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320 CONCRETE WATER METER BOXES
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345–1 3”, 4”, 6” WATER METER
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404-1 WATER AND SANITARY SEWER CROSSING
404-2 WATER AND SANITARY SEWER CROSSING
405 BROKEN SEWER LINE REPLACEMENT
420-1 PRE-CAST CONCRETE SEWER MANHOLE
420-2 PRE-CAST CONCRETE SEWER MANHOLE
421 OFFSET MANHOLE FOR 8” – 30” PIPE
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501-4 HEADWALL IRRIGATION 18” TO 60” PIPE
501-5 HEADWALL – DROP INLET
502-1 TRASH RACK
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503 IRRIGATION STANDPIPE
504 CONCRETE BLOCK JUNCTION BOX
505 CONCRETE PIPE COLLAR

506 IRRIGATION VALVE INSTALLATION
507 ENCASED CONCRETE PIPE (SHALLOW INSTALLATION)
510 CORRUGATED METAL PIPE AND INSTALLATION
520 STORM DRAIN MANHOLE BASE (48” OR SMALLER)
521 STORM DRAIN MANHOLE BASE (51” OR LARGER)
522 STORM DRAIN MANHOLE SHAFT
523-1 PRESSURE MANHOLE
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524 STORM DRAIN LATERAL PIPE CONNECTIONS
530 3”–6” CURB OPENING CATCH BASIN – TYPE ‘A
531 5”–6” CURB OPENING CATCH BASIN – TYPE ‘B
532 8” CURB OPENING CATCH BASIN – TYPE ‘C
533-1 CATCH BASIN TYPE ‘D
533-2 CATCH BASIN TYPE ‘D
533-3 CATCH BASIN TYPE ‘D
534-1 CATCH BASIN – TYPE ‘E
534-2 CATCH BASIN – TYPE ‘E (DETAILS)
534-3 CATCH BASIN – TYPE ‘E (DETAILS)
534-4 CATCH BASIN – TYPE ‘E (DETAILS)
534-5 ALTERNATE GRATE STYLES – SUMP LOCATION
535 CATCH BASIN – TYPE ‘F’ – FOR USE WITHOUT CURB
536-1 COMMON DETAILS AND SECTIONS FOR CURB OPENING
CATCH BASINS
536-2 ALTERNATE COVER FOR CURB OPENING CATCH BASINS
537 CATCH BASIN – TYPE ‘G
538 CATCH BASIN – TYPE ‘H
539 GRATES FOR CATCH BASINS – TYPE ‘G’ AND ‘H
540-1 CATCH BASIN GRATES
540-2 CATCH BASIN GRATES
541 CATCH BASIN SUBGRADE DRAIN
545 END SECTION – REINFORCED CONCRETE PIPE
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."

4. MANY DETAILS COVER MORE THAN ONE SHEET.
   THESE SHEETS HAVE BEEN GIVEN THE SAME
   NUMBER WITH A SUFFIX NUMBER, EXAMPLE:
   391–1 AND 391–2.

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.

DETAIL NO. 101
STANDARD DETAIL ENGLISH
GENERAL INFORMATION

REvised
DETAIL NO. 101
### PLAN SYMBOLS

<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>SIDEWALK</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>
</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.)

DETAIL NO. 120-1
STANDARD DETAIL ENGLISH
SURVEY MARKER
REVISED 01-01-2001
DETAIL NO. 120-1
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)

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 APPEARING TRAFFIC.
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”

DETAIL NO. 2 – MEDIAN BARRIER

DETAIL NO. 3 – RUB RAIL SPlice (SPlice AT POSTS ONLY)
5/8" MACH. BOLT AND 1-3/4" x 11/16" x 9/64" WASHER. LENGTH DETERMINED BY TOTAL BLOCK THICKNESS AND SELF DRILLING ANCHOR.

5/8" x 8-1/2" CARRIAGE BOLT, USE TWO 1-3/4" x 3" x 3/16" WASHERS WITH 1" x 11/16" SLOTTED HOLES, ONE OF WHICH SHALL BE RECESSED 1" INTO BACK OF BLOCK.

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
ATTACHMENT OF GUARD RAIL TO STRUCTURES

ELEVATION

SECTION A-A

DETAIL NO. 1
GUARD RAIL POST INSTALLATION ON STRUCTURES

DETAIL NO. 5
BUFFER END SECTION

DETAIL NO. 4
STANDARD DETAIL ENGLISH

STEEL GUARD RAIL

DETAIL NO. 135-4

REVISED DETAIL NO. 135-4
SAFETY POST SECTION

EXISTING CONCRETE OR ASPHALT PAVEMENT

4" OR 6" DIA. POST

CLASS B CONCRETE PER SECT. 725

EXISTING GRADE

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

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

FILL WITH GROUT AND CROWN TOP

4" MIN.
NOTES:

1. POSTS AND RAILS SHALL BE 1.5" SCHEDULE 40 HOT-DIPPED GALVANIZED STEEL PIPE ASTM A 53, GRADE A (2.72 #/LF, 1.9" O.D.). GALVANIZING SHALL BE IN ACCORDANCE WITH SECTION 771.

