UNIFORM STANDARD DETAILS
for
PUBLIC WORKS CONSTRUCTION
SPONSORED and DISTRIBUTED by the
MARICOPA ASSOCIATION of GOVERNMENTS

2017 REVISION TO THE 2015 EDITION
ARIZONA
### 100 SERIES: GENERAL INFORMATION

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>2011</td>
<td>GENERAL INFORMATION</td>
</tr>
<tr>
<td>110-1</td>
<td>2011</td>
<td>PLAN SYMBOLS (SYMBOLS)</td>
</tr>
<tr>
<td>110-2</td>
<td>2011</td>
<td>PLAN SYMBOLS (LINE TYPES)</td>
</tr>
<tr>
<td>112</td>
<td>1998</td>
<td>DIMENSIONING FOR ROAD IMPROVEMENT PLANS</td>
</tr>
<tr>
<td>120</td>
<td>2015</td>
<td>SURVEY MARKER</td>
</tr>
<tr>
<td>122</td>
<td>2011</td>
<td>PAVEMENT MARKER FOR FIRE HYDRANTS</td>
</tr>
<tr>
<td>130</td>
<td>2003</td>
<td>BARRICADES</td>
</tr>
<tr>
<td>131</td>
<td>1998</td>
<td>STREET SIGN BASE</td>
</tr>
<tr>
<td>140</td>
<td>2009</td>
<td>BOLLARD</td>
</tr>
<tr>
<td>141</td>
<td>2009</td>
<td>HAZARD MARKER</td>
</tr>
<tr>
<td>145</td>
<td>2016</td>
<td>SAFETY RAIL</td>
</tr>
<tr>
<td>150</td>
<td>1998</td>
<td>PRECAST SAFETY CURB</td>
</tr>
<tr>
<td>160</td>
<td>2013</td>
<td>6’ CHAIN LINK FENCE AND GATE</td>
</tr>
</tbody>
</table>

### 200 SERIES: STREET INFORMATION

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-1</td>
<td>2016</td>
<td>TRENCH BACKFILL AND SURFACE REPLACEMENT</td>
</tr>
<tr>
<td>200-2</td>
<td>2016</td>
<td>TRENCH BACKFILL AND SURFACE REPLACEMENT</td>
</tr>
<tr>
<td>201</td>
<td>2014</td>
<td>ASPHALT PAVEMENT EDGE DETAILS</td>
</tr>
<tr>
<td>202</td>
<td>1998</td>
<td>ALLEY DETAILS (PAVED AND UNPAVED)</td>
</tr>
<tr>
<td>203</td>
<td>1998</td>
<td>SCUPPERS</td>
</tr>
<tr>
<td>204</td>
<td>1998</td>
<td>EQUIPMENT CROSSING</td>
</tr>
<tr>
<td>205</td>
<td>2006</td>
<td>PAVED TURNOUTS</td>
</tr>
<tr>
<td>206-1</td>
<td>2007</td>
<td>CONCRETE SCUPPER</td>
</tr>
<tr>
<td>206-2</td>
<td>2007</td>
<td>CONCRETE SCUPPER</td>
</tr>
<tr>
<td>206-3</td>
<td>2007</td>
<td>CONCRETE SCUPPER (ISOMETRIC VIEW)</td>
</tr>
<tr>
<td>210</td>
<td>2012</td>
<td>RESIDENTIAL SPEED HUMP</td>
</tr>
<tr>
<td>211</td>
<td>1998</td>
<td>STANDARD TRENCH PLATING DETAIL</td>
</tr>
<tr>
<td>212</td>
<td>2015</td>
<td>UTILITY POTHOLE REPAIR</td>
</tr>
<tr>
<td>220-1</td>
<td>2007</td>
<td>CURB AND GUTTER TYPES A, B, C AND D</td>
</tr>
<tr>
<td>220-2</td>
<td>2007</td>
<td>CURB AND GUTTER TYPES E AND F</td>
</tr>
<tr>
<td>221</td>
<td>2014</td>
<td>CURB AND GUTTER TRANSITION TYPE A TO TYPE C, INTEGRAL ROLL CURB, GUTTER AND SIDEWALK</td>
</tr>
<tr>
<td>222</td>
<td>2008</td>
<td>SINGLE CURB - TYPES A, B AND TERMINATION</td>
</tr>
<tr>
<td>223</td>
<td>1998</td>
<td>MEDIUM NOSE TRANSITION</td>
</tr>
<tr>
<td>224</td>
<td>1998</td>
<td>JOINT FOR DRAINAGE INLETS AND MANHOLE COVERS</td>
</tr>
<tr>
<td>225</td>
<td>2016</td>
<td>CONCRETE PAVERS</td>
</tr>
<tr>
<td>230</td>
<td>2014</td>
<td>SIDEWALKS</td>
</tr>
<tr>
<td>234</td>
<td>2012</td>
<td>CURB MODIFICATION AT DETECTABLE WARNING</td>
</tr>
<tr>
<td>235-1</td>
<td>2012</td>
<td>CURB RAMPS (TYPE A)</td>
</tr>
<tr>
<td>235-2</td>
<td>2012</td>
<td>CURB RAMPS (TYPE B)</td>
</tr>
<tr>
<td>235-3</td>
<td>2012</td>
<td>CURB RAMPS (TYPE C)</td>
</tr>
<tr>
<td>235-4</td>
<td>2011</td>
<td>CURB RAMPS (TYPE D)</td>
</tr>
<tr>
<td>235-5</td>
<td>2011</td>
<td>CURB RAMPS (TYPE E)</td>
</tr>
<tr>
<td>235-6</td>
<td>2017*</td>
<td>DUAL CURB RAMP (RADIAL, 25’-35’ R) ATTACHED SIDEWALK</td>
</tr>
<tr>
<td>236-1</td>
<td>2017*</td>
<td>DUAL CURB RAMP (RADIAL, 25’-35’ R) DETACHED SIDEWALK</td>
</tr>
<tr>
<td>236-2</td>
<td>2017*</td>
<td>DUAL CURB RAMP (RADIAL, 20’ R) ATTACHED SIDEWALK</td>
</tr>
<tr>
<td>236-3</td>
<td>2017*</td>
<td>DUAL CURB RAMP (RADIAL, 20’ R) ATTACHED SIDEWALK</td>
</tr>
</tbody>
</table>

### 300 SERIES: WATER INFORMATION

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>1998</td>
<td>BLOCKING FOR WATER GATE AND BUTTERFLY VALVES</td>
</tr>
<tr>
<td>302</td>
<td>1998</td>
<td>JOINT RESTRAINT WITH TIE RODS (DRAWING)</td>
</tr>
<tr>
<td>302-2</td>
<td>1998</td>
<td>JOINT RESTRAINT WITH TIE RODS (NOTES)</td>
</tr>
<tr>
<td>303-2</td>
<td>1998</td>
<td>JOINT RESTRAINT FOR DUCTILE IRON AND POLYETHYLENE WRAPPED DUCTILE IRON WATER PIPES (DRAWING)</td>
</tr>
<tr>
<td>305</td>
<td>1998</td>
<td>JOINT RESTRAINT FOR DUCTILE IRON AND POLYETHYLENE WRAPPED DUCTILE IRON WATER PIPES (TABLES)</td>
</tr>
<tr>
<td>310</td>
<td>2017*</td>
<td>STEEL WATER METER BOX COVER</td>
</tr>
<tr>
<td>315</td>
<td>2017*</td>
<td>POLYMER CONCRETE WATER METER BOX COVER</td>
</tr>
<tr>
<td>319</td>
<td>2017*</td>
<td>TRAFFIC RATED BOX AND COVER</td>
</tr>
<tr>
<td>320</td>
<td>2017*</td>
<td>NON TRAFFIC RATED WATER METER BOXES</td>
</tr>
<tr>
<td>321</td>
<td>1998</td>
<td>STANDARD WATER METER VAULT</td>
</tr>
<tr>
<td>340</td>
<td>2002</td>
<td>INSTALLING TAPPING SLEEVES AND VALVES</td>
</tr>
<tr>
<td>342</td>
<td>1998</td>
<td>CONCRETE PRESSURE PIPE TAPPING SLEEVE</td>
</tr>
<tr>
<td>345-1</td>
<td>1998</td>
<td>3&quot;, 4&quot;, 6&quot; WATER METER</td>
</tr>
<tr>
<td>345-2</td>
<td>1998</td>
<td>4&quot;, 6&quot; WATER METER WITH ON-SITE HYDRANTS</td>
</tr>
<tr>
<td>346</td>
<td>1998</td>
<td>FIRE LINE DETECTOR CHECK VAULT</td>
</tr>
<tr>
<td>360-1</td>
<td>2013</td>
<td>DRY BARREL FIRE HYDRANT INSTALLATION</td>
</tr>
<tr>
<td>360-2</td>
<td>2013</td>
<td>WET BARREL FIRE HYDRANT INSTALLATION</td>
</tr>
<tr>
<td>360-3</td>
<td>2013</td>
<td>FIRE HYDRANT INSTALLATION DETAILS</td>
</tr>
<tr>
<td>362</td>
<td>1999</td>
<td>LOCATIONS FOR NEW FIRE HYDRANTS</td>
</tr>
<tr>
<td>370</td>
<td>1998</td>
<td>VERTICAL REALIGNMENT OF WATER MAINS</td>
</tr>
<tr>
<td>380</td>
<td>1998</td>
<td>THRUST BLOCKS FOR WATER LINES</td>
</tr>
<tr>
<td>381</td>
<td>1998</td>
<td>ANCHOR BLOCKS FOR VERTICAL BENDS</td>
</tr>
<tr>
<td>389</td>
<td>2001</td>
<td>CURB STOP WITH VALVE BOX AND COVER</td>
</tr>
<tr>
<td>390</td>
<td>1998</td>
<td>CURB STOP WITH FLUSHING PIPE</td>
</tr>
<tr>
<td>391</td>
<td>2017*</td>
<td>VALVE BOX INSTALLATION AND GRADE ADJUSTMENT</td>
</tr>
<tr>
<td>391-2</td>
<td>2017*</td>
<td>VALVE BOX INSTALLATION AND GRADE ADJUSTMENT</td>
</tr>
<tr>
<td>392</td>
<td>2015</td>
<td>DEBRIS CAP INSTALLATION</td>
</tr>
<tr>
<td>393</td>
<td>2017*</td>
<td>WATER VALVE EXTENSION</td>
</tr>
</tbody>
</table>

* NEWLY REVISED.
### 400 SERIES: SEWER INFORMATION

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>403-1</td>
<td>1998</td>
<td>PIPE SUPPORT ACROSS TRENCHES</td>
</tr>
<tr>
<td>403-2</td>
<td>1998</td>
<td>PIPE SUPPORT ACROSS TRENCHES</td>
</tr>
<tr>
<td>403-3</td>
<td>1998</td>
<td>ALTERNATIVE TO PIPE SUPPORT</td>
</tr>
<tr>
<td>404-1</td>
<td>2006</td>
<td>WATER AND SANITARY SEWER SEPARATION/PROTECTION</td>
</tr>
<tr>
<td>404-2</td>
<td>2006</td>
<td>WATER AND SANITARY SEWER SEPARATION/PROTECTION</td>
</tr>
<tr>
<td>404-3</td>
<td>2006</td>
<td>WATER AND SANITARY SEWER SEPARATION/PROTECTION</td>
</tr>
<tr>
<td>405</td>
<td>1998</td>
<td>BROKEN SEWER LINE REPLACEMENT</td>
</tr>
<tr>
<td>420-1</td>
<td>2015</td>
<td>CONCRETE SANITARY SEWER MANHOLE</td>
</tr>
<tr>
<td>420-2</td>
<td>2015</td>
<td>PRE-CAST CONCRETE MANHOLE BASE</td>
</tr>
<tr>
<td>420-3</td>
<td>2015</td>
<td>CONCRETE MANHOLE BASE</td>
</tr>
<tr>
<td>421</td>
<td>2015</td>
<td>OFFSET MANHOLE 8&quot; TO 30&quot; PIPE</td>
</tr>
<tr>
<td>422</td>
<td>2015</td>
<td>MANHOLE FRAME AND COVER ADJUSTMENT</td>
</tr>
<tr>
<td>423-1</td>
<td>2012</td>
<td>24&quot; CAST IRON MANHOLE FRAME AND COVER</td>
</tr>
<tr>
<td>423-2</td>
<td>2012</td>
<td>30&quot; CAST IRON MANHOLE FRAME AND COVER</td>
</tr>
<tr>
<td>424-1</td>
<td>2012</td>
<td>24&quot; CAST IRON WATERTIGHT MANHOLE FRAME AND COVER</td>
</tr>
<tr>
<td>424-2</td>
<td>2012</td>
<td>30&quot; CAST IRON WATERTIGHT MANHOLE FRAME AND COVER</td>
</tr>
<tr>
<td>425</td>
<td>1998</td>
<td>24&quot; ALUMINUM MANHOLE FRAME AND COVER</td>
</tr>
<tr>
<td>426</td>
<td>2007</td>
<td>DROP SEWER CONNECTIONS</td>
</tr>
<tr>
<td>427</td>
<td>1998</td>
<td>STUB OUT AND PLUGS</td>
</tr>
<tr>
<td>429</td>
<td>2015</td>
<td>INDUSTRIAL WASTE CONTROL VAULT WITH MANHOLE</td>
</tr>
<tr>
<td>440-1</td>
<td>2007</td>
<td>TYPE 'A' SEWER BUILDING CONNECTION - ELECTRONIC BALL MARKERS (STANDARD)</td>
</tr>
<tr>
<td>440-2</td>
<td>2007</td>
<td>TYPE 'B' SEWER BUILDING CONNECTION - TWO-WAY CLEANOUT AND METER BOX AT R/W</td>
</tr>
<tr>
<td>440-3</td>
<td>2007</td>
<td>TYPE 'C' SEWER BUILDING CONNECTION - ONE-WAY CLEANOUT AND METER BOX</td>
</tr>
<tr>
<td>440-4</td>
<td>2006</td>
<td>SEWER SERVICE CURB CROSSING STAMP DETAIL</td>
</tr>
<tr>
<td>441</td>
<td>2001</td>
<td>SEWER CLEANOUT</td>
</tr>
</tbody>
</table>

### 500 SERIES: IRRIGATION AND STORM DRAIN INFORMATION

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>501-1</td>
<td>2012</td>
<td>HEADWALL</td>
</tr>
<tr>
<td>501-2</td>
<td>2012</td>
<td>HEADWALL</td>
</tr>
<tr>
<td>501-3</td>
<td>1998</td>
<td>HEADWALL 42&quot; TO 84&quot; PIPE</td>
</tr>
<tr>
<td>501-4</td>
<td>1998</td>
<td>HEADWALL IRRIGATION 18&quot; TO 60&quot; PIPE</td>
</tr>
<tr>
<td>501-5</td>
<td>2014</td>
<td>HEADWALL DROP INLET</td>
</tr>
<tr>
<td>502-1</td>
<td>1998</td>
<td>TRASH RACK</td>
</tr>
<tr>
<td>502-2</td>
<td>2004</td>
<td>TRASH RACK</td>
</tr>
<tr>
<td>503</td>
<td>1998</td>
<td>IRRIGATION STANDPIPE</td>
</tr>
<tr>
<td>504</td>
<td>1998</td>
<td>CONCRETE BLOCK JUNCTION BOX</td>
</tr>
<tr>
<td>505</td>
<td>1998</td>
<td>CONCRETE PIPE COLLAR</td>
</tr>
<tr>
<td>506</td>
<td>1998</td>
<td>IRRIGATION VALVE INSTALLATION</td>
</tr>
<tr>
<td>507</td>
<td>2017*</td>
<td>ENCASED CONCRETE PIPE (FOR SHALLOW INSTALLATION)</td>
</tr>
<tr>
<td>510</td>
<td>1998</td>
<td>CORRUGATED METAL PIPE AND INSTALLATION</td>
</tr>
</tbody>
</table>

### 500 SERIES: IRRIGATION AND STORM DRAIN INFORMATION (CONTINUED)

<table>
<thead>
<tr>
<th>Detail</th>
<th>Revised</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>520</td>
<td>1998</td>
<td>STORM DRAIN MANHOLE BASE (48&quot; AND SMALLER)</td>
</tr>
<tr>
<td>521</td>
<td>1998</td>
<td>STORM DRAIN MANHOLE BASE (51&quot; OR LARGER)</td>
</tr>
<tr>
<td>522</td>
<td>2015</td>
<td>STORM DRAIN MANHOLE SHAFT</td>
</tr>
<tr>
<td>523-1</td>
<td>1998</td>
<td>PRESSURE MANHOLE</td>
</tr>
<tr>
<td>523-2</td>
<td>1998</td>
<td>PRESSURE MANHOLE</td>
</tr>
<tr>
<td>524</td>
<td>1998</td>
<td>STORM DRAIN LATERAL PIPE CONNECTIONS</td>
</tr>
<tr>
<td>530</td>
<td>1998</td>
<td>3'-6&quot; CURB OPENING CATCH BASIN - TYPE 'A'</td>
</tr>
<tr>
<td>531</td>
<td>1998</td>
<td>5'-6&quot; CURB OPENING CATCH BASIN - TYPE 'B'</td>
</tr>
<tr>
<td>532</td>
<td>1998</td>
<td>8'-0&quot; CURB OPENING CATCH BASIN - TYPE 'C'</td>
</tr>
<tr>
<td>533-1</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'D'</td>
</tr>
<tr>
<td>533-2</td>
<td>1999</td>
<td>APRON FOR TYPE 'D' CATCH BASIN</td>
</tr>
<tr>
<td>533-3</td>
<td>2007</td>
<td>FRAME AND GRATE FOR TYPE 'D' CATCH BASIN</td>
</tr>
<tr>
<td>533-4</td>
<td>2007</td>
<td>7'-0&quot; CURB OPENING CATCH BASIN TYPE 'D' - GRATE DETAILS</td>
</tr>
<tr>
<td>534-1</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'E'</td>
</tr>
<tr>
<td>534-2</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'E' (DETAILS)</td>
</tr>
<tr>
<td>534-3</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'E' (DETAILS)</td>
</tr>
<tr>
<td>534-4</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'E' (DETAILS)</td>
</tr>
<tr>
<td>534-5</td>
<td>1998</td>
<td>ALTERNATE GRATE STYLES, SUMP LOCATION</td>
</tr>
<tr>
<td>535</td>
<td>2009</td>
<td>CATCH BASIN TYPE 'F' (FOR USE WITHOUT CURB)</td>
</tr>
<tr>
<td>536-1</td>
<td>1999</td>
<td>COMMON DETAILS AND SECTIONS FOR CURB OPENING CATCH BASINS</td>
</tr>
<tr>
<td>536-2</td>
<td>1998</td>
<td>ALTERNATIVE COVER FOR CURB OPENING CATCH BASINS</td>
</tr>
<tr>
<td>537</td>
<td>2002</td>
<td>CATCH BASIN TYPE 'G'</td>
</tr>
<tr>
<td>538</td>
<td>1998</td>
<td>CATCH BASIN TYPE 'H'</td>
</tr>
<tr>
<td>539</td>
<td>1998</td>
<td>GRATES FOR CATCH BASINS, TYPE G AND H</td>
</tr>
<tr>
<td>540-1</td>
<td>1998</td>
<td>CATCH BASIN GRATES</td>
</tr>
<tr>
<td>540-2</td>
<td>1998</td>
<td>CATCH BASIN GRATES</td>
</tr>
<tr>
<td>541</td>
<td>2005</td>
<td>CATCH BASIN SUBGRADE DRAIN</td>
</tr>
<tr>
<td>545</td>
<td>1998</td>
<td>END SECTION - REINFORCED CONCRETE PIPE</td>
</tr>
<tr>
<td>550</td>
<td>1998</td>
<td>SPILLWAY INLET AND OUTLET</td>
</tr>
<tr>
<td>552</td>
<td>2015</td>
<td>FORD CROSSING WITH CUT-OFF WALLS</td>
</tr>
<tr>
<td>555</td>
<td>2010</td>
<td>EROSION PROTECTION/GABIONS</td>
</tr>
</tbody>
</table>

* NEWLY REVISED.
1. THESE DETAILS HAVE BEEN PREPARED IN AN EFFORT TO STANDARDIZE THE CONSTRUCTION DETAILS USED BY VARIOUS CONTRACTING AGENCIES IN MARICOPA COUNTY. THEY ARE TO BE USED IN CONJUNCTION WITH THE CURRENT EDITION OF THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" SPONSORED AND DISTRIBUTED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS.

2. MANY NOTES WITHIN THESE DETAILS REFER TO VARIOUS SECTIONS OF THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION." WHERE THIS REFERENCE IS MADE, ONLY THE ABBREVIATION "SECT." IS USED. AN EXAMPLE OF THIS REFERENCE WOULD BE: "CLASS 'A' CONCRETE PER SECT. 725."

3. MANY NOTES WITHIN THESE DETAILS REFER TO OTHER DETAILS WITHIN THIS BOOK. WHERE THIS REFERENCE IS MADE, THE ABBREVIATION "DETAIL" IS USED. AN EXAMPLE OF THIS WOULD BE: "SEE DETAIL 391 FOR VALVE BOX INSTALLATION."


5. AN EFFORT HAS BEEN MADE TO INCLUDE THE MOST COMMONLY USED CONSTRUCTION DETAILS IN THIS BOOK. ITEMS WHICH REQUIRE DESIGN CONSIDERATION BY THE DESIGNING ENGINEER HAVE NOT BEEN INCLUDED.

6. SOME OF THE DETAILS PRINTED HEREIN MAY BE USED BY SOME OF THE AGENCIES BUT NOT OTHERS. THE DESIGNING ENGINEER SHOULD THEREFORE CONTACT THE AGENCY WITHIN WHOSE JURISDICTION HE IS WORKING FOR DIRECTION AS TO WHICH DETAIL OR PORTIONS OF DETAILS SHOULD BE USED.

7. DETAIL DRAWINGS ARE NOT TO SCALE.
NOTES:
1. PLAN SYMBOLS FOR EXISTING FEATURES ARE TO BE DASHED, GRAY SCALED, OR DRAWN USING THIN LINENWORK.
2. ADD LABELS TO PLAN SYMBOLS AS NEEDED FOR CLARITY.
SECTION LINE
R/W
EASEMENT
PROPERTY LINE (OPTION 1)
PROPERTY LINE (OPTION 2)
JURISDICTIONAL BOUNDARY (OPTION 1)
JURISDICTIONAL BOUNDARY (OPTION 2)
ROADWAY CENTERLINE
UNDERGROUND ELECTRIC BURIED CABLE
UNDERGROUND ELECTRIC CONDUIT
UNDERGROUND ELECTRIC DUCT BANK
OVERHEAD ELECTRIC
UNDERGROUND TELEPHONE LINE
OVERHEAD TELEPHONE LINE
FIBER OPTIC
CABLE TELEVISION
OVERHEAD CABLE TELEVISION
TELEPHONE DUCT BANK

CHAIN LINK FENCE
BARBED WIRE FENCE
BLOCK WALL
WOOD WALL
GAS LINE (12" & SMALLER)
GAS LINE * (GREATER THAN 12”)
SEWER LINE (12” & SMALLER)
SEWER LINE * (GREATER THAN 12”)
NEW STORM DRAIN PIPE *
STORM DRAIN * (GREATER THAN 12”)
IRRIGATION LINE (12” & SMALLER)
IRRIGATION LINE * (GREATER THAN 12”)
NEW IRRIGATION LINE *
WATER LINE (12” & SMALLER)
WATER LINE * (GREATER THAN 12”)

4" G (MATERIAL)
15" G (MATERIAL)
8" S (MATERIAL)
18" S (MATERIAL)

* SCALE TO ACTUAL WIDTH

DETAIL NO. 110-2
STANDARD DETAIL
ENGLISH

PLAN SYMBOLS

REVISED 01-01-2011
DETAIL NO. 110-2
DIMENSION SHOULD BE GIVEN ONCE ON EACH SHEET AND SHOULD BE PLACED NEAR THE CENTER OF THE SHEET. IF ANY OF THE GIVEN CONDITIONS CHANGE, THEY SHOULD BE REDIMENSIONED AT THE POINT OF CHANGE.

