To: All Users of the Roadway Construction Standard Drawings  
From: Mary Viparina  
Assistant State Engineer  
Roadway Engineering Group 

Date: 18 April 06  
Subject: C-Standards Update

The October 2004 Roadway Construction Standard Drawings have been revised and updated, and are available for download on the Roadway Design web site at the following address: http://www.azdot.gov/highways/rdwyeng/roadwaydesign/viewable_drawings.asp

The attached spreadsheet summarizes the changes made to the previous drawings. The changes of note are more fully described below:

- C-02.20 & C-02.30: Revised cut and fill slope dimensions;
- C-05.30, Shts 3 & 4 of 7: Modified PLAN and PERSPECTIVE views to clarify ramp location;
- C-05.30, Sht 7 of 7: Added a PLAN and SECTION views for a brick detectable warning strip;
- C-10.76: Modified SECTION views to depict "F" shape; and
- C-11.10: Re-issued the drawings in four sheets. Sheet 4 shows the clamp designed to enhance the bicycle ridability of the cattle guard.

Design personnel should implement the updated drawings and incorporate them into their project plans. For projects at or near completion, where the inclusion of all new standard drawings is not practical, the 1A Sheet must accurately reflect the correct revision dates for the design. Construction personnel should review the drawing revisions for possible implementation on construction projects.

Please distribute this memorandum to all users within your Group, Section, or District, and arrange for printing of the updated Standard Drawings for those without computer access. Copies of the complete set of Roadway Construction Standard Drawings (either 8-1/2" x 11" or 11" x 17") may be obtained from Engineering Records located at 1655 West Jackson, Room 175, Phoenix, AZ 85007-3217 or by telephoning 602-712-8216.

The updated Construction Standards Index (1A Sheet) and Barrier Summary Sheets are also available online at the address shown above.

Please direct questions regarding this memorandum or the updated standards to Kenneth Cooper, Roadway Standards Engineer at 602-712-8674.

MAV/KRC/krc

c:  
Roadway Engineering Group  
Traffic Engineering Group  
Valley Project Management Group  
Environmental and Enhancement Group  
Districts (10)  
Statewide Project Management Group  
FHWA  
Contracts and Specifications Section  
Construction Group  
Bridge Group  

Regional Traffic Engineers (4)  
Materials Group  
Local Government Section  
Engineering Consultant Section  
District Permits Office (9)  
Engineering Records  
Maintenance Group  
Dan Lance  
Sam Maroufkhani  
Doug Forstie
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From: Terry Otterness
Sent: Tuesday, April 25, 2006 11:13 AM
To: Chris Cooper; Urso Penalosa; Said Asad; Tim Wilson; Paul O'Brien; Joseph Warren; Baljeet Chawla; Vincent Li; Steve Mishler; Alfredo Zapata; Ken Brown; Robert Fortune; Kenneth Cooper; Jeff Beimer; LeRoy Brady; Susan Tellez; Robert Miller; Larry Maucher; George Wallace; Jim Delton; John Lawson; Steve Jimenez; John Carr; John Dickson; Greg H. Gentsch; Roger Hopt; George Chin; Chuck Gillick; Reza Karimvand; Daniel MacDonald; John Melanson; Lev Derzhavets; Oliver Antony; Pat Mahoney; Rod Collins; William Lyons; Bill Harmon; Dallas Hammit; David Sikes; John Harper; John Hauskins; Michael Kondelis; Paul Patane; Perry Powell; Richard Powers; Ron Casper
Cc: Mary Viparina; Sam Maroufkhan; Dan Lance; Doug Forstie; Sam Elters
Subject: Construction Std. Drawings- Slope Design Standard Revisions- C-02.20 & C-02.30

Please forward this e-mail notification to all roadway design personnel utilizing the subject Standard Drawings.

Please refer to the updated Construction Standard Drawings (Rev.date 4/06) that were issued today under separate e-mail notification. The maximum fill slope rates for Std. C-02.20 Rural Undivided and Fringe-Urban Highways and Std. C-02.30 Miscellaneous Roadways have been revised from 1 1/2:1 to 2:1. Also, the maximum cut slope rates for these two standards have been revised from 1:1 to 2:1. No slope changes have been made to Std. C-02.10 Rural Divided Highways. These revisions have been coordinated with the Materials Group Geotechnical Design.

The revisions to the slopes reflect what has been the norm for most projects. The 2:1 fill slopes provide a more stable embankment and provide an improved slope rate to establish vegetation and erosion control. The flatter 2:1 cut slope rates will also provide the same advantages. When in rock cuts, Geotechnical Design will continue to provide the maximum slope that can be used by the designer. Also, when cuts are in the higher ranges and there may be a significant project cost involved, Geotechnical Design will provide the designer the maximum slope that can be used to reduce the excavation required. The design process for establishing slope design for a project has not changed. The standard slopes simply provide the initial design slopes and the designer is to adjust the slopes for the project needs considering safety, material type, project costs, slope stabilization and other needs.