2. PAINT RAIL PER MAG SPECIFICATIONS SECTION 530 WHEN REQUIRED BY PLANS. SHOP PRIME 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.
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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'

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

TYPICAL SECTION

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”</td>
<td>2.875”</td>
</tr>
<tr>
<td>LINE POST</td>
<td>1-1/2”</td>
<td>1.900”</td>
</tr>
<tr>
<td>STRAIN POST</td>
<td>1-1/2”</td>
<td>1.900”</td>
</tr>
<tr>
<td>BRACE</td>
<td>1-1/4”</td>
<td>1.666”</td>
</tr>
<tr>
<td>STRETCH BAR</td>
<td>3/16”x3/4” FLAT</td>
<td>3/16”x3/4” FLAT</td>
</tr>
<tr>
<td>GATE POST</td>
<td>3-1/2”</td>
<td>4.000”</td>
</tr>
<tr>
<td>TOP RAIL</td>
<td>1-1/4”</td>
<td>1.666”</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 DESIGNATE 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-86__ FIXTURE
FRANGIBLE COUPLING AND DISCONNECT PLUG
FINISHED GRADE

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)
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.)
A.C. PAVEMENT MATCH GRADATION AND THICKNESS OF EXISTING PAVEMENT AND COURSES

SAWCUT & TACK

24" A.B.C.

A.B.C., GRANULAR BACKFILL OR NATIVE BACKFILL PER SECT. 702 & 601 OR CLSM PER SECT. 604 & 728

CLSM PER SECTION 728

TYPE A

TRENCH WIDTH

12" A.B.C. OR EXISTING SUBGRADE WHICHEVER IS GREATER

A.B.C. PER SECT. 702 AND 601 OR CLSM PER SECT. 604 & 728

A.C. BASE COURSE

A.C. SURFACE COURSE

VARIES

12" TRENCH WIDTH

1" MAX.

TOTAL THICKNESS TO MATCH EXISTING

SURFACE OUTSIDE OF TRENCH LINES DAMAGED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL THICKNESS AND CONDITION.

COMPACTED BACKFILL DENSITY PER SECT. 601

A.B.C. OR DECOMPOSED GRANITE PER SECT. 702

NOTES:

1. BEDDING PER SECTION 601.
2. ASPHALT CONCRETE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 321.
3. TRENCHES IN ASPHALT PAVEMENTS LESS THAN 18" WIDE SHALL BE BACKFILLED WITH CLSM OR ABC SLURRY (NO CEMENT) AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.
4. TYPES 'D' AND 'E' REQUIRE 9" OF A.B.C. AT TOP OF TRENCH WHEN THERE IS AN EXISTING BASE.
5. THE TYPE OF CLSM SHALL BE 1/2 SACK OR 1 SACK AS SPECIFIED BY THE SPECIAL PROVISIONS, PLANS OR ENGINEER.

TYPE B

CHIP SEAL COAT PER SECT. 330 & 336

COMPACTED BACKFILL DENSITY PER SECT. 601

TYPE C

CLASS A CONCRETE PER SECT. 725

A.B.C., GRANULAR BACKFILL OR NATIVE BACKFILL PER SECT. 702 & 601 OR CLSM PER SECT. 604 & 728

TRENCH WIDTH

12"

TYPE D

ASPHALT CONCRETE

COMPACTED BACKFILL DENSITY PER SECT. 601

TYPE E

OIL CAKE
TYPE 'A'

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

TYPE 'B'

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

TYPE 'C'

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

12' (16')
12'

UNPAVED ALLEY DETAIL

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

RESIDENTIAL ALLEY DETAIL

2" ASPHALTIC
CONC. SECT. 710

THICKENED EDGE
(OMIT IF MATCHING
TO EXISTING
ASPHALT AREA)

CONC. GUTTER REQUIRED WHERE
LONGITUDINAL GRADE LESS THAN 0.20%

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

6" A.B.C.
SECT. 702

6" A.B.C.
SECT. 702

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

GRADING
SECT. 301

GRADING
SECT. 301

LESS THAN 20'

2" ASPHALTIC
CONC. SECT. 710

6" A.B.C.
SECT. 702

6" A.B.C.
SECT. 702

3% BRUSH
FINISH

CLASS 'A'
CONCRETE

TROWEL
SMOOTH

3% BRUSH
FINISH
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.

DETAIL C

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

2" x 2" x 1/8" ANGLE BOTH SIDES

SECTION 'A-A'

SECTION 'B-B'

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

EXPANSION JOINT

SIDEWALK

EXPANSION JOINT

TRANSITION FROM ROLL CURB TO VERTICAL CURB

SEE NOTE 5

SEE NOTE 1

SEE NOTE 2

2" x 2" x 1/8" ANGLE BOTH SIDES

STEEL DIAMOND PLATE A-36

EXPANSION JOINT

4"

'S'

6" SLOPE=1.5%

LIP OF GUTTER

DIAMOND PLATE

GUTTER FLOW LINE
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° – 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.
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.

SECTION D-D
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 ROADS), 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.
8. CONTACT THE AGENCY (OR INSPECTOR) ONE WEEK PRIOR TO INSTALLATION TO COORDINATE PAVEMENT MARKINGS AND SIGNING.

