UNIFORM STANDARD DETAILS
for
PUBLIC WORKS CONSTRUCTION
SPONSORED and DISTRIBUTED
by the

MARICOPA ASSOCIATION of GOVERNMENTS

1998
ARIZONA

(Includes Revisions for 2011)

Note: Update packet does not include details approved in prior revisions.
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1. THESE DETAILS HAVE BEEN PREPARED IN AN EFFORT TO STANDARDIZE THE CONSTRUCTION DETAILS USED BY VARIOUS CONTRACTING AGENCIES IN MARICOPA COUNTY. THEY ARE TO BE USED IN CONJUNCTION WITH THE CURRENT EDITION OF THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" SPONSORED DISTRIBUTED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS.

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

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


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

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

7. DETAIL DRAWINGS ARE NOT TO SCALE.
NOTES:
1. PLAN SYMBOLS FOR EXISTING FEATURES ARE TO BE DASHED, GRAY SCALDED, OR DRAWN USING THIN LINENWORK.
2. ADD LABELS TO PLAN SYMBOLS AS NEEDED FOR CLARITY.
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* Scale to actual width
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.)

CAP DETAIL

SEE NOTE 5

REMOVE BURRS AND SAND FROM TOP

SEE NOTE 6

STD. WROUGHT WASHER

BRASS CAP, SEE DETAIL

CLASS 'B' CONCRETE AS PER SECT. 725

SAND OR EARTH

STD. WROUGHT WASHER

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

FOR UNPAVED STREETS AND ALLEYS

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

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

SEDGE MARKS

CYLINDER - 8" DIAM. (MIN.)

CYLINDER - 8" DIAM. (MAX.)

NO. 5 REBAR AS PER SECT. 727

ROUND OR SQUARE 6" (MIN.) - 8" (MAX.)

CLSS 'B' CONC. AS PER SECT. 725

TYPE 'C' (WITHOUT FRAME)

TYPE 'A' (WITH FRAME PER DETAIL 270)

SURVEY MARKER

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 (PER ARS 33-103). CONCRETE POST IS CHAMFERED 3/4" AT TOP.

3. SECTION CORNERS, 1/4 CORNERS AND CENTER OF SECTIONS SHALL BE 30" LONG, ALL OTHER MARKERS SHALL BE A MINIMUM OF 16" PER THE ARIZONA BOARD OF TECHNICAL REGISTRATION (BTR) UNLESS SUBSURFACE OBSTRUCTIONS LIMIT LENGTH.

4. IN ALL CASES, THE POINT SURVEYED SHALL BE IDENTIFIED BY A PUNCH MARK AND IN ADDITION THE CAP SHALL BE STAMPED WITH THE REGISTERED LAND SURVEYOR (RLS) REGISTRATION NUMBER AND YEAR.

5. WHEN APPLICABLE, STAMP THE APPROPRIATE PUBLIC LAND MARKINGS PER CURRENT MANUAL OF INSTRUCTIONS FOR THE SURVEY OF THE PUBLIC LANDS OF THE UNITED STATES, PREPARED BY THE BUREAU OF LAND MANAGEMENT.

6. IN ALL CASES WHEN MONUMENTS ARE SET A CORNER RECORD OR RESULTS OF SURVEY SHALL BE RECORDED. (PER BTR)
NOTES:

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

NOTES:

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

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

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

4. TWO COATS OF WHITE PAINT PER SECTION 790 SHALL BE APPLIED TO ALL EXPOSED SURFACES OF THE BARRICADE. AN ADDITIONAL TWO COATS OF ORANGE PAINT PER SECTION 790 SHALL BE APPLIED TO CREATE THE ALTERNATE ORANGE AND WHITE STRIPES FOR TEMPORARY BARRICADES AND TWO COATS OF RED PAINT PER SECTION 790 SHALL BE APPLIED TO CREATE ALTERNATE RED AND WHITE STRIPES FOR PERMANENT BARRICADES. HIGHWAY SAFETY SPHERES (BEADS) PER ADOT 708-2.02 SHALL BE APPLIED BY HAND TO ALL CROSS MEMBERS, FRONT AND BACK AND ON BOTH COLORS, IMMEDIATELY AFTER PAINTING. THE STRIPES SHALL SLOPE DOWNWARD IN THE DIRECTION TRAFFIC IS TO PASS.
FLANGED STEEL 'U' CHANNEL (2 LBS. OR 3 LBS. PER SQUARE FOOT AS SPECIFIED)

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

2" DIA. STANDARD PIPE GALVANIZED

NOTES

TYPE 'A'

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

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

TYPE 'B' & TYPE 'C'

CONCRETE BASE FOUNDATIONS SHALL BE CLASS 'C' CONCRETE AS PER SECT. 505 AND 725.
NOTES
1. POSTS AND BLOCKS SHALL BE 8" x 8" ROUGH WOOD, PRESSURE TREATED AND UNPAINTED. HOLES SHALL BE BORED BEFORE TREATMENT. SEE SECT. 415.
2. ALL GUARD RAIL PLATE, FITTINGS, HARDWARE, ETC. SHALL BE GALVANIZED.
3. TYPE 'A' GUARD RAIL INSTALLED ON NORMAL SHOULDER LINE.
4. TYPE 'B' GUARD RAIL INSTALLED ON WIDENED ROADWAY SHOULDER LINE.
5. TYPE 'B' INSTALLATION SHOWN. TYPE 'A' INSTALLATION SAME EXCEPT THAT INSIDE FACE OF GUARD RAIL SHALL FALL ON THE NORMAL SHOULDER LINE AS INDICATED BY PLAN DRAWING.
6. INSTALL LAP PLATES SO THAT EXPOSED EDGES ARE AWAY FROM APPROACHING TRAFFIC.

**FACE ELEVATION**

- 5/8" x 18" BUTTON HEAD BOLT AND RECESSED NUT
- 1-3/4" x 11/16" x 9/16" WASHER
- 8" x 8" x 1"-2" BLOCK
- FINISH SHOULDER LINE
- VARIES
- SUBGRADE
- WIDENING
- 2'
- 3'-0"
- NORMAL SHOULDER LINE

**SIDE ELEVATION**

- 60d SPIKE 2/BLOCK
- 3-5/16"
- MIN.

**PLAN**

- 25:1 A.C. TAPER
- 25:1 TAPER
- NORMAL SHOULDER LINE
- TRAFFIC

**DETAIL NO. 1**

- 5/8" x 1/4" BUTTON HEAD SPICE BOLT WITH RECESSED NUT
- 1-3/4" x 3" x 3/16" WASHER WITH 1" x 11/16" SLOTTED HOLE
W SECTION BACK-UP PLATE
FOR STEEL POSTS

STEEL W SECTION, 12 GAUGE

W BEAM (STEEL POST)

W6x8.5 STEEL POST
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)

INSTALLATION OF GUARD RAIL IN EMBANKMENT CURB SECTION
NOTE
1. 5/8" BOLT SIZE SELF DRILLING ANCHOR SHALL HAVE A MINIMUM 1500# PULL OUT STRENGTH IN 2500 P.S.I. CONCRETE IN ACCORDANCE WITH MANUFACTURER’S SPECIFICATIONS.

SECTION

DETAiL NO. 4
ATTACHMENT OF GUARD RAIL TO STRUCTURES

ELEVATION

DETAiL NO. 5
BUFFER END SECTION

DETAIL NO. 1
GUARD RAIL POST INSTALLATION ON STRUCTURES

1" SQUARE OR HEX. HEAD MACH. BOLT, NUT AND WASHERS

2-1/2"

SLOTTED HOLES (4) 29/32" x 1-1/8"

2-1/4"

1"-4"

2-1/4" APPROX.

29/32" x 1-1/8"

TWO 6" x 6" x 1/2" ANGLE 8" LONG

FOUR-5/8" BOLT SIZE SELF DRILLING ANCHOR AND BOLTS. SEE NOTE 1

POST LENGTH AS REQUIRED

FINISHED GRADE

A A

A

1-4"

MAX.

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.

BLOCK THICKNESS AS REQUIRED

PIER OR ABUTMENT
FILL WITH GROUT AND CROWN TOP

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

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

¾" x 5½" DIAMETER CAP PLATE
SEAL WELD ALL AROUND

5" DIA. STEEL GUARD POST SCH. 40

½" A-36 STEEL COLLAR
5½" x 7½" OD. FILLET WELD
TO GUARD POST BOTH SIDES, ALL AROUND

1" SLEEVE PROJECTION

CLASS B CONCRETE PER SECT. 725

6" DIA. x 34" SCH. 40
GROUND SLEEVE WITH
¾" x 6½" CAP PLATE.
SEAL WELD ALL AROUND

1" SLOPE
2" GAP
3" CLEAR

3" MIN. TYP.

EXISTING GRADE, TYP.

CLASS B CONCRETE PER SECT. 725

36" MINIMUM

VARI E PER PLANS

30"

6"

VARI E PER PLANS

36"

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

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

¾" x 5½" DIAMETER CAP PLATE
SEAL WELD ALL AROUND

5" DIA. STEEL GUARD POST SCH. 40

½" A-36 STEEL COLLAR
5½" x 7½" OD. FILLET WELD
TO GUARD POST BOTH SIDES, ALL AROUND

1" SLEEVE PROJECTION

CLASS B CONCRETE PER SECT. 725

6" DIA. x 34" SCH. 40
GROUND SLEEVE WITH
¾" x 6½" CAP PLATE.
SEAL WELD ALL AROUND

1" SLOPE
2" GAP
3" CLEAR

3" MIN. TYP.

EXISTING GRADE, TYP.

CLASS B CONCRETE PER SECT. 725

36" MINIMUM

VARI E PER PLANS

30"

6"

VARI E PER PLANS

36"

SUBCRIPTION

NO. 140

MARICOPA ASSOCIATION OF GOVERNMENTS

STANDARD DETAIL
ENGLISH

BOLLARD

REVISED
01-01-2009

DETAIL NO.
140

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

2. REMOVABLE POSTS SHALL HAVE 1" DIA. HOLES DRILLED THROUGH AT A DISTANCE ½ THE OVERALL POST LENGTH FROM TOP.

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

NOTES

1. CONTRACTOR SHALL CLEAN ROADWAY SURFACE PRIOR TO PLACEMENT OF FLEXIBLE TUBULAR MARKER.
2. FLEXIBLE TUBULAR MARKERS SHALL BE CEMENTED TO THE PAVEMENT SURFACE WITH AN EPOXY ADHESIVE IN ACCORDANCE WITH THE TUBULAR MARKER MANUFACTURER’S SPECIFICATIONS.
3. YELLOW TUBULAR MARKERS SHALL HAVE A YELLOW POST AND YELLOW "HIGH INTENSITY GRADE" RETROREFLECTIVE SHEETING. ORANGE TUBULAR MARKERS SHALL HAVE AN ORANGE POST AND WHITE HIGH INTENSITY RETROREFLECTIVE SHEETING.
4. POST SHALL BE FLEXIBLE, HIGH IMPACT RESISTANT PLASTIC MATERIAL.