Thank you for your attention to these revisions. Please forward this e-mail to all users within your Groups and Districts. Contact your Roadway Group representative for any questions regarding these revisions.

Terry H. Otterness, P.E.  
Staff Engineer 
Roadway Design Section 
PH  602-712-4285 
FAX 602-712-3075 
totterness@azdot.gov
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GENERAL NOTES

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

2. Pavement structure slope is nominal. Actual slope is controlled by D. See Shoulder Wedge Detail.

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

4. For slopes controls within interchange areas, see project plans.

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

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

NOTE TO DESIGNERS

- The 9' minimum is required when guardrail is utilized on the project. Treatment shall be uniform throughout the project length. The 9' requirement may be waived under special conditions where guardrail is not utilized.

- 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 6', use 5' semi-tangents for slope rounding. For each additional foot of cut add 1' to semi-tangent to 11' maximum.

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

SUBGRADE/SLOPE HINGE TREATMENT DETAIL

SHOULDER WEDGE DETAIL

SLOPE ROUNDING DETAIL

MINIMUM DITCH CONDITIONS DETAIL
GENERAL NOTES
1. Roadway width, cut/ditch width, cross slope, and pavement structure section will be shown on project plans.
2. Pavement structure slope is nominal. Actual slope is controlled by D. See Shoulder Wedge Detail.
3. Slopes beyond the pavement structure, such as embankment and cut slopes, are relative to horizontal.
4. When median slopes intersect, see project plans for controls.
5. These slopes are intended to be used with new or reconstructed roadways.

MINIMUM SLOPES

INTERMEDIATE SLOPES

MAXIMUM SLOPES

MINIMUM DITCH CONDITIONS DETAIL

NOTE TO DESIGNERS
- The 9' minimum is required when guardrail is utilized on the project. Treatment shall be uniform throughout the project length. The 9' requirement may be waived under special conditions where guardrail is not utilized.

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 6', use 5' semi-tangents for slope rounding. For each additional foot of cut add 1' to semi-tangent to 11' maximum.
GENERAL NOTES

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

2. Pavement structure slope is nominal. Actual slope is controlled by GSD. See Shoulder Wedge Detail.

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

NOTE TO DESIGNERS

① USE OF THIS STANDARD IS LIMITED. SEE ROADWAY DESIGN GUIDELINES, SECTION 306.2.

① The 6' minimum is required when guardrail is utilized on the project. Treatment shall be uniform throughout the project length. The 6' requirement may be waived under special conditions where guardrail is not utilized.

SHOULDER WEDGE DETAIL

① The 6' minimum is required when guardrail is utilized on the project. Treatment shall be uniform throughout the project length. The 6' requirement may be waived under special conditions where guardrail is not utilized.

SLOPE Rounding DETAIL

① 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 6', use 5' semi-tangents for slope rounding. For each additional foot of cut add 1' to semi-tangent to 11' maximum.
1. All concrete shall be Class B. Embankment curb concrete shall be in accordance with the Std Specs.  
2. Where rock is encountered the outlet may be omitted, as approved by the Engineer.  
3. Spillway invert slope shall be uniformly downward from A to B, See Section B-B.  
4. All posts within the inlet shall have a "leaveout" measuring a minimum of 1 1/2" in front and 1/2" at each side, to the full depth of the concrete. The "leaveout" behind Post 1 & 3 shall end at the toe of the curb. The "leaveout" behind Post 2 shall measure 8" minimum. After guardrail installation, the "leaveout" shall be filled with a one-sack grout mix or alternate material as approved by the Engineer.  
5. Location may be adjusted to accommodate guardrail post layout.
Curb Height Varies 0" to 1" Maximum In Depressed Curb Area Beyond the End of Barrier. See Plans for Curb Height.

