This File contains revisions to the English version of the Standard Road Plans effective for the 04-21-20 letting.

Federal and state laws prohibit employment and/or public accommodation discrimination on the basis of age, color, creed, disability, gender identity, national origin, pregnancy, race, religion, sex, sexual orientation or veteran’s status. If you believe you have been discriminated against, please contact the Iowa Civil Rights Commission at 800-457-4416 or Iowa Department of Transportation’s affirmative action officer. If you need accommodations because of a disability to access the Iowa Department of Transportation’s services, contact the agency’s affirmative action officer at 800-262-0003.
INSTRUCTIONS: The attached Standard Road Plans have received approval and may be referred to in the plans by number. Questions concerning information contained on the Standard Road Plans should be directed to the Methods Section, Design Bureau, telephone (515) 239-1727 or email daniel.harness@iowadot.us.

**NOTE** The following revisions are effective with the 4/21/2020 letting. Projects let prior to this date may reference earlier versions of these Standard Road Plans.

<table>
<thead>
<tr>
<th>Standard Road Plan</th>
<th>Description of Revision</th>
</tr>
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<tbody>
<tr>
<td><strong>BA Index</strong></td>
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<tr>
<td>BA-100</td>
<td>Removed INTERIM from the standard.</td>
</tr>
<tr>
<td>BA-102</td>
<td>Removed INTERIM from the standard.</td>
</tr>
<tr>
<td>BA-103</td>
<td>Removed INTERIM from the standard.</td>
</tr>
<tr>
<td><strong>DR Index</strong></td>
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</tr>
<tr>
<td>DR-201</td>
<td>Added Designer Info button.</td>
</tr>
<tr>
<td>DR-202</td>
<td>Added Designer Info button.</td>
</tr>
<tr>
<td>DR-203</td>
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<td>DR-211</td>
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<td>DR-212</td>
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</table>
DR-213  
Added Designer Info button.

DR-503  
Added Designer Info button.

DR-504  
New. Replaces Road Design Detail 500-19.

DR-641  
Modified dimension line on Plan view.

EC Index  

EC-204  
Modified circle notes 3 and 5.

EC-602  
Modified circle note 4.

PM Index  

PM-110  
Modified NPY4.

PM-111  
Added SLSW.

PM-310  
Added two lane exit and entrance ramp tapers.

PR Index  

PR-102  
Removed INTERIM from the standard.

PR-103  
Removed INTERIM from the standard.

PR-105  
Removed INTERIM from the standard.

PR-120  
Removed INTERIM from the standard.

PR-121  
Removed INTERIM from the standard.

PV Index  

PV-10  
Changed 18" strip of normal pavement surface to 24". This is being done to better accommodate bicyclists.
PV-101
Modified Dowel Assemblies on Sheets 6 and 7 to eliminate reference to 14’ pavements.

PV-102
Split DRIVEWAY DROP CURB detail into two details. Added new circle note 4 on Sheet 1. Renumbered circle note on Sheet 5.

PV-103
New logo.

PV-104
New logo.

PV-11
Void.

PV-202
New logo.

PV-203
New logo.

PV-301
New logo.

PV-302
New logo.

PV-303
New logo.

PV-304
New logo.

PV-305
New logo.

PV-410
Removed INTERIM from the standard.

PV-411
Removed INTERIM from the standard and modified leader line for circle note 9.

PV-412
Removed INTERIM from the standard.

PV-414
Removed INTERIM from the standard.

PV-501
New logo and modified circle note 2.
PV-502
New logo and modified circle note 2.

PV-504
New logo and modified circle note 2.

PV-505
New logo and modified circle note 2.

PV-507
New logo and modified circle note 2.

PV-508
New logo and modified circle note 2.

PV-510
New logo and modified circle note 2.

PV-511
New logo and modified circle note 2.

PV-513
New logo and modified circle note 2.

PV-514
New logo and modified circle note 2.

SI Index
SI-174
New.

SW Index
SW-104
Modified PVC Table Title.

SW-201
Changed 1 to I on Bedding Material.

SW-202
Changed 1 to I on Bedding Material.

SW-301
Changed 1 to I on Bedding Material and removed steps.

SW-302
Added Class I Bedding Material.

SW-303
Added Class I Bedding Material and removed steps.
SW-304
  Added Class I Bedding Material and removed steps.

SW-305
  Added Class I Bedding Material and removed steps.

SW-307
  Changed 1 to I on Bedding Material in Note 1. Added EXTERNAL to title.

SW-308
  New

SW-401
  Added Class I Bedding Material and removed steps.

SW-402
  Added Class I Bedding Material.

SW-403
  Added Class I Bedding Material.

SW-404
  Added Class I Bedding Material and removed steps.

SW-405
  Changed 1 to I on Bedding Material and removed steps.

SW-406
  Added Class I Bedding Material.

SW-501
  Added Class I Bedding Material.

SW-502
  Added Class I Bedding Material.

SW-503
  Added Class I Bedding Material.

SW-504
  Added Class I Bedding Material.

SW-505
  Added Class I Bedding Material.

SW-506
  Added Class I Bedding Material.

SW-507
  Added Class I Bedding Material and changed maximum box out length to 17’.

SW-508
  Added Class I Bedding Material and changed maximum box out length to 17’.
SW-509
Added Class I Bedding Material and changed maximum box out length to 17’.

SW-510
Added Class I Bedding Material and changed maximum box out length to 17’.

SW-511
Added Class I Bedding Material.

SW-512
Changed 1 to I on Bedding Material.

SW-513
Added Class I Bedding Material.

SW-515
New

SW-521
Converted to joint standard. Modified circle note 1.

SW-541
Changed well walls to 6 inch reinforced. Modified TYPICAL SECTION and c1 and c2 bar lengths. Added note 4. Added Class I bedding material.

SW-542
Modified g3 and g5 bar lengths. Modified SECTIONS A-A, B-B, and C-C on Sheets 2 and 3. Converted to a joint standard with SUDAS.

SW-545
Changed well walls to 6 inch reinforced. Modified 4b1 and 4b2 bar spacing. Modified bars 4e1 and 4e6. Modified SECTION C-C on Sheets 3 and 4.

SW-601
Add option for 3-piece HMA casting.

SW-602
Add option for 3-piece HMA casting.

SW-604
Added Type 7 casting. Modified circle notes.

TC Index

TC-061
Renumbered circle notes 8 to 11 and added circle note 12.

TC-062
Modified W6-1 sign in bottom drawing on Sheet 1 to W6-2.

TC-212
Added note DO NOT USE ON PRIMARY ROADWAYS and new general notes.
TC-214
   Modified circle note 4.

TC-218
   Modified circle note 3.

TC-252
   Added Portable Dynamic Message Sign and new note 4 on Sheet 2.

TC-415
   New.

TC-417

TC-418
   Modified circle note 4.

TC-421
   Modified circle note 1.

TC-422
   Modified circle note 2.

TC-423
   Removed reference to "5 devices". Added new circle note 3.

TS Index

TS-102
   Modified conduit details in MAST ARM POLE FOUNDATION drawings on Sheets 1, 2, and 3.
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<td>04-21-20</td>
<td>44&quot; Concrete Median Barrier (Full Section)</td>
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<td>BA-101</td>
<td>10-21-14</td>
<td>44&quot; Concrete Median Barrier Width Transition</td>
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<td>BA-102</td>
<td>04-21-20</td>
<td>44&quot; Concrete Barrier (Half Section)</td>
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<td>BA-103</td>
<td>04-21-20</td>
<td>34&quot; Concrete Barrier (Half Section)</td>
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<td>BA-104</td>
<td>10-15-19</td>
<td>34&quot; Concrete Barrier for use with Reinforced Paved Shoulder</td>
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<td>BA-105</td>
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<td>34&quot; to 44&quot; Concrete Barrier Transition Section</td>
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<td>10-21-14</td>
<td>Reinforced Paved Shoulder for Concrete Barrier</td>
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<td>Concrete Barrier End Section</td>
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<td>10-17-17</td>
<td>Concrete Barrier Tapered End Section</td>
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<td>BA-150</td>
<td>10-15-19</td>
<td>Side Obstacle Protection with Concrete Barrier and Guardrail</td>
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<td>BA-200</td>
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<td>Steel Beam Guardrail Components</td>
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<td>04-18-17</td>
<td>Steel Beam Guardrail Barrier Transition Section (MASH TL-3)</td>
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<td>BA-202</td>
<td>10-20-15</td>
<td>Steel Beam Guardrail Bolted End Anchor</td>
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<td>10-15-19</td>
<td>Steel Beam Guardrail W-Beam End Anchor</td>
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<td>Steel Beam Guardrail Tangent End Terminal (MASH TL-3)</td>
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<td>BA-206</td>
<td>10-15-19</td>
<td>Steel Beam Guardrail Flared End Terminal For Cable Connection</td>
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<td>Guardrail Post Adaptor Unit</td>
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<td>Steel Beam Guardrail Long - Span System for Post Conflicts</td>
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<td>BA-221</td>
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<td>Steel Beam Guardrail Tangent End Terminal (MASH TL-2)</td>
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<td>BA-250</td>
<td>10-18-16</td>
<td>Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post (MASH TL-3)</td>
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<tr>
<td>BA-251</td>
<td>04-19-16</td>
<td>Steel Beam Guardrail Installation at Side Obstacle (Two-Way Protection)</td>
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<td>BA-252</td>
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<td>Steel Beam Guardrail Installation at Side Obstacle (One-Way Protection)</td>
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<td>BA-253</td>
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<td>Steel Beam Guardrail Installation at Railroad Signal</td>
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<td>BA-260</td>
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<td>Steel Beam Guardrail Installation at Concrete Barrier or Bridge End Post (MASH TL-2)</td>
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<tr>
<td>NO.</td>
<td>DATE</td>
<td>TITLE</td>
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<td>------------------------------------------------------</td>
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<tr>
<td>BA-351</td>
<td>10-15-19</td>
<td>High Tension Cable Guardrail</td>
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<td></td>
<td></td>
<td>Temporary Barrier Rails</td>
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<tr>
<td>BA-401</td>
<td>10-15-19</td>
<td>Temporary Barrier Rail (Precast Concrete)</td>
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<td></td>
<td>Crash Cushions</td>
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<tr>
<td>BA-500</td>
<td>04-19-16</td>
<td>Temporary Crash Cushions Sand Barrel</td>
</tr>
</tbody>
</table>

Cable Guardrail

Temporary Barrier Rails

Temporary Barrier Rail (Precast Concrete)

Crash Cushions

Temporary Crash Cushions Sand Barrel
Concrete Barrier, BA-100 and Footing

Concrete Barrier, BA-100 or

Possible Contract Item:

Per Foot

3"

5"

12"

44"

WT. (lbs.)

CONCRETE QUANTITIES

<table>
<thead>
<tr>
<th>Size</th>
<th>Number of Bars</th>
<th>Length</th>
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</thead>
<tbody>
<tr>
<td>7'-4&quot;</td>
<td>107</td>
<td>19'-6&quot;</td>
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</tbody>
</table>

SECTION A-A

ELEVATION

Use epoxy-coated Grade 60 reinforcing bars. Provide 2 inches minimum cover. Anchor barrier reinforcement to prevent movement. Secure each section at the front, back, and at 3' 6" minimum intervals using a method approved by the Engineer.

Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

Saw contraction joints as indicated. Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 17 foot maximum, 15 foot minimum joint spacing.

Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

Fill out corner strips with a 3/4 inch dressed and beveled strip.

Construct concrete footing when barrier is not placed on concrete slab. Apply Article 2403.03 of the Standard Specifications, but the use of forms is optional. If forms are used, place backfill around the completed footing.

Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge line.

Possible Contract Item: Concrete Barrier, BA-100 or Concrete Barrier, BA-100 and Footing

Possible Tabulation: 108-18

CONCRETE QUANTITIES

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<tr>
<th>Mark</th>
<th>Size</th>
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<th>WT. (lbs.)</th>
<th>Max. Spacing</th>
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<tr>
<td>g1</td>
<td>5</td>
<td>14</td>
<td>7'-4&quot;</td>
<td>19'-6&quot;</td>
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<tr>
<td>f1</td>
<td>5</td>
<td>7</td>
<td>19'-6&quot;</td>
<td>141</td>
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REINFORCING BAR LIST
Per Section (Approx. 20 feet)

<table>
<thead>
<tr>
<th>Bar</th>
<th>Size</th>
<th>Number of Bars</th>
<th>Length</th>
<th>Weight (lbs.)</th>
<th>Spacing</th>
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<tbody>
<tr>
<td>g1</td>
<td>5</td>
<td>14</td>
<td>7'-3&quot;</td>
<td>106</td>
<td>1'-6&quot;</td>
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<tr>
<td>f1</td>
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</table>

Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 17 foot maximum, 15 foot minimum joint spacing.

Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

\begin{align*}
\text{Concrete Quantities} \\
\text{Per foot} \\
0.11 \text{ cy}
\end{align*}
SAWED CONTRACTION JOINT
Saw cut top and front face. Saw cut back if exposed.

DETAIL 'A'
Special Shaping for Barrier over Intake

REINFORCING BAR LIST
Per Section (Approx. 20 feet)

<table>
<thead>
<tr>
<th>Bar</th>
<th>Size</th>
<th>Number of Bars</th>
<th>Length</th>
<th>Weight (lbs.)</th>
<th>Spacing</th>
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</thead>
<tbody>
<tr>
<td>g1</td>
<td>5</td>
<td>14</td>
<td>5'-8&quot;</td>
<td>83</td>
<td>1'-6&quot;</td>
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<tr>
<td>M</td>
<td>5</td>
<td>6</td>
<td>19'-6&quot;</td>
<td>94</td>
<td>______</td>
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</tbody>
</table>

CONCRETE QUANTITIES
Per foot
0.10 cy

ELEVATION
Use Grade 60 epoxy-coated reinforcing bars. Provide 2 inches minimum cover. Anchor all reinforcement to prevent movement. Secure each section at the front, back, and at 3'-6" intervals using a method approved by the Engineer.

Expansion joints are necessary only where specifically required by project plans. Conform expansion material to the shape of the barrier. No sealer is required.

Where abutting sections are placed as separate pours, a butt joint may be used. Extend longitudinal reinforcement into the abutting section a minimum of 1'-6".

For barrier dowelled to pavement, match pavement joints. For free-standing barrier with integral footings, use 17 foot maximum, 15 foot minimum joint spacing.

When connecting to BA-105 or BA-107, include 4 additional #5 bars embedded a minimum of 3 feet into the BA-103 barrier.

Use 1 inch diameter deformed dowel bars of sufficient length to ensure 6 inch minimum embedment in barrier and supporting surface. Install dowels either in supporting surface when placed, or in drilled holes using polymer grout complying with Materials I.M. 491.11 or hydraulic cement grout complying with Materials I.M. 491.13.

Fill all exposed corners with a 1/4 inch dressed and beveled strip.

Construct concrete footing when barrier is not placed on concrete slab. Apply Article 2403.03 of the Standard Specifications, but the use of forms is optional. If forms are used, place backfill around the completed footing.

Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge lines.

Possible Contract Item: Concrete Barrier, BA-103 or Concrete Barrier, BA-103 and Footing

Possible Tabulation:
Concrete Barrier, BA-103 and Footing

Concrete Barrier, BA-103

Possible Expansion Joint or End of Barrier

Fillet all exposed corners with a 1/4 inch dressed and beveled strip.

Construct concrete footing when barrier is not placed on concrete slab. Apply Article 2403.03 of the Standard Specifications, but the use of forms is optional. If forms are used, place backfill around the completed footing.

Place barrier markers at 100 foot increments in areas with non-continuous lighting, or 250 foot increments in areas with continuous lighting. Marker color to be the same as adjacent edge lines.

Possible Contract Item: Concrete Barrier, BA-103 or Concrete Barrier, BA-103 and Footing

Possible Tabulation:
Concrete Barrier, BA-103 and Footing

Concrete Barrier, BA-103

Possible Expansion Joint or End of Barrier

Fillet all exposed corners with a 1/4 inch dressed and beveled strip.

Concrete Barrier, BA-103

Possible Expansion Joint or End of Barrier

Fillet all exposed corners with a 1/4 inch dressed and beveled strip.

Concrete Barrier, BA-103

Possible Expansion Joint or End of Barrier

Fillet all exposed corners with a 1/4 inch dressed and beveled strip.

Concrete Barrier, BA-103

Possible Expansion Joint or End of Barrier

Fillet all exposed corners with a 1/4 inch dressed and beveled strip.

Concrete Barrier, BA-103
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<td>DR-101</td>
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<td>Pipe Culvert (Bedding and Backfill)</td>
</tr>
<tr>
<td>DR-102</td>
<td>04-21-15</td>
<td>Pipe Culvert (Cover and Camber)</td>
</tr>
<tr>
<td>DR-103</td>
<td>04-21-15</td>
<td>Pipe Culvert (Installation Details)</td>
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<td>DR-104</td>
<td>04-19-16</td>
<td>Depth of Cover Tables for Concrete and Corrugated Pipe</td>
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<tr>
<td>DR-111</td>
<td>04-17-18</td>
<td>Box Culvert (Backfill)</td>
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<tr>
<td>DR-121</td>
<td>10-17-17</td>
<td>Connected Pipe Joints</td>
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<td>DR-122</td>
<td>10-18-16</td>
<td>Construction of Type &quot;C&quot; Concrete Adaptors for Pipe Culvert Connections</td>
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<tr>
<td>DR-141</td>
<td>04-18-17</td>
<td>Pipe Bends and Half Pipe</td>
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<td>04-21-15</td>
<td>Culvert Pipe Tee Sections</td>
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<td>04-21-20</td>
<td>Concrete Aprons</td>
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<td>Low Clearance Concrete Pipe Aprons</td>
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<td>Metal Pipe Aprons and Beveled Ends</td>
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<td>Metal Arch Aprons (for Corrugated Metal Pipe)</td>
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<td>Concrete Apron with End Wall</td>
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<td>Beveled Pipe and Guard</td>
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<td>Pipe Apron Guard</td>
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<td>Subdrains Standard (Farm Tile Replacement)</td>
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<td>Subdrain Outlets (Standard Subdrain, Pressure Release and Special)</td>
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<td>Precast Concrete Headwall for Subdrain Outlets</td>
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<td>Unclassified Letdown Structure Single Elbow</td>
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**TYPE 1 APRONS**

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**TYPE 2 APRONS**

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<th>C</th>
<th>E</th>
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*Contract Item: Apron, Concrete*
*Tabulations: 104-3 104-5C*
Tongue end on inlet end section. Groove end on outlet end section. Inlet end section is shown.

Possible Contract Item:
Low Clearance Concrete Pipe Aprons

Possible Tabulations:
104-3
104-4

Install connected pipe joints as shown on DR-121.

Comply with AASHTO M 206 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

Tongue end on inlet end section. Groove end on outlet end section. Inlet end section is shown.
ARCH PIPE (MULTI-SECTION APRON)

<table>
<thead>
<tr>
<th>NOMINAL SPAN X RISE</th>
<th>EQUIVALENT SPAN</th>
<th>RISE</th>
<th>APPROXIMATE DIMENSIONS</th>
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<tr>
<td></td>
<td>Inches</td>
<td>Inches</td>
<td>Inches</td>
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<td>90</td>
<td>115</td>
<td>72</td>
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<tr>
<td>120 X 78</td>
<td>96</td>
<td>122</td>
<td>77 1/2</td>
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<tr>
<td>138 X 88</td>
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<td>154 X 97</td>
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<td>95 1/4</td>
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<tr>
<td>169 X 107</td>
<td>132</td>
<td>193</td>
<td>105 1/2</td>
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</table>

- Tongue end on inlet end section. Groove end on outlet end section. Inlet end section is shown.
- 132 inch size is a three piece end section.
**PLAN**

**END**

**Span**

**Rise**

**T**

**F**

**C**

**B**

**E**

**SECTION A-A**

**DIAMETER**

**EQUIVALENT**

**APPROXIMATE DIMENSIONS**

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<th>Slope</th>
<th>APPROXIMATE DIMENSIONS</th>
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<td>14</td>
<td>3:1</td>
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<td>24</td>
<td>30</td>
<td>19</td>
<td>3:1</td>
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<td>3 92 54 18 72 60</td>
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<td>29</td>
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<td>2.5:1</td>
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<td>113</td>
<td>72</td>
<td>1:6:1</td>
<td>9 36 93 33 96 113</td>
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</table>

Comply with AASHTO M 207 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

Tongue end on inlet end section. Groove end on outlet end section. Inlet end section shown.

Low Clearance

Concrete Pipe Aprons

Elliptical Pipe

Comply with AASHTO M 207 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated hereon for the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

Tongue end on inlet end section. Groove end on outlet end section. Inlet end section shown.

Low Clearance

Concrete Pipe Aprons

Elliptical Pipe
Install aprons and hardware fabricated from galvanized steel complying with Section 4141 of the Standard Specifications. Alternate design details may be submitted to the Engineer for approval.

Aprons may be attached to culvert pipe as follows:

A. If normal culvert is of circumferential type, use an approved bolt or clamp to fasten directly to culvert.

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect the culvert pipe using special dimple band connector.
   2. "Dimple" bands are not allowed when a positive joint is specified.

Refer to Materials I.M. 441 for approved coupling devices.

Repair, to the Engineer’s satisfaction, breaks or damage to the coating that occur during handling or installation.

Price bid for "Aprons, Metal" is full compensation for fabrication and installation of the metal apron.

1. On sizes 60 inches and larger, the reinforced edge should be supplemental with a galvanized stiffener angle attached with bolts.
2. Install Galvanized Toe Plate (same gage metal as apron) on all aprons 24 inch diameter and larger.

Possible Contract Item:
Apron, Metal.

Possible Tabulations:
104-3
104-6C

When specifically required as part of detail project plans, ends of pipe culvert may be provided with beveled ends as shown.

Either Full Bevel or Step Bevel may be used unless one type is specified. The slope of the bevel is 3:1 unless specified otherwise. Beveled ends, when required, are incidental to the price bid for the culvert.
**TYPICAL CROSS SECTION**

**PLAN VIEW**

**END VIEW**

**APPROX. SLOPE**

<table>
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<tr>
<th>SPAN/RISE</th>
<th>EQUIV DIA</th>
<th>GAGE</th>
<th>DIMENSIONS (in inches)</th>
<th>APPROX SLOPE</th>
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<td>16</td>
<td>16</td>
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<td>18''</td>
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<td>24&quot; x 18&quot;</td>
<td>21''</td>
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<td>8</td>
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<td>72''</td>
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</table>

**Possible Contract Items:**
- Aprons, Metal, Arch

**Possible Tabulations:**
- 104-3

**Design Notes:**
A. All 3 piece bodies are to have 12-gage sides and 10-gage center panels. Multiple panel bodies are to have lap seams which are to be tightly joined by galvanized rivets or bolts.
B. For the 77"x52" and 83"x57" sizes, the reinforced edge is to be supplemented by galvanized angles. The angles are to be attached by galvanized nuts and bolts.
C. Angle reinforcement is to be placed under the center panel seams on the 77"x52" and 83"x57" sizes.
D. Galvanized Toe plate is to be available as an accessory when specified on the order and is to be the same gage as the end section.

**Installations:**
Install aprons and hardware fabricated from galvanized steel complying with Section 4141 of the Standard Specifications. Alternate design details may be submitted to the Engineer for approval.

Comply with the following:
1. All 3 piece bodies are to have 12-gage sides and 10-gage center panels. Multiple panel bodies are to have lap seams which are to be tightly joined by galvanized rivets or bolts.
2. For the 77"x52" and 83"x57" sizes, the reinforced edge is to be supplemented by galvanized angles. The angles are to be attached by galvanized nuts and bolts.
3. Angle reinforcement is to be placed under the center panel seams on the 77"x52" and 83"x57" sizes.
4. Galvanized Toe plate is to be available as an accessory when specified on the order and is to be the same gage as the end section.

Aprons may be attached to culvert pipe as follows:
A. If culvert is of circumferential corrugation, use an approved bolt or clamp to fasten apron directly to culvert.
B. If culvert is of helical corrugation type:
1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using a special dimple band connector.
2. "Dimple" bands are not allowed when a positive joint is specified.

**Repair:**
Repair, to the Engineer's satisfaction, breaks or damage to the coating that occur during handling or installation.

**Price Bid for "Aprons, Metal, Arch"**
A full compension for fabrication and installation of metal arch aprons as indicated herein.

**Possible Contract Items:**
- Aprons, Metal, Arch

**Possible Tabulations:**
- 104-3
**Type 2 Aprons**

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<th>Diameter</th>
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<td>30''</td>
<td>9'-6''</td>
<td>1.8:1</td>
<td>21''</td>
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For the End Wall, match the thickness and reinforcing used for the pipe apron.

