TO: All Users of Construction Standards
FROM: Terry H. Otterness, Design Program Manager, Roadway Engineering Group
SUBJECT: New Metric Construction Standards

New Metric Construction Standard Drawings and Index have been completed and are hereby issued as a new document. Do not discard the existing non-metric version of the Construction Standard Drawings.

Unless otherwise noted on the standards, all length dimensions are in millimeters.

Slope designations for metric have changed from H:V (4:1, 6:1) to V:H (1:4, 1:6). For slopes steeper than 1:1, the horizontal component is unity. As an example, the old designation for a half to one slope (1/2:1) becomes 2:1.

There are two new standards, C-10.62 and C-10.71. Standard C-10.22 has a new second sheet that is a timber post alternate for the freeway guard rail.

One standard has been deleted: C-06.20 - Detour Geometrics.

Several standards have been revised in addition to conversion to metric. Major revisions include: revising gutter depression depths, eliminating Type A curb and gutter, clarifying gutter depression versus inlet depression at catch basins, revising reinforcing steel clearances and dimensions, and clarifying manhole frames and covers to match what vendors can supply.
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### Straight Hdwls w/End Sct, Pipe (l>200) (All Dia)

- Straight Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia=1,050 and larger)
- Straight Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>0,900 and smaller)
- "U" Hdwl w/End Sct, Pipe (l>200) (All Dia)
- "U" Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>0,900 and larger)
- "U" Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>1,050 and smaller)
- Wing Hdwl w/End Sct, Pipe (l>200) (All Dia)
- Wing Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>1,050 and larger)
- Wing Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>0,900 and smaller)
- "L" Hdwl w/End Sct, Pipe (l>200) (All Dia)
- "L" Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia=1,050 and larger)
- "L" Hdwl w/End Sct, Pipe (l>500 or smaller) (Dia>0,900 and smaller)
- Pipe Ext W/End Sct & Berm (l>200) (All Dia)
- Pipe Ext W/End Sct & Berm (l>500 or smaller) (Dia=1,050 and larger)
- Pipe Ext W/End Sct & Berm (l>500 or smaller) (Dia>0,900 and smaller)
- Pipe Ext W/End Sct Roadway Widening (l>200)
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GENERAL NOTES

1. Roadway width, cut ditch width, cross slope, and pavement structure section will be shown on project plans.

2. Design highwater should not be located above the subgrade in unserved ditch.

3. Pavement structure slope is nominal. Actual slope is controlled by QI. See Shoulder wedge detail.

4. Slopes beyond the pavement structure, such as embankment and inter slopes, are relative to horizontal.

5. For slopes within interchange areas, see project plans.

6. When median slopes intersect, see project plans for controls.

7. These slopes are intended to be used with new or reconstructed roadways.

- The 2.8 m/min is required when guard rail is utilized on the project. Treatment shall be uniform throughout the project length.

- The 2.8 m requirement may be waived under special conditions where guard rail is not utilized. The 2.8 m min shall not be waived when the thickness of structure section has not been finalized.

- All dimensions are in meters.

INTERMEDIATE SLOPES

SHOULDER WEDGE DETAIL

SLOPE Rounding DETAIL

Except in solid rock, or as directed by the Engineer, the intersection of roadway cut slopes with the ground surfaces shall be rounded. For cuts up to 1.0 m, use 1.0 m radii tangent for slope rounding. For each additional 0.5 m of cut and 0.3 m to semi-tangent 0.3 m maximum.
GENERAL NOTES

1. Roadway width, cut ditch width, cross slope, and pavement structure section will be shown on project plans.

2. Design highwater should not be located above the subgrade in un paved ditch.

3. Pavement structure slope is nominal. Actual slope is controlled by GI, shoulder slope details.

4. Slopes beyond the pavement structure, such as embankment and cut slopes, are relative to horizontal.

5. When median slopes intersect, see project plans for control.

6. These slopes are intended to be used with new or reconstructed roadways.

    The 2.8 m is required when guard rail is utilized on the project. Treatment shall be uniform throughout the project length. The 2.8 m requirement may be waived under special conditions where guard rail is not utilized. The 2.8 m min shall not be waived when the thickness of structure section has not been finalized.

All dimensions are in meters.

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

MINIMUM DITCH CONDITIONS DETAIL

SHOULDER WEDGE DETAIL

SLOPE ROUNDOFF DETAIL

Except in solid rock, or as directed by the Engineer, the intersection of roadway cut slopes with the ground surfaces shall be rounded. For cuts up to 1.8 m use 1.5 m semi-tangents for slope rounding. For each addition 0.3 m of cut and 0.3 m to semi-tangent to 3.3 m maximum.
GENERAL NOTES

1. Roadway width, cut ditch width, cross slope, and pavement structure section will be shown on project plans.

2. Design highwater should not be located above the subgrade in ungraded ditch.

3. Pavement structure slope is nominal. Actual slope is controlled by ID. See Shoulder Wedge Detail.

4. Slopes beyond the pavement structure, such as embankment and cut slopes, are relative to horizontal.

5. These slopes are intended to be used with new or reconstructed roadways.

The 0.8 m min is required when guardrail is utilized on the project. Treatment shall be uniform throughout the project length. The 0.8 m requirement may be waived under certain circumstances if determined by the Engineer. The 0.8 m shall be utilized. The 0.8 m min shall not be waived when the thickness of structure section has not been finalized.

All dimensions are in meters.

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

MINIMUM DITCH CONDITIONS DETAIL

SHOULDER WEDGE DETAIL

SLOPE RACING DETAILS

Except in solid rock, or as directed by the Engineer, the intersection of roadway, cut slopes, and ground surfaces shall be rounded. For cuts up to 80°, use 0.5 m radius; for slopes running for more than 90°, use 0.3 m to semi-tangent to 0.5 m maximum.
GENERAL NOTES

1. Round edge profile intersections with vertical curves having an approximate length in meters equal to 20% of design speed in km/h.

2. For main roadway curves without shoulders, Lc is the same as for shoulderless curves but with 0.1 Lc on tangents and 0.3 Lc on curves.

3. Shoulders transition with the adjacent travel lane when their normal cross slopes are the same.

4. If shoulders have a normal cross slope steeper than the adjacent lane, the shoulder transition will begin at a different point than that of the adjacent lane. See shoulder transition detail.

LEGEND

A - Point at which adverse crown removal begins.
B - Point at which super-elevation transition begins.
C - Point of equality between super-elevation and normal crown.
D - PLC location for circular curve transition.
E - Point at which full super-elevation is reached.
Lc - Length of Normal Crown Removal
Ly - Length of Super-elevation Runoff
E.T.L. - Edge of traveled lane
* - Distance BC + INCl.IL/1
φ - Length of Shoulder Transition = INCl.IL/RAD of shoulder.

SHOULDER TRANSITION DETAIL

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

SUPER-ELEVATION DISTRIBUTION

C-02S0

6/95
GENERAL NOTES

1. Dimensions of ditches shall be shown on the plans, as bottom width, depth and length.

2. Ditches shall be constructed with a minimum grade to prevent erosion. Ditch outlet treatment shall be as provided on plans.

All dimensions are in meters.
GENERAL NOTES
1. Dimensions of dikes shall be shown on the plans as top width, height, length and top of dike elevation.
2. Dike side slopes outside the recovery area shall be shown on the plans.

All dimensions are in meters.

TYPE B TRANSVERSE MEDIAN DIKE
- Slope relative to grade of median at intersection with toe.

TYPICAL TRANSVERSE MEDIAN DIKE INSTALLATION
GENERAL NOTES
1. Berm construction similar for box culvert and pipe with headwalls.

2. Berm construction shown is for extension of existing facilities. Berm construction similar for new facilities.

All dimensions are in meters.
### GENERAL NOTES

1. For C-02.10 slopes with embankment height over 7.3 m, use length for 7.3 m embankment height from Table 2.24 (180m, height > 7.2 m).

2. For C-02.20 slopes with embankment height over 9.6 m, use length for 9.6 m embankment height from Table 2.25 (180m, height > 9.6 m).

3. For C-02.30 slopes with embankment height over 10.4 m, use length for 10.4 m embankment height from Table 2.26 (180m, height > 10.4 m).

4. For spillway details, see Std C-04.10.

#### LENGTH OF SPILLWAY (m)

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### C-02.10 AND C-02.20 SLOPES

![Diagram of C-02.10 and C-02.20 Slopes](image)

**Spillway Length Table**

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**Spillway Details**

- See Std C-04.10.

**Spillway Length Table**

- C-04.30

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**Design Approvals**

-州立亚利桑那州交通运输局
-分部：公路
-标准图集

---

**STATE OF ARIZONA**

**DEPARTMENT OF TRANSPORTATION**

**DIVISION OF HIGHWAYS**

**STANDARD DRAWINGS**

**C-04.30**
### General Notes

1. For C-02.10 slopes with embankment height over 7.2 m, use length for 7.2 m embankment height from Table T-240, embankment height 7.2 m.

2. For C-02.20 slopes with embankment height over 8.6 m, use length for 8.6 m embankment height from Table T-360, embankment height 8.6 m.

3. For C-02.30 slopes with embankment height over 4.0 m, use length for 4.0 m embankment height from Table T-360, embankment height 4.0 m.

4. For downdrain details, see Std C-04.20.

### DownDrain Length Table

#### Table 1: DownDrain Lengths

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<th>Thickness (cm)</th>
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#### C-02.30 SLOPES

[Diagram of C-02.30 SLOPES]

#### C-02.10 AND C-02.20 SLOPES

[Diagram of C-02.10 AND C-02.20 SLOPES]
GENERAL NOTES

1. Stub shall have annular corrugation. Downdrain piping beyond stub may be either annular or helical.

2. Couplings shall be mechanical heat-shrinkable polyolefin sheets. One piece lap type neoprene sheet or slip seal at 300 mm min width and 0.32 mm min thickness.

3. Maximum Q Allowable = 0.23 m³/s
   Minimum Q Allowable = 0.3 m³/s
GENERAL NOTES

SINGLE CURB AND CURB AND GUTTER

1. Single curb and curb and gutter may be constructed by the use of forms or the concrete may be extruded.

2. When the pavement section slopes away from the gutter, the grade of the gutter shall match the pavement cross slope. Therefore, the gutter depression is not applicable.

3. Two inch deep contraction joints shall be placed in the curb and the gutter at locations where other joints in adjacent portional cement concrete pavement and at approximate 4.5 m centers when account to asphaltic concrete pavement, joints shall be either hand tooled or sawed.

4. Expansion joints shall be located at tangent points in curb returns, at structures and at maximum 18 m intervals. The 13 mm joint filler shall extend the full depth at the concrete.

5. Concrete shall be finished with a steel trowel followed by brushing with a fine brush along the length of the curb and gutter.

6. All exposed edges and hand tooled joints shall be finished with a tool having a 6 mm radius unless a larger radius is indicated.

EMBANKMENT CURB

1. No additional finish will be required after extrusion or removal of the forms when the curb presents a neat appearance and the surface is uniform in texture and color.

2. The curb shall conform to the cross section as shown except that the horizontal dimensions shall not vary more than 15 mm.

EXPANSION JOINT DETAIL

EMBANKMENT CURB

VALLEY GUTTER

CURB TERMINAL SECTION
Type 5 - Curb & Gutter Transition

Curb & Gutter
Type B or C
Std. C-05.10

Curb & Gutter
Type D
Std. C-05.10

Curb & Gutter
Type E or D
Std. C-05.10

See Plans

Type 6 - Curb & Gutter Transition

Curb & Gutter
Type B or C
Std. C-05.10

Curb & Gutter
Type D
Std. C-05.10

Curb & Gutter
Type E or D
Std. C-05.10

See Plans
GENERAL NOTES

1. Unless otherwise specified, driveways shall be 150 mm in depth.

2. Transverse contraction joints, 50 mm deep, shall be placed in driveways if the driveway width is over 6 m. If the driveway thickness is greater than 200 mm, 10 mm contraction joint depth shall be 1/3, where T is the thickness of the driveway. Joints shall be either formed or sawed. Forms shall be removed after concrete is finished with a tool having a 6 mm radius. See sheet 3 of 2 for the Construction Joint Detail.

3. Expansion joints shall be located between driveways and sidewalks and all building structures. The 13 mm joint filler shall expand the full depth of the concrete. See sheet 3 of 2 for the Expansion Joint Detail.

4. Concrete shall be finished by means of a float, then steel troweled and then broomed with a fibre brush in a transverse direction.