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 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 ADJOINING 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.)
AGENCY'S APPROVED 12.5 mm ASPHALT CONCRETE PLACED IN 2" LIFTS.  6" MINIMUM THICKNESS OR MATCH EXISTING ASPHALT CONCRETE SHALL BE PLACED WITHIN 4 HOURS AFTER PLACEMENT OF CLSM.

1/2 SACK CLSM FROM 6" ABOVE TOP OF THE HIGHEST UTILITY TO THE BOTTOM OF NEW ASPHALT CONCRETE.

6" BEDDING ABOVE TOP OF THE HIGHEST UTILITY PIPE TO CONFORM TO SECTION 601.4.2.

HIGHEST EXISTING UTILITY(S)

POTHOLE PLAN VIEW
(NOMINAL DIMENSIONS)
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VERTICAL CURB AND GUTTER
(TYPE A)

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)

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)

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.

SPECIAL SECT. USE FOR HIGH SIDE CURB WITH SHEET DRAINAGE ACROSS STREET.

PAVEMENT FLUSH WITH LIP OF GUTTER

1/2" BATTER OPTIONAL

NOTE: PARKWAY OR SIDEWALK - SEE NOTE 3

24" ROADWAY WIDTH
CURB AND GUTTER TRANSITION

1/2" EXPANSION JOINT FILLER SHALL BE BITUMINOUS TYPE PREFORMED, A.S.T.M. D-1751

5' CURB TRANSITION

RADIUS AS SHOWN ON PLANS

5/8" R

6"

1"

3/4" R

(4) 1/2" x 8" ANCHOR BOLTS

GALVANIZED SEMI-STEEL HOUSING

SLOPE TO 6" IN 8'

10-1/4"

7/8" MIN.

7-1/2"

10"

7/8"

3/4" R

1/2"

1/2" BATTER OPTIONAL

7-1/2"

11-1/4"

1/2" BATTERY SUPPORT

ELECTRICAL CONDUIT

GLASS MIRROR REFLECTOR IN ALUMINUM MOUNTING

CURB WARNING BEACON

INTEGRAL ROLL CURB, GUTTER AND SIDEWALK

SCORE MARK 1/8" WIDE x 1/2" DEEP - TOOL BOTH EDGES

ROADWAY WIDTH

4'

7"

17"

5"

24"

7-1/2"

12"

6"

5/8"

1.5%

1/2"

NOTES:

1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.

2. CONTRACTION JOINT SPACING 15' MAXIMUM.

3. EXPANSION JOINTS PER SECT. 340.

4. CLASS 'B' CONCRETE PER SECT. 725.

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.
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.
5. Maximum spacing of contraction joints is 10’
6. Concrete to be Class 'B' per Sect. 725.

Typical Curb Termination

Type 'A'

Type 'B'

R = 3/4"
MEDIAN LANDSCAPING
OR SURFACE AS REQUIRED

ROAD MEDIAN

WIDTH
AS SHOWN ON PLANS

FACE
OF CURB

12"

CURB HEIGHT
SEE PLANS

CURB HEIGHT Varies
(5' MINIMUM)

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

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

1. 1/2 INCH EXPANSION JOINT, ASTM D-1751 PER SEC. 729 AND ELASTOMERIC SEALANT PER SEC. 342
2. CONTRACTION JOINTS PER SEC. 342
3. MATERIALS AND CONSTRUCTION PER SEC. 342
4. PORTLAND CEMENT CONCRETE SHALL BE CLASS A
5. DESIGN PARAMETERS FOR THE THICKNESS IS BASED ON:
   ASSUMES MODULUS OF SUBGRADE REACTION ($k$) = 100 psi
   CONCRETE WORKING STRESS ($f_{w}$) = 300 psi
   TERMINAL SERVICABILITY INDEX ($p_f$) OF 2.5 OVER 20 YEARS
   AND 1 MILLION TOTAL EQUIVALENT 18-KIP SINGLE-AXLE LOAD APPLICATIONS

DETAIL NO. 225

STANDARD DETAIL
ENGLISH

CONCRETE PAVERS

REVISED 01-01-2005

DETAIL NO. 225
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.

EXPANSION JOINT

CONTRACTION JOINT

SEE NOTE 3
NOTES:

1. Control Elevations shown are in relation to the gutter and are located radially. Gutter elevation = 0.

2. Class 'B' concrete construction as per Section 723.

3. When curb heights of 7" are shown on plans, use dimensions shown in [ ]'s.

SECTION B–B

RIGHT-OF-WAY LINE

TOP OF S/W

TOP OF RAMP

BOTTOM OF RAMP CURB WHEN FORMED AND Poured SEPARATELY

SECTION A–A

MATCH CUTTER FLOW LINE

CONSTRUCTION JOINT 1" DEEP OR FORMED SEPARATELY

SUBGRADE PREPARATION, SEE Sect. 301

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

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

2. CLASS ‘B’ CONCRETE CONSTRUCTION AS PER SECTION 725.
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.

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<td>6''</td>
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<tr>
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<td>16'</td>
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<td>6''</td>
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<td>*24' MIN. FOR TWO WAY TRAFFIC</td>
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<tr>
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<td>5''</td>
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<td>5''</td>
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<tr>
<td>*16' DESIRABLE</td>
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TABLE B