GIVEN DIMENSIONS IN ORDER STARTING WITH THE LONGEST AND ENDING WITH THE SHORTEST, AS SHOWN IN THE SKETCH.

GIVE COMPLETE DIMENSIONS.

IF THE CENTERLINE OF PAVEMENT DOES NOT FALL ON THE SECTION LINE OR MONUMENT LINE OF THE STREET, DIMENSION AS ABOVE AND SHOW THE DIFFERENCE BETWEEN THE SECTION OR MONUMENT LINE AND THE CENTERLINE.
NOTES:

1. TYPE 'A' TO BE USED AT INTERSECTIONS OF MAJOR STREETS & COLLECTOR STREETS, SECTION CORNERS, SECTION 1/4 CORNERS, CENTER OF SECTIONS, AND AT OTHER POINTS AS SHOWN ON PLANS.

2. TYPE 'B' TO BE USED (EXCEPT WHERE TYPE 'A' IS SPECIFIED) AT INTERSECTION OF STREET CENTERLINES, P.C.'S, P.T.'S AND P.I.'S OF CURVES, SECTION 1/16 CORNERS, SUBDIVISION CORNERS, CHANGE IN ALIGNMENT OF SUBDIVISION BOUNDARIES, AND AT OTHER POINTS AS SHOWN ON PLANS.

3. FOR UNPAVED STREETS AND ALLEYS SET TOP OF MARKER SIX INCHES BELOW FINISHED GRADE.

4. CAP TO BE CONSTRUCTED OF RED BRASS OR BRONZE.

5. LETTERS TO BE APPROX. 1/32" WIDE & 1/32" DEEP.

6. FLATTENING THE BOTTOM 2" OF THE GALVANIZED PIPE IS OPTIONAL.

7. TOP OF CONCRETE POST IS CHAMFERED 3/4" EXCEPT WHEN SET FLUSH WITH PAVEMENT.

8. THE CAP SHALL SHOW THE POINT SURVEYED BY A PUNCH MARK OR S CRIED CROSS AND THE CAP SHALL BE STAMPED WITH THE YEAR AND THE REGISTERED LAND SURVEYOR'S (RLS) REGISTRATION NUMBER.

9. WHEN APPLICABLE, THE CAP SHALL BE STAMPED WITH THE APPROPRIATE PUBLIC LAND MARKING PER CURRENT MANUAL OF INSTRUCTIONS FOR THE SURVEY OF PUBLIC LANDS OF THE UNITED STATES, PREPARED BY THE BUREAU OF LAND MANAGEMENT.

10. SUBMIT TO THE ENGINEER A COPY OF THE RECORDED CORNER RECORD OR RESULTS OF SURVEY TO DOCUMENT COMPLIANCE WITH THE ARIZONA BOARD OF TECHNICAL REGISTRATION REQUIREMENTS.
NOTES:

1. LOCATE PAVEMENT MARKER IN CENTER OF TRAVEL LANE AND Align WITH HYDRANT.
2. FOR MULTIPLE LANE ROADS LOCATE PAVEMENT MARKER IN LEFT MOST THROUGH TRAFFIC LANE.
3. ADJUST MARKER LOCATION TO BE LOCATED OUTSIDE OF ANY DELINEATED CROSSWALK AREA.
4. FOR HYDRANT LOCATED ON FAR SIDE OF RAISED MEDIAN, LOCATE PAVEMENT MARKER ON TOP OF MEDIAN CURB ALIGNED WITH HYDRANT.
5. OMIT FOR CUL-DE-SAC GREATER THAN 250' IN LENGTH.
6. FIRE HYDRANT PAVEMENT MARKERS SHALL BE 2-WAY RETROREFLECTIVE BLUE: ADOT TYPE B8, 911A-BLUE BY FIRE LITE AMERACE CORPORATION, OR APPROVED EQUAL.
NOTES:

1. FASTEN WITH 1/2" x 5" LAG SCREWS WITH 2 FLAT WASHERS OR (2) 5/8" BOLTS, WITH 4 FLAT WASHERS.

2. 2" x 8" DOUGLAS FIR PLANK (LENGTH TO BE DETERMINED ON PLANS.)

3. WHEN BARRICADE (TYPE "A") IS CONSTRUCTED ON BASES INSTEAD OF POSTS SET INTO THE GROUND, IT MAY BE DESIRABLE TO BALLAST THE BASES WITH SAND BAGS OR BY STAKING TO PROVIDE RESISTANCE TO OVERTURNING DURING PERIODS OF HIGH WINDS.

4. TWO COATS OF WHITE PAINT PER SECTION 790 SHALL BE APPLIED TO ALL EXPOSED SURFACES OF THE BARRICADE. AN ADDITIONAL TWO COATS OF ORANGE PAINT PER SECTION 790 SHALL BE APPLIED TO CREATE THE ALTERNATE ORANGE AND WHITE STRIPES FOR TEMPORARY BARRICADES AND TWO COATS OF RED PAINT PER SECTION 790 SHALL BE APPLIED TO CREATE ALTERNATE RED AND WHITE STRIPES FOR PERMANENT BARRICADES. HIGHWAY SAFETY SPHERES (BEADS) PER ADOT 708-2.02 SHALL BE APPLIED BY HAND TO ALL CROSS MEMBERS, FRONT AND BACK AND ON BOTH COLORS, IMMEDIATELY AFTER PAINTING. THE STRIPES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PASS.
NOTES

TYPE 'A'

USE DRIVING HEAD FOR DRIVING ALL FLANGED STEEL 'U' CHANNEL POSTS.

IN LIEU OF DRIVING FLANGED STEEL 'U' CHANNEL POSTS MAY BE SET IN CONCRETE BASE FOUNDATION AS PER TYPE 'B' BASE.

TYPE 'B' & TYPE 'C'

CONCRETE BASE FOUNDATIONS SHALL BE CLASS 'C' CONCRETE AS PER SECT. 505 AND 725.
FILL WITH GROUT AND CROWN TOP

6” RETROREFLECTIVE ENGINEER’S TAPE (3M HIGH DENSITY YELLOW PRESSURE SENSITIVE TAPE OR APPROVED EQUIVALENT), TYP.

4” OR 6” DIA. STEEL GUARD POST, SCH. 40, GALVANIZED

1/4” x 5 5/6” DIAMETER CAP PLATE
SEAL WELD ALL AROUND

5” DIA. STEEL GUARD POST SCH. 40

1/2” A-36 STEEL COLLAR
5 5/6” ID x 7 1/6” OD, FILLET WELD TO GUARD POST BOTH SIDES, ALL AROUND

1” SLEEVE PROJECTION

6” DIA. X 34” SCH. 40 GROUND SLEEVE WITH 7/8” X 6 5/6” CAP PLATE, SEAL WELD ALL AROUND

NOTES

1. BOLLARDS SHALL HAVE A HEIGHT OF 3 FEET OR BE EQUAL TO THE HEIGHT OF THE BACK SCREEN WALL OF BIN ENCLOSURES. POSTS SHALL BE PLACED A MINIMUM OF 4” FROM THE WALL.

2. REMOVABLE POSTS SHALL HAVE 1” DIAM HOLES DRILLED THROUGH AT A DISTANCE 1/2 THE OVERALL POST LENGTH FROM TOP.

3. REMOVABLE POST – GRIND SMOOTH ALL SHARP EDGES PRIOR TO GALVANIZATION. GALVANIZE PER ASTM A54 AFTER FABRICATION.
**TYPE 1 SURFACE MOUNT**

**TYPE 2 GROUND MOUNT**

**NOTES**

1. CONTRACTOR SHALL CLEAN ROADWAY SURFACE PRIOR TO PLACEMENT OF FLEXIBLE TUBULAR MARKER.
2. FLEXIBLE TUBULAR MARKERS SHALL BE CEMENTED TO THE PAVEMENT SURFACE WITH AN EPOXY ADHESIVE IN ACCORDANCE WITH THE TUBULAR MARKER MANUFACTURER’S SPECIFICATIONS.
3. YELLOW TUBULAR MARKERS SHALL HAVE A YELLOW POST AND YELLOW "HIGH INTENSITY GRADE" RETROREFLECTIVE SHEETING. ORANGE TUBULAR MARKERS SHALL HAVE AN ORANGE POST AND WHITE HIGH INTENSITY RETROREFLECTIVE SHEETING.
4. POST SHALL BE FLEXIBLE, HIGH IMPACT RESISTANT PLASTIC MATERIAL.
NOTES:
1. POSTS AND RAILS SHALL BE 1.90 INCH OUTSIDE DIAMETER HIGH STRENGTH HEAVY INDUSTRIAL STEEL PIPE CONFORMING TO ASTM F1043 MATERIAL GROUP IA-2 (2.72 LB/FT, MINIMUM YIELD STRENGTH = 50 KSI) OR MATERIAL GROUP 1C GALVANIZED AFTER FORMING (2.20 LB/FT, MINIMUM YIELD STRENGTH = 50 KSI).
2. PAINT RAIL PER MAG SPECIFICATIONS SECTION 530 WHEN REQUIRED BY PLANS. SHOULDER WITH RUST INHIBITING PRIMER (FIELD REPAIR PRIMER AS NEEDED). COLOR PER PLANS.
3. VERTICAL POSTS TO BE EVENLY SPACED.
4. REMOVE ALL SHARP EDGES.
5. INSTALL SAFETY RAIL AS REQUIRED BY PLANS OR SPECIFICATIONS.
6. THE EMBEDMENT FOR ANCHOR TYPES 1, 2 AND 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE.
7. SAFETY RAIL IS NOT TO BE USED AS A PEDESTRIAN BRIDGE RAIL.

NOTE: SEE PLANS FOR ANCHORAGE DETAILS FOR ATTACHMENT TO SINGULARLY REINFORCED AND NON-REINFORCED WALLS.
5/8" HOLE FOR 1/2" DIA. PIN, 24" LONG, HOT ROLLED STEEL

TYPE A

5/8" HOLE OR 1/2" DIA. PIN, 24" LONG, HOT ROLLED STEEL

TYPE B-1 = 36"
TYPE B-2 = 48"
TYPE B-3 = 72"

TYPE B-1, B-2, AND B-3

RADIUS 3/4" MIN. - 1" MAX.

NO. 3 REINFORCING BAR AS PER SECTION 727
69" FOR TYPES 'A' AND 'B-3'
45" FOR TYPE 'B-2'

NOTES:
1. DIMENSIONAL AND REINFORCEMENT CHANGES WILL BE PERMITTED UPON PRIOR WRITTEN APPROVAL OF THE ENGINEER.
2. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE CLASS 'A' PER SECTION 725.

1/2" DIA. PINS - 24" LONG, HOT ROLLED STEEL

6" DIA. CONCRETE CYLINDER
CONCRETE CLASS B
PER SECTION 725

SAFETY CURB
INSTALLATION ON DIRT
NOTES
1. ALL CONCRETE SHALL BE CLASS 'C' PER SECT. 725.
2. FITTINGS NOT SPECIFICALLY DETAILED SHALL BE HEAVY DUTY DESIGN.
3. STRAIN POSTS SHALL BE SPACED AT 500' MAXIMUM SPACING.
4. BOTH CORNER AND STRAIN POSTS SHALL HAVE STRAIN PANELS.
5. ALL POSTS SHALL BE CAPPED.
6. MEMBER SIZES SHALL BE THE FOLLOWING:

<table>
<thead>
<tr>
<th>MEMBER</th>
<th>AISC SIZE</th>
<th>OUTSIDE DIA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORNER POST</td>
<td>2-1/2&quot;</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>LINE POST</td>
<td>1-1/2&quot;</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>STRAIN POST</td>
<td>1-1/2&quot;</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>BRACE</td>
<td>1-1/4&quot;</td>
<td>1.666&quot;</td>
</tr>
<tr>
<td>STRETCH BAR</td>
<td>3/16&quot;x3/4&quot; FLAT</td>
<td>3/16&quot;x3/4&quot; FLAT</td>
</tr>
<tr>
<td>GATE POST</td>
<td>3-1/2&quot;</td>
<td>4.000&quot;</td>
</tr>
<tr>
<td>TOP RAIL</td>
<td>1-1/4&quot;</td>
<td>1.666&quot;</td>
</tr>
</tbody>
</table>

7. CONSTRUCTION AND MATERIALS SHALL CONFORM TO SECT. 420 AND 772, RESPECTIVELY. SEE TABLE 772-1 FOR WEIGHTS OF MEMBERS.
"T TOP" TRENCH REPAIR

TRENCH WIDTH PER SECTION 601.4
TRENCH CROSS-SECTION TYP. SEE DETAIL 200-2.

BASE: A.C. PER SECT. 702 & 601
TRENCH CROSS-SECTION TYP. SEE DETAIL 200-2.

SHELF
FINAL BACKFILL:
A.C. OR NATIVE
BACKFILL PER SECT. 702 & 601 OR CLSM
PER SECT. 604 & 728
(SWILL NOTES 2 & 3)

12" MIN.
MATCH EXISTING
BASE, WHICHEVER IS
GREATER
12" MIN.

NOTE:
1. PAVEMENT MATCHING AND SURFACE REPLACEMENT SHALL BE IN ACCORDANCE WITH SECTION 336.
2. MATERIAL FOR FINAL BACKFILL AND BASE (IF APPLICABLE) SHALL BE AS NOTED HEREIN UNLESS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS. CLSM SHALL BE 1/2-SACK OR 1-SACK PER SECTIONS 604 AND 728.
3. FINAL BACKFILL SHALL BE 1/2-SACK OR 1-SACK CLSM PER SECTIONS 604 AND 728 FOR TRENCH DEPTHS GREATER THAN 4 FEET UNLESS A SAFE (OHSAA COMPLIANT) WORKING SPACE AT LEAST 30" WIDE IS PROVIDED TO CONDUCT COMPACTION TESTING.
4. BASE FINAL BACKFILL AND PIPE ENGAGEMENT ZONE COMPACTION SHALL BE IN ACCORDANCE WITH SECTION 601.
5. ASPHALT CONCRETE SURFACE AND BASE COURSES SHALL COMPLY WITH SECTION 336.2.4.1 UNLESS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS.
6. USE TYPE "A" FOR LONGITUDINAL TRENCH REPAIR AND USE "T-TOP" FOR TRANSVERSE TRENCH REPAIR (SEE DETAIL 200-2) UNLESS OTHERWISE SPECIFIED IN CONTRACT DOCUMENTS. TYPE "B" TRENCH REPAIR MAY BE USED FOR TRANSVERSE TRENCH REPAIR IF SPECIFIED BY THE AGENCY.
7. PROVIDE MINIMUM 12" WIDE SHELF AS SHOWN IN "T-TOP" TRENCH REPAIR AT ENDS OF TYPE "A" TRENCH REPAIR EXCEPT WHERE EDGE ABBUTS EXISTING CONCRETE.
8. USE "T-TOP" PAVEMENT REPLACEMENT WHERE A TRENCH IS NOT PARALLEL TO A STREET OR GOES THROUGH AN INTERSECTION.
9. THE JUNCTION LOCATION OR JOINT CONFIGURATION MAY VARY FROM THAT SHOWN TO ELIMINATE REMNANTS, TO ELIMINATE FULL DEPTH SAWCUT JOINTS FROM BEING LOCATED WITHIN A WHEEL PATH AS REQUIRED BY SECTION 336, OR WHEN AN OFFSET JOINT IS CONSTRUCTED.
10. SEE DETAIL 200-2 FOR REMNANT PAVEMENT REMOVAL REQUIREMENTS.
11. EXPOSED COPPER OR POLYETHYLENE WATER PIPE UP TO 2" IN DIAMETER IN TRENCHES TO BE BACKFILLED WITH CLSM SHALL BE WRAPPED WITH MINIMUM 3/4" THICK PREFORMED PIPE-COVERING FOAM INSULATION BEFORE PLACING CLSM.
LONGITUDINAL TRENCH
(TRENCH IN PAVEMENT PARALLEL TO TRAFFIC)

EXISTING S/W TYP.

q. OF STREET

TRENCH

EXISTING PAVEMENT

EXISTING C/G TYP.

TRANSVERSE TRENCH
(TRENCH IN PAVEMENT NOT PARALLEL TO TRAFFIC)

EXISTING S/W TYP.

TRENCH

q. OF STREET

EXISTING PAVEMENT

EXISTING C/G TYP.

TRENCH WIDTH

FINAL BACKFILL

TOP OF PIPE, CONDUIT OR CONCRETE-ENCASED DUCT BANK

12"

SPRINGLINE

HAUNCHING

BEDDING

MINIMUM WIDTH AT SPRINGLINE ON EACH SIDE OF PIPE

Curb, gutter, concrete pavement or other concrete structure

EDGE OF CONCRETE

EXIST. AC

REMOVE IF REMNANT IS 48" WIDE OR LESS AND RESTORE PER DETAIL 200-1

TYPE “A”, TYPE “B” OR "T-TOP" TRENCH REPAIR

NOTES:

1. SEE SECTION 601 FOR TRENCH EXCAVATION, BACKFILLING AND COMPACTION REQUIREMENTS.

2. SEE DETAIL 200-1 FOR DETAILED TRENCH REPAIR REQUIREMENTS FOR TRENCH TYPES NOTED HEREFIN.

3. SEE DETAIL 211 FOR REQUIREMENTS REGARDING THE USE OF PLATING TRANSVERSE TRENCHES. USE OF STEEL PLATES SHALL NOT EXCEED 72 HOURS AFTER COMPLETION OF BACKFILL AND PRIOR TO FINAL PATCHING.
A.C. PAVEMENT
AGGREGATE BASE
PER STANDARD
SECT. 310
GRADING PER
STANDARD
SECT. 301

TYPE 'A'

A.C. PAVEMENT
AGGREGATE BASE
PER STANDARD
SECT. 310
GRADING PER
STANDARD
SECT. 301

TYPE 'B'

OVERLAY OR
FINISHING COURSE
TACK COAT
EXISTING PAVEMENT
OR NEW PAVEMENT
AGGREGATE BASE
PER STANDARD
SECT. 310
GRADING PER
STANDARD
SECT. 301

SAFETY EDGE

D = DESIGN THICKNESS OF A.C.
PAVEMENT PLUS AGGREGATE BASE.

EDGE ROADWAY PAVEMENT

UNPAVED SHOULDER
RECOMPACT TO 95%

TACK COAT

COMPACTED SUBGRADE

5' MIN.
PAVED ALLEY DETAIL

THICKENED EDGE
(OMIT IF MATCHING TO EXISTING ASPHALT AREA)

CONC. GUTTER REQUIRED WHERE LONGITUDINAL GRADE LESS THAN 0.20%

FULL ALLEY WIDTH

VARIES

VARIES

3" ASPHALTIC
CONC. SECT. 710

3%

6" A.B.C.
SECT. 702

3%

12"

GRADE ALLEY FULL WIDTH
AND INSTALL 6" A.B.C. OR CRUSHED GRANITE AS INDICATED

GRADING SECT. 301

BRUSH FINISH

CLASS 'A' CONCRETE

TROWEL SMOOTH

LENGTH BETWEEN CONTRACTION JOINTS – 15'
EXPANSION JOINTS – 100' MAX.

12' (16')

VARIES

VARIES

6" A.B.C.
SECT. 702

GRADING SECT. 301

3" CROWN EXCEPT WHERE
DIRECTED OTHERWISE IN
WRITING BY THE ENGINEER

LESS THAN 20'

2" ASPHALTIC
CONC. SECT. 710

GRADING SECT. 301

6" A.B.C.
SECT. 702

UNPAVED ALLEY DETAIL

RESIDENTIAL ALLEY DETAIL
3/8" FLATHEAD STAINLESS STEEL CAP SCREW COUNTERSINK (6 EACH MIN.)

SEE NOTE 5

SEE NOTE 1

TRANSITION FROM ROLL CURB TO VERTICAL CURB

1/8"

2" x 2" x 1/8"

ANGLE BOTH SIDES

NO. 4 REINFORCEMENT BAR, 4" LONG 3 EACH SIDE, MIN.

SECTION 'A-A'

SECTION 'B-B'

NOTES:
1. ANGLE EQUALS 45° UNLESS SPECIFIED ON PLAN.
2. DIMENSION 'B' EQUALS 'A' + 2'
3. (→) INDICATES DIRECTION OF FLOW.
4. PAINT STEEL ACCORDING TO SECTION 790.
   PAINT NUMBER 1-A OR 1-B.
5. R EQUALS 1" UNLESS OTHERWISE DIRECTED.
6. H EQUALS CURB FACE HEIGHT.
7. FOR ROLL CURB AND GUTTER, USE 2" TRANSITIONS TO VERTICAL CURB.
8. CONCRETE SHALL BE CLASS B PER SECT. 725 AND INSTALLED PER SECT. 505.
PLAN OF CONCRETE EQUIPMENT CROSSING

NOTES:

1. WHEN EQUIPMENT CROSSING LIES ADJACENT TO BRIDGE OR BOX CULVERT, CONSTRUCT THE EQUIPMENT CROSSING TO WIDTH OF BRIDGE ROADWAY.

2. ALL DOWELS IN CENTER JOINTS SHALL BE DEFORMED BARS AND SHALL HAVE UNBROKEN BOND. THEY SHALL BE HELD SECURELY IN PLACE, PARALLEL TO THE SUBGRADE AND PERPENDICULAR TO THE CENTER LINE OF THE ROAD.

3. THE EDGING TOOL USED FOR ALL LONGITUDINAL JOINTS SHALL BE SO CONSTRUCTED AS TO PROVIDE A SMOOTH TROWELED SURFACE 3" WIDE ON EACH SIDE OF THE JOINT.

4. IF APPROVED BY THE ENGINEER, OTHER DEFORMATIONS MAY BE USED IN LONGITUDINAL JOINT — DETAIL 'C'.

5. DETAIL 'C' TO BE USED ONLY WHEN FULL WIDTH CAN NOT BE Poured IN ONE POUR. USE DETAIL 'D' IF FULL WIDTH IS Poured IN ONE POUR.
NOTES:

1. **W** = INDICATES WIDTH OF PAVED SURFACE OF TURNOUT.
   **L** = INDICATES LENGTH OF PAVED SURFACE OF TURNOUT.
   **R** = RADIUS.

2. SIZE AND TYPE OF TURNOUT SHALL BE NOTED ON PLANS AS FOLLOWS:
   90° = NO RADIUS: WxL=SURFACE-TYPE; (12' x 30'-A.C.—TYPE "B" TURNOUT).
   90° WITH A RADIUS: WxLxR=SURFACE-TYPE; (12' x 20' x 15'-A.C.—TYPE "C"
   TURNOUT). OTHER THAN 90° WITH 2 RADIUS-TYPE "S": WxLxR1xR2=SURFACE-TYPE;
   (12' x 20' x 15'-A.C.—TYPE "S" TURNOUT).
   OR IT MAY BE NOTED ON PLANS IN CONVENTIONAL TERMS.

3. TURNOUTS TO BE STRAIGHT TYPE UNLESS OTHERWISE NOTED ON PLANS.

4. A.C. AND BASE MATERIAL THICKNESS FOR TURNOUTS SHALL BE THE
   SAME AS SHOWN ON THE ROADWAY SECTION, UNLESS OTHERWISE NOTED.