- Curb & Gutter Type B, C, C-1, D, D-1, D-2 or D-3

CURB & GUTTER TRANSITIONS

**TYPE 1 - CURB & GUTTER TRANSITION**

- Dimensions May Vary
  - Type D, D-1, D-2 or D-3
  - Std Dwg C-05.00

**TYPE 2 - CURB & GUTTER TRANSITION**

- Dimensions May Vary
  - Type D, D-1, D-2 or D-3
  - Std Dwg C-05.00

**TYPE 3 - CURB & GUTTER TRANSITION AT PAVED CORE**

- Dimensions May Vary
  - Type D, D-1, D-2 or D-3
  - Std Dwg C-05.00

**TYPE 4 - CURB & GUTTER TRANSITION**

- Radius Point
- See Plans for Radius

**SECTION A-A**

- Gutter Line
- Radius Point
- See Plans for Radius

**SECTION B-B**

- Dimensions May Vary
- Top of Curb
- See Plans for Dimensions

**PLAN**

- Roadway Width
- Top of Curb
- See Plans for Dimensions
Face of Curb

General Notes

1. Ramp centerline shall be radial from the face of the curb at the Sidewalk Ramp Control Point.
2. The 12:1 and 15:1 ramp slopes shown are the steepest slopes allowed for a ramp 10 ft long or less. Where the 12:1 or 15:1 slopes would require the ramp to extend longer than 10 feet, the ramp may be limited to a 10 ft length with slopes steeper than 12:1 or 15:1. Ramp length is measured along the back of the sidewalk.
3. Drainage inlets should not be located within the marked crosswalks, or if crosswalks aren't marked, within the area a standard marked crosswalk would enclose.
4. Concrete shall receive a rough broom finish as shown.
5. See Std Dwgs C-05.10 and C-05.20 for joint details.
6. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

Ramp depth shall be laid out radially from the back of the 6" wide Detectable Warning Strip, except that in no case shall it be less than 4" wide at the back of the sidewalk.

Refer to Plans for additional information.

For additional information, see Sheet 7 of 7.

State of Arizona
Department of Transportation
Roadway Standard Drawings
GENERAL NOTES

1. Ramp centerline shall be radial from the face of the curb at the sidewalk ramp control point.
2. The 15:1 ramp slope shown is the steepest slope allowed for a ramp 10 ft long or less. Where the 15:1 slope would require the ramp to extend longer than 10 feet, the ramp may be limited to a 10 ft length with slope steeper than 15:1. Ramp length is measured along the back of the sidewalk.
3. Drainage inlets should not be located within the marked crosswalks, or if crosswalks aren't marked, within the area of a standard marked crosswalk would encroach.
4. Concrete shall receive a rough broom finish as shown, the side slope wings do not receive a broom finish.
5. The Engineer may approve replacing the side slope wing with a curb at a location where access to the side of a ramp run is blocked by a pole, utility box, other obstruction, or by a non-accessible surface such as a dirt planter strip.
6. See Std Dwg C-05.10 and C-05.20 for joint details. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

Drainage inlets should not be located within the marked crosswalks, or if crosswalks aren't marked, within the area a standard marked crosswalk would encroach.

7. See Std Dwgs C-05.10 and C-05.20 for joint details. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

The Engineer may approve replacing the side slope wing with a curb at a location where access to the side of a ramp run is blocked by a pole, utility box, other obstruction, or by a non-accessible surface such as a dirt planter strip.
GENERAL NOTES

1. For use where sidewalk is not continuous.
2. Ramp centerline shall be radial from the face of the curb at the Sidewalk Ramp Control Point.
3. The 15:1 ramp slope shown is the steepest slope allowed for a ramp 10 ft long or less. Where the 15:1 slope would require the ramp to extend longer than 10 feet, the ramp may be limited to a 10 ft length with slope steeper than 15:1. Ramp length is measured along the back of the sidewalk.
4. The top of the Ramp Curb along the back of the Sidewalk Ramp shall match the elevation of the adjacent back of sidewalk and run parallel to the Sidewalk Ramp. The Ramp Curb along the side of the Sidewalk Ramp shall match the elevation of the back of the Curb & Gutter and the back of Ramp Curb.
5. Drainage Inlets should not be located within the marked crosswalks, or if crosswalks aren't marked, within the area a standard marked crosswalk would enclose.
6. Concrete shall receive a rough broom finish as shown.
7. See Std Dwgs C-05.10 and C-05.20 for joint details.
8. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

LEGEND

- Pedestrian Push Button Pole When Shown on Traffic Plans. See Traffic Signal Plans for Additional Information

PERSPECTIVE

ELEVATION

DEPRESSED CURB AT SIDEWALK RAMP

ROADWAY STANDARD DRAWINGS
STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION

NO
3
2
1
4

REV.
DRAWING NO.

Sheet 3 of 7

10" Maximum to Face of Pedestrian Push Button

Minimum Slope = 100:1 (0.01 '/ft)
Maximum Slope = 50:1 (0.02 '/ft)
**GENERAL NOTES**

1. For use where sidewalk is not continuous.

2. Ramp centerline shall be radial from the face of the curb at the Sidewalk Ramp Control Point.

3. The top of the Ramp Curb along the back of the Sidewalk Ramp shall match the elevation of the adjacent back of sidewalk and run parallel to the Sidewalk Ramp. The Ramp Curb along the side of the Sidewalk Ramp shall match the elevation at the back of the Curb & Gutter and the back of Ramp Curb.

4. Drainage inlets should not be located within marked crosswalks, or if crosswalks aren't marked, within the area a standard marked crosswalk would enclose.

