PREFACE

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

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

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

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

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

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

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

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

REFERENCE

The term "APWA Section" which is used on the plans refers to specification sections published by the Utah Chapter of the American Public Works Association in the document entitled "Manual of Standard Specifications". The Manual of Standard Specifications has been in existence since 1991 and was originally entitled "Utah Public Works General Conditions and Standard Specifications for Construction".
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The “Recommended English Equivalents” are rounded for use in interpreting metric sizes.

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Arrow diagram for project close-out

1. PROJECT CLOSE-OUT: The diagram shows sequence of activities for project completion up to the end of the Contract Time, during the one year correction period, and after the end of the one year correction period.

2. REFERENCE:
   A. Progress Schedule, APWA Section 01 32 16.
   B. Project Record Documents, APWA Section 01 78 50.
**Straw bale barrier**

1. DESCRIPTION: A temporary sediment barrier consisting of a row of entrenched and anchored straw bales.

2. APPLICATION: To intercept and detain small amounts of sediment from disturbed areas of limited extent. To decrease the velocity of sheet flows and low-to-moderate level channel flows.
   
   A. Perimeter Control. Place barrier at down gradient limits of disturbance.
   B. Sediment Barrier. Place barrier at toe of slope or soil stockpile.
   C. Protection of Existing Waterways. Place barrier at top of stream bank.
   D. Inlet Protection.

3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
   
   A. Bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting each other.
   B. All bales shall be either wire-bound or string-tied. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales (in order to prevent deterioration of the bindings).
   C. The gaps between bales shall be chinked (filled by wedging) with straw to prevent water from escaping between the bales. Loose straw scattered over the area immediately uphill from a straw bale barrier tends to increase barrier efficiency.
   D. When bales are installed at the toe of a slope, they should be placed away from the slope for increased storage capacity.
   E. Straw bale barriers shall be removed when they have served their usefulness, but not before the up-slope areas have been permanently stabilized.

4. MAINTENANCE:
   
   A. Inspect immediately after any rainfall and at least daily during prolonged rainfall.
   B. Close attention must be paid to the repair of damaged bales, end runs and undercutting beneath bales.
   C. Necessary repairs or replacement of bales must be accomplished promptly.
   D. Remove sediment deposits after each rainfall. The must be removed when the level of deposition reaches approximately one-half the height of the bale(s).
   E. Realign bales to provide a continuous barrier and to fill gaps.
   F. Recompact soil around bales as necessary to prevent piping.
NARRATIVE: This plan may be used for the construction of a storm water best management practice (BMP). It is not inclusive of all practices available and is only specific to the construction of this type. Maintenance of this type of installation is important and should be continuously monitored by the contractor and engineer. Details shown here highlight important parts of construction, and should be modified as needed.

PLAN

SECTION

Straw bale barrier
**Silt fence**

1. **DESCRIPTION:** A temporary sediment barrier consisting of a filter fabric stretched across and attached to supporting posts and entrenched.

2. **APPLICATION:** To intercept sediment from disturbed areas of limited extent.
   A. Perimeter Control: Place barrier at down gradient limits of disturbance.
   B. Sediment Barrier: Place barrier at toe of slope or soil stockpile.
   C. Protection of Existing Waterways: Place barrier at top of stream bank.
   D. Inlet Protection.

3. **INSTALLATION/APPLICATION CRITERIA:** Refer to APWA Section 01 57 00.
   A. Synthetic filter fabric shall be a pervious sheet of propylene, nylon, polyester, or polyethylene yarn. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of 6 months of expected usable construction life at a temperature range of 0 deg. F. to 120 deg. F.
   B. Burlap shall be 10 ounces per square yard of fabric.
   C. Posts for silt fences shall be either 2” x 4” diameter wood, or 1.33 pounds per linear foot steel with a minimum length of 5 feet. Steel posts shall have projections for fastening wire to them.
   D. The fabric is cut on site to desired width, unrolled, and draped over the barrier. The fabric toe is secured with rocks or dirt. The fabric is secured to the mesh with twin, staples or similar devices.
   E. When attaching two silt fences together, place the end post of the second fence inside the end post of the first fence. Rotate both posts at least 180 degrees on a clockwise direction to create a tight seal with the filter fabric. Drive both posts into the ground and bury the flap.
   F. When used to control sediments from a steep slope, silt fences should be placed away from the toe of the slope for increased holding capacity.

4. **MAINTENANCE:**
   A. Inspected immediately after each rainfall and at least daily during prolonged rainfall.
   B. Should the fabric on a silt fence or filter barrier decompose or become ineffective before the end of the expected usable life and the barrier still be necessary, the fabric shall be replaced promptly.
   C. Sediment deposits should be removed after each storm event. They must be removed when deposits reach approximately one-half the height of the barrier.
   D. Re-anchor fence as necessary to prevent shortcutting.
   E. Inspect for runoff bypassing ends of barriers or undercutting barriers.
NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

1. SECURE MESH TO POSTS WITH WIRE STAPLES 1" LONG OR TIE WIRES OR HOG RINGS

2. AVOID JOINTS (NOTE 3E)

WITH ENGINEER'S APPROVAL, AN EXTRA STRENGTH FILTER FABRIC CAN BE USED IN LIEU OF WIRE MESH SUPPORT

TOE DETAIL

Silt fence
Diversion dike

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

2. APPLICATION: To intercept up gradient runoff and convey around construction site. To divert sediment laden runoff.
   A. Construct along midpoint of construction slope to intercept runoff and channel to controlled discharge point.
   B. Construct around base of soil stockpiles to capture sediment.
   C. Construct around perimeter of disturbed areas to capture sediment.

3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
   A. The dike should be built before construction begins.
   B. Clear and grub area for dike construction.
   C. Excavate channel and place soil on down gradient side.
   D. Shape and machine compact excavated soil to form ridge.
   E. Place erosion protection (rip rap, mulch) at outlet. Stabilize channel and ridge as required with mulch, gravel or vegetative cover. Temporary or permanent seeding and mulch shall be applied to the dike within 15 days of construction.
   F. The dike should be located to minimize damages by construction operations and traffic.

4. MAINTENANCE:
   A. Inspect immediately after each rainfall and at least daily during prolonged rainfall.
   B. Look for runoff breaching dike or eroding channel or side slopes.
   C. Check discharge point for erosion or bypassing of flows.
   D. Repair and stabilize as necessary.
   E. Inspect daily during vehicular activity on slope, check for and repair any traffic damage.
NARRATIVE:  THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

**TOP OF SLOPE (TYP)**

**BASE OF SLOPE (TYP)**

*Diversion dike*
Inlet protection – gravel sock

1. **DESCRIPTION:** Placement of gravel sock on grade upstream of, or in front of storm drain inlets to filter or pond water runoff

2. **APPLICATION:** At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

3. **INSTALLATION/APPLICATION CRITERIA:** Refer to APWA Section 01 57 00.
   A. **On-grade inlet protection:**
      1. On-grade inlet protection should be used when completely blocking a storm drain inlet box would result in forcing water further downstream would cause flooding or other undesirable results.
      2. Prepare filter media (gravel sock, straw waddle, or other approved media) in accordance with manufacturer’s recommendations.
      3. Install filter media just upstream of the inlet box.
      4. Filter media shall butt tightly against the face of the curb and angle at approximately a 45 degree angle away from the curb to trap runoff between the media and the curb.
      5. Excessive flows will flow either over or around the filter media and into the inlet box.
      6. Expect ponding behind the filter media.
   B. **Drop inlet protection:**
      1. Drop inlet protection should be used at low points in the curb and when diverting flows further downstream will not cause undesirable results.
      2. Prepare filter media (gravel sock, straw waddle, or other approved media) in accordance with manufacturer’s recommendations.
      3. Install filter media around the entire perimeter of the inlet grate.
      4. Filter media shall butt tightly against the face of the curb on both sides of the inlet grate.
      5. Excessive flows will either flow around the media or over the top and into the inlet box.
      6. Expect ponding around the inlet box.

4. **MAINTENANCE:**
   A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
   B. Remove sediment accumulated when it reaches 2 inches in depth.
   C. Replace filter medium when damage has occurred or when medium is no longer functioning as intended.
NARRATIVE:  THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

ON-RGBADE INLET PROTECTION DETAIL

DROP INLET PROTECTION DETAIL

Inlet protection - gravel sock
Inlet protection – gravel

1. DESCRIPTION: Placement of gravel filter over storm drain inlet to filter water runoff.

2. APPLICATION: At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
   A. Place 1/2 inch opening wire mesh over the inlet grate extending one foot past the grate in all directions.
   B. Place filter fabric over the mesh. Filter fabric should be selected based on soil type.
   C. Place graded gravel (2 inch to 4 inch in size), to a minimum depth of 12 inches, forming a wall around the grate on all sides. The wall shall have side slopes so that gravel does not spill over the grate.
   D. The filter fabric immediately over the grate needs to remain exposed so that the grate can be visually inspected.
   E. Place a delineator at the inlet grate so that the gravel surrounding it will not inadvertently be graded or moved and to protect the inlet from damage.

4. MAINTENANCE:
   A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
   B. Remove sediment accumulated when it reaches 4 inches in depth.
   C. Replace filter fabric and clean or replace gravel if clogging is apparent.
NARRATIVE: This plan may be used for the construction of a storm water best management practice (BMP). It is not inclusive of all practices available and is only specific to the construction of this type. Maintenance of this type of installation is important and should be continuously monitored by the contractor and engineer. Details shown here highlight important parts of construction, and should be modified as needed.

**DROP INLET PROTECTION**

**CURB INLET PROTECTION**

*Inlet protection - gravel*
**Inlet protection – fence or straw bale**

1. **DESCRIPTION:** A temporary sediment barrier around storm drain inlet.

2. **APPLICATION:** At inlets in paved or unpaved areas where up gradient area is to be disturbed by construction activities.

3. **INSTALLATION/APPLICATION CRITERIA:** Refer to APWA Section 01 57 00.
   A. Provide up gradient sediment controls, such as silt fence during construction of inlet.
   B. When construction of inlet is complete erect straw bale barrier, silt fence or other approved sediment barrier to surround perimeter of inlet.
   C. Install filter fabric completely around grate.

4. **MAINTENANCE:**
   A. Inspect inlet protection after every large storm event and at a minimum of once monthly.
   B. Remove sediment accumulated when it reaches 4 inches in depth.
   C. Repair or re-align barrier or fence as needed.
   D. Look for bypassing or undercutting and re-compact soil around barrier or fence as required.
NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

**Inlet protection - fence or straw bale**

**STRAW BALE BARRIER**
(PLAN No. 121)

**SILT FENCE**
(PLAN No. 122)
**Equipment and vehicle wash down area**

1. **DESCRIPTION:** A temporary stabilized pad of gravel for general washing of equipment and construction vehicles.

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

3. **INSTALLATION/APPLICATION CRITERIA:** Refer to APWA Section 01 57 00.
   A. Clear and grub area and grade to provide maximum slope of 1 percent away from paved roadway.
   B. Compact subgrade.
   C. Place filter fabric under wash down area if desired (recommended for wash area that remains more than 3 months).
   D. Install silt fence down gradient (see Plan No. 122)

4. **MAINTENANCE:**
   A. Requires periodic top dressing with additional stones.
   B. Solely used to control sediment in wash water. Cannot be utilized for washing equipment or vehicles that may cause contamination of runoff (such as fertilizer equipment or concrete equipment).
   C. The wash area shall be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way.
   D. Periodic top dressing with 2 inch stone may be required, as conditions demand, and repair any structures used to trap sediments.
   E. Inspect daily for loss of gravel or sediment buildup.
   F. Inspect adjacent area for sediment deposit and install additional controls as necessary.
   G. Expand stabilized area as required to accommodate activities.
   H. Maintain silt fence as outlined in Plan No. 122.
NARRATIVE: THIS PLAN MAY BE USED FOR THE CONSTRUCTION OF A STORM WATER BEST MANAGEMENT PRACTICE (BMP). IT IS NOT INCLUSIVE OF ALL PRACTICES AVAILABLE AND IS ONLY SPECIFIC TO THE CONSTRUCTION OF THIS TYPE. MAINTENANCE OF THIS TYPE OF INSTALLATION IS IMPORTANT AND SHOULD BE CONTINUOUSLY MONITORED BY THE CONTRACTOR AND ENGINEER. DETAILS SHOWN HERE HIGHLIGHT IMPORTANT PARTS OF CONSTRUCTION, AND SHOULD BE MODIFIED AS NEEDED.

1. SECURE MESH TO POSTS WITH WIRE STAPLES 1" LONG OR TIE WIRES OR HOG RINGS

2. SECURE FABRIC TO MESH WITH TWINE, STAPLES OR SIMILAR

SLIT FENCE
(PLAN No. 122)

COARSE AGGREGATE
2" TO 4" SIZE

FLOW

WASH DOWN AREA

50' MIN.

15' MIN.

8" MIN.

3' MAX

Plan No. 125

Equipment and vehicle wash down area

February 2006
Stabilized roadway entrance

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

2. APPLICATION: At any site where vehicles and equipment enter the public right of way.

3. INSTALLATION/APPLICATION CRITERIA: Refer to APWA Section 01 57 00.
   A. Clear and grub area and grade to provide maximum slope of 1 percent away from paved roadway.
   B. Compact subgrade.
   C. Place filter fabric under stone if desired (recommended for entrance area that remains more than 3 months).

4. MAINTENANCE:
   A. Requires periodic top dressing with additional stones.
   B. Prevent tracking or flow of mud into the public right-of-way.
   C. Periodic top dressing with 2 inches stone may be required, as conditions demand, and repair any structures used to trap sediments.
   D. Inspect daily for loss of gravel or sediment buildup.
   E. Inspect adjacent areas for sediment deposit and install additional controls as necessary.
   F. Expand stabilized area as required to accommodate activities.
NARRATIVE: This plan may be used for the construction of a storm water best management practice (BMP). It is not inclusive of all practices available and is only specific to the construction of this type. Maintenance of this type of installation is important and should be continuously monitored by the contractor and engineer. Details shown here highlight important parts of construction, and should be modified as needed.
PART 2
ROADWAYS

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**Abbreviations and symbols for roadway drawings**

1. **LETTERING SIZE:** 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.

2. **LETTERING STYLE:** Capital letters preferred.

3. **EXISTING IMPROVEMENTS:** Shown in light shaded dashed line.

4. **NEW IMPROVEMENTS:** Shown in solid continuous line.
Curb and gutter

1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. If flow line grade is greater than 0.5 percent (s=0.005), provide 6 inches uncompacted thickness. If less, provide 8 inches uncompacted thickness.
   C. Place material per APWA Section 32 05 10.
   D. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE**: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT**: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
   A. Set top of filler flush with surface of concrete.
   B. Expansion joints are required at the start or end of a street intersection curb return.
   C. Expansion joints are not required in slip form work.

4. **CONTRACTION JOINT**: Make contraction joints vertical.
   A. 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   B. If necessary, match location of contraction joints in portland cement concrete roadway pavements.

5. **REINFORCEMENT**: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

6. **FINISH**: Broomed.

7. **PROTECTION AND REPAIR**:
   A. Fill flow-line with water. Repair construction that does not drain.
   B. Protect concrete from deicing chemicals during cure.
**TYPE A**

CONCRETE AREA = 1.665 SQ. FT.

**TYPE B**

CONCRETE AREA = 1.926 SQ. FT.

**TYPE C**

CONCRETE AREA = 1.517 SQ. FT.

**TYPE D**

CONCRETE AREA = 1.680 SQ. FT.

**Curb and gutter joint detail**

COLD JOINT No. 4 REBAR (NOTE 5) 18" ø 24" O.C.

CONTRACTION JOINTS (NOTE 4)

EXPANSION JOINT (NOTE 3)

FLOWLINE 10'
Curb and gutter

1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. If flow line grade is greater than 0.5 percent \( (s=0.005) \), provide 6 inches uncompacted thickness. If less, provide 8 inches uncompacted thickness.
   C. Place material per APWA Section 32 05 10.
   D. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE**: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT**: Make expansion joints vertical, full depth, 1/2 wide with type F1 joint filler material per APWA Section 32 13 73.
   A. Set top of filler flush with surface of concrete.
   B. Expansion joints are required at the start or end of a street intersection curb return.
   C. Expansion joints are not required in slip form work.

4. **CONTRACTION JOINT**: Make contraction joints vertical.
   A. 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   B. If necessary, match location of contraction joints in portland cement concrete roadway pavements.

5. **REINFORCEMENT**: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

6. **FINISH**: Broomed.

7. **PROTECTION AND REPAIR**:  
   A. Fill flow-line with water. Repair construction that does not drain.
   B. Protect concrete from deicing chemicals during cure.
**TYPE F**

- **BOTTOM OF CONTRACTION JOINT**
- **R = 36"**
- **12"**
- **8"**
- **8"**
- **24"**

**CONCRETE AREA = 1.989 SQ. FT.**

**NOTE 1A**

---

**TYPE F**

- **BOTTOM OF CONTRACTION JOINT**
- **R = 3/4"**
- **6"**
- **2"**
- **6-3/4"**
- **12"**
- **8"**
- **24"**

**CONCRETE AREA = 1.347 SQ. FT.**

**NOTE 1A**

---

**TYPE G**

- **FLOWLINE**
- **COLD JOINT**
  - No. 4 REBAR (NOTE 5)
  - 18" Ø 24" O.C.
- **CONTRACTION JOINTS** (NOTE 4)
- **EXPANSION JOINT** (NOTE 3)

**CURB AND GUTTER JOINT DETAIL**
Curbs

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical., full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
   A. Set top of filler flush with surface of concrete.
   B. Expansion joints are required at the start or end of a street intersection curb return.
   C. Expansion joints are not required in curb tangents or slip form work.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   B. If necessary, match location of contraction joints in adjacent concrete flatwork.

5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

6. FINISH: Broomed.
CONCRETE AREA = 0.58 SQ. FT.

TYPE P

CONCRETE AREA = 1.0278 SQ. FT.

TYPE Q

CONCRETE AREA = 0.472 SQ. FT.

TYPE R

CONCRETE AREA = 0.487 SQ. FT.

TYPE S

COLD JOINT
No. 4 REBAR (NOTE 5)
18” 24” O.C.

FLOWLINE

CONTRACTION JOINTS
(NOTE 4)

EXPANSION JOINT
(NOTE 3)

JOINT SPACING DETAIL

Curbs

Plan No. 209

May 2005
1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT:** Make contraction joints vertical, at least 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.

