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### Aggregate Base
- Select Material
- Subgrade Seal

### Ground Line Profile
- Ground Line Section
- Barbed Wire Fence & Gate
- Chain Link Fence & Gate
- Guard Rail & Breakaway Cable Terminal
- Gas Line
- Irrigation Ditch, Concrete
- Irrigation Ditch, Earth
- Irrigation Line (1" x 20')
- Irrigation Line (1" x 100')
- Power or Joint Use Line
- Sanitary Sewer (1" x 20')
- Sanitary Sewer (1" x 100')
- Storm Drain (1" x 20')
- Storm Drain (1" x 100')
- Street Light with Mast Arm
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**NOTE**

ALL LINES AND SYMBOLS NOT SHOWN WILL CONFORM TO:
American National Standard Symbols for Section Lining (ANSI Y14.2-1973)
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**STATE OF ARIZONA**
**DEPARTMENT OF TRANSPORTATION**
**DIVISION OF HIGHWAYS**
**STANDARD DRAWINGS**

**GENERAL ABBREVIATIONS**

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*Date:* 1/83
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**General Abbreviations**

- **DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS STANDARD DRAWINGS**
- **STATE OF ARIZONA**
- **DRAWING NO. C-01.31**
- **DESIGN APPROVED**
- **REV 1/83**
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GENERAL NOTES

1. Roadway width, cut ditch, super-elevation, and type and thickness of roadway surfacing will be shown on project plans.

2. For cuts up to 6' use 5' semi-tangents for slope rounding. For each additional foot of cut add 1' to semitangent to 11' maximum.

3. Wetted perimeter should not extend above subgrade in unpaved ditch.

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

5. The desirable maximum embankment slope rate should be 4:1 within interchange and grade separation areas.

6. When median slopes intersect, see project plans.

*Variable to 6:1 maximum

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

MINIMUM DITCH CONDITIONS

TYPICAL SECTIONS
1. Roadway width, cut ditch, superelevation, and type and thickness of roadway surfacing will be shown on project plans.

2. For cuts up to 6' use 5' semitangents for slope rounding. For each additional foot of cut add 1' to semitangent to 11' maximum.

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TYPICAL SECTIONS

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

MINIMUM DITCH CONDITIONS

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1. Roadway width, cut ditch, superelevation, and type and thickness of roadway surfacing will be shown on project plans.

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*Variable to 4:1 maximum
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**Note:**
- Width is in feet.
- Grade is in percent.
- Speed is in miles per hour (mph).

**Diagram:**
- A simple diagram showing a profile view of a road with a width indicated.
- The diagram includes a line labeled 'x' and 'y' to illustrate the layout.

**Explanation:**
- The table provides a reference for widths ranging from 1 to 20 feet, with corresponding grades and speeds.
- The diagram complements the table, providing a visual representation of the road's layout.

**Example Calculation:**
- For a width of 10 feet, a grade of 5%, and a speed of 60 mph, the table indicates a specific value (e.g., 2.5).
- The diagram visually represents the road's profile, showing the relationship between width, grade, and speed.
GENERAL NOTES
1. Dimensions of ditches and dykes, as shown on plans, are top width, height and length.
2. Ditches shall be constructed with a minimum grade to prevent erosion. Ditch outlet treatment shall be as provided on plans.
3. See Std. C-03.20 for parallel channel and dyke treatment with respect to recovery area.

CROWN DYKE

CROWN DITCH

TYPE A DYKE

TYPE B TRANSVERSE MEDIAN DYKE

* Slope relative to grade of median at intersection with toe.

GRADER DITCH

GENERAL CHANNEL SLOPES

DITCH AND DYKE

TYPICAL DYKE INSTALLATION AT STRUCTURE
Place dykes at structures to create a water cushion.

Sheep's fin. rwy.

Dyke side slope rate. 6:1 max., 10:1 desirable
1 1/2:1 max., 4:1 desirable

20' min. to toe of slope

Plan will indicate which side of ditch the dyke is to be placed.
* If channel lies within recovery area, use continuation of emb. slope for inner channel slope and 4:1 slope rate for outer channel slope.

CHANNEL

DYKE WITHIN RECOVERY AREA

GENERAL NOTES
See also Std. C-03.10
GENERAL NOTES

1. Concrete for the spillway inlet, spillway and outlet shall be Class B.
2. Where rock is encountered, the outlet may be omitted.
3. When outlet is used, the wire mesh shall extend through the joint into the outlet in lieu of bonding into the key.
4. Spillway invert slope shall be uniformly downward from A to B.
GENERAL NOTES
1. Round all exposed concrete corners.
2. Tank, stub, trash rack and angle supports shall be shop fabricated, welded and galvanized in accordance with ASME M 36.
3. Stub shall have annular corrugation. Down drain piping beyond stub may be either annular or helical.
4. Permissible couplings shall be mechanical, heat-shrinkable polyoloy sheet; one piece lap type neoprene sheet or slip seam; all 12" min. width and 18 ga. min.
5. Inlet invert slope shall be uniformly downstream from one foot inside of embankment curb base.
6. Inlet and outlet concrete shall be Class B. Embankment curb concrete shall be in accordance with Standard Specifications.

OUTLET DETAIL

OUTLET-HEADWALL AND CONCRETE APRON

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DESIGNER:
CHECKER:
DRAFTSMAN:
DATE:
0-16-20
GENERAL NOTES

1. For C-02.10 slopes with embankment height over 24', L = L for embankment height from table + 2.2e(emb. height - 24).
2. For C-02.20 slopes with embankment height over 32', L = L for 32' embankment height from table + 1.8(emb. height - 32).
3. For C-02.30 slopes with embankment height over 13', L = L for 13' embankment height from table + 1.8(emb. height - 13).
GENERAL NOTES

1. For C-02.10 slopes with embankment height over 24', \( L = L \) for embankment height from table + 2.24(emb. height - 24).
2. For C-02.20 slopes with embankment height over 32', \( L = L \) for 32' embankment height from table + 1.8(emb. height - 32).
3. For C-02.30 slopes with embankment height over 13', \( L = L \) for 13' embankment height from table + 1.8(emb. height - 13).
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 roadway section slopes away from the gutter, the slope of the gutter shall match the roadway cross slope.

3. Two inch deep contraction joints shall be placed in the curb and the gutter at locations which match the joints in adjacent Portland cement concrete pavement and at approximately 15 foot centers when adjacent to asphaltic concrete pavement. Joints shall be either hand tooled or sawed.

4. One half inch thick expansion joints shall be located at tangent points in curb returns, at structures and at maximum 60 foot intervals. The ½ inch joint filler shall extend the full depth of 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 ¼ inch radius unless a larger radius is indicated.

EMBANKMENT CURB:

1. No additional finishing will be required after extrusion or removal of the forms when curb resists 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 ½ inch.
GENERAL NOTES:
1. Unless otherwise specified, sidewalks shall be 4 inches in depth and driveways shall be 6 inches in depth.

2. One inch deep transverse contraction joints shall be placed in sidewalks at intervals of approximately 5 feet. If the sidewalk is over 7 feet in width, a 1 inch deep longitudinal contraction joint shall be placed in the center of the sidewalk. The maximum area of sidewalk without contraction joints shall be approximately 36 square feet. Contraction joints in driveways shall be 1 inch in depth. Joints shall be either formed or sawed. Formed joints shall be finished with a tool having a ⅜ inch radius.

3. One half inch expansion joints shall be located between sidewalks or driveways and all abutting structures. Maximum length of sidewalk without expansion joint shall be 50 feet. The ⅛ inch joint filler shall extend the full depth of the concrete.

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

---

**Driveway with Sidewalk Adjacent to Curb**

**Driveway with Sidewalk Setback**

**Depressed Curb at Driveway Entrance**

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Slope 0.01% Per Ft.
GENERAL NOTES

Paved Turnouts: Plans notation will be WxL, surface material, type and standard. Example: 20' X 30' A.S.T.C., Type A, Standard C-06.10
Show R graphically.
Base material shall be the same as what shown for main roadway, unless otherwise noted.
Excavation or embankment for turnouts shall be included in quantities for main roadways.
Dimensions indicated as minimum shall be avoided whenever possible in favor of those indicated as desirable.
Driveways and depressed curbs shall be located as noted on plans or as directed by the Engineer.
The Type 'A' turnout is the preferable turnout design. Type 'B' and 'C' shall only be used when absolutely necessary.