5. Top of curbing (C) and driveway elevations shown are in relation to the gutter, gutter (C).

6. Where curb heights of 150 mm or less are shown on plans, use dimensions shown in 1/16.

7. Where curb heights of more than 175 mm are shown on plans, see plans.

LEGEND

○ Cross slope (0.01 m/m typ)
● Straight grade with downward slope.
* Maximum slope = 0.02 m/m

SECTION A-A

SECTION B-B
GENERAL NOTES

1. Unless otherwise specified, sidewalks shall be 100 mm in depth.

2. Transverse contraction joints, 25 mm deep, shall be placed in sidewalks at intervals of approximately 45 m or at a spacing that matches adjacent curb and gutter. If the sidewalk is over 2.2 m in width, a 50 mm deep longitudinal contraction joint shall be placed in the center of the sidewalk. The maximum allowable spacing between contraction joints or scoring lines shall be approximately 1.4 m.

3. Expansion joints shall be located between sidewalks and driveways, and at abutting structures. Expansion joints shall match the joints in the adjacent concrete pavement or existing concrete curb and sidewalks. Maximum length of sidewalks without an expansion joint shall be 38 transverse meters. The 15 mm joint filler shall extend the full depth of the concrete.

4. Concrete shall be finished by means of a float, then steel troweled and then broomed with a tine brush in a transverse direction.

5. Sidewalks shall be constructed to a desirable width of 1.000 m on major streets, a minimum width of 1.200 m on residential streets, or as shown on the plans.

6. Scoring lines shall be 6 mm in depth. They shall be placed at 1500 mm spacing when the contraction joint interval is 4500 mm, and at 800 mm spacing when the contraction joint interval is 5600 mm.
GENERAL NOTES

1. Top of curb (TC) and top of ramp elevations shown are in relation to the gutter.

2. See Std C-05.10, C-05.11 and C-05.20 for joint requirements.

3. When curb heights of 150 mm or less are shown on plans, use dimensions shown in 1/16 in.

4. When curb heights of more than 175 mm are shown on plans, see plans and ADA requirements.

- For sidewalk widths greater than 1540 mm, the overall sidewalk ramp width shall match the sidewalk width.

ELEVATION

DEPRESSED CURB AT SIDEWALK RAMP

SECTION A-A

PERSPECTIVE

GROOVE DETAIL

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

SIDEWALK RAMP
TYPE: 4

C-05.30
Sheet 4 of 4
GENERAL NOTES

1. Traffic signs foundations, traffic sign foundations, and pull boxes for traffic signs and traffic signals shall be installed prior to placement of median paving.
2. See Std C-05.20, C-05.30, and C-05.20 for joint requirements.
3. Decorative median paving shall be stamped concrete, concrete pavers or as specified on the project plans.
4. Decorative median paving shall not be placed on a median nose transition or on a median island on a structure.
5. A 100 mm x 150 mm concrete header shall be used to end decorative paving at locations when concrete sidewalk ramps are not present.
6. Median nose transitions shall not be placed on departure ends of raised medians.
7. Top of curb (TC) and top of ramp elevations shown in relation to the gutter, Gutter Older.
8. When curb heights of 150 mm are shown on plans, use dimensions shown in ²/₂₄.
9. See Structure Plans for raised median structures.

SECTION A-A

SECTION B-B

SECTION C-C

NOSE TRANSITION LAYOUT
1. Driveway types:
   - Residential: one providing access to a single family residence, to a duplex, or to an apartment building containing five or fewer dwelling units.
   - Commercial: one providing access to an office, retail or institutional building or to an apartment building having more than five dwelling units.
   - Industrial: one directly serving a substantial number of truck movements to and from loading docks of an industrial facility, warehouse or truck terminals.

2. Joint use driveways may become desirable for landowners of adjacent properties to service both properties. If this is the case, only one of the two adjacent landowners need apply for the access permit, but a notarized written mutual agreement, signed by all parties involved, must accompany the application form.

3. Driveways for high volume traffic generators shall be approved individually by Traffic Engineering section.

4. Driveways with curb returns in urban areas shall be installed only with the approval of Traffic Engineering section.

5. Driveways and depressed curbs shall be located as noted on plans or as directed by the Engineer.

6. Drainage structures shall be provided under driveways where necessary.

7. Dimensions indicated as minimum shall be avoided whenever possible in favor of those indicated as desirable.

8. The Type "A" turnout is the preferred turnout design. Type "B" and "C" shall only be used when absolutely necessary.

9. Paved turnouts, plan notation, will be N XL surface material, type and standard. Examples: 6 m x 9 m ACTG, Type A, Std C-0610. Show radius (R) graphically.

10. Construction of curb, gutter, sidewalk and drainage facilities in urban areas by the permittee along that portion of the highway frontage under permit application may be a stipulation of the permit approval if there appears to be reasonable need.

11. Excavation or embankment for turnouts shall be included in quantities for main roadways.

12. Base material shall be the same as that shown for main roadway, unless otherwise noted.


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**URBAN DEVELOPMENTS**

- (1) 2.25 m Min
- Industrial Set Back Line
- Industrial - 6 m Min, 12 m Max

---

**RURAL DEVELOPMENTS**

- Residential - 3 m Min, 9 m Max
- P/L
- Industrial Set Back Line
- P/L

---

**GENERAL NOTES**

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STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DRIVEWAY & TURNOUT LAYOUTS

6/95
GENERAL NOTES
1. When load transfer dowel assemblies are required, use dimensions shown in 19a. See Assembly Placement and Edge Clearance Detail, Std C-07.02.
2. In all form-type pavement construction, LWP joints shall be used in flexible pavement construction either LWP or LC joints may be used.
3. Same as weakened plane joint detail, except initial saw cut will not be required.

JOINT ABBREVIATIONS
LWP - Longitudinal Weakened Plane Joint
TRP - Transverse Weakened Plane Joint
LC - Longitudinal Construction Joint
TC - Transverse Construction Joint
E. H. - Expansion Joints
S - AC/PCC Pavement Edge Seal Joint
T - PCCP Thickness

WEAKENED PLANE JOINT DETAIL
**Curb & Gutter Joint**
- **G Joint**
- 6 mm R (typ)
- New PCP
- 300
- 300

**Half Barrier Joint**
- **B Joint**
- New PCP
- 300
- 300
- 154x600 Reinforcing Bars at 1500 C to C

**Median Barrier Joint**
- **B Joint**
- PCCP on Both Sides of Barrier
- 13 mm Preformed Expansion Joint Material (typ)
- New PCP
- 300
- 300
- Silicon Sealant Recess 6 mm from Paveement Surface

**Median Barrier Joint**
- **B Joint**
- AC Pavement On Back Side of Barrier
- New AC Pavement
- 300
- 300
- 154x600 Reinforcing Bars at 1500 C to C

**Joint Abbreviations**
- D - Gutter Thickness
- C - Gutter Joint
- B - Barrier Joint
- T - PCP Thickness

**General Notes**
1. Joints are generally shown with pavement sloping toward the joint. Joints are similar with pavement sloping away from the joint.
GENERAL NOTES

1. Skewed PCP joints shall be used when load transfer dowel assemblies are not required.
2. "A" shall equal 1.3 minimum (Typical).
   "B" shall equal 0.9 minimum (Typical).
   "C" shall equal 0.6 minimum (Typical).
3. See Std C-07.01 for PCP joints and additional notes.
4. All transverse joints shall be in line with joints in adjacent slabs.
5. See Std C-05.01 for curb and gutter joint requirements.
6. At intersection of side roads or streets, joints shall be placed to give the intersection a symmetrical appearance while conforming to the cross section of the intersecting road or street.
7. The reinforcing bars in the LRP & LC joints shall be placed no greater than 0.375 m from the LC joint.

   Transverse Construction Joint (TC) allowable limits (Typ):

   All dimensions are in meters.
GENERAL NOTES

1. Skewed PCCP joints shall be used when load transfer dowel assemblies are not required.

2. "A" shall equal 1.2 minimum (typical), "B" shall equal 0.9 minimum (typical), "C" shall equal 0.6 minimum (typical).

3. See Std C-D1 for PCCP joints and additional notes.

4. All transverse joints shall be in line with joints in adjacent slabs.

5. See Std C-D2.4 for curb and gutter joint requirements.

6. At intersection of side roads or streets, joints shall be placed to give the intersection a symmetrical appearance while conforming to the cross section of the intersecting road or street.

7. The reinforcing bars in the LWP & LC joints shall be placed no greater than 0.375 m from the TC joint.

8. Transverse Construction Joint (TC) allowable limits (typ).

9. All dimensions are in meters.
GENERAL NOTES

1. Non-skewed PCCP joints shall be used with load transfer dowel assemblies.

2. See Sec C-07.01 for PCCP joints and additional notes.

3. All transverse joints shall be in line with joints in adjacent sides and are perpendicular (90°) to the longitudinal joints.

4. At intersection of side roads or streets, joints shall be placed to give the intersection a symmetrical appearance while conforming to the cross section of the intersecting road or street.

5. See Sec C-05.10 for curb and gutter joint requirements.

6. The reinforcing bars in the LWP & LC joints shall be placed no greater than 0.375 m from the TC joint.

7. Transverse weakened plane joint shall be constructed at least 1.8 m from a transverse construction joint.

All dimensions are in meters.
GENERAL NOTES

1. Non-sunked PCCP joints shall be used with load transfer sleeve assemblies.

2. See Sld C-07.08 for PCCP joints and additional notes.

3. All transverse joints shall be in line with joints in adjacent slabs and are perpendicular (90°) to the longitudinal joints.

4. At intersection of side roads or streets, joints shall be placed to give the intersection a symmetrical appearance while conforming to the cross section of the intersecting road or street.

5. See Sld C-05.10 for curb and gutter joint requirements.

6. The reinforcing bars in the LWP & LC joints shall be placed no greater than 0.315 m from the TC joint.

7. Transverse weakened plane joint shall be constructed at least 3.6 m from a transverse construction joint.

All dimensions are in meters.
GENERAL NOTES

1. Non-skewed PCCP joints shall be used with load transfer dowel assemblies.
2. See Std C-07.01 for PCCP joints and additional notes.
3. All transverse joints shall be in line with joints in adjacent slabs and are perpendicular (90°) to the longitudinal joints.
4. At intersection of side roads or streets, joints shall be placed to give the intersection a symmetrical appearance while conforming to the slab section of the intersecting road or street.
5. See Std C-05.10 for curb and gutter joint requirements.
6. The reinforcing bars in the LWP & LC joints shall be placed no greater than 0.375 m from the LC joint.
7. Transverse weakened plane joint shall be constructed at least 1.0 m from a transverse construction joint.

All dimensions are in meters.
GENERAL NOTES

1. Dimensions with a tolerance may be adjusted to align with the nearest transverse weakened plane construction joint as directed.
2. See Sta C-07.04 for joint information.
3. See plans for ramp dimensions.
4. See plans for C-07.05 for Sections 4-A and B-B.
5. The ratio of transverse to longitudinal joint spacing shall be greater than 2:1 but not more than 3:2.
6. Ramp transverse joints shall be perpendicular (90°) to the ramp longitudinal joints, except as shown at the ramp terminal.

- 1.8 Minimum
- Varies 5.0 maximum

- Transition, See Sta C-05.42
- Without curb & gutter
- 3.6 Face of Curb to Face of Curb

1. Mainline Structure Section, See Plans
2. Ramp Structure Section, See Plans
3. Curb Structure Section, See Sta C-08.20

All dimensions are in meters, unless otherwise shown.
RAMP TERMINAL AT CROSSROAD

SECTION A-A
RAMP TAPER

SECTION B-B
GORE AREA

RAMP WITH Curb AND GUTTER

RAMP WITHOUT CURB AND GUTTER

GENERAL NOTES

1. See Std C-07.04 for General Notes and Transverse Joint Layout at GORE Areas.
2. Without Curb & Gutter
   ▲ 0.8 Minimum
   ▾ Varies - 0.4 Minimum
   3.3 Minimum
   ▼ Face of Curb to Face of Curb
3. Transition, See Std C-05.12
   1. Mainline Structure Section, See Plans
   2. Ramp Structure Section, See Plans
   3. GORE Structure Section, See Std C-08.20

All dimensions are in meters, unless otherwise shown.
GENERAL NOTES

1. Bedding per Section 501 of the Standard Specifications.

2. Asphalt concrete shall be in accordance with the requirements of the Standard Specifications.

3. 300 mm (12) is required on the sides of trenches that are not parallel to the centerline of the street.