5. **REINFORCEMENT:** ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

6. **FINISH:** Broomed.

7. **PROTECTION AND REPAIR:**
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure.
CONCRETE AREA = 2.764 SQ. FT.

4'-0" WATERWAY

CONCRETE AREA = 4.16 SQ. FT.

6'-0" WATERWAY
1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE**: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT**: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT**: Make contraction joints vertical.
   A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.

5. **REINFORCEMENT**: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

6. **WATERWAY**: Use width shown on the Drawings. If not shown then 4 feet for a residential street and 6 feet for a non-residential street.

7. **FLOW-LINE**: A 4 feet wide waterway and a 6 feet wide waterway are shown on Plan No. 213. If a wider waterway is specified or required, offset the flow line in the waterway to match (lines up with) the curb and gutter flow line. Adjust cross slope grades to match existing slopes.

8. **FINISH**: Broomed.

9. **PROTECTION AND REPAIR**:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure.
**Dip driveway approach**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT:** Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. **FINISH:** Broomed.

6. **PROTECTION AND REPAIR:**
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
SECTION A–A – APPROACH REQUIRING SERVICE TRUCK ACCESS

SECTION A–A – TYPICAL DRIVEWAY APPROACH

Dip driveway approach

December 20, 2005
Mountable curb driveway approach

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s
      permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent
      or greater. Maximum lift thickness before compaction is 8 inches when using
      riding compaction equipment or 6 inches when using hand held compaction
      equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days.
      Use caution; however, as concrete crazing (spider cracks) may develop if air
      temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with
      fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with
   type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with
   surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches
      thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a
      maximum of 15 feet.

5. FINISH: Broomed.

6. PROTECTION AND REPAIR:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
**SECTION A–A — APPROACH REQUIRING SERVICE TRUCK ACCESS**

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<th>STREET TYPE</th>
<th>BREAKOVER ANGLE (MAXIMUM)</th>
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<tr>
<td></td>
<td>C</td>
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<tr>
<td>RESIDENTIAL</td>
<td>16%</td>
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<tr>
<td>OTHER</td>
<td>6%</td>
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**SECTION A–A — TYPICAL DRIVEWAY APPROACH**

<table>
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<tr>
<th>STREET TYPE</th>
<th>BREAKOVER ANGLE (MAXIMUM)</th>
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<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>RESIDENTIAL</td>
<td>16%</td>
</tr>
<tr>
<td>OTHER</td>
<td>6%</td>
</tr>
</tbody>
</table>

**Mountable curb driveway approach**

December 2005

Plan No. 216
Flare driveway approach – type A

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements. Not required if driveway ramp is constructed without a cold joint.

6. FIELD CHANGES TO SLOPE REQUIREMENTS: The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
   A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.

7. FINISH: Broomed.

8. PROTECTION AND REPAIR:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
SECTION A–A - APPROACH REQUIRING SERVICE TRUCK ACCESS

SECTION A–A - TYPICAL DRIVEWAY APPROACH

Flare driveway approach - type A
Flare driveway approach – type B

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements. Not required if driveway ramp is constructed without a cold joint.

6. FIELD CHANGES TO SLOPE REQUIREMENTS: The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
   A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.

7. FINISH: Broomed.

8. PROTECTION AND REPAIR:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
SECTION A-A - APPROACH REQUIRING SERVICE TRUCK ACCESS

SECTION A-A - TYPICAL DRIVEWAY APPROACH

*Flare driveway approach - type B*
Saw-cut driveway approach

1. SIDEWALK:
   A. Remove and replace all deteriorated, weak, or unsound concrete.
   B. Thickness of sidewalk at driveway ramp to match thickness of driveway ramp.
   C. Match elevation of driveway walk to the nearest joint beyond the width of the driveway.

2. CURB CUTTING:
   A. No over-cutting where cuts merge.
   B. Bevel front edge at flow-line or have saw-cut match flow-line.
   C. Grind sawed surface so that no blade marks appear.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73.
      Set top of filler flush with surface of concrete.

4. WATER PROOFING: Follow APWA Section 07 19 00 requirements.
Saw-cut driveway approach

Plan No. 222
Open driveway approach

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements. Not required if driveway ramp is constructed without a cold joint.

6. FIELD CHANGES TO SLOPE REQUIREMENTS: The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
   A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.

7. FINISH: Broomed.

8. PROTECTION AND REPAIR:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
SECTION A–A – APPROACH REQUIRING SERVICE TRUCK ACCESS

SECTION A–A – TYPICAL DRIVEWAY APPROACH

Open driveway approach
1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE**: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT**: Make expansion joints vertical, full depth 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT**: Make contraction joints vertical.
   A. 1/8 inch wide and 2 inches deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is .25 times the slab thickness (in inches) to a maximum of 15 feet.

5. **REINFORCEMENT**: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements. Not required if driveway ramp is constructed without a cold joint.

6. **FIELD CHANGES TO SLOPE REQUIREMENTS**: The following design parameters are to be used as a guide. Specific uses or site conditions may require profile design submittal for review and acceptance.
   A. As a rule, driveway grades may have a 6 percent change in slope over a 11 feet wheel base run for both crest or sag vertical curves.
   B. Where heavy truck use and fire truck access applies, or to improve design speed, design grades should be cut in half.
   C. Grades subject to roadway crown and gutter span to be reviewed by ENGINEER for high centering and vehicle approach speed.

7. **FINISH**: Broomed.

8. **PROTECTION AND REPAIR**:
   A. Fill flow-line with water. Repair construction that doesn’t drain.
   B. Protect concrete from deicing chemicals during cure period.
SECTION A–A – APPROACH REQUIRING SERVICE TRUCK ACCESS

SECTION A–A – TYPICAL DRIVEWAY APPROACH

Piped driveway approach
Piped driveway approach

1. ASPHALT CONCRETE: As specified in APWA Section 32 12 05. Compaction to be within range of 92 to 96 percent relative to ASTM D 2041 (Rice Method).

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.
Concrete sidewalk

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
   A. Set top of filler flush with surface of concrete.
   B. Expansion joints are not required in slip formwork except at the start or end of the installation activity.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.

5. FINISH: Broomed.
PLAN

EXPANSION JOINT (NOTE 3)  
SIDEWALK  
CARRIAGE WALK  
IF DRIVEWAY APPROACHES ARE NOT AVAILABLE, PROVIDE 5 FEET SQUARE FLATWORK AT INTERVALS OF 200 FEET MAXIMUM

SECTION A–A

STREET TYPE  | T  
-------------|----
RESIDENTIAL (WITH PARK STRIP) | 4"  
RESIDENTIAL (NO PARK STRIP) | 6"  
OTHER  
REPLACEMENTS MATCH EXISTING, 4" MIN.
SEE DRIVEWAY APPROACH PLANS FOR SIDEWALK THICKNESS AT DRIVEWAYS

SECTION B–B

SIDEWALK JOINT DETAIL

Concrete sidewalk

L_{\text{MIN}} = W
L_{\text{MAX}} \text{ (in feet)} = 2.5 \times T \text{ (in inches)}
= 15 \text{ FEET MAX.}
Patterned concrete park strip

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT:** Make expansion joints vertical, full depth, 1/2 inch wide with type F1 joint filler material per APWA Section 32 13 73.
   A. Set top of filler flush with surface of concrete.
   B. Place joints to match expansion joint locations in sidewalk.

4. **CONTRACTION JOINT:** Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. For non-square panels, maximum length to width ratio is 1.5 to 1.

5. **PATTERN:** Place pattern uniformly over surface to a depth of 1/2 inch.

6. **COLOR:** As specified or as selected by ENGINEER.
**Patterned concrete park strip**

**Plan No. 232**

January 2006
Corner curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. APEX AREA: The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.

8. PROTECTION AND REPAIR:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING AT SIDEWALK LEVEL

NARRATIVE:
- Site conditions will vary. Configuration of ramp, landing, and transition may be changed, but they must meet dimensions and slopes shown here.
- If the sides of a pedestrian access route or the extension of a lateral line of the sidewalk intersects a flow-line radius, then a corner curb cut assembly must be constructed.
- Grade breaks at ends of ramps must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb returns, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

**EXAMPLE A**

**EXAMPLE B**

**MATERIALS**

**MAXIMUM SLOPES**

<table>
<thead>
<tr>
<th></th>
<th>RUNNING SLOPE</th>
<th>CROSS SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDING</td>
<td>L</td>
<td>1:48 (2%)</td>
</tr>
<tr>
<td>RAMP</td>
<td>R</td>
<td>1:12 (8.33%)</td>
</tr>
<tr>
<td>CLEAR SPACE</td>
<td>C</td>
<td>1:20 (5%)</td>
</tr>
</tbody>
</table>

Cross slope is perpendicular to direction of pedestrian travel. Running slope is in the direction of pedestrian travel.
Corner curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. APEX AREA: The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.

8. PROTECTION AND REPAIR:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING BETWEEN SIDEWALK AND STREET LEVELS

NARRATIVE:
- Site conditions will vary. Configuration of ramp, landing, and transition may be changed, but they must meet dimensions and slopes shown here.
- If the sides of a pedestrian access route or the extension of a lateral line of the sidewalk intersects a flow-line radius, then a corner curb cut assembly must be constructed.
- Grade breaks at ends of ramps must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb returns, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

EXAMPLE C

EXAMPLE D

MATERIALS

MAXIMUM SLOPES

Corner curb cut assembly

Plan No. 235

August 2006 57
Corner curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. APEX AREA: The apex area may have curb and gutter, curb walls, flares, ramps, landings, detectable warning surface and landscaping. Flow-line grade may exceed 2 percent to match street grade.

8. PROTECTION AND REPAIR:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING AT STREET LEVEL

NARRATIVE:
- Site conditions will vary. Configuration of ramp, landing, and transition may be changed, but they must meet dimensions and slopes shown here.
- If the sides of a pedestrian access route or the extension of a lateral line of the sidewalk intersects a flow-line radius, then a corner curb cut assembly must be constructed.
- Grade breaks at ends of ramps must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb returns, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

\[
\begin{align*}
\text{L} &= 4 \text{ feet square minimum} \\
\text{R} &= 4 \text{ feet wide minimum} \\
\text{C} &= 4 \text{ feet square minimum}
\end{align*}
\]

EXAMPLE F

(WITH NO PARK STRIP)

(WITH PARK STRIP)

EXAMPLE F

MATERIALS

MAXIMUM SLOPES

Corner curb cut assembly

<table>
<thead>
<tr>
<th></th>
<th>Running Slope</th>
<th>Cross Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDING</td>
<td>1:48 (2%)</td>
<td>1:48 (2%)</td>
</tr>
<tr>
<td>RAMP</td>
<td>1:12 (8.33%)</td>
<td>1:48 (2%)</td>
</tr>
<tr>
<td>CLEAR SPACE</td>
<td>1:20 (5%)</td>
<td>1:48 (2%)</td>
</tr>
</tbody>
</table>

Cross slope is perpendicular to direction of pedestrian travel. Running slope is in the direction of pedestrian travel.

Plan No. 235

August 2006
Tangent curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. PROTECTION AND REPAIR:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING AT SIDEWALK LEVEL

Narrative:
- Site conditions will vary. Configuration of ramp and landing may be changed, but they must meet dimensions and slopes shown here.
- Grade breaks at ends of ramps must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

\[ L & L = 4 \text{ feet square minimum} \]
\[ R = 4 \text{ feet wide minimum} \]
\[ C = 4 \text{ feet square minimum} \]

Example 1

Example 2

Materials

Tangent curb cut assembly

Maximum slopes

Plan No. 236
Tangent curb cut assembly

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. PROTECTION AND REPAIR:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING BETWEEN SIDEWALK AND STREET LEVELS

NARRATIVE:
- Site conditions will vary. Configuration of ramp and landing may be changed, but they must meet dimensions and slopes shown here.
- Grade breaks at ends of ramps must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

EXAMPLE 3

EXAMPLE 4

MATERIALS

Tangent curb cut assembly

MAXIMUM SLOPES
1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE**: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution, concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINT**: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT**: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. **FLARE**: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. **DETECTABLE WARNING SURFACE**: A detectable warning surface is required in a ramp, transition, or landing that provides a flush connection to the street. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.

7. **PROTECTION AND REPAIR**:
   A. Protect concrete from deicing chemicals during cure.
   B. Fill flow line with water. Repair construction that doesn’t drain.
LANDING AT STREET LEVEL

NARRATIVE:
- Site conditions will vary. Configuration of ramp and landing may be changed, but they must meet dimensions and slopes shown here.
- Grade breaks must be perpendicular to the direction of pedestrian travel.
- Use of flares, curb walls, etc., are at engineer's discretion.
- Length of any ramp not required to exceed 15 feet.

\[ \text{L} = 4 \text{ FEET SQUARE MINIMUM} \]
\[ \text{R} = 4 \text{ FEET WIDE MINIMUM} \]
\[ \text{C} = 4 \text{ FEET SQUARE MINIMUM} \]

EXAMPLE 5

MATERIALS

Tangent curb cut assembly

MAXIMUM SLOPES

<table>
<thead>
<tr>
<th>Material</th>
<th>Running Slope</th>
<th>Cross Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANDING</td>
<td>1:12 (8.33%)</td>
<td>1:48 (2%)</td>
</tr>
<tr>
<td>RAMP</td>
<td>1:12 (8.33%)</td>
<td>1:48 (2%)</td>
</tr>
<tr>
<td>CLEAR SPACE</td>
<td>1:20 (5%)</td>
<td>STREET GRADE</td>
</tr>
</tbody>
</table>

Cross slope is perpendicular to direction of pedestrian travel. Running slope is in the direction of pedestrian travel.


Islands and median

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.

3. EXPANSION JOINT: Make expansion joints vertical.
   A. Full depth 1/2 inch thick type F1 joint filler material per APWA Section 32 13 73. Set top of filler flush with surface of concrete.

4. CONTRACTION JOINT: Make contraction joints vertical.
   A. 1/8 inch wide and 1 inch deep or 1/4 slab thickness if slab is greater than 4 inches thick.
   B. Maximum length to width ratio for non-square panels is 1.5 to 1.
   C. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.

5. FLARE: If a flare is in a pedestrian circulation area, the slope of the flare shall be 1:10 (10%) maximum measured perpendicular to the pedestrian access route.

6. DETECTABLE WARNING SURFACE: Access through islands and medians can add difficulty to the crossing for some users. There are many factors to consider when placing the detectable warning surface. The edges of the warning surface can be useful as cues to the direction of a crossing. Perpendicular and non-perpendicular connections are shown in APWA Plan No. 238.
NARRATIVE:

- When deciding to cut-through a median or island, or to ramp an island, consider slope and cross slope of road, drainage, and width of median or island.

- Where there is no island curb, locate the detectable warning at edge of roadway.

**Islands and median**

August 2006

Plan No. 237
**Detectable warning surface**

1. **DETECTABLE WARNING SURFACE:**
   A. Dome Size:
      1. Base diameter – 0.9 inches minimum, 1.4 inches maximum.
      2. Top diameter – 50 percent of the base diameter minimum to 65 percent of the base diameter maximum.
      3. Height: - 0.2 inches.
   B. Dome Spacing:
      1. Center to center spacing – 1.6 inches minimum, 2.4 inches maximum.
      2. Base-to base spacing of 0.65 inches minimum measured between the most adjacent domes.
   C. Dome Row Alignment:
      1. Perpendicular Assembly: Perpendicular to the bottom grade break
      2. Non-perpendicular Assembly Transition 1: Perpendicular to grade break at the bottom of the ramp.
      3. Non-perpendicular Assembly Transition 2: Perpendicular or radial to the flow line.
   D. Contrast: Provide a surface that contrasts visually with adjacent walking surface either light-on-dark, or dark-on-light.
   E. Size:
      1. 2 feet minimum in the direction of pedestrian travel.
      2. Full width of area where a ramp, transition, or landing provides a flush connection to the street. Minimum width of flush connection is 4 feet.

2. **PAVER**
   A. Material: ENGINEER’s choice of
      1. Geotextile filter fabric, bedding and joint sand, and solid interlocking concrete paver units per APWA Section 32 14 13.
      2. Brick and mortar (not shown) per APWA Section 32 14 16.
   B. Layout: All cut pavers are half pavers or larger.

3. **RIBBED PANEL**
   A. Material: CONTRACTOR’s choice with ENGINEER’s acceptance.
   B. Layout: Trim panel, as required matching required geometries.
   C. Installation: Per manufacturer’s recommendations.

4. **TILE**
   A. Material: CONTRACTOR’s choice with ENGINEER’s acceptance.
   B. Layout: Trim panel, as required matching required geometries.
   C. Installation: Per manufacturer’s recommendations.
TRUNCATED DOME DETAIL

TRANSLATION 1

ACCESS ROUTE
4'-0" MIN
RAMP
SLOPE
GRADE BREAK
5 FEET
MAXIMUM

TRANSITION

FLOW LINE

50 TO 65% OF
BASE DIAMETER

0.9" TO 1.4"

PLAN

1.6" TO 2.4"

SECTION

0.65" MIN

1.6" TO 2.4"

PERPENDICULAR ASSEMBLY

PAVER (NOTE 2)
2-1/2" x 4" x 8"

1/2" BEDDING SAND

1" DIA. DRAIN HOLES AT LOWER CORNERS.
FILL HOLES WITH PEA GRAVEL. COVER HOLES WITH GEOTEXTILE.

RESPONSE P

1/2" BEDDING SAND

RIBBED PANEL (NOTE 3)

DETAIL—R

TILE (NOTE 4)

DETAIL—T

Detectable warning surface

August 2006
Parking meter post

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

ANGLE PARKING

2" GALVANIZED PIPE SCHEDULE 40
GROUND OR PAVEMENT SURFACE

TYPICAL ELEVATION

SOIL INSTALLATION

NON-SOIL INSTALLATION

DETAILS

Parking meter post
Form strip filler

1. BACKFILL: Use native materials. Compact to prevent settling.

2. WIDTH OF REPLACEMENT: Any sod placed wider than 1 foot must be authorized by the ENGINEER.

3. IRRIGATION SYSTEM: Retain and protect existing irrigation systems. Repair damage caused by construction operation.

4. TOPSOIL AND SOD: Supply and install topsoil and sod per APWA Section 31 05 13 and APWA Section 32 92 00 respectively.
SIDEWALK

B

DRIVEWAY APPROACH
CARRIAGE WALK
ETC.