TYPE 2 GROUND MOUNT
NOTES:
1. POSTS AND RAILS SHALL BE 1.5" SCHEDULE 40 HOT-DIPPED GALVANIZED STEEL PIPE ASTM A 53, GRADE B (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. SHIP 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.
6. THE EMDEMENT FOR ANCHOR TYPES 1, 2 AND 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE.
7. SAFETY RAIL IS NOT TO BE USED AS A PEDESTRIAN BRIDGE RAIL.

NOTE: SEE PLANS FOR ANCHORAGE DETAILS FOR ATTACHMENT TO SINGULARLY REINFORCED AND NON-REINFORCED WALLS.

ELEVATION

TYPE 1:
ANCHOR PLATE DETAIL

TYPE 2:
EXPANSION BOLT DETAIL

TYPE 3:
PIPE SLEEVE DETAIL

TYPE 4:
GROUND INSTALLATION DETAIL

DETAIL NO. 145
STANDARD DETAIL ENGLISH
SAFETY RAIL

REVISED 01-01-2011
DETAIL NO. 145
5/8" HOLE FOR 1/2" DIA. PIN, 24" LONG, HOT ROLLED STEEL

TYPE A

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

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

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

RADIUS 3/4" MIN. – 1" MAX.
NO.3 REINFORCING BAR AS PER SECTION 727
69" FOR TYPES 'A' AND 'B-3'
45" FOR TYPE 'B-2'

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

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

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

SAFETY CURB
INSTALLATION ON DIRT

TYPICAL SECTION
NOTES
1. ALL CONCRETE SHALL BE CLASS 'C' PER Sect. 725.
2. FITTINGS NOT SPECIFICALLY DETAILLED 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>AISI SIZE</th>
<th>OUTSIDE DIA.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORNER POST</td>
<td>2–1/2&quot;</td>
<td>2.875&quot;</td>
</tr>
<tr>
<td>LINE POST</td>
<td>1–1/2&quot;</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>STRAIN POST</td>
<td>1–1/2&quot;</td>
<td>1.900&quot;</td>
</tr>
<tr>
<td>BRACE</td>
<td>1–1/4&quot;</td>
<td>1.666&quot;</td>
</tr>
<tr>
<td>STRETCH BAR</td>
<td>3/16&quot;x3/4&quot; FLAT</td>
<td>3/16&quot;x3/4&quot; FLAT</td>
</tr>
<tr>
<td>GATE POST</td>
<td>3–1/2&quot;</td>
<td>4.000&quot;</td>
</tr>
<tr>
<td>TOP RAIL</td>
<td>1–1/4&quot;</td>
<td>1.666&quot;</td>
</tr>
</tbody>
</table>

7. CONSTRUCTION AND MATERIALS SHALL CONFORM TO Sect. 420 AND 722, RESPECTIVELY. SEE TABLE 722 FOR WEIGHTS OF MEMBERS.

---

NO. 7 COILED SPRING REINFORCED WIRE TIE WITH 12 GUAG WIRE OR HOG RING FASTENERS 1"–6" C TO C.

---

END BAY 10'
NOTE:
L-xxx NUMBERS DESIGNATES FAA SPECIFICATION NO.

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

PROVIDE 2" SLACK FOR CONNECTIONS.

GROUND CLAMP
CONDUIT (IF SPECIFIED)

L-867 BASE W/COVER
L-823 CONNECTOR
L-830 TRANSFORMER
L-824 CABLE 1/C, #8, 5 KV, (5.6 AMP ONLY)

BARE COPPER COUNTERPOISE WIRE (IF SPECIFIED)

BUILDING BLOCK (BRICK OR CONC. BLOCK)

3/4" DIA. DRAIN HOLE
12" x 12" x 12" ABC PER SECTION 702
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;


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. ;
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LONGITUDINAL TRENCH
(TRENCH IN PAVEMENT PARALLEL TO TRAFFIC)

TRANSVERSE TRENCH
(TRENCH IN PAVEMENT NOT PARALLEL TO TRAFFIC)

EXISTING S/W TYP.

EXISTING PAVEMENT

TRENCH

q OF STREET

EXISTING C/G TYP.

EXISTING S/W TYP.

TRENCH

q OF STREET

EXISTING C/G TYP.

CURB, GUTTER, CONCRETE PAVEMENT OR CROSSWALK, DECORATIVE PAVERS, OR EXISTING PATCH

TOP OF PIPE, CONDUIT OR CONCRETE-ENCASED DUCT BANK

FOUNDATION PER SECT. 601

BEDDING: GRANULAR MATERIAL PER SECT. 601.4

12" MIN

BACKFILL

EXIST. AC

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

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

NOTES:

1. SEE MAG DETAIL 200-1 FOR DETAILED TRENCH REPAIR REQUIREMENTS FOR TRENCH TYPES NOTED HEREIN.

2. SEE MAG DETAIL 211 FOR REQUIREMENTS REGARDING THE USE OF PLATING TRANSVERSE TRENCHES. USE OF STEEL PLATES SHALL NOT EXCEED 72 HOURS AFTER COMPLETION OF BACKFILL AND PRIOR TO FINAL PATCHING.
A.C. PAVEMENT

AGGREGATE BASE
PER STANDARD
SECT. 310

GRADING PER
STANDARD
SECT. 301

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

TYPE 'A'

A.C. PAVEMENT

AGGREGATE BASE
PER STANDARD
SECT. 310

GRADING PER
STANDARD
SECT. 301

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

EXPANSION JOINT

SIDEWALK

EXPANSION JOINT

SEE NOTE 5

SEE NOTE 1

TRANSITION FROM ROLL CURB TO VERTICAL CURB

2" × 2" × 1/8"

ANGLE BOTH SIDES

NO.4 REINFORCEMENT BAR, 4" LONG

3 EACH SIDE, MIN.

NOTE 5

SEE NOTE 1

SECTION 'A−A'

SECTION 'B−B'

NOTES:

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

NOTES:

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

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

3. THE EDGING TOOL USED FOR ALL LONGITUDINAL JOINTS SHALL BE SO CONSTRUCTED AS TO PROVIDE A SMOOTH TROWED 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: WxRxR–SURFACE–TYPE; (12’ x 20’ x 15’–A.C.–TYPE "C"
   TURNOUT). OTHER THAN 90° WITH 2 RADIUS–TYPE "S": WxLxR1 xR2–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.
SECTION A–A

SECTION B–B

SECTION C–C SPILLWAY

NOTES:
1. TRANSITION TO SPILLWAY/CHANNEL AS PER APPROVED PLANS.
2. A CENTER WALL SHALL BE INSTALLED IN SCUPPERS WIDER THAN 4' OR IF MORE THAN 1 SCUPPER IS BUILT IN SERIES.
3. EXPANSION JOINT FILLER SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, ASTM D-1751.
4. CONCRETE FOR THE SCUPPER SHALL BE CLASS 'A' PER SECTION 725. CONCRETE FOR THE SPILLWAY SHALL BE CLASS 'A' OR CLASS 'B'.
5. 12" OFFSET DISTANCE SHALL BE INCREASED TO 2'-6" FOR DESIGNATED BICYCLE PATHS.
NOTES:

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

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

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

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

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

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

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

7. INSTALLATION JOINTS:
   A. STANDARD INSTALLATION:
      THE EXISTING ROADWAY SHALL BE MILLED TO A MINIMUM DEPTH OF 3/4" AROUND THE PERIMETER. CROSS SECTION DIMENSIONS DO NOT INCLUDE THE 3/4" MILLING. CONTRACTOR MUST PROVIDE VERIFICATION OF CROSS-SECTION DIMENSIONS.
   B. ALTERNATIVE INSTALLATION:
      FOR TRANSVERSE JOINTS (CROSS ROADWAY), THE EXISTING ASPHALT SHALL BE SAW CUT AND REMOVED FOR A WIDTH OF 24", THE ASPHALT SHALL BE REPLACED WITH THE SAME ASPHALT AND AT THE SAME TIME AS THE HUMP ASPHALT. FOR LONGITUDINAL JOINTS, THE EXISTING ASPHALT SHALL BE OVERLAID AND TAPERED IN 12". CROSS-SECTION DIMENSIONS REFLECT DISTANCES FROM THE SURFACE OF EXISTING ASPHALT.

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>PLATE SIZE</th>
<th>LONGITUDINAL</th>
<th>TRANSVERSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>(B)</td>
<td>THICKNESS</td>
</tr>
<tr>
<td>12&quot;</td>
<td>18&quot;</td>
<td>1&quot;</td>
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<td>18&quot;</td>
<td>1&quot;</td>
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<tr>
<td>24&quot;</td>
<td>18&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>18&quot;</td>
<td>1&quot;</td>
</tr>
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<td>48&quot;</td>
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<td>1-1/4&quot;</td>
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<td>1-1-4&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>18&quot;</td>
<td>1-3/8&quot;</td>
</tr>
</tbody>
</table>
TYPE A OR B PAVEMENT REPAIR
FLUSH WITH EXISTING PAVEMENT

ASPHALT

VARIABLE THICKNESS

BACKFILL MATERIAL OPTIONS:
- NATIVE SOIL PER SECTION 601.4.3 (TYPE B ONLY)
- ABC PER SECTION 702 (TYPE B ONLY)
- 1/2-SACK CLSM PER SECTION 728

HIGHEST EXISTING UTILITY(S)

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

SECTION VIEW

TYPE A PAVEMENT REPAIR

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

PLAN VIEW

TACK EDGES

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

SECTION A–A

TYPE B PAVEMENT REPAIR

NOTES:
1. CUT, REMOVE AND REPLACE PAVEMENT PLUG IN ACCORDANCE WITH SECTION 335.
2. PLACE BACKFILL IN ACCORDANCE WITH SECTION 335.
3. BONDING MATERIAL SHALL BE AS SPECIFIED IN SECTION 708.