4. Types D & E require 225 mm of AB at top of trench when there is an existing base.

5. See Standard Drawing C-1316 for Typical pipe Installation.

LEGEND

- Compacted Backfill Density Per Section 501
- AB, Granular Backfill or Native Backfill Per Section 327-2 and 501
- AB Per Section 303-2 and 501

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS
TRENCH BACKFILL
AND PAVEMENT REPLACEMENT

C-07.06
GENERAL NOTES

1. See Std C-07.01 for joint information.
2. See plans for crossroad dimensions.
3. See Std C-07.04 and C-07.05 for ramp joints.
4. The ratio of transverse to longitudinal joint spacing shall be greater than 3.3 but not more than 3.9.
5. Transverse joints shall be perpendicular to the longitudinal joints, except as shown at the ramp terminal.
   ▲ 1.3 Minimum
   ○ Varies - 1.4 Maximum
   ■ Varies - 3.6 m when adjacent gutter widths are 600 mm or less.
   • 4.5 m when adjacent gutter widths are greater than 600 mm.

All dimensions are in meters.

CROSSROAD AT RAMP TERMINAL
GENERAL NOTES
1. For paved gore area details, see Std C-08.20.
2. Pavement deceleration is to be used only under special conditions necessitating ramp curvature ahead of gore.
3. The 50h taper and corresponding offsets shall also apply when the main roadway has curvature or combined tangent and curvature.
   * Normal to ramp.
   ** Distance normal to main roadway construction centerline.

All dimensions are in meters.
GENERAL NOTES

1. Shoulder Grooving shall be applied to the shoulders of rural highways when called for on the plans in accordance with the following shoulder widths:
   - Undivided highways: Shoulders 1.8 m and greater
   - Divided highways: Left shoulders 1.2 m and greater

2. Shoulder Grooving shall be omitted across principal intersecting roadways or other interruptions in normal shoulder width as directed by the Engineer.

3. Shoulder Grooving shall be constructed by making indentations in the asphaltic concrete.

   The indentations may be formed by rolling the hot asphalt concrete with a roller to which half segments of 50 mm nominal diameter pipe have been welded to the drum. The pipe segments shall be 600 mm long and spaced at approximately 200 mm centers.

4. Each roller shall be equipped with an acceptable guide that extends in front of the roller and is clearly visible to the operator in order that proper alignment of the completed scored shoulder is obtained.

5. The contractor may utilize other equipment or methods to construct the shoulder grooving if approved by the Engineer.
GENERAL NOTES

1. All embankment curb shall be protected by guard rail.

2. Guard rail shall extend beyond the limits of embankment curb.

3. See Std. C-10.03 for measurement limits.


PLAN

SECTION

TYPE A GUARD RAIL INSTALLATION
GENERAL NOTES
1. All embankment curb shall be protected by guard rail.
2. Guard rail shall extend beyond the limits of embankment curb.
3. See Std. C-10.03 for measurement limits.

PLAN

SECTION

TYPE B GUARD RAIL INSTALLATION
THREE BEAM BRIDGE RETROFIT

BRIDGE DADO RETROFIT
GENERAL NOTES

1. See plans and barrier summary sheets for location and type of guardrail, timber post installation shown.

2. See Construction Standard Drawings C-06.10, 06.12, 10.01, and 10.02 for dimensions and details not shown.

3. Type B guard rail installation shown. For Type A guard rail installation, use Type D-1 Curb and Gutter. Instead of the Type D-1 Curb and Gutter shown, for Type A guard rail installation, place the Guard Rail Extruder terminal as per Standard Drawing C-10.41.

4. See Plans for type and location of drainage facilities.

5. Bituminous joint filler (3 mm) shall be placed where the curb & gutter or concrete widening abuts isolated drains, catch basins, decks, barrier, etc. Segmented joints, 50 mm in depth, shall be placed to match adjacent joints in PCCP or at 4.5 m intervals where adjacent to AC or continuously reinforced concrete pavement.

SECTION A-A

Concrete Barrier Transition
Type D-1 C-10.31

Curb & Gutter Transition
Type D-1 C-05.10

Concrete Half Barrier Transition
See Plans

Approach W Beam Transition to Concrete Half Barrier
Std. C-10.80

SECTION B-B

Curb & Gutter Transition
Type 2

Curb & Gutter Transition
Type 2

Length = 4.0 m
Std. C-05.12

Concrete Half Barrier Transition
See Plans

Concrete Curb & Gutter Type B or C
Std. C-05.10

PLAN

Typical Half Barrier Terminal
W/Type B or C Curb & Gutter

Payment Limits
Type B or C Curb With Variable Gutter Width
Length = 20.75 m for Type A Guard Rail

Length = 25.95 m for Type B Guard Rail

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

6/95
GENERAL NOTES
1. See Std A-C-1,02 for other typical installations at bridge piers.
2. Transition median paving cross slope to meet level foundation pad. See Plans for length and location.

MODIFIED SINGLE PIER OR COLUMN

SECTION C-C

SECTION A-A

SECTION B-B
GENERAL NOTES
1. Use Type 3 Nested Steel W Beam to span downdrain or spillway inlet as shown in the plan view.
2. Use Type 3 to span multiple obstructions as shown in the elevation view.

PLAN

ELEVATION

NESTED STEEL W BEAM - TYPE 3 - LONG SPAN
Length = 11.430 m
GENERAL NOTES

1. See Std C-10.20 and C-10.21 for additional information and dimensions.

PLAN

ELEVATION

BOLTED ANCHOR
BOX CULVERT INSTALLATION
GENERAL NOTES

1. Drill through top of box culvert with rotary drill.
2. Bracket may be made of one piece hot bent, or two pieces welded together.
3. Short timber posts anchored to box culvert roof shall be 203x203 mm only.
Concrete Barrier Transition, Std C-10.10 or Bridge
Concrete Barrier Transition, Std C-10.80

254x254x1980 mm Wood Post

203x203x1625 mm Wood Post (Typ)

C150x12.2 Rub Rail
Std C-10.80

(152x203x356 mm Wood Block (Typ)

Measurement Limit

G4281 System
Gr G4281 System

Traffic

PLAN

Rectangular Plate
Washer (O) Required
(under head of Bolt
on the First Two Posts
Only)

M6x2x460 mm Button Head Bolt (O) and
Reducer Nut (O) with Wide Type A Plain
Washer Under Nut (Typ)

C150x12.2 Rub Rail
Std C-10.80

Rectangular Plate
Washer Not Required

Guard Rail Transition
(Timber Post)

ELEVATION

Notes:
For Notes and Dimensions Not Shown.
See Guard Rail Transition Above.

C150x12.2 Rub Rail
Std C-10.80

Post System

ELEVATION

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DESIGN APPROVED: 6/95

GUARD RAIL TRANSITION
# BEAM TO CONCRETE HALF BARRIER (APPROACH)
**Concrete Barrier**

**Half Barrier** (Block 1 Shown)

**Concrete Barrier**

**Half Barrier** (Block 2 Shown)

**Concrete Barrier**

**Median Barrier** (Block 2 Shown)

**Block and Anchorage Details**

**Block Details**

**Notes**
Block 1 is a 310x356x6.4 mm Plate

<table>
<thead>
<tr>
<th>BLOCK</th>
<th>A</th>
<th>B</th>
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<tr>
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<tr>
<td>5</td>
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<td>87</td>
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</tbody>
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Dimensions:
- Concrete Barrier:
  - Height: 373
  - Width: 211
  - Depth: 174
- Half Barrier (Block 1 Shown):
  - Width: 13
  - Depth: 19
- Half Barrier (Block 2 Shown):
  - Height: 211
  - Width: 13
  - Depth: 19
- Median Barrier (Block 2 Shown):
  - Height: 505
  - Width: 13
  - Depth: 19

**Material Details**
- M6x2 Hex Nut
- Lock Weld to Plate
- 6.4 mm Plate
- 19 mm R
- 80 mm x 150 mm x 80 mm
- 83 mm x 83 mm x 83 mm
- 80 mm x 40 mm x 40 mm
- 115 mm x 115 mm x 40 mm
- 310 mm x 310 mm x 40 mm
- Blocks 2, 3, 4 and 5

**Hardware**
- Beam Transition to Concrete Barrier

**State of Arizona Department of Transportation**

**Division of Highways Standard Drawings**

**Hardware for Beam Transition to Concrete Barrier**
TYPE B GUARD RAIL INSTALLATION

TYPE A GUARD RAIL INSTALLATION
TYPE B GUARD RAIL INSTALLATION

SECTION

PLAN

11400
6700

SECTION

PLAN

TYPE A GUARD RAIL INSTALLATION

11400
5500

Rounding - See Plans

Normal Slope
Per Plans

0.01%/m

Optional
Construction
Joint

Pavement Width

Variable Width Gutter
See Plans
Gutter Depression to Match
Adjoining Gutter Depression

Subgrade

Gutter Flow Line

Curb & Gutter
See Plans

Gutter Line

Curb & Gutter
See Plans

Curb & Gutter
See Plans

Curb & Gutter
See Plans

500 Taper

Gutter Flow Line

Gutter Flow Line
GENERAL NOTES
1. Soil plates, steel tubes, offset strut, yokes, bearing plate and pipe sleeves shall be fabricated from structural steel ASTM A 36/A 36M.

SOIL PLATE DETAIL

TYPE A POST DETAIL

TYPE B POST DETAIL

STEEL TUBE DETAIL

M6x2x240 mm Hex Bolt and Hex Nut with Rise Type A Plain Washers Under Head and Under Nut (Typ)

2 - M6x2x200 mm Hex Bolt and Hex Nut with Rise Type A Plain Washers Under Nut (Typ)

See Soil Plate Detail (Typ)

See Steel Tube Detail (Typ)

See Offset Strut Detail for Required Hardware

See Soil Plate Detail (Typ)

See Steel Tube Detail (Typ)
1. The cable assembly shall be tightened to remove slack.
GENERAL NOTES

1. Half Barrier shall be constructed by the slip form or formed cast-in-place method.
2. When obstacles are encountered which prevent the use of slip form equipment, the obstacle shall be accomplished by the use of stationary forms.
3. Concrete shall be Class 5, design strength f_c = 20 MPa.
4. If the footing and barrier are cast monolithically, 20M 5 shaped rebar will not be required.
5. In no case shall the width of barrier exceed the width of the barrier footing or overhang the adjacent pavement.
6. 10M Rebar shall extend 300 mm past the construction joint at the completion of the day's pour.

* Depth to match adjacent CPCP thickness (200 mm Min.)
GENERAL NOTES

1. Half Barrier shall be constructed by the slip form or
   formed Cast-In-Place method.

2. When obstacles are encountered which prevent the
   use of slip form equipment, the closure shall be
   accomplished by the use of stationary forms.

3. Concrete shall be Class S, design strength 20 MPa.

4. IOW Rebar shall extend 300 mm past the construction
   joint at the completion of the day's pour.

5. Thickness of footing, "D", can be adjusted to match
   the PCP thickness, as approved by the Engineer.

6. When the pavement section slopes away from
   the gutter, the slope of the gutter shall match the
   pavement cross slope. Therefore, the 50 mm gutter
   depression is not applicable.

7. When bridges are encountered, the cross slope of
   the gutter shall be transitioned to match the cross
   slope of the bridge. Length of the transition is 4.5 m.
GENERAL NOTES

1. Concrete shall be Class S, design strength f'c = 20 MPa.
2. If the footing and barrier are cast monolithically, 20M S shaped rebars will not be required.
3. In no case shall the width of barrier exceed the width of the barrier footing or overhang the adjacent pavement.
4. 10M Rebar shall extend 300 mm past the construction joint at the completion of the day's pour.
GENERAL NOTES

1. Concrete shall be Class S, design strength f'c = 30 MPa.

2. The half barrier shall be placed upon a bed of grout in order to provide a uniform bearing.

3. Dowel joints shall be grouted under pressure until all of the openings and the joints are filled.

4. This standard shall not be used when an individual run consists of less than five 6 meter sections.

5. All bend dimensions for reinforcing steel shall be cut to size of bars.

PLAN

ELEVATION

CONSTRUCTION JOINT DETAIL
GENERAL NOTES
1. All concrete shall be Class 5 (f.c.: 20 MPa).
2. All reinforcing steel shall conform to Section 003.
3. All reinforcing steel shall have 40 mm minimum clear cover unless otherwise noted.
4. Transversal construction joints shall extend through the foundation slab and be located at intervals not to exceed 6 m.
5. See drainage sheets for slotted drain and catch basin details.
6. Departure termination may be substituted for the C-1076 barrier transition under departure conditions.
7. See Std. C-0520 for sidewalk construction.
8. All bend dimensions for reinforcing steel shall be out-to-out of bars.