Curb and Gutter

A

PLAN

12" FORM STRIP FILLER
(NOTE 2)

5" TOPSOIL AND SOD
(TYP)

SIDEWALK

BACKFILL
(NOTE 1)

IRRIGATION SYSTEM
(NOTE 3)

TYPICAL

SECTION A-A

SECTION B-B

Form strip filler

Plan No. 242
Asphalt concrete pavement tie in

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **DIMENSION:**
   A. Aggregate Base: Match existing thickness or 8 inches minimum.
   B. Asphalt Pavement: Match thickness plus 1 inch, or
      1) 6 inches maximum in residential streets
      2) 8 inches maximum in non-residential streets.

3. ** ASPHALT CONCRETE PAVEMENT JOINTS:** Provide a neat straight joint between existing and new asphalt concrete. Saw-cut joint if existing pavement exceeds 2 inches in thickness or if portland cement concrete underlies asphalt concrete pavement.

4. **TACK COAT:** APWA Section 32 12 14. Clean all vertical surfaces adjacent to the patch. Apply full coverage tack coat.

5. ** ASPHALT PAVEMENT:** Use hot weather or cold weather asphalt concrete patch material specified in APWA Section 33 05 25.
   A. Install in lifts no greater than 3 inches after compaction.
   B. Compact each lift to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.
CASE 1 – POSITIVE STREET SLOPE TIE-IN

ASPHALT TO BE SET 1/4” MIN. TO 1/2” MAX. ABOVE LIP OF GUTTER.

CASE 2 – NEGATIVE STREET SLOPE TIE-IN

ASPHALT TO BE SET 1/4” MIN. TO 1/2” MAX. ABOVE LIP OF GUTTER.
**Curb and gutter replacement without pavement tie in**

1. **UNTREATED BASE COURSE**: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CRACK SEALANT**: CAS1 per APWA Section 32 13 73.

3. **STEEL PLATE**: Plate provides a clean straight edge allowing asphalt concrete be milled out in the future for rehabilitation without damaging the curb and gutter. If straight edge between portland cement concrete and asphalt concrete cannot be provided, remove and replace curb and gutter per Plan No. 251.
SECTION

KEEP LIP OF NEW CURB AND GUTTER 1/4" TO 1/2" LOWER THAN EXISTING PAVEMENT

FORM FACE OF CURB LIP WITH A STEEL PLATE. LEAVE PLATE IN PLACE LONG ENOUGH TO ASSURE CONCRETE WILL MAINTAIN ITS SHAPE (NOTE 3)

DETAIL A

Curb and gutter replacement without pavement tie-in
Asphalt concrete pavement overlay

1. MILLING: APWA Section 02 41 14.
   A. Remove compacted millings on prepared surfaces.
   B. Mill around gutter lip radii to specified depth prior to paving.

2. TACK COAT: APWA Section 32 12 14.
   A. Clean all horizontal and vertical surfaces in or adjacent to milled areas.
   B. Apply full coverage.

3. PAVING GEOTEXTILE FABRIC: APWA Section 31 05 19.
   A. Place fabric no closer than 1.5 feet from edge of new overlay pavement.
   B. Do not use fabric on grades greater than 3 percent or in travel lanes within the following distances from a signalized intersection or stop sign.
      1) 100 feet where speeds are less than 30 mph.
      2) 150 feet where speeds are greater than 30 mph.

4. MINIMUM PAVEMENT OVERLAY THICKNESS:
   A. 2 times maximum aggregate particle size for asphalt concrete mixes.
   B. 4 times nominal maximum aggregate particle size for SUPERPAVE mixes.

5. PAVEMENT OVERLAY: APWA Section 32 12 16. Make pavement flush with the lip of gutter in bicycle lane and sidewalk curb cuts.
EDGE MILL

MILL

MILL DEPTH (NOTE 4)

MAXIMUM BREAKOVER ANGLE 2%

MILL OFF EXISTING PAVEMENT

1.5% MINIMUM
2% TARGET
5.0% MAXIMUM

SLOPE

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

MILL

SET NEW ASPHALT PAVEMENT 1/4" MIN. TO 1/2" MAX. ABOVE LIP OF GUTTER

OVERLAY

SECTION

1.5% MINIMUM
5.0% MAXIMUM

PAVING GEOTEXTILE FABRIC (NOTE 3)

TACK COAT

OVERLAY

EXISTING PAVEMENT

TACK COAT

A - NO FABRIC

B - WITH FABRIC

Asphalt concrete pavement overlay

Plan No. 253

May 2005 79

Drawing 1 of 2
Asphalt concrete pavement overlay

1. MILLING: APWA Section 02 41 14.
   A. Remove compacted millings on prepared surfaces.
   B. Mill around gutter lip radii to specified depth prior to paving.

2. TACK COAT: APWA Section 32 12 14.
   A. Clean all horizontal and vertical surfaces in or adjacent to milled areas.
   B. Apply full coverage.

3. PAVING GEOTEXTILE FABRIC: APWA Section 31 05 19.
   A. Place fabric no closer than 1.5 feet from edge of new overlay pavement.
   B. Do not use fabric on grades greater than 3 percent or in travel lanes within the following distances from a signalized intersection or stop sign.
      1) 100 feet where speeds are less than 30 mph.
      2) 150 feet where speeds are greater than 30 mph.

4. MINIMUM PAVEMENT OVERLAY THICKNESS:
   A. 2 times maximum aggregate particle size for asphalt concrete mixes.
   B. 4 times nominal maximum aggregate particle size for SUPERPAVE mixes.

5. PAVEMENT OVERLAY: APWA Section 32 12 16. Make pavement flush with the lip of gutter in bicycle lane and sidewalk curb cuts.
FULL WIDTH MILL

MILL DEPTH
(NOTE 4)

REMOVE AT LEAST
TOP 1-INCH LAYER
THAT IS NORMALLY
OXIDIZED AND BRITTLE

MILL OFF
EXISTING
PAVEMENT

SLOPE
{ 1.5% MINIMUM
2% TARGET
5.0% MAXIMUM }

MILL

SET NEW ASPHALT PAVEMENT
1/4" MIN. TO 1/2" MAX.
ABOVE LIP OF GUTTER

A

OR

B

1.5% MINIMUM
5.0% MAXIMUM

1.5% MINIMUM
5.0% MAXIMUM

OVERLAY

SECTION

OVERLAY

EXISTING
PAVEMENT

PAVING GEOTEXTILE
FABRIC (NOTE 3)

TACK
COAT

A

NO FABRIC

B

WITH FABRIC

Asphalt concrete pavement overlay

Plan No.
253

May 2005
81

Drawing 2 of 2
**Asphalt concrete "T" patch**

1. **ADDITIONAL PAVEMENT REMOVAL:** Remove additional pavement to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement if such street feature is within 2 feet of the second saw-cut.

2. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

3. **FLOWABLE FILL:** Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material which flows easily and vibration is not required. Cure to initial set before placing aggregate base or asphalt pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.

4. **TACK COAT:** APWA Section 32 12 14. Full tack coat coverage on all vertical surfaces.

5. ** ASPHALT PAVEMENT:** Use asphalt concrete specified in APWA Section 33 05 25.
   A. Install in lifts no greater than 3 inches after compaction.
   B. Compact to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.

6. **REINFORCEMENT:** ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 12 inches on center.
   A. Required if existing concrete thickness is 6 inches or greater.
   B. Not required if (1) existing concrete is less than 6 inches thick, (2) existing concrete is deteriorating, (3) excavation is less than 3 feet square, (4) asphalt pavement is substituted for concrete substrate.

7. **CONCRETE SUBSTRATE:** Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure to initial set before placing new asphalt concrete patch.

8. **JOINT REPAIR:** If a crack occurs at the "T" patch connection to existing pavement or at any street fixture, seal the crack per APWA Section 32 01 17.

9. **PATCH REPAIR:** Repair the asphalt pavement patch if any of the following conditions within the patch occur.
   A. Pavement surface distortion exceeds 1/4 inch deviation in 10 feet. Repair option: Plane off surface distortions. Coat planed surfaces with a cationic or anionic emulsion that complies with APWA Section 32 12 03 and provide sand blotter.
   B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
   C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay.
SHALLOW EXCAVATION
(LESS THAN 48 INCHES FROM PAVEMENT SURFACE TO BOTTOM OF EXCAVATION)

EXAMPLE 1
(ASPHALT RESTORATION)

EXAMPLE 2
(COMPOSITE RESTORATION)

Asphalt concrete "T" patch
Asphalt concrete "T" patch

1. ADDITIONAL PAVEMENT REMOVAL: Remove additional pavement to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement if such street feature is within 2 feet of the second saw-cut.

2. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER's permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

3. FLOWABLE FILL: Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material which flows easily and vibration is not required. Cure to initial set before placing aggregate base or asphalt pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.

4. TACK COAT: APWA Section 32 12 14. Full tack coat coverage on all vertical surfaces.

5. ASPHALT PAVEMENT: Use asphalt concrete specified in APWA Section 33 05 25.
   A. Install in lifts no greater than 3 inches after compaction.
   B. Compact to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.

6. REINFORCEMENT: ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 24 inches on center.
   A. Required if existing concrete thickness is 6 inches or greater.
   B. Not required if (1) existing concrete is less than 6 inches thick, (2) existing concrete is deteriorating, (3) excavation is less than 3 feet square, (4) asphalt pavement is substituted for concrete substrate.

7. CONCRETE SUBSTRATE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure to initial set before placing new asphalt concrete patch.

8. JOINT REPAIR: If a crack occurs at the "T" patch connection to existing pavement or at any street fixture, seal the crack per APWA Section 32 01 17.

9. PATCH REPAIR: Repair the asphalt pavement patch if any of the following conditions occur within the patch.
   A. Pavement surface distortion exceeds 1/4 inch deviation in 10 feet. Repair option: Plane off surface distortions. Coat planed surfaces with a cationic or anionic emulsion that complies with APWA Section 32 12 03 and provide sand blotter.
   B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
   C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay.
DEEP EXCAVATION
(MORE THAN 48 INCHES FROM PAVEMENT SURFACE TO BOTTOM OF EXCAVATION)

EXAMPLE A
(ASPHALT RESTORATION)

EXAMPLE B
(COMPOSITE RESTORATION)

Asphalt concrete "T" patch
Concrete pavement patch

1. ADDITIONAL PAVEMENT REMOVAL: Remove additional pavement to an existing joint in the concrete slab. If greater than 1/2 slab, remove full slab.

2. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 32 05 10.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

3. FLOWABLE FILL: Provide 28 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use fill material, which flows easily, and vibration is not required. Cure to initial set before placing new concrete pavement. Use flowable fill in excavations that are too narrow to receive compaction equipment.

4. REINFORCEMENT: ASTM A 615, Grade 60, No. 5 galvanized or epoxy coated deformed steel 24 inches on center.

5. TACK COAT: Type II (non-redispersible) polyvinyl acetate base or acrylic base latex per ASTM C 1059. Do not apply tack coat to expansion joints.

6. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If curb and gutter was poured monolithic to the pavement slab then such curb and gutter must also be removed and replaced or the patch slab thickness must be increased by 3 inches from the lip of gutter for 5 feet.
   B. Clean all edges of dirt, oil and loose debris prior to concrete placement. Apply a concrete bonding compound as tack coat. Place concrete per APWA Section 03 30 10.
   C. Match existing concrete thickness.
   D. Plane off surface distortions that exceed 1/4 inch deviation in 10 feet. Coat planed surfaces with a water repellant product that complies with APWA Section 07 19 00.
   E. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

7. JOINTS: Saw cut the surface of the new cement concrete to match existing concrete pavement joint patterns. Use the appropriate joint types shown in Plan No. 261.
ROADWAY TRENCH  
(Section)

DIRECTION OF TRAVEL

CONTRACTION JOINT

FILL OVER-CUTS WITH EPOXY CEMENT

IF MORE THAN 1/2 SLAB IS TO BE REMOVED, REMOVE AND REPLACE FULL SLAB

TYPE 'C' JOINT (PLAN No. 261)
TACK COAT (NOTE 4)

TYPE 'F' JOINT IN EXPANSION JOINTS (PLAN No. 261)

TYPE 'C' JOINT (PLAN No. 261)
TACK COAT (NOTE 4)

EXPANSION JOINT

ROADWAY POTHOLE  
(Plan View)

Concrete pavement patch
Concrete pavement joints

1. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel rebar or smooth steel dowels with diameter and length as indicated.
   A. Space rebar and dowels at 12 to 15 inches on center.
   B. Grease dowels to provide movement in expansion joints.
   C. Keep tie bars in the vertical center of the concrete slab and perpendicular to the joint during concrete placement.

2. SAWING: Keep at least 3 working power saws on-site when concrete is being placed. Saw crack control joints (contraction joints) before shrinkage cracking takes place. Do not tear or ravel concrete during sawing. In cool weather, the joint sawing may be delayed only for the time required to prevent tearing and raveling the concrete. Cut joint to dimensions recommended by sealant manufacturer and approved by ENGINEER.

3. JOINTS: Lay out joints to aid construction and control random cracking.
   A. Longitudinal joint spacing is 12 feet for concrete pavement less than 9 inches thick and 15 feet for concrete pavement 9 inches thick and thicker.
   B. Transverse joints spacing is $30 \times T$ (slab thickness in feet) where the maximum slab length to slab width ratio is 1.5 to 1.
   C. Extend transverse contraction joints continuously across the full width of the concrete. Make the joints coincide with curb and gutter joints.
   D. Make adjustments in joint locations to meet inlet or manhole locations.

4. JOINT FILLER: Type F1 per APWA Section 32 13 73, extending to the bottom of the concrete slab.

5. BACKER ROD: Type 1 (round rod) APWA Section 32 13 73. It must be oversized approximately 25 percent to fit tightly into each joint and compatible with hot poured sealant.

6. JOINT SEALANT: Hot applied, APWA Section 32 13 73. Remove dirt, oil and curing compounds from joint reservoir. Seal joints immediately after cleaning.
Concrete pavement joints

Plan No. 261

June 2005 89
Concrete pavement joints

1. BASKET ASSEMBLY:
   A. Attach basket assembly firmly to existing or new base. Secure dowels and tie bars firmly in the basket assembly. All wire sizes shown are minimum.
   B. During concrete placement, keep the dowels in vertical center of the concrete, perpendicular to the joint, and parallel to the direction of concrete slab expansion.
Rebar at all corners of isolation joints that do not intersect a longitudinal or transverse joint

**Example 1**

Use round type 'C' joint when distance between expansion joint and slab joint is less than 18".

**Example 3**

**Typical Street Fixture Isolation Joints**

Dowel or rebar size chart

<table>
<thead>
<tr>
<th>Diameter (inches)</th>
<th>Total Length (inches)</th>
<th>Spacing</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5&quot;-8&quot;</td>
<td>5/8</td>
<td>14</td>
<td>12&quot; O.C.</td>
</tr>
<tr>
<td>9&quot;-12&quot;</td>
<td>1</td>
<td>18</td>
<td>12&quot; O.C.</td>
</tr>
</tbody>
</table>

Dowel or tie-bar basket assembly

Concrete pavement joints

Plan No. 261

June 2005
Crack sealing – asphalt pavement

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

2. BACKER ROD: Type 1 round, closed cell per ASTM D 5249, (APWA Section 32 13 73).
Crack filling – asphalt pavement

1. FILLER: Asphalt rubber or rubberized asphalt per APWA Section 32 01 17.
TYPE A
FLUSH FILL

TYPE A
CAP FILL

TYPE B

1"  3" TO 5"  1"

0.125" (TYP)

Crack filling - asphalt pavement
Corner and boundary markers

1. SURVEYOR'S TAG: Show surveyor's professional license number.

2. SUBDIVISIONS: Mark boundaries with type `D' marker. Mark all angle and curve points with type `D' markers, or reference them to an adjacent block or lot corner, which is also marked with a type `D' marker.
NOTE 1

2" (TYP)

# 5 REBAR
18" LONG

NOTE 1

FILL PIPE WITH SAND/CEMENT PASTE

1" DIA. PIPE
18" LONG

TYPE A

TYPE B

CORNER MARKERS

NOTE 1

2" (TYP)

GROUND SURFACE

FILL PIPE WITH SAND/CEMENT PASTE

2" DIA. PIPE
24" LONG MIN

NOTE 1

FILL PIPE WITH SAND/CEMENT PASTE

2" DIA. PIPE
24" LONG MIN

TYPE C

TYPE D

BOUNDARY MARKER

Corner and boundary markers
Monument cap and base

1. **ABBREVIATIONS**: The following is a list of commonly used abbreviations used on the monument cap. Apply other marks and abbreviations as applicable.
   - **INT**: Intersection
   - **ML INT**: Monument line intersection
   - **P.C.**: Point of curvature
   - **P.C.C.**: Point of compound curve
   - **P.I.**: Point of intersection
   - **P.O.C.**: Point on curve
   - **P.O.T.**: Point on Tangent
   - **P.R.C.**: Point of reverse curve
   - **P.T.**: Point of tangency
   - **S.C.**: Section Corner
   - **W.C.**: Witness corner

2. **DATE**: Show month, day, and year when cap was marked.

3. **LICENSE**: Show license number of land surveyor who marked the cap.

4. **CONCRETE**: Class 4000 per APWA Section 03 30 04 for precast and cast in-place monuments.

5. **REINFORCEMENT**: ASTM A 615, grade 60, deformed steel rebar.
Monument cap and base
Frame and cover for monument

1. CASTINGS: Grey iron class 20 minimum per ASTM A 48.

2. COATINGS: Coat all metal parts with asphaltum paint.

3. SETTING: Set frame independent of monument base.
NOTE: USE EXTENSION IN PORTLAND CEMENT CONCRETE PAVEMENTS. USE FRAME IN ASPHALT CONCRETE PAVEMENTS
Survey monument placement under pavements

1. BACKFILL: Install and compact all backfill material per APWA Section 32 05 10.

2. FOUNDATION: Compact bottom of excavated hole before placement of precast or cast in-place monument post.

3. CONCRETE: Class 4000 per APWA Section 03 30 04.
The installed monument must be independent of the roadway pavement. Vibrations of the pavement surface must be transmitted to the underlying soils and not to the monument. This will assure the monument remains undisturbed.

