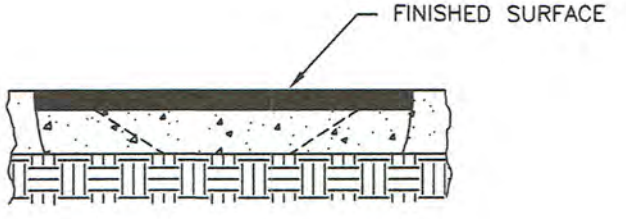
PROCESS AND MIX HEATED PAVEMENT IN PLACE, THEN ADD AND MIX ASPHALT REJUVENATOR, THEN ADD ADDITIONAL BITUMINOUS CONCRETE AS NEEDED



SCREED AND LEVEL PROCESSED AREA
RAISE PROCESSED AREA AS NEEDED FOR COMPACTION



COMPACT AREA WITH STEEL DRUM ROLLER



AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Patch repair - in place hot reused bituminous paving

Plan
254
August 2011

Bituminous pavement T-patch

1. GENERAL

A. Vertical cuts in bituminous pavement may be done by saw or pavement zipping. If cuts greater than 6 inches are necessary to prevent pavement "break off" consult ENGINEER for directions on handling addtional costs.

B. Repair a T-patch restoration if any of the following conditions occur prior to final payment or at the end of the one year correction period.

1) Pavement surface distortion exceeds 1/4-inch deviation in 10 feet. Repair option - plane off surface distortions. coat planed surface with a cationic or anionic mulsion that complies with APWA Section 32 12 03..
2) Separation appears at a connection to an existing pavement or any Street Fixture. Repair option - blow separation clean and apply joint sealant, Plan 265.
3) Cracks at least 1-foot long and 1/4-inch wide occur more often than 1 in 10 square feet. Repair option - blow clean and apply crack seal, Plan 265.
4) Pavement raveling is greater than 1 square foot per 100 square feet. Repair option - Mill and inlay, APWA Sections 32 01 16.71 and 32 12 05.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Flowable Fill: Target is 60 psi in 28 days with 90 psi maximum in 28 days, APWA Section 31 05 15. It must flow easily requiring no vibration for consolidation.

C. Reinforcement. No. 5, galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

D. Concrete: Class 4000, APWA Section 03 30 04.

E. Tack Coat: APWA Section 32 12 13.13.

F. Bituminous Concrete. APWA Section 32 12 05.

1) Warm Weather Patch: PG64-22-DM-1/2, unless indicated otherwise.
2) Cold Weather Patch: Modified MC-250-FM-1 as indicated in APWA Section 33 05 25.

3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

B. Flowable Fill: Cure to initial set before placing aggregate base or bituminous pavement. Use in excavations that are too narrow to receive compaction equipment.

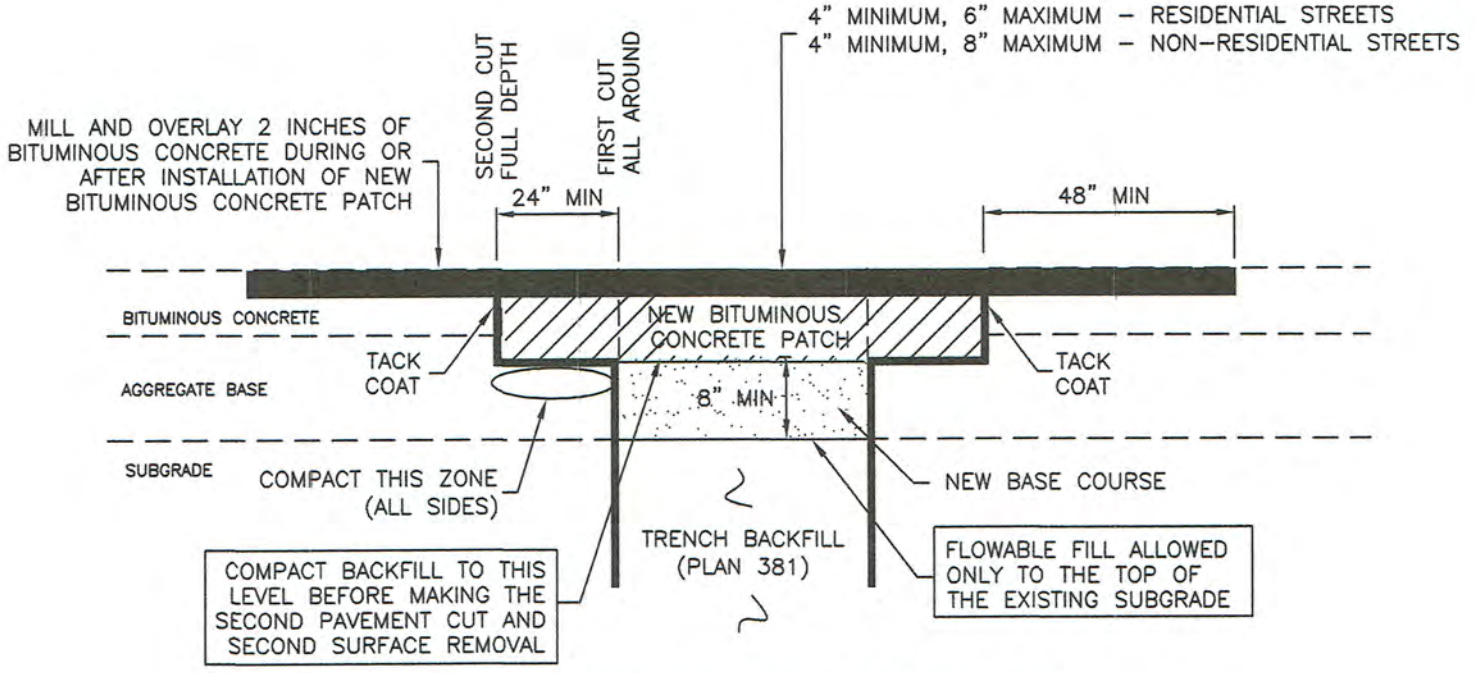
C. Tack Coat. Clean all horizontal and vertical surfaces. Apply full coverage all surfaces.

D. Pavement Placement: Follow APWA Section 32 12 16.13. Unless indicated otherwise, lift thickness is 3-inches minimum after compaction. Compact to 94 percent of ASTM D2041 (Rice density) plus or minus 2 percent.

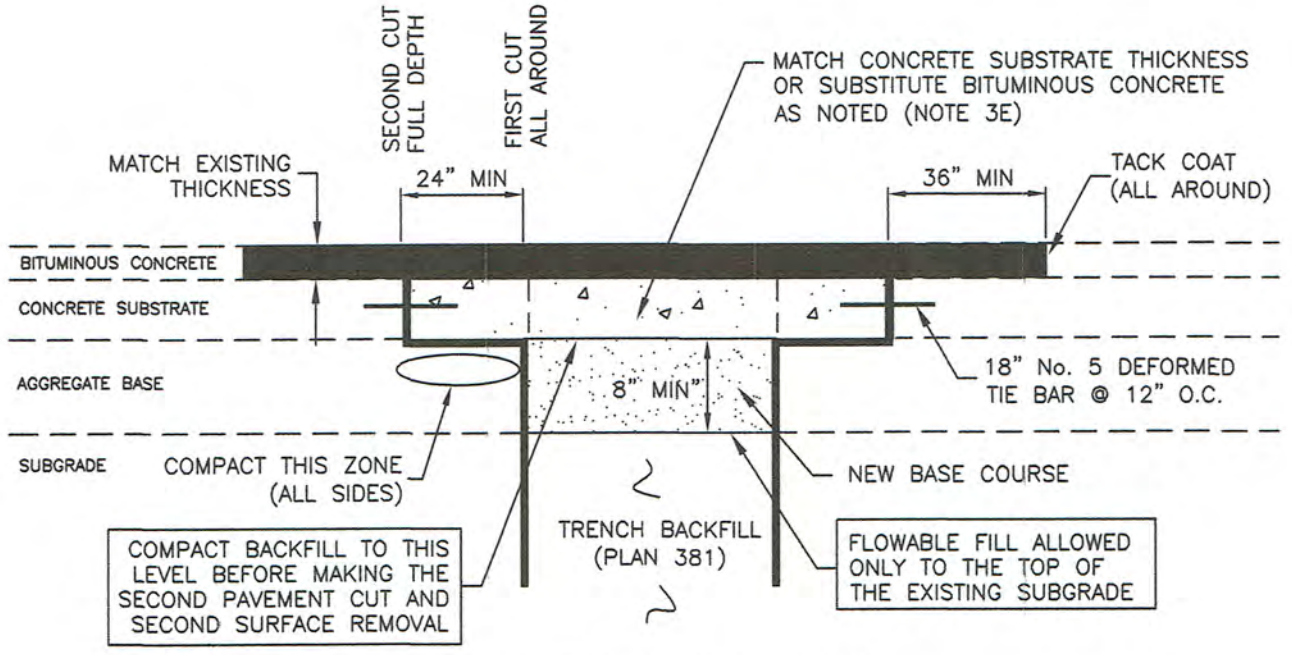
E. Bituminous Concrete Substitution: If bituminous concrete is substituted for Portland cement concrete substrate, omit rebar and provide 1.25 inches of bituminous concrete for each 1 inch of Portland cement concrete. Follow paragraph E requirements.

F. Reinforcement. Required if thickness of existing Portland-cement concrete substrate is 6-inches or greater. Not required if 1) less than 6-inches thick, 2) if existing concrete is deteriorating, 3) if excavation is less than 3 feet square, or 4) if bituminous pavement is substituted for Portland-cement concrete substrate.

G. Concrete Substrate. Cure to initial set before placing new bituminous concrete patch.



BITUMINOUS CONCRETE RESTORATION



COMPOSITE RESTORATION

Concrete pavement patch

1. GENERAL:

A. If a pavement panel and its curb and gutter are of monolithic construction, the curb and gutter will have to be removed with the pavement panel or the curb and gutter may remain if a partial panel removal meets distance requirements shown on sheet 2.

B. Partial panel removals only apply to rehabilitation of existing pavements and not to projects constructing new or original pavement. Repairs to pavements on new projects require full panel placement.

C. Additional requirements are specified in APWA Section 32 01 19.

2. PRODUCTS Not Used

3. EXECUTION

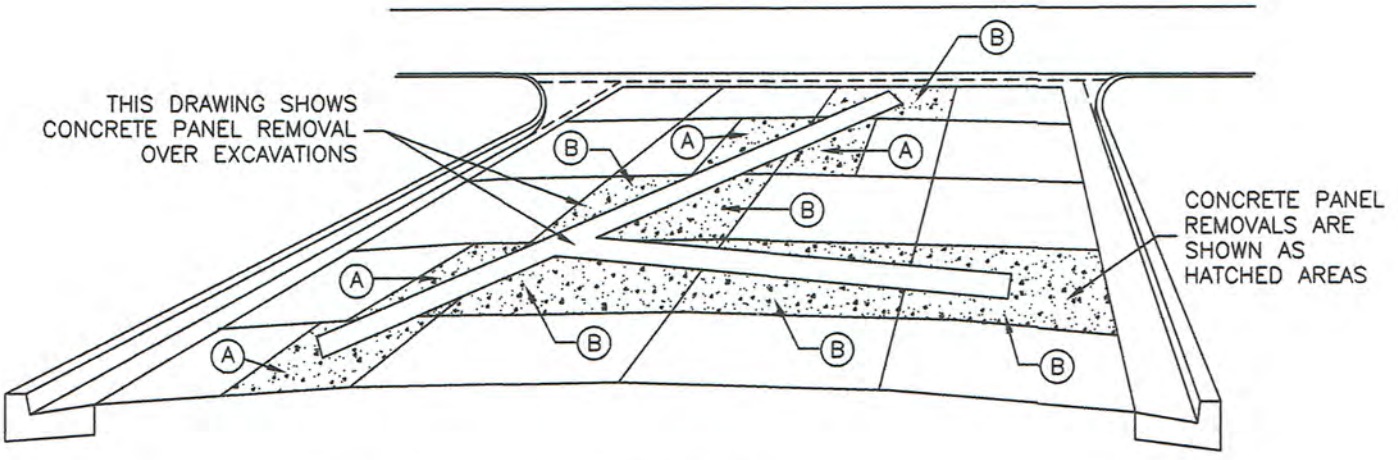
A. Partial Panel Removal:

1) Make core holes at all corners of panel.
2) Make the first saw cut full depth around panel edges. Steel reinforcement may be encountered during sawing. Finish sawing the selected mid-point of the panel using the core holes as beginning and end points of the saw cut. Do not cut into the adjacent panel.
3) Make second tapered saw cut.
4) Remove center of panel.
5) Remove remaining perimeter concrete including any corner concrete.

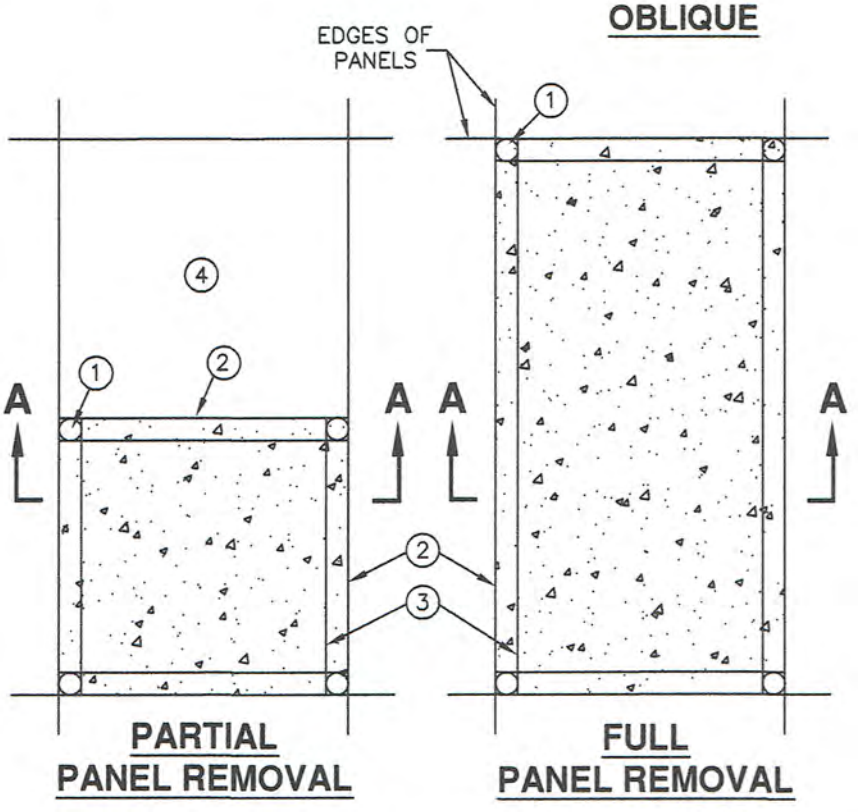
B. Full Panel Removal:

1) Make core holes at all corners of panel.
2) Make full depth saw cut around panel edges. Steel reinforcement may be encountered during sawing.
3) Make second tapered saw cut.
4) Remove center of panel.
5) Remove remaining perimeter concrete including any corner concrete at the core holes.

TYPICAL PANEL REMOVAL



OBLIQUE



PARTIAL PANEL REMOVAL

FULL PANEL REMOVAL

INSTRUCTIONS:

(A) PARTIAL PANEL REMOVAL

(B) FULL PANEL REMOVAL

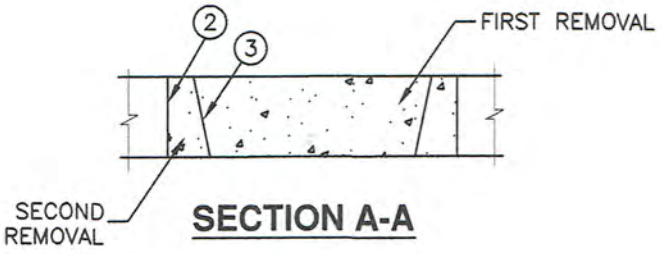
. . . . . .

(1) DRILL ≥4–INCH DIAMETER HOLES AT CORNERS OF REMOVAL AREA

(2) FIRST SAW CUT FULL DEPTH. DO NOT CUT INTO ADJACENT PANEL

(3) SECOND TAPERED SAW CUT FULL DEPTH. DO NOT CUT INTO ADJACENT PANEL

(4) REMOVE WHOLE PANEL IF REMAINING WIDTH OR LENGTH IS LESS THAN 1/2 PANEL WIDTH OR LENGTH



SECTION A-A

Concrete pavement patch

1. GENERAL:

A. Reproduce existing pavement joint layout even if repairs straddle an existing joint.
B. Additional requirements are specified in APWA Section 32 01 19.

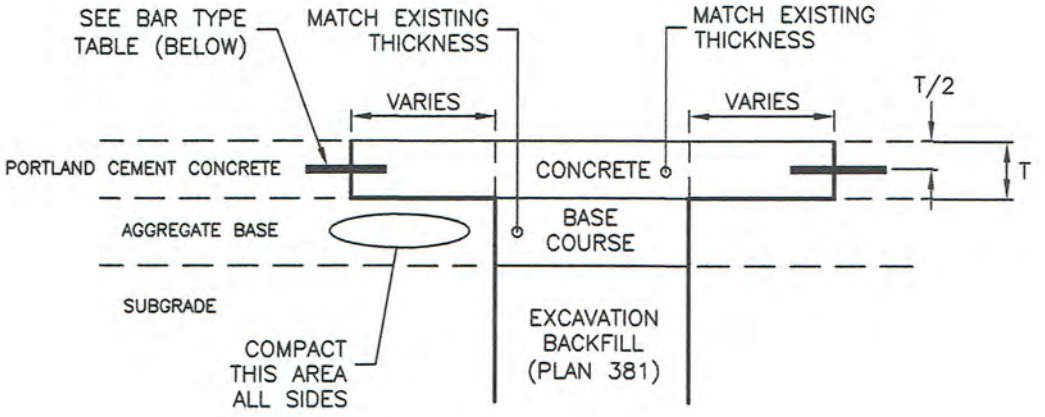
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Bars: 60 ksi yield grade steel, ASTM A615 epoxy coated or galvanized deformed or smooth with diameter and length indicated.
C. Adhesive: Epoxy adhesive grout, APWA Section 03 30 10 for gluing bars in drilled holes in concrete.
D. Bond Breaker (Grease): Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
E. Concrete: Class 4000, APWA Section 03 30 04.
F. Concrete Curing Agent: White pigmented membrane forming compound (Type II Class A or B), APWA Section 03 39 00.
G. Water Repellant: Penetrating compound, APWA Section 07 19 00.

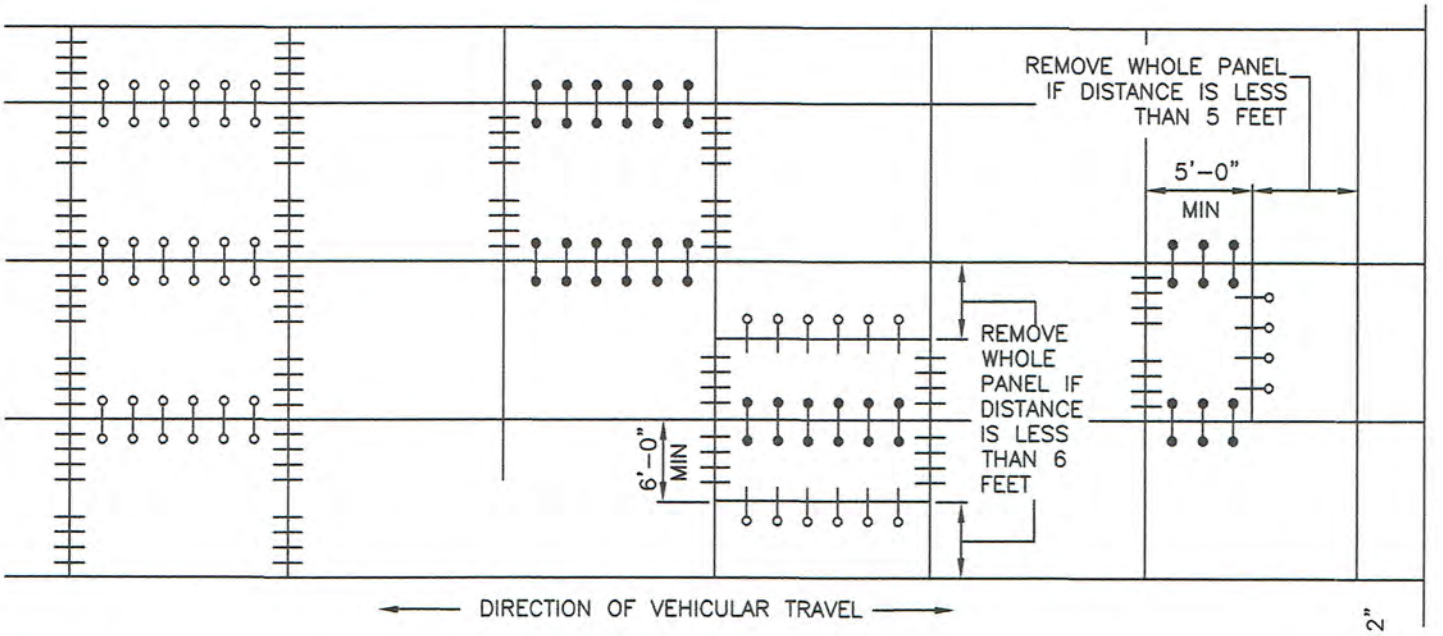
3. EXECUTION

A. Base Course Placement: APWA Section 32 05 10. Match existing aggregate base thickness. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Joint Preparation: Use a rigid drill frame to drill holes in the vertical center of the adjacent concrete panel. Drill holes parallel to the panel surface. Provide the specified space between drill holes. For dowel bars, drill the holes parallel to the thoroughfare centerline. Limit deviation from parallel to 1/4 inch in the length of the dowel bar. Clean vertical surface of the adjacent concrete.
C. Reinforcement: Remove dirt, dust, and rust from bars. Do not install tie bars that interfere with dowel bars.
    1) For tie bars, place adhesive at the back of each hole so adhesive flows out, around, and fully encases each inserted bar. DO NOT coat one end of the bar and then insert the bar into the hole. Prevent loss of adhesive upon insertion.
    2) For dowel bars, place grease at the back of each hole so grease flows out, around, and fully encases each inserted bar. Grease the bar before insertion.
    3) Grease protruding dowel bar prior to concrete placement.
D. Bond Breaker: Place bond breaker on all pavement joints that compose existing joints, both transverse and horizontal.
C. Concrete Placement: Repack loose bars and dampen base course uniformly. Place concrete, consolidate along face of existing concrete panels and under reinforcement, keep vibrators away from reinforcing steel, and prevent segregation. Match adjacent surface texture.
D. Cure: Apply curing agent in total coverage in 2 directions after texturing. Keep cure temperature even throughout extent and depth of concrete patch.
F. Traffic: Not allowed on patch until concrete strength is achieved.
G. Surface Distortions: After cure, remove surface distortions that exceed 1/4-inch deviation in 10 feet. Apply water repellant to surfaces receiving grinding.

BACKFILL AND PANEL TIE-IN

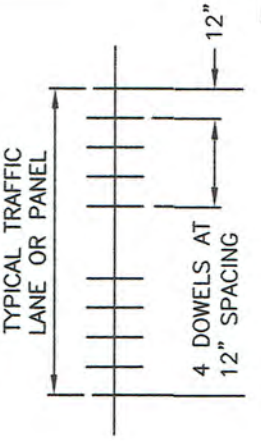


BACKFILL



BAR TYPE	BAR TYPE TABLE
○—○	30" LONG No. 5 TIE BARS AT 30" CENTERS
●—●	30" LONG No. 5 TIE BARS AT 15" CENTERS
○—	18" LONG No. 10 TIE BARS AT 12" CENTERS (NO BACKER ROD OR STRESS CUT)
—	18" LONG DOWEL BARS – SEE TABLE 1

TABLE 1	
PAVEMENT THICKNESS	DOWEL DIAMETER
LESS THAN 9"	1"
≥ 9" AND < 11"	1.25"
11" OR GREATER	1.5"



PANEL TIE-IN

Concrete pavement joints

1. GENERAL

A. ENGINEER will select joint type if not shown on drawings.

B. If separation appears at a connection to an existing pavement or street fixture during the one year correction period, blow separation clean and apply joint sealant per Plan 265.

2. PRODUCTS

A. Joint Filler: Type F1 extending to the bottom of the concrete slab, APWA Section 32 13 73.

B. Backer Rod: Type 1, oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant, APWA Section 32 13 73

C. Joint Sealant. HAS1, APWA Section 32 13 73.

D. Bond Breaker (Grease): Paraffin wax, lithium grease, or other semi-solid, inert lubricant.

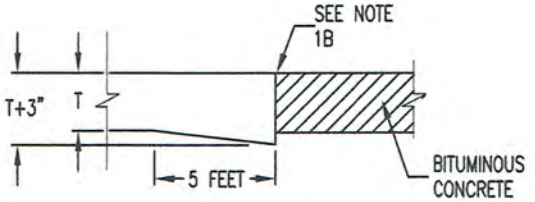
3. EXECUTION

A. Joints:

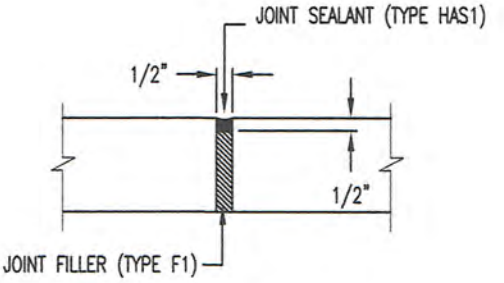
1) Saw crack control joints (contraction joints) before shrinkage cracking takes place. Do not tear or ravel concrete during sawing. In cool weather, the joint sawing may be delayed only for the time required to prevent tear or raveling of the concrete. Cut joint to dimensions shown or recommended by sealant manufacturer and acceptable to ENGINEER.

2) Remove dirt, oil, and curing compounds from backer rod and stress cut reservoirs and seal joints immediately after cleaning.

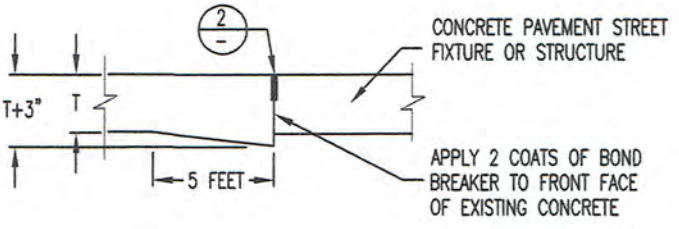
CONTACT JOINTS



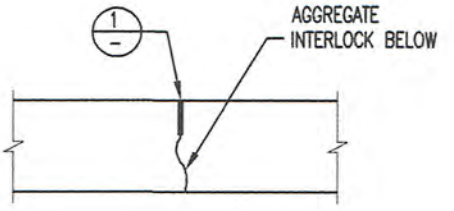
C-1



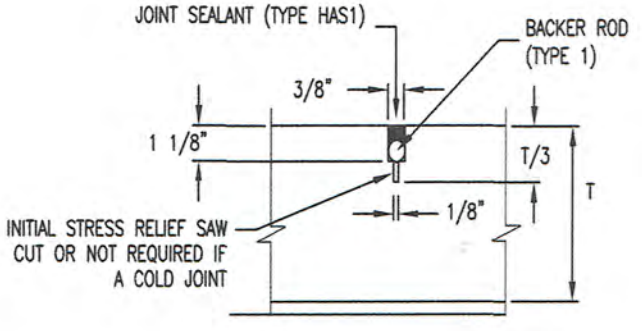
C-3



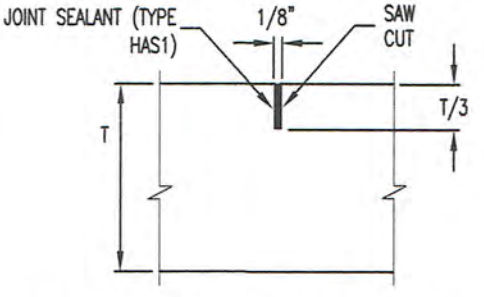
C-2



C-4



BACKER ROD DETAIL 1



STRESS CUT DETAIL 2

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Concrete pavement joints

Plan
261.1
May 2016

Concrete pavement joints

1. GENERAL

A. ENGINEER will select joint type if not shown on drawings.
B. If separation appears at a connection to an existing pavement or street fixture during the one year correction period, blow separation clean and apply joint sealant per Plan 265.

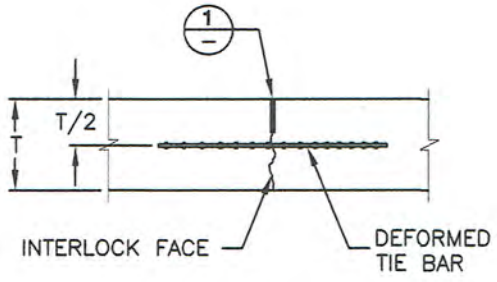
2. PRODUCTS

A. Bars: 60 ksi yield grade steel, ASTM A615, epoxy coated or galvanized, with diameter and length indicated.
B. Joint Filler: Type F1 extending to the bottom of the concrete slab, APWA Section 32 13 73.
C. Backer Rod: Type 1, oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant, APWA Section 32 13 73
D. Joint Sealant. HAS1, APWA Section 32 13 73.
E. Bond Breaker (Grease): Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
F. Adhesive: Epoxy adhesive grout, APWA Section 03 30 10 for gluing bars in drilled holes in concrete.

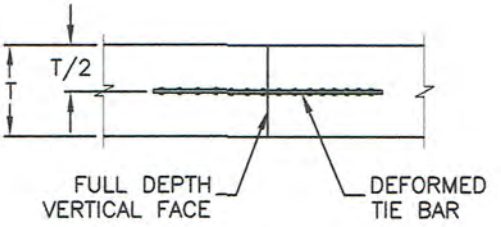
3. EXECUTION

A. Preparation Before Bar Insertion:
   1) Select joint layout to aid construction and to control concrete cracking.
   2) Use a rigid drill frame to drill holes on indicated centers. Drill parallel to the pavement surface. Remove dust from vertical concrete surface.
   3) Place adhesive at the back of each hole so adhesive flows out, around, and fully encases each inserted bar. DO NOT coat one end of the bar and then insert the bar into the hole. Prevent sealant flow-out upon bar insertion.
B. Tie Bars: Remove dirt, dust and rust.
C. Joints:
   1) 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 tear or raveling of the concrete. Cut joint to dimensions shown or recommended by sealant manufacturer and acceptable to ENGINEER.
   2) Remove dirt, oil, and curing compounds from backer rod and stress cut reservoirs and seal joints immediately after cleaning.

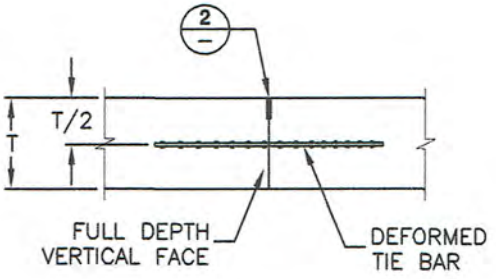
TIE-BAR JOINTS



T-1
INTERLOCK FACE



T-3
MID PANEL

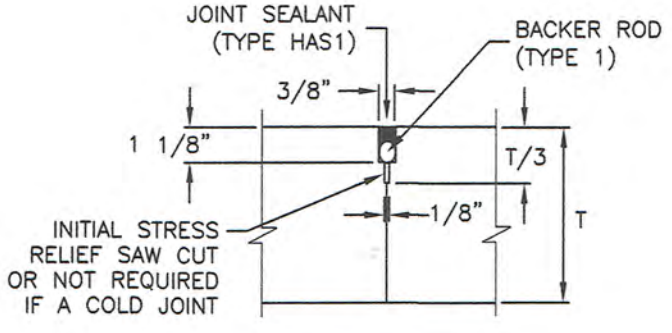


T-2
VERTICAL FACE

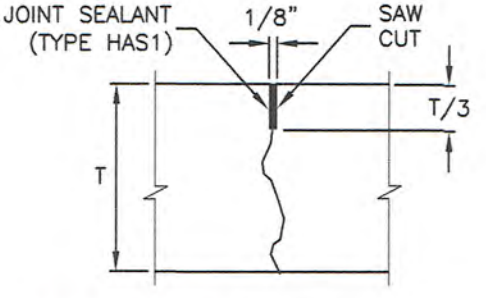
TABLE 1

JOINT TYPE	PANEL LOCATION	TIE BAR DIAMETER	LENGTH	SPACING O.C.
TB–1	INTERLOCK FACE	5/8"	30"	30"
TB–2	VERTICAL FACE	5/8"	30"	15"
TB–3	MID PANEL	1.25"	18"	12"

O.C. = ON CENTER



BACKER ROD DETAIL 1



STRESS CUT DETAIL 2

Concrete pavement joints

1. GENERAL

A. ENGINEER will select joint type if not shown on drawings.
B. If separation appears at a connection to an existing pavement or street fixture during the one year correction period, blow separation clean and apply joint sealant per Plan 265.

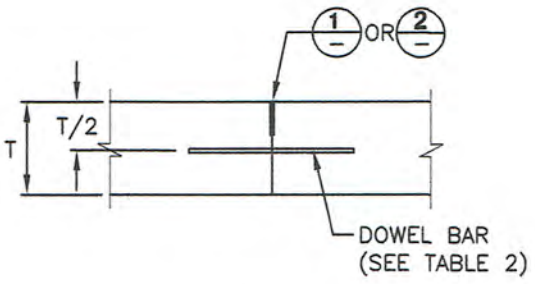
2. PRODUCTS

A. Bars: 60 ksi yield grade steel, ASTM A615, epoxy coated or galvanized, with diameter and length indicated.
B. Joint Filler: Type F1 extending to the bottom of the concrete slab, APWA Section 32 13 73.
C. Backer Rod: Type 1, oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant, APWA Section 32 13 73
D. Joint Sealant. HAS1, APWA Section 32 13 73.
E. Bond Breaker (Grease): Paraffin wax, lithium grease, or other semi-solid, inert lubricant.
F. Adhesive: Epoxy adhesive grout, APWA Section 03 30 10 for gluing bars in drilled holes in concrete.

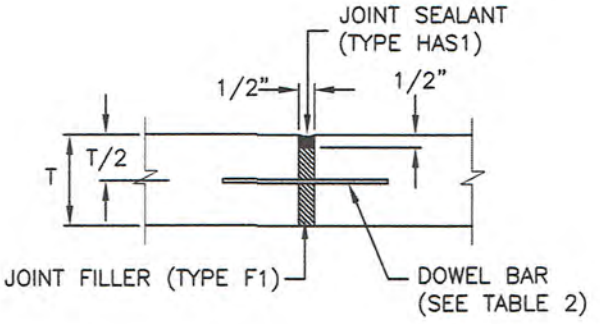
3. EXECUTION

A. Preparation Before Bar Insertion:
   1) Select joint layout to aid construction and to control concrete cracking.
   2) Use a rigid drill frame to drill holes on indicated centers. Drill parallel to the roadway centerline and parallel to the pavement surface. Limit drilling deviation from parallel to 1/4 inch. Remove dust from vertical concrete surface.
B. Dowel Bars:
   1) Remove dirt, dust and rust.
   2) Apply a bond breaker (grease) over entire surface length of dowel bars This will allow concrete movement in expansion joints.
C. Joints:
   1) Do not tear or ravel concrete during sawing. In cool weather, the joint sawing may be delayed only for the time required to prevent tear or raveling of the concrete. Cut joint to dimensions shown or recommended by sealant manufacturer and acceptable to ENGINEER.
   2) Remove dirt, oil, and curing compounds from backer rod and stress cut reservoirs and seal joints immediately after cleaning.

DOWEL JOINTS



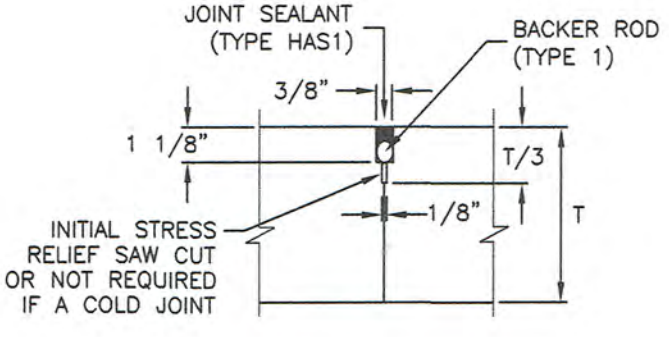
D-1



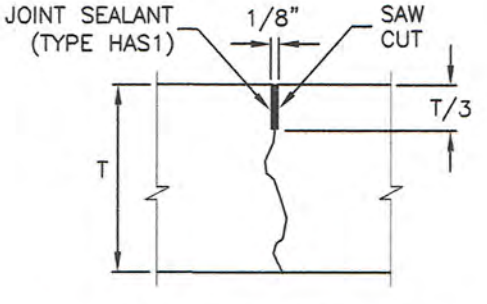
D-2

TABLE 2			
PAVEMENT THICKNESS (T)	DOWEL DIAMETER	LENGTH	SPACING O.C.
LESS THAN 9"	1"	18"	12"
≥ 9" AND < 11"	1.25"	18"	12"
11" OR GREATER	1.5"	18"	12"

O.C. = ON CENTER



BACKER ROD DETAIL 1/—



STRESS CUT DETAIL 2/—

Concrete pavement joints

1. GENERAL

A. Keep at least 3 working power saws on-site when concrete is being placed.
B. Lay out joints to aid construction and to control concrete cracking.

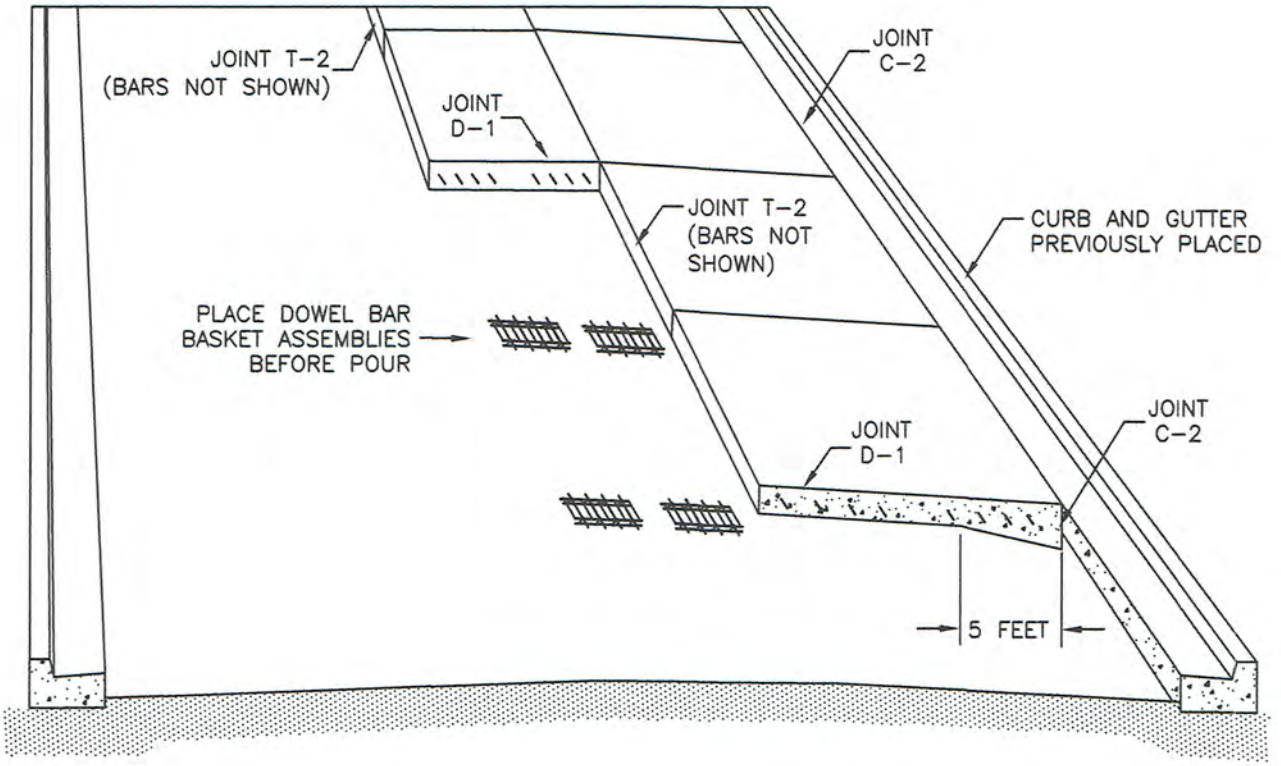
2. PRODUCTS

A. Bars: 60 ksi yield grade steel, ASTM A615, epoxy coated or galvanized, with diameter and length indicated,
B. Wire: Steel. Sizes shown are minimum.
C. Bond Breaker (Grease): Paraffin wax, lithium grease, or other semi-solid, inert lubricant.

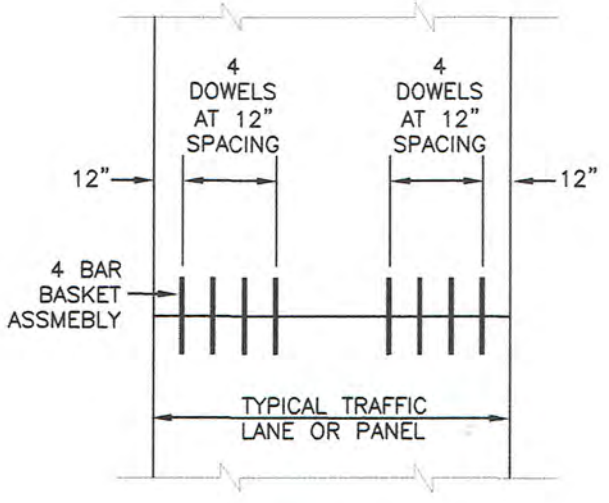
3. EXECUTION

A. Basket Assembly:
   1) Remove dirt, dust and rust from bars.
   2) Allow longitudinal movement of dowel bar in the basket assembly.
   3) Apply bond breaker (grease) to entire surface length of dowel bars. This will allow concrete movement in expansion joints.
B. Basket Installation: Attach basket assemblies firmly to the existing or new aggregate base course. Place baskets so dowel bars are parallel to the roadway centerline and parallel to the pavement surface. Limit bar deviation from parallel to 1/4 inch.
C. Joints:
   1) Longitudinal joint spacing is 12 feet maximum for concrete pavements.
   2) Transverse joint spacing measured in feet not to exceed 2 x T (slab thickness in inches) or 15 feet maximum. The maximum slab length to slab width ratio is 1.5 to 1.
   3) Extend transverse contraction joints continuously across the full width of the concrete. Make joints coincide with curb and gutter joints.
   4) Make adjustments in joint locations to meet inlet or manhole locations.
   5) 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 tear or raveling of the concrete. Cut joint to dimensions shown or recommended by sealant manufacturer and acceptable to ENGINEER.
   6) Remove dirt, oil, and curing compounds from joint reservoir. Seal joint immediately after cleaning.

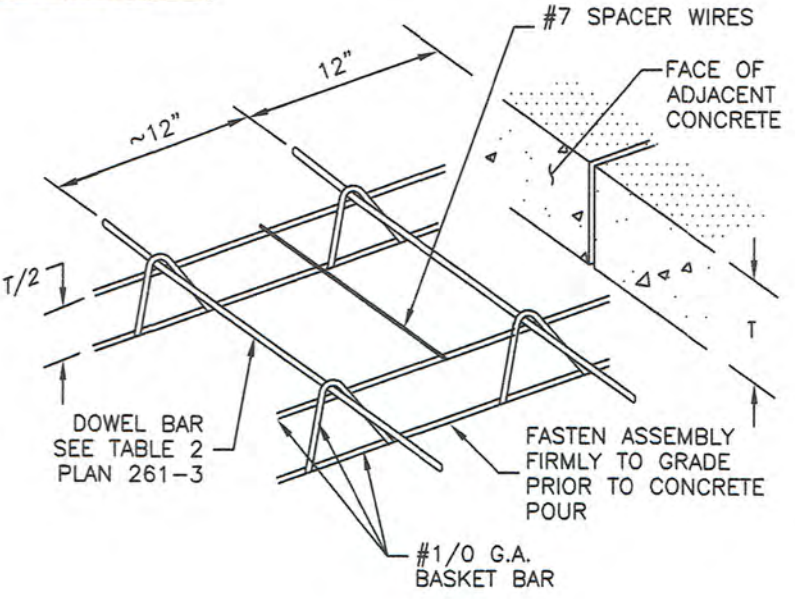
TYPICAL DOWEL BASKET ASSEMBLY AND INSTALLATION



INSTALLATION



PLAN



ASSEMBLY

Concrete pavement joints

1. GENERAL

A. Lay out joints to aid construction and to control random cracking.

B. If separation appears at a connection to an existing pavement or street fixture during the one year correction period, blow separation clean and apply joint sealant per Plan 265.

2. PRODUCTS

A. Bars: 60 ksi yield grade steel, ASTM A615, epoxy coated or galvanized, with diameter and length indicated.

3. EXECUTION

A. Preparation Before Bar Insertion:

1) Use a rigid drill frame to drill holes on indicated centers. Drill parallel to the pavement surface. Remove dust from vertical concrete surface.

2) Place adhesive at the back of each hole so adhesive flows out, around, and fully encases each inserted bar. DO NOT coat one end of the bar and then insert the bar into the hole. Prevent sealant flow-out upon bar insertion.

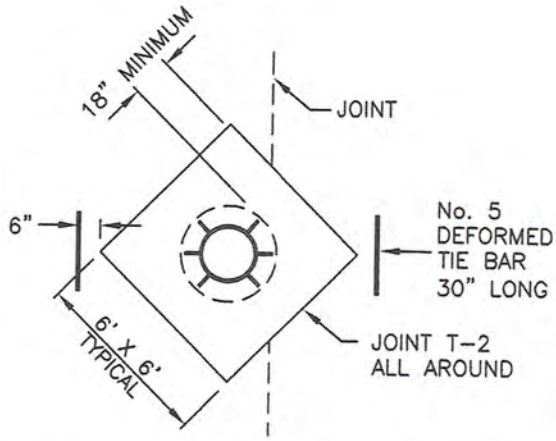
B: Tie Bars: Remove dirt, dust and rust.

C. Joints:

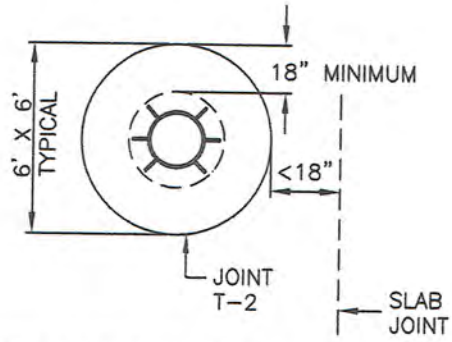
1) Saw crack control joints (contraction joints) before shrinkage cracking takes place. Do not tear or ravel concrete during sawing. In cool weather, the joint sawing may be delayed only for the time required to prevent tear or raveling of the concrete. Cut joint to dimensions shown or recommended by sealant manufacturer and acceptable to ENGINEER.

2) Remove dirt, oil and curing compounds from backer rod and stress cut reservoirs and seal joints immediately after cleaning.

TYPICAL ISOLATION JOINTS AT STREET FIXTURES

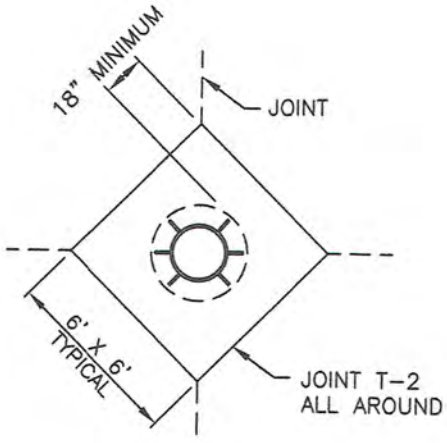


INSTALL DEFORMED TIE BAR AT ALL CORNERS OF ISOLATION JOINTS THAT DO NOT INTERSECT A LONGITUDINAL OR TRANSVERSE JOINT

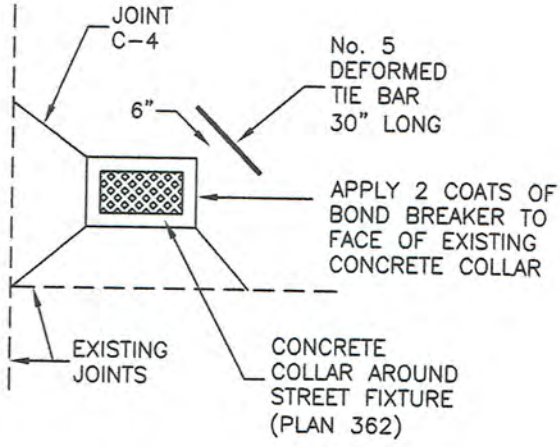


USE ROUND TYPE JOINT WHEN DISTANCE BETWEEN EXPANSION JOINT AND SLAB JOINT IS LESS THAN 18 INCHES

Example 1



Example 2



Example 3

Dowel bar retrofit

1. GENERAL

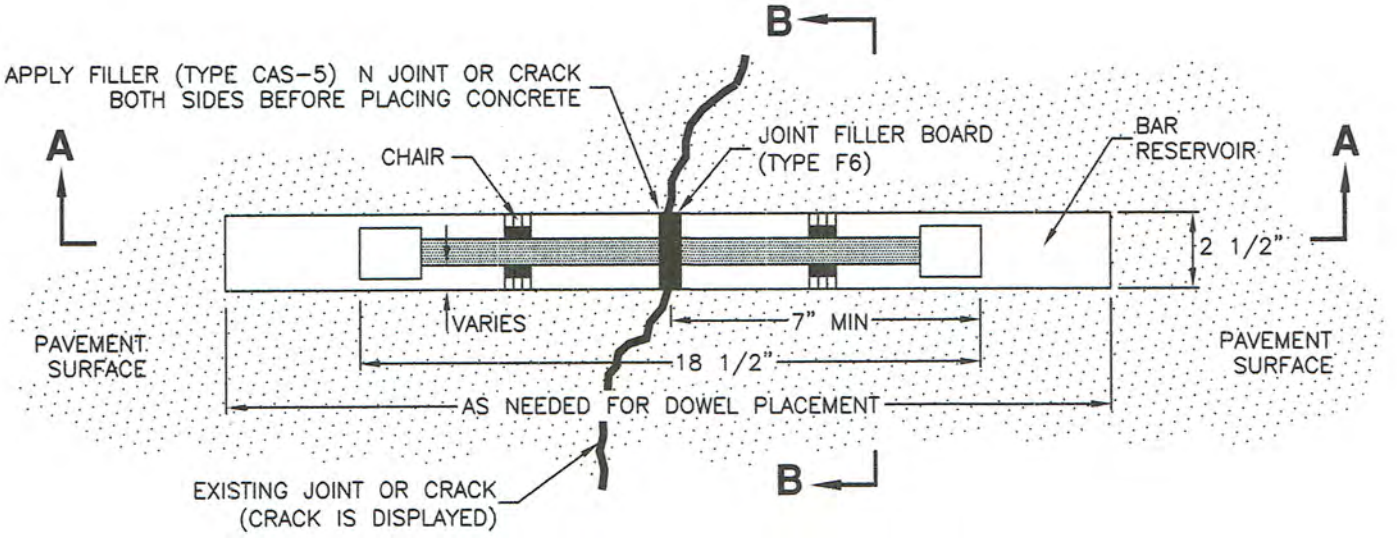
A. Dowel bar assemblies are placed across existing transverse joints and cracks in concrete roadway pavement slabs 8-inches thick or thicker.

2. PRODUCTS

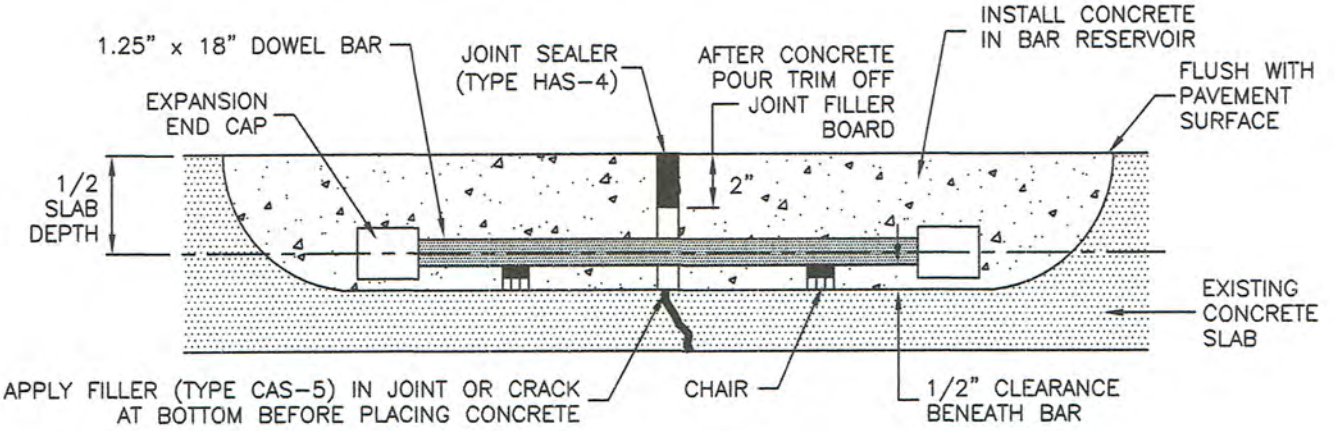
A. Dowel Bars: Smooth galvanized or epoxy coated grade 60 ksi steel, ASTM A615, free of burrs or other deformations detrimental to free movement of bar in concrete. Bars can only be sawn (not sheared) and coated with white pigmented bond breaking curing compound at the factory. DO NOT apply bond breaker while the dowel bar assemblies are in the reservoir.
B. Expansion Caps: Non-metallic allowing 1/4-inch bar movement inside of cap.
C. Chairs: Non-metallic designed to press securely against the reservoir bottom and sides.
D. Joint Products: As specified in APWA Section 32 13 73 for the following applications.
   1) Filler board – F-6.
   2) Crack or joint filler – CAS-5.
   3) Joint Sealer – HAS-4.
E. Concrete: 3000 psi in 3 hours, and 5000 psi in 24 hours (ASTM C109).
   1) 3/8-inch aggregate maximum.
   2) Shrinkage maximum in 4 days 0.13 percent, ASTM C157.
   3) Bond strength of 1000 psi in 24 hours (ASTM C882).
F. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

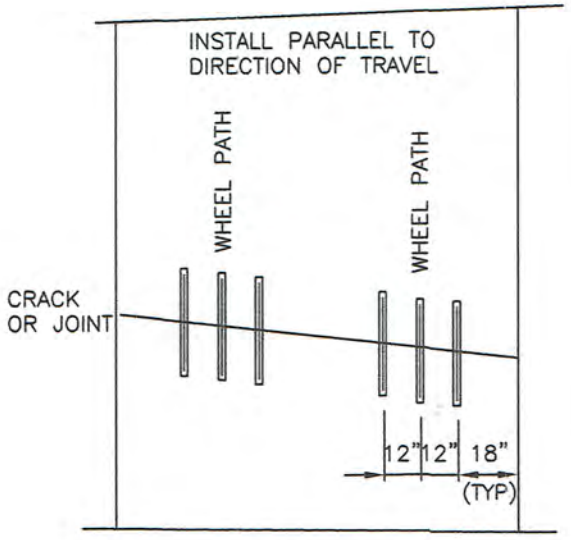
A. Saw cut slab to create a reservoir parallel to the roadway centerline. Skewed joints or cracks may require slots longer than the length shown in the plan. Employ saws capable of cutting a minimum of three slots simultaneously if more than 100 bars are to be placed in the Work. Less than 100, a walk behind saw may be used if a template is used to ensure the slot locations are within the specified tolerances.
B. Chip-off concrete fins in reservoir and clean by sand blast or high pressure water blast, or other. Remove dust, slurries, and concrete debris from reservoir and adjacent lanes carrying traffic. Stop work if removal operations cause damage to the pavement that is to remain. Correct removal procedures before proceeding.
C. Apply joint sealer to cracks and joints in the reservoir.
D. Place joint filler board in vertical plane of transverse joint or crack. Fit board tightly to reservoir, and bar. Keep filler board vertical during concrete patch placement.
E. Install and consolidate concrete patch. Match elevation of surface adjacent to reservoir. If grinding is a part of the contract place concrete 1/8 to 1/4 inch higher.
F. Finish the patch surface smooth and apply curing agent.
G. After cure application, remove joint filler board across width of reservoir to a depth of 2-inches and seal the joint with joint sealer.



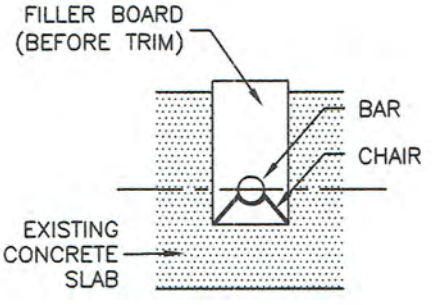
PLAN



SECTION A-A



TYPICAL LANE



SECTION B-B

Crack sealing

1. GENERAL

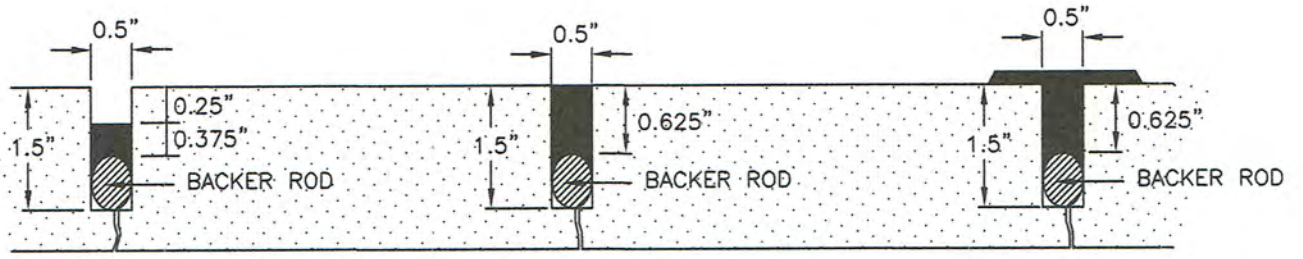
A. Includes sealing cracks in roadway pavement surfaces.

2. PRODUCTS

A. Sealer: Asphalt rubber or rubberized asphalt, APWA Section 32 01 17.
B. Backer Rod: Type 1, oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant, APWA Section 32 13 73

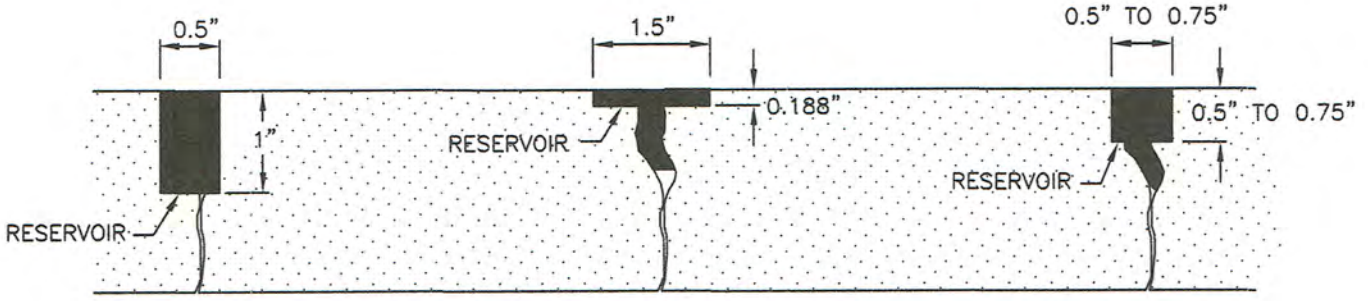
3. EXECUTION

A. Blow cracks clean. Remove foreign matter, loosened particles, and weeds.
B. Use a hot air lance when surfaces are wet or when air temperature is less than 40 deg. F. Do not burn the surrounding Pavement. Fill cracks immediately after heating, or reheat.
C. If a thin chip, slurry, or micro-surface seal is to be applied. Provide a flush fill. Remove crack overfill by squeegee.
D. Allow at least one week for repaired cracks to cure and harden before placing thin overlays.



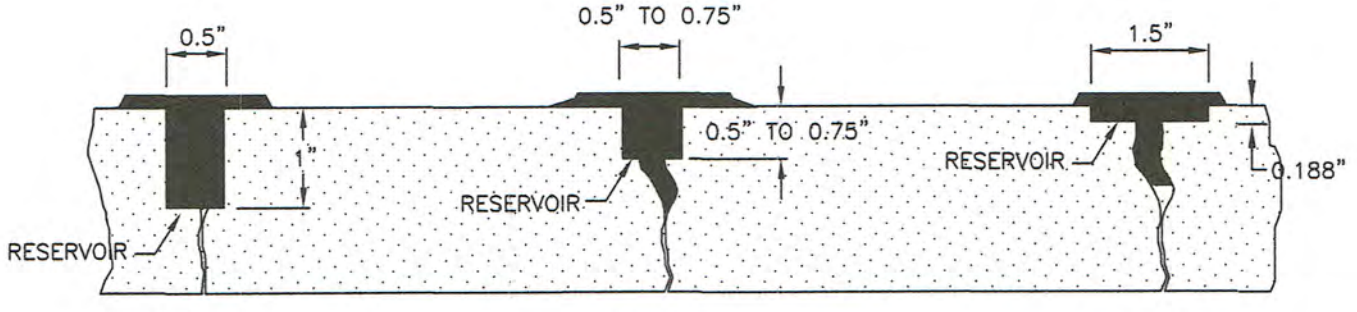
TYPE A **TYPE B** **TYPE C**

BACKER ROD SEAL



TYPE D **TYPE E** **TYPE F**

RESERVOIR SEAL



TYPE G **TYPE H** **TYPE J**

CAP AND RESERVOIR SEAL

Crack filling

1. GENERAL

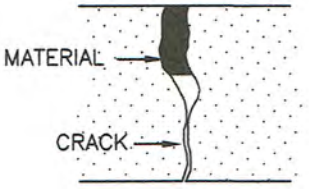
A. Includes filling cracks in roadway pavement surfaces.

2. PRODUCTS

A. Filler: Asphalt rubber or rubberized asphalt, APWA Section 32 01 17.

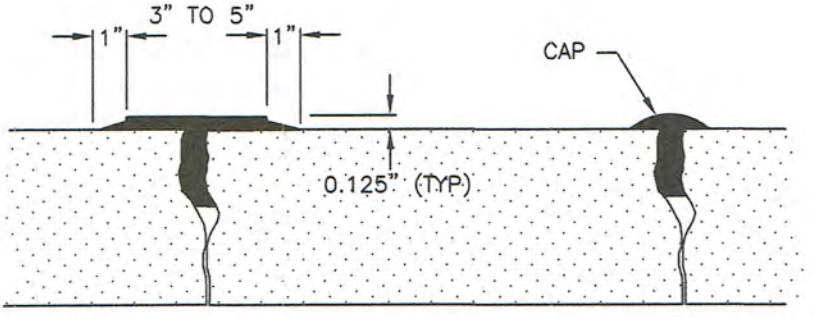
3. EXECUTION

A. Blow cracks clean. Remove foreign matter, loosened particles, and weeds.
B. Use a hot air lance when surfaces are wet or when air temperature is less than 40 deg. F. Do not burn the surrounding Pavement. Fill cracks immediately after heating, or reheat.
C. If a thin chip, slurry, or micro-surface seal is to be applied. Provide a flush fill. Remove crack overfill by squeegee.
D. Allow at least one week for repaired cracks to cure and harden before placing thin overlays.



TYPE A

FLUSH FILL



TYPE B **TYPE C**

CAP FILL

Corner and boundary markers

1. GENERAL

A. Includes installation of reference marks and surveyor tags.

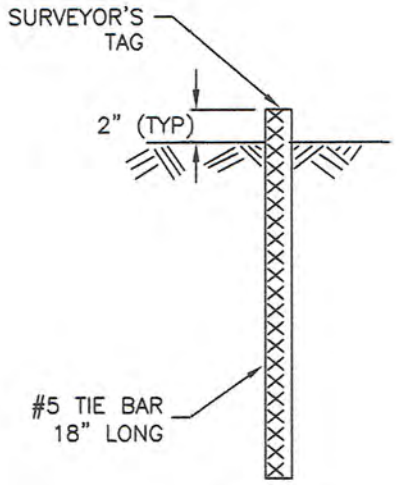
2. PRODUCTS

A. Surveyor’s Tag: Brass showing surveyor's professional license number.

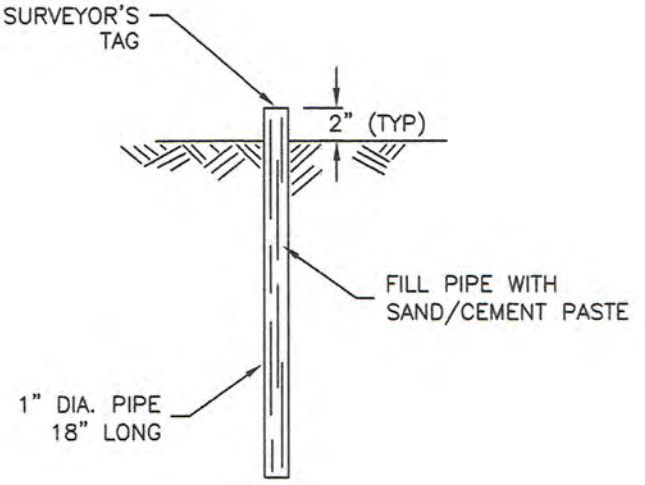
3. EXECUTION

A. Mark subdivision boundaries with type `D' marker.

B. Mark all angles 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.

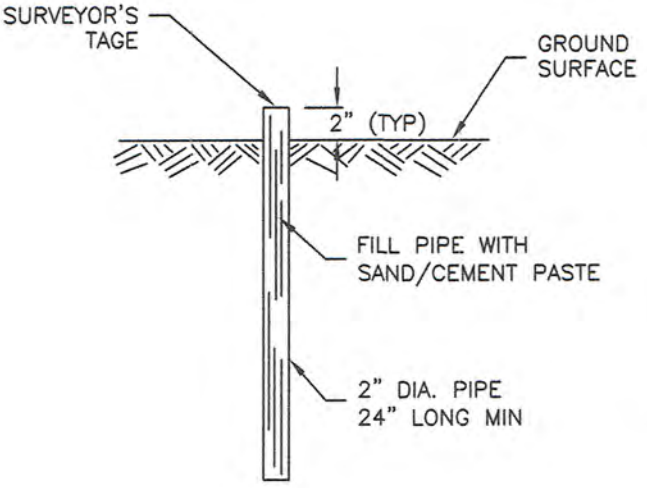


TYPE A

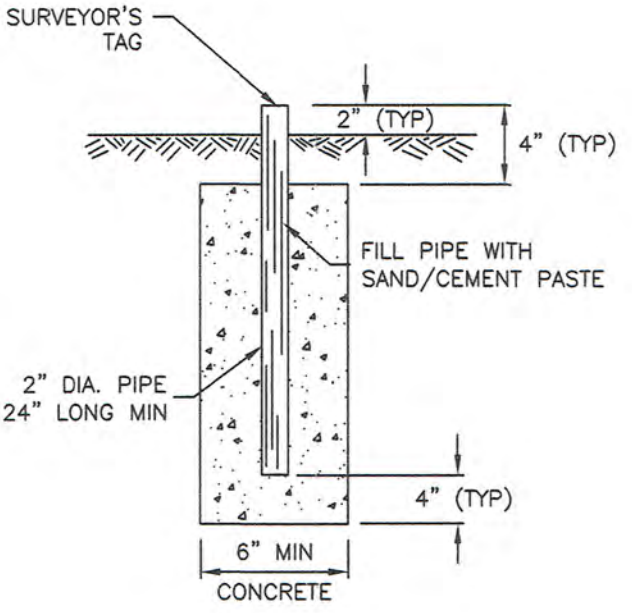


TYPE B

CORNER MARKERS



TYPE C



TYPE D

BOUNDARY MARKERS

Monument cap and base

1. GENERAL

A. Includes fabrication of monument cap and base.

2 PRODUCTS

A. Cap: Brass or bronze with the following abbreviations. 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

B. Concrete: Class 4000, APWA Section 03 30 04.

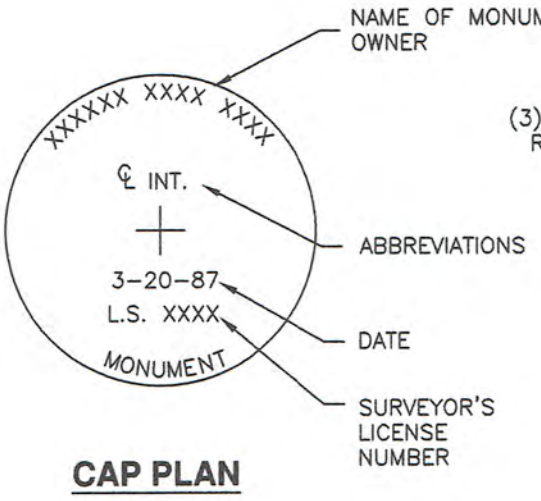
C. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

3. EXECUTION

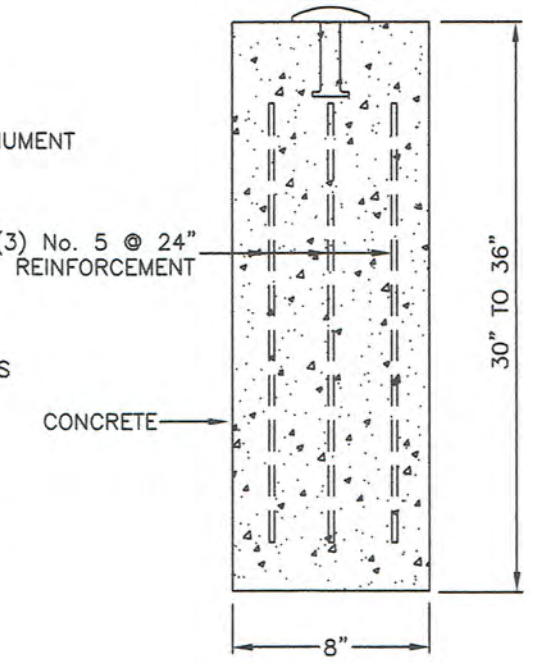
A. Monument Cap: Show month, day, and year when cap was marked.

B. License: Show license number of land surveyor who marked the cap.

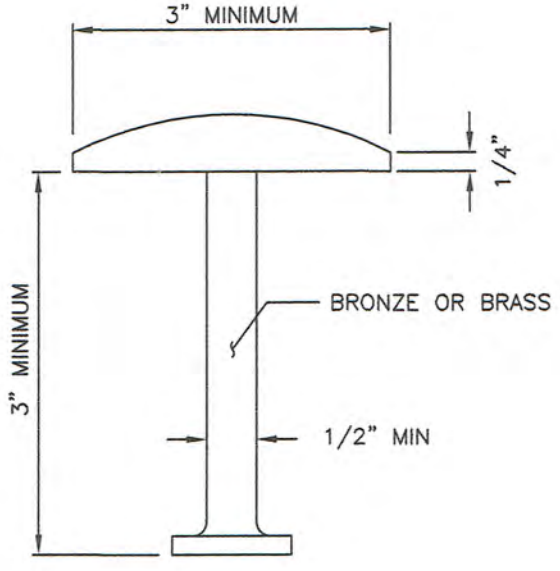
C. Provide either precast or cast in-place monument base.



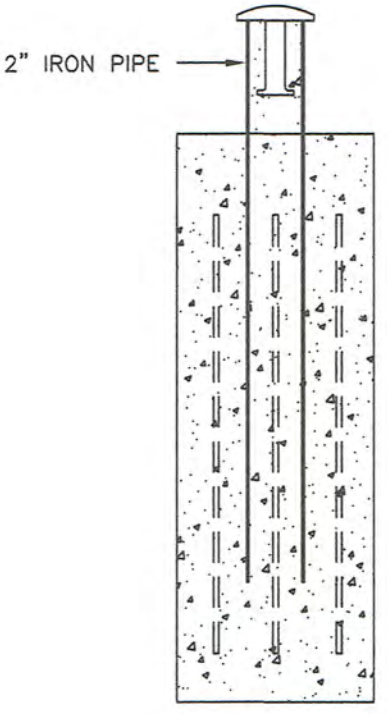
CAP PLAN



SECTION OF BASE
TYPICAL SETTING



CAP SECTION



SECTION OF BASE
ALTERNATE SETTING

Frame and cover for monument

1. GENERAL

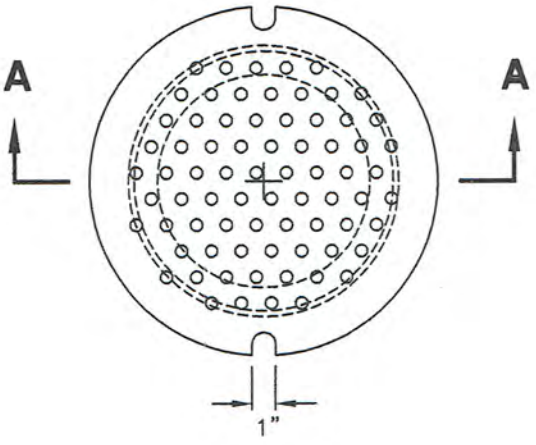
A. The drawing is a frame and cover castings for monument boxes, Plan 274 and 275.

2. PRODUCT

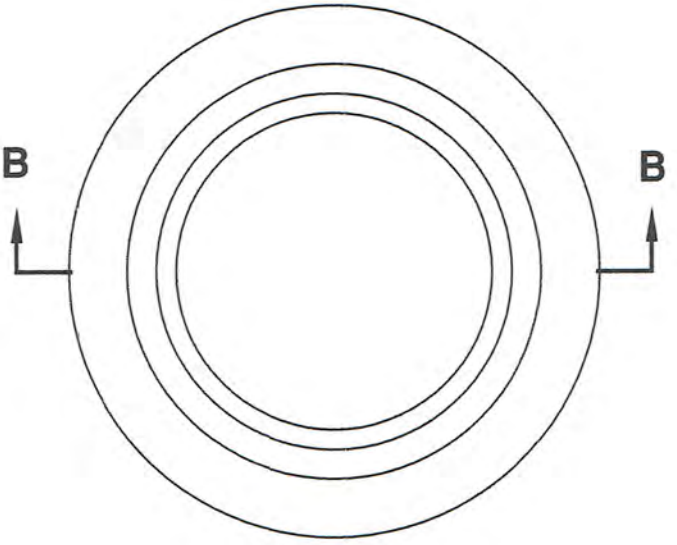
A. Castings: Class 20 grey iron, ASTM A48, coated with asphalt based paint or better.

3. EXECUTION

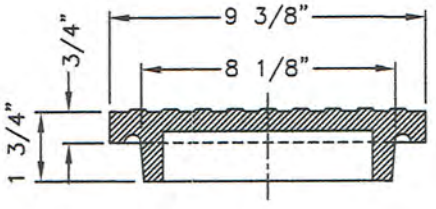
A. Set frame independent of monument post.



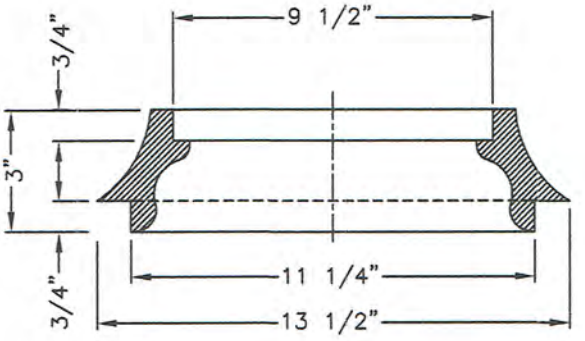
COVER



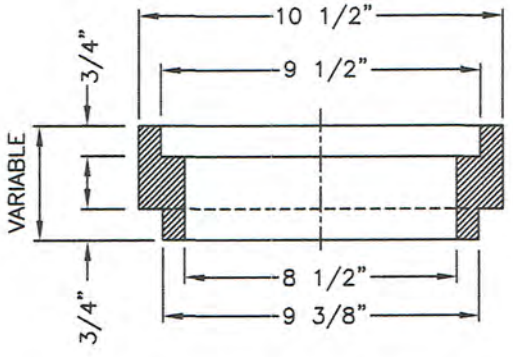
FRAME



SECTION A-A



SECTION B-B



EXTENSION

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

Survey monument placement under pavements

1. GENERAL

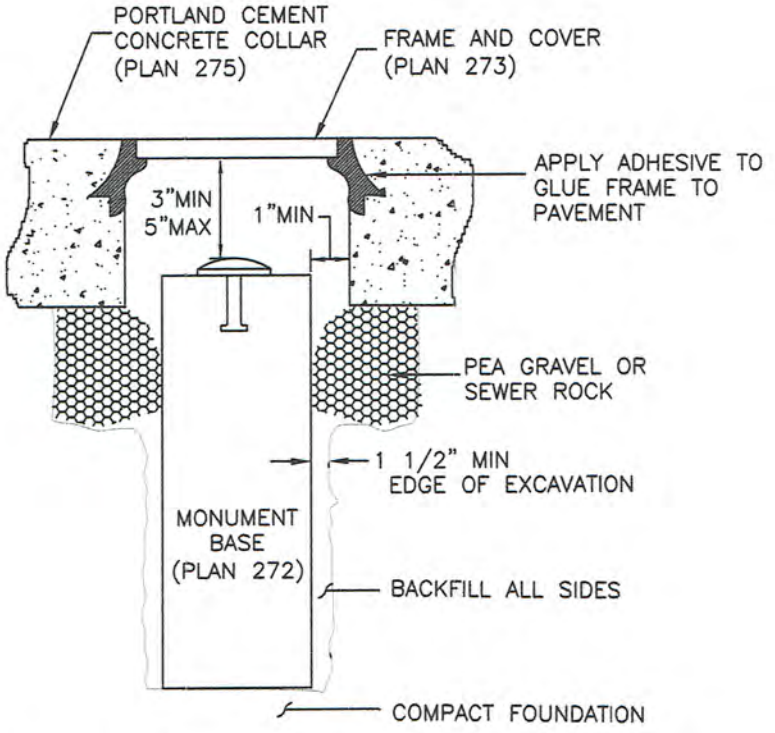
A. The installed monument must be independent of the roadway pavement so that vibrations of the pavement surface are transmitted to the underlying soils and not to the monument. This will assure the monument remains undisturbed.

2. PRODUCT

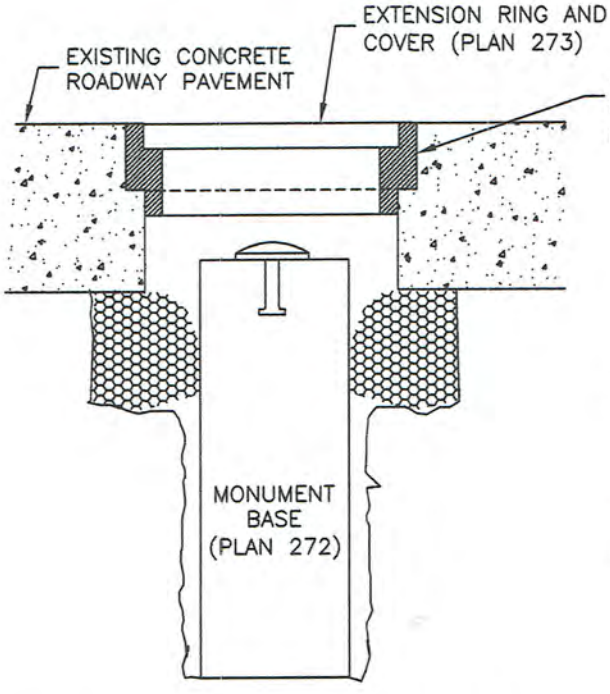
A. Castings: Class 20 grey iron, ASTM A48, coated with asphalt based paint or better.
B. Backfill: Native soil or backfill borrow, APWA Section 31 05 13.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Adhesive: Epoxy adhesive grout, APWA Section 03 30 10.
E. Pea Gravel: Nominal size 3/4, APWA Section 31 05 13.
F. Sewer Rock: Nominal size 1”, APWA Section 31 05 13.

3. EXECUTION

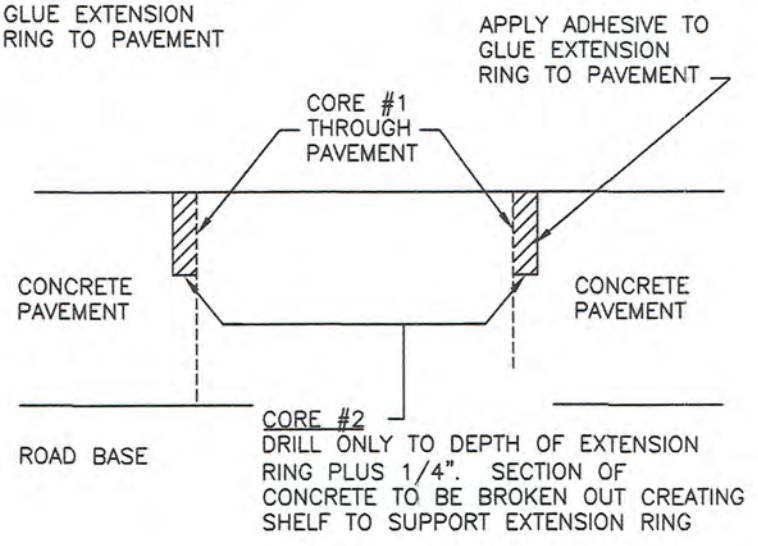
A. Locate monument base so reference point falls within 1-inch diameter circle in the center of marker plate. Install maker plate in monument base before the concrete sets.
B. Compact bottom of excavated hole before placement of precast or cast-in-place monument post.
C. Compact backfill to 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
D. Set top of frame and cover level with concrete collar.
E. Set frame independent of monument post.



BITUMIOUS CONCRETE PAVEMENTS



CEMENT CONCRETE PAVEMENTS



DETAIL 1

(REQUIRES TWO CONCRETE CORE DRILLS)

Cover collar for survey monuments

1. GENERAL

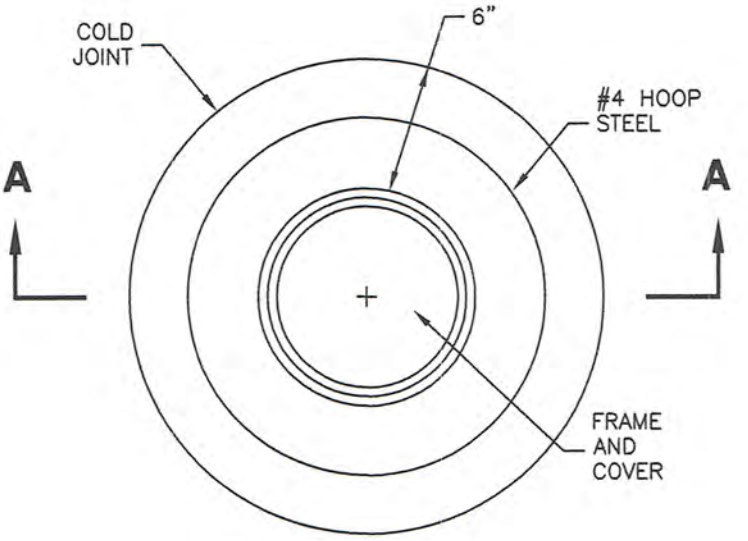
A. In a pavement surface, fill an annular space around a frame and cover casting with concrete. The concrete will support the casting under traffic loadings.

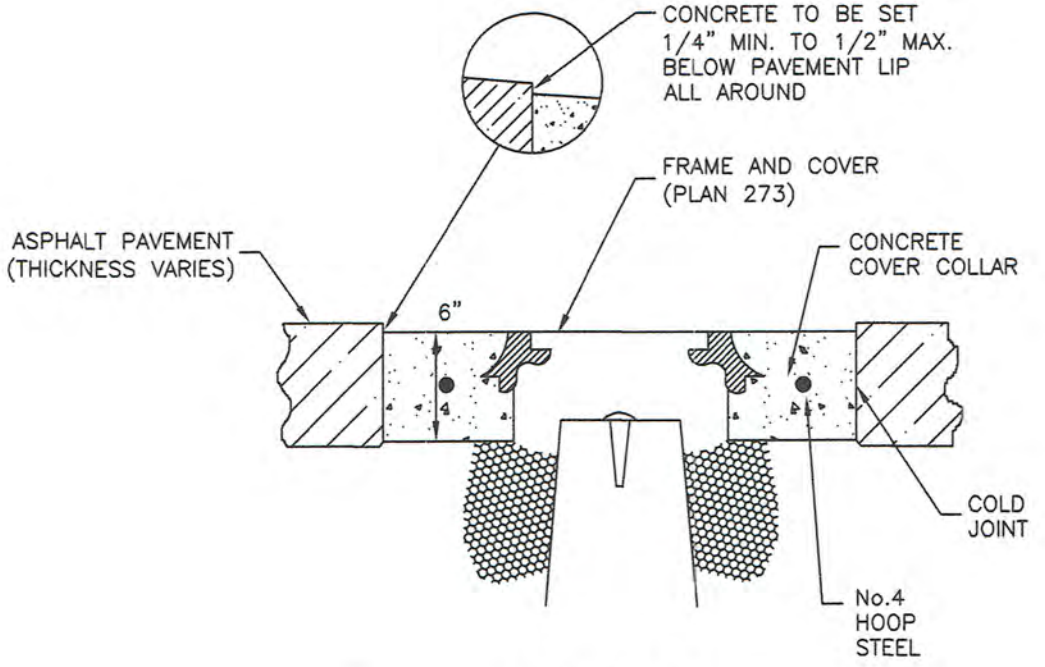
2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.
B. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Pavement Preparation: Provide a neat vertical and concentric joint between concrete and existing bituminous concrete surfaces. Clean edges of all dirt, oil, and loose debris.
B. Concrete Placement: Fill the annular space around the frame and cover casting with concrete. Apply a broom finish. Apply a curing agent.