Dimension shown is the minimum and is considered the design length. Adjust for any difference between the actual length of concrete apron installed and the length indicated herein within the length of concrete culvert pipe furnished.

When specified in the contract documents, install pipe apron guards as shown on DR-213. Adjust connection locations to avoid conflict with end wall. Pipe apron guards are incidental to "Concrete Aprons".

For End Wall, match the thickness and reinforcing used for the pipe apron.

Dimension shown is the minimum and is considered the design length. Adjust for any difference between the actual length of concrete apron installed and the length indicated herein within the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

Possible Tabulation: 104-3
**Low Clearance Concrete Pipe Aprons**

Possible Tabulations:
- 104-3
- 104-4

Possible Contract Item:
- ARCH PIPE

---

<table>
<thead>
<tr>
<th>NOMINAL DIMENSIONS</th>
<th>EQUIVALENT SPAN</th>
<th>RISE</th>
<th>SLOPE</th>
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</table>

Comply with AASHTO M 206 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated herein for the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

To: Tongue end on inlet end section, Groove end on outlet end section. Inlet end section shown.

Alternate Design

---

**SECTION A-A**

**PLAN**

**END**

**APPROVED BY DESIGN METHODS ENGINEER**

**REVISIONS:**
- Added Designer Info button.

**STANDARD ROAD PLAN**

**DR-206**

**SHEET 1 of 2**
### Alternate Design

**RISE APPROXIMATE DIMENSIONS**

<table>
<thead>
<tr>
<th>DIAMETER</th>
<th>SPAN</th>
<th>RISE</th>
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<th>APPROXIMATE DIMENSIONS</th>
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<td>9 36 58 38 96 113</td>
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Comply with AASHTO M 207 for Apron Reinforcement.

Dimension "E" shown is minimum and is considered the design length. Appropriately adjust for any difference between the actual length of concrete apron installed and the length indicated herein for the length of concrete culvert pipe furnished.

Install connected pipe joints as shown on DR-121.

1. Tongue end on inlet end section, Groove end on outlet end section. Inlet end section shown.

---

**ELLIPICAL PIPE**

**Section A-A**

**Plan**

**End Wall**

**Top Elevation**

**End Wall**

**Section A-A**

**Alternate Design**

**Elliptical Pipe**
Pipe Diameter

Top of Sloped End Section

Bolts to hold the surfaces tightly together

Optional Toe Plate Extension (same gage as end section)

Reinforced edge full length of end section (see Section A-A)

Pipe Culvert Length of Measurement

Galvanized Strap

Sheet rolled snugly against steel rod

Holes at 12° C.C.

Overall Width

EDGE OF SIDEWALL

Parallel Safety Bars

Holes at 12° C.C.

EXTRA ROD OR NO. 4 GALVANIZED ROD

Minimum 5/8" Dia. Galvanized Steel Rod or No. 4 Galvanized Reinforcing Bar.

2" (Approx.)

Parallel safety bars will be required only when specified in the project plans.

Number of bars required will vary depending on the length of the end section.

Pipe 30" diameter and larger. For pipe 24" diameter and smaller, parallel safety bars will be required only when specified in the project plans.

Possible Contract Item: Aprons, Safety Slope

Possible Tabulation: 104-3

Install aprons and hardware fabricated from galvanized steel complying with Section 441 of the Standard Specifications. Alternate design details may be submitted to the Engineer for approval.

Apron may be attached to culvert pipe as follows:

A. If normal culvert is of circumferential corrugation type, use an approved bolt or clamp to fasten apron directly to apron.

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using special dimple band connector.
   2. "Dimple" bands will not be allowed when a positive joint is specified.

Refer to Materials I.M. 441 for approved coupling devices.

Repair, to the Engineer's satisfaction, breaks or damage to the coating that occur during handling or installation.

Price bid for "Aprons, Safety Slope" is full compensation for fabrication and installation of the apron.

1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe.

2. Use an approved bolt or clamp to fasten apron directly to apron.

A. If normal culvert is of circumferential corrugation type:

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using special dimple band connector.
   2. "Dimple" bands will not be allowed when a positive joint is specified.

Refer to Materials I.M. 441 for approved coupling devices.

Repair, to the Engineer's satisfaction, breaks or damage to the coating that occur during handling or installation.

Price bid for "Aprons, Safety Slope" is full compensation for fabrication and installation of the apron.

Number of bars required will vary depending on the length of the end section.

Parallel safety bars are required for pipes 30" diameter and larger. For pipe 24" diameter and smaller, parallel safety bars will be required only when specified in the project plans.

Possible Contract Item: Aprons, Safety Slope

Possible Tabulation: 104-3

Install aprons and hardware fabricated from galvanized steel complying with Section 441 of the Standard Specifications. Alternate design details may be submitted to the Engineer for approval.

Apron may be attached to culvert pipe as follows:

A. If normal culvert is of circumferential corrugation type, use an approved bolt or clamp to fasten apron directly to apron.

B. If normal culvert is of helical corrugation type:
   1. Use an approved sizing ring securely fastened to inside diameter of apron to connect to the culvert pipe using special dimple band connector.
   2. "Dimple" bands will not be allowed when a positive joint is specified.

Refer to Materials I.M. 441 for approved coupling devices.

Repair, to the Engineer's satisfaction, breaks or damage to the coating that occur during handling or installation.

Price bid for "Aprons, Safety Slope" is full compensation for fabrication and installation of the apron.
For reinforcing steel used in construction of "Beveled Pipe and Guard", use deformed bars meeting the requirements of Article 4151.03 of the Standard Specifications and hot-dip galvanized according to ASTM A123.

Use Class 'C' Concrete in the construction of Beveled Pipe and Guard.

Cut the pipe to fit the foreslope. Cut slots into the pipe for placement of the No. 8 bars. After the foreslope has been placed, fit the No. 8 bars into the slots cut in the pipe so they will be in proper position when the concrete collar is poured.

Price bid for "Beveled Pipe and Guard," each, is full compensation for furnishing all materials and constructing the Beveled Pipe and Guard.

Special Note:
A silt fence ditch check is required immediately upstream from the inlet. Refer to EC-201 for construction details.

### TABLE OF DIMENSIONS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
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<th>B</th>
<th>C</th>
<th>D</th>
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<td>19</td>
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### REINFORCING BAR LIST

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<th>SHAPE</th>
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<td>See Detail</td>
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Possible Contract Item: 
Beveled Pipe and Guard

Possible Tabulations:
104-3
112-8

---

For construction details, refer to EC-201.
Provide guard dimensions to fit with Type of apron provided (DR-201, DR-202, DR-205, or DR-206). "V" Bar is to completely rest on apron.

Use ASTM A615, Grade 40, or merchant quality, smoothed or deformed steel bars in construction of the guard. Comply with fabrication requirements of Section 2404 of the Standard Specifications.

Hot-dip galvanize the completed apron guard according to ASTM A123.

Use bolts, nuts, washers, and fasteners complying with Article 4153.06 of the Standard Specifications.

① All guards are to have at least one intermediate cross bar. If pipe size is 60 inches or greater, use two intermediate cross bars equally spaced.
The dimensions shown in the "Tabulation of Safety Grate Treatment" are from the original construction plans. Verify these dimensions at the site before fabricating components.

Submit shop drawings. Approval of drawings is not required as part of the fabrication process. Drawings will be used to document the item as constructed.

Use correct pipe diameters and correct dimensions. Ensure safety grate fits properly into the headwall opening.

Reinforcing steel may be encountered when drilling holes through the existing structure wall.

Install bolts and lock nuts complying with Article 4153.06 of the Standard Specifications at all locations as shown. Use brackets that comply with ASTM A36 and are galvanized per ASTM A123. Use steel washers meeting the dimensional requirements of Materials I.M. 403.07.

Furnish Schedule 40 pipes meeting the requirements of Article 4153.05 of the Standard Specifications. Galvanize all pipes, fittings, and hardware after all cutting, welding, drilling and fabrication. In the shop drawings, show members planned for field cutting and drilling to provide for installation tolerances. Repair galvanizing of those members according to the Iowa DOT.

Gas Metal-Arc and Flux-Cored Arc welding may be used for welding incidental items as indicated on this sheet, provided that the fabricator furnishes certifications for the gas and uses approved filler metal and qualified welders approved by the Iowa DOT.

Payment for "Safety Grate, (Type 1, 2, 3, or 4), Culvert" is full compensation for furnishing all materials and work necessary to fabricate and install the grate system as required for each headwall opening.

1. Equal spaces 24 inches minimum, 30 inches maximum, edge of sidewall to center of bracket or center to center of bracket.
2. Cross Bar diameter equals to or greater than Grate Bar diameter.
3. If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

Possible Contract Items:
Safety Grate, (Type 1, 2, 3, or 4), Culvert
Possible Tabulation:
106-24
1. Drill 1/2 inch diameter holes using equipment designed to cut through concrete and reinforcing steel.

2. Bend plates or strips without cracking material.

3. 3/8 inch bolt, lock nut and washers. All holes are to be 1/2 inch diameter.

4. Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.

---

**Shim Detail**

**Top View**
- Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.
- Drill 1/2 inch diameter holes using equipment designed to cut through concrete and reinforcing steel.
- Bend plates or strips without cracking material.
- 3/8 inch bolt, lock nut and washers. All holes are to be 1/2 inch diameter.
- Shim thickness equal to difference in diameters of Grate Bar and Cross Bar.

---

**Headwall Bracket**

**Top View**
- 1/4" hole
- 1/2" plate
- 3/4" x 1/2" slots
- 1/2" of Grate Bar

**Front View**
- 1/4" hole
- 1/2" plate
- 3/4" x 1/2" slots
- 1/2" of Grate Bar
If more than 20 feet, midspan support is required. Refer to sheets 3 and 4.

Length of span (20 feet maximum).
1. Drill ¾ inch diameter holes using equipment designed to cut through concrete and reinforcing steel.
2. Set approved anchor bolts using epoxy grout as described in Materials I.M. 453.08 for anchor bolts.
1. Beveled pipe and guard. See Standard Road Plan DR-212.
2. Requires approximately 7 degree elbow.
3. Place the top edge of beveled pipe and guard at a point where the distance between the edges of the shoulders are approximately 22 feet apart.
4. Median ditch flow line.

Limits of 18'' Unclassified Entrance Pipe Culvert

Possible Tabulation:
- Beveled Pipe and Guard
- Culvert, Unclassified Entrance Pipe, 18" Dia.
- Embankment-in-Place
- Excavation, class 10, Roadway and Borrow
- Special Backfill

Possible Contract Items:
- Beveled Pipe and Guard
- Culvert, Unclassified Entrance Pipe, 18" Dia.
- Embankment-in-Place
- Excavation, class 10, Roadway and Borrow
- Special Backfill

TABLE OF QUANTITIES

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<th>Bid Item</th>
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<th>Median Width</th>
<th>Standard Road Plan No</th>
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<td>Limits of 18'' Unclassified Entrance Pipe Culvert</td>
<td>252' 344' 112' 196' 82' 162' 56' 74' 148' 88'</td>
<td>50' 60' 54' 64' 68' 24' 66' 24' 62' 02' 100' 03' 100' 00'</td>
<td>PV-501 PV-504 PV-507 PV-502 PV-505 PV-508 PV-511 PV-513 PV-514</td>
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<td>Red Rum</td>
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<td>PV-510 PV-511 PV-513 PV-514</td>
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LONGITUDINAL SECTION AT PIPE CENTERLINE

PLAN VIEW

LOCATION STATION
**SECTION**

A = Concrete Pipe Length
B+C+E = C.M.P. or P.E.P. Length

**PLAN**

B is \( \epsilon \) of roadway, dike survey or other as detailed on the plans.

Skew angle is the angle which one end of the pipe is ahead (by stationing) of a line perpendicular to the \( \epsilon \).

(Example: Skew Rt. ahead 30 degrees)

Standard type joint couplings are required. See Materials I.M. 441.

1. Refer to the following:
   - DR-201 for circular concrete
   - DR-202 for low clearance concrete
   - DR-205 for circular concrete with end wall
   - DR-206 for low clearance concrete with end wall

2. Refer to the following:
   - DR-203 for the circular metal
   - DR-204 for arch metal

3. See DR-121
4. See DR-122
5. Optional "D" section only when specified in the tabulation. Refer to DR-141

Possible Tabulation:

104-3

Standard type joint couplings are required. See (Example: Skew Rt. ahead 30 degrees)

Refer to the following:

- DR-201 for circular concrete
- DR-202 for low clearance concrete
- DR-205 for circular concrete with end wall
- DR-206 for low clearance concrete with end wall

See DR-121

See DR-122

Optional "D" section only when specified in the tabulation. Refer to DR-141

Possible Tabulation:

104-3
## Erosion Control

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<td>Wood Excelsior Mat for Ditch Protection</td>
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<td>Sod for Ditch Protection</td>
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<td>Wood Excelsior Mat for Slope Protection</td>
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<td>Turf Reinforced Mat (TRM)</td>
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<td>04-21-20</td>
<td>Perimeter and Slope Sediment Control Devices</td>
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<td>10-18-16</td>
<td>Rock Erosion Control (REC)</td>
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<td>EC-602</td>
<td>04-21-20</td>
<td>Open-Throat Curb Intake Sediment Filter</td>
</tr>
</tbody>
</table>
Not intended for use in perennial or intermittent streams.

Fill and compact rills and gullies (see Detail 'B') prior to placing Perimeter and Slope Sediment Control Device. Ensure ground surface is smooth in order to provide continuous contact with Perimeter and Slope Sediment Control Device. Minor ground shaping may be required. Filling and compacting rills and gullies, and minor ground shaping, is incidental to Perimeter and Slope Sediment Control Device.

1. Overlap joints per Detail 'A'. Turn the lower 10 feet of each run up the slope to help contain runoff. When placed such that runoff is conveyed along the device, additional run-ups and/or means may be required to reduce erosion along the device. Run-ups will be included in the installation length.

2. Extra material required to install overlaps will not be included in the installation length.

3. Space stakes at 4 foot maximum spacing. Use minimum actual stake size ½" x ⅜" wood stakes.

Possible Contract Item:
Perimeter and Slope Sediment Control Device
Possible Tabulation:
100-19
Installation Length (measured along device)

Top of Slope or Undisturbed Area

Perimeter and Slope Sediment Control Device

Section A-A

LEGEND

- Contour Lines
- Flow
- Wood Stake

SLOPE PROTECTION

1. Space stakes at 4 foot maximum spacing. Use minimum actual stake size 2" X 2" wood stakes.

2. Install Slope Protection perpendicular to slope (parallel to contours). Overlap joints per Detail 'A'. Run the last 10 feet of each device up the slope to prevent flow runaround. Run-ups will be included in the installation length.
Ditch Protection

- Installation in ditch (measured along device)
- Contour lines
- Flow
- Wood stake

LEGEND

Perimeter and Slope Sediment Control Device

INSTALLATION IN DITCH

Installation Length (measured along device)

- Space stakes at 2 foot maximum spacing. Use minimum actual stake size 3/4" x 2" wood stakes.
- Install Ditch Protection perpendicular to ditch. Overlap joints per Detail 'A'.

---

Installing Perimeter and Slope Sediment Control Device:

1. Begin at the beginning of the ditch.
2. Install the device perpendicular to the ditch.
3. Space the stakes at 2-foot maximum spacing.
4. Use minimum actual stake size 3/4" x 2" wood stakes.
5. Overlap joints per Detail 'A'.

---

Contour Lines

- Flow
- Wood Stake
Remove sediment filter upon stabilization of sediment sources.

1. Trim frame as needed to tightly fit in the intake throat. Overlap fabric a minimum of 3 inches and securely fasten.
2. Securely attach filter fabric to the wire frame leaving an overflow opening above the filter fabric.
3. Woven material meeting the requirements of Table 4196.01-1 of the Standard Specifications, except a maximum apparent opening size US Sieve No. 10 and a minimum flow rate of 145 gallons per minute per square foot.
4. Insert sediment filter to create a compression fit in the intake throat. If overflow opening is not present after inserting filter, trim filter fabric so opening is present.

Possible Tabulation:
- Removal of Open-throat Curb Intake Sediment Filter
- Maintenance of Open-throat Curb Intake Sediment Filter

Possible Contract Items:
- 100-36

Possible Diagrams:
- OPEN-THROAT CURB INTAKE SEDIMENT FILTER
- SEDIMENT FILTER CROSS SECTION
- SEDIMENT FILTER PLACEMENT
## Pavement Markings

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<td>04-21-20</td>
<td>Symbols and Legends</td>
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<td>10-21-14</td>
<td>Stop Lines and Islands</td>
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<td>PM-210</td>
<td>10-15-19</td>
<td>Separation in Two-Lane Roadway</td>
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<tr>
<td>PM-211</td>
<td>10-15-19</td>
<td>Separation in Four-Lane Roadway</td>
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<tr>
<td>PM-220</td>
<td>10-18-16</td>
<td>Passing Lane</td>
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<tr>
<td>PM-221</td>
<td>10-18-16</td>
<td>Climbing Lane</td>
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<td>PM-222</td>
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<td>PM-230</td>
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<td>Transition at Abrupt Changes in Pavement Width</td>
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<td>PM-240</td>
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<td>PM-242</td>
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<td>PM-310</td>
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<td>Entrance and Exit Ramps</td>
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<td>PM-420</td>
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<td>Two-Lane Roadway with no Turn Lanes (One-Way Stop Condition)</td>
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<td>PM-520</td>
<td>10-15-19</td>
<td>Two-Lane Roadway with no Turn Lanes (Two-Way Stop Condition)</td>
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<tr>
<td>PM-521</td>
<td>10-15-19</td>
<td>Two-Lane Roadway with Right Turn Lanes</td>
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<tr>
<td>PM-522</td>
<td>04-16-19</td>
<td>Two-Lane Roadway with Left Turn Lanes</td>
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<tr>
<td>PM-550</td>
<td>10-15-19</td>
<td>Two-Lane Roadway with Two-Way Left Turn Lane</td>
</tr>
<tr>
<td>PM-560</td>
<td>10-15-19</td>
<td>Divided Multi-Lane Roadway with no Turn Lanes</td>
</tr>
<tr>
<td>PM-561</td>
<td>10-15-19</td>
<td>Divided Multi-Lane Roadway with Right Turn Lanes</td>
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<td>PM-562</td>
<td>10-15-19</td>
<td>Divided Multi-Lane Roadway with Left Turn Lanes</td>
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<tr>
<td>PM-620</td>
<td>10-15-19</td>
<td>Two-Lane Roadway with no Turn Lanes (Four-Way Stop Condition)</td>
</tr>
<tr>
<td>PM-650</td>
<td>10-15-19</td>
<td>Multi-Lane Roadway with Two-Way Left Turn Lane</td>
</tr>
<tr>
<td>PM-760</td>
<td>10-15-19</td>
<td>Divided Multi-Lane Roadway Median</td>
</tr>
</tbody>
</table>
Lane layouts shown are typical.

Centerlines and lane lines may be painted either side of centerline.

Drawings on sheets 1 and 2 are oriented to represent direction of traffic moving from left to right.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22
**LINE TYPES**

- **DLW4** DOTTED LINE (White)
- **DDY4** DOUBLE DOTTED LINE (Yellow)
- **DLY4** DOTTED LINE (Yellow)
- **CHW8** CHANNELIZING LINE (White)
- **CHY8** CHANNELIZING LINE (Yellow)
- **LDW8** LANE DROP (White)
- **SLW2** STOP LINE (White)
- **YLW2** YIELD LINE (White)
- **CBW6** CROSSWALK BAR (White)
- **CLW6** CROSSWALK LINE (White)
SPW6  SLOPED CURB 4" (White)

SPY4  SLOPED CURB 4" (Yellow)

SPW6  SLOPED CURB 6" (White)

STW6  STANDARD CURB 6" (White)

SPY6  SLOPED CURB 6" (Yellow)

STY6  STANDARD CURB 6" (Yellow)

MNY4  MEDIAN NOSE (Yellow)

1. Apply paint from back of curb to gutter line.
Layouts shown are for typical installations. Drawings are oriented to represent direction of traffic moving from left to right.

Center markings within the lane.

All dimensions shown are nominal. For proper proportion details, see current MUTCD Standard Highway Signs and Markings booklet.

Pavement word, symbol, and arrow markings are to be proportionally scaled to fit within the width of the facility upon which they are applied.

Except for the SCHOOL word marking, all markings are to be no more than one lane in width.

Add template for Right Turn Arrow (RTAW) to Left Turn Arrow (LTAW) or Combined Straight and Left Turn Arrow (CSLW) to create new templates.

Possible Contract Item: Pavement Marking Symbols and Legends Items

Possible Tabulation: 108-29
When placed across one lane, use the smaller dimensions shown. When placed across two lanes, use the larger dimensions shown.
For line information, see PM-110.

Possible Contract Item:
Pavement Marking Line Items

Possible Tabulation:
108-22
Added two lane exit and entrance ramp tapers.
Added two lane exit and entrance ramp tapers.
LEGEND

- Direction of Traffic
- BLW4 Broken Lane Line (White)
- CHW8 Channelizing Line (White)
- ELW4 Edge Line Right (White)
- ELY4 Edge Line Left (Yellow)
- LDW8 Lane Drop (White)
- DLW4 Dotted Line (White)
- RLY4 Ramp Edge Line Left (Yellow)
- RLI4 Ramp Edge Line Right (White)

TWO LANE EXIT RAMP WITH PARALLEL DECELERATION LANE

1/2 Deceleration Lane Length
Full Width Deceleration Lane 1/2 Mile Minimum Length
Paved Gore
Ramp Width

TWO LANE EXIT RAMP WITH LANE DROP

1/2 Deceleration Lane Length
Full Width Deceleration Lane 1/2 Mile Minimum Length
Paved Gore
Ramp Width

PM-310
REVISION
04-21-20
SHEET 4 of 7

REVISIONS: Added two lane exit and entrance ramp layouts.
**TWO LANE EXIT RAMP WITH DOUBLE PARALLEL DECELERATION LANE**

**LEGEND**

- **Direction of Traffic**
- **DLW4** Dotted Line (White)
- **RLW4** Ramp Edge Line Right (White)
- **BLW4** Ramp Edge Line Left (Yellow)
- **LDW8** Lane Drop (White)
- **BLW4** Broken Lane Line (White)
- **ELY4** Edge Line Right (White)
- **RLY4** Ramp Edge Line Left (Yellow)
- **CHW8** Channelizing Line (White)
- **ELY4** Edge Line Left (Yellow)
Added two lane exit and entrance ramp tapers.

LEGEND

- **Direction of Traffic**
- **BLW4** Broken Lane Line (White)
- **CHW8** Channelizing Line (White)
- **ELW4** Dotted Line (White)
- **ELY4** Edge Line Right (Yellow)
- **DLW4** Edge Line Left (White)
- **RLW4** Ramp Edge Line Right (White)
- **RLY4** Ramp Edge Line Left (Yellow)
- **LDW8** Lane Drop (White)

TWO LANE ENTRANCE RAMP WITH SINGLE PARALLEL ACCELERATION LANE
Added two lane exit and entrance ramp tapers.

LEGEND

- Direction of Traffic
- BLW4: Broken Lane Line (White)
- CHW8: Channelizing Line (White)
- ELY4: Edge Line Right (Yellow)
- ELW4: Edge Line Left (White)
- LDW8: Lane Drop (White)
- DLW4: Dotted Line (White)
- RLW4: Ramp Edge Line Right (Yellow)
- RLY4: Ramp Edge Line Left (White)
# Pavement Rehabilitation

<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR-101</td>
<td>04-21-15</td>
<td>Full Depth Patch with 'EF' Joint in PCC</td>
</tr>
<tr>
<td>PR-102</td>
<td>04-21-20</td>
<td>Full Depth PCC Patch without Dowels</td>
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<tr>
<td>PR-103</td>
<td>04-21-20</td>
<td>Full Depth PCC Patch with Dowels</td>
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<tr>
<td>PR-104</td>
<td>10-21-14</td>
<td>Full Depth Patch continuous Reinforced PCC Pavement</td>
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<tr>
<td>PR-105</td>
<td>04-21-20</td>
<td>Full Depth Ramp PCC Patch with Dowels</td>
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<tr>
<td>PR-107</td>
<td>10-16-18</td>
<td>Partial Depth PCC Finish Patches</td>
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<tr>
<td>PR-110</td>
<td>10-21-14</td>
<td>PCC Crack and Joint Cleaning and Filling</td>
</tr>
<tr>
<td>PR-120</td>
<td>04-21-20</td>
<td>Double Reinforced Pavement Over Box Culverts</td>
</tr>
<tr>
<td>PR-121</td>
<td>04-21-20</td>
<td>Reinforced Concrete Panel at Box Culvert</td>
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<tr>
<td>PR-140</td>
<td>04-21-15</td>
<td>Subbase Patches</td>
</tr>
<tr>
<td>PR-201</td>
<td>10-21-14</td>
<td>Runouts for Resurfacing</td>
</tr>
<tr>
<td>PR-202</td>
<td>10-21-14</td>
<td>Notches for Resurfacing (with or without Runout)</td>
</tr>
</tbody>
</table>
See PV-101 for joint and bar placement details.

