## CITY COUNCIL

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<tr>
<td>Harry LaRosiliere</td>
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<tr>
<td>Lissa Smith</td>
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<tr>
<td>Ben Harris</td>
<td>Deputy Mayor ProTem</td>
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<tr>
<td>Angela Miner</td>
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<tr>
<td>Rick Grady</td>
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<tr>
<td>Ron Kelley</td>
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<tr>
<td>Tom Harrison</td>
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<td>David Downs</td>
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## CITY MANAGER

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<tr>
<td>Bruce Glasscock</td>
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<tr>
<td>Mark Israelson</td>
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<tr>
<td>Jim Parrish</td>
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<tr>
<td>Jack Carr, P.E.</td>
<td>Deputy City Manager</td>
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## CITY STAFF

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<tr>
<td>Gerald Cosgrove, P.E.</td>
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<td>Christina Day</td>
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<td>B. Caleb Thornhill, P.E.</td>
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<td>Lloyd Neal, P.E.</td>
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<td>Daniel Prendergast, P.E.</td>
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<tr>
<td>Michael Martin, P.E.</td>
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September 2016
### EFFECTIVE DATE

The following are the effective date(s) of the City of Plano and all of its amendments:

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| **SC02** | Lintel Angle Support Option | **Jan-16** |
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<td>Single Box Culverts Cast-In-Place SCC-5 &amp; SCC-6 – 1</td>
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<td>Single Box Culverts Cast-In-Place SCC-8-1</td>
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<td>Single Box Culverts Cast-In-Place SCC-8-2</td>
<td>Mar-16</td>
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<td>TX31</td>
<td>Single Box Culverts Cast-In-Place SCC-9-1</td>
<td>Mar-16</td>
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<td>TX32</td>
<td>Single Box Culverts Cast-In-Place SCC-9-2</td>
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<td>Single Box Culverts Cast-In-Place SCC-10-1</td>
<td>Mar-16</td>
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<td>Single Box Culverts Cast-In-Place SCC-10-2</td>
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<td>TX35</td>
<td>Box Culverts Precast Miscellaneous Details SCP-MD</td>
<td>Mar-16</td>
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<td>TX36</td>
<td>Single Box Culverts Precast 3’-0” Span SCP-3</td>
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<td>TX37</td>
<td>Single Box Culverts Precast 4’-0” Span SCP-4</td>
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<td>Single Box Culverts Precast 5’-0” Span SCP-5</td>
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<td>Single Box Culverts Precast 6’-0” Span SCP-6</td>
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<td>Single Box Culverts Precast 7’-0” Span SCP-7</td>
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<td>Single Box Culverts Precast 8’-0” Span SCP-8</td>
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<td>Single Box Culverts Precast 9’-0” Span SCP-9</td>
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<td>TX43</td>
<td>Single Box Culverts Precast 10’-0” Span SCP-10</td>
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<td>Single Box Culverts Precast 11’-0” Span SCP-11</td>
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<td>Single Box Culverts Precast 12’-0” Span SCP-12</td>
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<td>TX46</td>
<td>Concrete Wingwalls with Straight Wings SC-0</td>
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<td>TX47</td>
<td>Concrete Wingwalls with Flared Wings FW-0</td>
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<td>TX48</td>
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SD-Standard Details

April 2017
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<td>TX52</td>
<td>Concrete Headwalls with Flared Wings CH-FW-30</td>
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<td>Concrete Headwalls with Parallel Wings CH-PW-0</td>
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<td>TX55</td>
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REGULAR SECTION

LEFT TURN SECTION

LEGEND:

1. SAWED LONGITUDINAL DUMMY JOINT
2. - CONSTRUCTION JOINT (FULL WIDTH PAVMT. IS ALLOWED WHERE APPROVED BY CITY OF PLANO). DELETE IF PAVING IS 25 FT. WIDTH TO BE MINSNED LATER. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 33'-36'.
REGULAR SECTION

LEFT TURN SECTION

MIN 6" TOP SOIL AND GRASS, GROUND COVER (TYP.) ALL SLOPES, MEDIANs, AND PARKWAYS PER ITEM 2.15, 3.10.1, 3.10.2, 3.10.3 OF THE SPECIAL PROVISIONS.

4/5/17

NOTE: FOR RETROFIT TURN LANES AND MEDIAN OPENINGS, TWO (2) ADDITIONAL INCHES OF CONCRETE CAN BE INSTALLED IN PLACE OF LIME STABILIZATION.

LEGEND: ① - SAWED LONGITUDINAL DUMMY JOINT
② - CONSTRUCTION JOINT (FULL WIDTH PWMT. IS ALLOWED WHERE APPROVED BY CITY OF PLANO). DELETE IF PAVING IS 25 FT. WIDTH TO BE WIDENED LATER. INSTALL CURB IF PAVING IS LESS THAN FULL WIDTH OF 33'-36'.
2" P.V.C. SCHEDULE 40 DOWE GREY ELECTRICAL STREET LIGHT CONDUIT SHALL BE PLACED IN ALL MEDIANS. 3' OFF MEDIAN CURB UNLESS OTHERWISE SHOWN ON THE PLANS. BURIAL DEPTH SHALL BE 3'-0" BELOW FINISH GRADE. 30 INCH RADIUS SWEEP BENDS TO BE USED AT ALL STREET LIGHT BASES AND HANDHOLE BOXES.

<table>
<thead>
<tr>
<th>STREET TYPE</th>
<th>STREET WIDTH</th>
<th>R.O.W. WIDTH</th>
<th>R = 250.00'</th>
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<tbody>
<tr>
<td>MAJOR/B+</td>
<td>2'-48'</td>
<td>140'-160'</td>
<td></td>
</tr>
<tr>
<td>MAJOR/B</td>
<td>2'-36'</td>
<td>130'-160'</td>
<td>A = 11'25&quot;18&quot;</td>
</tr>
<tr>
<td>MAJOR/C</td>
<td>2'-33'</td>
<td>110'</td>
<td>T = 25.00</td>
</tr>
<tr>
<td>SECONDARY/D</td>
<td>2'-24'</td>
<td>92'</td>
<td>L = 49.83</td>
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</tbody>
</table>

**NOTES:**
1. A POLYPROPYLENE PULL ROPE (200 LB) SHALL BE PLACED IN ALL CONDUIT. THIS CORD SHALL EXTEND A MINIMUM OF 1'-0" FROM THE END OF THE CONDUIT. ITEM 8.10.3
2. CONTACT ELECTRIC PROVIDER PRIOR TO INSTALLING STREET LIGHT ELECTRIC CONDUIT. PLACEMENT OF ELECTRIC HANDHOLE BOXES SHALL BE AS DIRECTED BY ELECTRIC SERVICE PROVIDER. BOXES MAY BE OBTAINED FROM ELECTRIC SERVICE PROVIDER.

**NOTE:**
SEE DETAIL P26 FOR TYPICAL CONTOUR OF MAJOR/MAJOR INTERSECTION FOR INTERSECTION WIDENING DETAIL.

**TYPE B, B+, & C PAVEMENT**
Pavement bars to be bent down into header. Header and pavement to be monolithic.

No form

Drilled holes blown clean dowels coated with epoxy resin

#4 x 24" deformed dowel at same spacing as pavement reinforcement

Expansion joint

Concrete pavement

Future pavement

Pavement thickness

Cap
ALL WORK BETWEEN HEADERS TO BE DONE BY OTHERS UNLESS OTHERWISE SPECIFIED

HEADER AND PAVEMENT TO BE MONOLITHIC

* T = PAVEMENT THICKNESS

END 6" CURB

2" CURB

1/4" R.

CONCRETE

VARIABLE THICKNESS HOT MIX ASPHALT

6'-0"

20'-0"

5'-0" (USUAL)

SYMETRICAL ABOUT E
RESIDENTIAL STREET
(TYPE G)

COLLECTOR STREET
(TYPE E & F)

REINFORCED CONCRETE PAVEMENT
All reinforcing bars shall be No. 3 transverse bars to be spaced on 24" centers. Longitudinal bars to be spaced on 24" except where noted.