COLD
JOINT
6"
#4 HOOP
STEEL
A
A
FRAME
AND
COVER


CONCRETE TO BE SET
1/4" MIN. TO 1/2" MAX.
BELOW PAVEMENT LIP
ALL AROUND
FRAME AND COVER
(PLAN 273)
ASPHALT PAVEMENT
(THICKNESS VARIES)
CONCRETE
COVER COLLAR
6"
4
COLD
JOINT
No.4
HOOP
STEEL

SECTION A-A

Street name signpost

1. GENERAL

A. Get ENGINEER's approval of sign format and installation.

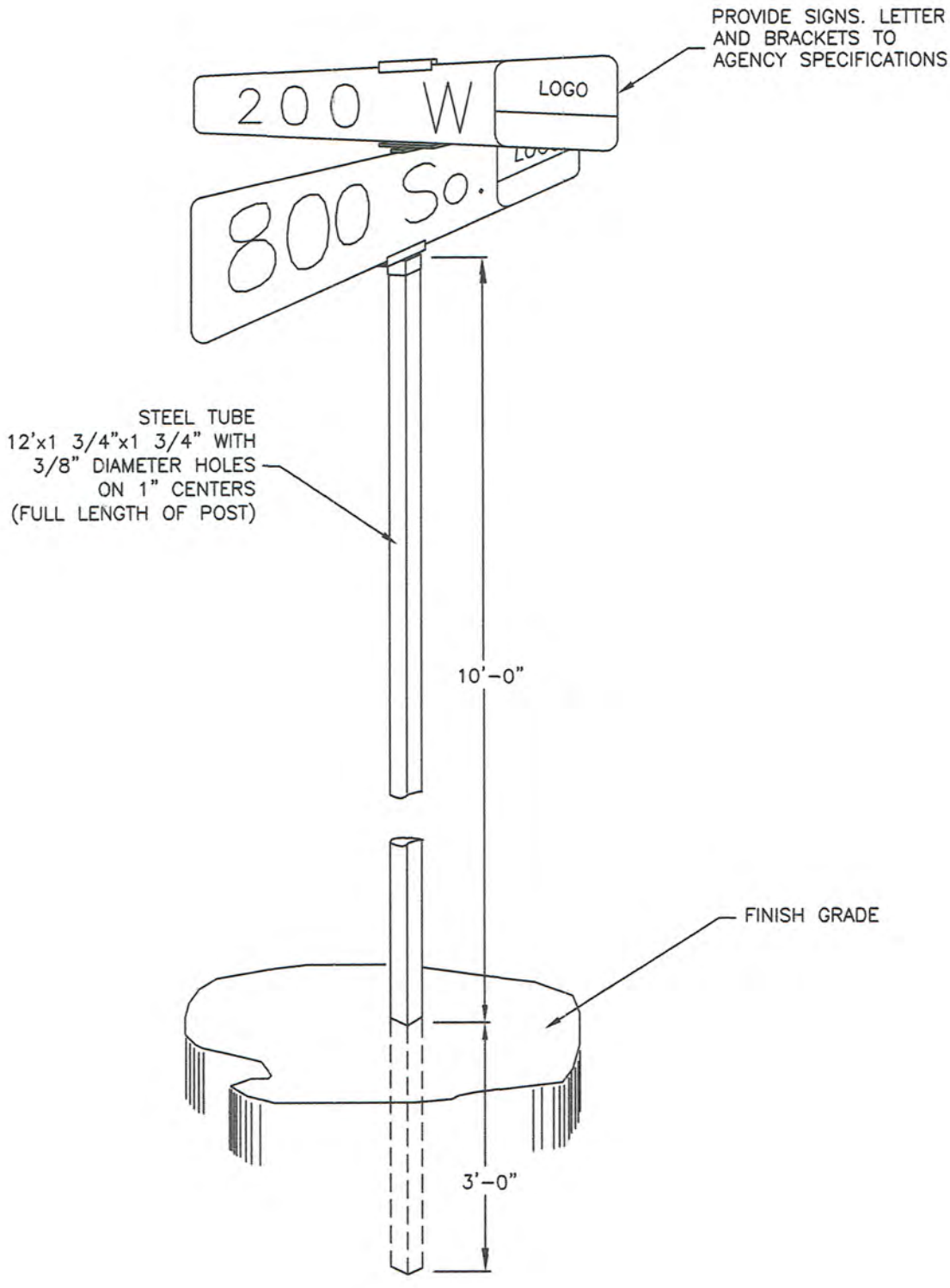
2. PRODUCTS

A. Bolts, Nuts, Washers, Accessories: Stainless or galvanized steel, APWA Section 05 05 23.

3. EXECUTION

A. Install sign posts on corner selected by ENGINEER.

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).



AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Street name signpost

Plan
292
April 1997

Abbreviations and symbols for storm drains

1. GENERAL

A. Lettering Size: 10 point at final production.
B. Lettering Style. Capital letters preferred.
C. Existing Improvements. Shown in light shaded dashed line.
D. New Improvements. Shown in solid continuous line.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOLS	DEFINITIONS
	CENTER LINE
15+00	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
X X	FENCE
4250	CONTOUR LINE
4250	CONTOUR ELEVATION
	BANK SLOPES
SD	STORM DRAIN LINE
W	WATER LINE
G	GAS LINE
T	TELEPHONE CABLE
E	ELECTRIC CABLE
SS	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
WM	WATER METER
MH	MANHOLE
CB	CATCH BASIN
COB	CLEANOUT BOX
	POLE AND ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
BM NO. 46 ELEV. 4256.50	BENCH MARK
	SIGN
PP	POWER POLE
TP	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.

	PROFILE
	GROUND PROFILE
ROUND ARCH BOX	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUND WATER ELEVATION

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Abbreviations and symbols for storm drains

Plan
301
April 2011

30" Frame and cover

1. GENERAL

A. The frame and cover fits.
   1) Cleanout box type B in Plan 331, and
   2) Precast manhole in Plan 341.

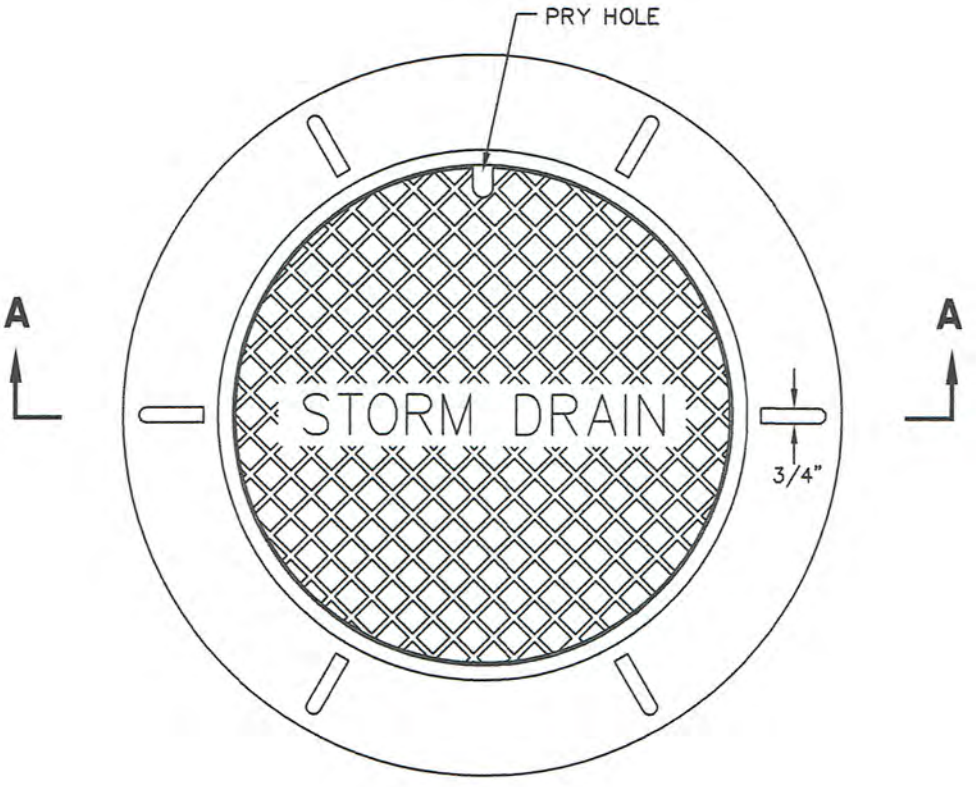
2. PRODUCTS

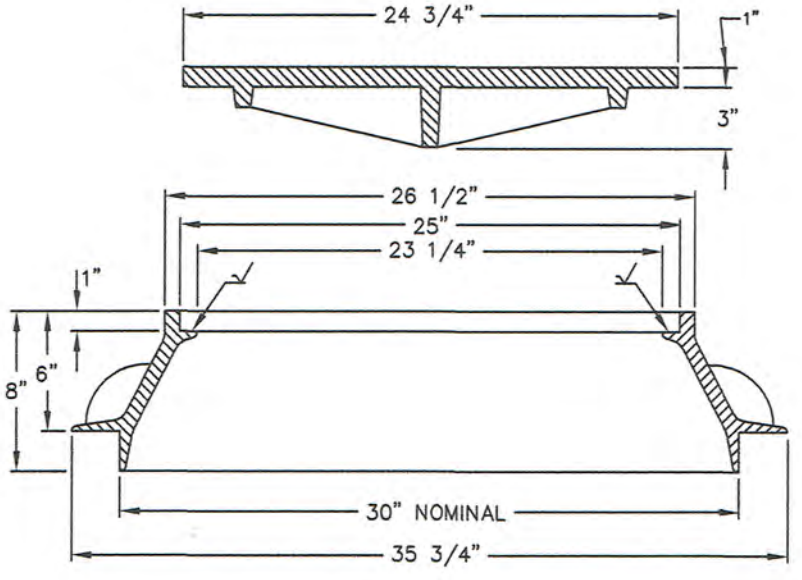
A. Castings: Grey iron class 35 minimum, ASTM A48.
   1) Coated with asphalt based paint or better (except on machined surfaces).
   2) Cast the heat number on the frame and cover.
   3) Give the frame and cover a machine finish so the cover will not rock.
   4) √ designates a machine finished surface.
   5) Cast the words “STORM DRAIN" on the cover in upper case flush with the surface finish.

3. EXECUTION

A. Except in paved streets, provide locking manhole covers in easements, alleys, parking lots, and all other places. 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.

TYPE A





SECTION A-A

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

30" Frame and cover

Plan
302.1
September 2001

30" Frame and cover

1. GENERAL

A. The frame and cover fits.
   1) Cleanout box type B in Plan 331, and
   2) Precast manhole in Plan 341.

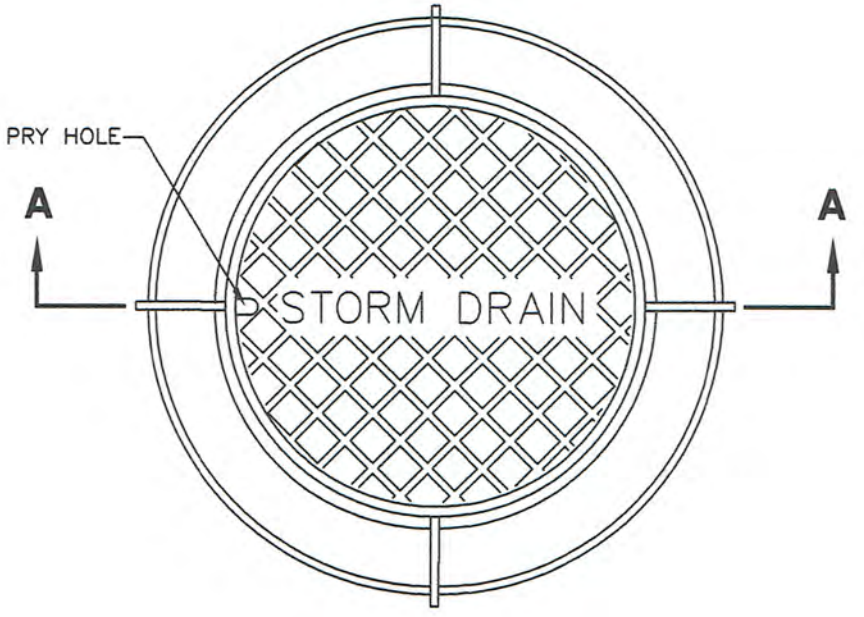
2. PRODUCTS

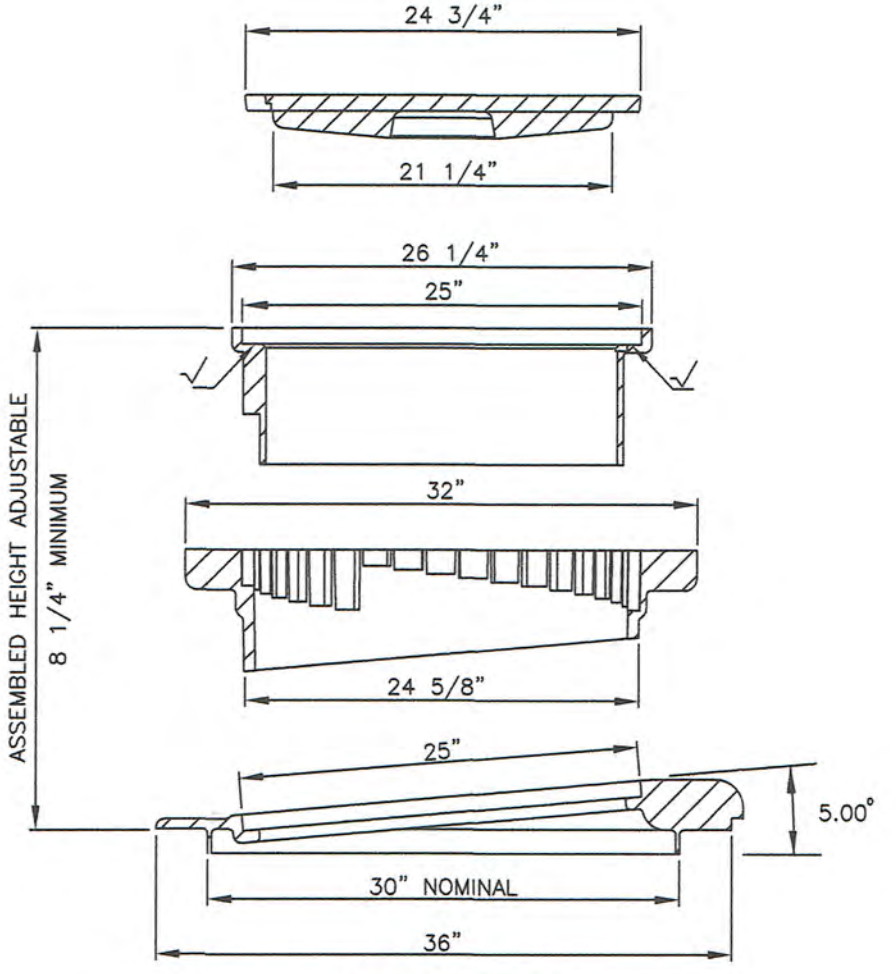
A. Castings: Grey iron class 35 minimum, ASTM A48.
   1) Coated with asphalt based paint or better (except on machined surfaces).
   2) Cast the heat number on the frame and cover.
   3) Give the frame and cover a machine finish so the cover will not rock.
   4) √ designates a machine finished surface.
   5) Cast the words “STORM DRAIN" on the cover in upper case flush with the surface finish.

3. EXECUTION

A. Except in paved streets, provide locking manhole covers in easements, alleys, parking lots, and all other places. 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.

TYPE B





SECTION A-A

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

30" Frame and cover

Plan
302.2
September 2001

44" Frame and cover

1. GENERAL

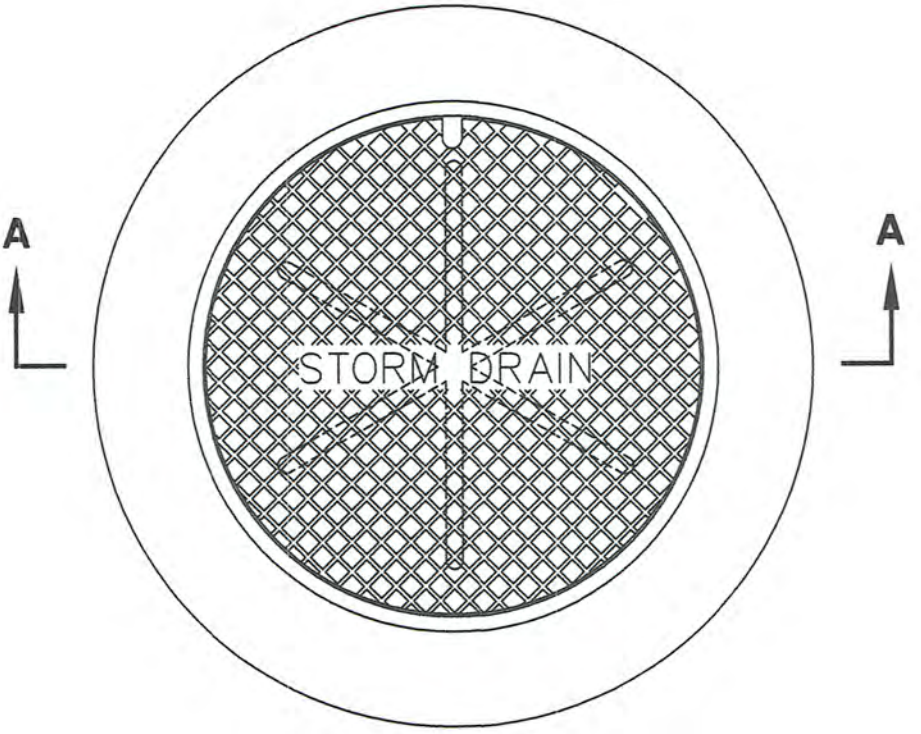
A. The frame and cover fits.
   1) Cleanout box type B in Plan 331, and
   2) Precast manhole in Plan 341.

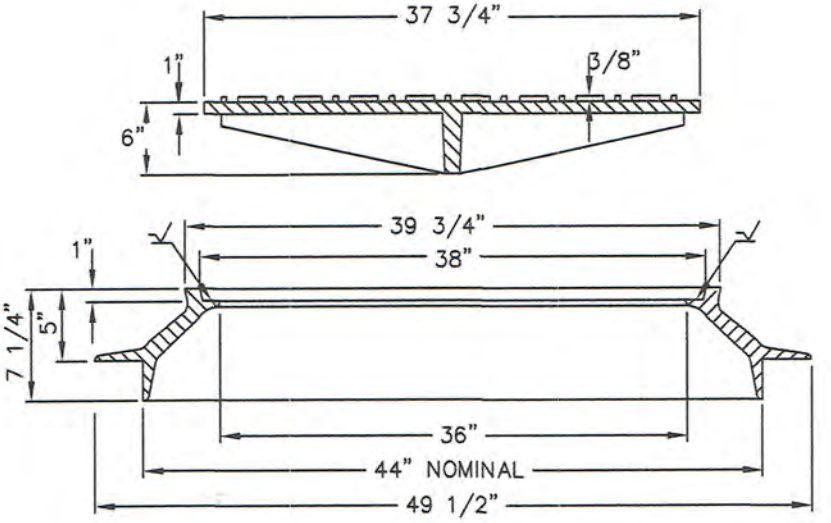
2. PRODUCTS

A. Castings: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better (except on machined surfaces).
   1) Cast the heat number on the frame and cover.
   2) Give the frame and cover a machine finish so the cover will not rock.
   3) √ designates a machine-finished surface.
   4) Cast the words “STORM DRAIN" on the cover in upper case flush with the surface finish.

3. EXECUTION

A. Except in paved streets, provide locking manhole covers in easements, alleys, parking lots, and all other places. 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.





SECTION A-A

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

44" Frame and cover

Plan
303
November 2001

48" Cover and frame

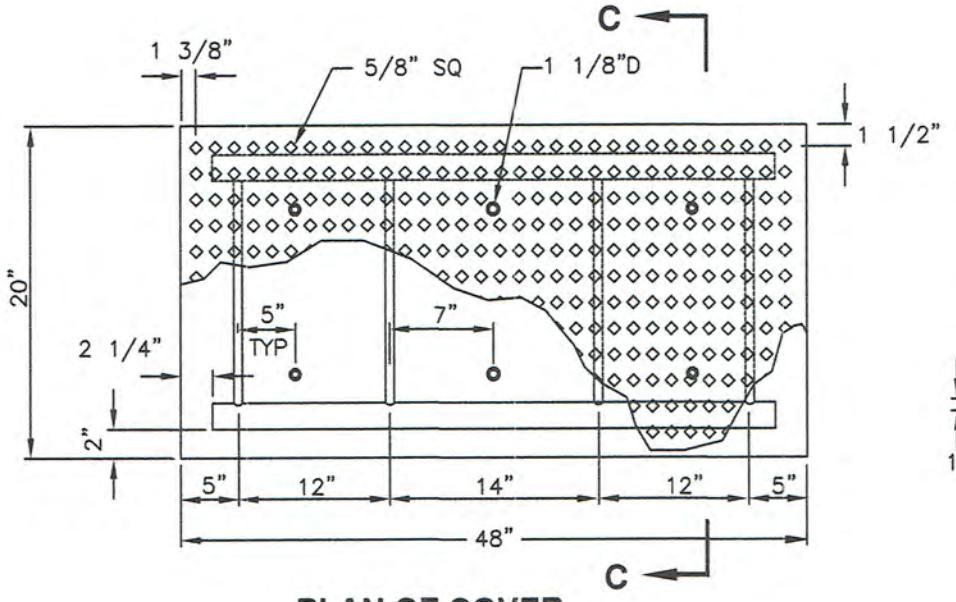
1. GENERAL

A. The cover and frame fits cleanout box type A in Plan 331.

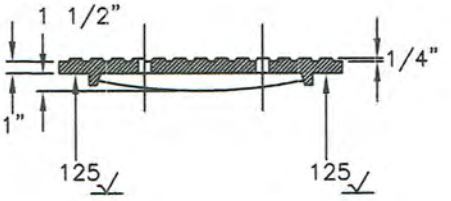
2. PRODUCTS

A. Castings: Grey iron class 35 minimum per ASTM A48
   1) Coated with asphalt based paint or better (except on machined surfaces).
   2) Cast the foundry and heat number on the cover and frame.
   3) Give the cover and frame a machine finish so the cover will not rock.
   4) √ designates a machine finished surface.

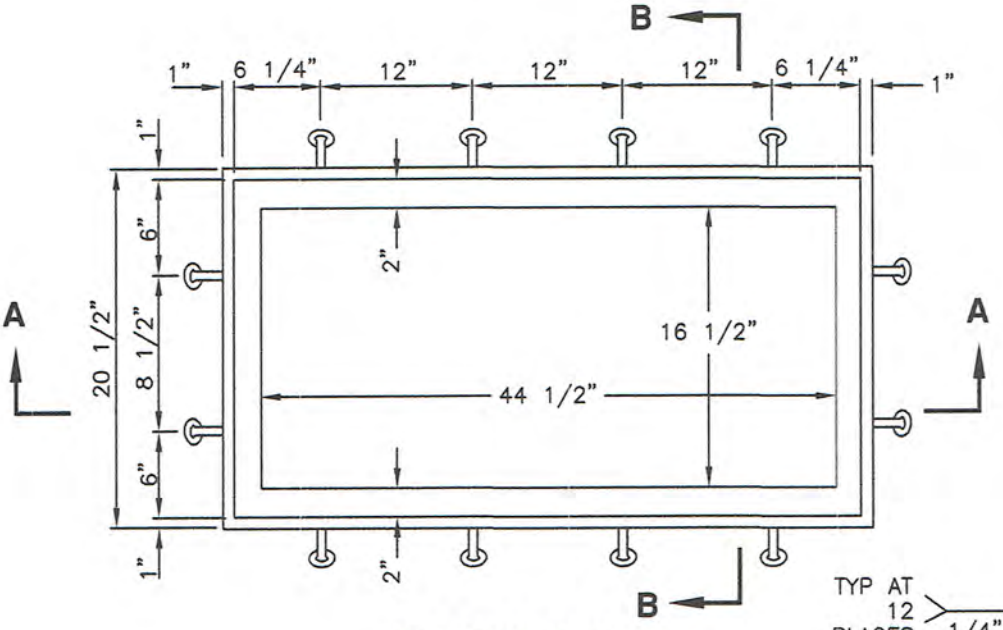
3. EXECUTION (Not used)



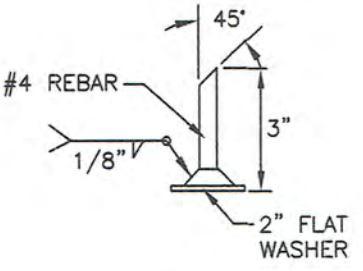
PLAN OF COVER



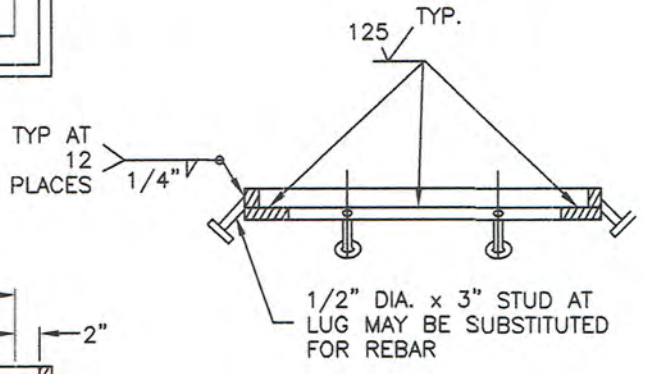
SECTION C-C



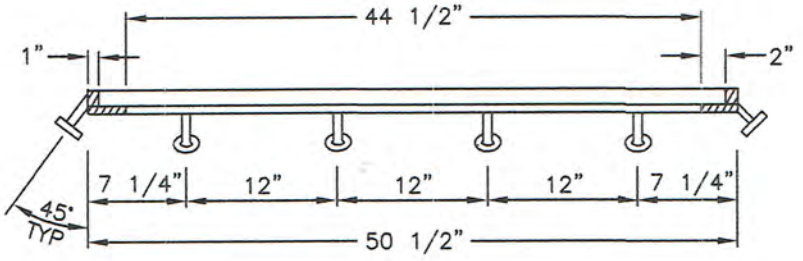
PLAN OF FRAME



DETAIL 1



SECTION B-B



SECTION A-A

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

48" Cover and frame

Plan
304
April 1997

51" Cover and frame

1. GENERAL

A. Cover fits A, B, C and D frames.

B. Use this cover in roadways and other areas subject to heavy loading.

2. PRODUCTS

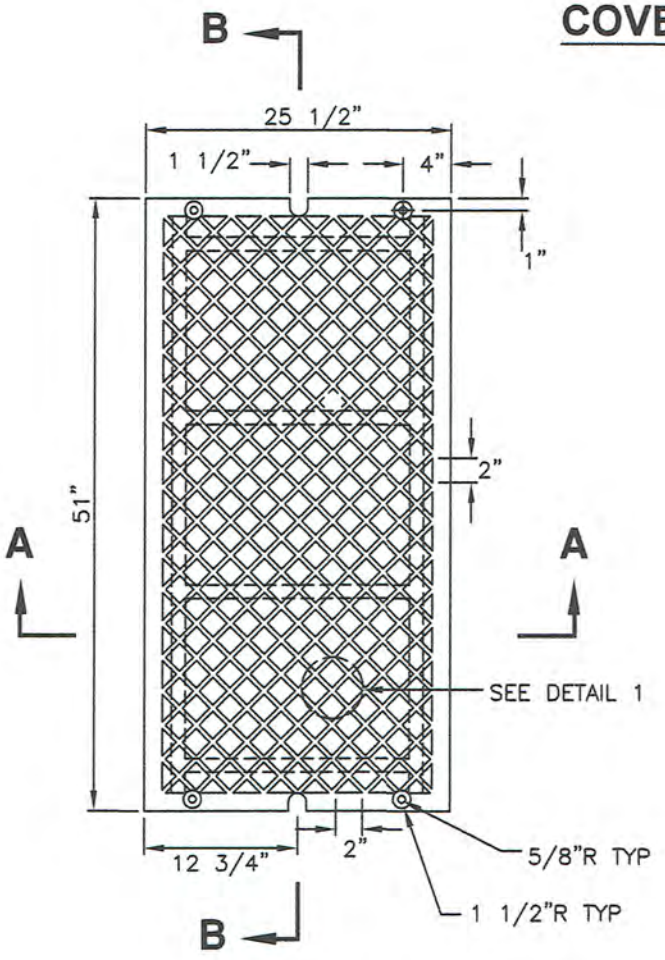
A. Frame: ASTM A36 steel, or ASTM A48 grey iron class 35 minimum, coated with asphalt based paint or better. Drill and tap frames at factory to match covers.

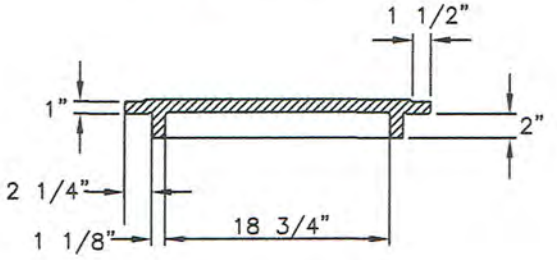
B. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION

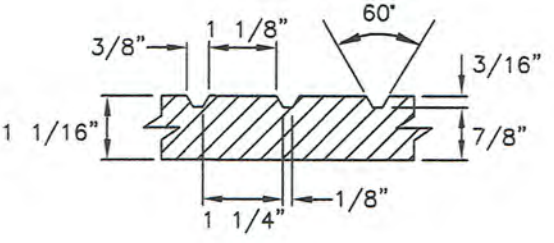
A. Keep frames and covers bolted together before and during installation.

COVER

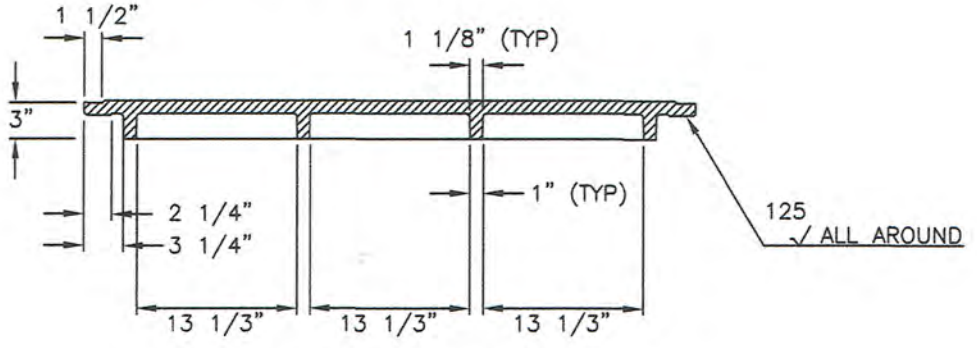




SECTION A-A



DETAIL 1



SECTION B-B

AMERICAN PUBLIC WORKS ASSOCIATION
APWA Utah Chapter

51" Cover and frame

Plan
305.1
April 1997

51" Cover and frame

1. GENERAL

A. The frame fits cleanout box type C shown in Plan 331.

B. Use this frame in roadways and other areas subject to heavy loadings.

2. PRODUCTS

A. Castings: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better (except on machined surfaces).

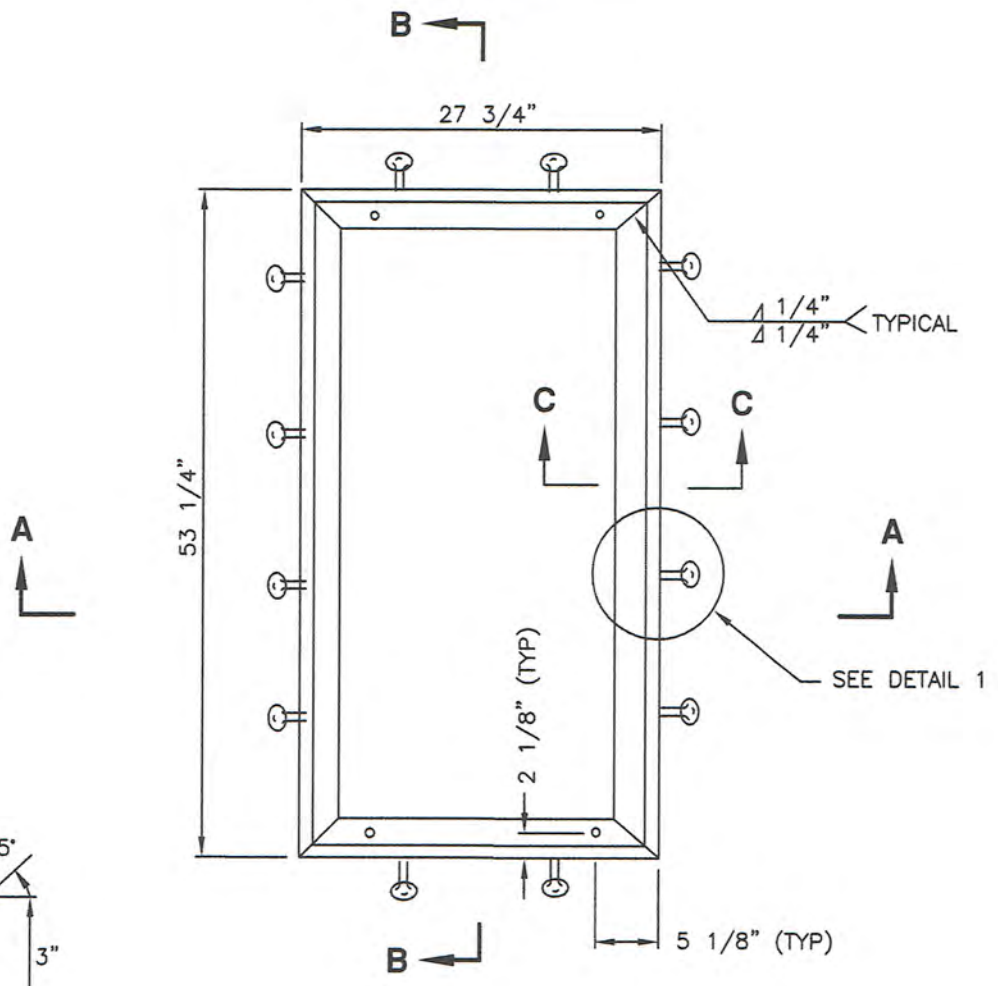
1) Cast the heat number on the cover.
2) Give the cover a machine finish so the cover will not rock.
3) √ designates a machine finished surface.
4) Drill and tap covers at factory to match frames.

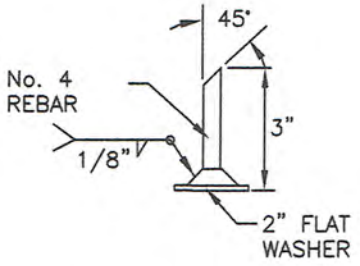
B. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION

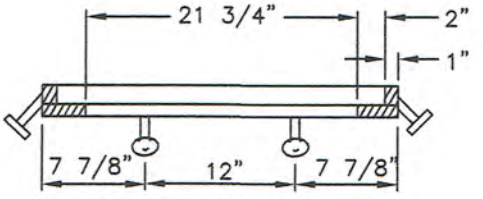
A. Keep covers and frames bolted together before and during installation.

FRAME A

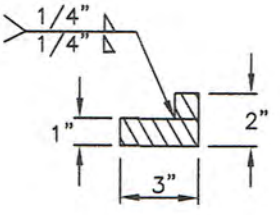




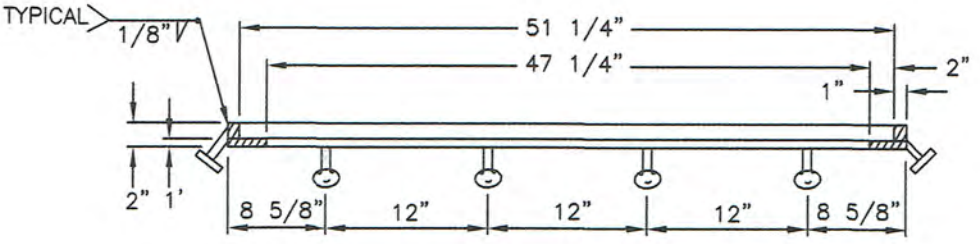
DETAIL 1



SECTION A-A



SECTION C-C



SECTION B-B

September 2010

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

51" Cover and frame

Plan
305.2
September 2010

51" Cover and frame

1. GENERAL

A. Use this frame in roadways and other areas subject to heavy loadings.

2. PRODUCTS

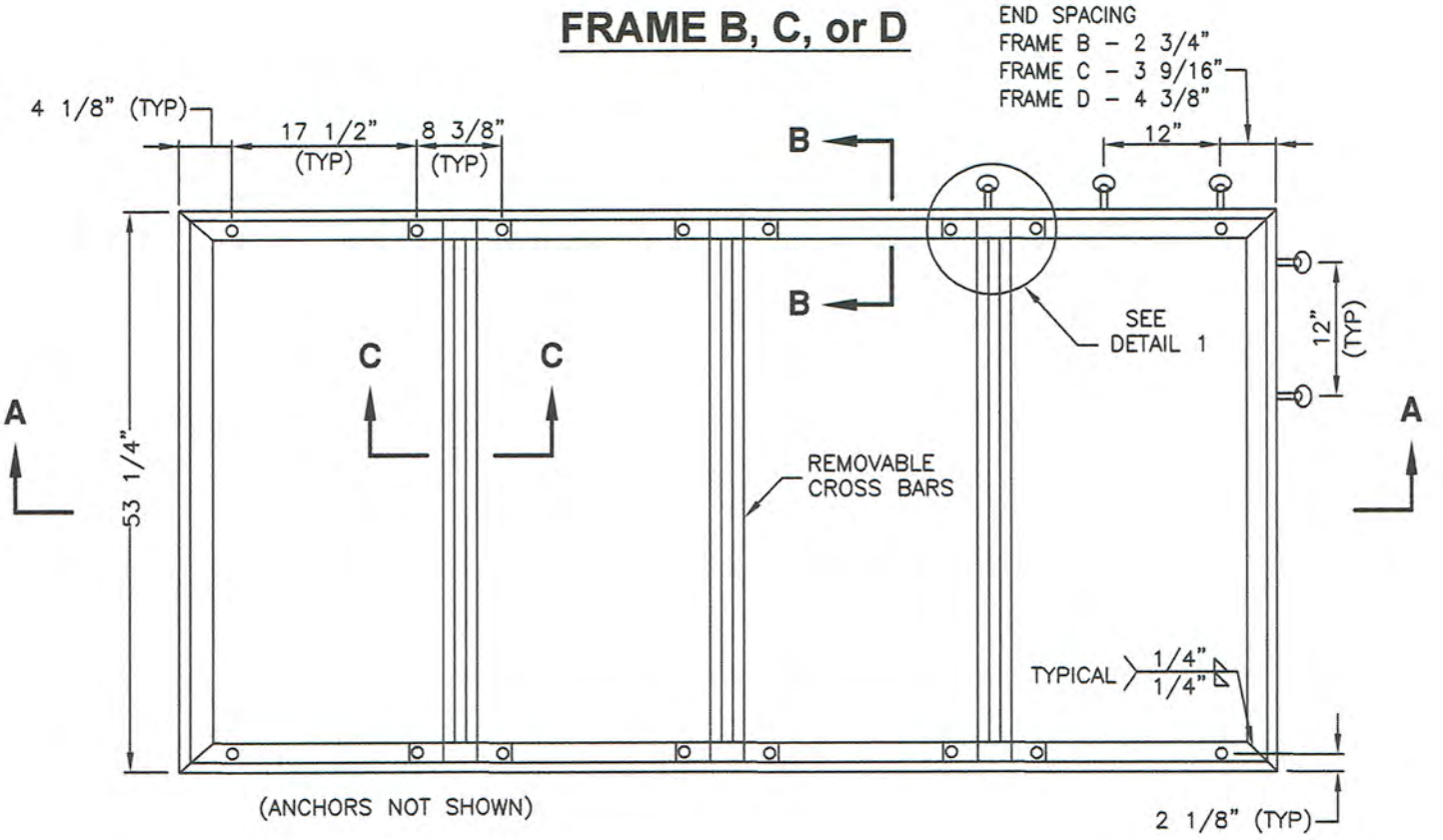
A. Frame: ASTM A36 steel, or ASTM A48 grey iron class 35 minimum, coated with asphalt based paint or better. Drill and tap frames at factory to match covers.

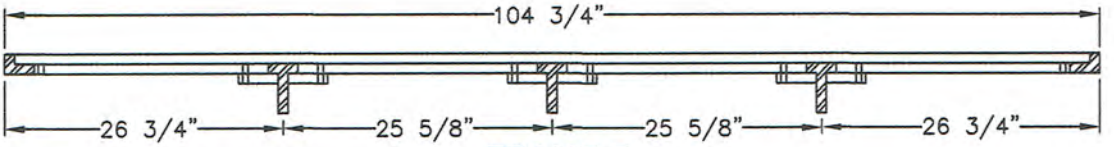
B. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION

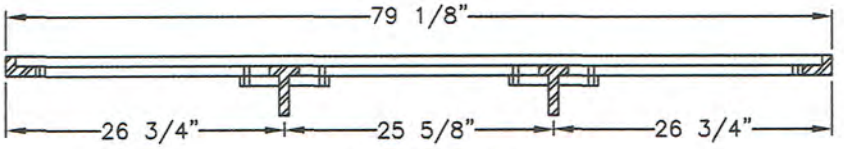
A. Keep frames and covers bolted together before and during installation.

FRAME B, C, or D



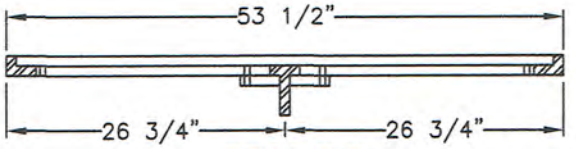


FRAME D

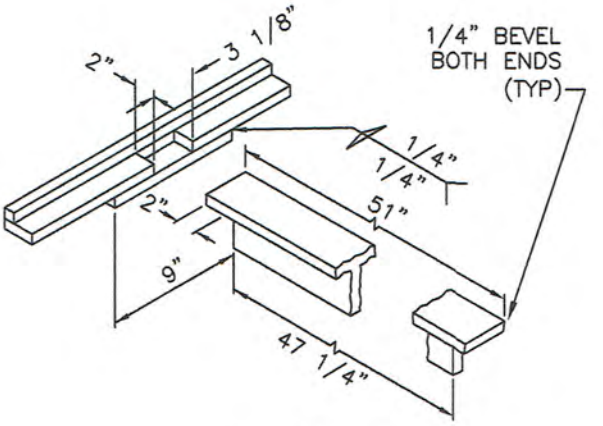


FRAME C

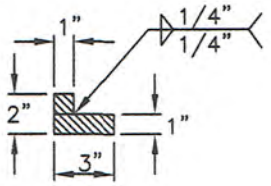
(ANCHORS NOT SHOWN)



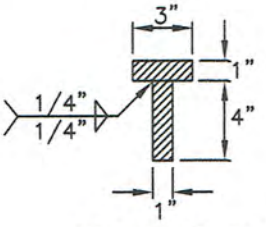
FRAME B



DETAIL 1



SECTION B-B



SECTION C-C

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

51" Cover and frame

Plan
305.3
September 2010

35 1/2" Grate and frame

1. GENERAL

A. The grate and frame fits concrete boxes in Plan 315.

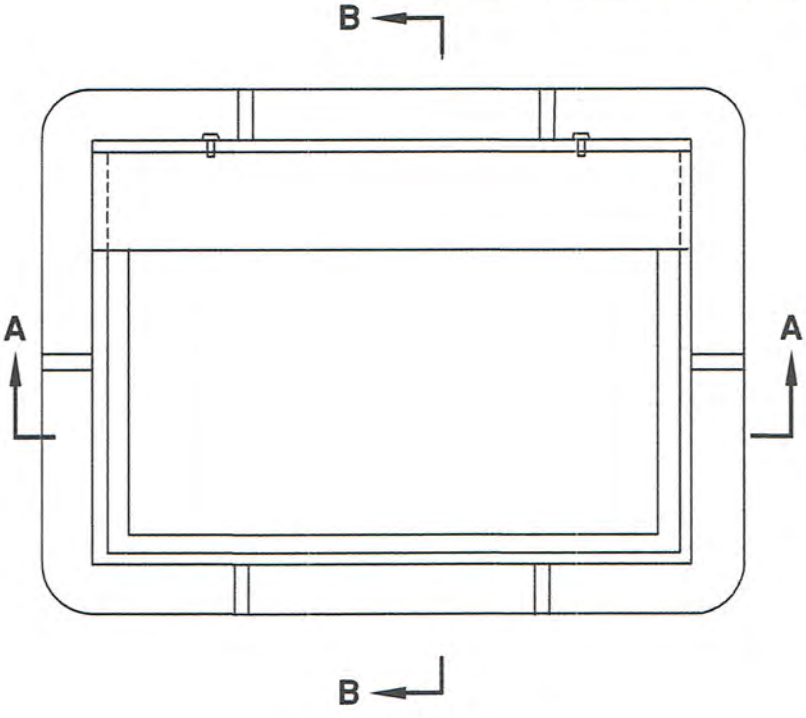
2. PRODUCTS

A. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better.

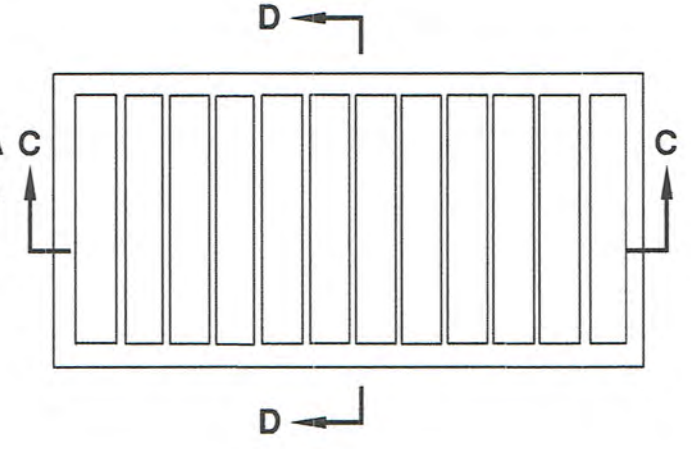
B. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION (Not used)

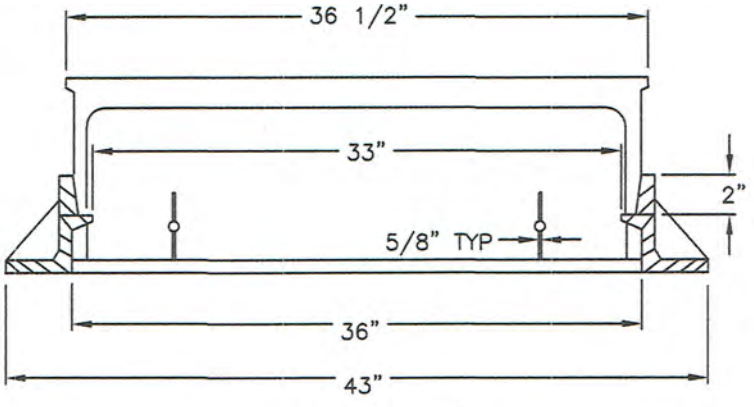
CURB OPENING FRAME AND GRATE



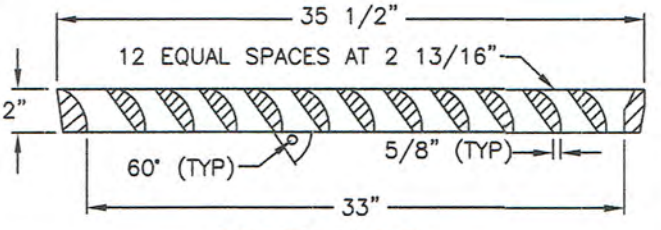
PLAN



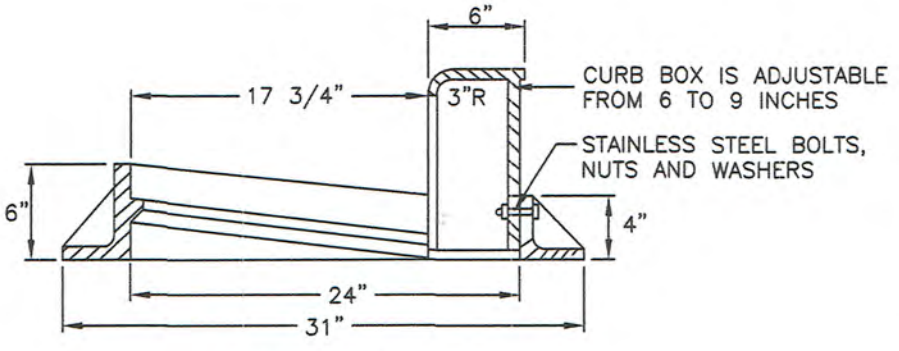
PLAN



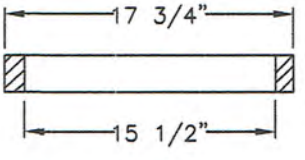
SECTION A-A



SECTION C-C



SECTION B-B



SECTION D-D

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

35 1/2" Grate and frame

Plan
308
January 1999

47 3/4" Grate and frame

1. GENERAL

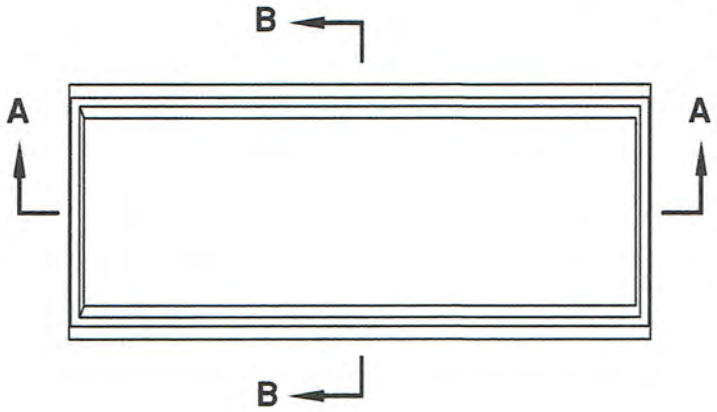
A. The grate and frame fits cleanout box Type A in Plan 331.

2. PRODUCTS

A. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better (except on machined surfaces).

3. EXECUTION (Not used)

VANE GRATE



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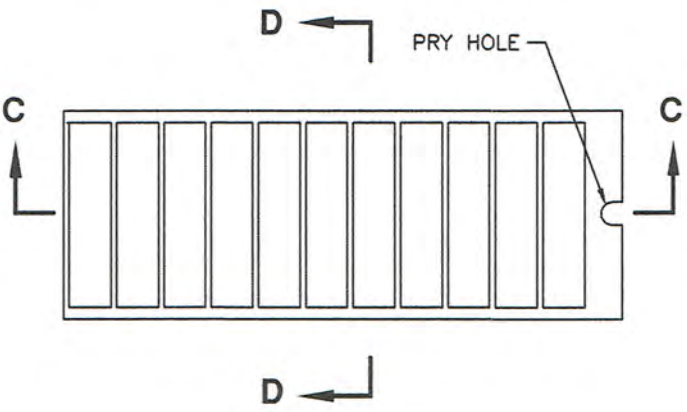
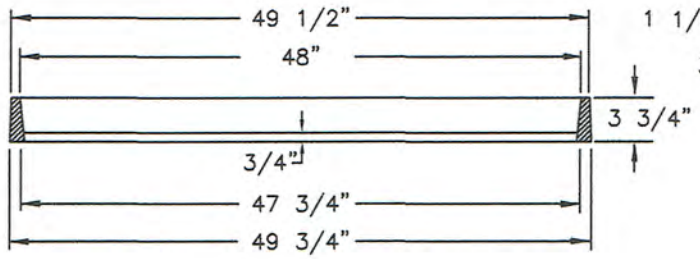
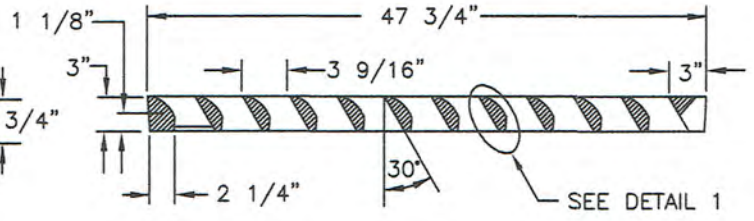


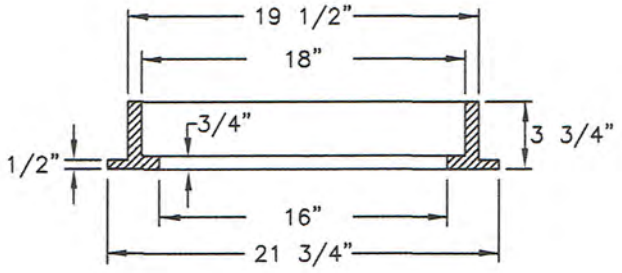
GRATE



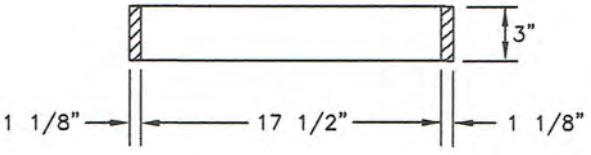
SECTION A-A



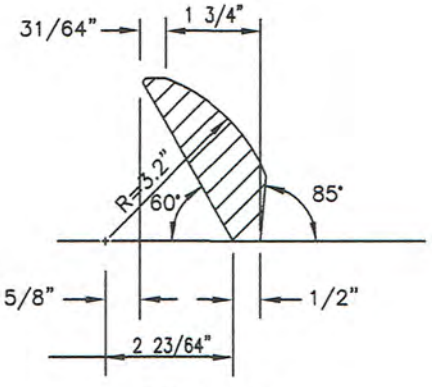
SECTION C-C



SECTION B-B



SECTION D-D



DETAIL 1

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

47 3/4" Grate and frame

Plan
309.1
June 2006

47 3/4" Grate and frame

1. GENERAL

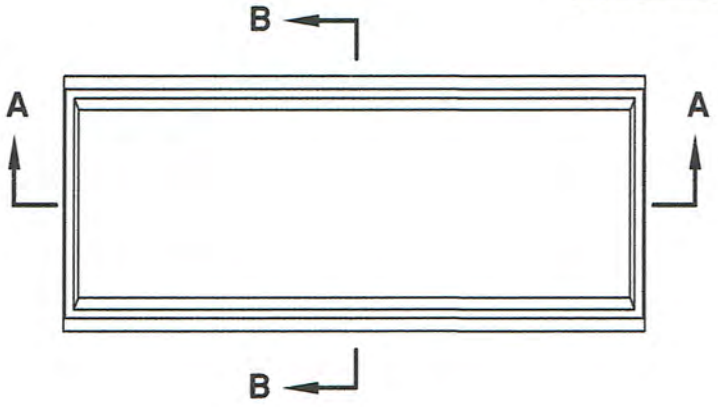
A. The grate and frame fits cleanout box Type A in Plan 331.

2. PRODUCTS

A. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better (except on machined surfaces).

3. EXECUTION (Not used)

GRID GRATE



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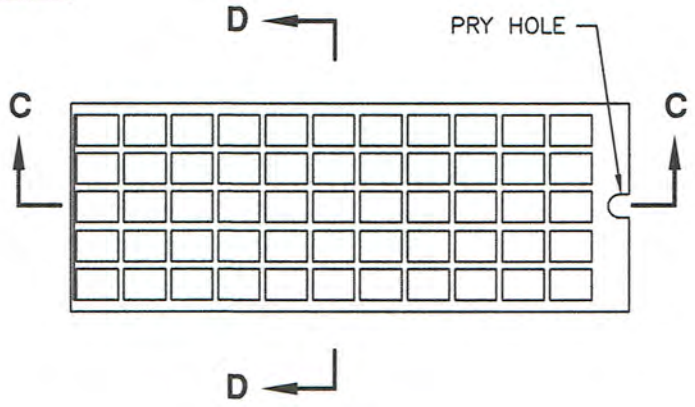
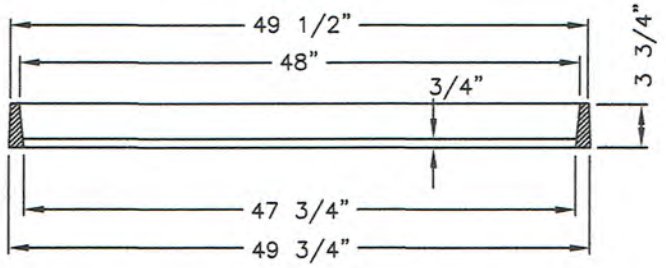
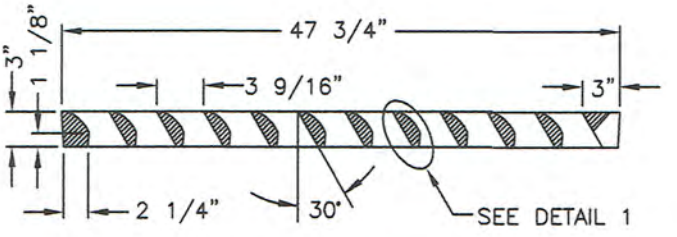


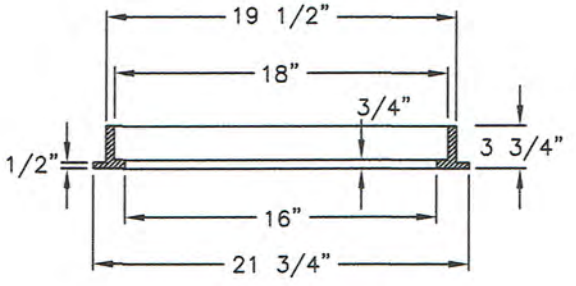
GRATE



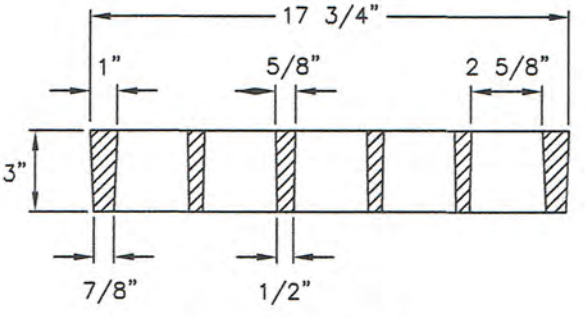
SECTION A-A



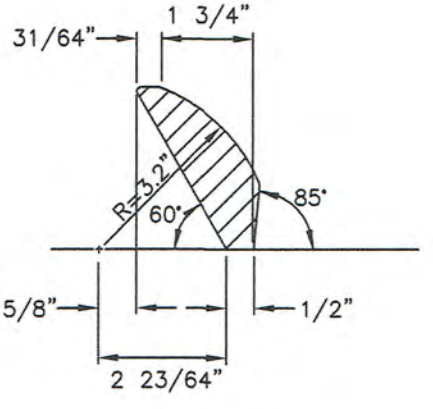
SECTION C-C



SECTION B-B



SECTION D-D



DETAIL 1

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

47 3/4" Grate and frame

Plan
309.2
June 2006

48" Grate and frame

1. GENERAL

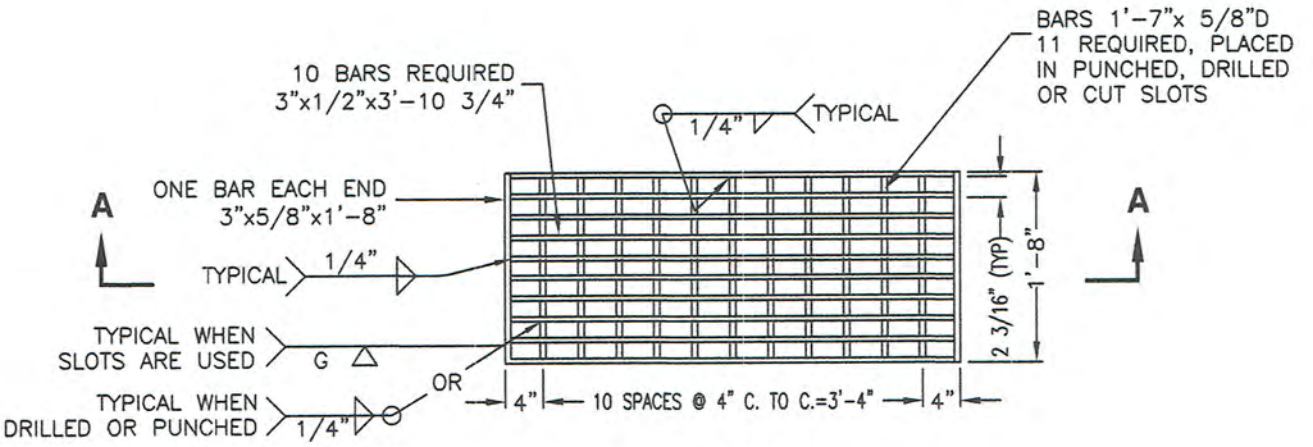
A. The grate and frame fits cleanout box Type A in Plan 331.

2. PRODUCTS

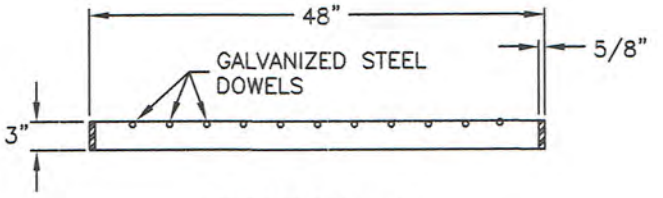
A. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better (except on machined surfaces). Cast the heat number on the grate and frame. Cast frame and lugs as one solid complete unit.

B. Steel Frames: Studs may be welded to the frame. Use ASTM A36 steel. Coat the unit with asphalt based paint or better.

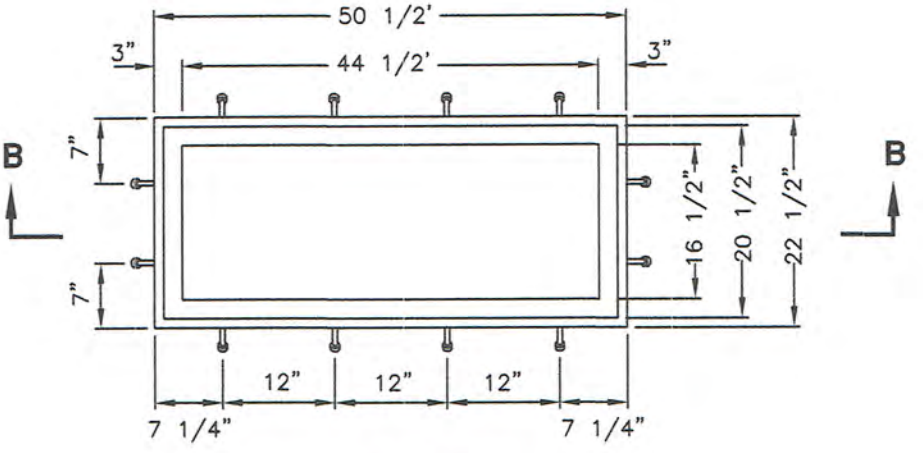
3. EXECUTION (Not used)



GRATE



SECTION A-A



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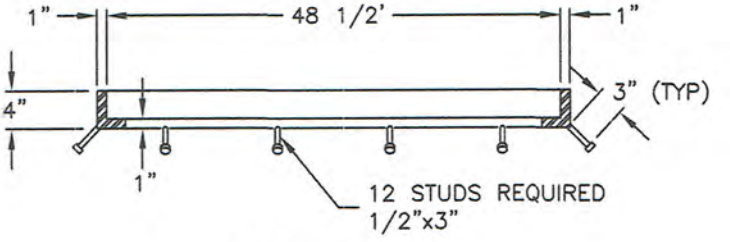


SECTION B-B

Catch basin

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

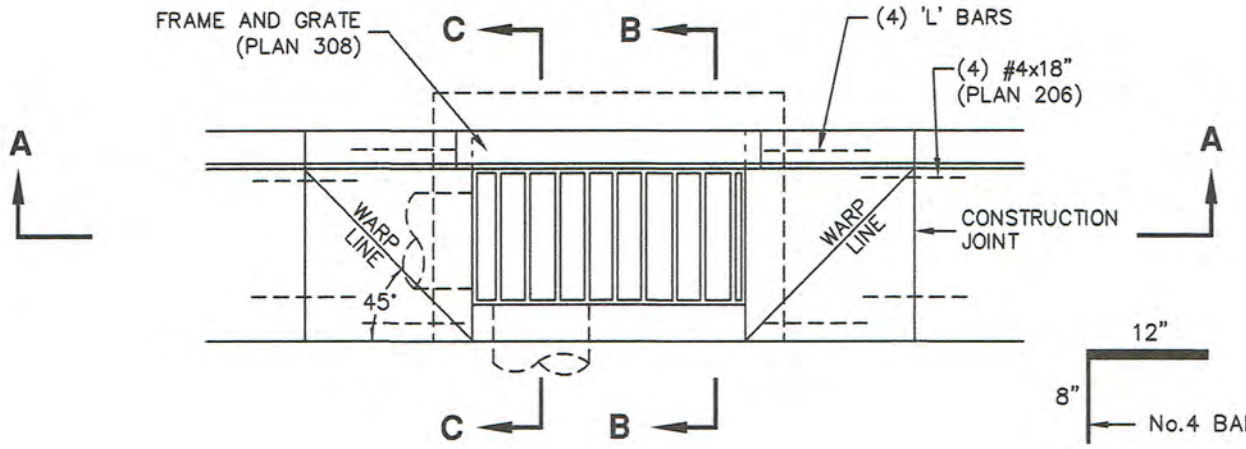
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

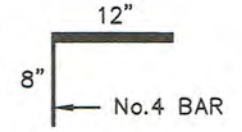
3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Face Opening: Make opening at least 4-inches high. Provide at least a 2-inch drop between the "warp line" in the gutter flow-line and the top of the grate at the curb face opening.
C. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
D. Backfill: Place backfill against the basin wall. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

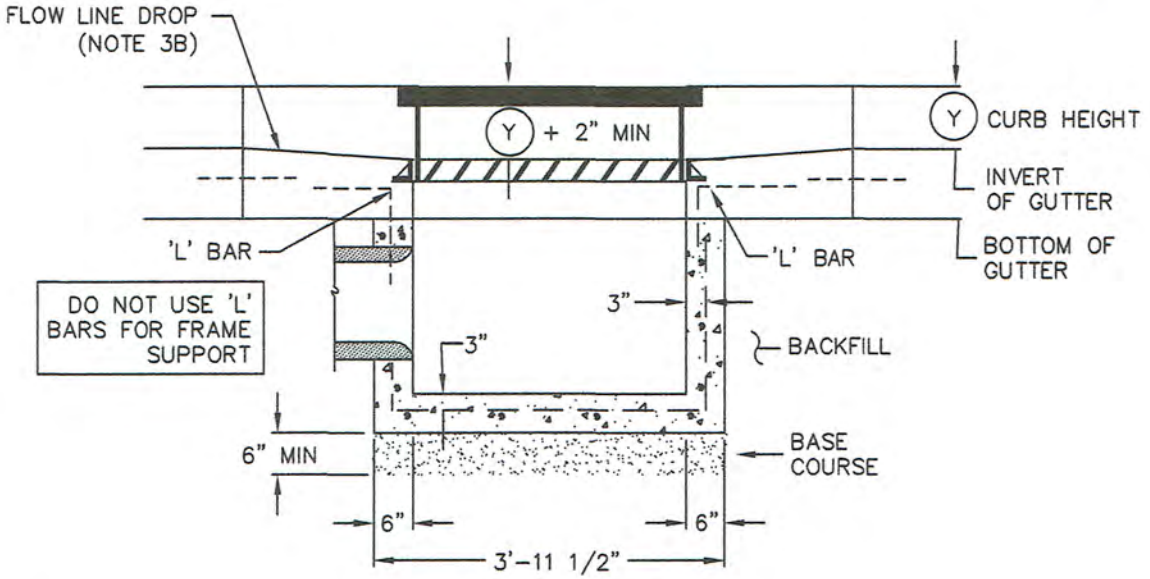
SINGLE GRADE



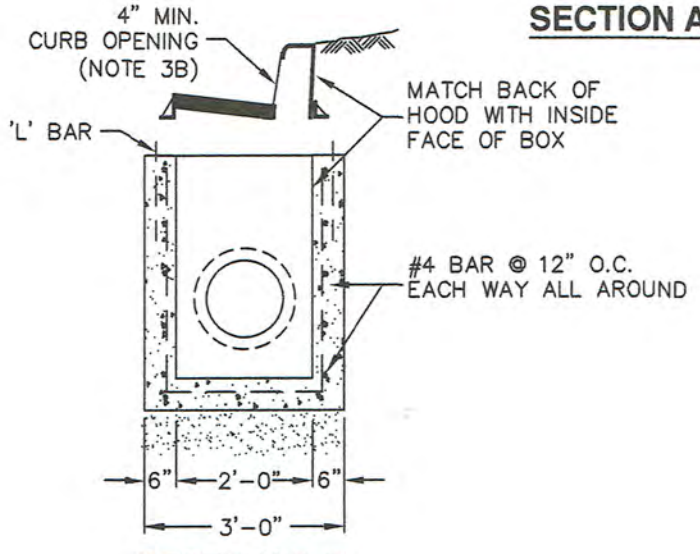
PLAN



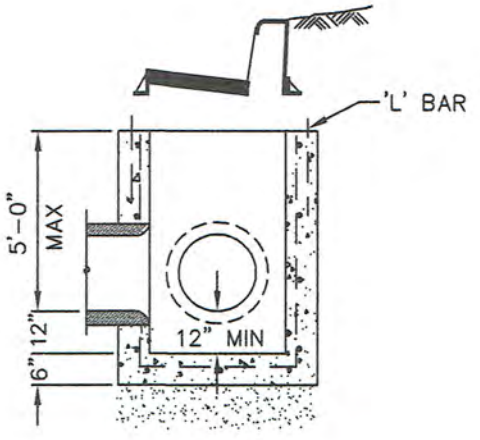
"L" BAR DETAIL



SECTION A-A



SECTION B-B



SECTION C-C

Catch basin

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

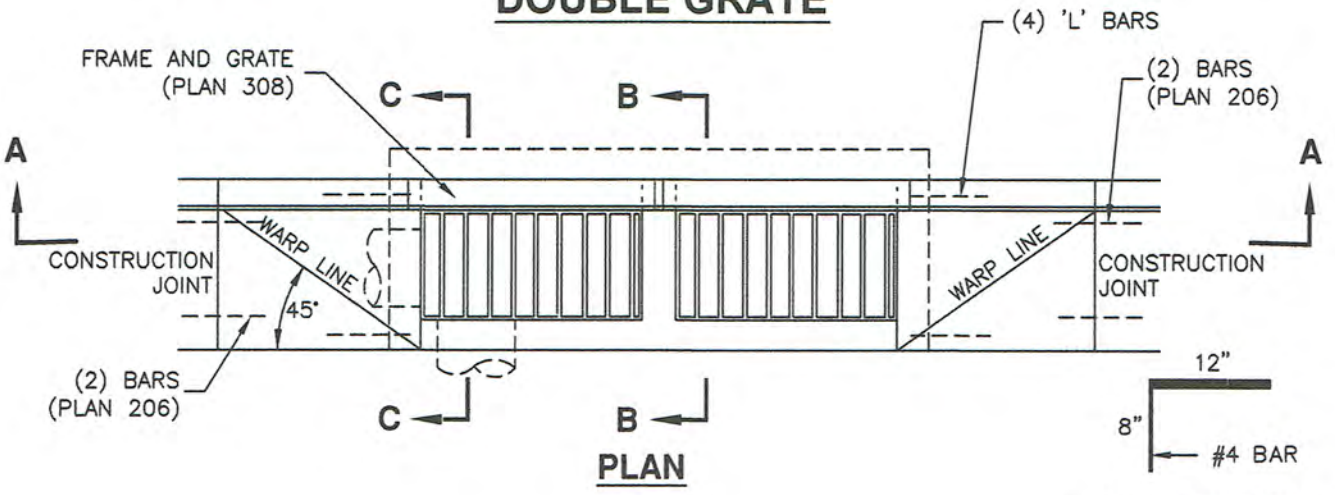
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

3. EXECUTION

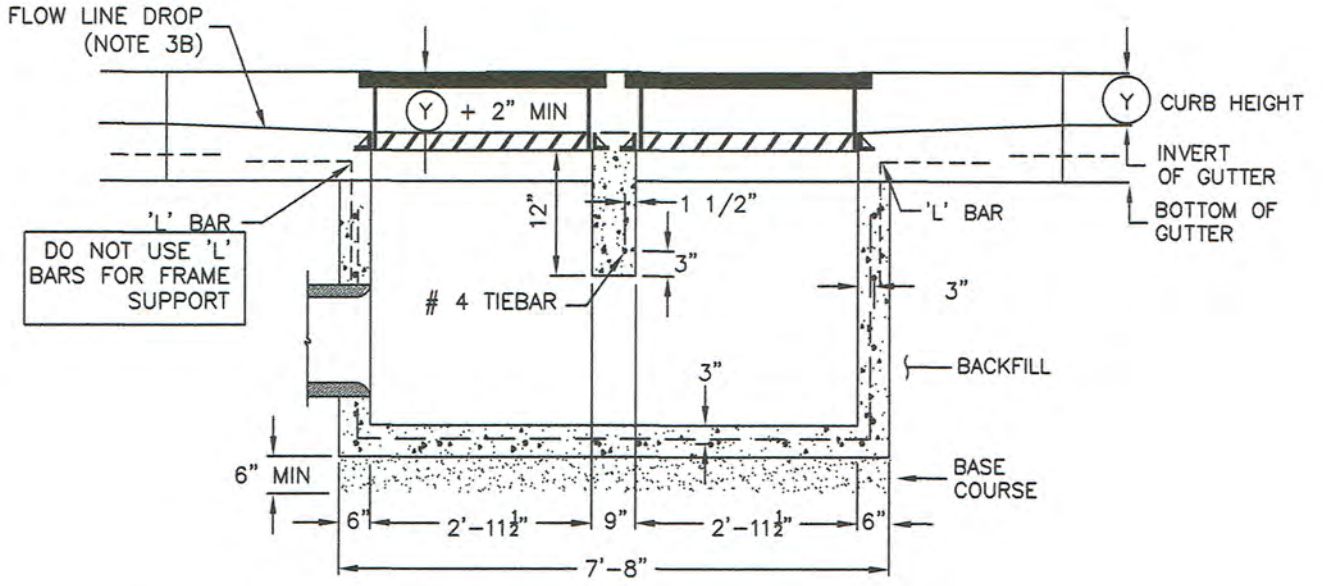
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Curb Face Opening: Make opening at least 4-inches high. Provide at least a 2-inch drop between the "warp line" in the gutter flow-line and the top of the grate at the curb face opening.
C. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
D. Backfill: Place backfill against the basin wall. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

DOUBLE GRATE

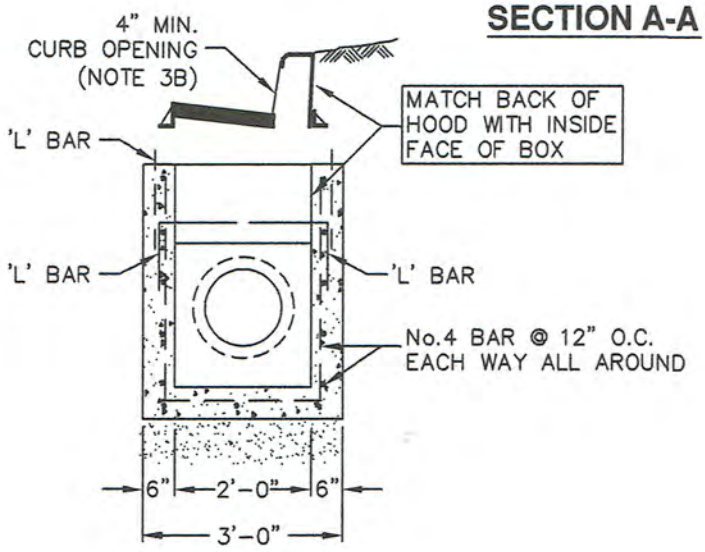


PLAN

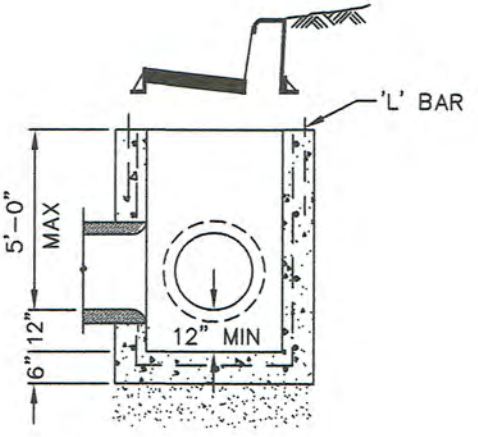
"L" BAR DETAIL



SECTION A-A



SECTION B-B



SECTION C-C

Combination catch basin and cleanout box

1. GENERAL

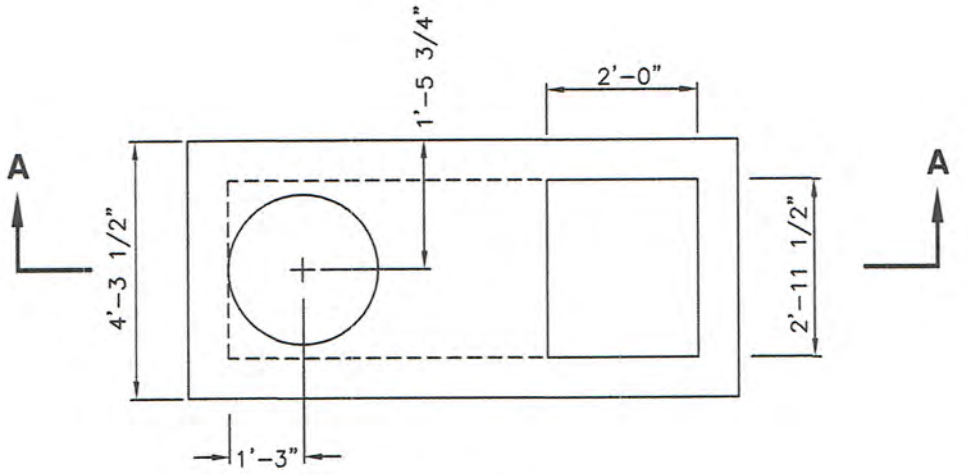
A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

2. PRODUCTS

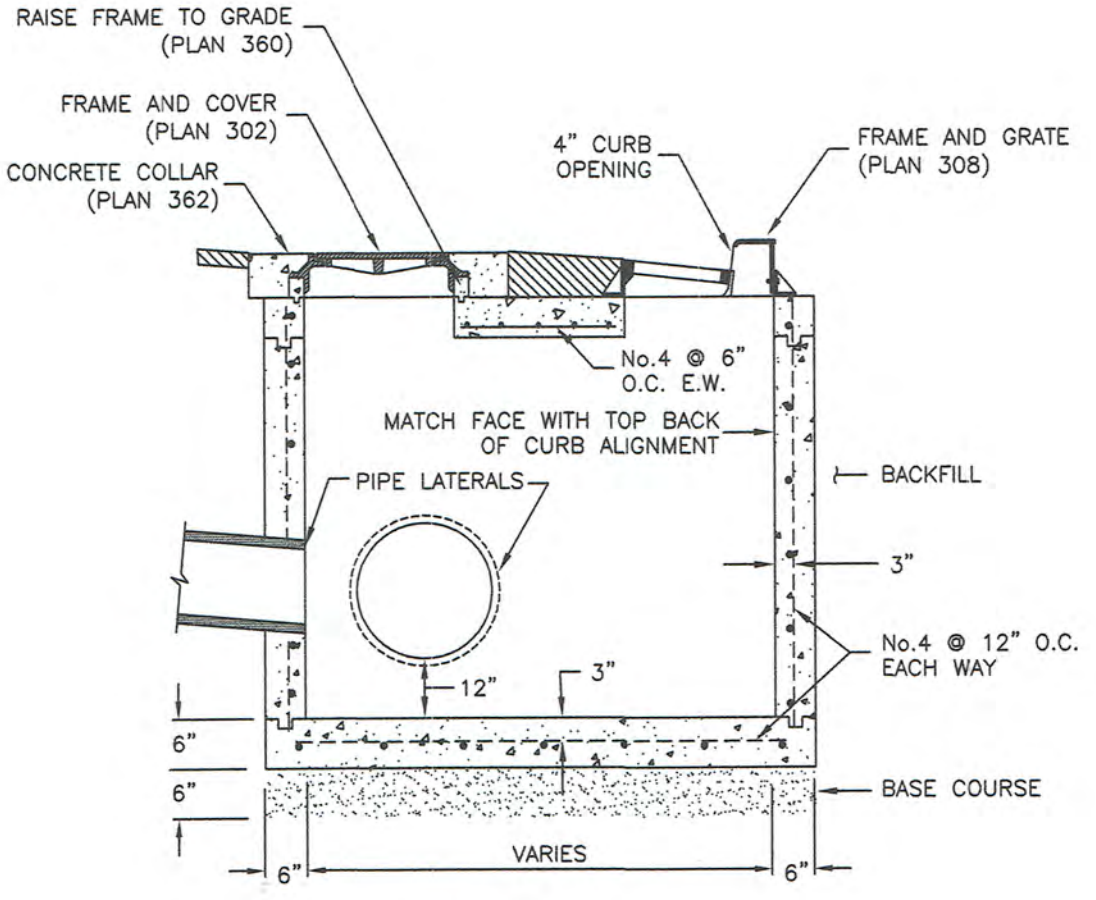
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Ladder Rungs: Plastic, or plastic coated steel typically 8-inches wide.

3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. 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.
C. Ladder Rungs: Provide rungs in boxes over 6 feet deep. When measured from the floor of the box, place bottom rung the greater distance of 4 feet from the floor of the box or 1 foot above the top of the pipe. Place top rung within 3 feet of bottom of box ceiling.
D. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Backfill: Provide backfill against all sides of the box. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



PLAN



SECTION A-A

Curb face inlet box

1. GENERAL

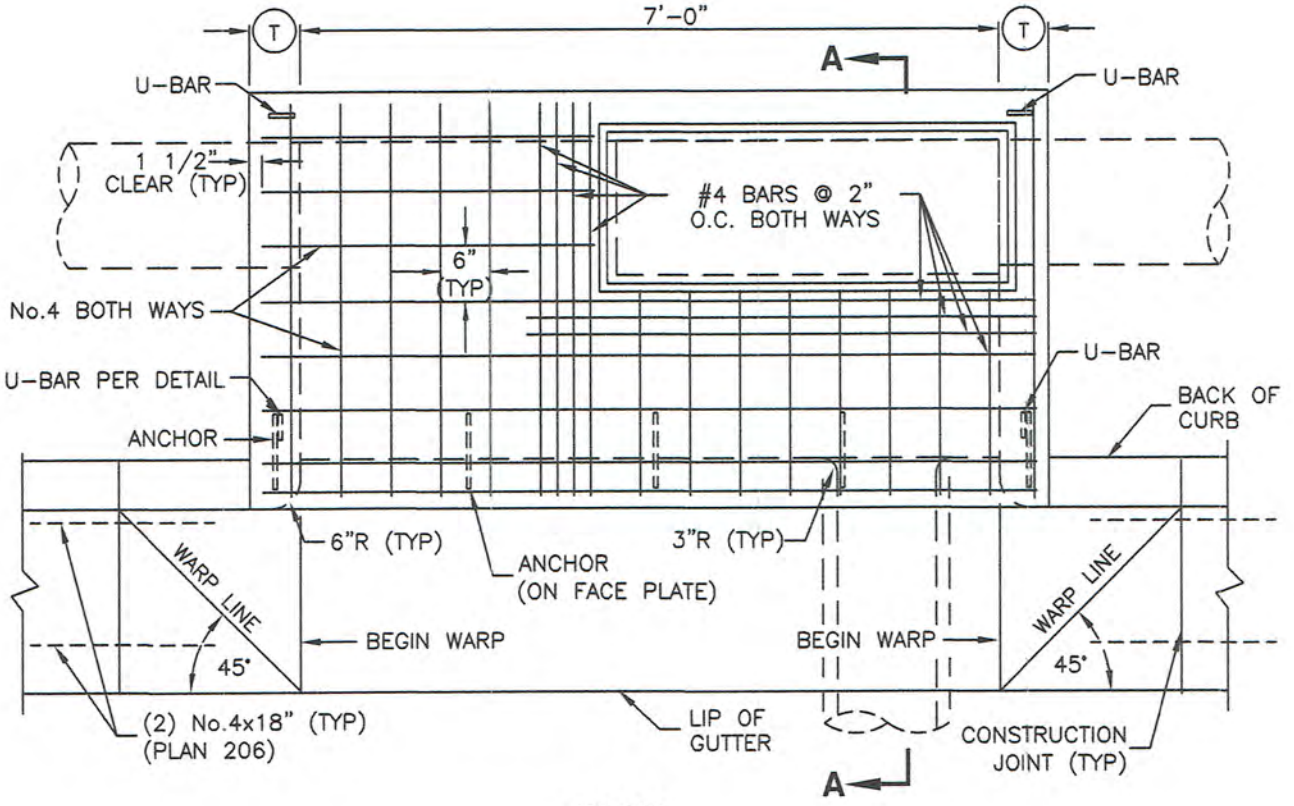
A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

2. PRODUCTS

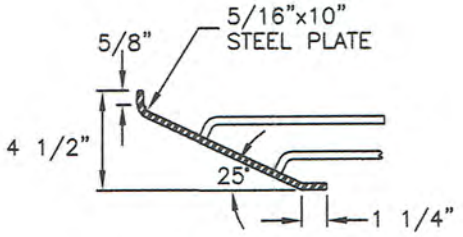
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
E. Face Plate: Steel, ASTM A36 hot dip galvanized after fabrication.
F. Frame and Cover: Grey iron class 30 minimum, ASTM A48.