Driveaway 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 terminal.

Driveways for high volume traffic generators shall be approved individually by Traffic
Engineering Section.
Driveways with curb returns in urban areas shall be installed only with the approval of
Traffic Engineering Section.

Joint Use Driveways - it may become desirable for landowners of adjacent properties to
require a joint driveway 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.

Construction of curb, gutter and sidewalk 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.

Drainage structures shall be provided under driveways where necessary.
**Adjusted tangent section lengths as required, Ramp 1a distance.

**Table:**

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*Curves No. II superelevation are for a design speed 20 mph less than entrance speed.

**General Notes:**

Detour "A" entrance shall be used where approaching vehicle must turn left. Detour "B" shall be used where approaching vehicle must turn right.

Detour from a horizontal curve: On the inside of the curve the detour take off shall be a curve, see table. On the outside a tangent take off shall be used. A vertical curve may be required to affect a smooth grade change. The design speed shall be comparable between vertical and horizontal alignment.

The entrance design speed of a detour shall not be less than the normal posted speed of the existing roadway. The design speed for the remainder of the detour may be 20 mph less than the normal posted speed.

Any intermediate detour entrance may be designed on the basis of normal posted speed less 20 mph, where visible construction activity has slowed traffic for the preceding 1/4 mile.

The minimum width of the detour shall be 28' for existing roadways 30' or wider and a minimum of 24' for existing roadways less than 30' in width.

The entrance taper for Detour "A" shall be extended until full detour width is attained. For Detour "B" the entrance taper shall be extended until a minimum of 15' is attained beyond the edge of existing roadway.

Any deviation from the standard must be approved by the Design Engineer and Traffic Engineer and the Engineer shall submit the alignment and profile of the proposed change for their review.

Native material used in constructing the detour embankment will be considered suitable for backfill around pipe; however, it shall be reasonably free of rocks and debris.

**State of Arizona**
**Department of Transportation**
**Division of Highways**
**Standard Drawings**

**Drawn by:**
**Reviewed by:**

**GEOMETRIST, DETOUR**

**Drawn No.: C-620**

1/85
S indicates sawed contraction control joint
CN indicates construction joint
LL indicates longitudinal joint
See Std. C-07.20

Typical joint sequence

PLAN

See General Notes

CONSTRUCTION JOINT CN
To be used at end of pour

TRANVERSE EXPANSION JOINT AT BRIDGE APPROACH SLAB

GENERAL NOTES
All transverse joints shall be in line with joints in adjacent slabs.

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.
Timbers used in transverse expansion joint shall be rough redwood and conform to commercial grade.
Backer Rod - (Expanded cellular rubber) Shall conform to the requirements of ASTM D 1956 Grade # SEB 41.

DESIGN APPROVED
STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS
PAVEMENT, CONCRETE, TRANSVERSE JOINTS
11/83

DRAWN BY
J. J. Boland
D-07.10
LONGITUDINAL JOINT DETAILS

JOINT TYPE "E"
CONSTRUCTION JOINT

Note: #4 indicates pavement thickness

1/4" radii

Curb & Gutter

Pavement

JOINT TYPE "G"

Existing concrete

PLAN

Concrete curb & gutter

#4 x 2'-0" bars
2'-6" c to c max.

Longitudinal Joint Type "H"

Joint Type CN

SECTION A-A

General Notes

In slip form type pavement construction, Longitudinal Joint Type "F" shall be used. In fixed form type construction either Longitudinal Joint Type "E" or "F" may be used.

Backer Rod - (Expanded cellular rubber) Shall conform to the requirements of ASTM D 1056 Grade # S6E 41.
GENERAL NOTES
All concrete shall be Class S, 2000 lbs. psi
GENERAL NOTES
1. For ramp cross section details, see Std. O-8.20.
2. For gore area paving details, see Std. O-8.20.
3. Shaded areas indicate differential shoulder delineation.
4. Parallel deceleration is to be used only under special conditions necessitating ramp curvature ahead of nose.
GENERAL NOTES
1. The 50:1 taper and corresponding offsets shall also apply when the
main roadway has curvatures or combined tangent and curvature.
2. Curb area paving, joints and scores shall be edged with a 4" "K" tool.
3. Shaded areas indicate differential shoulder delineation.
4. Min. nose paving length shall be that required to attain a width of
20'.

2") deep longitudinal scores
in sections averaging over
15" in width.
2") deep lateral scores
at 15" min. intervals.

Note: Use 4" joint and preformed
joint filler in any portion of
the periphery shutting P.C.C.
permanent.

4") Class B Conc.

Section A-A

Curb Area Paving

RAMP CROSS SECTION

22' Diamond 26' Loop
Finishing Course

12'
8' or 10'

RAMP CROSS SECTION

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DRAWING NO. 0-8.20

DESIGN APPROVED

1/83

E. J. MILLI

VIEW H. C.

GEOMETRICS, ENTRANCE RAMP

REV
GENERAL NOTES

Where shown on the plans rumble strips shall be constructed on the highway shoulders by making indentations approximately \( \frac{5}{8} \) deep in the asphalt concrete surfacing.

The indentations shall be formed by rolling the asphalt concrete while still hot with a roller to which segments of \( \frac{5}{8} + \frac{1}{2} \) steel rods have been welded to the drum.

The rod segments shall be 2' long and be fully welded to the roller drum at approximately 8" centers.

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.

Use on interstate and primary roadways 40' and wider.
GENERAL NOTES

1. Grooves in curbed shoulders shall terminate at the face of the single curb or at the edge of the gutter.

2. Grooves shall extend through pavement edge of shoulders with no curb.

GROOVE SPACING

<table>
<thead>
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<th>Design Speed Per Plans M.P.H.</th>
<th>Spacing Ft.</th>
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<td>50</td>
<td>35</td>
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<tr>
<td>40</td>
<td>30</td>
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</table>
Use Appropriate End Treatment
Or Use Other Systems

Shown G4(2W) System

Use FLARED BCT ASSEMBLY

GENERAL NOTES
All embankment curb shall be protected by guard rail.
Guard rail, exclusive of flares, shall not begin or end within embankment curb.

PLAN

Hinge Point
Normal Shoulder Width
Embankment Curb
Slope as Required

With Embankment Curb
SECTION A-A

Without Embankment Curb
SECTION B-B

TYPE A GUARD RAIL INSTALLATION

Emb Slope
Subgrade

3"
90°

High Reflectivity Reflective Sheeting

REFLECTOR TAB DETAIL

47/8"
GENERAL NOTES

All embankment curb shall be protected by guard rail.
Guard rail, exclusive of flares, shall not begin or end within embankment curb.

PLAN

Hinge Point
Slope as Required
Normal Slope per Plans
Emb Slope
Subgrade

With Embankment Curb
SECTION A-A

TYPE B GUARD RAIL INSTALLATION

REFLECTOR TAB DETAIL

REFLECTOR TAB DETAIL

Use FLARED BCT ASSEMBLY

USE APPROPRIATE END TREATMENT

25' TAPER

Normal Roadway Shoulder
2' Widening

2' Widening

Normal Shoulder Width

Embarkment Curb

3'

Reflecter Tab

2' Widening

Normal Shoulder Width

Without Embankment Curb
SECTION B-B
GENERAL NOTES

Length shall be as shown unless otherwise indicated on the project plans.
No. 6 'S' Shaped Rebar.

PLAN
(Type 1 Shown)

\[ \frac{1}{8} \times \frac{1}{2} \text{ Deep Contraction Joint} \]

Construction Joint (See General Note 6)

No. 6 X 2'-2" Rebar

**SIDE ELEVATION**

**GENERAL NOTES:**
1. Median Barrier shall be constructed by the slip form or extrusion 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. Unless otherwise specified on project plans, the Type 1 Median Barrier shall be constructed.
4. Concrete shall be Class S, design strength \( f' = 3000 \) p.s.i.
5. If the footing and barrier are cast monolithically No. 6 'S' shaped rebars and optional construction joint will not be required.
6. Construction joints shall be kept to a minimum. Joints shall be finished with tool having a 1/4 inch radius.
7. Contraction joints shall be sealed with an approved joint sealant.