1. Same longitudinal dummy joint
2. Construction joint (Full width pavement is allowed where approved by engineering department)

TABLE OF CROWN HEIGHTS AND ORDINATES FOR VARIOUS PARABOLIC SECTIONS
Sulf-Form pavement must meet crown grades at gutters, at mid-points, and centerline

<table>
<thead>
<tr>
<th>ROADWAY WIDTH (W)</th>
<th>PAVEMENT THICKNESS</th>
<th>TOTAL CROWN HEIGHT</th>
<th>3/4 POINT</th>
<th>MID-POINT</th>
<th>1/4 POINT</th>
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<tbody>
<tr>
<td>26'</td>
<td>6&quot;</td>
<td>4&quot;</td>
<td>2-1/4&quot;</td>
<td>1&quot;</td>
<td>1/4&quot;</td>
</tr>
<tr>
<td>36'</td>
<td>8&quot;</td>
<td>6&quot;</td>
<td>3-3/8&quot;</td>
<td>1-1/2&quot;</td>
<td>3/8&quot;</td>
</tr>
<tr>
<td>44'</td>
<td>8&quot;</td>
<td>6&quot;</td>
<td>3-3/8&quot;</td>
<td>1-1/2&quot;</td>
<td>3/8&quot;</td>
</tr>
</tbody>
</table>
INTEGRAL CURB & GUTTER

SEPARATE CURB & GUTTER

CONCRETE ROOT BARRIER
37'-6" EACH LANE (2-33' & 36' STREET)
25'-0" EACH LANE (2-24' STREETS)
50'-0" (48' STREET)
37'-6" (36', 40', & 44' STREETS)
25'-0" (26' STREET)

12'-6"
12'-6"
12'-6"

7" POST
2" POST

METAL BEAM GUARD RAIL MAY BE ALUMINUM (0.105") OR GALVANIZED STEEL (12 GA.) SEE TxDOT METAL BEAM GUARD FENCE DETAIL GP(33)-14

FASTEN TO POST WITH ONE 5/8" BOLT WITH 1 3/4" O.D. WASHER BEHIND POST, 7/8" HOLE IN POST
CONTINUOUS 2" ORANGE REFLECTING TAPE ACROSS BARRICADE

FRONT ELEVATION

27½" +/-
6½"
21½" +/-

12½", LAP
3½"

2½" 4½" 4½"

SLOTTED Holes
29/32" X 11/8"

SAME AS SECTION THRU ELEMENT

SLOTTED Holes
29/32" X 11/8"

TERMINAL SECTION

NOTE: ACTUAL SECTION MAY BE SLIGHTLY DIFFERENT DEPENDING UPON MFR.

SECTION THRU RAIL ELEMENT

TYPICAL END OF ROAD PERMANENT BARRICADE DETAIL
MATCH EXISTING EXPANSION JOINTS IF WIDENING

SAWED TRANSVERSE DUMMY JOINTS SPACED 20'-0" FOR PAVING ≥ 8" THICK OR 15'-0" FOR PAVING < 8" THICK OR MATCH EXISTING IF WIDENING

PROVIDE Q JOINT

SAWED DUMMY JOINTS

SAWED TRANSVERSE DUMMY JOINTS SPACED 15'-0"

R.O.W.

PARABOLIC CROWN

STRAIGHT CROWN

BACK OF CURB

PROVIDE Q JOINT

R.O.W.

R.O.W.

R.O.W.

PROVIDE Q JOINT
MONOLITHIC MEDIAN NOSE

DETAIL OF NOSE FOR MEDIAN ISLAND > 6' WIDE

SECTION A-A

NOTE: MONOLITHIC MEDIAN NOSE & PAVEMENT WITHIN PAY LINES SHALL BE PAID FOR PER EACH, COMPLETE IN PLACE

SECTION B-B

NOTE: MONOLITHIC MEDIAN NOSE SHALL BE PAID FOR PER EACH, COMPLETE IN PLACE
NOTE: MONOLITHIC MEDIAN NOSE & PAVEMENT SHALL BE PAID FOR PER EACH, COMPLETE IN PLACE

SECTION B-B

SECTION A-A

MONOLITHIC MEDIAN NOSE
DETAIL OF MEDIAN PAVEMENT

MEDIAN PAVING

MEDIAN PAVING STONE DETAIL

TYPICAL CROSS SECTION

PAVING STONE SHALL BE INTERLOCKING CONCRETE PER ITEMS 2.3.7 AND 5.8.8 OF THE SPECIAL PROVISIONS AND SHALL BE ANTIQUE RED COLOR.
TRANSVERSE EXPANSION JOINT

(SPACE 600 FT. MAXIMUM, LOCATE AT INTERSECTIONS)

T = PAVEMENT THICKNESS

NOTES:

1. MACHINE DRILL HOLE INTO EXISTING PAVING FOR DOWEL BAR INSERTION. FILL HOLE WITH ENOUGH EPOXY TO COMPLETELY FILL VOID.

2. LONGITUDINAL BUTT CONSTRUCTION MAY BE UTILIZED IN PLACE OF LONGITUDINAL HINGED (KEYWAY) JOINT AT CONTRACTOR'S OPTION.

3. DOWEL BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG.

4. DRILLING BY HAND IS NOT ACCEPTABLE. PUSHING DOWEL BARS INTO GREEN CONCRETE IS NOT ACCEPTABLE.

LONGITUDINAL BUTT JOINT

24" #6 SMOOTH DOWEL BAR

3/4" REDWOOD EXPANSION JOINT FILLER (OR ALTERNATE PER NCTCC SPECIFICATIONS)

DOWEL SLEEVE (CLOSED END) FIT DOWEL AND BE SECURED TO BE INSTALLED 1-1/2" O.C.

NOTE:

DOWELS & REINFORCING BARS SHALL BE SUPPORTED BY A BASKET OR OTHER APPROVED DEVICE.

PAVEMENT JOINTS

4/5/17

Plano

ENGINEERING
STANDARD DETAILS

PAVING DETAILS

P15
1. Dowels & rebars shall be supported by an approved device.
2. Expansion joints to be the same as used for concrete street paving.

Minumum width 24'-0"

6"-3000 P.S.I. or 8"-3600 P.S.I. reinforced with #3 bars 24" o.c. both ways on 6" subgrade compacted to 95%-98% standard proctor density at ± 3% optimum moisture content.

Fire Lane Paving & Joint Detail

Vertical saw cut 3/8" wide (min.)

Hot poured rubber joint sealing compound

#3 bars on 24" ctrs. both ways

Sawed Dummy Joint

Vertical saw cut 3/8" min.

Hot poured rubber joint sealing compound

Sawed groove

#3 bars on 24" ctrs. both ways

First pour

Second pour

Lap bars 30 dia. & tie

Construction Joint for Pavements

Note: Contractor shall protect keyway prior to second pour. If longitudinal keyway is damaged, contractor shall repair with the use of longitudinal butt joint. Drill dowels into first pour.

T = Pavement thickness

Top 1/4" of joint shall be free of joint sealing compound.
**STANDARD 10’, 12’, 16’, & 20’ ALLEY SECTION**

**STANDARD ALLEY SECTION WITH CURBS**

**NOTE:** CURBS NOT ALLOWED IN RESIDENTIAL AREAS EXCEPT AS APPROVED BY THE CITY

*FOR ALLEY RECONSTRUCTION PROJECTS, SUBGRADE SHALL BE 6” THICK RECYCLED CONCRETE OR FLEXIBLE BASE PER TEXOT ITEM 247. THE SUBGRADE WIDTH SHALL BE EQUAL TO THE WIDTH OF THE ALLEY PAVEMENT AND NOT EXTEND BEYOND THE PAVING EDGE. FILTER FABRIC SHALL BE PLACED BETWEEN THE NATURAL GROUND AND BOTTOM OF THE SUBGRADE.*
TYPE I ALLEY ENTRANCE

TYPE II ALLEY ENTRANCE

ALLEY RETURN DETAILS
MOUNTABLE CURB SECTION

MOUNTABLE CURB DETAIL – PLAN VIEW
TYPICAL DRIVE OR STREET CONNECTION TO EXISTING ASPHALT STREET

10-5" END CURB

3-6" THICK ASPHALT TRANSITION

6" LONG BAR DIAMETER 30 T-F ABSENT THICKNESS

NO. 3 - 24" LONG BAR DIAMETER 30 T-F ABSENT THICKNESS

6" OR AS SPECIFIED OR AS REQUIRED

10-5"
SECTION A-A

SECTION B-B

DRIVEWAY RETURN TO STREET

Paving Details

4/5/17
TYPICAL PLAN VIEW

TYPICAL CROSS SECTION A–A
RESIDENTIAL ALLEY DRIVEWAY APPROACH

NOTES:
1. APPROACH TO BE MINIMUM 6" THICK, 3000 PSI CONCRETE WITH #3 STEEL (3/8") AT 24" O.C. EACH WAY ON CHAIRS.
2. IF OVER EXCAVATED BACKFILL ONLY WITH APPROVED SAND OR GRAVEL APPROACH. CONCRETE CANNOT REST ON LOOS DIRT 35% COMPACTION.
3. ALL SMOOTH DOWELS MUST BE LUBRICATED.
4. ALLEY APPROACH - DRILL INTO ALLEY 12" DEEP AT 24" O.C. AND INSTALL 24" LONG #4 DEFORMED DOWELS. EXPANSION JOINT CONSTRUCTED AT PROPERTY LINE.

RESIDENTIAL ALLEY DRIVEWAY APPROACH

TRANSVERSE EXPANSION JOINT AT DRIVEWAYS

NOTE:
DOWELS & REINFORCING BARS SHALL BE SUPPORTED BY CHAIRS OR OTHER APPROVED DEVICE
CONCRETE STREET OR DRIVEWAY REPAIR

SEE EMBEDMENT FOR TYPE OF PIPE

ASPHALT OVERLAY STREET OR DRIVEWAY REPAIR

SEE EMBEDMENT FOR TYPE OF PIPE
NOTE: ALLEY PAVING TO BE PLACED IN SHADED AREA WHEN SCREENING WALL IS ALONG PROPERTY LINE.