3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Reinforcement: Center steel in walls and slabs with a minimum cover of 2-inches. Keep steel 2-inches clear around pipe and lid opening. Tie-bars required at all corners, vertical and horizontal. Tie-bars connecting two walls must match wall bar size and spacing. Tie-bars connecting walls to top and bottom slabs must match slab steel size and spacing.
C. Water stops. Install rubber-based water-stops on all plastic pipes when connecting plastic pipes to cleanout boxes. Hold water-stop in place with stainless steel bands.
D. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly.
    1) 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.
    2) Make smooth curves at sill and side wall 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.
    3) 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.
    4) Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Pipe Connections: Grout around all pipe openings.
F. Backfill: Provide backfill against the all box walls. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



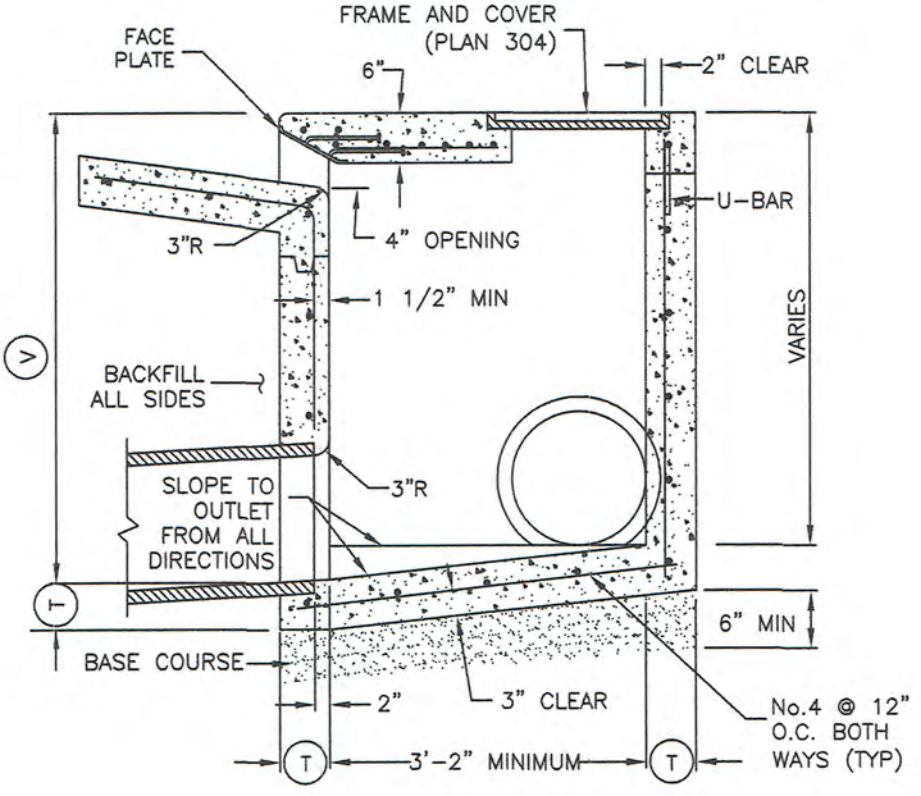
PLAN



FACE PLATE DETAIL

"U" BAR DETAIL

TABLE OF DIMENSION
(T) = 6" IF V=4'-0" OR LESS
(T) = 8" IF V=4'-1" TO 8'-0"
(T) = 10" IF V=8'-1" OR MORE



SECTION A-A

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Curb face inlet box

Plan
317
March 2011

Debris grate inlet

1. GENERAL

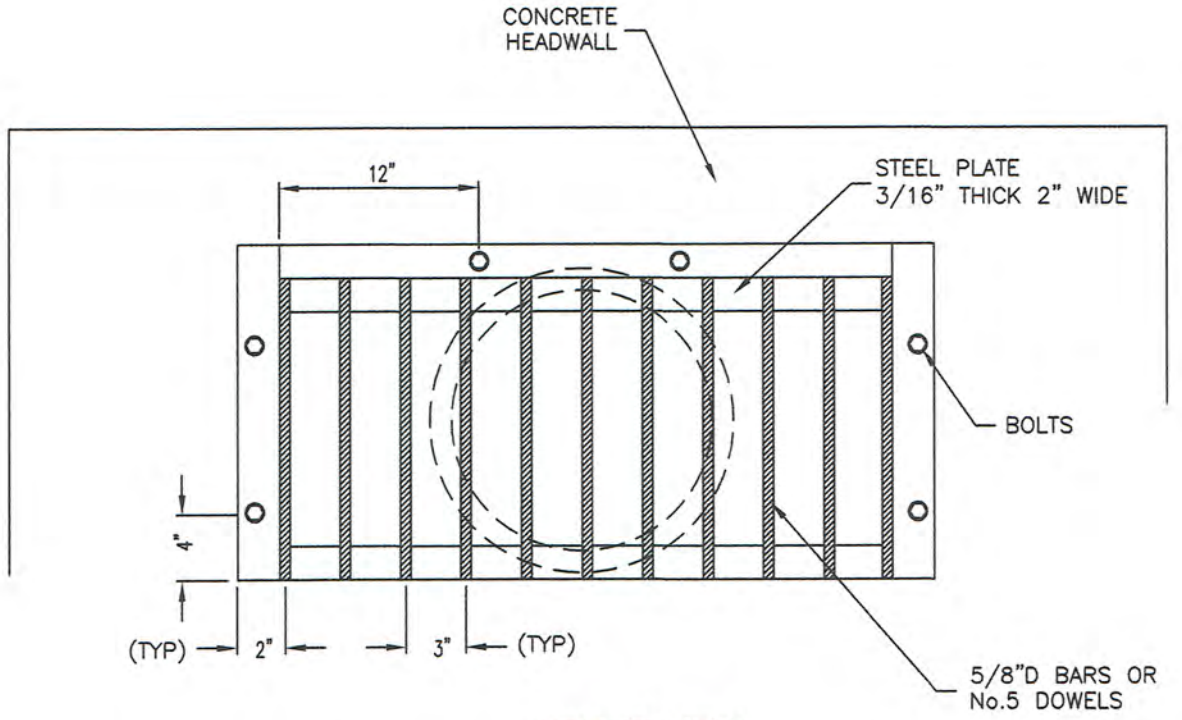
A. Variance from specified dimensions must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion

2. PRODUCTS

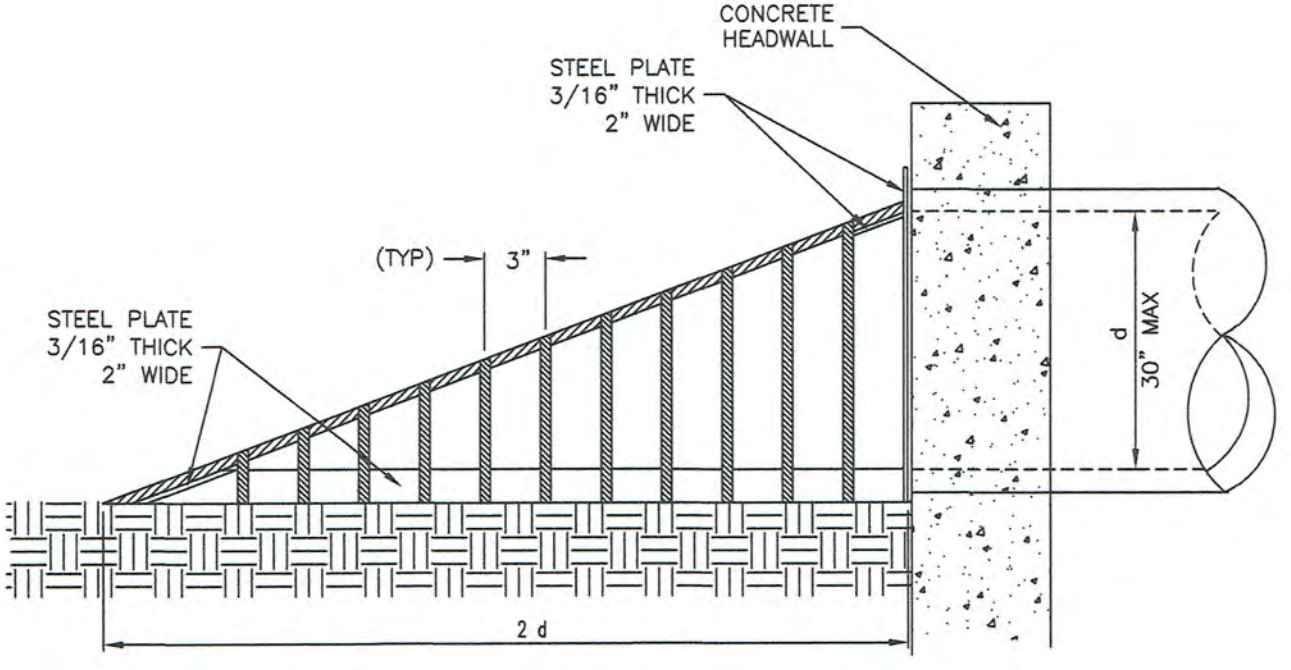
A. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.
B. Steel: ASTM A36, coated with asphalt based paint or better.

3. EXECUTION

A. Coat all welded joints with asphalt based paint or better.



FRONT VIEW



RIGHT SIDE VIEW

Backflow preventer

1. GENERAL

A. Flap gate is used on pressurized storm drains, irrigation lines and ground water lines.
B. When fully open, gate must not impede flow in the mainline pipe.

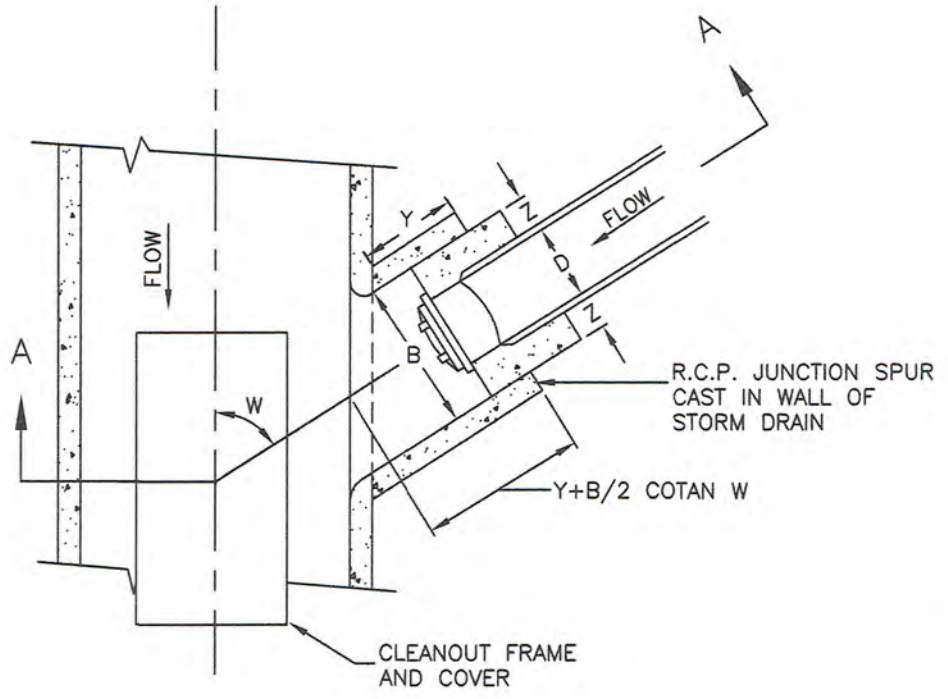
2. PRODUCTS

A. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
B. Concrete: Class 4000, APWA Section 03 30 04.
C. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.
D. Flap Gate: Spigot back or flat back designed for 20 feet of seating head unless specified elsewhere.

3. EXECUTION

A. Concrete Placement: APWA Section 03 30 10.
B. Mount the flap gate on a concrete collar poured in the end of a junction pipe spur.
C. Mount bolts and embed bolts 5-inches into the collar.
D. The `Y' dimension is measured at the top of the junction structure pipe spur for trapezoidal reinforced concrete channel.

FLAP GATE



PLAN VIEW

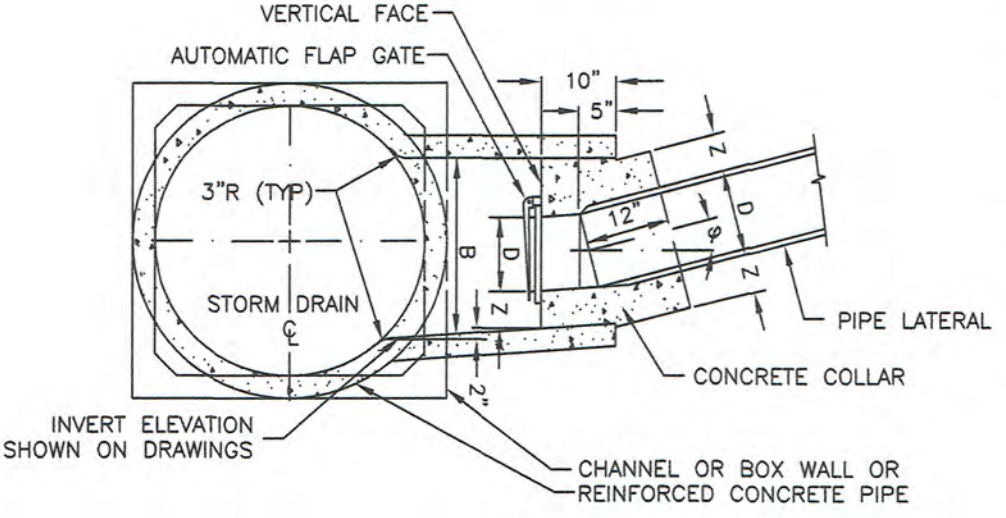


TABLE OF DIMENSIONS			
D In.	B In.	Z In.	Y In.
4	16	5.0	2.0
6	18	5.0	2.0
8	20	5.0	3.0
10	22	5.0	3.0
12	24	5.0	4.0
15	27	5.0	4.0
18	33	5.0	4.0
21	39	5.0	4.0
24	42	5.0	4.0
30	51	6.0	4.5
36	60	6.0	5.0
42	72	7.0	6.0
48	81	7.0	6.5
54	87	7.0	7.0
60	96	8.0	8.0
66	108	8.0	8.5
72	114	8.0	9.0
78	126	9.0	9.5
84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

SECTION A-A

Backflow preventer

1. GENERAL

A. Pinch valve is used on pressurized storm drains, irrigation lines and groundwater lines.

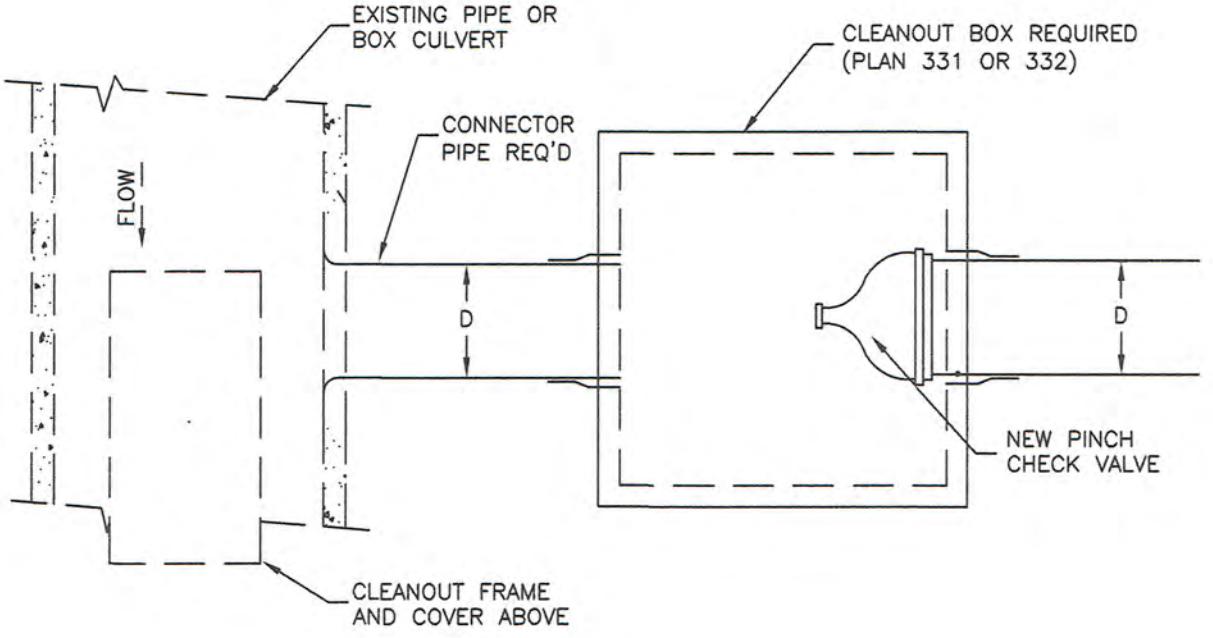
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
A. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
B. Concrete: Class 4000, APWA Section 03 30 04.
C. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.
D. Pinch Valve: Designed for 20 feet of seating head unless specified elsewhere.

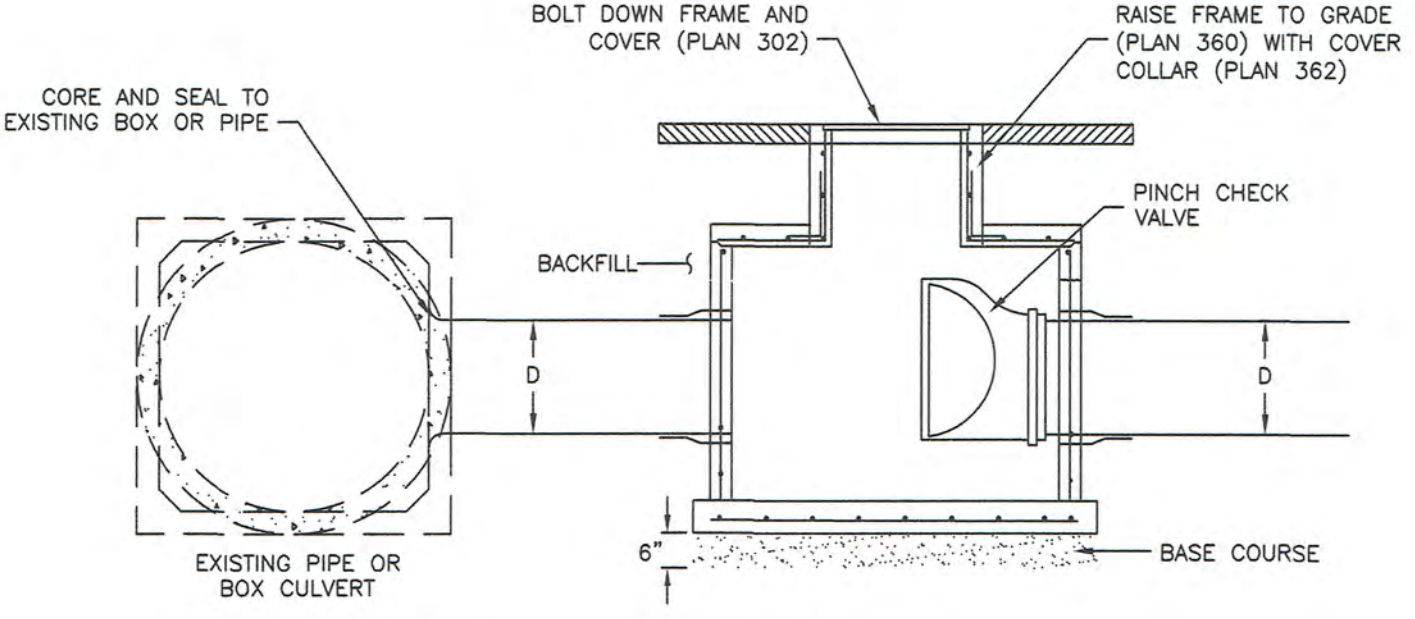
3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Reinforcement Placement: APWA Section 03 20 00.
C. Concrete Placement: APWA Section 03 30 10.
D. Backfill: Place backfill against the basin wall. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

PINCH VALVE



PLAN



SECTION A-A

Curb face outlet box

1. GENERAL

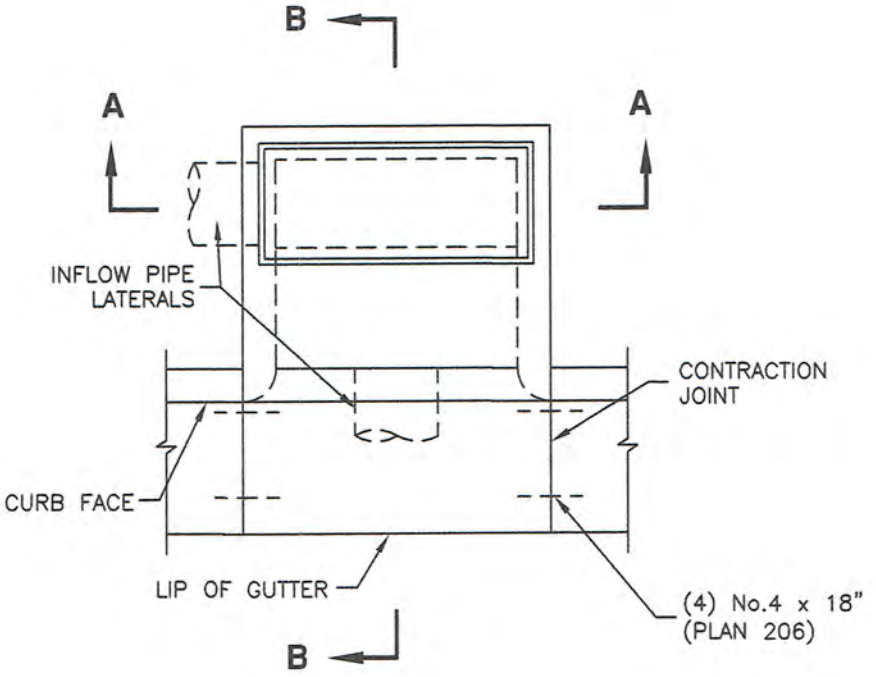
A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

2. PRODUCTS

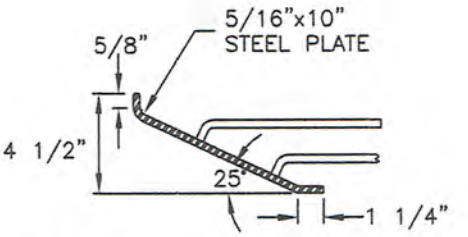
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Face Plate: Steel, ASTM A36 hot dip galvanized after fabrication.

3. EXECUTION

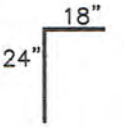
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Invert Cover: During construction, place invert covers over the top of pipe in manholes that currently convey sewerage.
C. Reinforcement: Center steel in walls and slabs with a minimum cover of 2-inches. Keep steel 2-inches clear around pipe and lid opening. Tie-bars required at all corners, vertical and horizontal. Tie-bars connecting two walls must match wall bar size and spacing. Tie-bars connecting walls to top and bottom slabs must match slab steel size and spacing.
D. Water Stops. Install rubber-based water-stops on all plastic pipes when connecting plastic pipes to cleanout boxes. Hold water-stop in place with stainless steel bands.
E. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly. Provide 1/2 -inch radius edges. Apply a broom finish. Apply a curing agent.
F. Pipe Connections: Grout around all pipe openings.
G. Backfill: Provide backfill against all sides of the box wall. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



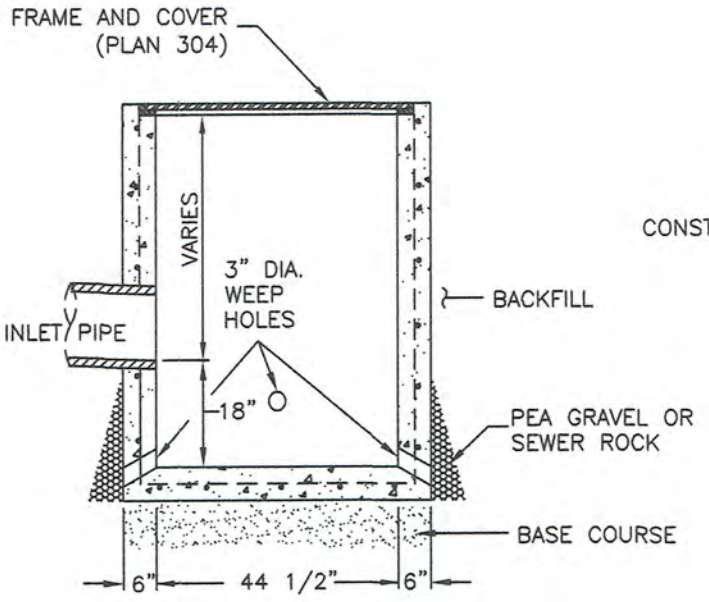
PLAN



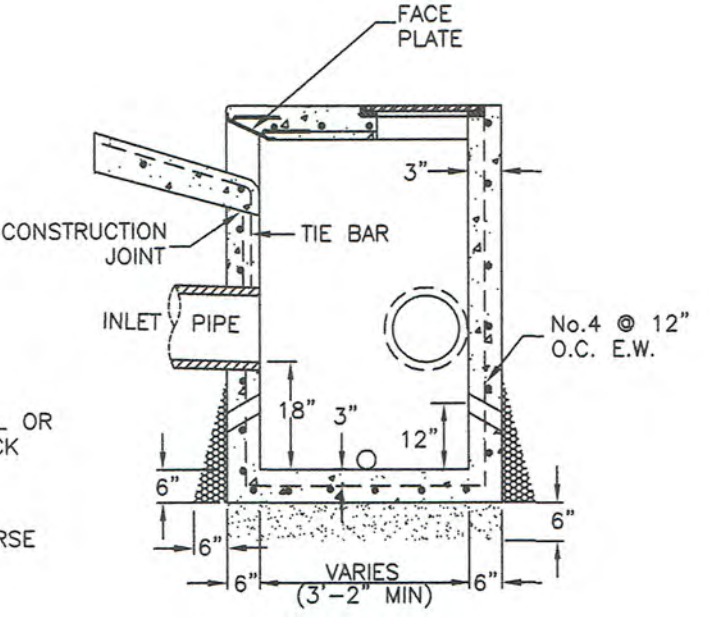
FACE PLATE DETAIL



TIE BAR DETAIL



SECTION A-A



SECTION B-B

Pipe outfall

1. GENERAL

A. Round concrete pipe application.
B. Additional requirements are specified in APWA Section 33 05 02.

2. PRODUCTS

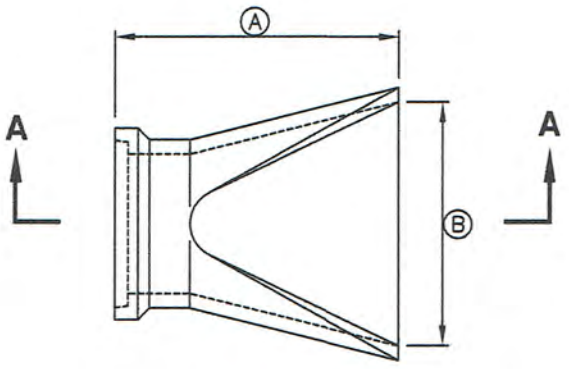
A. Use the same quality of precast end section as the pipe.
B. Use the joint material and connection that is the same as the joints in the pipeline.

3. EXECUTION

A. General dimensions and geometric shapes may vary from manufacturer to manufacturer.
B. Steel reinforcement is not required in the concrete end section shown.
C. Provide joint restraint connectors if required by ENGINEER.

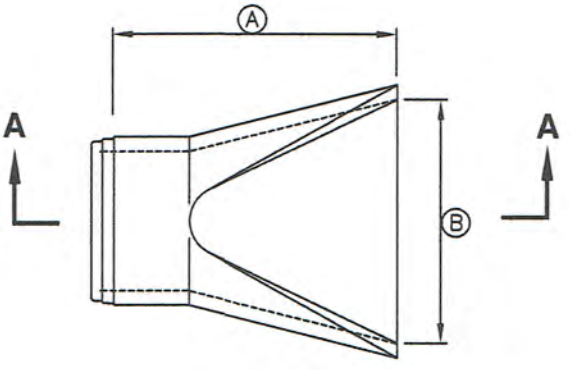
ROUND WITH FLARE

BELL END

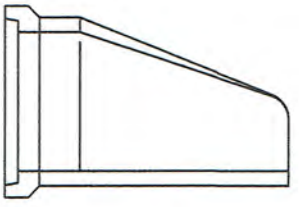


PLAN VIEW

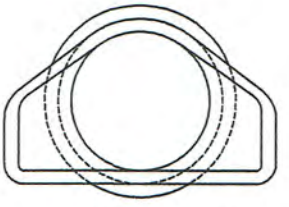
SPIGOT END



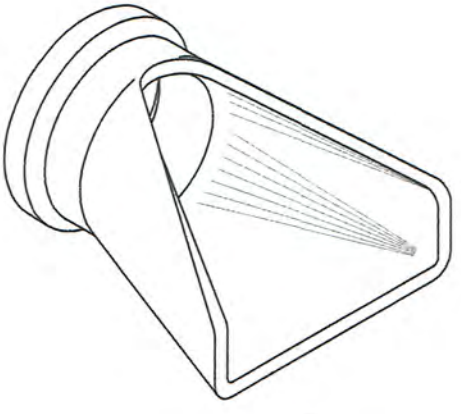
PLAN VIEW



SECTION A-A



END VIEW



OBLIQUE

TABLE OF DIMENSION		
PIPE SIZE	DIMENSION Ⓐ	Ⓑ
18"	73"	36"
24"	73"	48"
30"	73"	60"
36"	97"	72"
42"	98"	78"
48"	98"	84"

NOTE:
MINIMUM DIMENSIONS ARE SHOWN. ACTUAL SIZES MAY BE SLIGHTLY LARGER

Pipe outfall

1. GENERAL

A. Elliptical concrete pipe application
B. Additional requirements are specified in APWA Section 33 05 02.

2. PRODUCTS

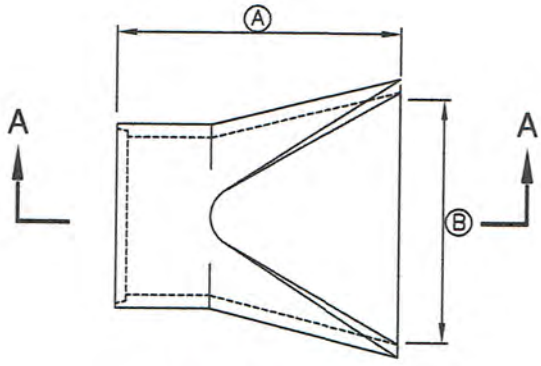
A. Use the same quality of precast end section as the pipe.
B. Use the joint material and connection that is the same as the joints in the pipeline.

3. EXECUTION

A. General dimensions and geometric shapes may vary from manufacturer to manufacturer.
B. Steel reinforcement is not required in the concrete end section shown.
C. Provide joint restraint connectors if required by ENGINEER.

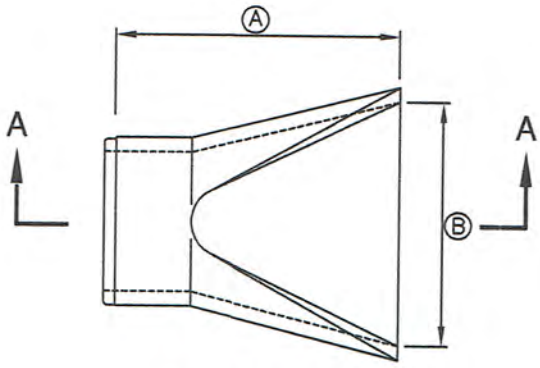
ELLIPTICAL WITH FLARE

GROOVED END

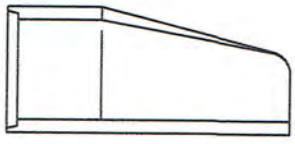


PLAN VIEW

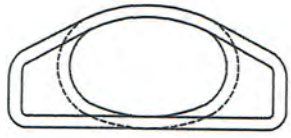
TONGUE END



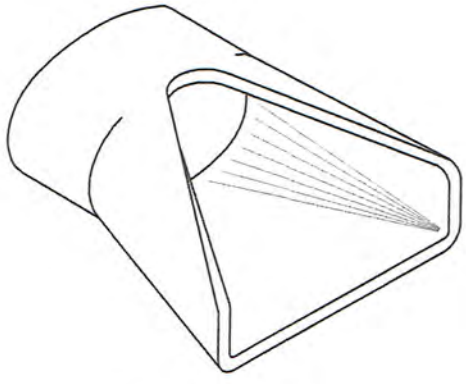
PLAN VIEW



SECTION A-A



END VIEW



OBLIQUE

TABLE OF DIMENSION		
PIPE SIZE (INCH)	DIMENSION Ⓐ	Ⓑ
19x30	6'–0"	4'–0"
24x38	6'–0"	5'–0"
29x45	8'–0"	6'–0"
34x53	8'–0"	6'–6"
38x60	8'–0"	7'–0"
43x68	8'–0"	7'–6"
48x76	8'–0"	8'–0"
NOTE: MINIMUM DIMENSIONS ARE SHOWN. ACTUAL SIZES MAY BE SLIGHTLY LARGER		

Pipe outfall

1. GENERAL

A. Provide room downstream to lay the access control rack flat.

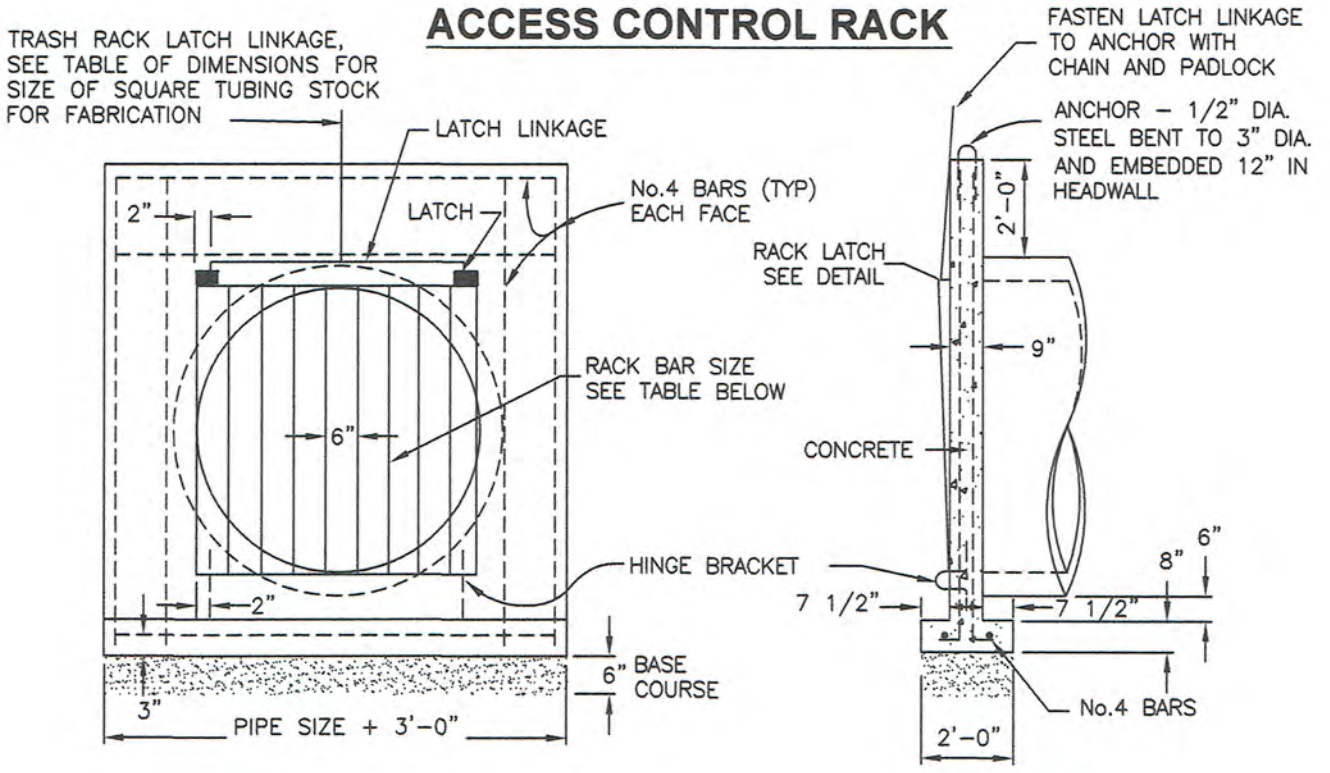
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches. Sewer rock or pea gravel, APWA Section 31 05 13.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

3. EXECUTION

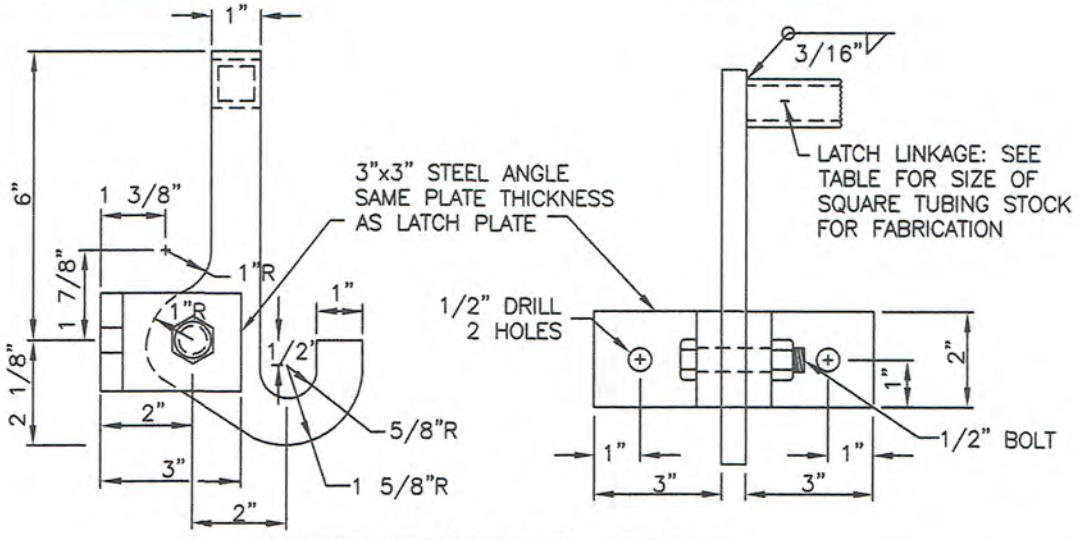
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness before compaction is 8 -inches. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Steel: Weld rack with reinforcing steel or round bars of equal cross-section.
C. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
D. Installation:
   1) Fasten latch bracket to headwall with 1/2" x 6" stainless steel bolts and hex nuts or 1/2" stainless steel expansion bolts.
   2) 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.
   3) Fabricate hinge bracket from #4 rebar.
E. Backfill: Place backfill on all sides and behind headwall of outfall. Maximum lift thickness before compaction is 8-inches. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

ACCESS CONTROL RACK



FRONT VIEW

SIDE VIEW



LEFT LATCH DETAIL (TYPICAL)

TABLE OF DIMENSION

PIPE SIZE	RACK BAR SIZE	LATCH PATE THICKNESS	LATCH LINKAGE SIZE
18"	#4	1/4"	1", .095" THICK
21"	"	"	"
24"	#5	"	"
27"	"	3/8"	"
30"	#6	"	"
33"	"	"	1", .133" THICK
36"	#7	"	"

PIPE SIZE	RACK BAR SIZE	LATCH PLATE THICKNESS	LATCH LINKAGE SIZE
42"	#7	1/2"	1", .133" THICK
48"	"	"	"
54"	#8	"	"
60"	"	"	"
66"	"	"	"
72"	"	"	"
84"	"	"	"

Cleanout box

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.
B. This box may be used as an inlet box. Install the appropriate frame and grate.

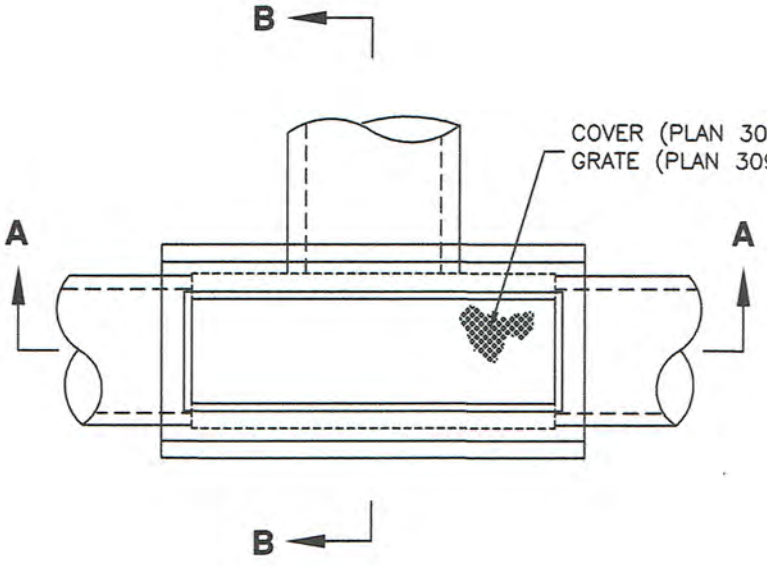
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Stabilization-Separation Geotextile: High MARV, woven or non-woven, APWA Section 31 05 19.

3. EXECUTION

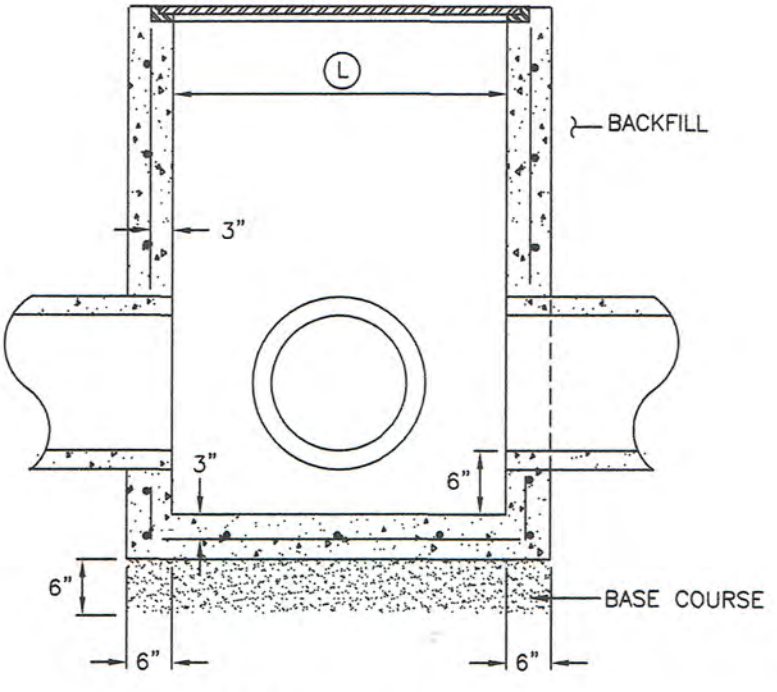
A. Foundation Stabilization: Get ENGINEER's permission to use a sewer rock or granular backfill borrow in a geotextile wrap to stabilize an unstable foundation.
B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
C. Joints: Place flexible gasket-type sealant in all manhole joints.
D. Reinforcement: Center steel in walls and slabs with a typical cover of 3-inches. Keep steel 2-inches clear around pipe and lid opening. Tie-bars required at all corners, vertical and horizontal. Tie-bars connecting two walls must match wall bar size and spacing. Tie-bars connecting walls to top and bottom slabs must match slab steel size and spacing.
E. Water stops. Install rubber-based water-stops on all plastic pipes when connecting plastic pipes to cleanout boxes. Hold water-stop in place with stainless steel bands.
F. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
G. Pipe Connections: Grout around all concrete pipe openings.
H. Backfill: Provide backfill against all of the box walls. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

TYPE A

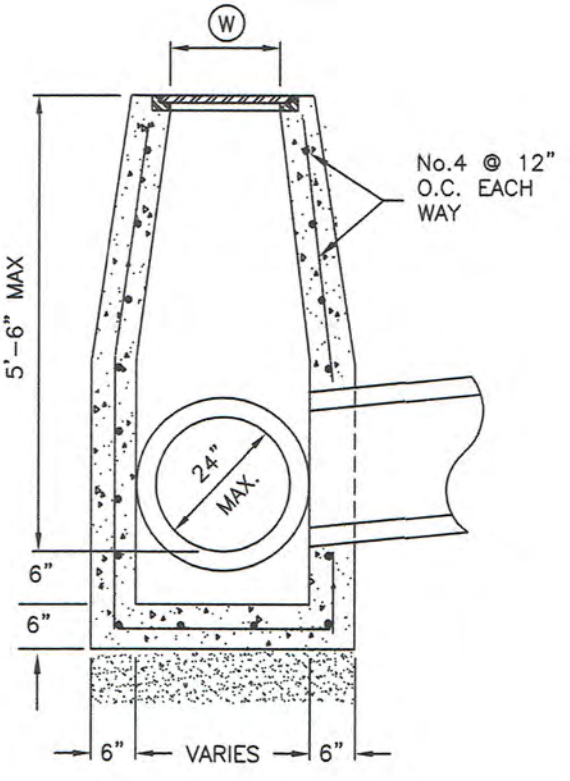


STANDARD PLAN REFERENCE No.	Ⓛ	Ⓦ
304	44 1/2"	16 1/2"
305	47 1/2"	21 3/4"
309	47 3/4"	16"
310	44 1/2"	16 1/2"

PLAN



SECTION A-A



SECTION B-B

Cleanout box

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

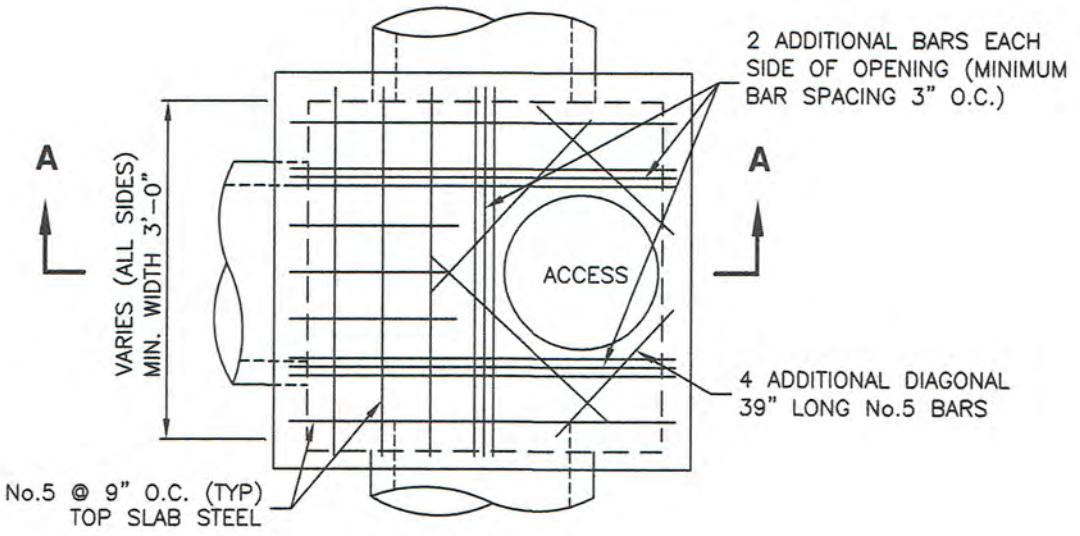
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Stabilization-Separation Geotextile: High MARV, woven or non-woven, APWA Section 31 05 19.
F. Ladder Rungs: Plastic, or plastic coated steel typically 8-inches wide.

3. EXECUTION

A. Foundation Stabilization: Get ENGINEER's permission to use a sewer rock or a sewer rock in a geotextile wrap to stabilize an unstable foundation.
B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
C. Reinforcement: Center steel in walls and slabs with a minimum cover of 2-inches. Keep steel 2-inches clear around pipe and lid opening. Tie-bars required at all corners, vertical and horizontal. Tie-bars connecting two walls must match wall bar size and spacing. Tie-bars connecting walls to top and bottom slabs must match slab steel size and spacing.
D. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Access: Eccentric access is shown. Before construction, verify if concentric access is required. Adjust reinforcement accordingly.
F. Ladder Rungs: 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.
G. Backfill: Provide backfill against all of the box walls. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

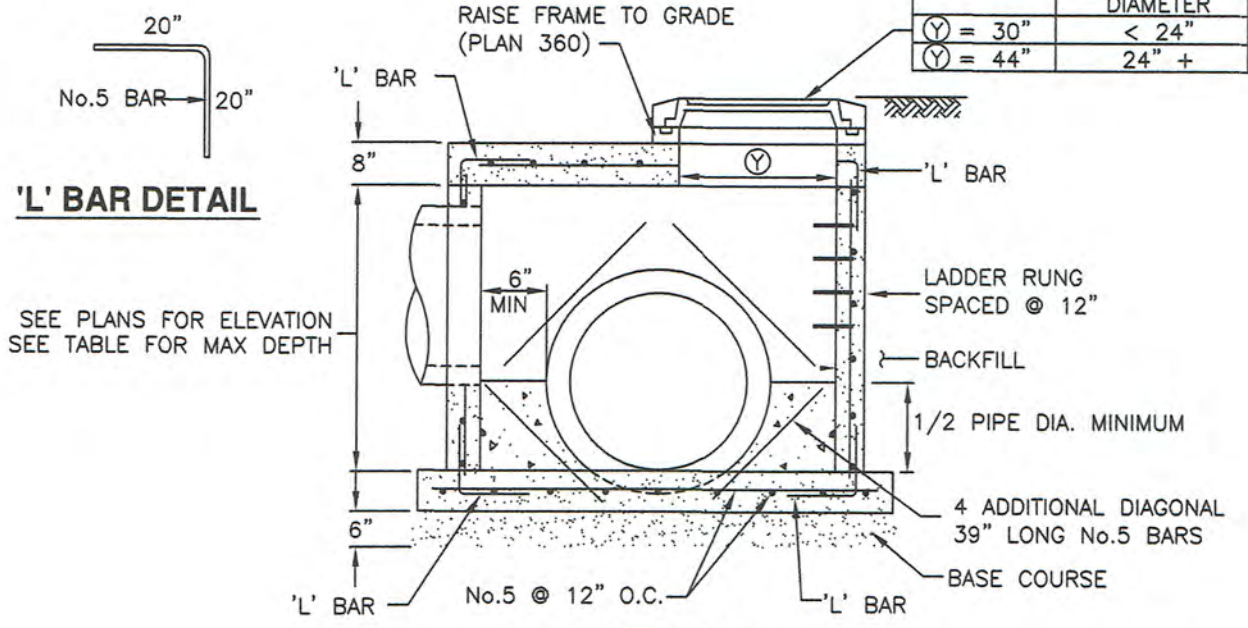
TYPE B



PLAN

'L' BAR DETAIL

DIMENSION	LARGEST PIPE DIAMETER	SEE PLAN No.
Ⓨ = 30"	< 24"	302
Ⓨ = 44"	24" +	303



SECTION A-A

WALL THICKNESS AND WALL STEEL				
LOW WATER TABLE				
MAX. BOX WIDTH	6 FEET	8 FEET	8 FEET	9 FEET
MAX. BOX DEPTH	5 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"

Cleanout box

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.

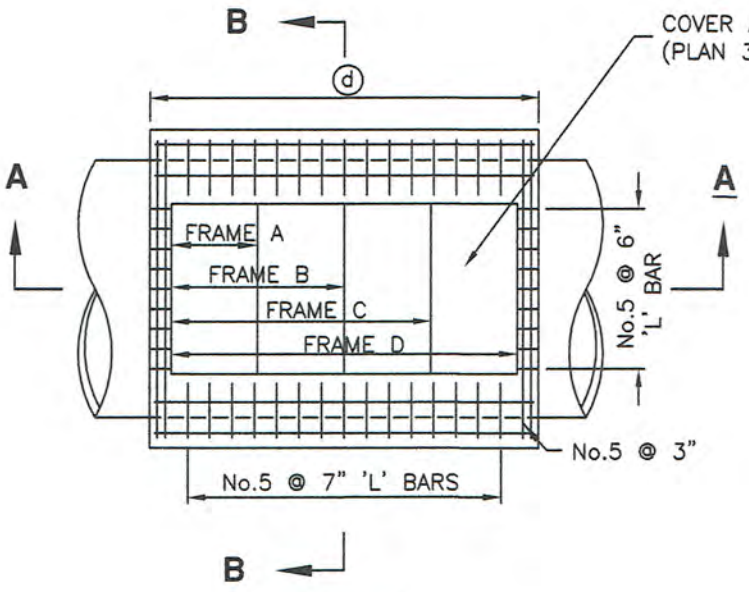
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Stabilization-Separation Geotextile: High MARV, woven or non-woven, APWA Section 31 05 19.
F. Ladder Rungs: Plastic, or plastic coated steel typically 8-inches wide.

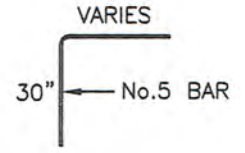
3. EXECUTION

A. Foundation Stabilization: If unstable, get ENGINEER's permission to use a sewer rock or a sewer rock in a geotextile wrap to stabilize an unstable foundation.
B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
C. Reinforcement: Center steel in walls and slabs with a minimum cover of 2-inches. Keep steel 2-inches clear around pipe and lid opening. Tie-bars required at all corners, vertical and horizontal. Tie-bars connecting two walls must match wall bar size and spacing. Tie-bars connecting walls to top and bottom slabs must match slab steel size and spacing.
D. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
E. Access: Eccentric access is shown. Before construction, verify if concentric access is required. Adjust reinforcement accordingly.
F. Ladder Rungs: 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.
G. Backfill: Place backfill against all of the box walls. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

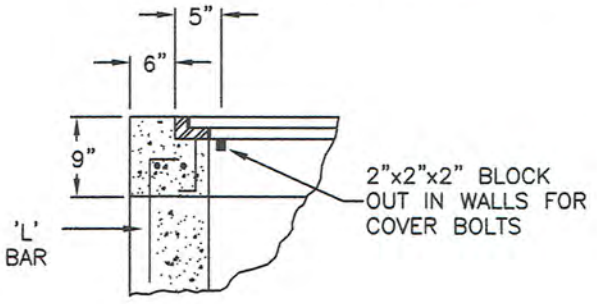
TYPE C



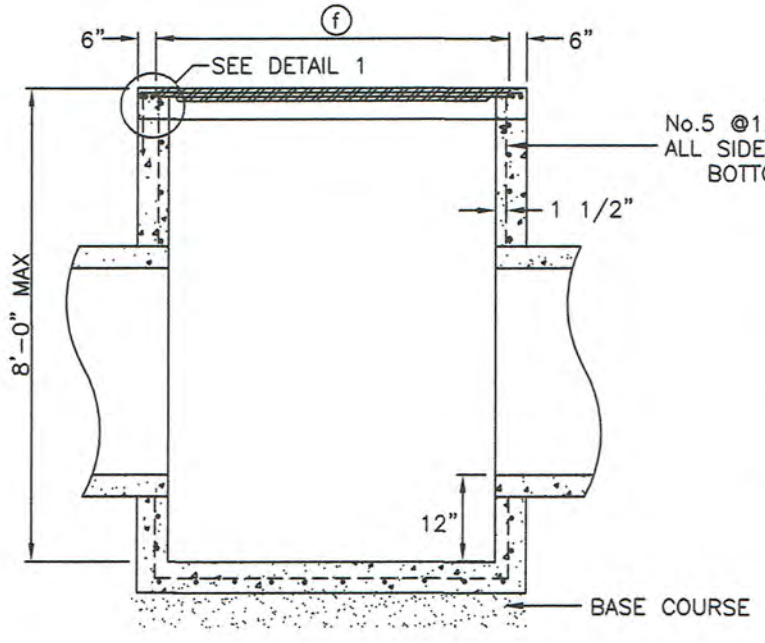
PLAN



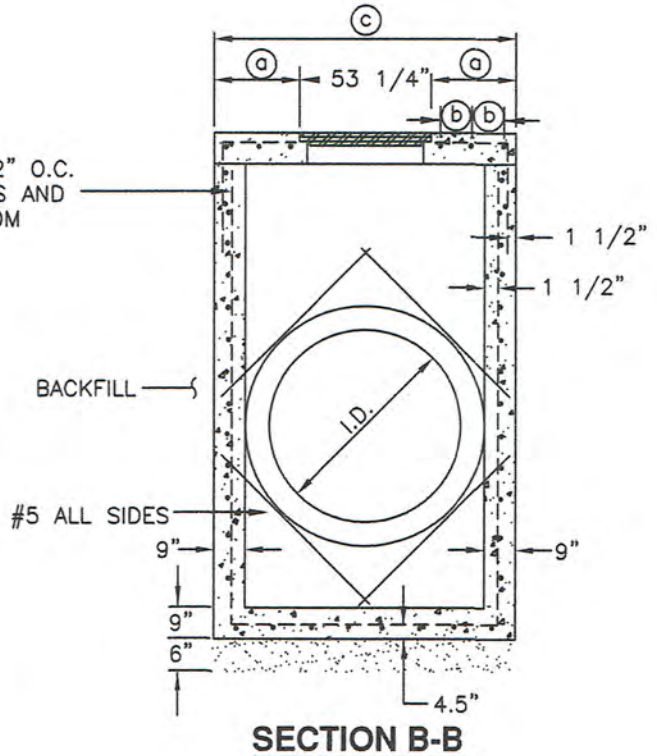
'L' BAR DETAIL



DETAIL 1



SECTION A-A



SECTION B-B

TABLE OF DIMENSIONS				
PIPE I.D.	ⓐ	ⓑ	ⓒ	ⓓ ⓕ
<48"	6"	0"	65 1/4"	SEE TABLE OF DECK WIDTHS
48"	6"	0"	54 1/4"	
54"	15 5/8"	5 1/2"	84 1/2"	
60"	19 1/8"	7"	91 1/2"	
66"	22 5/8"	9"	93 1/2"	

TABLE OF DECK WIDTHS		
FRAME	ⓓ	ⓕ
A	39 3/4"	27 3/4"
B	65 1/4"	53 1/4"
C	90 3/4"	78 3/4"
D	116 1/4"	104 1/4"

Precast box

1. GENERAL

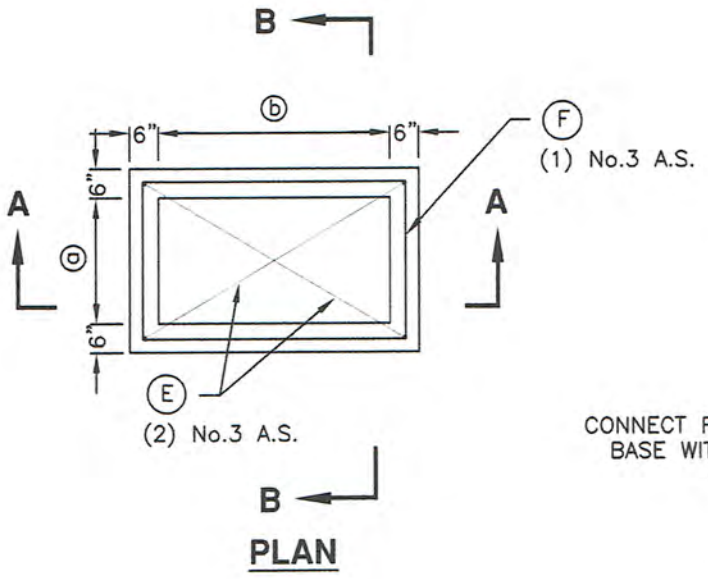
A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the box.
B. This drawing is acceptable where the water table elevation is less than 3 feet above the floor of the box. If elevation of water table is higher, engineering calculations and drawings must be submitted to and approved by the ENGINEER.
C. Submit bar design detail for ENGINEER's review.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Precast Concrete: Class 4000 precast, APWA Section 03 40 00.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615. Coated steel is not required for small drainage structures shown on this drawing.
E. Frame and Cover (or Grate): Use the appropriate unit indicated in the Contract Documents.
F. Joint Sealant: Rubber-based, compressible.

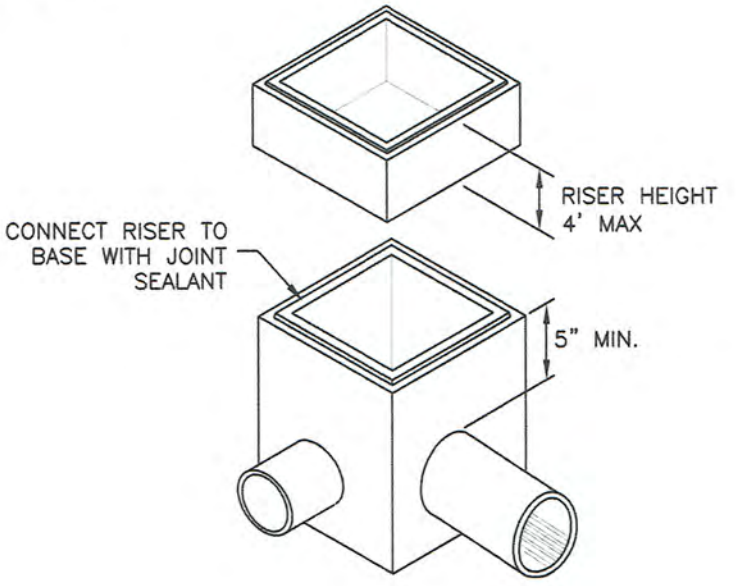
3. EXECUTION

A. Concrete Placement: Provide 2-inches of concrete cover over reinforcing steel.
B. Lifting Points: Provide at least 2 lifting points per section that avoid interference with the reinforcing steel and that are designed according to PCI (Prestressed Concrete Institute) design handbook. Lift only from the engineered lifting points.
C. Depth: Drainage boxes and riser combinations that exceed 8-feet from finished grade to the bottom of the box requires ENGINEER's approval. Submit design calculations and shop drawings.
D. Core Holes:
    1) Provide core holes that are at least 4" larger than attaching outer pipe diameter. Cut core holes at the manufacturing plant unless ENGINEER permits field core holes.
    2) Center core holes to leave 2" of concrete measured horizontally from inside wall of the box to core hole. Locate core hole vertically so bottom of core hole will be at or above floor elevation with at least 5-inches of concrete directly above the core hole to the top of the box.
    3) Deviations from core hole tolerances require shop drawings. Shop drawings will identify lifting point number and location.
E. Precast Top: Design precast top for AASHTO HL-93 live loads and submit rebar detail and stamped design drawings to ENGINEER. Show connection detail for frame and grate or cover.

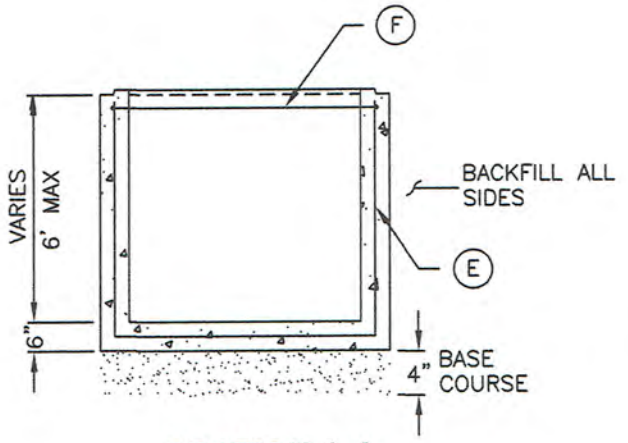


PLAN

RISERS: ON BOXES DEEPER THAN 4 FEET, PROVIDE AN UNREINFORCED PRECAST CONCRETE RISER MATCHING THE DRAINAGE BOX SIZE



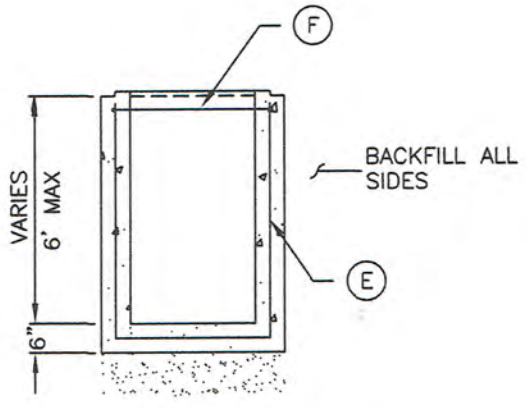
OBLIQUE



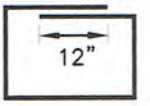
SECTION A-A

TABLE OF DIMENSIONS		
BOX SIZE	ⓐ	ⓑ
1.5 x 4	18"	48"
2 x 2	24"	24"
2 x 3	24"	36"
2.5 x 4	30"	48"
3 x 3	36"	36"
3 x 3.5	36"	42'
4 x 4	48"	48"

NOTE: OTHER BOX SIZES (LESS THAN 48") WITH DIFFERENT a AND b DIMENSIONS ARE ACCEPTABLE



SECTION B-B

REINFORCING STEEL LAYOUT	
PROVIDE 2" MIN. COVER ON ALL BARS	
BAR (E)	BAR (F)
	

Adjust reinforced concrete deck to grade

1. GENERAL

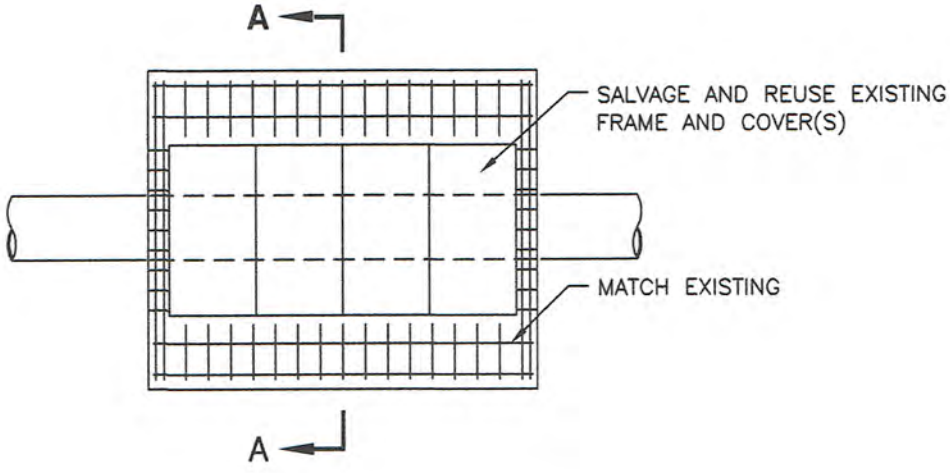
A. Alternate 1 applies to lowering the whole deck to grade.
B. Alternate 2 applies to raising or lowering part of the deck to grade.

2. PRODUCTS

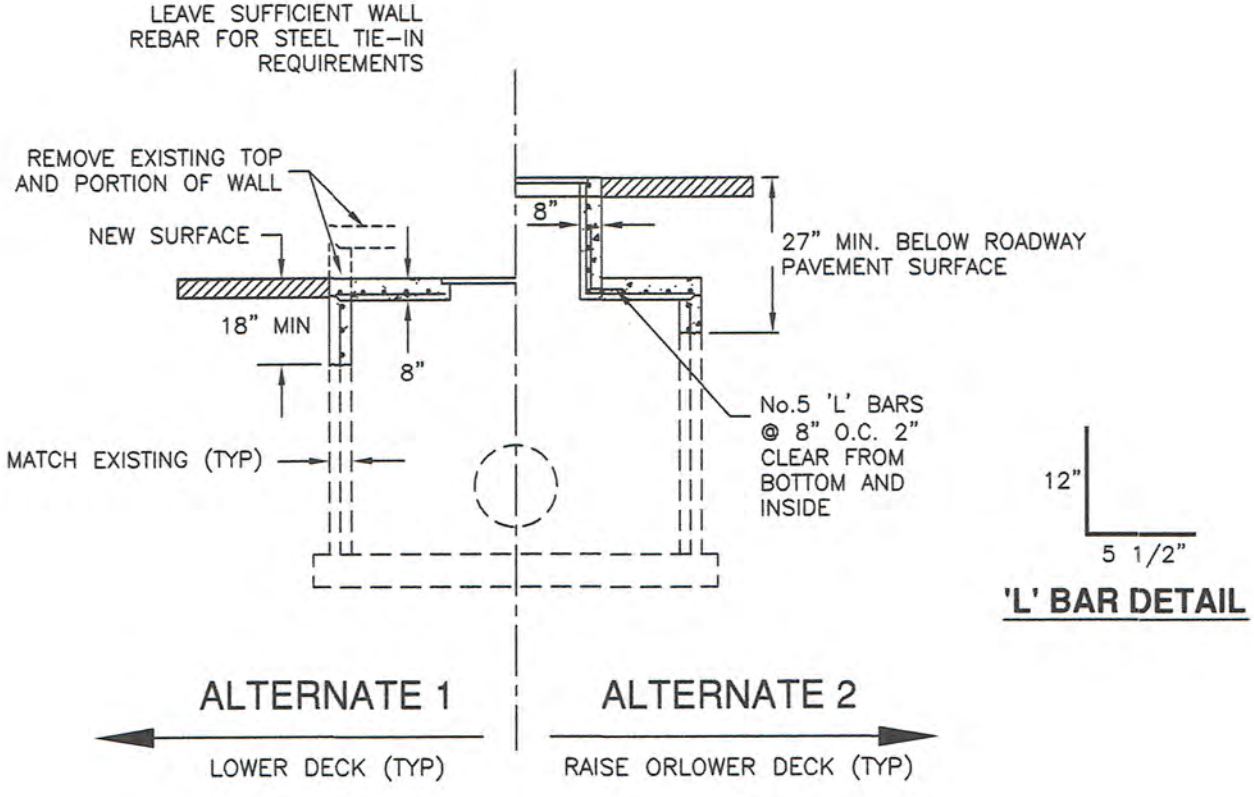
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

3. EXECUTION

A. Steel Placement: APWA Section 03 20 00.
B. Concrete Placement: APWA Section 03 30 10. Adjust concrete dimensions at frame accordingly. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.



PLAN



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

SECTION A-A

Precast manhole

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the manhole.

B. Manhole size.
   1) Diameter is 4-feet: For pipe under 12" diameter.
   2) Diameter is 5-feet: For pipe 12" and larger, or when 3 or more drain pipes intersect the manhole.

C. Wall thickness:
   1) Precast reinforced concrete walls 4 3/4" minimum.
   2) Cast-in-place concrete to be 8 inches thick minimum.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.

C. Concrete: Class 4000, APWA Section 03 30 04.

D. Riser and Reducing Riser: ASTM C478.

E. Joint Sealant: Rubber based, compressible.

F. Grout: 2 parts sand to 1 part cement mortar, ASTM C1329.

G. Stabilization-Separation Geotextile: Moderate or high at CONTRACTOR's choice, APWA Section 31 05 19.

3. EXECUTION

A. Foundation Stabilization: Get ENGINEER's permission to use a sewer rock or a sewer rock in a geotextile wrap to stabilize an unstable foundation.

B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

C. Invert cover. During construction, place invert covers over the top of pipe in manholes that currently convey sewerage. See Plan 412.

D. Concrete Deck or Reducing Riser: When depth of manhole from pipe invert to finish grade exceeds 7 feet, use an ASTM C478 reducing riser.

E. Pipe Connections: Grout around all pipe openings.

F. Pipe Seal: Install rubber-based pipe seals on all plastic pipes when connecting plastic pipes to manholes. Hold water-stop in place with stainless steel bands.

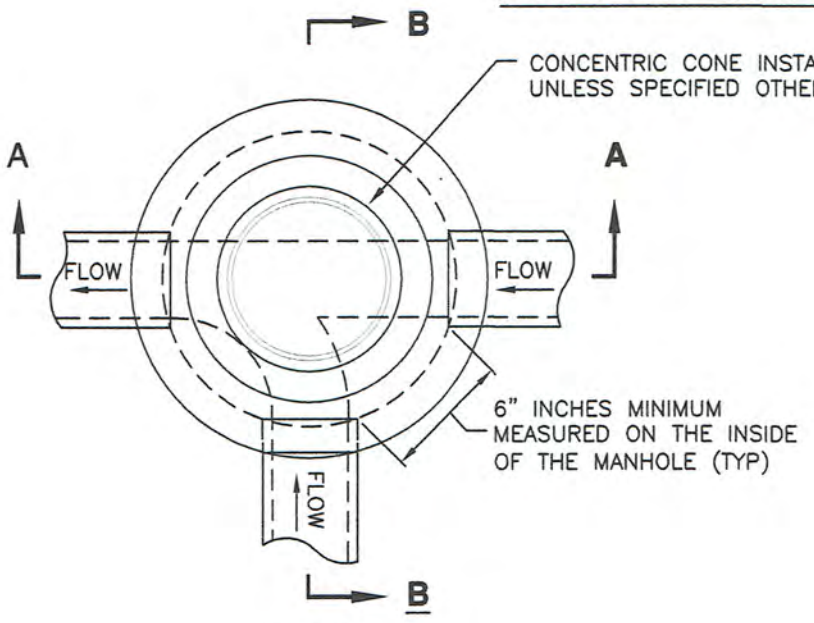
G. Joints: Place flexible sealant in all riser joints. Finish with grout.

H. Adjustment: If the required manhole adjustment is more than 1'-0", remove the cone and grade rings and adjust the manhole elevation with the appropriate manhole section, the cone section, and the grade rings or plastic form to make frame and lid match finish grade.

I. Finish: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.

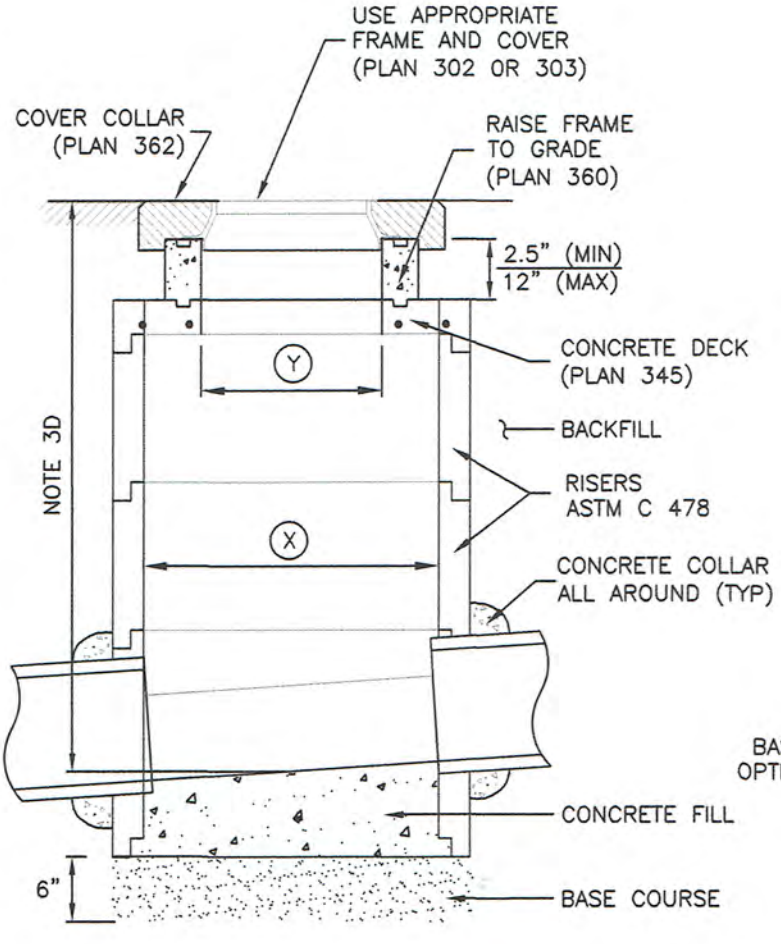
J. Backfill: Provide backfill against the manhole shaft. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

CAST IN PLACE BASE

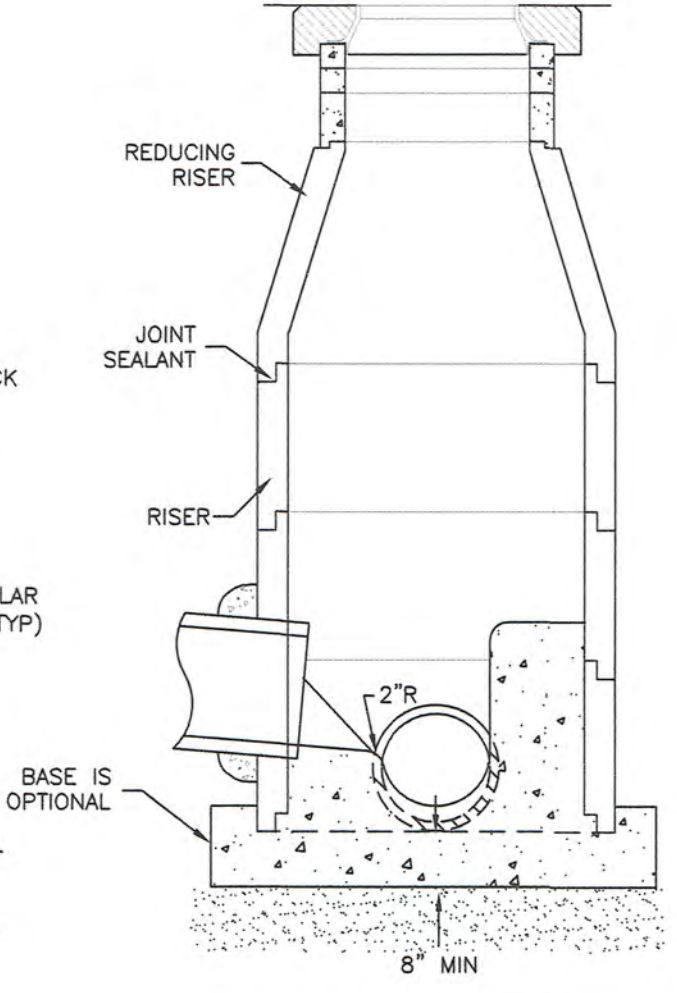


PLAN

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



SECTION A-A
(CONCRETE DECK OPTION)



SECTION B-B
(REDUCING RISER OPTION)

Precast manhole

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the manhole.

B. Manhole size.
   1) Diameter is 4 feet: For pipe under 12" diameter.
   2) Diameter is 5 feet: For pipe 12" and larger, or when 3 or more drain pipes intersect the manhole.

C. Wall thickness:
   1) Precast reinforced concrete walls 4 3/4" minimum.
   2) Cast-in-place concrete to be 8 inches thick minimum.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.

C. Concrete: Class 4000, APWA Section 03 30 04.

D. Riser and Reducing Riser: Reinforced concrete pipe, Class III, ASTM C478.

E. Joint Sealant: Rubber based, compressible.

F. Grout: 2 parts sand to 1 part cement mortar.

3. EXECUTION

A. Foundation Stabilization: Get ENGINEER's permission to use a sewer rock or pea gravel to stabilize an unstable foundation.

B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

C. Invert cover. During construction, place invert covers over the top of pipe in manholes that currently convey sewerage. See Plan 412.

D. Concrete Deck or Reducing Riser: When depth of manhole from pipe invert to finish grade exceeds 7 feet, use an ASTM C478 reducing riser cone.

E. Pipe Connections: Grout around all pipe openings.

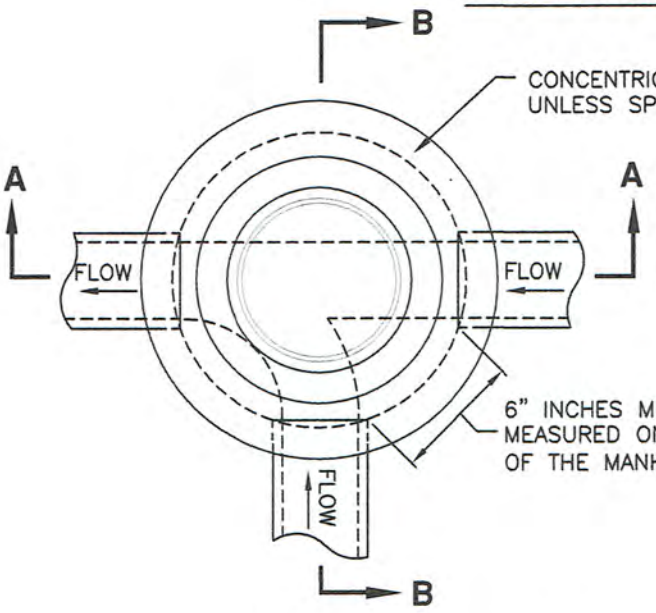
F. Water Stops: Install rubber-based water-stops on all plastic pipes when connecting plastic pipes to manholes. Hold water-stop in place with stainless steel bands.

G. Joints: Place flexible sealant in all joints. Finish with grout.

H. Finish: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.

I. Backfill: Provide backfill against the manhole shaft. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

PIPE PASS THROUGH BASE



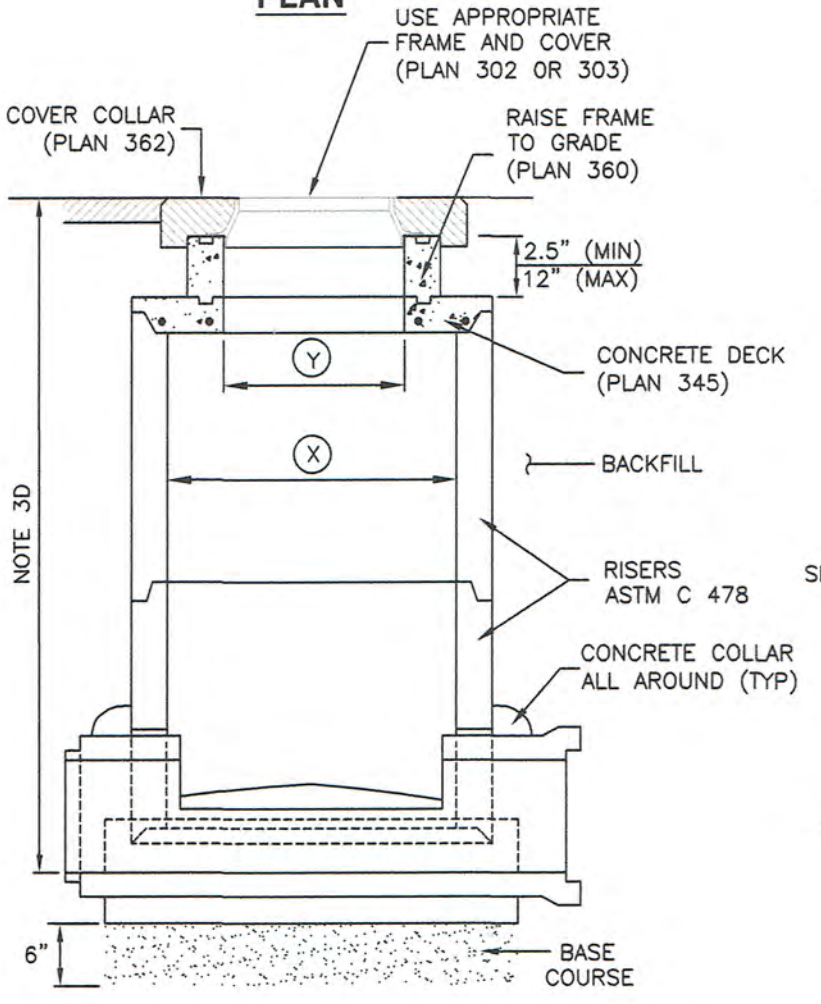
CONCENTRIC CONE INSTALLATION UNLESS SPECIFIED OTHERWISE.

NOTE: INVERT CONNECTION SHOWN IS NOT APPLICABLE IF LATERAL INVERT DOES NOT COINCIDE WITH MAIN INVERT (SECTION B–B)

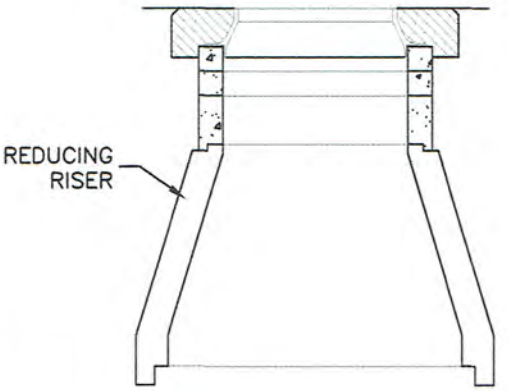
6" INCHES MINIMUM MEASURED ON THE INSIDE OF THE MANHOLE (TYP)

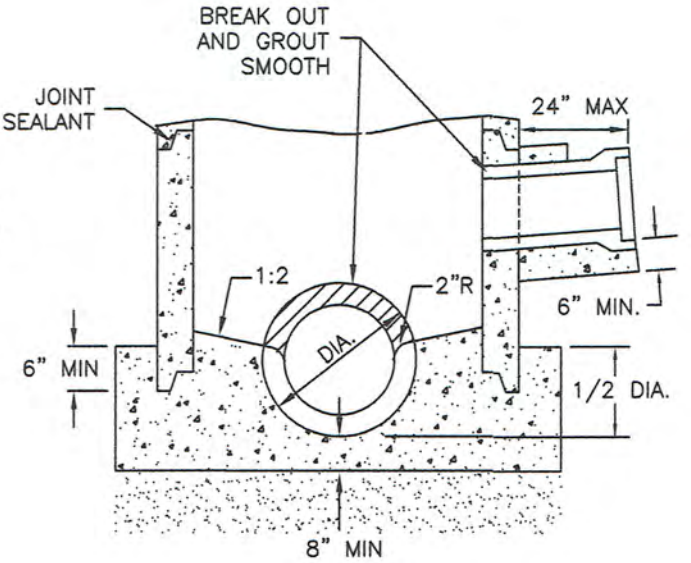
TABLE OF DIMENSIONS	
MANHOLE STYLE	DIMENSION
A	Ⓧ =48" Ⓨ =30"
B	Ⓧ =60" Ⓨ =44"
C	Ⓧ =60" Ⓨ =30"

PLAN



SECTION A-A
(CONCRETE DECK OPTION)





SECTION B-B
(REDUCING RISER OPTION)

Concrete deck

1. GENERAL

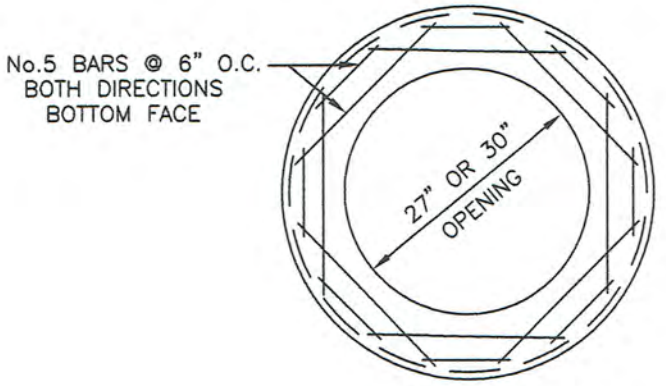
A. Deck is made for round manhole riser grade rings.