**SECTION B-B**
GENERAL NOTES:
1. Concrete shall be Class S, design strength $f'_c = 3000$ psi.
2. Unless otherwise specified on project plans, the Type 1 Median Barrier shall be constructed.
3. Median Barrier shall be placed upon either Asphalt or Portland Cement Concrete Pavement.
4. Pavement thickness adjacent to Median Barrier shall be 3/4 inch minimum.
5. Joints shall be finished with a tool having a 1/4 inch radius.
6. This standard shall not be used when an individual run consists of less than five 20 foot sections.

END ELEVATION
GENERAL NOTES:

1. Concrete shall be Class S, design strength f' = 3000 p.s.i.
2. Unless otherwise specified on the project plans, the Type 1 Median Barrier shall be constructed.
3. Median Barrier shall be placed upon either Asphaltic or Portland Cement Concrete Pavement.
4. Pavement thickness adjacent to Median Barrier shall be 3/4 inch minimum.
5. The Median Barrier shall be placed upon a bed of grout in order to provide a uniform bearing.
6. Dowelled joints shall be grouted under pressure until all of the openings and the joint are filled.
7. This standard shall not be used when an individual run consists of less than five 20 foot sections.

END ELEVATION

SECTION A-A

SPECIFICATIONS

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STATE OF ARIZONA

DRAWING No.

1/03
GENERAL NOTES

●=Indicates ARTBA designation.

For First Two Posts
Use Std C-10.17

Use Rectangular Plate Washer (●)
Under Post Bolt Head On First Post

ELEVATION

Start Reflectized Tabs

6'3"  6'3"  6'3"  6'3"  4'2"  4'2"  6'3"  6'3"

For First Two Posts
Use Std C-10.17

FLARED GEOMETRICS

<table>
<thead>
<tr>
<th>Dist Along Y Axis To Face Of Guard Rail</th>
<th>Dist Along Parabolic Curve</th>
<th>Dist Along X Axis</th>
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<tr>
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<td>20'10&quot;</td>
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<tr>
<td>37'6&quot;</td>
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</table>

DESIGN APPROVED

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

STANDARD DRAWINGS

FLARED BREAKAWAY CABLE
TERMINAL ASSEMBLY

REV. 1/01

DRAWING NO. C 10.16

BITUMINOUS SURFACE

3" Bituminous Surfacing

Normal Slope Per Plans

SECTION A-A

LAYOUT AND DETAILS OF THE FLARE
GENERAL NOTES

1. BCT Cable Assembly shall be tightened to remove slack.

2. 3/8"-14UNC x 3 1/4" Heavy Hex Screw, connecting BCT Terminal Post (Steel) and BCT (Steel) Foundation Plates, shall be torqued to 170 ft. lbs.

3. To ensure that the BCT (Steel) Bearing Plate remains in position, one wrap of 14 Gauge Galvanized Steel Wire shall be wrapped around the BCT Terminal Post (Steel) and near the top of the plate.

- Indicates ARTBA designation.
GENERAL NOTES

1. Extend buried W-Beam 6'-3" post last short post.
2. Drill through top of box culvert with rotary drill.
3. Bracket may be made of one piece hot bent, or two pieces welded together.
4. Short posts anchored to box culvert roof shall be 6" x 6" only.
5. Rectangular Plate Washer (●) shall be used only at below ground connections

● Indicates ARTBA designation.

ELEVATION

buried anchor pipe culvert installation

SECTION A-A

installation detail

bolted anchor box culvert installation

BRACKET DETAIL
GENERAL NOTES

1. Extend buried W-Beam 6' - 3" past last short post.
2. Drill through top of box culvert with rotary drill.
3. Bracket may be made of one piece hot bent, or two pieces welded together.
4. Rectangular Plate Washer ( ) shall be used only at below ground connections.
   - Indicates ARTBA designation.

PLAN

ELEVATION

SECTION A-A

BURIED ANCHOR
PIPE CULVERT INSTALLATION

INSTALLATION DETAIL

BOLTED ANCHOR
BOX CULVERT INSTALLATION

BRACKET DETAIL
### TABLE

<table>
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<tr>
<td>5</td>
<td>4½&quot;</td>
<td>3½&quot;</td>
</tr>
</tbody>
</table>

**NOTE:** Block 1 is a ½" x 12" x 14" Plate
Block 2 may be a Solid 6" x 14" Plate tapered in thickness from 1½" to ½" welded to ½" x 12" x 14" Plate.

### DETAIL F

- ¼"-10 UNC x 1½" Hex Bolt and Hex Nut
- With Type B Beveled Washer (Under Head)
- And Wide Type A Washer (Under Nut) (Typ.)
- 1" Drill (Block 2 Only)
- ¾" II UNC Ferrule Wing Nut

**SECTION THRU BLOCK AND ANCHORAGE**

### DETAIL H

**TERMINAL CONNECTOR BACK PLATE**
<table>
<thead>
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<th>BLOCK</th>
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<tr>
<td>5</td>
<td>4½&quot;</td>
<td>3½&quot;</td>
</tr>
</tbody>
</table>

**NOTE:** Block 1 is a 3½" x 12" x 14" Plate Block 2 may be a solid 6" x 14" Plate tapered in thickness from 1½" to 2½" welded to 3½" x 12" x 14" Plate

**Concrete Barrier**

1" Dia Sleeve

1/2" UNC x 11/2" Hex Bolt and Hex Nut With Type B Beveled Washer (Under Head) and Wide Type A Washer (Under Nut) (Typ)

1" Drill (Block 2 Only)

1/2" UNC Ferrule Wing Nut

**DETAIL F**

SECTION THRU BLOCK AND ANCHORAGE

1/2" x 12" x 14" Plate Tack welded to Plate (Block 3, 4, & 5)

1/2" Rod

**DETAIL G**

BLOCK DETAILS

1/2" Drill Blocks 3, 4, 5, 1" Drill Block 2

1" Drill, 5 Holes

**DETAIL H**

TERMINAL CONNECTOR BACK PLATE

**STATE OF ARIZONA**

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

STANDARD DRAWINGS

TRANSITION W BEAM
(TIMBER POST) TO CONCRETE HALF BARRIER

Sheet 5 of 5
GENERAL NOTES

- Indicates ARTBA designation.

ELEVATION

Note: All Slots 1/4" x 2", All Square Holes 3/16"
### Table: Dimension
<table>
<thead>
<tr>
<th>Block</th>
<th>A</th>
<th>B</th>
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</tr>
<tr>
<td>5</td>
<td>4 11/16&quot;</td>
<td>3 1/16&quot;</td>
</tr>
</tbody>
</table>

**NOTE:** Block 1 is a 1 1/2" x 12" x 14" Plate
Block 2 may be a solid 6" x 14" Plate tapered in thickness from 11/16" to 1/2" Welded to 1 1/2" x 12" x 14" Plate

### Diagram: Concrete Barrier
- 3/8" - 10 UNC x 1 1/2" Hex Bolt and Hex Nut
- With Type B Beveled Washer (Under Head) and Wide Type A Washer (Under Nut) (Typ)
- 1" Drill (Block 2 Only)
- 3/8" - 11 UNC Ferrule Wing Nut

### Diagram: Section Thru Block and Anchorage
- 1/2" x 12" x 14" Plate
- 1/2" Plate
- 1/2" Rod
- 3/8" UNC Hex Nut Tack Welded To Plate (Block 3, 4, & 5)

### Diagram: Detail F
- Terminal Connector Back Plate
- Drill Blocks 3, 4, 5, 1" Drill Block 2
- 1" Drill, 5 Holes

### Diagram: Detail G
- Block Details
**Detail F**

**Section Thru Block and Anchorage**

- **Concrete Barrier**
- **1" Dia Sleeve**
- \(\frac{3}{4}"\) UNC x 1\(\frac{1}{2}\)" Hex Bolt and Hex Nut
- With Type B Beveled Washer (Under Head) And Wide Type A Washer (Under Nut) (Typ)
- 1" Drill (Block 2 Only)
- \(\frac{3}{8}"\) UNC Ferrule
- Wing Nut

**Detail H**

**Terminal Connector Back Plate**

- 1\" Drill, 5 Holes

**Detail G**

**Block Details**

- Block 1 is a \(\frac{1}{2}\)" x 12" x 14" Plate
- Block 2 may be a solid 6" x 14" Plate tapered in thickness from 1\(\frac{1}{2}\)" to \(\frac{3}{8}\)" welded to \(\frac{1}{2}\)" x 12" x 14" Plate

**Table**

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**Note:**
### Table: Dimensions

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<tr>
<td>5</td>
<td>4 1/2&quot;</td>
<td>5 1/2&quot;</td>
</tr>
</tbody>
</table>

**Note:** Block 1 is a 1 1/2" x 12" x 14" plate. Block 2 may be a solid 6" x 14" plate tapered in thickness from 1 1/2" to 3 1/2" welded to 1 1/2" x 12" x 14" plate.