### TYPICAL

<table>
<thead>
<tr>
<th>ALLEY WIDTH (W)</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tr>
<td>20'</td>
<td>2.5'</td>
<td>10.0'</td>
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**ALLEY TURN FOR $\Delta = 75^\circ - 90^\circ$**

**SECTION A-A**

**ALLEY TURN**
ALLEY INTERSECTING ALLEY

ALLEY SCREENING WALL

Pour after wall & alley construction (dowel #3 bars 7" into existing alley paving on 24" centers)

Construct keyway or L-bar saw and seal for new alley construction

Extend reinf. 1'-9"
CONCRETE MOW STRIP AROUND STREET LIGHT BASE TOP OF CONCRETE TO BE AT GRADE LEVEL CONCRETE TO BE 4" THICK 3000 PSI WITH #3 BARS

NOTES:
1. CONCRETE TO BE MINIMUM 3000 PSI AT 28 DAYS. (5 SACK) MAXIMUM AGGREGATE 3/4", TOP OF FOUNDATION TO BE TROVELED TO A FLAT AND LEVEL SURFACE. AVOID EXCESSIVE TROWELING. CONCRETE TO SET A MINIMUM OF 72 HOURS BEFORE POLE INSTALLATION.
2. REBAR HOOPS ARE TIED BEGINNING 3" BELOW TOP OF CONCRETE FORM AND ARE REPEATED AT APPROXIMATE 1FT. INTERVALS TO BOTTOM OF FOUNDATION.
3. USE ANCHOR BOLT TEMPLATE FURNISHED BY POLE MANUFACTURER FOR ALIGNING ANCHOR BOLTS.
4. CONCRETE FORM OR SONOTUBE TO EXTEND TO BOTTOM OF TRENCH OR AS NEEDED.
5. PROVIDE 24" PICTAIL FOR CONNECTION OF GROUND WIRE TO POLE.
6. A MINIMUM OF 12" OF BARE #6 50 CU WIRE TO BE PLACED IN BOTTOM OF HOLE AND COVERED WITH 2" OF DRIT.
7. IF SOIL HAS BEEN DISTURBED, EXTEND FOUNDATION BY DEPTH OF DISTURBED SOIL.

SECTION A-A

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<td>.5 LB.</td>
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<td>1</td>
<td>GROUND, POLE BUTT WIRE COIL</td>
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<td>CONCRETE</td>
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</table>
NOTE: SIDEWALK AND RETAINING
WALL SHALL BE PAID FOR TOGETHER
MEASURED BY SF OF SIDEWALK PLUS
SF OF RETAINING WALL FACE

3/4" CHAMFER

#3 BARS @ 12"

#3 BARS
18" O.C. (MAX.)

#4 BARS 12" O.C.

5'-0"

6'-0" WHEN ABUTTING CURB

SOLID SOD BERMUDA GRASS

1/4" PER FT. USUAL

3/8" RADIUS

SLOPE 1/4" PER FT.
TOWARD STREET

#3 BARS 14" O.C.

3" C.L.

3" DIA.
WEEPHOLES
(10'-0" O.C.)

CONTINUOUS POCKET OF
3/4" STONE WRAPPED IN
FILTER FABRIC

TYPE 6 RETAINING WALL
SECTION A–A  OVERFLOW FLUME  SECTION B–B

R.O.W.  2'-6" USUAL  3000 PSI CONCRETE
GRADE BREAK  A  #3 BAR 24" O.C.

12:1 SLOPE FOR SIDEWALK
VARIES

FACE OF STREET CURB

BLOCK-OUT LIMIT IF NOT MONOLITHIC WITH STREET PAVEMENT

PAVEMENT REINFORCEMENT LAPPED 30 DIA. OR #3 BAR DOWEL 24" LONG

TOP OF STREET CURB

STREET GUTTER

SECTION AT STREET CURB FACE  SECTION C–C

PLAN FLUME

USUAL MAX. 4' W/2

#3 BARS ON 24" CENTERED IN BOTH WAYS

8/5/16

STREET OVERFLOW FLUME
SIDE ELEVATION

CONCRETE TO BE MIN. 3000 P.S.I.
#3 BARS 24" O.C.E.W.

SIDEWALK CONTROL JOINTS SHALL BE GROOVED 3/8" DEEP ON 4'-0" CENTERS

5'X5' ADA PASSING ZONE AS REQ'D (200 MIN.)

4'-0" ADJACENT TO SCREENING WALLS OR CURBS

#3 SMOOTH DOWELS 18" LONG, LUBRICATED SPACING 12" O.C.

1/2" EXPANSION JOINTS SHALL BE FILLED WITH PREMOLDED BITUMINOUS EXPANSION JOINT FILLER OR REDWOOD JOINTS SHALL BE SPACED AT INTERVALS EQUAL TO THE WIDTH OF THE SIDEWALK MULTIPLIED BY 10. FOR A 4' SIDEWALK, SPACING=4'X10=40'.

PLAN

WALK SHALL BE 5' WHEN NEXT TO CURB

SLOPE 1/4" PER FT. TOWARD STREET

EDGE 1/2" R.

AS SPECIFIED 5'-0" USUAL

3/8" RADIUS

SECTION

SIDEWALK NOTES:

1. IF A 4' SIDEWALK IS WITHIN 18" OF THE BACK OF CURB, THE SIDEWALK SHALL BE PLACED ADJACENT TO THE BACK OF CURB AND WIDENED TO 5'.

2. IF A SIDEWALK IS WITHIN 12" OF A STORM SEWER INLET, THE SIDEWALK SHALL BE PLACED ADJACENT TO THE INLET AND DOWELED IN.

CONCRETE SIDEWALK

PLANO

ENGINEERING

STANDARD DETAILS

PAVING DETAILS

P32

8/5/16
NOTE: DASHED LINES SHOW POSSIBLE GEOMETRIC CONSTRUCTION, NOT LANE LINES.

INTERSECTION OF TYPE "C" THOROUGHFARE WITH TYPE C AND ABOVE, ROW-REQUIREMENTS
INSTALL 12" #3 SMOOTH DOWEL BARS AT 24" O.C. – DRILL 6" INTO EX. SIDEWALK

TOP "SQUARED" LANDING
PAY LIMIT FOR RAMP

IF REQUIRED FOR GRADING, INSTALL 6"-10" MAX. HEIGHT CURB OR 10"-30" HEIGHT SIDEWALK WALL

PLACE NEAREST EDGE OF DETECTABLE WARNING 2" MAX. FROM BACK OF CURB

* STREET GRADE NOT TO EXCEED 5.0% ACROSS ACCESSIBLE ROUTES (STREET CROSSING)

FACE OF CURB
CURB TRANSITION

RAMP

** STRENGTH NOT TO DECREASE ACROSS ACCESSIBLE ROUTES (STREET CROSSING)

PAY LIMIT FOR RAMP

4X4 LANDING

4" MIN. (TYP.)

R.O.W.

R.O.W.

BOTTOM LANDING

2.0% MAX

2.0% MAX

2.0% MAX

2.0% MAX

2.0% MAX

2.0% MAX

6.0% MAX

8.3% MAX

4" X 4" DETECTABLE WARNING

STREET CROSSING

BEGIN MAX 2.0% FROM ACCESSIBLE ROUTE

* BRICK RED DETECTABLE WARNING SURFACE SHALL BE PROVIDED AS SHOWN BY INSTALLING MET SET ADA REPLACEABLE TACTILE WARNING SURFACE UNIT ADA REP MANUFACTURED BY ADA SOLUTIONS, INC OR APPROVED EQUAL. INSTALL ACCORDING TO MANUFACTURER RECOMMENDATIONS. USE ONLY MANUFACTURED STANDARD SIZES.

* FOR STREET CROSSINGS WITHOUT STOP OR YIELD CONTROL.

** FOR STREET CROSSINGS WITH STOP OR YIELD CONTROL.

BARRIER FREE RAMP TYPE 'A'

4/10/17
INSTALL 18" #3 SMOOTH DOWEL BARS AT 24" O.C. - DRILL 9" INTO EX. SIDEWALK

IF REQUIRED FOR GRADING, INSTALL 6'-10" MAX. HEIGHT CURB OR 10'-30" HEIGHT SIDEWALK WALL

PAY LIMIT FOR RAMP

BOTTOM LANDING (4'X4' MIN.)

PLACE NEAREST EDGE OF DETECTABLE WARNING 2" MAX. FROM BACK OF CURB

FACE OF CURB

CURB TRANSITION

SLOPE 2% FROM ACCESSIBLE ROUTE

BLOCK OUT

2' X 4' DETECTABLE WARNING

BRICK RED DETECTABLE WARNING SURFACE SHALL BE PROVIDED AS SHOWN BY INSTALLING WET SET ADA REPLACEABLE TACTILE WARNING SURFACE UNIT ADA REP MANUFACTURED BY ADA SOLUTIONS, INC OR APPROVED EQUAL. INSTALL ACCORDING TO MANUFACTURER RECOMMENDATIONS. USE ONLY MANUFACTURED STANDARD SIZES.