2. PRODUCTS

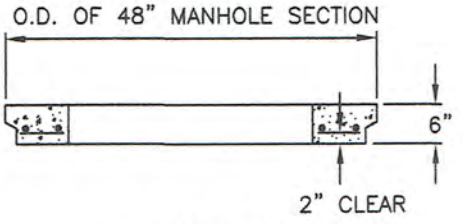
A. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
B. Concrete: Class 4000, APWA Section 03 40 00

3. EXECUTION

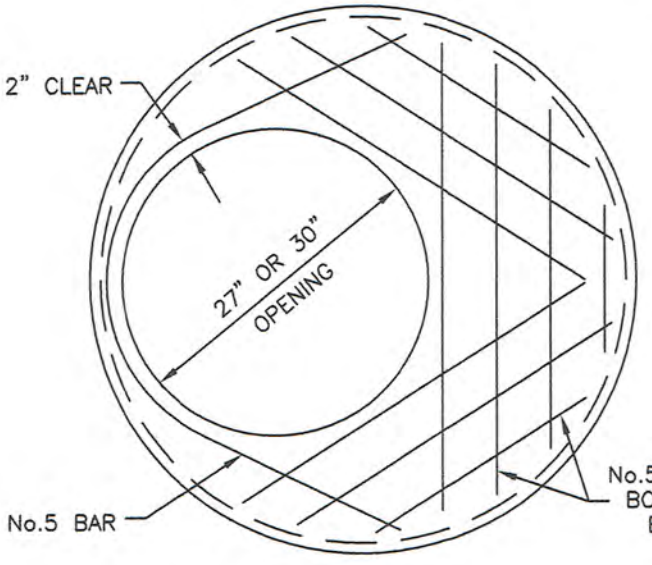
A. Reinforcement: Placement APWA Section 03 20 00.
B. Concrete Placement: APWA Section 03 30 10. Apply a curing agent.



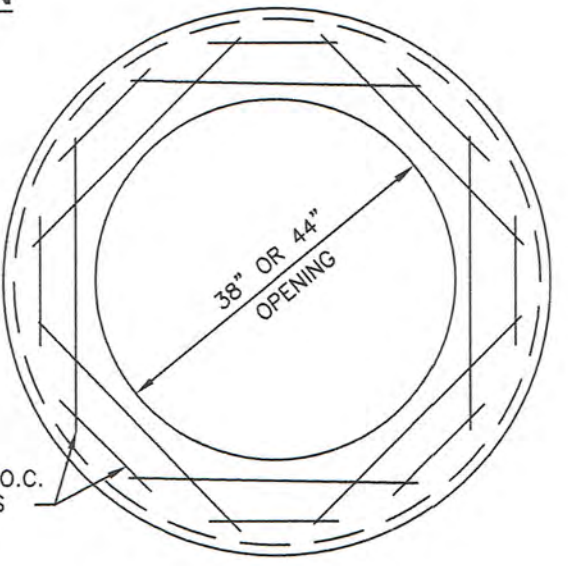
48" DECK PLAN



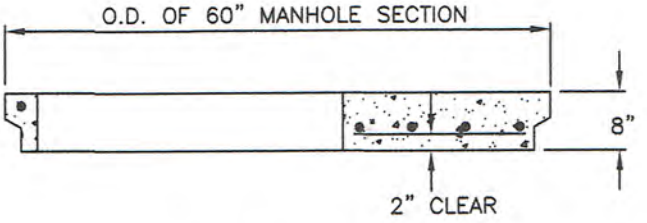
SECTION



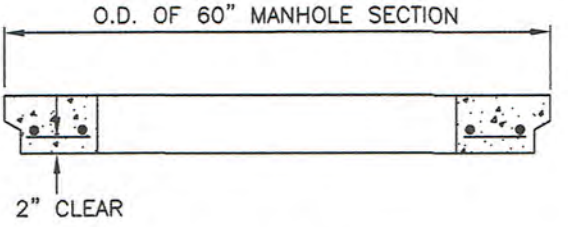
60" DECK PLAN



60" DECK PLAN



SECTION



SECTION

Raise frame to grade

1. GENERAL

A. Grade rings are used in non-pressurized applications to adjust frame to grade.

2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.

B. Reinforcement: Deformed, 60 ksi yield grade hoop steel, ASTM A615.

1) 2 1/2" High Rings: Provide two 1/4" diameter steel hoops tied with No. 14 AWS gage wire, 8" on center.

2) 6" and 8" High Rings: Provide four 1/4" diameter steel hoops, tied with No. 14 AWS gage wire, 8" on center.

C. Gasket: Rubber-based, compressible.

3. EXECUTION

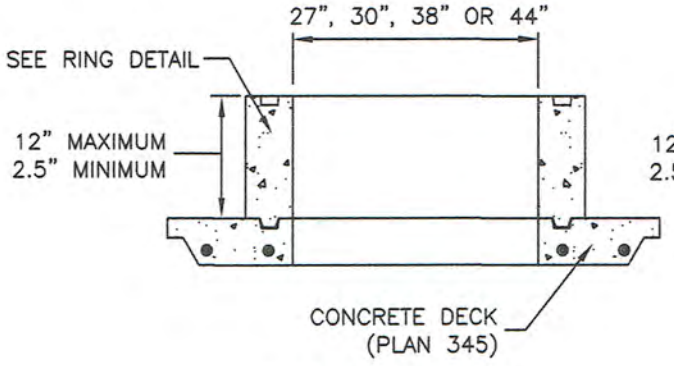
A. Ring Manufacture:

1) Fabrication, APWA Section 03 30 10.

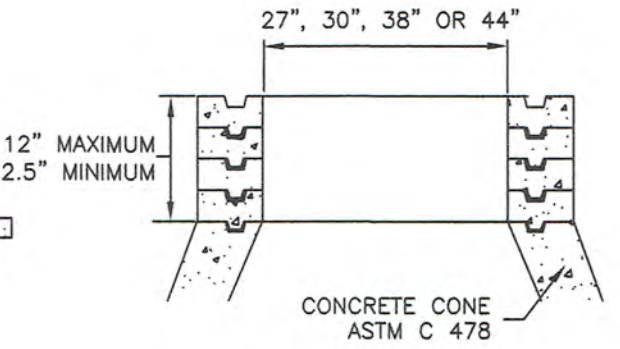
2) Cure, APWA Section 03 39 00.

B. Field Installation: Seat rings with a compressible gasket.

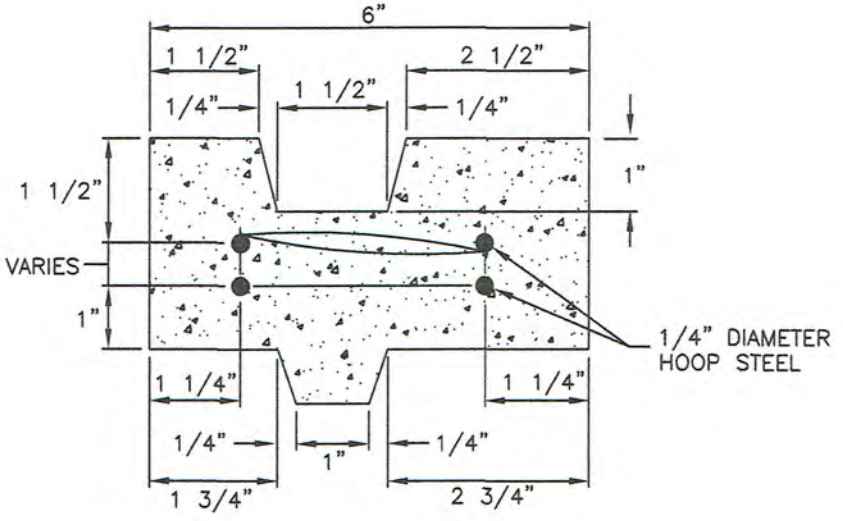
GRADE RING



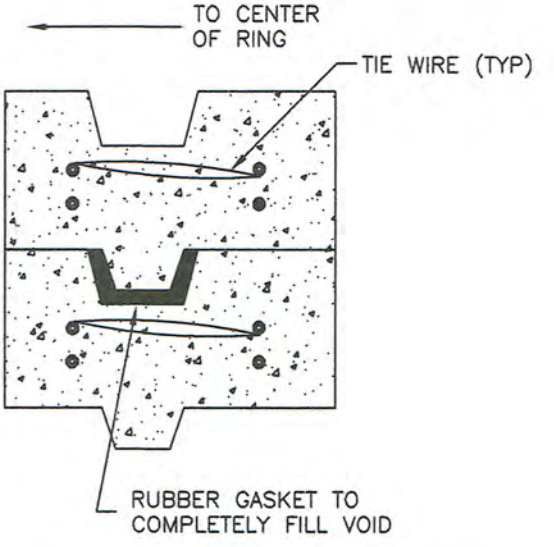
DECK SECTION



CONE SECTION



RING DETAIL



GASKET DETAIL

Raise frame to grade

1. GENERAL

A. The plastic form is used to keep concrete in the annular space when fabricating cover collars for storm drain manholes, sanitary sewer manholes or other utilities.

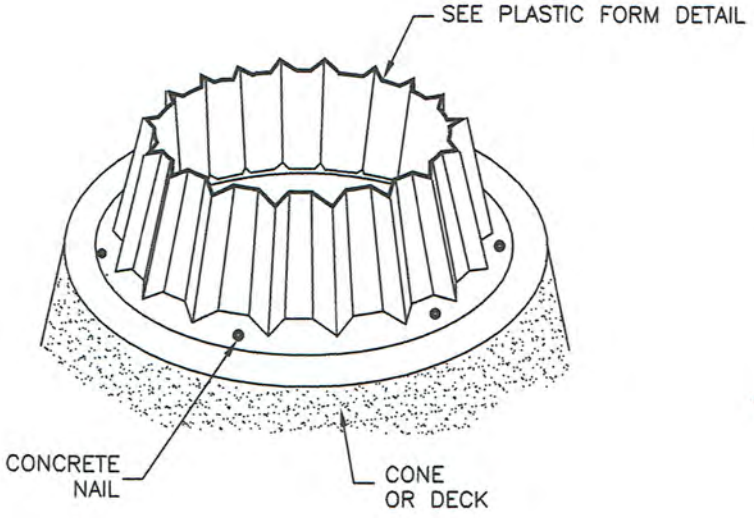
2. PRODUCTS

A. Concrete Nails: CONTRACTOR's choice.

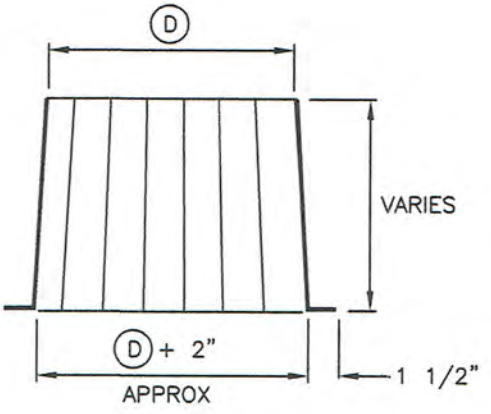
3. EXECUTION

A. Adjust plastic form height so that the top of the manhole frame and cover matches longitudinal slope and cross slope of the pavement surface, and cover is 1/2-inch lower than the pavement surface.

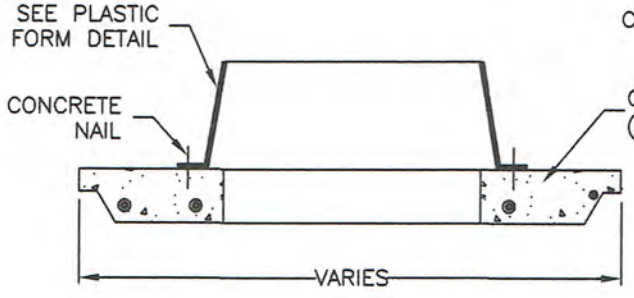
PLASTIC FORM



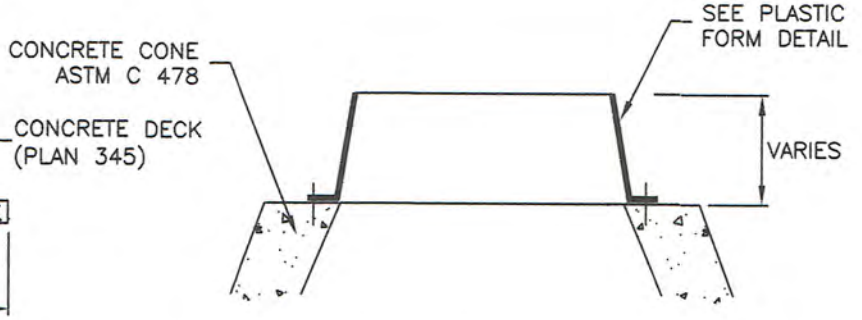
PLASTIC FORM OBLIQUE



PLASTIC FORM DETAIL



DECK SECTION



CONE SECTION

Cover collar for storm drains

1. GENERAL

A. In a pavement surface, the concrete will support the frame under traffic loadings.

2. PRODUCTS

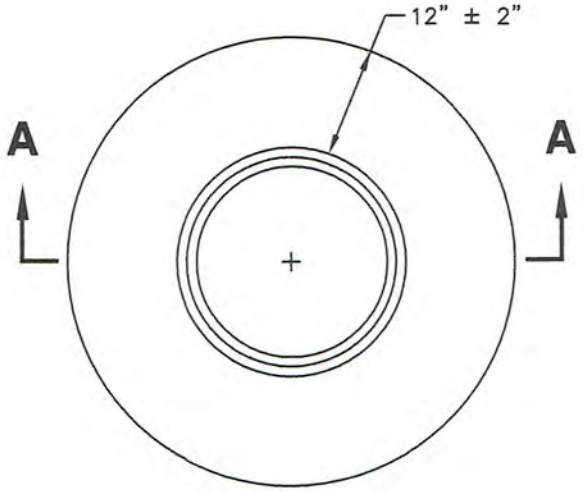
A. Concrete: Class 4000, APWA Section 03 30 04.

B. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

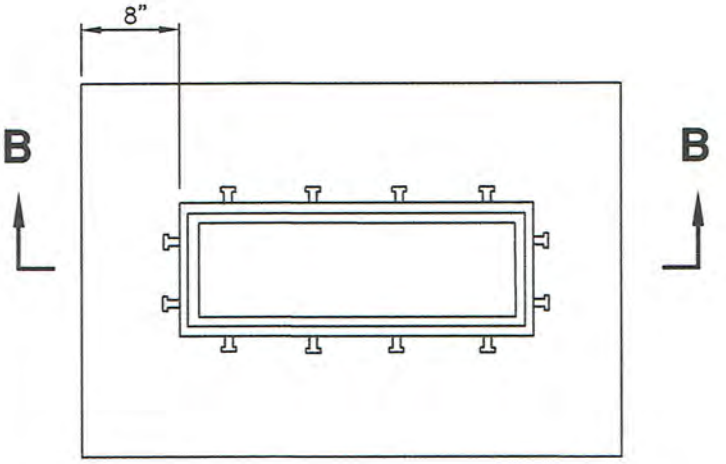
3. EXECUTION

A. Pavement Preparation: Provide a neat vertical and concentric joint between concrete and existing bituminous concrete surfaces. Clean edges of all dirt, oil, and loose debris.

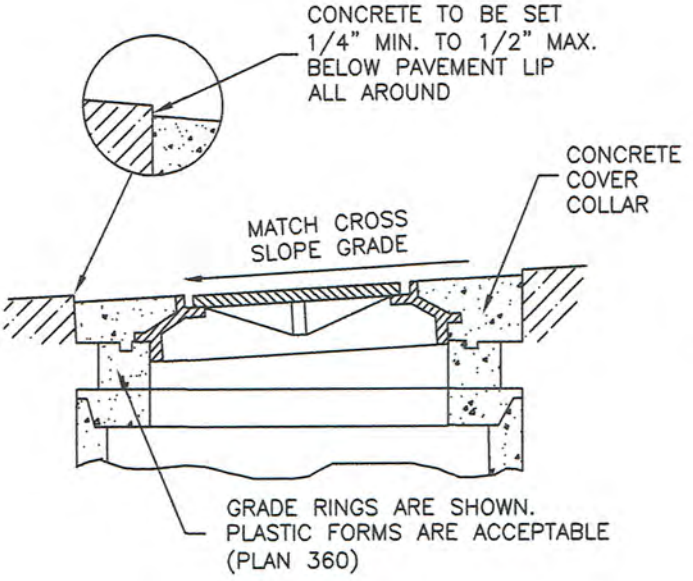
B. Concrete Placement: APWA Section 03 30 10. Fill the annular space around the frame and cover casting with concrete. Apply a broom finish. Apply a curing agent.



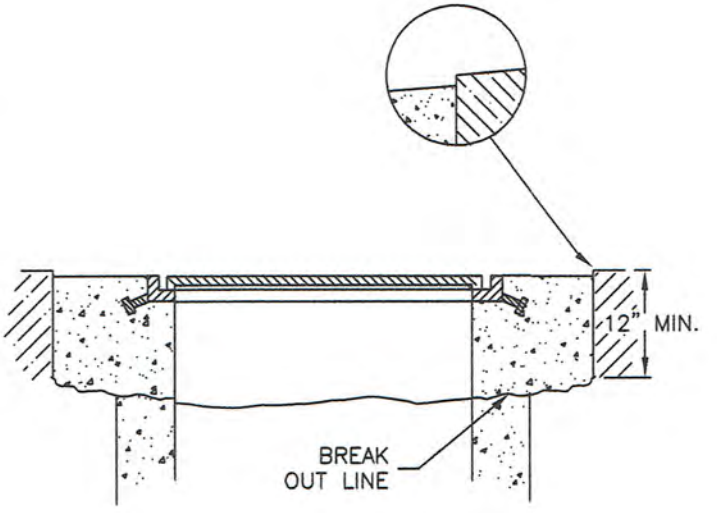
PLAN
(ROUND FRAME)



PLAN
(RECTANGULAR FRAME)



SECTION A-A



SECTION B-B

Area drain

1. GENERAL

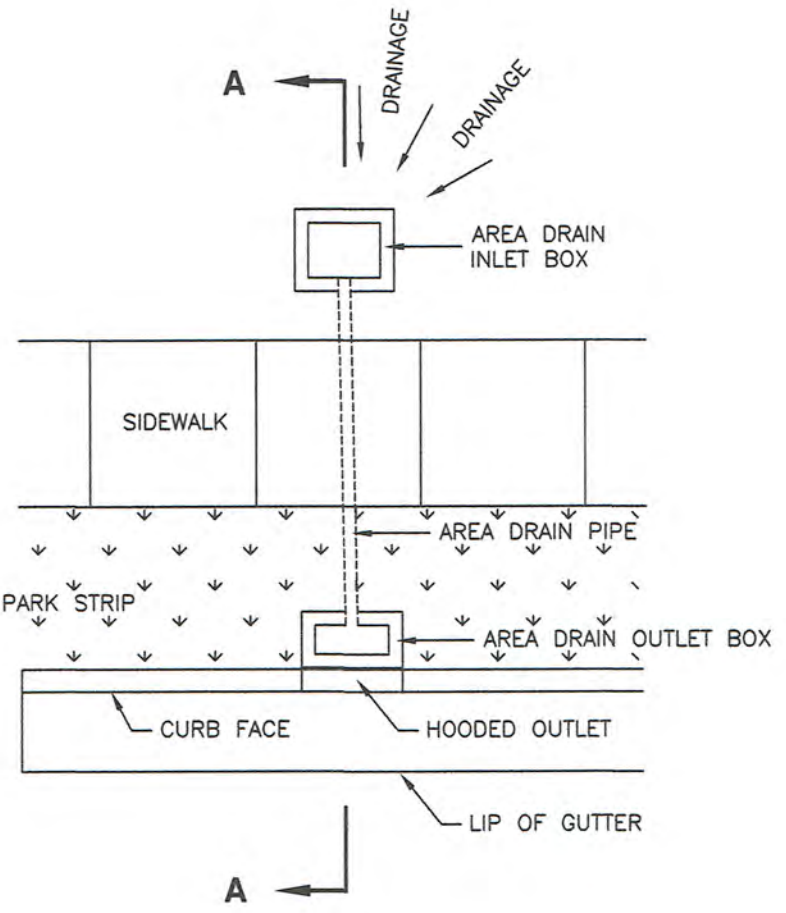
A. Provide an underground drainage system to convey drain water from areas back of sidewalk to the curb face.

2. PRODUCTS

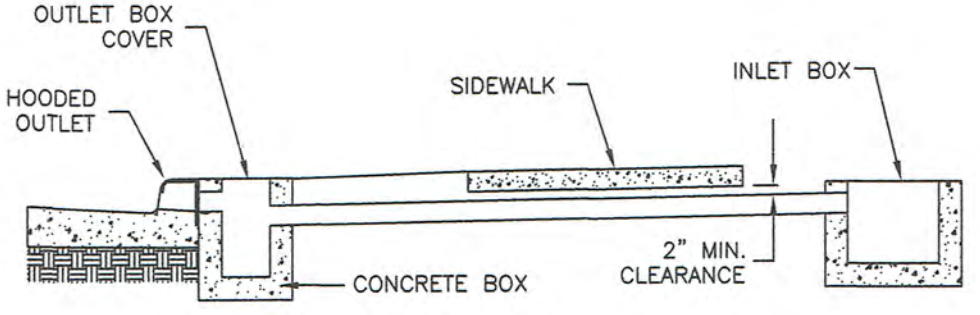
A. Concrete: Class 4000, APWA Section 03 30 04.
B. Backfill: Native soil.
C. Casting: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better.
D. Area Drain Pipe: PVC unless specified elsewhere.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
B. Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



PLAN



SECTION A-A

Concrete pier

1. GENERAL

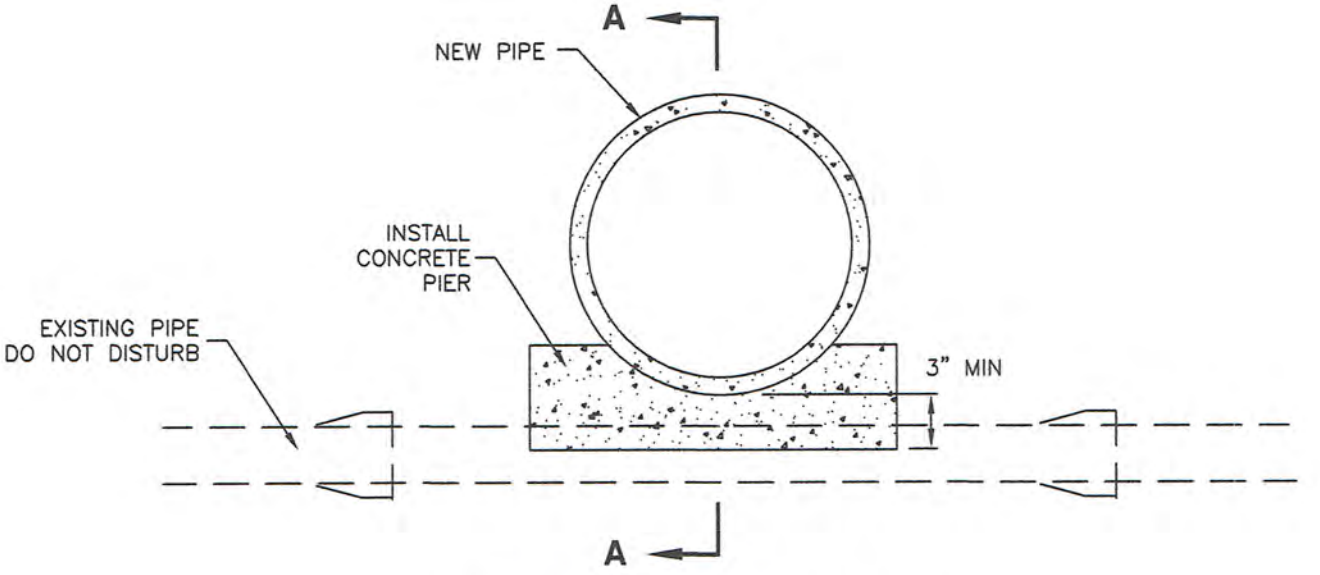
A. The purpose for providing piers is to protect the underlying pipeline from current and future loads imposed by the backfilling operation.

2. PRODUCTS

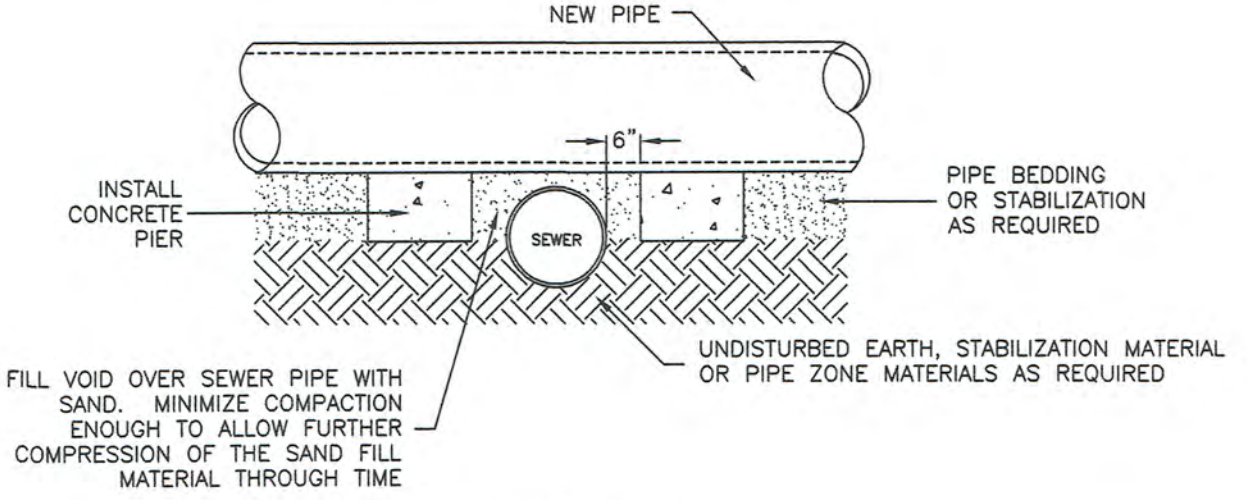
A. Sand: APWA Section 31 05 13.
B. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

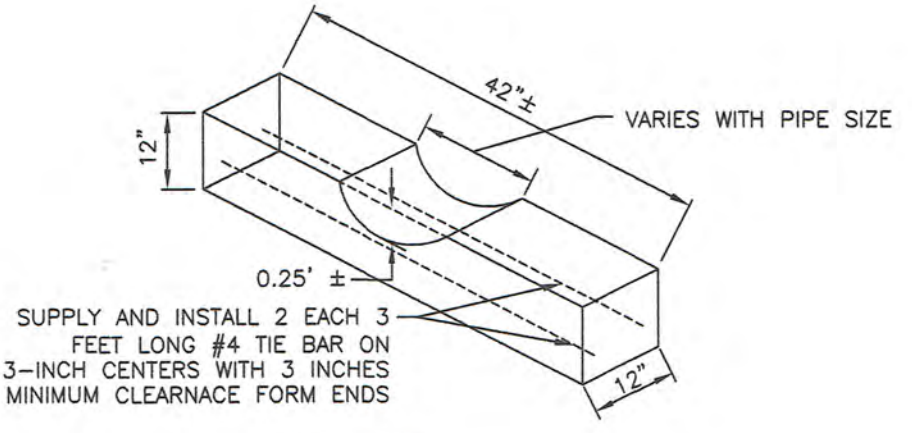
A. Use caution when crossing over buried pipeline or conduit.
B. Do not compact sand between pier installations.



CONCRETE PIER DETAILS



SECTION A-A



OBLIQUE

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Concrete pier

Plan
373
December 2010

Trench backfill

1. GENERAL

A. The drawing applies to backfilling a trench (and embankment) above the pipe zone.

2. PRODUCTS

A. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 3-inches.

B. Flowable Fill: APWA Section 31 05 15. Target is 60 psi in 28 days with 90 psi maximum in 28 days, It must flow easily requiring no vibration for consolidation.

3. EXECUTION

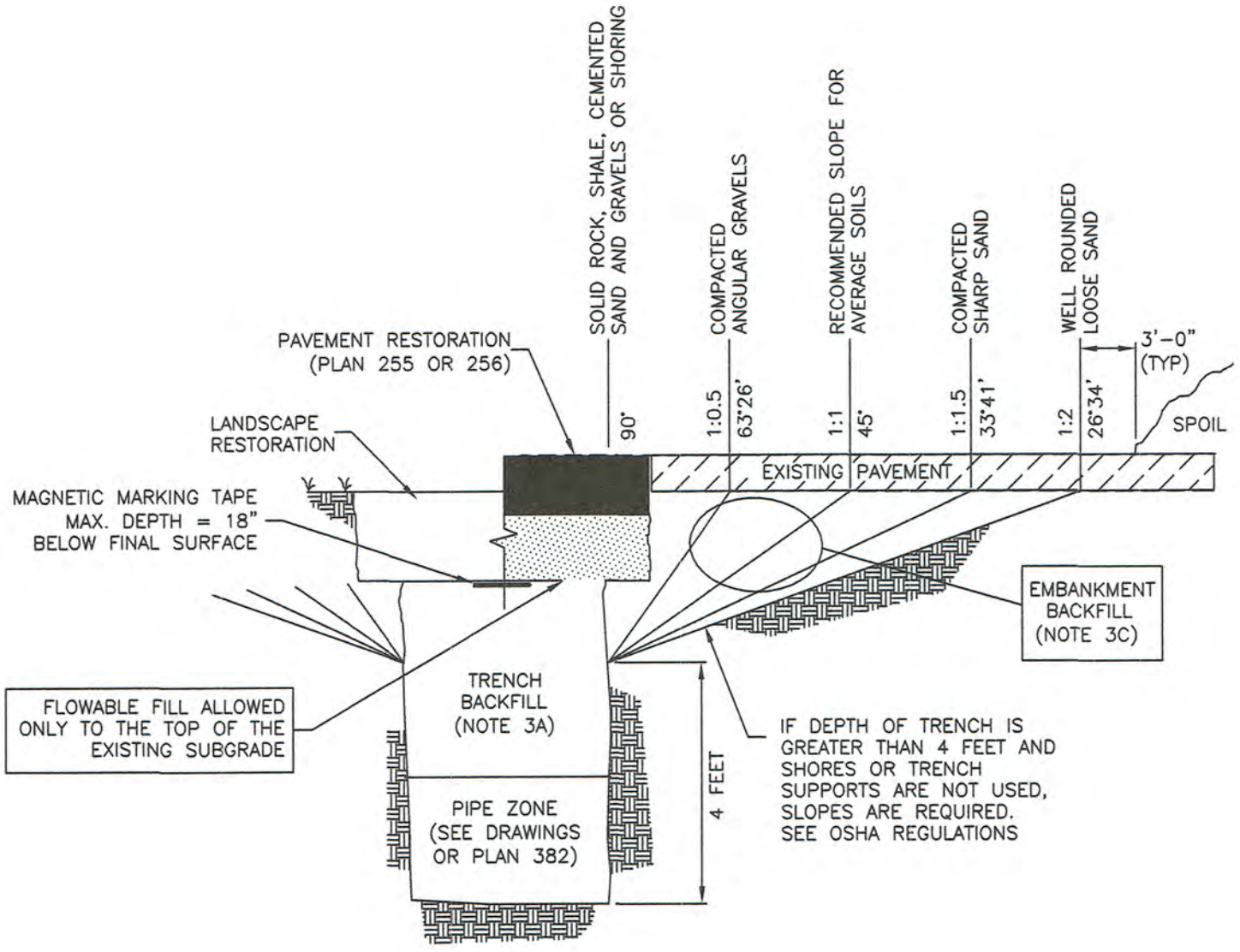
A. Trench Backfill Above the Pipe Zone: Follow requirement indicated in APWA Section 33 05 20 and the following provisions. See Standard Plan 382 for backfilling the pipe zone.
   1) DO NOT USE sewer rock, pea gravel, or recycled RAP aggregate as trench backfill.
   2) Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.
   3) Water jetting is NOT allowed.

B. Flowable Fill: If controlled low strength material is placed in the trench. Cure the material before placing surface restorations.

C. Embankment Backfill: When trench sides are sloped proceed as follows.
   1) Maximum lift thickness is 8-inches before compaction.
   2) Compact per APWA Section 31 23 26 to 95 percent or greater relative to a standard proctor density.
   3) Submission of quality control compaction test result data may be requested by ENGINEER at any time. Provide results of tests immediately upon request.

D. Surface Restoration:
   1) Landscaped Surface: Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements. Rake to match existing grade. Replace vegetation to match pre-construction conditions.
   2) Paved Surface: Follow APWA Section 33 05 25 (bituminous pavement surfacing), or APWA Section 33 05 25 (concrete pavement surfacing). Do not install surfacing until compaction density is acceptable to ENGINEER. .

NARRATIVE: THIS PLAN SHOWS VARIOUS SLOPES RECOMMENDED FOR VARIOUS TYPES OF SLOPE STABILITY PROBLEMS. THE VERTICAL TEXT INDICATES VARIOUS MATERIALS THAT MAY BE ENCOUNTERED. THE SERVICES OF A PROFESSIONAL SOILS ENGINEER SHOULD BE USED TO VERIFY SLOPE STABILITY.



Pipe zone backfill

1. GENERAL

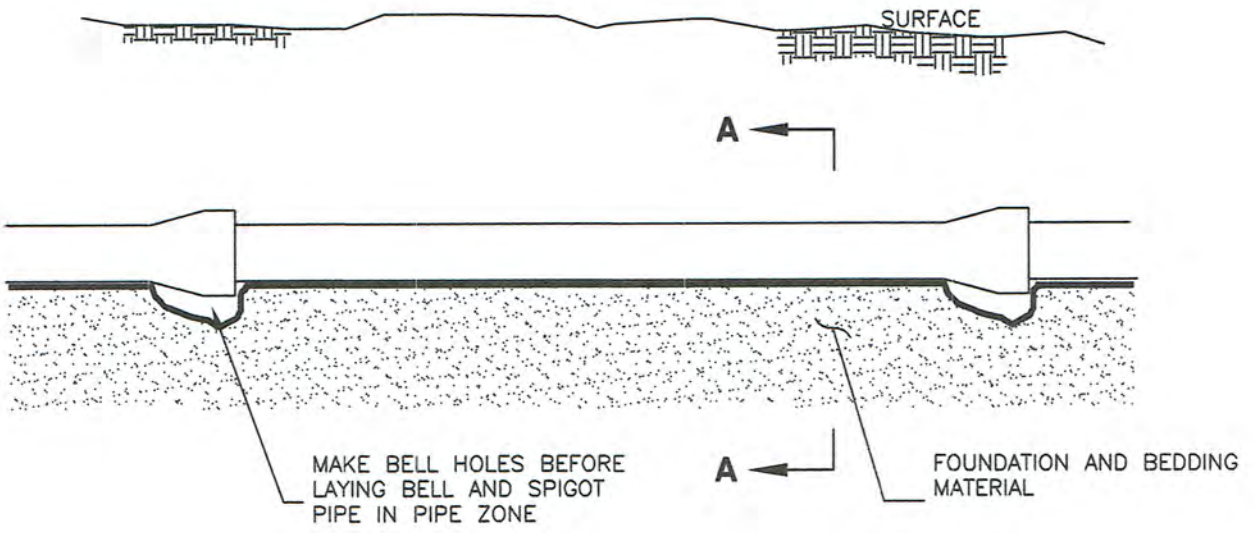
A. Install the pipe in the center of the trench or no closer than 6-inches from the wall of the pipe to the wall of the trench.

2. PRODUCTS

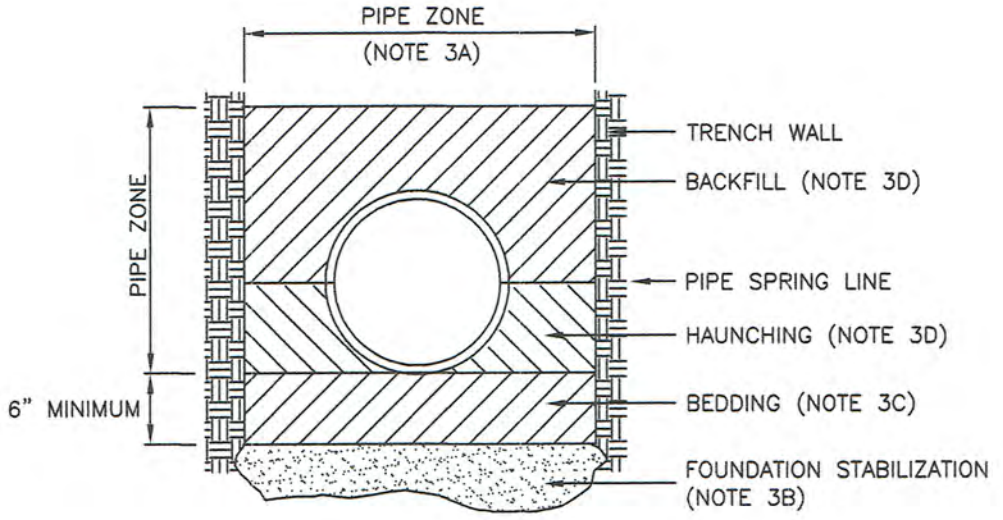
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: APWA Section 03 30 04.
D. Flowable Fill: Target is 60 psi in 28 days with 90 psi maximum in 28 days, APWA Section 31 05 15. It must flow easily requiring no vibration for consolidation.
E. Stabilization-Separation Geotextile: Moderate or high at CONTRACTOR's choice, APWA Section 31 05 19.

3. EXECUTION

A. Excavate the Pipe Zone: Width is measured at the pipe spring line and includes any necessary sheathing. Provide width recommended by pipe manufacturer. Follow manufacturer's recommendations when using trench boxes.
B. Foundation Stabilization: Get ENGINEER's permission before installing common fill. Vibrate to stabilize. Installation of stabilization-separation geotextile will be required to separate backfill material and native subgrade materials if common fill cannot provide a working surface or prevent soils migration.
C. Bedding: Follow APWA Section 33 05 20 requirements and the following provisions.
    1) Furnish untreated base course material unless specified otherwise by pipe manufacturer.
    2) Maximum lift thickness is 8-inches.
    3) Bedding immediately under the pipe should not be compacted, but loosely placed.
    4) Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
    5) When using concrete, provide at least Class 2,000, APWA Section 03 30 04.
D. Pipe Zone: DO NOT USE sewer rock, pea gravel, or recycled RAP aggregate in the pipe zone. Water jetting is NOT allowed.
    1) Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26 unless pipe manufacturer requires more stringent installation.
    2) Submission of quality control compaction test result data developed for the haunch zone may be requested by ENGINEER at any time. CONTRACTOR is to provide results of tests immediately upon request.
E. Flowable Fill (when required and if allowed by pipe manufacturer):
    1) Place the controlled low strength material, APWA Section 31 05 15.
    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.



ELEVATION VIEW



SECTION A-A

INSTALLATION

CONCRETE PIPE: FOLLOW ASTM C 1479
"STANDARD PRACTICE FOR INSTALLATION OF PRECAST CONCRETE SEWER, STORM DRAIN, AND CULVERT PIPE USING STANDARD INSTALLATIONS.

PLASTIC 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.

Abbreviations and symbols for sewer

1. GENERAL

A. Lettering Size: 10 point at final production.
B. Lettering Style. Capital letters preferred.
C. Existing Improvements. Shown in light shaded dashed line.
D. New Improvements. Shown in solid continuous line.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOLS	DEFINITIONS
	CENTER LINE
15+00	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
X X	FENCE
4250	CONTOUR LINE
4250.0	CONTOUR ELEVATION
	BANK SLOPES
SD	STORM DRAIN LINE
W	WATER LINE
G	GAS LINE
T	TELEPHONE CABLE
E	ELECTRIC CABLE
SS	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
WM	WATER METER
MH	MANHOLE
CB	CATCH BASIN
COB	CLEANOUT BOX
	POLE AND ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
BM NO. 46 ELEV. 4256.50	BENCH MARK
	SIGN
PP	POWER POLE
TP	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.

PROFILE

	GROUND PROFILE
ROUND ARCH BOX	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUND WATER ELEVATION

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

30" Frame and cover

1. GENERAL

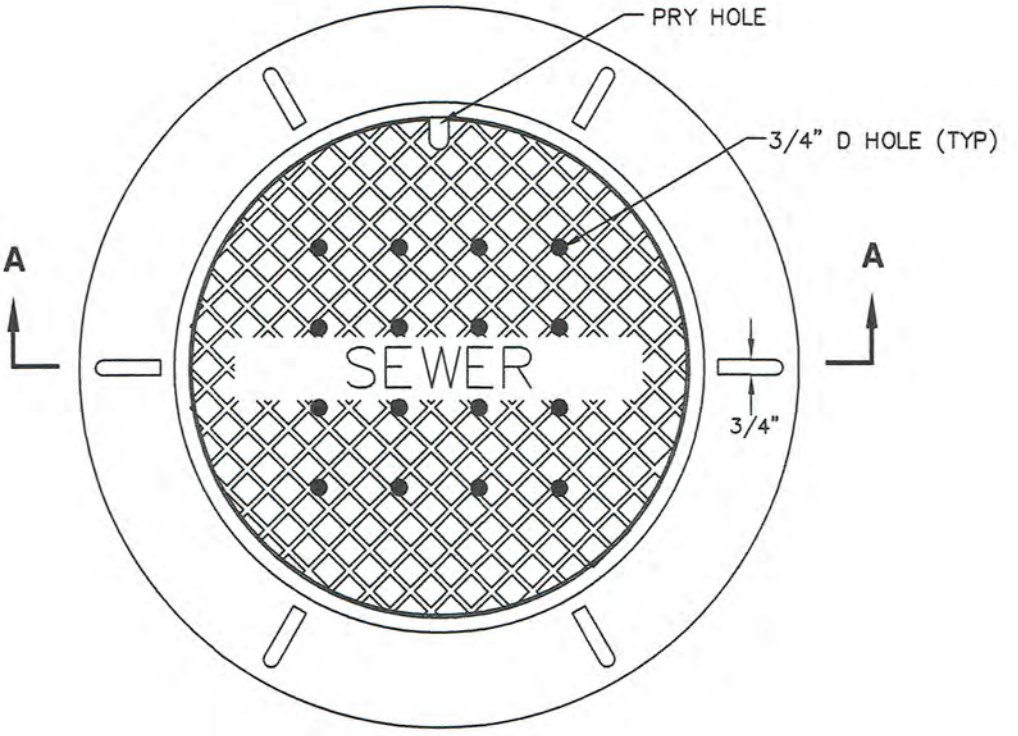
A. The frame and cover fits the manhole in Plan 411.

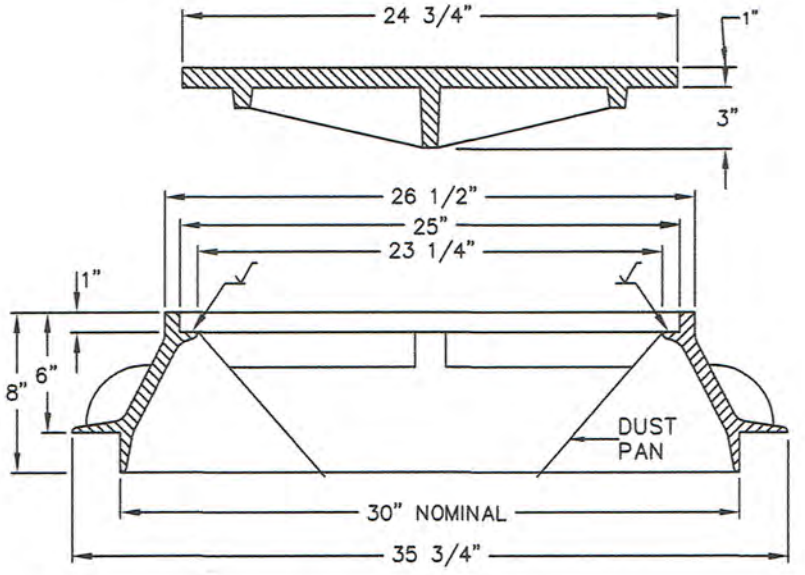
2. PRODUCTS

A. Castings: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better (except on machined surfaces).
   1) Cast the heat number on the frame and cover.
   2) Give the frame and cover a machine finish so the cover will not rock.
   3) √ designates machined surface.
   4) Cast the words “SEWER" on the cover in upper case flush with the surface finish.

3. EXECUTION

A. Except in paved streets, provide locking manhole covers in easements, alleys, parking lots, and all other places. 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.


PRY HOLE
3/4" D HOLE (TYP)
A
A
SEWER
3/4"


24 3/4"
1"
3"
26 1/2"
25"
23 1/4"
1"
8"
6"
DUST
PAN
30" NOMINAL
35 3/4"

SECTION A-A

Sanitary sewer manhole

1. GENERAL

A. The drawing shows typical pipe connections. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering pipe connection to the manhole.

B. Manhole size.
   1) Diameter is 4 feet: For sewers under 12" diameter.
   2) Diameter is 5 feet: For sewers 12" and larger, or when 3 or more pipes intersect the manhole.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.

B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.

C. Concrete: Class 4000, APWA Section 03 30 04.

D. Riser and Reducing Riser: ASTM C478.

E. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

F. Grout: 2 parts sand to 1 part cement mortar, ASTM C1329.

G. Stabilization-Separation Geotextile: Moderate or high at CONTRACTOR's choice, APWA Section 31 05 19.

3. EXECUTION

A. Foundation Stabilization: Get ENGINEER's permission to use a sewer rock or a granular backfill borrow in a geotextile wrap to stabilize an unstable foundation.

B. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

C. Invert Cover. During construction, place invert covers over the top of pipe in manholes that currently convey sewerage. See Plan 412.

D. Pipe Connections: Grout around all pipe openings.

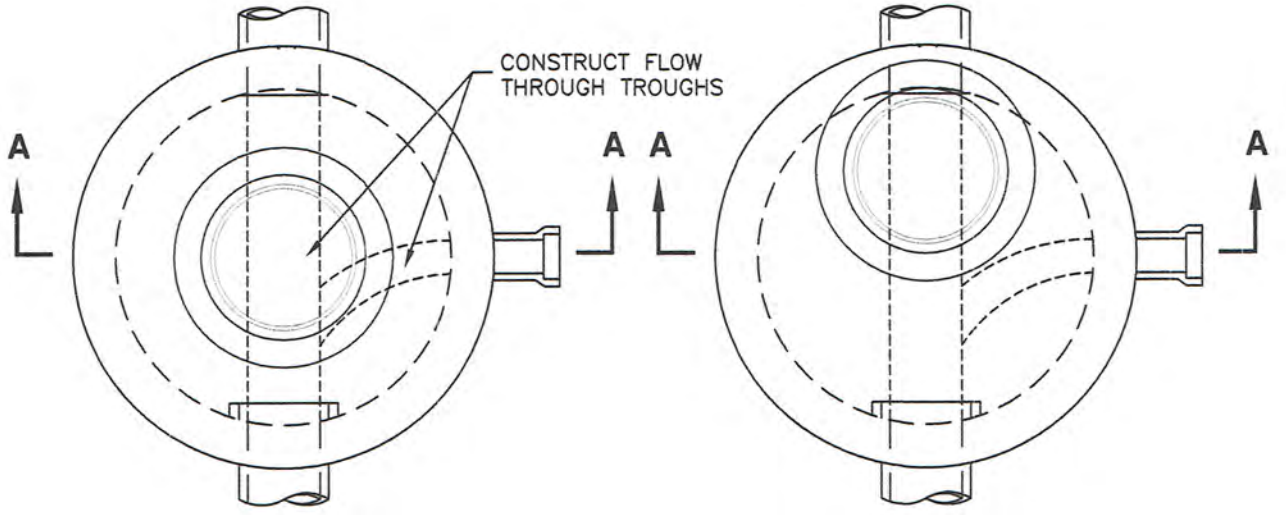
E. Pipe Seal: Install rubber-based pipe seals on all plastic pipes when connecting plastic pipes to manholes. Hold water-stop in place with stainless steel bands.

F. Joints: Place flexible gasket-type sealant in all riser joints. Finish with grout.

G. Adjustment: If the required manhole adjustment is more than 1'-0", remove the cone and grade rings and adjust the manhole elevation with the appropriate manhole section, the cone section, and the grade rings or plastic form to make frame and lid match finish grade.

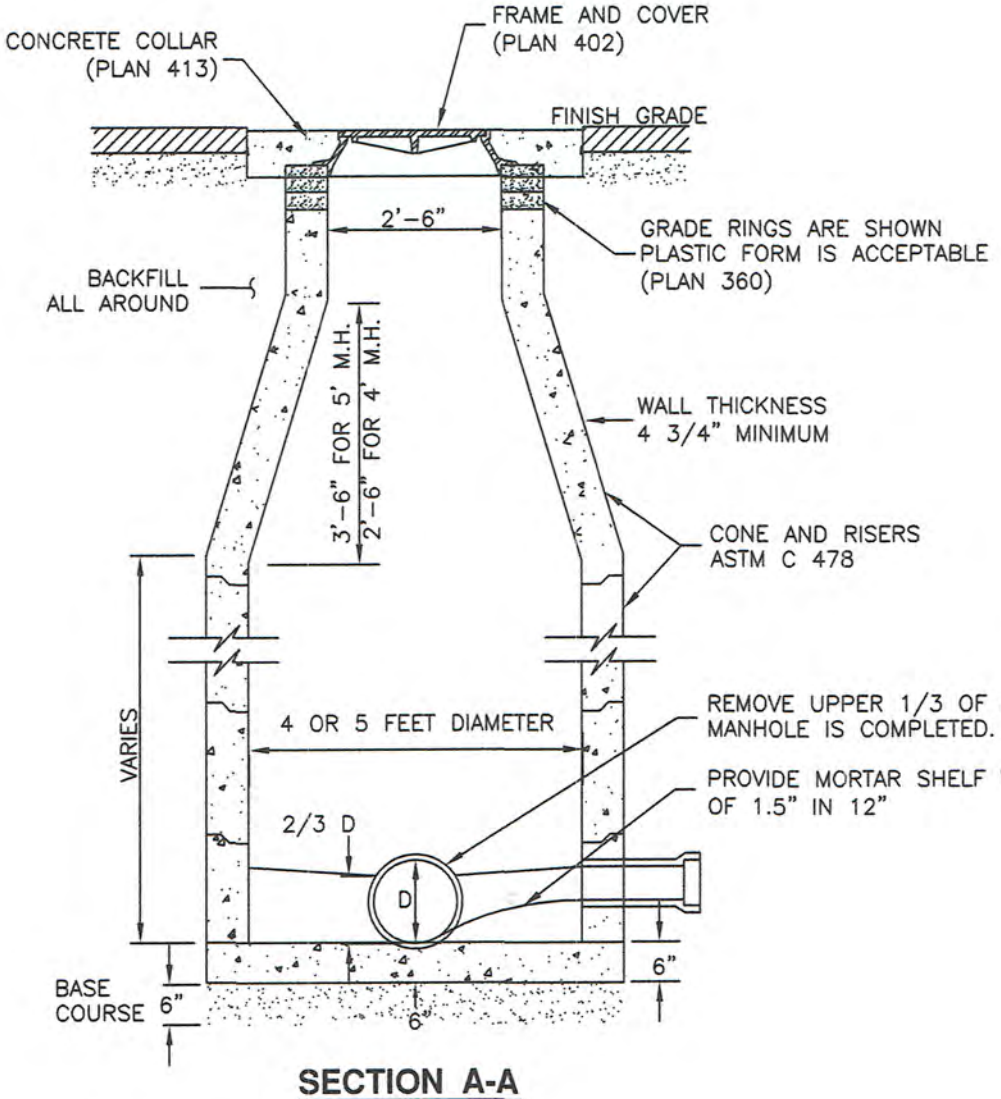
H Finish: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.

I. Backfill: Provide backfill against the manhole shaft. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.

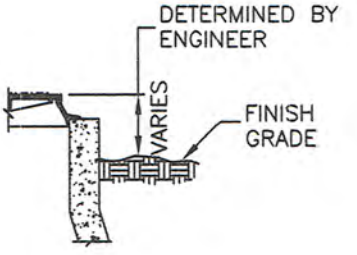


PLAN
(CONCENTRIC RISER)

PLAN
(ECCENTRIC RISER)



SECTION A-A



DETAIL
(UNIMPROVED AREAS)

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Sanitary sewer manhole

Plan
411
April 2011

Invert cover

1. GENERAL

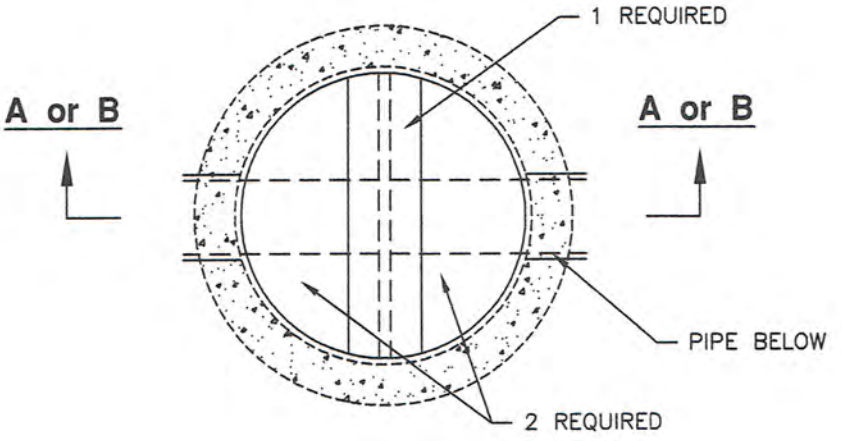
A. Invert covers are installed to prevent debris from entering the inflow or outflow pipes during construction.

2. PRODUCTS

A. Plywood: 5/8" thick exterior grade, APWA Section 06 10 00.

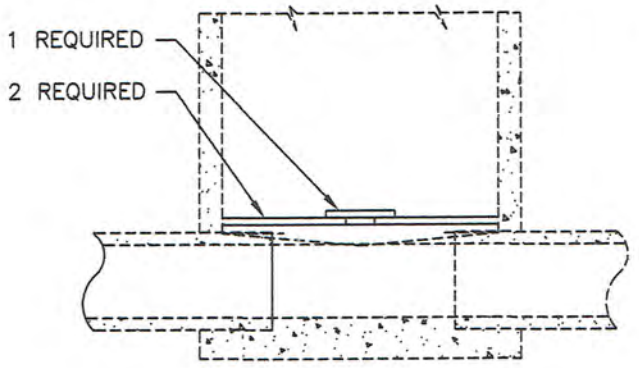
3. EXECUTION

A. Option 1: Install invert cover over manhole shelf.
B. Option 2: If a pipe enters above the mainline pipe, install 2' x 4" bracing to raise invert cover above top of the highest pipe inlet. Install solid bracing attached to wall.
C. If manhole is not round, cut invert cover to match shape.
D. Do not interfere with flow in pipeline.
E. Nail all three pieces of each invert cover securely together.



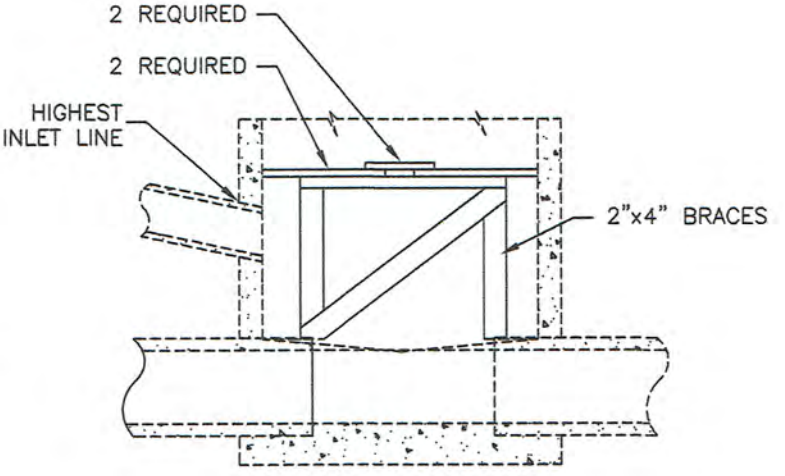
PLAN

(INVERT COVER IN PLACE)



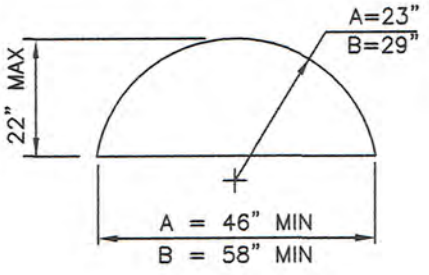
SECTION A-A

OPTION 1

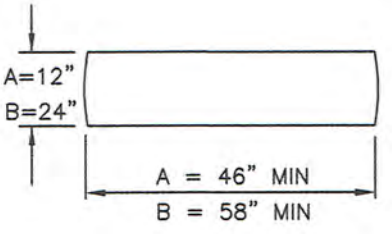


SECTION B-B

OPTION 2



2 REQUIRED



1 REQUIRED

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

Cover collar for sanitary sewer manhole

1. GENERAL

A. In a pavement surface, the concrete will support the frame under traffic loadings.

2. PRODUCTS

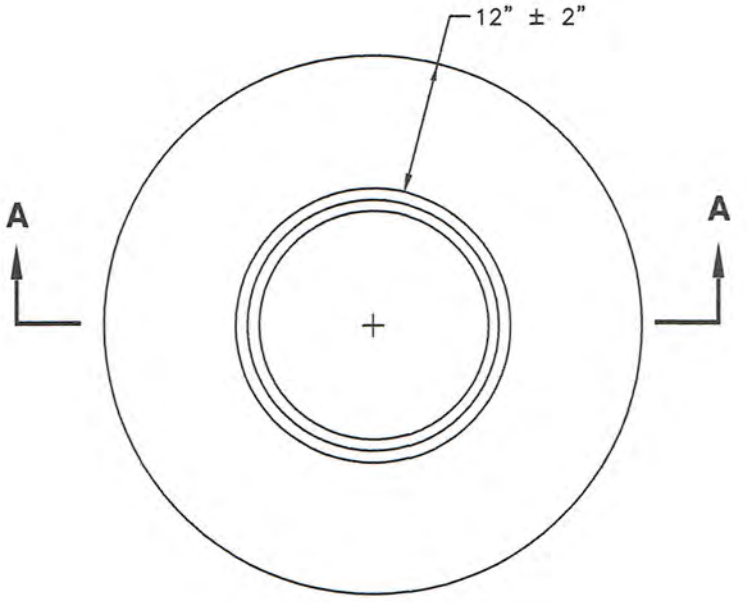
A. Concrete: Class 4000, APWA Section 03 30 04.

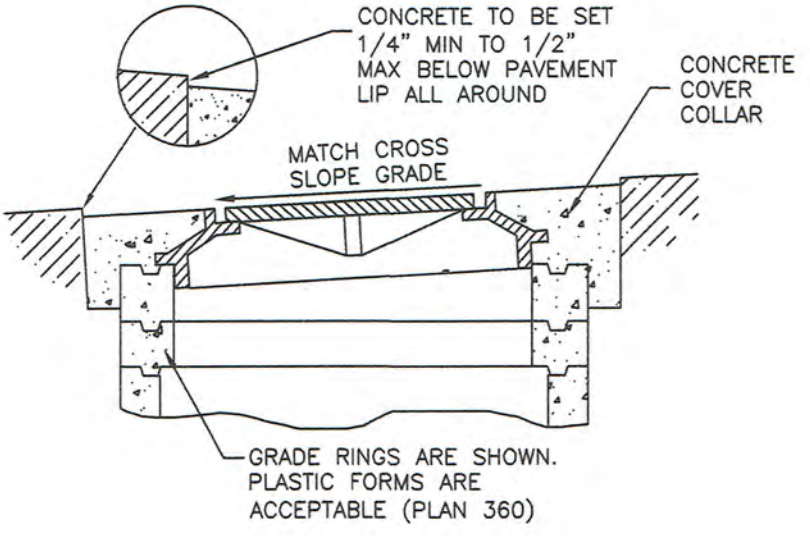
B. Concrete Curing Agent: Type ID Class A (clear with fugitive dye), membrane forming compound, APWA Section 03 39 00.

3. EXECUTION

A. Pavement Preparation: Provide a neat vertical and concentric joint between the concrete collar and the bituminous pavment surface. Clean edges of all dirt, oil, and loose debris.

B. Concrete Placement: Fill the annular space around the frame and cover casting with concrete. Apply a broom finish. Apply a curing agent.


12" ± 2"
A
A


CONCRETE TO BE SET
1/4" MIN TO 1/2"
MAX BELOW PAVEMENT
LIP ALL AROUND
CONCRETE
COVER
COLLAR
MATCH CROSS
SLOPE GRADE
GRADE RINGS ARE SHOWN.
PLASTIC FORMS ARE
ACCEPTABLE (PLAN 360)

SECTION A-A

Sewer lateral connection

1. GENERAL

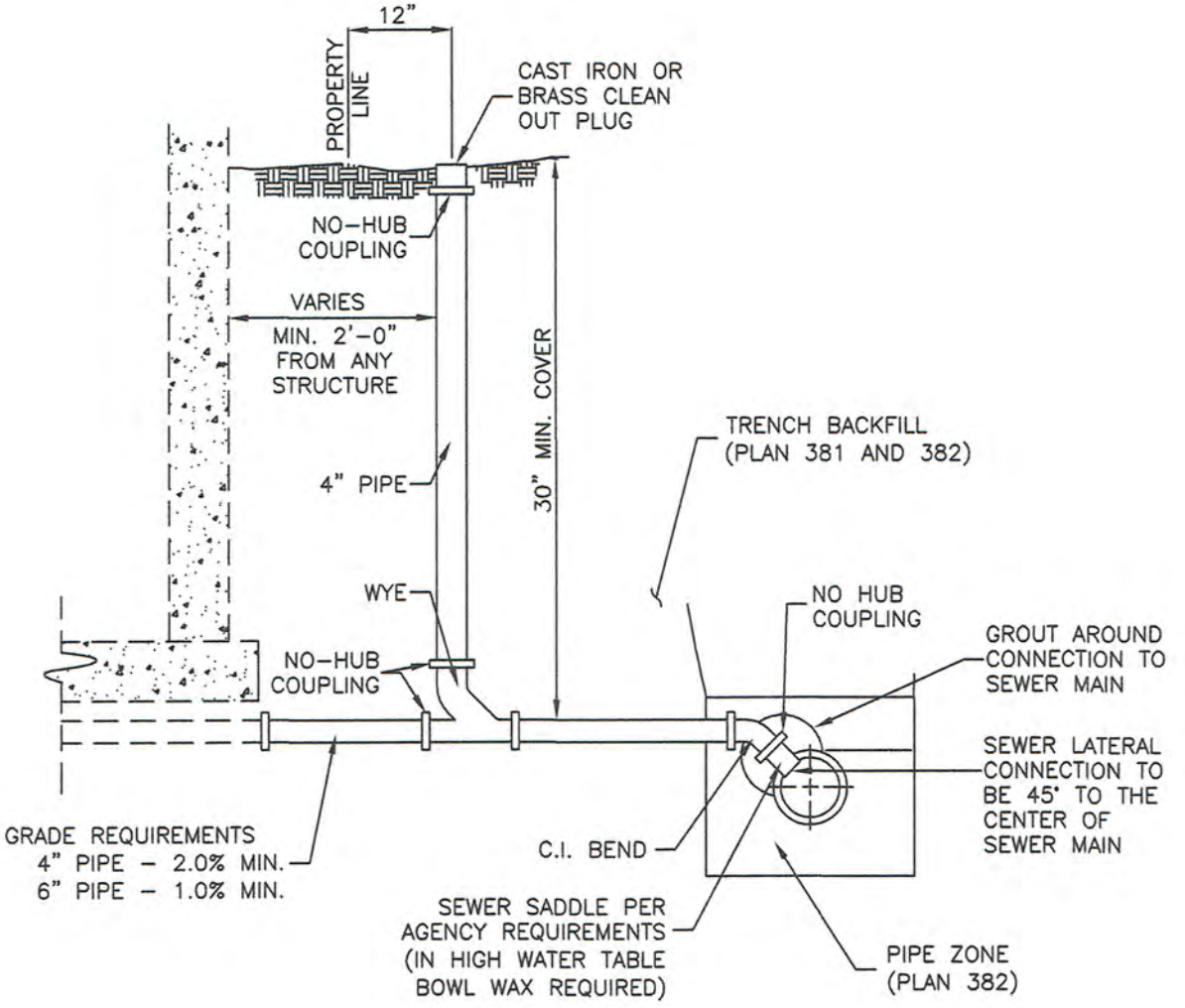
A. Before installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
B. Before backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.
C. Verify if CONTRACTOR or agency is to install the wye.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Provide agency approved wye or tee with appropriate donut.
D. Stainless steel straps required.

3. EXECUTION

A. Tape wrap pipe as required by soil conditions.
B. Remove core plug from sewer main. Do not break into sewer main to make connection.
C. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.


12"
PROPERTY LINE
CAST IRON OR BRASS CLEAN OUT PLUG
NO-HUB COUPLING
VARIES
MIN. 2'-0" FROM ANY STRUCTURE
4" PIPE
30" MIN. COVER
TRENCH BACKFILL (PLAN 381 AND 382)
WYE
NO HUB COUPLING
GROUT AROUND CONNECTION TO SEWER MAIN
NO-HUB COUPLING
SEWER LATERAL CONNECTION TO BE 45° TO THE CENTER OF SEWER MAIN
GRADE REQUIREMENTS
4" PIPE - 2.0% MIN.
6" PIPE - 1.0% MIN.
C.I. BEND
SEWER SADDLE PER AGENCY REQUIREMENTS (IN HIGH WATER TABLE BOWL WAX REQUIRED)
PIPE ZONE (PLAN 382)

Sewer lateral relocation

1. GENERAL

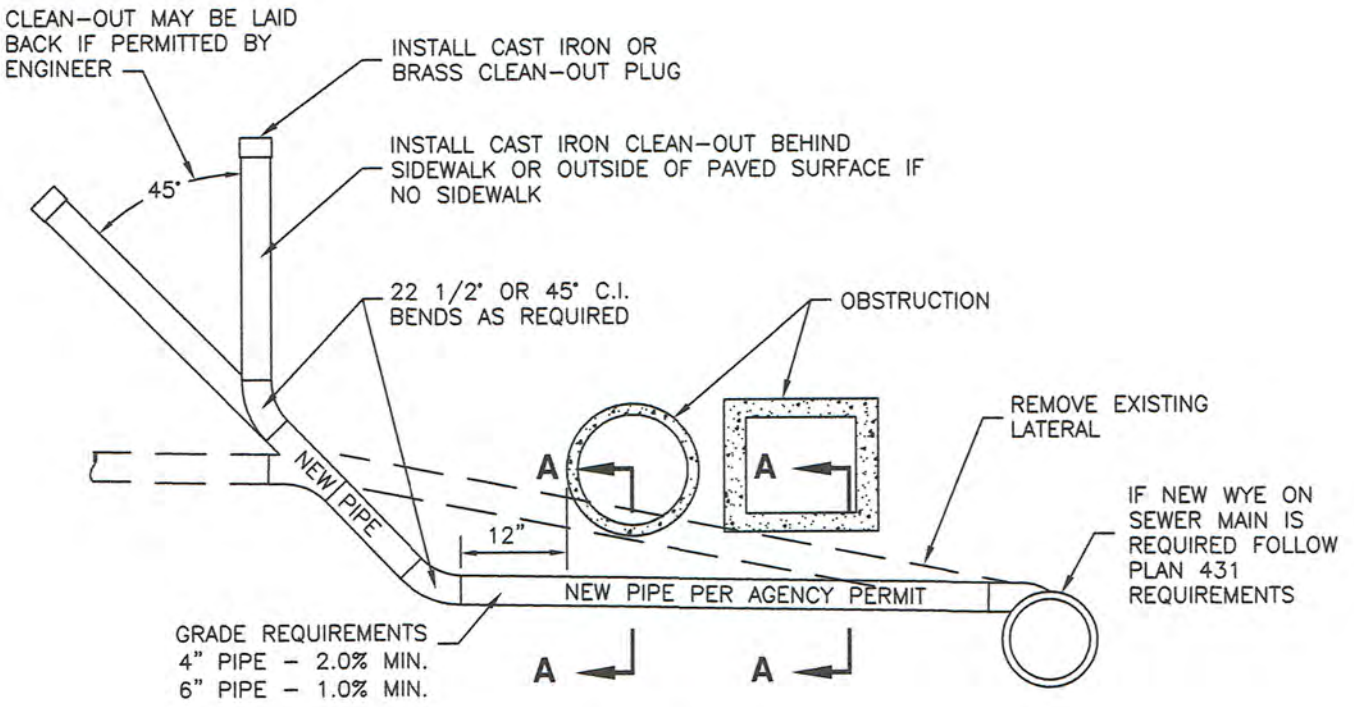
A. Before installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
B. Before backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.
C. Verify if CONTRACTOR or agency is to install the wye or donut.

2. PRODUCTS

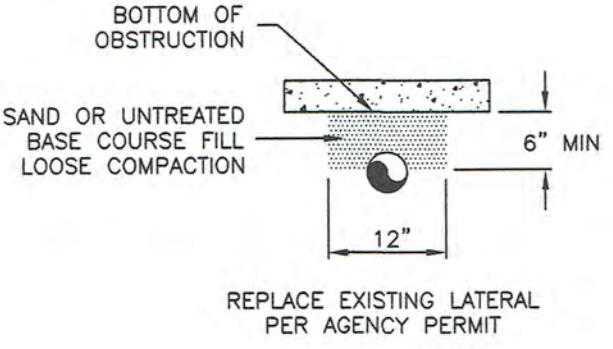
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Provide agency approved wye or tee with appropriate donut.

3. EXECUTION

A. Tape wrap metal pipe and metal fittings.
B. Do not install couplings under the obstruction.
C. Under the obstruction, loosely compact granular material or sand. Flowable fill not allowed.
D. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



SECTION



SECTION A-A

Pipe drop

1. GENERAL

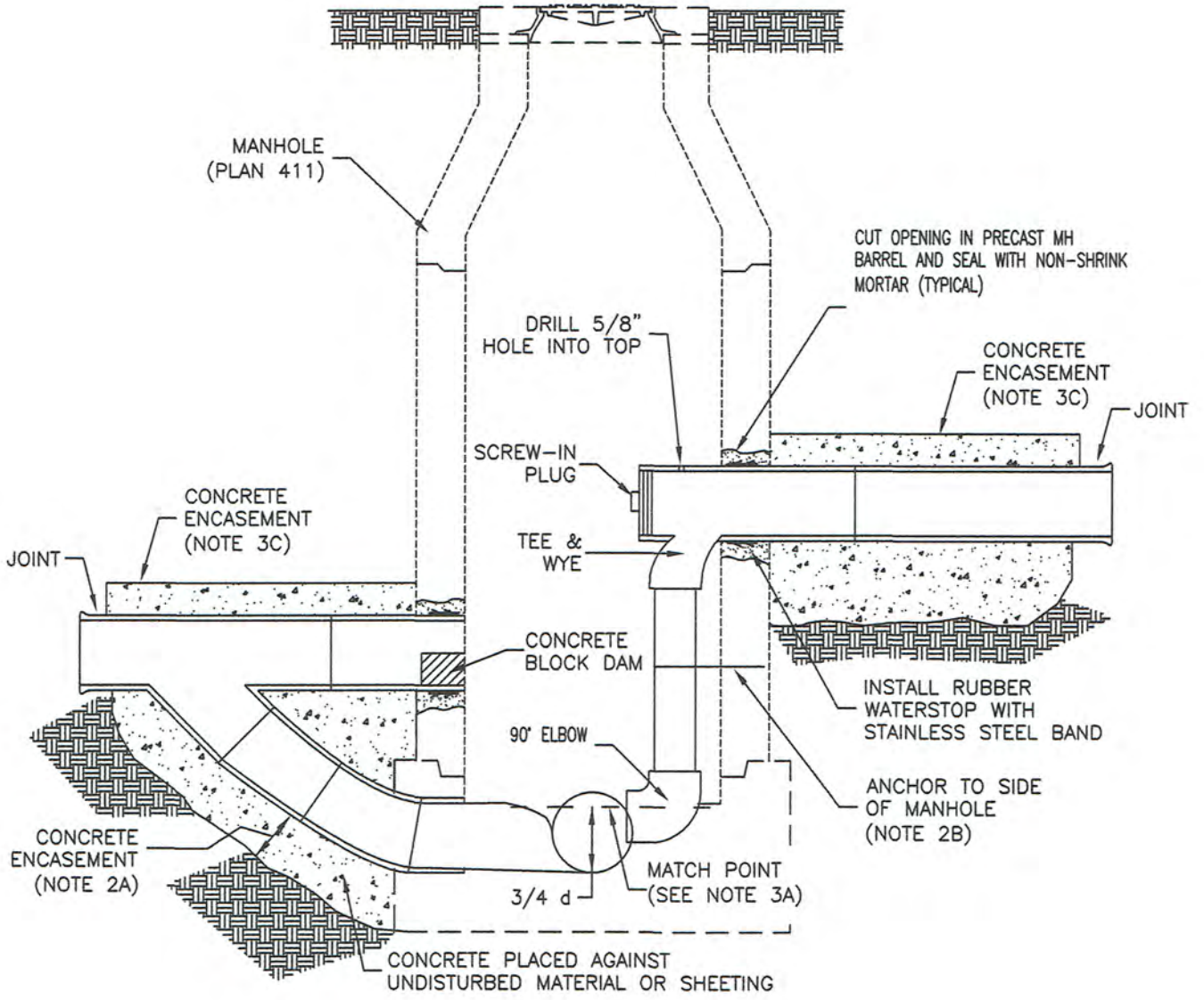
A. Only one drop pipe is allowed inside the manhole.
B. Size of drop pipe is to be the same diameter as sewer mainline pipe that it serves.

2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.
B. Anchors: Use stainless steel anchors that are acceptable to ENGINEER.

3. EXECUTION

A. At the match point, match the 3/4 diameter points of the pipes.
B. If the drop is more than 18-inches, anchor the riser to the wall every 12-inches.
C. Extend concrete encasement to first joint beyond excavation for drop connection.


MANHOLE
(PLAN 411)
CUT OPENING IN PRECAST MH
BARREL AND SEAL WITH NON-SHRINK
MORTAR (TYPICAL)
DRILL 5/8"
HOLE INTO TOP
CONCRETE
ENCASEMENT
(NOTE 3C)
JOINT
SCREW-IN
PLUG
CONCRETE
ENCASEMENT
(NOTE 3C)
JOINT
TEE &
WYE
CONCRETE
BLOCK DAM
INSTALL RUBBER
WATERSTOP WITH
STAINLESS STEEL BAND
90° ELBOW
ANCHOR TO SIDE
OF MANHOLE
(NOTE 2B)
CONCRETE
ENCASEMENT
(NOTE 2A)
3/4 d
MATCH POINT
(SEE NOTE 3A)
CONCRETE PLACED AGAINST
UNDISTURBED MATERIAL OR SHEETING
ALTERNATE 1
SHALLOW DROP (TYP)
ALTERNATE 2
DEEP DROP (TYP)

SECTION

Grease trap

1. GENERAL

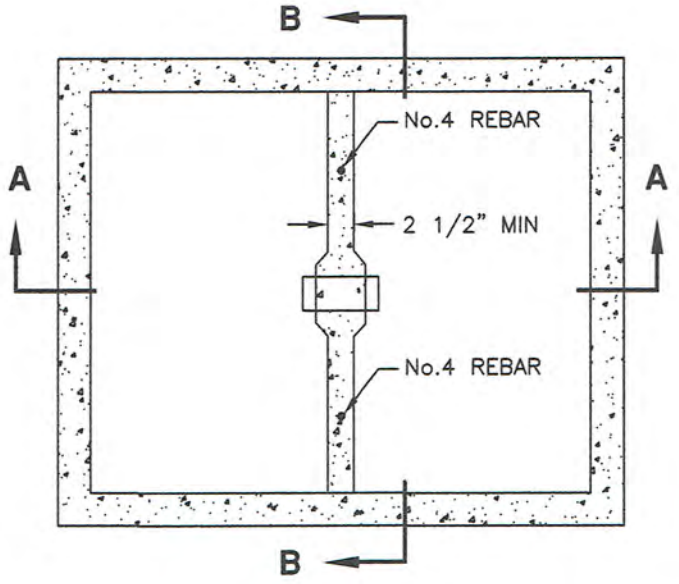
A. Before backfilling around concrete box, secure inspection of installation by ENGINEER.

2. PRODUCTS

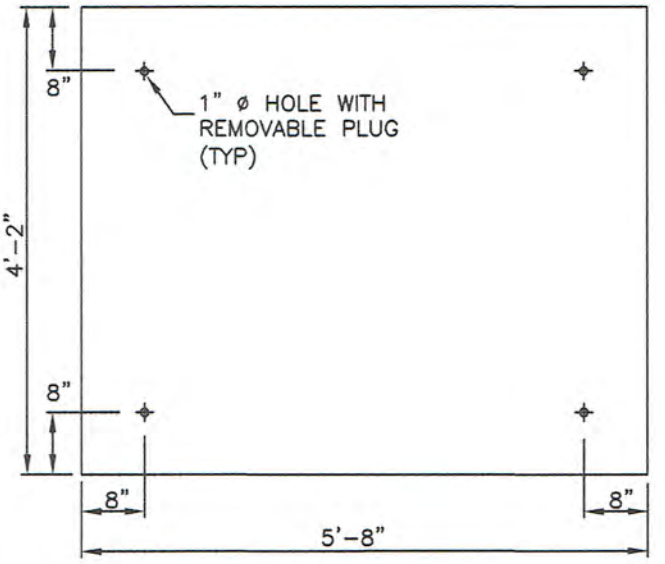
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. PVC Pipe: APWA Section 33 05 07.

3. EXECUTION

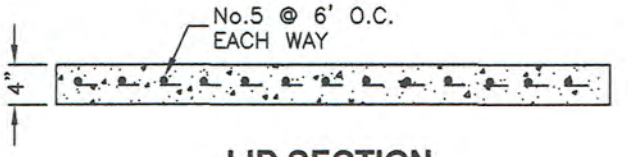
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness it 6-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Reinforcement Placement: APWA Section 03 20 00.
C. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
D. Fill annular space around pipe wall penetrations with waterproof sealer.
E. Backfill: Provide backfill against the box walls. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



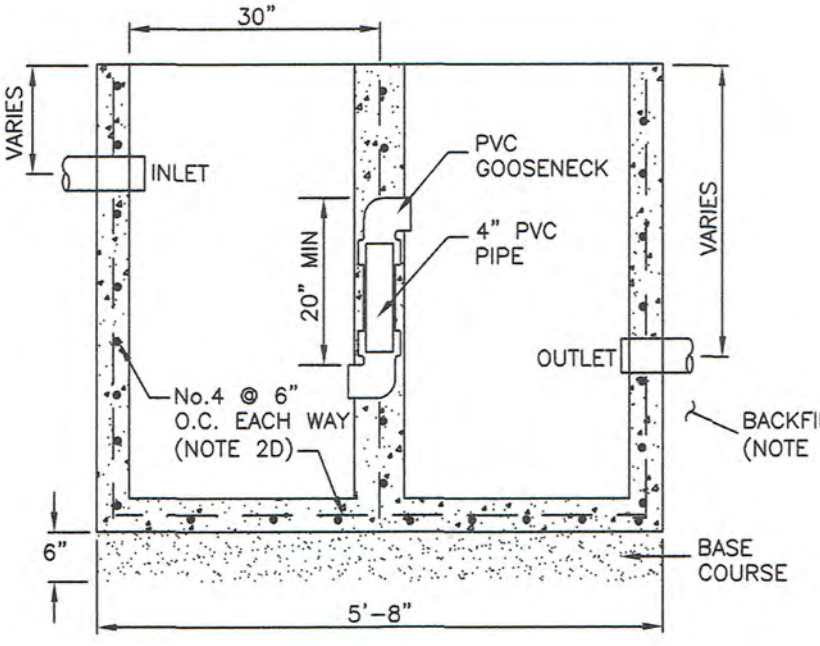
BOX PLAN



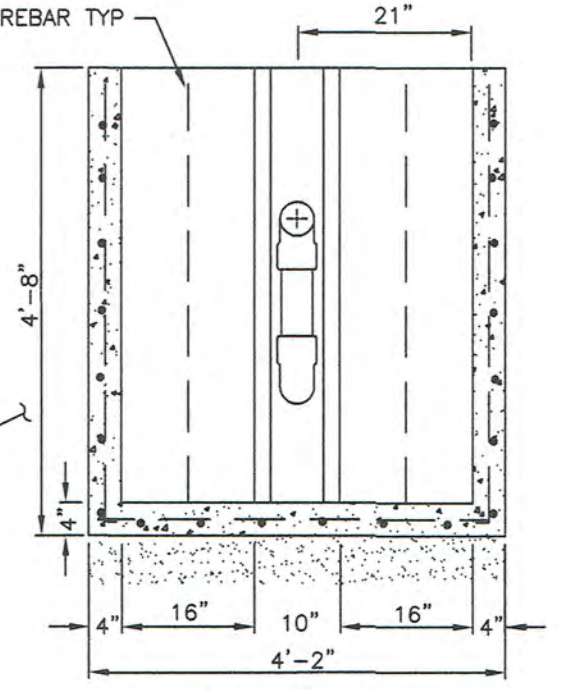
LID PLAN



LID SECTION



SECTION A-A



SECTION B-B

Abbreviations and symbols for water

1. GENERAL

A. Lettering Size: 10 point at final production.
B. Lettering Style. Capital letters preferred.
C. Existing Improvements. Shown in light shaded dashed line.
D. New Improvements. Shown in solid continuous line.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOLS	DEFINITIONS
	CENTER LINE
15+00	CONSTRUCTION CENTER LINE
	PROPERTY OR R/W LINE
	EASEMENT LINE
	MONUMENT LINE
X X	FENCE
4250	CONTOUR LINE
4250.0	CONTOUR ELEVATION
	BANK SLOPES
SD	STORM DRAIN LINE
W	WATER LINE
G	GAS LINE
T	TELEPHONE CABLE
E	ELECTRIC CABLE
SS	SANITARY SEWER LINE
	ASPHALT PAVING
	FIRE HYDRANT
	WATER VALVE
WM	WATER METER
MH	MANHOLE
CB	CATCH BASIN
COB	CLEANOUT BOX
	POLE AND ANCHOR
	STREET LIGHT
	UNDISTURBED EARTH
	STRUCTURE

SYMBOLS	DEFINITIONS
	CURB & GUTTER
	SIDEWALK
	RAILROAD TRACKS
	GUARD RAIL
	OPEN DITCH, CANAL
	CULVERT
	SECTION CORNER
	SOIL BORING
	MONUMENT
BM NO. 46 ELEV. 4256.50	BENCH MARK
	SIGN
PP	POWER POLE
TP	TELEPHONE POLE
	DECIDUOUS TREE
	CONIFEROUS TREE
	P.I.
	P.C. OR P.T.