---

**Concrete Barrier:**
- 1" Dia Sleeve
- One 3/4"-10 UNC x 11 1/2" Hex Bolt (Top) (Shown)
- One 3/4"-10 UNC x 13" Hex Bolt (Bottom) and Two Hex Nut With Four Type B Beveled Washers (Under Head And Nut) Per Block (Typ)
- 1" Drill (Block 2 Only)
- 3/8"-1/2 UNC Ferrule Wing Nut

**Section Thru Block and Anchorage**

**Detail D**

**Detail E**

**Block Details**

**Detail F**

**Terminal Connector Anchor**

---

**Technical Notes:**
- Each weld shall develop the tensile strength of the wire.
- No. 4 Rebar 1'-0"
- No. 4 Rebar 4" x 4" x 4" x 4"
- RPW Typ All Contact Points
- Drills Blocks 3, 4, 5, 1" drill Block B
- 1" Drill, 5 Holes
- 1/4" UNC Ferrule Wing Nut (Typ)
ELEVATION

ONE WAY TRAFFIC—RIGHT SIDE OF ROADWAY
OR TWO WAY TRAFFIC
**GENERAL NOTES**

1. BCT Cable Assembly shall be tightened to remove slack.

2. 3/8"-10 UNC x 3 3/4" Heavy Hex Screw, connecting Base Plate A to Base Plate B, shall be torqued to 170 ft-lbs.

3. To ensure that the BCT (Steel) Bearing Plate remains in position, one wrap of 1/4 Gauge Galvanized Steel Wire shall be wrapped around the BCT Terminal Post (Steel) and near the top of the plate.
One Wrap 14 Gauge Galvanized Steel Wire

BCT Cable Assembly Detail P

3/2" x 6 1/2" x 1/4" Plate Detail C

1/8" 4 1/4" 3/4" Plate

GENERAL NOTES

1. BCT Cable Assembly shall be tightened to remove slack.

2. 3/8"-11UNC x 3 1/2" Heavy Hex Screw, connecting Base Plate A to Base Plate B, shall be torqued to 170 ft. lbs.

3. To ensure that the BCT (Steel) Bearing Plate remains in position one wrap of 14 Gauge Galvanized Steel Wire shall be wrapped around the BCT Terminal Post (Steel) and near the top of the plate.

DETAIL A

DETAIL B (BASE PLATE B)

DETAIL C

DETAIL D (BEARING PLATE)

DETAIL E (BASE PLATE C)

DETAIL F (BASE PLATE A)

DETAIL G

FLAT PLATE WASHER
GENERAL NOTES

1. BCT Cable Assembly shall be tightened to remove slack.

2. 5/8"-11UNC x 3 1/2" Heavy Hex Screw, connecting Base Plate A to Base Plate B, shall be forged to 170 ft. lbs.

3. To ensure that the BCT (Steel) Bearing Plate remains in position, one wrap of 14 Gauge Galvanized Steel Wire shall be wrapped around the BCT Terminal Post (Steel) and near the top of the plate.

DETAIL A

DETAIL B (BASE PLATE B)

DETAIL C

DETAIL D (BEARING PLATE)

DETAIL E (BASE PLATE C)

DETAIL F (BASE PLATE A)

DETAIL G

FLAT PLATE WASHER
GENERAL NOTES

1. Tension wire: AWG No. 9 (0.148") galv. to conform to ASTM-A-116 Class 2. Wind wire approximately 3 times around ferrule.

2. 1" Support bracket: (0.250") ASTM-A-569, Galv. ASTM-A-123 (after fabrication)

3. Ferrule for tension take-up: ASTM-A-369, 9/16" ID x 1-3/16" long x 0.074" with 3/16" notch in ends. Galv. ASTM-A-153 Class B-3 (after fabrication)


7. 4" x 1" Plate round or square spacer: 9/16" Dia. hole ASTM-A-36, Galv. ASTM-A-153 Class C.

8. Stainless steel strap & seal shall conform to ASTM-A-176 Type 430. Straps 0.020" x 0.125" (single crimp)


10. Glaze screen: 18 Ga. steel, ASTM-A-526, Galv. ASTM-A-525/CG2S5, expanded to the following dimensions: 1.33" shortway of diamond and 4.0" longway of diamond (C to C of bridges) with a strand width of 0.250" angled at approx. 20° to plane of orig. sheet. Top edge to be shop curved, and crimped on 12" centers. After expansion, galv. steel shall be prepared according to MIL Spec. TT-C-490 and primed with baked on Zn chromate epoxy min. 0.2 Muill. dry film. Finish coat shall be Polyurethane Enamel min. 1.0 Muill. by the electrostatic spray method. Color shall be indicated on plans.


13. All intermediate post support brackets shall face in same direction. End panel support brackets shall face as shown.

*Note: Contractor may drill holes or cast holes to set anchor bolt required to anchor plate of glaze screen post assembly to the median barrier. If cast hole is used, seat bolt in sulfur, epoxy or other material approved by the Engineer.
GENERAL NOTES

Posts shall be 12'-0" C to C. Structural steel shall conform to ASTM-A-36, Galv. ASTM-A-125.


Type B washer shall conform to ASTM-F-430, Galv. ASTM-A-153 Class C.

Helical spring lock washer shall conform to ASTM-A-313, Galv. ASTM-A-153 Class C.

For other glare screen dimensions and specifications, see Standard C-10.96.
GENERAL NOTES:
1. Standard Plans for Cattle Guard, Footing Type, consists of Standards C-11.10, C-11.11, and C-11.12.
2. Cattle guard shall be sloped to conform to the roadway cross section, except where an odd number of grill units is specified in a crowned roadway, the center grill unit shall be installed level.
3. Where the adjacent roadway is paved, an angle 4" X 4" X 3/8" with 5/8" diameter stud with head, 1'-0" alternate center to center is required.
4. Where the adjacent roadway is unpaved, an angle assembly is required. An angle assembly consists of one 4" X 4" X 3/8" angle and one 2" X 2" X 3/8" angle connected with 5/8" diameter studs. The studs shall be bent 90° and placed on 1'-0" centers.
5. Each angle and angle assembly shall be fabricated to form a single piece for the full length of the cattle guard.
6. Quantities shown for concrete and reinforcing bars are to be considered approximations for informational purposes only.
7. When guard rail is to be used at the cattle guard, it may be possible to reduce the number of grill units required.
GENERAL NOTES:
1. For Cattle Guard details see Std. C-11.10.

BAR 3 X 1/2 X 6" Long

Bar 3 X 1/2 X 6" Long, 4 Per Grill Unit

Diameter Hole In Angle And Bar

13/16

Minimum Bend Radius

3/4"

6 X 3 1/2 X 3/8"

10 UNC X 2 1/2" Heavy Hex Structural Bolt And

Heavy Hex Nut Grade "A" With Regular Helical
Spring Lock Washer, 4 Per Grill Unit

MINIMUM Bend Radius

3/8"

1 1/2"

BEAMS

8 X 18

W 8 X 15

3/8" x 18.4

1/2"

Welded Beam (Fy=42ksi)

Welded Beam (Fy=42ksi)

0.185"

0.532"

0.185"

F.P. flow thru high frequency electrical resistance weld

SECTION C-C

BEAMS

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

ROADWAY CATTLE GUARD
GRILL & GRILL CLAMP DETAIL

DESIGN APPROVED
1/83

Y. F. T. H. U. N.

MCCARTY
C-11.11

REV

SHEET NO.

SHEET NO.

SHEET NO.
GENERAL NOTES:

1. For Cattle Guard details see Std. C-11.10.

2. Material for shoulder transition shall be placed to the finished roadway elevation for the entire length of the transition. When 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.