PLAN VIEW

18"–24"

18"–24"

SECTION A–A

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

BONDING MATERIAL

PAVEMENT PLUG

DRILLED/CORED PILOT HOLE
**NOTES: (TYPE A)**
1. ALL EXPOSED SURFACES TO BE TROWEL FINISHED EXCEPT AS SHOWN. SEE SECT. 340.
2. H=6" OR AS SPECIFIED ON PLANS.
3. CONTRACTION JOINT SPACING 10' MAXIMUM.
4. EXPANSION JOINTS AS PER SECT. 340.
5. CLASS 'B' CONCRETE PER 725.
6. WHEN THE ADJACENT PAVEMENT SECTION SLOPES AWAY FROM THE GUTTER, THE SLOPE OF THE GUTTER PAN SHALL MATCH PAVEMENT CROSS SLOPE.

**NOTES: (TYPE B)**
1. CONSTRUCT CURB AND INSTALL 1/2" MASTIC EXPANSION JOINTS, A.S.T.M. D-1751, SECT. 340.
2. BROOM FINISH ALL SURFACES.
3. RIBBON CURB MAY SLOPE TOWARDS PAVEMENT OR PARKWAY AS INDICATED ON PLANS.
4. CONTRACTION JOINT SPACING 10' MAXIMUM.
5. CONCRETE SHALL BE CLASS 'B' PER SECT. 725 AND INSTALLED PER SECT. 505.

**NOTES: (C & D)**
1. ALL WORK AND MATERIALS SHALL CONFORM TO SECT. 304, 505 AND 725. BROOM FINISH TO EXPOSED SURFACE.
2. CONTRACTION JOINT SPACING 10' MAXIMUM.
3. EXPANSION JOINTS AS PER SECT. 340.
4. CLASS 'B' CONCRETE PER 725.
MOUNTABLE CURB AND GUTTER (TYPE E)

MOUNTABLE CURB AND GUTTER (TYPE F)

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

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

CURB AND GUTTER TRANSITION

NOTES: (INTEGRAL ROLL CURB, GUTTER AND SIDEWALK)
1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.
2. CONTRACTION JOINT SPACING 5' MAXIMUM.
3. EXPANSION JOINTS PER SECT. 340.
4. CLASS 'B' CONCRETE PER SECT. 725.
NOTES:
1. ALL VERTICAL SURFACES TO BE FORMED.
2. VERTICAL SURFACES DOWN FROM 2" BELOW UNDISTURBED SOIL MAY BE PLACED AGAINST NEAT CUT IF APPROVED BY THE ENGINEER AND CONCRETE WILL NOT EXTEND MORE THAN 1" BEYOND THEORETICAL FACE.
3. ALL EXPOSED SURFACES TO BE STRIPPED GREEN AND TROWEL FINISHED.
4. CONCRETE CURBS CONFORM TO SECT. 340.
5. MAXIMUM SPACING OF CONTRACTION JOINTS IS 10'
6. CONCRETE TO BE CLASS 'B' PER SECT. 725.
7. WHEN PAVEMENT AND BASE COURSE EQUALS OR EXCEEDS 10" IN DEPTH, THE ENTIRE ROADWAY SIDE OF THE CURB SHALL BE FORMED. THE TOTAL CURB HEIGHT REMAINS 18" UNLESS NOTED OTHERWISE.
NOTE:
LENGTH OF TRANSITION SHALL BE EQUAL TO RADIUS OF MEDIAN NOSE, (S' MINIMUM). FOR LOCATION SEE PLANS.
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 (f1) = 300 psi
   TERMINAL SERVICABILITY INDEX (p1) OF 2.5 OVER 20 YEARS
   AND 1 MILLION TOTAL EQUIVALENT 18-KIP SINGLE-AXLE LOAD APPLICATIONS
NOTES:

1. SIDEWALK CONSTRUCTION SHALL CONFORM TO SECTION 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 JOINTS SHALL CONFORM TO SECTION 340, BE INSTALLED
   PRIOR TO CONCRETE PLACEMENT, AND AT A MAXIMUM SPACING OF 50'.
   THE EXPANSION JOINT MUST PROVIDE COMPLETE SEPERATION OF THE
   SIDEWALK FROM ADJOINING CONCRETE.
5. CONCRETE SHALL BE CLASS 'B' PER SECTION 725.
6. WHEN SIDEWALK AND ADJACENT CURB ARE INSTALLED MONOLITHICALLY,
   THE MID-POINT SCORE LINE SHALL EXTEND ACROSS THE CURB.
NOTES:
1. CLASS 'B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. SIDEWALK SURFACE TO MATCH 1½% SLOPE FROM TOP OF CURB
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DETAIL IS ADA COMPLIANT FOR $S_G \leq 2\%$.

$S_G =$MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>CURB RAMP MINIMUM LENGTH</th>
<th>$S_G \leq 1%$</th>
<th>$S_G \leq 2%$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>5’</td>
<td>4.0”</td>
<td>4.5”</td>
</tr>
<tr>
<td>6&quot;</td>
<td>7½’</td>
<td>6.0”</td>
<td>6.5”</td>
</tr>
<tr>
<td>7”</td>
<td>9’</td>
<td>6.5”</td>
<td>7.5”</td>
</tr>
</tbody>
</table>

**TYPE 'A' (DETACHED SIDEWALK)**

**SECTION A-A**

<table>
<thead>
<tr>
<th>DETAIL NO.</th>
<th>STANDARD DETAIL ENGLISH</th>
<th>CURB RAMPS</th>
<th>REVISED</th>
<th>DETAIL NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>235-1</td>
<td></td>
<td></td>
<td>01-01-2011</td>
<td>235-1</td>
</tr>
</tbody>
</table>
CURB AND GUTTER DETAIL 220, TYPE A

EXPANSION JOINT AT CURB RETURN

RAMP CURB HEIGHT TO MATCH S/W ELEVATION @ EACH END

TAPER

SEE NOTE 4 & 5

EXPANSION JOINT AT CURB RETURN

ROUGH BROOM FINISH, USE A RIPPLE SURFACE PATTERN

GUTTER FLOW LINE

S_D = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>L (min)</th>
<th>S_D &lt; 1%</th>
<th>S_D &lt; 2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>4.0'</td>
<td>4.0'</td>
<td>4.5'</td>
</tr>
<tr>
<td>6&quot;</td>
<td>6.0'</td>
<td>6.0'</td>
<td>6.5'</td>
</tr>
<tr>
<td>7&quot;</td>
<td>7.0'</td>
<td>6.5'</td>
<td>7.5'</td>
</tr>
</tbody>
</table>

S_D = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

NOTES:
1. CLASS B CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
4. INCREASE 'L' OR 'D' AS NEEDED TO HAVE THE TOP OF RAMP FORM A RADIAL LINE.
5. WHEN TOP OF RAMP IS LESS THAN 4", FROM CURB RETURN, EXTEND RAMP TO THE CURB RETURN.
6. DETAIL IS ADA COMPLIANT FOR S_D < 2%.

SECTION B-B

TYPE 'B'

SECTION A-A

BOTTOM OF RAMP CURB WHEN FORMED AND Poured SEPARATELY

TOP OF S/W TOP OF LANDING

CONTRACTION JOINT 1" DEEP OR FORMED SEPARATELY

DETECTABLE WARNING

SUBGRADE PREPARATION, SEE SECTION 301

RIGHT-OF-WAY LINE

S/W RAMP

VARIES

5'-0" LANDING

2'-2" CURB RAMP

2" 1-1/2"

LANDING @ 1/2 % SLOPE

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

DETAIL

SECTION B-B

SECTION A-A

TYPE 'C'

 DETAIL NO. 235-3

STANDARD DETAIL ENGLISH

CURB RAMPS

REvised 01-01-2011

DETAIL NO. 235-3
**NOTES:**
1. CLASS 'B' CONCRETE PER SECTION 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
3. SIDEWALK SURFACE TO MATCH 1 1/2 % SLOPE FROM TOP OF CURB.
4. DETECTABLE WARNING IS TO COMPLY WITH THE JURISDICTIONAL AGENCY'S REQUIREMENTS.
5. DETAIL IS ADA COMPLIANT FOR S₆ ≤ 2%.

---

### TYPE 'D' DETACHED SIDEWALK

#### TABLE

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>CURB RAMP MINIMUM LENGTH</th>
<th>S₆ ≤ 1%</th>
<th>S₆ ≤ 2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>5&quot;</td>
<td>4.0'</td>
<td>4.5'</td>
</tr>
<tr>
<td>6&quot;</td>
<td>7 1/2'</td>
<td>6.0'</td>
<td>6.5'</td>
</tr>
<tr>
<td>7&quot;</td>
<td>9&quot;</td>
<td>6.5'</td>
<td>7.5'</td>
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</tbody>
</table>

S₆ = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS
SECTION B-B

RAMP CURB HEIGHT TO MATCH S/W ELEVATION @ EACH END

ROUGH BROOM FINISH, USE A RIPPLE SURFACE PATTERN

SECTION A-A

RIGHT-OF-WAY LINE
10:1 SIDEWALK TAPER TYPICAL BOTH SIDES

EXPANSION JOINT

SIDEWALK WIDTH AS SHOWN ON PLANS

D (min)

<table>
<thead>
<tr>
<th>CURB HEIGHT</th>
<th>S_G ≤1%</th>
<th>S_G ≤2%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>4.0&quot;</td>
<td>4.5&quot;</td>
</tr>
<tr>
<td>6&quot;</td>
<td>6.0&quot;</td>
<td>6.5&quot;</td>
</tr>
<tr>
<td>7&quot;</td>
<td>6.5&quot;</td>
<td>7.5&quot;</td>
</tr>
</tbody>
</table>

S_G = MAXIMUM GUTTER SLOPE WITHIN RAMP LIMITS

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

TYPE 'E'
NOTES:

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

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

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

4. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.

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

CONTRACTION JOINT AT APPROXIMATELY 1/3 DISTANCE FROM EXPANSION JOINT. (MATCH TO CURB RAMP JOINT OR SIDEWALK JOINT)

SECTION A-A
VALLEY GUTTER
NOTES:

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

2. CONTRACTION JOINT ON D/W CENTERLINE.

3. CONTRACTION JOINT.

4. 1/2-INCH EXPANSION JOINTS SHALL COMPLY WITH SECTION 340.