PLAN VIEW
NEW CURB
SLOPE TO MATCH BRIDGE CURB
13 mm ENHANCED JOINT FILLER
B
LIP OF GUTTER
SLOTTED DRAIN
SEE PLANS

PLANT VIEW

SECTION B-B
AT CATCH BASINS

ELEVATION

DEPARTURE TERMINATION DETAIL

BARRIER GUTTER DETAIL
GENERAL NOTES

1. Half Barrier shall be constructed by the slip form or formed Cast-In-Place method.

2. When obstacles are encountered which prevent the use of slip form equipment, the closure shall be accomplished by the use of stationary forms.

3. Concrete shall be Class S, design strength f<sub>c</sub> = 20 MPa.

4. If the footing and barrier are cast monolithically, 20M S shaped rebar will not be required.

5. In no case shall the width of barrier exceed the width of the barrier footing or overhang the adjacent pavement.

6. 20M Rebar shall extend 300 mm past the construction joint at the completion of the day's pour.

△ Depth to match adjacent PCCP thickness 1200 mm Min.

ELEVATION

SECTION A-A

WITH PCC PAVEMENT

WITH AC PAVEMENT
GENERAL NOTES

1. Concrete shall be Class 5, design strength f_c = 50 MPa.

2. Half Barrier shall be placed upon either geometric or Portland Cement Concrete Pavement.

3. Pavement thickness adjacent to Half Barrier shall be 10 mm minimum.

4. The Half Barrier shall be placed upon a bed of grout in order to provide a uniform bearing.

5. Grouted joints shall be grouted under pressure until all of the openings are filled.

6. This standard shall not be used when an individual run consists of less than five 6 meter sections.

7. All bend dimensions for reinforcing steel shall be cut to cut out of bars.

PLAN

ELEVATION

SECTION B-B
CONSTRUCTION JOINT DETAIL

END SECTION

SECTION A-A
GENERAL NOTES

1. Half Barrier shall be constructed by the Fixed Form Cast In Place method.
2. Concrete shall be Class S, design strength f_c = 20 MPa.
3. All reinforcing steel shall have 50 mm minimum clear cover unless otherwise noted.
4. All bend dimensions for reinforcing steel shall be out-to-out of bend.

PLAN

See Dowel Installation and Construction Joint Detail

ELEVATION

BARRIER WITH CURB AND GUTTER
Joint Assembly
Concrete Barrier
13 mm Bituminous Joint Filler
Concrete Barrier Transition
30 mm Dia Sleeve
100
330
280

Dowel Locations

DOWEL INSTALLATION AND CONSTRUCTION JOINT DETAIL

Rub Rail Terminal Anchor
Std. C-10.74

520
150
50
165
255

RUB RAIL SLOT DETAIL

Roadway Width

65
150
Variety of See Plans
6 R

25 R

Barrier End

Concrete Barrier

Block Anchor Assembly
Std. C-10.74

# Beam Transition Block
Std. C-10.39

19

BLOCK AND ANCHORAGE HALF BARRIER (BLOCK 2 SHOWN)

Concrete Barrier

Ferrule Wing Nut Block Anchor
Std. C-10.74

# Beam Transition Block
Std. C-10.39

19

BLOCK AND ANCHORAGE HALF BARRIER (BLOCK 1 SHOWN)

Curb End

CURB TRANSITION DETAIL

Roadway Width

65
150
Variety of See Plans
6 R

100 R

25 R

13 mm Batter

13 mm Batter
BLOCK ANCHOR ASSEMBLY

TERMINAL CONNECTOR ANCHOR ASSEMBLY

* Each Weld Shall Develop The Tensile Strength Of The Wire

FERRULE WING NUT BLOCK ANCHOR

RUB RAIL TERMINAL ANCHOR
1. All concrete shall be Class '5' f'c = 20 MPa.
2. All reinforcing steel shall conform to Section 1003.
3. All reinforcing steel shall have 40 mm minimum clear cover unless otherwise noted.
4. See drainage sheets for slotted drain and catch basin details.
5. Barrier transition shall match both adjoining curb and gutter and concrete hate barrier.
7. All bend dimensions for reinforcing steel shall be out-to-out of bar.
GENERAL NOTES
1. Concrete shall be Class 'S' f/c = 20 MPa.
2. All reinforcing steel shall conform to Section 1003.
3. All reinforcing steel shall have 40 mm minimum clear cover unless otherwise noted.
4. See drainage sheets for slotted drain and catch basin details.
5. Barrier transition shall match both adjoining curb and gutter and concrete half barrier.
6. See Std. C-05.20 for sidewalk construction.
7. All bend dimensions for reinforcing steel shall be out-to-out of bar.
**GENERAL NOTES**

1. All concrete shall be Class "S" (f'c = 20 MPa).
2. All reinforcing steel shall conform to Section 1003.
3. All reinforcing steel shall have 40 mm minimum clear cover unless otherwise noted.
4. See drainage sheets for dapped drain and catch basin details.
5. Barrier transition shall match both adjoining curb and gutter and concrete half barrier.
6. All bend dimensions for reinforcing steel shall be out-to-out of bars.

- Varies = 750 mm; 1350 mm or width as per plans.

---

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**

---
1. All concrete shall be Class "5" (fck = 20 MPa).
2. All reinforcing steel shall conform to Section 1003.
3. All reinforcing steel shall have 40 mm minimum clear cover unless otherwise noted.
4. See drainage sheets for slotted drain and catch basin details.
5. Barrier transition shall meet the adjoining concrete half-barrier alignment.
6. See Std. C-05.20 for sidewalk construction.
7. All bend dimensions for reinforcing steel shall be out-to-out of bar.
Concrete Barrier Transition, Std C-10.10, C-10.11 or Bridge Concrete Barrier Transition, Std B-21.10 & B-21.20

C150x12.2 Rub Rail

Rub Rail Transition Assembly, Std C-10.83

44111 System
44291 System
44150 System
44250 System

PLAN

Rub Rail Anchor Std C-10.83

M6x2x340 mm Round Head Square Neck Bolt and Hex Nut with Wide Type A Plain Washer (Under Nut) Type

Modified C150x12.2 Rub Rail
See Rub Rail Detail

ELEVATION - TIMBER POST

Rub Rail Anchor Std C-10.83

M6x2x75 mm Round Head Square Neck Bolt and Hex Nut with Wide Type A Plain Washer (Under Nut) Type

Modified C150x12.2 Rub Rail
See Rub Rail Detail

ELEVATION - STEEL POST
**PLAN**

**RUB RAIL BACK BLOCKOUT DETAIL**

**SECTION**

- M16x2x40 mm Hex Bolt and hex Nut with Wide Type A Plain Washer (Typ)
- M16x2x40 mm Round Head Square Neck Bolt and Hex Nut with Wide Type A Plain Washer (Typ)

**PLAN**

- STEEL POST
- TIMBER POST

**Elevation**

**RUB RAIL TERMINAL ASSEMBLY**

**Rub Rail Terminal Anchor (Typ) Std. C-10.83**

**Hardware for Rub Rail**

- Rub Rail Terminal Anchor
- M16x2x80 mm Hex Head Bolt with Round Washer (Typ)
- M16x2x80 mm Hex Head Bolt with Round Washer (Typ)

**Design Approver: John M. Ottone**

**State of Arizona Department of Transportation Division of Highways Standard Drawings C-10.83**
GENERAL NOTES

1. Posts shall be 3810 mm C to C. Structural steel shall conform to ASTM A 36/A 36M, galvanized ASTM A 123.

2. Hex head bolt shall conform to ASTM A 320, galvanized ASTM A 153 Class C.

3. Helical spring lock washer shall conform to ASTM A 325, galvanized ASTM A 153 Class C.

4. Tension wire 3.17 mm thick, galvanized to conform to ASTM A 116 Class B.

5. Hog ring 2.68 mm thick, galvanized ASTM A 116 Class B. Fasten glare screen to top and bottom tension wire spaced approximately 600 mm apart.

6. Glare Screens 1.02 mm thick steel, galvanized ASTM A 653/A 653MZ coating 7700. Expanded to the following dimensions: 34 mm long, 100 long, 1000 long, and 1000 long. Glare screen shall be installed such that its portion of screen blocks light from headlights. See Direction Detail.

7. Splices allowed in glare screen at posts only, with full-diameter overlap.

8. Glare screen shall be constructed without interruption to the greatest degree possible.

ELEVATION

TENSION WIRE ROUTING DETAIL
GENERAL NOTES

1. Material for shoulder transition shall be placed to the finished roadway elevation for the entire length of the transition, then the roadway is paved. Aggregate Subbase or Aggregate Base shall be used. When roadway is unpaved, a material equivalent to the existing roadway shall be used.
GENERAL NOTES

1. This design applicable only to wood tie track construction. Wood arms shall be unpainted and cut from material meeting the specifications of the existing ties.

2. 76x76x4.8 mm treads, 50x12.7 mm bearing bars and 50 mm nominal diameter pipe wing assemblies shall be primed with one coat of No. 1 paint and finished with two coats of yellow enamel paint.

SECTION B-B

SECTION A-A

NOTE:
For Section Between Double Track, Detail No. 3

DETAIL NO. 1

DETAIL NO. 2

DETAIL NO. 3

DETAIL NO. 4

DETAIL NO. 5

© SHIM HEIGHT

<table>
<thead>
<tr>
<th>RAIL</th>
<th>RAIL WEIGHT Kg/m</th>
<th>39.7</th>
<th>44.6</th>
<th>54.6</th>
<th>57.0</th>
<th>59.0</th>
<th>65.0</th>
<th>14.4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SHIM HEIGHT mm</td>
<td>57</td>
<td>73</td>
<td>89</td>
<td>98</td>
<td>103</td>
<td>111</td>
<td>116</td>
</tr>
<tr>
<td>16 mm DIAMETER GALVANIZED DOME HEAD SPIKE</td>
<td>SPIKE LENGTH mm</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>280</td>
<td>330</td>
<td>330</td>
<td>330</td>
</tr>
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</table>

FOR 2.4 M TIES

FOR 2.7 M TIES

Verlis with Tie Length
See Detail No. 1 and No. 2.
GENERAL NOTES
1. Length of post and braces shall not be less than 2134 mm.
2. Woven wire fence fabric shall be attached to the post at the top, bottom, and intermediate wires.
3. Intermediate Post Assemblies shall be located as shown and at intervals to utilize standard roles to minimize cutting and waste.
4. A twisted wire stay shall be centered between posts.
5. ASTM design number

TYPICAL WOVEN WIRE FENCE INSTALLATION-TYPE 1 WW SHOWN

TYPE 1 WOVEN WIRE (WW)

TYPE 2 WOVEN WIRE (WW)

TYPE 3 WOVEN WIRE (WW)

TYPE 4 WOVEN WIRE (WW)

FENCE FABRIC DIMENSIONS AND DESIGN NUMBERS
GENERAL NOTES

1. Intermediate Post Assemblies shall be located as shown at intervals not to exceed 200 ft., or midway between all braced posts.

2. For gate fence the bottom wire shall be barless.

3. The stays on gate fence shall have their ends turned up to prevent injuries to game.

TYPICAL BARBED WIRE FENCE INSTALLATION-TYPE 2 BW SHOWN

TYPE 1 BARBED WIRE (BW) (4 WIRE)

TYPE 2 BARBED WIRE (BW) (5 WIRE)

BARBED WIRE GAME FENCE (GF)
GENERAL NOTES
1. Post assemblies shall consist of an upright angle 64x64x6.4 mm at 8.00 kN/m, and brace angles 64x64x6.4 mm at 4.75 kN/m.

TYPICAL FENCE LOCATION AT CATTLE GUARD

TYPICAL CROSS SECTIONS OF LINE POST SHAPES

DETAIL A

TYPICAL FENCE LOCATION

DETAIL B
INTERMEDIATE POST ASSEMBLY

DETAIL C
END POST ASSEMBLY

DETAIL D
CORNER POST ASSEMBLY

DETAIL E
FENCE CONNECTION TO WINGWALL
GENERAL NOTES

1. Posts shall be round, in-section, or rod-formed and shall conform to the nominal dimensions and tolerances for all phases as described in Section A. Dimensional tolerances for all phases shall be in accordance with ASTM A490. In addition, the nominal thickness of all posts are fabricated shall have a nominal thickness, before galvanizing, of not less than 2.0 mm for line posts and 3.3 mm for terminal posts.

2. Chain-link fabric shall be either zinc-coated or aluminum-coated galvanized steel wire fabric. Zinc-coated or aluminum-coated steel shall conform to the requirements of ASTM A490. Coated. Aluminum-coated steel fabric shall conform to the requirements of ASTM A463, with a minimum weight of coating of 22 g per square meter of wire surface area. Fabric shall be 3.0 mm thick for all fence fabric 1520 mm or less in height and shall be 3.76 mm thick for fences greater than 1520 mm in height.