\subsection{A ASPHALT CONCRETE PAVEMENTS}

- Existing concrete roadway pavement
- Extension ring and cover (Plan No. 273)
- Cement epoxy grout to be used for sealing and filling between extension ring and pavement

\subsection{B CEMENT CONCRETE PAVEMENTS}

Survey monument placement under pavements

Plan No. 274

December 2001

Page 103
Cover collar for survey monuments

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

2. JOINTS: Provide a neat vertical joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.
**CONCRETE COVER COLLAR (NOTE 1)**

**PLAN**

**SECTION A–A**

- Concrete to be set 1/4" min. to 1/2" max. below pavement lip all around
- Asphalt pavement (thickenss varies)
- Frame and cover (Plan No. 273)
- Cold joint (Note 2)

**Cover collar for survey monuments**
Defective concrete

1. NARRATIVE: This drawing defines parameters for determining whether new or existing concrete is defective. Replacement is required if any component has one or more of the conditions shown.
TWENTY FIVE PERCENT OF SURFACE AREA HAS SPALLED OR SPALL DEPTH > 1/2 INCH. REPLACEMENT IS REQUIRED.

VERTICAL OR HORIZONTAL DISPLACEMENT OF 1/2" OR MORE, REPLACEMENT IS REQUIRED.

3 OR MORE CRACKS EXTEND THROUGH CONCRETE. BOTH ENDS OF CRACK MUST LINK WITH SLAB EDGE, JOINT OR ANOTHER CRACK. REPLACEMENT IS REQUIRED.

HEAVES, SETTLEMENT, SPALLS OR DEPRESSIONS WHICH ALLOW WATER TO POND OR CAUSES ICE POCKETS, REPLACEMENT IS REQUIRED.

OBLIQUE

Defective concrete
Street name sign (typical)

1. FORMAT: Secure ENGINEER's approval of sign format and installation.

2. INSTALLATION:
   A. Install signs on the northwest and southeast corners of the intersection.
   B. Install the edge of the sign 2 feet from the vertical extension of the back of curb as near as possible to the approach curb P.C. (point of curvature).
PROVIDE SIGNS, LETTERS AND BRACKETS TO AGENCY SPECIFICATIONS

GALVANIZED STEEL TUBE
12' X 1 3/4" X 1 3/4"
3/8" DIAMETER HOLES
1" ON CENTER
(FULL LENGTH OF POST)

FINISH GRADE

Street name sign (typical)
PART 3

STORM DRAINS

Abbreviations and Symbols

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373 Concrete pier .................................................................................................................. 177

Trenching

381 Trench Backfill .............................................................................................................. 179
382 Pipe zone backfill .......................................................................................................... 181
Abbreviations and symbols for storm drains

1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.

2. LETTERING STYLE: Capital letters preferred.

3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.

4. NEW IMPROVEMENTS: Shown in solid continuous line.
<table>
<thead>
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<th>DEFINITIONS</th>
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Abbreviations and symbols for storm drains

April 1997
1. **CASTINGS:** Grey iron class 35 minimum per ASTM A 48.

2. **COATINGS:** Except machined surfaces, coat all metal parts with asphaltum paint.

3. **INSCRIPTIONS:** Cast the words "STORM DRAIN" on the cover flush with the surface finish.

4. **HEAT NUMBER:** Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. **FIT:** ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. **LOCKING:** Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.

7. **CLEANOUT STRUCTURE:** See Plan No. 330.

8. **MANHOLE STRUCTURES:** See Plan No. 341.
PRY HOLE

STORM DRAIN

TYPE A

24 3/4"

1"

26 1/2"

25"

23 1/4"

SECTION A–A

30" Frame and cover

30" NOMINAL

35 3/4"
**30" Frame and cover – type B**

1. **CASTINGS:** Grey iron class 35 minimum per ASTM A 48.

2. **COATINGS:** Except machined surfaces, coat all metal parts with asphaltum paint.

3. **INSCRIPTIONS:** Cast the words "STORM DRAIN" on the cover flush with the surface finish.

4. **HEAT NUMBER:** Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. **FIT:** ✓ designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. **LOCKING:** Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.

7. **CLEANOUT STRUCTURE:** See Plan No. 330.

8. **MANHOLE STRUCTURES:** See Plan No. 341.
30" Frame and cover
1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INSCRIPTIONS: Cast the words "STORM DRAIN" on the cover flush with the surface finish.

4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. FIT: \( \checkmark \) designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. LOCKING: Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.


8. MANHOLE STRUCTURES: See Plan No. 341.
48" Cover and frame

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. CONCRETE BOX: See Plan No. 331.

4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
PLAN OF COVER

PLAN OF FRAME

SECTION C–C

DETAIL 1

SECTION A–A

48" Cover and frame
51" Cover and frame - cover

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.

4. ACCESSORIES: Stainless steel bolts, washers, and accessories required. See APWA Section 05 05 23.

5. CONCRETE BOX: See Plan No. 332.

6. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.
NARRATIVE

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

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

COVER PLAN VIEW

SECTION A-A

DETAIL 1

SECTION B-B

51" Cover and frame - cover
51" Cover and frame - type A frame

1. NARRATIVE: Use this frame and cover in roadways and other areas subject to heavy loadings. This cover fits Type A, B, C and D frames.

2. FRAME: ASTM A 36 steel, or ASTM A 48 grey iron class 35 minimum.

3. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

4. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.

5. CONCRETE BOX: See Plan No. 332.
PLAN - TYPE A FRAME

SECTION A-A

SECTION B-B

SECTION C-C

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

1. FRAME: ASTM A 36 steel, or ASTM A 48 grey iron class 35 minimum.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. PRE-DRILL: Drill and tap covers at factory to match frames. Keep covers and frames bolted together prior to and during installation.

4. CONCRETE BOX: See Plan No. 332.
PLAN - TYPE B, C, AND D FRAMES

SECTION VIEWS
TYPES B, C & D

SECTION B-B

SECTION C-C

51" Cover and frame - type 'B', 'C', or 'D' frame
35 1/2" Grate and frame with adjustable curb box

1. CASTING: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INLET BOX: See Plan No. 315.
35 1/2" Grate and frame with adjustable curb box

Plan No. 308
47 3/4" Grate and frame

1. CASTING: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INLET BOX: See Plan No. 331.
**VANE GRATE**

**FRAME**

**GRATE**

**SECTION A-A**

**SECTION C-C**

**SECTION B-B**

**SECTION D-D**

**DETAIL 1**

*47 3/4" Grate and frame*
47 3/4" Grate and frame

1. CASTING: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INLET BOX: See Plan No. 331.
GRID GRATE

FRAME

GRATE

SECTION A–A

SECTION C–C

SECTION B–B

SECTION D–D

DETAIL 1

47 3/4" Grate and frame
48” Grate and frame

1. CAST IRON FRAMES: Grey iron class 35 minimum per ASTM A 48. Cast frame and lugs as one solid, complete unit.

2. STEEL FRAMES: Studs may be welded to the frame. Use ASTM A 36 steel.

3. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

4. INLET BOX: See Plan No. 331.
**Grate**

**Section A-A**

**Frame**

**Section B-B**

*48" Grate and frame*
1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **BACKFILL:** Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel.

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

5. **PIPE LATERALS:** The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.

6. **CURB FACE OPENING:** Make opening at least 4 inches high. Provide at least a 2 inch drop between the “begin warp” line in the gutter flow-line and the top of the grate at the curb face opening.
TYPE A - CURB INLET WITH SINGLE GRATE

SECTION A-A

SECTION B-B

SECTION C-C

Catch basin
**Catch basin**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **BACKFILL:** Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel.

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

5. **PIPE LATERALS:** The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.

6. **Curb Face Opening:** Make opening at least 4 inches high. Provide at least a 2 inch drop between the “begin warp” line in the gutter flow-line and the top of the grate at the curb face opening.
TYPE B - CURB INLET WITH DOUBLE GRATE

SECTION A–A

SECTION B–B

SECTION C–C

Catch basin
Combination inlet / cleanout box

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. BACKFILL: Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. PIPE LATERALS: The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.

6. LADDER RUNGS: Provide plastic coated steel ladder rungs in boxes over 6 feet deep. Place bottom rung 6 inches above top of pipe.

7. CURB FACE OPENING: Make opening at least 4 inches high. Provide at least a 2 inch drop from the concrete gutter flow-line to the top of the grate at the curb face opening.
PLAN

RAISE FRAME TO GRADE
(PLAN No. 360 OR 361)

FRAME AND COVER
(PLAN No. 302)

CONCRETE COLLAR
(PLAN No. 362)

4" CURB OPENING
(NOTE 7)

FRAME AND GRATE
(PLAN No. 308)

#4 Ø 6" O.C.
EACH WAY (NOTE 3)

MATCH FACE WITH
TOP BACK OF CURB
ALIGNMENT

CONCRETE (NOTE 4)

PIPE LATERALS
(NOTE 5)

BACKFILL (NOTE 2)

3"

#4 Ø 12" O.C.
EACH WAY (NOTE 3)

UNTREATED BASE
COURSE (NOTE 1)

SECTION A—A

Combination inlet/cleanout box
Curb inlet / outlet

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **BACKFILL:** Provide and place per APWA Section 31 23 23 on all sides of basin. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. **PIPE LATERALS:** The drawing shows alternate connections to the catch basin. Refer to construction drawings for connection locations.

6. **FRAME AND COVER:** Grey iron class 30 minimum per ASTM A 48. Coat all metal parts with asphaltum paint.

7. **LADDER RUNGS:** Provide plastic coated steel ladder rungs in boxes over 4 feet deep.
   A. If V = 3 feet or less, place one step above the floor of the basin.
   B. If V = 3 feet or more, place steps at 12 inch intervals from the floor of the basin with the top step at least 12 inches below the top of the manhole.

8. **INSTALLATION:**
   A. Locate connector pipe at the downstream end of the basin unless specifically noted otherwise on the construction drawings. Trim pipe to the final shape and length before placement of concrete.
   B. Make smooth curves at sill and sidewall at the gutter opening. Provide all exposed edges and corners with 1/2 inch radius edge finish. Match grade, slope, color and finish of adjacent curb and walkways.
   C. Make curb opening at least 4 inches high. Provide at least a 2 inch drop from the concrete gutter flow-line to the top of the grate at the curb face opening.
Dowel detail

#3 bar, 4 req'd

Curb inlet / outlet

Plan No. 317

August 2001

143

Drawing 1 of 2
Curb inlet / outlet

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

Curb inlet / outlet
Debris grate inlet

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

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

2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. INSTALLATION:
   A. Mount the automatic flap gate on a concrete collar poured in the end of a junction spur.
   B. Use nickel copper alloy mounting bolts and embed bolts 5 inches into the collar.
   C. Provide flap gate designed for 20 feet of seating head unless specified otherwise in the Contract Documents.
   D. The `Y` dimension is measured at the top of the junction structure spur for trapezoidal reinforced concrete channel.
   E. Flap gate may be either spigot back or flat back unless specified in the Contract Documents.
TABLE OF DIMENSIONS

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</tr>
</tbody>
</table>

SECTION A–A

Automatic flap gate (pressurized storm drains)
**Curb outlet**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   - A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   - B. Place material per APWA Section 31 23 23.
   - C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **BACKFILL:** Provide and place per APWA Section 31 23 23 on all sides of basin.
   Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Center steel in walls and slabs with a minimum cover of 2 inches. Keep steel 2 inches clear around pipe and lid opening.

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

5. **PIPE LATERALS:** The drawing shows alternate connections to the curb outlet. Refer to construction drawings for connection locations or refer to field location of existing piping when engineering connection to existing piping.
PLAN

FRAME AND COVER (PLAN No. 304)

INLET PIPE

3" DIA. WEEP HOLES

18"

VARENT

BACKFILL (NOTE 2)

PEA GRAVEL OR SEWER ROCK

UNTREATED BASE COURSE (NOTE 1)

SECTION A--A

CONSTRUCTION JOINT (TYP)

A1 REBAR

FACE PLATE (PLAN No. 317)

A1 REBAR

CONCRETE (NOTE 4)

#4 @ 12" O.C. EACH WAY (NOTE 3)

SECTION B--B

Curb outlet

Plan No.

322

August 2001

151
**Pipe outfall access control rack**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   
   B. Place material per APWA Section 31 23 23.
   
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

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

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Weld rack with reinforcing steel or round bars of equal.

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

5. **STEEL:** ASTM A 36.

6. **INSTALLATION:** Provide room to lay rack flat downstream.
   
   A. Fasten latch bracket to headwall with 1/2” x 6” stainless steel bolts and hex nuts or 1/2” stainless steel expansion bolts.
   
   B. When rack is in the closed position, the bottom rack bar must be tight against the top of the hinge bracket so that the rack cannot be lifted off of the latch.
   
   C. Fabricate hinge bracket from #4 rebar.
**Pipe outfall access control rack**

**Table of Dimensions**

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Rack Bar Size</th>
<th>Latch Plate Thickness</th>
<th>Latch Linkage Size</th>
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<tbody>
<tr>
<td>18&quot;</td>
<td>#4</td>
<td>1/4&quot;</td>
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<tr>
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<td>24&quot;</td>
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<tr>
<td>36&quot;</td>
<td>#7</td>
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**Notes:**
- Rack Latch Linkage: See Table for Size of Square Tubing Stock for Fabrication
- Rack Bar Size: See Table Below
- Concrete: (Note 4)
- Hinge Bracket
- Rack Latch See Detail
- #4 Bars (Typ) Each Face
- UNEUTREATED BASE COURSE (NOTES 1 AND 2)
- 1/2" Bolt
- 1/2" Drill 2 Holes
- 3/16" V
- 3" X 3" Steel Angle Same Plate Thickness as Latch Plate

**Plan No.: 323**

April 1997
Cleanout box

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

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

3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements. Center steel in walls and slabs with a minimum cover of 2 inches. Keep steel 2 inches clear around pipe and lid opening. A1 bars required at all corners, vertical and horizontal. A1 bars connecting two walls must match wall bar size and spacing. A1 bars connecting walls to top and bottom slabs must match slab steel size and spacing.

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

5. PIPE LATERALS: Refer to Drawings for connection locations.

6. ACCESS: Eccentric access is shown. Prior to construction, verify if concentric access is required. Adjust reinforcement accordingly.

7. LADDER RUNGS: Plastic. Required in boxes greater than 6 feet deep with eccentric access. Align rungs with location of access opening. Rungs not required in boxes with concentric access.

8. WALL THICKNESS AND WALL STEEL

<table>
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<th></th>
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<td>Max. Box Depth</td>
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<td>Wall Thickness</td>
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<tr>
<td>Wall Curtain Steel</td>
<td>#5 @ 12”</td>
<td>#5 @ 6”</td>
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<tr>
<td></td>
<td>#5 @ 6”</td>
<td>#7 @ 9”</td>
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<tr>
<td>Wall Thickness</td>
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<td>10 inches</td>
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<tr>
<td>Wall Curtain Steel</td>
<td>#5 @ 9”</td>
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<tr>
<td></td>
<td>#5 @ 6”</td>
<td>#6 @ 6”</td>
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BASE WITHOUT SUMP

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<tr>
<td>Υ = 44&quot;</td>
<td>24&quot;+</td>
<td>303</td>
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</tbody>
</table>

A1 BAR

RAISE FRAME TO GRADE
(PLAN No. 360 OR 361)

CONCRETE (NOTE 4)

4 ADDITIONAL DIAGONAL
39" LONG # 5 BARS

LADDER RUNGS (NOTE 7)
SPACED @ 12" O.C.

BACKFILL (NOTE 2)

WALL THICKNESS (NOTE 8)

1/2 PIPE DIA.
MINIMUM

PROVIDE FORMED
CONCRETE INVERT

UNTREATED BASE
COURSE (NOTE 1)

SECTION A–A

Cleanout box

Plan No. 330
Cleanout box

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

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

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. **PIPE LATERALS:** The drawing shows alternate connections to the curb outlet. Refer to Construction Drawings for connection locations.

6. **COVER AND FRAME:** See Plan No. 304. Adjust concrete dimensions at frame accordingly.

7. **GRATE AND FRAME:** See Plan No. 309 or 310. Adjust concrete dimensions at frame accordingly.
NARRATIVE

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

COVER OR GRATE (NOTE 6 OR 7)

BACKFILL (NOTE 2)

CONCRETE (NOTE 4)

UNTREATED BASE COURSE (NOTE 1)

SECTION A–A

SECTION B–B

Cleanout box
**Cast in-place manhole**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **BACKFILL:** Provide and place per APWA Section 31 23 23 on all sides of manhole. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. **COVER AND FRAME:** See Plan No. 305. Adjust concrete dimensions at frame accordingly.
**SECTION A–A**

<table>
<thead>
<tr>
<th>PIPE I.D.</th>
<th>Table of Dimensions</th>
<th>Table of Manhole Covers</th>
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<td>98-1/2&quot;</td>
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---

**Cast-in-place manhole**

August 2001

Plan No. 332
Adjust reinforced concrete deck to grade

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

2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. COVER AND FRAME: For storm drain application see Plan No. 305. Adjust concrete dimensions at frame accordingly.
SALVAGE AND REUSE EXISTING FRAME AND COVER(S)

MATCH EXISTING

PLAN

LEAVE SUFFICIENT WALL REBAR FOR TIE-IN FOR STEEL REQUIREMENTS (NOTE 2)

REMOVE EXISTING TOP AND PORTION OF WALL

NEW SURFACE

MATCH EXISTING (TYP)

EXISTING STRUCTURE

#5 'L' BARS @ 8" O.C.
2" CLEAR FROM BOTTOM AND INSIDE

27" MIN. BELOW ROADWAY PAVEMENT SURFACE

18" MIN

ALTNERATE 1
(LOWER DECK (TYP))

ALTNERATE 2
RAISE OR LOWER DECK (TYP)

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

SECTION A-A

Adjust reinforced concrete deck to grade
**Precast manhole**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.  
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.  
   B. Place material per APWA Section 31 23 23.  
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

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

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

4. **STATIONING AND ELEVATIONS:**  
   A. Stations of manholes shown on the Drawings apply to the centerline of the shaft.  
   B. Elevations shown at the shaft's center refer to the prolonged (or extended) invert grade of the pipe.  
   C. Inlet pipe elevation applies to a point of intersection of the inlet pipe invert to the manhole wall.

5. **CONCRETE DECK OR REDUCING RISER:** When depth of manhole from pipe invert to finish grade exceeds 6'-7", use an ASTM C 478 reducing riser cone.

6. **DISTANCE “P”:** “P” varies as per size of pipes, such that the horizontal inside diameter of the pipe intersects the inside face of the riser.

7. **JOINTS:** Place flexible gasket-type sealant in all manhole joints.

8. **BASE OF MANHOLE:** Pour in one continuous operation.