Construct rectangular patches even when existing pavement joints are skewed.

1. Joint spacing 10 feet minimum, 17 feet maximum, 15 feet optimum.
2. The face of the patch should be near vertical. Protrusions less than 2 inches need not be removed if uniformly tapered from bottom of saw cut to bottom of patch. A slope or ledge on this face will not be allowed.
3. If resurfacing is part of the contract, do not saw or seal joint after patching. If patch is not to be surfaced, then saw and seal according to PV-101.
4. If resurfacing is part of the contract, saw 'C' joints, but do not seal. If the patch is not to be resurfaced, then saw and seal according to PV-101.
5. Establish a new joint at approximate mid patch. This joint does not need to align with any existing joint or crack in adjacent pavement.
6. 'B' joint if end of patch does not match an existing joint or crack in the adjacent lane.
7. If one lane patch exceeds 50 feet, both lanes should be considered for patching.
8. Possible Subbase Patch, see PR-140.
9. If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per PR-140.
10. Saw out through overlay so that cut is $\frac{1}{16}$ inches into original pavement.

Possible Contract Items:
CT Joint
Patches, Full-Depth Repair
Patches by Count (Repair)
Patches, Full-Depth Finish, by Count
Patches, Full-Depth Finish, by Area
Patches, Full-Depth Finish, by Area (50 feet or greater in length)

Possible Tabulation:
102-6C
- Existing Pavement
- Possible Joint
- Match Existing Joint Spacing
- Existing Joint
- 10' or more
- New ‘CD’ joint must be at least 5 feet from the patch end.
- Joint Spacing 10 feet minimum, 17 feet maximum, 15 feet optimum.
- Joint material between patch and concrete in adjacent lane.
- If one lane patch exceeds 50 feet, both lanes should be considered for patching.
- If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, consider for patching.
- Possible Subbase Patch, see PR-140.
- If longitudinal subchain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per PR-140.
- Possible Contract Items:
  - CD Joint Assembly
  - CT Joint
  - Patches, Full-Depth Finish, by Area
  - Patches, Full-Depth Finish, by Count
  - Patches, Full-Depth Finish, by length (50 feet in length or greater)
  - Patches, Full-Depth Repair
- Possible Tabulation:
  - 102-6C
- See PV-101 for joint and bar placement details.
- Construct rectangular patches even when existing pavement joints are skewed.
- Joint material between patch and concrete in adjacent lane.
- May require ‘CD’ and/or ‘CT’ joints.
- May require ‘CD’ joints.
- If more than 10’ from edge of lane (slab).
- 4 at 12” Spacing
- Variable
- 4 at 12” Spacing
- 12”
- Lane (Pavement) Line
- Internal edge of travel lane
- Outer edge of lane greater than 12’
- Non-Slack
- Slab
- Subgrade smooth and graded to a uniform elevation.
- Concrete Removal Area
- Removal of subbase or subgrade if required by plan.
- Existing Pavement
- Full depth Saw Cut
- Composite Pavement
- PCC Patch
- Dowels or Tie Bars
- Subgrade and grading

BAR SIZE TABLE

<table>
<thead>
<tr>
<th>Existing PCC Pavement Thickness</th>
<th>Less than 8&quot;</th>
<th>8&quot; to 12&quot;</th>
<th>More than 12&quot;</th>
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<tbody>
<tr>
<td>DOWEL SIZE</td>
<td>#6</td>
<td>#10</td>
<td>#11</td>
</tr>
<tr>
<td>TIE BAR SIZE</td>
<td>#6</td>
<td>#10</td>
<td>#11</td>
</tr>
</tbody>
</table>

REVISIONS:
- Removed INTERIM from the standard.

APPROVED BY DESIGN METHODS ENGINEER
**PARTIAL RAMP WIDTH PATCHES (NO EXISTING LONGITUDINAL JOINT)**

- **Joint Spacing**
  - Minimum: 10 feet
  - Maximum: 17 feet
  - Optimum: 15 feet

- **Joint Conditions**
  - If there is no existing joint or crack in the adjacent pavement, place a 'CT' joint. If there is an existing joint or crack in the adjacent pavement, place a 'CD' joint at the same transverse location. Saw but do not seal 'CT' joints.
  - New 'CD' joint must be a minimum 5 feet from the patch end.
  - Do not saw or seal the joint. Place 2 inch preformed joint material between patch and concrete in adjacent joint.

- **Joint Placement**
  - Saw but do not seal 'CT' or 'CD' joints.
  - Place 'CD' joint a minimum of 5 feet from the patch end.

**Possible Contract Items:**
- CD Joint Assembly
- CT Joint
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Patches, Full-Depth Finish, by Area (50 feet in length or greater)
- Patches, Full-Depth Repair

**Possible Tabulation:**
- 102-6C
- 102-7C

---

**PARTIAL RAMP WIDTH PATCHES (EXISTING LONGITUDINAL JOINT)**

- **Joint Spacing**
  - Minimum: 3 feet
  - Maximum: 10 feet

- **Joint Conditions**
  - New 'CD' joint must be a minimum 5 feet from the patch end.
  - Do not saw or seal the joint. Place 2 inch preformed joint material between patch and concrete in adjacent joint.

- **Joint Placement**
  - Saw but do not seal 'CT' joints.
  - Place 'CD' joint a minimum of 5 feet from the patch end.

**Possible Contract Items:**
- CD Joint Assembly
- CT Joint
- Patches by Count (Repair)
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Patches, Full-Depth Finish, by Area (50 feet in length or greater)
- Patches, Full-Depth Repair

**Possible Tabulation:**
- 102-6C
- 102-7C

---

See PV-101 for joint and bar placement details.
FULL RAMP WIDTH PATCHES
(NO EXISTING LONGITUDINAL JOINT)

FULL RAMP WIDTH PATCHES
(EXISTING LONGITUDINAL JOINT)
**PAVEMENT REMOVAL DETAILS**

- Full depth Saw Cut
- Removal of subbase or subgrade if required by plan.

**LONGITUDINAL SECTION THRU PATCH**

- PCC Pavement
- Dowels or Tie Bars
- Composite Pavement

**BAR SIZE TABLE**

<table>
<thead>
<tr>
<th>DOWEL SIZE</th>
<th>Thick</th>
<th>Less than 8&quot;</th>
<th>8&quot; to 10&quot;</th>
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<tr>
<td>#6</td>
<td>2</td>
<td>12</td>
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<td>#10</td>
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<td>#10</td>
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</tbody>
</table>

**NOTES:**

6. Possible Subbase Patch, see PR-140.
7. If longitudinal subdrain (shoulder) is not to be placed or if it is not present on side of roadway to be patched, then place drain per PR-140.
Price bid for standard pavement of the specified thickness is full compensation for constructing the pavement as detailed herein and elsewhere in the plans, including all necessary reinforcement and expansion joints as required on this project.

See PV-101 for joint details:

1. Construction Joints will be allowed if:
   A. Joint is located at center of culvert.
   B. Joint is a minimum of 6 feet from edge of culvert.
   C. Two joints may be used if condition B is met and center panel is a minimum of 15 feet in length.

2. Refer to typical sections elsewhere in the plans for pavement thickness.

3. Existing Pavement Joints:
   A. When joints are 'C'; use 'B' joint.
   B. When joints are 'CD'; use 'RD' joint.
   C. If existing pavement is HMA or Composite (HMA over PCC); use 'E' joint.

4. New Pavement Joints:
   A. When joints are 'C'; use 'B' joint.
   B. When joints are 'CD'; use 'E' joint.

5. Place Pavement Joint no closer than 5 feet from existing joint.

6. Lap all bars 15 inches.

7. Limits of excavation and type of backfill are shown elsewhere on the plans.

8. Extend Double Reinforced Pavement a minimum of 10 feet beyond limits of excavation.
Price bid for standard pavement of the specified thickness is full compensation for constructing the pavement as detailed, including all necessary reinforcement and expansion joints as required on this sheet.

See PV-101 for joint details.

Provide minimum 2 inch clearance for all reinforcement.

1. Refer to typical sections elsewhere in the plans for pavement thickness.
2. Limits of excavation and type of backfill are shown elsewhere on the plans.
3. Extend Double Reinforced Pavement a minimum of 10 feet beyond the limits of excavation.
4. Place joint no closer than 5 feet from existing joint.

Double Reinforced Concrete Panel

Possible Existing Joint

Backfill

T" Joint

'EF' Joint

Concrete Panel

Double Reinforced Concrete Panel

See Detail 'A'

See Detail 'B'

E Furnace

Reinforcing Bar

10' Min., 17' Max.

See Detail 'B'

Transverse bars are 23'-6'' long, No. 5 bars at 12'' centers, Longitudinal bars variable length.

PV-101

PV-101

PV-101

PV-101

PV-101

PV-101

PV-101

PV-101

PV-101

PV-101
<table>
<thead>
<tr>
<th>NO.</th>
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<tr>
<td>PV-3</td>
<td>04-16-19</td>
<td>Safety Edge</td>
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<tr>
<td>PV-10</td>
<td>04-21-20</td>
<td>Rumble Strip Panel for Intersection Approach</td>
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<tr>
<td>PV-12</td>
<td>04-19-16</td>
<td>Milled Shoulder Rumble Strips</td>
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<tr>
<td>PV-13</td>
<td>10-17-17</td>
<td>Milled Centerline Rumble Strips</td>
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<tr>
<td>PV-20</td>
<td>10-21-14</td>
<td>Paved Islands</td>
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<td>PV-101</td>
<td>04-21-20</td>
<td>Joints</td>
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<td>PV-102</td>
<td>04-21-20</td>
<td>PCC Curb Details</td>
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<td>PV-103</td>
<td>04-21-20</td>
<td>Manhole Boxouts in PCC Pavement</td>
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<td>PV-104</td>
<td>04-21-20</td>
<td>Ramped Median Nose</td>
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<td>PV-105</td>
<td>10-21-14</td>
<td>PCC Pavement Widening</td>
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<td>PV-106</td>
<td>10-17-17</td>
<td>PCC Railroad Approach Section</td>
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<tr>
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<td>04-21-15</td>
<td>Jointing PCC Pavement Widening</td>
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<tr>
<td>PV-201</td>
<td>10-15-19</td>
<td>Manhole Boxouts in HMA Pavement and HMA Overlays</td>
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<td>PV-202</td>
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<td>Hot Mix Asphalt Resurfacing</td>
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<td>04-21-20</td>
<td>HMA Base Widening</td>
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<td>10-17-17</td>
<td>HMA Railroad Approach Section</td>
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<td>04-21-20</td>
<td>Superelevation Details Two Lane Roadway</td>
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<td>04-21-20</td>
<td>Superelevation Details Four Lane Roadway</td>
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<td>PV-303</td>
<td>04-21-20</td>
<td>Superelevation Details Ramps</td>
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<tr>
<td>PV-410</td>
<td>04-21-20</td>
<td>Deceleration Taper for 16' Exit Ramp</td>
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<tr>
<td>PV-411</td>
<td>04-21-20</td>
<td>Acceleration Taper for 16' Entrance Ramp</td>
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<tr>
<td>PV-412</td>
<td>04-21-20</td>
<td>Deceleration Taper for 18' Exit Loop</td>
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<td>Acceleration Taper for 18' Entrance Loop</td>
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<td>One- Lane Detour Connection</td>
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<td>10-21-14</td>
<td>Two-Lane Detour Connection</td>
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<td>Median Crossover (50' Median)</td>
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<td>Median Crossover (50' Median) 16' Wide 1 Lane</td>
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<td>Median Crossover (50' Median) 28' Wide 2 Lane</td>
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<td>Median Crossover (68.24' Median)</td>
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<td>Median Crossover (82' Median)</td>
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<td>Median Crossover (82' Median) 16' Wide 1 Lane</td>
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<td>PV-511</td>
<td>04-21-20</td>
<td>Median Crossover (82' Median) 28' Wide 2 Lane</td>
</tr>
<tr>
<td>PV-512</td>
<td>04-21-15</td>
<td>Median Crossover (100' Median)</td>
</tr>
<tr>
<td>PV-513</td>
<td>04-21-20</td>
<td>Median Crossover (100' Median) 16' Wide 1 Lane</td>
</tr>
<tr>
<td>PV-514</td>
<td>04-21-20</td>
<td>Median Crossover (100' Median) 28' Wide 2 Lane</td>
</tr>
</tbody>
</table>

**Ramp Tapers**

**Detours and Median Crossovers**
Construct rumble strip panel prior to opening to traffic.

Refer to the contract documents for pavement patching and jointing information.

Possible Contract Items:
- CD Joint Assembly
- CT Joint
- Patches, Full-Depth Finish, by Area
- Patches, Full-Depth Finish, by Count
- Rumble Strip Panel (HMA Surface)
- Rumble Strip Panel (PCC Surface)
- Rumble Strip Panel (In Full Depth Patch)
- Rumble Strip Panel (PCC Surface)

Possible Tabulations:
- 102-6C
- 112-7

**SECTION A-A**
(RUMBLE STRIP CUT IN PAVEMENT)

**SECTION A-A**
(RUMBLE STRIP PLACED IN PLASTIC P.C. CONCRETE)
See Bar Size Table for Contraction Joints on Sheet 2.

Locate "DW" joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.

Place bars within the limits shown under dowel assemblies.

Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.

Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when 'T' is greater or equal to 8 inches. Use 'C' joints when 'T' is less than 8 inches.

"RT" joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.

See dowel assemblies for fabrication details.

See bar size table for contraction joints on Sheet 2.

Locate "DW" joint at a mid-panel location between future 'C' or 'CD' joints. Place no closer than 5 feet to a 'C' or 'CD' joint.

Place bars within the limits shown under dowel assemblies.

Edge with 1/8 inch tool for length of joint. For HT joint, remove header block and board when second slab is placed.

Unless specified otherwise, use 'CD' transverse contraction joints in mainline pavement when 'T' is greater or equal to 8 inches. Use 'C' joints when 'T' is less than 8 inches.

"RT" joint may be used in lieu of 'DW' joint at the end of the days work. Remove any pavement damaged due to the drilling at no additional cost to the Contracting Authority.

See dowel assemblies for fabrication details.
**BAR PLACEMENT**
(Appplies to all joints unless otherwise detailed.)

**DETAIL A**
(Saw cut formed by conventional concrete sawing equipment.)

**DETAIL B**
(Saw cut formed by approved early concrete sawing equipment.)

**SECTION A-A**
(Detail at Edge of Pavement)

**TRANSVERSE CONTRACTION**

---

**LEGEND**
- PCC: Existing Pavement
- □: Proposed Pavement

**BAR SIZE TABLE FOR CONTRACTION JOINTS**

<table>
<thead>
<tr>
<th>$T$</th>
<th>Solid Dowel Diameter</th>
<th>Tubular Dowel Diameter</th>
<th>Tie Bar Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&lt; 8''$</td>
<td>$\frac{3}{4}''$</td>
<td>$\frac{7}{8}''$</td>
<td>$#6$</td>
</tr>
<tr>
<td>$\geq 8''$ but $&lt; 10''$</td>
<td>$1\frac{1}{4}''$</td>
<td>$1\frac{3}{8}''$</td>
<td>$#10$</td>
</tr>
<tr>
<td>$\geq 10''$</td>
<td>$1\frac{1}{2}''$</td>
<td>$1\frac{5}{8}''$</td>
<td>$#11$</td>
</tr>
</tbody>
</table>

Tubular Dowel Bars will not be allowed for RD joints.

---

8. Saw 'CD' joint to a depth of $T/3 \pm 1/4''$; saw 'C' joint to a depth of $T/4 \pm 1/4''$.

9. When tying into old pavement, $\frac{1}{2}$ represents the depth of sound PCC.
### FIGURE 7010.101

#### ABUTTING PAVEMENT JOINT - RIGID TIE

<table>
<thead>
<tr>
<th>Joint</th>
<th>Bars</th>
<th>Bar Length and Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8&quot;</td>
<td>'BT-1'</td>
<td>#4 36&quot; Long at 30&quot; Centers</td>
</tr>
<tr>
<td>≥ 8&quot;</td>
<td>'BT-2'</td>
<td>#5 30&quot; Long at 30&quot; Centers</td>
</tr>
</tbody>
</table>

#### ABUTTING PAVEMENT JOINT - RIGID TIE (Drilled)

<table>
<thead>
<tr>
<th>Joint</th>
<th>Bars</th>
<th>Bar Length and Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 8&quot;</td>
<td>'BT-5'</td>
<td>#4 24&quot; Long at 30&quot; Centers</td>
</tr>
<tr>
<td>≥ 8&quot;</td>
<td>'BT-4'</td>
<td>#5 24&quot; Long at 15&quot; Centers</td>
</tr>
</tbody>
</table>

#### KEYED JOINT FOR ADJACENT SLABS

(Where T is 8" or more)

### 'KS-1'

Single Reinforced Pavement (Bridge Approach)

#### 'KS-2'

Double Reinforced Pavement (Bridge Approach)

### 'KT-1'

Bar supports may be necessary for fixed form paving to ensure the bar remains in a horizontal position in the plastic concrete.

Sawing or sealing of joint not required.

The following joints are interchangeable, subject to the pouring sequence:

- 'BT-1', 'L-1', and 'KT-1'
- 'KT-2' and 'L-2'
- 'KT-3' and 'L-3'

### 'L-1'

Plastic concrete.

### 'KS-1'

Pouring sequence:

11. Joint Bars

- KT-1
- KT-2
- KT-3

#### MATERIALS

See Detail D-1, D-2, or D-3

#### LEGEND

- Existing Pavement
- Proposed Pavement
TIE BAR PLACEMENT
(Appplies to all joints unless otherwise detailed.)

DETAIL D-1
(Required when specified in the contract documents.)

DETAIL D-2
(Required when the Department of Transportation is not the Contracting Authority, or when specified in the contract documents)

DETAIL D-3
(Required when the Department of Transportation is the Contracting Authority, or when specified in the contract documents)

KEYWAY DIMENSIONS

<table>
<thead>
<tr>
<th>Keyway Type</th>
<th>Pavement Thickness</th>
<th>T</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>8&quot; or greater</td>
<td>1 3/16&quot;</td>
<td>2 3/4&quot;</td>
<td></td>
</tr>
<tr>
<td>Narrow</td>
<td>Less than 8&quot;</td>
<td>1&quot;</td>
<td>2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

LEGEND

Existing Pavement
Proposed Pavement

LONGITUDINAL CONTRACTION

When tying into old pavement, represents the depth of sound PCC.

Sealant or cleaning not required.
FIGURE 7010.101

Dowel Placement
(Appplies to all joints unless otherwise detailed.)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF-1</td>
<td>2&quot;</td>
</tr>
<tr>
<td>CF-2</td>
<td>2 1/2</td>
</tr>
<tr>
<td>CF-3</td>
<td>3&quot;</td>
</tr>
<tr>
<td>CF-4</td>
<td>3 1/2</td>
</tr>
</tbody>
</table>

JOINT IN CURB (View at Back of Curb)

Joint Filler Material
(See Bar Size Table for Dowelled Expansion Joints)

1" Joint Sealant Material
(See Dowel Assemblies for fabrication details and placement limits. Coat the free end of dowel bar to prevent bond with pavement. At intake locations, dowel bars may be cast-in-place.)

Predrill or preform holes in joint material for appropriate dowel size.

Compact tire buffings by spading with a square-nose shovel.

DOWELED EXPANSION JOINTS

<table>
<thead>
<tr>
<th>TYPE</th>
<th>WIDTH</th>
<th>FILLER MATERIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>1&quot;</td>
<td>Resilient (Detail F)</td>
</tr>
<tr>
<td>EE</td>
<td>2&quot;</td>
<td>Flexible Foam (Detail F)</td>
</tr>
<tr>
<td>EF</td>
<td>3 1/2</td>
<td>Flexible Foam (Detail G)</td>
</tr>
</tbody>
</table>

BAR SIZE TABLE FOR DOWELED EXPANSION JOINTS

<table>
<thead>
<tr>
<th>Dowel Diameter</th>
<th>2&quot;, 2 1/2&quot;, 3&quot;, 3 1/2&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
<td>&lt; 8&quot;</td>
</tr>
<tr>
<td></td>
<td>8&quot; but &lt; 10&quot;</td>
</tr>
<tr>
<td></td>
<td>≥ 10&quot;</td>
</tr>
</tbody>
</table>

Tubular Dowel Bars will not be allowed for expansion joints.

LEGEND

Existing Pavement
Proposed Pavement

TIRE BUFFINGS

18" Long Dowel at 12" Centers
(See Dowelled Expansion Joints Table)
Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to each other in the assembly within ± 1/8 inch.

Use wires with a minimum tensile strength of 50 ksi.

Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail + 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Dowel Assemblies

**Dowel Height and Diameter for Doweled Contraction Joints**

<table>
<thead>
<tr>
<th>Diameter (Solid)</th>
<th>Diameter (Tubular)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7&quot; to 7 1/2&quot;</td>
<td>3 1/2&quot;</td>
</tr>
<tr>
<td>8&quot; to 8 3/4&quot;</td>
<td>4 1/4&quot;</td>
</tr>
<tr>
<td>10&quot; to 10 3/4&quot;</td>
<td>5 3/4&quot;</td>
</tr>
<tr>
<td>12&quot; to 13&quot;</td>
<td>6 1/4&quot;</td>
</tr>
</tbody>
</table>

Tubular Dowel Bars will not be allowed for RD joints.
Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

Use wires with a minimum tensile strength of 50 ksi.

Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail ± 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Clip and remove center portion of tie during field assembly.

1/4 inch diameter wire.

Tubular Dowel Bars will not be allowed for expansion joints.

Use wires with a minimum tensile strength of 50 ksi. Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail ± 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Clip and remove center portion of tie during field assembly.

1/4 inch diameter wire.

Tubular Dowel Bars will not be allowed for expansion joints.

Use wires with a minimum tensile strength of 50 ksi. Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail ± 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Clip and remove center portion of tie during field assembly.

1/4 inch diameter wire.

Tubular Dowel Bars will not be allowed for expansion joints.

Use wires with a minimum tensile strength of 50 ksi. Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail ± 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Clip and remove center portion of tie during field assembly.

1/4 inch diameter wire.

Tubular Dowel Bars will not be allowed for expansion joints.

Use wires with a minimum tensile strength of 50 ksi. Details apply to both transverse contraction and expansion joints.

Weld alternately throughout.

0.306 inch diameter wire. Wire sizes shown are the minimum required.

Maximum 0.177 inch diameter wire, welded or friction fit to upper side rail, both sides.

Measured from the centerline of dowel bar to bottom of lower side rail ± 1/4 inch.

Per lane width, install a minimum of 8 anchor pins evenly spaced (4 per side), to prevent movement of assembly during construction. Anchor assemblies placed on pavement or PCC base with devices approved by the Engineer.

If dowel basket assemblies are required for curbed pavements, the assembly length is based on the jointing layout. See PV-101, sheet 8.

Ensure dowel basket assembly centerline is within 2 inches of the intended joint location longitudinally and has no more than 1/4 inch horizontal skew from end of basket to end of basket.

Clip and remove center portion of tie during field assembly.

1/4 inch diameter wire.
Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.

Use wires with a minimum tensile strength of 50 ksi.

Details apply to both transverse contraction and expansion joints.

Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.

For uniform lane widths: 3" - 6". For taper and variable width pavements: 3" - 12".

- FIGURE 7010.101
- OPTIONAL LEG SHAPES
- ANCHOR PIN
- #1/0 Gauge Wire
- (0.306" diameter)
- 1/8" min.
- 12" min.
- 2"
- 45°
- Anchor Pin
- Back of Curb
- Top of Pavement
- Edge of Pavement
- Longitudinal Joint
- Centerline Joint
- Gutterline Joint
- Placement Limits (Rural Section)
- Use wires with a minimum tensile strength of 50 ksi.
- Use 18 inch long dowel bars with a tolerance of ± 1/8 inch. Ensure the centerlines of individual dowels are parallel to the other dowels in the assembly within ± 1/8 inch.
- Details apply to both transverse contraction and expansion joints.
- Diameter of bend around dowel is dowel diameter + 1/8 to 3/16 inches.
- For uniform lane widths: 3" - 6". For taper and variable width pavements: 3" - 12".