5. ANY EXCAVATION OR EMBANKMENT FOR TURNOUTS IS INCLUDED IN THE
   ROADWAY QUANTITIES.

6. TURNOUTS ARE TO BE PLACED WHERE SHOWN ON PLANS, OR AS DIRECTED
   BY THE ENGINEER.

* UNLESS OTHERWISE NOTED ON PLANS
SCUPPER PLAN VIEW

SECTION A–A

SECTION B–B

SECTION C–C SPILLWAY

NOTES:
1. TRANSITION TO SPILLWAY/CHANNEL AS PER APPROVED PLANS.
2. A CENTER WALL SHALL BE INSTALLED IN SCUPPERS WIDER THAN 4' OR IF MORE THAN 1 SCUPPER IS BUILT IN SERIES.
3. EXPANSION JOINT FILLER SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, ASTM D-1751.
4. CONCRETE FOR THE SCUPPER SHALL BE CLASS 'A' PER SECTION 725. CONCRETE FOR THE SPILLWAY SHALL BE CLASS 'A' OR CLASS 'B'.
5. 12" OFFSET DISTANCE SHALL BE INCREASED TO 2'-6" FOR DESIGNATED BICYCLE PATHS.
NO. 4 REINFORCEMENT
WELDED TO ANGLE SEE
DETAIL 536-1,
SECTION C-C

NOSE ANGLE
∠ 3" x 4" x 1/2"

STANDARD CURB BATTER

CONCRETE EDGE

3/4" 2" 3/4" 3/4" 5-1/2"
1/4"x3-1/2"x5-1/2" ft

NO. 4 REINF. BAR (TYP)

RAIL POST

WELD PLATE

SAFETY RAIL SEE
DETAIL 145 & NOTE 5

5" SAFETY RAIL OFFSET

SEE DETAIL
ABOVE LEFT

SEE NOTE 6
S=1.5%

SEE NOTE 6
S=3.4%

6" MIN

8" MIN

SECTION D-D

NOTES:
1. TRANSITION TO SPILLWAY/CHANNEL AS PER APPROVED PLANS.
2. A CENTER WALL SHALL BE INSTALLED IN SCUPPERS WIDER THAN 4'
   OR IF MORE THAN 1 SCUPPER IS BUILT IN SERIES.
3. EXPANSION JOINT FILLER SHALL BE 1/2" BITUMINOUS TYPE PREFORMED
   EXPANSION JOINT FILLER, ASTM D-1751.
4. CONCRETE FOR THE SCUPPER SHALL BE CLASS 'A' PER SECTION 725.
   CONCRETE FOR THE SPILLWAY SHALL BE CLASS 'A' OR CLASS 'B'.
5. SAFETY RAIL SHALL BE CONTINUOUS BETWEEN THE SPILLWAY
   EXTERIOR WALLS.
6. USE WELD PLATES FOR SAFETY RAIL ANCHORS LOCATED IN THE
   5" THICK CONCRETE.
SAFETY RAIL EXTENSIONS BEYOND SCUPPER PER DETAIL 145.
NOTES:

1. HUMPS MUST BE THE FULL 3" FOR MAXIMUM EFFECT BUT SHALL NOT EXCEED 3.25".

2. HUMPS CONSTRUCTED OVER 3.25" OR LESS THAN 3.00" SHALL BE REMOVED AND REPLACED AT THE CONTRACTOR'S EXPENSE.

3. CROSS-SECTION ELEVATIONS SHALL HAVE A MAXIMUM TOLERANCE OF ±0.25".

4. SPEED HUMPS SHALL NOT BE PLACED OVER MANHOLES, WATER VALVES, SURVEY MONUMENTS, JUNCTION CHAMBERS, ETC. OR IN CONFLICT WITH DRIVEWAYS.

5. SPEED HUMPS MUST BE PLACED AT LOCATIONS APPROVED BY THE AGENCY.

6. HUMP TO BE CONSTRUCTED WITH ASPHALT MIX APPROVED BY THE AGENCY. ASPHALT COMPACTION SHALL BE PER SECTION 321. A TACK COAT PER SECTION 713 SHALL BE APPLIED PRIOR TO APPLICATION OF PAVEMENT.

7. INSTALLATION JOINTS:

   A. STANDARD INSTALLATION:
   THE EXISTING ROADWAY SHALL BE MILLED TO A MINIMUM DEPTH OF 3/4" AROUND THE PERIMETER. CROSS SECTION DIMENSIONS DO NOT INCLUDE THE 3/4" MILLING. CONTRACTOR MUST PROVIDE VERIFICATION OF CROSS-SECTION DIMENSIONS.

   B. ALTERNATIVE INSTALLATION:
   FOR TRANSVERSE JOINTS (CROSS ROADWAY), THE EXISTING ASPHALT SHALL BE SAW CUT AND REMOVED FOR A WIDTH OF 24". THE ASPHALT SHALL BE REPLACED WITH THE SAME ASPHALT AND AT THE SAME TIME AS THE HUMP ASPHALT. FOR LONGITUDINAL JOINTS, THE EXISTING ASPHALT SHALL BE OVERLAID AND TAPERED IN 12". CROSS-SECTION DIMENSIONS REFLECT DISTANCES FROM THE SURFACE OF EXISTING ASPHALT.

8. CONTACT THE AGENCY (OR INSPECTOR) ONE WEEK PRIOR TO INSTALLATION TO COORDINATE PAVEMENT MARKINGS AND SIGNING.
NOTES:

1. USE TYPE 1 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS LESS THAN 30 MPH. USE TYPE 2 PLATE INSTALLATION WHERE POSTED SPEED LIMIT IS 30 MPH OR GREATER.

2. FOR TYPE 2 PLATE INSTALLATION, THE STEEL PLATE SHALL BE RECESSED BY MILLING INTO THE EXISTING ASPHALT TO SET FLUSH WITH THE SURFACE OF THE EXISTING ASPHALT. FULL DEPTH CUTTING OF PAVEMENT SECTION OUTSIDE OF TRENCH IS NOT PERMITTED. MILLING DEPTH SHALL MATCH THICKNESS OF PLATE. THE GAP BETWEEN THE EDGE OF THE PLATE AND THE ADJACENT EXISTING ASPHALT PAVEMENT MUST BE FILLED WITH TEMPORARY ASPHALT.

3. TRENCH WIDTHS ARE BASED ON AN ANALYSIS PER THE 14TH EDITION OF STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES BY AASHTO. AN ASSUMED AXLE LOADING OF 12 TONS WITH A 30% IMPACT FACTOR WAS USED. THE AXLE LENGTH IS 6 FEET. THEREFORE THE NUMBER OF WHEELS CARRIED BY A PLATE DEPENDS ON THE ROADWAY WIDTH.

4. STEEL PLATE MUST BE ABLE TO WITHSTAND H-20 TRAFFIC LOADINGS WITHOUT ANY MOVEMENT.

5. PLATES SHALL BE FABRICATED FROM ASTM A36 STEEL (MIN).

6. PLATES SHALL BE SECURED FROM LATERAL MOVEMENT AND VERTICAL VIBRATION (ASSOCIATED NOISE) WHILE IN USE BY TEMPORARY ASPHALT (COLD MIX.)
TYPE A PAVEMENT REPAIR

1. DIMENSIONS ARE NOMINAL.
2. EDGES SHALL BE CUT TO A NEAT VERTICAL FACE.
3. PLACE CLSM BACKFILL IN ACCORDANCE WITH SECTION 604.
4. PLACE AGENCY-APPROVED ASPHALT CONCRETE IN MAXIMUM 2" LIFTS.

TACK EDGES

6" MIN. THICKNESS OR MATCH EXISTING, WHICHER IS GREATER.

SECTION A-A

TYPE B PAVEMENT REPAIR

1. CUT, REMOVE AND REPLACE PAVEMENT PLUG IN ACCORDANCE WITH SECTION 355.
2. PLACE BACKFILL IN ACCORDANCE WITH SECTION 355.
3. BONDING MATERIAL SHALL BE AS SPECIFIED IN SECTION 708.

BONDING MATERIAL

1-1/2" TO 2" COMPACTED CRUSHED GRAVEL (ASTM C33 #8)

SECTION A-A

FINAL BACKFILL MATERIAL OPTIONS:
- NATIVE SOIL PER SECTION 601 (TYPE B ONLY)
- ABC PER SECTION 702 (TYPE B ONLY)
- 1/2-SACK CLSM PER SECTION 728

HIGHEST EXISTING UTILITY(S)

MATERIAL TO CONFORM TO SECTION 601

TYPE A OR B PAVEMENT REPAIR
FLUSH WITH EXISTING PAVEMENT

ASPHALT VARIABLE THICKNESS

PLAN VIEW

DRILLED/CORED PILOT HOLE

PLAN VIEW

DETAIL NO. 212
STANDARD DETAIL ENGLISH
UTILITY POTHOLE REPAIR

REvised 01-01-2015
DETAIL NO. 212
**NOTES: (TYPE A)**

1. All exposed surfaces to be trowel finished except as shown. See Sect. 340.
2. H = 6" or as specified on plans.
3. Contraction joint spacing 10' maximum.
4. Expansion joints as per Sect. 340.
5. Class 'B' concrete per 725.
6. When the adjacent pavement section slopes away from the gutter, the slope of the gutter pan shall match the pavement cross slope.

**NOTES: (TYPE B)**

2. Broom finish all surfaces.
3. Ribbon curb may slope towards pavement or parkway as indicated on plans.
4. Contraction joint spacing 10' maximum.
5. Concrete shall be Class 'B' per Sect. 725 and installed per Sect. 505.

**NOTES: (C & D)**

1. All work and materials shall conform to Sect. 304, 505 and 725. Broom finish to exposed surface.
2. Contraction joint spacing 10' maximum.
3. Expansion joints as per Sect. 340.
4. Class 'B' concrete per 725.
MOUNTABLE CURB AND GUTTER (TYPE E)

MOUNTABLE CURB AND GUTTER (TYPE F)

CURB TRANSITION TYPE 'E' TO TYPE 'A'

CURB TRANSITION TYPE 'F' TO TYPE 'A'

NOTES: (E & F)
1. ALL EXPOSED SURFACES TO BE TROWEL FINISHED EXCEPT AS SHOWN. SEE SECT. 340.
2. CONTRACTION JOINT SPACING 10' MAXIMUM.
3. EXPANSION JOINTS PER SECT. 340.
4. CLASS 'B' CONCRETE PER SECT. 725.
5. WHEN THE ADJACENT PAVEMENT SECTION SLOPES AWAY FROM THE GUTTER, THE SLOPE OF THE GUTTER PAN SHALL MATCH THE PAVEMENT CROSS SLOPE.
CURB TRANSITION TYPE 'A' TO TYPE 'C'

NOTES: (CURB AND GUTTER TRANSITIONS)
1. TRANSITIONS WILL BE PAID FOR AS THE PREDOMINANT TYPE OF CURB AND GUTTER BEING TRANSITIONED. WHEN TYPE 'A' CURB AND GUTTER ARE USED AT CURB RETURNS AND TYPE 'C' CURB AND GUTTER IS PREDOMINANTLY USED ELSEWHERE, THE TYPE 'A' TO TYPE 'C' TRANSITIONS SHALL BE MEASURED AND PAID FOR AS TYPE 'C' CURB AND GUTTER.
2. WHERE PROPOSED CONSTRUCTION IS TO BE CONNECTED TO EXISTING CURB AND GUTTER, THE TRANSITION SHALL BE INDICATED ON PLANS.
3. CLASS 'B' CONCRETE PER SECTION 725.
4. TRANSITION BETWEEN TYPICAL SECTIONS SHALL BE ACCOMPLISHED BY THE USE OF DIRECT STRAIGHT LINE TRANSITIONS OF THE FLOW LINE AND OTHER SURFACE FEATURES.

CURB AND GUTTER TRANSITION

NOTES: (INTEGRAL ROLL CURB, GUTTER AND SIDEWALK)
1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.
2. CONTRACTION JOINT SPACING 5' MAXIMUM.
3. EXPANSION JOINTS PER SECTION 340.
4. CLASS 'B' CONCRETE PER SECTION 725.
NOTES:

1. ALL VERTICAL SURFACES TO BE FORMED.

2. VERTICAL SURFACES DOWN FROM 2" BELOW UNDISTURBED SOIL MAY BE PLACED AGAINST NEAT CUT IF APPROVED BY THE ENGINEER AND CONCRETE WILL NOT EXTEND MORE THAN 1" BEYOND THEORETICAL FACE.

3. ALL EXPOSED SURFACES TO BE STRIPPED GREEN AND TROWEL FINISHED.

4. CONCRETE CURBS CONFORM TO SECT. 340.

5. MAXIMUM SPACING OF CONTRACTION JOINTS IS 10'

6. CONCRETE TO BE CLASS 'B' PER SECT. 725.

7. WHEN PAVEMENT AND BASE COURSE EQUALS OR EXCEEDS 10" IN DEPTH, THE ENTIRE ROADWAY SIDE OF THE CURB SHALL BE FORMED. THE TOTAL CURB HEIGHT REMAINS 18" UNLESS NOTED OTHERWISE.

TYPICAL CURB TERMINATION
NOTE:
LENGTH OF TRANSITION SHALL BE
EQUAL TO RADIUS OF MEDIAN NOSE,
(5' MINIMUM). FOR LOCATION
SEE PLANS.

4" THICK, CLASS 'B' CONCRETE
PLACED IN MEDIAN NOSE TO
1 FOOT BACK FROM TRANSITION.
USE A LIGHT BROOM FINISH.
PAVEMENT PER CONTRACT DOCUMENTS

COMPACTED SUBGRADE PER SECT 301 (TYP)

6" MIN CONCRETE HEADER
SEE NOTE 4

1/4" R (TYP)

80mm CONCRETE PAVER (TYP)

CONTINUOUS EXPANSION JOINT

1" MAX SAND LAYING COURSE (TYP)

4"

9"

CONCRETE BASE SLAB

CLASS "A" CONCRETE (TYP)

CONCRETE HEADER

ELASTOMERIC SEALANT (SEE NOTE 2)

1/2"

CONTRACTION JOINT DETAIL

TYPICAL SECTION
AGAINST PAVEMENT

ELASTOMERIC SEALANT AND EXPANSION JOINT FILLER
(SEE NOTE 1)

NOTES:
1. EXPANSION JOINTS PER SECT 342, EVERY 50'.
2. CONTRACTION JOINTS PER SECT 342, EVERY 10'.
3. MATERIALS AND CONSTRUCTION PER SECT 342.
4. HEADERS SHALL BE 12" AT CROSSWALKS.
5. 60mm PAVERS MAY BE ACCEPTED WITH AGENCY APPROVAL IN NON TRAFFIC AREAS ONLY.

TYPICAL AT END OR ALTERNATE SECTION
AGAINST CONCRETE

1" MAX SAND LAYING COURSE

4"

1/2"

4" FOR 80mm
3 1/4" FOR 60mm PAVERS

80mm CONCRETE PAVER (TYP)

COMPACTED SUBGRADE/ABC PER SECT 301/310

EXPANSION JOINT DETAIL

TYPICAL SECTION (RAISED MEDIAN)

CURB PER CONTRACT DOCUMENTS
VERT CURB & GUTTER PER STD DETAIL 220-1, TYPE A OR SINGLE CURB PER STD DETAIL 222, TYPE 'A'

DETAILED NO. 225
STANDARD DETAIL ENGLISH INTERLOCKING CONCRETE PAVERS

01-01-2016

DETAILED NO. 225
NOTES:
1. SIDEWALK CONSTRUCTION SHALL CONFORM TO SECTION 340.
2. EXPANSION JOINTS SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, PER SECTION 729.
3. LARGE AGGREGATE, IN CONTRACTION JOINT SHALL BE SEPARATED TO A DEPTH OF 1", FINISH DEPTH SHALL BE A MINIMUM OF 3/4".
4. EXPANSION JOINTS SHALL CONFORM TO SECTION 340, BE INSTALLED PRIOR TO CONCRETE PLACEMENT, AND AT A MAXIMUM SPACING OF 50'.
5. CONCRETE SHALL BE CLASS 'B' PER SECTION 725.
6. WHEN SIDEWALK AND ADJACENT CURB ARE CONSTRUCTED MONOLITHICALLY, ALL EXPANSION AND CONTRACTION JOINTS SHALL EXTEND ACROSS THE CURB.
PLAN VIEW

CURB RAMP

DEPRESSED CURB WIDTH

BACK OF CURB

VERTICAL CURB & GUTTER

CURB RAMP CONTROL POINT @ FACE OF CURB

CURB WIDTH VARIES

DEPRESSED CURB

STRAIGHT ALIGNMENT AT BACK OF DEPRESSED CURB TO MATCH EDGE OF DETECTABLE WARNING STRIP
The image contains a detailed diagram of a curb ramp with various annotations and measurements. The diagram includes labels for different parts such as 'LANDING', 'EXPANSION JOINT AT CURB RETURN', and 'CURB AND GUTTER DETAIL'. The text below the diagram provides specifications and notes:

**NOTES:**
1. CLASS 'B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. SIDEWALK SURFACE TO MATCH 1 1/2% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DETAIL IS ADA COMPLIANT FOR \( S_G \leq 2\% \).

**Table:**

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>CURB RAMP MINIMUM LENGTH</th>
<th>( S_G \leq 1% )</th>
<th>( S_G \leq 2% )</th>
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<tr>
<td>4&quot;</td>
<td>5'</td>
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<td>4.5'</td>
</tr>
<tr>
<td>6&quot;</td>
<td>7 1/2'</td>
<td>6.0'</td>
<td>6.5'</td>
</tr>
<tr>
<td>7&quot;</td>
<td>9'</td>
<td>6.5'</td>
<td>7.5'</td>
</tr>
</tbody>
</table>

\( S_G \) = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

**Legend:**
- **Section A-A**
- **Type 'A' (Detached Sidewalk)**
- **Curb Ramps**
- **Revised:** 01-01-2012
- **Detail No.:** 235-1

The diagram also includes a note on the right side: 'SUBGRADE PREPARATION, SEE SECTION 301'.
NOTES:
1. CLASS 'B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
4. INCREASE 'L' OR 'D' AS NEEDED TO HAVE THE TOP OF RAMP FORM A RADIAL LINE.
5. WHEN TOP OF RAMP IS LESS THAN 4" FROM CURB RETURN, EXTEND RAMP TO THE CURB RETURN.
6. DETAIL IS ADA COMPLIANT FOR $S_o \leq 2\%$.

$S_o =$ MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>$D_{(min)}$</th>
<th>$S_o \leq 1%$</th>
<th>$S_o \leq 2%$</th>
</tr>
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<tr>
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<td>7&quot;</td>
<td>7.0'</td>
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<td>7.5'</td>
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</table>

SECTION B-B

TYPE 'B'

SECTION A-A
NOTES:
1. CLASS 'B' CONCRETE CONSTRUCTION PER SECTION 725.
2. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENT.
3. RAMP LONGITUDINAL SLOPE SHALL BE 12:1 OR FLATTER.
4. RAMP CROSS SLOPE SHALL BE 1½%.
5. DETAIL IS ADA COMPLIANT FOR CURB RADII ≥ 20' AND GUTTER SLOPE ≤ 2.0%.

DETAIL

SECTION B-B

SECTION A-A

TYPE 'C'

Details of curb ramps, including dimensions and construction requirements.
ROUGH BROOK FINISH, USE A RIPPLE SURFACE PATTERN

RIGHT-OF-WAY LINE

D (min)

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>CURB RAMP MINIMUM LENGTH</th>
<th>S_0≤1%</th>
<th>S_0≤2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>5&quot;</td>
<td>4.0&quot;</td>
<td>4.5&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>7½&quot;</td>
<td>6.0&quot;</td>
<td>6.5&quot;</td>
</tr>
<tr>
<td>7&quot;</td>
<td>9&quot;</td>
<td>6.5&quot;</td>
<td>7.5&quot;</td>
</tr>
</tbody>
</table>

S_0 = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

NOTES:
1. CLASS 'B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. SIDEWALK SURFACE TO MATCH 1¾% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DETAIL IS ADA COMPLIANT FOR S_0≤2%.

SECTION A-A

TYPE 'D' DETACHED SIDEWALK

DETECTABLE WARNING

CURB AND GUTTER DETAIL 220, TYPE A

EXPANSION JOINT

GUTTER FLOW LINE

SUBGRADE PREPARATION, SEE SECTION 301
SECTION A-A

RIGHT-OF-WAY LINE
VARIES 6'
5'-0" LANDING
2" CURB
RAMP
LANDING @ ½ % SLOPE
CONTRACTION JOINT 1" DEEP OR FORMED SEPARATELY
DETECTABLE WARNING
SUBGRADE PREPARATION, SEE SECTION 301

SECTION B-B

BOTTOM OF RAMP CURB WHEN FORMED & POURED SEPARATELY
RIGHT-OF-WAY LINE
10:1 SIDEWALK TAPER TYPICAL BOTH SIDES
EXPANSION JOINT
S/ W RAMP
TOP OF S/ W EXPANSION JOINT
TOP OF LANDING
RAMP CURB HEIGHT TO MATCH S/ W ELEVATION @ EACH END
ROUGH BROOM FINISH, USE A RIPPLE SURFACE PATTERN
EXPANSION JOINT
CURB AND GUTTER DETAIL 220, TYPE A
DETECTABLE WARNING
D (min)
CURB HEIGHT S G ≤ 1% S G ≤ 2%
4" 4.0' 4.5'
6" 6.0' 6.5'
7" 6.5' 7.5'
S G = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

NOTES:
1. CLASS B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
4. DETAIL IS ADA COMPLIANT FOR S G ≤ 2%.

TYPE 'E'

CURB RAMPS

DETAIL NO. 235-5
STANDARD DETAIL ENGLISH

REVISED 01-01-2011
DETAIL NO. 235-5
NOTES:

1. CLASS 'A' CONCRETE PER SECTION 725, PC TO PT.
2. CONSTRUCTION INCLUDING EXPANSION JOINTS AND MAXIMUM SLOPES SHALL CONFORM TO SECTION 340.
3. WALKWAY SURFACE TO MATCH 1.5% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DISTANCE BETWEEN RAMPS MAY BE ADJUSTED TO IMPROVE ALIGNMENT WITH RECEIVING RAMP WHEN ALLOWED BY THE JURISDICTIONAL AGENCY.
6. SPECIAL DESIGN IS REQUIRED FOR GUTTER GRADES GREATER THAN 2%.

SECTION A-A
5' transition from roll to vertical curb per detail 221 when required.

Limits of heavy broom finish (typ).

Curb modification see detail 234 (typ).

Detectable warning (typ).

Curb height 6" min.

Ramp A

Ramp B

1.5% cross slope (2% max) (typ).

Unpaved.

Expansion joint at curb return (typ).

Curb and gutter detail 220, type A per plan (typ).

4" x 4" min turning space keep within crosswalk (typ).

Curb option.

2. Radius shown on plans

3. Varieties

4. 2 min

5. See note 5

6. See note 5

7. Gutter line

8. Subgrade preparation, see section 301

9. Thickness transition

10. Detectable warning

NOTES:

1. Class 'A' concrete per section 725, PC to PT.

2. Construction including expansion joints and maximum slopes shall conform to section 340.

3. Walkway surface to match 1.5% slope from top of curb.

4. Detectable warning is to comply with the jurisdictional agency's requirements.

5. Distance between ramps may be adjusted to improve alignment with receiving ramp when allowed by the jurisdictional agency.