3. Other wires shall be 4.85 mm diameter coil spring or steel wire with a minimum tensile strength of 520 MPa and shall be zinc-coated or aluminum-coated.

4. Truss rods shall be 9.5 mm diameter adjustable rods. Truss tightening shall have a strip thickness of not less than 6.3 mm.

5. Stretcher bars shall be 4.76 mm by 19 mm steel flat bars. Stretcher bar bands shall be 3 mm by 25 mm preformed steel bands.

6. Bottom tension wire shall be 7.5 mm from top of crown on concrete footings.

7. Intermediate post assemblies shall be spaced at 150 meter intervals or midway between pull posts when the distance between such posts is less than 150 meters and more than 150 meters.

8. See State 3 of 3 for typical fence location.

TYPICAL CHAIN LINK FENCE INSTALLATION - TYPE I SHOWN

TYPICAL POST DIMENSIONS

<table>
<thead>
<tr>
<th>Fabric Height</th>
<th>Corner, End, Intermediate, Gate, Latch and Pull Posts</th>
<th>Line Posts</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Length (m)</td>
<td>Roll Formed</td>
</tr>
<tr>
<td>915</td>
<td>1830</td>
<td>60</td>
</tr>
<tr>
<td>1200</td>
<td>2130</td>
<td>60</td>
</tr>
<tr>
<td>1520</td>
<td>2440</td>
<td>60</td>
</tr>
<tr>
<td>1830</td>
<td>2740</td>
<td>60</td>
</tr>
<tr>
<td>Over 1830</td>
<td>Height 73</td>
<td>89x99</td>
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STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

FENCE, CHAIN LINK TYPE I
C-1220
Sheet 1 of 3
GENERAL NOTES

1. Barbed wire for use with Type 2 chain link fence shall be 2.50 mm thick stainless steel wire with 4 point 2.03 mm thick barbs spaced 127 mm apart and shall be either zinc-coated or aluminum-coated. Zinc-coated steel wire shall conform to the requirements of ASTM A221, Class 1 coating. Aluminum-coated steel wire shall conform to the requirements of ASTM A585, Type 1, Class 1 coating.

2. Barbed wire support arms shall be of the type shown on the plans, shall be fabricated from commercial quality steel, and shall be zinc-coated in accordance with the requirements of AASHTO M151.

3. Bottom tension wire shall just clear top of crown on concrete footings.

4. For details and notes not shown - see chain link fence Type 1, sheet 1 of 3.

5. See sheet 3 of 3 for typical fence location.

TYPICAL CHAIN LINK FENCE INSTALLATION - TYPE 2 SHOWN

TYPICAL POST DIMENSIONS

<table>
<thead>
<tr>
<th>Fabric Height</th>
<th>Corner, End, Intermediate, Gate, Latch and Put Posts</th>
<th>Line Posts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Round</td>
<td>Rot Formed</td>
</tr>
<tr>
<td></td>
<td>Length</td>
<td>L</td>
</tr>
<tr>
<td>1830</td>
<td>2590</td>
<td>60</td>
</tr>
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DETAIL G
BARBED WIRE SUPPORT ARM
### Typical Gate Dimensions

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<thead>
<tr>
<th>Gate Leaf Width</th>
<th>Vertical Braces</th>
<th>Gate Post Size</th>
<th>Gate Leaf Width</th>
<th>Vertical Braces</th>
<th>Gate Post Size</th>
<th>Gate Leaf Width</th>
<th>No of Equally Spaced Vertical Braces</th>
<th>Tension Rods Per Braced Panel</th>
<th>Gate Post Size</th>
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<tr>
<td>1830 H or Less</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1830 to 3960</td>
<td>1</td>
<td>0</td>
<td>1830 to 3960</td>
</tr>
<tr>
<td>915 to 2440</td>
<td>0</td>
<td>73</td>
<td>915 to 2440</td>
<td>0</td>
<td>73</td>
<td>3960 to 4880</td>
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<td>1</td>
<td>3960 to 4880</td>
</tr>
<tr>
<td>2440 to 4880</td>
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<td>102</td>
<td>2440 to 4880</td>
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<td>102</td>
<td>4880 to 6400</td>
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<td>4880 to 6400</td>
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<td>4880 to 5490</td>
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<td>102</td>
<td>4880 to 5490</td>
<td>2</td>
<td>102</td>
<td>6400 to 8230</td>
<td>2</td>
<td>1</td>
<td>6400 to 8230</td>
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<td>8530 and Larger</td>
<td>3</td>
<td>1</td>
<td>8530 and Larger</td>
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</table>

### Notes
- **Single and Double Swing Gates**
- **Rolling Gates**
- **Gates for Chain Link Fence - Type 1 Shown**
  (Type 2, With Barbed Wire Typical)
GENERAL NOTES

1. All concrete shall be Class S, 30 psi.

2. All bolts, nuts, washers and fittings shall meet the dimensional requirements of the American National Standards Institute (ANSI) unless otherwise designated and shall be galvanized in accordance with ASTM A453.

3. Galvanized swaged fitting and U-Bolt shall conform to ASTM A449.

4. The 19 mm galvanized wire rope shall conform to ASTM A30 8.2 Type 2.

5. The wire fabric, ties, bands, stretcher bars, and other fittings and hardware shall conform to AASHTO M28.

6. The wire fabric fence shall follow contour of the graded median.

7. The exception for the concrete anchor block shall be to meet ties. Maximum excess shall be 75 mm.

8. Perforated posts shall be square tube formed from 3.67 mm thick ASTM A 500/A 500M cold rolled carbon steel. The square tubes shall be welded directly in the corner by high frequency resistance welding or equal. The posts to be externally scarfed to agree with standard corner radii of 4 mm ± 0.6 mm.

9. Perforated posts shall be galvanized to the requirements of ASTM A 653/A 653M. Coating shall be 27.5.

10. The cables shall have enough tension to prevent sagging. The location of the concrete anchor blocks may be varied to provide enough tension to keep prevent sagging.

11. Two interior U-bolt and clamp bars shall be spaced at 1/3 of the distance between posts.

12. See Standard C-12-2D for 1200 mm fabric details.

13. An alternate to rectangular concrete anchor block shall be a 900 mm diameter round footing with an additional depth of 100 mm.

14. The median approach grade within 30 m of the chain link cable barrier should not exceed a grade break of 10 percent.
GENERAL NOTES

1. Pipes shall be installed either in a trench condition or in a non-trench condition in natural ground or in embankment.
2. In a trench condition, the vertical and horizontal limits shall be maintained. If horizontal limits are exceeded or the vertical limits are not maintained, a non-trench condition exists.
3. Bracing and shoring shall conform to OSHA requirements.
4. Pipe backfill may be bedding material.
5. In a non-trench condition, the embankment for pipe stability shall be constructed in lifts to the limits shown in the detail simultaneously with the bedding and pipe backfill. If the contractor chooses to construct it as a trench condition, the embankment shall be constructed before excavating the trench.

D - Outside diameter of full circle pipe or outside dimension (when wall is not of arch, arch pipe, elliptical pipe).

T - Minimum wall thickness for NCCP. See Plans.

Δ - D + 500 mm maximum for diameters up to 1220 mm and D + 900 mm maximum for diameters 1220 mm and over.

- 150 mm except when an unyielding or unstable material. See standards specifications.

- TRENCH BACKFILL
- PIPE BACKFILL
- BEDDING

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

TYPICAL PIPE INSTALLATION
C-1315
GENERAL NOTES
1. Design of end section shall conform to standards.
2. End section joint conformation shall match the pipe joints.
3. Embankment slope shall be warped to match slope of end section.

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Approx Weight</th>
<th>Approx Slope</th>
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<tr>
<td>610</td>
<td>690 kg</td>
<td>1105 762 1867 1219 3</td>
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<tr>
<td>685</td>
<td>875 kg</td>
<td>1257 610 1867 1372 3</td>
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<tr>
<td>760</td>
<td>990 kg</td>
<td>1372 502 1873 1524 3</td>
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<tr>
<td>910</td>
<td>1860 kg</td>
<td>1600 883 2482 1829 3</td>
</tr>
<tr>
<td>1010</td>
<td>2440 kg</td>
<td>1600 889 2489 1981 3</td>
</tr>
</tbody>
</table>

PLAN

SECTION A-A

SPACING FOR MULTIPLE INSTALLATION

FRONT ELEVATION

SKewed CULVERT

RIGHT ANGLE CULVERT

Culvert Length as Shown on Plan

Embankment Slope

Normal Toe of Slope

Culvert Length as Shown on Plan
**GENERAL NOTES**

1. The end section may be joined to the pipe or connector section by bolts, rivets, dimpled bands, slip-seam bands or threaded rod type fasteners. For allowable connector types, see table.

2. The type 1 connector is by means of bolts or rivets. Maximum circumferential fastener spacing shall be 100 mm or a minimum of 8 fasteners per joint. The type 1 joint may be used with either annular or helical corrugations.

3. Type 2 and 3 connectors shall be used only with annular or helical pipe with a requisite number of annular corrugations.

4. Type 4 and 5 connectors shall be used with helical pipe.

5. All steel end section components shall be galvanized.

6. Toe of embankment shall be beveled to match toe of skewed end section.

7. A term shall be added to match toe of skewed end section.

8. The foregoing applies to all cross section configurations.

---

**Dimensions**

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>Ga</th>
<th>A</th>
<th>B</th>
<th>H</th>
<th>L</th>
<th>W</th>
<th>Approx Slope</th>
<th>Connection Type</th>
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<td>152</td>
<td>194</td>
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<td>760</td>
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<td>310</td>
<td>203</td>
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**Dimensions**

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<th>Rise</th>
<th>A</th>
<th>B</th>
<th>H</th>
<th>L</th>
<th>W</th>
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<td>1346</td>
<td>2134</td>
<td>23</td>
</tr>
</tbody>
</table>
GENERAL NOTES

1. For lateral dimensions of invert paving, use 72" control for DAM and span for DWA.

2. Paving shall be scored laterally at 450 mm minimum intervals along the length of the pipe.

3. Use bevel on inlet headwall only.

4. Wire mesh shall be fastened or welded to corrugation crests at intervals and in a manner approved by the Engineer. Laps shall be 150 mm minimum.

5. Paving shall not be placed until backfilling is completed.

6. Concrete shall be Class B.

7. See Std C-14:20 for headwall and bevel dimensions not shown.

HEADWALL INSTALLATION

PROJECTING INSTALLATION

SECTION A-A

SECTION B-B
GENERAL NOTES

1. This end treatment is to be used only for those cattle and/or vehicle passes not used for drainage.

2. All concrete shall be Class B. An optional 50 mm AB invert covering base course and 100 mm of concrete may be used in the 3600 mm diameter pipe.

3. Anchor bolts shall be retained in a horizontal position during pour with final tightening a minimum of 7 days after pour.

4. Pipe shall be backfilled before concrete bond beam is constructed. Minimum forming may be used.

5. Edges of wire mesh shall be fastened or welded to corrugation creases at intervals and in a manner approved by the Engineer. Laps shall be a minimum of 150 mm.

6. For installation normal to roadway centerline only.
TYPE D & G CURB AND GUTTER WITH SLOTTED DRAIN

Concrete Class B
AB Class 2
460 or 610 CMP

Excavation Limits When Placed Adjacent to PCPP

Bearing Bar
150x4.8 mm Plate Cont

100x300 mm Plate Cont

Concrete Anchor Bolt
with 13 mm Heavy Hex Nut at 610.6 C to C

M12x1,5x120 mm Round Head Square Neck Bolt
with Heavy Hex Nut

CMP Coupling Band with
36.7, 64x36x4.8x38 mm

CMP Slotted Drain

SECTION A-A

Finished Grade

A

Typical

14 mm Square Hole

Typical

150 (Typ)

CMP joint Sealant

Coupling Band

SECTION B-B

GENERAL NOTES

1. Slotted drain pipe shall be 68x3 mm corrugated steel pipe with a minimum wet thickness of 1.63 mm and shall conform to the requirements of AASHTO M66A.

2. All concrete shall be Class B.

3. Reinforcing steel shall conform to AASHTO M-300.

4. Structural steel shall conform to ASTM A 36 A 36M.

5. Concrete anchors shall conform to ASTM A 307 and hex nuts shall conform to ASTM A 36M, Class 8.

6. All slotted drain pipe hardware except anchor bolts and reinforcing steel shall be given two coats of Zn paint.

7. When annular pipe is used, apply water proof sealer before attaching coupling bands.

8. When helical pipe is used, it shall be formed with at least one annular corrugation at each end of each pipe section. Water proof sealer shall be applied to the annular corrugation prior to attachment of coupling bands.