5. BACK OF CURB - CONSTRUCTION JOINT.

6. CONCRETE CLASS AS NOTED IN TABLE. CONCRETE PER SECTION 725.

7. SUBGRADE PREPARATION, SECT. 301.

8. FLOW LINE OF GUTTER.

9. DEPRESSED CURB.

10. SECT. A–A AND ELEVATION: D/W SHOWN WITH VERTICAL CURB AND GUTTER, ROLL TYPE CURB AND GUTTER TREATED SIMILARLY.

11. ROUGH BROOM FINISH FULL WIDTH OF RAMP AND WINGS. TROWEL AND USE LIGHT HAIR BROOM FINISH FOR WALKWAY AREA.

<table>
<thead>
<tr>
<th>COMMERCIAL AND INDUSTRIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVeway WIDTH</td>
</tr>
<tr>
<td>COMMERCIAL</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
</tr>
<tr>
<td>24' MIN. FOR TWO WAY TRAFFIC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RESIDENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVeway WIDTH</td>
</tr>
<tr>
<td>MAJOR STREET</td>
</tr>
<tr>
<td>COLLECTOR STREET</td>
</tr>
<tr>
<td>LOCAL STREET</td>
</tr>
<tr>
<td>*16' DESIRABLE</td>
</tr>
</tbody>
</table>

SECTION A–A
NOTES:

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

2. CONTRACTION JOINT ON D/W CENTERLINE.

3. CONTRACTION JOINT.

4. 1/2-INCH EXPANSION JOINTS SHALL COMPLY WITH SECTION 340.

5. BACK OF CURB – CONSTRUCTION JOINT.

6. CONCRETE CLASS AS NOTED IN TABLE. CONCRETE PER SECTION 725.

7. SUBGRADE PREPARATION, SECT. 301.

8. FLOW LINE OF GUTTER.

9. DEPRESSED CURB.

10. SECT. A–A AND ELEVATION: D/W SHOWN WITH VERTICAL CURB AND GUTTER, ROLL TYPE CURB AND GUTTER TREATED SIMILARLY.

11. ROUGH BROOM FINISH FULL WIDTH OF RAMP AND WINGS. TROWEL AND USE LIGHT HAIR BROOM FINISH FOR WALKWAY AREA.

### COMMERCIAL AND INDUSTRIAL

<table>
<thead>
<tr>
<th>DRIVEWAY WIDTH</th>
<th>MIN.</th>
<th>MAX.</th>
<th>CLASS</th>
<th>DEPTH 'X'</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMERCIAL</td>
<td>± 16'</td>
<td>40'</td>
<td>A</td>
<td>9&quot;</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>± 16'</td>
<td>40'</td>
<td>A</td>
<td>9&quot;</td>
</tr>
<tr>
<td>± 24' MIN. FOR TWO WAY TRAFFIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### RESIDENTIAL

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

**SECTION A–A**

Curb and gutter match flowline. 1/2" R, 3/4" ± 1/4" slope. 6" or depth 'X' whichever is greater.

**DEPRESSED CURB**

FOR DRIVEWAY WIDTH

SEE TABLE
TABLE A

<table>
<thead>
<tr>
<th>ZONING</th>
<th>DRIVEWAY WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMERCIAL AND INDUSTRIAL</td>
<td>16' MIN. 40' MAX.</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>16'</td>
</tr>
<tr>
<td>INDUSTRIAL</td>
<td>16'</td>
</tr>
<tr>
<td>*24' WHERE 2-WAY TRAFFIC IS ANTICIPATED</td>
<td></td>
</tr>
</tbody>
</table>

TABLE B

<table>
<thead>
<tr>
<th>ZONING</th>
<th>DRIVEWAY WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESIDENTIAL</td>
<td>16' MIN. 30' MAX.</td>
</tr>
<tr>
<td>MAJOR STREET</td>
<td>16' 30'</td>
</tr>
<tr>
<td>COLLECTOR STREET</td>
<td>12' 30'</td>
</tr>
<tr>
<td>LOCAL STREET</td>
<td>12' 30'</td>
</tr>
<tr>
<td>*16' WIDTH IS DESIRABLE</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. EXPANSION JOINTS SHALL COMPLY TO SECTION 340.
2. THIS TYPE D/W TO BE USED ONLY UPON APPROVAL OF ENGINEER.
3. CLASS 'B' CONCRETE CONSTRUCTION AS PER SECT. 725
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.
NOTES:
1. EXPANSION JOINTS SHALL CONFORM TO SECTION 340.
2. CLASS 'B' CONCRETE, PER SECT. 725.
3. SUBGRADE PREPARATION, PER SECT. 301.
4. ROUGH BROOM FINISH FULL WIDTH OF 5' WARP SECTION, EACH SIDE OF ALLEY ENTRANCE.
NOTES:

1. ROUGH BROOM FINISH FULL WIDTH OF 4’ WARP SECTION, EACH SIDE OF ALLEY ENTRANCE.
2. CLASS 'B' CONCRETE CONSTRUCTION PER SECT. 725.
3. SUBGRADE PREPARATION, PER SECT. 301.
4. EXPANSION JOINTS SHALL CONFORM TO SECT. 340.

SECTION A—A

ROLL TYPE CURB AND GUTTER
THICKEN CONCRETE FROM 6" TO 8" IN 18" AT BACK OF ALLEY ENTRANCE

COMBINED CURB AND GUTTER

MATCH FLOWLINE

-3/4" ± 1/4"  

SECTION A–A

PROPERTY LINE  

5' MIN.  

ALLEY RIGHT-OF-WAY  

5' MIN.  

10' MAXIMUM

BACK OF ALLEY ENTRANCE

CONSTRUCTION JOINT OR SCORE MARK

BACK OF S/W

S/W LESS THAN 5'  

S/W 5'-0" OR GREATER

S/W WIDTH VARIES

FLOW LINE GUTTER

LIP OF GUTTER

DEPRESSED CURB

DEPRESSED CURB

WARP

WARP

WARP

NOTES:

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

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

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

4. SUBGRADE PREPARATION, PER SECT. 301.

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

1. CLASS 'B' CONCRETE CONSTRUCTION PER SECT. 725.
2. EXPANSION JOINTS SHALL CONFORM TO SECT. 340.
3. SUBGRADE PREPARATION PER SECTION 301.
WATER VALVE, SURVEY MONUMENT, OR SEWER CLEAN OUT FRAME & GRADE ADJUSTMENT

LETTERS ON COVER TO BE AS FOLLOWS: "SEWER", "WATER", OR "SURVEY" AS DIRECTED

TOTAL WIDTH OF WORD "SEWER" OR "WATER"
3"-3 3/4". TOTAL WIDTH OF WORD "SURVEY"
4.5"-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.

FRAME AND COVER

DETAIL NO. 270
STANDARD DETAIL ENGLISH
FRAMES AND COVER

REVISED 01-01-2001
DETAIL NO. 270
**NOTE:**

This detail covers water gate valves, 4" to 12" inclusive, regardless of type of pipe used. Larger lines to be detailed on plans.

**CONCRETE FOOTING - CLASS 'B' CONCRETE PER SECT. 725**

**WATER MAIN**

**SIDE OPERATOR**

**HUB-END GATE VALVE**

**STANDARD JOINT**

**SHORT LENGTH (APPROX. 3')**

**FINISH GRADE**

**CLASS ‘C’ CONCRETE AS PER SECT. 725**

Form as required to keep clear of joints.

**CEMENT GROUTING UNDER VALVE (NON-SHRINKING)**

**WATER GATE VALVE**

**WATER MAIN**

**BRICK PIER AS REQUIRED**

**X + 4” OR 12” MIN.**

**TRENCH BOTTOM**

**CONCRETE FOOTING EQUAL TO TRENCH WIDTH**

**BUTTERFLY VALVE**

**WATER MAIN**

**TRENCH WALL**

**X**

**NOTES:**

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

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

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

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

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

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

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


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

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


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

DEAD ENDS

HORIZONTAL BENDS

TEES

VERTICAL UP BEND

VERTICAL DOWN BENDS

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

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
<th>DEAD ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2°</td>
<td>LRR=0'</td>
</tr>
<tr>
<td>4</td>
<td>18</td>
<td>7</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>6</td>
<td>25</td>
<td>10</td>
<td>5</td>
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<td>8</td>
<td>32</td>
<td>13</td>
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<td>56</td>
</tr>
<tr>
<td>10</td>
<td>38</td>
<td>16</td>
<td>8</td>
<td>68</td>
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<td>24</td>
<td>79</td>
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<td>145</td>
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</table>

### RESTRAINED LENGTHS, LR, FOR DUCTILE IRON PIPE WITH POLYETHYLENE WRAP

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE INCHES</th>
<th>HORIZONTAL BENDS</th>
<th>TEES</th>
<th>VERTICAL OFFSETS</th>
<th>DEAD ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>90°</td>
<td>45°</td>
<td>22-1/2°</td>
<td>LRR=0'</td>
</tr>
<tr>
<td>4</td>
<td>26</td>
<td>11</td>
<td>5</td>
<td>69</td>
</tr>
<tr>
<td>6</td>
<td>36</td>
<td>15</td>
<td>7</td>
<td>99</td>
</tr>
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<td>211</td>
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<tr>
<td>24</td>
<td>113</td>
<td>47</td>
<td>22</td>
<td>337</td>
</tr>
</tbody>
</table>

**NOTES:**

1. ALL JOINTS WITHIN THE SPECIFIED LENGTH LR MUST BE RESTRAINED.
   ALL LENGTHS ARE GIVEN IN FEET.
2. THE MAXIMUM TEST PRESSURE SHALL NOT EXCEED 200 PSI
3. THE MINIMUM DEPTH OF BURY SHALL BE 3' TO TOP OF PIPE.
4. RESTRAINED LENGTHS MAY BE REDUCED WHEN SUPPORTED BY ENGINEERING CALCULATIONS.
NUMBER "1", 1-1/4" HIGH, RAISED 1/8"

RADIUS 3/4"

PLAN

TOP OF COVER

WATER

FOR CASTING SPECIFICATIONS
SEE SECT. 787

SECTION B-B

SECTION A-A

SECTION C-C

TOP OF COVER
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.
PLANT OF COVER

SECTION B-B

INSPECTION PLATE

LETTERING DETAIL

NOTES:
1. FOR CASTING SPECIFICATIONS, SEE SECT. 787.
2. THE BEARING EDGES OF THESE CASTINGS SHALL BE MACHINED TO INSURE A FULL BEARING ON A FLAT SURFACE.
NOTE:

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

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

---

**PLAN VIEW**

CAST IRON WATER METER BOX
LID FITTING BOX NO. 1, 2, 3 OR 4 AS REQUIRED.
SEE APPLICABLE DETAIL

**SECTION A—A**

**SECTION B—B**

**METER BOX DIMENSIONS**

<table>
<thead>
<tr>
<th>DIMS</th>
<th>1</th>
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<td>5/8&quot; OR 1&quot;</td>
<td>1-1/2&quot;</td>
<td>2&quot;</td>
<td></td>
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</tbody>
</table>
ALTERNATE: 3/8" STEEL PLATE (ASPHALT COATED) WITH 2" x 2" HINGED ACCESS DOOR

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

PRE-CAST VAULT SECTION
NOTE: PRECAST REINFORCED VAULT SECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH MANUFACTURER’S SPECIFICATIONS AND DETAILS AS APPROVED BY ENGINEER.