9. **FINISH:** Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.
CAST-IN-PLACE BASE

TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>MANHOLE TYPE</th>
<th>DIMENSION</th>
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<tbody>
<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>X=60&quot; (Y)=44&quot;</td>
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<tr>
<td>C</td>
<td>X=60&quot; (Y)=30&quot;</td>
</tr>
</tbody>
</table>

FRAME AND COVER
(PLAN No. 302 OR 303)

RAISE FRAME TO GRADE
(PLAN No. 360 OR 361)

DECK OR RISER
(NOTE 5)

2.5" (MIN)
12" (MAX)

BACKFILL
(NOTE 2)

RCP CL III RISER
PER ASTM C 478

CONCRETE COLLAR
ALL AROUND (TYP)

DISTANCE "P"
(NOTE 6)

UNTREATED BASE
COURSE (NOTE 1)

SECTION A–A

Precast manhole

August 2001

Plan No.

341

Drawing 1 of 2
Precast manhole

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

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

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

4. STATIONING AND ELEVATIONS:
   A. Stations of manholes shown on the Drawings apply to the centerline of the shaft.
   B. Elevations shown at the shaft's center refer to the prolonged (or extended) invert grade of the pipe.
   C. Inlet pipe elevation applies to a point of intersection of the inlet pipe invert to the manhole wall.

5. CONCRETE DECK OR REDUCING RISER: When depth of manhole from pipe invert to finish grade exceeds 6'-7", use a reducing riser section.

6. DISTANCE “P”: “P” varies as per size of pipes, such that the horizontal inside diameter of the pipe intersects the inside face of the riser.

7. JOINTS: Place flexible gasket-type sealant in all manhole joints.

8. BASE OF MANHOLE: Pour in one continuous operation.

9. FINISH: Provide smooth and neat finishes on interior of cones, shafts, and rings. Imperfect moldings or honeycombs will not be accepted.
PIPE PASS-THROUGH BASE

TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>MANHOLE TYPE</th>
<th>DIMENSION</th>
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</thead>
<tbody>
<tr>
<td>A</td>
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</tr>
<tr>
<td>B</td>
<td>X = 60&quot; Y = 44&quot;</td>
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<tr>
<td>C</td>
<td>X = 60&quot; Y = 30&quot;</td>
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</tbody>
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FRAME AND COVER (PLAN No. 302 OR 303)

RAISE FRAME TO GRADE (PLAN No. 360 OR 361)

DECK OR RISER (NOTE 5)

BACKFILL (NOTE 2)

CONCRETE COLLAR ALL AROUND (TYP)

BREAK OUT AND GROUT SMOOTH

UNTREATED BASE COURSE (NOTE 1)

SECTION A--A

SECTION B--B

Precast manhole

Plan No. 341

August 2001

165

Drawing 2 of 2
Concrete Deck

1. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

2. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
#5 BARS @ 6" O.C.
BOTH DIRECTIONS BOTTOM FACE

48" DECK PLAN

O.D. OF 48" MANHOLE SECTION

SECTION

2" CLEAR

#5 BAR

60" DECK PLAN

2" CLEAR

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

60" DECK PLAN

O.D. OF 60" MANHOLE SECTION

SECTION

2" CLEAR

Concrete deck
Raise frame to grade – plastic form

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

PLASTIC FORM DETAIL

DECK SECTION

CONE SECTION

Raise frame to grade - plastic form
1. CONCRETE: Class 4000 per APWA Section 03 30 04. Place concrete per APWA Section 03 30 10. Cure per APWA Section 03 39 00.

2. REINFORCEMENT: ASTM A 615, grade 60 steel per APWA Section 03 20 00.  
   A. 2 1/2" High Rings: Provide two 1/4" diameter steel hoops tied with No. 14 AWS gage wire, 8" on center.  
   B. 6" and 8" High Rings: Provide four 1/4" diameter steel hoops, tied with No. 14 AWS gage wire, 8" on center.

3. JOINTS: Seat rings with a compressible gasket for non-pressurized applications.
Raise frame to grade - grade ring

May 2006

Plan No. 361

171
Cover collar for storm drains

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

2. JOINTS: Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle or straight edge cut. Clean edges of all dirt, oil and loose debris.
CONCRETE COVER COLLAR (NOTE 1)

CONCRETE TO BE SET 1/4" MIN. TO 1/2" MAX. BELOW PAVEMENT UP ALL AROUND

MATCH CROSS SLOPE GRADE

GRADE RINGS ARE SHOWN PLASTIC FORMS ARE ACCEPTABLE (PLAN No. 360 or 361)

BREAK OUT LINE

SECTION A–A

SECTION B–B

Cover collar for storm drains
Area drain pipe

1. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
Plan No. 372

Area drain pipe

April 1997

175
Concrete pier

1. BACKFILL: Install and compact all backfill material per APWA Section 33 05 20.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
NARRATIVE

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

INSTALL CONCRETE PIER

EXISTING PIPE DO NOT DISTURB

NEW PIPE

3" MIN.

CONCRETE PIER DETAILS

NEW PIPE

PIPE BEDDING OR STABILIZATION AS REQUIRED

UNDISTURBED EARTH, STABILIZATION MATERIAL OR PIPEZONE MATERIALS AS REQUIRED

FILL VOID OVER SEWER PIPE WITH SAND. MINIMIZE COMPACTION ENOUGH TO ALLOW FURTHER COMPRESSION OF THE SAND FILL MATERIAL THROUGH TIME.

SECTION A-A

OBLIQUE

Concrete pier

SUPPLY AND INSTALL 2 EA. 3' LONG #4 REBAR ON 3" CENTERS WITH 3" MIN. EMBEDMENT
Trench backfill

1. BACKFILL: Above the pipe zone.
   A. Granular Fill. Limit maximum particle size to 6 inches. Place fill per APWA Section 33 05 20. Compact to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction. Do not use clay without ENGINEER’s review and acceptance. Water jetting is NOT allowed in backfilling operation.
   B. Flowable Fill. Provide and place controlled low strength material per APWA Section 31 05 15. Cure the fill before placing surface restorations.

2. LANDSCAPED RESTORATION: Provide landscaped surfaces with topsoil. Rake to match existing grade. Replace vegetation to match pre-construction conditions. See APWA Section 32 92 00 or APWA Section 32 93 13 requirements.

3. PAVEMENT RESTORATION: Do not install asphalt or concrete surfacing until trench compaction is accepted by ENGINEER.

4. PEA GRAVEL: Pea gravel is not allowed in any part of the trench.
PAVEMENT RESTORATION
SEE PLAN No. 255 OR 256
(NOTE 3)

LANDSCAPE RESTORATION
(NOTE 2)

MAGNETIC MARKING TAPE
MAX. DEPTH = 18"
BELOW FINAL SURFACE

BACKFILL
(NOTE 1)

PIPE ZONE BACKFILL
SEE DRAWINGS OR
PLAN No. 382

SECTION

Trench backfill

Plan No. 381

May 2006
Pipe zone backfill

1. BACKFILL: Do not use sewer rock or recycled RAP aggregate in the pipe zone without ENGINEER’s written approval.
   A. Granular Fill Below Pipe Spring Line.
      1) Furnish 3/4 inch crushed aggregate base material, unless specified otherwise by pipe manufacturer. When using concrete, provide at least Class 2,000 per APWA Section 03 30 04.
      2) Install and compact backfill material per pipe manufacturer’s recommendations.
      3) Water jetting is not allowed in backfilling operation.
      4) Submission of quality control compaction test result data developed for haunching areas may be requested by ENGINEER at any time. CONTRACTOR is to provide results of tests immediately upon request.
   B. Granular Fill Above Pipe Spring Line.
      1) Furnish 3/4 inch crushed aggregate base material, unless specified otherwise by pipe manufacturer. Place in lifts not exceeding 8 inches before compaction.
      2) Water jetting is not allowed in backfilling operation.
      3) Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater unless pipe manufacturer requires more stringent installation.
   C. Flowable Fill.
      1) Provide and place controlled low strength material per APWA Section 31 05 15 if allowed by pipe manufacturer.
      2) Prevent pipe flotation by installing in lifts and providing pipe restraints as required by pipe manufacturer.
      3) Reset pipe to line and grade if pipe “floats” out of position.

2. PIPE ZONE WIDTH: Provide width recommended by pipe manufacturer. Width of pipe zone is measured at the pipe spring line and includes any necessary sheathing. In trench box applications, follow manufacturer’s recommendations.

3. PIPE LOCATION: Install pipe in center of trench or no closer than 6 inches from wall of pipe to wall of trench.

4. PEA GRAVEL: Pea gravel is not allowed in any part of the pipe zone.

5. FOUNDATION STABILIZATION: Use sewer rock of APWA Section 31 05 13. Installation of stabilization-separation geotextile per APWA Section 31 05 19 will be required to separate backfill material and native subgrade materials if sewer rock cannot provide a working surface or to prevent soils migration.
INSTALLATION

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

PVC AND HDPE PIPE: FOLLOW ASTM D 2321
*STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY-FLOW APPLICATIONS.

CORRUGATED METAL PIPE: FOLLOW ASTM A 798
*STANDARD PRACTICE FOR INSTALLING FACTORY-MADE CORRUGATED STEEL PIPE FOR SEWERS AND OTHER APPLICATIONS.

VITRIFIED CLAY PIPE: FOLLOW ASTM C 12.
*STANDARD RECOMMENDED PRACTICE FOR INSTALLING VITRIFIED CLAY PIPE LINES.
PART 4
SANITARY SEWER

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Trenching
See Trenching requirements under Section 3
Abbreviations and symbols for sewer

1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.

2. LETTERING STYLE: Capital letters preferred.

3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.

4. NEW IMPROVEMENTS: Shown in solid continuous line.
Abbreviations and symbols for sewer

April 1997
30" Frame and cover

1. **CASTINGS:** Grey iron class 35 minimum per ASTM A 48.

2. **COATINGS:** Except machined surfaces, coat all metal parts with asphaltum paint.

3. **INSCRIPTIONS:** Cast the words "SEWER" on the cover flush with the surface finish.

4. **HEAT NUMBER:** Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. **FIT:** \( \checkmark \) designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. **LOCKING:** Provide covers for manholes located in easements, rights-of-way, alleys, parking lots, and all other places except paved streets, with allen socket set screw locking devices. Drill and tap two holes to a depth of 1 inch at 90 degrees to pry hole and install 3/4 x 3/4 inch allen socket set screws.

7. **MANHOLE STRUCTURE:** See Plan No. 411.
PLAN

SECTION A-A

30" Frame and cover

Plan No. 402
Sanitary sewer manhole

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

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

3. MANHOLE SIZE: For sewers under 12" diameter, build a 4 feet diameter manhole. For sewers 12" and larger, and when 3 or more pipes intersect in the manhole, build a 5 feet diameter manhole.

4. GROUT: Grout around all pipe openings with 2:1 sand/cement mortar.

5. JOINTS: Place flexible gasket-type sealant in all manhole joints.

6. ALTERNATES:
   A. Precast reinforced concrete walls 5 inches thick (to be acceptable to the ENGINEER.
   B. Cast in-place concrete to be 8 inches thickness minimum.

7. INVERT COVERS: Place invert covers over the top of pipe in all manholes during construction. See Plan No. 412.

8. WATER STOPS: Install rubber water-stop on all plastic pipes when connecting plastic pipes to manholes. Hold water-stop in place with stainless steel bands.
CONSTRUCT FLOW TROUGHS

FRAME AND COVER
(PLAN No. 402)

FINISH GRADE

DETERMINED BY ENGINEER

VARIES

FINISH GRADE

BACKFILL (NOTE 1)

3'-6" FOR 5' M.H.
2'-0" MAX.
2'-6" FOR 4' M.H.

ALTERNATES (NOTE 6)

RCP CL III RISER AND CONES PER ASTM C 478

REPLACE UPPPER 1/3 OF PIPE AFTER MANHOLE IS COMPLETED
CONSTRUCT MORTAR SHELF WITH A SLOPE OF 1.5" IN 12"

SECTION A-A

Sanitary sewer manhole

April 1997

Plan No.

411

189
Invert cover

1. MATERIAL: 5/8" thick exterior grade plywood.

2. INSTALLATION:
   A. Install invert cover over manhole shelf. With pipe entering above the mainline pipe, install 2' x 4" bracing to raise invert cover above top of the highest pipe inlet. If necessary, install solid bracing attached to wall.
   B. If manhole is not round, cut invert cover to match shape.
   C. Install so no debris can enter the pipe.
   D. Do not interfere with flow in pipeline.
   E. Nail all three pieces of each invert cover securely together.
PLAN
(INVERT COVER IN PLACE)

SECTION A–A
OPTION 1

SECTION B–B
OPTION 2

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

Invert cover
Cover collar for sanitary sewer manhole

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

2. JOINTS: Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.
CONCRETE COVER COLLAR (NOTE 1)

PLAN

CONCRETE TO BE SET
1/4" MIN. TO 1/2" MAX.
BELOW PAVEMENT LIP
ALL AROUND

MATCH CROSS SLOPE GRADE

CONCRETE (NOTE 1)

GRADE RINGS ARE SHOWN
PLASTIC FORMS ARE ACCEPTABLE
(PLAN No. 360 or 361)

SECTION A–A

Cover collar for sanitary sewer manhole
Sewer lateral connection

1. **INSPECTION:**
   A. Prior to installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
   B. Prior to backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.

2. **INSTALLATION:**
   A. Provide agency approved wye or tee with appropriate donut. Verify whether CONTRACTOR or agency is to install the wye.
   B. Tape wrap pipe as required by soil conditions.
   C. Remove core plug from sewer main. Do not break into sewer main to make connection.
   D. Stainless steel straps required.

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

**Sewer lateral connection**

April 1997

Plan No. 431
Sewer lateral relocation

1. **INSPECTION:**
   A. Prior to installation, secure acceptance by ENGINEER for all pipe, fittings, and couplings to be used.
   B. Prior to backfilling, secure inspection of installation by ENGINEER. Give at least 24 hours notice.

2. **INSTALLATION:**
   A. Provide agency approved wye or tee with appropriate donut. Verify whether CONTRACTOR or agency is to install the wye.
   B. Tape wrap pipe as required by soil conditions.
   C. Do not install couplings under the obstruction.
   D. Under the obstruction, loosely compact granular material or sand. Flowable fill not allowed.

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

GRADE REQUIREMENTS
4" PIPE - 2.0% MIN.
6" PIPE - 1.0% MIN.

NEW PIPE PER AGENCY PERMIT

BOTTOM OF OBSTRUCTION
SAND OR UNTREATED
BASE COURSE FILL
LOOSE COMPACTION

12"

6" MIN

REPLACE EXISTING LATERAL
PER AGENCY PERMIT

SECTION A–A

Sewer lateral relocation

Plan No.
432

May 2006
197
Pipe drop

1. PIPE DROPS: Only one drop pipe is allowed inside the manhole. Size the drop pipe to be same diameter as sewer pipe discharging into manhole.

2. MATCH POINT: Match the 3/4 diameter points of the pipes.

3. ANCHOR: If the drop is more than 18 inches, anchor the riser to the wall every 12 inches. Use stainless steel anchors which are acceptable to ENGINEER.

4. CONCRETE: Class 4000 per APWA Section 03 30 04. Extend encasement to first joint beyond excavation for drop connection.
SANITARY SEWER MANHOLE (PLAN No. 411)

CONCRETE ENCASEMENT (NOTE 4)

CUT OPENING IN PRECAST MH BARREL AND SEAL WITH NON-SHRINK MORTAR (TYPICAL)

DRILL 5/8" HOLE INTO TOP SCREW-IN-PLUG

JOINT

TEE & WYE

BRICK DAM

INSTALL RUBBER WATERSTOP WITH STAINLESS STEEL BAND

ANCHOR TO SIDE OF MANHOLE SEE NOTE 3

CONCRETE ENCASEMENT (NOTE 4)

3/4 d MATCH POINT (NOTE 2)

CONCRETE PLACED AGAINST UNDISTURBED MATERIAL OR SHEETING

CONCRETE ENCASEMENT (NOTE 4)

90° ELBOW

ALTERNATE 1

SHALLOW DROP (TYP)

ALTERNATE 2

DEEP DROP (TYP)

SECTION

Pipe drop
1. **INSPECTION:** Prior to backfilling around concrete box, secure inspection of installation by ENGINEER.

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

3. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. **WALL PENETRATIONS:** Fill annular space around piping with waterproof sealer.
**BOX PLAN**

- #4 REBAR
- 2 1/2" MIN

**LID PLAN**

- 1" HOLE WITH REMOVABLE PLUG-TYPICAL

**LID SECTION**

- #5 @ 6" O.C. EACH WAY

**SECTION A-A**

- INLET
- PVC GOOSENECK
- 4" PIPE
- OUTLET
- #4 @ 6" O.C. EACH WAY (NOTE 3)

**SECTION B-B**

- REBAR TYP
- BACKFILL (NOTE 2)

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*Grease trap*
## Abbreviations and Symbols

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## Trenching

See Trenching requirements under Section 3

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1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.

2. LETTERING STYLE: Capital letters preferred.

3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.

4. NEW IMPROVEMENTS: Shown in solid continuous line.
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**Abbreviations and symbols for water**

Plan No. 501

April 1997
27" Frame and cover

1. CASTINGS: Grey iron class 30 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INSCRIPTIONS: Cast the name of the agency or it's acronym as the first line. Cast the word `WATERWORKS' as the second line. Cast the word `VALVE' (or applicable word) as the third line. Cast all letters on the cover in upper case flush with the surface finish.

4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. FIT: \( \checkmark \) designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. MANHOLE STRUCTURE: See Plan No. 505.
27" Frame and cover

Plan No. 502

April 1997

207
38” Frame and double cover

1. CASTINGS: Grey iron class 35 minimum per ASTM A 48.

2. COATINGS: Except machined surfaces, coat all metal parts with asphaltum paint.

3. INSCRIPTIONS: Cast the name of the agency or its acronym as the first line. Cast the word ‘WATERWORKS’ as the second line. Cast the word ‘VALVE’ (or applicable word) as the third line. Cast all letters on the cover in upper case flush with the surface finish.

4. HEAT NUMBER: Place foundry and heat number on the inside of the frame and on the bottom of the cover.

5. FIT: \(\sqrt{\text{\_\_}}\) designates machined surface. Give the frame and cover a machine finish so the cover will not rock.