6. Special design is required for gutter grades greater than 2%.
**NOTES:**

1. CLASS 'A' CONCRETE PER SECTION 725, PC TO PT.
2. CONSTRUCTION INCLUDING EXPANSION JOINTS AND MAXIMUM SLOPES SHALL CONFORM TO SECTION 340.
3. WALKWAY SURFACE TO MATCH 1.5% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. SPECIAL DESIGN IS REQUIRED FOR GUTTER GRADES GREATER THAN 2%.
5' TRANSITION FROM ROLL TO VERTICAL CURB PER DETAIL 221 WHEN REQUIRED

RIGHT-OF-WAY LINE PER PLANS

F/C RADIUS AS SHOWN ON PLANS

LIMITS OF HEAVY BROOM FINISH (TYP)

ROLL CURB

SEA LEVEL

PER PLANS

PC

FL

VARYING

RAMP A

15% PREferred (TYP)

S/M N (TYP)

RAMP B

S/M N (TYP)

10% MAX (TYP)

1.5% CROSS SLOPE (2% MAX) (TYP)

SEE NOTE 7 (TYP)

FL

EXPANSION JOINT AT CURB RETURN (TYP)

CURB AND GUTTER DETAIL 220, TYPE A PER PLAN (TYP)

Curb height 4" MIN

DETECTABLE WARNING (TYP)

2" MIN

SEE NOTE 5

SEE NOTE 8 (TYP)

VARYING

VARYING

LEGEND

RAMP CONTROL POINT AT FACE-OF-CURB SEE PLANS (TYP)

DESIGN ELEVATION SEE PLANS

FL = FLOW LINE, FG = FINISHED GRADE

NOTES:

1. CLASS 'A' CONCRETE PER SECTION 725. PC TO PT.
2. CONSTRUCTION INCLUDING EXPANSION JOINTS AND MAXIMUM SLOPES SHALL CONFORM TO SECTION 340.
3. WALKWAY SURFACE TO MATCH 1.5% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DISTANCE BETWEEN RAMPS MAY BE ADJUSTED TO IMPROVE ALIGNMENT WITH RECEIVING RAMP WHEN ALLOWED BY THE JURISDICTIONAL AGENCY.
6. SPECIAL DESIGN IS REQUIRED FOR GUTTER GRADES GREATER THAN 2%.
7. WING SLOPE SHALL NOT EXCEED 10% MEASURED PERPENDICULAR TO RAMP.
8. RAMP ALIGNMENT SHOULD CONNECT CONTROL POINT TO CONTROL POINT OF RECEIVING RAMP WITHIN 5 FEET.
LEGEND

- RAMP CONTROL POINT
- AT FACE-OF-CURB
- SEE PLANS (TYP)
- DESIGN ELEVATION SEE PLANS
- FL = FLOW LINE, FG = FINISHED GRADE

NOTES:
1. CLASS 'A' CONCRETE PER SECTION 725, PC TO PT.
2. CONSTRUCTION INCLUDING EXPANSION JOINTS AND MAXIMUM SLOPES SHALL CONFORM TO SECTION 340.
3. WALKWAY SURFACE TO MATCH 1.5% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DISTANCE BETWEEN RAMPS MAY BE ADJUSTED TO IMPROVE ALIGNMENT WITH RECEIVING RAMP WHEN ALLOWED BY THE JURISDICTIONAL AGENCY.
6. SPECIAL DESIGN IS REQUIRED FOR GUTTER GRADES GREATER THAN 2%.
7. WING SLOPE SHALL NOT EXCEED 10% MEASURED PERPENDICULAR TO RAMP.
8. RAMP ALIGNMENT SHOULD CONNECT CONTROL POINT TO CONTROL POINT OF RECEIVING RAMP WITHIN 5 FEET.
**LEGEND**

- RAMP CONTROL POINT AT FACE-OF-CURB SEE PLANS (TYP)
- DESIGN ELEVATION SEE PLANS FL = FLOW LINE, FG = FINISHED GRADE

**NOTES:**
1. CLASS 'A' CONCRETE PER SECTION 725, PC TO PT.
2. CONSTRUCTION INCLUDING EXPANSION JOINTS AND MAXIMUM SLOPES SHALL CONFORM TO SECTION 340.
3. WALKWAY SURFACE TO MATCH 1.5% SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. SPECIAL DESIGN IS REQUIRED FOR GUTTER GRADES GREATER THAN 2%.
6. WING SLOPE SHALL NOT EXCEED 10% MEASURED PERPENDICULAR TO RAMP.
7. RAMP ALIGNMENT SHOULD CONNECT CONTROL POINT TO CONTROL POINT OF RECEIVING RAMP WITHIN 5 FEET.
NOTES:

1. ALL CONCRETE TO BE CLASS 'A' UNLESS OTHERWISE APPROVED (SECTION 725).

2. EITHER A CONSTRUCTION JOINT OR CONTRACTION JOINT IS REQUIRED AT THE STREET CENTERLINE.

3. A SEPARATE CONCRETE PAD IS REQUIRED AT ALL EXPANSION JOINTS AND ALL CONSTRUCTION JOINTS.

4. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.

5. CONTRACTION JOINTS SHALL SEPARATE LARGE AGGREGATE BY MOVING THE AGGREGATE TO EITHER SIDE OF THE JOINT FOR A MINIMUM DEPTH OF 2½ INCHES. THE FINISHED JOINT SHALL HAVE 1/4 INCH MAXIMUM RADIi AT THE TOP SURFACE AND BE A MINIMUM OF 3/4 INCHES OF DEPTH.

CONTRACTION JOINT AT APPROXIMATELY 1/3 DISTANCE FROM EXPANSION JOINT. (MATCH TO CURB RAMP JOINT OR SIDEWALK JOINT)
NOTES:
1. DEPRESSED CURB SHALL BE PAID FOR AT THE CONTRACT UNIT PRICE FOR THE TYPE OF CURB USED AT THAT LOCATION.
2. CONTRACTION JOINT ON D/W CENTERLINE.
3. CONTRACTION JOINT.
4. 1/2-INCH EXPANSION JOINTS SHALL COMPLY WITH SECTION 340.
5. BACK OF CURB – CONSTRUCTION JOINT.
6. CONCRETE CLASS AS NOTED IN TABLE. CONCRETE PER SECTION 725.
7. SUBGRADE PREPARATION, SECT. 301.
8. FLOW LINE OF GUTTER.
9. DEPRESSED CURB.
10. SECT. A–A AND ELEVATION: D/W SHOWN WITH VERTICAL CURB AND GUTTER, ROLL TYPE CURB AND GUTTER TREATED SIMILARLY.
11. ROUGH BROOM FINISH FULL WIDTH OF RAMP AND WINGS.
12. TROWEL AND USE LIGHT HAIR BROOM FINISH FOR WALKWAY AREA.
13. 'DRIVEWAY ENTRANCE WIDTH' IS THE DRIVEWAY WIDTH PLUS ADDITIONAL WIDENING REQUIRED BY THE LOCAL JURISDICTION.
14. ELEVATION AT TOP OF DRIVEWAY RAMP SHALL BE EQUAL TO OR HIGHER THAN NORMAL CURB ELEVATION.

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<tr>
<th>COMMERCIAL AND INDUSTRIAL</th>
<th>DRIVEWAY ENTRANCE WIDTH</th>
<th>MIN.</th>
<th>MAX.</th>
<th>CLASS</th>
<th>DEPTH 'X'</th>
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<td>COMMERCIAL</td>
<td>16′</td>
<td>40′</td>
<td>A</td>
<td>9″</td>
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<tr>
<td>INDUSTRIAL</td>
<td>16′</td>
<td>40′</td>
<td>A</td>
<td>9″</td>
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<tr>
<td>*24′ MIN. FOR TWO WAY TRAFFIC</td>
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<td>B</td>
<td>5″</td>
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<tr>
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<td>30′</td>
<td>B</td>
<td>5″</td>
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<tr>
<td>*16′ DESIRABLE</td>
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SECTION A–A

CABLE AND GUTTER
MATCH FLOWLINE
SLOPE 1.5% DESIRABLE 2.0% MAXIMUM
DEPTH 'X'
6" OR DEPTH WHICHEVER IS GREATER
### Notes:
1. Depressed curb shall be paid for at the contract unit price for the type of curb used at that location.
2. Contraction joint(s) for driveway entrance: Width less than 22' NONE required; width greater than 22' and less than 30' locate single joint on D/W centerline; width of 30' or greater locate two joints to equally divide the driveway entrance width.
3. Detail geometricas are based on a curb height of Six Inches (6") , an attached sidewalk width of five feet (5'), and a driveway ramp length not exceeding six feet (6'). Geometric modifications may be required when conditions are modified.
4. 1/2-inch expansion joints shall comply with Section 340.
6. Concrete class as noted in Table: concrete per section 725.
7. Subgrade preparation, Sect. 301.
11. Rough broom finish full width of ramp and wings.
12. Trowel and use light hair broom finish for walkway area.
13. "Driveway entrance width" is the driveway width plus additional widening required by the local jurisdiction.
14. Elevation at top of driveway ramp shall be equal to or higher than normal curb elevation.

### Commercial and Industrial Table

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<thead>
<tr>
<th>DRIVeway ENTRANCE WIDTH</th>
<th>MIN.</th>
<th>MAX.</th>
<th>CLASS</th>
<th>DEPTH 'X'</th>
<th>DRIVeway ENTRANCE WIDTH</th>
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<td>5&quot;</td>
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<td>INDUSTRIAL</td>
<td>16'</td>
<td>40'</td>
<td>A</td>
<td>9&quot;</td>
<td>COLLECTOR STREET</td>
<td>12'</td>
<td>30&quot;</td>
<td>B</td>
<td>5&quot;</td>
</tr>
<tr>
<td>+24&quot; min. for two way traffic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>LOCAL STREET</td>
<td>12'</td>
<td>30&quot;</td>
<td>B</td>
<td>5&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*16&quot; DESIRABLE</td>
<td></td>
<td></td>
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</tbody>
</table>

### Residential Table

<table>
<thead>
<tr>
<th>DRIVeway ENTRANCE WIDTH</th>
<th>MIN.</th>
<th>MAX.</th>
<th>CLASS</th>
<th>DEPTH 'X'</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAJOR STREET</td>
<td>16&quot;</td>
<td>30&quot;</td>
<td>B</td>
<td>5&quot;</td>
</tr>
<tr>
<td>COLLECTOR STREET</td>
<td>12&quot;</td>
<td>30&quot;</td>
<td>B</td>
<td>5&quot;</td>
</tr>
<tr>
<td>LOCAL STREET</td>
<td>12&quot;</td>
<td>30&quot;</td>
<td>B</td>
<td>5&quot;</td>
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<td>*16&quot; DESIRABLE</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
**TABLE A**

<table>
<thead>
<tr>
<th>ZONING</th>
<th>DRIVEWAY WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMERCIAL AND INDUSTRIAL</td>
<td></td>
</tr>
<tr>
<td>16'</td>
<td>40'</td>
</tr>
<tr>
<td>16'</td>
<td>40'</td>
</tr>
</tbody>
</table>

*24' WHERE 2-WAY TRAFFIC IS ANTICIPATED*

**TABLE B**

<table>
<thead>
<tr>
<th>ZONING</th>
<th>DRIVEWAY WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDENTIAL</td>
<td></td>
</tr>
<tr>
<td>MAJOR STREET</td>
<td>16'</td>
</tr>
<tr>
<td>COLLECTOR STREET</td>
<td>12'</td>
</tr>
<tr>
<td>LOCAL STREET</td>
<td>12'</td>
</tr>
</tbody>
</table>

*16' WIDTH IS DESIRABLE*

**NOTES:**

1. EXPANSION JOINT SHALL COMPLY TO SECTION 340.
2. THIS TYPE D/W TO BE USED ONLY UPON APPROVAL OF ENGINEER.
3. CONCRETE:
   - RESIDENTIAL CLASS B
   - COMMERCIAL AND INDUSTRIAL

**SECTION A-A**

- PROPERTY LINE
- PROVIDE EXPANSION JOINTS @ S/W
- WHEN LENGTH (D) IS 16' OR GREATER, A CONTRACTION JOINT SHALL BE PROVIDED AT END OF RETURN AS SHOWN.

- FLOW LINE TROWEL 12" WIDE
- 6" THICK - RESIDENTIAL
- 9" THICK - COMMERCIAL AND INDUSTRIAL
- EXPANSION JOINT
- PAID AS CURB AND GUTTER
- THIS AREA INDICATES LIMITS OF DRIVEWAY PAYMENT AREA
- SUBGRADE PREPARATION AS PER SECT 301
NOTES:

1. SUFFICIENT RIGHT-OF-WAY MUST BE AVAILABLE TO CONSTRUCT THE BUS BAY.

2. 1/2" BITUMINOUS PREFORMED EXPANSION JOINT FILLER ASTM D-1751 PER SPECIFICATION SECTION 729.

3. SUBGRADE PREPARATION PER SPECIFICATION SECTION 301 COMPACTED TO 95% MINIMUM DENSITY.

4. CONCRETE SHALL BE CLASS 'A' PER SPECIFICATION SECTION 725.

5. CONCRETE BUS BAY PAVEMENT SHALL BE BROOM FINISHED, EXCEPT WHERE OTHERWISE NOTED.

6. CONTRACTION JOINTS IN THE BUS BAY PAVEMENT SHALL MATCH THOSE IN THE CURB, 15 FT. MAXIMUM SPACING.

7. CONCRETE BEARING PAD (SECTION A-A) TO BE POURRED SEPARATELY FROM CONCRETE BUS BAY PAVEMENT.

SECTION A-A

- Bond breaker between bearing pad and pavement shall be 15 Lb. Felt or equal.

SECTION B-B

- Flow line
- 2% slope or as noted on plans
- New A.C. pavement
- Std. Det. 222 Type 'A' modified single curb
- Std. Det. 230 sidewalk width per plans

SECTION C-C

- Std. Det. 222 Type 'A' modified single curb
- R=1/2"
- R=3/4"
- 6" min.
TYPE A - WITHOUT RETAINING CURB
* SEE PLANS FOR ALLEY SURFACING REQUIREMENTS

TYPE B - WITH RETAINING CURB
* SEE PLANS FOR RETAINING CURB LENGTHS,
  TOP OF CURB ELEVATIONS, AND ALLEY SURFACING REQUIREMENTS

NOTES:
1. CLASS "A" CONCRETE PER SECTION 725.
2. LIMITS OF HEAVY ROUGH BROOM FINISH.
3. EXPANSION JOINTS PER SECTION 340.
4. SUBGRADE PREPARATION PER SECTION 301.
5. SINGLE CURB PER DETAIL 222, TYPE "B".
6. ALLEY SURFACING PER PLANS.
7. DEPRESSED CURB SHALL BE PAID FOR AT THE CONTRACT
   UNIT PRICE FOR THE TYPE OF CURB USED AT THAT LOCATION.
8. CONTROL JOINT.
THICKEN CONCRETE FROM 6" TO 8" IN 18" AT BACK OF ALLEY ENTRANCE

PROPERTY LINE

ALLEY RIGHT-OF-WAY

BACK OF ALLEY ENTRANCE

CONSTRUCTION JOINT OR SCORE MARK

BACK OF CURB

FLOW LINE GUTTER

LIP OF GUTTER

DEPRESSED CURB

DEPRESSED CURB

WARP

WARP

NOTES:

1. IF ALLEY ENTRANCE IS USED FOR DRAINAGE, THE CENTER BACK OF ALLEY ENTRANCE MAY BE DEPRESSED 2" FOR 4" CURB OR 3" FOR 6" CURB.

2. ROUGH BROOM FINISH FULL WIDTH OF 5' WARP SECTION, EACH SIDE SIDE OF ALLEY ENTRANCE.

3. CLASS 'B' CONCRETE CONSTRUCTION PER SECT. 725.

4. SUBGRADE PREPARATION, PER SECT. 301.

5. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
NOTES:
1. CLASS 'B' CONCRETE CONSTRUCTION PER SECT. 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECT. 340.
3. SUBGRADE PREPARATION PER SECTION 301.
GRADE ADJUSTMENT FOR FRAME AND COVER

COVER SECTION A–A

1. CASTING TO CONFORM TO SECT. 787.
3. #4 REINFORCING STEEL HOOP EQUALLY CENTERED HORIZONTALLY & VERTICALLY.
4. / INDICATES MACHINE FINISHED SURFACE.

NOTES:

MINIMUM WEIGHT 16#/ 63#
GRADE ADJUSTMENT FOR FRAME AND COVER

COVER SECTION A-A

NOTES:
1. CASTING TO CONFORM TO SECTION 787.
2. LETTERS ON COVER TO BE AS FOLLOWS, PER AGENCY REQUIREMENTS:
   3/4" HIGH "RECLAIMED WATER" OR 1/2" HIGH "NONPOTABLE WATER".
   LETTERS TO BE RAISED 1/16".
3. Indicates machine finished surface.
4. VALVE BOX SHALL HAVE A ROUND BOTTOM TO ACCOMMODATE RISER PIPE.

C.I. FRAME AND COVER
NOTE:
This detail covers water gate valves, 4" to 12" inclusive, regardless of type of pipe used. Larger lines to be detailed on plans.

WATER GATE VALVE

CONCRETE FOOTING EQUAL TO TRENCH WIDTH

Cement grouting under valve (non-shrinking)

NOTES:
1. This detail covers butterfly valve installation, 3" to 12" inclusive, regardless of type of pipe or joint used. Larger lines to be detailed on plans.

2. Valve box and cover required per details 270 and 391.
RODS ARE ATTACHED TO LUGS CAST ON BELL OF HYDRANT. IF HYDRANT IS NOT FITTED WITH LUGS, RODS ARE ATTACHED AS SHOWN BY THE DOTTED LINES.
THIS DETAIL IS FOR USE ONLY ON UNDERGROUND INSTALLATIONS WHERE THE USE OF CONCRETE THRUST BLOCKING PER DETAIL 380 CANNOT BE USED BECAUSE OF OBSTRUCTIONS, OR REQUIREMENTS OF THE SPECIFICATIONS...

* **CLAMPS** SHALL BE 1/2 BY 2 INCHES FOR PIPE 4 AND 6 INCHES IN DIAMETER; 5/8 BY 2-1/2 INCHES FOR PIPE 8 AND 10 INCHES; 5/8 BY 3 INCHES FOR PIPE 12 INCHES. BOLT HOLES SHALL BE 1/16 INCH IN DIAMETER LARGER THAN BOLTS.

* **RODS** SHALL BE 3/4 INCHES IN DIAMETER FOR PIPES 4, 6, AND 8 INCHES IN DIAMETER; 7/8 INCHES FOR PIPE 10 INCHES AND 1 INCH IN DIAMETER FOR PIPE 12 INCHES.

* **BOLTS** SHALL BE 5/8 INCHES IN DIAMETER FOR PIPE 4, 6 AND 8 INCHES IN DIAMETER; 3/4 INCHES FOR PIPE 10 INCHES AND 7/8 INCHES IN DIAMETER FOR PIPE 12 INCHES.

* **WASHERS** MAY BE CAST IRON OR STEEL, ROUND OR SQUARE. DIMENSIONS FOR CAST IRON WASHERS ARE 5/8 BY 3 INCHES FOR PIPE 4, 6, 8 AND 10 INCHES IN DIAMETER AND 3/4 BY 3-1/2 INCHES FOR PIPE 12 INCHES. DIMENSIONS FOR STEEL WASHERS ARE 1/2 BY 3 INCHES FOR PIPE 4, 6, 8 AND 10 INCHES IN DIAMETER AND 1/2 BY 3-1/2 INCHES FOR PIPE 12 INCHES IN DIAMETER. HOLES SHALL BE 1/8 INCH LARGER THAN THE RODS.

FOR PIPE LARGER THAN 12 INCHES IN DIAMETER, RESTRAINT DETAILS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO INSTALLATION.


2. HIGH STRENGTH, HEAT TREATED CAST IRON TEE-HEAd BOLTS WITH HEXAGON NUTS, ALL IN ACCORDANCE WITH THE STRENGTH REQUIREMENTS OF A.W.W.A. C-111, MAY BE USED IN LIEU OF THE CADMIUM PLATED BOLTS AND NUTS.

3. THE SKETCHES IN THIS SERIES OF FIGURES SHOW ACCEPTABLE METHODS OF PROVIDING ANCHORAGE. THERE IS NO PARTICULAR SIGNIFICANCE TO BE ATTACHED TO WHETHER THE SKETCH SHOWS A BELL AND SPIGOT JOINT OR A STANDARD MECHANICAL JOINT. THE ANCHORING PROCEDURE ILLUSTRATED APPLIES IN MOST CASES TO EITHER TYPE OF JOINT. IN SOME CASES, DIMENSIONS OF THE PARTICULAR PIPE OR HUB AND SPACE AVAILABLE FOR WORKING AROUND THE PARTICULAR JOINT WILL INFLUENCE THE CHOICE OF METHODS USED.


5. **COATING TYPE:** A.H.D. ASPHALTIC PRIMER 719(A). - ALL EXPOSED METAL.
LRN = SHORTEST LENGTH OF PIPE RESTRAINED TO THE RUN OF THE TEE FITTING (BOTH SIDES OF TEE).

DEAD ENDS

HORIZONTAL BENDS

TEES

VERTICAL UP BEND

VERTICAL DOWN BENDS

UNDISTURBED SOIL
### RESTRAINED LENGTHS, LR, FOR DUCTILE IRON PIPE

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
<th>DEAD ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2&quot;</td>
<td>LRN=0&quot;</td>
</tr>
<tr>
<td></td>
<td>DOWN BEND</td>
<td>UP BEND</td>
<td>DOWN BEND</td>
<td>UP BEND</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-----------</td>
<td>---------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>7</td>
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<td>24</td>
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### RESTRAINED LENGTHS, LR, FOR DUCTILE IRON PIPE WITH POLYETHYLENE WRAP

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
<th>DEAD ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2&quot;</td>
<td>LRN=0&quot;</td>
</tr>
<tr>
<td></td>
<td>DOWN BEND</td>
<td>UP BEND</td>
<td>DOWN BEND</td>
<td>UP BEND</td>
</tr>
<tr>
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</tr>
<tr>
<td>4</td>
<td>26</td>
<td>11</td>
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<tr>
<td>6</td>
<td>36</td>
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<td>7</td>
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<td>8</td>
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<td>98</td>
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<td>289</td>
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<tr>
<td>24</td>
<td>113</td>
<td>47</td>
<td>22</td>
<td>337</td>
</tr>
</tbody>
</table>

**NOTES:**
1. ALL JOINTS WITHIN THE SPECIFIED LENGTH LR MUST BE RESTRAINED. ALL LENGTHS ARE GIVEN IN FEET.
2. THE MAXIMUM TEST PRESSURE SHALL NOT EXCEED 200 PSI
3. THE MINIMUM DEPTH OF BURY SHALL BE 3' TO TOP OF PIPE
4. RESTRAINED LENGTHS MAY BE REDUCED WHEN SUPPORTED BY ENGINEERING CALCULATIONS.
NOTES:

1. STEEL COVER MATERIAL TO BE PER ASTM A786

2. POTABLE WATER COVER PAINTED BLACK AND RECLAIMED WATER COVER PAINTED PANTONE PURPLE 512. USE OIL BASED PAINT ALKALI RESIN PER SECTION 790

3. DIMENSIONS SHOWN SHALL NOT VARY MORE THAN A 1/16 OF AN INCH

4. ALL COVERS MADE OUT OF DIAMOND CHECKER PLATE

5. STANDARD AUTOMATIC METER READER (AMR) HOLE 2" PER AGENCY OR STANDARD SPECIFICATION

6. REFER TO DETAIL 320 FOR VERTICAL LOAD RATING

<table>
<thead>
<tr>
<th>AMR DETAIL OPTION</th>
<th>STEEL WATER METER COVER DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEE NOTE NO. 4</td>
<td>STEEL WATER METER BOX COVER</td>
</tr>
<tr>
<td></td>
<td>DIMS</td>
</tr>
<tr>
<td></td>
<td>COVER NUMBER</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>15–3/4”</td>
</tr>
<tr>
<td>B</td>
<td>3–7/8”</td>
</tr>
<tr>
<td>C</td>
<td>9”</td>
</tr>
<tr>
<td>D</td>
<td>1/2”</td>
</tr>
<tr>
<td>E</td>
<td>1–1/2”</td>
</tr>
<tr>
<td>F</td>
<td>7–1/8”</td>
</tr>
<tr>
<td>G</td>
<td>8–1/4”</td>
</tr>
<tr>
<td>H</td>
<td>1/8”</td>
</tr>
<tr>
<td>I</td>
<td>3–3/4”</td>
</tr>
<tr>
<td>J</td>
<td>NA</td>
</tr>
<tr>
<td>K</td>
<td>NA</td>
</tr>
<tr>
<td>L</td>
<td>13–7/8”</td>
</tr>
<tr>
<td>M</td>
<td>15”</td>
</tr>
<tr>
<td>N</td>
<td>14 GAUGE</td>
</tr>
</tbody>
</table>
NOTES:

1. POTABLE WATER COVER TINTED GRAY AND RECLAIMED WATER COVER TINTED PANTONE PURPLE 512

2. DIMENSIONS SHOWN SHALL NOT VARY MORE THAN A 1/16 OF AN INCH

3. ACCEPTABLE ALTERNATIVES INCLUDE "SHEET MOLDED COMPOUND" (SMC), AND "BULK MOLDED COMPOUND" (BMC). PLASTICS ARE NOT ACCEPTABLE MATERIALS

4. SLOTTED AUTOMATIC METER READING (AMR) HOLE PER AGENCY OR STANDARD SPECIFICATION

5. MARKING PER AGENCY AND/OR UTILITY

6. REFER TO DETAIL 320 FOR VERTICAL LOAD RATING

POLYMER CONCRETE COVER DIMENSIONS

<table>
<thead>
<tr>
<th>DIMS</th>
<th>COVER NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
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</tr>
<tr>
<td>C</td>
<td>5&quot;</td>
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<tr>
<td>D</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>E</td>
<td>8–1/2&quot;</td>
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<td>F</td>
<td>4–3/8&quot;</td>
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<tr>
<td>I</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>J</td>
<td>1–1/2&quot;</td>
</tr>
<tr>
<td>K</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>
NOTES:

1. COVER AND BOX COMBINATION SHALL MEET AASHTO H20

2. DIMENSIONS SHOWN SHALL NOT VARY MORE THAN A 1/16 OF AN INCH

3. MARKINGS PER AGENCY AND/OR UTILITY

4. STACKABLE EXTENSION AVAILABLE TO ACHIEVE DEPTH DESIRED

5. GROUND BELOW THE BOX TO BE COMPACTED TO 95% MAXIMUM DENSITY

6. 6" CONCRETE COLLAR IF REQUIRED BY AGENCY

TRAFFIC BOX DIMENSIONS

<table>
<thead>
<tr>
<th>DIMS</th>
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<tbody>
<tr>
<td>(1324)</td>
<td>(1730)</td>
</tr>
<tr>
<td>A</td>
<td>29 3/4&quot;</td>
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<td>B</td>
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<tr>
<td>D</td>
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<td>H</td>
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<td>I</td>
<td>9 1/2&quot;</td>
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<td>J</td>
<td>16 1/4&quot;</td>
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<td>K</td>
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<td>28 5/8&quot;</td>
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<tr>
<td>O</td>
<td>4&quot;</td>
</tr>
<tr>
<td>P</td>
<td>18&quot;</td>
</tr>
</tbody>
</table>
NOTES:

1. THE METER BOXES SHALL CONFORM TO DIMENSIONS AS SHOWN AND SHALL NOT VARY MORE THAN A 1/16 OF AN INCH

2. THE METER BOXES SHALL BE MADE OF CLASS 'AA' CONCRETE PER SECT. 725. ACCEPTABLE ALTERNATIVE MATERIALS INCLUDE "POLYMER CONCRETE", "SHEET MOLDED COMPOUND" (SMC), "BULK MOLDED COMPOUND" (BMC), AND POLYETHYLENE WITH POLYMER CONCRETE FRAME

3. MINIMUM VERTICAL LOAD RATING PER TIER 5 ANSI/SCTE77 TESTING STANDARD FOR GRADE LEVEL ENCLOSURES AND COVERS

4. FOR LOAD REQUIREMENTS ABOVE 5,000 POUNDS USE DETAIL 319, TRAFFIC RATED BOX AND COVER

METER BOX DIMENSIONS

<table>
<thead>
<tr>
<th>DIMS</th>
<th>BOX NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
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<tr>
<td>B</td>
<td>18-1/2&quot;</td>
</tr>
<tr>
<td>C</td>
<td>11-3/4&quot;</td>
</tr>
<tr>
<td>D</td>
<td>12&quot;</td>
</tr>
<tr>
<td>E</td>
<td>14&quot;</td>
</tr>
<tr>
<td>F</td>
<td>16&quot;</td>
</tr>
<tr>
<td>G</td>
<td>9-1/4&quot;</td>
</tr>
<tr>
<td>H</td>
<td>7&quot;</td>
</tr>
<tr>
<td>I</td>
<td>9-1/4&quot;</td>
</tr>
<tr>
<td>J</td>
<td>5-7/8&quot;</td>
</tr>
<tr>
<td>K</td>
<td>1-1/2&quot;</td>
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<tr>
<td>L</td>
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<td>M</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>N</td>
<td>16&quot;</td>
</tr>
<tr>
<td>O</td>
<td>1/2&quot;</td>
</tr>
<tr>
<td>P</td>
<td>5/8&quot;</td>
</tr>
<tr>
<td>Q</td>
<td>3/4&quot;</td>
</tr>
</tbody>
</table>

3/4" METER 1" METER 1-1/2" METER 2" METER
ALTERNATE: 3/8" STEEL PLATE (ASPHALT COATED) WITH 2" x 2" HINGED ACCESS DOOR

NOTE: TO FACILITATE INSTALLATION OF PRE-CAST VAULT USING CAST-IN-PLACE FOOTINGS, SET CENTER SECTION ON BLOCKS TO GRADE THEN POUR FOOTING. DO NOT BACKFILL CENTER SECTION UNTIL VAULT TOP IS IN PLACE AND FOOTING IS Poured.

PRE-CAST VAULT SECTION

NOTE: PRECAST REINFORCED VAULT SECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS AND DETAILS AS APPROVED BY ENGINEER.

CAST-IN-PLACE OR PRECAST TOP SECTION

CONCRETE MASONRY UNITS (BLOCK) WITH SOLID GROUTED WALLS (GROUT CONFORM TO SECT. 776, CMU CONFORM TO SECT. 775)

BLOCK MASONRY MAY BE USED IN LIEU OF CAST-IN-PLACE VAULT WALLS, NO. 4 REBAR IN EVERY OTHER CORE.

CAST-IN-PLACE VAULT SECTION
NOTES:

1. TAPPING SLEEVE TO BE PLACED A MINIMUM OF 18” FROM ANY BELL COUPLING, VALVE, FITTING OR OTHER OBSTRUCTION.

2. CONTRACTOR SHALL EXCAVATE AS SHOWN AND SHALL SET TAPPING SLEEVE AND VALVE AND TIGHTEN ALL BOLTS PRIOR TO THE PRESSURE TEST.

3. ALL TAPPING SLEEVES AND VALVES MUST BE PRESSURE TESTED PRIOR TO BLOCKING OR TAPPING. THE TEST MUST BE WITNESSED AND APPROVED BY THE INSPECTOR.

4. BLOCKS ARE TO EXTEND TO UNDISTURBED GROUND AND BE INSTALLED BEFORE THE TAP IS MADE. ALL FLANGE BOLTS SHALL BE FREE AND CLEAR OF CONCRETE.

5. CONCRETE THRUST BLOCKS SHALL BE CLASS ‘B’ PER SECT. 725. NORMALLY, CURE TIME FOR CONCRETE IS 24 HOURS BEFORE BACKFILLING.

6. TAPS SHALL BE MADE BY CITY CREWS AT PREVAILING RATES OR BY APPROVED CONTRACTORS WHEN ALLOWED BY AGENCY.

7. THIS DETAIL COVERS TAPPING SLEEVES 4” THROUGH 16” IN SIZE ON DUCTILE IRON, CAST IRON AND ASBESTOS CEMENT PIPE. ANY OTHER SIZE OR TYPE OF PIPE WILL REQUIRE A SEPARATE SUBMITTAL AND APPROVAL BY THE ENGINEER.

<table>
<thead>
<tr>
<th>SIZE OF PIPE BEING CONNECTED</th>
<th>MINIMUM THRUST AREA REQUIRED EQUALS (AxB) (SQUARE FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4” AND LESS</td>
<td>3</td>
</tr>
<tr>
<td>6”</td>
<td>4</td>
</tr>
<tr>
<td>8”</td>
<td>6</td>
</tr>
<tr>
<td>10”</td>
<td>9</td>
</tr>
<tr>
<td>12”</td>
<td>13</td>
</tr>
<tr>
<td>16”</td>
<td>23</td>
</tr>
</tbody>
</table>
FOR VAULT CONSTRUCTION SEE DETAIL 321

TYPICAL BOTH SIDES

FINISH GRADE

WRAP EXPOSED END OF GALV. PIPE IN CONCRETE WITH TAR PAPER OR BUILDING PAPER.

HOLE DIAMETER IS 1" LARGER THAN FLANGE O.D.

FLOW

SOLDER 2" COPPER TO MALE THREAD ADAPTERS

6" MIN. TYP.

INSULATE WATER MAIN FROM CONCRETE BOX WITH EXPANSIVE MATERIAL

18" MIN

(A) - VARIES, SEE TABLE OF VAULT SIZES

VAULT DIMENSION DETAILS

<table>
<thead>
<tr>
<th>A.C.P. SIZE</th>
<th>3&quot;</th>
<th>4&quot;</th>
<th>6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>8'-4&quot;</td>
<td>10'-6&quot;</td>
<td>12'-0&quot;</td>
</tr>
<tr>
<td>(B)</td>
<td>4'-4&quot;</td>
<td>5'-0&quot;</td>
<td>5'-0&quot;</td>
</tr>
</tbody>
</table>

NOTE: METER VAULTS MAY BE EITHER CONCRETE MASONRY UNITS OR CAST-IN-PLACE OR PRE-CAST CONCRETE. SEE DETAIL 321 FOR VAULT CONSTRUCTION.
LEGEND

1. DOUBLE STRAP ALL BRONZE SERVICE SADDLES.
2. CORP. STOP, 2" (BALL TYPE).
3. ADAPTER, FLANGED, TO MECH. JOINT FOR A.C.P.
4. GATE VALVE, FLANGED, WITH HAND WHEEL, OPEN LEFT.
5. TURBOMETER: ROCKWELL SERIES 'W' OR HERSEY SERIES 'M.H.R.' OR NEPTUNE TRIDENT TURBINE.
6. FLANGED SWING CHECK VALVE WITH EXTERNAL LEVER AND WEIGHT.
7. 2" BRONZE CHECK VALVE.
8. 2" TURBOMETER: ROCKWELL 'W-160' OR HERSEY 'M.H.R.' OR NEPTUNE TRIDENT TURBINE.
9. STRAINER (3", 4", 6") AVAILABLE FROM METER MANUFACTURER, INSTALL ONLY WHEN 'TURBO' IS USED.
10. FLANGED SPOOL (3 PIPE DIAMETERS IN LENGTH).
11. O.S.&Y. GATE VALVE, FLANGED WITH HAND WHEEL OPEN LEFT, AND RISING STEM.
13. 6" OR 10" STRAINER, U.L. APPROVED.
14. 2" THREADED OUTLET AND GATE VALVE.

NOTES

1. FOR LARGER METERS, SPECIAL VAULT DESIGN IS REQUIRED.
2. USE OF REMOTE READING DEVICE AT OPTION OF UTILITY.
3. CERTAIN AGENCIES AND/OR UTILITIES PREFER TO CONSTRUCT VAULT, CONTACT AGENCY INVOLVED PRIOR TO VAULT CONSTRUCTION.
NOTES:

1. FIRELINE FROM CITY MAIN TO PROPERTY LINE SHALL BE CONSTRUCTED OF CAST IRON PIPE.

2. REINFORCING TO BE 1/2" DIAMETER REBAR ON 6" CENTERS EACH WAY ON TOP AND 12" CENTERS EACH WAY ON THE SIDES.

3. COVERS TO CONSIST OF TWO METER BOX COVERS DET. 314.

4. BY-PASS METER TO BE ACCORDING TO GOVERNING AGENCY.

5. CHECK VALVE TO BE GLOBE MODEL "A" GRINNEL, HERSEY MODEL D.C., VIKING MODEL "A" OR APPROVED EQUAL.

6. VAULT SHALL BE CONSTRUCTED IN OWNERS PROPERTY AGAINST THE FRONT PROPERTY LINE OR ANOTHER APPROVED LOCATION. WALLS AND FENCES SHALL NOT OBSTRUCT ACCESS.

7. CITY CONTROL VALVE TO BE REQUIRED AT MAIN.

8. PARTS OF PIPE TO BE EMBEDDED IN CONC. SHALL BE WRAPPED WITH 30 LB ASPHALT ROOFING FELT.

9. REMOTE READING DEVICE SHALL BE OF SELF GENERATING ELECTRICAL TYPE. HYDRAULIC OR MECHANICAL DRIVE REGISTERS WILL NOT BE ACCEPTABLE.

10. CONCRETE TO BE CLASS 'B' PER SECT. 725.

<table>
<thead>
<tr>
<th>DIAM. OF PIPE</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>BY-PASS METER SIZE</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>60&quot;</td>
<td>66&quot;</td>
<td>49&quot;</td>
<td>5/8&quot; x 3/4&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>66&quot;</td>
<td>72&quot;</td>
<td>49&quot;</td>
<td>5/8&quot; x 3/4&quot;</td>
<td>30&quot;</td>
</tr>
<tr>
<td>8&quot;</td>
<td>72&quot;</td>
<td>72&quot;</td>
<td>58&quot;</td>
<td>1&quot;</td>
<td>36&quot;</td>
</tr>
<tr>
<td>10&quot;</td>
<td>78&quot;</td>
<td>72&quot;</td>
<td>69&quot;</td>
<td>1-1/2&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>
NOTES:

1. JOINTS BETWEEN THE VALVE AND THE MAIN SHALL BE FLANGED TYPE. JOINTS BETWEEN THE VALVE AND HYDRANT SHALL BE RESTRAINT OR MECHANICAL TYPE.

2. RESTRANTS SHALL BE MECHANICAL RESTRAINT OR THRUST BLOCK PER DETAIL 380.

3. A FLANGE JOINT BY MECHANICAL JOINT VALVE SHALL BE USED AS THE TRANSITION BETWEEN THE JOINT TYPES.

4. PIPING BETWEEN WATER VALVE AND HYDRANT SHALL BE DUCTILE IRON.

5. SEE DETAIL 362 FOR LOCATION OF HYDRANT.

6. PUMPER CONNECTION SHALL FACE THE STREET.

7. NO VALVES ARE TO BE LOCATED IN CURB.

8. NATIONAL STANDARD THREADS REQUIRED ON ALL CONNECTIONS UNLESS OTHERWISE DIRECTED.

9. SEE DETAIL 360-3 FOR CONCRETE PAD.

10. FIRE HYDRANT SHALL BE FRESHLY PAINTED PRIOR TO FINAL ACCEPTANCE.

11. SEE SECTION 756 FOR HYDRANT MATERIAL.
NOTES:

1. JOINTS BETWEEN THE VALVE AND THE MAIN SHALL BE FLANGED TYPE. JOINTS BETWEEN THE VALVE AND HYDRANT SHALL BE MECHANICAL RERAINT MECHANICAL TYPE.

2. RESTRAINTS SHALL BE MECHANICAL RERAINT OR THRUST BLOCK PER DETAIL 380.

3. A FLANGE JOINT BY MECHANICAL JOINT VALVE SHALL BE USED AS THE TRANSITION BETWEEN THE JOINT TYPES.

4. PIPING BETWEEN WATER VALVE AND HYDRANT SHALL BE DUCTILE IRON.

5. SEE DETAIL 362 FOR LOCATION OF HYDRANT.

6. PUMPER CONNECTION SHALL FACE THE STREET.

7. NO VALVES ARE TO BE LOCATED IN CURB.

8. NATIONAL STANDARD THREADS REQUIRED ON ALL CONNECTIONS UNLESS OTHERWISE DIRECTED.

9. SEE DETAIL 360-3 FOR CONCRETE PAD.

10. FIRE HYDRANT SHALL BE FRESHLY PAINTED PRIOR TO FINAL ACCEPTANCE.

11. THE HYDRANT SHALL HAVE 2- 2½" PORT AND 1- 4½" PORT (INDUSTRIAL OR COMMERCIAL).

12. THE HYDRANT SHALL HAVE 1- 2½" PORT AND 1- 4½" PORT (RESIDENTIAL).
TYP MAIN CONNECTION (PREFERRED)

OFFSET FITTINGS

WATER MAIN

VARIES

6" SHORT BODY
90° BEND

PUMPER CONNECTION TO FACE CURB

ALT MAIN CONNECTION

SQUARE OR ROUND IS ACCEPTABLE
IF ROUND: 24" DIAMETER MIN. REQUIRED

CONCRETE PAD LOCATION DETAIL

NOTES:

1. CONCRETE FOR PAD SHALL BE CLASS "A".
2. SCORE LINE SHALL BISECT CONCRETE PAD AT MID POINT OF ALL SIDES.
3. CONCRETE COLOR SHALL MATCH ADJACENT CONCRETE. THE FINISHED CONCRETE SURFACE SHALL HAVE A ROUGH BROOM FINISH (SURFACE ONLY).
4. MULTIPLE OFFSET FITTINGS SHALL NOT BE ALLOWED.
5. MINIMUM 36" CLEARANCE PER NFPA-24 AROUND FIRE HYDRANT.
6. 1/2" BITUMINOUS EXPANSION SHALL BE PLACED AROUND THE BARREL OF THE FIRE HYDRANT AT THE CONCRETE PAD.
NOTES:

1. OBSTRUCTIONS SUCH AS UTILITY POLES, STREET SIGNS, IRRIGATION BOXES, FENCES, ETC., MUST NOT BE PLACED BETWEEN CURB AND HYDRANT AND WITHIN THE RADIUS FOR FIRE DEPT. ACCESS.

2. DIMENSIONS SHOWN ON CONSTRUCTION DRAWINGS SUPERSEDE LOCATIONS SHOWN HERE.

3. ON LOCATIONS IN MIDBLOCK, THE FIRE HYDRANT WILL BE ALIGNED WITH A PROPERTY LINE.

PARKWAY AREA OR NO SIDEWALK

AREA WITH SIDEWALK
CAST IRON

CAST IRON MECHANICAL JOINT

NOTES:

1. THIS DETAIL COVERS MOVING OF WATER MAINS 2" TO 12" ONLY.

2. THRUST BLOCKING AS PER DET. 380 & 381.

3. IF OFFSET IS TO GO OVER OBSTRUCTION, JOINT RESTRAINTS MUST BE USED.

4. PIPE IS TO BE CAST IRON OR DUCTILE IRON.
TYPICAL LOCATIONS OF THRUST BLOCKS

NOTES:
1. TABLE IS BASED ON 200 P.S.I. TEST PRESSURE AND 3,000 LBS/SQ FT. SOIL. IF CONDITIONS ARE FOUND TO INDICATE SOIL BEARING IS LESS, THE AREAS SHALL BE INCREASED ACCORDINGLY.
2. AREAS FOR PIPES LARGER THAN 16" SHALL BE CALCULATED FOR EACH PROJECT.
3. FORM ALL NON-BEARING VERTICAL SURFACES.
4. THRUST BLOCKS ARE TO EXTEND TO UNDISTURBED GROUND. CONCRETE TO BE CLASS 'C', SECT. 725.

MINIMUM THRUST BLOCK AREA REQUIRED (YxW) (SQ. FT.)

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>WATER PIPE</th>
<th>TEE, DEAD END, 90° BEND</th>
<th>45° &amp; 22 1/2° BENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot; OR LESS</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6&quot;</td>
<td></td>
<td>4</td>
<td>3</td>
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<td>12&quot;</td>
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<td>14</td>
<td>7</td>
</tr>
<tr>
<td>16&quot;</td>
<td></td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

SECTION A—A
NOTES:

1. EITHER THIS DETAIL OR RESTRAINT RODS CAN BE USED WHEN IT IS ALLOWED TO RELOCATE A WATER LINE UPWARD OR DOWNWARD TO CROSS A CONFLICT.

2. DUCTILE IRON PIPE MAY BE USED.

3. BARS TO CONCRETE THRUST BLOCK TO BE COATED WITH 2 COATS COAL TAR, EPOXY OR BY OTHER APPROVED METHOD. BARS TO HAVE 90° HOOK ON LOWER END, AS PER TABLE.
NOTES:
1. CURB STOP TO BE MUELLER ORISEAL (H-10283), FORD BALL VALVE B11-777, HAYES BULLETIN 400, J. JONES (J-1900) OR APPROVED EQUAL.
2. REDUCER MAY BE USED WHEN CONNECTING TO SMALLER GALVANIZED PIPE.
3. THIS DETAIL IS TO BE USED WHEN CONNECTING EXISTING GALVANIZED PIPE TO ASBESTOS CEMENT PIPE OR CAST IRON PIPE.

NOTE:
1. VALVE BOX TO BE SUPPORTED ON BRICKS TO PREVENT VERTICAL LOADS FROM BEING TRANSMITTED TO THE SMALL PIPE.
CAST IRON WATER METER BOX COVER PER DETAIL 311

CONCRETE WATER METER BOX NO. 2 PER DETAIL 320

GROUND LEVEL

CAST IRON WATER METER BOX COVER PER DETAIL 311

CONCRETE WATER METER BOX NO. 2 PER DETAIL 320

6" GRAVEL BED

CAST IRON VALVE BOX (LOCKING) PER DETAIL 391-1 BASE TO REST ON THRUST BLOCK

2" BRASS OR COPPER

2" ADAPTER BRASS OR COPPER

2" CORP STOP

2" P.E. OR COPPER PIPE

WATER MAIN

2" TAPPED CAP (CAST IRON)

2" BRASS ELL

2" BRASS COUPLING

WATER LINE

TAPPED PLUG OR CAP

BRONZE OR BRASS FITTING

CONCRETE THRUST BLOCK PER DETAIL 380

VALVE BOX LOCATION MAY VARY IF APPROVED BY THE CITY ENGINEER.

TYPE 'A'

TYPE 'B'

DETAIL NO. 390

STANDARD DETAIL
ENGLISH

CURB STOP WITH FLUSHING PIPE

REVISED 01-01-1998

DETAIL NO. 390
NOTES:
1. VALVE BOX SHALL BE ADJUSTED TO THE FINISHED GRADE PRIOR TO PLACEMENT OF CONCRETE.
2. USE DEEP SKIRTED LID (4" OR MORE) TYPE, SLIDING ADJUSTABLE CAST IRON VALVE BOX C.I. MIN 30,000 P.S.I.
3. GROUND BELOW THE CONCRETE RISER PAD TO BE COMPACTED 95% MAXIMUM DENSITY.
4. CUT RISER PIPE TO LENGTH IN FIELD. CAUTION: IF EXISTING RISER IS ASPHALT-CEMENT PIPE (ACP) FOLLOW OSHA GUIDELINES FOR WORKING WITH ACP.
5. #4 REINFORCING STEEL HOOP EQUALLY CENTERED HORIZONTALLY & VERTICALLY.
6. CONCRETE SHALL BE CLASS "AA" PER SECTION 725.
7. WATER VALVE EXTENSIONS SHALL BE INSTALLED WHEN THE DIMENSION FROM FINISH GRADE TO THE TOP OF THE OPERATING NUT EXCEEDS 5 FEET. SEE DETAIL 393 FOR VALVE EXTENSION.
NOTES:

1. IF TWO OR MORE SECTIONS OF PIPE ARE USED TO MAKE
   THE VALVE BOX RISER, THEY SHALL BE COUPLED OR
   BONDED TO FORM DEBRIS-TIGHT JOINTS.
2. VALVE BOX SHALL BE PLUMB AND CENTERED AROUND THE
   OPERATING NUT.
3. THE TOP OF THE VALVE SHALL BE KEPT CLEAN.
4. THE TOP OF THE RISER SHALL BE A MINIMUM OF 1 INCH
   ABOVE UNDISTURBED OR COMPACTED SOIL AND SHALL
   HAVE A MINIMUM CLEARANCE OF 2" FROM THE RISER TO
   THE LID SKIRT.

SEE NOTE 2

INSTALL 8" CI FRAME
AND COVER PER
DETAIL 270

CONCRETE TO BE
ON UNDISTURBED
OR COMPACTED
SOIL.

COMPACTED BACKFILL IN
LAYERS NOT TO DISTURB THE
RISER PIPE. DENSITY PER
TABLE 601-2.