9. Cover slot during construction with removable tape or other acceptable substitute.

10. Slotted drain pipe shall be clean at the time of final acceptance.

11. Concrete curb and gutter thru the slotted drain shall be paid for under the respective curb and gutter items.

12. Refer to curb and gutter details for dimensions and details not shown.


STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

SLOTTED DRAIN DETAILS

C-13.6
GENERAL NOTES

1. Pipe collars not required where direct catch basin connections can be made within 1" of a normal 90°
   installation, either horizontally or vertically.

2. "T" connections direct to the main drainage trunk line should be avoided and used only where manhole
   connections are impractical.

SECTION A-A
TYPICAL CONNECTION BETWEEN
CATCH BASIN AND MANHOLE

SECTION B-B
Pipe Cross Connection

SECTION C-C
TYPICAL CONNECTION BETWEEN
CATCH BASIN AND MAIN STORM DRAIN

SECTION D-D

PLAN
TYPICAL SLOTTED DRAIN AND CATCH BASIN
INSTALLATION WITH MANHOLE

PLAN
TYPICAL SLOTTED DRAIN AND CATCH BASIN
INSTALLATION WITHOUT MANHOLE
GENERAL NOTES
1. Prefabricated tees shall be used when the outside
   diameter of the inlet pipe exceeds one half of the
   inside diameter of the main storm drain, except
   when the mains are shown on plans.
2. Centerline of the inlet pipe shall intersect the
   centerline of the main storm drain except when
   elevation "S" is shown on plans.
3. If L is 45° or less, type 1 shall be used.
4. All concrete shall be class B.
5. All reinforcing steel shall conform to 1003-1.2,
   Grade 300.
6. Reinforcing steel shall have 50 mm minimum cover.
**GENERAL NOTES**

1. All shear pin angles shall be flush and true to face. Cover with waterproof grease prior to installation of pin.

2. Shear pin holes in the angle shall be drilled for a tight fit of the pins.

3. Both ends of the shear pins shall be peened after installation.

4. Shear pin material shall be commercially pure aluminum wire alloy 1000, Temper 0, Federal Spec. QQ-A-515A.

5. Gevantize at ferrous parts after fabrication.

6. Frame and hinge angles shall have the outstanding legs out.

7. All structural steel shall be ASTM A 36/A 36M.

8. Barrier bars shall be equally spaced.

9. Hinge pin material shall be bolt stock and threaded on both ends so nut and lock washer can flush with the lower angle. Cover pin with waterproof grease prior to installation. Insert or damage exposed threads after installation.

**PIECE ACCESS BARRIER FRONT ELEVATION**

**ACCESS BARRIER GATE DIMENSION SCHEDULE**

<table>
<thead>
<tr>
<th>Size of Outlet Pipe</th>
<th>No. of Barrier Gates</th>
<th>Frame Length</th>
<th>Shear Pin Clip Angle</th>
<th>Hinge Pins</th>
<th>Hinge Angles</th>
<th>No. &amp; Length of Anchor Bolts</th>
<th>W (Out of Frame Angle)</th>
<th>Strapping (kg)</th>
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<tbody>
<tr>
<td>760</td>
<td>1</td>
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<td>13*</td>
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<td>13*</td>
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<tr>
<td>1220</td>
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<td>127x76x6.4</td>
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<td>19*</td>
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<td>4-1170</td>
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<td>127x76x6.4</td>
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<td>19*</td>
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<td>5-2365*</td>
<td>13-990*</td>
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</table>

* Per Gate

**INSTALLATION DETAIL FOR DOUBLE GATES**

**STORM DRAIN OUTLET DETAILS**

STATE OF ARIZONA  DEPARTMENT OF TRANSPORTATION  DIVISION OF HIGHWAYS  STANDARD DRAWINGS  C-13,75  OUTLET DETAILS  6/95
GENERAL NOTES

1. Compact soil at end of pipe plug to 95% of maximum density.
2. If depth of cover is less than 1.5 m or greater than 3 m increase plug thickness a minimum of 100 mm.

DRAINAGE OUTLET INTO CHANNEL

STORM DRAIN PLUG

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

STORM DRAIN
OUTLET DETAILS

C-13.75
Sheet 2 of 2
GENERAL NOTES

1. All concrete shall be Class B.
2. All reinforcing steel shall conform to (003-1), Grade 60.
3. All reinforcing steel shall have 75 mm minimum clear cover.
4. A concrete collar shall be required where pipes of different diameters or materials are joined or where the design change in alignment or grade exceeds that allowed for a standard joint.
5. When pipes of different diameters are joined with a concrete collar, "T" and "H" shall be those of the larger diameter.
6. The diameter of the circular ties shall be the outside diameter of pipe + T.
7. Pipe ends to be trimmed such that the maximum distance between pipes at any point is 50 mm.

| PIPE COLLAR TABLE |
|-------------------|-----|-----|-----|
| Pipe Size | L   | T   | 10M Ties |
| 300     | 300 | 100 | 3    |
| 460     | 300 | 125 | 3    |
| 610     | 300 | 150 | 3    |
| 760     | 450 | 200 | 3    |
| 910     | 450 | 200 | 3    |
| 1070    | 525 | 250 | 4    |
| 1220    | 525 | 250 | 4    |
| 1370    | 525 | 250 | 4    |
| 1520    | 525 | 275 | 4    |
| 1680    | 600 | 275 | 5    |
| 1830    | 600 | 350 | 5    |
| 1980    | 600 | 350 | 5    |
| 2130    | 675 | 400 | 5    |
| 2440    | 675 | 400 | 5    |

OUTLET COLLAR DETAIL
GENERAL NOTES

1. Pipes can be placed in any wall.
2. Sump floor shall have a wood trowel finish and a minimum 1/4" slope in all directions to outlet.
3. All structural steel shall be ASTM A36/A36M.
4. Welding shall be in accordance with Standard Welding Specifications.
5. Grade, frame, beam and nose angle shall be given one shop coat of No. 1 paint.
6. All concrete shall be Class B.
7. Construction joints and drains shall be placed to meet field conditions. See Std C-15A.70.
8. Any specified inlet depression shall be warped to opening according to Std C-15A.70.
9. Curb opening areas, sq. ft, for type 1-single and type 1-double equal 0.023 and 0.046, respectively. For each 25" of "H" x inlet depression - 60 mm. See Std C-15A.70.
10. See Stds C-15A.50 and C-15A.60 for grate and frame details and grate opening areas.
11. x 19" for longitudinal and 75" for transverse bar gratles.
   ** 600 mm for L, LB, EF, TW and TB series I; for L, LB, EF, TW and TB series II; and for L, LB, EF, TW and TB series III, use 555 mm with combined curb and gutter.
   *** 650 mm for L, LB, EF, TW and TB series II; and for L, LB, EF, TW and TB series III, use 555 mm with combined curb and gutter.
   150 mm when H > 2.5 m or less.
   200 mm when H > 2.5 m but less than 5.0 m. See Section B-B.

SECTION B-B
USE THIS SECTION WHEN "H" > 200 mm

DETAILED DRAWING

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
STANDARD DRAWINGS

6/95

CATCH BASIN, TYPE I

C-15A.70
PLAN - CATCH BASIN TYPE 4 - SINGLE

GENERAL NOTES

1. Pipes can be placed in any wall.
2. Sump floor shall have a wood trowel finish and a minimum 1% slope in all directions toward outlet pipe.
3. Curb over catch basin shall not be constructed until catch basin concrete has set for a minimum of 24 hours.
4. See Std C-15.50 and C-15.60 for grate and frame details and opening areas.
5. Any specified inset depression shall be warped to opening according to Std C-15.70.
6. All structural steel shall be ASTM A 36/A 36M.
7. Grate, frame, and beam shall be given one shop coat of No. 1 paint.
8. All concrete shall be Class B.
9. Construction joints and grating shall be placed to meet field conditions, Std C-15.70.
10. ** - 19 mm for longitudinal and 75 mm for transverse bars, 60 mm for LR, LB, EF, TR and TB series 1 grates, 455 mm for LK, LB, EF, TR and TB series 2 grates. Use 455 mm with combined curb and gutter.

** - 150 mm when H is 2.5 m or less.
200 mm when H is greater than 2.5 m. See Section B-B.

SEC_ION B-B
USE THIS SECTION WHEN t>200 mm

DETAIL NO. 1

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
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STANDARD DRAWINGS
CATCH BASIN, TYPE 4
C-15.50

6/95
GENERAL NOTES

1. LW = Longitudinal welded
   LB = Longitudinal bolted
   EF = Electroformed

2. Restrict use to grades of 3/3 or less.

3. Grating units and frames shall be fabricated from structural steel ASTM A36/A36M except as noted.

4. All welding shall be in accordance with Standard Welding Specifications.

5. The completed assembly shall be given one shop coat of No. 1 paint.

6. Frames and grates shall fit to a maximum rock of 2.4 mm at any point.

7. For type EF grates, see Std C-15.50.

---

SECTION FRAME

PLAN

Delete Anchors on One Side for Curb Opening Basin
Std C-15.10
(1 typ)

Delete Anchors on One End for Basins Using I-Beam
Grate Support
Std C-15.10, Detail No. 2
(1 typ)

SECTION

GRATES TYPE TW-1 AND TW-2

Grate Type | Clear Bar Spacing | No. Bars | X | Grate Opening Sq m
---|---|---|---|---
TW or TB - 1.0 | 25 | 26 | 76 | 0.278
TW or TB - 1.2 | 35 | 35 | 308 |
TW or TB - 2.0 | 50 | 16 | 28 | 0.433
TW or TB - 2.1 | 26 | 26 | 21 | 0.216
TW or TB - 2.2 | 35 | 35 | 21 | 0.224
TW or TB - 2.2 | 50 | 16 | 28 | 0.246

BAR SPACER DETAIL

CAST IRON, CAST STEEL OR STEEL BAR STOCK

Nut and Cut Washers

Spot Weld or Peel

13 mm Rods

Threaded Ends

X (See Table)
GENERAL NOTES
1. No inlet depression shall extend into a traffic lane.
2. Maximum combined gutter and inset depression is 75 mm. See Detail No. 1.
3. Maximum distance along curb between catch basins where full gutter depression is used is 10 ft.
4. See Std. C-15.80 for aprons used with C-15.80 Catch Basin.

LEGEND
- Normal pavement or gutter flow line elevation.
- Depressed elevation.
- Straight grade with downward slope.
- Normal gutter width per Std. C-05.10.
- Types 1, 3, & 5.
- Type 4 & C-15.11.

CATCH BASIN SPACING AT SUMP CONDITION

INLET DEPRESSION

CATCH BASIN WITH SLOTTED DRAIN

CATCH BASIN TYPE 4
OFF ROADWAY LOCATION

CATCH BASIN CONSTRUCTION DRAIN
DRAIN MAY BE DELETED AT OPTION OF ENGINEER
GENERAL NOTES

1. Apron shall be 4C or portland cement concrete as specified on plans.
2. All concrete shall be Class B.
3. Grating shall be fabricated of structural steel.
4. Structural steel shall be in accordance with ASTM A 36/A 36M.
5. Welding shall be in accordance with Standard Welding Specifications.
6. Grating assembly shall be given one shop coat of No. 1 paint.
7. W indicated on plans.

* 200 mm when Net Height Exceeds 2.5 m.

SECTION A-A

SECION B-B

MEDIAN DITCH GRADE DETAIL

DETAIL NO. 1
GENERAL NOTES

1. Concrete shall conform to the requirements for Class I Concrete. The minimum strength shall be 30 MPa.

2. Grout shall be in accordance with Standard Specifications except water content shall be such that the consistency is proper for smooth troweling.

3. Grate cross rods shall be resistance welded, fillet welded or electro-forged to bearing bars.

4. The completed grate shall be given one shop coat of No. 1 paint.

5. Foundation soil and backfill shall be in accordance with Section 203-5 of the Standard Specifications.
GENERAL NOTES
1. All structural steel shall be in accordance with ASTM A 36/A 36M.
2. Grate design is not suitable for locations subject to bicycle traffic.
3. All welding shall be in accordance with Standard Welding Specifications.
4. The completed grate assembly frame & grate shall be given two shop coats of No. 1 paint.
5. The installation and inspection of steel studs welded to steel acting as connection devices to the concrete shall conform to the American Institute of Steel Construction Steel Welding Code AWS D1.4-47.

