UNIFORM STANDARD DETAILS for PUBLIC WORKS CONSTRUCTION

SPONSORED and DISTRIBUTED by the MARICOPA ASSOCIATION of GOVERNMENTS

1998 ARIZONA

(Includes Revisions Through 2003)
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500 SERIES
IRRIGATION AND STORM DRAIN INFORMATION (CTD)

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550 SPILLWAY INLET AND OUTLET
552 CONCRETE CUT-OFF WALLS
555 EROSION PROTECTION/RIPRAP
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 METRIC 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.
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONCRETE PVMT. SECTION</td>
<td>MANHOLE</td>
</tr>
<tr>
<td>SUBGRADE SEAL SECTION</td>
<td>SEWER CLEANOUT</td>
</tr>
<tr>
<td>SELECT MATERIAL SECTION</td>
<td>RAILROAD</td>
</tr>
<tr>
<td>AGGREGATE BASE SECTION</td>
<td>IRRIGATION LINE</td>
</tr>
<tr>
<td>BITUMINOUS PVMT. SECTION</td>
<td>IRRIGATION STANDPIPE</td>
</tr>
<tr>
<td>EXISTING PAVEMENT</td>
<td>&quot;L&quot; HEADWALL</td>
</tr>
<tr>
<td>OBLITERATE PAVEMENT</td>
<td>TELEPHONE OR TEL. LINE</td>
</tr>
<tr>
<td>CONCRETE PAVEMENT</td>
<td>POWER OR JOINT LINE</td>
</tr>
<tr>
<td>BITUMINOUS PAVEMENT</td>
<td>DOWN GUY &amp; ANCHOR</td>
</tr>
<tr>
<td>SECTION LINE</td>
<td>STREET LIGHT</td>
</tr>
<tr>
<td>ROADWAY CENTER LINE</td>
<td>STREET SIGN</td>
</tr>
<tr>
<td>SURVEY MONUMENT</td>
<td>TRAFFIC SIGN</td>
</tr>
<tr>
<td>FIRE HYDRANT</td>
<td>TRAFFIC SIGNAL LIGHT</td>
</tr>
<tr>
<td>WATER METER</td>
<td>CURB &amp; GUTTER</td>
</tr>
<tr>
<td>WATER OR GAS VALVE</td>
<td>VALLEY GUTTER</td>
</tr>
<tr>
<td>GAS METER</td>
<td>SINGLE GUTTER</td>
</tr>
<tr>
<td></td>
<td>MAIL BOX</td>
</tr>
<tr>
<td></td>
<td>EXISTING WATER LINE</td>
</tr>
<tr>
<td></td>
<td>EXISTING TELEPHONE LINE</td>
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<tr>
<td></td>
<td>EXISTING SEWER LINE</td>
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<td></td>
<td>EXISTING GAS LINE</td>
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<tr>
<td></td>
<td>EXISTING STORM DRAIN LINE</td>
</tr>
<tr>
<td></td>
<td>EXISTING IRRIGATION LINE</td>
</tr>
</tbody>
</table>
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, AND AT OTHER SPECIAL PONTS IF REQUIRED BY ENGINEER, AS SHOWN ON PLANS.
2. TYPE 'B' TO BE USED AT INTERSECTION OF STREET CENTERLINES (EXCEPT WHERE TYPE 'A' IS SPECIFIED), CORNERS OR CHANGES IN ALIGNMENT OF SUBDIVISION BOUNDARIES (WHEN THEY FALL IN PAVEMENT), P.C.'S AND P.T.'S OF CURVES. WHEN P.I. FALLS IN PAVEMENT, THEN THE P.I. SHALL BE MONUMENTED.
3. TYPE 'C' TO BE USED AT CORNERS OF, AND CHANGE IN ALIGNMENT OF, SUBDIVISION BOUNDARIES WHERE CORNERS OR CHANGE POINTS FALL OUTSIDE OF PAVED AREAS OR IN ALLEYS.
4. LETTERS TO BE APPROX. 1/32" WIDE & 1/32" DEEP.
5. USE STANDARD WROUGHT IRON WASHER 3" O.D. X 11/64" THICK WITH 1-3/8" HOLE
6. CAP TO BE CONSTRUCTED OF RED BRASS OR BRONZE.
7. FRAME & COVER TO INCLUDE CHAIN PER DET. 270.
   (OPTIONAL PER AGENCY REQUIREMENTS.)
NOTES:

1. TYPE 'D' NORMALLY USED AT STREET INTERSECTIONS, AS SUBDIVISION MONUMENTS AND 1/16 CORNERS.

2. TYPE 'E' NORMALLY USED ON SECTION CORNERS, 1/4 CORNERS AND AT THE CENTER OF SECTIONS. CONCRETE POST IS CHAMFERED 3/4" AT TOP. MINIMUM LENGTH OF POST 31-1/2". LENGTH DEPENDS ON SUBSURFACE OBSTRUCTIONS SUCH AS OLD CONCRETE PAVING, ROCK, ETC. 3/4" GALVANIZED PIPE SET IN THIS POST SHALL BE A MINIMUM OF 30" LONG EXCLUSIVE OF COUPLING, SEE PLANS.

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

4. FRAME AND COVER TO INCLUDE CHAIN PER STD. DETAIL 270.
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.
FLANGED STEEL 'U' CHANNEL (2 LBS. OR 3 LBS. PER SQUARE FOOT AS SPECIFIED)

2-1/2" DIA. STANDARD PIPE GALVANIZED OR 2-3/8" O.D. STANDARD PIPE GALVANIZED (AS SPECIFIED)

2" DIA. STANDARD PIPE GALVANIZED

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.
NOTES
1. Posts and blocks shall be 8" x 8" rough wood, pressure treated and unpainted. Holes shall be bored before treatment. See Sect. 415.
2. All guard rail plate, fittings, hardware, etc. shall be galvanized.
3. Type ‘A’ guard rail installed on normal shoulder line.
4. Type ‘B’ guard rail installed on widened roadway shoulder line.
5. Type ‘B’ installation shown. Type ‘A’ installation same except that inside face of guard rail shall fall on the normal shoulder line as indicated by plan drawing.
6. Install lap plates so that exposed edges are away from approaching traffic.

FACE ELEVATION

SIDE ELEVATION

PLAN

DETAIL NO. 1

STANDARD DETAIL
ENGLISH

STEEL GUARD RAIL

REVISED

DETAIL NO. 135–1
'W' SECTION BACK-UP PLATE FOR STEEL POSTS

W6x8.5 STEEL POST

STEEL 'W' SECTION, 12 GAUGE

'W' BEAM (STEEL POST)

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

6" 6" 12-1/4"

27" 6"
NOTES:
1. TOP AND RUB RAIL SHALL NOT PROJECT MORE THAN 1" IF ADJUSTMENT SHORTENING IS REQUIRED, THREADS SHALL BE LEFT IN FUNCTIONAL CONDITION.
2. HORIZONTAL DISTANCE BETWEEN TOP RAIL AND MEDIAN CURB SHALL NOT EXCEED 12"
NOTE
1. 5/8" BOLT SIZE SELF DRILLING ANCHOR SHALL HAVE A MINIMUM 1500# PULL OUT STRENGTH IN 2500 P.S.I. CONCRETE IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.

SECTION

DETAIL NO. 4
ATTACHMENT OF GUARD RAIL TO STRUCTURES

DETAIL NO. 1
GUARD RAIL POST INSTALLATION ON STRUCTURES

DETAIL NO. 5
BUFFER END SECTION
EXISTING CONCRETE OR ASPHALT PAVEMENT

FILL WITH GROUT AND CROWN TOP

6" REFLECTIVE ENGINEER'S TAPE (3M HIGH DENSITY YELLOW PRESSURE SENSITIVE TAPE OR APPROVED EQUIVALENT)

4" DIA. OR 6" DIA. X 6'-0" STEEL POST, SCHEDULE 40, GALVANIZED

EXISTING GRADE

CLASS B CONCRETE PER SECT. 725

4" OR 6" DIA. POST

SAFETY POST SECTION
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"

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'

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

SAFETY CURB
INSTALLATION ON DIRT

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.
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'</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>LINE POST</td>
<td>1-1/2'</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>STRAIN POST</td>
<td>1-1/2'</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>BRACE</td>
<td>1-1/4'</td>
<td>1.666&quot;</td>
</tr>
<tr>
<td>STRETCH BAR</td>
<td>3/16&quot;x3/4&quot;</td>
<td>3/16&quot;x3/4&quot;</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 722, RESPECTIVELY. SEE TABLE 722 FOR WEIGHTS OF MEMBERS.