RISER 8" C-900 PVC
PER AWWA C900 OR
APPROVED EQUAL
SEE NOTE 1

SEE NOTE 3
SHEET 1
NOTES:

1. THE DEBRIS CAP SHALL BE DESIGNED AND INSTALLED TO PREVENT DEBRIS SUCH AS DIRT, DUST, SAND, ETC., FROM PASSING AROUND THE CAP AND DOWN INTO THE VALVE HOUSING. THE CAP SHALL BE HELD IN PLACE BY A MECHANISM WHICH WILL NOT DAMAGE THE VALVE HOUSING.

2. THE CAP SHALL BE MANUFACTURED OF CORROSIVE RESISTANT MATERIALS.

3. DEBRIS CAP SHALL BE INSTALLED AS CLOSE UNDER THE CAST IRON COVER WITHOUT INTERFERING WITH COVER OPERATION.

4. THE CAP SHALL BE CAPABLE OF SECURELY HOLDING A STANDARD LOCATING COIL, "SCOTCH MARK" 4 DISK MARKER BY 3M OR EQUAL.

5. THE CAP SHALL BE CONSTRUCTED TO ALLOW THE DEVICE TO BE SECURED BY A LOCK. THE LOCK (PAD, BARREL, ETC.) SHALL BE SUPPLIED BY THE AGENCY.

6. THE CAP SHALL BE INSTALLED IN ALL VALVE HOUSINGS AS REQUIRED BY THE CONTRACT DOCUMENTS OR BY THE AGENCY'S POLICIES.
**PIPE SLEEVE DETAIL**

**MATERIAL:** STEEL PER ASTM A513

2" SQUARE OPERATING NUT (WITH STAINLESS STEEL FLAT WASHER - 0.43 ID x 1 OD x 0.1 THICK STAINLESS STEEL HEX BOLT - 3/8-16 x 1") NUT TO BE HELD DOWN WITH NUT ON THREADED SHAFT AS STD VALVE STEM ATTACHMENT.

**NOTES:**

1. EXTENSION STEM: WITH A SQUARE SOCKET ON THE BOTTOM TO FIT A 2" SQUARE VALVE OPERATING NUT. VALVE EXTENSIONS ARE REQUIRED ON ALL VALVES INSTALLED WHERE THE OPERATING NUT IS OVER 5' BELOW THE SURFACE. LENGTH TO FIT EACH INSTALLATION. OPERATING NUT TO BE HELD ON TOP OF EXTENSION WITH STOP NUT.

2. PAINTING: ALL STEEL TO HAVE A PRIME COAT OF PAINT NO. 1-D AND ONE HEAVY APPLICATION (FINISH COAT) OF PAINT NO. 9 AS PER SECTION 790.

3. DIRT RING TO FLOAT FREELY ON THE TOP OF THE SUPPORT PLATE.

4. PIPE SLEEVE SHALL BE SECURELY WELDED TO THE UPPER AND LOWER PORTION OF THE 1-1/4" EXTENSION ROD.
NOTES:

1. TYPE ‘A’ PIPE SUPPORT MAY BE USED FOR ANY TYPE CROSSING CONDITION.

2. TYPE ‘C’ PIPE SUPPORT MAY BE USED FOR CROSSINGPIPES WITH A SELL DIAMETER OF 18” OR LESS IF SUFFICIENT CLEARANCE OVER STORM SEWER IS AVAILABLE AND TOTAL SPAN IS LESS THAN 34’.

3. INTERMEDIATE PIPE SUPPORT SHALL BE USED IN CONJUNCTION WITH TYPE ‘C’ PIPE SUPPORT IF TOTAL SPAN EXCEEDS MAX. ‘W’ IN TABLE.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING ALL SUPPORTS BOTH PERMANENT AND TEMPORARY. TEMPORARY SUPPORTS SHALL NOT BE A SEPARATE PAY ITEM.

5. PERMANENT PIPE SUPPORTS MAY BE DECREASED FROM PLAN QUANTITIES OR EXTENDED TO INCLUDE SOME LISTED BELOW AS TEMPORARY SUPPORTS IF CONDITIONS WARRANT THESE CHANGES AT THE TIME OF CONSTRUCTION. DECISION SHALL BE MADE BY THE ENGINEER.


7. USE TYPE ‘B’ PIPE SUPPORT INSTEAD OF TYPE ‘C’ WHEN CLEARANCE IS LESS THAN ‘Y’ IN TABLE, BETWEEN PIPES.

8. CLASS ‘A’ CONCRETE AS PER SECT. 725 UNLESS OTHERWISE NOTED.

SCHEDULE OF REQUIRED SUPPORTS

<table>
<thead>
<tr>
<th>PERMANENT</th>
<th>TEMPORARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEWER LINES</td>
<td>CAST IRON PIPE</td>
</tr>
<tr>
<td>OTHER UTILITIES AS NOTE ON THE PLANS OR AS REQUIRED BY THE ENGINEER AT TIME OF CONSTRUCTION.</td>
<td>CONC. BOX CULVERT</td>
</tr>
<tr>
<td>CONC. IRRIG. PIPE</td>
<td>TRAFFIC CONTROL CONDUIT</td>
</tr>
<tr>
<td>BURIED TELCO.</td>
<td>WATER &amp; SEWER LINES</td>
</tr>
<tr>
<td>GAS PIPES</td>
<td>CONC. STORM DRAIN</td>
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<tr>
<td>CONC. BOX CULVERT</td>
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</tr>
<tr>
<td>WATER &amp; SEWER LINES</td>
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</tr>
</tbody>
</table>
EXISTING CROSSING PIPE

NEW DUCTILE IRON PIPE
CLASS 52 SIZE TO MATCH EXISTING PIPE

NOT TO EXCEED ONE PIPE LENGTH

JOINT METHOD WILL VARY DEPENDING ON EXISTING PIPE MATERIAL

VARIES

5'-0" MIN

BACKFILL AND COMPACT
PER SECTION 601

VARIES

5'-0" MIN
WATER LINE EXCLUSION AND EXTRA PROTECTION ZONES*

NOTES:
ZONE A: NO WATER LINES ALLOWED/MINIMUM SEPARATION.
ZONE B: EXTRA PROTECTION REQUIRED FOR WATER LINES.
* REFER TO STANDARD 610, WATER LINE CONSTRUCTION.
WATER LINE EXTRA PROTECTION

DUCTILE IRON PIPE WITH RESTRAINED OR MECHANICAL JOINTS*

EXTRA PROTECTION DUCTILE IRON PIPE
(GRAVITY OR PRESSURIZED) SEWER LINE

NOTES:
* REFER TO MAG STANDARD SPECIFICATION SECTION 610.
ENCASEMENT FOR PIPE CROSSING*

NOTES:
1. CLASS 'C' CONCRETE AS PER SECTION 725.
*REFER TO MAG STANDARD SPECIFICATION SECTION 610.
REPLACE ALL PAVING ACCORDING TO SECTION 336

NEW CONSTRUCTION

EXISTING SEWER CONNECTION OR MAIN BROKEN DURING EXCAVATION FOR NEW CONSTRUCTION

EXCAVATE 6" BEYOND UNBROKEN BELL TO ALLOW ROOM FOR INSPECTION

18" MIN. WHEN USING BELL CONNECTION

COMPACTION SHALL BE DONE IN ACCORDANCE WITH SECT. 601

6" MIN. WHEN USING CAULDER CONNECTION

SAW SOUND PIPE SQUARE

REPLACEMENT WHEN NEW TRENCH

2' WIDE OR LESS

NEW CONSTRUCTION

12" MIN. SOLID BEARING ON EACH SIDE

SAW SOUND PIPE SQUARE

REBAR TO BE NO. 4 WITH MAX. OF 6" BETWEEN & MIN. OF 3 BARS

DIAMETER AT BELL

CONC. PER SECT. 725, CLASS 'C'

SECTION 'A-A'

NOTES:

1. BROKEN PIPE SHALL BE REPLACED WITH A MINIMUM OF ONE FULL JOINT AND TWO SHORT LENGTHS WITH UNBROKEN BELLS. CONSTRUCTION AND JOINTS TO BE MADE AS PER SECTION 615.
**TYPE 'A' TOP**
(PRECAST ECCENTRIC CONICAL TOP MANHOLE)

24" OR 30" FRAME & COVER PER DET.
423, 424, 425 (TYP)

OVERALL ADJUSTMENT RING
HEIGHT SHALL BE 12" MIN TO 18" MAX (TYP)

USE BUTYL RUBBER MASTIC JOINT SEALANT ON ALL JOINTS; EXCEPT TOP ADJUSTMENT RINGS

PRECAST RISER SECTIONS AS REQUIRED

CONCRETE SHELF SHALL BE PER DETAIL 420-3 SECTION A-A

DIAMETER PER PLAN

CEMENT MORTAR

4" TYP

3" MIN

5" MAX

FLOW

CLASS "A" CONCRETE BASE PER SECTION 725, 505

24" MAX ADJUSTING RINGS PER DETAIL 422 (TYP)

24" TO 26-3/4" ON 48" MANHOLE
30" ON 60" MANHOLE (TYP)

NOTES:

1. PRECAST STEEL REINFORCED MANHOLE SECTIONS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C 476 EXCEPT AS MODIFIED HEREIN.

2. CAST-IN-PLACE MANHOLE BASE TO BE CONSTRUCTED IN ONE PLACEMENT.

3. CAST-IN-PLACE MANHOLE BASE SHELF AND CHANNEL TO RECEIVE SMOOTH TROWEL FINISH.

4. MANHOLE COATINGS PER AGENCY.

5. SEE MAG DETAIL 422 FOR FINAL ADJUSTMENT TO GRADE.

6. ANY MANHOLE OVER 20' SHALL REQUIRE ENGINEER (STRUCTURAL) CALCNS.

7. THE MANHOLE ACCESS POINT SHALL BE ORIENTED IN SUCH A WAY THAT THE OPENING IS DIRECTLY ABOVE THE LOWEST INVERT, OR AS OTHERWISE DIRECTED BY THE PLANS OR ENG.

8. FOR PRECAST BASE SEE DETAIL 420-2.

9. FLAT TOPS SHALL ONLY BE USED WITH APPROVAL FROM THE ENGINEER.
NOTES:

1. PRECAST, MANUFACTURER SHALL BE AN NATIONAL PRECAST CONCRETE ASSOCIATION (NPCA) CERTIFIED PLANT. ENTIRE PRECAST BASE SHALL BE MANUFACTURED AT THE PLANT PER ASTM C478.

2. MAG "AA" 4000 PSI CONCRETE SHALL BE USED FOR PRECAST MANHOLE BASES.

3. SPRING LINE OF CAST-IN-PLACE BELL SHALL STOP AT INSIDE FACE OF MANHOLE.

4. JOINTS FOR BARREL SECTION SHALL BE TONGUE AND GROOVE TYPE. ALL LIFTING HOLES SHALL BE SEALED WITH GROUT.

5. ALL PRECAST MANHOLE BASES SHALL BE PLACED ON 8" MINIMUM OF ABC PER SECTION 702 COMPACTED TO 100% MAXIMUM DENSITY.

6. ALL MODIFICATIONS SHALL BE APPROVED BY THE ENGINEER.

7. MINIMUM WALL THICKNESS SHALL BE PER ASTM C478 (MIN 5").

8. REINFORCEMENT SHALL BE DESIGNED BY AN ARIZONA REGISTERED PROFESSIONAL ENGINEER.

9. CHANNEL TRANSITION SHALL BE CONSTANT FROM INLET TO OUTLET OF MANHOLE TO FACILITATE SMOOTH TRANSITIONS AND ACCOMMODATE CORRESPONDING MANDREL.

10. THERE SHALL BE NO HARD CONNECTIONS (GROUTED) INTO THE MANHOLE BASE UNLESS APPROVED BY THE ENGINEER.

11. ALL SEWER SERVICE CONNECTIONS SHALL HAVE THE SAME CONNECTION TYPES IN THE PRECAST MANHOLE BASE.

12. ALL CORE HOLES INTO THIS STRUCTURAL PRECAST BASE SHALL BE COATED WITH AN APPROVED COATING MATERIAL.

13. THE MANHOLE BOTTOM SHALL EXTEND OUTSIDE THE MANHOLE WALL A MINIMUM 6" WIDE ON 48" BASES, 7" WIDE ON 60" BASES, AND 8" WIDE ON 72" BASES. EXTENDED BOTTOM SHALL BE A MINIMUM OF 5" THICK.

14. ALL PIPE CONNECTIONS SHALL BE IN COMPLIANCE WITH ASTM F477 OR ASTM C425. AN EXTRA STRENGTH VCP BELL WITH A POLYURETHANE JOINT THAT MEETS ASTM C425 MAY BE USED WITH VCP.
OUTLET PIPE PER APPROVED PLANS

CHANNEL, FORMED WITH PRECAST AND CAST IN PLACE BASE, (TYP).

90° MIN ANGLE

IF NO SIDE SEWERS, FORM ONE CONTINUOUS CHANNEL

PROVIDE A ±12 INCH TANGENT AT ALL PIPE CONNECTIONS (TYP)

FLOW

FLOW

FLOW

FLOW

SECTION A–A

TOP OF SHELF TO TOP OF PIPE (MIN 2% SLOPE) NOT TO EXCEED 3"

2"± RADIUS

CHANNEL TRANSITION SHALL BE CONSISTENT FROM INLET TO OUTLET OF MANHOLE TO FACILITATE SMOOTH TRANSITIONS AND ACCOMMODATE CORRESPONDING TRANSITIONS MANDREL.

TYPICAL CHANNEL

SEE DETAIL 420–2 FOR NOTES

CONCRETE MANHOLE BASE

DETAIL NO. 420-3

STANDARD DETAIL

ENGLISH

MARICOPA ASSOCIATION OF GOVERNMENTS

REVISED 01-01-2015

DETAIL NO. 420-3
PIPE SIZE & ELEVATION AS SHOWN ON PLANS

48" I.D. FOR 8" - 14" PIPE
60" I.D. FOR 15" - 30" PIPE

MANHOLE ADJUSTMENT PER DETAIL 422

SEE DETAIL 420-1 FOR ADJUSTMENT REQUIREMENTS

MANHOLE TO BE PRECAST PER SECT. 625

PRECAST RISER PER ASTM C-478

4" TYP

2% MIN NOT TO EXCEED 3"

CLASS A CONCRETE PER SECT. 725, 505

TROWEL FINISH SMOOTH

30" MIN. 36" MAX.

CEMENT MORTAR (TYP)

8" IF MANHOLE IS 13' OR LESS
12" IF MANHOLE IS OVER 13'
NOTES:

1. CONTRACTORS SHALL ADJUST ALL MANHOLE RINGS AND COVERS, INCLUDING MANHOLES OUTSIDE OF THE PAVEMENT.
2. ADJUSTMENT SHALL BE CONSTRUCTED PER MAG SECTION 345.
3. MANHOLE COATINGS PER AGENCY
4. GROUT SHALL BE USED BETWEEN FRAME AND ADJUSTING RING TO ACHIEVE WATER TIGHTNESS.

<table>
<thead>
<tr>
<th>SPACER TYPE</th>
<th>REQUIRED THICKNESS</th>
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<tbody>
<tr>
<td>BRICK</td>
<td>GREATER THAN 2&quot;</td>
</tr>
<tr>
<td>4&quot;X2&quot; STEEL SPACER</td>
<td>1/2&quot; TO 2&quot;</td>
</tr>
<tr>
<td>GROUT</td>
<td>LESS THAN 1/2&quot;</td>
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</table>

OUT OF PAVEMENT—FINISH GRADE

CONCRETE COLLAR, CLASS 'AA' CONCRETE PER SECT. 725 & 505

SUBGRADE PREPARATION TO CONFORM TO SECT. 301 OR 601

#4 REINFORCING STEEL HOOP EQUALLY CENTERED HORIZONTALLY & VERTICALLY (IF REQUIRED BY AGENCY)

ADJUSTING RINGS

ADJUSTING RING DETAIL

(2) NO.2 HOOPS FOR 4"
RING TIED WITH NO. 4 A.S.& W. GAUGE WIRE.
6" & 8" RING REQUIRE (4) NO. 2 HOOPS.

MEDIUM BROOM FINISH WITH RADially SCOREd MARKS (4 MIN.)
NOTE:
LETTERING ON MANHOLE COVER TO CONTAIN NAME OF AGENCY AND UTILITY FOR WHICH MANHOLE IS NEEDED, (I.E. "PHOENIX SANITARY SEWER"), OR AS DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD IDENTIFYING THE AGENCY INVOLVED. LETTERS TO BE 2" IN HEIGHT AND RAISED FLUSH W/ TOP OF RINGS. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% MORE OR LESS THAN THE APPROXIMATE WEIGHT SPECIFIED. CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 35 AND AASHTO M306. THE BEARING SURFACES OF THE FRAMES AND COVERS SHALL BE MACHINED AND THE COVERS SHALL SEAT FIRMLY WITHOUT ROCKING. ALL DIMENSIONS SHALL HAVE A 1/16" TOLERANCE.
NOTE:
LETTERING ON MANHOLE COVER TO CONTAIN NAME OF AGENCY AND UTILITY FOR WHICH MANHOLE IS NEEDED, (i.e. "PHOENIX SANITARY SEWER"), OR AS DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD IDENTIFYING THE AGENCY INVOLVED. LETTERS TO BE 2" IN HEIGHT AND RAISED FLUSH W/ TOP OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% MORE OR LESS THAN THE APPROXIMATE WEIGHT SPECIFIED. CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 35 AND AASHTO M306. THE BEARING SURFACES OF THE FRAMES AND COVERS SHALL BE MACHINED AND THE COVERS SHALL SEAT FIRMLY WITHOUT ROCKING. ALL DIMENSIONS SHALL HAVE A 1/16" TOLERANCE.
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NOTE:
LETTERING ON MANHOLE COVER TO CONTAIN NAME OF AGENCY AND UTILITY FOR WHICH MANHOLE IS NEEDED, (I.E. "PHOENIX SANITARY SEWER"), OR AS DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD IDENTIFYING THE AGENCY INVOLVED. LETTERS TO BE 2" IN HEIGHT AND RAISED FLUSH W/ TOP OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% MORE OR LESS THAN THE APPROXIMATE WEIGHT SPECIFIED. CASTINGS SHALL CONFORM TO ASTM A-48, CLASS 35 AND AASHTO M306. THE BEARING SURFACES OF THE FRAMES AND COVERS SHALL BE MACHINED AND THE COVERS SHALL SEAT FIRMLY WITHOUT ROCKING. ALL DIMENSIONS SHALL HAVE A 1/16" TOLERANCE.
NOTES:

1. MATERIAL SHALL CONFORM TO A.S.T.M. STANDARDS
   B. 179-65 ALLOY SI122A
   B. 179-65 ALLOY CN122A
   B. 108-65 ALLOY SC103A
   (ALL 3 ACCEPTABLE)

2. LETTERING ON MANHOLE COVER TO CONTAIN NAME
   OF AGENCY AND UTILITY FOR WHICH MANHOLE IS
   NEEDED. (I.E. "PHOENIX SANITARY SEWER"), OR AS
   DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS
   TO BE SUCH THAT LETTERS AND WORDS ARE
   EQUALLY SPACED AND BALANCED TO FORM A
   COMPLETE CIRCLE WITH SPACERS BEFORE AND
   AFTER THE WORD IDENTIFYING THE AGENCY
   INVOLVED. LETTERS TO BE 2" RAISED 1/8"
   ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE
   SUBMITTED FOR APPROVAL.

3. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2%
   LESS THAN THE APPROXIMATE WEIGHT SPECIFIED.

4. CASTINGS SHALL CONFORM TO SECT. 787.

5. SHALL CONFORM TO SECT. 625.3.1 - (FRAME
   AND COVER).
TYPICAL STUB OUT

NOTES:

1. NOTE: COMPACT SOIL AT END OF PIPE TO 95% OF MAXIMUM DENSITY.

2. IF DEPTH OF COVER IS LESS THAN 5' OR GREATER THAN 10' INCREASE PLUG THICKNESS A MIN. OF 4".

SEWER LINE

VIT. CLAY PIPE

BAND SEAL COUPLING

PREFORMED JOINT

ANCHOR WITH BRICK OR STAKE AT TRENCH BOTTOM OR TIE TO BELL END

STUB OUT AND PLUGS
NOTES:

1. THIS CONTROL VAULT WITH MANHOLE AND COVER SHALL BE USED ON 6" AND 8" DIAMETER SEWER WITH FLOWS IN THE RANGE OF 40 TO 340 GPM.

2. VAULT TO BE CONSTRUCTED ON STRAIGHT RUN OF BUILDING SEWER, ACCESSIBLE AND SAFELY LOCATED ON THE OWNERS PROPERTY ADJACENT TO A PUBLIC RIGHT-OF-WAY.

3. THE PALMER BOWLUS FLUME SHALL BE INSTALLED PER THE MANUFACTURERS RECOMMENDATIONS.

4. THE PRE-CAST CONCRETE VAULT SHALL BE RECTANGULAR WITH MINIMUM INSIDE DIMENSIONS OF 4' WIDE AND 6' LONG AND AT A DEPTH OF THE DESIGN OF THE BUILDING SEWER.

5. A SHOP DRAWING SHALL BE SUBMITTED TO THE CONTRACTING AGENCY FOR APPROVAL BEFORE INSTALLATION OF THE VAULT AND THE PALMER BOWLUS FLUME WILL BE ALLOWED.
NOTES:

1. ELECTRONIC MARKER SHALL BE A 3M MODEL 1424-XR/10 [4" DIAMETER SELF LEVELING MARKER BALL GREEN IN COLOR] OR APPROVED EQUAL OR AS REQUIRED BY THE LOCAL AGENCY.

2. MARKER SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER’S DIRECTIONS, 2’ BACK FROM THE END OF THE SEWER SERVICE STUB AND CINCH TIED TO PIPE OR ABOVE PIPE AS REQUIRED BY LOCAL AGENCY. AN ADDITIONAL MARKER SHALL BE INSTALLED AT EACH SERVICE STUB BEND.

3. ELECTRONIC MARKER SHALL BE RESTORED BY CONTRACTOR IF DISTURBED WHEN PRIVATE SERVICE LINE CONNECTION IS INSTALLED.

4. MARKER SHALL BE USED IN ADDITION TO A 2"X4" METAL STUD.

5. CONSTRUCTION DETAIL APPLIES WHERE CONTRACTOR BUILDS HOUSE CONNECTION. TAP EXTENDS TO PROPERTY LINE IN ALLEYS OR STREETS OR TO EASEMENT LINE.

6. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.

7. CONSTRUCT TAP AT MINIMUM SLOPE IF COVER WILL BE LESS THAN 5’ AT PROPERTY LINE.

8. ALL FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D-2321. THE CONTRACTOR MAY VARY FROM THE DRAWING TO USE THE APPROPRIATE WYES, TEE-WYES AND BENDS TO ENSURE NO MISALIGNMENT OF THE PIPE AND FITTINGS. BLOCK OR BRACE FITTINGS JOINTS TO ENSURE ZERO DEGREES ANGULAR JOINT DEFLECTION.

9. END OF TAP TO BE SEALED AND MARKED AS NOTED.
NOTES:

1. CONSTRUCTION DETAIL APPLIES WHERE CONTRACTOR BUILDS HOUSE CONNECTION. TAP EXTENDS TO PROPERTY LINE IN ALLEYS OR STREETS OR TO EASEMENT LINE.

2. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.

3. CONSTRUCT TAP AT MINIMUM SLOPE IF COVER WILL BE LESS THAN 5' AT PROPERTY LINE.

4. IF DEPTH REQUIRES, MINIMUM SLOPE CAN BE REDUCED TO 1/8" PER FOOT PROVIDED STUB IS STAKED TO GRADE.

5. ALL FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D-2321. THE CONTRACTOR MAY VARY FROM THE DRAWING TO USE THE APPROPRIATE WYES, TEE-WYES AND BENDS TO ENSURE NO MISALIGNMENT OF THE PIPE AND FITTINGS. BLOCK OR BRACE FITTING JOINTS TO ENSURE ZERO DEGREES ANGULAR JOINT DEFLECTION.