- BEND AROUND DOWEL
- (Curb and Gutter - 1/4 or 1/3 Point Jointing)
- Back of Curb
- 1/4 or 1/3 Point
- Longitudinal Joint
- Placement Limits
- (Curb and Gutter - 1/4 or 1/3 Point Jointing)

- PLACEMENT LIMITS
- DOWEL ASSEMBLIES
FIGURE 7010.102

**SUDAS DIRECTOR**

**DESIGN METHODS ENGINEER**

---

**FORM**

**GRADE**

**ELEV.**

---

**6" STANDARD CURB**

R 3”

Slope as per plans

---

**6" SLOPED CURB**

Slope as per plans

---

**4" SLOPED CURB**

Slope as per plans

---

**DROP CURB AT SIDEWALK**

1½ (max.)

Back of Curb

Gutterline

Level Line

---

**DRIVEWAY DROP CURB**

(Iowa Department of Transportation is not the Contracting Authority)

1½ to 3”

(as specified)

---

**DRIVEWAY DROP CURB**

(Iowa Department of Transportation is the Contracting Authority)

1½ to 3”

(as specified)

---

**BEAM CURB**

*For short replacement sections, match existing curb profile

---

**DETAIL A**

**CURB AND GUTTER UNIT**

---

For joint details, see PV-101.

---

1. 6 inch Standard Curb, 6 inch Sloped Curb, or 4 inch Sloped Curb as specified.

2. ½ inch if Proposed Pavement is HMA. No elevation difference if Proposed Pavement is PCC.

3. "BT", "KT", or "L" joint if Proposed Pavement is PCC. "B" joint if Proposed Pavement is HMA.

4. 0 to 2 inches for residential entrances. 1½ to 3 inches for industrial or commercial entrances.

---

PV-102

SUDAS

IOWADOT

REV/ISION

5

PV-102

SHEET 1 of 2

REV/ISIONS:

Split DRIVEWAY DROP CURB detail into two details. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-101

SHEET 1 of 2

REV/ISIONS:

See DRIVEWAY DROP CURB detail on Sheet 1. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-102

SUDAS

IOWADOT

REV/ISION

5

PV-102

SHEET 1 of 2

REV/ISIONS:

Split DRIVEWAY DROP CURB detail into two details. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-101

SHEET 1 of 2

REV/ISIONS:

See DRIVEWAY DROP CURB detail on Sheet 1. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-102

SUDAS

IOWADOT

REV/ISION

5

PV-102

SHEET 1 of 2

REV/ISIONS:

Split DRIVEWAY DROP CURB detail into two details. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-101

SHEET 1 of 2

REV/ISIONS:

See DRIVEWAY DROP CURB detail on Sheet 1. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-102

SUDAS

IOWADOT

REV/ISION

5

PV-102

SHEET 1 of 2

REV/ISIONS:

Split DRIVEWAY DROP CURB detail into two details. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.

---

PV-101

SHEET 1 of 2

REV/ISIONS:

See DRIVEWAY DROP CURB detail on Sheet 1. Added new circle note on Sheet 1. Renumbered circle note on Sheet 5.
If proposed pavement is PCC, match joint spacing for proposed pavement. Place ‘E’ joints in curb and gutter section where expansion joints are to be placed in proposed pavement.

JOINTING DIAGRAM FOR CURB AND GUTTER UNIT

CURB RUNOUT FOR ALL CURBS

CURB TRANSITION FROM 6" STANDARD TO 6" SLOPED

CURB TRANSITION FROM 6" SLOPED TO 4" SLOPED

CURB TRANSITION FROM 6" STANDARD TO 4" SLOPED

Any Curb

6" Standard

5'-0" Transition

6" SLOPED

5'-0" Transition

4" SLOPED

15' Normal

CURB AND GUTTER UNIT

15' Normal

Proposed Pavement

Curb and Gutter

Curb and Gutter

PCC CURB DETAILS
AT JOINT INTERSECTION

OFFSET AT JOINT INTERSECTION

CIRCULAR

AT A SINGLE JOINT

Construct boxout with Class C concrete or match pavement class. Minimum 2 inches clear on reinforcement. Center casting within boxout area.

1. 'KT-1', 'KT-2', 'BT-1', or 'BT-2' joint if three-piece floating casting (SW 601 Type B and D or SW-602 Type F) is used. 'E' joint if two-piece fixed casting (SW 601 Type A and C or SW-602 Type E) is used.

2. 4 foot 8 inch (typ.) #4 bar. Place at mid-slab.

3. #4 hoops (variable length). Place at mid-slab.

4. No boxout is required for three-piece floating castings (SW 601 Type B and D or SW-602 Type F). If a boxout is used with a three-piece casting, construct as detailed in Section A-A for three-piece floating casting.

(For three-piece floating casting)

(For two-piece fixed casting)
For details of paved median, see contract documents.

2. ‘EE’ Joint. Expansion joints located at the end of normal curb.

3. ‘E’ Joint. If median is paved, place expansion joints at the end of normal curb.

4. If boxout length is less than or equal to 12 feet, provide ‘RD’ joint.

5. Special shaping of curb.

6. Quantities for ramped median nose area are included in roadway pavement quantities.

7. When X or Y is 4 feet or greater the expansion joints will be at the beginning of the rounded median.

\[ X = W/2 + 7.5'' \]
\[ Y = W/2 + 12'' \]
Fillet width is 3.33 feet for each inch of overlay thickness.

1. The ratio of the Intermediate Course runout length to the total runout length is the same as the ratio of the Intermediate Course resurfacing thickness to the total resurfacing thickness.

2. Special shaping of existing surface prior to placement of fillet may be required by the Engineer and is incidental to other work on the project.

3. For existing fillets at non-paved roads and entrances, construct a wedge shaped fillet matching the thickness of the resurfacing.

Unless specified otherwise, construct full runouts for HMA resurfacing at a rate of 50 feet for each 1 inch of resurfacing thickness.

Construct temporary runouts at a length of 10 feet for each 1 inch of resurfacing thickness. Place subgrade paper, burlap, or similar material over adjacent surfaces to facilitate removal of wedges.

Construct wedge shaped HMA fillets at all paved entrances and paved intersecting roads. Construct full thickness fillets at all non-paved entrances and non-paved side roads.

Fillet sizes as listed in the Normal Fillet Sizes table are recommended and are to be used for design and estimating purposes. The Engineer will establish the length and width of each individual fillet to accommodate conditions at the site.

### GENERAL DETAILS

**NORMAL FILLET SIZES**

<table>
<thead>
<tr>
<th>TYPE OF ACCESS</th>
<th>SIZE</th>
<th>MIN. - #&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Entrance</td>
<td>40</td>
<td>6&quot; Min.</td>
</tr>
<tr>
<td>Farm Entrance</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Commercial Entrance</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Non-Paved Road</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>* Paved Road</td>
<td>Variable</td>
<td></td>
</tr>
</tbody>
</table>

* See layout drawing for details of construction of special areas.
"P" and "T" are specified by the individual project plans. Dimensions may vary for superelevated curves or at locations specifically designated by the Engineer.

Handle excavated asphalt materials as detailed elsewhere in the project plans.

Construct special shaping of widening units through bridge approach sections as directed by the Engineer.

Excavation in excess of that indicated is incidental to other work on the project.

Place Special Backfill only at locations where specifically required by the Engineer. This work will be paid for as "Extra Work" as per Article 1109.03 of the Standard Specifications.

6 inches of Special Backfill required when widening unit is part of the proposed traffic lane or when noted in project plans.

Possible Contract Items:
- Base Widening, Hot Mix Asphalt Mixture
- Removal of Curb
- Removal of Flumes
- Excavation, Class 13, For Widening
- Special Backfill
- Asphalt Binder

Possible Tabulations:
- 106-5
- 110-4
- 110-3

"P" and "T" are specified by the individual project plans.
TRANSITION DETAILS - TANGENT TO CURVE

- When spiral curve transitions are not required:
  - Place 70% of full superelevation at the PC and PT.
  - Place 30% of the runoff length within the curve.

- Unless otherwise specified, all lengths are measured along the centerline of construction.

- Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

- Smooth curves should be established at the time of construction at sections A-D along the profile edges of lines A-C.

- Axis of rotation coincides with profile grade location.

- \( m \) = 30% of Runoff Length (L)
- \( \Theta \) = 12" Regardless of Pavement Width
- \( g \) = Normal Cross Slope (2%)
- \( L \) = Distance to Change Cross Slope from 0% to e
- \( e \) = Superelevation Rate
- \( x \) = Distance to Change Cross Slope from 0% to 2%
- \( s \) = Normal Shoulder Slope

- Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18

TRANSITION DETAILS - SPIRAL CURVE

Refer to specific curve data contained in project plans for tangent runoff length (x), runoff length (L), and full superelevation (e).

DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES
High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope breaks with the adjacent pavement reaches 8.0%. Maintain 8% break over until superelevation rate reaches 7%, if superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.
Refer to specific curve data contained in project plans for tangent runoff length (x), runoff length (L), and full superelevation (e).

When spiral curve transitions are not required:
Place 70% of full superelevation at the PC and PT
Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Superelevations on this standard are shown for curves to the right. Curves to the left are a mirror image of what is shown.

Smooth curves should be established at the time of construction at sections A-D along the profile edges of lines A-C.

Axis of rotation coincides with profile grade location.

\[ m = 30\% \text{ of Runoff Length (L)} \]
\[ g = 24' \text{ Regardless of Pavement Width} \]
\[ L = \text{Distance to Change Cross Slope from 0\% to e} \]
\[ e = \text{Superelevation Rate} \]
\[ x = \text{Distance to Change Cross Slope from 0\% to 2\%} \]
\[ s = \text{Normal Shoulder Slope} \]

Spiral curve length coincides with runoff length (L)

Possible Tabulation:
101-18
High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface
**Case U**  
(Section where $e \geq 7.0\%$)  
- High Side Shoulder: Maintain normal shoulder cross slope ($s$) until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

**Case T**  
(Section where high side shoulder crown break rule occurs)  
- Low Side Shoulder: Maintain normal shoulder cross slope ($s$) until the adjacent pavement slope equals $s$, then slope the shoulder at the same cross slope as the adjacent pavement.

**Case S**  
(Section where low side shoulder crown break rule occurs)  

---

**DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES**

**Subgrade Surface**
Refer to specific curve data contained in project plans for tangent runoff length (x), runoff length (L) and full superelevation (e).

Place 70% of full superelevation at the P.C. and P.T.

Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the baseline.

Smooth curves should be established at the time of construction at sections A-B along the profile edge of lines A and B.

Axis of rotation coincides with profile grade location.

\[ m = 30\% \text{ of Runoff Length (L)} \]
\[ g = \text{Pavement Width} \]
\[ g = \text{Normal Cross Slope (2\%)} \]
\[ L = \text{Distance to Change Cross Slope from 0\% to e} \]
\[ e = \text{Superelevation Rate} \]
\[ x = \text{Distance to Change Cross Slope from 0\% to 2\%} \]
\[ s = \text{Normal Shoulder Slope} \]

Possible Tabulation:

101-18
High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 9% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.
1. High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%, if superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

2. Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

3. Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

(Section where e ≥ 7.0%)
Super elevation details for a six lane roadway with a depressed median.

**Transition Details - Tangent to Curve**
- Construction lines A-D.
- Transition lines at sections A-F along profile edges.
- Smooth curves should be established at the time of construction.
- Curves to the right are a mirror image of what is shown.
- Axis of rotation coincides with profile grade location.

**Transition Details - Spiral Curve**
- Construction lines A-D.
- Transition lines at sections A-F along profile edges.
- Smooth curves should be established at the time of construction.
- Curves to the right are a mirror image of what is shown.
- Axis of rotation coincides with profile grade location.

Superelevations on this standard are shown for curves to the right: Curves to the left are a mirror image of what is shown.

Refer to specific curve data contained in project plans for tangent runoff length (x), runoff length (L), and full superelevation (e).

When spiral curve transitions are not required:
- Place 70% of full superelevation at the PC and PT.
- Place 30% of the runoff length within the curve.

Unless otherwise specified, all lengths are measured along the centerline of construction.

Possible Tabulation: 101-18
© Iowa DOT

STANDARD ROAD PLAN
PV-304

SURELEVATION DETAILS
SIX LANE ROADWAY
DEPRESSED MEDIAN

High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

[Diagram showing rotation of slopes and profile grades for different sections (A-A, B-B, C-C, D-D, E-E, F-F)]
High Side Shoulder: Maintain normal shoulder cross slope (s), until the cross slope break with the adjacent pavement reaches 8.0%. Maintain 8% breakover until superelevation rate reaches 7%. If superelevation rate exceeds 7.0%, maintain a 1% shoulder cross slope away from the adjacent pavement.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.
TABLE OF OFFSETS AND DROPS FOR LEFT ROADWAY

<table>
<thead>
<tr>
<th>Location of Cross Sections</th>
<th>Offset (Ft)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Line A To Line B</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
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<tr>
<td></td>
<td>Slope (%)</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.30</td>
<td>12(e)</td>
</tr>
<tr>
<td>From Line B To Line C</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Slope (%)</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>From Line C To Line D</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Slope (%)</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

TABLE OF OFFSETS AND DROPS FOR RIGHT ROADWAY

<table>
<thead>
<tr>
<th>Location of Cross Sections</th>
<th>Offset (Ft)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Line A To Line B</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Slope (%)</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.24</td>
<td>0.30</td>
<td>12(e)</td>
</tr>
<tr>
<td>From Line B To Line C</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Slope (%)</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
<td>-2.0</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>From Line C To Line D</td>
<td>Offset (Ft)</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Slope (%)</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
<td>-2.5</td>
</tr>
<tr>
<td></td>
<td>Drop (Ft)</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

DIAGRAMMATIC PROFILES OF THE PAVEMENT EDGE LINES
TRANSITION DETAILS - TANGENT TO CURVE

TRANSITION DETAILS - SPIRAL CURVE

Possible Tabulation: 101-18
High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.
CASE A 
(e ≥ 3.6%)

CASE B 
(2.8% < e < 3.8%)

CASE C 
(e ≤ 2.8%)

High Side Shoulder: Maintain normal shoulder cross slope (s) until the cross slope break with the adjacent pavement reaches 8.0%, then slope the shoulder at the same rate as the adjacent pavement maintaining an 8% cross slope breakover.

Low Side Shoulder: Maintain normal shoulder cross slope (s) until the adjacent pavement slope equals s, then slope the shoulder at the same cross slope as the adjacent pavement.

Subgrade Surface: Subgrade surface cross slope parallel to pavement surface cross slope.

CASE T 
(Section where high side shoulder crown break rule occurs)

CASE S 
(Section where low side shoulder crown break rule occurs)

LEFT ROADWAY

RIGHT ROADWAY

SECTION AT THE PC OR PT

SECTION WHERE SHOULDER SLOPE TRANSITION BEGINS

LEFT ROADWAY

RIGHT ROADWAY

STANDARD ROAD PLAN

SUPERELEVATION DETAILS

SIX LANE ROADWAY

CLOSED MEDIAN
Construct ramp exit pavement the same thickness as mainline pavement.

Ramp exit pavement shown by shaded area is 1332 square yards.

For joint details, see PV-101.

1. For header construction details at the beginning of taper, see Typical 7101 or Typical 7102.
2. Construct subbase for ramp exit pavement the same thickness as mainline subbase.

**TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER**

<table>
<thead>
<tr>
<th>OFFSET (ft)</th>
<th>DROP (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.67</td>
<td>0.48</td>
</tr>
<tr>
<td>3.33</td>
<td>0.48</td>
</tr>
<tr>
<td>6.67</td>
<td>0.48</td>
</tr>
<tr>
<td>10.00</td>
<td>0.48</td>
</tr>
<tr>
<td>13.33</td>
<td>0.48</td>
</tr>
<tr>
<td>16.67</td>
<td>0.48</td>
</tr>
</tbody>
</table>

**TABLE OF SHOULDER TRANSITION LENGTHS**

<table>
<thead>
<tr>
<th>Shoulder Width beyond Edge of Mainline Pavement</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>NA</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** \( W \) is the width of the outside lane to the Edge of Pavement.
Transverse Joints Perpendicular to Mainline Pavement

Reference Point for 15' Max. Joint Spacing

Transverse Joints Perpendicular to Ramp Baseline

'CD' Joints at 15' Max. Spacing along Mainline

Reference Point for 15' Max. Joint Spacing

'Transverse Joints Perpendicular to Ramp Baseline

'CD' Joints at 15' Max. Spacing along Ramp

16' EXIT RAMP

1. 'BT-2' or 'KT-2' Joint.
2. 'C' Joint.
3. 'B' Joint. 2' minimum, 4' maximum.
4. 10' minimum or equal to mainline shoulder width.
5. 'B' or 'C' Joint. 2' minimum, 4' maximum.
6. 'L-2' Joint.

'References:
Removed INTERIM from the standard.
Construct ramp entrance pavement the same thickness as mainline pavement.

Ramp entrance pavement shown by shaded area is 1793 square yards.

For joint details, see PV-101

1. For header construction details at the end of taper, see Typical 7101 or Typical 7102.

2. Construct subbase for ramp entrance pavement the same thickness as mainline subbase.

TABLE OF OFFSETS AND DROPS FOR 16' RAMP TAPER

| Distance From Point | Mainline 'A' (Ft) | 200 | 225 | 227 | 175 | 150 | 125 | 100 | 75 | 50 | 25 | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|---------------------|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Drop (Ft) | 0.87 | 0.86 | 0.85 | 0.84 | 0.83 | 0.82 | 0.81 | 0.80 | 0.79 | 0.78 | 0.77 | 0.76 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Skips (%) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| Drop (Ft) | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Skips (%) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| Drop (Ft) | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| Skips (%) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |
| Distance From Point | Mainline 'A' (Ft) | 228.86 | 222.98 | 222.00 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 | 217.76 |
| Drop (Ft) | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| Skips (%) | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 | 5.40 |

NOTE: The algebraic difference between profile grade for Ramp Base Line at F and relative profile grade of Mainline at H is 0.54%.
Transverse 'CD' Joints Perpendicular to Mainline Pavement

Transverse 'CD' Joints Perpendicular to Ramp Baseline

CD' Joints at 15' max. Spacing along Mainline

CD' Joints at 15' max. Spacing along Ramp

Transverse Joints Perpendicular to Ramp Baseline

Transverse Joints Perpendicular to Mainline Pavement

Reference Point for 15' Max. Joint Spacing

---

1. 'BT-2' or 'KT-2' Joint.
2. 'C' Joint.
3. 'B' Joint, 2' minimum, 4' maximum.
4. Construct transverse joints on the entrance ramp taper perpendicular to the tapered edge where the gore area is greater than 4 feet.
5. 'C' Joint equal to mainline shoulder width.
6. 10' minimum, or equal to mainline shoulder width.
7. 'B' or 'C' Joint, 2' minimum, 4' maximum.
8. 'L-2' Joint.
**PROFILE**

**Table of Offsets and Drops for 18' Exit Loop Taper**

<table>
<thead>
<tr>
<th>Distance from Point</th>
<th>Along Line 'A' (Ft.)</th>
<th>500</th>
<th>550</th>
<th>600</th>
<th>650</th>
<th>700</th>
<th>750</th>
<th>800</th>
<th>850</th>
<th>900</th>
<th>950</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset (Ft.)</td>
<td>Constant 18' Offset</td>
<td>0.04</td>
<td>0.08</td>
<td>0.12</td>
<td>0.16</td>
<td>0.20</td>
<td>0.24</td>
<td>0.28</td>
<td>0.32</td>
<td>0.36</td>
<td>0.40</td>
<td>0.44</td>
</tr>
<tr>
<td>Drop (Ft.)</td>
<td>Constant 3% Slope</td>
<td>0.04</td>
<td>0.08</td>
<td>0.12</td>
<td>0.16</td>
<td>0.20</td>
<td>0.24</td>
<td>0.28</td>
<td>0.32</td>
<td>0.36</td>
<td>0.40</td>
<td>0.44</td>
</tr>
</tbody>
</table>

**NOTE:** The algebraic difference between profile grade for Loop Base Line at M and relative profile grade of Mainline at C is 0.2%.

**Construct loop exit pavement the same thickness as mainline pavement.**

**Loop exit pavement shown by shaded area is 1332 square yards.**

**For joint details, see PV-101.**

**For header construction details at the beginning of taper, see Typical 7101 or Typical 7102.**

**Construct subbase for loop exit pavement the same thickness as mainline subbase.**

---

**Table of Shoulder Transition Lengths**

<table>
<thead>
<tr>
<th>W</th>
<th>12'</th>
<th>14'</th>
<th>16'</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>NA</td>
<td>97</td>
<td>97</td>
</tr>
</tbody>
</table>

**NOTE:** W is the width of the outside lane to the Edge of Pavement.
Transverse Joints Perpendicular to Mainline Pavement

Transverse Joints Perpendicular to Loop Baseline

600'

CO' Joints at 15' max. Spacing along Mainline

CO' Joints at 15' max. Spacing along Loop

Reference Point for 15' Max. Joint Spacing

18' EXIT LOOP

1. 'BT-2' or 'KT-2' Joint.
2. 'C' Joint.
3. 'B' Joint. 2' minimum, 4' maximum.
4. 'L-2' Joint.
5. 12' minimum or equal to mainline shoulder width.
6. 'B' or 'C' Joint. 2' minimum, 4' maximum.
Construct loop entrance pavement the same thickness as mainline pavement.

Loop entrance pavement shown by shaded area is 1329 square yards.

For joint details, see PV-101.

1. For header construction details at the end of taper, see Typical 7101 or Typical 7102.
2. Construct subbase for loop entrance pavement the same thickness as mainline subbase.

NOTE: The algebraic difference between profile grade for Loop Base Line at and relative profile grade of Mainline at is 0.350.

**TABLE OF OFFSETS AND DROPS FOR 18' LOOP TAPER**

| Distance From Point | 475 | 450 | 425 | 400 | 375 | 350 | 325 | 300 | 275 | 250 | 225 | 200 | 175 | 150 | 125 | 100 | 75 | 50 | 25 | 0 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| From | Line A | To | Line B | Offset (Ft) | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 |
| Slope (%) | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| Drop (Ft) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| From | Line B | To | Line C | Offset (Ft) | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 |
| Slope (%) | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Drop (Ft) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| From | Line C | To | Line D | Offset (Ft) | 0.00 | 1.00 | 2.00 | 3.00 | 4.00 | 5.00 | 6.00 | 7.00 | 8.00 | 9.00 | 10.00 | 11.00 | 12.00 | 13.00 | 14.00 | 15.00 | 16.00 | 17.00 | 18.00 |
| Slope (%) | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 | 0.72 |
| Drop (Ft) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**TABLE OF SHOULDER TRANSITION LENGTHS**

| Distance From Point | 475 | 450 | 425 | 400 | 375 | 350 | 325 | 300 | 275 | 250 | 225 | 200 | 175 | 150 | 125 | 100 | 75 | 50 | 25 | 0 |
|---------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Shoulder Width Beyond Edge of Mainline Pavement | NA | 10' | 10' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' | 12' |

NOTE: is the width of the outside lane to the Edge of Pavement.

**SECTION A-A**

**SECTION B-B**

**SECTION C-C**
Transverse Joints Perpendicular to Mainline Pavement

- 'B' or 'K' Joint. 2' minimum, 4' maximum.
- 'L' Joint. 2' minimum, 4' maximum.
- 'BT-2' or 'KT-2' Joint.

Transverse Joints Perpendicular to Loop Baseline

- 'C' Joint equal to mainline shoulder.
- 10' minimum or equal to mainline shoulder width.
- 'B' or 'C' Joint. 2' minimum, 4' maximum.

Reference Point for 15' Max. Joint Spacing

'CD' Joints at 15' max. Spacing along Mainline

'CD' Joints at 15' max. Spacing along Loop

'CD' Joints at 15' max. Spacing along Mainline

18' ENTRANCE LOOP

ACCELERATION TAPER

FOR 18' ENTRANCE LOOP
Detour Pavement options: 9" PCC or 12" HMA
For joint details, see PV-101.

1. Median crossover is symmetrical about centerline.
2. For PCC Detour Pavement, match existing roadway joints. 'CD' joints are required.
3. For HMA Detour Pavement, match existing roadway joints. 'BT' joint is required.
4. 'KT-2' or 'L-2' joint if mainline pavement is new construction. Bend bars out.
   'BT-3' joint if mainline pavement is existing. 'B' joint if Detour Pavement is HMA.