<table>
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<tr>
<th>Grate and Frame Dimensions</th>
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</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

SECTION A-A

SECTION B-B

BRACE PLATE DETAIL
GENERAL NOTES

1. All concrete shall be Class B.

2. All reinforcing bars shall be 10W except two 20W bars over pipe. Bar spacing approximately 300 mm center to center unless otherwise noted.

3. 10° wing wall flare shows 45° normally desirable. See Hydraulics and Utility and Railroad Engineering Sections.

PIPE DIMENSIONS

<table>
<thead>
<tr>
<th>ID</th>
<th>L</th>
<th>E</th>
<th>F (Approx)</th>
<th>$m^3$ Concrete</th>
<th>Reinforced Steel</th>
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<tr>
<td>40</td>
<td>600</td>
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STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

460 TO 1520 mm DIAMETER PIPES

6/95
GENERAL NOTES

1. All concrete shall be Class B.
2. Structural steel shall be in accordance with AS/NZ 3678.
3. All cover steel and exposed appurtenances shall be given one shop coat of No. 1 paint.
4. Pumps shall specify locked or bolted cover for standpipe No. 2.
5. For specific details of a flush pavement or sidewalk installation, see Utility and Railroad Engineering Section.
PRECAST IRRIGATION GATE
For Open Ditch Installation
TYPE 1

ELEVATION
SECTION

Masonry Mortar
Slope to fit
Local Conditions

Ground Line

Pipe Size 150 mm Thru 460 mm
as noted on plans

Pipe Size 150 mm Thru 460 mm
as noted on plans

Slot in Concrete for Gate

Utility Concrete Ring
for Lawn Installation

Concrete 1" or
3/8" to be included
with valve.

Irrigation Valve Number of Valve
shall correspond to the size of
Pipe, No 150 to No 350.

ELEVATION
SECTION

IRRIGATION GATE
For Standpipe Installation
TYPE 2

PART SECTION
FLUSH IRRIGATION VALVE

TYPE 2 IRRIGATION GATE
For pipes 150 mm through 610 mm. Gate and frame
shall be galvanized iron. Type shown is for concrete
pipe. For DWP, external steel adjustable band shall be
used in place of internal steel ring.
GENERAL NOTES

1. Rock shall be sound and durable, of rounded or angular shape and with a maximum diameter of 200 mm or less. Pebbles and boulders shall not be included. Mortar or set-in-place rock is not acceptable.

2. Wire mesh splice shall have a 150 mm minimum lap vertically and horizontally.

TYPE 1 AND 2 BANK PROTECTION

<table>
<thead>
<tr>
<th>TYPE</th>
<th>H</th>
<th>TOP OF BANK PROTECTION ABOVE THE STREAM BED</th>
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<tr>
<td>3</td>
<td>0 to 600</td>
<td>600 to 1200</td>
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<td>0 to 900</td>
<td>1200 to 2100</td>
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<tr>
<td>2</td>
<td>0 to 1800</td>
<td>1800 to 3600</td>
</tr>
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TYPE 3 BANK PROTECTION

Min. 9.07 kg Retread Rail or Equal, 2.5 m Long, Type 3 Bank Protection, 2 to 1.5.
GENERAL NOTES

1. Rock shall be sound and durable, of rounded or angular shape and with a nominal diameter of 100 mm and 525 mm minimum. Flat or needle shaped are not acceptable. Rock shall be comprised of 50% min 200 to 300 mm and 50% max 450 to 525 mm.

2. Wire mesh splice shall have a 150 mm minimum tie vertically and horizontally.
GENERAL NOTES

1. Precast manholes shall conform to the requirements of AASHTO M 1999, except that the compressive strength of each unit will be determined and accepted in accordance with Section 106(a) of the AASHTO Specifications.  

2. Concrete for all other manholes shall be Class B.

3. Every fifth course of bricks in manhole No. 1 shall be laid as stretchers.

4. See Std C-18.30 and C-18.40 for additional information and dimensions.

5. See plans for Std C-18.20 frame and cover type.

6. Steps shall be placed in manholes in accordance with the requirements of AASHTO M 1999.

7. See Std C-18.40 for location of Station Location Reference Point.

8. Manhole height, "H", shall be measured from the lowest pipe invert to the top of the manhole frame.
GENERAL NOTES

1. When specified on the plans, the cover excluding grates shall include agency identification and conform to the following: Lettering on manhole cover to contain name of agency and utility as directed. Letters and words to be equally spaced. Letters to be 51 mm in height and raised 3 mm above level of cover. Type of lettering and layout to be submitted for approval.

2. Casting weights shown are minimum weights and are for either cast iron or ductile iron castings. Maximum casting weights shall not exceed 105 percent of weights shown.

3. WBL loading minimum.

4. Details shown are typical.

5. Alternate designs of manhole frame and cover may be utilized with the approval of the engineer as long as minimum loading and weight are equivalent.
GENERAL NOTES
1. All dimensions are minimum except where noted.
2. Location and elevation shown on plans.
3. Conspicuous to conform to Sect. 303-2 or 501.

PLAN

PRECAST ADJUSTING RING DETAIL

SECTION
MANHOLE COVER FRAME
ADJUSTMENT - PAVEMENT
CUT AND REPLACEMENT

Four Steel Spacers, 100x50 mm, Thickness
As Required From 13 to 50 mm. When
Thickness is less than 13 mm Use Mortar.
When大于 50 mm, Use Brick Or
Precast Adjusting Rings

2-No. 2 Hoops, 6.3 mm in Thickness.
For 100 mm Ring Tied with 5 mm Thick Wire.
150 and 200 mm Rings Require 4-No. 2 Hoops.

Set Thoroughly and
Paint with Grout.
GENERAL NOTES
1. Ford walls shall be Class B concrete.
2. Depth gauge tubing shall be protected against concrete entering through bottom or perforations.
3. Depth gauge tubing and both sides of numeric tabs shall be painted with two coats of white enamel. Numerals and markers shall be painted with one coat of gloss black enamel.

CONCRETE SURFACE ROAD
CONCRETE WALLS

BITUMINOUS SURFACE ROAD
CONCRETE WALLS

J O I N T  D E T A I L

E L E V A T I O N  L O O K I N G  U P S T R E A M

V e r t i c a l  A l i g n m e n t  t o  b e  a s  n e a r  a v e r a g e  t r a n s v e r s e  g r a d e  o f  s t r e a m  a s  p o s s i b l e

D e p t h  G a u g e  ( 2 )

D e p t h  G a u g e  ( 1 )

W e l l  t o  b e  b u i l t  t o  t h e  f o o t  a b o v e  h i g h  w a t e r  l e v e l

W e l l  m a y  b e  b u i l t  t o  t h i s  l i n e
GENERAL NOTES

1. All timber shall be rough, pressure treated and unpainted.
2. Rock basket, full length of structure, shall be included only when called for on plans.
3. See plans for bituminous surface and base material details.
4. See Std C-19.20 for Depth Gauge details. Depth Gauge foundation may be utility concrete.

WITH TREATED BASE

TYPE 1
BITUMINOUS SURFACE ROAD

- Width of Seal Coat
- Roadway Width
- Flow
- Finished % Grade
- Slope 0.015 m/m

DETAIL A

- Rock Fill 150 mm Min Size
- 300 mm Dia x 300 Deep
- Conc Foundation for Depth Gauge, Full Circle for Type 1, Half Circle for Type 2
- 50 mm Nom Pipes 2.1 m, 2.4 m C to C

ELEVATION - TYPE 2

- Optional Rock Basket
- Full Length of Structure
- See Detail A and Plans

TYPE 2
BITUMINOUS SURFACE FORD
TIMBER CUTOFF WALLS

- Optional Rock Basket
- Down Stream from Cut Off Well
- Depth of Wall
- 3-2 by 12 Planks
- 89x89x500 mm Post
- 1.5 m C to C
- 99x99x500 mm Post
- 1.5 m C to C
- 2-38x286 mm Planks
- 40¢ Common Nails 3 Per Board
GENERAL NOTES

1. A survey monument, frame and cover, complete in place shall be considered a unit.

2. A right of way marker, consisting of a survey monument and a reference marker complete in place shall be considered a unit.

3. All markers shall be placed as shown on the plans or as directed by the engineer.

4. Frames may be either Type A or Type B.

5. Frames shall weigh at least 24 kg.

6. Covers shall weigh at least 9 kg.

7. Portions of the frame and cover to be machined is shown by the symbol "M". The allowable tolerance for machined areas shall be 0.4 mm. Concrete shall conform to the requirements of the specifications.

* 300 mm or pavement structure thickness, whichever is greater.

ELEVATION
SURVEY MONUMENT

H.W.Y. R. O.F W:
P.C. 10 + 543.826

RIGHT OF WAY MARKER

SURVEY MONUMENT
FRAME AND COVER

COVER SECTION

REVISED 03/10/2015

DESIGN: HARVEY OTTAWAY

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

SURVEY MONUMENT, FRAME AND COVER, RIGHT OF WAY MARKER

C-2110
GENERAL NOTES

1. Standard Marker may be used as bench, survey monument or N/M markers.
2. Standard Marker shall be made of brass, bronze or aluminum.
3. Standard Marker shall be furnished by the Department. Cast-insetter format may vary.
4. Bench Marks shall be established on headwalls, bridge curbs or other permanent structures.
5. Surfaces of Aluminum Markers in contact with concrete shall be epoxy coated.
6. Fluted shank may be straight or twisted.
7. Station, elevation, year or other information shall be hand stamped in field, as approved by the Engineer.
1. All concrete shall be Class B.

**FOR SINGLE INSTALLATION**

<table>
<thead>
<tr>
<th>Quotations Per Ft of Slab Length</th>
<th>Concrete</th>
<th>Reinforcing Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.237 m³</td>
<td>16 kg</td>
</tr>
</tbody>
</table>

**SECTION A-A**

10 mm Bars 300 C to C
Full length of slab
Lap 600 mm at splices

20 mm Bars at 150 C to C

**CROSS SECTION**

Utility Line

Slab Length as Shown on Plans
GENERAL NOTES

1. Type A encasement to be used for sewer laterals or house connections BELOW water lines.

2. Type B encasement to be used for sewer laterals or house connections ABOVE water lines.

3. The encasement shall extend at least 1.8 m on each side of the water line and must include the nearest joint.

4. Protection for Type A required when distance from bottom of water to top of sewer line is 600 mm or less. When the sewer is a 150 or 300 mm house connection no protection is required if distance is more than 600 mm.

5. For Type A crossings, Class 150 CIP, or ductile iron pipe may be used as an alternate. For Type B crossing reinforced encasement is always required.

TYPE A ENCASEMENT

TYPE B ENCASEMENT
GENERAL NOTES

1. Type A pipe support may be used for any type of crossing condition.

2. Type C pipe support may be used for crossing pipes with a bell diameter of 450 mm or less if sufficient clearance over storm sewer is available and total span is less than 5.0 m.

3. Intermediate pipe supports shall be used in conjunction with Type C pipe support if total span exceeds max. B in table.

4. The contractor shall be responsible for furnishing all supports both permanent and temporary. Temporary supports shall not be a separate pay item.

5. Permanent pipe supports may be decreased from plan quantities or extended to include some listed below as temporary supports if conditions warrant these changes at the time of construction. Decision shall be made by the engineer.

6. When Type A pipe support is used and whenever so directed by the engineer, the contractor shall place the wall with suitable openings to prevent unequal pressure resulting from flooding of the backfill. The volume of the placed opening shall not exceed 1/2 the volume of the supporting wall.

7. Use Type B pipe support instead of Type C when clearance between pipes is less than 1 in table.

8. Concrete cover for reinforcing steel shall be 75 mm, minimum.

SCHEDULE OF REQUIRED SUPPORTS

<table>
<thead>
<tr>
<th>PERMANENT</th>
<th>TEMPORARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cast Iron Pipe</td>
<td>Conc Storm Drain</td>
</tr>
<tr>
<td>Conc Irrig Pipe</td>
<td>Conc Box Culvert</td>
</tr>
<tr>
<td>Buried Trench</td>
<td>Traffic Control Conduit</td>
</tr>
<tr>
<td>Gas Pipe</td>
<td>Water and Sewer Lines</td>
</tr>
</tbody>
</table>

NOTE: Other utilities as noted on the plans or as required by the engineer at time of construction.

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

PIPE SUPPORT ACROSS TRENCHES
C-22.20
Sheet 2 of 3
GENERAL NOTES

1. Precast, reinforced manhole sections shall be manufactured in accordance with AASHTO M 1296, except that the compressive strength of each unit will be determined and accepted in accordance with section 206.3 of the specifications.