6. END OF TAP TO BE SEALED AND MARKED AS NOTED.

7. ELECTRONIC MARKER SHALL BE A 3M MODEL 1424-XR/ID [4" DIAMETER SELF LEVELING MARKER BALL GREEN IN COLOR] OR APPROVED EQUAL OR AS REQUIRED BY THE LOCAL AGENCY.

8. # 14 BARE COPPER LOCATOR WIRE ACCESSIBLE AT R/W AND AT PROPERTY OWNER CLEANOUT BOX NO GREATER THAN 4' DEEP.

9. STAMP OR WELD THE LETTER "S" ON LID OF METER BOX.

DETAIL NO. 440-2

STANDARD DETAIL ENGLISH

TYPE 'B' - SEWER BUILDING CONNECTION TWO-WAY CLEANOUT AND METER BOX AT R/W (WHEN SPECIFIED BY LOCAL AGENCY)

REVISED 01-01-2007

DETAIL NO. 440-2
NOTES:
1. CONSTRUCTION DETAIL APPLIES WHERE CONTRACTOR BUILDS HOUSE CONNECTION. TAP EXTENDS TO PROPERTY LINE IN ALLEYS OR STREETS OR TO EASEMENT LINE.
2. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.
3. CONSTRUCT TAP AT MIN. SLOPE IF COVER WILL BE LESS THAN 5' AT PROPERTY LINE.
4. IF DEPTH REQUIRES, MINIMUM SLOPE CAN BE REDUCED TO 1/8" PER FOOT PROVIDED STUB IS STAKED TO GRADE.
5. ALL FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D-2321. THE CONTRACTOR MAY VARY FROM THE DRAWING TO USE THE APPROPRIATE WYES, TEE—WYES AND BENDS TO ENSURE NO MISALIGNMENT OF THE PIPE AND FITTINGS. BLOCK OR BRACE FITTING JOINTS TO ENSURE ZERO DEGREES ANGULAR JOINT DEFLECTION.
6. END OF TAP TO BE SEALED AND MARKED.
7. ELECTRONIC MARKER SHALL BE A 3M MODEL 1424—XR/1D [4" DIAMETER SELF LEVELING MARKER BALL GREEN IN COLOR] OR APPROVED EQUAL OR AS REQUIRED BY THE LOCAL AGENCY.
8. INSTALL RAISED 4" THREADED PLUG IN CLEANOUT INCORPORATING 3M MODEL 1414 ELECTRONIC DISC MARKER. GREEN IN COLOR. LOCATOR PLUG TO BE QPK PRODUCTS MODEL #228—0004 DM OR APPROVED EQUAL.
9. STAMP OR WELD THE LETTER “S” ON LID OF METER BOX.
SECTION A–A

CURB STAMP ROLLED CURB

CENTERLINE SEWER SERVICE

SECTION A–A

CURB STAMP VERTICAL CURB

CENTERLINE SEWER SERVICE

NOTES:
1. STAMP TOP OF CURB WITH 4" TALL BY 1/4" DEEP "S" TO DESIGNATE SEWER SERVICE LINE CROSSING.
THE WORD 'SEWER' ON COVER

UNPAVED STREETS AND ALLEYS

CLASS 'AA' CONC. PER SECT. 725, 6"-8" THICK, 40" DIA.

SIZE OF PIPE AS SHOWN ON PLANS

STANDARD 45° BEND

FLOW LINE ELEVATION SHOWN ON PLANS TO THIS POINT

8" C.I. FRAME AND COVER DET. 270

PAVED STREETS AND ALLEYS

COMPACTED BACKFILL OR UNDISTURBED EARTH

STANDARD 45° BEND

VIT. CLAY PIPE PER SECT. 743

TO BE LAID ON UNDISTURBED EARTH OR COMPACTED SELECT MATERIAL (TYPE B) OR A.B.C.

STATION AND LENGTH SHOWN ON PLANS TO THIS POINT

NOTE:
END OF SEWER TAP TO BE SEALED AND MARKED IN ACCORDANCE WITH DET. 440

ONE FULL LENGTH OF PIPE

4" OR 6" V.C.P. TAP TO PROPERTY LINE

8"×8" WYE

6"×8" OR 4"×8" VITRIFIED CLAY INCREASER

CLEANOUT INSTALLATION

SEWER TAP AT CLEANOUT

DETAIL NO. 441

STANDARD DETAIL ENGLISH

SEWER CLEANOUT

REvised 01-01-2001

DETAIL NO. 441
**DOUBLE PIPE HEADWALL**

**ELEVATION**

Concrete masonry units (block) headwalls joined with cement mortar plastered both sides of wall full height and shall be cured per sect. 726.

**HEADWALL DIMENSIONS**

<table>
<thead>
<tr>
<th>Nominal Pipe Size</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
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<tbody>
<tr>
<td>12&quot;</td>
<td>1' - 4&quot;</td>
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<td>3' - 8&quot;</td>
<td>0' - 10&quot;</td>
<td>2' - 10&quot;</td>
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<tr>
<td>15&quot;</td>
<td>2' - 0&quot;</td>
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<td>4' - 0&quot;</td>
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<td>8' - 0&quot;</td>
<td>9' - 4&quot;</td>
<td>2' - 2&quot;</td>
<td>5' - 9&quot;</td>
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* Nominal pipe size given for reinforced conc. pipe.

**NOTES:**

1. All concrete shall be class 'A' per sect. 505 & 725.
2. Concrete masonry units (block) per sect. 510, 775 & 776.
3. Concrete reinf. shall be No. 4 bar 12" o.c. both ways.
2 - NO. 6 BARS BEND TO CONFORM TO PIPE

NOTES:
1. ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 725.
2. ALL REINFORCING BARS SHALL BE NO. 4 EXCEPT NO. 6 BARS OVER PIPE. BAR SPACING APPROXIMATELY 12" C TO C UNLESS OTHERWISE NOTED.
3. 30' WING WALL FLARE SHOWN; 45' NORMALLY DESIRABLE.
NOTES:

1. HIGH POINT OF HEADWALL SHALL NOT PROJECT MORE THAN 3” ABOVE SLOPE.

2. ALL CONCRETE SHALL BE CLASS ‘A’ PER SECT. 725.

3. ALL REINFORCING BARS SHALL BE NO. 4, 12” C TO C AND 3” CLEAR TO INSIDE OF FLOOR AND WALLS.
POURED WALLS

NO. 4 REINFORCED BARS 12" O.C. BOTH WAYS, CLASS 'A' CONCRETE PER SECT. 505, 725 & 727.

BLOCK WALLS

BLOCK HEADWALL TO HAVE ONE NO. 4 REINF. BAR CENTERED IN EACH CORE FOR FULL HEIGHT AND CORES FILLED WITH CONCRETE OR CEMENT GROUT (3:1 RATIO). ALL BLOCKS TO BE JOINTED WITH MORTAR. PLASTERED ON EXPOSED SURFACES THEN SPRAY WITH WHITE PIGMENTED CURING COMPOUND. SECT. 510, 727 & 728.

TRASH RACK

6" PLASTER FLOOR

SECTION A-A

1. REMOVE ALL SCALE FROM RACK BARS. METAL SPRAY OR PAINT WITH ONE COAT ZINC CHROMATE OR RED LEAD PRIMER (INDUSTRIAL QUALITY). OVERCOAT WITH GREY INDUSTRIAL ENAMEL SECT. 790.

2. SHAPE, COMPACT AND PLASTER NEW DITCH FROM HEADWALL TO UNDISTURBED EXISTING DITCH. PLASTER TO EXTEND TO MINIMUM ELEVATION NOTED 3 FEET BEYOND CONNECTION TO UNDISTURBED EXISTING DITCH.


4. 14" PLATE SHALL NOT EXTEND BELOW TOP OF PIPE.
NOTE:
PASTE COVER BOTH SIDES
ONE PRIME COAT, TWO
FINISH COATS, SECT. 790, PAINT NO. 9

10 GAUGE SHEET STEEL COVER

HANDLE EXTENDS 6" BELOW TOP WHEN GATE IS OPEN

TYPE 'A'

NOTES:

1. BRACE TO BE INSTALLED EVERY 2'
FROM TOP OF HEADGATE FRAME. BOTTOM
BRACE TO BE HIGH ENOUGH TO ENABLE
FULL OPENING OF HEADGATE.

2. INSTALL 1/2" BOLTS INTO LEAD
PLUG DRILLED TO WITHIN 1" OF OUT SIDE OF STANDPIPE. SPACERS
TO BE INSTALLED AT EACH BOLT
BETWEEN HEADGATE FRAME AND INSIDE
OF STAND PIPE.

3. LOCATION OF 2" HOLE FOR GATE
STEM TO BE DETERMINED AFTER
INSTALLATION OF GATE.

4. CONCRETE SHALL BE
CLASS A PER SECT. 725.

PAINT ARROW ON OUTSIDE OF STANDPIPE INDICATING DIRECTION "TO OPEN" HEADGATE.

SEE NOTE 3

(4) 3/8" BOLTS TO BE GROUTED INTO STANDPIPE EQUIDISTANT WITH 1-1/2"x3" RECTANGULAR WASHERS AND NUTS

GALVANIZED EXPANDED METAL LID (9 GAUGE)

SEE NOTE 2

REINF. CONC. PIPE

VARIABLE, 52" MAX.

FINISH GRADE

HEADGATE TO BE SWANSON 800 SERIES OR APPROVED EQUAL

FORM CONC. AROUND END OF PIPE BEHIND HEADGATE FRAME

SEE NOTE 1

GROUT JOINTS WATER TIGHT

TYPE 'B'

DETAIL NO. 503
STANDARD DETAIL ENGLISH
IRRIGATION STANDPIPE

REvised 01-01-1998
DETAIL NO. 503
SECTION A-A

CLASS 'B' CONCRETE PER SECTION 725

S/W OR GROUND GRADE

SIZE OF PIPE AS SHOWN ON PLANS

6" MIN.

VARES

SECTION B-B

ELEV. OF BOTTOM OF PAVEMENT SUBGRADE

2" MIN.

9-3/4" 6" 2" 6" 2" 6" 2" 6" 2" 6" 2" 6" 2" 6"

NOTES:

1. SIZE OF JUNCTION BOX TO BE DETERMINED BY THE ENGINEER.
2. GATE TYPE, SIZE AND NUMBER REQUIRED AS SHOWN ON PLANS OR AS SPECIFIED.
3. CONCRETE MASONRY UNITS (BLOCK) PER SECT. 510, 775 & 776

PLAN OF COVER

TO SECURE COVER TO STRUCTURE, USE 1/4"x3" GALVANIZED EYEBOLT AND 1/4"x6" GALVANIZED EYEBOLT BENT TO FORM ANCHOR, AND 3/16" GALVANIZED CHAIN 2" LONG

WELD EYEBOLT TO ANGLE

(2) 1-1/2"x1-1/2"x1/8" ANGLES WELDED TO 1-1/2" NO. 9 EXPANDED METAL (PENMETAL OR EQUAL)

FINISH EDGES WITH 18 GAUGE 1" BINDING, PENMETAL NO. 501 OR EQUAL

CONCRETE BLOCK JUNCTION BOX

01-01-1998

DETAIL NO. 504

STANDARD DETAIL ENGLISH

504
NOTES:

1. A concrete collar is required where pipes of different diameters or materials are joined, or where the change in alignment or grade exceeds that allowed for on ordinary joints.

2. Where pipes of different diameters are joined with a concrete collar, L and T should be those of the larger pipe, D=D-1, or D-2 whichever is greater.

3. For pipe sizes not listed and less than 66", use next size larger.

4. Omit reinforcing on pipe 24" or less in diameter.

5. Where reinforcing is required, the diameter of the circular ties shall be...outside diameter of pipe+T.

6. Field closures of pipe of the same diameter and without change in grade or alignment shall be made with a concrete collar.

7. Concrete shall be class B per Sect. 725.

\[ \text{A}^* = \text{angle of deflection} \]

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</tbody>
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NOTE:
CONTRACTOR MAY USE PRECUT FITTINGS IF DESIRED.
BID ITEM INCLUDES LATERAL PIPE, RISER, PAD, VALVE,
LABOR AND INCIDENTAL MATERIAL REQUIRED FOR
INSTALLATION.

CONSTRUCT OPTIONAL
CONCRETE SCOURING
 BASIN AROUND VALVE
 ASSEMBLY WHERE SPECIFIED

CLASS 'C' CONCRETE
 PER SECTION 725
 WITH TROWEL FINISH

BREAK PIPE
 AND MAKE
 WATERTIGHT
 JOINTS PER
 DETAIL 524

12"

PIECE END PER
 DETAIL 427

PIPE DIAMETER
 TO BE SAME AS
 VALVE SIZE

CONCRETE PIPE
 SECT. 735 & 736

PIPE DIAMETER
 TO BE SAME AS
 VALVE SIZE

GROUT AS PER
 DETAIL 524

CONCRETE TEE
 OR ELBOW

SNOW, IDEAL,
 WATERMAN ALFALFA
 VALVE OR EQUAL

REVISED
01-01-1998

DETAIL NO.
506

STANDARD DETAIL
ENGLISH

IRRIGATION VALVE INSTALLATION

DETAIL NO.
506
NOTES:

1. THIS DETAIL SHALL BE REQUIRED WHEN NEW OR EXISTING PIPE INSTALLATIONS WILL BE SUBJECT TO DAMAGE ANYTIME IN THE FUTURE DUE TO LACK OF PROPER COVER, AS DETERMINED BY THE ENGINEER.

2. FOR PIPE OVER 18" I.D., WOOD, METAL OR GYPSUM BOARD FORMS MUST BE USED TO FORM THE SIDES OF THE ENCASEMENT. GYPSUM BOARD FORMS MAY BE LEFT IN THE GROUND BELOW THE TOP OF THE ENCASEMENT. THIS SHALL BE OPTIONAL WITH POURING AGAINST TRENCH WALLS FOR ENCASEMENT OF 18" AND SMALLER PIPE.

3. FOR ALL SITUATIONS WHERE SIDE FORMS ARE USED, TRENCH WALLS SHALL BE OVER-EVACUTED TO ALLOW SUFFICIENT ROOM TO OPERATE PROPER MECHANICAL COMPACTION EQUIPMENT.

4. CONCRETE WHICH SPILLS BEYOND 12" FROM THE SIDES OF THE PIPE FOR ANY REASON SHALL BE REMOVED BACK TO THE PROPER LINE PRIOR TO BACKFILLING.

5. SEE SECTION 601 FOR TRENCH PREPARATION.

6. CONCRETE TO BE CLASS 'A' PER SECTION 725.

7. COVER TO BE APPROVED BY ENGINEER.

LONGITUDINAL SECTION

END SECTION
CONNECTOR CROSS SECTION

NOTE:
USE 5/8" WASHER AND NUT, ALL PIECES (NUTS, WASHERS, AND FABRICATED BOLTS) TO BE GALVANIZED AS PER A.S.T.M. A-123 LATEST REVISION.

8 HOLES 9/16" DIA.

C.M.P. CONNECTION TO MAIN STORM DRAIN
24" PIPE AND SMALLER

C.M.P. MAIN STORM DRAIN

1:2 MORTAR

2"x2"x12" GAUGE WELDED WIRE FABRIC WITH 12" CIRCUMFERENTIAL OVERLAP

C.M.P. PER A.A.S.H.T.O. SPEC. M-36 EXTERIOR COATING AND INTERIOR COATING PER A.A.S.H.T.O. SPEC. M-190, MAY BE TYPE 'A' OR 'D'

SELECT MATERIAL

TYP. BOTH SIDES AND BOTTOM

1/2"

STANDARD THREAD (COARSE)

8" MIN
(TYP.)

6" MIN
(CORRUGATED METAL PIPE AND INSTALLATION)

REVISED 01-01-1998

DETAIL NO. 510

STANDARD DETAIL ENGLISH

MARICOPA ASSOCIATION OF GOVERNMENTS

R=1/2 O.D.

R.C.P., C.P. OR C.M.P.

SEE BAND DETAIL

C.M.P. TYPE 'A' OR TYPE 'B'

SEE T-BOLT DETAIL

C.M.P. STORM DRAIN

T-BOLT

WELD ALL AROUND 1/2"

O.D.+24"

O.D.+24"

1/2"

2-1/2"

1-3/4"

8"

6" MIN
NOTES

1. ALL CONCRETE TO BE CLASS 'A' PER SECT. 725, 505.

2. MATCH SPRING LINES OF PIPE ENTERING MANHOLE UNLESS OTHERWISE NOTED.

3. CUT PIPES TO ALLOW SETTING OF 4” DIA. CYLINDRICAL FORM FROM 6” ABOVE MAIN LINE PIPE TO SPRING LINE. CUT PIPE 2” LARGER THAN FORM TO ALLOW 2” CONCRETE OVER ENDS OF ALL CUT PIPE.

4. INVERT AND BASE OF MANHOLE TO BE Poured AND INVERT TO BE SHAPED BY HAND TO MAKE SMOOTH TRANSITION. FINISH WITH RUBBER FLOAT.

5. CENTER MANHOLE ON PIPE JOINT WHERE PIPE CHANGES SIZES, LEAVING A GAP OF 12” MINIMUM, 24” MAXIMUM.
NOTES:
1. LINE PIPE AND STUB MAY BE CAST MONOLITHICALLY OR STUB MAY BE CAST ON TO LINE PIPE SECTION PRIOR TO COMPLETE CURING.
2. ALL LINE PIPE REINFORCEMENT SHALL BE TURNED UP INTO STUB.
3. THE VERTICAL STUB TO BE A.S.T.M. C-76 CLASS II WALL 'A' AND THE HORIZONTAL PIPE TO BE EQUAL TO STRENGTH OF PIPE ENTERING MANHOLE.
4. ALL REINFORCING STEEL SHALL CLEAR FACE OF CONCRETE BY 1-1/2" UNLESS SHOWN OTHERWISE.
5. CONCRETE ENCAFEEMENT SHALL BE CLASS 'A' PER SECT. 725 AND 505.

**TABLE OF VALUES FOR 'F' & 'D'**

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**SECTION A-A**

- NO.6 BARS 6" O.C. EACH SIDE OF SHAFT
- MAN HOLE SHAFT PER DETAIL 522
- PRECAST PIPE WITH VERTICAL STUB

**SECTION B-B**

- 8'-8" MIN.
- 2'-0" MIN.
- 48" DIA MIN.
- 4'-0" MIN.
NOTES:

1. PRECAST CONCRETE CONES AND SECTIONS TO BE A.S.T.M. C-478.
2. BRICK MAY BE USED IN LIEU OF OR IN COMBINATION WITH CONCRETE ADJUSTING RINGS.
3. PRECAST CONCRETE SECTIONS 48" DIA PIPE MAY BE FURNISHED IN STANDARD LENGTHS.
4. UNLESS OTHERWISE SHOWN ON PLANS, USE (2) 2-1/2" PRECAST CONCRETE ADJUSTING RINGS ON IMPROVED STREETS AND (4) 2-1/2" RINGS ON UNIMPROVED STREETS.
5. CONCRETE SHALL BE CLASS A PER SECTION 725 AND 505.

VERTICAL SECTION OF ECCENTRIC MANHOLE SHAFT
FOR A 30" M.H. OPENING, USE THE STD. WATER TIGHT 30" M.H. FRAME & COVER, AND ANCHOR THE FRAME AS OUTLINED IN THE INSTRUCTIONS NOTED ON THIS SHEET.

FOR A 24" M.H. OPENING, MODIFY THE STD. 24" M.H. FRAME & COVER, FOLLOWING THE NOTED PROCEDURES, ONE THRU FIVE.

NOTES:

1. DRILL (8) HOLES 17/32" IN COVER FOR 1/2" CAPSCREWS, COUNTERBORE 1/2" DEEP BY 1-1/8" DIA. TO ACCOMMODATE CAPSCREW AND SOCKET WRENCH. SPACE EQUALLY.

2. DRILL (8) HOLES AND TAP FOR 1/2" – 13 THREAD NATIONAL COARSE BOLT.

3. DRILL, TAP AND COUNTERBORE (2) HOLES FOR 1/2" CAPSCREWS TO BE USED FOR LIFTING COVER. PLUG WITH CAPSCREWS.

4. COVER AND FRAME MUST BE MATCHED, DRILLED AND TAPPED IN SETS.

5. CASTING DIMENSIONS GIVEN ABOVE ARE FROM DET. 424, 24" MANHOLE FRAME AND COVER. BOTH 24" AND 30" FRAMES TO BE ANCHORED AS FOLLOWS:

6. DRILL 1/2" HOLE IN FILLET. DO NOT USE ADJACENT FILLETS.

7. 1/4" STAINLESS STEEL CABLE. SECURED WITH CABLE CLAMPS.

8. 1/2"x9" HOOK AND EYE TURNBUCKLE.

9. 1/2" EYE BOLT WITH 1" DIA. EYE.

10. INSTALL THREE CABLES PER 24" COVER (FOUR CABLES FOR 30" COVERS). EYEBOLTS TO BE SET DIRECTLY BELOW FILLETS USED.

11. TRIPLE WRAP TURNBUCKLES AND CABLE CLAMPS WITH 1" WIDE TAPE. SAFE-T-CLAD, F.O.S. 655, OR APPROVED EQUAL.
NOTES:

1. DRILL (6) HOLES IN 30" COVER (4 HOLES IN 24" COVER) 17/32" CORED RECESS FOR 1/2" CAPSCREWS. SPACE EQUALLY (304 S.S.)

2. DRILL (6) HOLES IN 30" FRAME (4 HOLES IN 24" FRAME) AND TAP FOR 1/2" - NATIONAL COARSE BOLT (HEX HEAD).

3. COVER AND FRAME MUST BE MATCH MARKED, DRILLED AND TAPPED IN SETS.

4. DIMENSIONS, LETTERING, WEIGHTS AND MATERIALS SHALL CONFORM TO DET. 424.

5. REFER TO DETAIL 523-1 FOR INSTALLATION PROCEDURES.
NOTES:

1. **D** SHALL BE 24" OR LESS. FOR LARGER VALUE OF **D** USE MANHOLE OR JUNCTION STRUCTURE.
2. IN NO CASE SHALL THE OUTSIDE DIAMETER OF THE INLET EXCEED ONE HALF THE INSIDE DIAMETER OF THE MAIN STORM DRAIN.
3. CENTERLINE OF INLET SHALL BE ON RADIUS OF MAIN STORM DRAIN EXCEPT WHEN ELEVATION S IS SHOWN ON PLANS.
4. THE MINIMUM OPENING INTO THE STORM DRAIN SHALL BE THE OUTSIDE DIAMETER OF THE CONNECTING PIPE PLUS 1".
5. IF ANGLE X FROM HORIZONTAL IS 45° OR LESS USE TYPE 1. IF ANGLE X IS 45° OR OVER USE TYPE 2.
NOTE:
1. THE ENTIRE CATCH BASIN COVER MAY BE POURED IN PLACE OR PRECAST.
2. CONNECTION PIPES MAY BE PLACED IN ANY POSITION AROUND THE WALLS
   PROVIDED THE POSITION IS CONSISTENT WITH THE PLAN.
3. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE
   CONCRETE IS POURED.
4. FLOOR OF BASIN SHALL BE TROWELLED TO A HARD SMOOTH SURFACE AND
   SHALL SLOPE FROM ALL DIRECTIONS TO OUTLET.
5. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 D PAINT
   AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
6. CONCRETE SHALL BE CLASS A PER SECTION 725.

DIMENSIONS

CURB A
4"  3'-3"
6"  1'-9"
7"  1'-0"

T=6" IF V=4' OR LESS
T=8" IF V IS BETWEEN 4' AND 8'
T=10" IF V IS 8' OR MORE (IF V EXCEEDS
10' SPECIAL DESIGN IS REQUIRED)
V=3'-6" UNLESS OTHERWISE SPECIFIED.