* FOR STREET CROSSINGS WITH STOP OR YIELD CONTROL
SECTION A-A

SECTION B-B

BARRIER FREE RAMP
TYPE 'A', TYPE 'B' AND TYPE 'C'
SECTIONS
TYPICAL RAMP LAYOUT FOR "T" INTERSECTION
BRICK RED DETECTABLE WARNING SURFACE SHALL BE PROVIDED AS SHOWN BY INSTALLING WET SET ADA REPLACEABLE TACTILE WARNING SURFACE UNIT ADA REP MANUFACTURED BY ADA SOLUTIONS, INC OR APPROVED EQUAL. INSTALL ACCORDING TO MANUFACTURER RECOMMENDATIONS. USE ONLY MANUFACTURED STANDARD SIZES.

**SLOPED PAVEMENT SECTION**

PLACE NEAREST EDGE OF DETECTABLE WARNING 2" MAX FROM BACK OF CURB

**TRANSITION CURB**

DOVEL IN #3 BARS EVERY 24" 2.0% MAX

**LIMIT OF PAYLINE**

**EXIST. SIDEWALK** 5'-0"

**SLOPED PAVEMENT SECTION**

IF REQUIRED FOR GRADING, INSTALL 6'-8" MAX HEIGHT CURB OR 8'-30" HEIGHT SIDEWALK WALL

**R.O.W.**

**18" #3 SMOOTH BARS DOWEL 9" INTO EXIST. SIDEWALK, 12" O.C. (TYPICAL)**

**LIMIT OF PAYLINE**

**CURVE OR TANGENT POINT**

**EXIST. CURB**

**Curved or tangent point**

**R.O.W.**

**BARRIER FREE RAMP TYPE 'D' SIDEWALK AT BACK OF CURB**

**Plano**

**ENGINEERING STANDARD DETAILS**

**PAVING DETAILS**

**P42**

**4/10/17**
SECTION A-A

SECTION B-B

SECTION C-C

BARRIER FREE RAMP TYPE 'D'
SIDEWALK AT CURB SECTIONS
BRICK RED DETECTABLE WARNING SURFACE SHALL BE PROVIDED AS SHOWN BY INSTALLING WET SET ADA REPLACEABLE TACTILE WARNING SURFACE UNIT. ADA REPL MANUFACTURED BY ADA SOLUTIONS, INC OR APPROVED EQUAL. INSTALL ACCORDING TO MANUFACTURER RECOMMENDATIONS. USE ONLY MANUFACTURED STANDARD SIZES.
1. ALL SLOPES SHOWN ARE MAXIMUM ALLOWABLE. ADJUST CURB LENGTH OR GRADE OF APPROACH SIDEWALK AS DIRECTED.

2. ACCESSIBLE ROUTES ARE CONSIDERED ‘Ramps’ WHEN LONGITUDINAL SLOPES ARE BETWEEN 5% AND 8.33% (MAXIMUM ALLOWABLE). SIDEWALKS UNDER 5% ARE DEEMED ACCESSIBLE ROUTES AND MUST FOLLOW ALL APPLICABLE GUIDELINES.

3. LANDINGS SHALL BE PROVIDED AT THE TOP AND BOTTOM OF ALL CURB RAMPS AT STREET INTERSECTIONS. LANDINGS SHALL BE 4’ X 4’ MINIMUM WITH A MAXIMUM 2% SLOPE IN ANY DIRECTION. TOP LANDINGS’ WIDTH AND LENGTH SHALL MATCH THE WIDTH OF THE SIDEWALK (“SQUARED LANDINGS”). BOTTOM LANDINGS SHALL BE WHOLLY CONTAINED WITHIN THE CROSSWALK AND WHOLLY OUTSIDE THE PARALLEL VEHICLE TRAVEL PATH.

4. WHERE A 4’ SIDEWALK IS PROVIDED, A 5’ X 5’ PASSING AREA IS REQUIRED AT INTERVALS NOT EXCEEDING 200’.

5. MAXIMUM ALLOWABLE CROSS SLOPE ON SIDEWALK AND CURB RAMP SURFACES IS 2%.

6. ADDITIONAL INFORMATION ON CURB RAMP LOCATION, DESIGN, LIGHT REFLECTIVITY VALUES AND TEXTURE MAY BE FOUND IN THE MOST CURRENT EDITION OF THE TEXAS ACCESSIBILITY STANDARDS (TAS) AND 16 TAC 66.102. FEDERAL GUIDELINES SHALL SUPERCEDE ANY CONFLICTS.

7. CROSSWALK DIMENSIONS, CROSSWALK MARKINGS AND STOP BAR LOCATIONS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS. AT INTERSECTIONS WHERE CROSSWALK MARKINGS ARE NOT REQUIRED, CURB RAMPS AND ACCESSIBLE ROUTES SHALL ALIGN WITH THE THEORETICAL CROSSWALK UNLESS OTHERWISE DIRECTED.

8. ALL WORK ASSOCIATED WITH ACCESSIBLE ROUTES SHALL BE INSTALLED FLUSH WITH ALL FEATURES TO MINIMIZE VERTICAL SURFACE DISCONTINUITIES. PROVIDE A SMOOTH TRANSITION WHERE THE CURB RAMPS CONNECT TO THE STREET. EACH SEGMENT ALONG ACCESSIBLE ROUTE SHALL BE FLUSH WITH NO MORE THAN 1/8-INCH GRADE SEPARATION, OR 1/2-INCH GRADE SEPARATION IF BEVELED (BEVELED SLOPES SHALL BE NO STEEPER THAN 50%).

9. CURB RAMPS MUST CONTAIN A DETECTABLE WARNING SURFACE THAT CONSISTS OF RAISED TRUNCATED DOMES COMPLYING WITH SECTION 705 OF THE TAS. THE SURFACE MUST CONTRAST VISUALLY WITH THE ADJOINING SURFACES.

CONTRACTOR SHALL FURNISH AND INSTALL PRE-MANUFACTURED REPLACEABLE CAST-IN-PLACE DETECTABLE WARNING DEVICES (DWD’S), AS MANUFACTURED BY ADA SOLUTIONS, OR APPROVED EQUAL ADJACENT TO NON-COLORED CONCRETE, UNLESS SPECIFIED OTHERWISE IN THE PLANS. DWD’S SHALL BE BRICK RED IN COLOR.

10. DWD SHALL BE INSTALLED TO THE MANUFACTURER’S SPECIFICATIONS, AND SHALL MEET ALL ADA REQUIREMENTS.

11. DETECTABLE WARNING SURFACES MUST BE SLIP RESISTANT AND NOT ALLOW WATER TO ACCUMULATE.

12. DETECTABLE WARNING SURFACES SHALL BE A MINIMUM OF 24” IN DEPTH IN THE DIRECTION OF PEDESTRIAN TRAVEL AND EXTEND THE FULL WIDTH OF THE CURB RAMPS OR LANDINGS WHERE THE PEDESTRIAN ACCESS ROUTE ENTERS THE STREET.

13. DWD SHALL BE LOCATED SO THAT THE EDGE NEAREST THE BACK OF CURB IS A MAXIMUM 2” FROM THE BACK OF CURB. CURB RAMPS MAY INCLUDE DWD ON THE RAMP COMPONENT IF ANY PART OF THE NEAREST EDGE TO CURB DOES NOT EXCEED 5 FEET.


15. CONTRACTOR SHALL LEAVE AN 18 INCH STREET PAVING BLOCK OUT, MEASURED FROM BACK OF CURB, ADJACENT TO CURB RAMPS. BLOCK OUT SHALL BE POURLED MONOLITHICALLY WITH CURB RAMPS, DOWELED INTO STREET PAVEMENT (24” SMOOTH #4 DOMES PLACED 24” O.C.).

16. STREET CROSSINGS WITH STOP OR YIELD CONTROL SHALL ADHERE TO THE SAME GUIDELINES AS OTHER ACCESSIBLE ROUTES WITHIN PUBLIC RIGHT-OF-WAY, AND SHALL BE THE FULL WIDTH OF THE IN-LINE ACCESSIBLE ROUTE. CROSS SLOPES SHALL NOT EXCEED 2% AT PEDESTRIAN ACCESS ROUTES THAT ARE CONTAINED WITHIN STREET CROSSINGS WITHOUT YIELD OR STOP CONTROL. THE CROSS SLOPE OF THE ACCESS ROUTE SHALL MATCH THE STREET PROFILE GRADE (2% MAXIMUM).

17. PROVIDE CLEAR GROUND SPACE AT OPERABLE PARTS, INCLUDING PEDESTRIAN PUSH BUTTONS. OPERABLE PARTS SHALL BE PLACED WITHIN ONE OR MORE REACH RANGES SPECIFIED IN TAS 308.

18. PLACE TRAFFIC SIGNAL OR ILLUMINATION POLES, GROUND BOXES, CONTROLLER BOXES, SIGNS, DRAINAGE FACILITIES, AND OTHER ITEMS SO AS NOT TO OBSTRUCT THE PEDESTRIAN ACCESS ROUTE OR CLEAR GROUND SPACE.