NO. 7 COILED SPRING REINFORCED WIRE TIE WITH 12 GAUGE WIRE OR HOG RING FASTENERS 1'-6" C TO C
NOTE:
L-xxx NUMBERS DESIGNATES FAA SPECIFICATION NO.

MINIMUM 4" CONCRETE BACKFILL PER SECTION 725, CLASS "A".

PROVIDE 2" SLACK FOR CONNECTIONS.

GROUND CLAMP
CONDUIT (IF SPECIFIED)

3/4" DIA. DRAIN HOLE

12" x 12" x 12"
ABC PER SECTION 702

L-867 BASE W/COVER
L-823 CONNECTOR
L-830 TRANSFORMER
L-824 CABLE I/C, #8, 5 KV, (6.6 AMP ONLY)

BARE COPPER COUNTERPOISE WIRE (IF SPECIFIED)

BUILDING BLOCK (BRICK OR CONC. BLOCK)

L-86__ FIXTURE
FRANCIBLE COUPLING AND DISCONNECT PLUG
FINISHED GRADE

14" STANDARD
USE THE FOLLOWING FORMULA TO DETERMINE MAXIMUM DENSITY:

\[
D = \frac{(100-R)d+0.9RSx62.4}{100}
\]

OR USE THE GRAPH AS SHOWN BELOW:

WHERE:

- \(D\) = DRY DENSITY OF SAMPLE CONTAINING R PERCENT ROCK, LBS. PER CU. FT.
- \(R\) = PERCENT ROCK RETAINED ON A NO. 4 SIEVE.
- \(d\) = DRY DENSITY OF PORTION PASSING NO. 4 SIEVE LBS. PER CU.FT.
- \(S\) = BULK SPECIFIC GRAVITY OF ROCK.

EXAMPLE:

GIVEN A MATERIAL THAT HAS A DRY DENSITY OF 114 LBS PER CU. FT, A SPECIFIC GRAVITY OF 2.5, AND GIVEN THAT ONLY 29% OF A PORTION Passes THROUGH A NO. 4 SIEVE, WHAT IS THE DRY DENSITY OF THE SAMPLE?

SOLUTION:

STEP 1: PLOT THE DRY DENSITY OF MATERIAL PASSING A NO. 4 SIEVE (\(d\)) ON LEFT SIDE OF GRAPH (POINT 1). (EXAMPLE: POINT 1 SHOWS \(d = 114\) LBS. PER. CU.FT.);

STEP 2: PLOT THE BULK SPECIFIC GRAVITY OF ROCK (\(S\)) ON RIGHT MONOBAR (POINT 2). (EXAMPLE POINT 2 SHOWS \(S = 2.5\)).

STEP 3: CONNECT POINTS 1 AND 2 TO FORM LINE 1--2;

STEP 4: PLOT THE PERCENT OF ROCK RETAINED ON A NO. 4 SIEVE ON THE BOTTOM OF THE GRAPH (POINT 3). (EXAMPLE: POINT 3 SHOWS \(R = 29\) PERCENT)

STEP 5: DRAW HORIZONTAL LINE FROM POINT 4 TO LEFT SIDE OF GRAPH (POINT 5);

STEP 6: READ POINT 5 FOR THE VALUE OF THE DRY DENSITY (\(D\)). (EXAMPLE: POINT 5 SHOWS \(D = 121.6\) LBS. PER CU.FT.)
TYPE 'A'

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

TYPE 'B'

2" x 6" REDWOOD HEADER (ROUGH) PER STANDARD SECT. 778

1" x 2" x 18" WOOD STAKES AT 5'-0" O.C. PER STANDARD SECT. 778

TYPE 'C'
PAVED ALLEY DETAIL

UNPAVED ALLEY DETAIL

RESIDENTIAL ALLEY DETAIL

THICKENED EDGE (OMIT IF MATCHING TO EXISTING ASPHALT AREA)

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

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

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

LESS THAN 20'

2" ASPHALTIC CONC. SECT. 710
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”; WxLxR1 x R2–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
SECTION A-A

SECTION B-B

SECTION C-C

SPILLWAY

NOTE:
1. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE CLASS 'B' PER SECTION 725.
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, A.S.T.M. D-1751.

4. UNLESS OTHERWISE NOTED, CONCRETE SHALL BE CLASS "B" PER SECTION 725.
NOTES:
1. HUMPS MUST BE THE FULL 3" FOR MAXIMUM EFFECT BUT SHALL NOT EXCEED 3.25".
2. HUMPS CONSTRUCTED OVER 3.25" 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 18". 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.
   C. CONTACT THE AGENCY (OR INSPECTOR) ONE WEEK PRIOR TO INSTALLATION TO COORDINATE PAVEMENT MARKINGS AND SIGNING.

SECTION A—A
IMPORTANT: TO GAIN MAXIMUM EFFECT, HUMPS MUST BE THE FULL 3". CONTRACTORS MUST NOT EXCEED THIS HEIGHT BASED ON CONSIDERATION FOR EMERGENCY POLICE AND FIRE DEPARTMENT VEHICLES.
## 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 RECESSSED 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.)

### PLATE SIZE

<table>
<thead>
<tr>
<th>LONGITUDINAL</th>
<th>TRANSVERSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (B)</td>
<td>THICKNESS (W)</td>
</tr>
<tr>
<td>12” 18”</td>
<td>1”</td>
</tr>
<tr>
<td>12” 18”</td>
<td>1”</td>
</tr>
<tr>
<td>24” 18”</td>
<td>1”</td>
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<tr>
<td>36” 18”</td>
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</tr>
<tr>
<td>48” 18”</td>
<td>1”</td>
</tr>
<tr>
<td>60” 18”</td>
<td>1”</td>
</tr>
<tr>
<td>12” 18”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>24” 18”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>36” 18”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>36” 18”</td>
<td>1-1/4”</td>
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<tr>
<td>60” 18”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>60” 18”</td>
<td>1-1/4”</td>
</tr>
<tr>
<td>60” 18”</td>
<td>1-3/8”</td>
</tr>
</tbody>
</table>

**Type 1**

- STEEL PLATE ON TOP OF EXISTING ASPHALT
- 2” TEMPORARY ASPHALT

**Type 2**

- STEEL PLATE FLUSH WITH EXISTING ASPHALT (BOTH SIDES)
- 2” TEMPORARY ASPHALT (BOTH SIDES)
- STEEL PLATE RECESSED ON TOP OF MILLED SURFACE ASPHALT
**VERTICAL CURB AND GUTTER (TYPE A)**

- ROADWAY WIDTH: 24" + 7" + 6" + 1" = 32"
- BRUSH FINISH: 1/4" R
- VERTICAL CURB HEIGHT: H
- H kennenlernen
- 1/2" BATTER OPTIONAL

**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.

**ROLL CURB AND GUTTER (TYPE C)**

- ROADWAY WIDTH: 24" + 9-1/2" + 9-1/2" + 5" = 54"
- COLD JOINT
- SIDEWALK
- 1/2" BATTER OPTIONAL

**NOTES: (TYPE C)**

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.

**RIBBON CURB (TYPE B)**

- PARKWAY OR SIDEWALK: SLOPE = SEE NOTE 3
- ROADWAY WIDTH: 24"

**NOTES: (TYPE B)**

1. CONSTRUCT CURB AND INSTALL 1/2" MASTIC EXPANSION JOINTS, A.S.T.M. D-1751, SECT. 340.
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.
CURB AND GUTTER TRANSITION

NOTES: (CURB AND GUTTER TRANSITIONS)
1. THE CURB TRANSITION WILL BE PAID FOR AS TYPE 'C', WHEN A PROJECT CONSISTS OF TYPE 'C' CURB AND GUTTER THROUGHOUT, THE ENTIRE RETURN SHALL BE MEASURED AND PAID FOR AS TYPE 'A'.
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 SECT. 725.