6. MANHOLE STRUCTURE: See Plan No. 505.
OBLIQUE

SECTION

38" Frame and double cover
Concrete boxes

1. INSPECTION: Prior to backfilling around concrete box, secure inspection of installation by ENGINEER.

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

3. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

5. WALL PENETRATIONS: Fill annular space around piping with waterproof sealer.

6. COVER PLACEMENT: Place frame and cover directly over valve or meter location.
1. **INSPECTION:** Prior to backfilling, secure inspection of installation by ENGINEER.

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

3. **HYDRANT:** Dry barrel per AWWA C502. Additional water system requirements are specified in APWA Section 33 11 00.
   - A. Provide at least 1 cubic yard of APWA Section 31 05 13 sewer rock around drain hole at base of hydrant. Wrap plastic over sewer rock to prevent silting.
   - B. Paint fire hydrant to agency’s fire hydrant paint code.
   - C. Apply non-oxide grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.
   - D. Notify fire department as soon as hydrant is placed in service.

4. **THRUST BLOCKS:**
   - A. Prior to pouring concrete, wrap pipe system with 8 mil thick plastic sheet to prevent bonding of concrete to pipe system.
   - B. Not required for flange or welded pipe systems.
3/4" and 1" meter

1. METER PLACEMENT:
   A. In new construction, install meter at center of lot or per agency requirements.
   B. All meters are to be installed in the park strip or within 7 feet of the property line (street side).
   C. Do not install meters under driveway approaches, sidewalks, or curb and gutter.

2. METER BOX:
   A. In landscaped areas and driveway approaches, set box so grade of the frame and cover matches the grade of the surrounding surface.
   B. In street surfaces or other vehicular traffic areas, provide the same type of meter box as required for 1 1/2" and 2" service meters. See Plan 522.

3. PIPE: Coordinate with utility agency or property owner for type of pipe to be used outside of right-of-way.

4. INSPECTION: Prior to backfilling around meter box, secure inspection of installation by ENGINEER.

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

6. CASTING: Grey iron class 35 minimum per ASTM A 48.
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* FURNISHED BY UTILITY AGENCY

3/4" and 1" meter

Plan No.

521

August 2001
1 1/2" and 2" meter

1. METER PLACEMENT:
   A. In new construction, install meter at center of lot or per agency requirements.
   B. All meters are to be installed in the park strip or within 7 feet of the property line (street side).
   C. Do not install meters under driveway approaches, sidewalks, or curb and gutter.

2. PIPE: Install type ‘K’ copper pipe to property line. Coordinate with utility agency for type of pipe to be used outside of right-of-way.

3. ALTERNATE: Turbine meters are required on all systems used exclusively for irrigation or fire protection. Where domestic use is applicable, use a standard meter.

4. BYPASS VALVE: Lock in off position.

5. BLOCKING: Use clay brick or concrete block.

6. CONCRETE BOX:
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.

7. INSPECTION: Prior to backfilling around the meter box, secure inspection of installation by ENGINEER.

8. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
RAISE FRAME TO GRADE (PLAN No. 360 OR 361)

BYPASS VALVE (NOTE 4)

DRAIN GRAVEL

FLOOR TO ROOF 7 FEET MINIMUM

FLOW

18"

>18"

FLOW

2" TURBO METER

STRAINER

BRASS PIPE

BLOCKING (NOTE 5)

SECTION

SECTION A–A

ALTERNATE
TURBO METER INSTALLATION (NOTE 3)

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<td>B</td>
<td>CONCRETE BOX</td>
<td>PLAN No. 505</td>
</tr>
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<td>C</td>
<td>METER BOLTS</td>
<td>5/8&quot; x 2 3/4&quot; BRASS</td>
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<td>D</td>
<td>1 1/2&quot; CUSTOM SETTER WITH BYPASS</td>
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<td>E</td>
<td>2&quot; CUSTOM SETTER WITH BYPASS</td>
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</tr>
</tbody>
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* FURNISHED BY UTILITY AGENCY

1 1/2" and 2" meter

Plan No. 522

August 2001

217
3" and 4" Compound meter with 2" bypass

1. **CONTROL VALVE**: Install valve with valve box adjacent to main.

2. **BLOCKING**: Clay brick or concrete block.

3. **SMALL FITTINGS**: Provide brass fittings and nipples. Do not use galvanized materials.

4. **CONCRETE BOX**: Plan No. 505
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
3" and 4" Compound meter with 2" bypass

Plan No. 523

August 2001
6" Compound meter with 2" bypass

1. CONTROL VALVE: Install valve with valve box adjacent to main.

2. BLOCKING: Clay brick or concrete block.

3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.

4. CONCRETE BOX: Plan No. 505.
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
**PLAN**

RAISE FRAME TO GRADE (PLAN No. 360 OR 361)

IF A COVER COLLAR IS REQUIRED SEE PLAN No. 574 (TYP)

**ELEVATION**

CLEARANCES (TYP) (NOTE 4B)

NOTE 2  
DRAIN GRAVEL  

**LEGEND**

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<tr>
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<tr>
<td>N</td>
<td>COPPER PIPING</td>
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* FURNISHED BY AGENCY

**6" Compound meter with 2" bypass**

Plan No. 525
**8" Compound meter with 2" bypass**

1. **CONTROL VALVE:** Install valve with valve box adjacent to main.

2. **BLOCKING:** Clay brick or concrete block.

3. **SMALL FITTINGS:** Provide brass fittings and nipples. Do not use galvanized materials.

4. **CONCRETE BOX:** Plan No. 505.
   
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
**LEGEND**

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<td>G</td>
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<td>2&quot; MALE METER FLANGE</td>
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<tr>
<td>N</td>
<td>COPPER PIPING</td>
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* FURNISHED BY AGENCY

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**8" Compound meter with 2" bypass**

Plan No. 527
10" Turbo meter with 6" turbo meter and 2" bypass

1. CONTROL VALVE: Install valve with valve box adjacent to main.

2. BLOCKING: Clay brick or concrete block.

3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.

4. CONCRETE BOX: Plan No. 505.
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
### 10" Turbo meter with 6" turbo meter and 2" bypass

**Plan No.** 529

**Legend**

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<td>10&quot; F.S. STRAINER</td>
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<td>E</td>
<td>10&quot; TURBO METER</td>
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</tr>
<tr>
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</tr>
</tbody>
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* FURNISHED BY AGENCY
Electrolysis monitoring station details
TYPICAL REFERENCE ELECTRODE—
1/2" ROUND BY 9" ZINC WITH NO. 12
STEEL WIRE CORE TO WHICH IS
ATTACHED, BY A COMPRESSION FIT
COPPER SLEEVE, A LENGTH OF PVC
COATED NO. 12 COPPER WIRE. THE
SLEEVE JOINT IS WRAPPED WITH
2 MILS OF PVC TAPE.

**Legend**

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<tr>
<td>A</td>
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<tr>
<td>B</td>
<td>CONCRETE SLAB (6&quot;x18&quot;x18&quot;)</td>
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<tr>
<td>C</td>
<td>1–#8 &amp; 1–#12 AWG COPPER WIRE WITH WHITE TW INSULATION</td>
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<td>D</td>
<td>REFERENCE ELECTRODE</td>
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<td>E</td>
<td>THERMITE WELD WIRE CONNECTION (TYPICAL)</td>
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<td>F</td>
<td>EXISTING SOIL</td>
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<td>2–#12 AWG COPPER WIRE WITH YELLOW TW INSULATION</td>
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<td>H</td>
<td>1–#8 &amp; 1#12 AWG COPPER WIRE WITH BLUE TW INSULATION</td>
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<td>FOREIGN PIPELINE</td>
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<td>L</td>
<td>PENSTOCK TERMINALS</td>
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<td>FOREIGN PIPELINE TERMINALS</td>
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<td>ON A PHEONOLIC PLATE</td>
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**Electrolysis monitoring station details**

Plan No. 535

April 1997
**Water service line**

1. **INSPECTION:** Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.

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

3. **FITTINGS:** Provide brass fittings and nipples. Do not use galvanized materials.
3/4" OR 1" METER
(PLAN No. 521)

EXISTING SURFACE

EXISTING GALVANIZED SERVICE
TO BE ABANDONED OR COPPER
SERVICE TO BE LOWERED

FROST LINE + 12"
OR 48" MINIMUM

TYPE "K" COPPER PIPE
LENGTH AS NECESSARY

SERVICE TAP
(PLAN No. 551 OR 552)

DISTANCE VARIES
WATER SERVICE ADJUSTMENT

Water service line

Plan No.
541
**Waterline loop**

1. **INSPECTION:** Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.

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

3. **PIPE:** Match existing service. Bend pipe around obstruction.

4. **THRUST BLOCKS:** Not required for flange or welded pipe systems.

5. **FITTINGS:** Use copper to copper flare fittings or copper to iron pack joint coupling with locking split clamp on iron pipe side and flare on copper side. All couplings to be brass.

6. **GREASE:** Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.

7. **STEEL SPOOL:** Weld in place and provide slip on flange except when fitting in pipe system could move. Epoxy line per AWWA C210, AWWA C213, and coated per AWWA C208, or AWWA C214.

8. **LOCATION:** Loop water mains over top of sewer lines.
**Type A - Water Service Line**

1. **Alternate 1**
   - Match size of existing service line to existing ground.
   - Frost line + 12" or use alternate 2.
   - Fittings (Note 5)

2. **Alternate 2**
   - OBSTRUCTION
   - Supply and install locking followers (typical)
   - Sleeve or couplings (typical)
   - Existing watermain (typical)
   - Thrust blocks and restraints per Plans No. 561 and 562.
   - See note 4 for non-use.

**Type B - Water Main**

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</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
<tr>
<td>D</td>
</tr>
</tbody>
</table>

*Waterline loop*
Fire hydrant replacement or relocation

1. **INSPECTION:** Prior to backfilling trench excavation, secure inspection of installation by ENGINEER.

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

3. **TEMPORARY THRUST BLOCKING:** Use wood.

4. **VALVE BOXES:** Salvage any C.I.S.T. valve boxes and reuse. Adjust to grade as necessary on relocated hydrant.

5. **PIPING:** Match existing pipe, fittings and coupling sizes and materials.

6. **ADJUSTMENTS:** Adjust hydrant to grade with hydrant extensions if necessary.

7. **CONNECTIONS:** If existing valve and hydrant have O.B. connections, delete MJ x Flange adapter and install 6 inch MJ sleeve.
NEW LATERAL REQUIRED

NEW 6" PIPE BEND
WITH LOCKING RESTRAINTS

NEW PIPE LENGTH AS NEEDED

NEW MJ X FLANG FITTING
ADAPTER WITH LOCKING FOLLOWER
OR USE A MECHANICAL JOINT HYDRANT
TO ELIMINATE A FITTING

INSTALL LOCKING FOLLOWER
ON EXISTING VALVE (IF NECESSARY)

RELOCATED HYDRANT AND VALVE

EXISTING WATERMAIN

EXISTING LATERAL REMAINS

EXISTING HYDRANT TO BE REPLACED

EXISTING VALVE

NEW MJ SLEEVE

REMOVE EXISTING TEE
OR PLUG AND ABANDON

NEW 6" PIPE

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

Fire hydrant replacement or relocation

Plan No. 543

April 1997 233
3/4" and 1" service taps

1. TAPPING: Place taps a minimum of 24 inches apart. Use a tapping tool that is sized corresponding to the size of the service line to be installed. No taps within 24 inches of end of pipe.

2. PVC OR AC PIPE: A service saddle clamp is required on all PVC and AC pipe taps unless specified otherwise.

3. TAPE: Teflon tape is required on all taps.

4. INSPECTION: Prior to backfilling around taps, secure inspection of installation by ENGINEER.

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

TYPE B – DIRECT TAP

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<td>TYPE K – SOFT</td>
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<td>B</td>
<td>CORPORATION STOP</td>
<td>BRASS</td>
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<td>C</td>
<td>SERVICE SADDLE CLAMP</td>
<td>(D.I., C.I., A.C.) **</td>
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<td>D</td>
<td>SERVICE SADDLE CLAMP</td>
<td>(P.V.C.)</td>
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<td>E</td>
<td>WATER MAIN PIPE</td>
<td>(D.I., C.I., A.C., P.V.C.)</td>
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* FURNISHED BY UTILITY AGENCY
** DI & CI PIPE MAY BE DIRECT TAPPED

3/4" and 1" service taps

May 2006  235
1 1/2” and 2” service taps

1. TAPPING: Place taps a minimum of 24 inches apart. Use a tapping tool that is sized corresponding to the size of the service line to be installed. No taps within 24 inches of end of pipe.

2. TAPE: Teflon tape is required on all taps.

3. BLOCKS: Clay brick or concrete block required under valve box to assure a 1” space before bearing on a corporation stop.

4. SADDLE CLAMP: Required on all taps.

5. INSPECTION: Prior to backfilling around taps, secure inspection of installation by ENGINEER.

6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
IF A COVER COLLAR IS REQUIRED
SEE PLAN No. 574 (TYP)

NOTE 3

3" 300# BALL CORP

SECTION

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<td>COPPER PIPE (SERVICE LINE)</td>
<td>TYPE K (SOFT)</td>
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* FURNISHED BY UTILITY AGENCY

1 1/2" and 2" service taps
1. **CONCRETE**: Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.

2. **PIPE JOINTS**: Do not cover with concrete. Leave completely accessible.

3. **GREASE**: Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.

4. **SPECIAL CONSTRUCTION REQUIREMENTS**:
   A. Thrust design for pipe sizes or configurations not shown require special design.
   B. Bearing areas, volumes, and special thrust blocking details shown on Drawings take precedence over this plan.
   C. Reinforcing steel bars to be epoxy coated at least 15 mils thick. Minimum stress yield strength of tie down bars is 70,000 psi.
   D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at option of ENGINEER).

5. **INSPECTION**: Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.

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

**Minimum Bearing Area in Sq. Ft.**

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<th>45° Bends</th>
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#4 Epoxy coated rebar with 12" min. embedment

Install thrust restraint see plan No. 562 (Typ) (MJ and push-on joints)
**Tie-down thrust restraints**

1. **CONCRETE:** Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.

2. **PIPE JOINTS:** Do not cover with concrete. Leave completely accessible.

3. **GREASE:** Apply poly-fm grease to all buried metal surfaces. Wrap with 8 mil thick polyethylene sheet and tape wrap.

4. **SPECIAL CONSTRUCTION REQUIREMENTS:**
   A. Thrust design for pipe sizes or configurations not shown require special design.
   B. Bearing areas, volumes, and special thrust blocking details shown on drawings take precedence over this plan.
   C. Reinforcing steel bars to be epoxy coated at least 15 mils thick. Minimum stress yield strength of tie down bars is 70,000 psi.
   D. Locking restraint devices may be used in conjunction with concrete thrust blocking (at option of ENGINEER).
   E. Restraint sizing is based upon a maximum operating pressure of 150 psi and a test pressure of 200 psi, and a minimum soil bearing stress of 2,000 psf. Operating pressures in excess of 150 psi or soils with less than 2,000 pound bearing strength will require special design.
   F. Concrete must be allowed to cure in thrust restraints for 5 days prior to pressurizing water lines or have additional approved thrust restraints installed prior to pressurizing the water line.

5. **INSPECTION:** Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.

6. **BACKFILL:** Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
### Tie-down thrust restraints

**Type A Restraint**
For 11 1/4" - 22 1/2" Vertical Bends

#### Table of Dimensions

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<thead>
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<th>Pipe Size Nominal Diameter (Inch)</th>
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**Type B Restraint**
For 45° Vertical Bends

#### Table of Dimensions

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</table>
2" washout valve

1. CONCRETE: Class 2000 minimum per APWA Section 03 30 04. Pour concrete against undisturbed soil.

2. TAPE: Apply tape wrap to the exterior of all galvanized pipe per AWWA C209.

3. SPECIAL DESIGN: Watermains 12" and larger will require special washout assembly design.

4. DRAINAGE: After installation of washout valve assembly, verify the washout valve riser drains to gravel.

5. INSPECTION: Prior to backfilling around thrust block, secure inspection of installation by ENGINEER.

6. BACKFILL: Provide and place per APWA Section 33 05 20. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
IF A COVER COLLAR IS REQUIRED SEE PLAN No. 574

* DISH OUT CONCRETE AS NECESSARY DO NOT ENCASE VALVE DOME OR OPERATING NUT IN THE CONCRETE

2" GALVANIZED IRON PIPE WITH 2" SCREW ON CAP
1/4" Ø DRAIN HOLE IN BOTTOM OF 90° BEND

WATERMAIN

PLUG OR CAP AS NECESSARY WITH 2" THREADED TAP

2" GALVANIZED IRON PIPE WITH ADAPTER
2" THREADED BRASS NIPPLE

1/4 CUBIC YARD DRAIN GRAVEL

SECTION

LEGEND

<table>
<thead>
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<th>No.</th>
<th>ITEM</th>
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<tbody>
<tr>
<td>A</td>
<td>VALVE BOX WITH LID</td>
<td>2 PIECE CAST IRON</td>
</tr>
<tr>
<td>B</td>
<td>4&quot; GATE VALVE WITH SCREW ENDS</td>
<td>2&quot;x 2&quot; OPERATING NUT</td>
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<tr>
<td>C</td>
<td>CONCRETE THRUST BLOCK</td>
<td>SEE PLAN No. 561</td>
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</tbody>
</table>

2" Washout valve

Plan No. 571

April 1997
Detector check valve with 3/4" bypass meter

1. CONTROL VALVE: Install valve with valve box adjacent to main.

2. BLOCKING: Clay brick or concrete block.

3. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.