19. STREET GRADES AND CROSS SLOPES ARE SHOWN ELSEWHERE IN THE PLANS.
GENERAL NOTES

A. GENERAL
   1. PAVEMENT THICKNESS FOR STRAIGHT CROWN STREETS SHALL BE AS SPECIFIED BELOW IN SPECIAL NOTES.
   2. USUAL PAVEMENT THICKNESS IS AS SHOWN IN SPECIAL NOTES. SUBGRADE DESIGN SHALL CONFORM TO CITY OF PLANO
      DEPARTMENT OF ENGINEERING REQUIREMENTS, AND SHALL EXTEND 12" (MIN.) BEHIND CURB.

B. REINFORCED CONCRETE PAVEMENTS.
   1. ALL CURBS SHALL BE PLACED INTEGRAL WITH PAVEMENT.
   2. CURBS SHALL MEET THE SAME STRENGTH AS SPECIFIED FOR THE CONCRETE PAVEMENT.
   3. DETAIL AND ARRANGEMENT OF JOINTS, ALL TYPES, SHALL BE AS SHOWN ON THE CITY OF PLANO STANDARD
      CONSTRUCTION DETAILS.
   4. BAR LAPS SHALL BE 30 DIAMETERS.

C. SUBGRADE
   SUBGRADE UNDER ALL PAVEMENT SHALL BE 6 INCHES THICK AND SHALL BE STABILIZED WITH AT LEAST 27 LBS. PER SQ. YD.
   HYDRATED LIME, COMPACTED TO A DENSITY NOT LESS THAN 95 PERCENT. LABORATORY TESTS MUST BE SUBMITTED TO THE
   ENGINEERING DEPARTMENT FOR APPROVAL TO DETERMINE AMOUNT OF LIME REQUIRED. LABORATORY TEST MAY BE WAIVED
   PROVIDED AT LEAST 36 LBS. OF LIME PER SQ. YD. IS USED. SEE ITEM 4.6.4 SPECIAL PROVISIONS, OR AS REQUIRED TO
   REDUCE THE P.I. TO 15.

D. MINIMUM 6" TOPSOIL AND GRASS GROUND COVER REQUIRED ON ALL SLOPES, PARKWAYS, AND OTHER DISTURBED, EROSALE
   AREAS PER ITEMS 2.15, 3.10.1, 3.10.2, AND 3.10.3 OF THE SPECIAL PROVISIONS

E. BAR CHAIRS SHALL BE FURNISHED.

F. CROSS SLOPE SHALL BE 1/4" PER FOOT UNLESS APPROVED BY ENGINEERING DEPARTMENT.

G. FIRE LANES CAN BE CONSTRUCTED OF 5"-3600 P.S.I. CONCRETE, (6 SACK MIX) 6"-3000 P.S.I. CONCRETE, 7" ASPHALTIC
   CONCRETE (5" TYPE A BASE, 2" TYPE C SURFACE) OR GRASSCRETE, TO BE LOCATED AS PER FIRE CODE.

SPECIAL NOTES

PAVEMENT THICKNESS AND STRENGTHS SHALL BE AS FOLLOWS UNLESS OTHERWISE SHOWN ON THE PLANS:

   TYPE B: 8" MIN.-5000 P.S.I. COMP.  TYPE E: RETAIL THRU INDUSTRIAL
            7" MIN.-4200 P.S.I. COMP.
   TYPE C: 8" MIN.-5000 P.S.I. COMP.  TYPE F: 8" MIN.-3600 P.S.I. COMP.
   TYPE D: 7" MIN.-4200 P.S.I. COMP.  TYPE G: 6" MIN.-3000 P.S.I. COMP. OR
            5" MIN.-3600 P.S.I. COMP. (6 SACK MIX)

ALL MEDIAN & PARKWAYS SHALL BE PROVIDED WITH GRASSED GROUNDCOVER. MATERIALS SHALL BE AS SPECIFIED IN
ITEM 2.15. TOP SOIL & SEEDING SHALL BE IN ACCORDANCE WITH ITEMS 3.8, 3.9, 3.10, AND 3.11 OF THE SPECIAL
PROVISIONS AND SPECIFICATIONS.

STRIPES OR BUTTONS FOR RIGHT TURN LANES WILL BE REQUIRED TO BE THE SAME AS FOR LEFT TURN LANES.

ALLEYS AND DRIVEWAYS

1. CONCRETE FOR ALLEY RETURNS AND DRIVEWAYS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS
   IDENTICAL TO THAT SPECIFIED FOR THE STREET PAVEMENT OF BASE WHEN BUILT AS COMPONENTS OF A
   CONCRETE PAVING PROJECT. WHEN BUILT SEPARATELY, THE STRENGTH SHALL BE AS SPECIFIED ON THE
   CONSTRUCTION PLANS.

2. CONCRETE FOR ALLEY PAVEMENT SHALL BE OF THE STRENGTH SPECIFIED ON THE CONSTRUCTION PLANS.
   (3000 P.S.I. OR 3600 P.S.I. MINIMUM COMPRESSIVE)

3. SPACING AND CONSTRUCTION OF JOINTS SHALL CONFORM TO STREET PAVEMENT DETAILS.

4. SUBGRADE SHALL BE COMPACTED FOR NEW CONSTRUCTION TO NOT LESS THAN 95% DENSITY, AND STABILIZED
   WITH HYDRATED LIME TO REDUCE P.I. TO 15, ONE FOOT EACH SIDE OF ALLEY PAVEMENT.

5. FOR REHAB. PROJECTS 6" OF FLEX BASE SUBGRADE, (COG SPECIFIED) TO OUTSIDE EDGE OF PAVING.
TYPE A STORM SEWER MANHOLE

(For pipe 18" to 30" in diameter)

PRECAST CONCRETE
ADJUSTMENT RINGS (SET IN MORTAR BED & BRING TO GRADE) MAXIMUM RING ADJUSTMENT 10"

ELEVATION

SECTION A-A

Provide 3/4" premolded expansion joint between manhole and concrete pavement and seal with hot poured rubber.

STORM TOP FLANGE MANHOLE

Note: Frame and cover shall be bass & hayes pattern no. 380-24 or approved equal (refer to city of plano approved materials list) and shall be of gray cast iron conforming to a.s.t.m. spec a-48 for class 30 cast iron.

TOP PLAN TYPE A STORM SEWER MANHOLE

Note: Maximum pipe size to be used 30"
TYPE B STORM SEWER MANHOLE

FOR PIPE 33" TO 78" IN DIAMETER

NOTE: FRAME AND COVER SHALL BE BASS & HAYES PATTERN NO.380-24 OR APPROVED EQUAL (REFER TO CITY OF PLANO APPROVED MATERIALS LIST). AND SHALL BE OF GRAY CAST IRON CONFORMING TO A.S.T.M. SPEC. A-48 FOR CLASS 30 CAST IRON.

TOP PLAN TYPE A
STORM SEWER MANHOLE

NOTE: MAXIMUM PIPE SIZE TO BE USED 30"

PRECAST CONCRETE ADJUSTMENT RINGS (SET IN MORTAR BED & BRING TO GRADE) MAXIMUM RING ADJUSTMENT 18"

TOP PLAN TYPE A
DETAIL OF UTILITY SUPPORT

DETAIL FOR WATER MAIN LOWERING

STORM SEWER CROSSING DETAILS
STORM SEWER PIPE BEDDING DETAIL

DEPTH OF TRENCH BELOW PIPE:
3" MIN. FOR 2" PIPE & SMALLER
4" MIN. FOR 30" TO 60" PIPE
6" MIN. FOR 60" PIPE & LARGER

MECHANICALLY FORMED JOINT FORMED
WITH 2 #3 BARS

VARIES

VARIES

VARIES

6" MIN.

1½" MIN. 12" 12"

MIN.

ALL STORM SEWER PIPE PLUGS SHALL BE CONCRETE

STORM SEWER EMBEDMENT AND CONCRETE COLLAR DETAILS

DETAIL OF CONCRETE COLLAR
FOR PIPE CONNECTIONS
PLAN — STANDARD INLET

PLAN — RECESSED INLET

SECTION A—A RECESSED AND STANDARD INLETS

4. 6, 8, AND 10 FOOT INLETS
REINFORCING STEEL SCHEDULE
4', 6', 8' AND 10' INLETS
Dimensions shown are for maximum size inlets

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<td>K 4</td>
<td>5 3</td>
<td>6</td>
<td>N -3&quot; 0 -3&quot;</td>
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</tbody>
</table>

* See Diagram for Dimensions.

BAR DIAGRAMS

BAR A

BAR B

BAR C & L

BAR D

BAR E

BAR F

BAR G

BAR H

BAR I & N

BAR J

BAR K

BAR L

BAR M

BAR N

* See Diagram for Dimensions.

** Field cut as required to accommodate drain pipe.
SLOPE TOP OF INLET 1/4" PER FT.

NOTES:
1. ALL COLD JOINTS SHALL BE SMOOTH & UNIFORM.
2. FORMED CONCRETE ABOVE PIPE SHALL BE 6" MIN.

SECTIONS B–B

WHERE SIDEWALKS ARE ADJACENT TO OR WITHIN 6" OF BACK OF INLET, DOWEL 12" #3 BARS AT 18" O.C.