INTEGRAL ROLL CURB, GUTTER AND SIDEWALK

NOTES:
1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.
2. CONTRACTION JOINT SPACING 16" MAXIMUM.
3. EXPANSION JOINTS PER SECT. 340.
4. CLASS 'B' CONCRETE PER SECT. 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.

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

ROAD MEDIAN

MEDIAN LANDSCAPING OR SURFACE AS REQUIRED

WIDTH AS SHOWN ON PLANS

FACE OF CURB

12"

NOSE P.C.

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

CURB HEIGHT VARIES (5' MINIMUM)

2-1/2" CURB

CURB HEIGHT, SEE PLANS
NOTES:
1. SIDEWALK CONSTRUCTION SHALL CONFORM TO SECT. 340.
2. EXPANSION JOINTS SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, A.S.T.M. D-1751.
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 JOINT 50' MAXIMUM SPACING PER SECT. 340.
5. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECT. 725.
NOTES:

1. CONTROL ELEVATIONS SHOWN ARE IN RELATION TO THE GUTTER AND ARE LOCATED RADIALY. GUTTER ELEVATION = 0.

2. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECT. 725.

3. WHEN CURB HEIGHTS OF 7" ARE SHOWN ON PLANS, USE DIMENSIONS SHOWN IN ""s.

SECTION B-B

SECTION A-A

R.O.W. LINE

ROUGH BROOCH FINISH, USE A RIPPLE SURFACE PATTERN

RAMP CURB (R.C.)

RAMP CURB HEIGHT MATCHES S/W ELEVATION

TAPER (PAID AS S/W)

1/4" GROOVES AT 1" O.C. FULL FACE OF RAMP

CURB AND GUTTER PER DETAIL NO. 220

CONTROL ELEVATIONS

SEE NOTES 1 AND 3

TOP OF S/W

TOP OF RAMP

VARIIES 6" RAMP

RIGHT-OF-WAY LINE

SUBGRADE PREPARATION, SEE SECT. 301

CONSTRUCTION JOINT 1" DEEP OR FORMED SEPARATELY

BOTTOM OF RAMP CURB WHEN FORMED AND POURLED SEPARATELY

FOR GROOVE SLOPING RAMP FACE, SEE DETAIL NO.1 ON TYPE 'D' RAMP DETAIL 234

MATCH GUTTER FLOW LINE

2' 7" 1'-5"

R.C.& S/W=6-7/8" (TYP) [=7-7/8"

T.C.=6" [=7"

T.C.=3"

T.C.=6" [=7"

T.C.=3"

T.C.=6" [=7"]
NOTES:
1. CONTROL ELEVATIONS SHOWN ARE IN RELATION TO THE GUTTER. GUTTER ELEVATION=0.
2. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECT. 725.
3. WHEN CURB HEIGHTS OF 7" ARE SHOWN ON PLANS, USE DIMENSIONS SHOWN IN [ ]S.
4. EXPANSION JOINTS SHALL CONFORM TO SECT. 340
1/4" GROOVES AT 1" O.C. FULL FACE OF RAMP

S/W = 4-3/4"

T.C. = 4"

RADIUS AS SHOWN ON PLANS

CONTROL ELEVATIONS

NOTES:

1. CONTROL ELEVATIONS SHOWN ARE IN RELATION TO THE GUTTER AND ARE LOCATED RADIALY. GUTTER ELEVATION = 0.

2. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECTION 725.

SECTION A-A

MATCH GUTTER FLOW LINE

MATCH GUTTER FLOW LINE

SUBGRADE PREPARATION.
SEE SECT. 301

RIGHT-OF-WAY LINE

VARIES

RAMP

GROOVE SLOPING RAMP FACE, SEE DETAIL NO. 1

1/4" WIDE

1" O.C. (TYP)

1/4" R (TYP.)

1/8" DEEP
NOTES:

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

2. 4" ON PROJECTS UNDER THE JURISDICTION OF THE COUNTY ENGINEER AND THE CITY OF MESA.

3. EITHER CONSTRUCTION JOINT OR CONTRACTION JOINT IS REQUIRED AT CENTERLINE OF STREET.

4. A SEPARATE CONCRETE PAD IS REQUIRED WHEN VALLEY GUTTER IS Poured HALF AT A TIME.

5. EXPANSION JOINTS SHALL CONFORM TO SECT. 340.
NOTES:

1. DEPRESSED CURB SHALL BE PAID FOR AT THE UNIT PRICE BID FOR THE TYPE OF CURB USED AT THAT LOCATION.

2. WHEN WIDTH EXCEEDS 22' PROVIDE A CONTRACTION JOINT ON D/W CENTERLINE.

3. BACK OF D/W OR FACE OF FUTURE S/W.

4. EXPANSION JOINTS SHALL COMPLY WITH SECTION 340.

5. BACK OF CURB – CONSTRUCTION JOINT OR SCORE MARK.

6. CLASS 'B' CONCRETE, SECT. 725.

7. SUBGRADE PREPARATION, SECT. 301.

8. FLOW LINE OF GUTTER.

9. DEPRESSED CURB.

10. SECT. A–A AND ELEVATION, D/W VERTICAL CURB AND GUTTER OR ROLL TYPE CURB AND GUTTER.

11. ROLL TYPE CURB AND GUTTER NOT PERMITTED IN THE CITY OF MESA.

12. 1/4" GROOVES AT 1" O.C. FULL WIDTH OF 5' WARP SECTION, EACH SIDE OF DRIVEWAY. SEE DETAIL NO. 1 ON TYPE 'D' RAMP DETAIL NO. 234.

COMMERCIAL AND INDUSTRIAL

<table>
<thead>
<tr>
<th>DRIVeway Width</th>
<th>MIN.</th>
<th>MAX.</th>
<th>CLASS</th>
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<tr>
<td>COMMERCIAL</td>
<td>*16'</td>
<td>40'</td>
<td>B</td>
<td>6&quot;</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>*16'</td>
<td>40'</td>
<td>B</td>
<td>6&quot;</td>
</tr>
</tbody>
</table>

*24" MIN. FOR TWO WAY TRAFFIC

RESIDENTIAL

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

*16' DESIRABLE

DEEPTH X

SECTION A–A

1.5% SLOPE

1" DEPTH X

ALTERNATE S/W LOCATION

FOR DRIVEWAY WIDTH

SEE TABLE

5’ MIN.

5’ MIN.

S/W LESS THAN 5’ OR GREATER

CURB AND GUTTER

CURB AND GUTTER

5’–0” MIN.

5’–0” MIN.

DETAIL NO. 250

STANDARD DETAIL

ENGLISH

DRIVEWAY ENTRANCES

REVISED 01–01–2003

DETAIL NO. 250
TABLE A

ZONING
COMMERCIAL AND INDUSTRIAL
- COMMERCIAL
- INDUSTRIAL
- 24" WHERE 2-WAY TRAFFIC IS ANTICIPATED

<table>
<thead>
<tr>
<th>MIN</th>
<th>MAX</th>
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<tbody>
<tr>
<td>16'</td>
<td>40'</td>
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</tbody>
</table>

TABLE B

ZONING
RESIDENTIAL
- MAJOR STREET
- COLLECTOR STREET
- LOCAL STREET

<table>
<thead>
<tr>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>16'</td>
<td>30'</td>
</tr>
<tr>
<td>12'</td>
<td>30'</td>
</tr>
</tbody>
</table>

NOTES:
1. EXPANSION JOINTS SHALL COMPLY TO SECTION 340.
2. THIS TYPE D/W TO BE USED ONLY UPON APPROVAL OF ENGINEER.
3. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECT. 725

SECTION A-A

| 5" THICK - RESIDENTIAL |
| 6" THICK - COMMERCIAL AND INDUSTRIAL |

SUBGRADE PREPARATION AS PER SECT. 301
NOTES: (PARKING BAY)

1. SUFFICIENT RIGHT-OF-WAY MUST BE AVAILABLE TO CONSTRUCT PARKING BAY.
2. PARKING BAYS WILL NOT BE ALLOWED WHERE THEY CONFLICT WITH BUS STOPS.