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<td>*16' WIDTH IS DESIRABLE</td>
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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
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 POURED 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
NEW A.C. PAVEMENT

SECTION C-C
STD. DET. 222 TYPE 'A' MODIFIED SINGLE CURB

FLOW LINE
10' TROWEL FINISH
1"-9"
3'-6"

R=3/4"
6"
10"
4"
3"

1" TROWEL FINISH
3'-4"

STD. DET. 230 SIDEWALK WIDTH PER PLANS

R=1/2"
6"
10"
4"
3"

NOTE:
- DRAWN TO PLAN 2003 DRAWN TO SCALE 2004
- DRAWN TO SCALE 2003 DRAWN TO PLAN 2004

DATE: 01-01-2005

DETAIL NO. 252

MARICOPA ASSOCIATION OF GOVERNMENTS
STANDARD DETAIL
ENGLISH
BUS BAYS

REVISED

DETAIL NO. 252
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.
THICKEN CONCRETE FROM 6" TO 8" IN 18" AT BACK OF ALLEY ENTRANCE

PROPERTY LINE

ALLEY RIGHT-OF-WAY

SECTION A-A

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.
WATER VALVE, SURVEY MONUMENT, OR SEWER CLEAN OUT FRAME & GRADE ADJUSTMENT

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)

SUBGRADE PREP AS REQUIRED COMPACTION TO CONFORM TO SECT. 301 OR 601.

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.

CHAIN ATTACHMENT (AS REQUIRED)

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

1/32" 2" MIN.

LOCK WASHER FLATTEN BOLT END

SEWER WATER SURVEY

DETAIL TYPICAL FOR BOTH FRAME AND COVER

COVER SECTION A-A

8" 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.

CLASS 'C' CONCRETE AS PER SECT. 725 FORM AS REQUIRED TO KEEP CLEAR OF JOINTS.

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.
**Pipe Size** | **A** | **B** | **C** | **D**
--- | --- | --- | --- | ---
4" | 12.5" | 10.125" | 2.5" | 1.75"
6" | 14.125" | 12.125" | 3.9375" | 2.1875"
10" | 19.125" | 16.125" | 5.375" | 5"
12" | 22.5" | 19.375" | 6.375" | 5.875"

**NOTE:**
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.
**DEAD ENDS**

LRN = SHORTEST LENGTH OF PIPE RESTRAINED TO THE RUN OF THE TEE FITTING (BOTH SIDES OF TEE).

**HORIZONTAL BENDS**

**TEES**

**VERTICAL UP BEND**

**VERTICAL DOWN BENDS**

UNDISTURBED SOIL
## Restrained Lengths, LR, for Ductile Iron Pipe

**Nominal Pipe Size Inches**

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2'</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>10</td>
<td>5</td>
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<td>6</td>
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<tr>
<td>10</td>
<td>38</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>45</td>
<td>19</td>
<td>9</td>
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<tr>
<td>14</td>
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<td>21</td>
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<td>16</td>
<td>57</td>
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<tr>
<td>24</td>
<td>79</td>
<td>33</td>
<td>16</td>
</tr>
</tbody>
</table>

## Restrained Lengths, LR, for Ductile Iron Pipe with Polyethylene Wrap

**Nominal Pipe Size Inches**

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2'</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>36</td>
<td>15</td>
<td>7</td>
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<td>8</td>
<td>47</td>
<td>19</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>56</td>
<td>23</td>
<td>11</td>
</tr>
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<td>12</td>
<td>65</td>
<td>27</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>74</td>
<td>31</td>
<td>15</td>
</tr>
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<td>16</td>
<td>82</td>
<td>34</td>
<td>16</td>
</tr>
<tr>
<td>18</td>
<td>90</td>
<td>37</td>
<td>18</td>
</tr>
<tr>
<td>20</td>
<td>98</td>
<td>41</td>
<td>20</td>
</tr>
<tr>
<td>24</td>
<td>113</td>
<td>47</td>
<td>22</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.
NUMBER "2", 1-1/4" HIGH, RAISED 1/8"

SEE SLOT DETAIL BELOW

NOTE:
FOR CASTING SPECIFICATIONS SEE SECT. 787.
SECTION A-A

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.
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.
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

REMOVABLE SUPPORT

(2) C.I. METER BOX COVERS SEE DETAIL 314

CONCRETE MASONRY UNITS (BLOCK) WITH SOLID GROUNDED 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

GROUNTED IN BOLT

HINGES

TOP SECTION

CENTER SECTION

(2) GRATE VENTS

(4) 5/8" DIAMETER FERRULE LOOP INSERTS

CAST-IN-PLACE FOOTING FOR PRE-CAST VAULT

FOOTING FOR CAST-IN-PLACE VAULT
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 ASPHALT 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>
</tr>
<tr>
<td>8&quot;</td>
<td>6</td>
</tr>
<tr>
<td>10&quot;</td>
<td>9</td>
</tr>
<tr>
<td>12&quot;</td>
<td>13</td>
</tr>
<tr>
<td>16&quot;</td>
<td>23</td>
</tr>
</tbody>
</table>

DETAIL NO. 340

STANDARD DETAIL
ENGLISH

INSTALLING TAPPING SLEEVES AND VALVES

REVISED 01-03-2002

DETAIL NO. 340
CONCRETE PRESSURE PIPE TAPPING SLEEVE

* DIMENSIONS TO BE FIELD VERIFIED
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.