CAST-IN-PLACE OR PRECAST TOP SECTION

FINISH GRADE

PRE-CAST VAULT TOP OPENING

CENTER SECTION

TOP SECTION

CAST- IN-PLACE FOOTING FOR PRE-CAST VAULT

CAST-IN-PLACE VAULT SECTION

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

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

CLASS "A" CONCRETE AS PER SECT. 725

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

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

REMOVABLE SUPPORT

12" MIN.

6"

FINISH GRADE

3"

6"

FOOTING FOR CAST-IN-PLACE VAULT

KEY

12" MIN.
NOTES:

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

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

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

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

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

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

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

<table>
<thead>
<tr>
<th>SIZE OF PIPE BEING CONNECTED</th>
<th>MINIMUM THRUST AREA REQUIRED EQUALS (AxB) (SQUARE FEET)</th>
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</thead>
<tbody>
<tr>
<td>4&quot; AND LESS</td>
<td>3</td>
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<td>6&quot;</td>
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<td>8&quot;</td>
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<td>12&quot;</td>
<td>13</td>
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<tr>
<td>16&quot;</td>
<td>23</td>
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</table>

DETAIL NO. 340

STANDARD DETAIL
ENGLISH

INSTALLING TAPPING SLEEVES AND VALVES

MARICOPA ASSOCIATION OF GOVERNMENTS

REvised 01-03-2002
DETAIL NO. 340
CONCRETE PRESSURE PIPE TAPPING SLEEVE

- **DRAW FLANGE**
- **GLAND FLANGE**
- **GROUT HOLE**
- **DRAW STUD AND NUTS**
- **PRESSURE PLATE**
- **INNER NECK**
- **VALVE STUD AND NUT**
- **BODY PLATE**
- **LOAD BEARING SET SCREW 3-REQD.**
- **CENTERLINE LENGTH**
- **LUG BOLT NUT & WASHER**
- **EXISTING MAIN**
- **SLEEVE**
- **GLAND**
- **GASKET**
- **GROUT**
- **4" (TYP.) SADDLE LENGTH**
- **EXIST. MAIN**

*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

(A) - VARIES, SEE TABLE OF VAULT SIZES

SECTION A-A

CONCRETE SUPPORT UNDER NO. 4 5 11 12

CRUSHED ROCK

6"X6"X6" CONCRETE BASE

WOOD SHIMS

2" GALV. PIPE SUPPORT

BY-PASS

3', 4', 6' WATER METER

VAULT DIMENSION DETAILS

<table>
<thead>
<tr>
<th>A.C.P. SIZE</th>
<th>3&quot;</th>
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<th>6&quot;</th>
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<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.
FOR VAULT CONSTRUCTION
SEE DETAIL 321

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".

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 CONCRETE 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>
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<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>
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<td>66&quot;</td>
<td>72&quot;</td>
<td>49&quot;</td>
<td>5/8&quot; x 3/4&quot;</td>
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<td>72&quot;</td>
<td>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.

7. IN LIEU OF THRUST BLOCKS, AN APPROVED JOINT RESTRAINT SYSTEM MAY BE USED.

FINISH GRADE OR ADJACENT GRADE, SEE NOTE #6

CRUSHED ROCK TRENCH MINIMUM OF 8 CU. FT. ALONG PIPE AND ABOVE DRAIN HOLE

SEE DETAIL 391 FOR VALVE BOX INSTALLATION

SEE DETAIL 301

6" SHORT BODY 90° BEND
SEE NOTE NO. 2

PUMPER CONNECTION TO FACE CURB
NOTES:

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

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

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

PARKWAY AREA OR NO SIDEWALK

AREA WITH SIDEWALK
CAST IRON

CAST IRON MECHANICAL JOINT

NOTES:

1. THIS DETAIL COVERS MOVING OF WATER MAINS 2" TO 12" ONLY.
2. THRUST BLOCKING AS PER DET. 380 & 381.
3. IF OFFSET IS TO GO OVER OBSTRUCTION, JOINT RESTRANTS MUST BE USED.
4. PIPE IS TO BE CAST IRON OR DUCTILE IRON.
NOTES:
1. TABLE IS BASED ON 200 P.S.I. TEST PRESSURE AND 3,000 LBS/SQ FT. SOIL. IF CONDITIONS ARE FOUND TO INDICATE SOIL BEARING IS LESS, THE AREAS SHALL BE INCREASED ACCORDINGLY.
2. AREAS FOR PIPES LARGER THAN 16" SHALL BE CALCULATED FOR EACH PROJECT.
3. FORM ALL NON–BEARING VERTICAL SURFACES.
4. THRUST BLOCKS ARE TO EXTEND TO UNDISTURBED GROUND, CONCRETE TO BE CLASS 'C', SECT. 725.

<table>
<thead>
<tr>
<th>MINIMUM THRUST BLOCK AREA REQUIRED (YxW) (SQ. FT.)</th>
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<tbody>
<tr>
<td>PIPE SIZE</td>
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<tr>
<td>TEE, DEAD END, 90° BEND</td>
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<tr>
<td>4&quot; OR LESS</td>
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<td>PIPE SIZE</td>
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<td>8&quot;</td>
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<td>12&quot;</td>
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</table>

* FOR 125 P.S.I. WORKING PRESSURE.

NOTES:

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

2. DUCTILE IRON PIPE MAY BE USED.

3. BARS TO CONCRETE THRUST BLOCK TO BE COATED WITH 2 COATS COAL TAR, EPOXY OR BY OTHER APPROVED METHOD. BARS TO HAVE 90° HOOK ON LOWER END, AS PER TABLE.

CONCRETE THRUST BLOCK CLASS 'B', SECT. 725

MECH. JOINT NOT FLANGES

C.I.M.J. PIPE

C.I.M.J. 45° BEND SHORT RADIUS

BACKFILL WITH GRANULAR MATERIAL

THRUST BLOCK PER DET. NO. 380

6'

12" MAX.

12" MIN.
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

2" P.E. OR COPPER PIPE

2" CORR STOP

2" BRASS COUPLING

WATER MAIN

2" TAPPED CAP (CAST IRON)

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

TYPE 'A'

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

BRONZE OR BRASS FITTING

WATER LINE

CONCRETE THRUST BLOCK PER DETAIL 380

2" COPPER PIPE

CONCRETE WATER METER BOX NO. 2 PER DETAIL 320

TYPE 'B'

2" ADAPTER BRASS OR COPPER
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 '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.


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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<td>SEWER LINES</td>
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<tr>
<td>CONC. IRRIG. PIPE</td>
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<tr>
<td>THE ENGINEER AT TIME OF</td>
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<tr>
<td>CONSTRUCTION.</td>
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</tbody>
</table>

SECTION A-A

PIPE CONDUIT

SECTION B-B

PIPE CONDUIT

TYPE 'A'

(2) NO. 4 REBARS

TYPE 'B'

SEE SECT. 601 FOR BACKFILL & COMPACTION

OPTIONAL BEARING WALL CONSTRUCTION FOR LARGE DIAMETER (D) PIPE TO BE FORMED IN TRENCH.

1/3 (D) + 2" 6" MIN.

TRENCH WALLS

CONC POUR AGAINST WALL OF TRENCH

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.


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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SECTION A-A

PIPE CONDUIT

SECTION B-B

PIPE CONDUIT

TYPE 'A'

(2) NO. 4 REBARS

TYPE 'B'

SEE SECT. 601 FOR BACKFILL & COMPACTION

OPTIONAL BEARING WALL CONSTRUCTION FOR LARGE DIAMETER (D) PIPE TO BE FORMED IN TRENCH.

1/3 (D) + 2" 6" MIN.

TRENCH WALLS

CONC POUR AGAINST WALL OF TRENCH

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'.

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### TABLE

<table>
<thead>
<tr>
<th>'W'</th>
<th>DEPTH OF COVER ON SUPPORTS</th>
<th>0' TO 8'</th>
<th>8' TO 16'</th>
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<tbody>
<tr>
<td></td>
<td>BAR NO.</td>
<td>Y</td>
<td>BAR NO.</td>
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<tr>
<td>TO 6'</td>
<td>5</td>
<td>8&quot;</td>
<td>6</td>
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<tr>
<td>7'</td>
<td>5</td>
<td>9&quot;</td>
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<td>8'</td>
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<td>9'</td>
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<td>11&quot;</td>
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<td>10'</td>
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<td>12&quot;</td>
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<td>11'</td>
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<td>13&quot;</td>
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<tr>
<td>12'</td>
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<td>14&quot;</td>
<td>7</td>
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<tr>
<td>13'</td>
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<td>15&quot;</td>
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<td>14'</td>
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<td>16'</td>
<td>7</td>
<td>18&quot;</td>
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</tr>
<tr>
<td>17'</td>
<td>8</td>
<td>19&quot;</td>
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**Provide 1:2 mortar bed with precast beam.**

**Class 'C' conc. bedding with precast beam only (conc. as per sect. 725).**

**See sect. 601 for backfill & compaction.**

---

**SECTION D-D**

**Pipe O.D. + 2" SEE NOTE 2**

**No. 6 rebar for precast beam only.**

**Min. bearing shall be 1/2 O.D. of pipe.**

**4" O.C. spacing, see table for bar size.**

---

**SECTION C-C**

**No. 2 ties 12" O.C.**

**(4) No. 5 rebars**

---

**INTERMEDIATE SUPPORT FOR TYPE 'B' CROSSINGS**

**12" or 'Y' whichever is greater, see table.**

**(4) Rebars (equal to beam reinforcement).**

---

**PLAN FOR TYPE 'B' SUPPORT**

**Crossing pipe**

---

**PIPE SUPPORTS ACROSS TRENCHES**

---
EXISTING CROSSING PIPE

NEW PIPE

NEW DUCTILE IRON PIPE CLASS 52 SIZE TO MATCH EXISTING PIPE

5'-0" MIN.