	PROFILE
	GROUND PROFILE
ROUND ARCH BOX	CULVERT
	P.V.I.
	P.V.C. OR P.V.T.
	GROUND WATER ELEVATION

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

27" Frame and cover

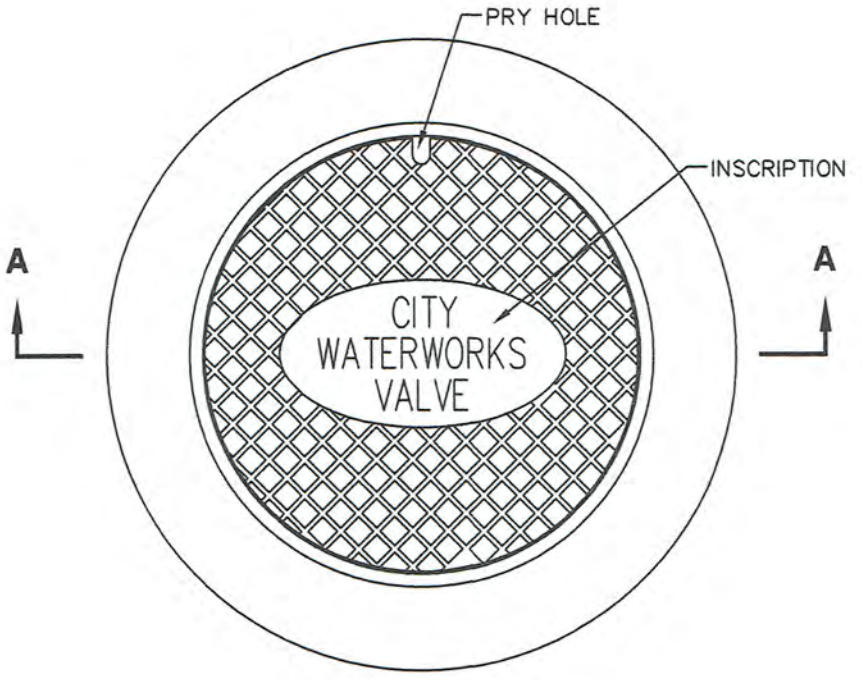
1. GENERAL

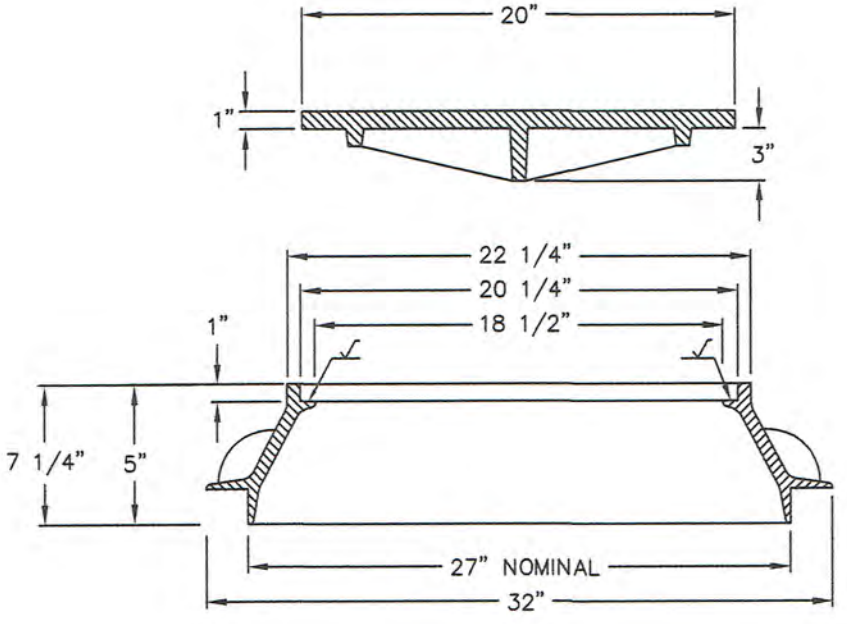
A. This frame and cover fits manholes in Plan 505.

2. PRODUCTS

A. Castings: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better (except on machined surfaces).
   1) Cast the heat number on the frame and cover.
   2) Give the frame and cover a machine finish so the cover will not rock.
   3) √ designates machined surface.
   4) Cast the name of the agency or its acronym as the first line. Cast the work "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.

3. EXECUTION (Not used)


PRY HOLE
INSCRIPTION
A
A
CITY
WATERWORKS
VALVE


20"
1"
3"
22 1/4"
20 1/4"
18 1/2"
1"
7 1/4"
5"
27" NOMINAL
32"

SECTION A-A

38" Frame and double cover

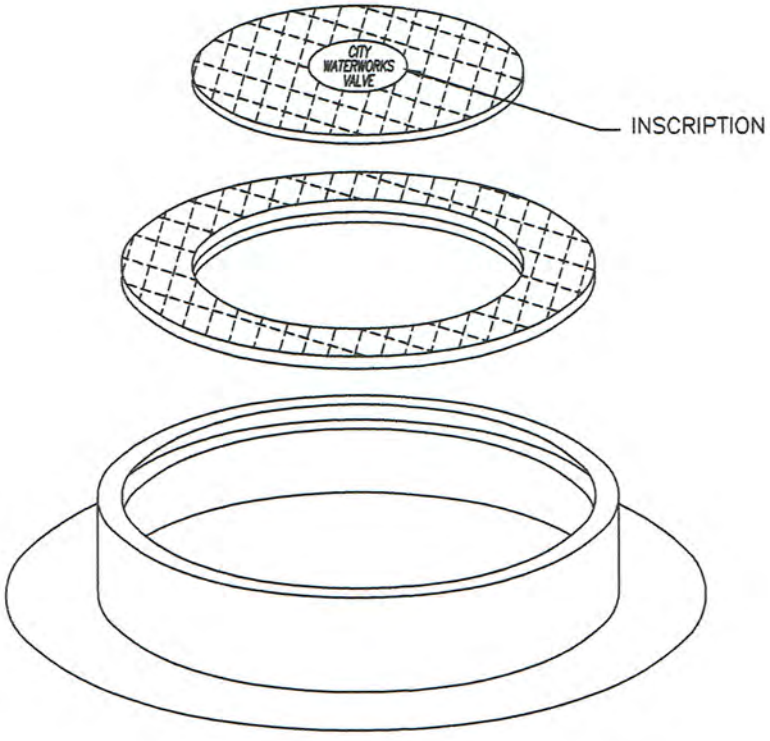
1. GENERAL

A. This frame and cover fits manholes in Plan 505.

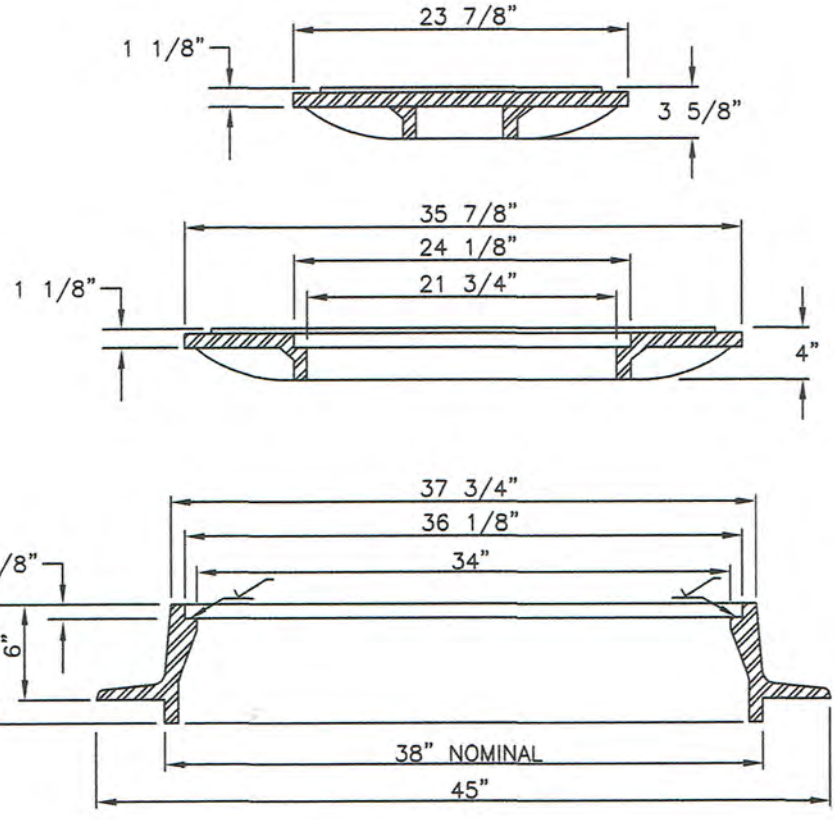
2. PRODUCTS

A. Castings: Grey iron class 35 minimum, ASTM A48, coated with asphalt based paint or better (except on machined surfaces).
   1) Cast the heat number on the frame and cover.
   2) Give the frame and cover a machine finish so the cover will not rock.
   3) √ designates machined surface.
   4) Cast the name of the agency or its acronym as the first line. Cast the work "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.

3. EXECUTION (Not used)



OBLIQUE



SECTION

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

38" Frame and double cover

Plan
503
April 1997

Concrete meter boxes

1. GENERAL

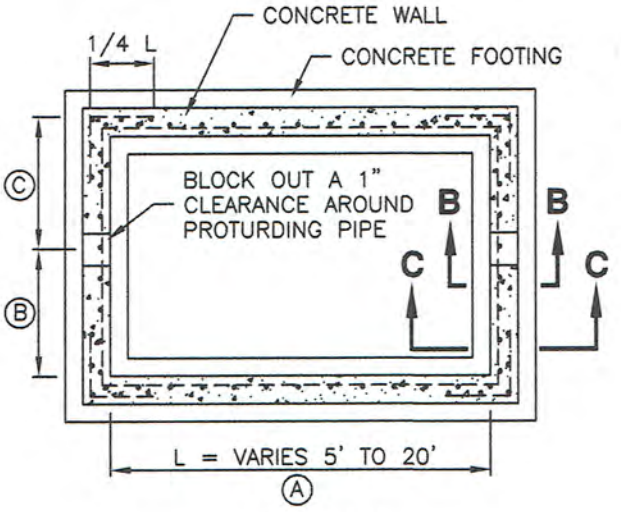
A. Before backfilling secure inspection of installation by ENGINEER.

2. PRODUCTS

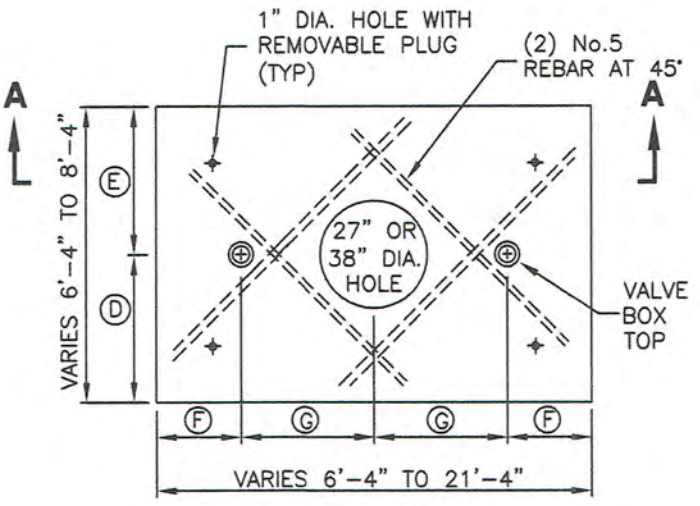
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04. Use type II cement (low alkali).
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.

3. EXECUTION

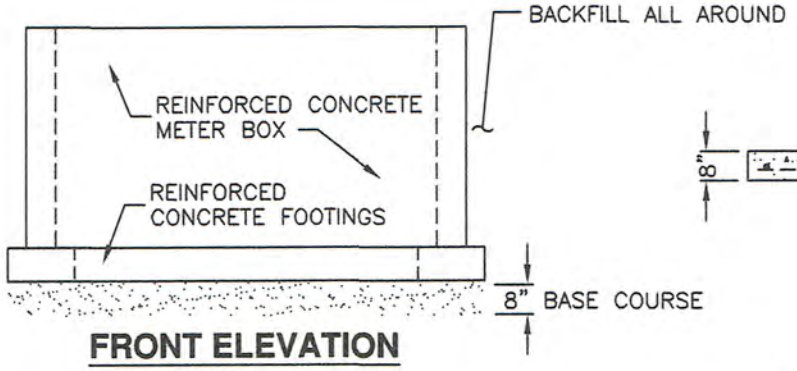
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Fill annular space around pipe wall penetrations with waterproof sealer.
D. Place frame and cover directly over valve or meter location.
E. Backfill: Provide backfill against the manhole shaft. Pea gravel and recycled RAP aggregate is NOT ALLOWED. Water jetting is NOT allowed. Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.



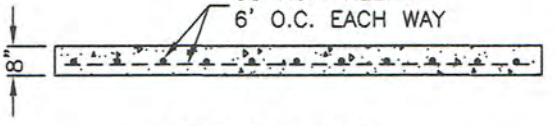
BOX PLAN



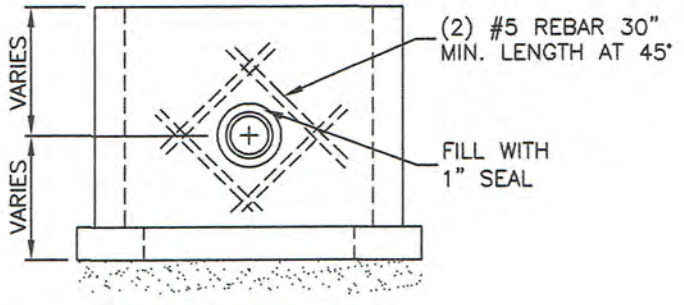
LID PLAN



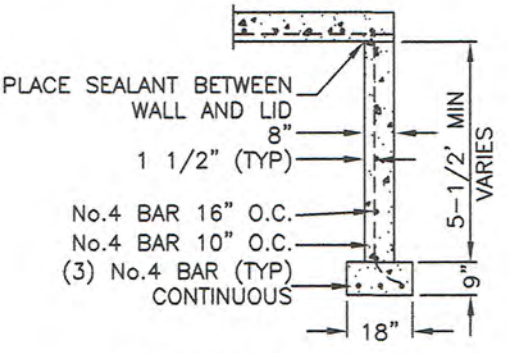
FRONT ELEVATION



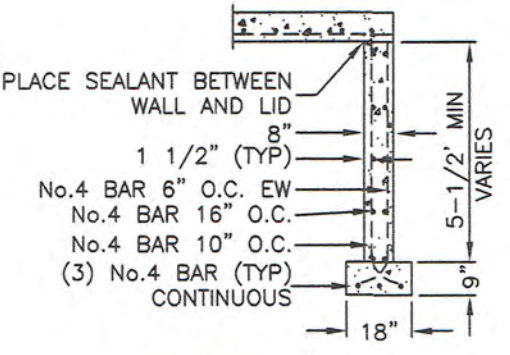
SECTION A-A



SIDE ELEVATION



SECTION B-B



SECTION C-C

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

Fire hydrant with valve

1. GENERAL

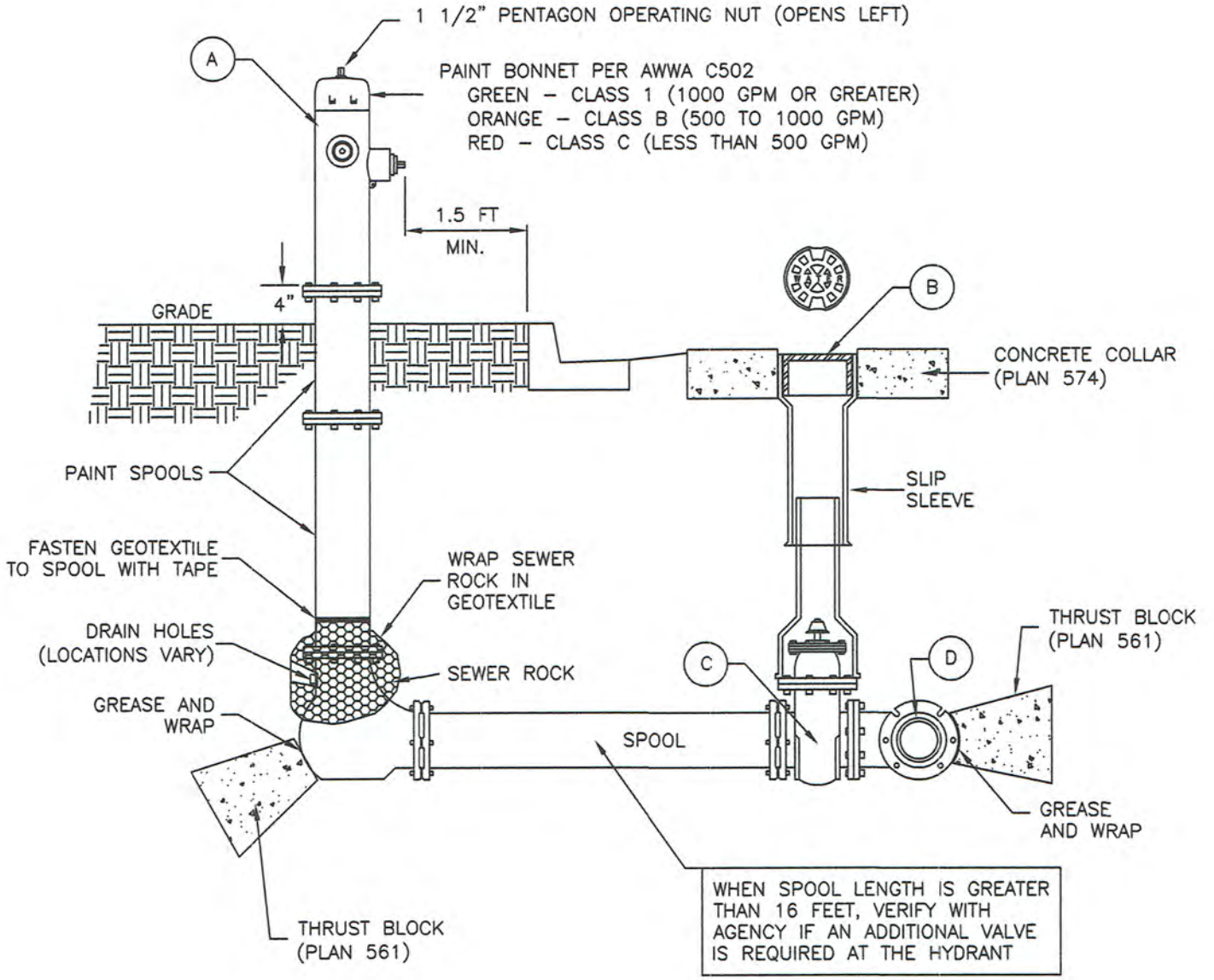
A. Before backfilling, secure inspection of installation by ENGINEER.
B. Additional requirements are specified in APWA Section 33 11 00.

2. PRODUCTS

A. Hydrant: Dry barrel, AWWA C502.
B. Thrust Bocks: Concrete Class 4000, APWA Section 03 30 04.
C. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
D. Backfill: APWA Section 31 05 13. Maximum particle size 2-inches.
   1) Sewer Rock: ASTM Size No. 3 (2” to 1”) or larger.
   2) Other Type of Common Fill: CONTRACTOR’s choice,.
E. Geotextile: Stabilization-separation fabric, APWA Section 31 05 19.

3. EXECUTION

A. Installation:
   1) Provide at least 1 cubic yard of sewer rock around drain hole at base of hydrant spool. Wrap geotextile around sewer rock and tape geotextile to hydrant spool to prevent silting of sewer rock.
   2) Paint fire hydrant to agency's fire hydrant paint code.
   3) Apply non-oxide grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
   4) Notify fire department as soon as hydrant is placed in service.
B. Thrust Blocks:
   1) Before pouring concrete, wrap pipe system with polyethylene sheet to prevent bonding of concrete to pipe system.
   2) Not required for flange or welded pipe systems.
C. Backfill: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



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

* FURNISHED BY UTILITY AGENCY

SECTION

3/4" and 1" meter

1. GENERAL

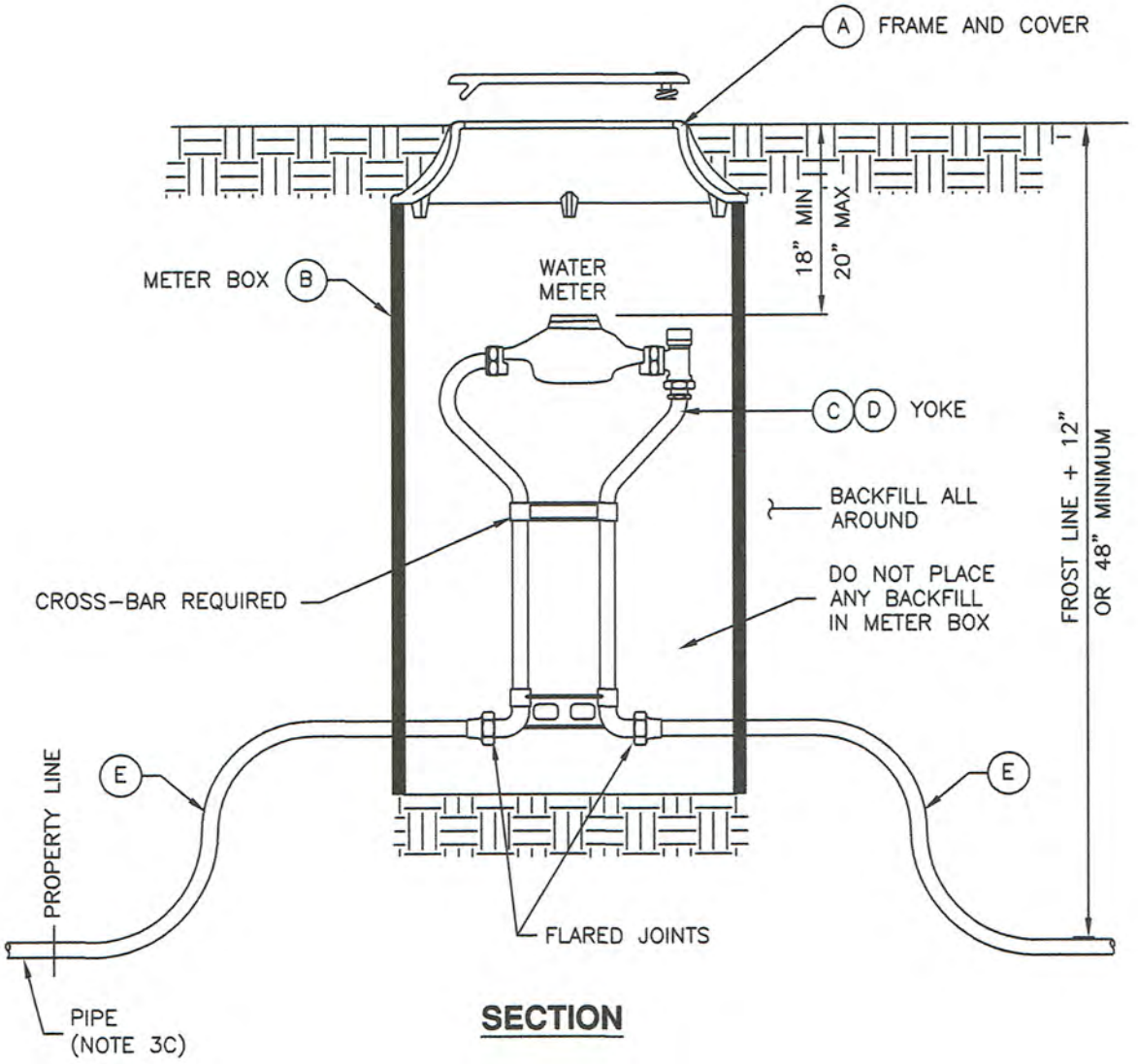
A. In street surfaces or other vehicular traffic areas (like driveway approaches), Install the same type of meter box as required for 1 1/2" and 2" service meters. See Plan 522.
B. Before backfilling, secure inspection of installation by ENGINEER.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better.

3. EXECUTION

A. Meter Placement:
   1) All meters are to be installed in the park strip or within 7 feet of the property line (street side).
   2) Do not install meters under driveway approaches, sidewalks, or curb and gutter.
B. Meter Box: Set box so grade of the frame and cover matches the grade of the surrounding surface.
C. Pipe Outside of Right-of-Way: Coordinate with utility agency or adjacent property owner for type of pipe to be used outside of right-of-way.
D. Inspection: Before backfilling around meter box, secure inspection of installation by ENGINEER.
E. Base Course and Backfill Placement: Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26. Maximum lift thickness before compaction is 8-inches.



SECTION

LEGEND			
No.	*	ITEM	DESCRIPTION
A		FRAME AND COVER	CAST IRON COVER
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

1 1/2" and 2" meter

1. GENERAL

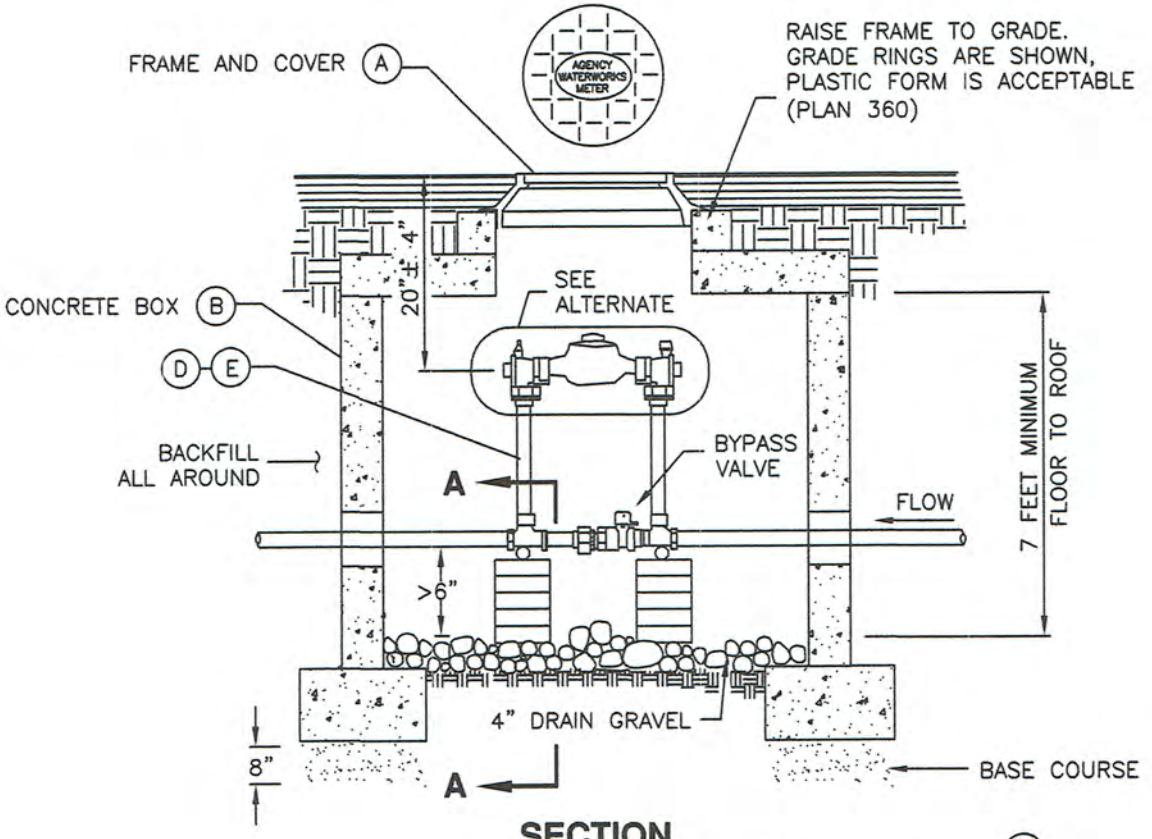
A. Turbine meters are required on all systems used exclusively for irrigation or fire protection.
B. Where domestic use is applicable, use a standard meter.
C. Before backfilling, secure inspection of installation by ENGINEER.

2. PRODUCTS

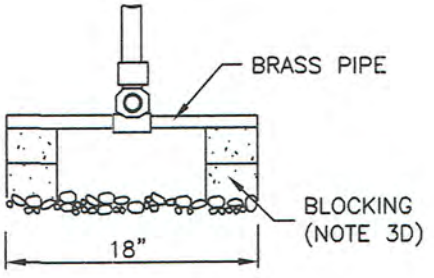
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Castings: Grey iron class 35 minimum per ASTM A48, coated with asphalt based paint or better.

3. EXECUTION

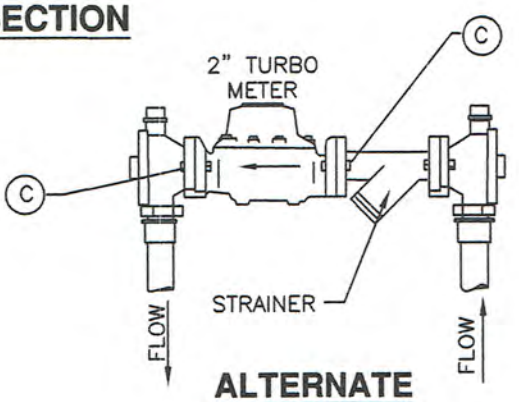
A. Meter Placement:
   1) All meters are to be installed in the park strip or within 7 feet of the property line (street side).
   2) Do not install meters under driveway approaches, sidewalks, or curb and gutter.
   3) In new construction, install meter at center of lot or per agency requirements.
B. Meter Box: Set box so grade of the frame and cover matches the grade of the surrounding surface.
. C. Bypass Valve: Lock in off position.
D. Blocking: Use clay brick or concrete block.
E. Concrete Box:
   1) Center frame and cover over water meter.
   2) Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal.
F. Pipe Outside of Right-of-Way: Coordinate with utility agency or adjacent property owner for type of pipe to be used outside of right-of-way.
G. Base Course and Backfill Placement: Maximum lift thickness before compaction is 8-inches. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



SECTION



SECTION A-A



ALTERNATE

TURBO METER INSTALLATION (NOTE 1A)

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

* FURNISHED BY UTILITY AGENCY

3" and 4" Compound meter with 2" bypass

1. GENERAL

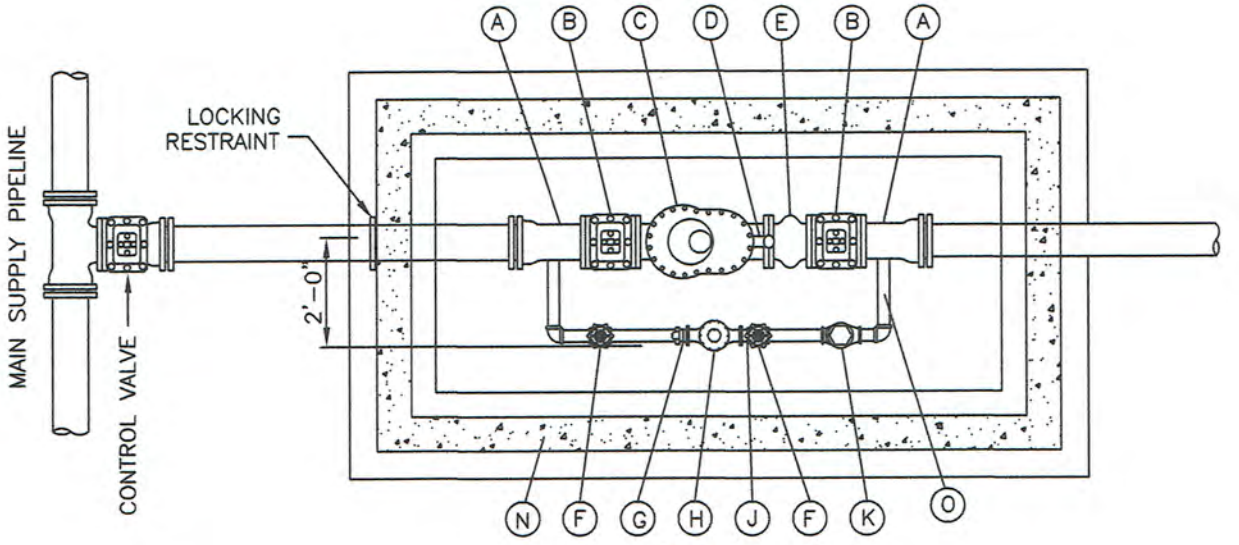
A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

2 PRODUCTS

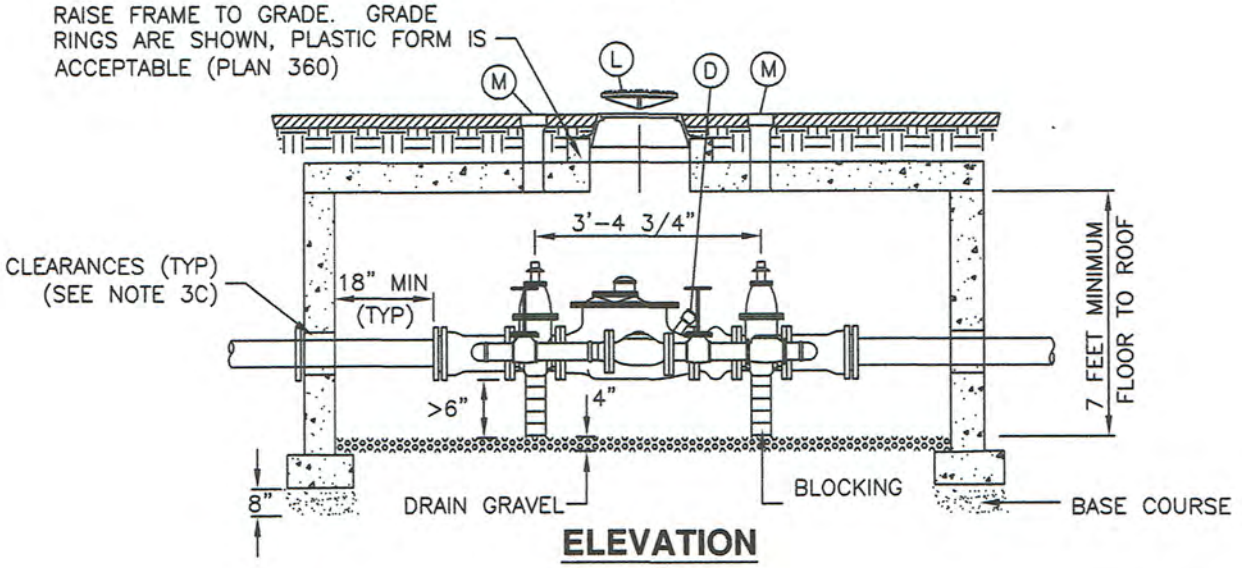
A. Small Fittings: Brass. Do not use galvanized materials.
B. Blocking: Clay brick or concrete block.
C. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.

3. EXECUTION

A. Control Valve: Install valve with valve box adjacent to main.
B. Center frame and cover over water meter.
C. Allow 1-inch clearance around waterline where water line passes through concrete box 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 502
(M)		TOP SECTION OF VALVE BOX WITH LID	PLAN 574
(N)		CONCRETE BOX	PLAN 505
(O)		COPPER PIPING	

* FURNISHED BY AGENCY

6" Compound meter with 2" bypass

1. GENERAL

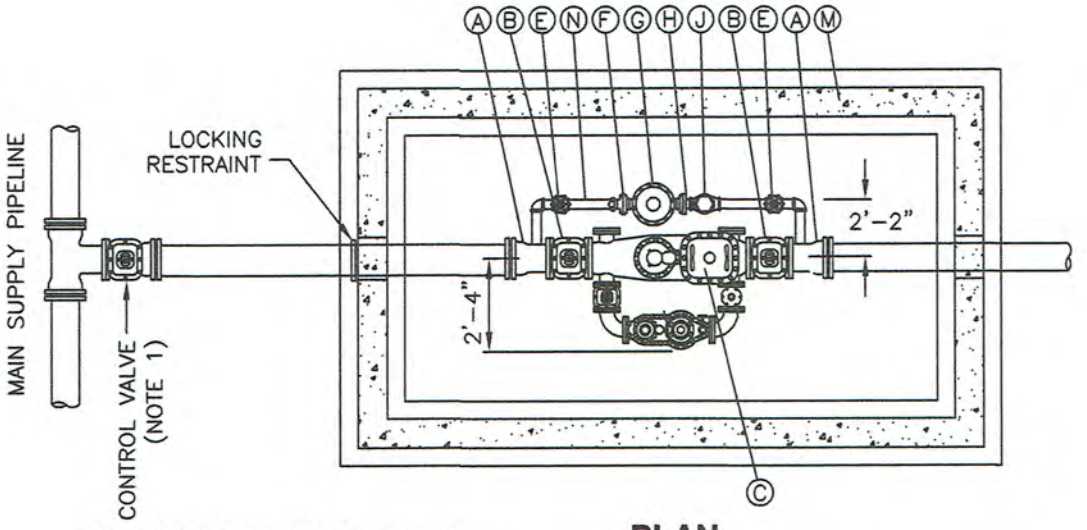
A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

2 PRODUCTS

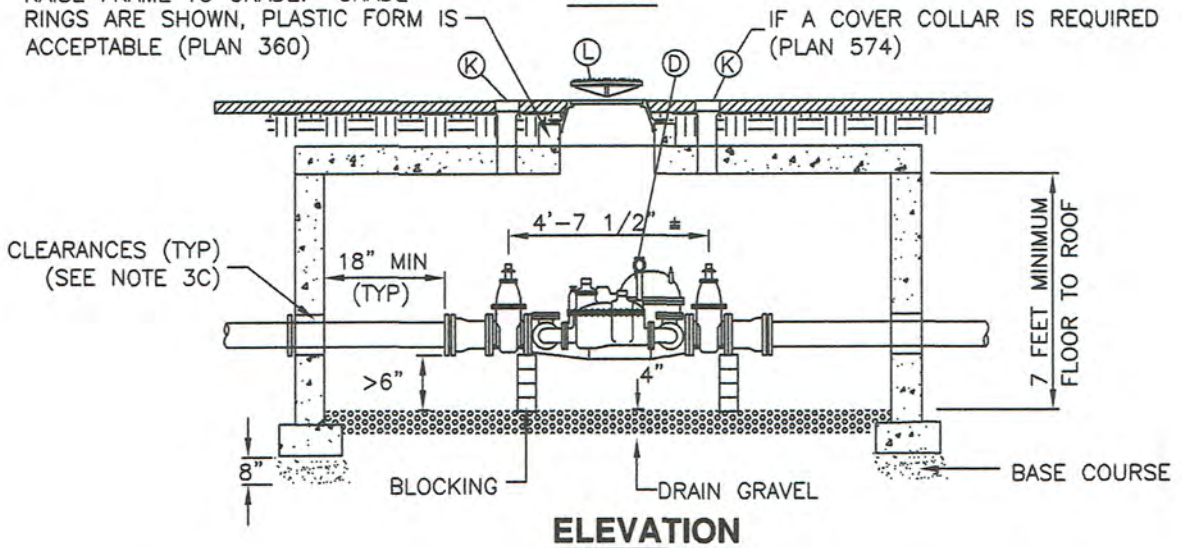
A. Small Fittings: Brass. Do not use galvanized materials.
B. Blocking: Clay brick or concrete block.
C. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.

3. EXECUTION

A. Control Valve: Install valve with valve box adjacent to main.
B. Center frame and cover over water meter.
C. Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
Ⓐ		6" FLANGE x M.J. ADAPTER	
Ⓑ		6" GATE VALVE WITH 2"x2" OPERATING NUT	
Ⓒ		6" x 3" METER	
Ⓓ		2" TEST ASSEMBLY	
Ⓔ		2" GATE VALVE	
Ⓕ		2" METER FLANGE	
Ⓖ		2" DISPLACEMENT METER	
Ⓗ		2" MALE METER FLANGE	
Ⓙ		2" CHECK VALVE	
Ⓚ		TOP SECTION OF VALVE BOX WITH LID	
Ⓛ		27" FRAME AND COVER	PLAN 574
Ⓜ		CONCRETE BOX	PLAN 502
Ⓝ		COPPER PIPING	PLAN 505

* FURNISHED BY AGENCY

8" Compound meter with 2" bypass

1. GENERAL

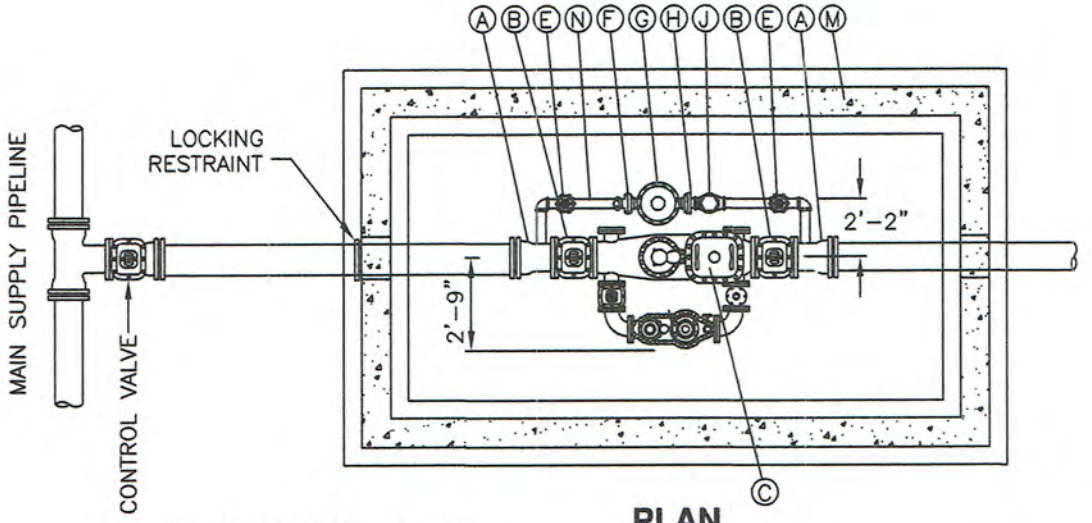
A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

2. PRODUCTS

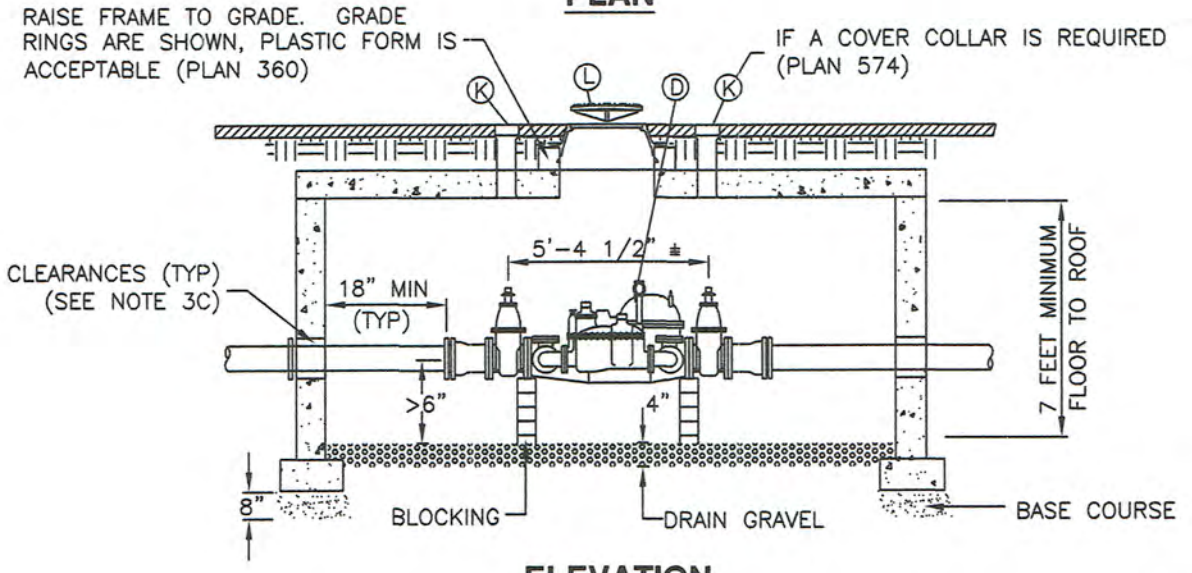
A. Small Fittings: Brass. Do not use galvanized materials.
B. Blocking: Clay brick or concrete block.
C. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.

3. EXECUTION

A. Control Valve: Install valve with valve box adjacent to main.
B. Center frame and cover over water meter.
C. Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
Ⓐ		8" FLANGE x M.J. ADAPTER	
Ⓑ		8" GATE VALVE WITH 2"x2" OPERATING NUT	
Ⓒ		8" x 4" METER	
Ⓓ		2" TEST ASSEMBLY	
Ⓔ		2" GATE VALVE	
Ⓕ		2" METER FLANGE	
Ⓖ		2" DISPLACEMENT METER	
Ⓗ		2" MALE METER FLANGE	
Ⓙ		2" CHECK VALVE	
Ⓚ		TOP SECTION OF VALVE BOX WITH LID	
Ⓛ		27" FRAME AND COVER	PLAN 574
Ⓜ		CONCRETE BOX	PLAN 502
Ⓝ		COPPER PIPING	PLAN 505

* FURNISHED BY AGENCY

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

1. GENERAL

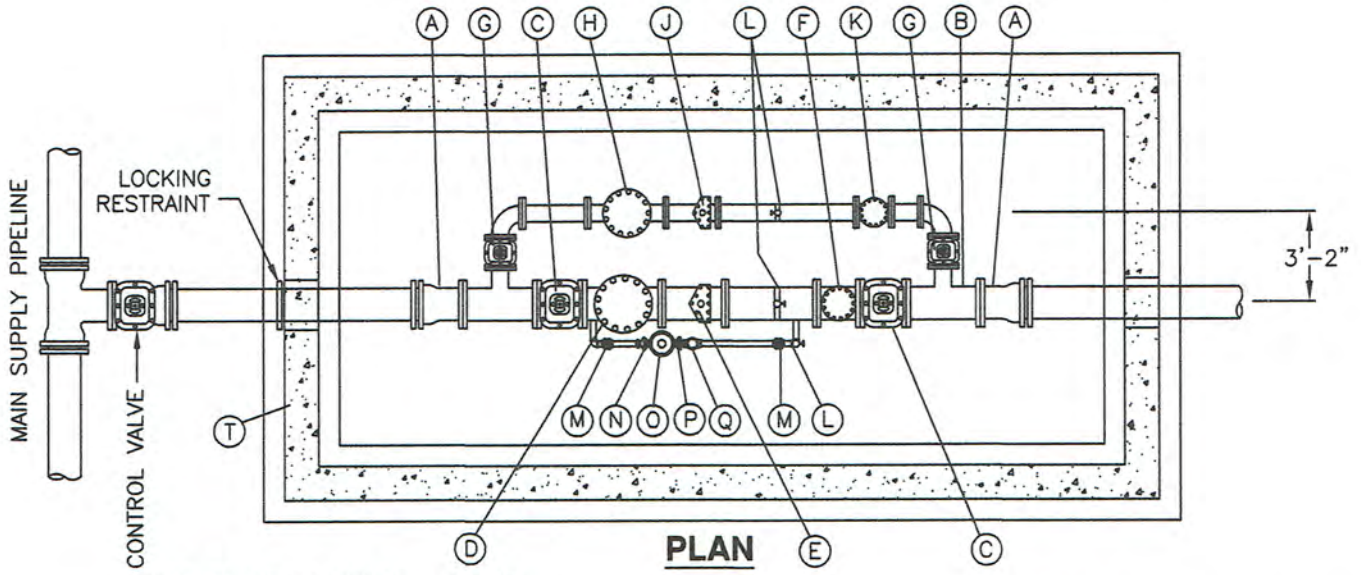
A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

2 PRODUCTS

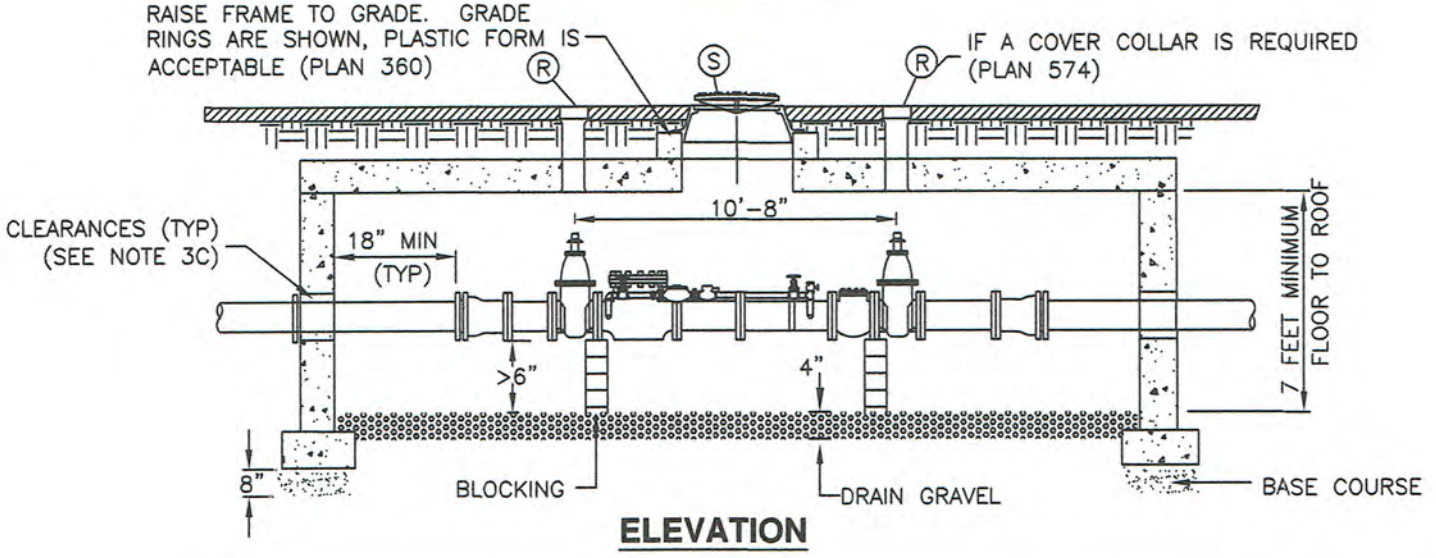
A. Small Fittings: Brass. Do not use galvanized materials.
B. Blocking: Clay brick or concrete block.
C. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.

3. EXECUTION

A. Control Valve: Install valve with valve box adjacent to main.
B. Center frame and cover over water meter.
C. Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
Ⓐ		10" FLANGE x M.J. ADAPTER	
Ⓑ		10" x 6" FLANGE TEE	
Ⓒ		10" GATE VALVE WITH 2"x2" OPERATING NUT	
Ⓓ		10" F.S. STRAINER	
Ⓔ		10" TURBO METER	
Ⓕ		10 CHECK VALVE	
Ⓖ		6" GATE VALVE	
Ⓗ		6" F.S. STRAINER	
Ⓙ		6" TURBO METER	
Ⓚ		6" CHECK VALVE	
Ⓛ		2" TEST TAP	
Ⓜ		2" GATE VALVE	
Ⓝ		2" METER FLANGE	
Ⓞ		2" DISPLACEMENT METER	
Ⓟ		2" MALE METER FLANGE	
Ⓠ		2" CHECK VALVE	
Ⓡ		TOP SECTION OF VALVE BOX WITH LID	PLAN 574
Ⓢ		27" FRAME AND COVER	PLAN 502
Ⓣ		CONCRETE BOX	PLAN 505

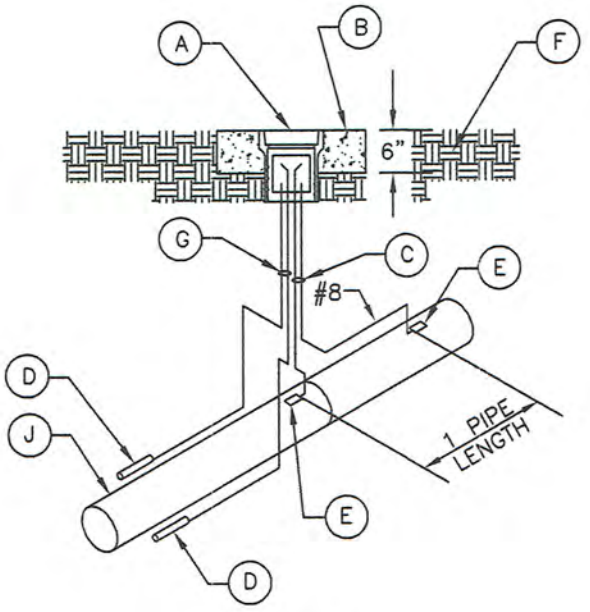
* FURNISHED BY AGENCY

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

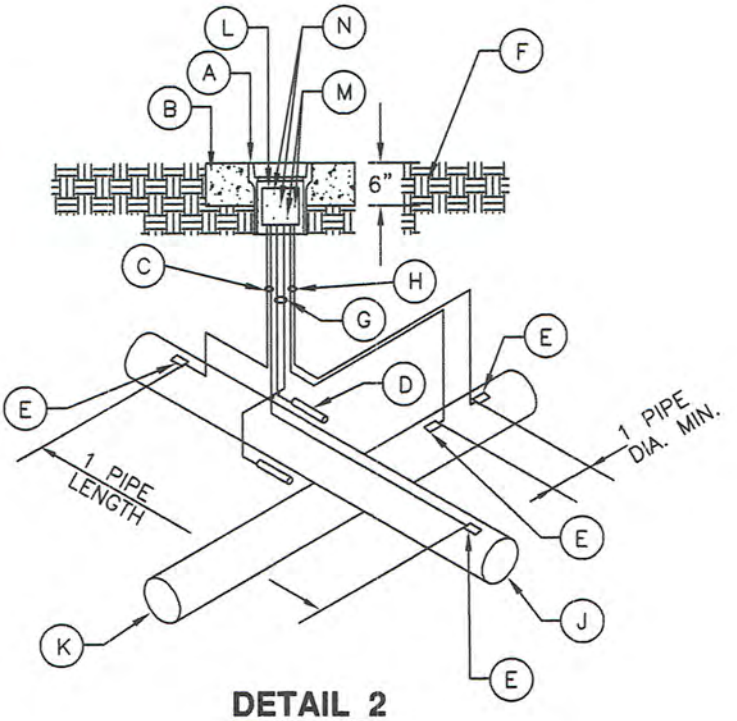
10" Turbo meter with 6" turbo meter and 2" bypass

Plan **529** August 2001

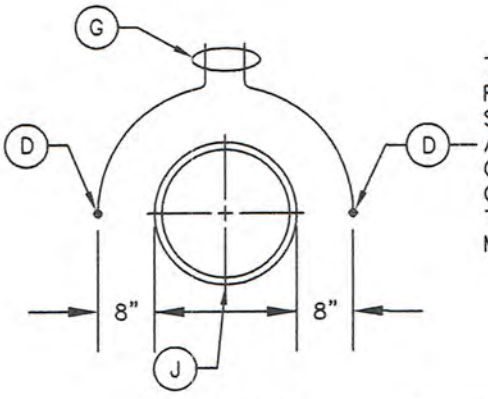
Electrolysis monitoring station details



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 MIL THICK 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. GENERAL

A. Before backfilling, secure inspection of installation by ENGINEER.

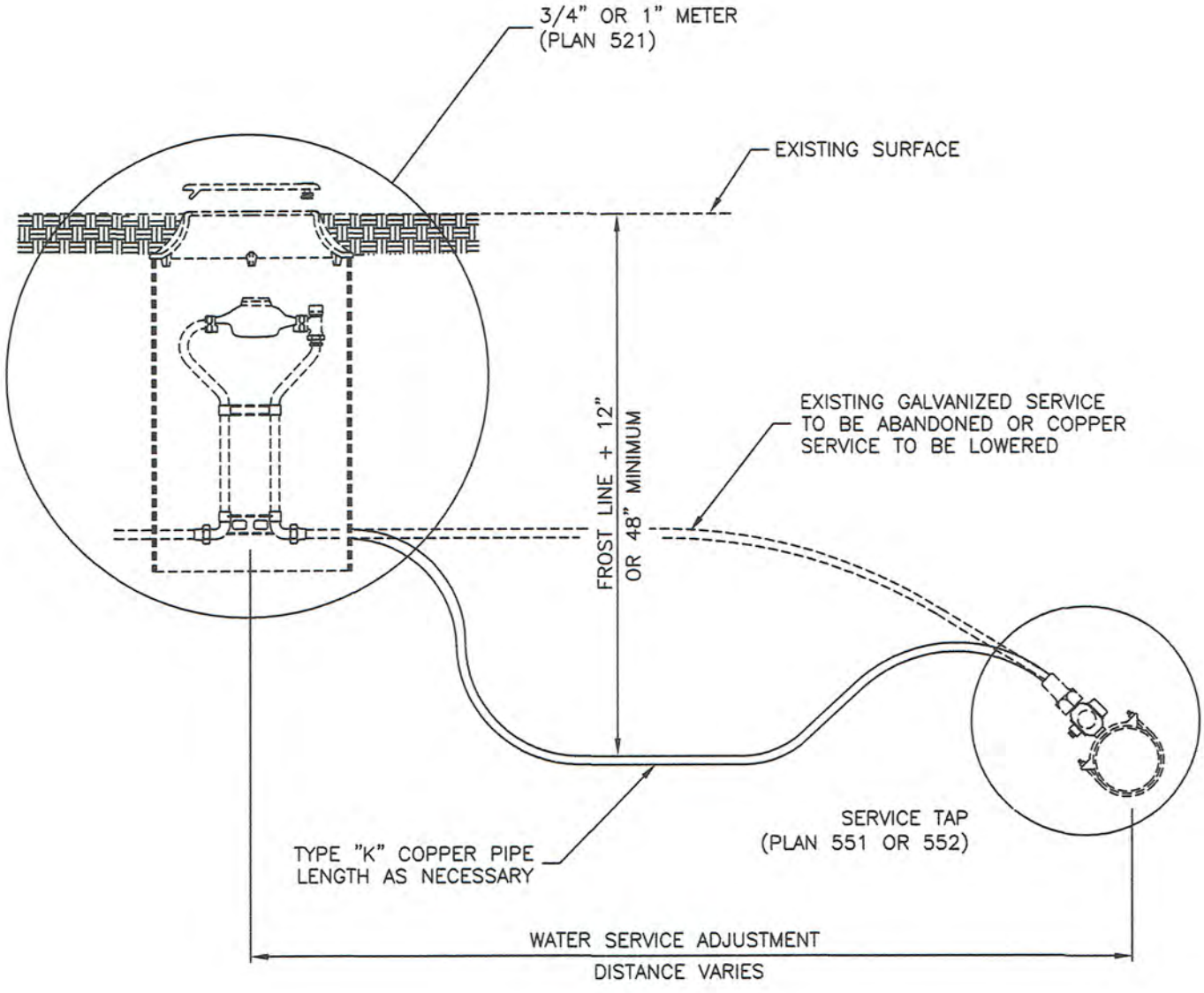
2. PRODUCTS

A. Fittings: Provide brass fittings and nipples. Do not use galvanized materials.

B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.

3. EXECUTION

A. Backfill: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Water service line

Plan
541
August 2001

Water service line loop

1. GENERAL

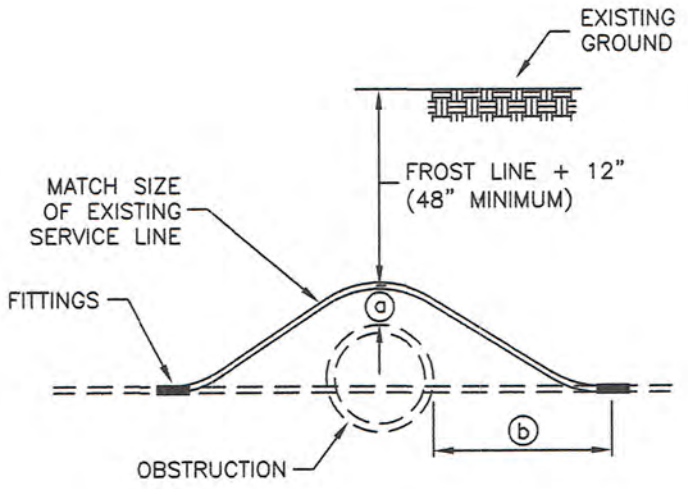
A. Before backfilling, secure inspection of installation by ENGINEER.

2. PRODUCTS

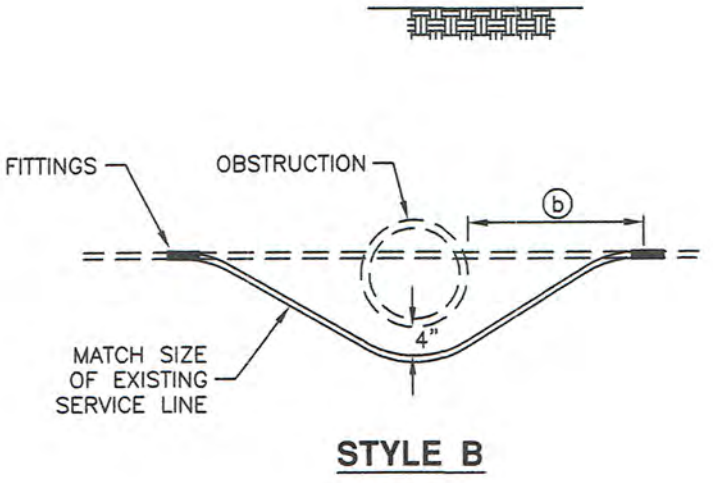
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Piping: Match existing pipe, fittings, coupling sizes and materials.
C. Thrust Bocks: Concrete Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
F. Grease: Non-oxide poly-FM.

3. EXECUTION

A. Thrust Blocks: Not required for flange or welded pipe systems. Before pouring thrust block concrete, wrap pipe system with plastic sheet to prevent bonding of concrete to pipe system.
B. 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.
C. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
D. Steel Spool: Weld in place and provide slip on flange except when fitting in pipe system could move. Epoxy line per AWWA C210, C213, and coated per AWWA C208, or C214.
E. Location: Loop water mains over top of sewer lines.
F. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



STYLE A



STYLE B

TABLE OF DIMENSIONS		
	OBSTRUCTION	
	SEWER MAIN	OTHER
ⓐ	18"	12" MIN.
ⓑ	10'-0"	12" MIN.

Water main line loop

1. GENERAL

A. Before backfilling, secure inspection of installation by ENGINEER.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Piping: Match existing pipe, fittings, coupling sizes and materials.
C. Thrust Bocks: Concrete Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
F. Grease: Non-oxide poly-FM.
G. Couplings: Brass.

3. EXECUTION

A. Thrust Blocks: Not required for flanged or welded pipe systems. Before pouring thrust block concrete, wrap pipe system in plastic sheet to prevent bonding of concrete to pipe system.
B. 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.
C. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
D. Steel Spool: Weld in place and provide slip on flange except when fitting in pipe system could move. Epoxy line per AWWA C210, C213, and coated per AWWA C208, or C214.
E. Location: Loop water mains over top of sewer lines.
F. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

STYLE A

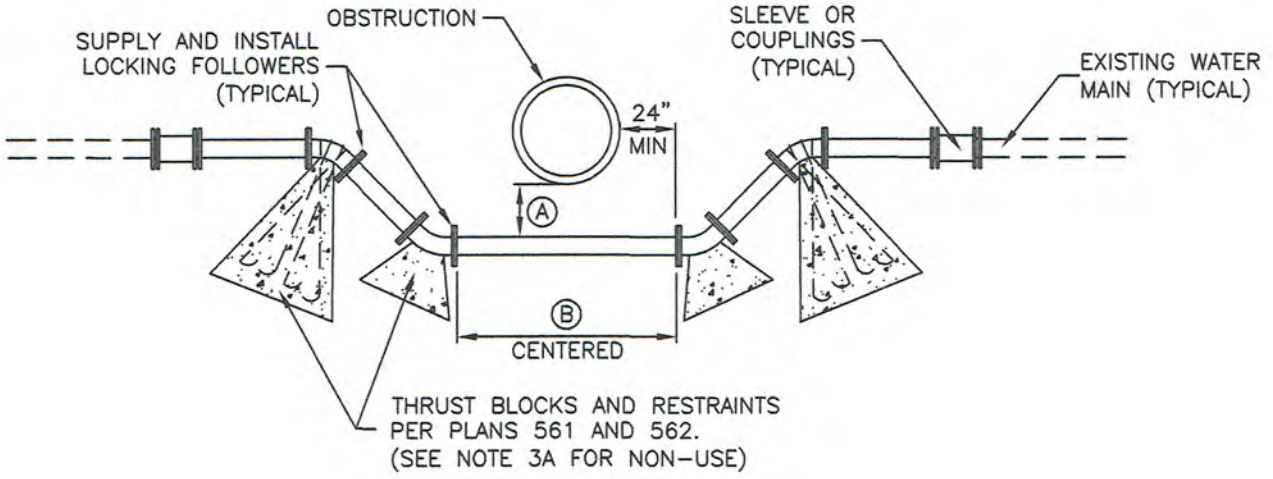


TABLE OF DIMENSIONS		
OBSTRUCTION	Ⓐ	Ⓑ
SEWER	18" MIN	20' MIN
OTHER	12" MIN	O.D. + 48"

Water main line loop

1. GENERAL

A. Before backfilling, secure inspection of installation by ENGINEER.

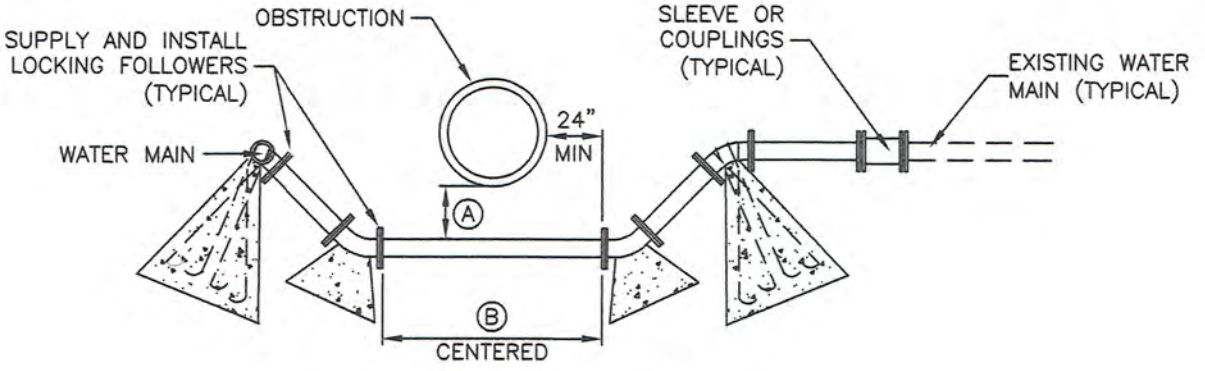
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Piping: Match existing pipe, fittings, coupling sizes and materials.
C. Thrust Bocks: Concrete Class 4000, APWA Section 03 30 04.
D. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
E. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
F. Grease: Non-oxide poly-FM.

3. EXECUTION

A. Thrust Blocks: Not required for flange or welded pipe systems. Before pouring thrust block concrete, wrap pipe system with plastic sheet to prevent bonding of concrete to pipe system.
B. 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.
C. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
D. Steel Spool: Weld in place and provide slip on flange except when fitting in pipe system could move. Epoxy line per AWWA C210, C213, and coated per AWWA C208, or C214.
E. Location: Loop water mains over top of sewer lines.
F. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

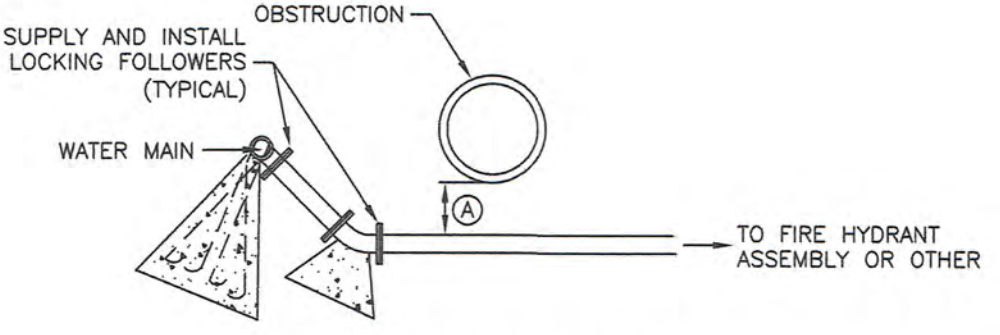
STYLE B AND C



THRUST BLOCKS AND RESTRAINTS
PER PLANS 561 AND 562.
(SEE NOTE 3A FOR NON-USE)

TABLE OF DIMENSIONS		
OBSTRUCTION	Ⓐ	Ⓑ
SEWER	18" MIN	20' MIN
OTHER	12" MIN	O.D. + 48"

STYLE B



THRUST BLOCKS AND RESTRAINTS
PER PLANS 561 AND 562.
(SEE NOTE 3A FOR NON-USE)

TABLE OF DIMENSIONS	
OBSTRUCTION	Ⓐ
SEWER	18" MIN
OTHER	12" MIN

STYLE C

Fire hydrant replacement or relocation

1. GENERAL

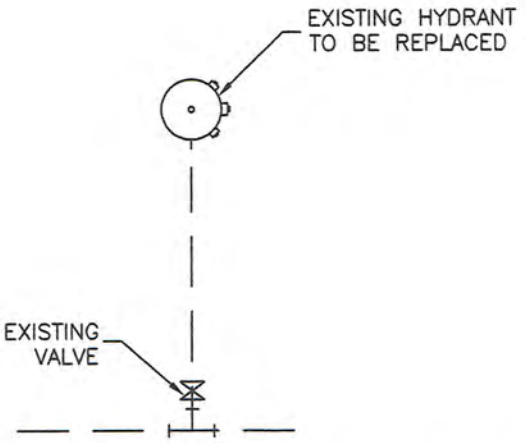
A. Drawing is a single line diagram showing a minimum and typical connection.
B. Additional water system requirements are specified in APWA Section 33 11 00.
C. Before backfilling, secure inspection of installation by ENGINEER.

2. PRODUCTS

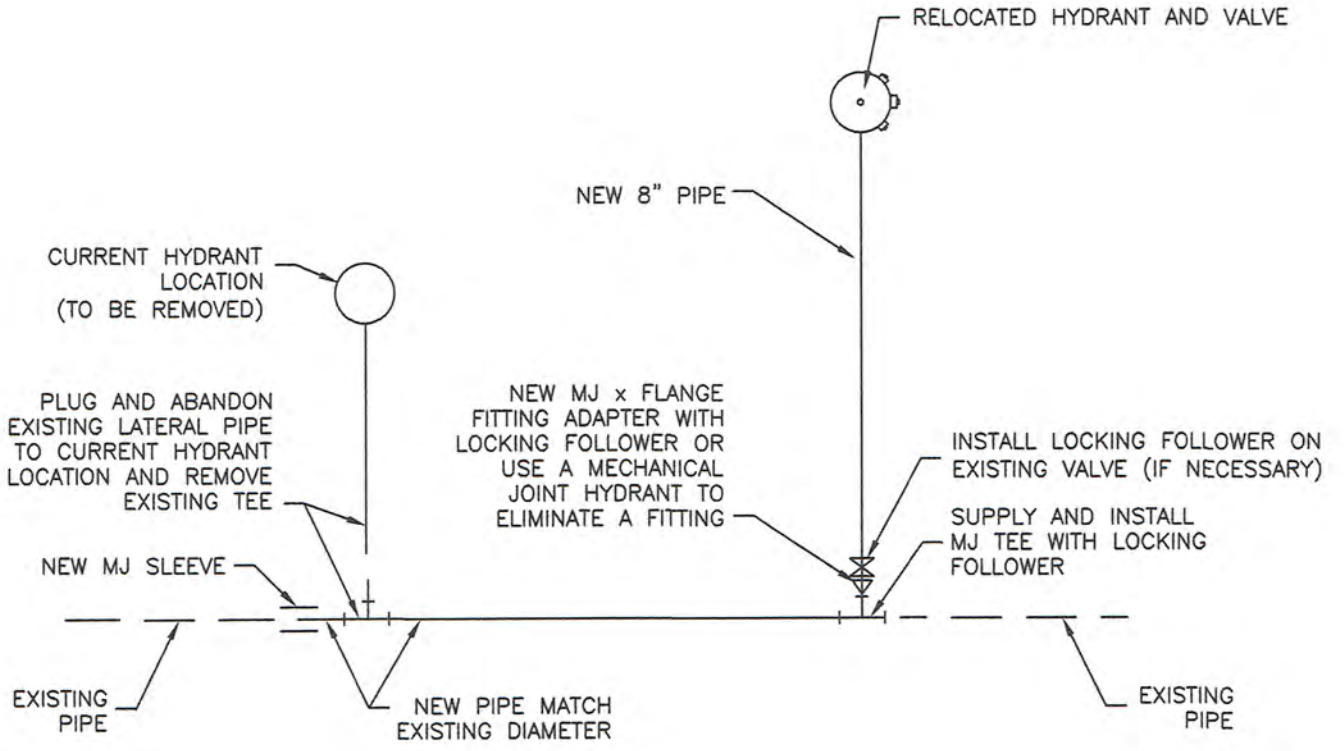
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Piping: Match existing pipe, fittings, coupling sizes and materials.
C. Thrust Blocks:
   1) Temporary - Use wood.
   2) Permanent - Concrete Class 4000, APWA Section 03 30 04.
D. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
E. Grease: Non-oxide poly-FM.

3. EXECUTION

A. Hydrant: Adjust to grade with pipe spool if necessary.
   1) Provide at least 1 cubic yard of sewer rock, APWA Section 31 05 13 around drain hole at base of hydrant. Wrap plastic over sewer rock to prevent silting.
   2) Paint fire hydrant to agency's fire hydrant paint code.
   3) Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
   4) Notify fire department as soon as hydrant is placed in service.
B. Connections: If existing valve and hydrant have O.B. connections, delete MJ x Flange adapter and install 6-inch MJ sleeve. Add a new valve at the tee connection.
C. Valve Boxes. Salvage any C.I.S.T. valve boxes and reuse. Adjust to grade as necessary on relocated hydrant.
D. Thrust Blocks: Not required on flanged or welded pipe systems. Before pouring concrete, wrap pipe system plastic sheet to prevent bonding of concrete to pipe system.
E. Backfill: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
F. Surface Restoration:
   1) Landscaped Surface: Rake to match existing grade. Replace vegetation to match pre-construction conditions. Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements.
   2) Paved Surface: Do not install bituminous concrete or Portland cement concrete surfacing until trench compaction is acceptable to ENGINEER. Follow APWA Section 33 05 25 (bituminous concrete surfacing), or APWA Section 33 05 25 (concrete surfacing).



REPLACEMENT OF FIRE HYDRANT



NOTE: THRUST BLOCKS REQUIRED
(PLAN 561 AND 562)

RELOCATION OF FIRE HYDRANT

3/4" and 1" Service taps

1. GENERAL

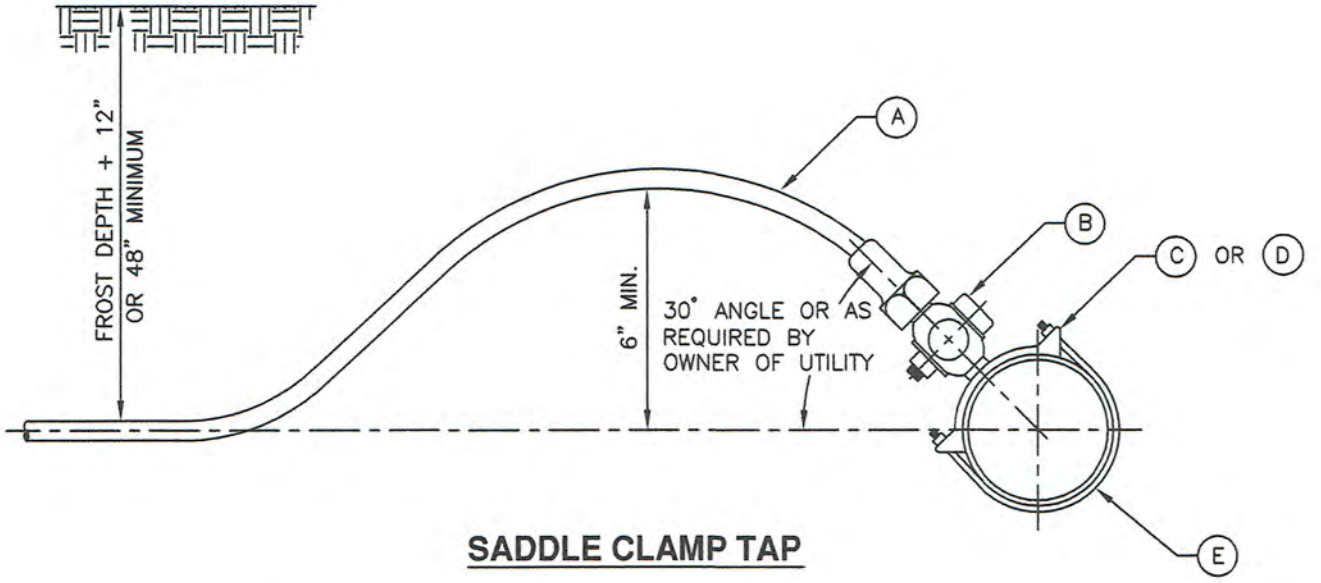
A. Before backfilling around taps, secure inspection of installation by ENGINEER.

2. PRODUCTS

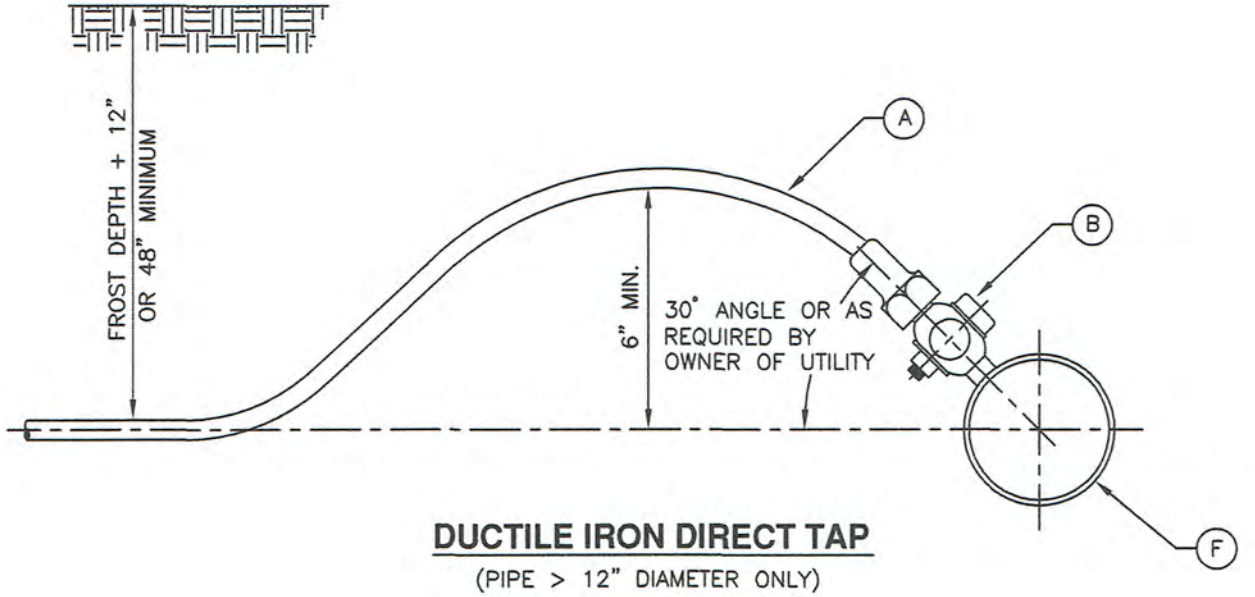
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Tape: Teflon tape is required on all taps.

3. EXECUTION

A. Tapping: Place taps a minimum of 36-inches apart. Use a tapping tool which is sized corresponding to the size of the service line to be installed. No taps within 36-inches of end of pipe.
B. PVC or AC Pipe: A service saddle clamp is required on all PVC and AC pipe taps unless specified otherwise.
C. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



SADDLE CLAMP TAP



DUCTILE IRON DIRECT TAP

(PIPE > 12" DIAMETER ONLY)

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.)
(F)		WATER MAIN PIPE	(DUCTILE IRON (D.I.) ONLY

* FURNISHED BY UTILITY AGENCY

** DI & CI PIPE MAY BE DIRECT TAPPED

1 1/2" and 2" Service taps

1. GENERAL

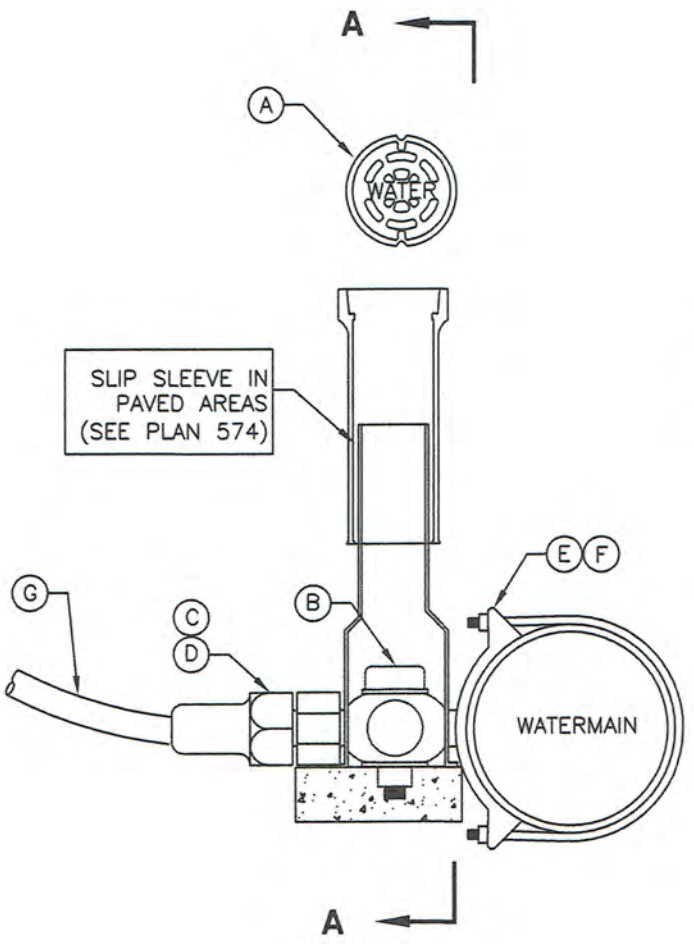
A. Before backfilling around taps, secure inspection of installation by ENGINEER.

2. PRODUCTS

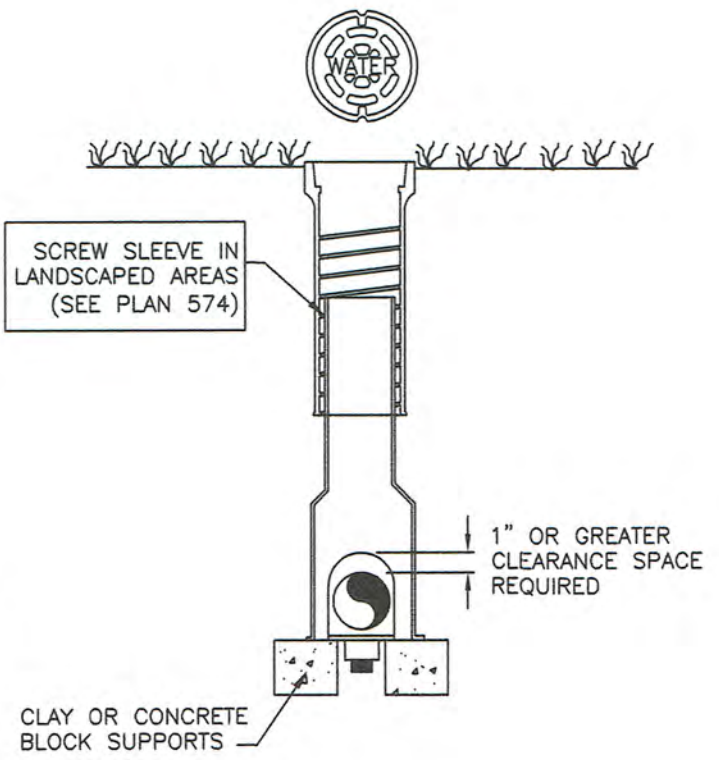
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Tape: Teflon tape is required on all taps.

3. EXECUTION

A. Tapping: Place taps a minimum of 36-inches apart. Use a tapping tool that is sized corresponding to the size of the service line to be installed. No taps within 36-inches of end of pipe.
B. PVC or AC Pipe: A service saddle clamp is required on all PVC and AC pipe taps unless specified otherwise.
C. Backfill: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
D. Blocks: Clay brick or concrete block required under valve box to assure a 1" or greater space between the box and the corporation stop and pipe assembly.



ELEVATION



SECTION A-A

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	P.V.C.
(G)		COPPER PIPE (SERVICE LINE)	TYPE K (SOFT)

* FURNISHED BY UTILITY AGENCY

Direct bearing thrust block

1. GENERAL

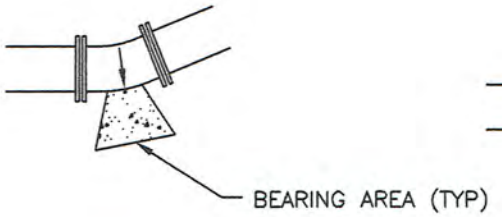
A. Thrust design for pipe sizes or configurations not shown require special design.
B. Bearing areas, volumes, and special thrust blocking details shown on Drawings take precedence over this plan.
C. Restraint sizing is based upon a maximum operating pressure of 150 psi and a test pressure of 200 psi, and a minimum soil bearing strength 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.
D. Before backfilling around thrust block, secure inspection of installation by ENGINEER.

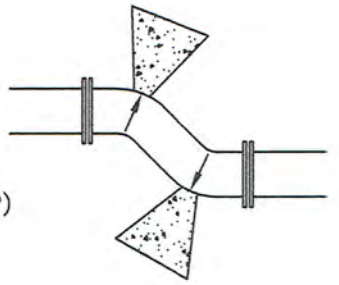
2. PRODUCTS

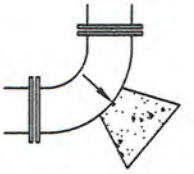
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Thrust Bocks: Concrete Class 4000, APWA Section 03 30 04.
D. Grease: Non-oxide poly-FM.

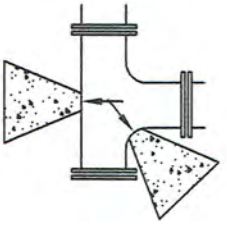
3. EXECUTION

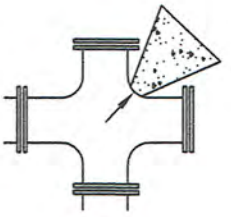
A. Pour concrete against undisturbed soil.
B. Pipe Joints: Do not cover with concrete. Leave completely accessible.
C. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at discretion of ENGINEER).
E. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.