2" TYPE 'K' COPPER BY-PASS

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.

10. CONCRETE TO BE CLASS "B" PER SECT. 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>
</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. 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.
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.
**CAST IRON**

- **EXIST. C.I. PIPE**
- **NEW PIPE**
- **SOLID SLEEVE**
- **C.I. B. & S. OFFSET**

**REMAINDER OF TRENCH TO BE BACKFILLED PER SECT. 601**

**6" MIN. CLEARANCE BACKFILLED WITH SELECTED FINE MATERIAL OR SAND**

**CAST IRON MECHANICAL JOINT**

- **EXIST. PIPE**
- **NEW PIPE**
- **SOLID SLEEVE**
- **BELL & SPIGOT**
- **BELL & BELL**

**NOTE:**
- DROP SECTION IS TO BE PREFABRICATED AND INSTALLED AS A SINGLE UNIT.

**ASBESTOS CEMENT**

- **NEW PIPE**
- **SOLID SLEEVE**
- **C.I. B. & S. OFFSET**

**REMAINDER OF TRENCH TO BE BACKFILLED PER SECT. 601**

**6" MIN. CLEARANCE BACKFILLED WITH SELECTED FINE MATERIAL OR SAND**

**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>
<th>WATER PIPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPE SIZE</td>
<td>TEE, DEAD END, 90° BEND</td>
</tr>
<tr>
<td>4&quot; OR LESS</td>
<td>3</td>
</tr>
<tr>
<td>6&quot;</td>
<td>4</td>
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<td>8&quot;</td>
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<tr>
<td>12&quot;</td>
<td>14</td>
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<tr>
<td>16&quot;</td>
<td>24</td>
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</tbody>
</table>

SECTION A–A

THRUST BLOCK

CURB STOP

THrust block area (YxW)

MIN.

MIN.

1/2 AREA REQUIRED FOR 90° BEND

TOTAL AREA EQUALS AREA REQUIRED FOR TEE

AREA FOR TEE

AREA REQUIRED FOR 90° BEND

DETAIL NO. 380

STANDARD DETAIL ENGLISH

THRUST BLOCKS FOR WATER LINES

REvised

DETAIL NO. 380
### 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" BRONZE CURB STOP

TAPPED PLUG OR CAP

WATER LINE

CONCRETE THRUST BLOCK PER DETAIL 380

WATER MAIN

2" P.E. OR COPPER PIPE

2" CORP STOP

2" BRASS COUPLING

2" BRASS ELL

2" TAPPED CAP (CAST IRON)

2" ADAPTER BRASS OR COPPER

2" COPPER PIPE

BRONZE OR BRASS FITTING

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

DETAIL NO. 390
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.

TYPE 'C'

TYPE 'A'
(TO BE USED IN AREAS SUBJECT TO VEHICULAR TRAFFIC.)

TYPE 'B'
(NOT SUBJECT TO VEHICULAR TRAFFIC)
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 SLIPAGE, 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.


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 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.
6. WHEN TYPE 'A' PIPE SUPPORT IS USED AND WHenever so directed by the Engineer, the Contractor shall pierce the wall with suitable opennings to prevent unequal pressure resulting from flooding of the backfill. the volume of the pierced opening shall not exceed 1/2 the volume of the supporting wall.
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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<tr>
<td>CAST IRON PIPE</td>
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<tr>
<td>OTHER UTILITIES AS</td>
</tr>
<tr>
<td>CONC. IRRI. PIPE</td>
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<tr>
<td>NOTED ON THE PLANS OR AS</td>
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<tr>
<td>BURIED TELCO.</td>
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<td>REQUIRED BY THE ENGINEER AT</td>
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<tr>
<td>GAS PIPES</td>
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<tr>
<td>TIME OF CONSTRUCTION.</td>
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<tr>
<td>CONC. STORM DRAIN</td>
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<tr>
<td>TRAFFIC CONTROL CONDUIT</td>
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<tr>
<td>CONC. BOX CULVERT</td>
</tr>
<tr>
<td>WATER &amp; SEWER LINES</td>
</tr>
</tbody>
</table>

SEE SECT. 601 FOR BACKFILL & COMPACTION.
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. 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 ENCASING 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 PIPE CROSSING

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

PLAN VIEW OF REPLACEMENT

EXCAVATE 6" BEYOND UNBROKEN BELL TO ALLOW ROOM FOR INSPECTION

COMPACTION SHALL BE DONE IN ACCORDANCE WITH SECT. 601

18" MIN. WHEN USING BELL CONNECTION

SAW SOUND PIPE SQUARE

NEW CONSTRUCTION

12" MIN. SOLID BEARING ON EACH SIDE

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

4"

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

**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.
24" TO 26-3/4" ON 48" M.H.
30" ON 60" M.H.

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

FLAT REINFORCED
CONC. TOP

"RAM NEK" PLASTIC
GASKET OR EQUAL

RUBBER GASKET
W/ EXPANDED
BELL JOINT

M.H. STEPS, SEE
NOTE 2

1-1/2"
NOMINAL
COVER
OVER STEEL.
(TYP.)