3. - 10 UNC X 11" Hex Bolt and Hex Nut, With 1 Type "A" Plain Washer.

POST AND BRACE ASSEMBLY

SECTION E-E

SHOULDER TRANSITION AT CATTLE GUARD
GENERAL NOTES
1. For all other cattle guard details, see Stds. C-11.10, 11.11 & 11.12.
2. This standard shall be used in embankment or where highly erodible soil is found.
3. All concrete shall be Class B.
3" x 3" x 3/16" treads. See Det. No. 5 for typ. welding.

8" x 8" posts, pressure treated & unsplit.

Z" Nom. Dia. Pipe (Typ.)

3-1/2" x 12" bolts & nuts

6" x 12" x 1/2"

Drill for 3-1/2" bolts

1/8"

3/16", Z" Tread

3/8" x 3/16" x 8" x 8" Tread

Z" Nom. Dia.

Std. Pipe.

Swage & drill for 1/2" bolt.

1/2" x 1/2" bearing bar.

9" x 9" posts per Std. C-10.01

Note: For section between double track, see Det. No. 3

TRANSVERSE & SECTION

8'-6"

2'-1/8" per Std. C-10.01

3'-6"

Det. No. 3

Det. No. 2

9" Typ.

L-Base of rail

1"-2 1/8" & 1/4" 5 7/8"

1"-2 1/8" & 1/4" 5/8"

8' tie use.

9' tie use.

3'-3/4"

DETAIL NO. 1

DETAIL NO. 2

DETAIL NO. 3

Center section for double tracks on 15' centers

SHIM HEIGHT

RAIL LBS./TD.

<table>
<thead>
<tr>
<th>LBS.</th>
<th>80</th>
<th>90</th>
<th>110</th>
<th>115</th>
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<td>1 1/8</td>
<td>1 3/8</td>
<td>1 1/8</td>
<td>1 1/8</td>
<td></td>
</tr>
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</table>

GALV. DOME HEAD SPIKE LENGTH

13" 14" 15" 16" 13" 13" 13"

1. This design applicable only to wood tie track construction. Wood shims shall be unsplit and cut from material meeting the specifications of the existing timbers.

2. 3" x 3" x 3/16" treads, 2" x 1/2" bearing bars and 2" Nom. Dia. pipe wing assemblies shall be primed with one coat No. 1 paint and finished with two coats of yellow enamel paint.
GENERAL NOTES

1. Length of post and braces shall not be less than 7'-0".

2. Woven wire fence fabric shall be attached to the post at the top and intermediate wires.

3. Intermediate Post Assemblies shall be located as shown and at intervals to utilize standard rolls to minimize cutting and waste.

4. A twisted wire stay shall be centered between posts.

TYPICAL WOVEN WIRE FENCE INSTALLATION—TYPE I WW SHOWN

FENCE FABRIC DIMENSIONS

AND DESIGN NUMBERS
GENERAL NOTES

1. Intermediate Post Assemblies shall be located as shown and at intervals not to exceed 650', or midway between all bracket posts.

2. For game fence the bottom wire shall be barbless.

3. The stays on game 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)
TYPICAL FLOOD GATE INSTALLATION
### GENERAL NOTES

1. Posts shall be round pipe, H-section or nail-formed and shall conform to the nominal dimensional requirements shown on the plans. In addition, the material of which posts are fabricated shall have a nominal thickness, before galvanizing, of not less than 0.11 inch.

2. Chain link fabric shall be either zinc-coated or aluminum-coated steel wire fence fabric. Zinc-coated steel fabric shall conform to the requirements of ASTM A392, Class I coating. Aluminum-coated steel fabric shall conform to the requirements of ASTM A491, with a minimum weight of coating of 0.40 ounce per square foot or wire surface area. Fabric shall be 11 gauge for all fence fabric 60 inches or less in height and shall be 9 gauge for fabrics greater than 60 inches in height.

3. Tension wires shall be 7 gauge 0.177 inch diameter coil spring steel wire with a minimum tensile strength of 75,000 pounds per square inch, and shall be zinc-coated or aluminum-coated.

4. Tress rods shall be 3/8 inch diameter adjustable rods. Tress tighteners shall have a strap thickness of not less than 1/4 inch.

5. Stretcher bars shall be 3/8 inch by 3/8 inch, flat bars. Stretcher bar bends shall be 1/8 inch by one inch preformed tee bends.

6. Bottom tension wire shall be 5 inches from top of crown on concrete foundations.

7. Intermediate post assemblies shall be spaced at 300 foot intervals or midway between pull posts when the distance between such posts is less than 1000 feet and more than 500 feet.

### TYPICAL POST DIMENSIONS

<table>
<thead>
<tr>
<th>FABRIC</th>
<th>CORNER, END, INTERMEDIATE, GATE</th>
<th>LATCH AND PULL POSTS</th>
<th>LINE POSTS</th>
<th>ROLL FORMED</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEIGHT</td>
<td>POST HOLE ROUND</td>
<td>ROLL FORMED</td>
<td>POST HOLE</td>
<td>ROLL FORMED</td>
</tr>
<tr>
<td>36</td>
<td>6' x 3'</td>
<td>2.00</td>
<td>10.52</td>
<td>200 x 175</td>
</tr>
<tr>
<td>48</td>
<td>10' x 3'</td>
<td>10.52</td>
<td>100 x 175</td>
<td>200 x 175</td>
</tr>
<tr>
<td>60</td>
<td>10' x 3'</td>
<td>200 x 175</td>
<td>100 x 175</td>
<td>200 x 175</td>
</tr>
<tr>
<td>72</td>
<td>10' x 3'</td>
<td>100 x 175</td>
<td>100 x 175</td>
<td>200 x 175</td>
</tr>
</tbody>
</table>

### TYPICAL CHAIN LINK FENCE INSTALLATION - TYPE I SHOWN

- **Tension Wires**
- **Vertical Brace**
- **Latch Post**
- **Intermediate Post**
- **Pull Post Assembly**
GENERAL NOTES

1. Barbed wire for use with Type 2 chain link fence shall be 12-gauge steel wire with 4-point 14-gauge barbs spaced five inches apart and shall be either zinc-coated or aluminum coated. Zinc-coated steel wire shall conform to the requirements of ASTM A456, Class I coating. Aluminum-coated steel wire shall conform to the requirements of ASTM A495, Type 1, Class I coating.

2. Barbed wire support arm 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 M111.

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.

TYPICAL CHAIN LINK FENCE INSTALLATION—TYPE 2 SHOWN

TYPICAL POST DIMENSIONS

<table>
<thead>
<tr>
<th>CORNER, END, INTERMEDIATE, GATE, LATCH AND PULL POSTS</th>
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</tr>
</thead>
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<tr>
<td>FABRIC</td>
<td>POST HOLE ROUND</td>
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</table>

DETAILED SECTION 5

BARBED WIRE SUPPORT ARM
TRENCH CONDITION
IN NATURAL GROUND OR IN EMBANKMENT
WITHOUT BRACING

TRENCH CONDITION
IN NATURAL GROUND OR IN EMBANKMENT
WITH BRACING SHOWN

TRENCH CONDITION
NON-TRENCH CONDITION
NRCIPCP IN NATURAL GROUND
OR IN EMBANKMENT

GENERAL NOTES

1. Pipes shall be installed either in a trench condition or in a non-trench condition in natural ground or in an 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 sloping shall conform to OSHA requirements.

4. Pipe backfill may be bedding material.

\[ D \] - Outside diameter of full circle pipe or outside dimension (span or rise) of arch, arch pipe, or elliptical pipe.

\[ T \] - Minimum wall thickness for NRCIPCP as per project plans.

\[ \Delta \] - \( D + 2 \) feet maximum for diameters up to 4 feet and \( D + 3 \) feet maximum for diameters 4 feet and over.

\[ \phi \] - 6 inches except when on unyielding or unstable material, then as per the standard specifications.

- NON-TRENCH CONDITION
- TRENCH CONDITION
- BEDDING
- PIPE BACKFILL
- TRENCH BACKFILL

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DESIGN APPROVED

TYPICAL PIPE INSTALLATION C-13.15
### General Notes

Design of end section shall conform to standards for reinforced concrete pipe.

End section joint conformation shall match the pipe joints.