NOTES: (BUS BAY)

1. SUFFICIENT RIGHT-OF-WAY MUST BE AVAILABLE TO CONSTRUCT BUS BAY.
2. RADII, SIDEWALK, CURB AND CUTTER, PAVING SLOPE AND CONCRETE APRON SHALL BE CONSTRUCTED AS FOR PARKING BAYS.
NOTES:
1. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
2. CLASS 'B' CONCRETE, PER SECT. 725.
3. SUBGRADE PREPARATION, PER SECT. 301.
4. 1/4" GROOVES AT 1" O.C. FULL WIDTH OF 5' WARP SECTION, EACH SIDE OF ALLEY ENTRANCE. SEE DETAIL NO. 1 ON TYPE 'D' RAMP DETAIL NO. 234.
NOTES:

1. 1/4" GROOVES AT 1" O.C. FULL WIDTH OF 4' WARP SECTION, EACH SIDE OF ALLEY ENTRANCE. SEE DETAIL NO. 1 ON TYPE 'D' RAMP DETAIL 234.

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

3. SUBGRADE PREPARATION, PER SECT. 301.

4. EXPANSION JOINTS SHALL CONFORM TO SECT. 340.
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. 1/4" GROOVES AT 1" O.C. FULL WIDTH OF 5' WARP SECTION, EACH SIDE OF ALLEY ENTRANCE. SEE DETAIL NO. 1 ON TYPE 'D' RAMP DETAIL NO. 234.

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.
CLASS 'AA' CONC. ALL AROUND FRAME PER SECT. 725

TOP OF SURVEY MONUMENT (BRASS CAP), WATER VALVE BOX (8" CONCRETE PIPE), SEWER PIPE (SIZE VARIES)

MEDIUM BROOM FINISH WITH RADIALLY SCORED JOINTS (4 MIN.)

EXISTING BITUMINOUS PAVEMENT

1/2" ROUNDHEAD BOLT 2" LONG

CASTING TO CONFORM TO SECT. 787. MINIMUM WEIGHT 16 LBS. FOR COVER.

CHAIN ATTACHMENT (AS REQUIRED)

LETTERS ON COVER TO BE AS FOLLOWS: "SEWER", "WATER", OR "SURVEY" AS DIRECTED TOTAL WIDTH OF WORD "SEWER" OR "WATER" 3-3/4". TOTAL WIDTH OF WORD "SURVEY" 4-1/2". LETTER SIZE 5/8" X 3/4", RAISED 1/16" ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL.

DETAIL TYPICAL FOR BOTH FRAME AND COVER

COVER SECTION A-A

SEWER WATER SURVEY

MINIMUM WEIGHT 63#
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 CLASS 'B' CONCRETE PER SECT. 725

NOTE:
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.

1. VALVE BOX AND COVER REQUIRED PER DETAILS 270 AND 391.

WATER GATE AND BUTTERFLY VALVES
JOINT RESTRAINT WITH TIE RODS

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
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<td>6-3/4&quot;</td>
<td>5-7/8&quot;</td>
</tr>
</tbody>
</table>

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).

UNDISTURBED SOIL

VERTICAL UP BEND

VERTICAL DOWN BENDS
### 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°</td>
<td>LRN=0'</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>7</td>
<td>4</td>
<td>30</td>
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<td>24</td>
<td>79</td>
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</table>

### 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°</td>
<td>LRN=0'</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>11</td>
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<td>69</td>
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<td>15</td>
<td>7</td>
<td>99</td>
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<tr>
<td>8</td>
<td>47</td>
<td>19</td>
<td>9</td>
<td>130</td>
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<td>24</td>
<td>113</td>
<td>47</td>
<td>22</td>
<td>337</td>
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</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.
SECTION A-A

SECTION B-B

NOTE:
FOR CASTING SPECIFICATIONS
SEE SECT. 787.
NOTES:
1. INSPECTION PLATE IS SAME AS USED WITH METER BOX COVER NO. 4.
2. FOR CASTING SPECIFICATIONS, SEE SECTION 787.
3. THE BEARING EDGES OF THESE CASTINGS SHALL BE MACHINED TO INSURE A FULL BEARING ON A FLAT SURFACE.
NOTES:
1. FOR CASTING SPECIFICATIONS, SEE SECT. 787. THE BEARING
2. THE BEARING EDGES OF THESE CASTINGS SHALL BE MACHINED TO INSURE A FULL BEARING ON A FLAT SURFACE.
NOTES:

1. FOR CASTING SPECIFICATIONS, SEE SECT. 787.

2. THE BEARING EDGES OF THESE CASTINGS SHALL BE MACHINED TO INSURE A FULL BEARING ON A FLAT SURFACE.
NOTES:

1. THE METER BOXES SHALL CONFORM TO THE DIMENSIONS AS SHOWN AND SHALL BE MADE OF PORTLAND CEMENT CONCRETE Poured AND TAMPERED (OR VIBRATED) IN TRUE FORMS.

2. USE CLASS 'AA' CONCRETE PER SECT. 725.

<table>
<thead>
<tr>
<th>DIMS</th>
<th>BOX NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
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<tr>
<td>A</td>
<td>19&quot;</td>
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<td>B</td>
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<tr>
<td>C</td>
<td>11&quot;</td>
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<tr>
<td>D</td>
<td>14&quot;</td>
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<td>E</td>
<td>16&quot;</td>
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<td>F</td>
<td>9&quot;</td>
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<td>G</td>
<td>7&quot;</td>
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<tr>
<td>H</td>
<td>9&quot;</td>
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<tr>
<td>I</td>
<td>6&quot;</td>
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<tr>
<td>J</td>
<td>1-1/2&quot;</td>
</tr>
<tr>
<td>K</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>L</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>M</td>
<td>16&quot;</td>
</tr>
<tr>
<td>N</td>
<td>2-1/2&quot;</td>
</tr>
<tr>
<td>5/8&quot; OR 3/4&quot; METER</td>
<td>1&quot;</td>
</tr>
<tr>
<td>METER</td>
<td>METER</td>
</tr>
</tbody>
</table>
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

CLASS "A" CONCRETE AS PER SECT. 725

FINISH GRADE

(2) CI METER BOX COVERS SEE DETAIL 314

NO. 5 REBAR 6" O.C. EACH WAY

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&quot; AND LESS</td>
<td>3</td>
</tr>
<tr>
<td>6&quot;</td>
<td>4</td>
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<tr>
<td>8&quot;</td>
<td>6</td>
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<td>10&quot;</td>
<td>9</td>
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<tr>
<td>12&quot;</td>
<td>13</td>
</tr>
<tr>
<td>16&quot;</td>
<td>23</td>
</tr>
</tbody>
</table>
FOR VAULT CONSTRUCTION SEE DETAIL 321

SECTION A–A

VAULT DIMENSION DETAILS

<table>
<thead>
<tr>
<th>A.C.P. SIZE</th>
<th>(A) 8'-4&quot;</th>
<th>10'-6&quot;</th>
<th>12'-0&quot;</th>
</tr>
</thead>
<tbody>
<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 UTILIY.
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 SECTION 725.

<table>
<thead>
<tr>
<th>DIA. 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>
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<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>
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<td>72&quot;</td>
<td>58&quot;</td>
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<td>72&quot;</td>
<td>69&quot;</td>
<td>1-1/2&quot;</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

SEE NOTE 2

NOTE 5.

DETECTOR CHECK VALVE...
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. 90° BEND NOT REQUIRED IF SUFFICIENT ROOM FOR PERPENDICULAR INSTALLATION.

3. FOR CONCRETE THRUST BLOCKS, SEE DETAIL 380.

4. A FLANGE JOINT BY MECHANICAL JOINT VALVE MAY BE USED AS THE TRANSITION BETWEEN THE JOINT TYPES.

5. SEE DETAIL 362 FOR LOCATION OF HYDRANT.

6. FINISH GRADE SHALL BE GROUND LEVEL, SIDEWALK, ADJACENT SIDEWALK, PAVEMENT, ADJACENT CURB OR OTHER NEARBY OBSTRUCTION DENYING WRENCH ACCESS TO THE BOTTOM FLANGE BOLTS.