5. Concrete shall receive a rough broom finish as shown.

6. See Std Dwgs C-05.20 and C-05.20 for joint details.

7. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

Pedestrian Push Button Post When Shown on Traffic Plans, See Traffic Signal Plans for Additional Information

- 5" Maximum to Face of Pedestrian Push Button

**LEGEND**

- Minimum Slope = 100:1 (0.01 '/ft)

- Maximum Slope = 50:1 (0.02 '/ft)

**DESCRIPTION OF REVISIONS**

- When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.
GENERAL NOTES

1. For use at mid-block locations.

2. Ramp centerline shall be perpendicular to the face of the curb at the Sidewalk Ramp Control Point.

3. The 1:15 ramp slope shown is the steepest slope allowed for a ramp 10 ft long or less. Where the 1:15 slope would require the ramp to extend longer than 10 ft, the ramp may be limited to a 10 ft length with slope steeper than 1:15. Ramp length is measured along the back of the sidewalk.

4. For sidewalk widths greater than shown on C-05.20, the overall Sidewalk Ramp depth shall match the sidewalk width.

5. Ramp curb height to match elevation at back of adjacent sidewalk.

6. Drainage inlet should not be located within the marked crosswalks, or if crosswalks aren’t marked, within the area a standard marked crosswalk would enclose.

7. Concrete shall receive a rough broom finish as shown.

8. See Std Dwgs C-05.10 and C-05.20 for joint details.

9. When installing brick detectable warning strips, the contractor shall take measures to avoid damaging the truncated domes. Bricks with damaged domes shall be replaced by the contractor at no additional cost.

LEGEND

Minimum slope : 100:1 (0.01 /ft)
Maximum slope : 50:1 (0.02 /ft)
Minimum slope : 15:1 (0.0667 /ft)

Roadway Width

Ramp Curb
See Ramp Curb Detail Sheet 1 of 7

Detectable Warning Strip
See Sheet 7 of 7

Depressed Curb & Gutter
Std Dwg C-05.10

Concrete

Rough Broom Finish

Detectable Warning Strip
See Sheet 7 of 7

Depressed Curb & Gutter
Std Dwg C-05.10

Location
See Plans

Perspective

ELEVATION

DEPRESSED CURB AT SIDEWALK RAMP

SECTION A-A

1.5' 5'-0" 1'-0" 4'-0" 1'-0"

Curb & Gutter
Std Dwg C-05.10

Ramp Payment Limit

2'-6" 2'-6"
GENERAL NOTES

1. Drain shall be placed in low corner and filled with coarse aggregate (AASHTO N43 Size 7) securely tied in a long-life geotextile sack.

LEGEND

- 1/8” Minimum (Typ) (0.05” Minimum ADA Actual)
- 1/8” to 3/16” (Typ) (0.06” to 2/4” ADA Actual)
- 3/16” to 1/8” (Typ) (0.09” to 1/4” ADA Actual)
- 50% to 65% of [ ]

TEXTURE PATTERN DETAIL

Sand

Thickness Varies

4” Waste Slab

1'-0” 3 Sides of Waste Slab

1/4” R (Typ)

Truncated Domes (Typ)

Slope to Drain

Drain shall be placed in low corner and filled with coarse aggregate (AASHTO N43 Size 7) securely tied in a long-life geotextile sack.

 Sidewalk Ramp

2'-0”

DETECTABLE WARNING STRIP

PLAN

SECTION

DETECTABLE WARNING STRIP

PLAN

SECTION

TRUNCATED DOME DETAIL

PLAN

ELEVATION

DETECTABLE WARNING STRIP

BRICK OPTION

PLAN

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
ROADWAY STANDARD DRAWINGS

APPROVED FOR DISTRIBUTION
APPROVED FOR DESIGN

4/06

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REV.

DRAWING NO.

MADE BY

DATE

DESCRIPTION OF REVISIONS

ROADWAY STANDARD DRAWINGS

REVISED TITLE

4/06

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
ROADWAY STANDARD DRAWINGS

APPROVED FOR DISTRIBUTION
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Slotted Drain Pipe

When shown on plans.

Concrete pad to be poured separately from concrete bus bay pavement.

1. The PCCP surfaces within the bus bay area shall be textured transversely. Surface texturing to conform to Std Spec 401.
2. Transverse weakened plane joints shall be constructed at a maximum spacing of 15' and shall align with joints in the concrete curb and gutter.
3. For additional data on slotted drains, see Std Dwg C-13.60.
4. See Std Dwg C-05.50 for sidewalk construction.
5. Concrete pad to be poured separately from concrete bus bay pavement.
6. See Std Dwg C-05.20 for sidewalk construction.