4. CONCRETE BOX:
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.

5. GRADE RING: 6 inch concrete grade ring required in roadways. See Plan No. 361.

6. SPOOLS: Length of flange x plain end spool varies.

   SPOOLS
   
<table>
<thead>
<tr>
<th>Pipe size</th>
<th>Pipe length</th>
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<tbody>
<tr>
<td>6&quot;</td>
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<td>8 1/4&quot;</td>
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<tr>
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7. VALVE OPTION: The valve in the box (item B legend) closest to the main, and the top section of the valve box (item J legend) may be eliminated at the option of the ENGINEER.
Detector check valve with 3/4" bypass meter

Plan No. 572

May 2006
6" Pressure reducing valve with 2" bypass

1. SMALL FITTINGS: Provide brass fittings and nipples. Do not use galvanized materials.

2. BLOCKING: Clay brick or concrete block.

3. TAPS: Provide two 3/4" I.P. taps with plugs for pressure gages.

4. CONCRETE BOX:
   A. Center frame and cover over water meter.
   B. Allow 1 inch clearance around waterline where line passes through wall. Seal opening with compressible seal.
6" Pressure reducing valve with 2" bypass

**LEGEND**

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<td>8&quot; M.J. X FLANGE ADAPTOR</td>
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<td>2</td>
<td>8&quot; x 6&quot; FLANGED REDUCER</td>
<td>CEMENT LINED</td>
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<td>3</td>
<td>8&quot; FLANGED STEEL SPOOL WITH 2&quot; OUTLET</td>
<td>EPOXY COATED AND LINED</td>
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<tr>
<td>4</td>
<td>2&quot; GATE VALVE</td>
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<tr>
<td>5</td>
<td>6&quot; GATE VALVE WITH 2&quot;X2&quot; OPERATING NUT</td>
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<tr>
<td>6</td>
<td>6&quot; PRESSURE REDUCING VALVE</td>
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</tr>
<tr>
<td>7</td>
<td>2&quot; PRESSURE REDUCING VALVE</td>
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<tr>
<td>8</td>
<td>27&quot; FRAME AND COVER</td>
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<td>9</td>
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<tr>
<td>10</td>
<td>CONCRETE BOX</td>
<td>PLAN No. 505</td>
</tr>
</tbody>
</table>

* FURNISHED BY AGENCY
**Cover collar for water valve boxes**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23. Do not use pea gravel or sewer rock. Place per APWA Section 32 05 10. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.

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

3. **JOINTS:** Provide a neat straight joint between existing and new asphalt concrete surfaces. Provide concentric circle cut. Clean edges of all dirt, oil and loose debris.
Cover collar for water valve boxes

Plan No. 574

August 2001
Air release assembly

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

2. **SMALL FITTINGS**: Provide brass fittings and nipples if not specified otherwise. Do not use galvanized materials.

3. **INSPECTION**: Prior to backfilling around the assembly, secure inspection of installation by ENGINEER.

4. **BACKFILL**: Provide and place per APWA Section 31 23 23. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness is 8 inches before compaction.
Air release assembly

April 1997
Plan No.
575
**Pressurized irrigation water and potable water interface**

1. **AIR GAP:** An air gap of at least two pipe diameters must exist between the maximum overflow lip of the catch basin and the end of the down-turned discharge pipe.

2. **STOP AND WASTE VALVE:** Locate the valve in an area where subsurface ground water will not accumulate or attach a drain pipe to the drain hole and drain to daylight with a non-corrodible #14 mesh screen over the end.

3. **CATCH BASIN:** The ground surrounding the catch basin must slope away from the catch basin (basin cannot be located where flooding could result in a water level higher than the maximum overflow lip of the catch basin).

4. **STAND PIPES:** Provide draining and freeze protection.

5. **SOLENOID VALVE:** A solenoid operated valve may be installed at this point provided the valve and housing are not constructed of plastic (must be brass or ferrous metal).

6. **SYSTEM DESIGN:** The catch basin valve and pump size must match the minimum discharge rate from the potable water system when indoor demands are also being expected from the system.

7. **PIPING MATERIALS:**
   A. All parts of the potable water system from the stop and waste valve to the air gap drop leg above the catch basin are to be copper or galvanized iron only.
   B. Below ground parts on the non-potable water system may be made of PVC or polyethylene at the owner’s discretion.
TYPE A – PUMP INTERCONNECT

<table>
<thead>
<tr>
<th>No.</th>
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<td>CONTROL VALVE</td>
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<td>CHECK VALVE</td>
<td>SIZE TO MATCH EXISTING PIPE.</td>
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<td>SUBMERSIBLE PUMP WITH FLOAT OPERATED CUT-OUT SWITCH</td>
<td>NOTE 6</td>
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<td>D</td>
<td>ELBOWS, TEES &amp; PIPE AS REQ'D</td>
<td>SCREWED OR FLANGED (OR BRAZED ABOVE GROUND ONLY)</td>
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<tr>
<td>E</td>
<td>CATCH BASIN</td>
<td>NOTE 6</td>
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<tr>
<td>F</td>
<td>ELECTRICAL BOX AND CONDUIT</td>
<td>PER ELECTRICAL CODE.</td>
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**Pressurized irrigation water and potable water interface**

Plan No. 593

April 1997
Pressurized irrigation water and potable water interface

1. SEPARATE SYSTEMS: Connect hose to only one system at a time. The other system is to remain separate. Do not direct connect potable and non-potable water systems with or without backflow prevention devices.

2. STOP AND WASTE VALVE: Locate the valve in an area where subsurface ground water will not accumulate, or attach a drain pipe to the drain hole and drain to daylight with a non-corrodible #14 mesh screen over the end.

3. TESTING: The reduced pressure backflow preventer (RPBP) device requires testing within 10 days of initial installation by a licensed backflow device tester and annually thereafter or more frequently at owner's option and expense.

4. BACKFLOW PREVENTER: Install the RPBP device above ground per the plumbing code. It mast not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.

5. STANDPIPES: Provide draining and freeze protection.

6. SYSTEM DESIGN: There may be up to 20 psi loss of head through the RPBP device. this is normal and the owner should expect a decrease in area coverage. Owner should design or modify the system for the lower pressure.

7 PIPING MATERIALS:
   A. All above ground parts are to be copper or galvanized iron only.
   B. Below ground parts on the non-potable water system may be made of PVC or polyethylene at the owner's discretion.

8. CAM LOCK FITTINGS: Provide 3/4" long male insert attached to the flexible hose.

RPBP = reduced pressure backflow preventer
TYPE B – BACKFLOW PREVENTER INTERCONNECT

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<td>FLEXIBLE DISCHARGE HOSE</td>
<td>100 P.S.I. WORKING PRESSURE 400 P.S.I. BURST PRESSURE</td>
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<td>SHUTOFF VALVES &amp; TEST COCKS ARE INCLUDED</td>
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<td>ELBOWS AND TEES</td>
<td>SCREWED, FLANGED, OR BRAZED ABOVE GROUND ONLY</td>
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Pressurized irrigation water and potable water interface

Plan No. 593

April 1997 255
PART 6
IRRIGATION AND LANDSCAPING

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Trees and Plants
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683 Shrubs and bushes........................................................................... 283
Abbreviations and symbols for irrigation and landscaping

1. LETTERING SIZE: 100 Leroy minimum except for line type and other background information. Use 120 Leroy for new work installation.

2. LETTERING STYLE: Capital letters preferred.

3. EXISTING IMPROVEMENTS: Shown in light shaded dashed line.

4. NEW IMPROVEMENTS: Shown in solid continuous line.
SYMBOL

DEFINITIONS

BACKFLOW PREVENTER ASSEMBLY
DOUBLE CHECK
REDUCED PRESSURE

CONTROLLER

DRINKING FOUNTAIN

ELECTRICAL CONDUIT

SPRAY HEAD
90°
180°
360°
VARIABLE
ROTOR POP UP

PIPE
PRESSURE MAIN
CIRCUIT PIPE

POINT OF CONNECTION

POWER SOURCE

PULL BOX:
HIGH VOLTAGE
LOW VOLTAGE

PUMP

SLEEVE:
NEW
EXISTING

STATION DESIGNATION
(REMOTE CONTROL VALVE)

THrust BLOCK

Abbreviations and symbols for irrigation and landscaping

Plan No.

601

April 1997

259
**Curb inlet box for irrigation**

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

2. **REINFORCEMENT:** ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. **GATE:** The gate shall securely seal the pipe.

5. **COATINGS:** Coat all metal parts with asphaltum paint.

6. **CASTING:** Grey iron class 20 minimum per ASTM A 48.

7. **STEEL:** ASTM A 36.

8. **ACCESSORIES:** Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.
Curb inlet box for irrigation

PLAN

SECTION A–A

SECTION B–B

HANDLE DETAIL

Plan No. 611

August 2005

Page 261
Irrigation diversion box

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

2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. GATE: The gate shall securely seal the pipe.

5. HINGE: 3" x 3" butt hinges welded to the cover plate.

6. SHIMS: Manufacture shims to match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.

7. COATINGS: Coat all metal parts with asphaltum paint.

8. STEEL: ASTM A 36.

9. ACCESSORIES: Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.
**Narrative**

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

**Plan View**

- **Section A-A**
  - GATE, $\varnothing 1/8'' \times (\varnothing + 1'')$ SQUARE
  - $\varnothing 1/2'' \times 4''$ LONG CONCRETE LINE
  - (2) $1/2''$ STANDARD WASHERS
  - $1/4'' X 1-1/2'' \times (\varnothing + 1)$

- **Section B-B**
  - GATE, $R 1/2''$ GATE
  - $R 1/4'' X 3/4'' \times 10''$

**Detail 1**

**Detail 2**

**Irrigation diversion box**

Plan No. 613

April 1997

Page 263
**Irrigation diversion box**

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

2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. GATE: The gate shall securely seal the pipe.

5. HINGE: 3" x 3" butt hinges welded to the cover plate.

6. SHIMS: Manufacture shims to match the thickness of the cover plate and install shims on the bolted side of the hinge between the hinge and the concrete box.

7. COATINGS: Coat all metal parts with asphaltum paint.

8. STEEL: ASTM A 36.

9. ACCESSORIES: Stainless steel bolts, nuts, washers etc., APWA Section 05 05 23.
**PLAN VIEW**

**SECTION A–A**

**SECTION B–B**

---

**Narrative**

Do not use this box in areas used by vehicular traffic or in sidewalks.

---

**Irrigation diversion box**

Plan No. 614
**Stationary head**

1. **INSPECTION:** Prior to backfilling around head, secure inspection of head installation by ENGINEER.

2. **PLACEMENT:**
   A. Adjust heads to final landscape grade.
   B. Keep heads 1/2 inch below edge of pavement surfaces.

3. **BACKFILL:** Install backfill material around heads and compact to prevent settling.

4. **SURFACE RESTORATION:** Cut sod around head to fit. Keep head flush with surrounding sod or seeded areas.

5. **COVERAGE:** Provide correct type of head and adjust throttle controls to obtain required coverage.
ADJUST TO FINISH GRADE WHEN LANDSCAPED SURFACE IS ESTABLISHED

TYPE F
FLUSH HEAD

TYPE S
 SHRUB HEAD

VARES (MIN 2"

PVC SCHEDULE 80 OR GALVANIZED STEEL

CURB, SIDEWALK, ETC.

1/2"

FINISH GRADE

TYPE Q
QUICK COUPLER

FINISH
GRADE

SEE ABOVE FOR TYPE OF HEAD

BACKFILL ALL SIDES
(NOTE 3)

PVC RISER
(LENGTH AS REQUIRED)

PVC ELBOW

18" LONG FLEXIBLE SWING PIPE

PVC TEE

SPIRAL BARB FITTING

LATERAL PIPE

SECTION

Stationary head
**Pop-up head**

1. **INSPECTION:** Prior to backfilling around head, secure inspection of head installation by ENGINEER.

2. **PLACEMENT:**
   A. Adjust heads to final landscape grade.
   B. Keep heads 1/2 inch below edge of pavement surfaces.

3. **BACKFILL:** Install backfill material around heads and compact to prevent settling.

4. **SURFACE RESTORATION:** Cut sod around head to fit. Keep head flush with surrounding sod or seeded areas.

5. **COVERAGE:** Provide correct type of head and adjust throttle controls to obtain required coverage.
FINISH GRADE (NOTES 2 AND 4)

TYPE N
NOZZLE HEAD

TYPE R
ROTOR HEAD

FINISH GRADE
SEE ABOVE FOR TYPE OF HEAD
BACKFILL ALL SIDES
(NOTE 3)
PVC RISER
(LENGTH AS REQUIRED)
PVC ELBOW
18" LONG FLEXIBLE SWING PIPE
PVC TEE
LESS THAN 10 GPM – USE SPIRAL BARB FITTINGS
MORE THAN 10 GPM – USE PRESSURIZED SWING JOINTS WITH O-RING SEALS

SECTION

Pop-up head
**Backflow preventer**

1. **INSPECTION:** Assure ENGINEER the backflow preventer system meets the Utah Safe Drinking Water Act.

2. **BACKFILL:** Install backfill material around valve box and compact to prevent settling.

3. **COATING:** Except machined surfaces, coat all items exposed to atmosphere with epoxy paint. Color to be selected by ENGINEER.

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

5. **INSTALLATION:** Install per the plumbing code. It must not be susceptible to flooding and must be accessible at all times for testing, repair, inspection, etc.

6. **TESTING** Test the backflow preventer within 10 days of installation by a licensed backflow device tester and report results to ENGINEER.
ABOVE GROUND > 3 INCH

BELLOW GROUND

Backflow preventer
Drain valve

1. **INSPECTION:** Prior to backfilling around drain, secure inspection of drain installation by ENGINEER. System must be pressurized during inspection.

2. **BACKFILL:** Install backfill material around pipe and valve and compact to prevent settling.

3. **PLACEMENT:** Provide positive drainage in entire system. Do not install automatic drain valves on the end of lateral pipes. Install upstream of the last head or at a low point to obtain full drainage.

4. **SALVAGE:** Deliver salvaged valves to ENGINEER unless specified otherwise.

5. **INSTALLATION:** Locate all valves at all low points on circuit pipe.
TYPE A – MANUAL DRAIN VALVE

TYPE B – AUTOMATIC DRAIN VALVE

Drain valve
Control valve

1. **INSPECTION:** Prior to backfilling around valve box, secure inspection of installation by ENGINEER. System must be pressurized during inspection.

2. **BACKFILL:** Install backfill material around pipe and valve box and compact to prevent settling.

3. **PLACEMENT:** Install automatic controllers and wiring per manufacturer's recommendations.
NARRATIVE
USE SCHEDULE 80 THREADED PIPING

FINISH GRADE

PROVIDE 12" OF EXPANSION LOOP SLACK WIRE AT ALL CONNECTIONS INSIDE VALVE BOX

SCHEDULE 80 PVC UNION

BACKFILL ALL SIDES (NOTE 2)

SCHEDULE 80 TOE NIPPLE AND BELL END OF PVC LATERAL PIPE

GRAVEL LAYER (12" MIN DEPTH)

ELEVATION

Automatic Control Valve
Brass Ball Valve

PVC Tee (SXSXT)
Mainline Pressure Pipe

Control Valve

Plan No. 633
**Isolation shut-off valve**

1. **INSPECTION**: Prior to backfilling around shut-off valve, secure inspection of valve installation by ENGINEER. System must be pressurized during inspection.

2. **BACKFILL**: Install backfill material around pipe and valve and compact to prevent settling.

3. **GATE VALVE**: Bronze, double disk wedge type with integral taper seats and non-rising stem.

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

5. **SALVAGE**: Return salvaged valves to ENGINEER unless specified otherwise.
STANDARD PLASTIC VALVE BOX WITH BOLT DOWN COVER

FINISH GRADE

CLASS 200 PVC SLEEVE (SIZE AND LENGTH AS REQUIRED) NOTCH OVER VALVE FOR STABILITY

GRAVEL SETTING BED TO SECURE SLEEVE

BACKFILL ALL SIDES (NOTE 2)

MAINLINE PIPE

COMPANION FLANGE WITH ALL NECESSARY GASKETS AND FITTINGS

VALVE SAME SIZE AS MAIN LINE OR CIRCUIT PIPE (NOTE 3)

CONCRETE THRUST BLOCK IF FITTING IS NEITHER FLANGED, WELDED, NOR SCREWED (PLAN No. 561 AND NOTE 4)

SECTION

isolation shut-off valve

Plan No.
635

April 1997 277
Wire runs for landscape irrigation

1. BACKFILL: Install and compact backfill material to prevent settling.

2. CIRCUIT PIPE: Where circuit pipe runs parallel to a pressure pipe, do not install over pressure pipe.

3. CONTROL WIRE: Use UF-UL listed copper control wire with PVC insulation for direct burial. Provide 12 inches of expansion loop wire at each valve and every 100 feet of wire length. Use waterproof wire connectors at all splices.
TIE A LOOSE 20" LOOP IN ALL WIRING AT CHANGES OF DIRECTION GREATER THAN 30 DEGREES. UNTIE ALL LOOPS AFTER CONNECTIONS HAVE BEEN MADE

**PLAN VIEW**

**SECTION**

TUBING OR WIRING TAPE AND BUNDLE AT 10' INTERVALS (NOTE 3)

FINISHED GRADE

**SECTION**

LATERAL PIPE (NOTE 2)

PRESSURE PIPE

WHERE POSSIBLE, TAPE TO BOTTOM OF PIPE AT 10' INTERVALS (NOTE 3)

FINISHED GRADE

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

2. TREE SIZE FOR PARK STRIPS:

<table>
<thead>
<tr>
<th>Tree Size</th>
<th>Park Strip Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Tree</td>
<td>8 feet or larger</td>
</tr>
<tr>
<td>Medium Tree</td>
<td>5- feet or larger</td>
</tr>
<tr>
<td>Small tree</td>
<td>3 feet or larger</td>
</tr>
</tbody>
</table>

3. TREE LOCATIONS:

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

4. ROOT BALL:
   B. After placing the tree in the hole remove wire and burlap if stability of the root ball allows. If not, remove only the top one or two rows of wire and an equal amount of burlap. Leave no twine or burlap on or near the surface of the ball or around the trunk. Cut vertical slits in burlap that remains. Do not fold burlap into the hole.

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

6. BACKFILL AND WATERING:
   A. Use soil removed from the hole as backfill. If soil is road base, mix with 1/3 organic mulch APWA Section 32 93 43. Mix thoroughly.
   B. Compact backfill in 6” layers. Water. Allow water to soak deeply into the soil. Make sure ball gets thoroughly wet.
PLACE ROOT COLLAR AT GRADE OR 2" ABOVE SURROUNDING GRADE

4" MULCH - KEEP MULCH 3 INCHES AWAY FROM TREE

BACKFILL (NOTE 6)

DIG TOP OF HOLE MINIMUM 3 TIMES THE DIAMETER OF THE ROOT BALL. SLOPE SIDES TO FINISH GRADE

SCARIFY SIDES & BOTTOM OF HOLE PRIOR TO PLANTING. SEAT ROOT BALL AS SHOWN TO STABILIZE TREE.