SEE DETAIL 391 FOR VALVE BOX INSTALLATION

CRUSHED ROCK TRENCH MINIMUM OF 8 CU. FT. ALONG PIPE AND ABOVE DRAIN HOLE
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 MIDDLE BLOCK, THE FIRE HYDRANT WILL BE ALIGNED WITH A PROPERTY LINE.

PARKWAY AREA OR NO SIDEWALK

AREA WITH SIDEWALK

DETAIL NO. 362
STANDARD DETAIL ENGLISH LOCATIONS FOR NEW FIRE HYDRANTS REVISED DETAILS NO. 362
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.

<table>
<thead>
<tr>
<th>MINIMUM THRUST BLOCK AREA REQUIRED (YxW) (SQ. FT.)</th>
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</thead>
<tbody>
<tr>
<td>PIPE SIZE</td>
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<tr>
<td></td>
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<tr>
<td>4&quot; OR LESS</td>
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<td>PIPE SIZE</td>
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<td>8&quot;</td>
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<td>12&quot;</td>
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* FOR 125 P.S.I. WORKING PRESSURE.

**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 ASPEROS 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

2" P.E. OR COPPER PIPE

2" P.E. OR COPPER PIPE

2" CORP STOP

2" BRASS COUPLING

2" BRASS ELL

WATER MAIN

2" TAPPED CAP (CAST IRON)

2" ADAPTER BRASS OR COPPER

2" COPPER PIPE

WATER LINE

BRONZE OR BRASS FITTING

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

2" BRONZE CURB STOP

TAPPED PLUG OR CAP

CONCRETE THRUST BLOCK PER DETAIL 380

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

TYPE 'A'

TYPE 'B'

CONCRETE WATER METER BOX NO. 2 PER DETAIL 320

6" GRAVEL BED
NOTES:

1. VALVE BOX SHALL BE ADJUSTED TO THE FINISHED GRADE PRIOR TO PLACING OF THE PORTLAND CEMENT CONCRETE SURFACE.

2. USE PARKSON TYLER, APCO OR EQUAL DEEP SKIRTED LID (4" OR MORE) TYPE, SLIDING ADJUSTABLE CAST IRON VALVE BOX C.I. MIN. T.S. 30,000 P.S.I.

3. GROUND BELOW CONCRETE PAD OR 3 BRICKS TO BE COMPACTED 95% OF MAX. DENSITY.
NOTES:

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

2. IF TWO OR MORE JOINTS OF A.C.P. ARE USED TO MAKE RISER, USE STANDARD A.C. PIPE RUBBER GASKET COUPLING TO JOIN PIPE. WHERE RISER LENGTH EXCEEDS 10' USE 12" A.C. PIPE.

3. STEM PAINTING: ALL STEEL TO HAVE PRIME COAT OF PAINT NO. 1-D AND ONE HEAVY APPLICATION (FINISH COAT) OF PAINT NO. 9 AS PER SECT. 790.
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. Once installed the cap must withstand, without slippage, a minimum vertical force of 50 pounds at a loading rate of 1 inch/minute.

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 handle and/or body of the cap shall be integrally colored if required by the agency. If required, the color shall conform to the one call locating service (blue stake) colors (ARS 40-360.21).

7. The cap shall be installed in all valve housings as required by the contract documents or by the agency's policies.

8. The debris cap shall be manufactured by SW Services, Inc. Phoenix, Arizona or equal.
NOTES:

1. LAY PIPE TO LINE AND GRADE ON BRICK CRADLE.

2. PLACE CLASS 'C' CONCRETE PER SECT. 725 & 505, IN SUCH A MANNER AS NOT TO FLOAT THE PIPE.
NOTES:

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

2. TYPE 'C' PIPE SUPPORT MAY BE USED FOR CROSSING PIPES WITH A BELL 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 6' 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.

<table>
<thead>
<tr>
<th>SCHEDULE OF REQUIRED SUPPORTS</th>
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<tr>
<td>PERMANENT</td>
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<tr>
<td>SEWER LINES</td>
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<td>OTHER UTILITIES AS</td>
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<td>NOTED ON THE PLANS</td>
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<tr>
<td>OR AS REQUIRED</td>
</tr>
<tr>
<td>BY THE ENGINEER AT TIME</td>
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<tr>
<td>OF CONSTRUCTION</td>
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</tbody>
</table>
NOTES:

1. SEPARATION DISTANCES AND/OR OTHER EXTRA PROTECTION SHALL BE REQUIRED TO PROTECT WATER MAINS FROM CONTAMINATION BY SANITARY SEWER MAINS.

2. THIS CRITERIA APPLIES TO PARALLEL MAINS AS WELL AS CROSSINGS.

3. SEE CROSS SECTION DETAIL FOR LIMITS OF SEPARATION/EXTRA PROTECTION. ALL DISTANCES ARE MEASURED PERPENDICULARLY FROM THE OUTSIDE OF THE PIPES.
   
   A. NO WATER MAINS SHALL FALL WITHIN ZONE A.
   B. EXTRA PROTECTION WILL BE REQUIRED WHEN THE WATER MAIN FALLS WITHIN ZONE B.
   C. EXTRA PROTECTION SHALL CONSIST OF CONSTRUCTING THE SANITARY SEWER MAIN WITH MECHANICAL JOINT OR RESTRAINED JOINT DUCTILE IRON PIPE FOR A DISTANCE OF TEN FEET ON EITHER SIDE OF THE WATER MAIN. THE DUCTILE IRON PIPE SHALL COMPLY WITH THE AGENCY'S REQUIREMENTS FOR SEWER INSTALLATION. IN THE CASE OF A CROSSING, THE NUMBER OF JOINTS SHALL BE HELD TO A MINIMUM WITH ONE FULL JOINT OF PIPE CENTERED OVER/UNDER THE OTHER. AN ALTERNATE PROTECTION MAY CONSIST OF ENCAISING BOTH PIPES IN CONCRETE AS SHOWN HEREIN.
   C. NO ADDITIONAL PROTECTION WILL BE REQUIRED OUTSIDE OF THE ZONE A AND B.

4. SEPARATION REQUIREMENTS FOR 4" OR 6" INDIVIDUAL HOUSE SERVICE CONNECTIONS SHALL COMPLY WITH THE AGENCY'S PLUMBING CODES.

5. RECLAIMED WATER SHALL BE CONSIDERED AS POTABLE WATER WHEN PLACED NEXT TO A SANITARY SEWER AND CONSIDERED A PRESSURE OR FORCE SANITARY SEWER MAIN, WHEN PLACED NEXT TO A POTABLE WATER MAIN.

6. CLASS "C" CONCRETE AS PER SECTION 725.

ENCASEMENT FOR PARALLEL PIPES
NOTE:
1. CLASS 'C' CONCRETE AS PER SECTION 725.
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

SOLID BEARING ON EACH SIDE

SAW SOUND PIPE SQUARE

REPLACEMENT WHEN NEW TRENCH 2' WIDE OR LESS

6" MIN. WHEN USING CAULDER CONNECTION

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

6" MIN. –
8" MAX.
REINFORCED CONC.
ADJUSTING RINGS

M.H. STEPS,
SEE NOTE 2

BELL UP OR
DOWN, CONT.
OPTION

FLOW

24" TO 26–3/4"
ON 48 M.H.,
30" ON 60" M.H.

8"
BRICK
BRICK MAY
BE USED
IN LIEU
OF PRECAST
ADJUSTING
RINGS

12"
MAX.

12"
TYP.

30" MIN.
36" MAX.

RING

** ALTERNATE BASE
WITH KNOCKOUTS FOR PIPES.
CLEARANCE AROUND PIPES
1" MIN. – 3" MAX.
EXCEPT LOWER CORNERS

8" IF M.H. IS 13’ OR LESS
12" IF M.H. IS OVER 13’

CEMENT
MORTAR

NOTES:

1. PRE-CAST, REINFORCED M.H. SECTIONS
SHALL BE MANUFACTURED
IN ACCORDANCE WITH A.S.T.M. C-478
EXCEPT AS MODIFIED HEREIN.

2. M.H. STEPS SHALL BE INSTALLED AT
SITE OF M.H. SECTION MANUFACTURE.
MINIMUM CLEARANCE EACH SIDE OF M.H.
LEG SHALL BE 1". STEPS SHALL BE MOUNTED
WITH 2 TO 1 SAND/CEMENT DRY PACK MORTAR.
(SEE DET. 428 FOR M.H. STEP.)
STEPS REQUIRED IN 48" DIAMETER MANHOLE.
STEPS NOT REQUIRED IN 60" DIAMETER MANHOLE.