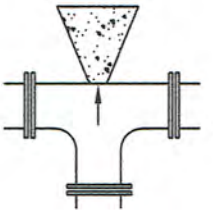


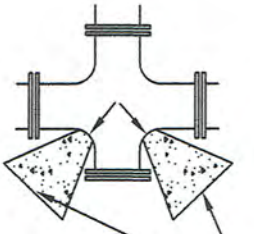




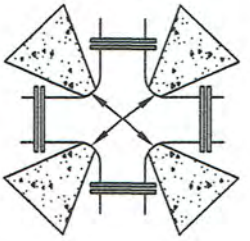


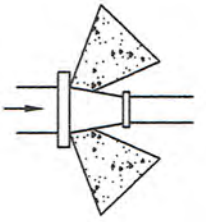


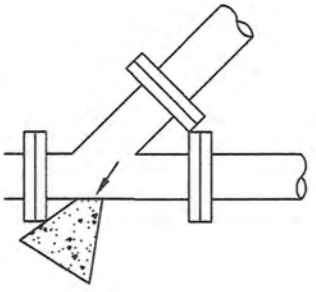




THE AREA OF BEARING PER THRUST BLOCK TO EQUAL 1/2 THE AREA SPECIFIED FOR THE LARGEST PIPE OR FITTING SIZE







SIZE OF PIPE	MINIMUM BEARING AREA IN SQ. FT.				
	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	2.5	2
8"	6.5	9.5	5	2.75	2.5
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	9
24"	53	74	41	21	12
30"	81	114	62	32	16

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Direct bearing thrust block

Plan
561
August 2010

Tie-down thrust restraints

1. GENERAL

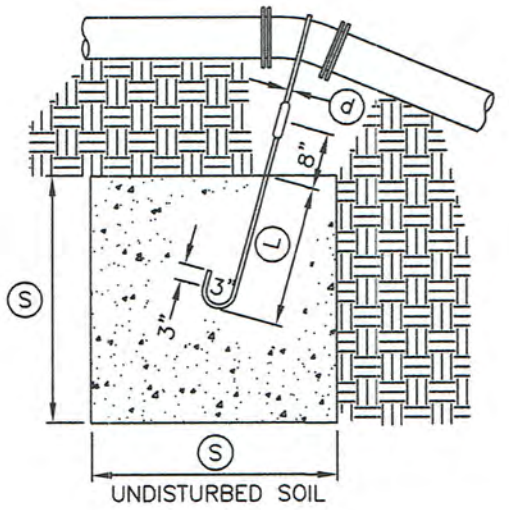
A. Thrust design for pipe sizes or configurations not shown require special design.
B. Bearing areas, volumes, and special thrust blocking details shown on Drawings take precedence over this plan.
C. Restraint sizing is based upon a maximum operating pressure of 150 psi and a test pressure of 200 psi, and a minimum soil bearing strength 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.
D. Before backfilling around thrust block, secure inspection of installation by ENGINEER.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4,000 minimum, APWA Section 03 30 04.
D. Reinforcement: Deformed, steel, ASTM A615. Give bars an epoxy coating at least 15 mils thick. Minimum stress yield strength of steel tie-down bars is 70,000 ksi.
E. Grease: Non-oxide poly-FM.

3. EXECUTION

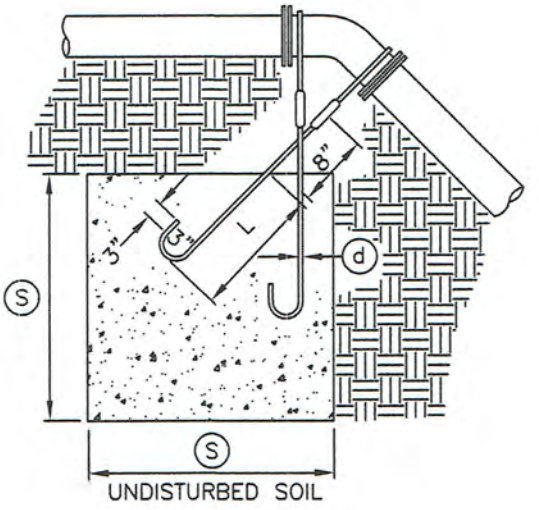
A. Pour concrete against undisturbed soil. Concrete must be allowed to cure in thrust restraints for 5 days before pressurizing water lines or have additional approved thrust restraints installed before pressurizing the water line.
B. Pipe Joints: Do not cover with concrete. Leave completely accessible.
C. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.
D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at discretion of ENGINEER).
E. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.



TYPE A RESTRAINT

FOR 11 1/4" – 22 1/2" VERTICAL BENDS

TABLE OF DIMENSIONS					
			(S)	(d)	(L)
PIPE SIZE NOMINAL DIAMETER – INCH	VERTICAL BEND IN DEGREES	CONCRETE BLOCKING IN CUBIC FEET	SIDE OF CUBE – FEET	DIAMETER OF SHANK OR REBAR RODS – INCH	DEPTH OF ROD CONCRETE – FEET
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	5/8"	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"	3.0
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					
			(S)	(d)	(L)
PIPE SIZE NOMINAL DIAMETER – INCH	VERTICAL BEND IN DEGREES	CONCRETE BLOCKING IN CUBIC FEET	SIDE OF CUBE – FEET	DIAMETER OF SHANK OR REBAR RODS – INCH	DEPTH OF ROD CONCRETE – 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"	3.0
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

4" washout valve

1. GENERAL

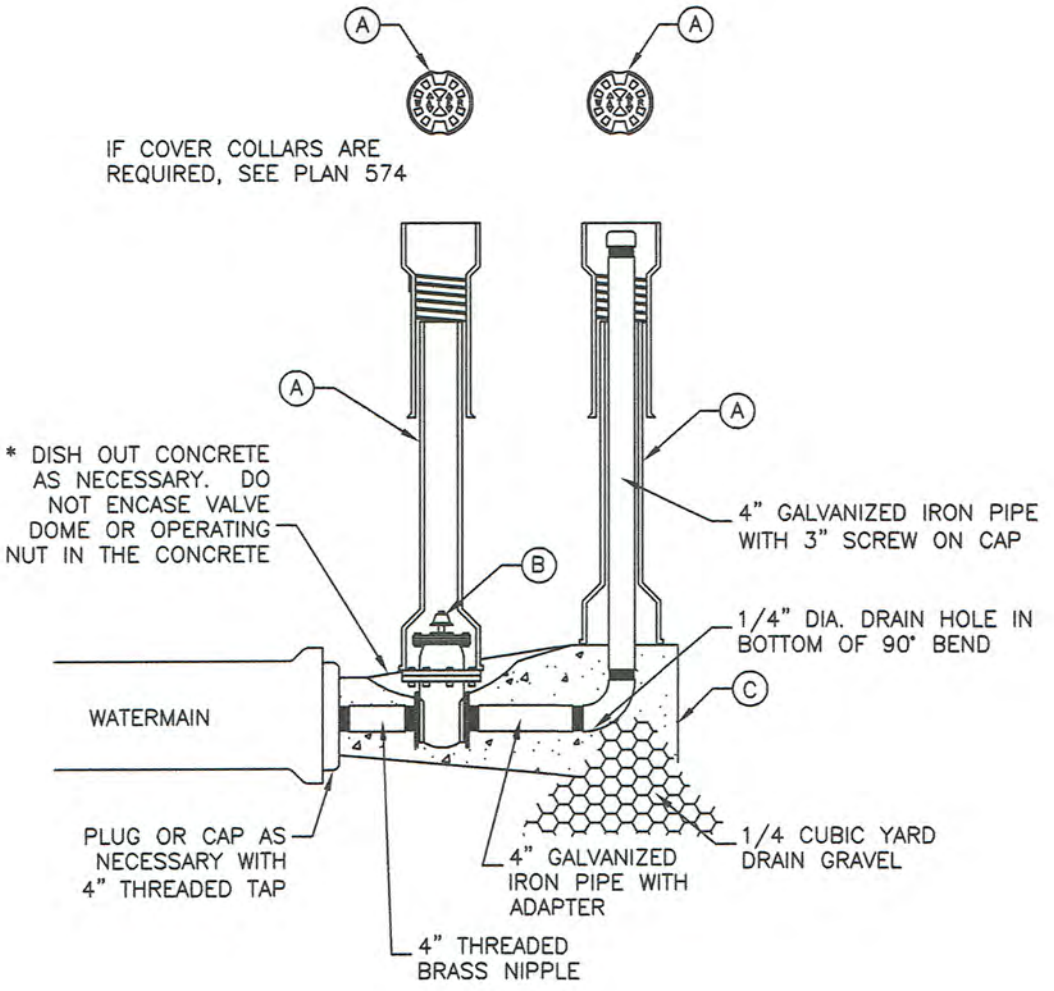
A. Before backfilling, secure inspection of installation by ENGINEER.
B. Water mains 12-inches and larger will require a special washout assembly design.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

A. Pour concrete against undisturbed soil.
B. Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.
C. Place plastic sheet at least 6 mils thick over drain gravel to prevent silting.
D. After installation of washout valve assembly, verify the washout valve riser drains to gravel.
E. Backfill and Base Course Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater of a modified proctor density, APWA Section 31 23 26.



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	PLAN 561

Detector check valve with 3/4" bypass meter

1. GENERAL

A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

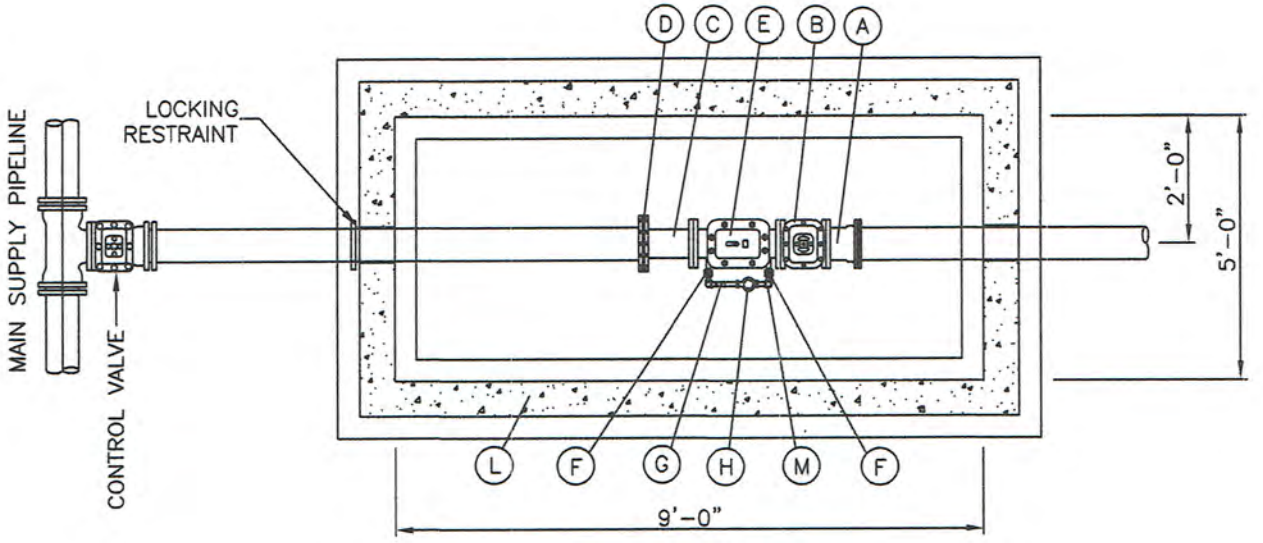
2. PRODUCTS

A. Blocking: Clay brick or concrete block.
B. Small Fittings: Brass. Do not use galvanized materials.
C. Grade Ring: 6-inch concrete grade ring required in roadways, Plan 361.
D. Spools: Length of flange x plain end spool vary.

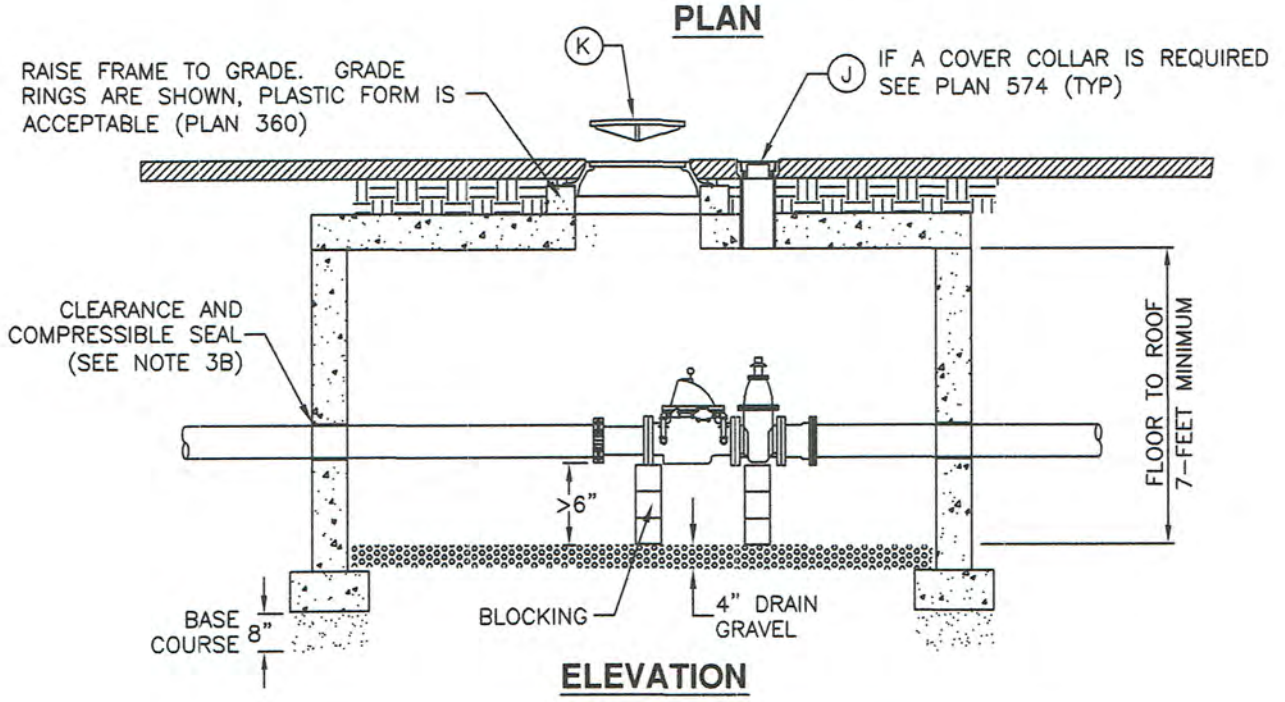
SPOOLS	
Pipe Size	Pipe Length
6"	10"
8"	8 1/4"
10"	6"

3. EXECUTION

A. Install control valve with valve box adjacent to main.
B. Concrete Box: Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal. Center frame and cover over water meter.
C. 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 discretion of the ENGINEER.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		FLANGE AND M.J. ADAPTER	CEMENT LINED
(B)		GATE VALVE WITH 2"x2" OPERATOR NUT	EPOXY & CEMENT LINED
(C)		FLANGE x P.E. SPOOL	NOTE 3B
(D)		MECHANICAL JOINT AND FLANGE	
(E)		DETECTOR CHECK VALVE	EPOXY COATED
(F)		3/4" VALVE	EPOXY COATED
(G)		3/4" CHECK VALVE	EPOXY COATED
(H)		3/4" METER	EPOXY COATED
(J)		TOP SECTION OF VALVE BOX WITH LID	NOTE 3C
(K)		27" FRAME AND COVER	PLAN 502
(L)		CONCRETE BOX	PLAN 505
(M)		COPPER PIPING	TYPE L (RIGID)

* FURNISHED BY AGENCY

6" Pressure reducing valve with 2" bypass

1. GENERAL

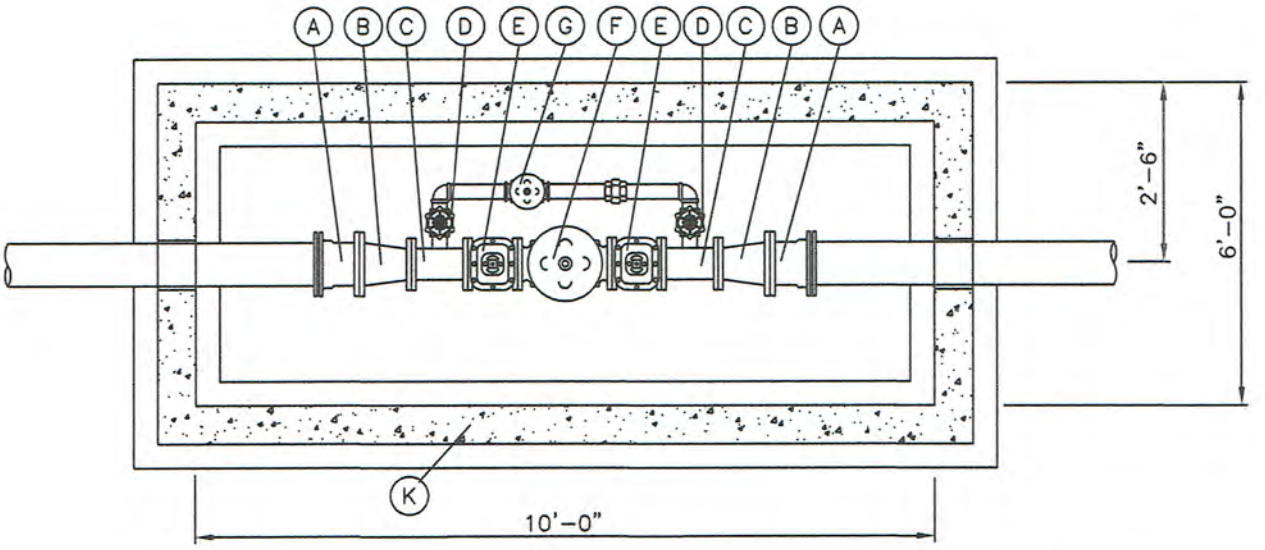
A. Configuration may be changed at ENGINEER's discretion.
B. Additional requirements are specified in APWA Section 33 12 16.

2. PRODUCTS

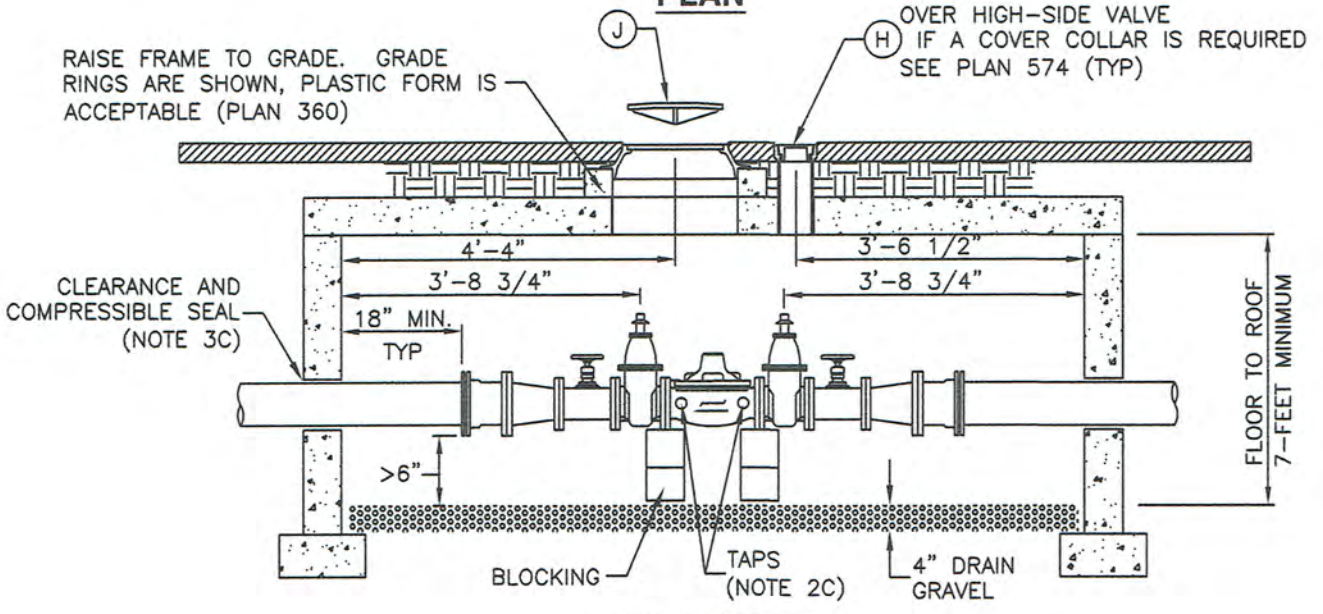
A. Small Fillings: Brass. Do not use galvanized materials.
B. Blocking: Clay brick or concrete block.
C. Taps: Provide two 3/4" I.P. taps with plugs for pressure gages.
D. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.

3. EXECUTION

A. Center frame and cover over water meter.
B. Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.
C. Allow 1-inch clearance around waterline where water line passes through concrete box wall. Seal opening with compressible seal.



PLAN



ELEVATION

LEGEND			
No.	*	ITEM	DESCRIPTION
(A)		8" M.J.x FLANGE ADAPTOR	CEMENT LINED
(B)		8" x 6" FLANGED REDUCER	CEMENT LINED
(C)		8" FLANGED STEEL SPOOL WITH 2" OUTLET	EPOXY COATED AND LINED
(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	PLAN 502
(H)		TOP SECTION OF VALVE BOX WITH LID	
(K)		CONCRETE BOX	PLAN 505

* FURNISHED BY AGENCY

Cover collar for water valve box

1. GENERAL

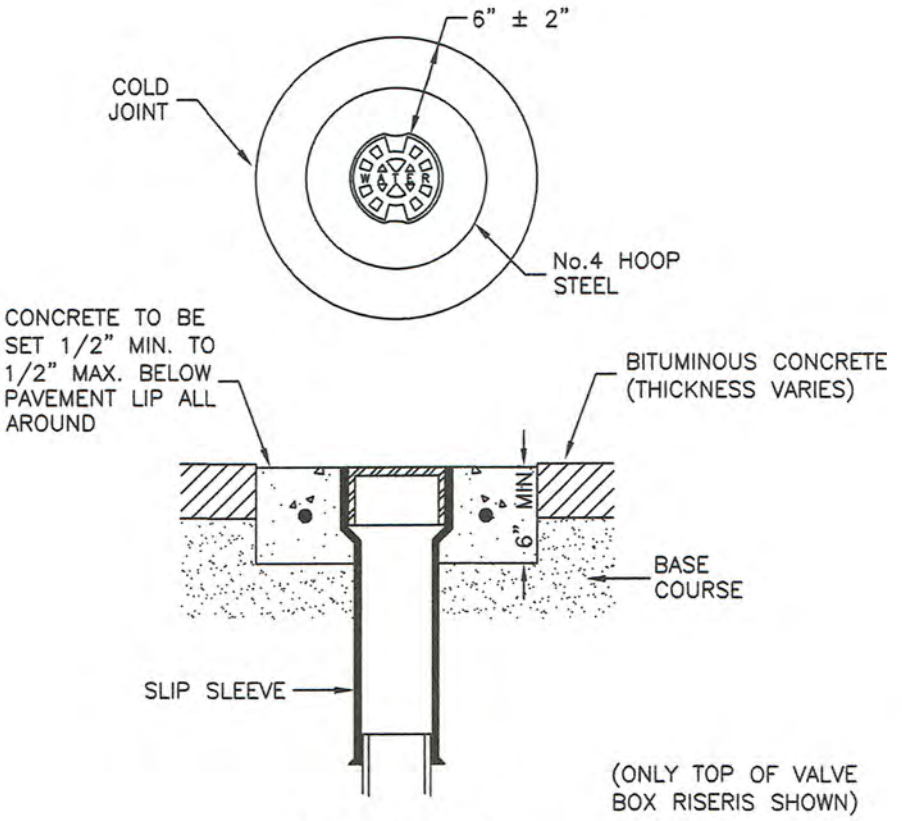
A. In a pavement surface, fill an annular space around a frame and cover casting with concrete. The concrete will support the casting under traffic loadings.

2. PRODUCTS

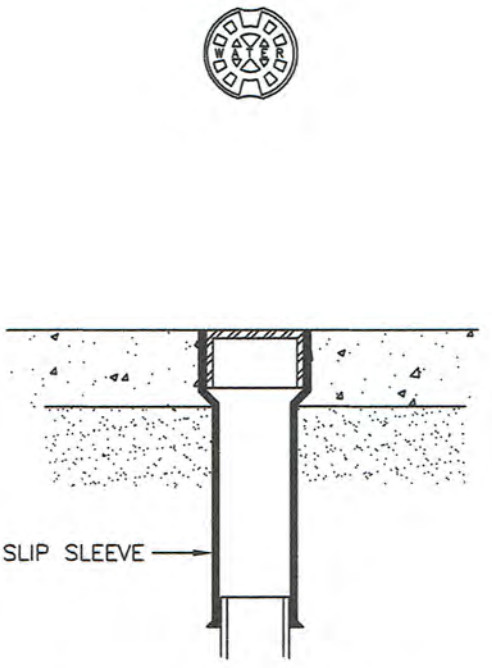
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Concrete: Class 4000, APWA Section 03 30 04.
C. Concrete Curing Agent: Type ID Class A (clear with fugitive dye), membrane forming compound, APWA Section 03 39 00.

3. EXECUTION

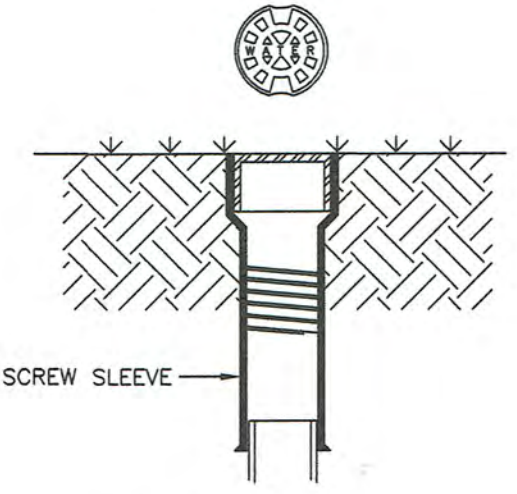
A. Base Course: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Pavement Preparation: Provide a neat vertical and concentric joint between concrete collar and existing bituminous concrete surface. Clean edges of all dirt, oil, and loose debris.



BITUMINOUS PAVEMENT



PORTLAND CEMENT CONCRETE PAVEMENT



LANDSCAPED AREA

Air release assembly

1. GENERAL

A. This drawing detail is applicable to water main piping less than 16-inches diameter.
B. PCCP, steel, MLAC and other water main pipe materials will require special detail or design drawings. Submit the design and detail drawings and materials to the ENGINEER for review before installation.
C. Installation in areas of high ground water or potential for water entering the vent pipe will require a special design to be provided by the ENGINEER.
D. Before backfilling around the assembly, secure inspection of installation by ENGINEER.

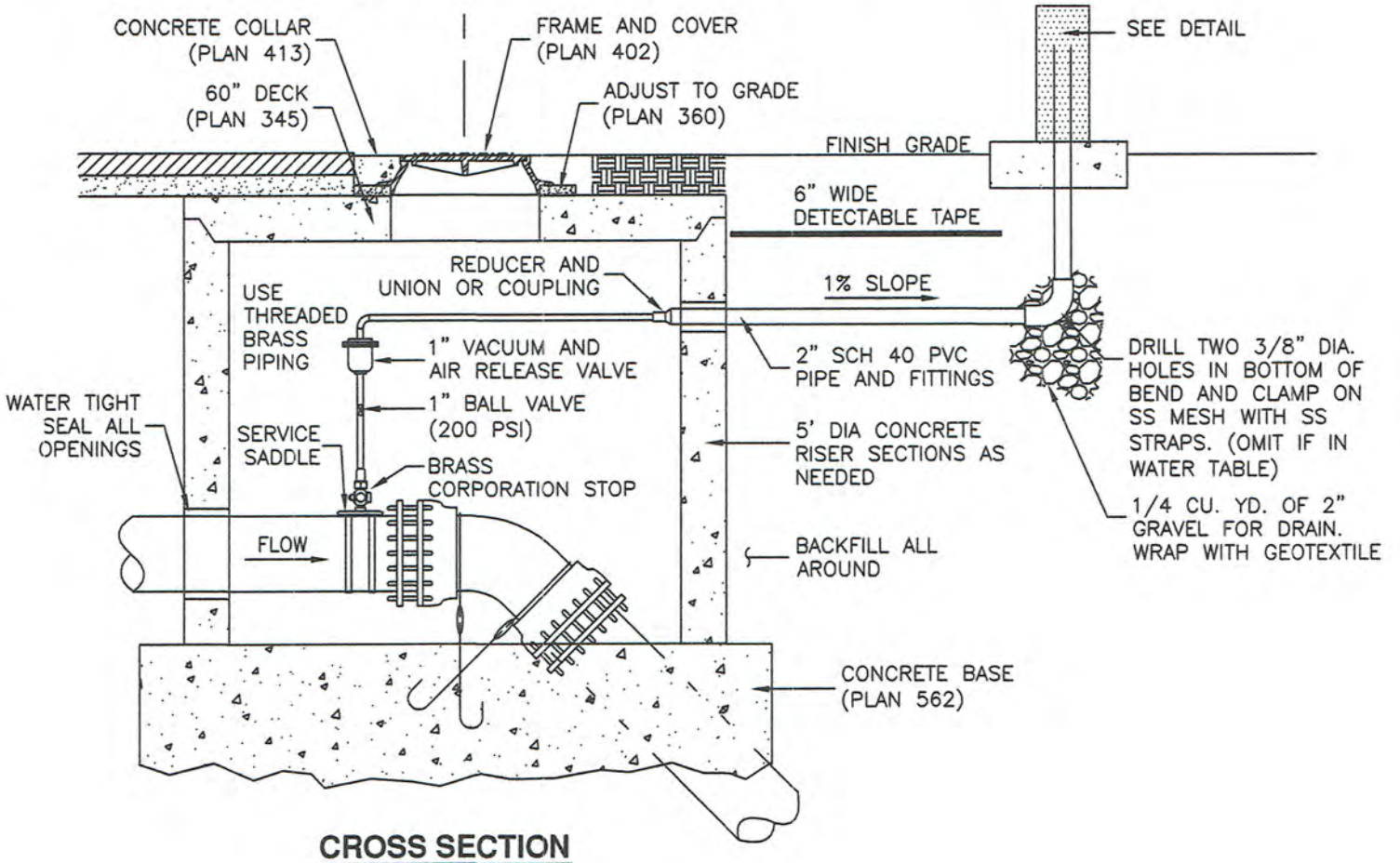
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Drain Gravel: Sewer rock, ASTM size no. 3 (2" to 1") or equal, APWA Section 31 05 13.
C. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Manhole: Riser, ASTM C478.
F. Reinforcement: Deformed, steel, ASTM A615. Give bars an epoxy coating at least 15 mils thick. Minimum stress yield strength of steel tie-down bars is 70,000 ksi.
G. Small Fittings: Brass. Do not use galvanized materials.
H. PVC Pipe and Fittings: Schedule 40, APWA Section 33 05 07.
I. Water Tight Wall Seal: Waterproof, compressible.

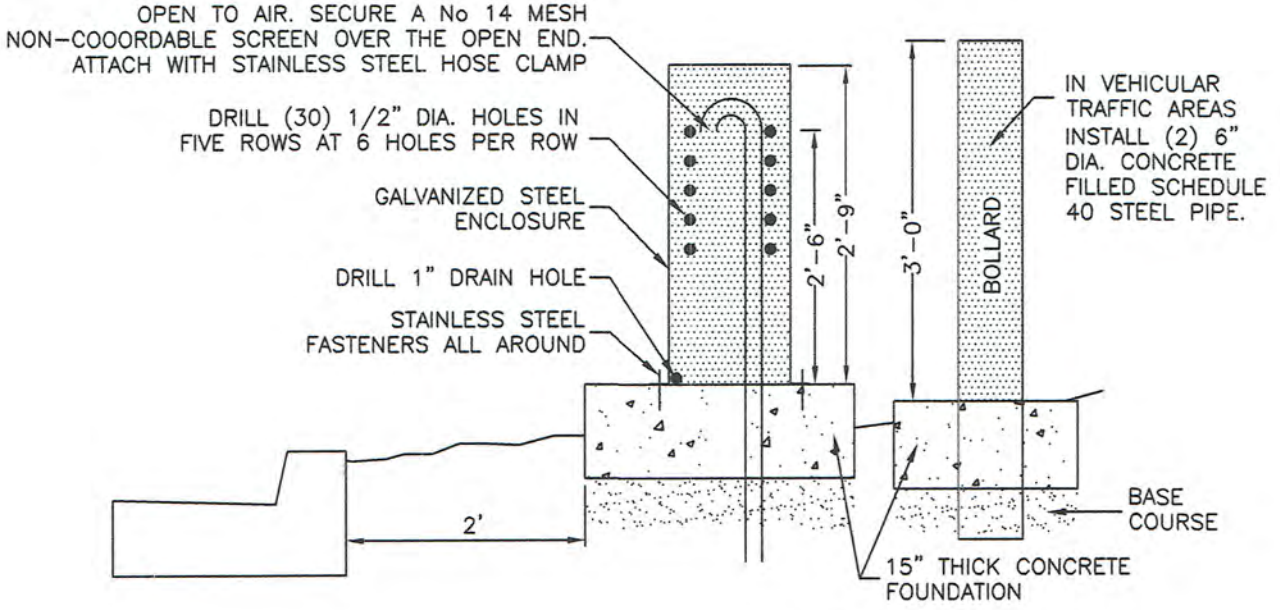
3. EXECUTION

A. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Apply tape wrap to the exterior of all buried steel pipe per AWWA C209.
C. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
D. Service saddle is required on all PVC and AC pipe taps unless specified otherwise. Ductile iron and cast iron pipe may be direct tapped.
E. Seal manhole joints water-tight and ground flush with interior wall.
F. Follow applicable AWWA and NSF standards when connecting piping.
G. If diameter of air relief valve is greater than 2-inches, provide piping to match its diameter from water main connection to open to air.

ROADWAY SURFACE RESTORATION | LANDSCAPED SURFACE RESTORATION



CROSS SECTION



DETAIL

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Air release assembly

Plan **575**

February 2011

Pressurized irrigation water and potable water interface

1. GENERAL

A. 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.

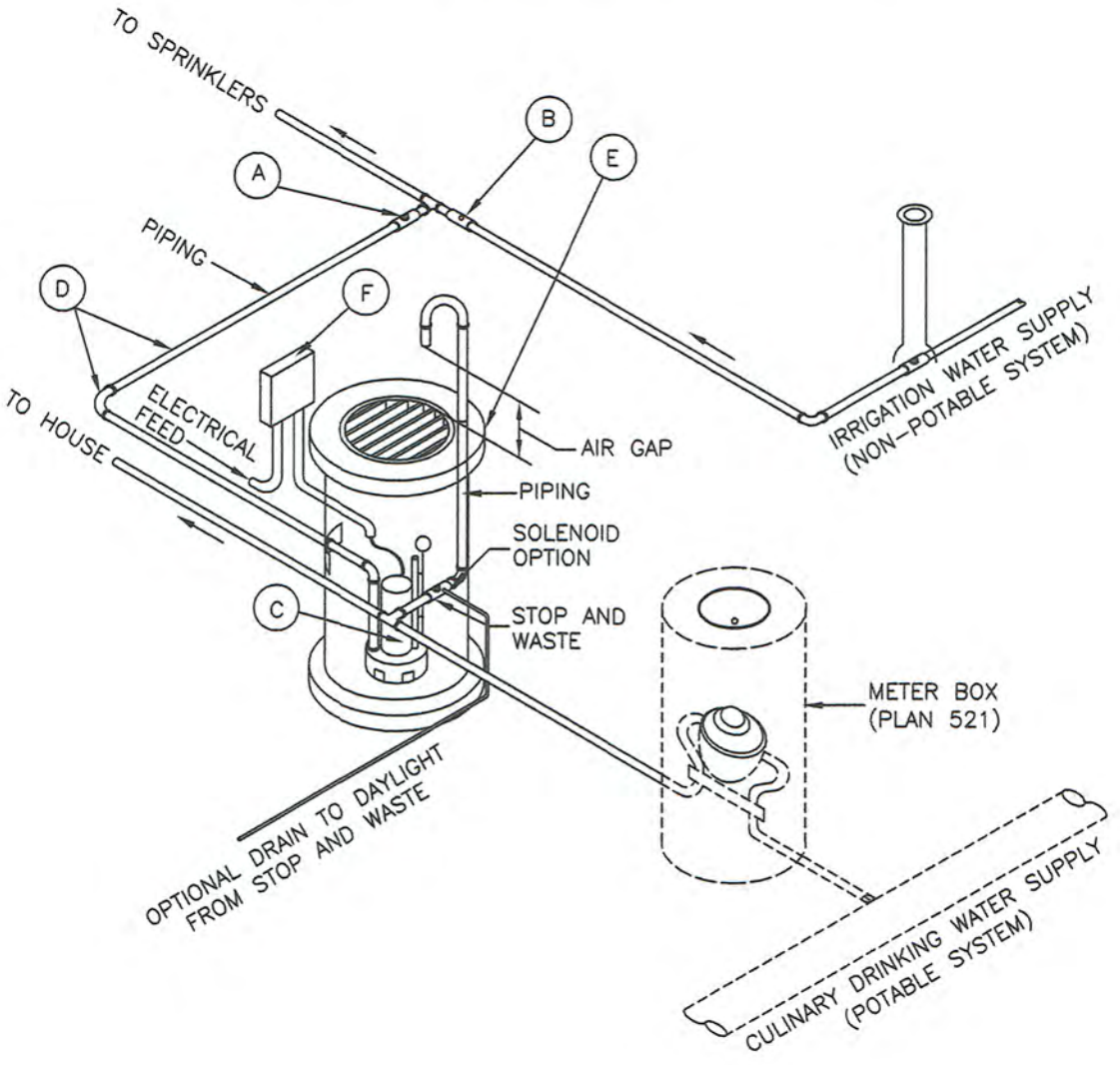
2. PRODUCTS

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 agency's discretion.

3. EXECUTION

A. 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.
B. 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.
C. 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).
D. Stand Pipes: Provide draining and freeze protection.
E. 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).
F. Galvanized Pipe: Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.

TYPE A - PUMP INTERCONNECT



LEGEND		
No.	ITEM	DESCRIPTION
A	CONTROL VALVE	NOTE 1A
B	CHECK VALVE	SIZE TO MATCH EXISTING PIPE
C	SUBMSERSIBLE PUMP WITH FLOAT OPERATED CUT-OUT SWITCH	NOTE 1A
D	ELBOWS, TEES & PIPE AS REQ'D	SCREWED OR FLANGED (OR BRAZED ABOVE GROUND ONLY)
E	CATCH BASIN	NOTE 1A
F	ELECTRICAL BOX AND CONDUIT	PER ELECTRICAL CODE

Pressurized irrigation water and potable water interface

1. GENERAL

A. There may be up to 20 psi loss of head through the reduced pressure backflow preventer (RPBP) device. This is normal and the agency should expect a decrease in area coverage. Agency should design or modify the system for the lower pressure.

2. PRODUCTS

A. Piping Materials.
   1) All above ground parts are to be copper or galvanized iron only.
   2) Below ground parts on the non-potable water system may be made of PVC or polyethylene at the agency's discretion.

B. Cam Lock Fittings: Provide 3/4" long male insert attached to the flexible hose.

3. EXECUTION

A. 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.

B. 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.

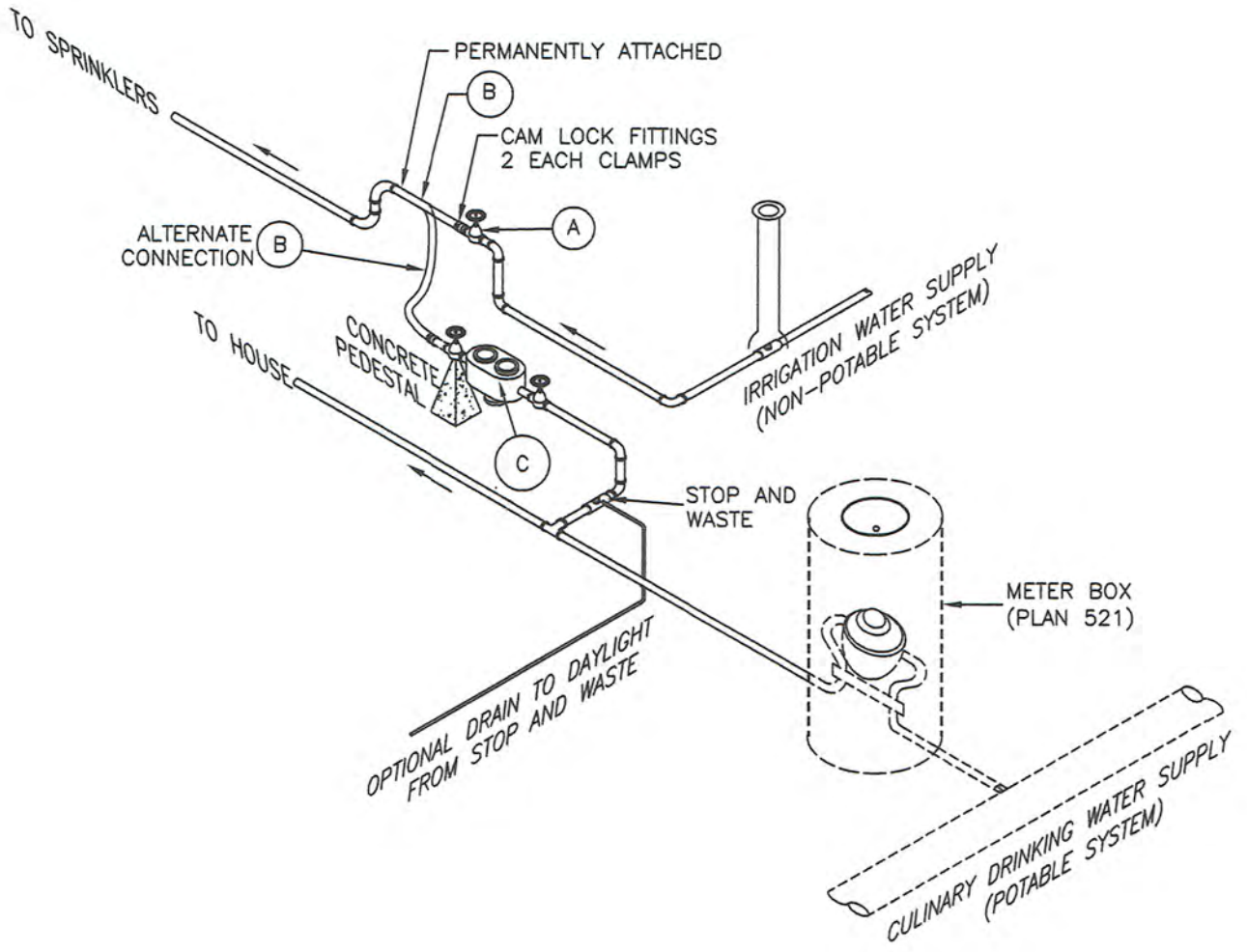
C. Testing: The RPBP device requires testing within 10 days of initial installation by a licensed backflow device tester and annually thereafter or more frequently at agency's option and expense.

D. 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.

E. Stand Pipes: Provide draining and freeze protection.

F. Galvanized Pipe: Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.

TYPE B- BACKFLOW PREVENTER INTERCONNECT



LEGEND		
No.	ITEM	DESCRIPTION
(A)	VALVE	BALL, RESILENT SEAT, GATE OR ACCEPTABLE ALTERNATE
(B)	FLEXIBLE DISCHARGE HOSE	100 PSI WORKING PRESSURE 400 PSI BUST PRESSURE
(C)	REDUCED PRESSURE BACK-FLOW PREVENTER (RPBP DEVICE	SHUTOFF VALVES & TEST COCKS ARE INCLUDED
(D)	ELBOWS AND TEES	SCREWED, FLANGED, (OR BRAZED ABOVE GROUND ONLY)

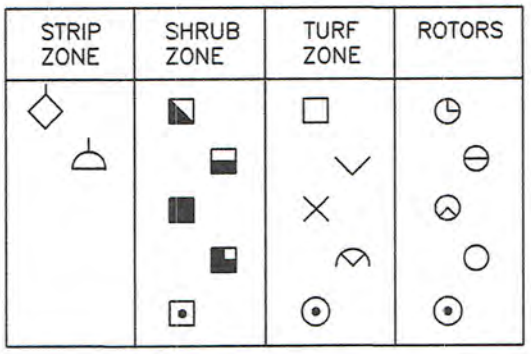
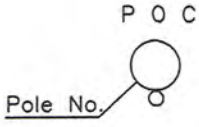
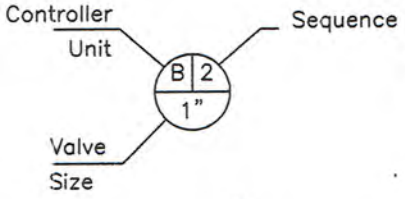
Abbreviations and symbols for irrigation and landscaping

1. GENERAL

A. Lettering Size: 10 point at final production.
B. Lettering Style. Capital letters preferred.
C. Existing Improvements. Shown in light shaded dashed lines.
D. New Improvements. Shown in solid continuous lines.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOL	DEFINITIONS
	BACKFLOW PREVENTER ASSEMBLY: DOUBLE CHECK REDUCED PRESSURE
	CONTROLLER
	DRINKING FOUNTAIN
	ELECTRICAL CONDUIT
	SPRAY HEAD NOZZLE GROUPS: 90° 180° 270° 360° VARIABLE
	PIPE: PRESSURE MAIN LATERAL PIPE
	POINT OF CONNECTION POWER POLE SOURCE
	PULL BOX: HIGH VOLTAGE
	LOW VOLTAGE
	PUMP
	SLEEVE:
	STATION DESIGNATION (REMOVE CONTROL VALVE)
	THRUST BLOCK

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

Curb face inlet - irrigation

1. GENERAL

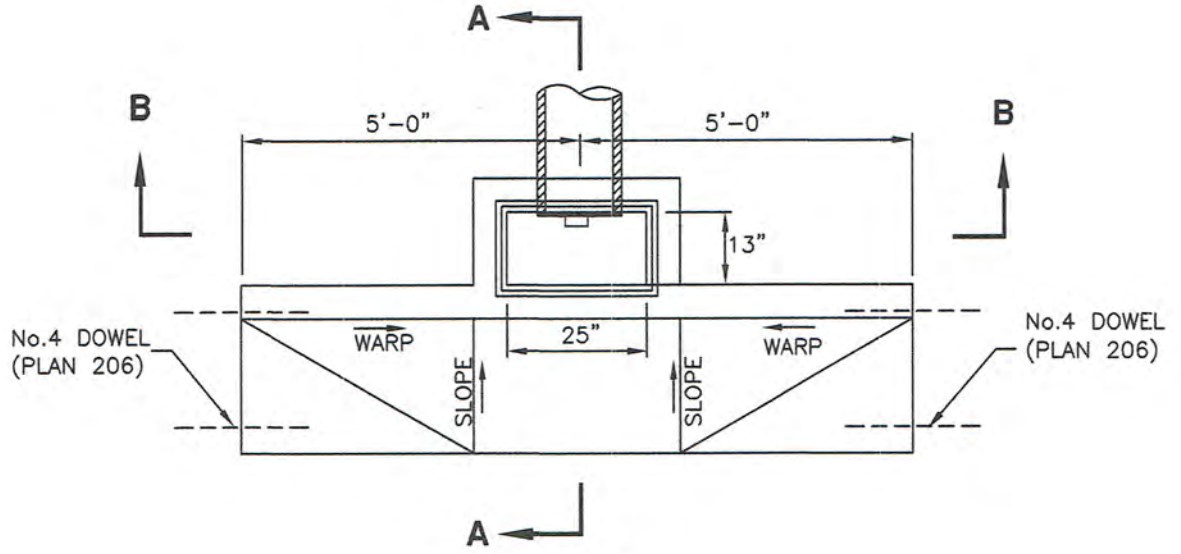
A. Before backfilling, get ENGINEER's inspection of installation.

2. PRODUCTS

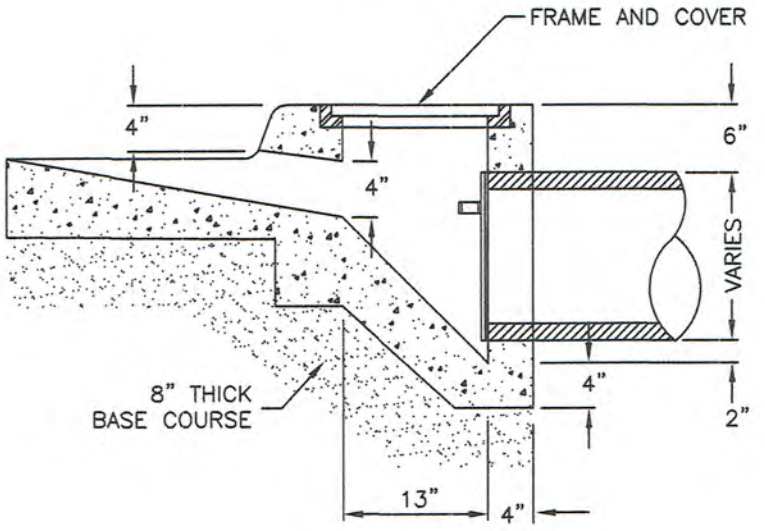
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.
F. Castings: Grey iron class 20 minimum, ASTM A48, coated with asphalt based paint or better.
G. Steel, ASTM A36, coated with asphalt based paint or better.
H. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION

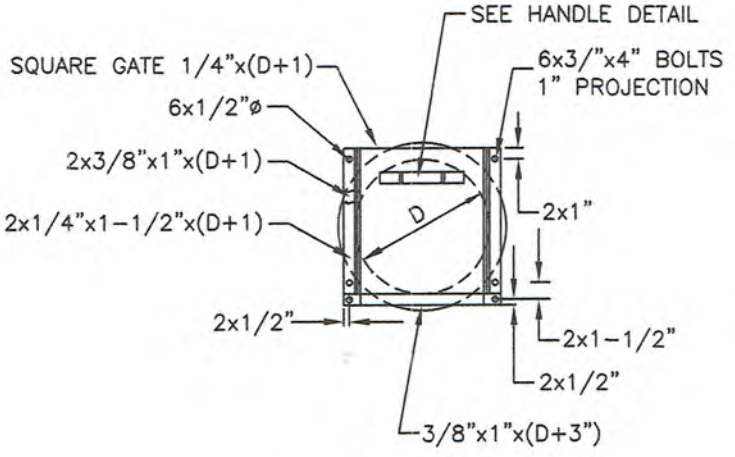
A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 6-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Gate: The gate shall securely seal water in or from the pipe.
D. Backfill: Maximum lift thickness is 8-inches before compaction. Compact to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26.



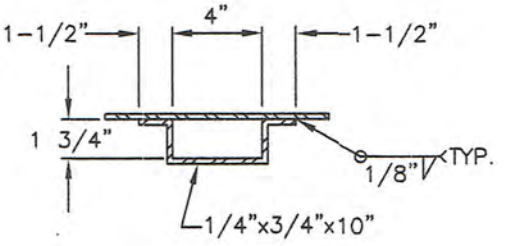
PLAN



SECTION A-A



SECTION B-B



HANDLE DETAIL

Irrigation diversion box

1. GENERAL

A. Before backfilling, get ENGINEER's inspection of installation.

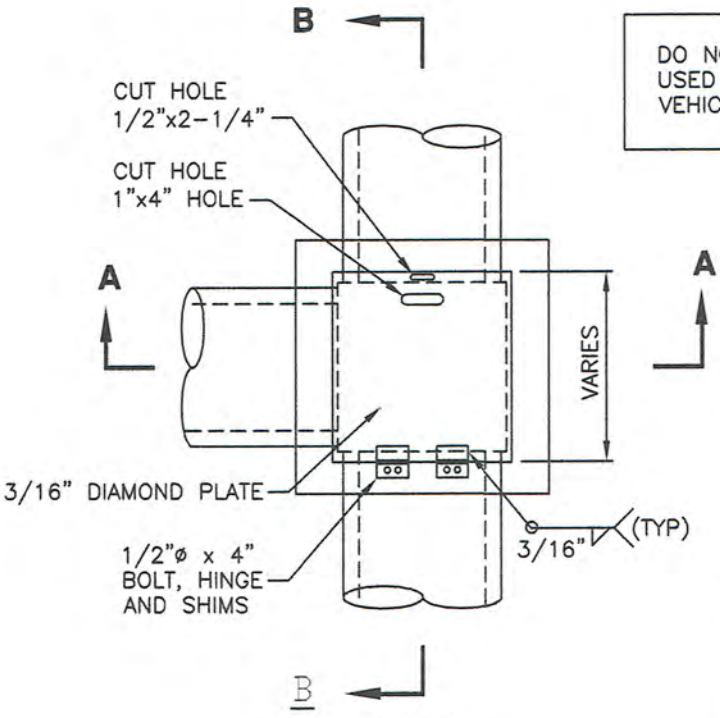
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.
F. Castings: Grey iron class 20 minimum, ASTM A48, coated with asphalt based paint or better.
G. Steel, ASTM A36, coated with asphalt based paint or better.
H. Hinge: Steel, 3" x 3" butt hinges welded to the cover plate.
I. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

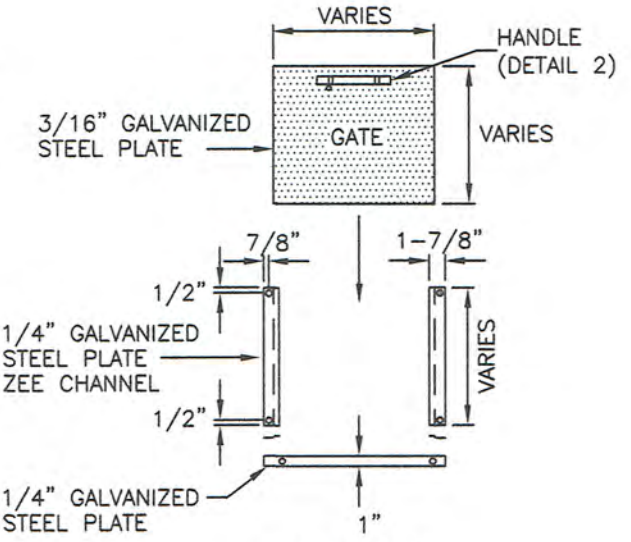
3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 6-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Gate: The gate shall securely seal water in or from the pipe.
D. Shims: Make shims match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.
E. Backfill: Maximum lift thickness is 8-Inches before compaction. Compact to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26

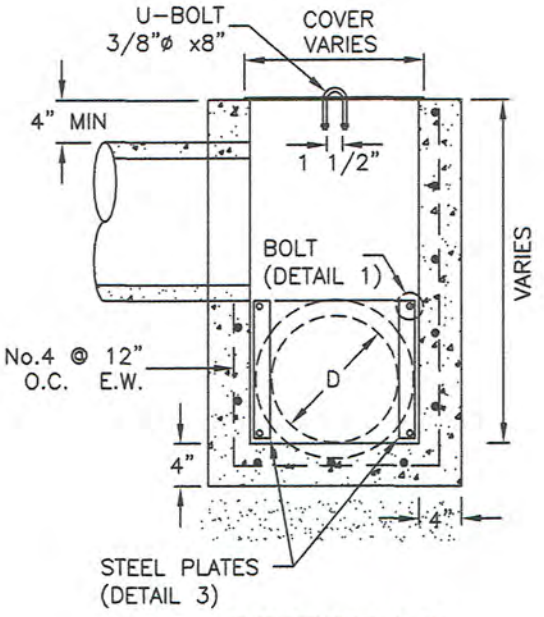
DO NOT USE THIS BOX IN AREAS USED BY PEDESTRIAN OR VEHICULAR TRAFFIC



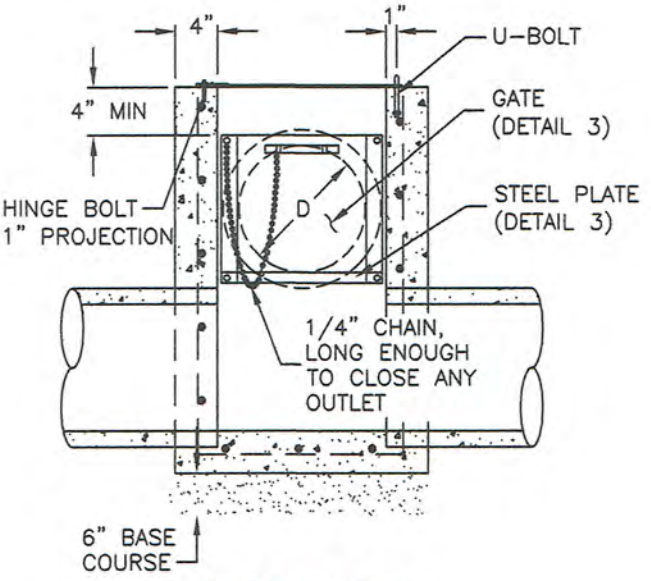
PLAN



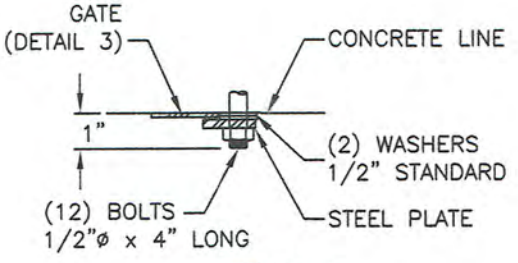
DETAIL 3



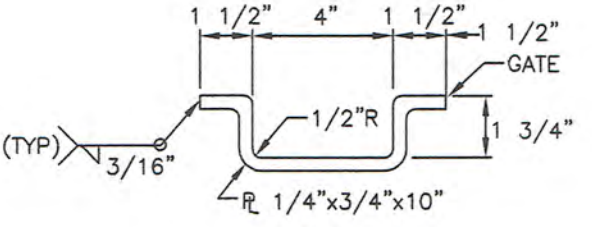
SECTION A-A



SECTION B-B



DETAIL 1



DETAIL 2

Irrigation diversion box

1. GENERAL

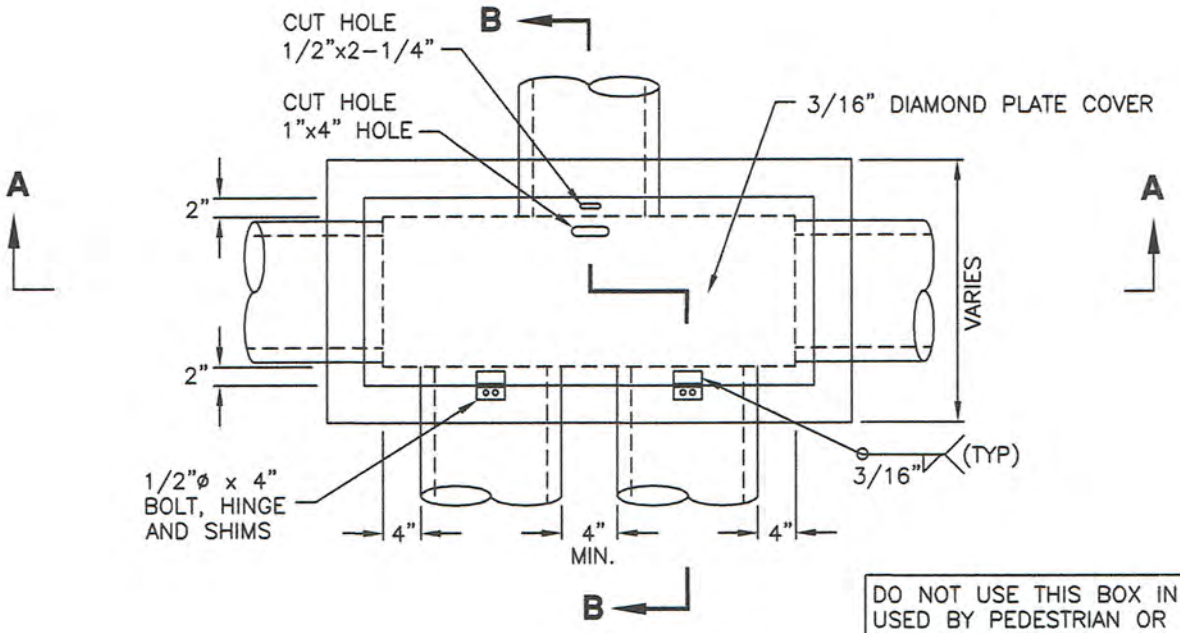
A. Before backfilling, get ENGINEER's inspection of installation.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
D. Concrete: Class 4000, APWA Section 03 30 04.
E. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.
F. Castings: Grey iron class 20 minimum, ASTM A48, coated with asphalt based paint or better.
G. Steel, ASTM A36, coated with asphalt based paint or better.
H. Hinge: Steel, 3" x 3" butt hinges welded to the cover plate.
I. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

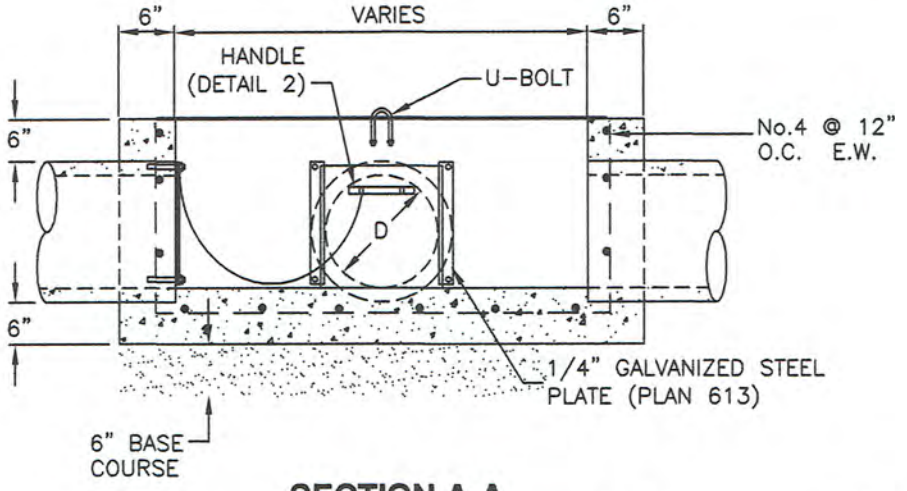
3. EXECUTION

A. Base Course Placement: APWA Section 32 11 23. Maximum lift thickness is 6-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Gate: The gate shall securely seal water in or from the pipe.
D. Shims: Make shims match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.
E. Backfill: Maximum lift thickness is 8-inches before compaction. Compact to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26.

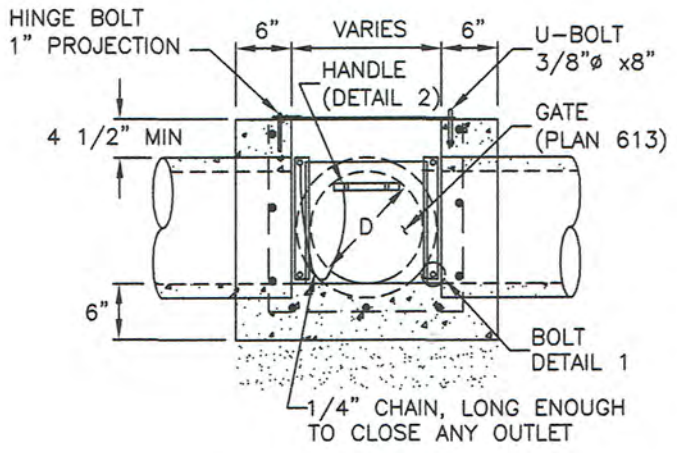


DO NOT USE THIS BOX IN AREAS USED BY PEDESTRIAN OR VEHICULAR TRAFFIC

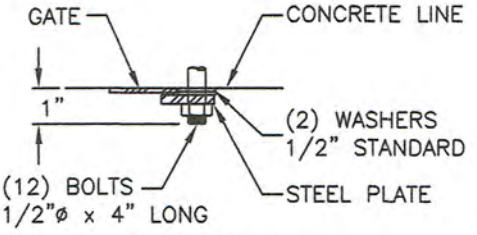
PLAN



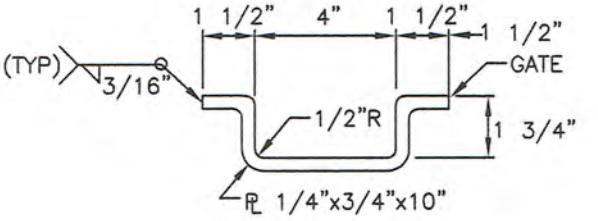
SECTION A-A



SECTION B-B



DETAIL 1



DETAIL 2

Stationary head

1. GENERAL

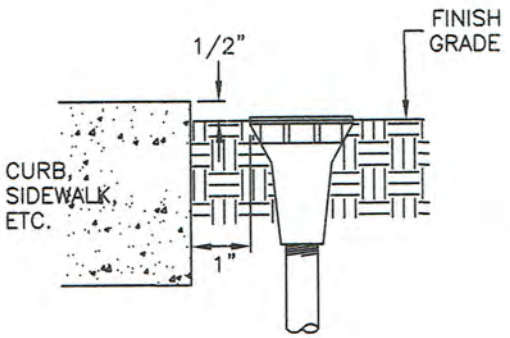
A. Before backfilling around head, get ENGINEER's inspection of head installation.

2. PRODUCTS

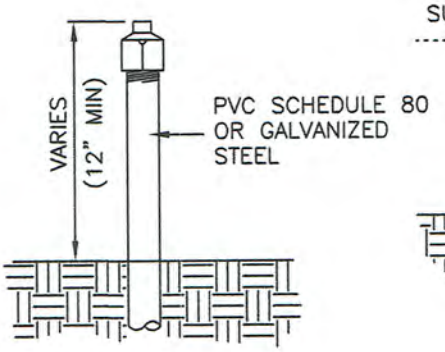
A. Heads: Plastic or steel.

3. EXECUTION

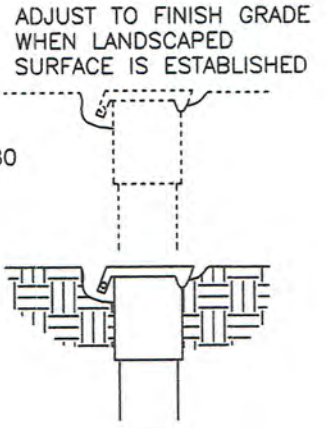
A. Adjust heads to final landscape grade and adjust throttle controls to obtain required coverage over final landscape grade.
B. Keep flush heads 1/2-inch below edge of pavement surfaces and flush with surrounding sod or seeded areas.
C. Compact backfill around heads to prevent settling.
D. Cut sod around head to fit.



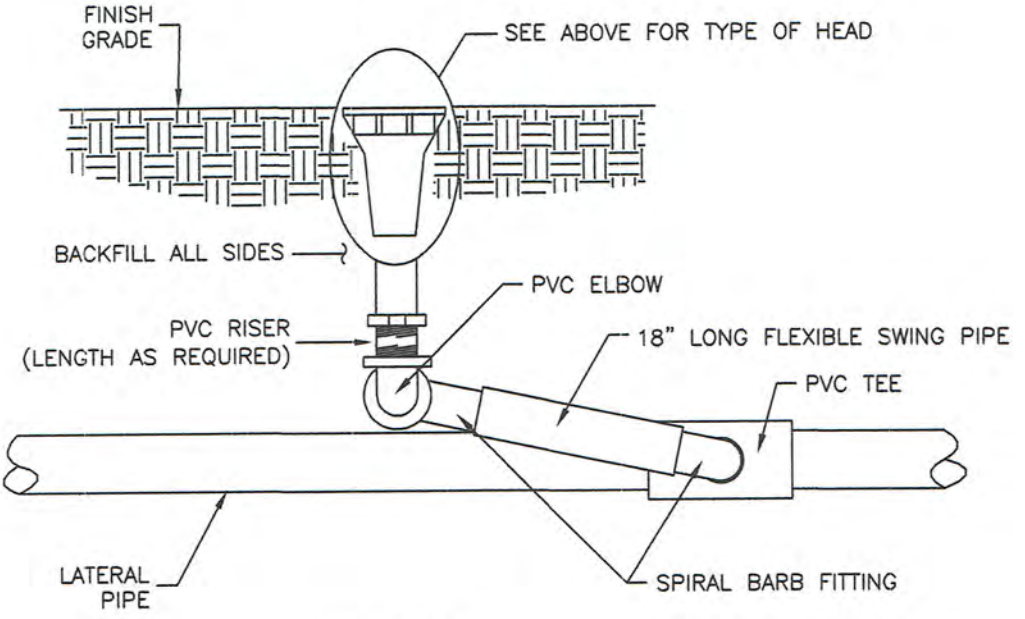
TYPE F
FLUSH HEAD



TYPE S
SHRUB HEAD



TYPE Q
QUICK COUPLER



SECTION

Pop-up head

1. GENERAL

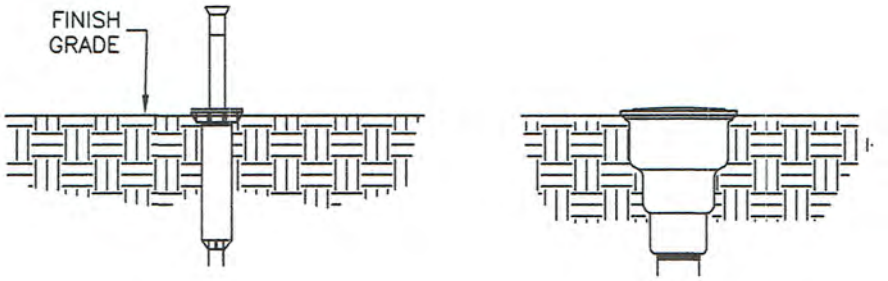
A. Before backfilling around head, get ENGINEER's inspection of head installation.

2. PRODUCTS

A. Heads: Plastic, brass, or steel.

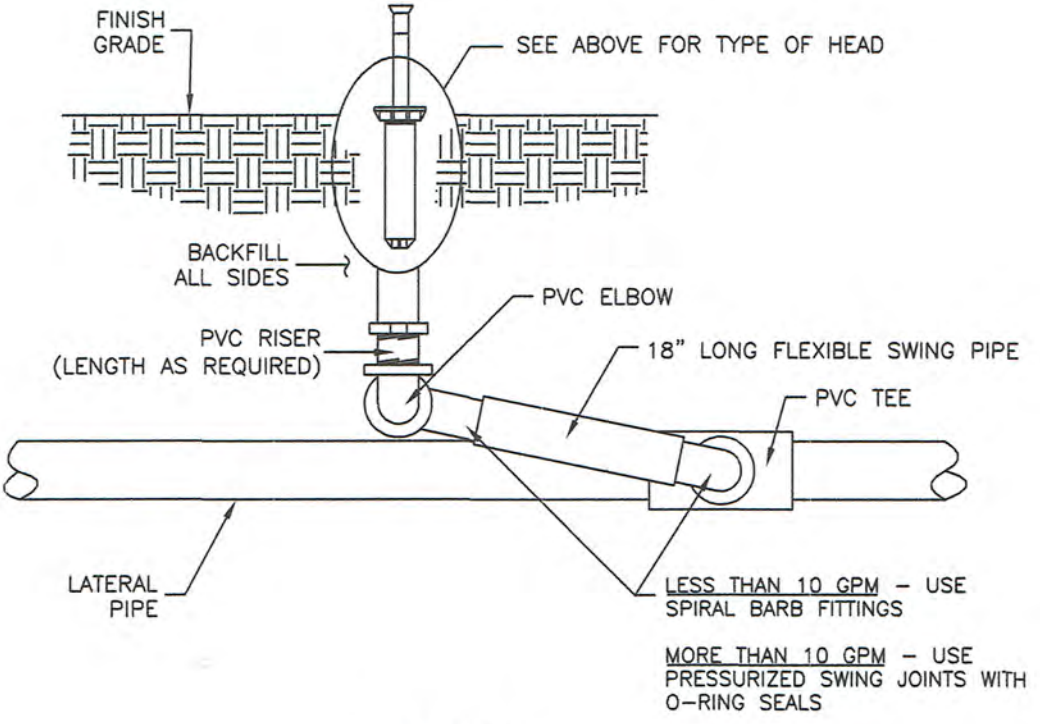
3. EXECUTION

A. Adjust heads to final landscape grade and adjust throttle controls to obtain required coverage over final landscape grade.
B. Keep flush heads 1/2-inch below edge of pavement surfaces and flush with surrounding sod or seeded areas.
C. Compact backfill around heads to prevent settling.
D. Cut sod around head to fit.



TYPE N
NOZZLE HEAD

TYPE R
ROTOR HEAD



SECTION

Backflow preventer

1. GENERAL

A. Test the backflow preventer within 10 days of installation by a licensed backflow device tester and report results to ENGINEER.
B. Tester is to assure CONTRACTOR and ENGINEER that the backflow preventer system meets the Utah Safe Drinking Water Act.

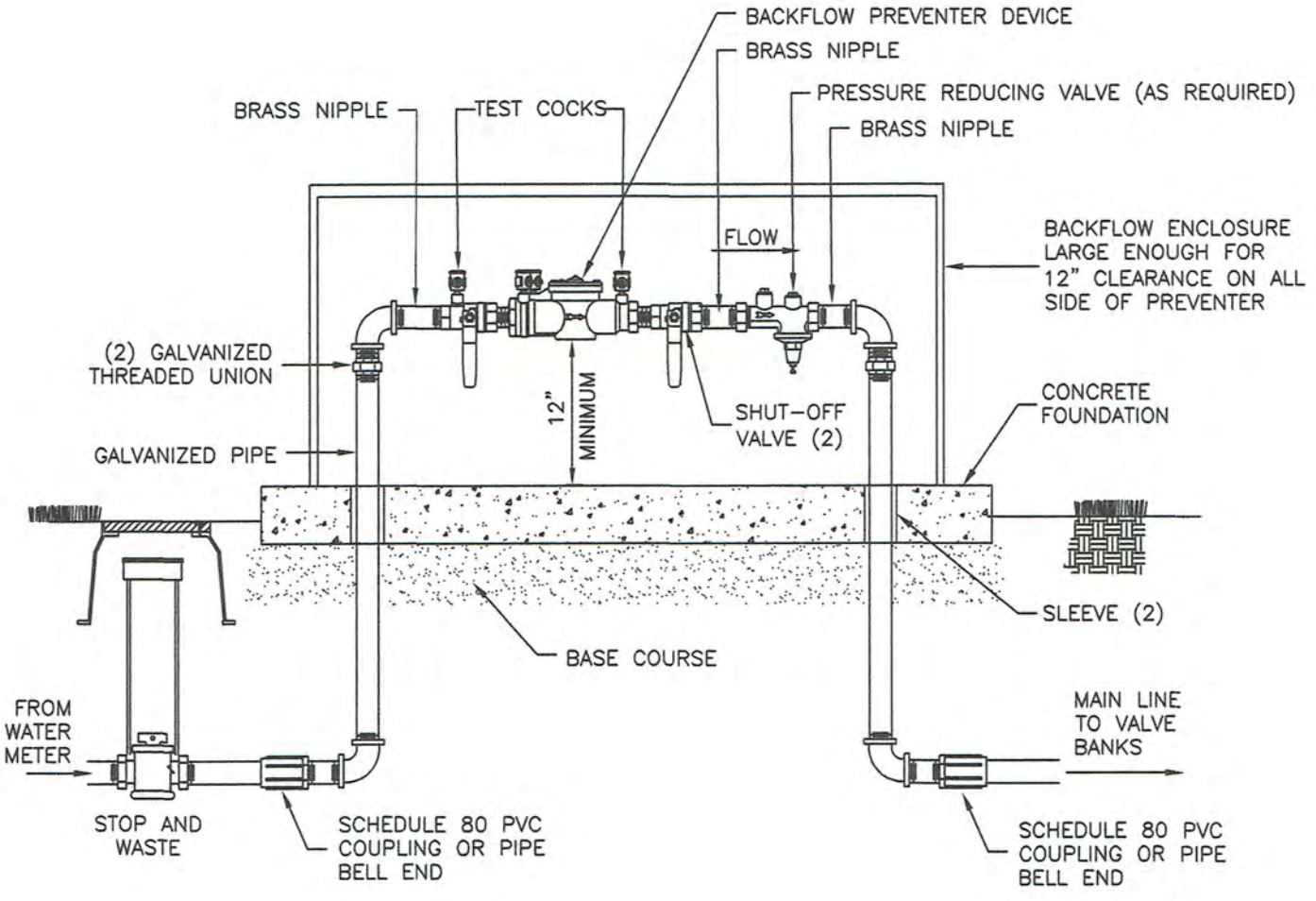
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.
E. Paint: Epoxy based. Color to be selected by ENGINEER.

3. EXECUTION

A. Install per plumbing code. It must not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.
B. Install backfill around concrete box. Compact in 8-inch lifts to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26.
C. Except machined surfaces, coat all items in atmosphere with epoxy paint.
D. Concrete placement, APWA Section 03 30 10. Provide 1/2-inch radius on edges. Apply a broom finish. Apply a curing agent.

LESS THAN 3" DIAMETER



Backflow preventer

1. GENERAL

A. Test the backflow preventer within 10 days of installation by a licensed backflow device tester and report results to ENGINEER.
B. Tester is to assure CONTRACTOR and ENGINEER that the backflow preventer system meets the Utah Safe Drinking Water Act.

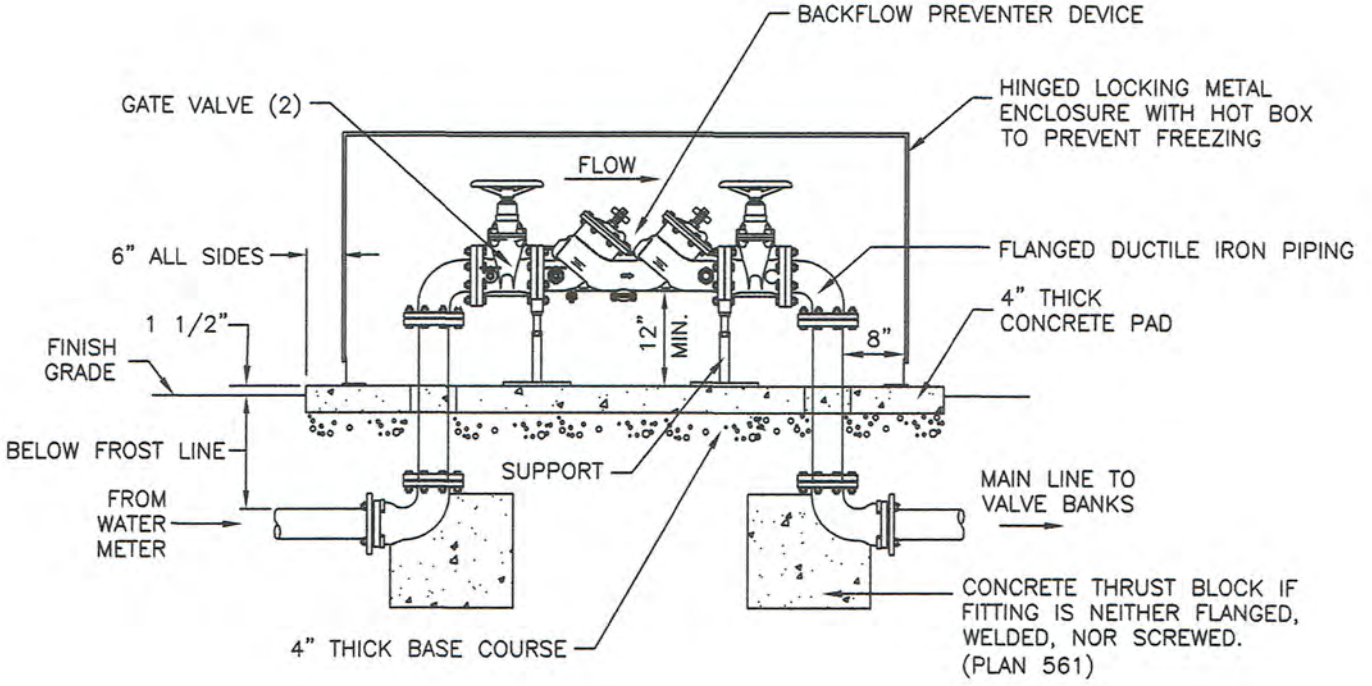
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.
E. Paint: Epoxy based. Color to be selected by ENGINEER.

3. EXECUTION

A. Install per plumbing code. It must not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.
B. Install backfill around concrete box. Compact in 8-inch lifts to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26.
C. Except machined surfaces, coat all items in atmosphere with epoxy paint.
D. Concrete placement, APWA Section 03 30 10. Provide 1/2-inch radius on edges. Apply a broom finish. Apply a curing agent.

3" AND LARGER


BACKFLOW PREVENTER DEVICE
GATE VALVE (2)
HINGED LOCKING METAL ENCLOSURE WITH HOT BOX TO PREVENT FREEZING
FLOW
6" ALL SIDES
FLANGED DUCTILE IRON PIPING
4" THICK CONCRETE PAD
1 1/2"
12" MIN.
8"
FINISH GRADE
BELOW FROST LINE
SUPPORT
MAIN LINE TO VALVE BANKS
FROM WATER METER
CONCRETE THRUST BLOCK IF FITTING IS NEITHER FLANGED, WELDED, NOR SCREWED. (PLAN 561)
4" THICK BASE COURSE

Drain valve

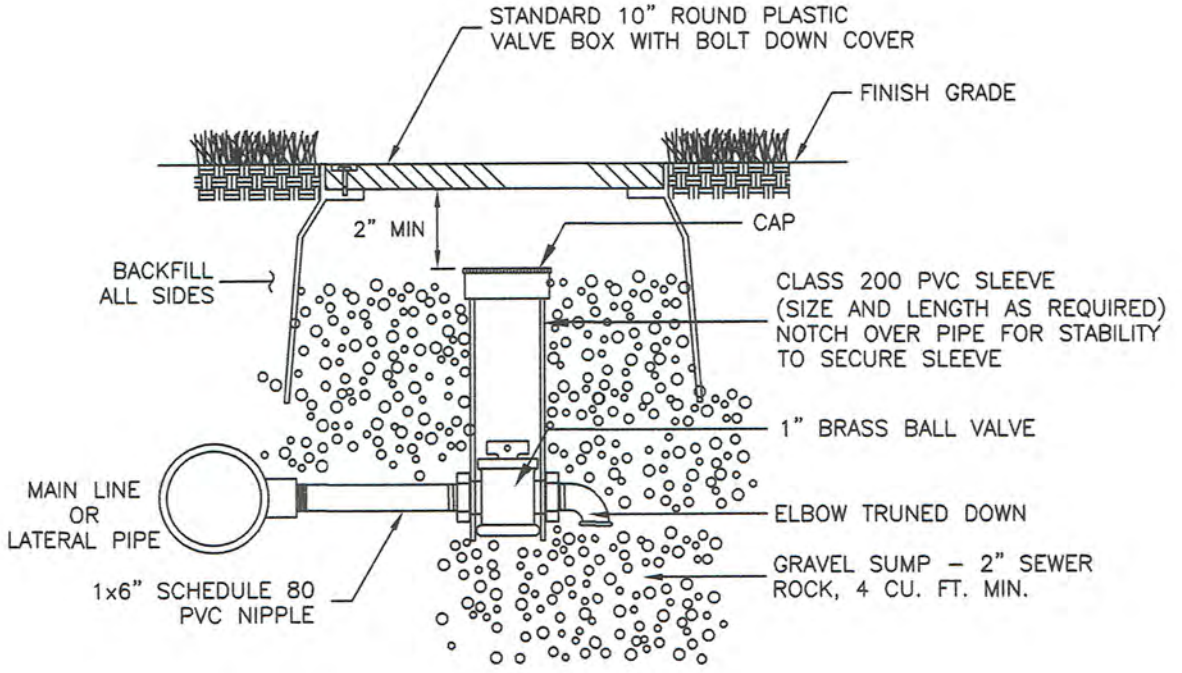
1. GENERAL

A. Before backfilling around drain, get ENGINEER's inspection of drain installation. System must be pressurized during inspection.

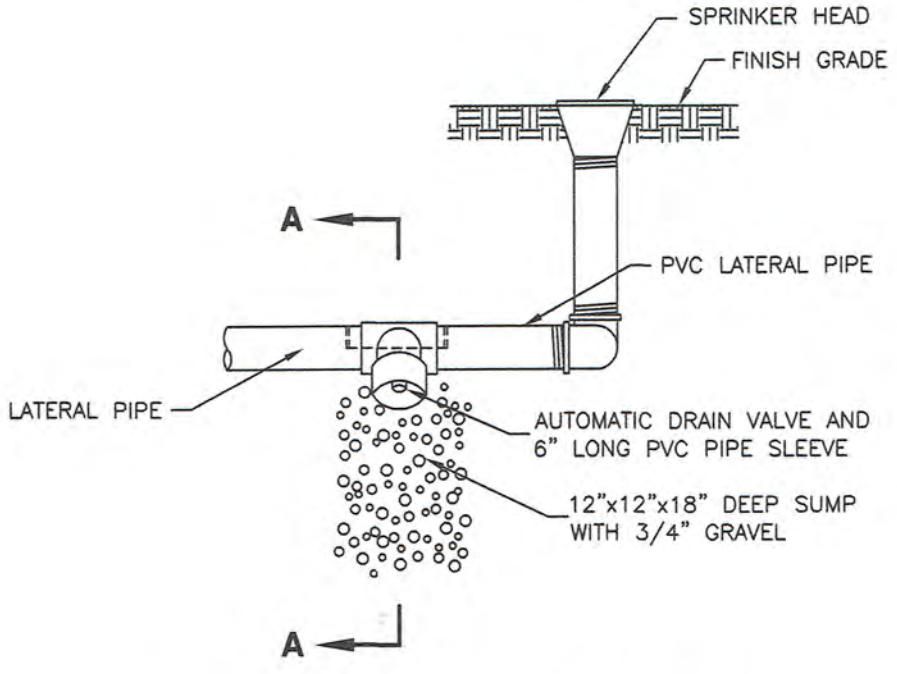
2. PRODUCTS (Not used)

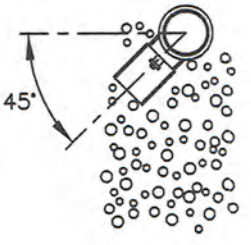
3. EXECUTION

A. Install backfill material around pipe and valve and compact to prevent settling.
B. 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.
C. Deliver salvaged valves to ENGINEER unless specified otherwise.
D. Locate all valves at all low points on lateral pipe.