5'-0" MIN.

JOINT METHOD WILL VARY DEPENDING ON EXISTING PIPE MATERIAL

NOT TO EXCEED ONE PIPE LENGTH

VARIES

5'-0" MIN.

5'-0" MIN.

BACKFILL AND COMPACT PER SECTION 601

VARIES

ALTERNATE TO PIPE SUPPORT
WATER LINE EXCLUSION AND EXTRA PROTECTION ZONES*

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

DUCTILE IRON PIPE WITH RESTRAINED OR MECHANICAL JOINTS*

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

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

NOTES:
1. CLASS 'C' CONCRETE AS PER SECTION 725.
*REFER TO MAG STANDARD SPECIFICATION SECTION 610.
REPLACE ALL PAVING ACCORDING TO SECTION 3.36

PLAN VIEW OF REPLACEMENT

COMPACtion SHALL BE DONE IN ACCORDANCE WITH SECT. 601

EXCAVATE 6" BEYOND UNBROKEN BELL TO ALLOW ROOM FOR INSPECTION

18" MIN. WHEN USING BELL CONNECTION

EXISTING SEWER CONNECTION OR MAIN BROKEN DURING EXCAVATION FOR NEW CONSTRUCTION

NEW CONSTRUCTION

REPLACEMENT WHEN NEW TRENCH 2' WIDE OR LESS

12" MIN. SOLID BEARING ON EACH SIDE

SAW SOUND PIPE SQUARE

COMPACTION SHALL BE DONE IN ACCORDANCE WITH SECT. 601

6" MIN. WHEN USING CAULDER CONNECTION

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

CONC. PER SECT. 725, CLASS 'C'

DIAMETER AT BELL

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

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

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.
FOR INSTALLATION IN PVM'T. SEE DETAIL 422

FINISH GRADE

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

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

FLAT REINFORCED CONC. TOP

BELL UP OR DOWN, CONT. OPTION

"RAM NEK" PLASTIC GASKET OR EQUAL

RUBBER GASKET W/ EXPANDED BELL JOINT

TYPE 'B' TOP

48" I.D., 60" FOR 15" PIPE AND OVER

5" TYP.

M.H. STEPS, SEE NOTE 2

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

4" TYP.

FLOW

CEMENT MORTAR CONC.

CLASS 'A' BASE PER SECT. 725, 505.

FLOW

CAST IN PLACE

PRESSED INTO BASE

BOTTOM M.H. REQUIRED

STD. M.H. SEC.
AS REQUIRED

6" RING

8" TYP.

6" TYP.

32" MAX. & MIN.

"12" TYP

2-1/8"

2-1/4" 1-5/8" 1-3/4"

1/4"

1/4" 1/4"

3/8"

1-1/4" 1"

6" 2-1/4"

ADJUSTING RING DETAIL

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

ROUND OR SQUARE BASE OPTIONAL
OFFSET MANHOLE 8" TO 30" PIPE

MANHOLE RING & COVER PER DETAIL 423, 424 & 425

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

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

PIECE & ELEVATION AS SHOWN ON PLANS

TROWEL FINISH

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

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

COMBINED CURB AND GUTTER

PAVEMENT

VARIES

5" 12"

2"

CLASS 'A' CONCRETE PER SECT. 725, 505

TROWEL FINISH SMOOTH

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

ROWLOCK RADIAL COURSE (BRICK M.H.)

MIN. VARIABLE
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

EXISTING OR RECENTLY INSTALLED PAVEMENT

M.H. WALL THICKNESS AND MATERIAL VARIES

SUBGRADE PREPARATION TO CONFORM TO SECT. 301 OR 601

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

MEDIUM BROOM FINISH WITH RADIALY SCORED MARKS (4 MIN.,)

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

BRICK SHALL BE IN ACCORDANCE WITH SECT. 775

CLASS 'A' CONCRETE PER SECT. 725, 505

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

ROWLOCK RADIAL COURSE

1/2"

3" TO 5"

26-3/4"

8"

8" WALL TO 1/3 DEPTH

12" WALL BELOW 3

40" MAX.

44" MAX.

12" MAX.

12" MAX.

12" FOR M.H. OVER 13' DEEP

TROWEL SMOOTH

4"

6"

12" WALL TO 1/3 DEPTH

REVISED

01-01-2001

DETAIL NO.

422

STANDARD DETAIL

ENGLISH

BRICK SEWER MANHOLE AND COVER FRAME ADJUSTMENT

DETAIL NO.

422
FACE OF COVER
CAST IRON

BACK OF COVER

CAST IRON MANHOLE RING

SECTION OF COVER
APPROX. WEIGHT 276 LBS.

SECTION OF RING
APPROX. WEIGHT 210 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

24" AGENCY IDENTIFICATION

BOTTOM VIEW
WT. (CL. 30) = 200 LBS
WT. (CL. 35) = 180 LBS

BOTTOM VIEW — TOP VIEW
WT. (CL. 30) = 224 LBS
WT. (CL. 35) = 219 LBS

30" MANHOLE FRAME AND COVER

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

SECTION 'A—A'
OF COVER

SECTION 'B—B'
OF COVER

NOTE:
LETTERING ON MANHOLE COVER TO CONTAIN NAME OF AGENCY AND UTILITY FOR WHICH MANHOLE IS NEEDED, (I.E. "PHOENIX SANITARY SEWER"), OR AS DIRECTED. THE TOTAL WIDTH OF INDIVIDUAL LETTERS TO BE SUCH THAT LETTERS AND WORDS ARE EQUALLY SPACED AND BALANCED TO FORM A COMPLETE CIRCLE WITH SPACERS BEFORE AND AFTER THE WORD IDENTIFYING THE AGENCY INVOLVED. LETTERS TO BE 2" IN HEIGHT AND RAISED 1/8" ABOVE LEVEL OF COVER. TYPE OF LETTERS TO BE SUBMITTED FOR APPROVAL. WEIGHT OF CASTINGS SHALL BE NO MORE THAN 2% LESS THAN THE APPROXIMATE WEIGHT SPECIFIED. CASTINGS SHALL CONFORM TO SECTION 787.
SECTION VIEW OF FRAME AND COVER WITH CAM LOCKING DEVICE

NOTES:

1. MATERIAL SHALL CONFORM TO A.S.T.M. STANDARDS
   A 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

- **Concrete Foundations on New Manholes to Extend Under Drop Connection**
- **Concrete to Spring Line of Pipe**
- **Concrete to Spring Line of Pipe**
- **Connection as Required**
- **Masonry Anchors Min. One Tie per 2 sq ft of Contact Area for Drop Connections to Existing Brick Manholes Only (Typ)**
- **Pipe Material of Drop Connection to Match New Construction**
- **Same Dia.**
- **45° Mitered Bend**
- **Square, Concrete Encasement Class 'C' Sect. 725 or Masonry Encasement Grouted Solid**
- **Manhole Wall**
- **Manhole Foundation**
- **Class 'C' Concrete Width of Trench Sect. 505 & 725**
- **Of Sewer**
- **Drop of 5' or More**
- **Of Sewer**
- **Y Branch**
- **Pour Invert**
- **Top of Sewer CL**
- **2.5' Min. to 5' Max**
- **Of Sewer**
- **Y Branch**
TYPICAL STUB OUT

NOTES:

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

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

SEWER LINE

VIT. CLAY PIPE

BAND SEAL COUPLING

PREFORMED JOINT

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

SEWAGE MANHOLE WALL

INVERT ELEVATION ACCORDING TO PLAN

DRAIN LINE

PIPE SIZE

PLUG THICKNESS "A"

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

1/2" LAYER CEMENT PLASTER (WATERTIGHT)

BLOCK OR BRICK AND MORTAR PLUG (SEE NOTE)

2"

GROUND LINE

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

VIT. CLAY PIPE

VIT. CLAY OR PLASTIC PLUG

DETAIL NO. 427

STANDARD DETAIL ENGLISH

STUB OUT AND PLUGS

REVISED 427
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 OWNERS PROPERTY ADJACENT TO A PUBLIC RIGHT-OF-WAY.

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

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

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

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

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

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

4. MARKER SHALL BE USED IN ADDITION TO A 2"x4" METAL STUD.

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

6. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.

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

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

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

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

2. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.

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

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

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

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

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

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

9. STAMP OR WELD THE LETTER "S" ON LID OF METER BOX.
4" OR 6" 45° WYE BRANCH

R/W LINE OR PROPERTY LINE

2"x4" METAL STUD ON SURFACE TO END OF TAP

#1 METER BOX PER DETAIL 320

THREADED CAP W/ ELECTRONIC MARKER SEE NOTE 8

FLOW

4" OR 6" 45° BENDS

1-WAY CLEANOUT TOWARDS MAIN

4" OR 6" SEWER PIPE

SLOPE:
MIN: 4" OR 6" = 1/4" PER FT.
MAX: 4" = 1-1/2" PER FT.
MAX: 6" = 7/8" PER FT.