3. USE LOW ALKALI CEMENT ONLY.
PIPE SIZE & ELEVATION AS SHOWN ON PLANS

TROWEL FINISH

MANHOLE STEPS PER SECT. 625

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

MANHOLE RING & COVER PER DETAIL 423, 424 & 425

MANHOLE TO BE BRICK OR PRECAST PER SECT. 625
BRICK SHALL BE IN ACCORDANCE WITH SECT. 775

1:3 CEMENT PLASTER COAT OUTSIDE OF PLASTER WITH MEMBRANE TYPE CURING COMPOUND IMMEDIATELY AFTER PLASTER HAS BEEN PLACED & FINISHED, "HUNT PROCESS" OR EQUAL

COURSE BRICK IN MORTAR OR CLASS 'C' CONCRETE PER SECT. 725, 505

CLASS 'A' CONCRETE PER SECT. 725, 505

TROWEL FINISH SMOOTH

PRECAST ADJUSTMENT RINGS OR BRICK AND MORTAR COLLAR OR COMBINATION NOT TO EXCEED 12" TOTAL

COMBINED CURB AND GUTTER

PAVEMENT VARIES

5"

4'

MIN. VARIABLE

ROWLOCK RADIAL COURSE (BRICK M.H.)

3" MIN.

2" MAX.

2"

8"

12" 12"
FOUR STEEL SPACERS, 4"x2" THICKNESS AS REQUIRED FROM 1/2" to 2" WHEN THICKNESS IS LESS THAN 1/2" USE MORTAR, WHEN GREATER THAN 1/2", USE BRICK.

M.H. FRAME AND COVER PER SECT. 625

M.H. STEP IS 48" M.H. ONLY

PIPE SIZE & ELEVATION AS SHOWN ON PLANS

M.H. RING & COVER STD. DETAIL 423, 424 & 425

MEDIUM BROOM FINISH WITH RADIIALLY SCORED MARKS (4 MIN.)

EXISTING OR RECENTLY INSTALLED PAVEMENT

1:3 CEMENT PLASTER COAT OUTSIDE WITH MEMBRANE TYPE CURING COMPOUND AFTER PLASTER HAS BEEN PLACED & FINISHED, "HUNT PROCESS" OR EQUAL

BRICK SHALL BE IN ACCORDANCE WITH SECT. 775

COURSE BRICK IN MORTAR OR CLASS 'C' CONCRETE PER SECT. 725, 505

CLASS 'A' CONCRETE PER SECT. 725, 505

TROWEL SMOOTH 12" FOR M.H. OVER 13" DEEP

1/2"

26-3/4"

3 TO 5"

VARIABLE

2

5"

12" MAX.

12"

12" MAX.

44" MIN.

40" MIN.

5/" MIN.

24"

5"

8"

2"

8" WALL TO 13" DEPTH

12" WALL BELOW 13"

SUBGRADE PREPARATION TO CONFORM TO SECT. 301 OR 601

CLASS 'AA' CONCRETE AS PER SECT. 725, 505

M.H. WALL THICKNESS AND MATERIAL VARIES
FACE OF COVER
CAST IRON

BACK OF COVER

CAST IRON MANHOLE RING

SECTION OF COVER
APPROX. WEIGHT 275 LBS.

NOTES:
1. WEIGHT OF CASTING SHALL BE NO MORE THAN 2% LESS THAN THE APPROXIMATE WEIGHT SPECIFIED.
2. CASTINGS SHALL CONFORM TO SECT. 787.
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 1/8" ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% LESS THAN THE APPROXIMATE WEIGHT SPECIFIED. CASTINGS SHALL CONFORM TO SECTION 787.
6 RIBS, EQUALLY SPACED 60°

TOP VIEW

6 RIBS, EQUALLY SPACED 60°

BOTTOM VIEW

SECTION 'B-B'

SECTION 'C-C'

SECTION VIEW OF FRAME AND COVER WITH CAM LOCKING DEVICE

NOTES:

1. MATERIAL SHALL CONFORM TO A.S.T.M. STANDARDS
   B 179-65 ALLOY SN122A
   B 179-65 ALLOY CN42A
   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 MANHOLE WALL

INVERT ELEVATION ACCORDING TO PLAN

MANHOLE FOUNDATION

BELL END

PLUG (SEE DETAIL RIGHT)

SIZE ACCORDING TO PLAN

DRY PACK FOR PRECAST CONCRETE MANHOLE

1/2" LAYER CEMENT PLASTER (WATERTIGHT)

BLOCK OR BRICK AND MORTAR PLUG (SEE NOTE)

PIECE SIZE

PLUG THICKNESS

12" - 36"  8"
39" - 48"  12"
51" - 72"  18"
75" - 90"  24"
96" - 114" 32"
120" - 132" 36"
138" - 150" 40"

DRAIN LINE

GROUND LINE

#20 COPPER WIRE WITH YELLOW INSULATION OR 2" x 4" STAKE

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

SEWER LINE

BAND SEAL COUPLING

VIT. CLAY PIPE

VIT. CLAY OR PLASTIC PLUG

PREFORMED JOINT

ANCHOR WITH BRICK OR STAKE AT TRENCH BOTTOM OR TIE TO BELL END
NOTES
1. ALL DIMENSIONS ARE MINIMUM EXCEPT WHERE NOTED.
2. CASTING AS PER SECT. 787.

CAST IRON MANHOLE STEP

NOTES
1. STEPS SHALL BE PLACED INTO WET CONCRETE WALL DURING MANUFACTURE OR MORTARED INTO HOLES AFTER CONCRETE HAS SET.
2. POLYPROPYLENE MUST MEET REQUIREMENTS OF A.S.T.M. 2146, TYPE II, GRADE 16906.

POLYPROPYLENE MANHOLE STEP
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 OWNER’S 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. 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. 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 DIRECTION.

5. END OF TAP TO BE SEALED AND MARKED AS NOTED.
SECTION B–B

STRAIGHT TYPE

PLAN

'L' TYPE

'U' TYPE

CLASS "A" CONC. AS PER SECT. 725

ANGULAR HEADWALL TO MEET O.D. OF PIPE

SPRAY BANDS WITH CURING COMP.

CLASS "A" CONC. AS PER SECT. 725

NO. 4 REINF. BAR FULL LENGTH IN EACH CORE. CORES TO BE FILLED WITH GROUT MIX 1:3

FOOTING

DITCH BANK

REINF. CONC. CLASS "A" PER SECT. 725

30' MIN. 45' MAX.

S=1/2 L 1 MIN, .707 L 1 MAX.

DETAIL NO. 501–1

STANDARD DETAIL ENGLISH HEADWALL

MARICOPA ASSOCIATION OF GOVERNMENTS

REVISED DETAIL NO. 501–1

1/4" CONC. PLASTERED WALL

INVERT GRADE SET BY ENGINEER OR BY S.R.V.U.A. ENGINEERS IN THEIR LATERALS

2" CONC. PLASTER CAP

PLASTER TOP DITCH

1/4" CONC. PLASTERED WALL TOP DITCH

SEE DETAIL "A" DETAIL 501–2

2–NO. 4 REINF. BARS LAID HORIZ. IN 2 PLACES AS SHOWN

18" MIN.

8" MIN.

16" MIN.

4" MIN.

16"

4"

6"
**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.

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**HEADWALL DIMENSIONS**

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<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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<tr>
<td>12&quot;</td>
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* Nominal pipe size given for reinforced conc. pipe.