Expansion Joint

Contraction Joint

GENERAL NOTES

SECTION A-A

SECTION B-B

SECTION C-C

SECTION D-D

Transverse weakened plane joints shall be constructed at a maximum spacing of 15' and shall align with joints in the concrete curb and gutter.
LOAD TRANSFER DOWEL ASSEMBLY

1. Load transfer dowel assemblies shall be used with non-skewed PCCP joints.
2. Load transfer dowel assemblies are to be placed at each transverse weakened plane joint on the traveled lanes as shown on the plans.
3. See Std Dwgs C-07.01 through C-07.04 for additional information.
4. See plans or Std Dwgs C-07.03 through C-07.04 for transverse joint spacing.
5. See plans for pavement thickness less than 12" or greater than 14".

Load transfer dowel assembly shall be assembled from the following materials:

- Dowel bars - 1 1/2" diameter x 1'-6" plain round bars with coating. See Special Provisions.
- Intermediate legs - 2 gauge or M-5.5 wire.
- End legs - 2 gauge or M-5.5 wire.
- Upper space bar - 2 gauge or M-5.5 wire x 12". See Dimension Table.
- Lower space bar - 2 gauge or M-5.5 wire x 12". See Dimension Table.
- Tie bars - M-1.5 wire x 16".
- Anchor strap - 1"x3" steel strap, 0.079 thick. Place with a 1 1/2" minimum length steel nail for LCB, 4" minimum length steel nail for ACB or AB, 0.145 diameter ASTM A227 Class 1 with 1/4" head or washer.

See Note 1
Std Dwgs C-07.01

Tie bars - W-1.5 wire x 16".

See Std Dwgs C-07.03 through C-07.04 for additional information.

See plans or Std Dwgs C-07.03 through C-07.04 for transverse joint spacing.

See Note 1
Std Dwgs C-07.01

Dowel Welds at Alternate Ends of Bars

ANCHOR STRAP DETAIL

END AND INTERMEDIATE LEG DETAIL

PLAN

ISOMETRIC

GENERAL NOTES

QUANTITY TABLE

<table>
<thead>
<tr>
<th>Item No</th>
<th>Lane Width (ft)</th>
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DIMENSION TABLE

<table>
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<td>12 14 16</td>
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</table>

<table>
<thead>
<tr>
<th>Tie bar</th>
<th>10-4 12-4 14-4</th>
</tr>
</thead>
</table>

Anchor strap - 2 x 3" steel strap, 0.079 thick.
GENERAL NOTES

1. Concrete shall be Class S, f'c=4000 PSI.
2. Rebar shall conform to Std Spec 1003.
3. Rebar shall have 2" minimum clear cover unless otherwise noted.
4. See drainage sheets for slotted drain and catch basin details.
5. Departure termination may be substituted for Std Dwg C-05.20 barrier transition under departure conditions.
6. See Std Dwg C-05.20 for sidewalk construction.
7. All bend dimensions for rebar are cut-out of rebar.

DEPARTURE TERMINATION WITHOUT GUARDRAIL

ELEVATION

DEPARTURE TERMINATION WITHOUT GUARDRAIL

ELEVATION

SECTION A-A

SECTION B-B

AT CATCH BASINS

BARRIER GUTTER DETAIL

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
ROADWAY STANDARD DRAWINGS

Sheet 3 of 3
4/06

C-10.51

Concrete shall be Class S, f'c=4000 PSI.
Rebar shall conform to Std Spec 1003.
Rebar shall have 2" minimum clear cover unless otherwise noted.
See drainage sheets for slotted drain and catch basin details.
Departure termination may be substituted for Std Dwg C-05.20 barrier transition under departure conditions.
See Std Dwg C-05.20 for sidewalk construction.
All bend dimensions for rebar are cut-out of rebar.

Concrete shall be Class S, f'c=4000 PSI.
Rebar shall conform to Std Spec 1003.
Rebar shall have 2" minimum clear cover unless otherwise noted.
See drainage sheets for slotted drain and catch basin details.
Departure termination may be substituted for Std Dwg C-05.20 barrier transition under departure conditions.
See Std Dwg C-05.20 for sidewalk construction.
All bend dimensions for rebar are cut-out of rebar.
GENERAL NOTES

1. Half Barrier shall be constructed by the slip or fixed form method.
2. When obstacles prevent the use of slip form equipment, stationary forms shall be used.
3. Concrete shall be Class S, <=4000 PSI.
4. #4 rebar shall extend 12” past the construction joint at the completion of the day’s pour.
5. Gutter thickness may be adjusted to match the PCCP thickness as approved by the Engineer.
6. When pavement section slopes away from the gutter, the slope of the gutter shall match the pavement cross slope. Therefore, the 2” gutter depression is not applicable.
7. At bridges, the cross slope of the gutter shall transition to match the cross-slope of the bridge. Length of the transition is 15’.
8. Two inch deep contraction joints shall be placed in the gutter at locations which match the joints in adjacent PCCP. Joints shall be hand-tooled or sawn.
9. Whenever half Barrier is backfilled, see Std Dwg C-10.50 for weep hole details unless otherwise specified on the plans.