Possible Tabulation:

Possible Contract Items:
Detour Pavement
Embankment In Place
Excavation, Class 10, Roadway and Borrow
Excavation, Class 13, Roadway and Borrow
Granular Shoulders, Type A
Removal of Pavement
Special Backfill

TABLE OF OFFSETS AND DROPS

<table>
<thead>
<tr>
<th>Distance (Feet)</th>
<th>468.69</th>
<th>400</th>
<th>350</th>
<th>301.41</th>
<th>250</th>
<th>200</th>
<th>150</th>
<th>100</th>
<th>50</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset A to C (Feet)</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.07</td>
<td>7.38</td>
<td>8.44</td>
<td>10.58</td>
<td>12.33</td>
<td>14.34</td>
<td>16.54</td>
</tr>
<tr>
<td>Drop A to B (Feet)</td>
<td>0.24</td>
<td>0.20</td>
<td>0.12</td>
<td>0.12</td>
<td>0.13</td>
<td>0.15</td>
<td>0.18</td>
<td>0.21</td>
<td>0.25</td>
<td>0.29</td>
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<tr>
<td>Drop A to B (Feet)</td>
<td>0.08</td>
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<td>0.32</td>
<td>0.39</td>
<td>0.46</td>
<td>0.53</td>
<td>0.60</td>
<td>0.67</td>
<td>0.74</td>
</tr>
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</table>

*Quantity based on 8" shoulder depth.

**NOTE:** 
- For joint details, see PV-101.
- 'CD' joints are required for PCC Detour Pavement.
- 'BT' or 'L-2' joint is required for HMA Detour Pavement.
- Median crossover is symmetrical about centerline.
- Bend bars out for 'KT-2' or 'L-2' joint.

**REVISIONS:** 
- New logo and modified circle note 2.
- Possible Tabulation:
- Possible Contract Items:
- Table of Offsets and Drops
- Design Quantity Table

**REVISION:**
- New logo and modified circle note 2.

**APPROVALS:** 
- Design Methods Engineer
- Construction Engineer

**STANDARD ROAD PLAN**

**PV-501**

**MEDIAN Crossover**

(50' MEDIAN)

16' WIDE 1 LANE

**SHEET:**
1 of 1
**SECTION A-A**

- Roadway
- Pavement
- Shoulder
- Granular
- Backfill
- Special

- Excavate 6" min.

**SECTION B-B**

- Roadway
- Pavement
- Shoulder
- Granular
- Backfill
- Special

- Excavate 6" min.

**DETAIL 'A'**

- Shoulder
- Paintline
- Edge of New Pavement
- R=3500'

**PERSPECTIVE VIEW**

**PROFILE**

- 0.00
- 0.20
- 0.40
- 0.60
- 0.80

**PLAN**

**TABLE OF OFFSETS AND DROPS**

<table>
<thead>
<tr>
<th>Distance (Yard)</th>
<th>515.48</th>
<th>348.20</th>
<th>55.63</th>
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<tbody>
<tr>
<td>Drop (ft)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**LOCATION STATION**

- 515.48
- 348.20
- 55.63

**DETAL 'A'**

- See Detail 'A'

**DESIGN QUANTITY TABLE**

<table>
<thead>
<tr>
<th>Item</th>
<th>Special Backfill</th>
<th>Granular Shoulder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detour Pavement Sq. Yds.</td>
<td>1685</td>
<td>*195</td>
</tr>
<tr>
<td>Special Backfill Tons</td>
<td>725</td>
<td></td>
</tr>
<tr>
<td>Granular Shoulder Tons</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Quantity based on 8" shoulder depth.

**Possible Tabulation:**

- Detour Pavement options: 9" PCC or 12" HMA
- For joint details, see PV-101.
- Median crossover is symmetrical about centerline.
- Median pipe for crossover. See Detail DR-504.
- For PCC Detour Pavement, match existing roadway joints. 'CD' joints are required.
- 'KT-2' or 'L-2' joint if mainline pavement is new construction. Bend bars out.
- 'BT-3' joint if mainline pavement is existing.
- 'B' joint if Detour Pavement is HMA.

**Possible Contract Items:**

- Detour Pavement
- Embankment In Place
- Excavation, Class 13, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

**Median Crossover**

- 28' wide 2 lane (50' median)

**REVISIONS:**

New logo and modified circle note.

**APPROVED BY DESIGN METHODS ENGINEER**

**STANDARD ROAD PLAN**

**PV-502**

**REVISIONS:**

New logo and modified circle note.
Detour Pavement options: 9" PCC or 12" HMA
For joint details, see PV-101.
1. Median crossover is symmetrical about centerline.
3. For PCC Detour Pavement, match existing roadway joints.
4. "C" joints are required.
5. "KT-2" or "L-2" joint if mainline pavement is new
   construction. Bend bars out.
   "BT-3" joint if mainline pavement is existing.
6. 18" joint if Detour Pavement is HMA.

Possible Tabulation:

**Possible Contract Items:**
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulders, Type A
- Removal of Pavement
- Special Backfill

**Possible Tabulation:**

**Medan Crossover (64' Median)
28' Wide 2 Lane**
**Section A-A**
- **Roadway pavement**
- **Granular shoulder**
- **Special backfill**
- **Existing shoulder width** 2%
- **Excavate 6' min.**

**Section B-B**
- **Roadway pavement**
- **Granular shoulder**
- **Special backfill**
- **Existing shoulder width** 2%
- **Excavate 6' min.**

**Detail 'A'**
- **Shoulder**
- **Granular shoulder**
- **Special backfill**
- **Edge of new pavement**
- **Pavement**

**Profile**
- **Line 'A'**
- **Line 'B'**
- **Drop (R)**

**Design Quantity Table**

<table>
<thead>
<tr>
<th>Detour Pavement</th>
<th>Special Backfill</th>
<th>Granular Shoulder</th>
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<tr>
<td>1375</td>
<td>870</td>
<td>245</td>
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</table>

*Quantity based on 8' shoulder depth.

Possible Contract Items:
- Detour Pavement
- Embankment in Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfill

Possible Tabulation:
- 112-8

Possible Details:
- Joint details see PV-101
- For PCC Detour Pavement, match existing roadway joints.
- 'CD' joints are required.
- For PCC Detour Pavement, match existing roadway joints.
- 'CD' joints are required.
- For PCC Detour Pavement, match existing roadway joints.
- 'CD' joints are required.

**Note:**
- Median crossover is symmetrical about centerline.
- Median pipe for crossover. See DR-504.
- For PCC Detour Pavement, match existing roadway joints. 'CD' joints are required.
- KT-2' or 1'-2' joint if mainline pavement is new construction. Bend bars out.
- BL-3' joint if mainline pavement is existing.
- B' joint if Detour Pavement is HMA.

**Possible Tabulation:**
- 112-8

**Standard Road Plan**
- **PV-507**
- **16' wide 1 lane**
- **(68.24' median)**

**Medial Crossover**
- **Location Station:**
- **Profile:**
- **Plan:**
- **Table of Offsets and Drops:**
- **Table of Design Quantities:**
- **Table of Possible Contract Items:**
- **Possible Tabulation:**
- **Possible Details:**

**Revision:**
- New logo and modified circle note 2.
Detour Pavement options: 9" PCC or 12" HMA
For joint details, see PV-101.
1. Median crossover is symmetrical about centerline.
3. For PCC Detour Pavement, match existing roadway joints. "C" joints are required.
4. "KT-2" or "L-2" joint if mainline pavement is new construction. Bend bars out.
"BT-3" joint if mainline pavement is existing. 10" joint if Detour Pavement is HMA.

Possible Tabulation:

- Detour Pavement options: 9" PCC or 12" HMA
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfills

Possible Contract Items:
- Detour Pavement
- Embankment In Place
- Excavation, Class 10, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfills
**Table of Offsets and Drops**

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<th>Distance (ft)</th>
<th>575.05</th>
<th>560</th>
<th>525</th>
<th>530</th>
<th>475</th>
<th>450</th>
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<th>150</th>
<th>125</th>
<th>100</th>
<th>75</th>
<th>50</th>
<th>25</th>
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<tbody>
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<td>Offset A to C (ft)</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
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<td>9.24</td>
<td>10.94</td>
<td>12.62</td>
<td>14.88</td>
<td>17.73</td>
<td>20.58</td>
<td>24.94</td>
<td>27.71</td>
<td>31.05</td>
<td>34.39</td>
<td>37.91</td>
<td>41.60</td>
<td>49.09</td>
<td></td>
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</tr>
<tr>
<td>Drop A to C (ft)</td>
<td>0.24</td>
<td>0.18</td>
<td>0.13</td>
<td>0.12</td>
<td>0.12</td>
<td>0.12</td>
<td>0.15</td>
<td>0.16</td>
<td>0.20</td>
<td>0.24</td>
<td>0.28</td>
<td>0.32</td>
<td>0.36</td>
<td>0.40</td>
<td>0.44</td>
<td>0.48</td>
<td>0.52</td>
<td>0.56</td>
<td>0.60</td>
<td>0.64</td>
<td></td>
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</tr>
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</table>

**Notes:**
- Detour Pavement options: 6" PCC or 12" HMA
- Median crossover is symmetrical about centerline.
- Median pipe for crossover. See DR-504.
- For PCC Detour Pavement, match existing roadway joints. 'CD' joints are required.
- 'KT-2' or 'L-2' joint if mainline pavement is new construction. Bend bars out.
- 'BT-3' joint if mainline pavement is existing.
- 'B' joint if Detour Pavement is HMA.

**Possible Tabulation:**
- Detour Pavement
- Embankment in Place
- Excavation, Class 13, Roadway and Borrow
- Excavation, Class 13, Roadway and Borrow
- Granular Shoulder, Type A
- Removal of Pavement
- Special Backfill

**Possible Contract Items:**
- PV-101
- PV-510
- DR-504

**Drawn by:**
- APPROVED BY DESIGN METHODS ENGINEER

**Sheet 1 of 1**

**Revision:**
- 04-21-20

**IOWA DOT STANDARD ROAD PLAN**

**PV-510**

**MEDIAN Crossover**

- 16' wide 1 lane

**REVISIONS:** New logo and modified circle note 2.
DETAIL 'A'

Pavement

Roadway

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'

DETAIL 'A'

See Detail 'A'

Pavement

Edge of New Pavement

Shoulder

Drainage

SECTION A-A

Excavate 6" min.

Existing Shoulder Width

Granular Shoulder

Special Backfill

Median

SECTION B-B

6' Header

2' Offset

PC

R=3500'
## Signs

<table>
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<th>TITLE</th>
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<tr>
<td>SI-101</td>
<td>04-19-16</td>
<td>Locations - Type 'A' Signs</td>
</tr>
<tr>
<td>SI-102</td>
<td>04-19-16</td>
<td>Locations - Type 'B' Signs</td>
</tr>
<tr>
<td>SI-111</td>
<td>04-19-16</td>
<td>Support Structures - Wood Posts</td>
</tr>
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<td>SI-112</td>
<td>04-19-16</td>
<td>Footings For Steel Breakaway Posts</td>
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<td>SI-113</td>
<td>10-15-19</td>
<td>Support Structures - Steel Breakaway Posts</td>
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<td>SI-114</td>
<td>04-19-16</td>
<td>Support Structures - Steel Breakaway Posts Rectangular Tube</td>
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<td>SI-119</td>
<td>10-17-17</td>
<td>Support Structures - Mounting Brackets</td>
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<td>SI-121</td>
<td>10-16-18</td>
<td>Fabrication - Sign Legend Components</td>
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<td>Fabrication - Type 'B' Signs</td>
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<td>SI-132</td>
<td>04-17-18</td>
<td>Installation - Type 'B' Signs</td>
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<td>10-17-17</td>
<td>Installation - Type &quot;A&quot; Sign Shim</td>
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<td>SI-171</td>
<td>04-18-17</td>
<td>Reference Location Sign Posts</td>
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<td>04-19-16</td>
<td>Delineators</td>
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<td>SI-173</td>
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<td>04-21-20</td>
<td>Emergency Management Ramp Signing</td>
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<td>SI-175</td>
<td>04-19-16</td>
<td>Chevrons</td>
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<td>SI-181</td>
<td>10-18-16</td>
<td>Permanent Road Closure - Rural</td>
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<td>SI-182</td>
<td>04-19-16</td>
<td>Permanent Road Closure - Urban</td>
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<td>SI-211</td>
<td>10-18-16</td>
<td>Object Marker and Delineator Placement with Guardrail</td>
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<td>SI-241</td>
<td>10-18-16</td>
<td>Sign Placement Approaching a Railroad Crossing</td>
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<td>SI-881</td>
<td>04-16-19</td>
<td>Special Signs for Workzones</td>
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<tr>
<td>SI-882</td>
<td>10-18-16</td>
<td>Special Signs for Restricted Width Traffic Control Zones</td>
</tr>
</tbody>
</table>
Furnish Type 1 delineator posts for each location unless specified otherwise in the plans.

\( \frac{3}{4} \) or \( \frac{1}{2} \) holes in delineators are acceptable.

All dimensions are in inches unless otherwise designated.

Install post of sufficient length to provide a minimum of 30 inches of embedment when installed at the specified mounting height.

EMERGENCY MANAGEMENT SIGN ASSEMBLY

All dimensions are in inches unless otherwise designated.

Type 1 - Shoulder Installation

Type 2 - Curb Installation

Type 3 - Bridge Barrier Rail Installation

Type 4 - Attachment to Other Feature

Type 5 - Depressed Median Installation

Type 6 - Raised Median Installation

Type 7 - Full Median Barrier Rail Installation

Type 8 - Split Median Barrier Rail Installation

Type 9 - Split Median Barrier Rail Installation with Grade Differential

- Hot-dipped galvanized steel bolts, self-locking nuts, and washers
- \( \frac{3}{4} \) x 2\( \frac{1}{4} \) - 18 NC hex bolts and hex self-locking nuts with washers
- \( \frac{1}{4} \) I.D. x \( \frac{3}{8} \) O.D. x 0.051

- 1 1/2 in. O.D. 1/8 in. thick Hot Dipped Galvanized Washer

Emergency Management Sign

Attach to feature with stainless steel bands.

Other features could be light poles, sign trunk legs, etc.

Attach to feature with stainless steel bands.
1.5" Radius, 0.5" Border, White on Green; [RAMP] B 2K; [1] C 2K; [2] D 2K.
## Storm and Sanitary Sewers

<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>TITLE</th>
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<tbody>
<tr>
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<td><strong>Trench and Backfill</strong></td>
</tr>
<tr>
<td>SW-101</td>
<td>04-17-18</td>
<td>Trench Bedding and Backfill Zones</td>
</tr>
<tr>
<td>SW-102</td>
<td>04-16-19</td>
<td>Rigid Gravity Pipe Trench Bedding</td>
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<tr>
<td>SW-103</td>
<td>04-16-19</td>
<td>Flexible Gravity Pipe Trench Bedding</td>
</tr>
<tr>
<td>SW-104</td>
<td>04-21-20</td>
<td>Pressure Pipe Trench Bedding</td>
</tr>
<tr>
<td>SW-105</td>
<td>04-17-18</td>
<td>Miscellaneous Pipe Bedding</td>
</tr>
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<td></td>
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<td><strong>General Sewer</strong></td>
</tr>
<tr>
<td>SW-201</td>
<td>04-21-20</td>
<td>Sanitary Sewer Service Stub</td>
</tr>
<tr>
<td>SW-202</td>
<td>04-21-20</td>
<td>Sewage Air Release Valve Pit</td>
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<tr>
<td>SW-203</td>
<td>04-17-18</td>
<td>Sanitary Sewer Cleanout</td>
</tr>
<tr>
<td>SW-211</td>
<td>04-17-18</td>
<td>Storm Sewer Pipe Connections</td>
</tr>
<tr>
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</tr>
<tr>
<td>SW-301</td>
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<td>Circular Sanitary Sewer Manhole</td>
</tr>
<tr>
<td>SW-302</td>
<td>04-21-20</td>
<td>Rectangular Sanitary Sewer Manhole</td>
</tr>
<tr>
<td>SW-303</td>
<td>04-21-20</td>
<td>Sanitary Sewer Manhole over Existing Sewer</td>
</tr>
<tr>
<td>SW-304</td>
<td>04-21-20</td>
<td>Rectangular Base/Circular Top Sanitary Sewer Manhole</td>
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<td>Tee-Section Sanitary Sewer Manhole</td>
</tr>
<tr>
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<td>04-21-15</td>
<td>Chimney Seals for Sanitary Sewer Manholes</td>
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<td>SW-307</td>
<td>04-21-20</td>
<td>Drop Connection for Sanitary Sewer</td>
</tr>
<tr>
<td>SW-308</td>
<td>04-21-20</td>
<td>Internal Drop Connection for Sanitary Sewer Manhole</td>
</tr>
<tr>
<td>SW-350</td>
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<td>Travel Trailer Dump Station</td>
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<td><strong>Storm Sewer Manholes</strong></td>
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<td>Deep Well Rectangular Storm Sewer Manhole</td>
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<td>SW-404</td>
<td>04-21-20</td>
<td>Rectangular Base/Circular Top Storm Sewer Manhole</td>
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<tr>
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<tr>
<td>SW-406</td>
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<td>Shallow Rectangular Storm Sewer Manhole</td>
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<tr>
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<tr>
<td>SW-501</td>
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<td>Single Grate Intake</td>
</tr>
<tr>
<td>SW-502</td>
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<td>Circular Single Grate Intake</td>
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<td>SW-503</td>
<td>04-21-20</td>
<td>Single Grate Intake with Manhole</td>
</tr>
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<td>SW-504</td>
<td>04-21-20</td>
<td>Single Grate Intake with Flush-Top Manhole</td>
</tr>
<tr>
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<td>04-21-20</td>
<td>Double Grate Intake</td>
</tr>
<tr>
<td>SW-506</td>
<td>04-21-20</td>
<td>Double Grate Intake with Manhole</td>
</tr>
<tr>
<td>SW-507</td>
<td>04-21-20</td>
<td>Single Open-Throat Intake, Small Box</td>
</tr>
<tr>
<td>SW-508</td>
<td>04-21-20</td>
<td>Single Open-Throat Intake, Large Box</td>
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<tr>
<td>SW-509</td>
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<td>Double Open-Throat Curb Intake, Small Box</td>
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<tr>
<td>SW-511</td>
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</tr>
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<td>04-21-20</td>
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<tr>
<td>SW-513</td>
<td>04-21-20</td>
<td>Open-Sided Area Intake</td>
</tr>
<tr>
<td>SW-514</td>
<td>04-17-18</td>
<td>Boxouts for Grate Intakes</td>
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<tr>
<td>SW-515</td>
<td>04-21-20</td>
<td>Triple Rectangular Area Intake</td>
</tr>
<tr>
<td>SW-521</td>
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<td>Linear Trench Drain</td>
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<tr>
<td>SW-538</td>
<td>10-15-19</td>
<td>Intake for Bridge End Drain</td>
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<tr>
<td>SW-539</td>
<td>10-15-19</td>
<td>Intake for Bridge End Drain (with Letdown)</td>
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<tr>
<td>SW-541</td>
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<td>Open-Throat Curb Intake under Pavement</td>
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<tr>
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<td>04-21-20</td>
<td>Extension Unit for Open-Throat Curb Intake under Pavement</td>
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<tr>
<td>SW-545</td>
<td>04-21-20</td>
<td>Single Open-Throat Curb Intake with Extended Opening</td>
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<tr>
<td>SW-546</td>
<td>04-17-18</td>
<td>Single Open-Throat Barrier Intake</td>
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<tr>
<td>SW-547</td>
<td>04-17-18</td>
<td>Triple-Grate Barrier Intake</td>
</tr>
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<td>SW-548</td>
<td>10-16-18</td>
<td>Single-Grate Barrier Intake, Circular</td>
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<tr>
<td>SW-549</td>
<td>04-17-18</td>
<td>Single-Grate Barrier Intake, Rectangular</td>
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<tr>
<td>SW-550</td>
<td>04-17-18</td>
<td>Alternate Construction Method (SW-508 and SW-510 Intake)</td>
</tr>
<tr>
<td>SW-562</td>
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<td>Vertical Throat Area Intake</td>
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## Storm and Sanitary Sewers

<table>
<thead>
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<tr>
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<td>Vertical Throat Area Intake (Large Box)</td>
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<tr>
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<tr>
<td>SW-601</td>
<td>04-21-20</td>
<td>Castings for Sanitary Sewer Manholes</td>
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<tr>
<td>SW-602</td>
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<td>SW-603</td>
<td>10-16-18</td>
<td>Castings for Grate Intakes</td>
</tr>
<tr>
<td>SW-604</td>
<td>04-21-20</td>
<td>Castings for Area Intakes</td>
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</tbody>
</table>
### BEDDING CLASSES

**Class P-1**
- Loose, Suitable Backfill Material or Undisturbed Material with Bell Shaping
- d = Outside diameter of pipe

**Class P-2**
- d = Trench width at top of pipe
- Min. = OD/8 or 4 inches (whichever is greater)
- Depth of bedding material below pipe: Min. = OD+18 inches or 1.25xOD+12 inches (whichever is greater)

**Class P-3**
- d = Depth of bedding material below pipe: Min. = OD/8 or 4 inches (whichever is greater)

### ALLOWABLE BURY DEPTH

#### Ductile Iron, AWWA C151, Class 52

<table>
<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>Class P-1 Bedding</th>
<th>Class P-2 Bedding</th>
<th>Class P-3 Bedding</th>
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</thead>
<tbody>
<tr>
<td>4</td>
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<td>40'</td>
<td>40'</td>
</tr>
<tr>
<td>6</td>
<td>40'</td>
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<td>40'</td>
<td>40'</td>
<td>40'</td>
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<tr>
<td>10</td>
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<td>40'</td>
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<td>40'</td>
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<tr>
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<td>40'</td>
<td>40'</td>
</tr>
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<td>24</td>
<td>29'</td>
<td>38'</td>
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</tr>
<tr>
<td>30</td>
<td>23'</td>
<td>31'</td>
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<td>36</td>
<td>22'</td>
<td>30'</td>
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<tr>
<td>42</td>
<td>21'</td>
<td>29'</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>19'</td>
<td>27'</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>19'</td>
<td>27'</td>
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#### PVC, AWWA C900, DR18

<table>
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<th>Class P-1 Bedding</th>
<th>Class P-2 Bedding</th>
<th>Class P-3 Bedding</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>19'</td>
<td>23'</td>
<td>40'</td>
</tr>
<tr>
<td>6</td>
<td>19'</td>
<td>23'</td>
<td>40'</td>
</tr>
<tr>
<td>8</td>
<td>19'</td>
<td>23'</td>
<td>40'</td>
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<td>23'</td>
<td>40'</td>
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<td>19'</td>
<td>23'</td>
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<td>23'</td>
<td>40'</td>
</tr>
<tr>
<td>20</td>
<td>19'</td>
<td>23'</td>
<td>40'</td>
</tr>
<tr>
<td>24</td>
<td>19'</td>
<td>23'</td>
<td>40'</td>
</tr>
</tbody>
</table>

1. Place remainder of bedding and backfill material as specified in the contract documents.

**Key**
- OD = Outside diameter of pipe
- TW = Trench width at top of pipe
- d = Depth of bedding material below pipe (whichever is greater)
Figure 4010.201

Sanitary Sewer Service Stub

1. Place bedding and backfill material as required for sewer main.
2. Service Line Slope:
   - 4 inch: 2% to 5%
   - 6 inch and greater: 1% to 5%

Sanitary Sewer Main Trench Wall
Sanitary Sewer Main
Tee or Wye
Class I Bedding Material
Slope
Row Line
Location Post
Cap or Plug
Service Line
10' to 12'
22.5° to 45°
1. Place bedding and backfill material as required for sewer main.

2. Service Line Slope:
   - 4 inch: 2% to 5%
   - 6 inch and greater: 1% to 5%

3. If service riser slope is steeper than 1:1, construct riser of entire service line with schedule 40 PVC (ASTM D 1785) or ductile iron (AWWA C151, Class 52). Use single length of pipe for riser, if possible.
Adjustment Rings
Arched Opening
Square Edge

1. SW-501 Type A or SW-602 Type G casting.
2. Place bedding material to springline of pipe.
3. Prevent riser from bearing on pipe by providing an arched opening with a diameter up to 6 inches larger than pipe diameter.

TYPICAL SECTION

SECTION A-A
1. For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

2. 12 inch minimum riser height above all pipe openings.

<table>
<thead>
<tr>
<th>Maximum Pipe Diameter (inches) for 2 Pipes</th>
<th>At 180° Separation</th>
<th>At 90° Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>60</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>72</td>
<td>42</td>
<td>30</td>
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<tr>
<td>84</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>96</td>
<td>60</td>
<td>42</td>
</tr>
</tbody>
</table>
Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Provide two #4 hoop bars at top opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. Wall widths vary with pipe diameter and range from 4 feet minimum to 5 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.
4. 12 inch minimum wall height above all pipe openings.
1. Provide two #4 hoop bars at top opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>36&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>Long Wall plus 18&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4b3</td>
<td>4</td>
<td>Base</td>
<td>Short Wall plus 18&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td>36&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td>Long Wall plus 12&quot;</td>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td>4t3</td>
<td>4</td>
<td>Top</td>
<td>Short Wall plus 12&quot;</td>
<td>6&quot;</td>
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<td>Wall</td>
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<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Wall</td>
<td>Wall Height minus 4&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Wall</td>
<td>Long Wall plus 12&quot;</td>
<td>12&quot;</td>
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</tbody>
</table>
For new pipe connections, provide cored opening with flexible pipe connector.