**ELEVATION**

CONCRETE MASONRY UNITS (BLOCK) HEADWALLS JOINED WITH CEMENT MORTAR AND CONCRETE PLASTERED BOTH SIDES OF WALL FULL HEIGHT AND SHALL BE CURED PER SECT. 726.
**INLET HEADWALL**

2 - NO. 6 BARS FORM AS SHOWN

**INLET HEADWALL FACE ELEVATION**

OUTLET SIMILAR

CONCRETE SHALL BE CLASS 'A' PER SECT. 725

**SECTION A-A**

FOR CMP, INSTALL 3/4" x 6" HEX HEAD BOLTS, 1'-6" C TO C

**SECTION B-B**

**CMP BEVEL DETAIL**

**1:1 1/2 EMBANKMENT SLOPE**

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<th>TYPE *</th>
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**1:4 EMBANKMENT SLOPE**

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* (IN) REFERS TO INLET (OUT) REFERS TO OUTLET
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.
### Dimensions

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<tr>
<th>I.D.</th>
<th>W</th>
<th>A</th>
<th>B</th>
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<td>3'-10'-3/4&quot;</td>
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### 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' conc 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 ratios). All blocks to be jointed with mortar, plastered on exposed surfaces then spray with white pigmented curing compound. Sect. 510, 727 & 776.

**NOTES:**

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.

3. Elevations A, B, C & D and dimensions E, F, G, H, I, J, K, L & M will be shown on plans. Dimensions should provide standard size block.

4. 14” plate shall not extend below top of pipe.
**CONCRETE MASONRY UNITS (BLOCK)**

**REINF. CONC. CLASS 'A' PER SECT.725**

**'U' TYPE**

**STRAIGHT TYPE**

**CONC. LINING THICKNESS 1-1/2" MIN., 2" MAX.**

---

**TYPE BASED ON PIPE SIZE**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PIPE SIZE</th>
<th>NO. OF BARS</th>
<th>LENGTH OF BARS</th>
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<td>12</td>
<td>5'-10 5/8&quot;</td>
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<td>E</td>
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<td>14</td>
<td>6'-7 3/4&quot;</td>
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**SECTION A-A**

**WALL**

**3" GALV. PIPE**

**1" GALV. PIPE**

**1/4"x2" STEEL BAR PLATE**

**C-C SPACING**

**6"**

**45°**

**TOP BANK**

**1/2" x 4-1/2" GALV BOLT SUNK IN PLASTER WITH BRASS NUT**

**LOCK TYPE WASHER AND 5/8" NUT**

**PROVIDE PLASTIC SLEEVE 3/4" DIA.**

---

**EYE BOLT**

**10" FOR BLOCK HEADWALLS**

**8" FOR REINF. CONC. HEADWALL**

---

**DETAIL NO. 502-2**

**STANDARD DETAIL ENGLISH TRASH RACK**

**REVISED DETAIL NO. 502-2**
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 standpipe.

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.

REINFL. CONC. PIPE

VARIES MIN. 48" MAX. 52"

FINISH GRADE

1" C.R.S. LIFT ROD

HEADGATE TO BE SWANSON 800 SERIES OR APPROVED EQUAL

FORM CONC. AROUND END OF PIPE BEHIND HEADGATE FRAME
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.

(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

SECTION B-B

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
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.

A*=ANGLE OF DEFLECTION

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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"

3/4

PIPE DIAMETER
TO BE SAME AS
VALVE SIZE

CONCRETE PIPE
SECT. 735 & 736

PLUG END PER
DETAIL 427

GROUT AS PER
DETAIL 524

CONCRETE TEE
OR ELBOW

SNOW, IDEAL,
WATERMAN ALFALFA
VALVE OR EQUAL

PIPE DIAMETER
TO BE SAME AS
VALVE SIZE

BID ITEM
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-ELEVATED TO ALLOW SUFFICIENT ROOM TO OPERATE PROPER MECHANICAL COMPACTON 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 SECT. 725.

7. COVER TO BE APPROVED BY ENGINEER.
**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.

**T-BOLT**

**C.M.P. MAIN STORM DRAIN**

**C.M.P. CONNECTION TO MAIN STORM DRAIN**

24" PIPE AND SMALLER

**BAND DETAIL**

2"x2"x12" GAUGE WELDED WIRE FABRIC WITH 12" CIRCUMFERENTIAL OVERLAP
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 ENCASEMENT SHALL BE CLASS 'A' PER SECT. 725 AND 505.

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TABLE OF VALUES FOR 'F' & 'D'

PRECAST PIPE WITH VERTICAL STUB

ENCASEMENT
VERTICAL SECTION OF ECCENTRIC MANHOLE SHAFT

MANHOLE FRAME AND COVER
PER DETAIL 423 AND 424

ECCENTRIC PRECAST CONCRETE CONE

3'-10" MINIMUM

ALL JOINTS SHALL BE FILLED WITH 1:2 MORTAR AND NEATLY POINTED OR WIPED ON INSIDE OF SHAFT.

1:2 MORTAR

NO. 4 HOOP

NO. 4 BARS

PLAN

USE WHERE THERE IS 3'-10" OR LESS COVER OVER PIPE

MANHOLE FRAME AND COVER PER DETAIL 423 AND 424

SECTION B-B

SHALLOW MANHOLE

BASE STRUCTURE PER DETAIL 520 OR 521

NO. 4 BARS

2"

4'-0"

2-1/8" 6"

1-1/4"

1-5/8"

1-3/4"

3/8"

3/8"

1-1/8"

2-1/2"

6"

1-5/8"

1-3/4"

1-1/8"

1-1/4"

1-1/4"

2-1/2" RINGS SHALL BE REINFORCED WITH TWO 1-1/4" ROUND STEEL HOOPS; 6" AND 8" RINGS SHALL BE REINFORCED WITH FOUR 1-1/4" HOOPS, TIED WITH NO. 14 A.S.& W. GAUGE WIRE 8" O.C.

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. MANHOLE STEPS SHALL BEGIN 2'-0" BELOW FINISHED GRADE AND CONTINUE AT 12" INTERVALS TO APPROXIMATELY 2' ABOVE MANHOLE SHELF. (AS REQUIRED BY AGENCY.)
6. CONCRETE SHALL BE CLASS A PER SECTION 725 AND 505.

REINFORCED CONCRETE ADJUSTING RING

DETAIL NO. 522

STANDARD DETAIL ENGLISH

STORM DRAIN MANHOLE SHAFT

REVISED DETAIL NO. 522
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 ACCOMODATE 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.

6. BOTH 24" AND 30" FRAMES TO BE ANCHORED AS FOLLOWS:

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

8. 1/4" STAINLESS STEEL CABLE. SECURED WITH CABLE CLAMPS.

9. 1/2"x9" HOOK AND EYE TURNBUCKLE.

10. 1/2" EYE BOLT WITH 1" DIA. EYE.

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

12. 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.
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.

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

<table>
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<tr>
<th>CURB</th>
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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 PROVIDING 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 SECTION 790.

6. CONCRETE SHALL BE CLASS A PER SECTION 725.

**DIMENSIONS**

<table>
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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.
**SECTION A-A**

- Access Opening *
- Curb Support
- See DET. 533-1
- (Det. No. 2)

**SECTION B-B**

- Hand Trowel
- Curved Surfaces (Treat as Curb Facing)
- No. 3 Dowel Bars

**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.
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**

- 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.
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 REBARING BARS SHALL BE NO. 4 14" 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

SECTION A-A

SECTION B-B

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.

PLAN VIEW

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 ELECTRIC 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.

FRAME DETAIL

GRATE DETAIL

SECTION F-F
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.
SECTION A-A
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 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 BOLTS, NUTS AND WASHERS

CURB BOX ADJUST.
TO 9" HIGH

DATE

1-1/4" R

17-3/4"
15-1/8"

24"
31"

2.2"
6"

3 1/4"

5/8"

3-1/4" R

1/2"

60°

5/8"

VANE DETAIL

DATE

FLOW

FLOW

DIRECTION OF FLOW

36¹/2"

35¹/2"

12 EQUAL SPACES AT 2-13/16"
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-B3 CLASS 35B.
FRAME WEIGHT 197 LBS.; GRATE 140 LBS.; CURB BOX 92 LBS.
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.