* SEE DETAILS 536-1 AND 536-2 FOR DETAILS AND SECTIONS
  COMMON TO ALL CURB OPENING CATCH BASINS.
** 4" LOCATIONS WHERE 4" S/W IS REQUIRED.
NOTES:

1. THE ENTIRE CATCH BASIN COVER MAY BE POURED IN PLACE OR PRECAST.

2. CONNECTION PIPES MAY BE PLACED IN ANY POSITION AROUND THE WALLS PROVIDED THE POSITION IS CONSISTENT WITH THE PLAN.

3. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS POURED.

4. FLOOR OF BASIN SHALL BE TROWELLED TO A HARD SMOOTH SURFACE AND SHALL SLOPE FROM ALL DIRECTIONS TO OUTLET.

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6. CONCRETE SHALL BE CLASS A PER SECTION 725.

DIMENSIONS

CURB A

<table>
<thead>
<tr>
<th>V</th>
<th>T</th>
<th>T</th>
<th>T</th>
</tr>
</thead>
</table>
| 4"      | 3"-3"   | 6"      | 1'-9"   | 7"      | 1'-0"
|         | 8"      | 10"     |         |

* SEE DETAILS 536-1 AND 536-2 FOR DETAILS AND SECTIONS COMMON TO ALL CURB OPENING CATCH BASINS.
** 4" LOCATIONS WHERE 4" S/W IS REQUIRED.
NOTES:

1. THE ENTIRE CATCH BASIN COVER MAY BE POURED IN PLACE OR PRECAST.

2. CONNECTION PIPES MAY BE PLACED IN ANY POSITION AROUND THE WALLS PROVIDED THE POSITION IS CONSISTENT WITH THE PLAN.

3. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS POURED.

4. FLOOR OF BASIN SHALL BE TROWELED TO A HARD SMOOTH SURFACE AND SHALL SLOPE FROM ALL DIRECTIONS TO OUTLET.

5. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO.1 D PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.

6. CONCRETE SHALL BE CLASS A PER SECTION 725.

** DIMENSIONS **

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<th>CURB</th>
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<td>4&quot;</td>
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<tr>
<td>6&quot;</td>
<td>9'-0&quot;</td>
</tr>
<tr>
<td>7&quot;</td>
<td>9'-0&quot;</td>
</tr>
</tbody>
</table>

T=6" IF V=4' OR LESS
T=8" IF V IS BETWEEN 4' AND 8'
T=10" IF V IS 8' OR MORE (IF V EXCEEDS 10' SPECIAL DESIGN IS REQUIRED)
V=4' UNLESS OTHERWISE SPECIFIED.

* SEE DETAILS 536-1 AND 536-2 FOR DETAILS AND SECTIONS COMMON TO ALL CURB OPENING CATCH BASINS.

** 4' LOCATIONS WHERE 4' S/W IS REQUIRED.**
2' CURB & GUTTER PER DETAIL 221 BOTH SIDES

CURB SUPPORT ANCHORS
3'-6" MAX. SPACING
SEE DETAIL 536-1, SECTION C-C

NOSE ANGLE
SEE DETAIL 536-1, SECTION C-C

NOTE: REINFORCING BARS SHOWN ARE FOR ROOF SLAB ONLY.
SEE NOTE NO. 5 AND SECTIONS FOR OTHER REINFORCING.

GRATE AND FRAME
SEE DETAIL 533-3
& 533-4

NOTES:
1. SINGLE C.B. (ILLUSTRATED), SUMP
   WITH WING BASIN UPSTREAM.
2. DOUBLE C.B. SUMP WITH SYMMETRICAL
   WING BASINS EACH SIDE.
3. PIPES CAN BE PLACED IN ANY WALL
   EXCEPT WALL ADJACENT TO A WING
   BASIN. PIPE SHALL BE TRIMMED TO
   FINAL SHAPE AND LENGTH BEFORE
   CONCRETE IS PLACED.
4. SUMP FLOOR SHALL HAVE A WOOD
   TROWEL FINISH AND A MIN. SLOPE
   OF 4:1 IN ALL DIRECTIONS TOWARD
   OUTLET PIPE.
5. ALL REINFORCING BARS SHALL BE NO.4
   18" C TO C BOTH WAYS AND 1-1/2"
   CLEAR TO INSIDE OF WALLS AND
   OUTSIDE WING BASIN FLOOR EXCEPT
   AS SHOWN. SEE SECT. 727.
6. ALL CONCRETE SHALL BE CLASS 'A',
   PER SECT. 725.
7. CONSTRUCTION JOINTS SHALL BE
   PLACED TO MEET FIELD CONDITIONS.
8. ALL EXPOSED STEEL SHALL BE
   GALVANIZED OR PAINTED WITH ONE
   SHOP COAT OF #1 PAINT AND TWO
   FIELD COATS OF #10 PAINT.

DIMENSIONS
V = 3'-3" MIN. WHEN L = 3'
V = 3'-5" MIN. WHEN L = 6'
V = 3'-7" MIN. WHEN L = 10'
V = 4'-0" MIN. WHEN L = 17'
T = 6" WHEN V IS LESS THAN 8'
T = 8" WHEN V IS EQUAL TO OR
   GREATER THAN 8'
H = CURB HEIGHT PRIOR TO THE
   TRANSITION

REINFORCEMENT DETAIL
APRON NOTES:

9. APRON IS CONSTRUCTED ONLY WHEN SPECIFIED ON PLANS.

10. CONCRETE IN APRON SHALL BE NOT LESS THAN 8" THICK.

11. CURB FACES AT CATCH BASIN OPENING AND POINT G SHALL BE THAT OF THE EXISTING CURB FACE PLUS 2" OR AS OTHERWISE SHOWN.

12. ELEVATION AT THE OUTER CORNERS OF THE LOCAL DEPRESSION SHOWN ON THE PLANS ARE FOR THE FINISHED SURFACE.

13. SEE DETAIL 533-1 FOR ADDITIONAL DIMENSIONS, REBAR PLACEMENT AND OTHER INFORMATION TO CONSTRUCT CATCH BASIN.

M AND N SHALL BE ON A STRAIGHT GRADE BETWEEN TOPS OF END HEADERS.
FRAME AND GRATE NOTES

14. FRAME AND GRATING SHALL BE TESTED FOR ACCURACY OF FIT AND SHALL BE MARKED IN SETS BEFORE DELIVERY.

15. ALL WELDING SHALL BE IN ACCORDANCE WITH STANDARD WELDING SPECIFICATIONS.

16. CROSS BARS AND END BARS MAY BE FILLET WELDED, RESISTANCE WELDED OR ELECTRO FORGED TO BEARING BARS.

17. ANCHORS SHALL BE 3/8” DIA. STEEL ROD, NO. 3 REBAR, 3/8” DIA. x 8” BOLTS OR 8” NELSON STUDS.

18. ALL PARTS SHALL BE OF STRUCTURAL GRADE STEEL.

19. ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED WITH ONE COAT #1 PAINT AND TWO FIELD COATS OF #10 PAINT.

SECTION F-F

BEARING BARS: 3-1/2” x 1/2” x 40” 2” C. TO C., 14 EACH

END BARS: 2-1/2” x 1/4” x 26-1/2” 2 EACH

CROSS BARS: 1/2” DIA. x 26-1/2” ROD 4” C. TO C., 9 EACH

FRAME AND GRATE
FOR TYPE 'D' CATCH BASIN

533-3

REVISED
01-01-2007

DETAIL NO. 533-3

STANDARD DETAIL ENGLISH
GRATE DETAIL
GRATE OPENING: 4.344 SQ. FT.

CROSS BARS:
1/2 DIA. x 24-7/8" ROD,
4" C. TO C., 9 EACH

BEARING BARS:
3-1/2"x1/2"x39-1/2"
1-7/8" C. TO C., 14 EACH

END BARS:
2-1/2"x1/4"x24-7/8"
2 EACH.
NOTES:

1. ADJUSTABLE CURB, FRAME AND GRATING UNITS SHALL BE STRUCTURAL STEEL OR CAST IRON.

2. PIPES MAY ENTER OR LEAVE ANY WALL. BOTTOM OF BOX TO BE SLOPED TO OUTLET PIPE FROM ALL DIRECTIONS AND TROWELLED TO A HARD SMOOTH SURFACE.

3. CONNECTION PIPES MAY BE PLACED IN ANY POSITION AROUND THE WALLS PROVIDED THE POSITION IS CONSISTENT WITH THE PLAN.

4. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS Poured.

5. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.

6. ALL CONCRETE, CLASS 'A' AS PER SECTION 725.

DIMENSION
V=3'-0" UNLESS OTHERWISE SPECIFIED.
* DIMENSIONAL CHANGE WITH DETAIL 534-3 AND DETAIL 534-4.
BOLT CURB BOX TO FRAME WITH 1/2" x 13" x 2-1/2" STEEL HEX BOLTS, NUTS AND WASHERS

CURB BOX ADJUST. TO 9" HIGH

DATE

SECTION B-B

CROSS-SECTIONAL AREA: 1.53 SQ. IN.

3-1/4" R

NOTE:
DIMENSIONAL CHANGE REQUIRED FROM 3'-5"
WIDTH TO 3'-0" AND 1'-9" DEPTH TO 2'-0"
MATERIAL CAST GRAY IRON ASTM A-48-83 CLASS 35B
FRAME WEIGHT 209 LBS; GRATE 140 LBS; CURB BOX 92 LBS.
BOLT CURB BOX TO FRAME WITH 1/2" x 13" x 2-1/2" STEEL HEX HEAD BOLTS, NUTS AND WASHERS

DIRECTION OF FLOW

1/2" (TYP.)

SECTION A–A

DOUBLE UNIT CAST IRON FRAME — GRATE — CURB BOX

SECTION B–B

CROSS-SECTIONAL AREA: 1.53 SQ. IN.

NOTE:

DIMENSIONAL CHANGE REQUIRED FROM 3’–5” WIDTH TO 6’–2”, AND 1’–9” DEPTH TO 2’–0”
REQUIRES ONE CENTER STEEL I-BEAM 4” x 7.7 LBS.
MATERIAL CAST GRAY IRON ASTM A–48–83 CLASS 35B.
FRAME WEIGHT 197 LBS.; GRATE 140 LBS.; CURB BOX 92 LBS.

VANE DETAIL

1/2"
SECTION A–A

NOTES:

1. PIPES MAY ENTER OR LEAVE ANY WALL. BOTTOM OF BOX TO BE SLOPED TO OUTLET PIPE FROM ALL DIRECTIONS AND TROWELLED TO A HARD SMOOTH SURFACE.

2. CONNECTION PIPES MAY BE PLACED IN ANY POSITION AROUND THE WALLS PROVIDED THE POSITION IS CONSISTENT WITH THE PLAN.

3. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS POURED.

4. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.

5. ALL WELDS ON FRAME AND SIDE BARS ON GRATE SHALL BE FULL LENGTH OF JOINT.

6. TOTAL COMBINED CLEARANCE BETWEEN FRAME AND GRATE IS 1/2".

NOTE:
SEE DETAIL 534–1 FOR THICKNESS AND SLOPE DIMENSIONS OF BOTTOM.
1) Horizontal plain round galvanized steel protection bar shall be used when curb face is 9" or more.

2) The bar shall be embedded 5" at each end.

SECTION C-C
FOR DETAILS 531, 532 AND 533

PLAN VIEW

STANDARD DETAIL
ENGLISH

COMMON DETAILS AND SECTIONS
FOR CURB OPENING CATCH BASINS

REVIEWED
01-01-1999
DETAIL NO. 536-1
SEE DROP HANDLE DETAIL

PLAN VIEW

1/2" DIA. STAINLESS STEEL BAR STOCK

FURNISH FOR EACH SIDE OF HANDLE:
1. EACH 304 S. STL. SPRING
   2-1/2" x 17/32" I.C. x 3/32"
2. EACH 1/2" HEX NUT
3. EACH 1/2" FLAT WASHER
   1. EACH 1/2" LOCK WASHER

DROP HANDLE

CONCRETE FILLER (CLASS B)

SECTION B-B

NOTE:
1. FRAME SHALL BE NON-LOCKING.

2. FRAME AND COVER SHALL BE CAST IRON OR ASTM A-36 STRL. HORIZONTAL SURFACE OF COVER IN CONTACT WITH FRAME SHALL BE MACHINED. ASA B-46 ROUGHNESS SHALL NOT EXCEED 1/32".

3. COVER SHALL BE FILLED WITH CONCRETE AND BROOM FINISHED.

4. SMALL VARIATIONS IN DIMENSIONS OF FEATURES OF A MINOR NATURE THAT ARE PART OF THE FOUNDRY'S CASTING ARE PERMISSIBLE.
ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 725. EXPOSED EDGES SHALL BE FINISHED WITH A 1/2" RADIUS.

DETAIL OF ANGLE FRAME

SINGLE GRATE

SECTION B-B

29" x 29" I.D. GRATE FRAME

B 8" 24"

3" x 2-1/2" x 1/2"

1/2" x 3-1/2" BOLT OR WELDED LUG, 4 EACH - ONE ON EACH CORNER

WELD INTO SECOND SPACE

1/2" DIA x 1" EYE BOLT

2-3/8" x 3-1/8" x 1/4"

BEVELED SIDES FOR WELDS

1/4" x 1-3/4" x 24" CHAIN

BAR GRATE
SEE DETAIL 539

DOUBLE GRATE

SECTION A-A

48"

SLOPE FLOOR TO OUTLET

PIPE SIZE AS REQUIRED BY PLANS

SECTION C-C

1/4" x 1-3/4" x 24" CHAIN TO 1" x 6" EYE BOLT IN WALL. BEND BOLT 1" ON END.

"D" VARIES

01-03-2002

DETAIL NO. 537

STANDARD DETAIL ENGLISH CATCH BASIN – TYPE 'G'
WHEN DOUBLE GRATE IS USED INCREASE THE LENGTH OF THE STRUCTURE ACCORDingly.

CUT HOLE IN PIPE 24" LONG FOR SINGLE GRATE STRUCTURES AND 48" LONG FOR DOUBLE GRATE. WIDTH DEPENDS ON DIA. OF PIPE, NOT TO EXCEED 22" MIN. WIDTH TO BE SET BY PROJECT ENGINEER.

SEE DETAIL 539 FOR GRATE

29" x 29" I.D. SINGLE FRAME
29" x 53" I.D. DOUBLE FRAME

DETAIL OF ANGLE FRAME GRATE SUPPORT

FOR PIPE LARGER THAN 24" DIA. (NOMINAL)

D = (VARIES)

SECTION A-A

SECTION A-A

24" PIPE (NOMINAL)
(6) 1/2" DIA. x 28-1/2" SINGLE, 52-1/2" DOUBLE TRANSVERSE RODS, 4" ON CENTER
FLUSH WITH GRATE SURFACE.

(2) 2" x 1/4" x 28-1/2" SINGLE, 52-1/2" DOUBLE END BARS

(15 SINGLE, 26 DOUBLE) 2-1/2" x 1/2" x 28" BEARING BAR
APPROXIMATELY 2" ON CENTER

3/16" EACH BAR & ROD

NOTES:

2. WELDING SHALL BE IN ACCORDANCE WITH A.W.S. SPECIFICATIONS.
3. FRAME AND GRATE SHALL BE TESTED FOR ACCURACY OF FIT
AND SHALL BE MARKED IN SETS BEFORE DELIVERY.
4. THE COMPLETED ASSEMBLY SHALL BE GIVEN ONE SHOP COAT OF
NO. 1 PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECTION 790.
5. THE GRATE SHALL BE FABRICATED TO WITHIN 1/8"
SPECIFIED DIMENSIONS.
NOTES:
1. GRATING UNITS AND FRAMES SHALL BE FABRICATED FROM STRUCTURAL STEEL EXCEPT AS NOTED.
2. WELDING SHALL BE IN ACCORDANCE WITH STD. WELDING SPECS.
3. THE COMPLETED ASSEMBLY SHALL BE GIVEN TWO SHOP COATS OF NO. 1 PAINT AS PER SECT. 790.
4. FRAME AND GRATE SHALL FIT TO A MAX. ROCK OF 0.093" AT ANY POINT.
5. RESTRICT USE TO GRADES OF 3% OR LESS.

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<td>TW OR T3-2.2</td>
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<td>16</td>
<td>1&quot;</td>
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</table>

TW INDICATES TRANSVERSE WELDED
T3 INDICATES TRANSVERSE BOLTED
**PLAN II**

3/8" ANCHOR
DELETE ON END
WHEN USED WITH
I BEAM SUPPORT

**PLAN II A**

X
(SEE TABLE)

FOR BAR
SPACING;
NUMBER OF
BARS AND
GRATE
OPENINGS,
SEE TABLE

**PLAN II B**

X
(SEE TABLE)

CROSS BARS:
3/8" DIA. 4"
C TO C.
BEARING BARS:
3-1/2"x 1/4"x 1-7/8"
C TO C.
END BARS:
2-1/2"x 1/4" CROSS
BARS MAY BE FILLET
WELDED, RESISTANCE
WELDED OR
ELECTROFORGED TO
BEARING BARS.

**SECTION D-D**

**SECTION C-C**

1/2" x 3-1/2" BARS

1/2" x 3-1/2" BARS

**SECTION A-A**

SPOT WELD
OR PEEN

NUT AND
CUT WASHER

1/2" ROD
THREADED ENDS

**SECTION B-B**

SPACER

9/16" Holes

**GRATING TYPE**  **CLEAR BAR SPACING**  **NO. BARS**  **X**  **GRATE OPENING ft²**

| LW OR LB-1.0 | 1" | 16 | 5/16" | 3.97 |
| LW OR LB-1.1 | 1-3/8" | 13 | 5/16" | 4.34 |
| LW OR LB-1.2 | 2" | 9 | 1-9/16" | 4.84 |
| EF-1     | 1-5/8" | 13 | 7/16" | 4.66 |
| LW OR LB-2.0 | 1" | 12 | 5/16" | 2.98 |
| LW OR LB-2.1 | 1-3/8" | 9 | 1-1/16" | 3.35 |
| LW OR LB-2.2 | 2" | 7 | 1-1/16" | 3.60 |
| EF-2     | 1-5/16" | 10 | 1/4" | 3.48 |

**BAR SPACER DETAIL**

CAST IRON, CAST STEEL
OR STEEL BAR STOCK

**NOTES:**

1. LW INDICATES LONGITUDINAL WELDED.
2. LB INDICATES LONGITUDINAL BOLTED.
3. EF INDICATES ELECTROFORGED.
4. GRATING UNITS AND FRAMES SHALL BE
   FABRICATED FROM STRUCTURAL STEEL
   'A-36 EXCEPT AS NOTED.
5. ALL WELDING SHALL BE IN ACCORDANCE
   WITH STANDARD WELDING SPECIFICATIONS.
6. THE COMPLETED ASSEMBLY SHALL BE
   GIVEN ONE SHOP COAT OF NO. 1 PAINT.
7. FRAMES AND GRATES SHALL FIT TO A
   MAXIMUM ROCK OF 0.093" AT ANY
   POINT.
8. GRATE TYPE LW AND EF RESTRICTED
   TO SLOPES OF 3% OR LESS
9. GRATES TYPE LB USE LONGITUDINAL
   GRADES IN EXCESS OF 3% OR AS AN
   ALTERNATE TO TYPES LW OR EF
   ON GRADES OF 3% OR LESS.

**DETAIL NO.** 540-2

**STANDARD DETAIL** ENGLISH

**CATCH BASIN GRATES**

**REVIEWED** 01-01-1998

**DETAIL NO.** 540-2
NOTES:

1. INSTALL WHEN REQUIRED BY PLANS, SPECIFICATIONS, OR APPROVED BY THE ENGINEER.

2. SEE PROJECT PLANS FOR CATCH BASIN DETAILS AND PAVEMENT STRUCTURAL SECTION.

CURB OPENING INLET

GRAFT OPENING INLET

A.B.C. AND/OR SELECT BASE

WOVEN WIRE 1/2" SQ. MESH #18 WIRE.

PLUG WITH CLASS "B" CONCRETE AFTER INSTALLATION OF ASPHALT/CONCRETE PAVEMENT

6" C.M.P. 18 GA.

PAVEMENT
**NOTES**

1. DESIGN OF END SECTION SHALL CONFORM TO STANDARD FOR REINFORCED CONCRETE PIPE.

2. END SECTION JOINT CONFORMATION SHALL MATCH THE PIPE JOINTS.

3. EMBANKMENT SLOPE SHALL BE WARPED TO MATCH SLOPE OF END SECTION.

4. CULVERT LENGTH IS AS SHOWN ON PLANS.
NOTES:
1. WHERE ROCK IS ENCOUNTERED THE OUTLET MAY BE OMITTED.
2. ALL PORTIONS OF SPILLWAY TO BE TROWEL FINISHED.
3. CONCRETE FOR THE SPILLWAY INLET, SPILLWAY AND OUTLET SHALL BE CLASS 'B' PER SECT. 725.
4. WHEN THE OUTLET IS USED, THE WIRE MESH SHALL EXTEND THROUGH THE JOINT INTO THE OUTLET IN LIEU OF BENDING INTO THE KEY.

EMBANKMENT CURB/EXTRUDED (OPTIONAL)
CONCRETE SURFACE FORD CONCRETE WALLS

FINISHED GRADE PER PLANS

DEPTH GAUGE SEE DETAIL (OPTIONAL)

3" WEEP HOLES

COURSE AGGREGATE FLOW

0.015'/FT OR AS NOTED

FINISHED Grade

2-#4 BARS TOP AND BOTTOM

8" CLASS 'A' CONCRETE PER SECTIONS 505 AND 725
(SECTION 324 DOES NOT APPLY)

SEE PLANS FOR BASE MATERIAL

*MIN. DISTANCE BELOW STREAM BED

BITUMINOUS SURFACE FORD CONCRETE WALLS

FINISHED GRADE PER PLANS

DEPTH GAUGE SEE DETAIL (OPTIONAL)

3" WEEP HOLES

COURSE AGGREGATE FLOW

0.015'/FT OR AS NOTED

FINISHED GRADE

2-#4 BARS TOP AND BOTTOM

2-#4 BARS TOP AND BOTTOM

SEE PLANS FOR BITUMINOUS SURFACE AND BASE MATERIAL

NOTES:
1. FORD WALLS SHALL BE CLASS 'A' CONCRETE PER SECT. 725.
2. DEPTH GAUGE SHALL BE PAINTED 2 COATS WHITE ENAMEL, NUMERALS AND MARKERS SHALL BE 1 COAT BLACK ENAMEL.
3. NUMBERS ON DEPTH GAUGE TO BE 2" HIGH.
4. HEIGHT OF DEPTH GAUGE PER PLANS.
5. REINFORCING BARS SHALL BE SET 3" CLEAR FROM SIDES OF CUT-OFF WALLS.
6. COURSE AGGREGATE AT WEEP HOLES SHALL BE ASTM C 33 SIZE 57, ENCLOSED IN FILTER FABRIC (SECTION 796, CLASS B), AND EXTENDED LATERALLY A MINIMUM OF SIX-INCHES (6") ON EACH SIDE OF THE WEEP HOLE.

BOTTOM OF UPSTREAM WALL

WALL MAY BE BUILT TO THIS LINE

3" WEEP HOLE

20' C TO C

ELEVATION LOOKING UPSTREAM
1. HEAVY GAUGE FRAME WIRE.
2. HEAVY GAUGE TRIPLE-TWIST HEXAGONAL MESH (OR EQUAL) FASTENED TO FRAME WIRE.
3. CONTINUOUS HEAVY GAUGE WRAPPED AROUND FRAMES TO FASTEN GABIONS TO EACH OTHER.
4. PARTITIONS TO PREVENT SHIFTING, NORMALLY ONE PER 3' LENGTH, INSTALLED AT FACTORY.

CUT BANK TO DEPTH "C" BEFORE PLACING GABIONS

EXIST GROUND LINE OR STREAM BED

GABIONS FILLED WITH STONE

NOTE:
OTHER SIZES AVAILABLE FROM MANUFACTURER.

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<th>NOMINAL SIZE COMBINATIONS</th>
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<tbody>
<tr>
<td>LENGTH</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>6'</td>
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<tr>
<td>9'</td>
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