Section A-A

Gutter Width Varies
2'-8" or 4'-6" (Typ)
See Plans

General Notes

1. Half Barrier shall be constructed by the slip or fixed form method.
2. When obstacles prevent the use of slip form equipment, stationary forms shall be used.
3. Concrete shall be Class S, <=4000 PSI.
4. #4 rebar shall extend 12” past the construction joint at the completion of the day’s pour.
5. Gutter thickness may be adjusted to match the PCCP 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 2” gutter depression is not applicable.
7. At bridges, the cross slope of the gutter shall transition to match the cross-slope of the bridge. Length of the transition is 15’.
8. Two inch deep contraction joints shall be placed in the gutter at locations which match the joints in adjacent PCCP. Joints shall be hand-tooled or sawn.
9. Whenever Half Barrier is backfilled, see Std Dwg C-10.50 for weep hole details, unless otherwise specified on the plans.

Concrete shall be Class S, <=4000 PSI.

Whenever Half Barrier is backfilled, see Std Dwg C-10.50 for weep hole details, unless otherwise specified on the plans.

Gutter Width Varies
2'-8" or 4'-6" (Typ)
See Plans

Concrete shall be Class S, <=4000 PSI.

Whenever Half Barrier is backfilled, see Std Dwg C-10.50 for weep hole details, unless otherwise specified on the plans.
GENERAL NOTES

1. All concrete shall be Class C, f'c=4000 PSI.
2. All rebar shall conform to Std Spec 1003.
3. All rebar shall have 2" minimum clear cover unless otherwise noted.
4. See drainage sheets for slotted drain and catch basin details.
5. Barrier transition shall match the adjoining concrete half barrier.
6. See Std Dwg C-05.20 for sidewalk construction.
7. All bend dimensions for rebar are out-to-out of bars.
   - 10½" to 8"
   - 7-5/8" to 10½"

See Barrier Gutter Detail
See Barrier Gutter Depression
See Plans

---

SECTION A-A

1. 10 3/8"
2. 4 7/8"
3. 6 Rebar
4. 12" Center to Center
5. 1 1/2" Clear of Side Walls
6. 11 1/4"

See Barrier Gutter Transition
See Plans

---

SECTION B-B

1. 10 3/8"
2. 4 7/8"
3. 6 Rebar
4. 12" Center to Center
5. 1 1/2" Clear of Side Walls
6. 11 1/4"

See Barrier Gutter Transition
See Plans

---

SECTION C-C

1. 10 3/8"
2. 4 7/8"
3. 6 Rebar
4. 12" Center to Center
5. 1 1/2" Clear of Side Walls
6. 11 1/4"

See Barrier Gutter Transition
See Plans

---

CONCRETE HALF-BARRIER TRANSITION

TYPE "F" AT RADIUS 32" TO 0"
See Plans
GENERAL NOTES

1. See plans and barrier summary sheets for location and type of guardrail and end treatments. Timber post installation shown.

2. See Std Dwg C-05.10, 05.12, 10.01 and 10.02 for dimensions and details not shown.

3. Type B guardrail installation shown. For Type A guardrail installation, use Type D-1 Curb and Gutter instead of the Type D-2 Curb and Gutter shown.

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

5. Optional joint filler (1/2") shall be placed when the curb & gutter or concrete widening abuts slotted drains, catch basins, dados, barrier, etc. Scored joints, 2" in depth, shall be placed to match adjacent joints in PCCP or at 15' intervals when adjacent to AC or continuously reinforced concrete pavement.

6. Optional construction joint.

Optional 
Construction Joint

Concrete Barrier:
Transition, Type 2
Std Dwg C-05.75
Sheet 2 of 2

Concrete Curb:
Transition, Type 5
Std Dwg C-05.80

Concrete Half Barrier:
Transition, Type 5
Std Dwg C-05.75

PLAN
1. Cattle guard shall include two (2) clamps per Sheet 4 at each gap between two (2) grill units, one at each end. Clamps shall be adjusted to provide a 1/4-inch plus or minus 1/16-inch gap between adjacent grill units.

2. Grill units shall be set on an angle iron assembly consisting of one piece of 6"x3 1/2"x 3/8" angle iron and studs with a head. The studs shall be placed on 1'-0" alternate centers. See Angle Assembly Detail 2.

3. Cattle guard shall be sloped to conform to the roadway grade and cross-section, except that where an odd number of grill units is specified in a crowned roadway, the center grill unit shall have a level cross slope.

4. Where the adjacent roadway is paved, an angle iron assembly shall consist of one piece of 4"x4"x 3/8" angle iron and studs with a head. The studs shall be placed on 1'-0" alternate centers. See Angle Assembly Detail 1.