For existing pipe connections, provide an arched opening with a diameter up to 6 inches larger than outside diameter of pipe. Install waterstop around existing pipe. Fill void between pipe and opening with non-shrink grout.

For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

12 inch minimum riser height above all pipe openings.

---

**Table:**

<table>
<thead>
<tr>
<th>Manhole Diameter (inches)</th>
<th>Maximum Pipe Diameter for 2 Pipes (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 180° Separation</td>
</tr>
<tr>
<td>48</td>
<td>24</td>
</tr>
<tr>
<td>60</td>
<td>36</td>
</tr>
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<td>72</td>
<td>42</td>
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<tr>
<td>84</td>
<td>48</td>
</tr>
<tr>
<td>96</td>
<td>60</td>
</tr>
</tbody>
</table>
Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
2. Provide two #5 hoop bars at intermediate top opening and at all pipe openings.
3. Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.
4. 12 inch minimum wall height above all pipe openings.
Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall opening (minimum) each side of pipe opening.

### REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5t1</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>48&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5t2</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>Long Wall plus 20&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>5t3</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>Short Wall plus 20&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>5t4</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>8&quot;</td>
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<td>43&quot;</td>
<td>12&quot;</td>
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<td>Long Wall plus 26&quot;</td>
<td>12&quot;</td>
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<tr>
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<td>5</td>
<td>Base</td>
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<td>Short Wall plus 26&quot;</td>
<td>12&quot;</td>
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<tr>
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<td>Long Wall plus 20&quot;</td>
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<td>5</td>
<td>Top</td>
<td></td>
<td>Short Wall plus 20&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>
For sewer pipes less than 48 inches in diameter, install eccentric reducers/increasers with a standard tee or utilize a composite tee.
Adjusted Rings

D1

SW-601 Casting

Infiltration Barrier

Adjustment Rings

Precast Top

Joint Sealant (typ.)

Precast Riser Section

48" dia.

SW-601 Casting

8" min. Class I Bedding Material

Composite Tee Section

Gasketed Pipe Joint (typ.)

8" min. Class I Bedding Material

COMPOSITE TEE

Alternate to standard tee with eccentric reducer (for pipes 36" and smaller).

COMPOSITE TEE DIMENSIONS

<table>
<thead>
<tr>
<th>Size</th>
<th>D1</th>
<th>H</th>
<th>T₁</th>
<th>T₂</th>
<th>C</th>
<th>Weight</th>
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<tbody>
<tr>
<td>48&quot; on 12&quot;</td>
<td>12&quot;</td>
<td>50&quot;</td>
<td>8½</td>
<td>29½</td>
<td>41½</td>
<td>5600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 15&quot;</td>
<td>15&quot;</td>
<td>50&quot;</td>
<td>7</td>
<td>28</td>
<td>43</td>
<td>5400 lbs.</td>
</tr>
<tr>
<td>48&quot; on 18&quot;</td>
<td>18&quot;</td>
<td>50&quot;</td>
<td>5½</td>
<td>26½</td>
<td>44½</td>
<td>5200 lbs.</td>
</tr>
<tr>
<td>48&quot; on 21&quot;</td>
<td>21&quot;</td>
<td>48&quot;</td>
<td>9½</td>
<td>17½</td>
<td>36</td>
<td>5800 lbs.</td>
</tr>
<tr>
<td>48&quot; on 24&quot;</td>
<td>24&quot;</td>
<td>48&quot;</td>
<td>8</td>
<td>16</td>
<td>40</td>
<td>5600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 27&quot;</td>
<td>27&quot;</td>
<td>48&quot;</td>
<td>9½</td>
<td>11½</td>
<td>38½</td>
<td>5900 lbs.</td>
</tr>
<tr>
<td>48&quot; on 30&quot;</td>
<td>30&quot;</td>
<td>48&quot;</td>
<td>8</td>
<td>10</td>
<td>40</td>
<td>5300 lbs.</td>
</tr>
<tr>
<td>48&quot; on 33&quot;</td>
<td>33&quot;</td>
<td>54&quot;</td>
<td>9½</td>
<td>11½</td>
<td>44</td>
<td>6600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 36&quot;</td>
<td>36&quot;</td>
<td>54&quot;</td>
<td>8</td>
<td>10</td>
<td>46</td>
<td>6100 lbs.</td>
</tr>
</tbody>
</table>
Construct drop and overflow from ductile iron pipe of same diameter specified for sewer main. Provide mechanical joints for all ductile iron pipe and fittings.

1. Place Class I bedding material, CLSM, flowable mortar, or concrete from top of elbow to bottom of sewer main.

2. Encase elbow in concrete. 12 inches minimum on all sides.
1 Core drill openings at least 12 inches from existing manhole joints.
2 Install flexible pipe coupler or pipe joint on new sanitary sewer 18 to 24 inches from outside of manhole wall.
3 Align elbow so discharge is directed at outlet pipe or at 45 degrees to manhole flow.
4 Reshape fillet to provide a smooth transition and to direct flow to outlet.

- Receiving Bowl
- Flexible Pipe Connection
- Influent Sanitary Sewer
- Flexible Pipe Coupler
- Solvent Welded Connection
- Bottom Elbow
- 48" or 60" diameter
- 8" min. Class I Bedding Material
1. Cast-in-place base shown. If base is precast integral with bottom riser, the footprint of the base is not required to extend beyond the outer edge of the riser.

2. For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.

3. 12 inch minimum riser height above all pipe openings.

<table>
<thead>
<tr>
<th>Manhole Diameter (inches)</th>
<th>Maximum Pipe Diameter (inches) for 2 Pipes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 180° Separation</td>
</tr>
<tr>
<td>48</td>
<td>24</td>
</tr>
<tr>
<td>60</td>
<td>36</td>
</tr>
<tr>
<td>72</td>
<td>42</td>
</tr>
<tr>
<td>84</td>
<td>48</td>
</tr>
<tr>
<td>96</td>
<td>60</td>
</tr>
</tbody>
</table>

- 6010.401
- SHEET 1 of 1
- FIGURE
- MANHOLE
- TYPICAL SECTION
- PLAN
- CIRCULAR STORM SEWER
- STANDARD ROAD PLAN
Adjacent walls may have different widths based upon pipe configuration, but the structure must be rectangular.

1. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

2. Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

3. Provide two #4 hoop bars at top opening and at all pipe openings.

4. 12 inch minimum wall height above all pipes.
2 Wall widths vary with pipe diameter and range from 40" minimum to 77" maximum. Provide 6" of wall width (minimum) each side of pipe opening.

3 Provide two #4 hoop bars at top opening and at all pipe openings.

### REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>t1</td>
<td>See Table</td>
<td>Top</td>
<td>Long Wall plus 8&quot;</td>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td>t2</td>
<td>See Table</td>
<td>Top</td>
<td>Short Wall plus 8&quot;</td>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>See Table</td>
<td>Base</td>
<td>Long Wall plus 14&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>b2</td>
<td>See Table</td>
<td>Base</td>
<td>Short Wall plus 14&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>w1</td>
<td>See Table</td>
<td>Walls</td>
<td>Long Wall plus 8&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>w2</td>
<td>See Table</td>
<td>Walls</td>
<td>Short Wall plus 8&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>w3</td>
<td>See Table</td>
<td>Walls</td>
<td>Wall Height minus 4&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
</tbody>
</table>

#### Diameter of Largest Pipe, D
- 48" or 54": Minimum Bar Size 6
- 33" to 42": Minimum Bar Size 5
- 30" or smaller: Minimum Bar Size 4
Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Provide two #4 hoop bars at top opening and at all pipe openings.

2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

3. Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

4. 12 inch minimum wall height above all pipes.

**TYPICAL SECTION**

- **12'' min.**
- **4w3**
- **12'' min.**
- **Depth**
- **(12'-0'' max.)**
- **10''**
- **4w2**
- **4t1**
- **Concrete Fillet**

**Bedding Material**

8'' min. Class I Bedding Material

**SW-602 Casting**

**Adjustment Rings**

**Top**

**Wall**

**Wall Height**

**8''**

**4''**

**12'' min.**

**27'' dia.**

**10''**

**Two #4 Hoop Bars**

**Concrete Fillet**

**Base**

**8'' min. Class I Bedding Material**

**Short Wall Width**

**8''**

**8''**
Provide two #4 hoop bars at top opening and at all pipe openings.

Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of walls.

Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

---

**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td>1</td>
<td>36&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td>—</td>
<td>Long Wall plus 12&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4t3</td>
<td>4</td>
<td>Top</td>
<td>—</td>
<td>Short Wall plus 12&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>—</td>
<td>36&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>—</td>
<td>Long Wall plus 18&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b3</td>
<td>4</td>
<td>Base</td>
<td>—</td>
<td>Short Wall plus 18&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td>—</td>
<td>Short Wall plus 48&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Walls</td>
<td>—</td>
<td>Wall Height minus 4&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Walls</td>
<td>—</td>
<td>Long Wall plus 12&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

---

**SECTION A-A**

1. Provide two #4 hoop bars at top opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of walls.
3. Wall widths vary with pipe diameter and range from 4 feet minimum to 9 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

---

**BENT BARS**

- Short Wall plus 8"
- Long Wall Width
- Wall Height minus 4"
- Wall Height
- 12" min.
- 12" min.
- 10"
Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

2. Provide two #5 hoop bars at intermediate top opening and at all pipe openings.

3. Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.

4. 12 inch minimum wall height above all pipes.
REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>5t1</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>48&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5t2</td>
<td>5</td>
<td>Top</td>
<td>Long Wall</td>
<td>9&quot;</td>
<td></td>
</tr>
<tr>
<td>5t3</td>
<td>5</td>
<td>Top</td>
<td>Short Wall</td>
<td>9&quot;</td>
<td></td>
</tr>
<tr>
<td>5t4</td>
<td>5</td>
<td>Top</td>
<td></td>
<td>8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5b1</td>
<td>5</td>
<td>Base</td>
<td></td>
<td>43&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>5b2</td>
<td>5</td>
<td>Base</td>
<td>Long Wall</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>5b3</td>
<td>5</td>
<td>Base</td>
<td>Short Wall</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>5w1</td>
<td>5</td>
<td>Wall</td>
<td>Short Wall</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>5w2</td>
<td>5</td>
<td>Wall</td>
<td>Wall Height</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>5w3</td>
<td>5</td>
<td>Wall</td>
<td>Long Wall</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>5w4</td>
<td>5</td>
<td>Wall</td>
<td>Short Wall</td>
<td>12&quot;</td>
<td></td>
</tr>
</tbody>
</table>

- Provide two #5 hoop bars at intermediate top opening and at all pipe openings.
- Wall widths vary with pipe diameter and range from 4 feet minimum to 12 feet maximum. Provide 12 inches of wall width (minimum) each side of pipe opening.
For sewer pipes less than 48 inch diameter, install eccentric reducers/increasers with a standard tee or utilize a composite tee.
COMPOSITE TEE DIMENSIONS

<table>
<thead>
<tr>
<th>Size</th>
<th>D1</th>
<th>H</th>
<th>T₁</th>
<th>T₂</th>
<th>C</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot; on 12&quot;</td>
<td>12&quot;</td>
<td>50&quot;</td>
<td>82&quot;</td>
<td>28&quot;</td>
<td>41\frac{1}{2}&quot;</td>
<td>5600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 15&quot;</td>
<td>18&quot;</td>
<td>50&quot;</td>
<td>51\frac{1}{2}&quot;</td>
<td>28&quot;</td>
<td>44\frac{1}{2}&quot;</td>
<td>5200 lbs.</td>
</tr>
<tr>
<td>48&quot; on 18&quot;</td>
<td>24&quot;</td>
<td>50&quot;</td>
<td>93\frac{1}{2}&quot;</td>
<td>17\frac{1}{2}&quot;</td>
<td>38\frac{1}{2}&quot;</td>
<td>5800 lbs.</td>
</tr>
<tr>
<td>48&quot; on 24&quot;</td>
<td>24&quot;</td>
<td>48&quot;</td>
<td>8&quot;</td>
<td>16&quot;</td>
<td>40&quot;</td>
<td>5600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 27&quot;</td>
<td>27&quot;</td>
<td>48&quot;</td>
<td>93\frac{1}{2}&quot;</td>
<td>11\frac{1}{2}&quot;</td>
<td>38\frac{1}{2}&quot;</td>
<td>5900 lbs.</td>
</tr>
<tr>
<td>48&quot; on 30&quot;</td>
<td>30&quot;</td>
<td>48&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>40&quot;</td>
<td>5300 lbs.</td>
</tr>
<tr>
<td>48&quot; on 33&quot;</td>
<td>33&quot;</td>
<td>54&quot;</td>
<td>93\frac{1}{2}&quot;</td>
<td>11\frac{1}{2}&quot;</td>
<td>44\frac{1}{2}&quot;</td>
<td>6600 lbs.</td>
</tr>
<tr>
<td>48&quot; on 36&quot;</td>
<td>36&quot;</td>
<td>54&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>46&quot;</td>
<td>6100 lbs.</td>
</tr>
</tbody>
</table>

COMPOSITE TEE
Alternate to standard tee with eccentric reducer (for pipes 36" and smaller).
Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

2. Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

3. Provide two #4 hoop bars at top opening and at all pipe openings.

4. 7 inch minimum wall height above all pipes.

Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

Provide two #4 hoop bars at top opening and at all pipe openings.

7 inch minimum wall height above all pipes.
Wall widths vary with pipe diameter and range from 40 inches minimum to 77 inches maximum. Provide 6 inches of wall width (minimum) each side of pipe opening.

Provide two #4 hoop bars at top opening and at all pipe openings.

Place a minimum of one w1 bar above each pipe opening.
1. Install four #4 diagonal bars at all pipe openings.
2. SW-603 Type R unless Type Q is specified in the contract documents.
3. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
4. 12 inch minimum wall height above all pipes.

Refer to SW-514 for boxout details.

SECTION A-A

**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Length</th>
<th>Count</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td>Wall Height minus 4&quot;</td>
<td>14</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Long Walls</td>
<td>3'-8&quot;</td>
<td>Varies</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Short Walls</td>
<td>2'-8&quot;</td>
<td>Varies</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>4'-2&quot;</td>
<td>4</td>
<td>10&quot;</td>
<td></td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>3'-2&quot;</td>
<td>5</td>
<td>10&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**MAXIMUM PIPE DIAMETERS**

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>15&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

Bedding Material

- 8" min. Class I Bedding Material
- Cast-in-place base shown.
- SW-603 Type R unless Type Q is specified in the contract documents.
- Pipe diameters above 12 inches minimum wall height above all pipes.
Refer to SW-514 for boxout details.

1. SW-603 Type R unless Type Q is specified in the contract documents.
2. Cast-in-place base shown. Base may be square. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. For additional configurations, maintain a minimum of 12 inches of concrete between vertical edges of pipe openings.
4. 12 inch minimum riser height above all pipes.

<table>
<thead>
<tr>
<th>Manhole Diameter (inches)</th>
<th>Maximum Pipe Diameter (inches) at 180° Separation</th>
<th>Maximum Pipe Diameter (inches) at 90° Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>60</td>
<td>36</td>
<td>24</td>
</tr>
<tr>
<td>72</td>
<td>42</td>
<td>30</td>
</tr>
<tr>
<td>84</td>
<td>48</td>
<td>36</td>
</tr>
<tr>
<td>96</td>
<td>60</td>
<td>42</td>
</tr>
</tbody>
</table>

TYPICAL SECTION

- Form Grade
- Casting
- Adjustment Rings
- Precast Riser Sections
- Precast Top
- Depth
- Manhole Diameter
- Concrete Fillet
- Lowest Flowline
- Base
- #4 Bars at 12" o.c. Each Way
- Location Station (Back of Curb)
- 8" min. Class I Bedding Material
- 6" min.
- 12" min.
- 24"
- 12" min.
Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.

12 inch minimum wall height above all pipes.
REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>12</td>
<td>3'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>8</td>
<td>4'-2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>7</td>
<td>4'-2&quot;</td>
<td>13&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>5</td>
<td>7'-2&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Short Walls</td>
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<td>Varies</td>
<td>3'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Long Walls</td>
<td></td>
<td>Varies</td>
<td>6'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Walls</td>
<td></td>
<td>18</td>
<td>Wall Height minus 4&quot;</td>
<td>13&quot;</td>
</tr>
</tbody>
</table>

MAXIMUM PIPE DIAMETERS

<table>
<thead>
<tr>
<th>Pipe Location</th>
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<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>30&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. Slope of 1.5% or as specified in the contract documents.
**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
</tr>
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<tbody>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>11</td>
<td>3'-8&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>8</td>
<td>5'-2&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>8</td>
<td>4'-2&quot;</td>
<td>13&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>5</td>
<td>8-2&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>4a1</td>
<td>4</td>
<td>Adj. Ring</td>
<td></td>
<td>6</td>
<td>3'-8&quot;</td>
<td>See Adj. Ring Plan</td>
</tr>
<tr>
<td>4a2</td>
<td>4</td>
<td>Adj. Ring</td>
<td></td>
<td>4</td>
<td>3-2&quot;</td>
<td>See Adj. Ring Plan</td>
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</table>

**MAXIMUM PIPE DIAMETERS**

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>18&quot;</td>
<td>24&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>30&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Diagonal Bar (typ.)
3. Location Station (Back of Curb)
4. ADJUSTMENT RING

---

**ADJUSTMENT RING**

**PLAN**

**SECTION B-B**
Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at all pipe openings.

2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.

3. 12 inch minimum wall height above all pipes.
**TYPICAL SECTION**

### REINFORCING BAR LIST

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<th>Count</th>
<th>Length</th>
<th>Spacing</th>
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<tbody>
<tr>
<td>4t1</td>
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<td>4</td>
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<td>4&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>4</td>
<td>7'-10&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>8</td>
<td>3'-2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td></td>
<td>20</td>
<td>7'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Long Walls</td>
<td></td>
<td>Varies</td>
<td>7'-4&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Short Walls</td>
<td></td>
<td>Varies</td>
<td>2'-8&quot;</td>
<td>12&quot;</td>
</tr>
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### MAXIMUM PIPE DIAMETERS

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>15&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>60&quot;</td>
<td>66&quot;</td>
</tr>
</tbody>
</table>

---

1. Install four #4 diagonal bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.

---

Bedding Material:
- 8" min. Class I

---

**NOTES:**
- Adjustments for beddings and structures are not shown.
- Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
- Install four #4 diagonal bars at all pipe openings.
- 12 inch minimum wall height above all pipes.
Maximum pipe diameters are set based on maximum structure depth of 6 feet-6 inches and the objective of placement of the centerline of the pipe on the centerline of the manhole opening for maintenance purposes.

Refer to SW-514 for boxout details.

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.

2. If Wall 1 is widened to 4 feet, the maximum pipe diameter can be increased to 36 inches.

3. If Wall 1 is widened to 4 feet, the maximum pipe diameter in Wall 3 can be increased to 42 inches.

### MAXIMUM PIPE DIAMETERS

<table>
<thead>
<tr>
<th>Wall</th>
<th>Max. Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30&quot; (2)</td>
</tr>
<tr>
<td>2</td>
<td>24&quot;</td>
</tr>
<tr>
<td>3</td>
<td>36&quot; (3)</td>
</tr>
<tr>
<td>4</td>
<td>42&quot;</td>
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</table>
**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td>4w1</td>
<td>4</td>
<td>7'-4&quot;</td>
<td>See Detail</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td>4w1</td>
<td>4</td>
<td>6'-8&quot;</td>
<td>See Detail</td>
</tr>
<tr>
<td>4t3</td>
<td>4</td>
<td>Top</td>
<td>4w1</td>
<td>4</td>
<td>2'-8&quot;</td>
<td>See Detail</td>
</tr>
<tr>
<td>4t4</td>
<td>4</td>
<td>Top</td>
<td>4w1</td>
<td>8</td>
<td>3'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4t5</td>
<td>4</td>
<td>Top</td>
<td>4w1</td>
<td>6</td>
<td>4'-2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>4w1</td>
<td>4</td>
<td>7'-10&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>4w1</td>
<td>4</td>
<td>3'-2&quot;</td>
<td>12&quot;</td>
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<td>4b3</td>
<td>4</td>
<td>Base</td>
<td>4w1</td>
<td>5</td>
<td>7'-2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b4</td>
<td>4</td>
<td>Base</td>
<td>4w1</td>
<td>4</td>
<td>4'-2&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
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<td>29</td>
<td>Wall Height minus 4&quot;</td>
<td>12&quot;</td>
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<tr>
<td>4w2</td>
<td>4</td>
<td>Wall 2</td>
<td>4w1</td>
<td>Varies</td>
<td>3'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Walls 1 and 3</td>
<td>4w1</td>
<td>Varies</td>
<td>6'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w4</td>
<td>4</td>
<td>Wall 4</td>
<td>4w1</td>
<td>Varies</td>
<td>7'-4&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w5</td>
<td>4</td>
<td>Wall 5</td>
<td>4w1</td>
<td>Varies</td>
<td>2'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w6</td>
<td>4</td>
<td>Wall 6</td>
<td>4w1</td>
<td>Varies</td>
<td>3'-10&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

1. Install four #4 diagonal bars at manhole opening and at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.

**FIGURE 6010.506 STANDARD ROAD PLAN**

<table>
<thead>
<tr>
<th>Rev 02/27/2014</th>
<th>SHEET 2 of 2</th>
</tr>
</thead>
</table>

**DOUBLE GRATE INTAKE WITH MANHOLE**
Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by 1/2 inch.
12 inch minimum wall height above all pipes.

Slope of 1.5% or as specified in the contract documents.

Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

### MAXIMUM PIPE DIAMETERS

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>30&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

### REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
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</thead>
<tbody>
<tr>
<td>4t1</td>
<td>4</td>
<td>Top</td>
<td>6</td>
<td>4</td>
<td>4'-6&quot;</td>
<td>See Insert</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td>4</td>
<td>3-6&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4t3</td>
<td>4</td>
<td>Top</td>
<td>10</td>
<td>10&quot;</td>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>6</td>
<td>3-6&quot;</td>
<td>11&quot;</td>
<td></td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>5</td>
<td>4'-6&quot;</td>
<td>10&quot;</td>
<td></td>
</tr>
<tr>
<td>4t1</td>
<td>4</td>
<td>Insert</td>
<td>4</td>
<td>Boxout Length minus 8&quot;</td>
<td>See Plan</td>
<td></td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td>14</td>
<td>Wall Height minus 4&quot;</td>
<td>14&quot;</td>
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<td>4w2</td>
<td>4</td>
<td>Long Walls</td>
<td>Varies</td>
<td>4'-8&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Short Walls</td>
<td>Varies</td>
<td>3-8&quot;</td>
<td>12&quot;</td>
<td></td>
</tr>
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</table>
Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by \( \frac{1}{2} \) inch.
REINFORCING BAR LIST

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
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<tbody>
<tr>
<td>4i1</td>
<td>4</td>
<td>Top</td>
<td>-----</td>
<td>7</td>
<td>4'6&quot;</td>
<td>See Insert</td>
</tr>
<tr>
<td>4i2</td>
<td>4</td>
<td>Top</td>
<td>-----</td>
<td>4</td>
<td>4'6&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4i3</td>
<td>4</td>
<td>Top</td>
<td>-----</td>
<td>10</td>
<td>1'-10&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>-----</td>
<td>6</td>
<td>4'-6&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>-----</td>
<td>6</td>
<td>4'-6&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>4i1</td>
<td>4</td>
<td>Insert</td>
<td>-----</td>
<td>4</td>
<td>Boxout Length minus 8&quot; See Plan</td>
<td></td>
</tr>
<tr>
<td>4w1</td>
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<td>Walls</td>
<td>-----</td>
<td>16</td>
<td>Wall Height minus 4&quot;</td>
<td>14&quot;</td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Walls</td>
<td>-----</td>
<td>Varies</td>
<td>4'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Walls</td>
<td>-----</td>
<td>Varies</td>
<td>4'-8&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

1. 12 inch minimum wall height above all pipes.
2. Slope of 1.5% or as specified in the contract documents.
3. Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.
4. For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.
1 Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by 1/4 inch.

SECTION A-A
(6 Inch Standard Curb Insert)

SECTION A-A
(4 Inch Sloped Curb Insert)
Rounded shaping at inlet.

Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

### REINFORCING BAR LIST

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<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
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<tr>
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<td>4</td>
<td>Base</td>
<td></td>
<td>5</td>
<td>8'-6&quot;</td>
<td>10&quot;</td>
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<td>4</td>
<td>Boxout Length minus 8&quot;</td>
<td>See Insert</td>
</tr>
<tr>
<td>4i1</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>6</td>
<td>8'-6&quot;</td>
<td>See Plan</td>
</tr>
<tr>
<td>4i2</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>8</td>
<td>3'-6&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4i3</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>18</td>
<td>10&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>4w1</td>
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<td>Walls</td>
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<td>22</td>
<td>Wall Height minus 4&quot;</td>
<td>13&quot;</td>
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<td>Long Walls</td>
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<td>Varies</td>
<td>4'-8&quot;</td>
<td>12&quot;</td>
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<tr>
<td>4w3</td>
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<td>Short Walls</td>
<td></td>
<td>Varies</td>
<td>3'-8&quot;</td>
<td>12&quot;</td>
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<tr>
<td>5w1</td>
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<td>Beam</td>
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<td>2</td>
<td>7'-3&quot;</td>
<td>4&quot;</td>
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</table>
FIGURE 6010.509
SUDAS DIRECTOR
DESIGN METHODS ENGINEER

MAXIMUM PIPE DIAMETERS

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>60&quot;</td>
<td>66&quot;</td>
</tr>
</tbody>
</table>

4 12 inch minimum wall height above all pipes.
5 Slope of 1.5% or as specified in the contract documents.

SECTION C-C

PLAN (SPACER)

ISOMETRIC
(Refer to SECTION B-B for alignment of Top with Spacer)

12 inch minimum wall height above all pipes.
Slope of 1.5% or as specified in the contract documents.
Insert shaping may be modified for insert widths less than 36 inches. For an 18 inch insert, reduce dimensions indicated by \( \frac{1}{2} \) inch.
Transverse joint spacing on new concrete pavement is controlled by the intake boxout. Adjust adjacent joint spacing as required to accommodate boxouts.

For retrofit intakes, match existing pavement joints. Stop any transverse pavement joints that do not conform to the minimum spacing requirements at the edge of the insert area.

Rounded shaping at inlet.

### Reinforcing Bar List

<table>
<thead>
<tr>
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<th>Size</th>
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<th>Shape</th>
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<th>Length</th>
<th>Spacing</th>
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<tr>
<td>4b1</td>
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<td>Base</td>
<td>Base</td>
<td>9</td>
<td>4'-6''</td>
<td>12''</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>Base</td>
<td>6</td>
<td>6'-6''</td>
<td>11''</td>
</tr>
<tr>
<td>4b1</td>
<td>4</td>
<td>Insert</td>
<td>Insert</td>
<td>4</td>
<td>Boxout Length minus 8''</td>
<td>See Insert</td>
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<td>4t1</td>
<td>4</td>
<td>Top</td>
<td>Top</td>
<td>7</td>
<td>8'-6''</td>
<td>See Plan</td>
</tr>
<tr>
<td>4t2</td>
<td>4</td>
<td>Top</td>
<td>Top</td>
<td>8</td>
<td>4'-4''</td>
<td>12''</td>
</tr>
<tr>
<td>4t3</td>
<td>4</td>
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<td>Top</td>
<td>18</td>
<td>1'-10''</td>
<td>6''</td>
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<tr>
<td>4w2</td>
<td>4</td>
<td>Long Walls</td>
<td>Varies</td>
<td>24</td>
<td>8'-8''</td>
<td>12''</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Short Walls</td>
<td>Varies</td>
<td>24</td>
<td>4'-8''</td>
<td>12''</td>
</tr>
<tr>
<td>5w1</td>
<td>5</td>
<td>Beam</td>
<td>Beam</td>
<td>2</td>
<td>8'-3''</td>
<td>4''</td>
</tr>
</tbody>
</table>

**Bent Bars**

4'-3"

24"

5w1
FIGURE 6010.510
SUDAS DIRECTOR
STANDARD ROAD PLAN
SW-510
REVISION 04-21-20
SHEET 3 of 3

1. Do not extend keyed joint into front wall of box.
2. 12 inch minimum wall height above all pipes.
3. Slope of 1.5% or as specified in the contract documents.

MAXIMUM PIPE Diameters

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>30&quot;</td>
<td>36&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>60&quot;</td>
<td>66&quot;</td>
</tr>
</tbody>
</table>

SECTION B-B

4. 8" min. Bedding Material
5. 5'-0" Bedding Material

SECTION C-C

6. 8" min. Concrete Fillet

Flowline

INTAKE, LARGE BOX

DOUBLE OPEN-THROAT CURB
INTAKE, LARGE BOX
1. Install four #4 diagonal bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.

<table>
<thead>
<tr>
<th>Location</th>
<th>Structure</th>
<th>Piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>15&quot;</td>
<td>18&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>24&quot;</td>
<td>30&quot;</td>
</tr>
</tbody>
</table>

MAXIMUM PIPE DIAMETERS

REVISIONS:
- Added Class I Bedding Material.
1. Precast (shown) or cast-in-place base:
   - Precast: 6 inch thick concrete with #6 welded wire mesh on 4 inch centers (WWF 4" x 4"). Center mesh vertically within base.
   - Cast-in-place: 8 inch thick non-reinforced concrete.

2. 12 inch minimum riser height above all pipes.

<table>
<thead>
<tr>
<th>Intake Size - Case 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outlet Pipe Diameter, D1</td>
</tr>
<tr>
<td>12&quot;</td>
</tr>
<tr>
<td>15&quot;</td>
</tr>
<tr>
<td>18&quot;</td>
</tr>
<tr>
<td>21&quot;</td>
</tr>
<tr>
<td>24&quot;</td>
</tr>
<tr>
<td>27&quot;</td>
</tr>
</tbody>
</table>

CASE 1

TYPICAL SECTION
Minimum riser diameter is 18 inches.
Structure may be built with openings on any or all sides. Provide openings and orientation as specified in the contract documents.

Adjacent walls may have different widths based upon pipe configuration, but structure must be rectangular.

1. Construct inlet openings with 15-inch #4 epoxy-coated bars at 8 inches on center. Embed bars a minimum of 3 inches into walls and top at all openings.
2. Grade to inlet elevation on open sides. Grade to top elevation on closed sides.
3. Corner pier required between openings of two adjacent walls. Extend wall reinforcing vertically through pier. Install one additional 15-inch #4 bar in pier.
4. Center pier required at center of any inlet opening with length of 5 feet or greater. Extend wall reinforcing vertically through pier. Install one additional 15-inch #4 bar in pier.
5. Wall widths vary with pipe diameter. Provide 6 inches of wall width (minimum) each side of pipe opening. Minimum wall width is 36 inches. Maximum wall width is 72 inches.
6. Cast-in-place base shown. If base is precast integral with walls, the footprint of base is not required to extend beyond the outer edge of the walls.
7. Install four #4 diagonal bars at all pipe openings.
8. 12" minimum wall height above all pipes.

---

**Location Station**

**Diagram Notes:**
- **Wall Width:** 6"
- **Grade to Inlet:** 6"
- **Grade to Top:** 6"
- **Location Station:** 4"
- **SW-602 Type G Casting:** 8'' min.
- **Diagonal Bar (typ.):** Center Pier (When Applicable)
- **Top Reinforcing #4 bars at 6" o.c. Each Way:** Wall Width
- **Concrete Fillet:** 6" min.
- **Bedding Material:** 8" min. Class I
- **8" min. Class I Bedding Material:** 6" min.
- **Inlet Opening:** 12" min.
1. Provide two #4 hoop bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.

**Location Station (Center of Structure)**

**Short Wall**
- 2'-4" (Max.)
- 3'-4"

**Long Wall**
- 4'-6"
- 5'-6"

**Base**
- 8" min. Class I Bedding Material

**Type 7 Grate**
- 4w1
- 4w3

**Concrete Fillet**
- 4b1
- 4b2

**Optional Construction Joint (typ.)**
- 12" min.

**Depth (8'-0" Max.)**

**Height**
- 4" (Max.)

**Wall Height**
- 8" min.
**MAXIMUM PIPE DIAMETERS**

<table>
<thead>
<tr>
<th>Pipe Location</th>
<th>Precast Structure</th>
<th>Cast-in-place Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Wall</td>
<td>18&quot;</td>
<td>21&quot;</td>
</tr>
<tr>
<td>Long Wall</td>
<td>36&quot;</td>
<td>42&quot;</td>
</tr>
</tbody>
</table>

**REINFORCING BAR LIST**

<table>
<thead>
<tr>
<th>Mark</th>
<th>Size</th>
<th>Location</th>
<th>Shape</th>
<th>Count</th>
<th>Length</th>
<th>Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>6</td>
<td>3'-6&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td></td>
<td>4</td>
<td>5'-8&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td></td>
<td>20</td>
<td>Wall Height minus 4&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Short Wall</td>
<td></td>
<td>Varies</td>
<td>3'-0&quot;</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w3</td>
<td>4</td>
<td>Long Wall</td>
<td></td>
<td>Varies</td>
<td>5'-2&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

1. Provide two #4 hoop bars at all pipe openings.
2. Cast-in-place base shown. If base is precast integral with walls, the footprint of the base is not required to extend beyond the outer edge of the walls.
3. 12 inch minimum wall height above all pipes.
4. If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.
PLAN

SECTION A-A

1. 6 inches or same as thickness of adjacent pavement, whichever is greater.
2. Linear Trench Drain.
3. For joint details, see PV-101.
4. Slope same as adjacent pavement.
5. Width as determined by manufacturer. Minimum 6 inches.

Minimum 6 inches.
Width as determined by manufacturer. Minimum 6 inches.

Linear Trench Drain.
1. 6 inches or same as thickness of adjacent pavement, whichever is greater.
2. Linear Trench Drain.
3. For joint details, see PV-101.
4. Slope same as adjacent pavement.
5. Width as determined by manufacturer. Minimum 6 inches.
6. Standard or sloped curb. For curb details, see PV-102.
7. Minimum thickness same as thickness of adjacent pavement or curb width, whichever is greater.
1. 39 inches when attaching the SW-542 extension unit.
2. 37 inches when attaching the SW-542 extension unit.
3. Additional keyed construction joint when attaching the SW-542 extension unit.
For joint details, refer to PV-101.

3. Additional keyed construction joint when attaching the SW-542 extension unit.

4. Top of well flush with pavement.
Extension unit may be used on either or both sides of SW-541 intakes. Details are similar when extension unit is on the opposite side.

1. g3 for 6 inch standard curb; g5 for 4 inch sloped curb.
2. c1 for 6 inch standard curb; c2 for 4 inch sloped curb. See SW-541 for reinforcing.
3. The location station is where the centerline of intake meets the back of the curb line.

Placing sequence: 1. Base; 2. Walls and Extension; 3. Top; 4. Insert

** REINFORCING BAR LIST **

<table>
<thead>
<tr>
<th>BAR</th>
<th>SIZE</th>
<th>LOCATION</th>
<th>SHAPE</th>
<th>NO.</th>
<th>LENGTH</th>
<th>WEIGHT</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>b2</td>
<td>4</td>
<td>Intake Wall</td>
<td></td>
<td>3</td>
<td>2'-6&quot;</td>
<td>6.0</td>
<td>9&quot;</td>
</tr>
<tr>
<td>t1</td>
<td>4</td>
<td>Bottom</td>
<td></td>
<td>3</td>
<td>4'-9&quot;</td>
<td>9.5</td>
<td>9&quot;</td>
</tr>
<tr>
<td>t2</td>
<td>4</td>
<td>Bottom</td>
<td></td>
<td>4</td>
<td>1'-7&quot;</td>
<td>4.3</td>
<td>18&quot;</td>
</tr>
<tr>
<td>g2</td>
<td>4</td>
<td>Wall</td>
<td></td>
<td>3</td>
<td>4'-9&quot;</td>
<td>3.1</td>
<td>-</td>
</tr>
<tr>
<td>g3</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>4</td>
<td>5'-4&quot;</td>
<td>12.7</td>
<td>18&quot;</td>
</tr>
<tr>
<td>g5</td>
<td>4</td>
<td>Top</td>
<td></td>
<td>4</td>
<td>5'-4&quot;</td>
<td>12.7</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>

Varies**

Round all edges to a 2" radius

Match Existing Pavement Joints

15'-10" (min.) to 20'-0" (max.)

c1 for 6 inch standard curb; c2 for 4 inch sloped curb. See SW-541 for reinforcing.

SW-542 Type G Casting

LOCATION STATION

Plan
(SW-542 EXTENSION AND SW-541 INTAKE)
SECTION A-A

Back of Curb

30"

21"

SECTION B-B

Back of Curb

18"

10"

10"

SECTION C-C

Face of 6" Standard Curb

Elevation

Form Grade

2" Clear

2" Clear

5'4"

5'4"

8"
**SECTION A-A**

- Back of Curb
- 11" 16" 10" 28" 21"

**SECTION B-B**

- Face of 4" Sloped Curb
- 11" 16" 33" 19" 10" c3 c2 g4 10" c3 10" g4
- Form Grade Elevation
- 2" Clear
- 5'-4" 3'-1"

**SECTION C-C**

- Pavement Slab
- g2 g1 f2 f1 g2 g1 b1 b2
- 2" Clear
- 21" 5'-4"

---

2:1 Slope (Horizontal:Vertical)

See SW-541 for reinforcing.

---

4 INCH SLOPED CURB

EXTENSION UNIT FOR OPEN-THROAT CURB

INTAKE UNDER PAVEMENT
1. g3 for 6 inch standard curb; g5 for 4 inch sloped curb.
2. c1 for 6 inch standard curb; c2 for 4 inch sloped curb. See SW-541 for reinforcing.
3. See SW-541 for reinforcing.

SECTION D-D

SECTION E-E
**TABLE OF DIMENSIONS**

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Minimum</th>
<th>6'10&quot;</th>
<th>9'-10&quot;</th>
<th>Typical Ext Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Length of Curb Opening</td>
<td>12'-0&quot;</td>
<td>14'-0&quot;</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
</tr>
<tr>
<td>C2</td>
<td>Extension Length</td>
<td>7'-10&quot;</td>
<td>9'-10&quot;</td>
<td>11'-10&quot;</td>
<td>13'-10&quot;</td>
</tr>
<tr>
<td>C3</td>
<td>Minimum Boxout Length</td>
<td>16'-0&quot;</td>
<td>18'-0&quot;</td>
<td>20'-0&quot;</td>
<td>22'-0&quot;</td>
</tr>
</tbody>
</table>

**SECTION A-A** (Typical Extension Unit)

- Keyed Joint
- Concrete Fillet
- 8" min. Bedding Material
- 8" min. Class I
- Gutter Grade
- Extension Length

**SECTION B-B** (Typical Intake Well)

- Keyed Construction Joint
- Concrete Fillet
- 8" min. Bedding Material
- 8" min.

**MAXIMUM PIPE DIAMETERS**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Precast</th>
<th>Cast-in-place</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>36&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

**REVISIONS:**
- Changed well walls to 6 inch reinforced. Modified 4b1 and 4b2 bar spacing.
- Modified bars 4e1 and 4e6. Modified SECTION C-C on Sheets 3 and 4.
- 12 inch minimum wall height above all pipes.

---

1. Match gutter slope. Drain to well.
2. Other lengths of opening may be constructed by varying the length of the extension and the rebar.
3. Includes 2 inches for 'ED' Joints.
4. Extension unit may be used on either or both sides of intake. Details are similar when extension unit is on the opposite side. For joint details, refer to PV-101.
Slope of 1.5% or as specified in the contract documents.

Other lengths of opening may be constructed by varying the length of the extension and the rebar.

Includes 2 inches for 'ED' Joints.

4e1 or 4e6. See Sheets 3 and 4.

Boxout Length - 23'-0" max.

Reinforcing Bar List

<table>
<thead>
<tr>
<th>MARK</th>
<th>BZ2</th>
<th>LOCATION</th>
<th>NO.</th>
<th>LENGTH</th>
<th>SPACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>4b1</td>
<td>4</td>
<td>Base</td>
<td>6</td>
<td>4'-6&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>4b2</td>
<td>4</td>
<td>Base</td>
<td>6</td>
<td>4'-6&quot;</td>
<td>11&quot;</td>
</tr>
<tr>
<td>4e1</td>
<td>4</td>
<td>Top</td>
<td>4</td>
<td>4'-3&quot;</td>
<td>See Detail</td>
</tr>
<tr>
<td>4e2</td>
<td>4</td>
<td>Post</td>
<td>4</td>
<td>1'</td>
<td>12&quot;</td>
</tr>
<tr>
<td>4w1</td>
<td>4</td>
<td>Walls</td>
<td>16</td>
<td>12'</td>
<td></td>
</tr>
<tr>
<td>4w2</td>
<td>4</td>
<td>Walls</td>
<td>16</td>
<td>4'-8&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Includes 2 inches for 'ED' Joints.

Flow Pathway

Boxout Length - 23'-0" max.
**SANITARY SEWER MANHOLES**

- **TYPE A**: Two-piece fixed casting
- **TYPE C**: Two-piece fixed casting with bolt-down cover
  - Bolt-Down Cover (Type C)
  - Anchor Bolt Hole

- **TYPE B**: HMA
- **TYPE D**: HMA
  - Three-piece floating casting for use in HMA paving
  - Three-piece floating casting with bolt-down cover for use in HMA paving
  - Bolt-Down Cover (Type D)

**Frame Notes:**
Size, spacing, and number of lugs and flanges may vary.

**Cover Notes:**
Roughness pattern and text style may vary.
Minimum one concealed pickhole.

- **Anchor the lower frame of all three-piece castings to the manhole structure.**
- **If specified, furnish bolt down frame and cover with four 1/2 inch minimum diameter stainless steel, hex nut, recessed cap screws. Secure cover with screws, washers, and rubber gasket seals.**
- **Casting height varies. Minimum adjustment range of 4 inches.**
**TYPE B: PCC**
Three-piece floating casting for use in PCC paving and PCC boxouts

**TYPE D: PCC**
Three-piece floating casting with bolt-down cover for use in PCC paving and PCC boxouts

---

**Frame Notes:**
Size, spacing, and number of lugs and flanges may vary.

**Cover Notes:**
Roughness pattern and text style may vary. Minimum one concealed pickhole.

1. Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

2. If specified, furnish bolt down frame and cover with four 1/2 inch minimum diameter stainless steel, hex nut, recessed cap screws. Secure cover with screws, washers, and rubber gasket seals.


4. Set casting at proper grade using the adjustment slots or adjustment mechanism. Remove bolts or mechanism upon completion of paving.

5. Height adjustment method may vary; two options are shown.
TYPE E
Two-piece fixed casting

TYPE F: HMA
Three-piece floating casting for use in HMA paving

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary. Minimum one pickhole.

1. Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casting frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

2. Casting height varies. Minimum adjustment range of 4 inches.

Anchor Bolt Hole
Flange (typ.)

STORM
SEWER

Anchor Bolt ①

PLAN

STORM
SEWER

Gasket to seal out debris

TYPICAL SECTION

33" min.
26" min.
24" min. clear opening
35½" min.
24" min.
7" min.

TYPICAL SECTION

33" min.
26" min.
35" min.
TYPE F: PCC
Three-piece floating casting for use in PCC paving and PCC boxouts

Frame Notes:
Size, spacing, and number of lugs and flanges may vary.

Cover Notes:
Roughness pattern and text style may vary. Minimum one pickhole.

1. Anchor the lower frame of all three-piece castings to the manhole structure. When specified in the contract documents, anchor the frame of two-piece castings to the manhole structure. If casing frame does not include anchor holes or slots, drill four 7/8 inch diameter holes, equally spaced around the frame.

2. Casting height varies. Minimum adjustment range of 4 inches.

3. Set casing at proper grade using the adjustment slots or adjustment mechanism. Remove bolts or mechanism upon completion of paving.

4. Height adjustment method may vary; two options are shown.

- Anchor Bolt
- Lug
- Steel Sleeve
- Gasket to seal out debris
- Height Adjustment Bolts and Slots
- Height Adjustment Mechanism

Typical Section

Adjustment Range: 4 inches

STORM SEWER MANHOLES

REVISIONS: Add option for 3-piece HMA casting

SUDAS
KOWADOT

CASTINGS FOR STORM SEWER MANHOLES
TYPE G
Two piece fixed casting

PLAN

TYPICAL SECTION

Cover Notes:
Roughness pattern and text style may vary.
Minimum one pickhole.

Two piece fixed casting

STORM

SEWER

1"
31" min.
25 3/8" min.
1 1/2"
4"

1 1/2"
24" min.
25 3/8" min.
26 3/8" min.

CASTINGS FOR
STORM SEWER MANHOLES
TYPE 3
(Light Duty)

TYPE 4

TYPE 5
(Light Duty)
For Placement on 24" to 30" RCP

Hole Optional

Flow

Flow

For Placement on 18" RCP

For Placement on 24" RCP

For Placement on 36" RCP

1 1/2" min.
2" max.

1 1/2" min.
2" max.

1 1/2" min.
2" max.

1 1/2" min.
2" max.

2 1/8" +

1 1/2" min.
2" max.

1 1/2" min.
2" max.

1 1/2" min.
2" max.

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2" max.

1 1/2" min.
2" max.
FIGURE 6010.604

CASTINGS FOR AREA INTAKES

TYPE 6

Minimum Weight = 85 lbs.

Type 7

Minimum Weight = 75 lbs.

Frame provided in three segments (two ends and one center). Bolt segments together as specified by the casting manufacturer.

Provide bicycle safe, vane style grates with a minimum open area of 4 square feet. At low points, grates with vanes facing both directions will be allowed.

If required by casting manufacturer, provide support beam under all frame joints. Modify structure walls as required to provide pocket for beam.

Cast grate without locking lugs so it may be used in an inverted position.

SECTION A-A

SECTION B-B

SECTION A-A

SECTION B-B

REVISIONS:

Added Type 7 casting. Modified circle notes.
# Traffic Control

<table>
<thead>
<tr>
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<th>TITLE</th>
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<tbody>
<tr>
<td>TC-1</td>
<td>10-15-19</td>
<td>Work Not Affecting Traffic (Two-Lane or Multi-Lane)</td>
</tr>
<tr>
<td>TC-61</td>
<td>04-21-20</td>
<td>Two-Lane, Two-way Operation</td>
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<td>TC-62</td>
<td>04-21-20</td>
<td>Permanent Two-Lane to Four-Lane Divided Transition</td>
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<td>TC-63</td>
<td>10-16-18</td>
<td>Lane Closure at Two-Lane to Four-Lane Transition.</td>
</tr>
<tr>
<td>TC-64</td>
<td>10-16-18</td>
<td>Lane Closure at Two-Lane to Four-Lane Transition with Flagger</td>
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<td>TC-81</td>
<td>10-15-19</td>
<td>Restricted Width Signing (Less Than 14.5 Feet)</td>
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<tr>
<td>TC-202</td>
<td>04-21-15</td>
<td>Work Within 15 ft of Traveled Way</td>
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<td>TC-203</td>
<td>10-15-19</td>
<td>Aerial Seeding Operations</td>
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<td>Lane Closure on Low Volume Roadway</td>
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<td>Spot Location Lane Closure with Flaggers</td>
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<td>Lane Closure with Signals (Up to Three Days)</td>
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<td>Lane Closure with Signals</td>
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<td>TC-217</td>
<td>10-18-16</td>
<td>Lane Closure with Signals and TBR</td>
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<td>04-21-20</td>
<td>Lane Closure with Pilot Car and Flagger Operated Signals</td>
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<td>Lane Closure Involving TWLTL</td>
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<td>TC-232</td>
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<td>Strip Sealing Operations</td>
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<td>Routes Closed to Traffic</td>
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<td>TITLE</td>
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<td>Paved On-Site Detour</td>
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<td>Signalized Equipment Crossing</td>
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<td>10-18-16</td>
<td>Unsignalized Equipment Crossing</td>
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<td>Construction Site Entrance</td>
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<td>TC-283</td>
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<td>Surveying Operations</td>
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<td>TC-284</td>
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<td>No Centerline Markings on Non-Primary Roadways</td>
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<td>Multi-Lane Roadways</td>
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<td>Work Within 15 ft of Traveled Way</td>
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<td>Lane Closure on Divided Highway</td>
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<td>Lane Closure on Undivided Highway</td>
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<td>Lane Closure at Ramps</td>
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<td>Lane Closure with TBR</td>
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<tr>
<td>TC-422</td>
<td>04-21-20</td>
<td>Closure of Two Adjacent Lanes on Divided Highway</td>
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<td>TC-423</td>
<td>04-21-20</td>
<td>Closure of Two Adjacent Lanes on Undivided Highway</td>
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<td>Closure of Continuous Two-Way Left Turn Lane and Adjacent Lane</td>
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<tr>
<td>TC-431</td>
<td>10-17-17</td>
<td>Slow Moving Vehicle Operating in the Traffic Lane</td>
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<td>TC-432</td>
<td>10-17-17</td>
<td>Shoulder Rumble Strip Operations</td>
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<td>TC-433</td>
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<td>Pavement Marking Operations</td>
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<td>Temporary Road Closure on Divided Highway</td>
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<td>TC-454</td>
<td>10-17-17</td>
<td>Temporary Detour Using Ramps on Divided Highway</td>
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<td>TC-601</td>
<td>10-15-19</td>
<td>Pedestrian Detour</td>
</tr>
<tr>
<td>TC-602</td>
<td>10-15-19</td>
<td>Sidewalk Diversion</td>
</tr>
</tbody>
</table>
OVERVIEW OF CROSSOVER

Place Two-Way Traffic symbol and DO NOT PASS signs alternately on both sides of the roadway at a maximum of one half mile intervals for both directions of travel. Always have signs in sight of motorists.