SECTION C–C

4, 6, 8, AND 10 FOOT INLET SECTIONS
NOTE: REINFORCEMENT SHOWN IS ADDITIONAL FOR SPECIAL CONDITION, FOR REMAINDER OF REINF. SEE SECTIONS.

PLAN

SECTION D-D
NOTES:
1. ALL COLD JOINTS SHALL BE SMOOTH & UNIFORM.
2. FORMED CONCRETE ABOVE PIPE SHALL BE 6" MIN.

SECTION B-B

WHERE SIDEWALKS ARE ADJACENT TO OR WITHIN 6" OF BACK OF INLET, DOVEL 12" #3 BARS AT 18" O.C.

SECTION C-C

12, 14, 16, AND 20 FOOT INLET SECTIONS
PLAN OF FRAME

BASS & HAYS
#855-52
OR APPROVED EQUAL

SECTION A-A

STORM SEWER INLET COVER
(1) The floor of the excavation must provide a firm, level bed for the base section to rest upon.

(2) A minimum of 6 inches of 1" diameter (maximum) rock or gravel shall be used to prepare the bedding to final grade or in lieu of this, at least 6 inches of 2-5 sack cement stabilized sand shall be used to prepare the bedding to grade. Cement stabilized sand shall be allowed to set by keeping hole pumped dry.

(3) After casting has been installed on the proper bedding, the backfill material, which is free flowing and clear of rocks, in excess of 4" diameter and other lumps which would prohibit proper compaction, shall be commenced in lifts of no more than 18". The material used for backfill should be of a type suitable to obtain the density requirements for the specific job.

(4) Precast inlets must be approved by city engineer.

(5) Locking device is required on all storm sewer lids.

(6) "No dumping" warning plaque to be installed on all standard and recessed inlets.

Note: Cast-in-place inlets to be minimum 4200 P.S.I. concrete.

![Diagram of installation for precast 5' and 10' curb inlets]
COMBINATION INLET NOTES:

1. Combination inlets to be used in all alleys where inlets are required.
2. All laps and extensions of reinforcing bars shall be 16 bar diameters unless noted otherwise.
3. Tack weld grates in place.
4. Pipe may be placed in any wall but shall not enter any corner or bottom.
5. Concrete shall be a min. of 4200 P.S.I.
6. "No Dumping" warning plaque to be installed on all combination inlets.

10'-0" typical or as shown on plans
All combination inlets each side

6" curb typical, all combination inlets
COMBINATION INLET NOTES:

1. Combination inlets to be used in all alleys where inlets are required.

2. All laps and extensions of reinforcing bars shall be 36 in diameters unless noted otherwise.

3. Tack weld grates in place.

4. Pipe may be placed in any wall, but shall not enter any corner or bottom.

5. Concrete shall be a min. of 4200 p.s.i.

6. "No dumping" warning plaque to be installed on all combination inlets.
COMBINATION INLET NOTES:

1. COMBINATION INLETS TO BE USED IN ALL ALLEYS WHERE INLETS ARE REQUIRED.
2. ALL LAPS AND EXTENSIONS OF REINFORCING BARS SHALL BE 26 BAR DIAMETERS UNLESS NOTED OTHERWISE.
3. TACK WELD GRATES IN PLACE.
4. PIPE MAY BE PLACED IN ANY WALL, BUT SHALL NOT ENTER ANY CORNER OR BOTTOM.
5. CONCRETE SHALL BE A MIN. OF 4200 P.S.I.
6. "NO DUMPING" WARNING PLAQUE TO BE INSTALLED ON ALL COMBINATION INLETS.

FOUR GRATE INLET
NOTE: GRATE AND FRAME SHALL BE PATTERN NO. 814 AS MANUFACTURED BY BASS & HAYES FOUNDRY, INC. OR APPROVED EQUAL.

GRATE INLET

SECTION F–F

SECTION G–G

GRATE DETAILS
PLAN

SECTION A-A

DROP INLET NOTES

1. ALL LAPS AND EXTENSIONS OF REINFORCING BARS SHALL BE 30 BAR DIAMETERS UNLESS NOTED OTHERWISE.

2. PIPE MAY BE PLACED IN ANY WALL BUT SHALL NOT ENTER ANY CORNER, OR BOTTOM.

3. CONCRETE TO BE MINIMUM OF 4200 P.S.I.

4. A "4" DROP INLET REFERS TO THE OUTSIDE DIMENSION.

DROP INLET SECTIONS
SECTION A-A

ALL CONCRETE SHALL BE 3000 P.S.I. REINFORCING SHALL BE #3 BARS 13" CENTERS EACH WAY.

CROUTED ROCK RP-RAP 6"-8" DIA., 18" THICK.

CHANNEL SLOPE 3:1 MAX.

MATCH CHANNEL SLOPE

R.C.P.

VARYING

CAN BE MODIFIED WITH PERMISSION OF CITY ENGINEER.

TYPE C HEADWALL
STO. CAST IRON METER LID WITH LOCK-TYPE COVER AND FRAME. TEXAS SPECIAL OR APPROVED EQUAL. PROVIDE 4-1" DIA. HOLES IN COVER.

EXISTING GROUND

EXTEND 3" ABOVE GROUND

24" DIA. PRECAST CONC. METER VAULT OR GOMP.

AIR AND VACUUM-AIR RELEASE VALVE

2" COPPER PIPE

2" GATE VALVE

8" BLIND FLANGE TAPPED 2"

2" COPPER PIPE

8" FLANGED OUTLET FOR 16" DIA. WATER MAINS AND LARGER

6" NIPPLE, 4" LONG ATTACHED TO BLIND FLANGE

SLOPE 1/8" PER FT.

WASHED GRAVEL

WATER LINE

VARIES

NOTE:
REFER TO APPROVED MATERIAL LIST FOR BRAND NAMES OF AIR RELEASE VALVES

TYPICAL AIR AND VACUUM-AIR RELEASE VALVE INSTALLATION
1. 4"-12" resilient seat gate valves shall be in accordance with AWWA Standard C-509.

2. A permanently attached valve extension stem (refer to approved materials list) shall be required for any valve that's operating nut is located in excess of 4 feet below the top of the valve box. This extension shall be of sufficient length to insure that its top is within 4' of valve box lid.

3. Ductile iron or C-900 PVC pipe shall be used for valve stack with valve box casting (refer to approved materials list).

4. Blue dot (3") on nearest curb face to valve (refer to approved list).
BLOW OFF VALVE DETAIL

- 2000 PSI 4 SACK CONCRETE
  THRUST BLOCK TO BE PLACED
  ON UNDISTURBED EARTH

- NOTE: MUST BE DISCHARGED INTO
  STORM SEWER, BRIDGE, OR
  CULVERT
① IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO AWWA STANDARDS SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE FOR WATER AND SANITARY SEWER IMPROVEMENTS. FIRE HYDRANTS SHALL HAVE A 5½" MINIMUM VALVE OPENING AND WITH A BARREL APPROXIMATELY 7" INSIDE DIAMETER.

② ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE.

③ ALL HYDRANTS SHALL BE APPROVED BY THE CITY.

④ FIRE HYDRANTS ARE NOT TO BE PLACED IN SIDEWALK.

⑤ FIRE HYDRANTS SHALL BE 5' BURY.

⑥ A MAXIMUM OF 1' EXTENSION IS ALLOWED.

⑦ BONNET TO FLANGE AND NOZZLE CAPS COLOR CODE FOR MAIN SIZE WHEREAS TO PLANO STANDARDS. REMAINDER OF HYDRANT ABOVE GROUND PAINTED ALUMINUM.

MIN. 7 CUBIC FEET OF WASHED GRAVEL FILL

POLY-WRAP

2000 PSI 4 SACK CONCRETE PLACED IN PLACE THRUST BLOCK MUST NOT BLOCK WEEP HOLE

PRECAST CONCRETE SLAB OR Poured-IN-PLACE

CONCRETE PAD

EXPANSION JOINT

LONG SWIVEL ADAPTER

MECHANICAL JOINT HYDRANT

MECHANICAL JOINT

VALVE

FLANGED TEE

CITY OF PLANO COLOR CODE
FOR WATER MAIN SIZE

<table>
<thead>
<tr>
<th>SIZE</th>
<th>COLOR</th>
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<tbody>
<tr>
<td>6&quot;</td>
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<tr>
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<td>BLUE</td>
</tr>
<tr>
<td>12&quot;</td>
<td>YELLOW</td>
</tr>
</tbody>
</table>
FIRE HYDRANT GUARD POST DETAIL

NOTE: FOR USE ONLY WHERE CURBS ARE NOT POSSIBLE OR AS REQUIRED

FIRE HYDRANT PAD

NOTE: IF VALVE IS WITHIN 2-FEET OF HYDRANT, INTEGRATE THE VALVE IN HYDRANT PAD.
A blue stimsonite fire-lite reflector (or approved equal) to be placed in the center of residential street or fire lane or nearest lane stripe for multi-lane roads opposite fire hydrants. The installation of this reflector shall be as prescribed by the manufacturer.

NOTE: DO NOT PLACE FIRE HYDRANTS WITHIN RADIUS.
BRICK PAVER DETAIL FOR SMALL OR LARGE METER CANS
ABOVE DIAGRAM MEASUREMENTS ARE FOR 2 OR MORE BOXES.