SET BALL ON UNDISTURBED SOIL DO NOT ALLOW AIR POCKETS OR VOIDS UNDER OR AROUND BALL

PROVIDE BERM TO RETAIN WATER

DO NOT FERTILIZE DURING PLANTING

SECTION

TURNBUCKLE (TYP)

WIRE AND HOES TIES

GUY WIRES

PLASTIC TUBE

COMPACTED BACKFILL

4"X4"X30" REDWOOD DEADMAN (TYP)

NOTICE
STAKING NOT PERMITTED except if authorized in writing by engineer

TYPICAL TREE STAKING DETAIL

Tree

Plan No. 681

October 2001

281
Shrubs and bushes

1. BACKFILL: Install and compact all backfill material to prevent settling

2. DEPTH OF PLANTING: Set shrubs and bushes at original depth.

3. FERTILIZER: Commercial fertilizer per FS O-F-241, uniform in composition.

4. ACCESSORIES: Wood or wood cellulose fiber free of growth or germination inhibiting ingredients.
COMMUNICATIONS

LIGHTING

Street Lighting

Plan 710 Riser------------------------------------- 287

730 Collar for street light pole--------------------------- 289
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TRAFFIC CONTROL

Light Pole Standards

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Speed Humps

761 Speed Bump---------------------------------------- 311
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POWER
Riser

1. CONDUIT: Galvanized.

2. ACCESSORIES: Galvanized steel bolts, nuts, washers, nails, etc., APWA Section 05 05 23

3. DRIP LOOP WIRING: For risers where CONTRACTOR is required to pull low voltage cable, (120/140 volt, 3 or 4 wires) extend enough wire from the conduit so OWNER can attach it to the 2’ drip loop.
DRIP LOOP WIRING (NOTE 1)

UPPER STANDOFFS (DETAIL 1)

6" STANDOFF (DETAIL 1)

TIE PULL ROPES TO BOTTOM STANDOFF

12" TO 30"

LONG RADIUS SWEEP RIGID METAL

CONDUIT

CONDUIT

CONDUIT

1-1/2" GALVANIZED STEEL STRUT

4"

3"

6"

5" MIN.

1/2" X 4" GALVANIZED LAG SCREW (TYP.)

STRUT

STRUT TYPE CLAMPS

CONDUITS

SECTION A-A

DETAIL 1

ELEVATION

Riser

Plan No.

710

June 2005

287
Collar for street light pole

1. BACKFILL: 95 percent or greater density.
2. REINFORCEMENT: ASTM A 615, grade 60, hoop steel.
NARRATIVE:
THIS IS A TYPICAL EXAMPLE
FOR POLES INSTALLED IN
LANDSCAPED AREAS

Collar for street light pole

#4 REBAR (NOTE 2)
LIGHT POLE BOLT
FOUNDATION FLANGE
GRADE
CLASS 4000 CONCRETE

3"
9"
6"
9"
Pull box

1. BACKFILL: 95 percent or greater density.
2. REINFORCEMENT: ASTM A 615, grade 60, steel.
3. CONCRETE: Class 4000 per APWA Section 03 30 04.
4. COATINGS: Coat all metal parts with asphaltum paint.
5. CASTING: ASTM A 48, grey iron, class 20 minimum.
6. ACCESSORIES: Stainless steel bolts, nuts, washers, etc., APWA Section 05 05 23
7. GROUND: Use exothermic weld connections
INSTALL 200 # PULL CORD IN EACH EMPTY CONDUIT AND LABEL

PLAN

CAST IRON LID

PLUG HOLES AFTER INSTALLATION

3/4" X 10' COPPERCLAD GROUND ROD 6" ABOVE BOTTOM (NOTE 7)

HEAVY DUTY (NOTE 5)

UTILITY LOGO

OBLIQUE

Pull box

June 2005

Plan No. 731
Trench for street light conduit

1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.

2. DETECTABLE MARKING TAPE: Permanent, red bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read “CAUTION: BURIED INSTALLATION BELOW”.
Trench for street light conduit

- Restore lawn or grass
- Use 8" topsoil
- Grade
- 6" Wide detectable marking tape (Note 2)
- Backfill borrow or topsoil (Note 1)
- Bedding sand
- 2" PVC Schedule 40 conduit

12" Min
**Trench for street light conduit**

1. **ADDITIONAL PAVEMENT REMOVAL:** Additional pavement removal to a painted lane stripe, a lip of gutter, a curb, an existing pavement patch, or an edge of the pavement is required if such street feature is within 2 feet of the second saw-cut.

2. **PVC CONDUIT:** APWA Section 33 05 07.

3. **IDENTIFICATION TAPE:** Permanent, red bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read "**CAUTION: BURIED INSTALLATION BELOW**".

4. **FLOWABLE FILL:** Provide 20 day 60 psi controlled low strength material as specified in APWA Section 31 05 15. Use a fill that flows easily and vibration is not required. Use flowable fill in excavations that are too narrow to receive compaction equipment. Before placing aggregate or pavement, cure to initial set.

5. **TACK COAT:** Full coverage on all vertical surfaces and surface of concrete substrate.

6. **ASPHALT PAVEMENT RESTORATION:** Use asphalt concrete specified in APWA Section 33 05 25.
   - A. Match existing thickness plus 1 inch but not less than 4 inches.
   - B. Install in lifts no greater than 3 inches after compaction. Compact each lift to 94 percent of ASTM D 2041 (Rice Method) plus or minus 2 percent.
   - C. If asphalt pavement is substituted for concrete substrate, omit rebar and provide 1.25 inches of pavement for each 1 inch of substrate.

7. **CONCRETE PAVEMENT RESTORATION:** Class 4000 per APWA Section 03 30 04.
   - A. Match existing concrete thickness.
   - D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

8. **PATCH REPAIR:** Repair patch if any of the following conditions within the patch occur.
   - B. Cracks at least 1-foot long and 1/4 inch wide occur more often than 1 in 10 square feet. Repair option: Crack seal.
   - C. Asphalt raveling is greater than 1 square foot per 100 square feet. Repair option: Mill and inlay
Trench for street light conduit
1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.

2. PVC CONDUIT: APWA Section 33 05 07.

3. IDENTIFICATION TAPE: Permanent, red or orange bright-colored, continuous-printed magnetic intended for direct-burial service not less than 6 inches wide by 4 mils thick. The tape shall read “CAUTION: BURIED INSTALLATION BELOW”.
Street light pole terminal

1. SERVICE DISCONNECT: APWA Section 26 13 13.

2. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23

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

3/4" X 10' COPPER CLAD GROUND ROD.

USE EXOTHERMIC WELD CONNECTIONS TO GROUND CASE, NEUTRAL WIRE AND GREEN GROUND WIRE.
Street light meter pedestal

1. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13, Density 95 percent or greater.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.

3. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23

4. CONDUIT: Galvanized
120/240 VOLTS, 1 PHASE

4 #"A" XHHW-2, ONE IS GREEN GROUND

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

METER PEDESTAL STAINLESS STEEL

CONCRETE PAD 6" THICK

3/4" X 10' COPPER CLAD GROUND ROD.

USE EXOTHERMIC WELD CONNECTIONS TO GROUND CASE, NEUTRAL WIRE AND GREEN GROUND WIRE.

3/4" AGGREGATE BASE COURSE 3" THICK

2" PVC CONDUIT FOR STREET LIGHT CONDUCTORS

NOTES

1. POWER DISTRIBUTION BLOCKS
2. LOAD CENTER FOR STREET LIGHTS
3. INCOMING SERVICE FROM OVERHEAD SECONDARY
4. TO STREET LIGHTS

Street light meter pedestal

Plan No. 737
**Screw-in base street light pole**

1. **CONCRETE**: Class 4000 per APWA Section 03 30 04.

2. **CONDUIT**: Galvanized.

3. **ACCESSORIES**: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23

4. **BACKFILL BORROW OR TOPSOIL**: APWA Section 31 05 13.

5. **GROUND COVER**: APWA Section 32 93 13.

6. **SCREW-IN BASE**: Material and dimensions to meet or exceed manufacturer’s recommendations.
Screw-in base street light pole

Plan No. 741

August 2005

303
Direct burial street light pole

1. CONCRETE: Class 4000 per APWA Section 03 30 04.
2. REINFORCEMENT: ASTM A 615, grade 60, steel.
3. CONDUIT: Galvanized.
4. ACCESSORIES: Galvanized steel bolts, nuts, washers, etc., APWA Section 05 05 23
5. BACKFILL BORROW OR TOPSOIL: APWA Section 31 05 13.
**Direct burial street light pole**

**Plan**

- Steel Pole
- Concrete Collar (Plan No. 730)
- 2" Conduit
- Pull Box with "Street Light" Logo (Plan No. 731)
- Waterproof fused connector kit
- Ground rod
- Waterproof fused connector kit

**Fused Connector Kits**
(1 each for 120 volts)
Fuse at 3 times full load amps of fixture
Buss Type

**Elevation**

- Direct burial steel pole
- 10'-0" to 16'-0"
- 36" Min.
- Ground #6 B.C. Neutral to pole
- Concrete collar (Plan No. 730)
- Grade
- Flowable fill, (APWA Section 31 05 15)
- Add and tamp sand or 1/2" minus well graded gravel to insure correct pole setting depth and drainage
- 15" Dia. Hole
- Undisturbed native soil
- 3/4" X 10' Copper clad ground rod
- Use exothermic weld to connect pole, neutral wire and green wire to ground

**August 2005**

Plan No. 742
Signal pole foundation

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

2. REINFORCEMENT: ASTM A 615, grade 60, deformed steel. See APWA Section 03 20 00 requirements.

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

4. ANCHOR BOLTS: When footing is located in an area to be paved, the top of the footing is to be placed 4 inches below grade with bolts extending 11 1/2 inches above top of footing to accommodate paving surface.
Signal pole foundation

Plan No. 751

April 1997

307
Signal pole wiring

1. MAST ARMS: Connect mast arms as shown on the drawings.

2. SPLICES: Make splices in pole base hand holes, not in pull boxes.

3. PEDESTRIAN SIGNAL CABLE: Run pedestrian signal cable from pedestrian head to pedestrian head or cabinet. Make no splices except in the signal mounting or head.

4. CONNECTIONS: Use terminal lugs to make all cabinet connections and all signal (vehicle and pedestrian) connections.

5. CONTROL CABLES: Provide cables meeting IMSA 19-1.

6. DETECTOR CABLES: Provide 2 conductor shielded 14 AWG stranded lead in cable. Loop to be wired with type 14 AWG THHN stranded, PVC/nylon jacket cable. Lead in cable to be IMSA 50-2, 2 conductor, twisted pair with shield and drain, black polyethylene.

7. COMMUNICATION CABLE: Provide type BJFA, 12 pair per specification RE-PE-39, 19 AWG, solid gel filled, shielded. IMSA 19-1 with PVC jacket.

8. WIRING CODE: As follows.
   7 Conductor #14 - vehicular signal
   red φ through phase red
   orange φ through phase amber
   green φ through phase green
   black φ left turn red or spare
   black/white φ through phase amber
   green φ through phase green
   black φ left turn red or spare

   5 Conductor #14 - pedestrian signal
   black φ side street DON'T
   orange φ side street WALK
   red φ artery DON'T
   green φ artery WALK
   white common

   4 Conductor #18 - pedestrian detection
   black φ phase 4 and/or 8
   white logic
   red φ phase 2 and/or 6
   green logic

   2 Conductor #18 - loop runs
   white designated φ loop runs
   black logic

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

SEE DETAIL 'B' PEDESTRIAN SIGNALS
NO SPLICE IN 5 CONDUCTOR CABLE RUN. SPLICE ONLY AT PEDESTRIAN SIGNAL HEADS

PUSH BUTTONS, NO SPLICES IN 4 CONDUCTOR CABLE RUNS, END CABLE ONLY AT THE BUTTON
GROUND NO.8 BARE COPPER WIRE TO POLE

SPlice THE 7 CONDUCTOR CABLE AT THE HAND HOLE, TWIST TOGETHER USING WIRE NUTS, AND TAPE WATER TIGHT, INCLUDING THE IN OUT CABLES TO THE NEXT POLE. LEAVE ENOUGH SLACK 3'-4' TO BE ABLE TO MAKE SPLICES OUTSIDE OF THE POLE THROUGH HAND HOLE
JUNCTION BOX REQUIRED AT EACH POLE LOCATION

LEAVE 3' LOOP IN CABLES TO ALLOW FOR MOVEMENT

CONCRETE FOUNDATION SEE PLAN No. 751
**Speed bump**

1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Use caution; however, as concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

3. **EXPANSION JOINTS:**
   A. Make expansion joints vertical, full depth.
   B. Provide F1 joint filler material 1/2 inch wide, APWA Section 32 13 73.
   C. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT:** Make contraction joints vertical 1/8 inch wide and 1/3 slab thickness.

5. **FINISH:** Broomed.

6. **JOINT REPAIR:** If a crack occurs at the connection to existing pavement, seal the crack per APWA Section 32 01 17.
1. **UNTREATED BASE COURSE:** Provide material specified in APWA Section 32 11 23.
   A. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.
   B. Place material per APWA Section 31 23 23.
   C. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.

2. **CONCRETE:** Class 4000 per APWA Section 03 30 04.
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   B. Place concrete per APWA Section 03 30 10.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type ID Class A or B (clear with fugitive dye) membrane forming compound unless specified otherwise.

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   C. Set top of filler flush with surface of concrete.

4. **CONTRACTION JOINT:** Make contraction joints vertical 1/8 inch wide and 1/3 slab thickness.

5. **FINISH:** Broomed.

6. **JOINT REPAIR:** If a crack occurs at the connection to existing pavement, seal the crack per APWA Section 32 01 17.
PART 8

GENERAL

Design Standards
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Security Fencing
Plan  831  Chain link fence .............................................................. 321

Miscellaneous
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Design vehicle – type A

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

VERTICAL CREST ANGLE

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

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

VERTICAL CREST ANGLES

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

Design vehicle - type B
Chain link fence

1. FENCES 5 FEET HIGH OR HIGHER: Use twisted and barbed selvage, top and bottom.

2. FENCES LOWER THAN 5 FEET: Use knuckled selvage on top, and twisted and barbed selvage on bottom.

3. TRUSS RODS AND BRACES: Not required for fabric heights less than 5 feet high.

4. TENSION WIRE: Use zinc coated, galvanized, No. 7 gage spring coil steel. Set wire at 1 inch over natural ground or 6 inches over concrete structures.

5. PIPE: Use ASTM A 120, schedule 40, hot dipped zinc coated steel.

6. POST SPACING: Locate posts at equal spacing for each segment with maximum spacing specified in standard specifications.

7. BARB WIRE ARM: Face arm towards exterior of fenced area.

8. CONCRETE: Class 4000 per APWA Section 03 30 04. Place per APWA Section 03 30 10. Cure per APWA Section 03 39 00.
**FENCE**

<table>
<thead>
<tr>
<th>HEIGHT OF FABRIC</th>
<th>FENCE POSTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LENGTH OF END CORNER, OR PULL POST</td>
</tr>
<tr>
<td>7' 3'</td>
<td>10'</td>
</tr>
<tr>
<td>6' 3'</td>
<td>9'</td>
</tr>
<tr>
<td>5' 3'</td>
<td>8'</td>
</tr>
<tr>
<td>4' 2'</td>
<td>6'</td>
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</tbody>
</table>

**GATE POSTS AND GATE FRAMES**

<table>
<thead>
<tr>
<th>HEIGHT UNDER 6 FEET</th>
<th>FRAME</th>
<th>GATE OPENING</th>
<th>POST</th>
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</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>SINGLE TO 6' OR DOUBLE TO 12'</td>
<td>2&quot;</td>
<td></td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>SINGLE OVER 6' TO 8' OR DOUBLE OVER 12' TO 16'</td>
<td>2 1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>SINGLE OVER 8' TO 12' OR DOUBLE OVER 16' TO 24'</td>
<td>3 1/2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6 FEET AND OVER</th>
<th>FRAME</th>
<th>GATE OPENING</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2&quot;</td>
<td>SINGLE OVER 6' TO 13' OR DOUBLE OVER 12' TO 26'</td>
<td>3 1/2&quot;</td>
<td></td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>SINGLE OVER 13' TO 18' OR DOUBLE OVER 26' TO 36'</td>
<td>6&quot;</td>
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</tr>
<tr>
<td>1 1/2&quot;</td>
<td>SINGLE OVER 18' OR DOUBLE OVER 36'</td>
<td>8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

** DETAILS**

**Chain link fence**

April 1997

Plan No. 831
Bus stop pad

1. UNTREATED BASE COURSE: Provide material specified in APWA Section 32 11 23.
   A. Place material per APWA Section 32 05 10. Maximum lift thickness before compaction is 8 inches when using riding compaction equipment or 6 inches when using hand held compaction equipment.
   B. Compact per APWA Section 31 23 26 to a modified proctor density of 95 percent or greater.
   C. Do not use gravel as a substitute for untreated base course without ENGINEER’s permission.

2. CONCRETE: Class 4000 per APWA Section 03 30 04.
   A. If necessary, provide concrete that achieves design strength in less than 7 days. Caution; concrete crazing (spider cracks) may develop if air temperature exceeds 90 degrees F.
   B. Place concrete per Section 32 16 13.
   C. Provide 1/2 inch radius on concrete edges exposed to public view.
   D. Cure concrete per APWA Section 03 39 00 with type II Class A or B (white pigmented) membrane forming compound unless specified otherwise.

3. REINFORCEMENT: ASTM A 615, grade 60, galvanized or epoxy coated deformed steel. See APWA Section 03 20 00 requirements.

4. EXPANSION JOINT:
   A. Make joint full depth and vertical.
   B. Provide F1 joint filler material 1/2 inch wide; APWA Section 32 13 17.
   C. Set top flush with surface of concrete.

5. CONTRACTION JOINT:
   A. Make joint vertical.
   B. Make joint 1/8 inch wide and 2 inch deep or 1/4 slab thickness if slab is greater than 8 inches thick.
   C. Maximum length to width ratio for non-square panels is 1.5 to 1.
   D. Maximum panel length (in feet) is 2.5 times the slab thickness (in inches) to a maximum of 15 feet.
   E. Match location of contraction joints in adjacent concrete roadway pavements.

6. FINISH: Broomed.
CURB AND GUTTER

TYPE 'C' JOINT (PLAN No. 261)

CONTRACTION JOINTS (NOTE 5)

SAWCUT (TYP)

VARIES

PLAN

TYPE 'A' JOINT (PLAN No. 261)

CONCRETE (NOTE 2)

T=10" 8"

3'-0"

THICKENED EDGE

9'-0"

COMPACT SUBGRADE TO 95%

SECTION A–A

Bus stop pad

Plan No. 880

September 2001

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