FLOW

CEMENT
MORTAR
CONC.
BASE PER SECT. 725, 505.

FLOW

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

ADJUSTING RING DETAIL

ROUND OR SQUARE
BASE OPTIONAL
PIECE 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 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

MANHOLE RING & COVER
PER DETAIL 423,
424 & 425

COMBINED CURB
AND GUTTER

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

MIN. VARIABLE

PAVEMENT VARIES

5"

8"

12"

1/2"

3/4"

2"

2"

MAX.

3/16"

ROWLOCK RADIAL COURSE
(BRICK M.H.)

1/2"
M.H. FRAME AND COVER PER SECT. 625

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. STEP IS 48"
M.H. ONLY

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

PIECE SIZE & ELEVATION
AS SHOWN ON PLANS

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

EXISTING OR RECENTLY INSTALLED PAVEMENT

12" WALL TO 13" DEPTH
12" WALL BELOW 13"

1/2"

SUBGRADE PREPARATION TO CONFORM TO SECT. 301 OR 601

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

M.H. WALL THICKNESS AND MATERIAL VARIES

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

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

BRICK SHALL BE IN ACCORDANCE WITH SECT. 775

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

3 TO 5"

BRICKS

40" MIN.

44" MAX.

26-3/4"

5"

8"

12" MAX.

12" MAX.

8"

12"

5"

12"

4"
FACE OF COVER
CAST IRON

BACK OF COVER

CAST IRON
MANHOLE RING

SECTION OF COVER
APPROX. WEIGHT 276 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.
24" MANHOLE FRAME AND COVER

BOTTOM VIEW - TOP VIEW
WT. (CL. 30) - 205 LBS
WT. (CL. 35) - 170 LBS

FRAME
BEAD 1/16" HIGH
3/4" 1 1/2"
2-1/8"

COVER TOP VIEW
7/8" DRILL,
11" DIA O.C.
2 HOLES AS
NECESSARY
FOR MACHINING

A

B

BOTTOM VIEW
WT. (CL. 30) - 224 LBS
WT. (CL. 35) - 219 LBS

FRAME
BATTER 1/8"

2" (MAX.)
SPACING

BOTTOM VIEW - TOP VIEW
WT. (CL. 30) - 324 LBS
WT. (CL. 35) - 207 LBS

COVER TOP VIEW
BEAD 1/8"
HIGH

B

BOTTOM VIEW
WT. (CL. 30) - 231 LBS
WT. (CL. 35) - 216 LBS

FRAME

2 1/2"
1 1/2"
1 1/2"

SAMPLE IDENTIFICATION

B

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 1" 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.

SECTION 'A-A' OF COVER

BATTER 3/16"
1 3/16" 1 1/2"
1 3/16"

MACHINE 3/16"
1 1/2"
1 1/2"

SECTION OF FRAME

BATTER 3/16"
1 3/16" 1 1/2"
1 3/16"

33-3/4"
3-1/2"

SECTION 'B-B' OF COVER

BATTER 1/8"
1/2"
1 1/8"

MACHINE 5/16"
1 1/2"
1 1/2"

SECTION OF FRAME

BATTER 3/16"
1 3/16" 1 1/2"
1 3/16"

1 1/2"
1 1/2"

1 1/2"

31-1/2"
3-1/2"
6 RIBS, EQUALLY SPACED 60°

TOP 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).
**Type A**
2.5' to 5' Drop

**Type B**
5' or More

- **Caulder Coupling Connection or Approved Equal**
- Concrete to Spring Line of Pipe
- Masonry Anchors Min.
  One Tie per 2 sq ft of Contact Area for Drop Connections to Existing Manholes Only (Typ)

- **Concrete Foundations on New Manholes to Extend Under Drop Connection**
- Square, Concrete Encasement Class 'C' Sect. 725 or Masonry Encasement Grouted Solid

- **45° Mitered Bend**
- **Manhole Wall**
- **Top of Sewer CL**

- **Pour Invert**

- **MANHOLE FOUNDATION**

- **OF SEWER**

- **MANHOLE WALL**

- **2.5' Min. to 5' Max**

- **STUB PIPE**

- **OF SEWER**

- **'Y' Branch**

- **SAME DIA.**

- **ALL PIPE TO BE VITRIFIED CLAY**

- **Concrete to Spring Line of Pipe**

- **Caulder Coupling Connection or Approved Equal**

- **Detail No. 426**

- **Revised 01-01-2004**

- **Detail No. 426**
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

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

PREFORMED JOINT

VIT. CLAY OR PLASTIC PLUG

VIT. CLAY PIPE

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

GROUND LINE

DRAIN LINE

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

PLUG THICKNESS
'A'

1/2" LAYER CEMENT PLASTER (WATERTIGHT)

BLOCK OR BRICK AND MORTAR PLUG (SEE NOTE)

2"

BELL END

SEWER MANHOLE WALL

INVERT ELEVATION ACCORDING TO PLAN

MANHOLE FOUNDATION

DRY PACK FOR PRECAST CONCRETE MANHOLE

PLUG (SEE DETAIL RIGHT)

SIZE ACCORDING TO PLAN

TYPICAL STUB OUT
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.
DOUBLE PIPE HEADWALL

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.