5. Where the adjacent roadway is unpaved, an angle iron assembly shall consist of one 4"x4"x 3/8" angle iron, one 2"x2"x 3/8" angle iron, and connected with studs. The assembly shall be crowned at the centerline and constructed with a bevel cut and welded. The studs shall be bent 90° and placed on 1'-0" centers. See Angle Assembly Detail 3.

6. Each angle iron and angle iron assembly shall be fabricated to form a single piece for the full length of the cattle guard.

7. Quantities shown for concrete and rebar are approximations for informational purposes only.

8. When a gate is to be installed, it shall be called out on the plans.

9. All rebar shall have a minimum cover of 3", or as shown on the plans.

10. Cattle guard beams shall be HS-20 loading unless otherwise shown on the plans.

UNIT TABLE

<table>
<thead>
<tr>
<th>Roadway Width (ft)</th>
<th>Grill Units Required</th>
<th>Concrete (Cu Yards)</th>
<th>Rebar (Lbs)</th>
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<tr>
<td>40</td>
<td>7</td>
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<td>510</td>
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</table>
PLAN

ELEVATION

SECTION C-C

BEAMS

RAIL UNIT

DRAWING NO.

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
ROADWAY STANDARD DRAWINGS

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REV.

ROADWAY CATTLE GUARD

Sheet 2 of 4

3/16" Diameter Hole In Angle and Bar

3/4" Minimum Band R

Angle Assembly Detail 2 or 4

1 3/8" Beam

5 3/8" High Strength Structural W-Bolt (N) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3" for Odd Number Grill Units (Typ)

6" for Even Number Grill Units (Typ)

7'-0" Beams

4 Per Grill Unit

3/4" - 10 UNC x 2 1/2" High Strength Structural Hex Bolt (H) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3/4" Diameter Hole In Angle and Bar

3/4" Minimum Band R

Angle Assembly Detail 2 or 4

1 3/8" Beam

5 3/8" High Strength Structural W-Bolt (N) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3" for Odd Number Grill Units (Typ)

6" for Even Number Grill Units (Typ)

7'-0" Beams

4 Per Grill Unit

3/4" - 10 UNC x 2 1/2" High Strength Structural Hex Bolt (H) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3/4" Diameter Hole In Angle and Bar

3/4" Minimum Band R

Angle Assembly Detail 2 or 4

1 3/8" Beam

5 3/8" High Strength Structural W-Bolt (N) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3" for Odd Number Grill Units (Typ)

6" for Even Number Grill Units (Typ)

7'-0" Beams

4 Per Grill Unit

3/4" - 10 UNC x 2 1/2" High Strength Structural Hex Bolt (H) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3/4" Diameter Hole In Angle and Bar

3/4" Minimum Band R

Angle Assembly Detail 2 or 4

1 3/8" Beam

5 3/8" High Strength Structural W-Bolt (N) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3" for Odd Number Grill Units (Typ)

6" for Even Number Grill Units (Typ)

7'-0" Beams

4 Per Grill Unit

3/4" - 10 UNC x 2 1/2" High Strength Structural Hex Bolt (H) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3/4" Diameter Hole In Angle and Bar

3/4" Minimum Band R

Angle Assembly Detail 2 or 4

1 3/8" Beam

5 3/8" High Strength Structural W-Bolt (N) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit

3" for Odd Number Grill Units (Typ)

6" for Even Number Grill Units (Typ)

7'-0" Beams

4 Per Grill Unit

3/4" - 10 UNC x 2 1/2" High Strength Structural Hex Bolt (H) and Nut (W) with Hardened Helical Spring Lock Washer (S)

4 Per Grill Unit
**GENERAL NOTES**

1. 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 AB shall be used. When the roadway is unpaved, a material equivalent to the existing roadway shall be used.

2. On steeper grades, the post shall be installed plumb to align with adjacent fencing. The brace assembly may be modified as necessary to support the post.

- Indicates AASHTO, AGC & ARTBA Task Force 13 designation

---

**POST AND BRACE ASSEMBLY**

- **SECTION E-E**
  - 6'-0" Dimensions: "8" Wide Concrete Curb Footing, 4 Places
  - 3/4" Diameter Hole
  - 5/16" (Typ)

- **SECTION D-D**
  - 2"x2"x 1/4" x6'-11" Tubular Post
  - 4 1/2 " (Typ)
  - 3 1/2 " (Typ)
  - 3/4"-10 UNCx11" Hex Bolt ( ) and Hex Nut ( ) with Plain Round Washer ( ) (Typ)
  - 3/4"-10 UNCx9 1/2 " Hex Bolt ( ) and Hex Nut ( ) with Plain Round Washer ( )