TYPE A - MANUAL DRAIN VALVE





SECTION A-A

TYPE B - AUTOMATIC DRAIN VALVE

Control valve

1. GENERAL

A. Before backfilling around valve box, get ENGINEER’s inspection of drain installation. System must be pressurized during inspection.

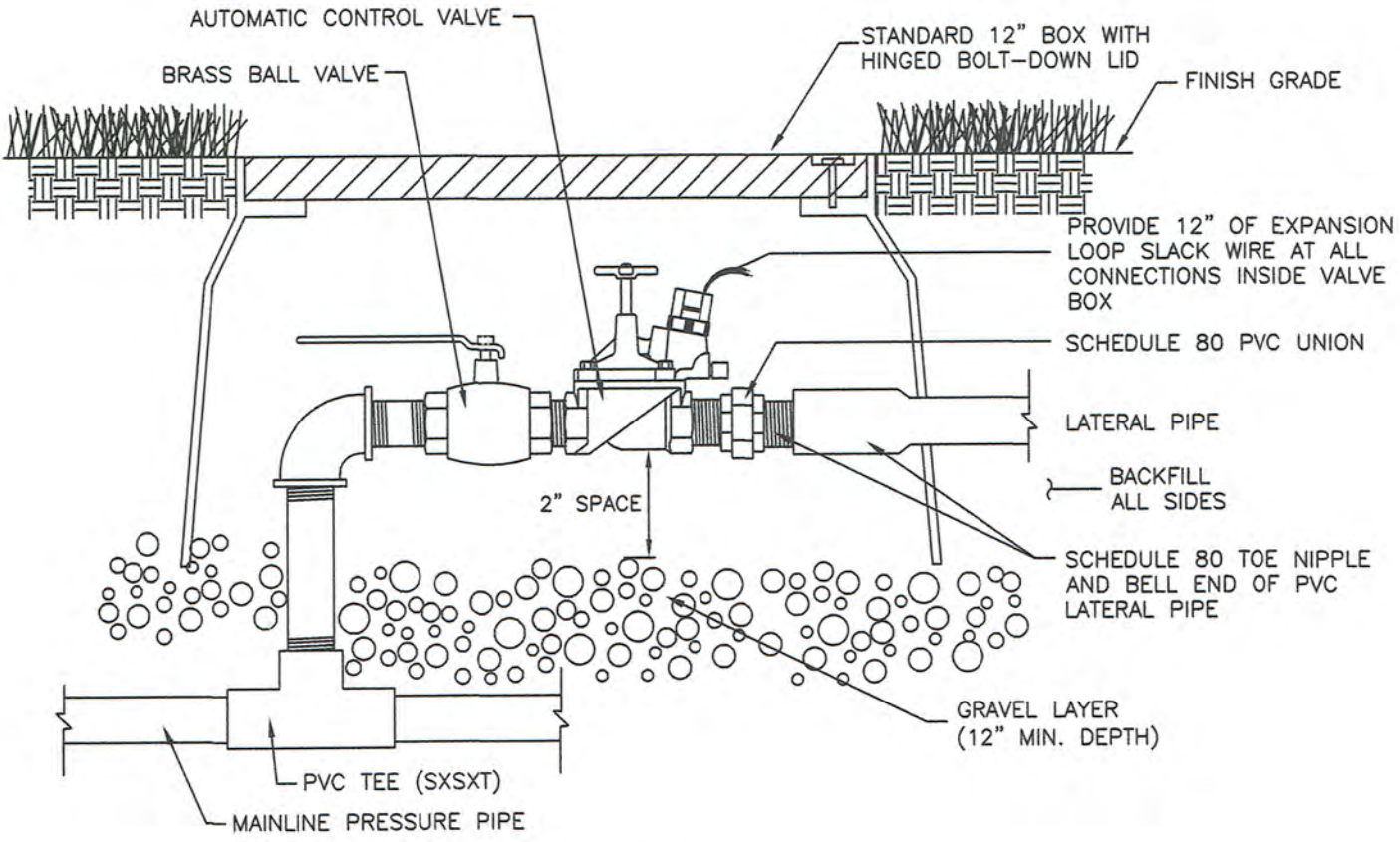
2. PRODUCTS

A. Backfill: APWA Section 31 05 13.
   1) Gravel with a maximum particle size 2-inches.
   2) Native soil.

3. EXECUTION

A. Install automatic controllers and wiring per manufacturer's recommendations.

NARRATIVE: USE SCHEDULE 80 THREADED PIPING



SXSXT = SLIP BY SLIP BY THREAD CONNECTIONS

Isolation valve

1. GENERAL

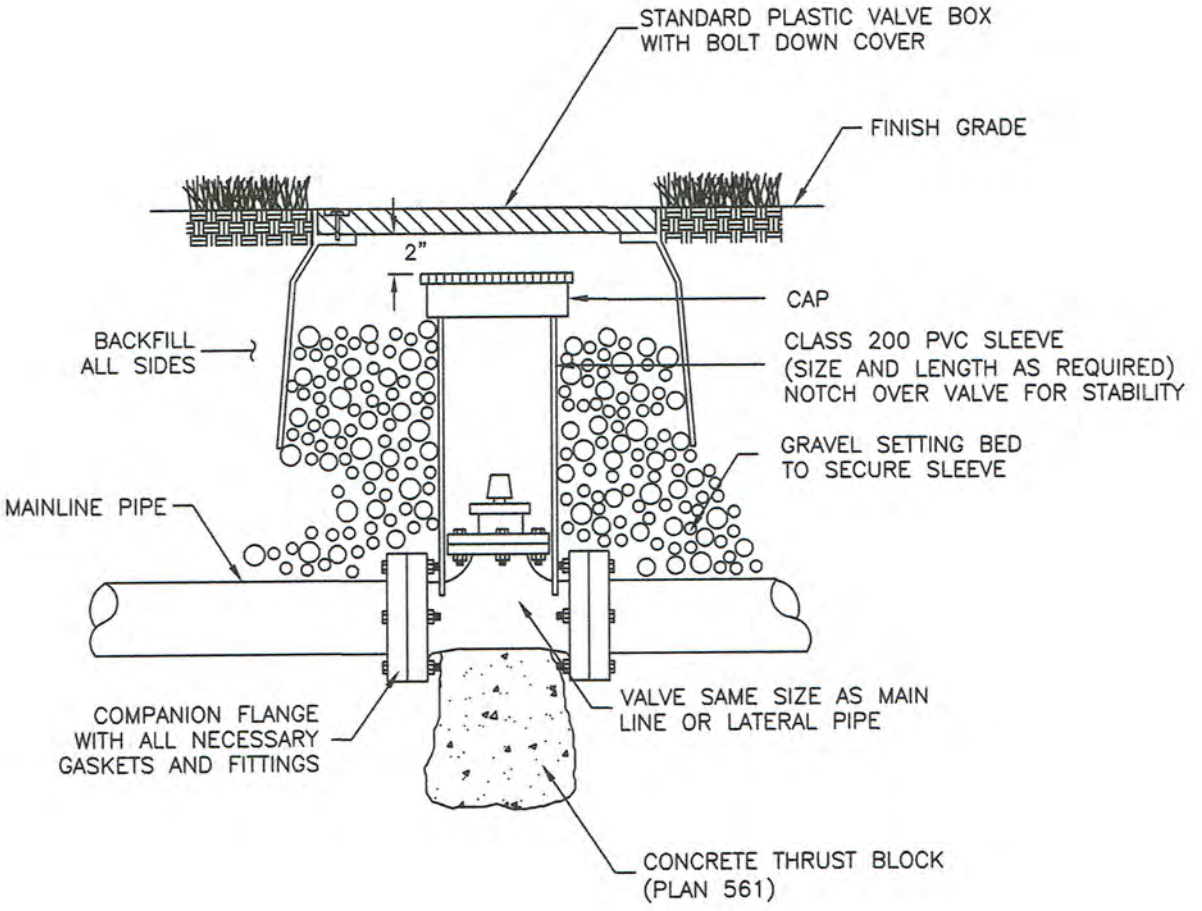
A. Before backfilling around the isolation valve, get ENGINEER's inspection of valve installation. System must be pressurized during inspection.

2. PRODUCTS

A. Backfill: APWA Section 31 05 13.
   1) Gravel with a maximum particle size 2-inches.
   2) Native soil.
B. Gate Valve: Bronze, double disk wedge type with integral taper seats and non-rising stem.
C. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

A. Install backfill material around pipe and valve box and compact to prevent settling.
B. Install automatic controllers and wiring per manufacturer's recommendations.
C. Place concrete, APWA Section 03 30 10.
D. Return salvaged valves to ENGINEER unless specified otherwise.



NOTE: FLANGED PIPE IS SHOWN.
INSTALLATION MAY BE WELDED,
SCREWED, OR OTHER

Wire runs for landscape irrigation

1. GENERAL

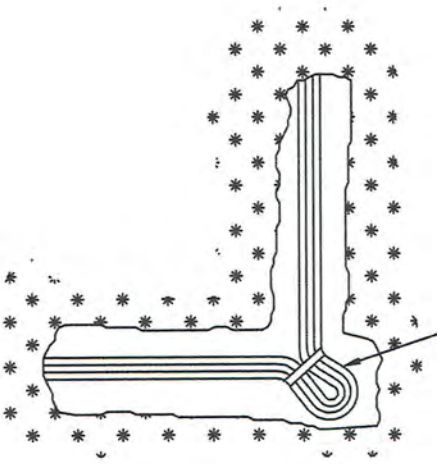
A. Before backfilling, get ENGINEER's inspection of installation.

2. PRODUCTS

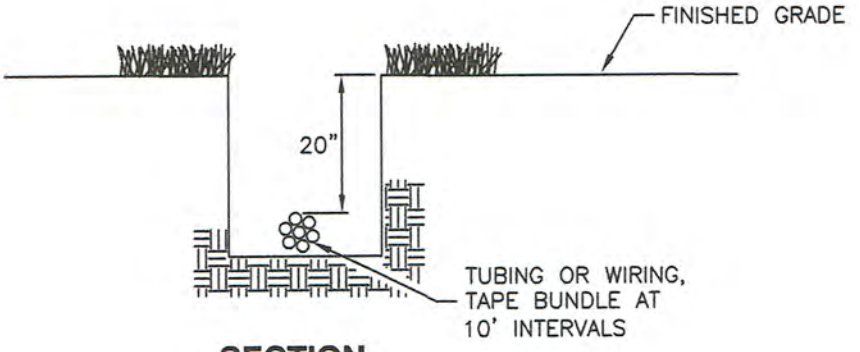
A. Control Wire: UF-UL listed copper.
B. Insulation: PVC for direct burial

3. EXECUTION

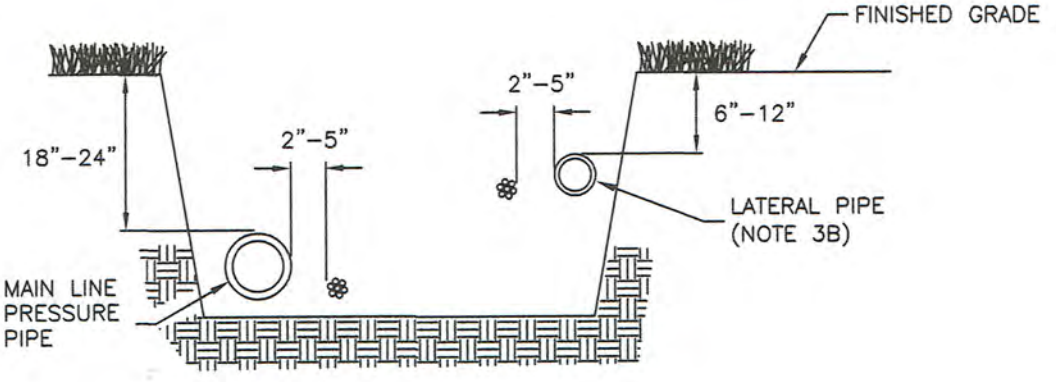
A. Backfill: Place backfill in trench. Water jetting is NOT allowed. Compact to 95-percent or greater relative to a standard proctor density, APWA Section 31 23 26.
B. Lateral Pipe: Where lateral pipe runs parallel to a mainline (pressure) pipe, do not install over main line pipe.
C. Control Wire: Provide 12-inches of expansion loop wire at each valve and every 100 feet of wire length. Use waterproof wire connectors at all splices.



PLAN



SECTION



SECTION

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Wire runs for landscape irrigation

Plan
651
April 2011

Tree

1. GENERAL

A. Definitions:
   1). Large Tree: Over 50 feet tall at maturity.
   2). Medium Tree: Between 30 and 50 feet tall at maturity.
   3). Small Tree: Up to 30 feet tall at maturity.
   4). Park Strip: Area between the edge of road, (back of curb) and the sidewalk.
   5). Tree Size: Average caliper diameter measured 6" above the root ball.

2 PRODUCTS

A. Tree:

Size	Width of Planting Area
Large	8 feet or larger
Medium	5 feet or larger
Small	3 feet or larger

B. Mulch: APWA Section 32 93 43

3. EXECUTION

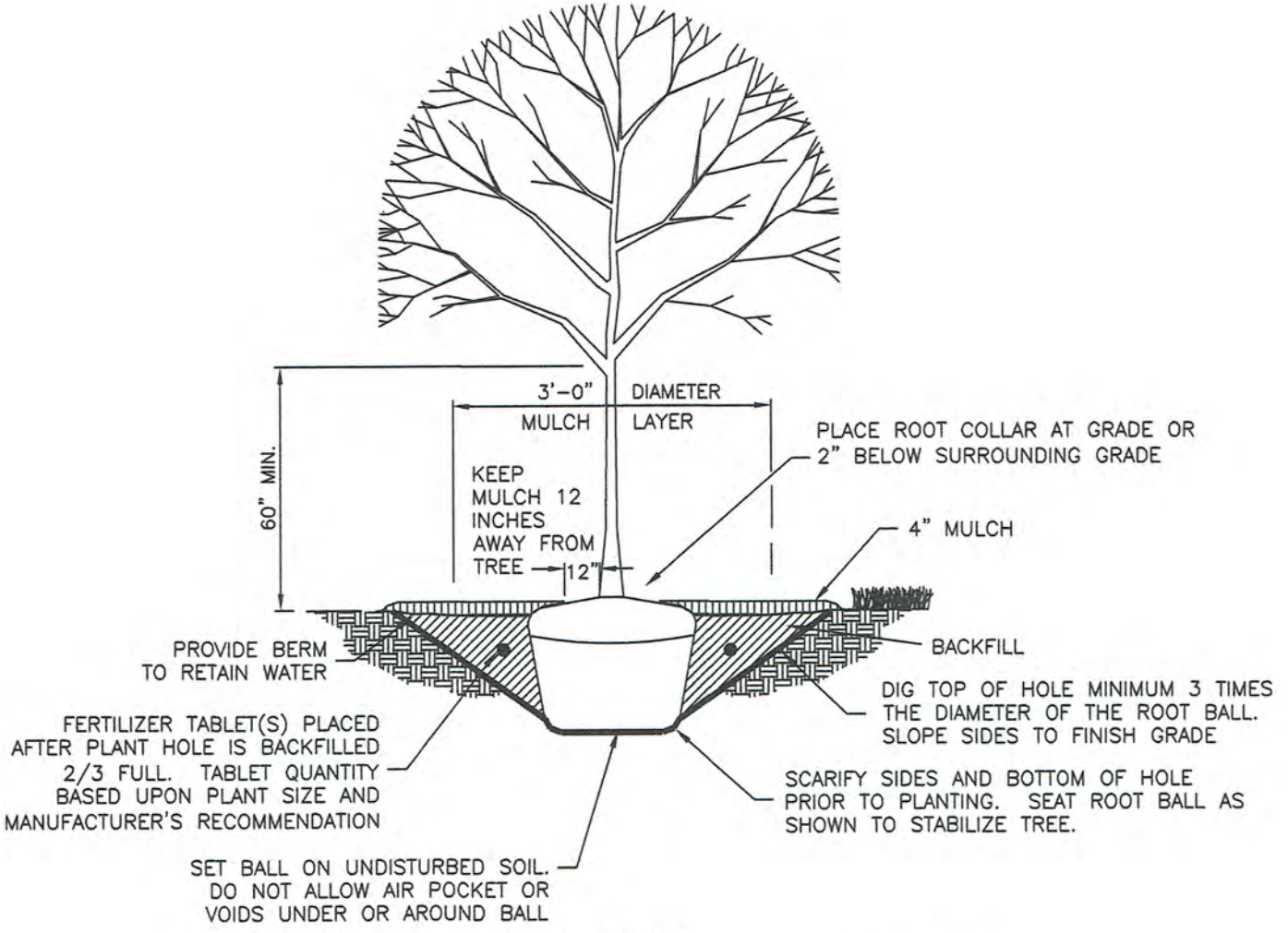
A. Planting Location:

Distance from	Distance
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

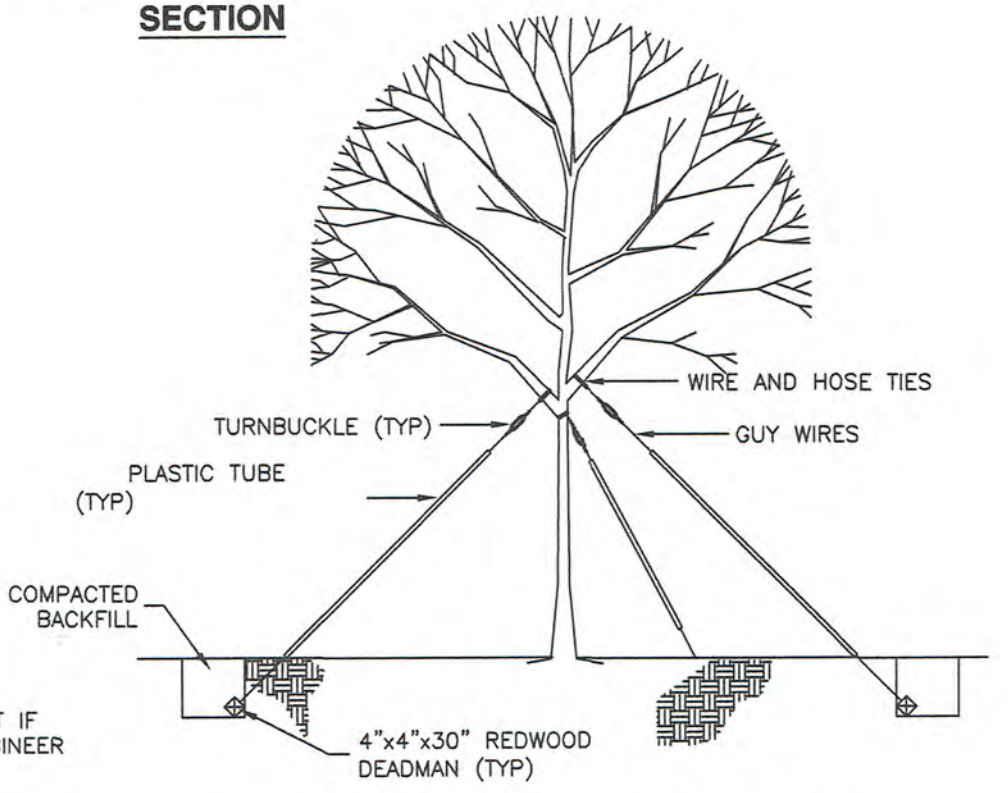
B. Root Ball:
   1). Prune circling roots, protruding root stubs, and fibrous matted roots flush with the root ball. Handle root ball with care. Minimize crumbling, cracking, and splitting.
   2). After placing the tree in the hole remove wire and burlap if stability of the root ball allows. If not, 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.

C. 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.

D. Backfill and Watering:
   1). Use soil removed from the hole as backfill. If soil is a base course material, mix with 1/3 organic mulch. Mix thoroughly.
   2). 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

Shrubs and bushes

1. GENERAL:

A. Before placing the shrub or bush, get ENGINEER's inspection of excavation.

B. Perform work in conformity with applicable requirements of American Association of Nurserymen, Inc. (AAN).

2. PRODUCTS

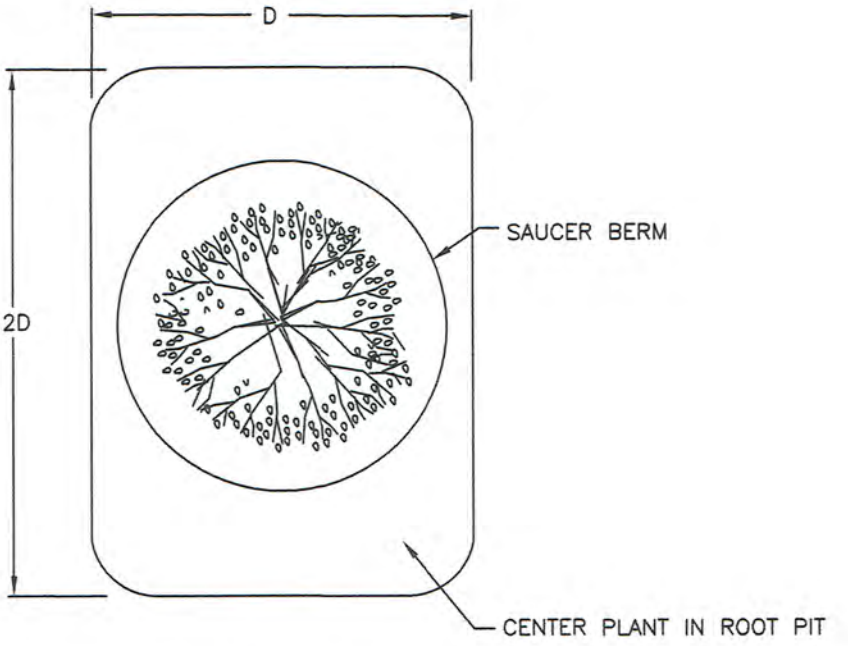
A. Commercial Fertilizer: Uniform in composition meeting FS O-F-241 requirements.

B. Wood or Wood Cellulose Fiber: Free of growth or germination inhibiting ingredients.

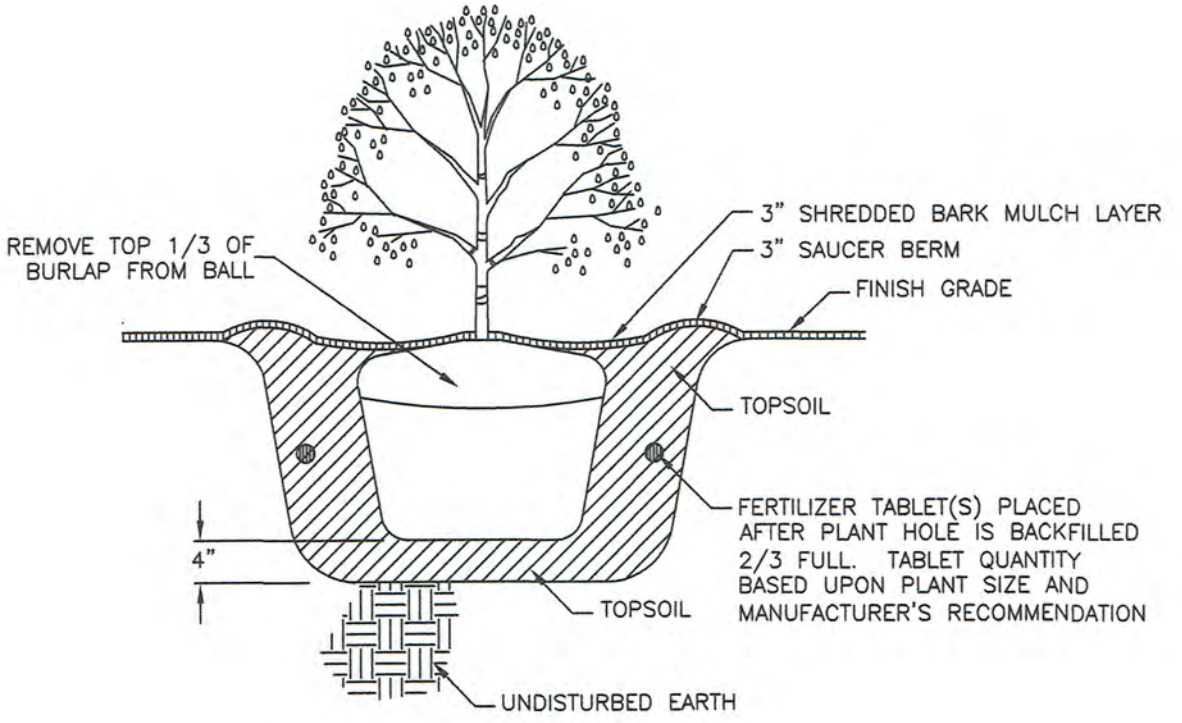
3. EXECUTION

A. Set shrubs and bushes at nursery depth.

B. Install and compact all backfill material to prevent settling.



PLAN



SECTION

Abbreviations and symbols for traffic signals

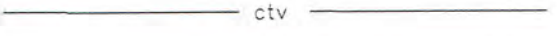
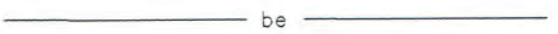
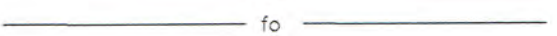
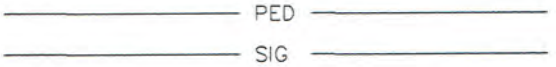
1. GENERAL

A. Lettering Size: 10 point at final production.

B. Lettering Style. Capital letters preferred.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)

SYMBOL	DEFINITIONS
	SIGNAL POLE IDENTIFICATION
	SIGNAL POLE MAST ARM
	SIGNAL POLE LUMINAIRE EXTENSION WITH ARM
	POWER SOURCE
	TRAFFIC SIGNAL POLE
	EXISTING SPAN WIRE POLE
	TYPE I, 12"–3 SECTION SIGNAL HEAD ASSEMBLY WITH LOUVERED BACK PLATE
	TYPE III, 12"–5 SECTION SIGNAL HEAD ASSEMBLY
	TRAFFIC SIGNAL CONTROLLER
	TYPE II–PC JUNCTION BOX
	TYPE III–PC JUNCTION BOX
	PEDESTRIAN SIGNAL HEAD
	PEDESTRIAN SIGNAL HEAD WITH PUSH BUTTON WITH AUDIBLE
	UNDERGROUND SERVICE PEDESTAL (USP)
	VIDEO DETECTION CAMERA
	POWER SOURCE
	MAST ARM MOUNTED SIGN
	VIDEO CAMERA
	VIDEO DETECTION ZONE
	JUNCTION BOX
	ELECTRIC POLE
	LIGHT POLE
	POWER POLE
	GUY WIRE
	CABLE OVERHEAD
	ELECTRIC OVERHEAD
	ELECTRIC BURIED
	FIBER OPTIC
	RIGHT OF WAY LINE
	PEDESTRIAN CIRCUIT
	TRAFFIC SIGNAL CIRCUIT
	STREET LIGHTING CIRCUIT
	FUTURE USE
	POWER SOURCE CIRCUIT

NOTE:

EXISTING FACILITIES MAY BE SHOWN IN SCREENED OR DASHED LINES

Riser

1. GENERAL

A. Detail 1 shows a typical installation. Conduit detail varies according to the service provided.

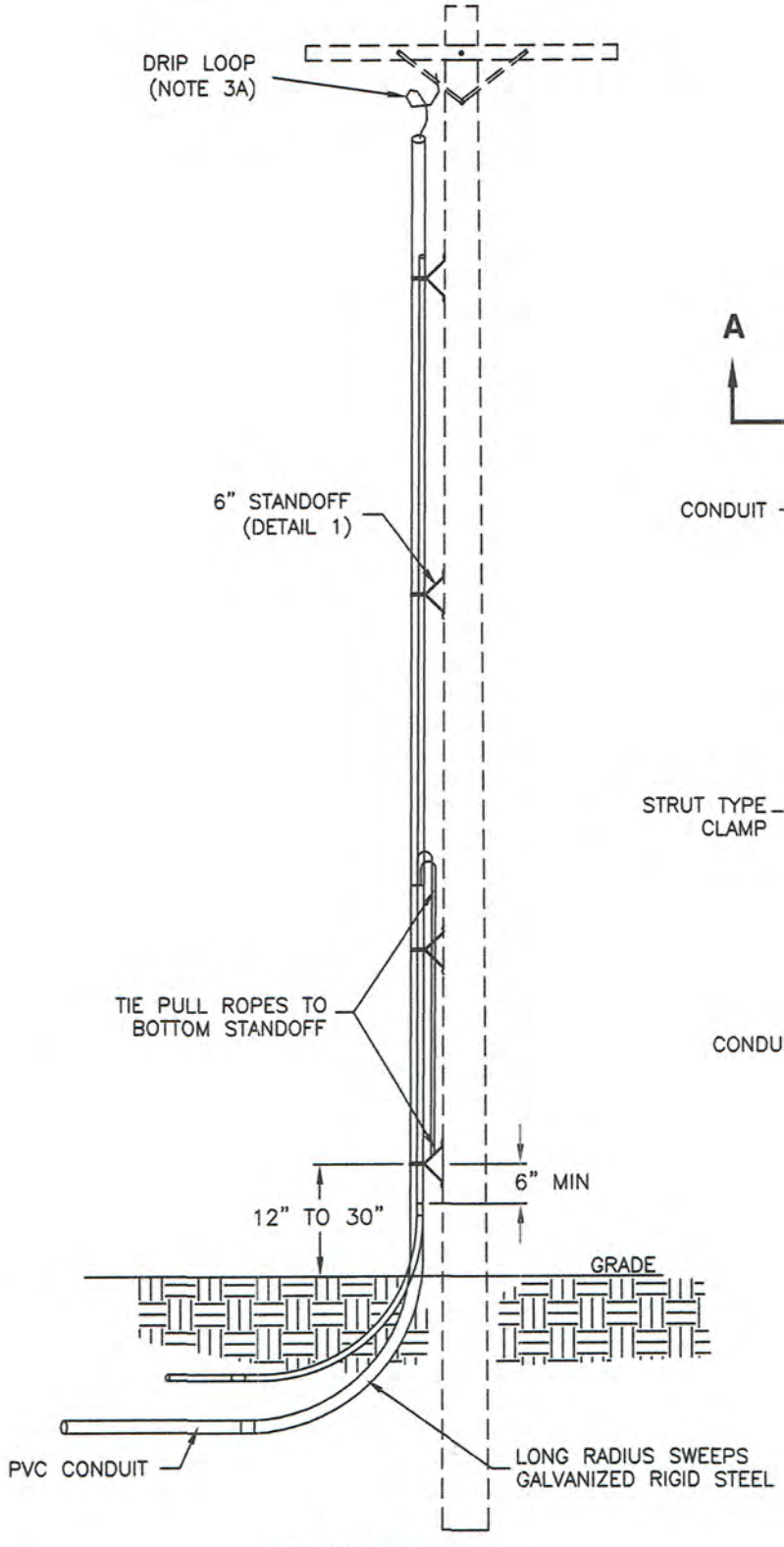
2. PRODUCTS

A. Conduit: Galvanized steel.
B. Bolts, Nuts, Washers, Nails, etc.: Galvanized steel, APWA Section 05 05 23.

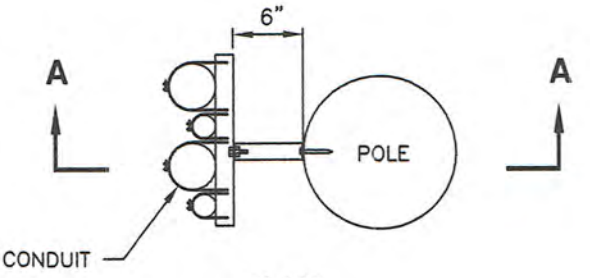
3. EXECUTION

A. 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 agency can attach it to the 2' drip loop.

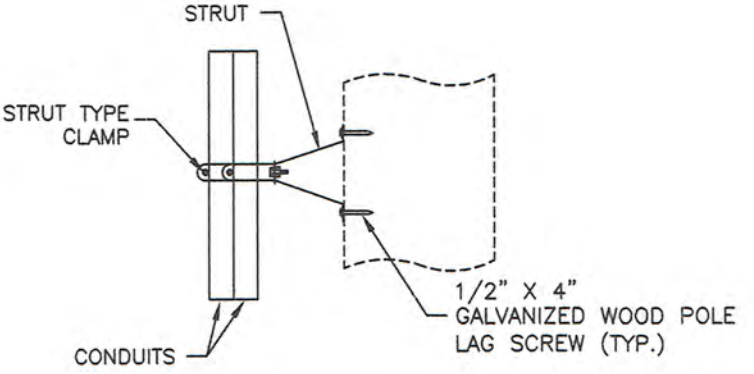
NARRATIVE: THIS IS A TYPICAL EXAMPLE. INSTALLATION VARIES ACCORDING TO THE SERVICE PROVIDED



ELEVATION



PLAN



SECTION A-A

DETAIL 1

Collar for street light pole

1. GENERAL

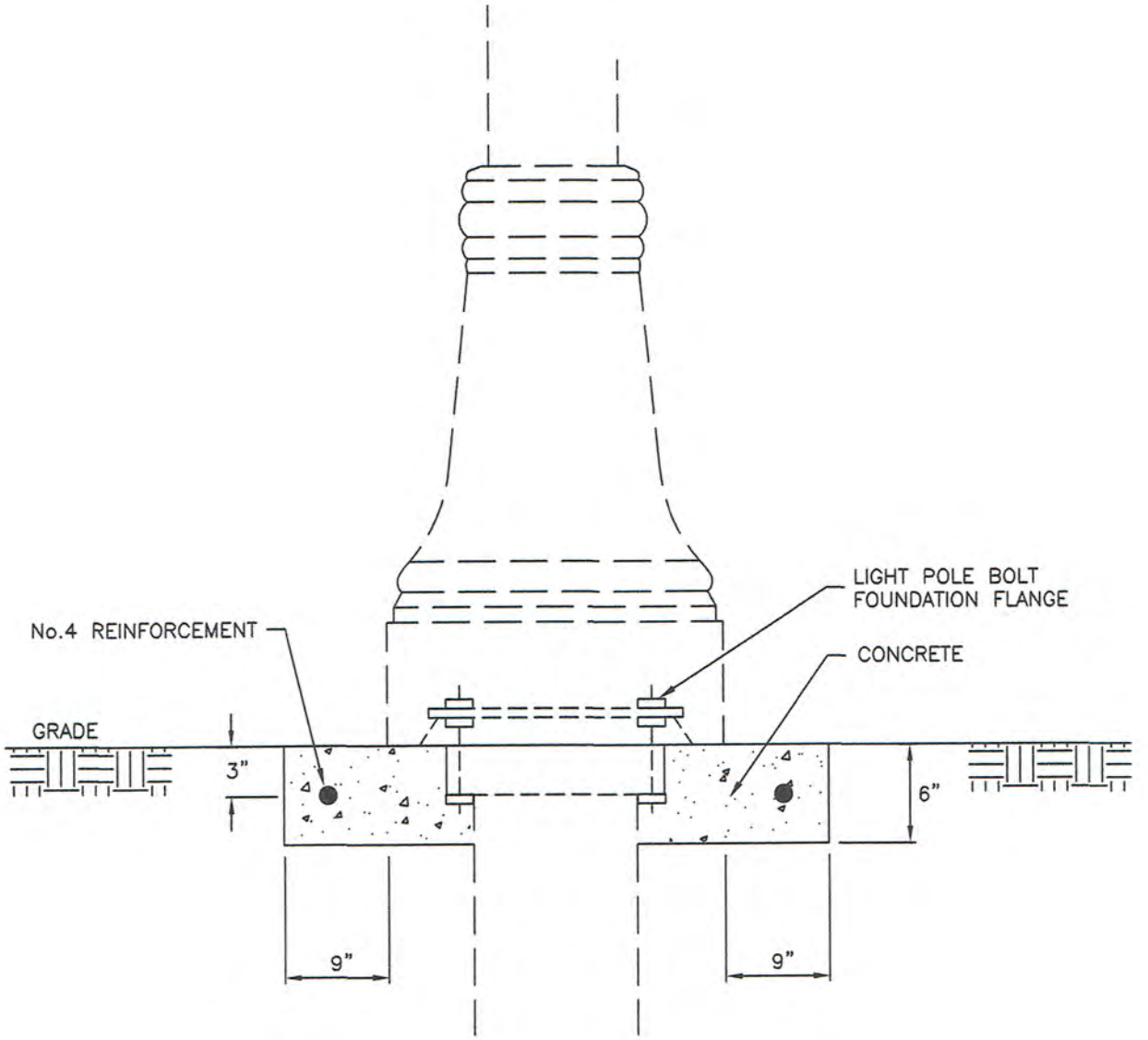
A. Collar acts as a mow strip in park strip areas.

2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.
B. Reinforcement: Deformed, 60 ksi yield grade hoop steel, ASTM A615.
C. Concrete Curing Agent: Clear membrane forming compound with fugitive dye (Type ID Class A), APWA Section 03 39 00.

3. EXECUTION

A. Concrete Placement: APWA Section 03 30 10. Provide concentric circle concrete with 1/2-inch radius edges in public view. Apply a broom finish. Apply a curing agent.



LANDSCAPED APPLICATION

Junction box

1. GENERAL

A. Set all junction boxes to match grade of surrounding terrain.
B. Other junction boxes subject to ENGINEER's acceptance.

2. PRODUCTS

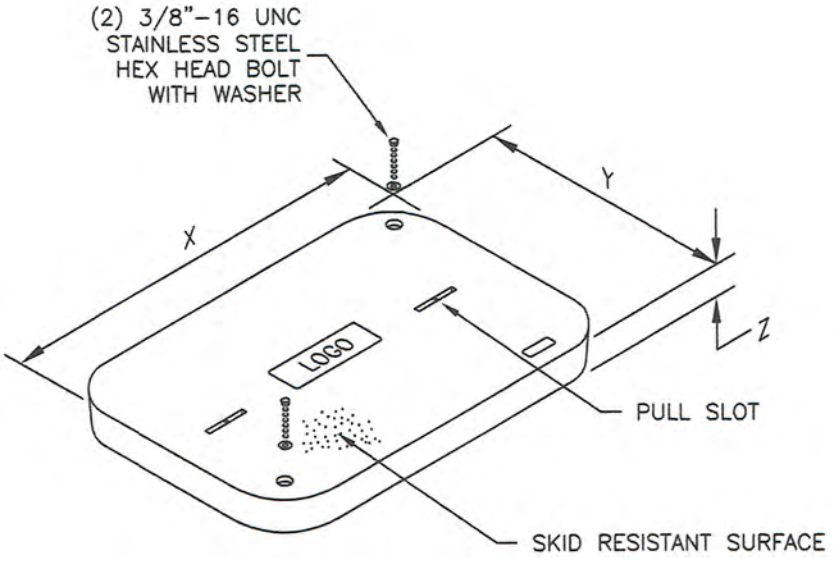
A. Junction Box:
   1) Support wheel load of 12,000 pounds and a maximum deflection of 1/2" with 8,000 pound load using a 10"x10" load.
   2) Reinforcement: Deformed, 60 ksi yield grade steel, ASTM A615.
   3) Logo
      "SIGNAL" for signals
      "STREET LIGHTING" for street lights
      "SIGNAL" for interconnects
   4) Made from polymer concrete consisting of sand and aggregate bound together with a polymer resin complying as a complete unit with the following properties

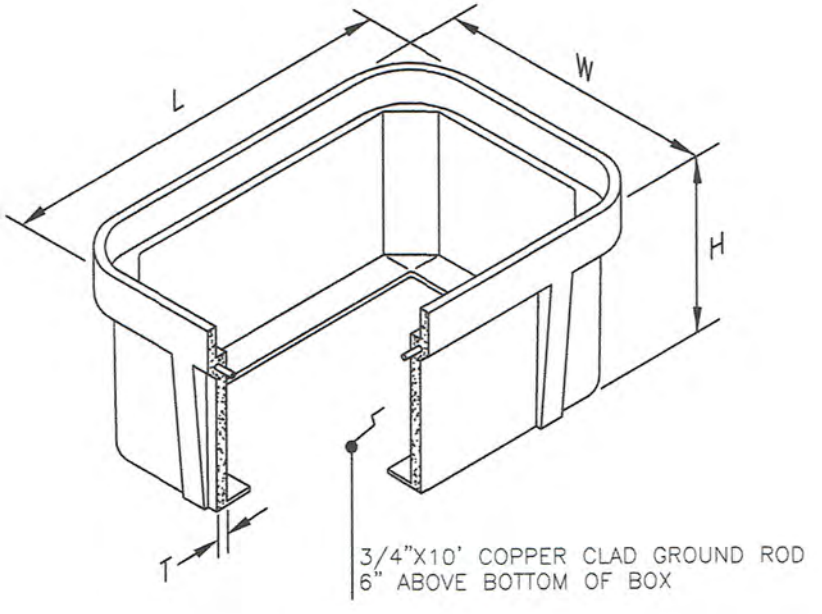
Property	ASTM	Polymer Concrete
Tensile Strength	C496	1,700 psi
Flexural Strength	D790	7,500 psi
Impact Resistance	D2444	72 foot-pounds
Compressive Strength	C109	11,000 psi
Effects of Acids	D543	Very Resistant
Effects of Alkalizes	D543	Very Resistant
Skid Resistance		0.50 coefficient

B. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.

3. EXECUTION

A. Cast conduit holes in junction box at the time of casting or drill at time of placement with no structural damage to box.
B. Make all drilled holes match the outside diameter of the conduit.
C. Ground: Install ground rod with each box installation.





TYPE AND DIMENSIONS							
TYPE	L	W	H	T	X	Y	Z
I	20 1/4	13 3/8	12	1/2	18 1/8	11 1/4	1 3/4
II	32 1/4	19 1/4	18	1 1/4	30 1/2	17 1/2	2
III	37 5/8	26	24	2	35 5/8	24	3
D	49 5/8	32 1/8	24	2	47 5/8	30 1/8	3

Trench for buried electrical conduit

1. GENERAL

A. The drawing is a typical arrangement. It shows installation in a landscaped area. The installation is similar under concrete flatwork in the park strip.

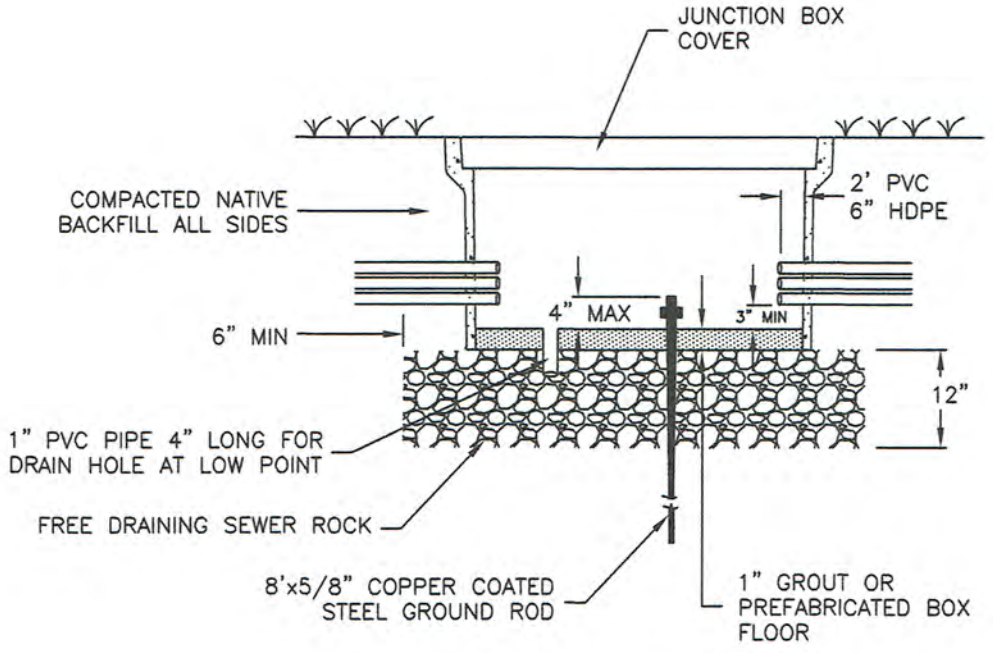
2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Maximum particle size 2-inches. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Bedding sand, backfill borrow, or topsoil, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Detectable Identification Tape: Permanent red color, continuously 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**".
D. Bolts, Nuts, Washers, Accessories: Stainless steel, APWA Section 05 05 23.
E PVC Conduit: APWA Section 33 05 07.

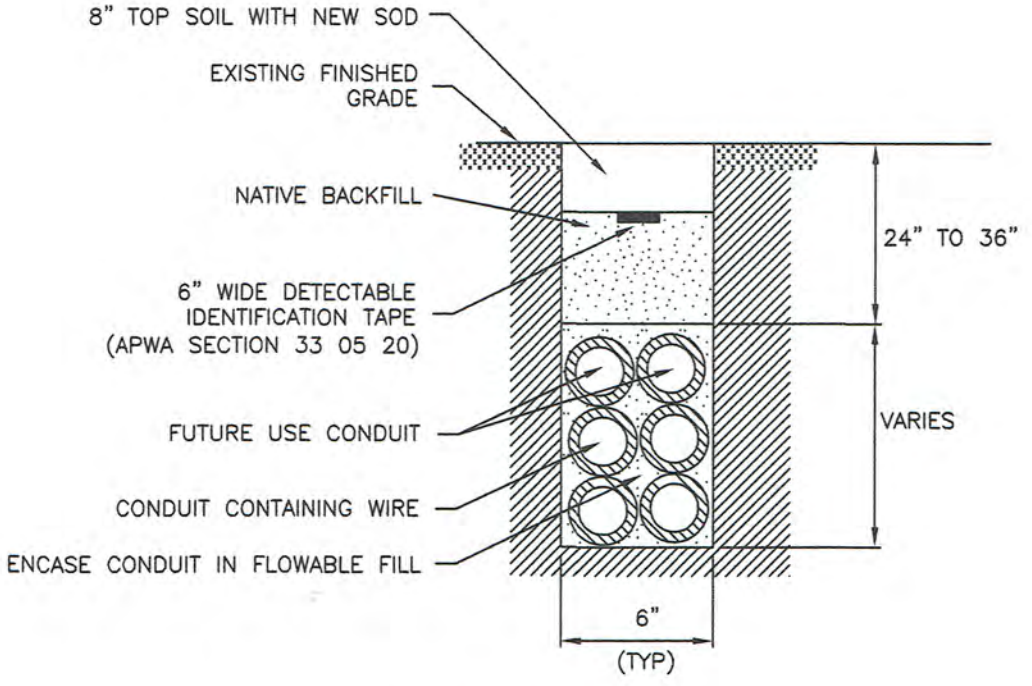
3. EXECUTION

A. Conduit:
    1) Install conduit through sides of junction box. Seal all conduit holes using a rubber-based sleeve gasket and expanding foam.
    2) In addition to circuit wires, provide all conduits with a 700 pound flat braided nylon pull wire.
    3) Seal ends of each conduit run with a sealing compound, CONTRACTOR's choice.
B. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 90 percent or greater relative to a standard proctor density, APWA Section 31 23 26. Water jetting is NOT allowed.
C. Ground: Use exothermic weld connections when making connection to the ground rod.
D. Landscaped Surface Restoration: Rake to match existing grade. Replace vegetation to match pre-construction conditions. Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements.

PARK STRIP



JUNCTION BOX DETAIL



TRENCH DETAIL

Trench for buried electrical conduit

1. GENERAL

A. The drawing is a typical arrangement. It shows installation requirements under roadway pavement and in landscaped areas.
B. Additional pavement removal to a painted lane strip, a lip of gutter, an existing pavement patch, or an edge of existing pavement is required if such street feature is within 2-feet of the second saw-cut.

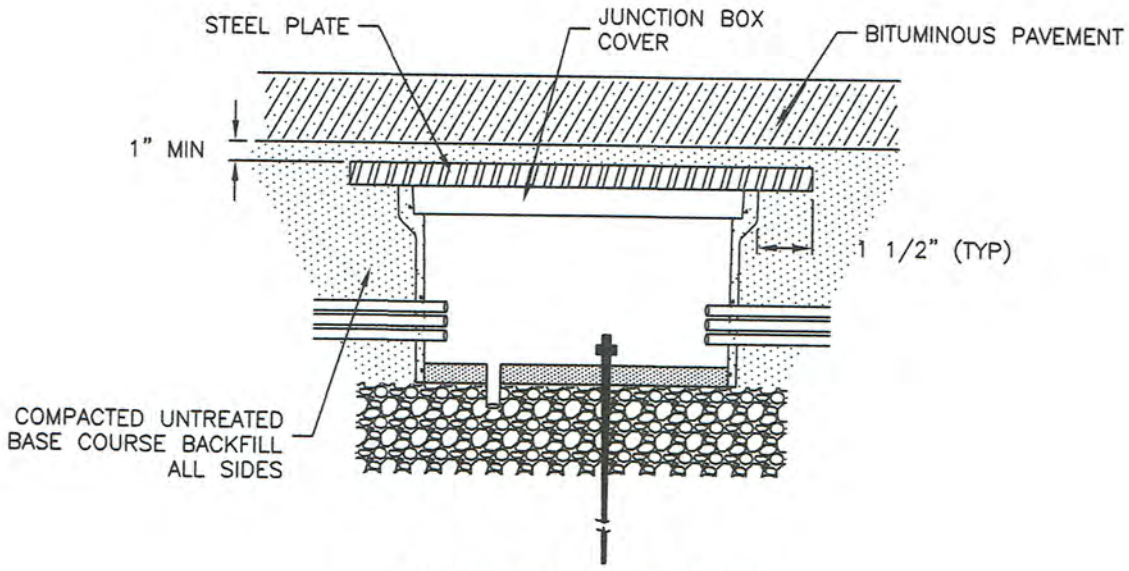
2. PRODUCTS

A. Bedding: Sand, APWA Section 31 05 13.
B. Backfill: Native soil, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Detectable Identification Tape: Permanent red color, continuously 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**".
D. Flowable Fill: Target is 60 psi in 28 days with 90 psi maximum in 28 days, APWA Section 31 05 15. Use a fill that flows easily and vibration is not required.
E. Bituminous Concrete: APWA Section 32 12 05.
   1) Warm weather patch – AC-20-DM-1/2,. Unless indicated otherwise.
   2) Cold weather patch – modified MC-250-FM-1, APWA Section 33 05 25.
F. PVC Conduit: APWA Section 33 05 07.

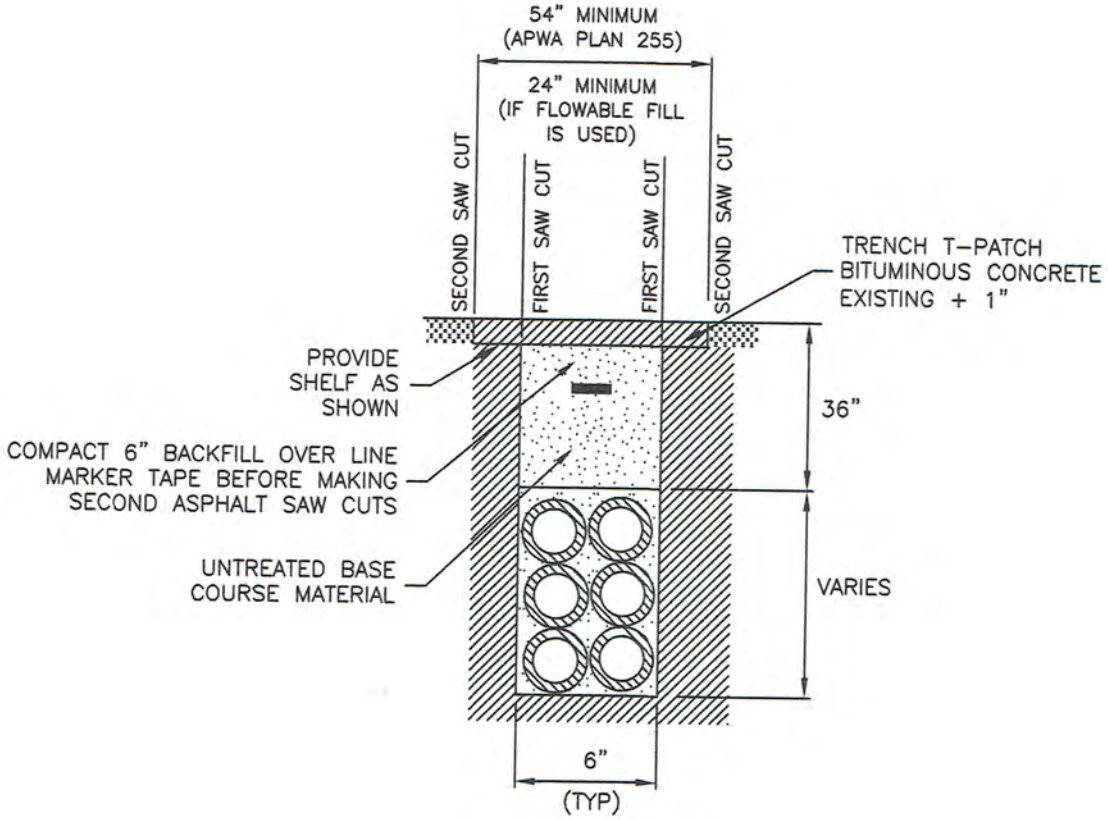
3. EXECUTION

A. Conduit:
   1) Install conduit through sides of junction box. Seal all conduit holes using a rubber-based sleeve gasket and expanding foam.
   2) In addition to circuit wires, provide all conduits with a 700 pound flat braided nylon pull wire.
   3) Seal ends of each conduit run with a sealing compound, CONTRACTOR's choice.
B. Base Course and Backfill Placement:
   1) Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26. Water jetting is NOT allowed.
   2) Use flowable fill in excavations that are less than 8" wide. Before placing aggregate or pavement over flowable fill, cure fill to initial set.
C. Ground: Use exothermic weld connections when making connection to the ground rod.
D. Before Surface Restoration.
   1) Do not install bituminous concrete or Portland cement concrete surfacing until trench compaction is accepted by ENGINEER.
   2) Provide tack coat full coverage on all vertical surfaces and surface of concrete substrate.
E. Roadway Pavement Restoration: Plan 255, 256, or 261 as applicable.

ROADWAY



JUNCTION BOX DETAIL



TRENCH DETAIL

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Trench for buried electrical conduit

Plan
732.2
September 2011

Joint use trench

1. GENERAL

A. The drawing is a typical arrangement. It applies to the conduit zone and backfilling the trench above the conduit zone.

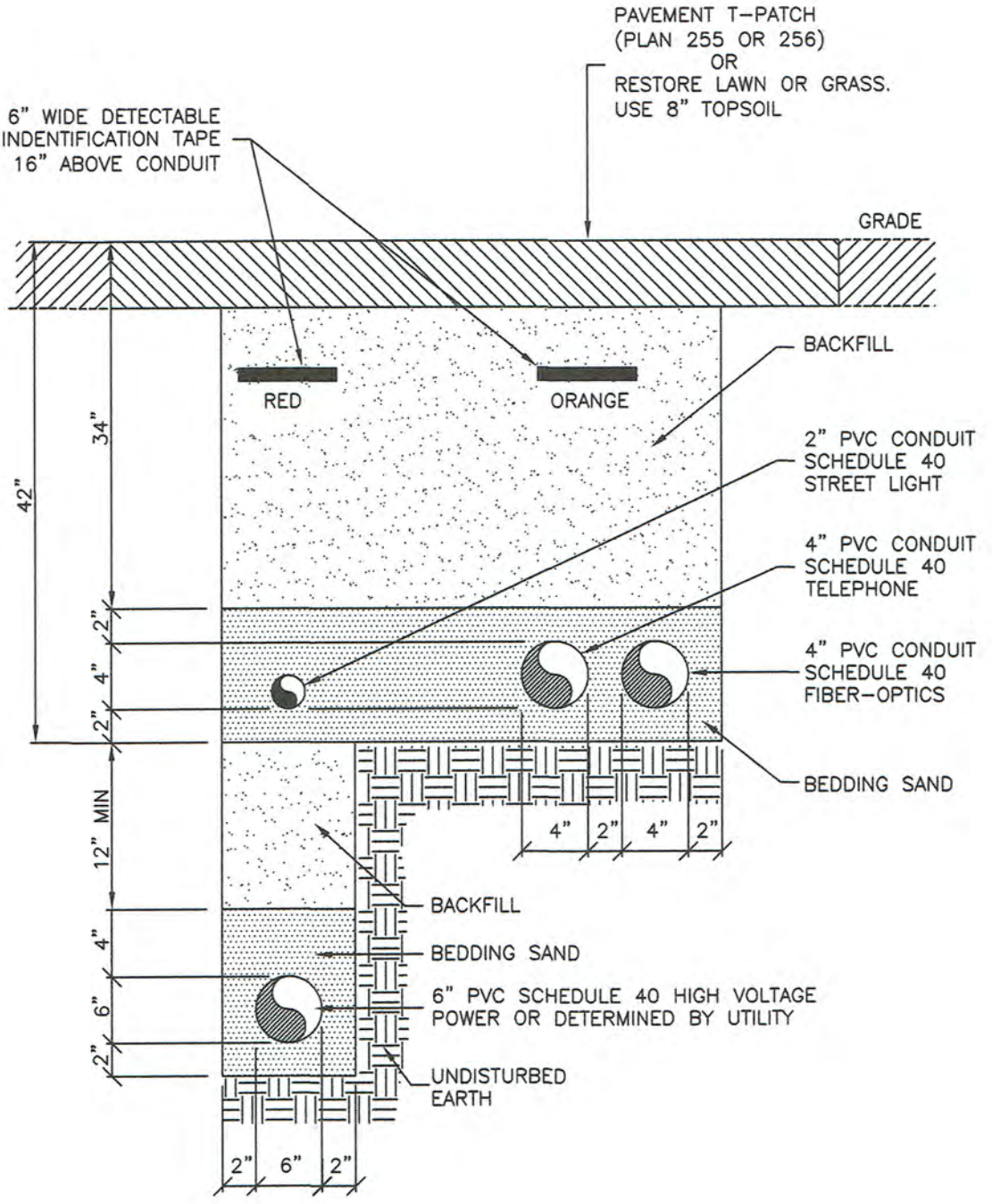
2. PRODUCTS

A. Base Course: Sand, APWA Section 31 05 13.
B. Backfill: Native soil, APWA Section 31 05 13. Maximum particle size 2-inches.
C. Sewer Rock or Pea Gravel: NOT ALLOWED as backfill in any part of the trench.
D. Flowable Fill: Target is 60 psi in 28 days with 90 psi maximum in 28 days, APWA Section 31 05 15. It must flow easily requiring no vibration for consolidation.
E. Detectable Identification Tape: Permanent color as indicated, 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**".
F. Conduit: PVC, APWA Section 33 05 07.

3. EXECUTION

A. Base Course and Backfill Placement: Maximum lift thickness is 8-inches before compaction. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26. Water jetting is NOT allowed.
B. Flowable Fill: Place controlled low strength material. Cure the fill before placing surface restorations.
C. Surface Restoration. Do not install bituminous concrete or Portland cement concrete surfacing until trench compaction is accepted by ENGINEER.
D. Landscaped Restoration: Rake trench backfill to match existing grade. Compact backfill to 90 percent relative to a standard proctor density, APWA Section 31 23 26. Replace vegetation to match pre-construction conditions. Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements.
E. Roadway Pavement Restoration: Plans No. 255, 256, or 261.

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



Street light pole terminal

1. GENERAL

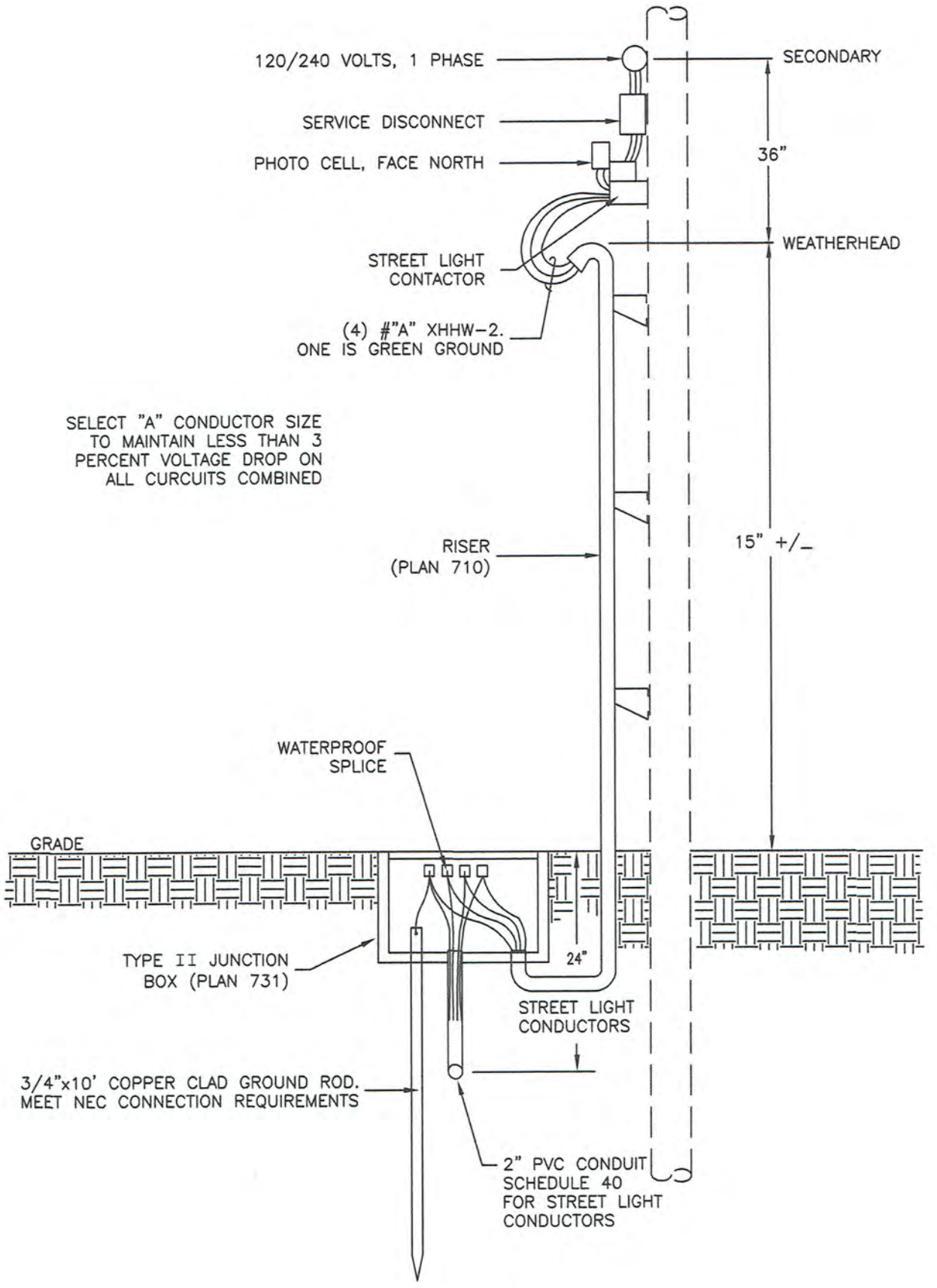
A. The drawing is a typical arrangement. Installation varies according to the service provided.

2. PRODUCTS

A. Conduit: Galvanized pipe above ground
B. Bolts, Nuts, Washers, Nails, etc.: Galvanized steel.

3. EXECUTION

A. 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 agency can attach it to the 2' drip loop.
B. Service Disconnect: APWA Section 26 13 13.
C. Ground: Meet NEC requirements.
D. Landscaped Restoration: Rake trench backfill to match existing grade. Replace vegetation to match pre-construction conditions. Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements.



AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Street light pole terminal

Plan
736
December 2010

Street light meter pedestal

1. GENERAL

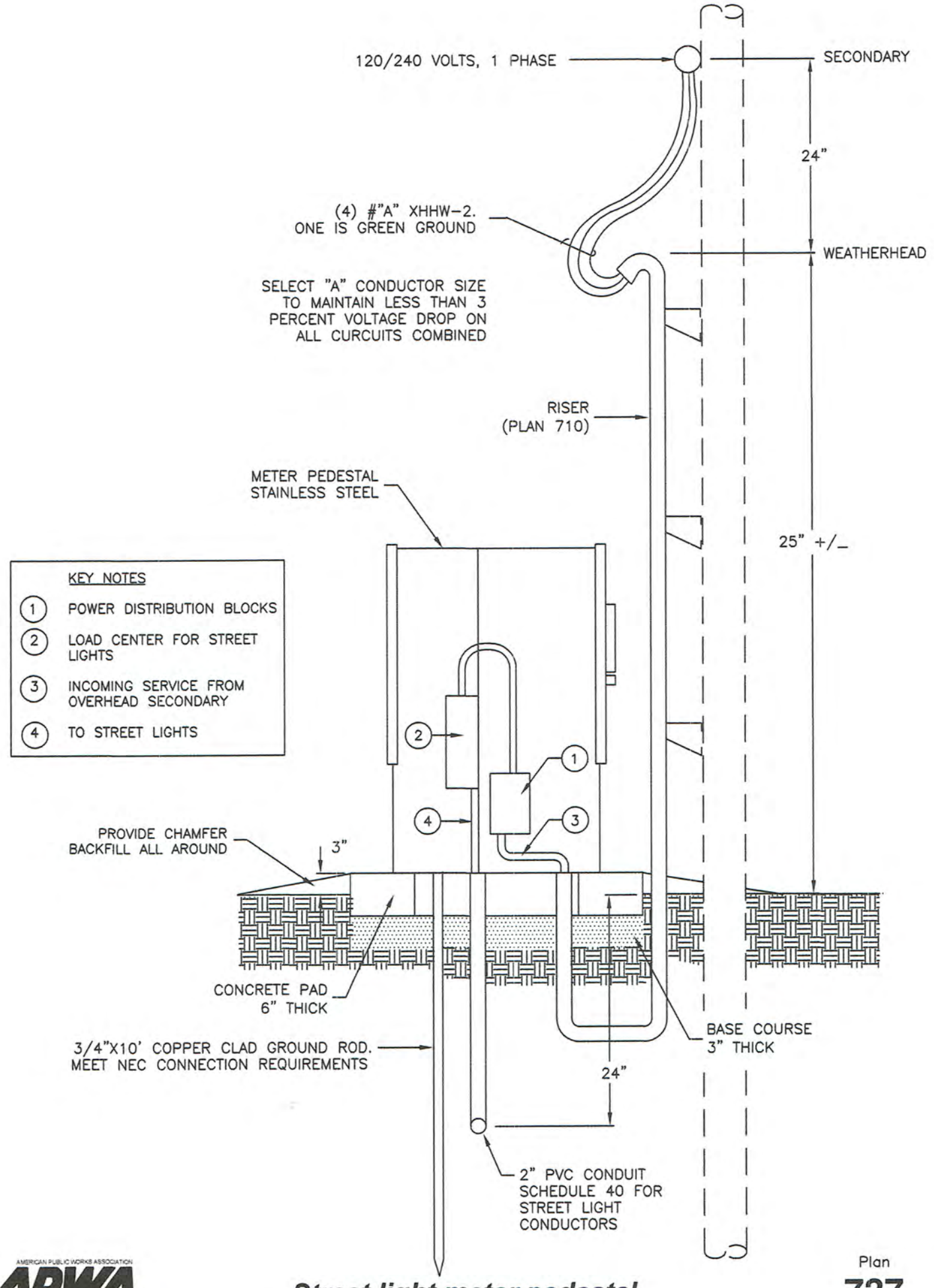
A. Install a concrete foundation for a meter pedestal.
B. Verify position and location with ENGINEER before proceeding.

2. PRODUCTS

A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Limit particle size to 2-inches.
C. Concrete: Class 4000, APWA Section 03 30 04.
D. Conduit: PVC, NEMA TC6, Type I for encased burial in concrete, Type II for direct burial. Fittings conform to NEMA TC9.
E. Junction Box: Buried type, plastic body and cover in non-vehicular areas or pre-cast concrete in vehicular areas with screw-on cast iron cover both equipped with stainless steel nuts, bolts, screws and washers.
D. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
E. Bolts, Nuts, Washers, Accessories: Stainless or galvanized steel, APWA Section 05 05 23.

3. EXECUTION

A. Pedestal Foundation Orientation:
   1) **Not within 18 inches of top back of curb (no exceptions)**.
   2) **Not within 12 inches of edge of sidewalk.** If less than 12" fill space with 4 inches of concrete and finish to match adjacent surfaces.
   3) When the cabinet door is opened all the way, the rotation does not block the sidewalk. There is a paved area for a technician to stand on when working at the pedestal (not in someone's grass or flower bed) and the technician is standing in the right-of-way.
B. Trenching: Place all conduits in the same trench where possible. Backfill compaction is 95 percent or greater relative to a standard proctor.
C. Wire: Attach the ground side of the power supply to the control cabinet ground terminal. Identify and label all field terminals.
D. Conduit:
   1) Before concrete placement, place all conduits in the same trench.
   2) Provide 1-inch minimum spacing between conduits in cabinet base.
   3) Cap or plug conduits at both ends until used.
   4) Seal all conduits inside junction box and cabinet after wiring is complete.
E. Ground: Meet NEC requirements.
F. Base Course and Backfill Placement: Compaction is 95 percent or greater relative to a standard proctor density, APWA Section 31 23 26.
G. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish.
H. Landscaped Restoration: Rake trench backfill to match existing grade. Replace vegetation to match pre-construction conditions. Follow APWA Section 32 92 00 (turf or grass) or APWA Section 32 93 13 (ground cover) requirements.



AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Street light meter pedestal

Plan
737
June 2005

Screw-in base street light pole

1. GENERAL

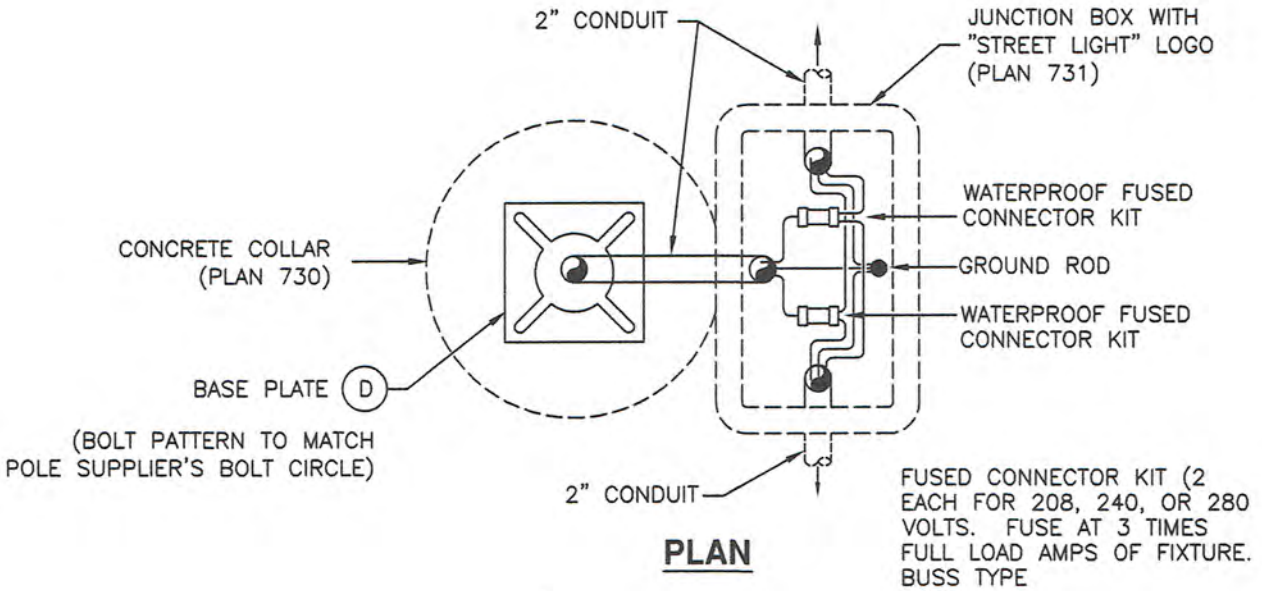
A. Before screwing in the base, use key holing procedure or other procedure to verify position of underground utilities and pipelines.

2. PRODUCTS

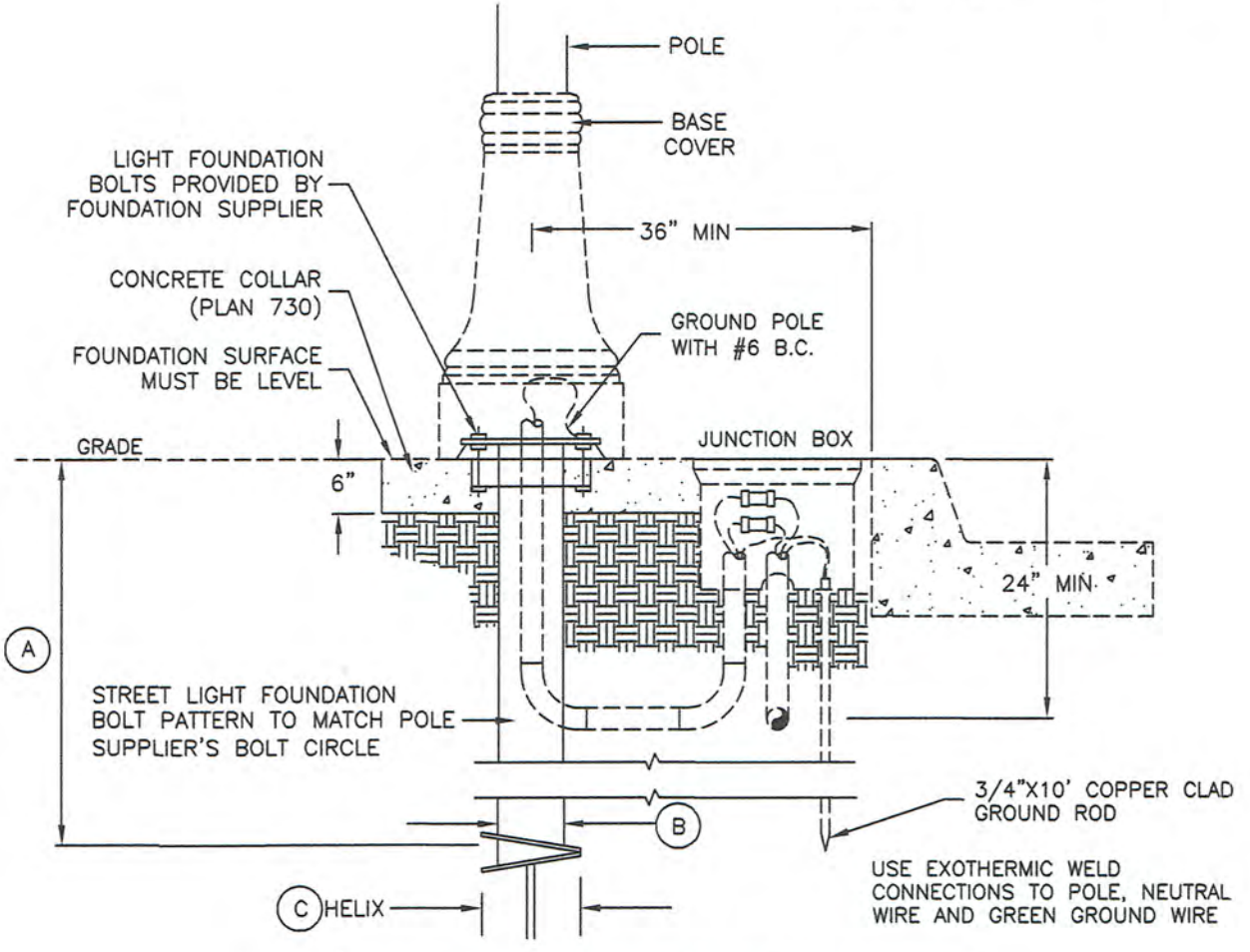
A. Concrete: Class 4000, APWA Section 03 30 04.
B. Ground Cover: Match existing, APWA Section 32 93 13.
C. Screw-in Base: Material and dimensions to meet or exceed manufacturer's recommendations.
D. Bolts, Nuts, Washers, Accessories: Stainless or galvanized steel, APWA Section 05 05 23.
E. Conduit: PVC schedule 40.

3. EXECUTION

A. Keyhole to verify pole placement and protect utilities, APWA Section 31 23 16.
B. Before concrete placement, place all conduits in same trench where possible.



PLAN



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

ELEVATION

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Screw-in base street light pole

Plan
741
August 2005

Direct burial street light pole

1. GENERAL

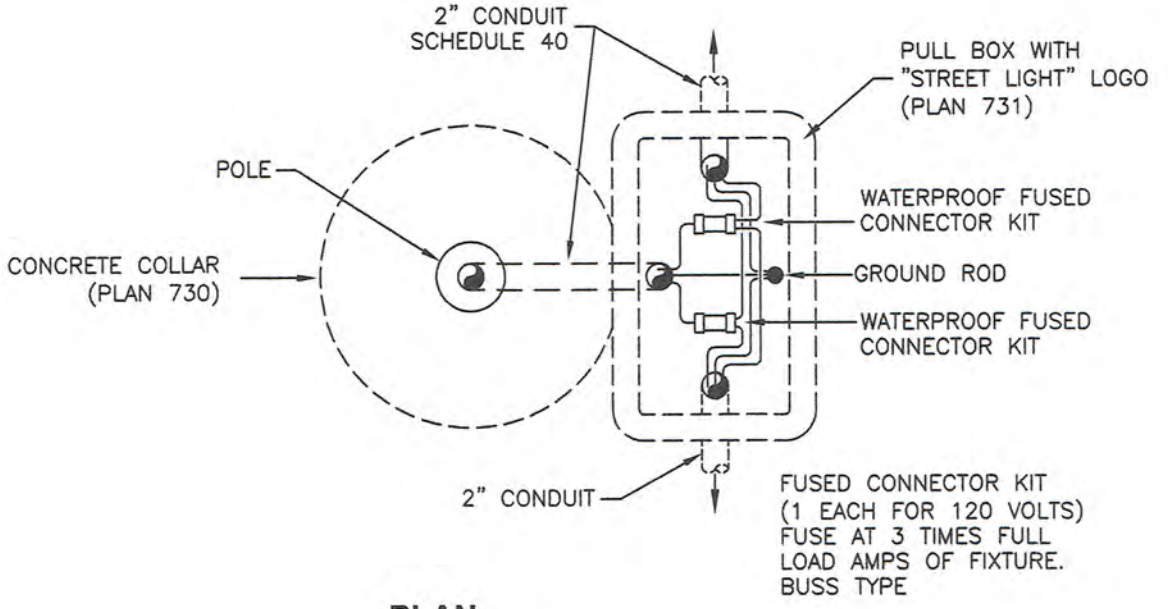
A. Before drilling, use key holing procedure or other procedure to verify position of underground utilities and pipelines.

2. PRODUCTS

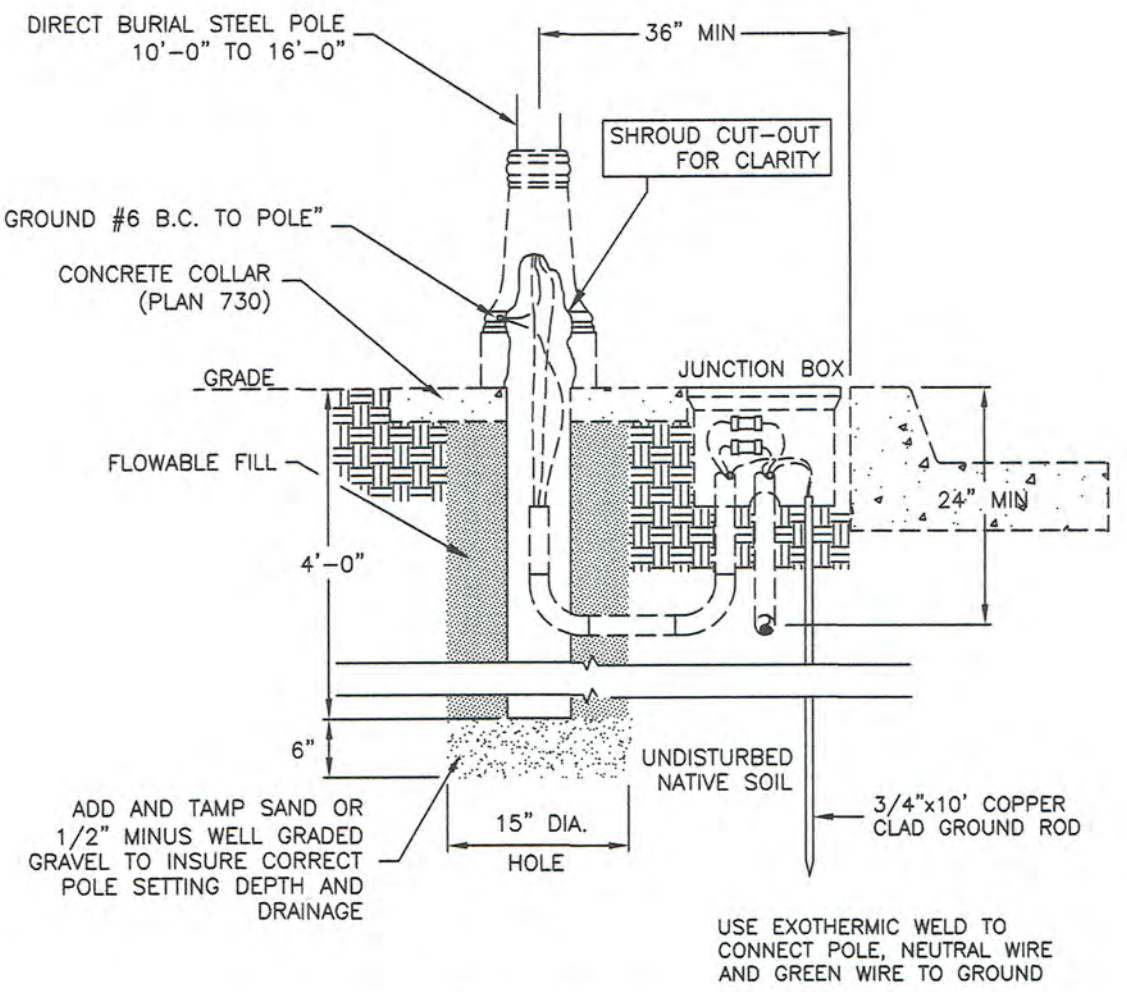
A. Concrete: Class 4000, APWA Section 03 30 04.
B. Backfill: Granular backfill borrow or topsoil, APWA Section 31 05 13. Limit particle size to 1-1/2-inches.
C. Ground Cover: APWA Section 32 93 13.
D. Flowable Fill: Target is 60 psi in 28 days with 90 psi maximum in 28 days, APWA Section 31 05 15. It must flow easily requiring no vibration for consolidation.

3. EXECUTION

A. Keyhole to verify pole placement and protect utilities, APWA Section 31 23 16.
B. Excavation. Use vacuum extraction or excavate by hand if utilities are in the site vicinity.
C. Flowable Fill: Use a fill material that flows easily and vibration is not required. Cure to initial set before placing concrete collar. Cure the fill for 7 days before erecting luminaire arms.
D. Before Concrete Placement: Place all conduits in same trench where possible.



PLAN



ELEVATION

Concrete base for street light pole

1. GENERAL

A. Match longitudinal grades of foundation cap with top of existing curb.

B. Establish grade from which foundation elevation is measured.

1) Existing Curb and No Sidewalk: Grade is 1/4-inch per foot sloped upward from the top of the back of curb.

2) Existing Curb and Sidewalk: Straight grade from top back of curb to near edge of sidewalk.

3) Inside of Existing Median. Straight grade between top of back of one curb to top of back of other curb.

C. When foundation cap is located in an area to be paved, the cap is to be placed below grade with bolts extending above top of cap to accommodate paving surface.

2. PRODUCTS

A. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

B. Anchor Bolt: Galvanized steel with galvanized washer and nut, APWA Section 05 05 23.

C. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

A. Keyhole to verify pole placement and protect utilities, APWA Section 31 23 16.

B. Excavation. Use vacuum extraction or excavate by hand if utilities are in the site vicinity.

C. Formwork: Use a circular form for the top 18-inches of foundation. If ground water is encountered, excavate additional depth and install sewer rock. Pump out water and provide a circular form for full length of foundation.

D. Before Concrete Placement:

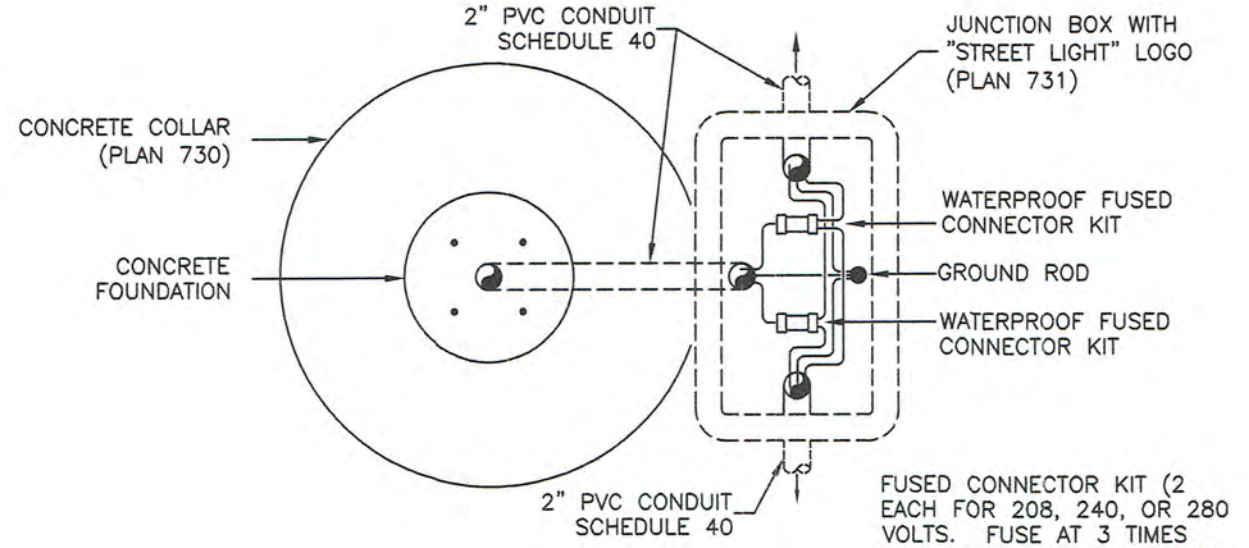
1) Do not weld reinforcing steel, anchor bolts, or galvanized steel conduit.