BRICK PAVER DETAIL FOR SINGLE BOX

METER BOX PLACEMENT DETAILS
1. Domestic water services shall not be connected to fire hydrant lines.
2. MopE may be used for 2" services only (refer to approved materials list).
3. For waterline rehabilitation projects, the pay item for new water services includes adjustment to 12" depth and connection to the private side of the water service by a licensed plumber.
4. On a 2" compound meter, set angle stop to 12" deep.

For 1" or smaller meter:
1. All taps shall be made at 45° angle to centerline of pipe. Minimum tap size to be 1 inch per 6.73 (0.5)(0.8)(2.1)(3), or (5).
2. No direct taps. Taps shall be made using service saddle. See City approved materials list.
2,000 P.S.I. CONCRETE QUANTITIES AT EACH LOCATION AS DESIGNATED ON THE PLANS

USE 1/8 BEND

STEEL STRAPS

WATER MAIN

CENTERLINE OF CREEK

42" MAN COVER

CLASS G Embedment

2,000 P.S.I. CONCRETE

UNDISTURBED EARTH

TYPICAL CREEK CROSSING
HALF SECTION
STREET CROSSING FOR WATER MAINS

NEW WATER LINE UNDER EXISTING SEWER LINE

NEW WATER LINE OVER EXISTING SEWER LINE

GENERAL NOTES:

1. ENCASEMENT PIPE: NEW, SMOOTH STEEL PIPE WITH WALL THICKNESS=00/120, 1/4" MIN., BITUMINOUS COATING, 3,500 P.S.I. MIN. YIELD STRENGTH.
2. CARRIER PIPE SHALL BE MADE-UP OUTSIDE THE ENCASEMENT PIPE & PUSHED THROUGH THE BORE. INSTALL RACI (OR APPROVED EQUAL) OR SMITH-OILAR CASING SPACERS ACCORDING TO MFR. RECOMMENDATIONS. MAINTAIN 1" MAX. CLEARANCE BETWEEN CASING SPACERS & ENCASEMENT PIPE.
3. MEET ALL CITY PERMIT REQUIREMENTS & DIRECTIONS OF THE CITY ENGINEER.
4. IF SEPARATION IS WIDER THAN REQUIRED SAFETY DISTANCES, AND IF SIDE SLOPES WILL ALLOW, INSPECTION OF BORE PIT MAY BE ALLOWED WITH ACCESS TO PITS BY MEANS OTHER THAN MAIN TRAFFIC LANES.
5. CONCRETE TO BE SACK 4 2000 PSI.
NAMEPLATE INDICATING:
MFG: FARR EQUIP. CO.
(800)-258-8041
MODEL: SW-PS
DATE MANUFACTURED

NOTE: PRECAST VAULTS MUST BE ON APPROVED MATERIALS LIST

PLAN VIEW

PAINT ALUMINUM
BILCO TYPE K
STEEL HATCHWAY

PRECAST CONCRETE Lid
w/ CAST IR
STEEL HATCHWAY

6'-0" LINK-SEAL TYP)

15" MIN.

10" MIN.

10" MIN.

12"X12" SUMP

ELEVATION

CONCRETE SUPPORTS

ROMAC SADDLE w/ 2" THREAD

DUCTILE IRON
STUB-OUT

METER VAULT

10/1/15
1. NOTIFY THE UTILITY OPERATIONS DEPARTMENT (972-769-4160) PRIOR TO CONSTRUCTION OF METER VAULT OR BY-PASS ASSEMBLY.

2. THE METER VAULT SHALL BE PRE-FABRICATED. REFER TO MANUFACTURER’S WEBSITE FOR INSTALLATION SPECIFICATIONS.

3. THE BOTTOM OF THE VAULTS SHALL BE 6” THICK-3,000 P.S.I. CONCRETE, REINFORCED WITH #4 STEEL BARS ON 12” CENTERS BOTH WAYS. A 4” DEEP X 12” DIAMETER SUMP SHALL BE INCLUDED TO ONE SIDE AND IN EITHER CORNER OF THE BOTTOM SLAB. A 4” CUSHION OF 3/4” CRUSHED STONE SHALL BE INSTALLED UNDER THE BOX. IF A PRE-FABRICATED VAULT IS TO BE USED, A LAYER OF RAM-NEK SHALL BE INSTALLED BETWEEN THE WALLS AND THE TOP OF THE BOX.

4. THE VAULT SHALL NOT BE INSTALLED IN ANY DRIVE OR PARKING AREA AND MUST BE LOCATED IN A UTILITY EASEMENT DEDICATED TO THE CITY OF PLANO. ALL PIPING INSIDE THE VAULT AND THE VAULT ITSELF MUST BE INSPECTED AND APPROVED BY THE UTILITY OPERATIONS DEPARTMENT.

5. THE VAULT LID SHALL BE A BILCO TYPE Q-4 LEAF DESIGN LID. ANGLE FRAME IS 1/4” STEEL WITH STRAP ANCHORS BOLTED TO THE EXTERIOR. THE LEAF IS 1/4” STEEL DIAMOND PATTERN PLATE, PIVOTING ON TORSION BARS FOR EASY OPERATIONS. THE MINIMUM LIVE LOAD CAPACITY IS 150 LBS. PER SQUARE FOOT. THE LID SIZE SHALL BE 3’ X 3’. THE LID SHALL BE PAINTED WITH 43-38 TREVCO DIFFUSED ALUMINUM PAINT OR APPROVED EQUAL.

6. ALL PIPING INSIDE THE VAULT SHALL BE DUCTILE IRON PIPE WITH FLANGED FITTINGS. THE OUTSIDE DIMENSION OF THE PIPING SHALL BE WITHIN THE FOLLOWING RANGES: 3” PIPE - 3.74 TO 3.85; 4” PIPE - 4.74 TO 4.90; 6” PIPE - 6.81 TO 6.96; 8” PIPE - 8.98 TO 9.20; 10” PIPE - 11.04 TO 11.61. VARIATION FROM THESE DIMENSIONS WILL RESULT IN THE VAULT BEING REJECTED.

7. THE STRAINER, METER, AND FLANGED ADAPTER COUPLING WILL BE PROVIDED AND INSTALLED BY THE CITY OF PLANO AT THE CONTRACTOR’S EXPENSE.

8. THE STRAINER, METER, AND FLANGED ADAPTER COUPLING MAY NOT BE INSTALLED UNTIL THE METER VAULT AND TAPS ARE ACCEPTED BY THE CITY OF PLANO UTILITY OPERATIONS DEPARTMENT. ALL UTILITIES MUST ALSO HAVE BEEN ACCEPTED AND RELEASED BY THE CITY OF PLANO ENGINEERING OFFICE PRIOR TO METER INSTALLATION.

9. THE CONTRACTOR SHALL MAKE THE BY-PASS AND METER TEST TAP INSIDE THE VAULT. IF THE SERVICE IS TO BE USED STRICTLY AS A DOMESTIC OR DOMESTIC/IRRIGATION COMBINATION, TAP A ON THIS DRAWING IS NOT NECESSARY. IF THE SERVICE IS USED STRICTLY FOR IRRIGATION TAP A IS REQUIRED. TAP A MUST BE AT LEAST TWO PIPE DIAMETERS DOWNSTREAM OF THE METER. TAPS B & C MUST BE MADE AT AN APPROXIMATE 45° ANGLE ON EACH END OF THE PIPE AND CENTERED 10 INCHES AWAY FROM THE WALL. ALL TAPS SHALL BE 2” AND THE CONTRACTOR SHALL INSTALL APPROVED SERVICE SADDLES WITH BRASS NIPPLES AND NO. 7550 OHIO BRASS OR APPROVED EQUAL GATE VALVES. (REFER TO THE CITY OF PLANO APPROVED MATERIALS LIST FOR SERVICE SADDLES.)

10. THE MAIN LINE GATE VALVES SHALL BE RESILIENT WEDGE DESIGN, NON-RISING STEM VALVES, WHICH HAVE RECEIVED FORMAL APPROVAL FROM THE CITY OF PLANO. ALL VALVES SHALL BE FLANGED BOTH ENDS AND HAVE HAND WHEELS.

11. CONTRACTOR SHALL HAVE CHOICE OF EITHER HAVING A LINK SEAL WALL SLEEVE MODEL WS-6-28-S-6 FOR 3” PIPE; MODEL WS-8-32-S-6 FOR 4” PIPE; MODEL WS-10-36-S-6 FOR 6” PIPE; MODEL WS-12-40-S-6 FOR 8” PIPE; MODEL WS-16-42-S-6 FOR 10” PIPE, CAST IN WALL OF THE VAULT. THE ABOVE MENTIONED WALL SLEEVES SHALL USE THE FOLLOWING LINK SEALS: FOR 3” PIPE 5#LS325-C; FOR 4” PIPE 7#LS400-C; FOR 6” PIPE 7#LS400-C; FOR 8” PIPE 9#LS400-C; FOR 10” PIPE 12#LS400-C. THE CONTRACTOR MAY HAVE THE VAULT WALL CORED BEFORE INSTALLATION OF VAULT AND PIPING. IF THE WALL IS CORED THE FOLLOWING SPECIFICATIONS SHALL BE USED: FOR 3” PIPE CORE SIZE SHALL BE 6” AND USE 5#LS325-C LINK SEALS; FOR 4” PIPE CORE SIZE SHALL BE 8” AND USE 5#LS400-C LINK SEALS; FOR 6” PIPE CORE SIZE SHALL BE 10” AND USE 7#LS400-C LINK SEALS; FOR 8” PIPE CORE SIZE SHALL BE 12” AND USE 9#LS400-C LINK SEALS; FOR 10” PIPE CORE SIZE SHALL BE 14” AND USE 11#LS-425-C LINK SEALS. BREAKING OF THE WALL WITH A JACKHAMMER OR USING PRE-CAST KNOCKOUT PANELS IS NOT PERMITTED.