NOTE:
CONSTRUCT BOX AS PER CATCH BASIN TYPE 'E' (LOWER PORTION ONLY).
NO. 4 REINFORCEMENT BARS, 12" SPACING, WELDED TO NOSE ANGLE WITH 3/8" WELDS BOTH SIDES

VARIABLE

6" NOSE ANGLE 2 1/4" x 4" x 1/2"

VARIABLE CURB HEIGHT

STANDARD CURB BATTER

1/4" DIAMOND FLOOR & COVER

3/8" FLAT HEAD STAINLESS STEEL CAP SCREWS – COUNTERSINK

EQUAL DISTANCE

1/2" NO. 3 REINF. STEEL ANCHOR BARS, WELDED TO FRAME

PROTECTION BAR

1" GALVANIZED BAR

FOR DETAILS 531, 532 AND 533

SECTION C-C

PROTECTION BAR SEE THIS DETAIL

SECTION D-D

NOTES:
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.

21-1/2" 19"

1-1/4" 1-1/4"

1/4" DIAMOND FLOOR & COVER

STEEL FILLER BLOCKS WELDED TO FRAME

L1-1/4" x 1-1/4" x 1/4" IRON FRAME

# 3 REINF. STEEL DOWEL BARS

DOWEL BAR
FURNISH FOR EACH SIDE OF HANDLE:
1. EACH 304-316 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.
4. EACH 1/2" LOCK WASHER.

NOTES:
1. FRAME SHALL BE NON-LOCKING.
2. FRAME AND COVER SHALL BE CAST IRON OR ASTM A-36 STL. 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.
29" x 29" I.D. GRATE FRAME

PLAN

29" x 53" I.D. GRATE FRAME

PLAN

29" x 29" I.D. GRATE FRAME

PLAN

SECTION B-B

SINGLE GRATE

SECTION B-B

GRATE

1/2" R

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

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

DETAILED ANGLE FRAME SUPPORT

GRATE SUPPORT

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

BOTH SIDES

A

SECTION A-A

DOUBLE GRATE

SLOPE FLOOR TO OUTLET

PIPE SIZE AS REQUIRED BY PLANS

SECTION C-C

BAR GRATE

SEE DETAIL 539

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

"D" VARIES

ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 725. EXPOSED EDGES SHALL BE FINISHED WITH A 1/2" RADIUS.
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

3" x 2-1/2" x 1/2" ANGLE IRON FRAME
1/2" DIA x 6" LUGS WELDED TO FRAME, 4 EACH - 1 ON EACH CORNER OF FRAME

FOR PIPE LARGER THAN 24" DIA.
(NOMINAL)

8"

D=(VARIERS)

SECTION A-A

CUT

SECTION A-A

24" PIPE (NOMINAL)

B=(VARIERS)

C=3'-4"

3'-4"

3'-4"
(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

28-1/2" SINGLE GRATE
52-1/2" DOUBLE GRATE

28-1/2"
28"
2-1/2"
1/4"
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.

<table>
<thead>
<tr>
<th>BAR TABLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>TW OR TB-1.0</td>
</tr>
<tr>
<td>TW OR TB-1.1</td>
</tr>
<tr>
<td>TW OR TB-1.2</td>
</tr>
<tr>
<td>TW OR TB-2.0</td>
</tr>
<tr>
<td>TW OR TB-2.1</td>
</tr>
<tr>
<td>TW OR TB-2.2</td>
</tr>
</tbody>
</table>

TW INDICATES TRANSVERSE WELDED
TB INDICATES TRANSVERSE BOLTED
3/8" ANCHOR
DELETE ON END
WHEN USED WITH I BEAM SUPPORT

SECTION C–C

SECTION D–D

SECTION A–A

SECTION B–B

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.

<table>
<thead>
<tr>
<th>GRATE TYPE</th>
<th>CLEAR BAR SPACING</th>
<th>NO. BARS</th>
<th>X</th>
<th>GRATE OPENING ft²</th>
</tr>
</thead>
<tbody>
<tr>
<td>LW OR LB–1.0</td>
<td>1&quot;</td>
<td>16</td>
<td>5/16&quot;</td>
<td>3.97</td>
</tr>
<tr>
<td>LW OR LB–1.1</td>
<td>1–3/8&quot;</td>
<td>13</td>
<td>5/16&quot;</td>
<td>4.34</td>
</tr>
<tr>
<td>LW OR LB–1.2</td>
<td>2&quot;</td>
<td>9</td>
<td>1–9/16&quot;</td>
<td>4.84</td>
</tr>
<tr>
<td>EF–1</td>
<td>1–5/8&quot;</td>
<td>13</td>
<td>7/16&quot;</td>
<td>4.66</td>
</tr>
<tr>
<td>LW OR LB–2.0</td>
<td>1&quot;</td>
<td>12</td>
<td>5/16&quot;</td>
<td>2.98</td>
</tr>
<tr>
<td>LW OR LB–2.1</td>
<td>1–3/8&quot;</td>
<td>9</td>
<td>1–1/16&quot;</td>
<td>3.35</td>
</tr>
<tr>
<td>LW OR LB–2.2</td>
<td>2&quot;</td>
<td>7</td>
<td>1–1/16&quot;</td>
<td>3.60</td>
</tr>
<tr>
<td>EF–2</td>
<td>1–5/16&quot;</td>
<td>10</td>
<td>1/4&quot;</td>
<td>3.48</td>
</tr>
</tbody>
</table>

BAR SPACER DETAIL
CAST IRON, CAST STEEL OR STEEL BAR STOCK
### 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.

### PIPE Dimensions

<table>
<thead>
<tr>
<th>PIPE DIA.</th>
<th>APPROX. WEIGHT (LBS.)</th>
<th>T</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>E</th>
<th>F</th>
<th>APPROX. SLOPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>1520</td>
<td>3</td>
<td>9-1/2</td>
<td>43-1/2</td>
<td>30</td>
<td>73-1/2</td>
<td>48</td>
<td>3</td>
</tr>
<tr>
<td>27&quot;</td>
<td>1930</td>
<td>3-1/4</td>
<td>10-1/2</td>
<td>49-1/2</td>
<td>24</td>
<td>73-1/2</td>
<td>54</td>
<td>3</td>
</tr>
<tr>
<td>30&quot;</td>
<td>2190</td>
<td>3-1/2</td>
<td>12</td>
<td>54</td>
<td>19-3/4</td>
<td>73-3/4</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>36&quot;</td>
<td>4100</td>
<td>4</td>
<td>15</td>
<td>63</td>
<td>34-3/4</td>
<td>97-3/4</td>
<td>72</td>
<td>3</td>
</tr>
<tr>
<td>42&quot;</td>
<td>5380</td>
<td>4-1/2</td>
<td>21</td>
<td>63</td>
<td>35</td>
<td>98</td>
<td>78</td>
<td>3</td>
</tr>
<tr>
<td>48&quot;</td>
<td>6550</td>
<td>5</td>
<td>24</td>
<td>72</td>
<td>26</td>
<td>98</td>
<td>84</td>
<td>3</td>
</tr>
<tr>
<td>54&quot;</td>
<td>8240</td>
<td>5-1/2</td>
<td>27</td>
<td>65</td>
<td>33-1/4</td>
<td>98-1/4&quot;</td>
<td>90</td>
<td>2 1/2</td>
</tr>
</tbody>
</table>
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.

SECTION A-A

SINGLE INLET

SPILLWAY SECTION

SECTION ON SPILLWAY C

DOUBLE INLET

EMBANKMENT CURB/EXTRUDED (OPTIONAL)
NOTES:
1. FOR 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 OPTIONAL.
5. TWO DEPTH GAUGES MAY BE USED. ONE ON EACH END OF UPSTREAM WALL. START WITH 2' INSTEAD OF 1'
Typical Gabions

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.

Nominal Size Combinations

<table>
<thead>
<tr>
<th>Length</th>
<th>Width</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'</td>
<td>3'</td>
<td>1', 1.5', 3'</td>
</tr>
<tr>
<td>9'</td>
<td>3'</td>
<td>1', 1.5', 3'</td>
</tr>
<tr>
<td>12'</td>
<td>3'</td>
<td>1', 1.5', 3'</td>
</tr>
</tbody>
</table>

Other sizes available from manufacturer.

Notes:

1. Plain rock or grouted rock may be substituted for sacked concrete.
2. Grout for riprap may be pneumatically placed mortar.