HEADWALL DIMENSIONS

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE</th>
<th>( L_1 )</th>
<th>( L_2 )</th>
<th>( L_3 )</th>
<th>( L_4 )</th>
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</table>

* 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**

- **CONSTR. JOINT**
- **SIZE**
- **12" O.C.**

---

**OUTLET HEADWALL**

- **CONSTR. JOINT**
- **12"**

---

**INLET HEADWALL FACE ELEVATION**

**OUTLET SIMILAR**

---

**SECTION B-B**

**BEVEL** SEE DETAIL, INLET ONLY

---

**SECTION A-A**

**CONCRETE SHALL BE CLASS 'A' PER SECT. 725**

---

**CMP BEVEL DETAIL**

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

---

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

<table>
<thead>
<tr>
<th>D</th>
<th>TYPE *</th>
<th>DIMENSIONS</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.
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 & 776.

RACK BARS

BAR 2” x 1/2”

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.


4. 14” PLATE SHALL NOT EXTEND BELOW TOP OF PIPE.
**CONCRETE MASONRY UNITS (BLOCK)**

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

**STRAIGHT TYPE**

**'U' TYPE**

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

**SLOPE 1:1 MIN. 1:1.5 MAX.**

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**SECTION A-A**

- **WALL**
- **3" GALV. PIPE**
- **1" GALV. PIPE**
- **45°**
- **1/4"x2" STEEL BAR PLATE**
- **C-C SPACING**
- **6"**
- **Z**
- **3" 1/2" x 4-1/2" GALV BOLT SUNK IN PLASTER WITH BRASS NUT**
- **TOP BANK**
- **LOCK TYPE WASHER AND 5/8" NUT**
- **PROVIDE PLASTIC SLEEVE 3/4" DIA.**

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**TYPE BASED ON PIPE SIZE**

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<tr>
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<td>12</td>
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<td>14</td>
<td>6'-7 3/4&quot;</td>
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**EYE BOLT**

- **WALL**
- **10" FOR BLOCK HEADWALLS 8" FOR REINF. CONC. HEADWALL**
- **3'-5/8" 3"**

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**TRASH RACK**

**DETAIL NO.** 502-2

**STANDARD DETAIL** ENGLISH

**MARICOPA ASSOCIATION OF GOVERNMENTS**

**TRASH RACK**

**REvised 01-01-2004**

**DETAIL NO.** 502-2
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 1

SEE NOTE 2

SEE NOTE 3

4 3/8" bolts to be grouted into standpipe equi-distant with 1-1/2" x 3" rectangular washers and nuts.

GALVANIZED EXPANDED METAL LID (9 GAUGE)

1" C.R.S. LIFT ROD

FORM CONC. AROUND END OF PIPE BEHIND HEADGATE FRAME

VARIES MIN. 48" MAX. 52"

FINISH GRADING

HEADGATE TO BE SWANSON 800 SERIES OR APPROVED EQUAL

GROUT JOINTS WATER TIGHT

GATE TYPE, SIZE AND NO. REQUIRED AS GIVEN ON PLANS

SIZE OF PIPE AS SHOWN ON PLANS

SIZE OF PIPE AS SHOWN ON PLANS

GATE HANDLE

1/4" ROD HANDLE

10 GAUGE SHEET STEEL COVER

HANDLE EXTENDS 6" BELOW TOP WHEN GATE IS OPEN

(2) 5/16" HOLE 4" O.C.
PLAN OF COVER

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

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.

\[ A^* = \text{ANGLE OF DEFLECTION} \]

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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

BREAK PIPE
AND MAKE
WATERTIGHT
JOINTS PER
DETAIL 524

12"

CLASS 'C' CONCRETE
PER SECTION 725
WITH TROWEL FINISH

MAIN

PIPE DIAMETER
TO BE SAME AS
VALVE SIZE

PLUG END PER
DETAIL 427

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

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-EXCAVATED TO ALLOW SUFFICIENT ROOM TO OPERATE PROPER MECHANICAL COMPACTION EQUIPMENT.

4. CONCRETE WHICH SPLILLS 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.

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

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

SECTION A-A

STANDARD THREAD (COARSE)

SELECT MATERIAL


T-BOLT

WELD ALL AROUND

8 HOLES 9/16" DIA.
CONNECTOR PIPE

6" MIN (TYP.)

1:2 MORTAR

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

BAND DETAIL

2" GUAGE BITUMINOUS COATED GALVANIZED METAL PLATE
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 END 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.

TABLE OF VALUES FOR 'F' & 'D'

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MAN HOLE SHAFT PER DETAIL 522

PRECAST PIPE WITH VERTICAL STUB

ENCASEMENT

SECTION A-A

SECTION B-B

STORM DRAIN MANHOLE BASE (51" OR LARGER)
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.
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 EVENLY.

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.
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. 720.