Embankment slope shall be warped to match slope of end section.

---

### Table: Dimensions - Inches

<table>
<thead>
<tr>
<th>PIPE DIA</th>
<th>APPROX. WEIGHT</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>SLOPE</th>
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<tr>
<td>24</td>
<td>15200</td>
<td>3</td>
<td>94</td>
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<td>73</td>
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<tr>
<td>27</td>
<td>19300</td>
<td>3½</td>
<td>10½</td>
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<td>24</td>
<td>73½</td>
<td>54</td>
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<tr>
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<td>21900</td>
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<td>54</td>
<td>82400</td>
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<td>27</td>
<td>75</td>
<td>33½</td>
<td>98½</td>
<td>90</td>
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</table>

---

### Diagrams:

- **Plan**: Diagram showing the layout of the pipe and its dimensions.
- **Section A-A**: Cross-sectional view of the pipe and its slope.
- **Front Elevation**: View showing the height and diameter of the pipe.
- **Spacing for Multiple Installation**: Diagram indicating the spacing required for multiple installations.
- **Right Angle Culvert**: Diagram of a culvert with a 90-degree angle.
- **Skewed Culvert**: Diagram of a culvert with a skewed angle, indicating the normal toe of slope.
### Pipe Arc Dimensions - Inches

<table>
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<tr>
<th>GA.</th>
<th>A1</th>
<th>B1</th>
<th>R</th>
<th>L</th>
<th>W</th>
<th>Approx. Slope</th>
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<td>6</td>
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<tr>
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<td>16</td>
<td>8</td>
<td>51</td>
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<tr>
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<td>14</td>
<td>19</td>
<td>9</td>
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<td>69</td>
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<td>87</td>
<td>138</td>
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### General Notes

The end section may be joined to the pipe or connector section by bolts, rivets, dimpled bands, slip-steel bands, or threaded rod type fasteners. For allowable connector types, see table. The type 1 connector (far left) is by means of bolts or rivets. Maximum circumferential fastener spacing shall be 12" and with a minimum of 8 fasteners per joint. The type 1 joint may be used with either annular or helical corrugations. Type 2 and 3 connectors shall be used only with annular pipe or helical pipe with a requisite number of annular corrugations. Type 4 and 5 connectors shall be used only with helical pipe. All steel end component sections shall be galvanized. Toe of embankment shall be warped to match toe of skewed end sections. A berm shall be added to abnormal projections per Std. 0-13.10. The foregoing applies to all cross section configurations.
GENERAL NOTES

For lateral dimension of invert paving, use 72° control for CMF and span for CMFA.
Paving shall be scored longitudinally at 1'-6" min. lateral intervals.
Use bevel on inlet headwall only.
Wire mesh shall be fastened or welded to corrugations crest at intervals and in a manner approved by the Engineer. Laps shall be 6" min.
Paving shall not be placed until backfilling is completed.
Concrete shall be Class "P".
See Std. C-14.20 for headwall and bevel dimensions not shown.
GENERAL NOTES

1. Payment limits shown include structural excavation for headwalls, cutoff walls, wingwalls, and sections, etc.
2. $W$ = Width
   $L$ = Length
   $H$ = Height of barrel or headwall w/o cutoff wall
3. • 6" max in rock & trench.
   1"-6" max all others
GENERAL NOTES

1. Placement of structure backfill around headwalls and wingwalls shall be the same as around structures.
2. 6" min in rock & trench
   1' - 6" min all others
GENERAL NOTES

1. Computation of structure backfill quantities for box culverts is based on the area of a typical installation (the total length of the structure plus 2H). No measurement is necessary for wing areas. Use H for box extensions on each end extended.

2. H = Height of barrel or headwall w/o cutoff wall.

3. ✪ 6" max in rock & trench
   1'-5" max all others
GENERAL NOTES

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

All concrete shall be Class B. An optional 12" A.B. invert paving base course and 6" of concrete may be used in the 344" diameter pipe.

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

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

Edges of wire mesh shall be fastened or welded to corrugation crests at intervals and in a manner approved by the Engineer. Laps shall be 6" minimum.

For installation normal to roadway centerline only.
For other headwall dimensions, steel reinforcing, inlet bevel and outlet bevel are identical for equal embankment slopes.

For inlet and outlet wingwall flare differences for headwalls normal to pipe, see Std. 0-11.20

See Structures Section Standards for headwall design for pipes over 84" Dia.
### GENERAL NOTES

1. See also Std. D-13.10
2. High point of headwall shall not project more than 3" above slope.
3. All concretes shall be Class B
4. All reinforcing bars shall be number 4, 1"-0" c to c and 3" clear to inside of walls and floor.

### PIPE DIMENSIONS

<table>
<thead>
<tr>
<th>I.D.</th>
<th>W</th>
<th>Single</th>
<th>Double</th>
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<td>2'-6&quot;</td>
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<td>3'-8&quot;</td>
<td>7'-10&quot;</td>
<td>4'-6&quot;</td>
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<tr>
<td>36&quot;</td>
<td>4'-0&quot;</td>
<td>9'-2&quot;</td>
<td>5'-2&quot;</td>
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<td>42&quot;</td>
<td>4'-6&quot;</td>
<td>10'-6&quot;</td>
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### QUANTITIES

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<td>DIV. of HIGHWAYS</td>
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<tr>
<td>HEADWALL, DROP INLET</td>
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</tbody>
</table>

- Title: "SECTION Z-Z"
- Title: "SECTION Y-Y"
- Title: "PLAN"
- Title: "ELEVATION"
**GENERAL NOTES**

Pipes can be placed in any wall. Floor shall have a wood trowel finish and a minimum 1/16" slope in all directions to outlet.

All structural steel shall be ASTM A 36. Welding shall be in accordance with Std. Welding Specifications.

Grate, frame, beam and nose angle shall be given one shop coat of No. 1 paint. Concrete shall be Class B. Construction joints and drains shall be placed to meet field conditions. See Std. C-15.70

Any specified gutter depression shall be warped to opening according to Std. C-15.70. Curb opening areas, sq. ft., for Type 1-Single and Type 1-Double equal 0.23 and 0.54, respectively, for each inch of "h" gutter depression. See Std. C-15.70.

For grate and frame details and grate opening areas, see Stds. C-15.50 & C-15.60.

**SECTION B-B**

*W5 X 18.5 or W5 X 19*

Use this section when作物is 8".

*Avoid conflict with grates.*

**DETAILED NO. 1**

Grate support for C.B. No. 1-Double only. See Det. No. 2.

NOTE: Provide Std. C-15.70

**Construction Joint**

Grate frame and frame anchors

Gutter control grade

See C.B. 1-Single and Section A-A for reinforcing steel details.

Dimensions are common to C.B. No. 1-Single except as shown.

**DETAILED NO. 2**

1/2" stove bolts, 2 per frame. Avoid conflict with grates.

**DETAILED NO. 3**

Grind to 3/8" radius

3/8" x 3 1/2" sq. head bolt

#3 bar

**PLAN-CATCH BASIN TYPE 1 - SINGLE**

No bottom reinforcing

SECTION A-A

3/4" clear from top of nose section and inside of wall. See Det. No. 1.

"h" of curb

Gutter depression as spec. See Std. C-15.70 Det. No. 1

Construction joint

#4 bars, 18" c to c, horiz. & vert., 1 1/2" clear to inside of wall.

#3 bars, 6" c to c

1 1/2" clear to top of nose section and inside of wall. See Det. No. 3.

"h" of curb

Grate support for C.B. No. 1-Double only. See Det. No. 2.
GENERAL NOTES

Type 3 - Sump only.
Type 3-Wing (Illustrated) sump with wing basin upstream.
Type 3-Double wing, sump with symmetrical wing basin each side.

Pipes can be placed in any wall except wall adjacent to wing basin.

Sump floor shall have a wood trowel finish and a minimum slope of 4:1 in all directions toward outlet pipe.

Cutter depression shall be warped to opening according to Std. 0-15.70

All structural steel shall be ASTM A 36. Nose angle, frame and cover shall be given one shop coat of No. 1 paint.

All concrete shall be Class B.

All reinforcing bars shall be #4, 1"-6" c to c both ways and 1/2" clear to inside of walls and outside of wing basin floor except as shown.