- **END VIEW**
  - 2" Square (Outside Nominal Dimension) x 8" Wide Concrete Curb Footing, 4 Places
  - 8" Diameter Hole
  - 4 1/2" (Typ)
  - 5/8" (Typ)

---

**SHOULDER TRANSITION AT CATTLE GUARDS**

- **SECTION E-E**
  - 13/16 Diameter Hole (Typ)
  - 7"
  - 4 1/2 
  - 3/4"-10 UNCx3 1/2 " Hex Bolt ( ) and Hex Nut ( ) with Plain Round Washer ( )

---

**STATE OF ARIZONA**

**DEPARTMENT OF TRANSPORTATION**

**ROADWAY STANDARD DRAWINGS**

**ROADWAY CATTLE GUARD**

**MADE BY**

**DATE**

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APPROVED FOR DESIGN

REISSUED STD DWG

4/06

---
3/4" Hex Nut (1 Required) with Plain Round Washer, Grade 3 Under Nut (Typ)

1/4" [ 1/16 "

3/4" Hex Nut (2 Required) with Plain Round Washer, Grade 3

3/4" Diameter All-Thread x 11 5/8"

1 3/4"

1 1/4"

2 1/2"

1"

2"

13/16 Diameter Hole (Typ)

3" (Typ)

6" (Typ)

See DETAIL A

1/4" (Typ)

1/4" R

3/16" R

3/8"

1 3/4"

1/2"

1/4"

1/2"

3/4" Diameter Hex (Typ)
GENERAL NOTES

1. Catch basin can be used on grade or at roadway sag.
2. Catch basin has three configurations:
   a. Sump Only—sump portion of catch basin (see detail 4, sheet 2 of 3).
   b. Single Wing (Illustrated)—sump with wing basin upstream.
   c. Double Wing—sump with symmetrical wing basins each side.
3. Pipes can be placed in any wall except wall adjacent to wing basin.
4. Floor shall be a wood trowelled finish. Slope of the sump portion of the catch basin along the axis of the pipe shall be 4:1.
5. Any specified inlet depression shall be warped to opening according to std deg C-15.70.
6. All rebar shall be ASTM A36.
7. Nose plate, access frame and cover shall be given one shop coat of number 1 paint.
8. All concrete shall be Class B.
9. Curb opening area (sq ft) per inch of curb "h" + gutter depression = curb opening length (ft) x 0.0833.
10. All welding shall be in accordance with std spec K04-SAW.
11. Construction joints and drains shall be placed to meet field conditions. See std deg C-15.70.
12. 8" when H is 8' or less; 8" when H is greater than 8'.

Catch basin can be used on grade or at roadway sag.

Catch basin has three configurations:
- Sump Only—sump portion of catch basin (see detail 4, sheet 2 of 3).
- Single Wing (Illustrated)—sump with wing basin upstream.
- Double Wing—sump with symmetrical wing basins each side.

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

Floor shall be a wood trowelled finish. Slope of the sump portion of the catch basin along the axis of the pipe shall be 4:1.

Any specified inlet depression shall be warped to opening according to std deg C-15.70.

All rebar shall be ASTM A36.

Nose plate, access frame and cover shall be given one shop coat of number 1 paint.

All concrete shall be Class B.

Curb opening area (sq ft) per inch of curb "h" + gutter depression = curb opening length (ft) x 0.0833.

All welding shall be in accordance with std spec K04-SAW.

Construction joints and drains shall be placed to meet field conditions. See std deg C-15.70.

8" when H is 8' or less; 8" when H is greater than 8'.
GENERAL NOTES

1. All structural steel shall be in accordance with ASTM A36.

2. All welding shall be in accordance with Std. Sec. 604-3.06.

3. The completed grate assembly (frame & grate) shall be given two shop coats of Number 1 paint.

NOTE TO DESIGNERS

Grate design is not suitable for locations subject to bicycle traffic.

<table>
<thead>
<tr>
<th>Type</th>
<th>Brace Plate</th>
<th>Brace Plate Detail</th>
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<tbody>
<tr>
<td>B</td>
<td>3 1/2 &quot;x 1/2 &quot;x 10&quot;</td>
<td>See Brace Plate Detail</td>
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<table>
<thead>
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<th>Type</th>
<th>Curb Height (in)</th>
<th>Catch Basin Frame Width (ft-in)</th>
<th>Catch Basin Grate Width (in)</th>
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NOTE TO DESIGNERS

Grate design is not suitable for locations subject to bicycle traffic.
GENERAL NOTES

1. All welding shall be in accordance with Std Spec 604-3.06.
2. Grate opening for grate shown is 4.75 Sq Ft.

NOTE TO DESIGNERS

Grate design shown is not suitable for locations subject to bicycle traffic. Use Std Dwg C-15.50 grate with Std Dwg C-15.92 frame (Sheet 2 of 2) for locations with bicycle traffic.