INVERT OF SERVICE LINE TO BE AT OR ABOVE CROWN OF MAIN

LEVEL

MAIN (SIZE VARIABLE)

NOTES:
1. CONSTRUCTION DETAIL APPLIES WHERE CONTRACTOR BUILDS HOUSE CONNECTION. TAP EXTENDS TO PROPERTY LINE IN ALLEYS OR STREETS OR TO EASEMENT LINE.
2. SIZE OF TAP SHALL BE DESIGNATED ON PLANS.
3. CONSTRUCT TAP AT MIN. SLOPE IF COVER WILL BE LESS THAN 5' AT PROPERTY LINE.
4. IF DEPTH REQUIREMENTS, MINIMUM SLOPE CAN BE REDUCED TO 1/8" PER FOOT PROVIDED STUB IS STAKED TO GRADE.
5. ALL FITTINGS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D-2321. THE CONTRACTOR MAY VARY FROM THE DRAWING TO USE THE APPROPRIATE WYES, TEE-WYES AND BENDS TO ENSURE NO MISALIGNMENT OF THE PIPE AND FITTINGS. BLOCK OR BRACE FITTING JOINTS TO ENSURE ZERO DEGREES ANGULAR JOINT DEFLECTION.
6. END OF TAP TO BE SEALED AND MARKED.
7. ELECTRONIC MARKER SHALL BE A 3M MODEL 1424-XR/10 [4" DIAMETER SELF LEVELING MARKER BALL GREEN IN COLOR] OR APPROVED EQUAL OR AS REQUIRED BY THE LOCAL AGENCY.
8. INSTALL RAISED 4" THREADED PLUG IN CLEANOUT INCORPORATING 3M MODEL 1414 ELECTRONIC DISC MARKER. GREEN IN COLOR. LOCATOR PLUG TO BE GPK PRODUCTS MODEL #228-0004 DM OR APPROVED EQUAL.
9. STAMP OR WELD THE LETTER "S" ON LID OF METER BOX.
1. Stamp top of curb with 4" tall by 1/4" deep "S" to designate sewer service line crossing.
CLEANOUT INSTALLATION

STANDARD 45° BEND

FLOW LINE ELEVATION SHOWN ON PLANS TO THIS POINT

STATION AND LENGTH SHOWN ON PLANS TO THIS POINT

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

PAVED STREETS AND ALLEYS

THE WORD 'SEWER' ON COVER

UNPAVED STREETS AND ALLEYS

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

SIZE OF PIPE AS SHOWN ON PLANS

STANDARD 45° BEND

COMPACTED BACKFILL OR UNDISTURBED EARTH

VIT. CLAY PIPE PER Sect. 743

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

SEWER TAP AT CLEANOUT

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

ONE FULL LENGTH OF PIPE

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

8"x8" WYE

6"x8" OR 4"x8" VITRIFIED CLAY INCREASER
This Page Is Reserved for Future Use.
SECTION B-B

CLASS "A" CONC. AS PER SECT. 725

ANGLE OF HEADWALL TO MEET O.D. OF PIPE

SPRAY BANDS WITH CURING COMP.

CLASS "A" CONC. AS PER SECT. 725

L1 MIN., 0.707 L1 MAX.

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

'U' TYPE

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

' L' TYPE

PLAN

FOOTING

BLOCK

DITCH BANK

6" MAX.

30" MIN.

6.5" MIN.

6" MIN.

L1

L2

L3

B

STRAIGHT TYPE
DOUBLE PIPE HEADWALL

HEADWALL DIMENSIONS

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* NOMINAL PIPE SIZE GIVEN FOR REINFORCED CONC. PIPE.

NOTES:
1. ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 505 & 725.
2. CONCRETE MASONRY UNITS (BLOCK) PER SECT. 510, 775 & 776.
3. CONCRETE REINF. SHALL BE NO.4 BAR 12" O.C. BOTH WAYS.

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.

DETAIL "A"
INLET HEADWALL

CONSTR. JOINT

D/2

12"

2 - NO. 6 BARS FORM AS SHOWN

INLET HEADWALL FACE ELEVATION

OUTLET SIMILAR

SECTION A-A

CONCRETE SHALL BE CLASS 'A' PER SECT. 725

1-1/2"

8"

SECTION B-B

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

CMP BEVEL DETAIL

1:1 1/2 EMBANKMENT SLOPE

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* (IN) REFERS TO INLET (OUT) REFERS TO OUTLET
2 - NO. 6 BARS BEND TO CONFORM TO PIPE

2 - NO. 6 BARS BEND TO CONFORM TO PIPE

NOTES:

1. ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 725.

2. ALL REINFORCING BARS SHALL BE NO. 4 EXCEPT NO. 6 BARS OVER PIPE. BAR SPACING APPROXIMATELY 12" C TO C UNLESS OTHERWISE NOTED.

3. 30° WING WALL FLARE SHOWN; 45° NORMALLY DESIRABLE.
### PIKE DIMENSIONS

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### NOTES:

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

2. ALL CONCRETE SHALL BE CLASS 'A' PER SECT. 725.

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

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

BLOCK WALLS

BLOCK HEADWALL TO HAVE ONE NO.4 REINF. BAR CENTERED IN EACH CORE FOR FULL HEIGHT AND CORES FILLED WITH CONCRETE OR CEMENT GROUT (3:1 RATIO). ALL BLOCKS TO BE JOINTED WITH MORTAR. PLASTERED ON EXPOSED SURFACES THEN SPRAY WITH WHITE PIGMENTED CURING COMPOUND. SECT. 510, 727 & 776.

TRASH RACK

RACK BARS

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.

SECTION A–A

45° BLOCK CORNER
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”x3” RECTANGULAR WASHERS AND NUTS

FINISH GRADE

HEADGATE TO BE SWANSON 800 SERIES OR APPROVED EQUAL

FORM CONC. AROUND END OF PIPE BEHIND HEADGATE FRAME

SIZE OF PIPE AS SHOWN ON PLANS

FINISH CONCRETE

1” C.R.S. LIFT ROD

4” LIF T ROD

4” MIN.

GROUT JOINTS WATER TIGHT

GROUT JOINTS WATER TIGHT

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

SIZE OF PIPE AS SHOWN ON PLANS

VARIABLE

CONCRETE AS REQUIRED TO SECURE GATE

REINF. CONC. PIPE

VARI EDS. MIN.

52” MAX.

HANDLE EXTENDS 6” BELOW TOP WHEN GATE IS OPEN

1/4” ROD HANDLE

6”

2-1/2”

10 GAUGE SHEET STEEL COVER

(2) 5/16” HOLES 4” O.C.

NOTE:

PAINT COVER BOTH SIDES ONE PRIME COAT, TWO FINISH COATS, SECT. 790, PAINT NO. 9

TYPE 'A'

TYPE 'B'
PLAN OF COVER

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

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

SECTION B-B

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

CLASS 'C' CONCRETE
PER SECTION 725
WITH TROWEL FINISH

BREAK PIPE
AND MAKE
WATERTIGHT
JOINTS PER
DETAIl 524

12"

1/2"

PLUG END PER
DETAIl 427

PIPE DIAMETER
TO BE SAME AS
VALVE SIZE

CONCRETE PIPE
SECT. 735 & 736

BID ITEM

PIPE DIAMETER
TO BE SAME AS
VALVE SIZE

SNOW, IDEAL,
WATERMAN ALFALFA
VALVE OR EQUAL

GROUT AS PER
DETAIl 524

CONCRETE TEE
OR ELBOW

REVIEWED 506

DETAIL NO. 506

STANDARD DETAIL
ENGLISH

IRRIGATION VALVE INSTALLATION
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-EVACUATED TO ALLOW SUFFICIENT ROOM TO OPERATE PROPER MECHANICAL COMPACTION EQUIPMENT.

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

5. SEE SECTION 601 FOR TRENCH PREPARATION.

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

7. COVER TO BE APPROVED BY ENGINEER.
**CONNECTOR CROSS SECTION**

**NOTE:**
Use 5/8" washer and nut, all pieces (nuts, washers, and fabricated bolts) to be galvanized as per A.S.T.M. A-123 latest revision.

**T-BOLT**

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

**BAND DETAIL**

**SECTION A-A**

C.M.P. PER A.A.S.H.T.O. SPEC. M-36, EXTERIOR COATING AND INTERIOR COATING PER A.A.S.H.T.O. SPEC. M-150, MAY BE TYPE 'A' OR 'D'

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

24" PIPE AND SMALLER

12 GAUGE BITUMINOUS COATED GALVANIZED METAL PLATE

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

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

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

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

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

5. CENTER MANHOLE ON PIPE JOINT WHERE PIPE CHANGES SIZES, LEAVING A GAP OF 12" MINIMUM, 24" MAXIMUM.
NOTES:

1. Line pipe and stub may be cast monolithically or stub may be cast on to line pipe section prior to complete curing.

2. All line pipe reinforcement shall be turned up into stub.

3. The vertical stub to be A.S.T.M. C-76 Class II wall 'A' and the horizontal pipe to be equal to strength of pipe entering manhole.

4. All reinforcing steel shall clear face of concrete by 1-1/2" unless shown otherwise.

5. Concrete encasement shall be Class 'A' per Sect. 725 and 503.

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MAN HOLE SHAFT PER DETAIL 522

PRECAST PIPE WITH VERTICAL STUB

ENCASEMENT

SECTION A-A

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

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

NOTES:

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

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

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

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

5. CASTING DIMENSIONS GIVEN ABOVE ARE FROM DET. 424, 24" MANHOLE FRAME AND COVER.

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

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

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

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

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

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

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

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

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

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

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

5. REFER TO DETAIL 523-1 FOR INSTALLATION PROCEDURES.
NOTES:
1. D SHALL BE 24" OR LESS. FOR LARGER VALUE OF D USE MANHOLE OR JUNCTION STRUCTURE.
2. IN NO CASE SHALL THE OUTSIDE DIAMETER OF THE INLET EXCEED ONE HALF THE INSIDE DIAMETER OF THE MAIN STORM DRAIN.
3. CENTERLINE OF INLET SHALL BE ON RADIUS OF MAIN STORM DRAIN EXCEPT WHEN ELEVATION S IS SHOWN ON PLANS.
4. THE MINIMUM OPENING INTO THE STORM DRAIN SHALL BE THE OUTSIDE DIAMETER OF THE CONNECTING PIPE PLUS 1".
5. IF ANGLE X FROM HORIZONTAL IS 45° OR LESS USE TYPE 1. IF ANGLE X IS 45° OR OVER USE TYPE 2.
PLAN VIEW

DEPRESSED GUTTER

SECTION A-A

NO. 3 DOWEL BARS
(BOTH WAYS)

NO. 3 REINF. BARS
(BOTH WAYS)

ACCESS OPENING *

SECTION B-B

Access Opening *

HAND TROWEL CURVED SURFACES
(TREAT AS CURB FACING)

NO. 3 DOWEL BARS
(NOT USED IF TOP IS PRECAST) *

SUBGRADE OPTIONAL
WITH CONTRACTOR

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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<td>6&quot;</td>
<td>1'-9&quot;</td>
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<tr>
<td>7&quot;</td>
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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.