Curb opening area (Sq. Ft.) per inch of curb "h" + cutter depression = curb opening length (ft.) x 0.0033.

Welding shall be in accordance with Standard Welding Specifications.

* Construction joints at or below bottom of curb line. Construction joints and drains shall be placed to suit field conditions. See Std. 0-15.70

\[ h = 0.06 \text{ when } H < H_e \text{ or less} \\
H_e = \text{when } H > H_e \]

See Sect. B-30, Std. 0-15.01.

H = \frac{W - 10}{L} \text{ min. when } L = 3'
\frac{W - 5}{L} \text{ min. when } L = 6'
\frac{W - 2}{L} \text{ min. when } L = 10'
\frac{W - 1}{L} \text{ min. when } L = 17'

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DEEP APPROVED
6/86

DEPARTMENT OF TRANSPORTATION
KITCH BASIN, TYPE 3
0-15.20
**GENERAL NOTES**

C.B. 5, sump only.
C.B. 5 Single, (illustrated), sump with wing basin upstream.
C.B. 5 Double, sump with symmetrical wing basins each side.

Pipes can be placed in any wall except wall adjacent to a wing basin.

Sump floor shall have a wood trowel finish and a minimum slope of 4:1 in all directions toward outlet pipe.

Welding shall be in accordance with Std. Welding Specifications.

Gutter depression shall be warped to opening according to Std. 0-15.70

All structural steel shall be in accordance with ASTM A 36.

Gutter angle shall be painted with one No. 1 shop coat.

All concrete shall be Class B

All reinforcing bars shall be #4, 18" c to c both ways and 1 1/2" clear to inside of walls and outside of wing basin floor except as shown.

Curb opening area (Sq. Ft.) per inch of curb = 1/4" gutter depression = curb opening length (Ft.) 

For grate and frame details and opening areas, see Secs. 0-15.50 & 0-15.60

Construction joints shall be placed to meet field conditions. Gc = 6" when H = 8' or less; 8" when H is greater than 8'. (See Section C-C)

Grate depression as specified, 3" max., 1" min.

#4 bars

**SECTION A-A**

2 1/2" x 2 1/2" x 1/2" x diagonal

Curb support anchor.

1" dia. bar with 3" min. 90° bend.

**SECTION C-C**

Use this section when i = 6°

**DETAIL NO. 1**

2" x 1 1/2" 4 1/2"

#3 bar

3" 8"

**DETAIL NO. 2**

3/8" x 3 1/2" sq.

head bolt anchor.

2 1/2" Grind to 3/8" R

**SECTION B-B**

- Head bolt anchor.
- Curb opening area (Sq. Ft.) per inch of curb = 1/4" gutter depression = curb opening length (Ft.) 

- For grate and frame details and opening areas, see Secs. 0-15.50 & 0-15.60

- Construction joints shall be placed to meet field conditions. Gc = 6" when H = 8' or less; 8" when H is greater than 8'. (See Section C-C)

- Grate depression as specified, 3" max., 1" min.

- #4 bars
**FRAME**

**SECTION**

**GRATE TYPES TW-1 & TW-2**

**GENERAL NOTES**

Grating units and frames shall be fabricated from structural steel except as noted. Structural steel shall be in accordance with ASTM A 36.

Welding shall be in accordance with Standard Welding Specifications.

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

TW indicates transverse welded.

TB indicates transverse bolted. Frame and grate shall fit to a max. roof of 0.093" at any point.

Restrict use to grades of 36 or less.

---

**TABLE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Clear Spacing</th>
<th>No. Bars</th>
<th>X</th>
<th>Grate Opening Sq. Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TW or TB-1.0</td>
<td>1&quot;</td>
<td>26</td>
<td>1&quot;</td>
<td>3.21</td>
</tr>
<tr>
<td>TW or TB-1.1</td>
<td>1 3/8&quot;</td>
<td>21</td>
<td>1&quot;</td>
<td>3.32</td>
</tr>
<tr>
<td>TW or TB-1.2</td>
<td>2&quot;</td>
<td>16</td>
<td>1&quot;</td>
<td>4.66</td>
</tr>
<tr>
<td>TW or TB-2.0</td>
<td>1&quot;</td>
<td>26</td>
<td>1&quot;</td>
<td>2.32</td>
</tr>
<tr>
<td>TW or TB-2.1</td>
<td>1 3/8&quot;</td>
<td>21</td>
<td>1&quot;</td>
<td>2.61</td>
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<tr>
<td>TW or TB-2.2</td>
<td>2&quot;</td>
<td>16</td>
<td>1&quot;</td>
<td>2.65</td>
</tr>
</tbody>
</table>
GUTTER DEPRESSION AND SPACING
CATCH BASIN TYPES 1, 4 & 5

GUTTER DEPRESSION
CATCH BASIN TYPE 3

Catch basin wall
6" x 18 ga. C.M.P.
Lgth. as req'd.

Subgrade
Slope to drain

Plug with
cone. upon
pvmnt. com-
pletion.

CATCH BASIN
CONSTRUCTION DRAIN
Drain may be deleted at
option of Engineer

GENERAL NOTES
No gutter depression shall extend into a traffic lane.

LEGEND
Cutter depression: 3" max. (See Detail No. 1)
O = Normal pavement or gutter flow line elev.
D = Depressed elevation.
= Straight grade with downward slope.
W = Normal gutter width per Std. O-05-70
PLAN PERSPECTIVE
ILLUSTRATING 1-WAY FLOW WITH DYKE

4 - 5/8" holes
2 11/16" X 3" Zee, 12.6#/ft.
or Detail No. 1 alternate.
4 - 1/2" X 4" bolt anchors.
3/16" Apron

GRATING DETAIL

* 8" when wall height exceeds 8'.

SECTION A - A

4:1 dike slope or median ditch grade.
(1-way or 2-way flow respectively)

#4 bars. See Section B-B

SECTION B - B

GENERAL NOTES

Apron shall be A.C. or P.C. concrete as specified on Plans.
Concrete shall be Class B.
Grating shall be fabricated of structural steel.
Structural steel shall be in accordance with ASTM A 36.
Welding shall be in accordance with Standard Welding Specifications.
Grating assembly shall be given one shop coat of No. 1 paint,
"H" indicated on Plans.

DESIGN APPROVED
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS
DEC
CATCH B, M, N
E-19, 80
GENERAL NOTES:
1. Concrete shall conform to the requirements for Class S Concrete. The minimum strength shall be 4000 psi.

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 compacted to not less than 95% of the maximum density determined in accordance with the requirements of the Materials Testing Manual of the Materials Services.
GENERAL NOTES

All concrete shall be Class B.

All reinforcing bars shall be #4 except two #6 bars over pipe. Bar spacing approximately 1'-0" c to c unless otherwise noted.

30" wing wall flare shown; 6" normally desirable. See Hydraulics and Utility & R.R. Eng'r. Division.

<table>
<thead>
<tr>
<th>PIPE</th>
<th>I.D.</th>
<th>L</th>
<th>R</th>
<th>F (Approx)</th>
<th>C.V. Conc.</th>
<th>Reinf. Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>L.H.P.</td>
<td>R.C.P.</td>
</tr>
<tr>
<td>18&quot;</td>
<td>2'-0&quot;</td>
<td>1'-0&quot;</td>
<td>1'-9&quot;</td>
<td>0.97</td>
<td>0.96</td>
<td>65</td>
</tr>
<tr>
<td>24&quot;</td>
<td>2'-0&quot;</td>
<td>1'-0&quot;</td>
<td>1'-9&quot;</td>
<td>1.11</td>
<td>1.07</td>
<td>78</td>
</tr>
<tr>
<td>30&quot;</td>
<td>3'-0&quot;</td>
<td>1'-6&quot;</td>
<td>2'-7&quot;</td>
<td>1.50</td>
<td>1.44</td>
<td>108</td>
</tr>
<tr>
<td>36&quot;</td>
<td>4'-0&quot;</td>
<td>2'-0&quot;</td>
<td>3'-6&quot;</td>
<td>2.08</td>
<td>2.01</td>
<td>150</td>
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<tr>
<td>42&quot;</td>
<td>5'-0&quot;</td>
<td>2'-6&quot;</td>
<td>4'-4&quot;</td>
<td>2.71</td>
<td>2.63</td>
<td>205</td>
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<tr>
<td>48&quot;</td>
<td>6'-0&quot;</td>
<td>3'-0&quot;</td>
<td>5'-2&quot;</td>
<td>3.39</td>
<td>3.30</td>
<td>270</td>
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<tr>
<td>54&quot;</td>
<td>7'-0&quot;</td>
<td>3'-6&quot;</td>
<td>6'-1&quot;</td>
<td>4.14</td>
<td>4.02</td>
<td>335</td>
</tr>
<tr>
<td>60&quot;</td>
<td>8'-0&quot;</td>
<td>4'-0&quot;</td>
<td>6'-11&quot;</td>
<td>4.96</td>
<td>4.80</td>
<td>410</td>
</tr>
</tbody>
</table>

DESIGN APPROVED

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DIETRICH MAHONY 18" TO 24" DIAMETER PIPES
1/83

DRAWING NO. C-16.10
PreCast Irrigation Gate

For open ditch installation

Type 1

Pipe size 6" thru 18" as called for on plans

16 ga. galv. iron gate

Slopes to fit local conditions

Masonry Mortar

Utility concrete ring for lawn installation

Concrete "T" or "L" to be included with valve.