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Possible Contract Items:
- Painted Symbols and Legends
- Pavement Marking Items
- Pavement Marking Removed
- Safety Closures
- Temporary Barrier Rail
- Temporary Crash Cushions
- Temporary Floodlighting
- Temporary Lane Separator System
- Traffic Control

Possible Tabulations:
See sheet 4 for supplemental drawings.

1. Refer to SI-881 for sign details.
2. Refer to PM-111 for arrow details.
3. Source Speed Limit signs at one-mile intervals.
4. Install an additional supplemental plaque with the message NEXT X MILES on the Two-Way Traffic symbol sign assembly on the right side of the roadway to inform motorists of the remaining length of two-lane traffic. Round X to the nearest whole-mile increment.
5. Temporary Crash Cushion. Refer to BA-800 for approved sand barrel layouts.
6. Use a 4 foot wide Type III Barricade.
7. For roadways with a posted speed limit of 60 mph or greater before road work:
   - Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.
   - Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.
   - Place Speed Feedback Sign at the end of the merge taper.
SUPPLEMENTAL CROSSTIE DRAWINGS

**Removal limits**

**Pavement Marking**

**Channelizing Line**

**BA-500 for approved sand barrel layouts.**

**Temporary Crash Cushion. Refer to BA-401 and 108-33 for TBR information.**

**Details shown herein are intended to provide additional information to the requirements shown on sheets 2 and 3.**

**Temporary Lane Separator System (Refer to TC-252)**

**LEGEND**

- White W.R.R. Tape
- Yellow W.R.R. Tape
- Edge Line
- Double Center Line
- Drum 42” Channelizer
- Crash Cushion
- Work Area
- Detour Pavement
- Safety Closure
- Tapered end section
- Minimum of one TBR section lying beyond C of crossover
- See Detail ‘A’
- 12’ lane width
- 5’
- 24’
RAMP LOCATIONS

CROSSOVER AT ENTRANCE RAMP

W6-3
48" x 48"

48" x 48" x 48"

CO 150' 300' 600'

Channelizing Line
(White W.R.R. Tape)

20' C/C

500'

Temporary Lane Separator System

CROSSOVER AT EXIT RAMP

W6-1
48" x 48"

48" x 48" x 48"

CO 150' 300' 600'

Channelizing Line
(White W.R.R. Tape)

20' C/C

500'

Temporary Lane Separator System

LEGEND

Temporary Lane Separator System

Direction of Traffic

Safety Closure

(Refer to TC-252)

PLACEMENT OF
DOUBLE YELLOW CENTERLINE

Tubular Marker

Double Center Line

Placed at bends

PLACEMENT OF
DOUBLE YELLOW CENTERLINE

Tubular Marker

Double Center Line

Placed at bends

1 Refer to SI-881 for sign details.
2 Add below R11-2 already included in Safety Closure.
3 Place TI-S5 from start of ramp gore to end of temporary ramp crossover.
4 Place TI-S5 from start of full width decel lane to end of ramp gore.

REVISIONS: Renumbered circle notes 8 to 11 and added circle note 12.

APPROVED BY DESIGN METHODS ENGINEER

STANDARD ROAD PLAN

TWO-LANE, TWO WAY OPERATION
Place yellow warning signs with black legend and symbols.

Place Type III barricades complying with Section 3F.01 of the MUTCD.
Use only during daylight hours. Typical applications include:
- Pavement repair
- Bridge repair when signals are not required.
- Guardrail connections at bridge.
- Secondary road intersections with Primary road.
- Sewing for full depth patch
- Joint sealing
- PR joints
- Surface patching
- Crack sealing

No parking on opposite shoulder within 500 feet of work area.

Ensure traffic in the open lane flows freely. Stop the first vehicle in the
closed lane from the position shown, then cross the traffic lane to stop
other vehicles.

### SPEED LIMIT

<table>
<thead>
<tr>
<th>Value</th>
<th>A</th>
<th>F and G</th>
<th>F + G</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 or less</td>
<td>250'</td>
<td>250'-3250'</td>
<td>3500'</td>
</tr>
<tr>
<td>40 - 45</td>
<td>350'</td>
<td>350'-3500'</td>
<td>3700'</td>
</tr>
<tr>
<td>50 or greater</td>
<td>500'</td>
<td>500'-3500'</td>
<td>4000'</td>
</tr>
</tbody>
</table>

1. A vehicle with an amber revolving light or amber strobe light may be
   substituted for the Type III barricade.

2. Provide a second flagger if:
   - The flagger's view of approaching traffic in the open lane is less
     than 3/4 mile or the work site is in an area of restricted sight
     distance, such as a No Passing zone, or
   - Excessive traffic delays are encountered.

3. F and G distances are to remain as near minimum values as work
   permits. However, to be able to move the work area without moving
   the advance signing, F and G distances may be varied within the limits of
   the table. Maximum movement can be achieved by setting one F or G
   value at the minimum and the other value at its maximum.

Possible Contract Items:
- Flaggers
- Traffic Control

---

**TC-212**

**STANDARD ROAD PLAN**

**SPOT LOCATION LANE CLOSURE WITH FLAGGERS**

**LEGEND**
- Traffic Sign
- Flagger
- Work Area
- Type III Barricade
- Direction of Traffic

**REVISIONS:**
- Added note DO NOT USE ON PRIMARY ROADWAYS and new general notes.

**APPROVED BY DESIGN METHODS ENGINEER**
**LEGEND**
- Traffic Sign
- Flagger
- 42" Channelizer
- Work Area
- Direction of Traffic
- Portable Rumble Strip Panel

### SPEED LIMIT (mph) | ADT | A | C | E | F | H max. | T
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>35 or less</td>
<td>up to 2,500</td>
<td>250'</td>
<td>40'</td>
<td>0'-200'</td>
<td>500'</td>
<td>2.5 mi.</td>
<td>50'</td>
</tr>
<tr>
<td></td>
<td>2,500 - 5,000</td>
<td>250'</td>
<td>40'</td>
<td>0'-200'</td>
<td>500'</td>
<td>2.0 mi.</td>
<td>50'</td>
</tr>
<tr>
<td></td>
<td>more than 5,000</td>
<td>500'</td>
<td>40'</td>
<td>0'-200'</td>
<td>1000'</td>
<td>1.5 mi.</td>
<td>50'</td>
</tr>
<tr>
<td>40 - 45</td>
<td>up to 2,500</td>
<td>360'</td>
<td>80'</td>
<td>0'-200'</td>
<td>700'</td>
<td>2.5 mi.</td>
<td>100'</td>
</tr>
<tr>
<td></td>
<td>2,500 - 5,000</td>
<td>360'</td>
<td>80'</td>
<td>0'-200'</td>
<td>700'</td>
<td>2.0 mi.</td>
<td>100'</td>
</tr>
<tr>
<td></td>
<td>more than 5,000</td>
<td>700'</td>
<td>80'</td>
<td>0'-200'</td>
<td>1000'</td>
<td>1.5 mi.</td>
<td>100'</td>
</tr>
<tr>
<td>50 or greater</td>
<td>up to 2,500</td>
<td>500'</td>
<td>100'</td>
<td>200-300'</td>
<td>1000'</td>
<td>2.5 mi.</td>
<td>100'</td>
</tr>
<tr>
<td></td>
<td>2,500 - 5,000</td>
<td>500'</td>
<td>100'</td>
<td>200-300'</td>
<td>1000'</td>
<td>2.0 mi.</td>
<td>100'</td>
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<tr>
<td></td>
<td>more than 5,000</td>
<td>1000'</td>
<td>160'</td>
<td>200-300'</td>
<td>2000'</td>
<td>1.5 mi.</td>
<td>100'</td>
</tr>
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</table>

1. Sign optional for ADT less than 5,000.
2. In rural areas, as work activity nears the downstream limits of dimension H, the lane closure may be extended up to 1.0 mile beyond the maximum distance, H, shown in the table. After the traffic control devices have been placed to extend the closure and after work activity has progressed, the advanced signing and devices at the beginning of the traffic control zone should be moved downstream so that the H distance is once again within the limits shown in the table. This one-mile extension will not be allowed during any peak traffic hours listed in the contract documents.
3. Refer to SI-881 for sign details.
4. For traffic control zones lasting more than 2 hours, place temporary Portable Rumble Strip Panel.

Possible Contract Items:
- Flagger
- Pilot Car
- Traffic Control

**Traffic Sign Flagger Work Area Direction of Traffic Portable Rumble Strip Panel**
No detection area required.

Timing for Push-button Actuated Signals
- Initial Green = 15 sec.
- Green Ext. = 2.5 sec.
- Yellow = 4.0 sec.

Install push-button actuated traffic signals.
Program signals to rest in RED.
GREEN and GREEN EXTENSION only are initiated by flagger.

For Temporary Traffic Signals, meet the requirements of Section 2528.03 of the Standard Specifications except for the following:
In lieu of a trailer or span-wire mounted system, signal heads may be located on the shoulders, one on each side of the roadway. Mount shoulder signal heads a minimum of 8 feet from the bottom of the signal head to the top of the ground surface.
In lieu of a trailer or span-wire mounted system, signal heads may be located on the shoulders, one on each side of the roadway. Mount shoulder signal heads a minimum of 8 feet from the bottom of the signal head to the top of the ground surface.

Possible Contract Items:
- Flagger
- Pilot Car
- Temporary Traffic Signal
- Traffic Control

Possible Tabulations:
108-27
108-28

**LEGEND**
- Flagger
- Temporary Traffic Signal
- Traffic Sign
- 42" Channelizer
- Work Area
- Direction of Traffic
- Portable Rumble Strip Panel

**SPEED LIMIT**

<table>
<thead>
<tr>
<th>SPEED LIMIT (mph)</th>
<th>ADT</th>
<th>A</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 2,500</td>
<td>500</td>
<td>2.5</td>
<td>mi</td>
</tr>
<tr>
<td>2,500 - 5,000</td>
<td>500</td>
<td>2.0</td>
<td>mi</td>
</tr>
<tr>
<td>more than 5,000</td>
<td>1000</td>
<td>1.5</td>
<td>mi</td>
</tr>
</tbody>
</table>
SIGN PLACEMENT ON
TYPE III BARRICADES

Typical Sign Placement

ROAD CLOSED

Sign Placement with
Supplemental Sign

Possible Contract Items:
Traffic Control
Safety Closures
Portable Dynamic Message Sign

Possible Tabulation:
108-13A
In situation 1, if the intersection is the point of detour these signs and barricade will become the responsibility of the contracting authority and may be modified by the contracting authority to fit detour signing.

When possible, a 100’ buffer is desirable.

When L is less than 300 feet, omit the ROAD CLOSED AHEAD sign.

Place for 7 calendar days prior to closure. The Engineer will determine the message to display. Remove when road is closed. Use of Portable Dynamic Message Sign is optional on non-primary roadways.
Contractor and resident access.

Public cross-traffic maintained.

No access to project.

(Applicable to T-intersections)

No access to project.

Public cross-traffic maintained.

A

Access only. (Applicable to T-intersections)

No public access. Contractor and resident access only. (Applicable to T-intersections)

During suspension of work, (such as over winter):

- Use Situation 2 on two-lane to four-lane projects.
- Situation 5 is preferred where cross-traffic is maintained.

When the distance between the last public road intersection and the ROAD CLOSED or ROAD CLOSED TO THRU TRAFFIC barricade is less than 1,000 feet, omit the ROAD CLOSED 500 FT sign.

**LEGEND**

- Traffic Sign
- Type III Barricade
- Work Area
- Road Closure

<table>
<thead>
<tr>
<th>Location</th>
<th>A</th>
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<td>200</td>
</tr>
<tr>
<td>Rural</td>
<td>500</td>
</tr>
</tbody>
</table>

**SITUATION 2**
Public cross-traffic maintained.
No access to project.

**SITUATION 3**
No access to project.
(Applicable to T-intersections)

**SITUATION 4**
Public cross-traffic maintained.
No access to project.

**SITUATION 5**
Public cross-traffic maintained.
Contractor and resident access.

**SITUATION 6**
No public access. Contractor and resident access only. (Applicable to T-intersections)
When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Possible Contract item:
Traffic Control

Legend
- Direction of Traffic
- Traffic Sign
- Drum
- 42" Channelizer
- Truck-Mounted Attenuator (TMA)
- Speed Feedback Sign
- Arrow Board
- Work Area

### Speed Feedback Sign

<table>
<thead>
<tr>
<th>SPEED LIMIT (mph)</th>
<th>A</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>M</th>
<th>T</th>
<th>A1</th>
<th>R</th>
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<tr>
<td>35 or less</td>
<td>250</td>
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<td>0.200</td>
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<td>80</td>
<td>40</td>
<td>0.300</td>
<td>320</td>
<td>50</td>
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<tr>
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<td>70</td>
<td>80</td>
<td>45</td>
<td>0.400</td>
<td>630</td>
<td>100</td>
<td>700</td>
<td>125</td>
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<td>70</td>
<td>80</td>
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<td>0.400</td>
<td>630</td>
<td>100</td>
<td>700</td>
<td>125</td>
</tr>
<tr>
<td>55 - 60</td>
<td>1000</td>
<td>100</td>
<td>55</td>
<td>600</td>
<td>770</td>
<td>100</td>
<td>2000</td>
<td>175</td>
</tr>
<tr>
<td>65 - 70</td>
<td>1000</td>
<td>100</td>
<td>65</td>
<td>700</td>
<td>940</td>
<td>100</td>
<td>2000</td>
<td>175</td>
</tr>
</tbody>
</table>

### SPEED LIMIT 55

- Spacing = D
- Spacing = C

### SPEED LIMIT 65

- Spacing = D
- Spacing = C

### SPEED LIMIT 70

- Spacing = D
- Spacing = C

### Traffic Control

- Pick up or Truck
- Speed Feedback Sign may be placed at the end of the merge taper.

### Equipment

- Equip all vehicles with an amber revolving light or amber strobe light.
- This arrow board may be operated in a four-corner caution mode.
- For roadways with a posted speed limit of 60 mph or greater before road work:
  - Place SPEED LIMIT 55 signs prior to the lane closure as shown.
  - Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.
  - For traffic control zones lasting more than 4 hours, a Speed Feedback Sign may be placed at the end of the merge taper.

### Road Work Ahead

- R2-1 48" x 48"
1. A vehicle with an amber revolving light or amber strobe light may be substituted for the Type III barricade.

2. Place Portable Dynamic Message Sign 3 calendar days prior to ramp closure. Leave in place until ramp is re-opened. The Engineer will determine the message to display.

Possible Contract Items:
- Safety Closure
- Traffic Control
- Portable Dynamic Message Sign

Possible Tabulation:

108-13A

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LEGEND

- Type III Barricade
- Traffic Sign
- 42" Channelizer
- Direction of Traffic
- Work Area
- Portable Dynamic Message Sign

PRECEDEING RAMP

EXIT CLOSSED

RAMP CLOSURE

R11-2
48" x 30"

40" Device Spacing

E5-2a
48" x 36"

48" x 36"

48" x 24"
A vehicle with an amber revolving light or amber strobe light may be substituted for the Type III barricade.

Place Portable Dynamic Message Sign 3 calendar days prior to ramp closure. Leave in place until ramp is re-opened. The Engineer will determine the message to display.

**LEGEND**

- Type III Barricade
- Traffic Sign
- Drum
- 42" Channelizer
- Direction of Traffic
- Work Area
- Portable Dynamic Message Sign
Place Portable Dynamic Message Sign 3 calendar days prior to ramp closure. Leave in place until ramp is re-opened. The Engineer will determine the message to display.
When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Where there is a lane line drop-off or rise, do not allow traffic to cross over the drop-off or rise, except for ramp locations where a BUMP (W8-1) sign is placed.

Lane line drop-offs greater than a nominal 4 inches are not allowed during non-working hours.

When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-5) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

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Lane line drop-offs greater than a nominal 4 inches are not allowed during non-working hours.
When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT LANE CLOSED 4 MILES and RIGHT LANE CLOSED 2 MILES signs (W20-6) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively.

Place Concrete Barrier Markers at 10 ft C/C on bridge rail.

For roadways with a posted speed limit of 60 mph or greater before road work:

Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.

For traffic control zones lasting more than 4 hours, place a Speed Feedback Sign at the end of the merge taper.

Refer to SI-881 for sign details.

For lanes closed to traffic, place two drums every 1000 feet. For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 100 feet.

Possible Contract Items:
- Painted Symbols and Legends
- Pavement Marking Items
- Pavement Markings Removed
- Symbols and Legends Removed
- Temporary Barrier Rail
- Temporary Crash Cushions

Possible Tabulations:
- 108-22
- 108-29
- 108-30
- 108-33

Legend:
- Traffic Sign
- Drum
- 42" Channelizer
- Speed Feedback Sign
- Arrow Board
- Temporary Crash Cushion
- Work Area
- Direction of Traffic
For roadways with a posted speed limit of 60 mph or greater before road work:

Place SPEED LIMIT AHEAD sign and SPEED LIMIT 55 sign prior to the lane closure as shown. Place SPEED LIMIT 65 or 70 beyond the work area as shown.

For traffic control zones lasting more than 4 hours, place a Speed Feedback Sign at the end of the merge taper.

Refer to SI-881 for sign details.

For lanes closed to traffic, place two drums every 1000 feet. For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 100 feet.
When the Average Daily Traffic (ADT) exceeds 20,000 vehicles per day or when a traffic queue extends beyond the advanced signing, place RIGHT/LEFT LANE CLOSED 4 MILES and RIGHT/LEFT LANE CLOSED 2 MILES signs (W20-0) on both sides of the roadway 4 miles and 2 miles in advance of the lane closure, respectively, as appropriate.

Where there is a lane line drop-off or rise, do not allow traffic to cross over the drop-off or rise, except for ramp locations where a BUMP (W8-1) sign is placed.

Lane line drop-offs greater than a nominal 4 inches are not allowed during non-working hours.

1. Refer to SI-881 for sign details.
2. For roadways with a posted speed limit of 60 mph or greater before road work:
   - Place SPEED LIMIT 55 signs prior to the lane closure as shown.
   - When the length of closure is greater than 1 mile, install SPEED LIMIT 55 signs in the closed lane at 1-mile intervals.
   - Remove or cover all existing signs that conflict with 55 mph speed limit while 55 mph speed limit is in effect.
   - For traffic control zones lasting more than 4 hours, place a Speed Feedback Sign at the end of the merge taper.
3. For lanes closed to traffic, place two drums every 1000 feet. For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 150 feet.
For traffic control zones in place for 3 calendar days or less, place arrow boards, devices and signs as shown. For traffic control zones in place for 4 calendar days or more, also remove permanent pavement markings and place temporary pavement markings as shown.

When this layout is used during nighttime hours and the width of existing traffic lanes is 11 feet or less, use tubular markers to separate two-way two-lane traffic.

For traffic control zones in place for 3 calendar days or less, place arrow boards, devices and signs as shown. For traffic control zones in place for 4 calendar days or more, also remove permanent pavement markings and place temporary pavement markings as shown.

1. Spacing = D for drums placed in tapers.
2. For lanes closed to traffic, place two drums every 1000 feet. For full depth excavations in a closed lane, place two drums in front of each location. Additional drums need not be placed for full depth excavations spaced closer than 150 feet.
3. For work zones in place for more than 3 calendar days, use TLSS. For work zones in place for 3 calendar days or less, 42" channelizers may be substituted for TLSS.
<table>
<thead>
<tr>
<th>NO.</th>
<th>DATE</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>TS-102</td>
<td>04-21-20</td>
<td>Traffic Signal Pole Foundation</td>
</tr>
</tbody>
</table>

04/21/20
The Type A Foundation is the normally required foundation construction. Where rock is encountered, the Engineer may approve the use of the Type B or C Foundation. Prior to installing a foundation in rock, obtain a subsurface investigation certified by a geotechnical engineer licensed in the State of Iowa.

1. Shape top 11 inches with forms. See Detail 'A'.
2. Install rodent guard or non-shrink grout with weep hole.
3. Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.

### TABLE

<table>
<thead>
<tr>
<th>Max. Mast Arm Length</th>
<th>Foundation</th>
<th>&quot;V&quot; Bars</th>
<th>Tie Bars</th>
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<tr>
<td></td>
<td>W</td>
<td>L</td>
<td>Count</td>
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<td>35'-0&quot;</td>
<td>3-0&quot;</td>
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<td>12</td>
</tr>
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</tr>
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<tr>
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<td>90'-0&quot;</td>
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<td>22'-0&quot;</td>
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</tr>
<tr>
<td>100'-0&quot;</td>
<td>4-0&quot;</td>
<td>24'-0&quot;</td>
<td>18</td>
</tr>
</tbody>
</table>

**Note:** All dimensions are out to out.
Type B Foundation is applicable for traffic signal poles with mast arm lengths up to 60 feet.

If the excavation for a Type B Foundation is left open for more than 1 calendar day, install temporary barrier rail if any part of the excavation is located within the clear zone. Temporary barrier rail layout requires the Engineer's approval.

Competent rock has an average unconfined compressive strength (q) of at least 2.0 ksi and rock quality designation of at least 90%. Conditions not meeting minimum requirements will require either:
- A site specific design, or
- Using the parameters for Mast Arm Pole Foundation in Soil.

1. Install rodent guard or non-shrink grout with weep hole.
2. Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.
3. Place 13 equally spaced #6 vertical bars.
4. Cast foundation concrete against competent rock. If foundation is formed, place backfill with concrete cast against rock.
5. When in contact with rock, place ground rods as specified in National Electrical Code, current edition.
6. #6 bars spaced at 8 inch maximum. Ties may be welded to vertical bars.
### MAST ARM POLE FOUNDATION IN ROCK

**TYPE C FOUNDATION**

**Top of Rock**

**2'-0" Min. 4'-0" Max.**

**“V” Bars (Typ.)**

**Drilled Shaft Tie Bars (Typ.)**

**Ground Rod Clamp**

**W = 1’-0”**

**W = 6”**

**8”**

**Typ. 4½” Min. D=4½” (Typ.)**

**3" Clearance**

**6 Spaces at 4” O.C.**

**“V” Bars**

**Ground Rod**

**Conduit**

**Anchor Bolts**

**#6 Ties**

**Shape top 11 inches with forms. See Detail ‘A’.”

**Install rodent guard or non-shrink grout with weep hole.**

**Furnish nut, nut and plate, or nut and anchor bolt assembly ring plate on embedded end.**

**When in contact with rock, place ground rods as specified in National Electrical Code, current edition.**

---

### TABLE: Foundation Details

<table>
<thead>
<tr>
<th>Max. Mast Arm Length</th>
<th>Foundation</th>
<th>“V” Bars</th>
<th>Tie Bars</th>
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<tbody>
<tr>
<td></td>
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<td>W&lt;sub&gt;max&lt;/sub&gt;</td>
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<td>35'-0&quot;</td>
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<td>2'-6&quot;</td>
<td>12'-0&quot;</td>
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<tr>
<td>100'-0&quot;</td>
<td>4'-0&quot;</td>
<td>3'-6&quot;</td>
<td>24'-0&quot;</td>
</tr>
</tbody>
</table>

*Broken rock has an average unconfined compressive strength (q<sub>u</sub>) of at least 1.0 ksi and rock quality designation of at least 20%.

**Competent rock has an average unconfined compressive strength (q<sub>u</sub>) of at least 2.0 ksi and rock quality designation of at least 90%.

**Total foundation length L must be sufficient to provide a 3 inch clearance between the bottom of the traffic signal pole anchor bolts and the bottom of the rock socket.**

**The Rock Socket Length L<sub>s</sub> can be decreased if the total length of the shaft is L long as shown in the table.**

**Conditions not meeting minimum requirements will require site specific designs or shall use the Type A Foundation Soil parameters.**

---

### BENT BAR DETAIL

- #6 Ties
- 8" Ty P
- D=4½" (Typ.)

**Note:** All dimension are out to out.
PEDESTAL POLE FOUNDATION IN SOIL OR ROCK

1. Shape top 11 inches with forms. See Detail 'A'.
2. Install rodent guard or non-shrink grout with weep hole.
3. Furnish nut, nut and plate, or nut and anchor bolt
   assembly ring plate on embedded end.

DETAIL 'A'

Pole Base

11" Shape with Forms
(Square or Circular)