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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.
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NOTES:
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3. OUTLET PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS Poured.
4. FLOOR OF BASIN SHALL BE TROWELLED TO A HARD SMOOTH SURFACE AND SHALL SLOPE FROM ALL DIRECTIONS TO OUTLET.
5. ALL STRUCTURAL STEEL TO BE PAINTED ONE SHOP COAT OF NO.1 D PAINT AND TWO FIELD COATS OF NO. 10 PAINT AS PER SECT. 790.
6. CONCRETE SHALL BE CLASS A PER SECTION 725.

DIMENSIONS
T=6" IF V=4" OR LESS
T=8" IF V IS BETWEEN 4" AND 8"
T=10" IF V IS 8" OR MORE (IF V EXCEEDS 10" SPECIAL DESIGN IS REQUIRED)
V=4" UNLESS OTHERWISE SPECIFIED.

* SEE DETAILS 536–1 AND 536–2 FOR DETAILS AND SECTIONS COMMON TO ALL CURB OPENING CATCH BASINS.
** 4" LOCATIONS WHERE 4" S/W IS REQUIRED.
NOTES:
1. SINGLE C.B. (ILLUSTRATED), SUMP WITH WING BASIN UPSTREAM.
2. DOUBLE C.B. SUMP WITH SYMMETRICAL WING BASINS EACH SIDE.
3. PIPES CAN BE PLACED IN ANY WALL EXCEPT WALL ADJACENT TO A WING BASIN. PIPE SHALL BE TRIMMED TO FINAL SHAPE AND LENGTH BEFORE CONCRETE IS PLACED.
4. SUMP FLOOR SHALL HAVE A WOOD TROWEL FINISH AND A MIN. SLOPE OF 4:1 IN ALL DIRECTIONS TOWARD OUTLET PIPE.
5. ALL REFORCING BARS SHALL BE NO. 4 18” C TO C BOTH WAYS AND 1-1/2” CLEAR TO INSIDE OF WALLS AND OUTSIDE OF WING BASIN FLOOR EXCEPT AS SHOWN. SEE SECT. 727.
7. CONSTRUCTION JOINTS SHALL BE PLACED TO MEET FIELD CONDITIONS.
8. ALL EXPOSED STEEL SHALL BE GALVANIZED OR PAINTED WITH ONE SHOP COAT OF #1 PAINT AND TWO FIELD COATS OF #10 PAINT.

PLAN VIEW

SECTION A-A

SECTION B-B

REINFORCEMENT DETAIL

DIMENSIONS

V = 3”-3” MIN. WHEN L = 3’
V = 3”-6” 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

CATCH BASIN TYPE 'D'
APRON NOTES:

9. APRON IS CONSTRUCTED ONLY WHEN SPECIFIED ON PLANS.

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

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

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

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

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

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

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

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

18. ALL PARTS SHALL BE OF STRUCTURAL GRADE STEEL.

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

Grate opening: 4.344 sq. ft.

**CROSS BARS:**
1/2 dia. x 24-7/8" rod, 4" c. to c., 9 each

**BEARING BARS:**
3-1/2"x1/2"x39-1/2"
1-7/8" c. to c., 14 each

**END BARS:**
2-1/2"x1/4"x24-7/8"
2 each.
DIMENSION
V=3'-0" UNLESS OTHERWISE SPECIFIED.
* DIMENSIONAL CHANGE WITH DETAIL
534-3 AND DETAIL 534-4.

SECTION A-A

SECTION B-B

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 TROWELED 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.

VANE DETAIL
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 350
- FRAME WEIGHT 209 LBS; GRATE 140 LBS; CURB BOX 92 LBS.

BOLT CURB BOX TO FRAME
WITH 1/2" x 13" x 2-1/2" STEEL
HEX BOLTS, NUTS AND WASHERS

CURB BOX ADJUST.
TO 9" HIGH

DATE

1-1/4" R

3/4"

2"

17-3/4"

24"

15-1/8"

6"

3"

5/8"

6"

6"

1"

3-1/4" R

2-1/2"
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.

6. TOTAL COMBINED CLEARANCE BETWEEN FRAME AND GRATE IS 1/2".
NO. 4 REINFORCEMENT BARS, 12" SPACING, WELDED TO NOSE ANGLE WITH 3/8" WELDS BOTH SIDES

1/4" DIAMOND FLOOR FLAT COVER

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

1" GALVANIZED BAR

1" DIA. BAR WITH 3° 90° BEND, 3-6" MAX. SPACING

1/4" DIAMOND FLOOR FLAT COVER

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

SECTION C–C

FOR DETAILS 531, 532 AND 533

SECTION D–D

PROTECTION BAR

SEE THIS DETAIL

STEEL FILLER BLOCKS WELDED TO FRAME

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

DOWEL BAR

# 3 REINF. STEEL DOWEL BARS

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.

D D

PLAN VIEW

CURB SUPPORT ANCHOR

1" DIA. BAR WITH 3° 90° BEND, 3-6" MAX. SPACING

1/4" DIAMOND FLOOR FLAT COVER

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

EQUAL DISTANCE

NO. 3 REINF. STEEL ANCHOR BARS, WELDED TO º FRAME

PROTECTION BAR

FOR DETAILS 531, 532 AND 533

DOWEL BARS
PLAN VIEW

SECTION A-A

SECTION C-C

SECTION B-B

NOTES:

1. FRAME SHALL BE NON-LOCKING.

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

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

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

DETAIL OF ANGLE FRAME  
GRATE SUPPORT

1/2" DIA X 1" EYE BOLT  
2-3/8" X 3-1/8" X 1/4"  
BEVELED SIDES FOR WELDS

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

3-5/8"

1/2" R

29" X 29" I.D.  
GRATE FRAME

8"

24"

3" X 2-1/2" X 1/2"

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

WELD INTO  
SECOND  
SPACE

SECTION A-A  
DOUBLE GRATE

SECTION B-B  
SINGLE GRATE

PLAN

PLAN

SECTION C-C

537

CATCH BASIN – TYPE 'G'

REVISED  01-03-2002  537
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 ON EACH CORNER OF FRAME

FOR PIPE LARGER THAN 24” DIA. (NOMINAL)

SECTION A-A

SECTION A-A

SECTION A-A

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

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

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

\[ \frac{3}{16} \text{"} \text{ EACH BAR & ROD} \]

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.
DELETE ANCHORS ON ONE SIDE FOR CURB OPENING BASIN

DELETE ANCHORS ON ONE SIDE FOR BASINS USING "1" BEAM GRATE SUPPORT

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.

SECTION A-A
GRATE TYPES TB-1 AND TB-2

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<th>CLEAR SPACING</th>
<th>NO. BARS</th>
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<td>16</td>
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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.

NOTES:
1. LW INDICATES LONGITUDINAL WELDED.
2. LB INDICATES LONGITUDINAL BOLTED.
3. EF INDICATES ELECTROFORGED.
4. GRATING UNITS AND FRAMES SHALL BE FABRICATED FROM STRUCTURAL STEEL "A-36 EXCEPT AS NOTED.
5. ALL WELDING SHALL BE IN ACCORDANCE WITH STANDARD WELDING SPECIFICATIONS.
6. THE COMPLETED ASSEMBLY SHALL BE GIVEN ONE SHOP COAT OF NO. 1 PAINT.
7. FRAMES AND GRATES SHALL FIT TO A MAXIMUM ROCK OF 0.093" AT ANY POINT.
8. GRATE TYPE LW AND EF RESTRICTED TO SLOPES OF 3% OR LESS.
9. GRATES TYPE LB USE LONGITUDINAL GRADES IN EXCESS OF 3% OR AS AN ALTERNATE TO TYPES LW OR EF ON GRADES OF 3% OR LESS.
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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<table>
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<th>PIPE DIA.</th>
<th>APPROX. WEIGHT (LBS.)</th>
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**Length of Pipe Per Plans**

**Plan**

**Spacing for Multiple Installation**

**Section A-A**

**Front Elevation**

**Skewed Culvert**

**Right Angle Culvert**

**Notes**

1. Design of end section shall conform to standard for reinforced concrete pipe.
2. End section joint conformation shall match the pipe joints.
3. Embankment slope shall be warped to match slope of end section.
4. Culvert length is as shown on plans.
NOTES:
1. WHERE ROCK IS ENCOUNTERED THE OUTLET MAY BE OMITTED.
2. ALL PORTIONS OF SPILLWAY TO BE TROWEL FINISHED.
3. CONCRETE FOR THE SPILLWAY INLET, SPILLWAY AND OUTLET SHALL BE CLASS 'B' PER SEC. 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

SPILLWAY SECTION

SECTION ON SPILLWAY & DOUBLE INLET
CONCRETE SURFACE FORD CONCRETE WALLS

FINISHED 0 GRADE
SLOPE 0.015/FT
8" CLASS 'A' CONCRETE PER SECTIONS 505 AND 725 (SECTION 324 DOES NOT APPLY)

2-#4 BARS TOP AND BOTTOM

8" SEE PLANS FOR BASE MATERIAL

2-#4 BARS TOP AND BOTTOM

ROADWAY W WIDTH

DEPTH GAUGE SEE DETAIL (OPTIONAL)
3" WEEP HOLES
FINE AGGREGATE FLOW

*MIN. DISTANCE BELOW STREAM BED

DEPTH GAUGE DETAIL
(OPTION OF THE CONTRACTING AGENCY)

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

DEPTH GAUGE
FINISHED GRADE
WALL TO BE BUILT ONE FOOT ABOVE HIGH WATER LEVEL

3% MAX
UPSTREAM WALL

WALL MAY BE BUILT TO THIS LINE

3" WEEP HOLE
20' C TO C

ELEVATION LOOKING UPSTREAM

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".

DETAIL NO. 552
STANDARD DETAIL ENGLISH
CONCRETE CUT-OFF WALLS
REvised 01-01-2009
DETAIL NO. 552
TYPICAL GABIONS

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

CUT BANK TO DEPTH "C" BEFORE PLACING GABIONS

EXIST GROUND LINE OR STREAM BED

Gabions filled with stone

NOTE:
OTHER SIZES AVAILABLE FROM MANUFACTURER.

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2'-0" MIN