Irrigation Valve Number of valve shall correspond to the size of the pipe in inches. No. 6 to No. 20.

Part Section

Flush Irrigation Valve

Type 2

For pipes 6" through 24". Gate and frame shall be galvanized iron. Type shown is for concrete pipe. For C.N.P., external steel adjustable band shall be used in place of internal steel ring.

Elevation

Section

Elevation

Section

Irrigation Gate

For standpipe installation

Type 2

Design Approved

State of Arizona
Department of Transportation
Division of Highways
Standard Drawings

Issue No.

IRRIGATION VALVE & GATE

Rev. C-16.30
GENERAL NOTES

Rock shall be sound and durable, of rounded or angular shape and with a nominal diameter of 8" min. and 12" max. Flat or needle shapes are not acceptable.

Wire mesh splice shall have 6" min. lap vertically and horizontally.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EMBANKMENT SLOPE RATE</th>
<th>MN</th>
<th>TOP OF BANK PROTECTION ABOVE STREAM BED</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2:1 or 1 1/2:1</td>
<td>0' to 2'</td>
<td>2' to 4'</td>
</tr>
<tr>
<td>1</td>
<td>2:1 or 1 1/2:1</td>
<td>0' to 2'</td>
<td>2' to 4'</td>
</tr>
<tr>
<td>2</td>
<td>2:1 or 1 1/2:1</td>
<td>0' to 6'</td>
<td>6' to 12'</td>
</tr>
</tbody>
</table>

*When other embankment slope rates are encountered, warp to 2:1 or 1 1/2:1; that is warp 1:1 slope to 1 1/2:1.
TYPES 4 & 5 BANK PROTECTION

6 X 6-Wi. 4 X Wi. Galv. Wire fabric placed as shown to enclose all but the top surface of the rock backfill and attached to the rails by a single wrapping with 3 strands of #9 Galv. wire, 1'-0" c to c.

Galv. wire fabric end piece. Type 4 = 6' Type 5 = 5'

Loop Cables around railroad rails as shown.

Rail heads face out

Type 4 = 4' Type 5 = 5'


Rock backfill

50# Railroad rail, 4' e to c Type 4 = 15' long Type 5 = 18' long

3/8" Dia. Cable

3/4" Dia. cable placed under basket.

SECTION A-A

GENERAL NOTES

Rock shall be sound and durable, of rounded or angular shape and with a nominal diameter of 8" min. and 21" max. Flat or needle shaped are not acceptable. Rock shall be comprised of 50% min. 8" to 12" and 50% max. 18" to 21".

Wire mesh splice shall have 6" min. lap vertically and horizontally.
GENERAL NOTES
1. Precast manholes shall conform to the requirements of AASHTO M 199 except that the compressive strength of each unit will be determined and accepted in accordance with Section 1006.7 of the ADOT 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. For manhole cut and replacement of bituminous or concrete pavement see Std. C-7-30.
5. For Std. C-12-60 frame and cover type, see Plans.

SECTION A-A
- New or exist. pmnt. structure
- Conc. pmnt.
- 1:2 Masonry Mortar
- 4:12 Batter

SECTION
- BRICK MANHOLE NO. 1
- CONCRETE MANHOLE NO. 2
- 3' - 0"
- 4' - 0"
- 2:12 Batter
- 1' - 0"
- 1' - 0"
- Optional constr. joint
- #6 bar

SECTION
- STANDARD BASE STRUCTURE
- FOR PIPES 6" TO 36" I.D.

HALF PLAN
- PIPES 36" I. D. & SMALLER
- 6' - 0"
- 3' - 0"
- #6 bars
- #6 X 10' - 0" bars.
- Circular bend.
- Conc.

HALF PLAN
- PIPES OVER 36" I. D.
- 2' - 0"
- 1' - 0"
- #6 bars
- #6 X 10' - 0" bars.
- Circular bend.

HALF SECTION
- MANHOLE NO. 3
- PRECAST REINFORCED CONCRETE

DIMENSIONS SHOWN ARE ILLUSTRATIVE.
Reinforcing shall be in accordance with AASHTO M-199

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

MANHOLE DETAILS

DESIGN APPROVED

EJ Schell

C-18.10
GENERAL NOTES
1. H 20 Loading Minimum
2. Detail shown is typical.
3. Alternate design of Manhole frame and cover may be utilized with the approval of the Engineer, as long as minimum loading and weight are equivalent.

FRAME
APPROX. WT. 200 LBS.

COVER
APPROX. WT. 200 LBS.
**TYPICAL PROFESSIONAL ENGINEERING DRAWING:**

**TYPE 1**
**BITUMINOUS SURFACE FORD**

- Optional Rock Basket downstream from cutoff wall. See Detail A.
- Depth Gauge
- Flow
- 2" nom. pipe

**TYPE 2**
**TIMBER CUT-OFF WALLS**

- 3" X 2" X 12" planks
- 2" nom. pipe

**DETAIL A**
- 2" nom. pipes, 7'-0" spaced 8' c to c
- 6 X 6 WL-14 X WL-14 welded wire fabric. Tie with 2-strands 49 ga. galv. wire 2" c to c each way. Tie top and bottom of basket to top 2" x 12" plank at 5' intervals and at each end. Tie by encircling plank with 2-strands of No. 9 wire.

**GENERAL NOTES**

- All timber shall be rough, pressure treated and unpainted.
- Rock basket, full length of structure, shall be included only when called for on Plans.
- See Plans for bituminous surface and base material details.
- See Std. C-19.10 for Depth Gauges, details.
- Depth Gauge foundation may be utility concrete.

**ELEVATION - TYPE 2**
ELEVATION
Survey Monument

ELEVATION
Reference Marker

RIGHT OF WAY MARKER

GENERAL NOTES
A Survey monument, frame and cover, complete in place shall be considered a unit.
A Right-of-way marker, consisting of a survey monument and a reference marker, complete in place shall be considered a unit.
All markers shall be placed as shown on the plans or as directed by the engineer.
Frames may be either Type A or Type B. Frames shall weigh at least 63 pounds.
Covers shall weigh at least 15 pounds.
Portions of frame and cover to be machined is shown by the symbol "X • •. The allowable tolerances for machined areas shall be ± 0.25". Concrete shall conform to the requirements of the specifications.

CAST IRON FRAME

SURVEY MONUMENT
FRAME AND COVER

1/8" Fillets Cover Only

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DRAWINGS

DESIGN APPROVED

1/83

1/24" SCALE

SURVEY MONUMENT, FRAME AND COVER, RIGHT OF WAY MARKER
G-21.10
GENERAL NOTES

Standard marker shall be made of brass, bronze or aluminum.
Standard marker will be furnished by the Department.
Bench marks will be established by the Engineer on headwalls, bridge curbs or other permanent structures.
Aluminum marker shall not be used when calcium chloride is used in the concrete.

For use as bench, survey monument and R/W markers

STANDARD MARKER
FOR SINGLE INSTALLATION

Quantities per ft. of slab length
Concrete | Reinforcing Steel
0.31 C.Y. 35.22 lbs.

GENERAL NOTES
Concrete shall be Class B

1 1/2" clear to base of slab

Utility line

SECTION A-A