2. Manhole steps shall be installed at the site of the manhole section and manufactured in accordance with industry standards meeting AASHTO M 1296 requirements. Steps not required in 1220 mm manhole.

3. Use low alkali cement only.

4. Pipe sizes and elevations shown on plans.

5. Frame and cover shall be adjusted to the finished grade prior to placing of the asphaltic concrete or RCCP surface.

PRECAST SEWER MANHOLE

TYPE B TOP

Brick or Concrete for Final Adjustment

Rubber Gasket with Expanded Bell Joint

Mastic or Approved Gasket

TYPE A TOP

Pre-Cast Eccentric Conical Top Manhole

Brick may be Used in Lieu of Precast Adjusting Rings

Steps in 1220 mm Manhole only See Note 2

Ball Up or Down Contractor Option

Cast in Place

Press into Base

Class 5 Concrete Base, f'c=25 MPa

Flow

Round or Square Base Optional
GENERAL NOTES
1. Compact soil at end of pipe to 95% of maximum density.
2. If depth of cover is less than 1.5 m or greater than 3 m, increase plug thickness a minimum of 100 mm.

TYPICAL STUB OUT

PIPE PLUG MARKER

STORM DRAIN LINE PLUG

SEWER LINE PLUG

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>PLUG THICKNESS 'A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>300-910</td>
<td>200</td>
</tr>
<tr>
<td>990-1200</td>
<td>300</td>
</tr>
<tr>
<td>1290-1500</td>
<td>450</td>
</tr>
<tr>
<td>1900-2290</td>
<td>600</td>
</tr>
<tr>
<td>2440-2900</td>
<td>800</td>
</tr>
<tr>
<td>3050-3550</td>
<td>900</td>
</tr>
<tr>
<td>3500-3810</td>
<td>1000</td>
</tr>
</tbody>
</table>

13 mm Layer
Cement Plaster
Water Tight
Block or Brick
and Mortar Plug
See Note 2

Band Seal Coupling

No. 20 Cooper Wire with Yellow
Insulation or 50x100 mm Stake
TYPE A

750 TO 1500 mm DROP

TYPE B

1500 mm OR MORE DROP
CLEANOUT INSTALLATION

200 mm Cast Iron Frame and Cover Std C2U10

Unpaved Streets and Alleys

Paved Streets and Alleys

Class B Concrete 150 mm Thick, 1000 mm Diameter

Compacted Backfill or Undisturbed Earth

Standard 45° Bend

Vitrified Clay Pipe

Size of Pipe as Shown on Plans

To be Laid on Undisturbed Earth or Compacted Backfill Material or All Class 2

Flow Line Elevation Shown on Plans to this Point

Station and Length Shown on Plans to this Point
GENERAL NOTES

1. Thrust blocks are to extend to undisturbed ground.

2. All concrete shall be class B.

3. Table is based on 14,650 kg/m² soil, if conditions are found to indicate soil bearing less, the areas shall be increased accordingly.

4. Areas for pipe larger than 400 mm shall be calculated for each project.

5. Form all non bearing vertical surfaces.

<table>
<thead>
<tr>
<th>PIPE SIZE (mm)</th>
<th>WATER PIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TEE, DEAD END, 90° BEND</td>
</tr>
<tr>
<td>100 &amp; LESS</td>
<td>0.28 m²</td>
</tr>
<tr>
<td>150</td>
<td>0.37</td>
</tr>
<tr>
<td>200</td>
<td>0.56</td>
</tr>
<tr>
<td>250</td>
<td>0.84</td>
</tr>
<tr>
<td>300</td>
<td>1.21</td>
</tr>
<tr>
<td>400</td>
<td>2.14</td>
</tr>
</tbody>
</table>

SECTION A-A
GENERAL NOTES

1. Gate valves 100 to 400 mm may be used with any type of pipe.
2. Gate valves larger than 400 mm to be detailed on plans.
3. Butterfly valves 75 to 300 mm may be used with any type of pipe.
4. Butterfly valves larger than 300 mm to be detailed on plans.
5. Valve box and cover required per Std C-23.30.
GENERAL NOTES

1. Either this detail or restraint rods may be used when allowed to relocate a water line upward to cross over a conflict.

2. Ductile iron pipe may be used.

3. Anchor blocks for places larger than 300 mm shall be calculated for each project.

4. Reinforcing bars to be coated with 2 coats of coal tar, epoxy, or other approved methods.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>MINIMUM BAR SIZE</th>
<th>A-DIMENSION HOOKS</th>
<th>MINIMUM BLOCK DIMENSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 mm</td>
<td>20M</td>
<td>150 mm</td>
<td>900x900x900</td>
</tr>
<tr>
<td>200 mm</td>
<td>20M</td>
<td>225 mm</td>
<td>1200x1200x750</td>
</tr>
<tr>
<td>300 mm</td>
<td>25M</td>
<td>225 mm</td>
<td>1200x1500x1500</td>
</tr>
</tbody>
</table>

* For 88 psi Working Pressure
GENERAL NOTES
1. This detail covers moving of water mains, 50 to 300 mm only.
2. Thrust blocking per Std C-23.10 and C-23.20.
3. If offset is to go over obstruction, joint restraints must be used.
4. Pipe is to be cast iron or ductile iron.
5. 45° cast iron bends may be used in place of cast iron offsets.
6. Drop section is to be prefabricated and installed as a single unit for cast iron mechanical joints.

CAST IRON

ASBESTOS CEMENT

CAST IRON MECHANICAL JOINT
GENERAL NOTES

1. Extension stem required on all valves where operating nut is over 1.5 m below surface. Extension stem shall be 30 mm minimum diameter steel bar, 300 mm long, with square socket on bottom to fit square valve nut. Length to be determined for each installation. 30 mm square operating nut to be held on top of the extension stem with stop nut.

2. If two or more joints of ACP are used to make a riser, use standard ACP pipe rubber gasket coupling to join pipe. Where riser pipe length exceeds 3 m, use 300 mm ACP pipe.

3. All steel to have prime coat of paint No. 4 and one heavy application (finish coat) of Light Grey Enamel paint as per section 1002-406L.

4. Valve box shall be adjusted to the finished grade prior to the pouring of the asphale concrete surface or RCCP.

5. Ground below the concrete pad or three bricks to be compacted to 95% of maximum density.

6. Use Bonk, Tyler 1000, or equal deep smooth cover 100 mm or more type, side adjustable cast iron valve box. CI minimum 15 210 MPa.

TYPE A-I
TO BE USED IN AREAS SUBJECT TO VEHICULAR TRAFFIC
TYPE A-2
TO BE USED WHEN VALVE BOX IS LOCATED WITHIN PCCP PAVEMENT

Finish Grade
Cover Only

200 mm Class 150 ACP Riser Pipe or Approved Equal
Class B Concrete
Alternate Bricks

TYPE B
NOT SUBJECT TO VEHICULAR TRAFFIC

Cast Iron Cover and Valve Box See Note 4
Finished Grade
Concrete Ring not Required when Adjusted in Unpaved Areas
The Word "Water" on the Cover (Typ)
Asphaltic Conc Pavement See Note 4
Poured Concrete Color 150 mm Thick and 750 mm Diameter

TYPE C
GENERAL NOTES

1. Thrust blocks are to extend to undisturbed ground.
2. Optional blocking of 500x200x500 mm solid concrete masonry units may be used as indicated.
3. All concrete shall be class B normally, cure 24 hours before backfilling, or use high, early strength concrete.
4. All tapes shall be made by city crews at prevailing rates.
5. Install permanent blocking under valve before tap is made. All flange bolts shall be clear of footing.
6. All tapping sleeves must be pressure tested prior to request for tap by city.
7. Contractor shall excavate as shown and shall set tapping sleeve and valve, and tighten all bolts prior to requesting city to make tap.
8. Tapping sleeve to be placed a minimum of 450 mm from any belt, coupling, valve, or other obstruction.
9. Areas for pipe larger than 400 mm shall be calculated.

PLAN

ELEVATION

<table>
<thead>
<tr>
<th>SIZE OF PIPE BEING CONNECTED</th>
<th>MINIMUM THRUST AREA REQUIRED (A x B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mm &amp; LESS</td>
<td>0.28 m²</td>
</tr>
<tr>
<td>150 mm</td>
<td>0.37 m²</td>
</tr>
<tr>
<td>200 mm</td>
<td>0.56 m²</td>
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<tr>
<td>250 mm</td>
<td>0.84 m²</td>
</tr>
<tr>
<td>300 mm</td>
<td>1.21 m²</td>
</tr>
<tr>
<td>400 mm</td>
<td>2.14 m²</td>
</tr>
</tbody>
</table>
GENERAL NOTES

1. This detail is for use only on underground installations where the use of concrete thrust blocking is not possible. This detail may be used because of obstructions, or requirements of the specifications.

2. Washers may be cast iron or steel, and may be round or square. Rods shall be 2.0 mm larger than the rods.

3. All tie rods, rod couplings, turnbuckles, bolts and nuts for these joints shall be of carbon steel equivalent to ASTM A-571, grade 80, with cadmium plating in accordance with ASTM B 678, except that the minimum thickness of the plating shall be 0.055 mm. Cadmium plated bolts shall have Class 2A threads and the nuts, rod couplings and turnbuckles shall have 2B threads.

4. High strength, heat treated cast iron tee-head bolts with hexagon nuts, all in accordance with the strength requirements of the applicable standard, may be used in lieu of the cadmium plated bolts and nuts.

5. The sketches in this series of figures show acceptable methods of providing anchorage. There is no particular significance to be attached to whether the sketch shows a bel and socket joint or a bent mechanical joint. The anchoring procedure illustrated applies in most cases to either type of joint, in some cases, dimensions of the particular pipe or hub and space available for working around the particular joint will influence the choice of methods used.

6. In certain assemblies of rod and clamps shown, rods run from a lug on the fitting for a clamp behind the hub of a ball to a clamp against a hydrant anchor only one joint. The stability of the joint, where the clamp is against the face of the ball, depends on having all above a relatively long piece of pipe on both sides of the joint. Consequently, if the distance between the first and the second joint is less than 3.0 m, the second joint shown shall be anchored by a clamp behind the hub of the ball and rods to a clamp at the face of the next ball.

7. For pipe larger than 300 mm diameter, restraint details shall be submitted for approval prior to installation.

8. All exposed metal shall be coated with anesthetic teak per subsection 307-2.02.

9. Bolt holes in clamps shall be 2 mm larger than the bolts.
GENERAL NOTES

1. The meter boxes shall conform to the dimensions as shown and shall be made of portland cement concrete poured and tamped (not vibrated) in true forms.

2. Use Class 5 concrete, f'c=30 Mpa.

METER BOX DIMENSIONS

<table>
<thead>
<tr>
<th>BOX NUMBER</th>
<th>DIM.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>483</td>
<td>622</td>
<td>749</td>
<td>853</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>305</td>
<td>425</td>
<td>470</td>
<td>578</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>279</td>
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<td>350</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>356</td>
<td>483</td>
<td>603</td>
<td>705</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>406</td>
<td>559</td>
<td>673</td>
<td>775</td>
<td></td>
</tr>
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<td>F</td>
<td>229</td>
<td>337</td>
<td>381</td>
<td>502</td>
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<tr>
<td>G</td>
<td>178</td>
<td>286</td>
<td>324</td>
<td>432</td>
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<td>M</td>
<td>406</td>
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<td>64</td>
<td>89</td>
<td>102</td>
<td>102</td>
<td></td>
</tr>
</tbody>
</table>

16 OR 18 MM METER | 25 mm METER | 38 mm METER | 50 mm METER
GENERAL NOTES

1. Cut and plugs must be adequately 'dry blocked'.

2. Dry blocks shall be standard size solid masonry concrete blocks, (ASTM C-159).

3. The quantity and arrangement of the blocking must withstand the line pressure by holding the cap or plug in position.

4. Concrete thrust blocks shall not be poured until the pressure is restored and the cap or plug is inspected for leakage.

5. Concrete shall not be poured over any portion of the abandoned pipe.

6. Minimum thrust block area per Std C-23,10.

1. Where a 100 mm or larger line is specified to be abandoned, the cut and plug should occur at the supply line main to avoid creating an unused dead end line.
GENERAL NOTES

1. All joints in hydrant run-out to be mechanical joints.
2. Hydrant Tee, Cou or approved equal may be used in place of Tee and 90° bend.
3. 90° bend not required if sufficient room for perpendicular installation.
4. See Std C-2330 and C-2331 for concrete thrust blocks.
5. A flange by mechanical joint shut-off valve, connecting directly to the Tee or below at the main shall be used.
6. Fire hydrant, fire hydrant threads, valve and valve boxes per municipality requirements.