2) Place all conduits in same trench.

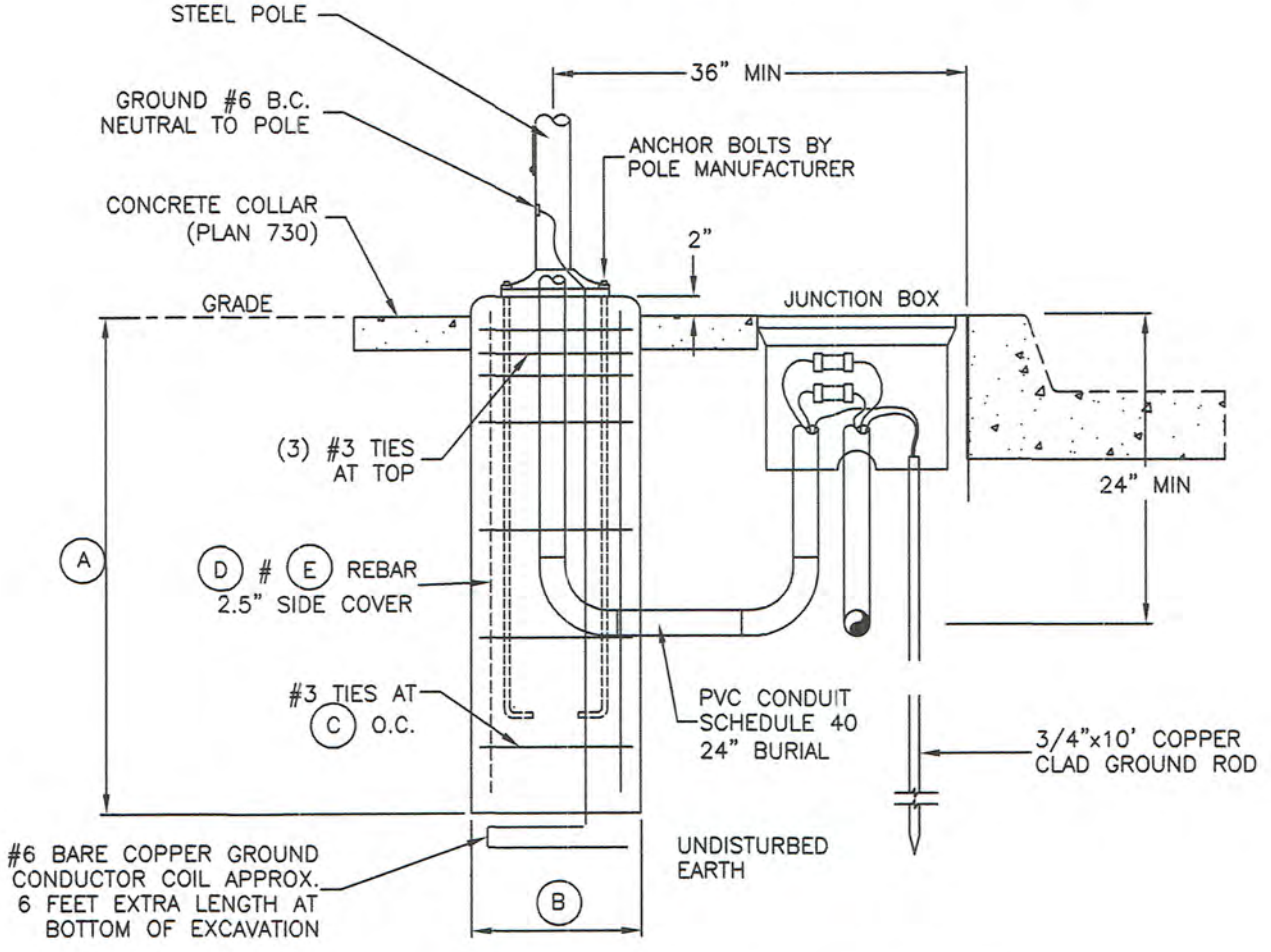
3) Use a template to hold anchor bolts in the proper positions and to the proper heights until concrete is placed and sets.

4) Protect conduits from plugging by sealing conduit ends before concrete placement.

E. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Cure concrete for 7 days before erecting pole.



PLAN



POLE LENGTH	DEPTH (A)	DIAMETER (B)	REBAR (C)	VIRTUAL (D)	REBAR (E)
10'–15'	4'–0"	18"	1 1/4"	8.6"	14
16'–25'	6'–0"	24"	1"	8.6"	14
26'–50'	9'–0"	30"	1"	6.6"	12

ELEVATION

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Concrete base for street light pole

Plan **743**

January 2011

Signal pole foundation

1. GENERAL

A. Match longitudinal grades of foundation cap with top of existing curb.

B. Establish transverse grades of foundation cap as follow.

1) Existing Curb and No Sidewalk: Grade is 1/4-inch per foot sloped upward from the top of the back of curb.
2) Existing Curb and Sidewalk: Straight grade from top back of curb to near edge of sidewalk.
3) Existing Median: Straight grade between top of back of one curb to top of back of other curb.

C. When foundation cap is located in an area to be paved, the cap is to be placed below grade with bolts extending above top of cap to accommodate paving surface.

2. PRODUCTS

A. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.

B. Anchor bolt: Galvanized steel with galvanized washer and nut, APWA Section 05 05 23.

C. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

A. Keyhole to verify pole placement and protect utilities, APWA Section 31 23 16.

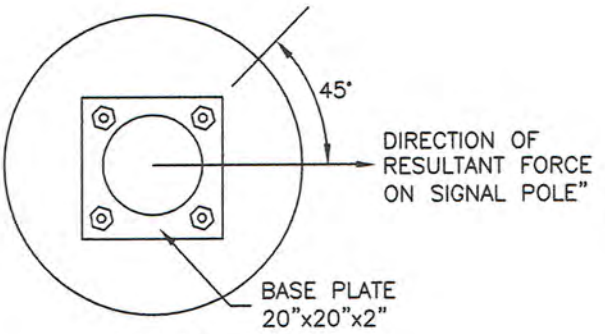
B. If a pedestrian signal push button is to be on the pole, install a concrete landing within 18 inches of the push button. Landing to be 4 inches thick, 4 feet square minimum and sloped no more than 2 percent in any direction.

C. Excavation and Backfill. Use vacuum excavation or excavate by hand if utilities are in the site vicinity. If ground water is encountered, excavate additional depth. Pump out water and provide a circular form for full length of foundation. Install sewer rock in circular form and outside of circular form. Install flowable fill between circular form and excavation walls.

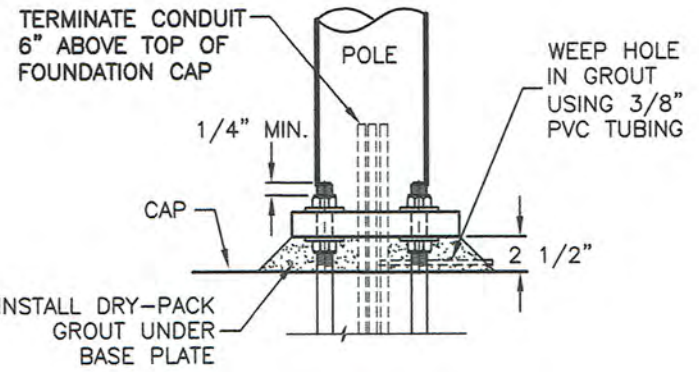
D. Before Concrete Placement:

1) Do not weld reinforcing steel, anchor bolts, or galvanized steel conduit.
2) Place all conduits in same trench.
3) Use a template to hold anchor bolts in the proper positions and to the proper heights until concrete is placed and sets.
4) Protect conduits by plugging all conduit ends.

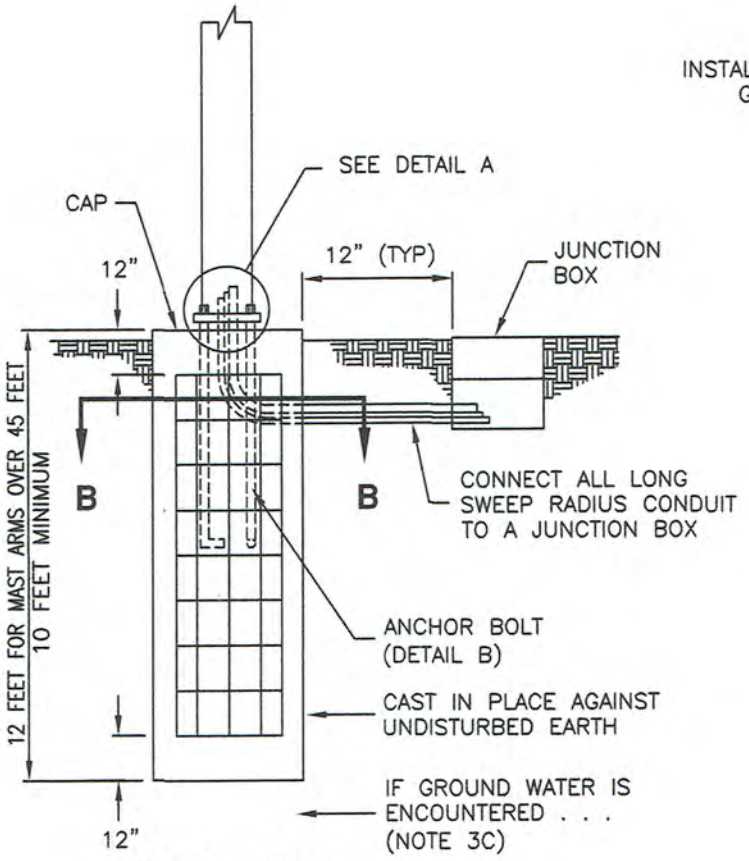
E. Concrete Placement in Signal Pole Foundation: APWA Section 03 30 10. Use a circular form for the top 18-inches of foundation. Provide 1/2 –inch radius edges. Cure concrete for 7 days before erecting pole and achieve concrete design strength before erecting mast arms.



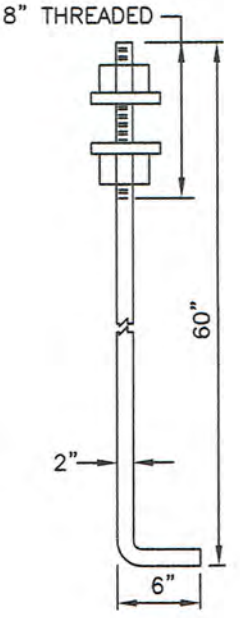
PLAN



DETAIL A



ELEVATION



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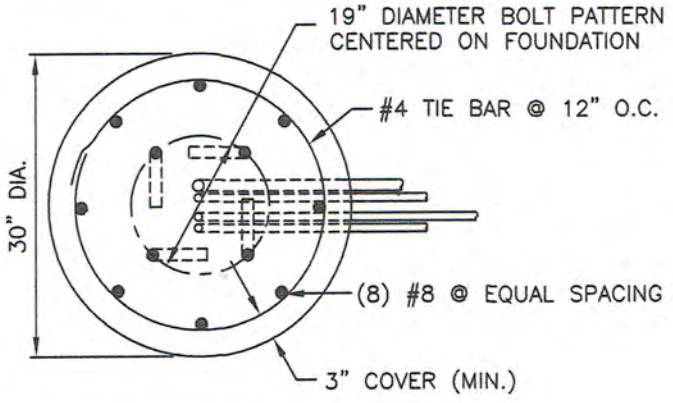


SECTION B-B

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Signal pole foundation

Plan
751
April 2011

Signal pole wiring

1. GENERAL

A. IMSA = International Municipal Signal Association.

2. PRODUCTS

A. Control Cables: IMSA 20-1, stranded copper.

7 Conductor #14 – vehicular signal mast arm red through red orange through amber green through green black red arrow left turn red or spare black/white left turn amber arrow blue left turn green arrow white signal neutral	5 Conductor #14 – vehicle signal near side red red lens orange amber lens green green lens white signal neutral
7 Conductor #14 – pedestrian signal red phase 2 and or 6 (Don't Walk) green phase 2 and or 6 (Walk) white signal neutral orange phase 4 and or 8 (Don't Walk) black phase 4 and or 8 (Walk)	4 Conductor #14 or #18 – pedestrian push button red phase 2 and or 6 black phase 4 and or 8 white signal neutral
3 Conductor #14 – pedestrian audible red phase 2 and or 6 black phase 4 and or 8 white cabinet neutral	#6 RHH/USE/RHW – cabinet supply power & grounding/street lighting black AC + 120 VAC white AC – #6 green earth ground #8 bare pole grounding
3 Conductor #14 – illuminated sign black sign AC + white signal neutral	2-conductor shielded stranded - detector lead-in cable: IMSA 50-2, 18 AWG shielded with drain, black. loop wire: IMSA 51-7, 14 AWG, cross-linked loose tube

B. Communication Cable: IMSA 19-1 with PVC jacket. Type BJFA, 19 AWG, solid gel filled, shielded, 12 pair per specification RE-PE-39.

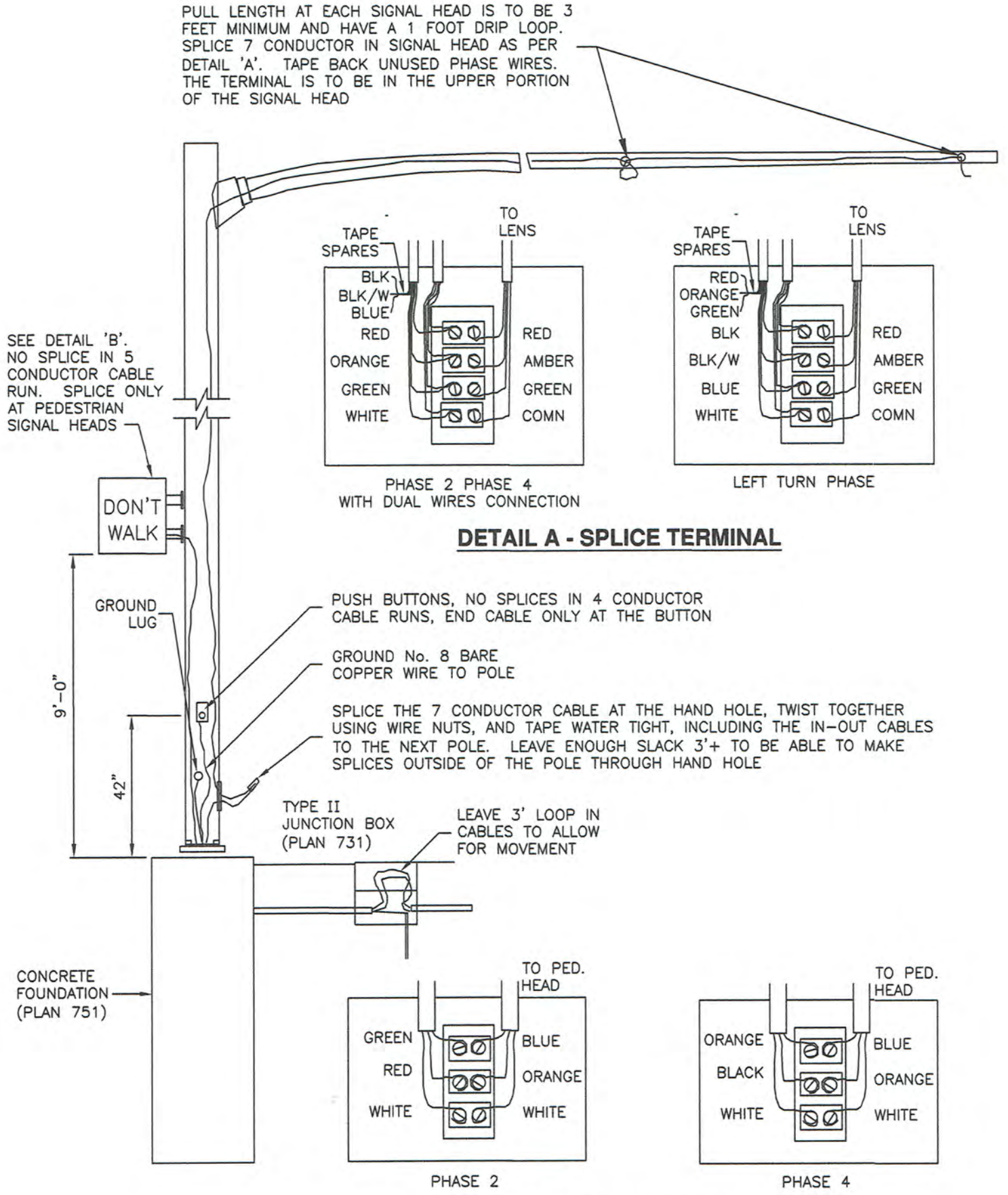
3. EXECUTION

A. Tape back unused wire.

B. Splices: Make no splices except in the signal head. Make splices in pole base hand holes, not in junction boxes.

C. Pedestrian Signal Cable: Run pedestrian signal cable from pedestrian head to pedestrian head or cabinet.

D. Connections: Use terminal lugs to make all cabinet connections and all signal connections (vehicle and pedestrian).



DETAIL A - SPLICE TERMINAL

DETAIL B - SPLICE TERMINAL

Signal light head

1. GENERAL

A. Keep all signal hardware at least 10 feet away from overhead power lines.
B. Get permission from ENGINEER before trimming trees or shrubs.

2. PRODUCTS

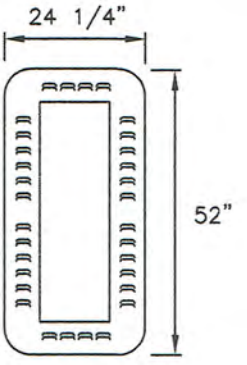
A. Signal Light Head.
   1. Housing: One-piece die-cast aluminum.
   2. Door: Aluminum with stainless steel hinge pins and swings 180 degrees.
   3. Visor: One-piece aluminum secured to the door with stainless steel hardware and removable.
   4. Mounts: 1 1/2" diameter.
B. Back-Plate: Aluminum and louvered.
C. Terminal Block: Located in top section for Type I, II, and III signal heads.
D. LED Modules: In all heads. Orient LED lenses for top upward alignment.
E. Paint: Factory powder coat.
   1. Visors, 12”x12” tunnel type: Gloss black.
   2. Heads: Gloss black.
   3. Back Plate: Flat black.

3. EXECUTION

A. Paint all metal components. Do not damage painted finish during transport or placement.
B. Install Type IV assemblies so hinged signal face swings open to the outside.

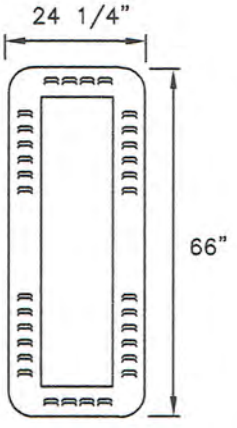
TYPES AND DRAWING SYMBOLS

TYPE I

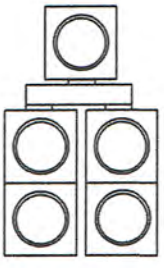


DRAWING SYMBOL

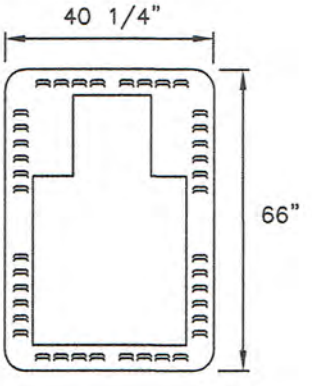
TYPE II



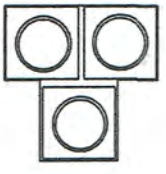
DRAWING SYMBOL



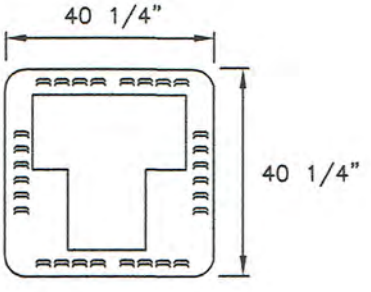
TYPE III



DRAWING SYMBOL



TYPE IV



DRAWING SYMBOL

Signal light head

1. GENERAL

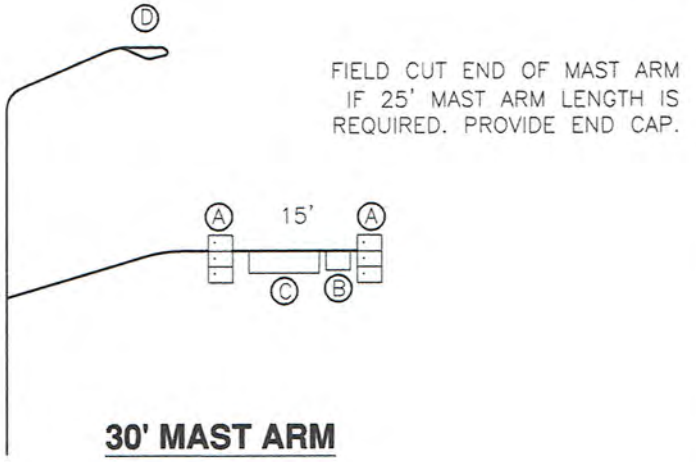
A. Keep all signal hardware at least 10 feet away from overhead power lines.
B. Get permission from ENGINEER before trimming trees or shrubs.

2. PRODUCTS (not used)

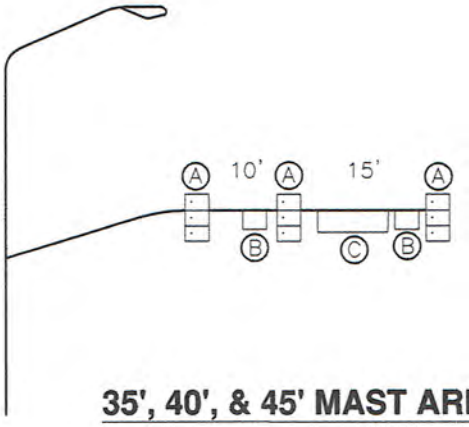
3. EXECUTION

A. Provide 17’-0” minimum clearance from bottom of signal head assembly to finished roadway surface. Assembly includes signal head, back plate and signal head mounting hardware.
B. Locate center of end signal head 1 foot from end of mast arm. For non-typical installations provide not less than 8’0” spacing.

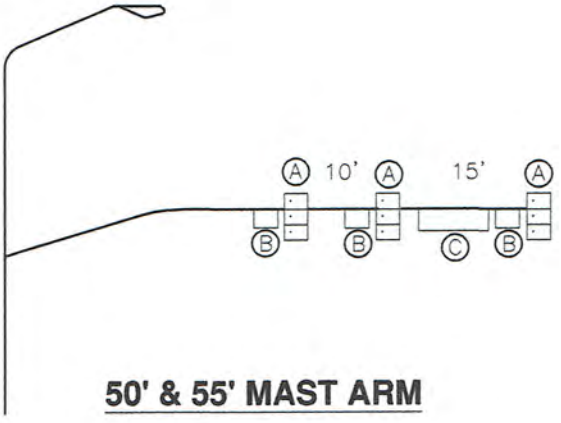
PLACEMENT



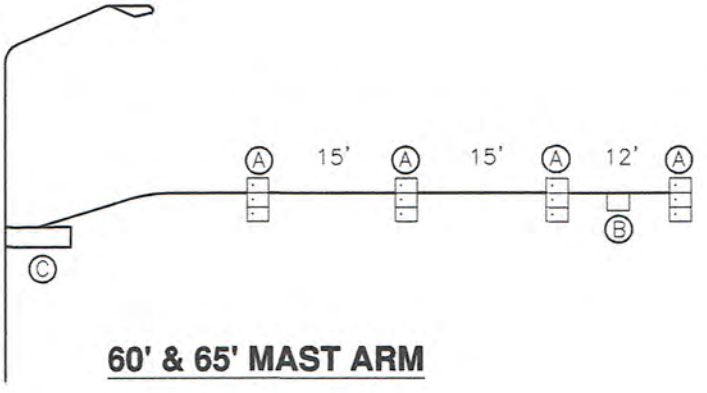
30' MAST ARM



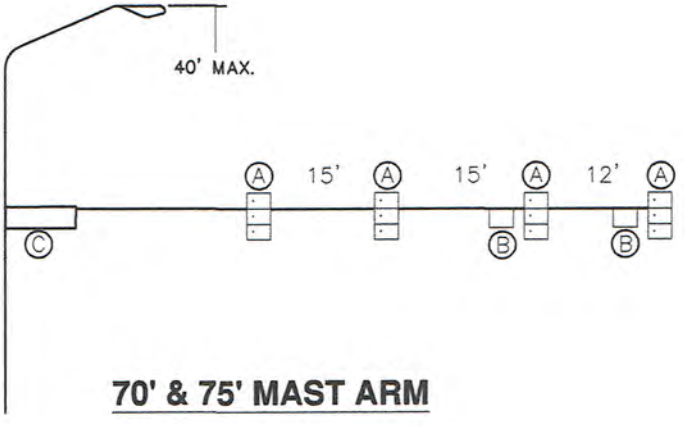
35', 40', & 45' MAST ARM



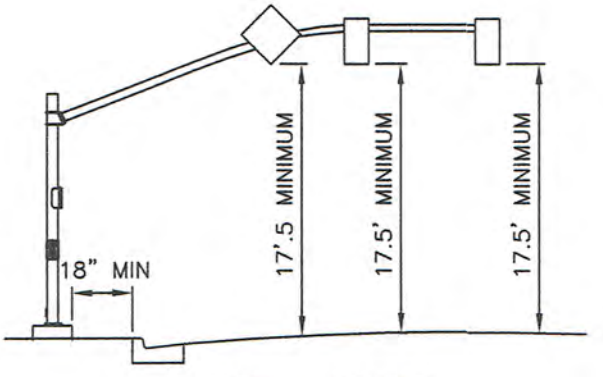
50' & 55' MAST ARM



60' & 65' MAST ARM



70' & 75' MAST ARM



CLEARANCES

DEVICE	DESCRIPTION/SIZE
Ⓐ SIGNAL	TYPE WITH BACK PLATE
Ⓑ SIGN	REGULATORY 24" x 30"
Ⓒ SIGN	STREET NAME 16" x 96" (MAX)
Ⓓ LUMINAIRE	ROADWAY LUMINAIRE

Signal cabinet base

1. GENERAL

A. Install a concrete foundation for a signal controller box.
B. Verify position and location with ENGINEER before proceeding.

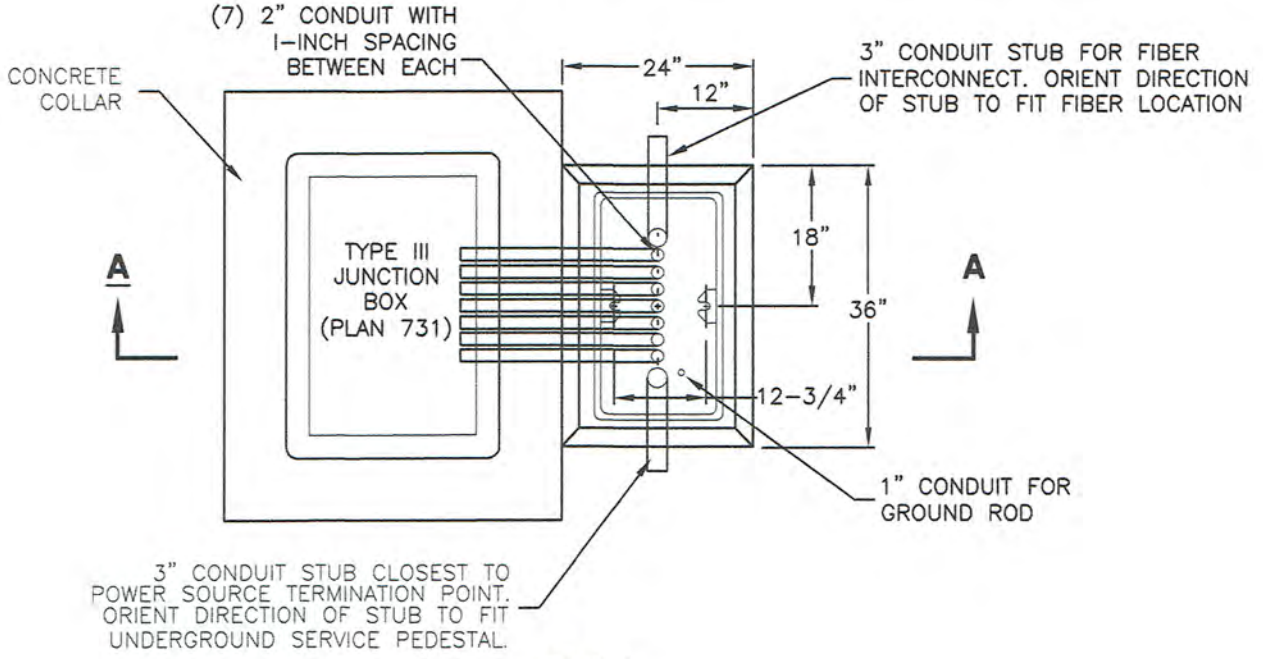
2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.
B. Conduit: PVC, NEMA TC6, Type I for encased burial in concrete, Type II for direct burial. Fittings conform to NEMA TC9.
C. Junction Box: Buried type, plastic body and cover in non-vehicular areas or pre-cast concrete in vehicular areas with screw-on cast iron cover both equipped with stainless steel nuts, bolts, screws and washers.
D. Anchor Bolt: Galvanized steel with galvanized washer and nut (APWA Section 05 05 23.

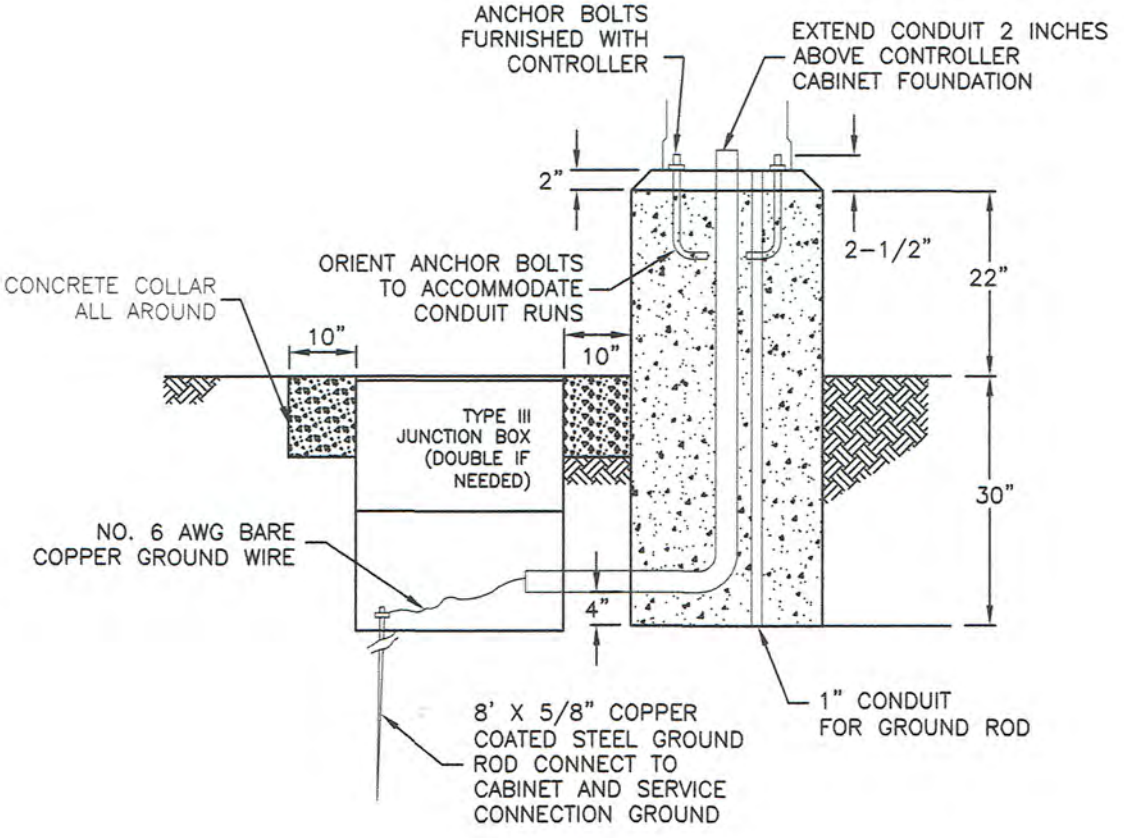
3. EXECUTION

A. Controller Foundation Orientation:
   1) **Not within 18 inches of top back of curb (no exceptions)**.
   2) **Not within 12 inches of edge of sidewalk.** If less than 12" fill space with 4 inches of concrete and finish to match adjacent surfaces.
   3) When the cabinet door is opened all the way, the rotation does not block the sidewalk. There is a paved area for a technician to stand on when working at the cabinet (not in someone's grass or flower bed) and the technician is standing in the right-of-way.
B. Trenching: Place all conduits in the same trench where possible. Backfill compaction is 95 percent or greater relative to a standard proctor.
C. Wire: Attach the ground side of the power supply to the control cabinet ground terminal. Identify and label all field terminals.
D. Conduit:
   1) Before concrete placement, place all conduits in the same trench.
   2) Provide 1-inch minimum spacing between conduits in cabinet base.
   3) Cap or plug conduits at both ends until used.
   4) Seal all conduits inside junction box and cabinet after wiring is complete.
E. Ground: Meet NEC requirements.
F. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish.
G. Landscaped Restoration: Rake trench backfill to match existing grade. Replace vegetation to match pre-construction conditions, APWA Section 32 92 00 or 32 93 13.

TYPE 5
(24 x 36)



PLAN



SECTION A-A

Signal cabinet base

1. GENERAL

A. Install a concrete foundation for a signal controller box.
B. Verify position and location with ENGINEER before proceeding.

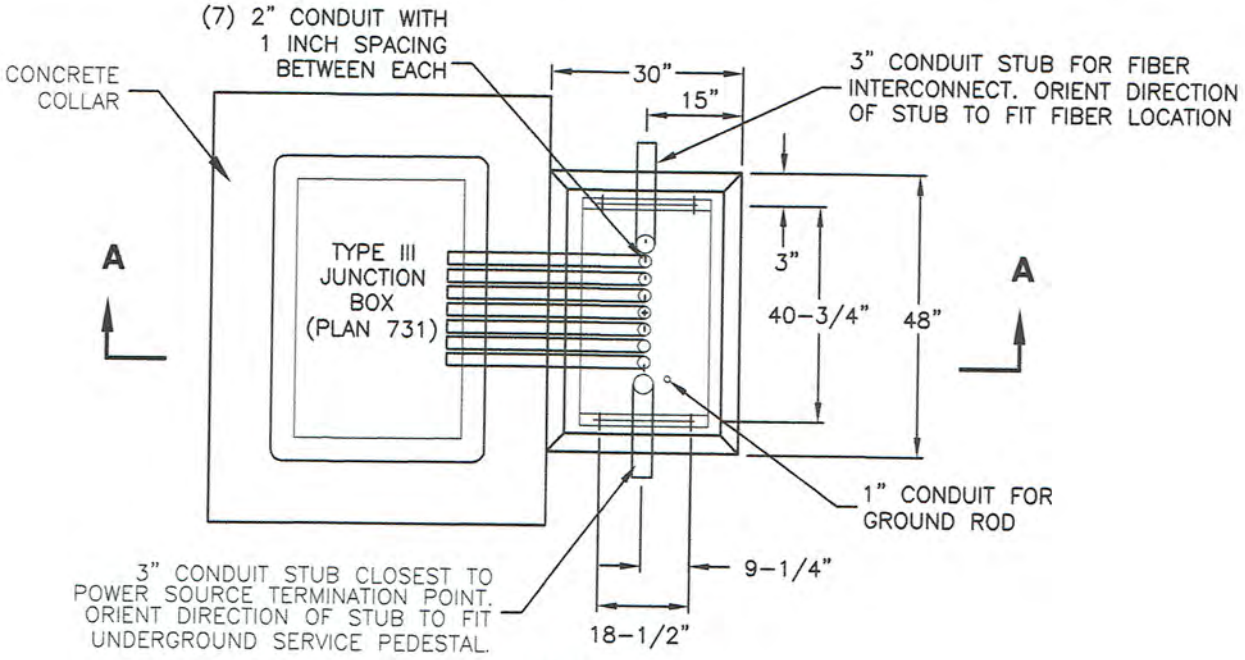
2. PRODUCTS

A. Concrete: Class 4000, APWA Section 03 30 04.
B. Conduit: PVC, NEMA TC6, Type I for encased burial in concrete, Type II for direct burial. Fittings conform to NEMA TC9.
C. Junction Box: Buried type, plastic body and cover in non-vehicular areas or pre-cast concrete in vehicular areas with screw-on cast iron cover both equipped with stainless steel nuts, bolts, screws and washers.
D. Anchor Bolt: Galvanized steel with galvanized washer and nut (APWA Section 05 05 23.

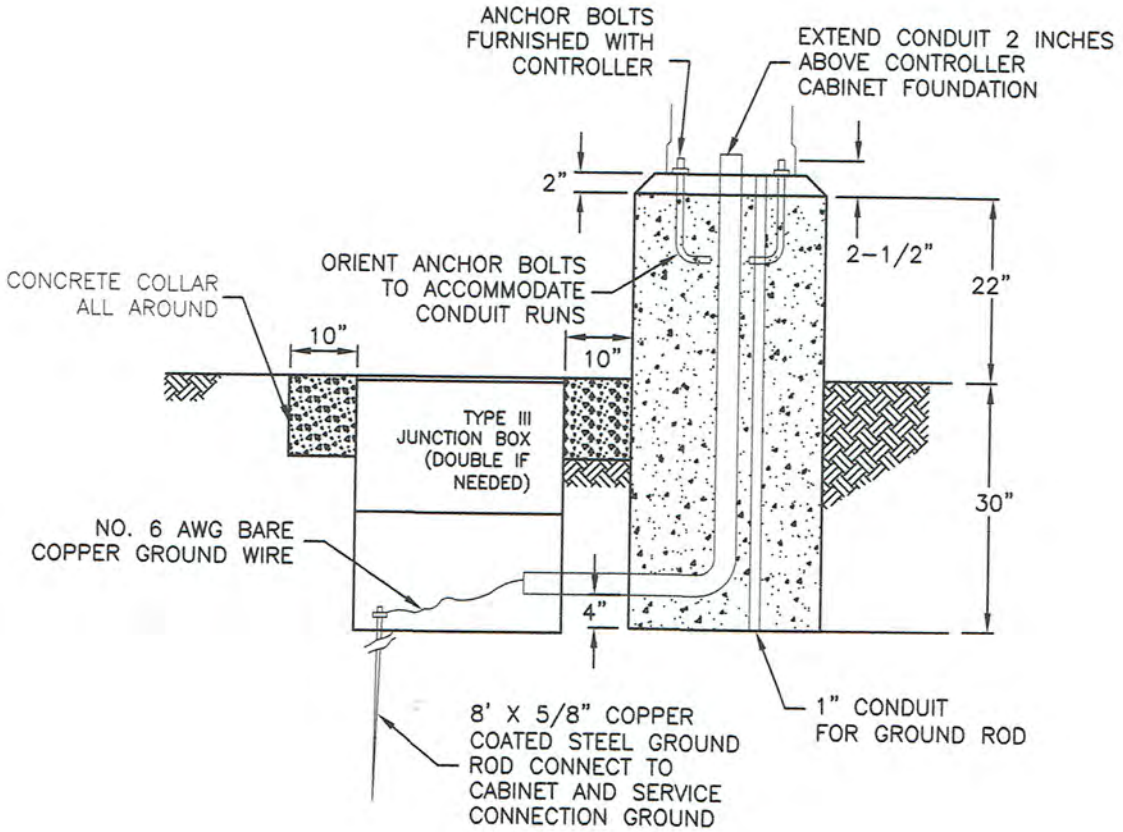
3. EXECUTION

A. Controller Foundation Orientation:
   1) **Not within 18 inches of top back of curb (no exceptions)**.
   2) **Not within 12 inches of edge of sidewalk.** If less than 12" fill space with 4 inches of concrete and finish to match adjacent surfaces.
   3) When the cabinet door is opened all the way, the rotation does not block the sidewalk. There is a paved area for a technician to stand on when working at the cabinet (not in someone's grass or flower bed) and the technician is standing in the right-of-way.
B. Trenching: Place all conduits in the same trench where possible. Backfill compaction is 95 percent or greater relative to a standard proctor.
C. Wire: Attach the ground side of the power supply to the control cabinet ground terminal. Identify and label all field terminals.
D. Conduit:
   1) Before concrete placement, place all conduits in the same trench.
   2) Provide 1-inch minimum spacing between conduits in cabinet base.
   3) Cap or plug conduits at both ends until used.
   4) Seal all conduits inside junction box and cabinet after wiring is complete.
E. Ground: Meet NEC requirements.
F. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish.
G. Landscaped Restoration: Rake trench backfill to match existing grade. Replace vegetation to match pre-construction conditions, APWA Section 32 92 00 or 32 93 13.

TYPE 6
(30 x 48)



PLAN



SECTION A-A

Pedestrian push button pole

1. GENERAL

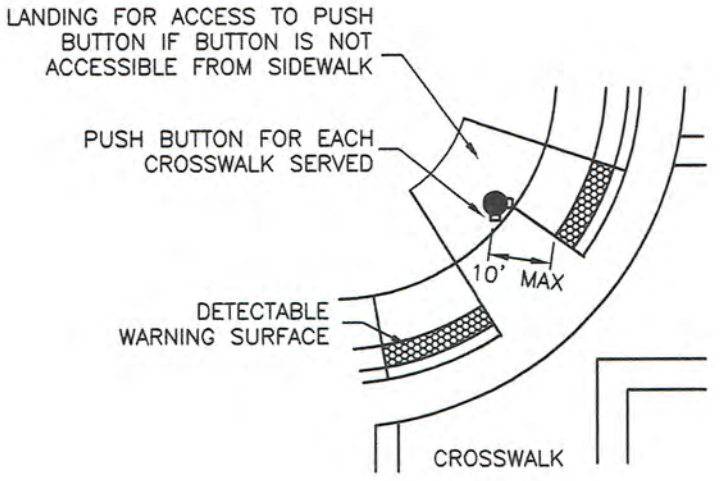
A. Provide a landing surface if push button pole is not accessible from the pedestrian way.
B. The push button must be within 10 feet of curb cut.

2. PRODUCTS

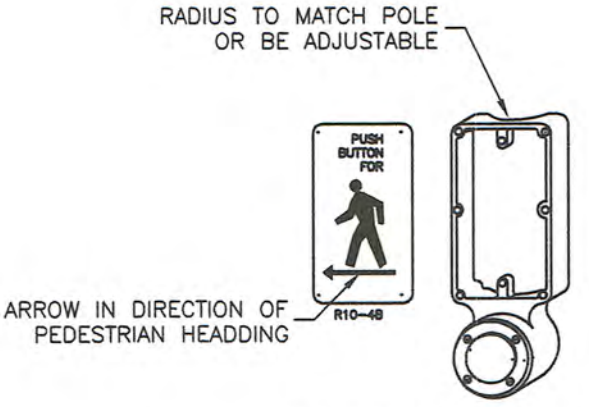
A. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
B. Anchor bolt: Galvanized steel with galvanized washer and nut, APWA Section 05 05 23.
C. Concrete: Class 4000, APWA Section 03 30 04.

3. EXECUTION

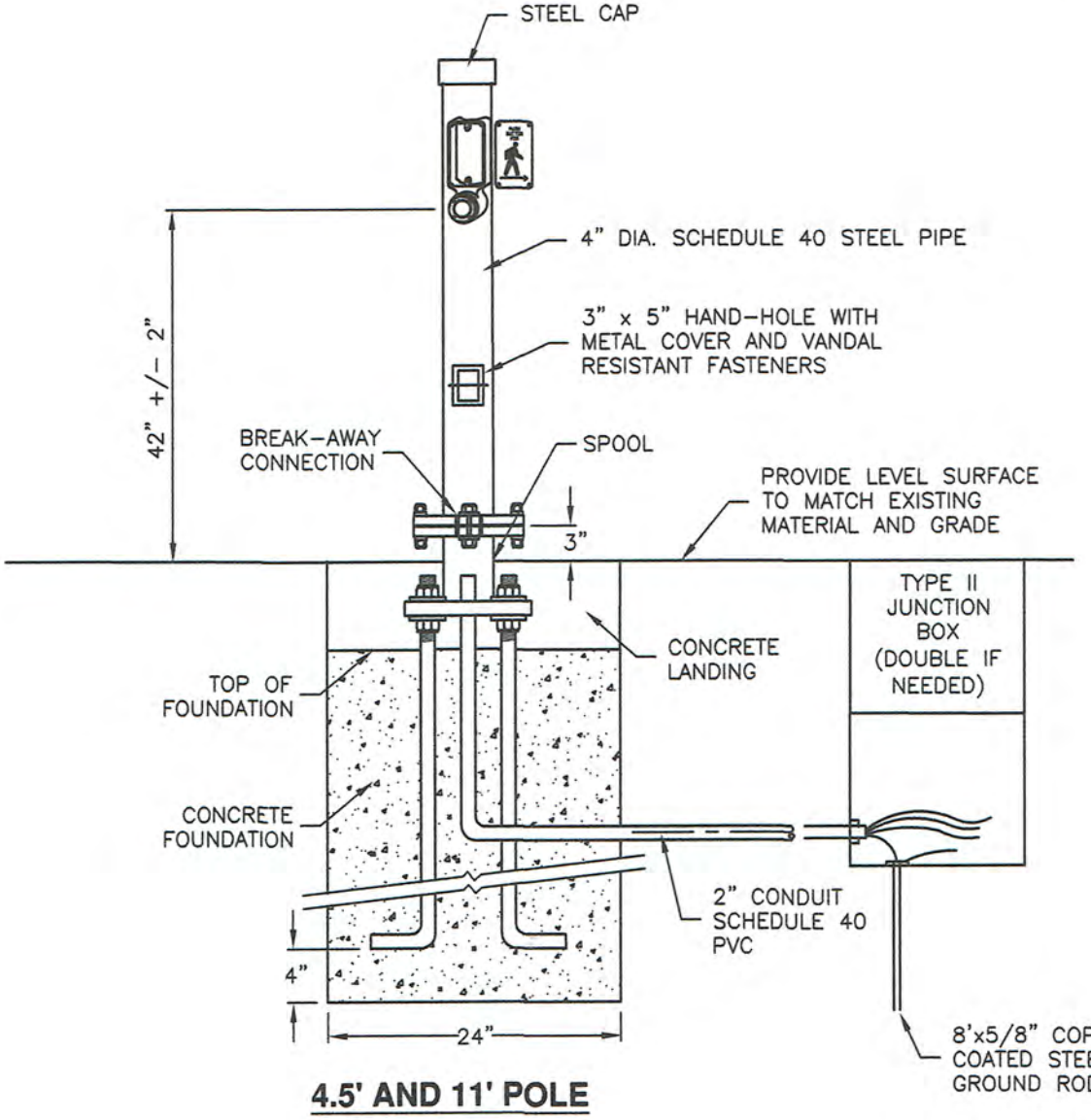
A. Keyhole to verify pole placement and protect utilities, APWA Section 31 23 16.
B. Excavation. Use vacuum extraction or excavate by hand if utilities are in the site vicinity.
C. Formwork: Use a circular form. If ground water is encountered, excavate additional depth and install sewer rock. Pump out water before placing concrete.
D. Before Concrete Placement:
   1) Place all conduits in same trench.
   2) Use a template to hold anchor bolts in the proper positions and to the proper heights until concrete is placed and sets.
   3) Protect conduits by plugging all conduit ends.
E. Concrete Placement: APWA Section 03 30 10. Provide 1/2 –inch radius edges. Cure concrete for 7 days before erecting pole .



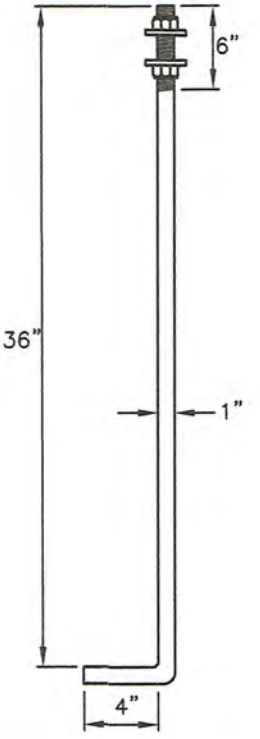
PLAN



PEDESTRIAN PUSH BUTTON ASSEMBLY



4.5' AND 11' POLE



ANCHOR BOLT

AMERICAN PUBLIC WORKS ASSOCIATION
APWA Utah Chapter

Pedestrian push button pole

Plan
755
June 2011

Speed bump

1. GENERAL

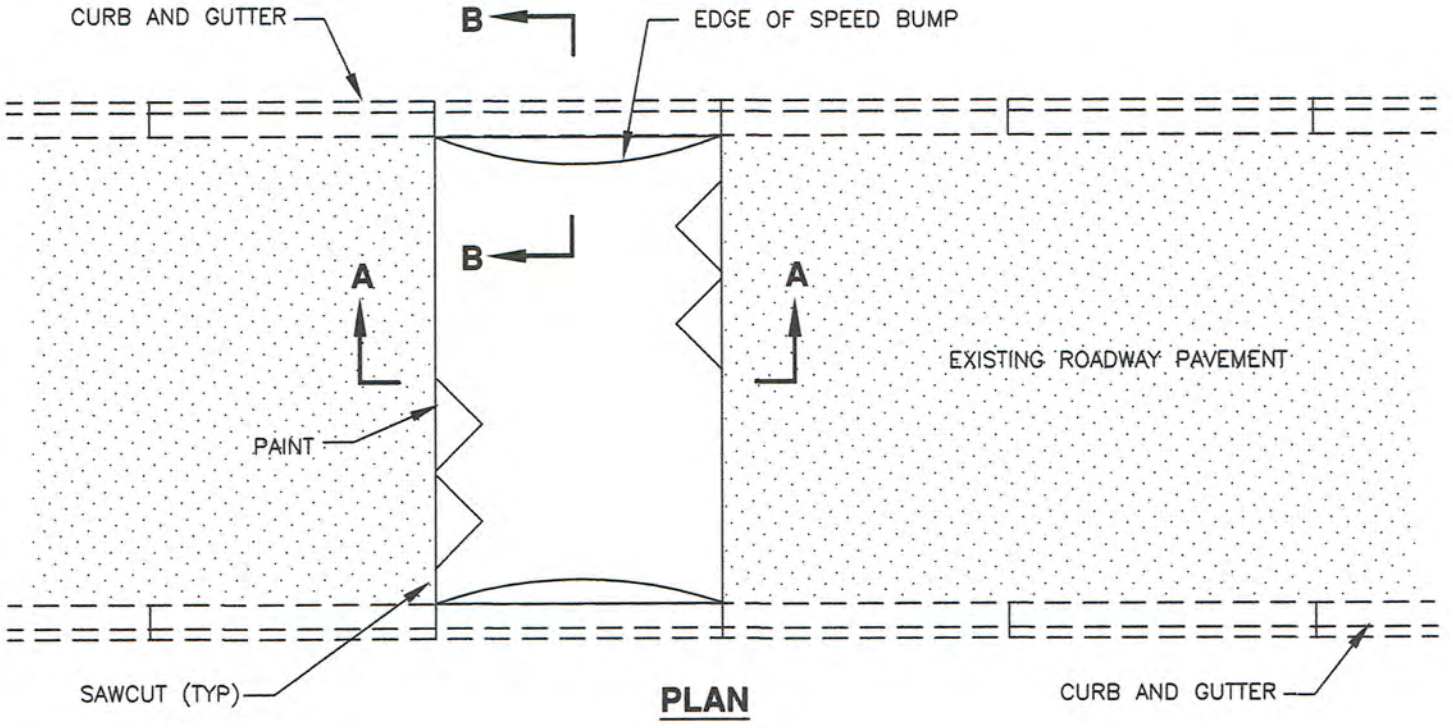
A. Variance from elevations shown must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.

2. PRODUCTS

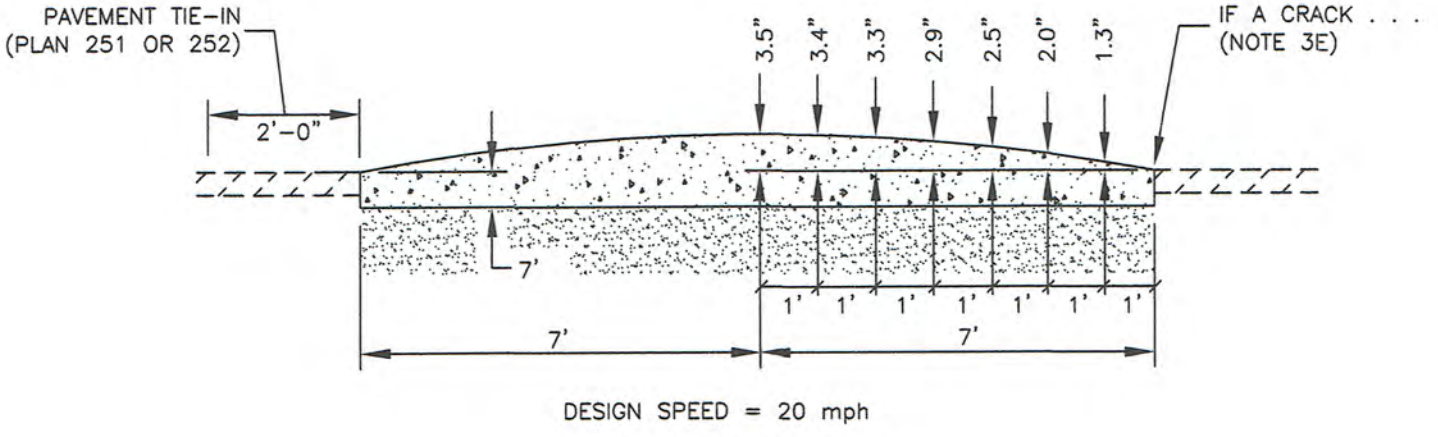
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Limit particle size to 2-inches.
C. Expansion Joint Filler: 1/2-inch thick type F1full depth, APWA Section 32 13 73..
D. Concrete: Class 4000, APWA Section 03 30 04. 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.
E. Concrete Curing Agent: White pigmented membrane forming compound (Type II Class A or B), APWA Section 03 39 00.

3. EXECUTION

A. Base Course and Backfill Placement: Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Clean all edges of dirt, oil and loose debris. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Expansion Joint: Vertical, full depth with top of filler set flush with concrete surface.
D. Contraction Joint: Vertical, 1/8-inch wide and 1/3 slab thickness. Match joint locations in adjacent Portland-cement concrete roadway pavement.
E. Joint Repair: If a crack or separation occurs at a connection to existing pavement during the one year correction period, blow the crack or separation clean and apply joint sealant per Plan 265.

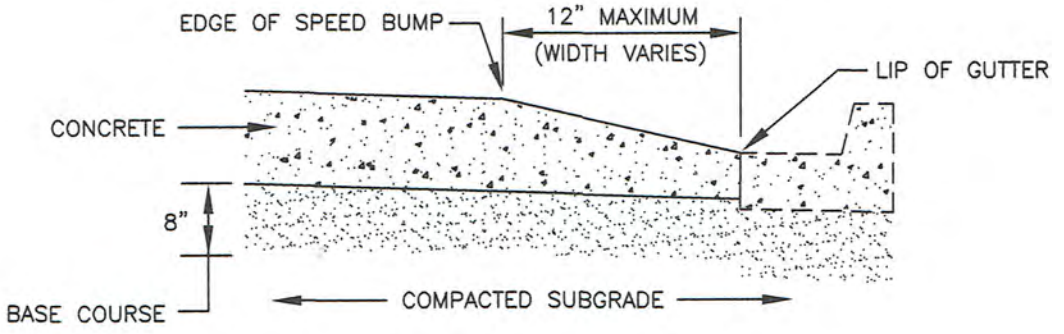


PLAN



DESIGN SPEED = 20 mph

SECTION A-A



SECTION B-B

Speed table

1. GENERAL

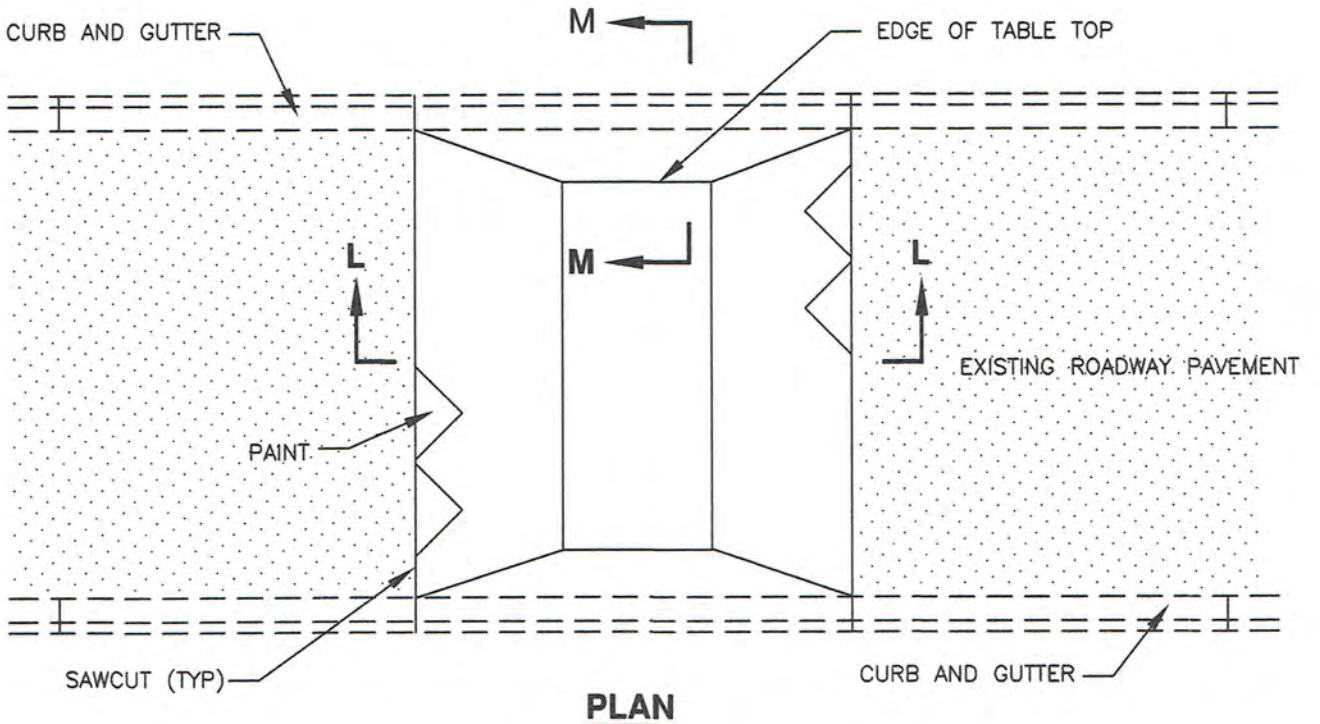
A. Variance from elevations shown must be acceptable to the ENGINEER. System configuration may be changed at ENGINEER's discretion.
B. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.

2. PRODUCTS

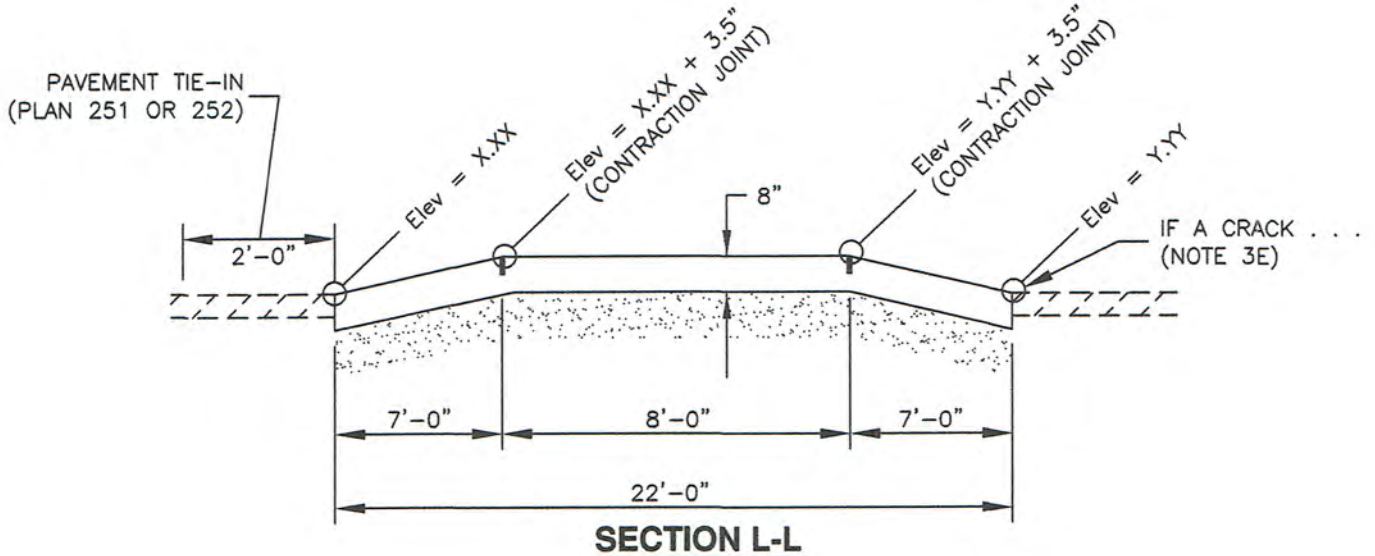
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Limit particle size to 2-inches.
C. Expansion Joint Filler: 1/2-inch thick type F1full depth, APWA Section 32 13 73..
D. Concrete: Class 4000, APWA Section 03 30 04. 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.
E. Concrete Curing Agent: White pigmented membrane forming compound (Type II Class A or B), APWA Section 03 39 00.

3. EXECUTION

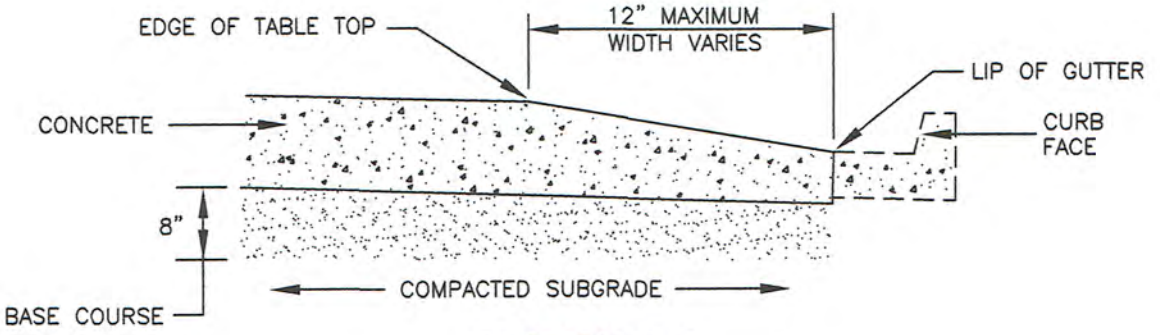
A. Base Course and Backfill Placement: Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment. Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26.
B. Concrete Placement: APWA Section 03 30 10. Clean all edges of dirt, oil and loose debris. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.
C. Expansion Joint: Vertical, full depth with top of filler set flush with concrete surface.
D. Contraction Joint: Vertical, 1/8-inch wide and 1/3 slab thickness. Match joint locations in adjacent Portland-cement concrete roadway pavement.
E. Joint Repair: If a crack or separation occurs at a connection to existing pavement during the one year correction period, blow the crack or separation clean and apply joint sealant perPlan 265.



PLAN



SECTION L-L



SECTION M-M

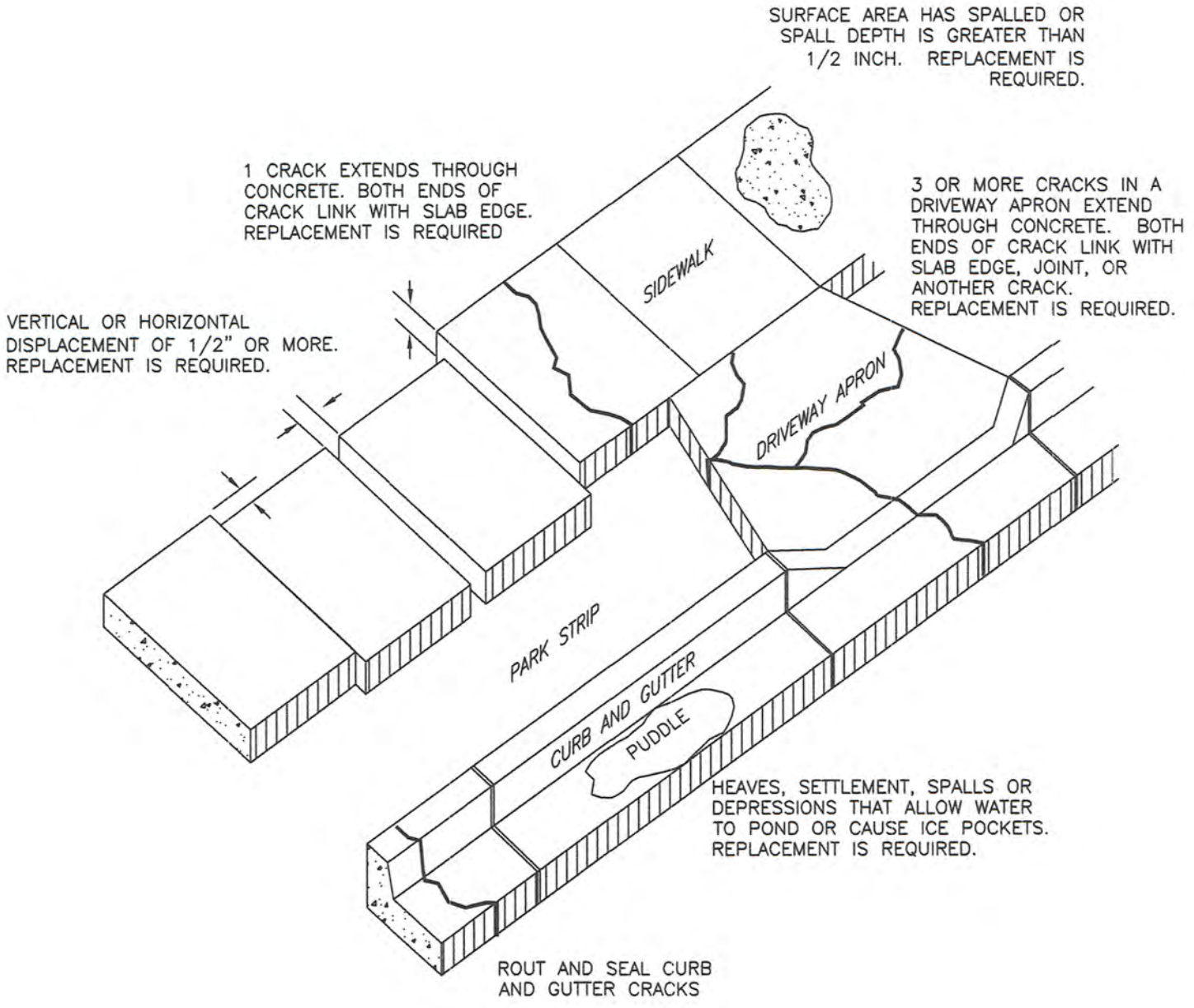
Defective concrete

1. GENERAL

A. The drawing defines parameters for determining whether new or existing concrete is defective.

2. PRODUCTS (Not used)

3. EXECUTION (Not used)



AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Utah Chapter

Defective concrete

Plan
802
April 2011

Design vehicle

1. GENERAL

A. The angles shown on the drawing are design maximums for constructing driveway slopes for a standard residential type of vehicle.

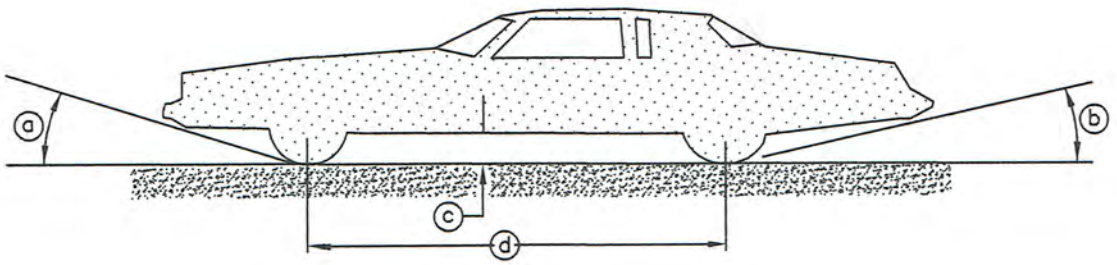
B. Use the following rules when Plan's 215, 221, 225, or 229 do not apply for constructing driveway approaches.

1) Slope of driveway approach from gutter to front edge of sidewalk should not exceed 20 percent.
2) Slope of driveway beyond the property line should not exceed 16 percent.
3) For access for commercial vehicles see Sheet 2 of Plan 805.

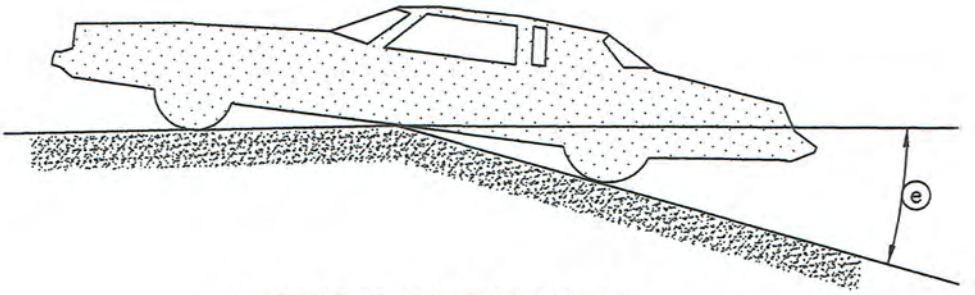
2. PRODUCTS (Not used)

3. EXECUTION (Not used)

TYPE A



VERTICAL SAG ANGLE



VERTICAL CREST ANGLE

ⓐ = MAXIMUM APPROACH ANGLE = 20.2° (SLOPE = 36.8%)
ⓑ = MAXIMUM DEPARTURE ANGLE = 9.2° (SLOPE = 16.2%)
ⓒ = MINIMUM RUNNING GROUND CLEARANCE = 4.3"
ⓓ = DESIGN VEHICLE WHEELBASE LENGTH = 10.8'
ⓔ = MAXIMUM RAMP BREAK-OVER ANGLE = 7.6° = 13.25%

Design vehicle

1. GENERAL

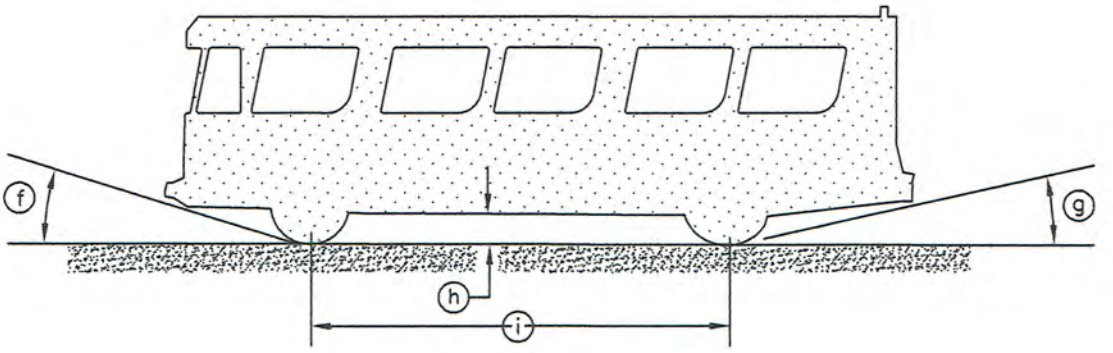
A. The angles shown on the drawing are design maximums for constructing driveway slopes for a standard commercial type of vehicle.

2. PRODUCTS (Not used)

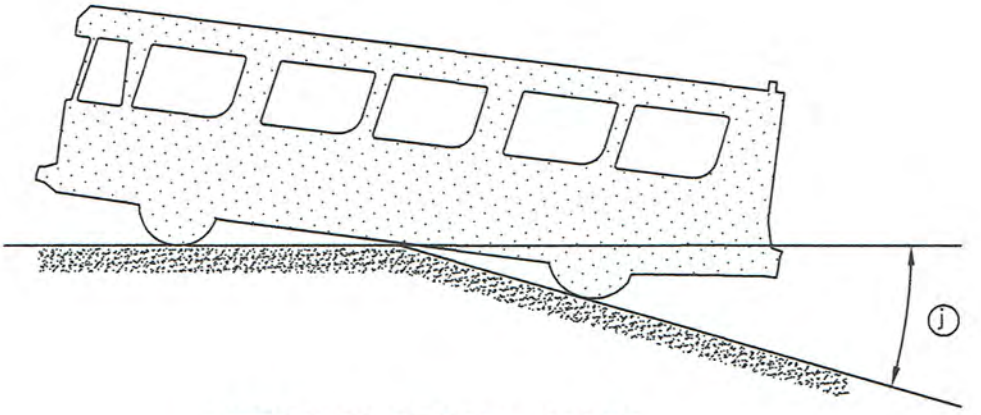
3. EXECUTION

A. To construct slopes for driveway approaches, see driveway approach plans.

TYPE B



VERTICAL SAG ANGLES



VERTICAL CREST ANGLES

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

Chain link fence

1. GENERAL

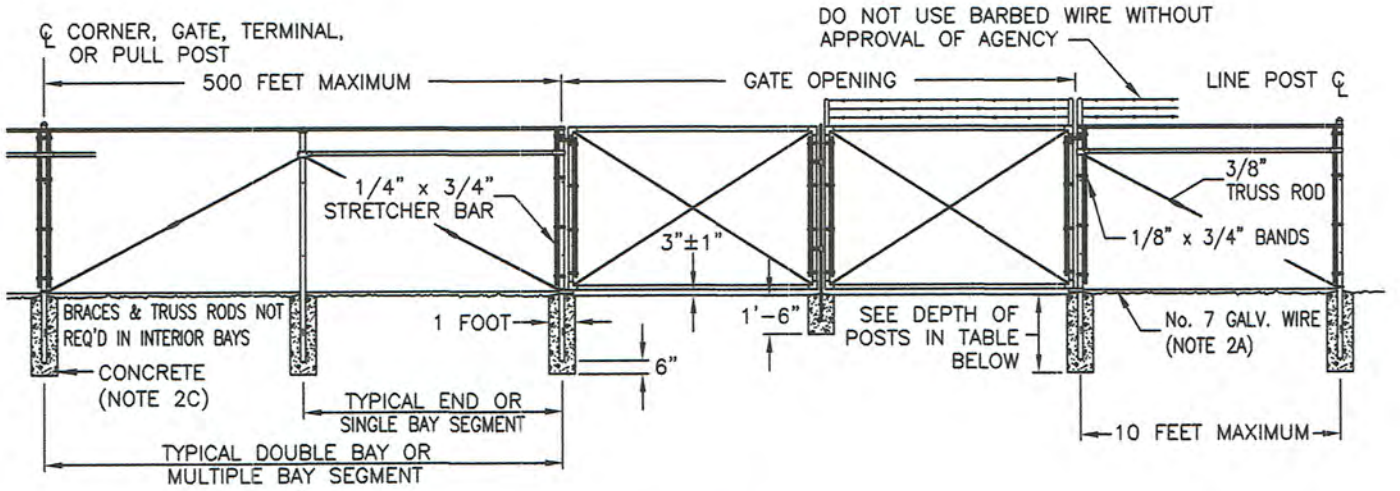
A. Additional chain link fence requirements are specified in APWA Section 32 31 13.

2. PRODUCTS

A. Tension Wire: Zinc coated, galvanized, No. 7 gage spring coil steel.
B. Posts: Schedule 40 hot dipped zinc coated steel pipe, ASTM A120.
C. Concrete: Class 4000, APWA Section 03 30 04.

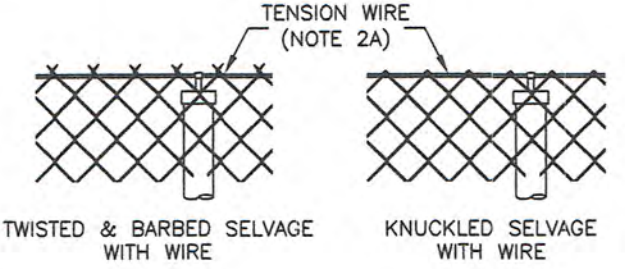
3. EXECUTION

A. Fence Fabric 5 Feet High or Higher: Use twisted and barbed selvage, top and bottom.
B. Fences Fabric Lower than 5 Feet: Use knuckled selvage on top, and twisted and barbed selvage on bottom.
C. Truss rods and Braces: Not required for fabric heights less than 5 feet high.
D. Tension Wire: Set wire at 1-inch over natural ground or 6-inches over concrete structures.
E. Post Spacing: Locate posts at equal spacing for each segment with maximum spacing specified in standard specifications.
F. Barb Wire Arm: Face arm towards exterior of fenced area.
G. Concrete Placement: APWA Section 03 30 10. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.

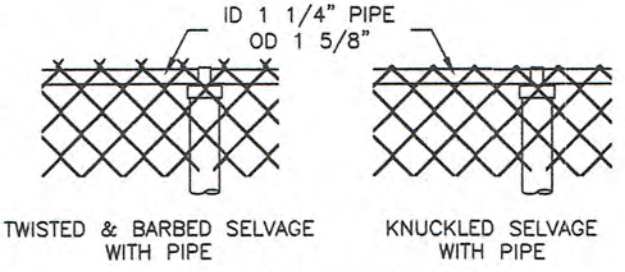


FENCE

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"

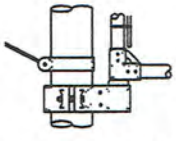


GATE POTS AND GATE FRAMES			
HEIGHT	FRAME	GATE OPENING	POST
UNDER 6 FEET	1 1/2"	SINGLE TO 6' OR DOUBLE TO 12'	2"
	1 1/2"	SINGLE OVER 6' TO 8' OR DOUBLE OVER 12' TO 16'	2 1/2"
	1 1/2"	SINGLE OVER 8' TO 12' OR DOUBLE OVER 16' TO 24'	3 1/2"
6 FEET AND OVER	1 1/2"	SINGLE TO 6' OR DOUBLE TO 12'	2 1/2"
	1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

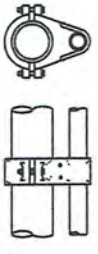


SEE NOTES 3A AND 3B (TYP)

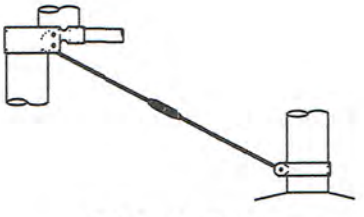
FABRIC



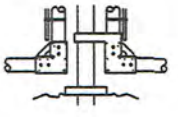
BOTTOM GATE HINGE



TOP GATE HINGE



BRACE & TRUSS CONNECTIONS



CENTER GATE STOP

DETAILS

AMERICAN PUBLIC WORKS ASSOCIATION APWA Utah Chapter

Chain link fence

Plan **831** April 1997

Bus stop pad

1. GENERAL

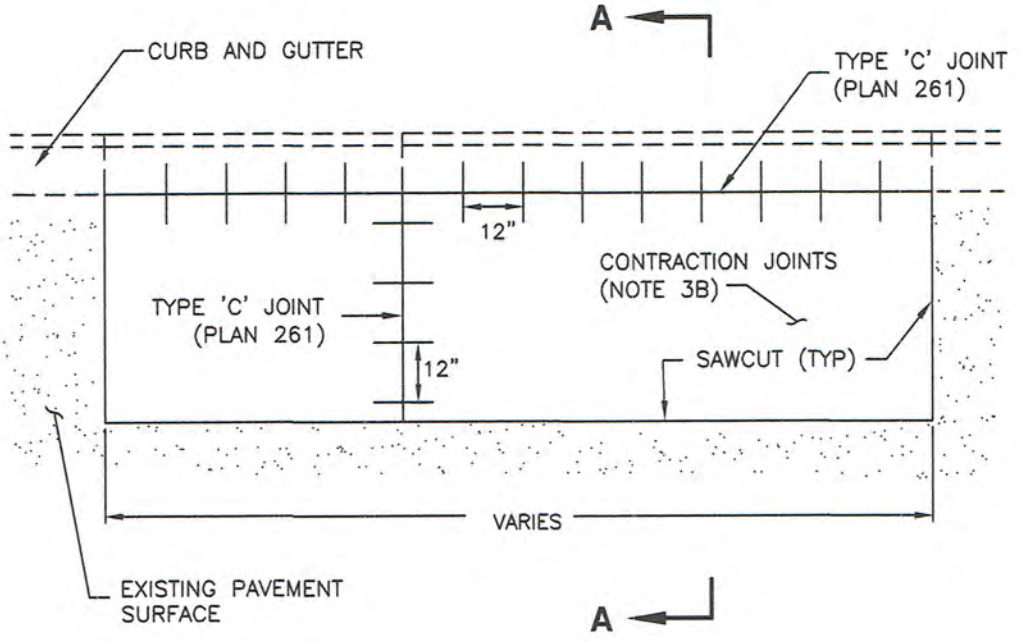
A. Configuration may be changed at ENGINEER's discretion
B. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.

2. PRODUCTS

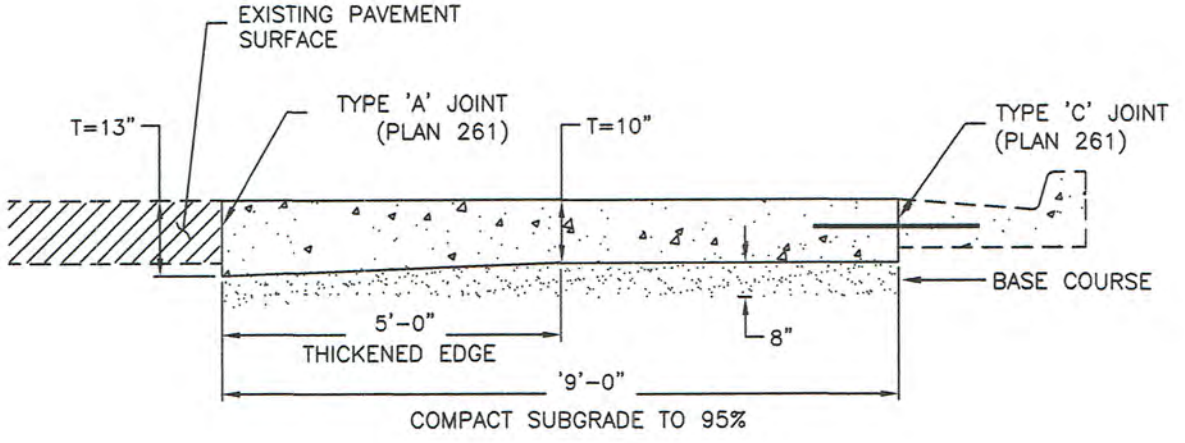
A. Base Course: Untreated base course, APWA Section 32 11 23. Do not use gravel as a base course without ENGINEER's permission.
B. Backfill: Common fill, APWA Section 31 05 13. Limit particle size to 2-inches.
C. Expansion Joint Filler: 1/2-inch thick type F1 full depth, APWA Section 32 13 73..
D. Concrete: Class 4000, APWA Section 03 30 04. 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.
E. Reinforcement: Galvanized or epoxy coated, deformed, 60 ksi yield grade steel, ASTM A615.
F. Concrete Curing Agent: White pigmented membrane forming compound (Type II Class A or B), APWA Section 03 39 00.

3. EXECUTION

A. Base Course and Backfill Placement: Compaction is 95 percent or greater relative to a modified proctor density, APWA Section 31 23 26. Maximum lift thickness before compaction is 8-inches when using riding equipment or 6-inches when using hand held equipment.
B. Concrete Placement: APWA Section 03 30 10.
    1. Install expansion joints vertical, full depth, with top of filler set flush with concrete surface.
    2. Install contraction joints vertical, 1/8-inch wide or 1/3 slab thickness. Maximum length to width ratio for non-square panels is 1.5 to 1. Maximum panel length (in feet) is 1.5 times the slab thickness (in inches). Match location of contraction joints in adjacent Portland-cement concrete roadway pavement.
    3. Clean all edges of dirt, oil and loose debris before placement. Match existing concrete thickness if thickness is greater than 8-inches. Provide 1/2-inch radius edges. Apply a broom finish. Apply a curing agent.



PLAN



SECTION A-A

TOPICAL INDEX

SIDEWALK

SIGNS AND SYMBOLS

STORM DRAINAGE SYSTEMS

STREET LIGHTING

SURFACE RESTORATION

END OF TOPICAL INDEX