6. CONCRETE SHALL BE CLASS A PER SECTION 725.

DIMENSIONS

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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 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

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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 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

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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. SUM P FLOOR SHALL HAVE A WOOD TROWEL FINISH AND A MIN. SLOPE OF 0.01 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 NO. 1 PAINT AND TWO FIELD COATS OF NO. 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 INCH 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.

PLAN VIEW
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.
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.
SECTION A--A

DOUBLE UNIT CAST IRON FRAME — GRATE — CURB BOX

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.)

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.

VANE DETAIL

SECTION B--B

DATE

Curb Box Adjust. To 9" High

2'

5/8"

3-1/4" R

60'

1/2"
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.
SECTION C–C

FOR DETAILS 531, 532 AND 533

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.
PLAN VIEW

SECTION A–A

SECTION B–B

SECTION C–C

DANCE HANDLE

NOTES:

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.
29" x 29" I.D. GRATE FRAME

PLAN

SINGLE GRATE

29" x 53" I.D. GRATE FRAME

PLAN

SECTION B-B

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

DETAIL OF ANGLE FRAME GRATE SUPPORT

WELD INTO 2ND 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
3-5/8"

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.

PIPE SIZE AS REQUIRED BY PLANS

SLOPE FLOOR TO OUTLET

SECTION A-A

SECTION C-C

CATCH BASIN - TYPE 'G'

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)

SECTION A-A

SECTION A-A

24" PIPE (NOMINAL)

D=(VARI)ES

C=3'-4"

2'-8" MIN.

8" MIN.

3'-4"

B=(VARI)ES

8"

24"

24"

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

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.

<table>
<thead>
<tr>
<th>BAR TYPE</th>
<th>CLEAR SPACING</th>
<th>NO. BARS</th>
<th>X</th>
<th>GRATE OPENING (ft²)</th>
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<tbody>
<tr>
<td>TW OR TB-1.0</td>
<td>1&quot;</td>
<td>26</td>
<td>1&quot;</td>
<td>3.21</td>
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<tr>
<td>TW OR TB-1.1</td>
<td>1-3/8&quot;</td>
<td>21</td>
<td>1&quot;</td>
<td>3.32</td>
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<tr>
<td>TW OR TB-1.2</td>
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<td>16</td>
<td>1&quot;</td>
<td>4.66</td>
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<tr>
<td>TW OR TB-2.0</td>
<td>1&quot;</td>
<td>26</td>
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<td>2.32</td>
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<tr>
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<td>1-3/8&quot;</td>
<td>21</td>
<td>1&quot;</td>
<td>2.41</td>
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<tr>
<td>TW OR TB-2.2</td>
<td>2&quot;</td>
<td>16</td>
<td>1&quot;</td>
<td>2.65</td>
</tr>
</tbody>
</table>

TW INDICATES TRANSVERSE WELDED
TB INDICATES TRANSVERSE BOLTED
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 B-B

1/2" ROD THREADED ENDS
SPOT WELD OR PEEN
NUT AND CUT WASHER
SPACER

SECTION D-D

3/16"
1/2" x 3-1/2" BARS

SECTION C-C

<table>
<thead>
<tr>
<th>GRADE 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>
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<td>LW OR LB-1.2</td>
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<td>1-9/16&quot;</td>
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<tr>
<td>EF-1</td>
<td>1-5/8&quot;</td>
<td>13</td>
<td>7/16&quot;</td>
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<td>10</td>
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<td>3.48</td>
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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. GRADE TYPE LW AND EF RESTRICTED TO SLOPES OF 3% OR LESS.
9. GRADES TYPE LB USE LONGITUDINAL GRADES IN EXCESS OF 3% OR AS AN ALTERNATE TO TYPES LW OR EF ON GRADES OF 3% OR LESS.
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.
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**PIPE DIA.**

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

### 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.

**END SECTION – REINFORCED CONCRETE PIPE**
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

COLD JOINT OR CONSTRUCTION JOINT

EMBANKMENT CURB/EXTRUDED (OPTIONAL)

SECTION ON SPILLWAY 
DOUBLE INLET

SPILLWAY INLET AND OUTLET
**CONCRETE SURFACE FORD CONCRETE WALLS**

**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 OPTIONAL.
5. TWO DEPTH GAUGES MAY BE USED. ONE ON EACH END OF UPSTREAM WALL. START WITH 2” INSTEAD OF 1”

---

**ELEVATION LOOKING UPSTREAM**

**DEPTH GAUGE DETAIL**

(OPTION OF THE CONTRACTING AGENCY)

**VERTICAL ALIGNMENT TO BE AS NEAR AVERAGE TRANSVERSE GRADE OF STREAM BED AS POSSIBLE**

**WALL TO BE BUILT ONE FOOT ABOVE HIGH WATER LEVEL**

**3” WEEP HOLE 20’ C TO C**
TYPICAL GABIONS

PLAN

ELEVATION

VARIABLE EXIST GROUND LINE OR STREAM BED

2'-0" MIN.

ELEVATION

TYPE 1 RIPRAP

PLAN

ELEVATION

AS CALLED FOR ON PLANS

1'-2" MIN.

ELEVATION

TYPE 2 RIPRAP

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.