12. THERE WILL BE A CONCRETE SUPPORT UNDER EACH GATE VALVE.

13. MINIMUM DEPTH OF ANY VAULT SHALL BE 4’-6”.

14. IF ELEVATION ADJUSTMENTS ARE NEEDED ON THE ACCESS LID CONTRACTOR SHALL CONTACT UTILITY OPERATIONS DEPARTMENT FOR APPROVAL PRIOR TO IMPLEMENTATION OF ADJUSTMENTS.

15. TOP OF METER VAULT MUST MATCH FINISH GRADE. NO EXTENSIONS PERMITTED.
NOTES:

PROVIDE 1" MINIMUM THICKNESS CONCRETE OR CEMENT MORTAR COATING IN THE FIELD FOR THE PROTECTION OF ALL EXPOSED STEEL SUCH AS FLANGES, CAULKED-JOINTS, THREADED OUTLETS, CLOSURES, etc. THE CEMENT MORTAR USED SHALL CONSIST OF ONE PART PORTLAND CEMENT TO TWO AND ONE-HALF PARTS OF FINE, SHARP (PLASTER) SAND WHERE SHOWN. COATING IS TO BE REINFORCED WITH WIRE MESH.

ANY SURFACE RECEIVING A CEMENT MORTAR COATING SHALL BE THOROUGHLY CLEAN AND WETTED WITH WATER JUST PRIOR TO PLACING THE CEMENT MORTAR COATING. AFTER PLACEMENT, CARE SHALL BE TAKEN TO PREVENT CEMENT MORTAR COATING FROM DRYING OUT TOO RAPIDLY BY COVERING WITH DAMP EARTH OR BURLAP. CEMENT MORTAR COATING SHALL NOT BE APPLIED DURING FREEZING WEATHER.

FITTINGS SHALL BE POLY-WRAPPED TO PREVENT BLOCKING FROM STICKING TO BOLTS.

STEEL STRAP THREADED THROUGH HEM OF BURLAP WRAPPER, DRAWN TIGHT AND FASTENED

BURLAP WRAPPER AS MANUFACTURED BY MAR-MAR CORP. OR EQUAL WIDTH OF WRAPPER TO BE 9" FOR 36" AND LARGER, 7" FOR 33" AND SMALLER

CEMENT MORTAR, MIXED TO A CONSISTENCY OF THICK CREAM, TO BE Poured IN FIELD

CEMENT MORTAR OF STIFF CONSISTENCY PLACED IN THE FIELD

STANDARD RUBBER GASKET JOINT

NOTE: ALL CLOSURE SECTIONS SHALL BE FABRICATED WITH HAND HOLES TO ALLOW WIPING INSIDE OF JOINTS AFTER CLOSURE IS IN PLACE

CORPORATION COCK, CC THREADS ON INLET END MUELLER OR APPROVED EQUAL

3/4" TO 1" = H 15008
1-1/2" TO 2" = H 15013

NOTE: IF CORPORATION COCK IS NOT PROVIDED IN FIELD, THEN STEEL PLUG SHALL BE COVERED WITH CEMENT MORTAR

PROTECTIVE COATING APPLIED IN FIELD

BRASS INSULATING BUSHING PLACED IN PLANT

LINE IN PLANT TO COVER ALL EXPOSED STEEL

THREADED CONNECTIONS

BURLAP WRAPPER

PROTECTIVE COATING APPLIED IN FIELD

WELDED WIRE MESH #8 GAUGE

FLANGED CONNECTIONS

REINFORCED CONCRETE CYLINDER
PIPE DETAILS
NOTE:
Any surface receiving a cement mortar coating shall be thoroughly cleaned and wetted with water just prior to placing the cement mortar coating. After placement, care shall be taken to prevent cement mortar coating from drying out too rapidly by covering with damp earth or burlap. Cement mortar coating shall not be applied during freezing weather.

Fittings shall be poly-wrapped to prevent blocking from sticking to bolts.
**PIECE DIMENSIONS**

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<th>Normal Size</th>
<th>Outer Diameter (O.D.)</th>
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**NOTES:**

1. ALL COMPACTING SHALL BE IN ACCORDANCE WITH STANDARD SPECIFICATIONS AND/OR SPECIAL PROVISIONS.
2. CONCRETE ENGAGEMENT SHALL BEGIN AND END 6 INCHES FROM THE END OF A JOINT.
3. W = 24" PLUS PIPE O.D.

---

**CONCRETE CRADLE BUTTONED**

- **CLASS "A" EMBEDMENT**
- **CLASS "G" EMBEDMENT**

---

**TABLE OF QUANTITIES OF MATERIALS IN CUBIC YARDS PER 100 LINEAR FEET**

<table>
<thead>
<tr>
<th>Inside Diameter of Pipe</th>
<th>Approx. Outside Diameter of Pipe</th>
<th>Trench Width in Inches</th>
<th>Trench Width in Feet</th>
<th>Class &quot;A&quot; Embedment</th>
<th>Class &quot;G&quot; Embedment</th>
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<td>12.66</td>
<td>20.02</td>
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**NOTE:** OPEN TRENCHING AND BORE HOLES SHALL NOT BE CLOSER THAN 10 FEET FROM THE EDGE OF PAVEMENT OR 5 FEET FROM FACE OF CURB.
SECTION A-A

CONCRETE PAD 24" SQUARE SHALL BE Poured AROUND ALL VALVE BOXES NOT PLACED WITHIN CONCRETE PAVEMENT 3000 P.S.I.

4-#3 BARS

FINISHED GRADE

30# FELT PAPER

VALVE BOX WITH NECESSARY EXTENSIONS PER DETAIL W03

#3 BAR CAGE

4-#3 BARS

30# FELT PAPER

3000 P.S.I. CONCRETE

REFER TO THE CITY OF PLANO APPROVED MATERIALS LIST FOR APPROVED BUTTERFLY VALVES.

SECTION B-B

BUTTERFLY VALVE DETAIL
GENERAL NOTES

1. ALL WATER LINES SHALL BE AS SPECIFIED IN THE STANDARD SPECIFICATIONS AND/OR SPECIAL PROVISIONS.
2. ALL MECHANICAL JOINT FITTINGS WILL BE REQUIRED TO BE INSTALLED WITH THE USE OF RESTRAINT GLANDS IN ACCORDANCE WITH THE CITY OF PLANO APPROVED MATERIALS LIST. THE RESTRAINT GLAND MUST BE EQUIPPED WITH ANCHOR LUGS FOR PERPENDICULAR CONTACT TO PVC PIPE.
3. ALL WATER MAINS SHALL HAVE THE FOLLOWING MINIMUM MEASURED FROM THE BOTTOM OF THE PAVING:
   6" AND SMALLER — 54" COVER
   8" — 60" COVER
   10" AND 12" PIPE — 72" COVER
4. BLEEDER LINES MUST BE REMOVED UPON COMPLETION OF WATER LINE TESTING BY REMOVING THE CORPORATION AND REPLACING IT WITH A BRASS PLUG.
5. ALL WATER MAINS SHALL BE SWABBED BY THE "POLY-PIC METHOD". POLYPIC SHALL BE PULLED THROUGH WATER LINES BEFORE LINES ARE ACCEPTED BY CITY.
6. ALL CALCULATIONS ARE BASED ON TOTAL INTERNAL PRESSURE OF 150 P.S.I.
7. ALLOWABLE SOIL BEARING PRESSURES MUST BE AT LEAST ONE TON PER SQUARE FOOT FOR THE THRUST BLOCKS SHOWN. IN SOILS OF LESSER CAPACITY, INCREASE SIZE AND BEARING AREA PROPORTIONATELY. VOLUMES OF VERTICAL BEND THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE FURNISHED AND THE CORRESPONDING WEIGHT OF THE CONCRETE (AT 4,000/C.Y.) EQUALS THE VERTICAL COMPONENT OF THRUST ON THE VERTICAL BEND. ALL BEARING SURFACES OF THRUST BLOCKS SHALL BE Poured AGAINST UNDISTURBED EARTH.
8. CONCRETE FOR BLOCKING SHALL BE MINIMUM 2000 P.S.I. CONCRETE.
9. DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER. BUT SHALL NOT BE LESS THAN THE DIMENSIONS SHOWN.
10. WATER METER BOXES SHALL BE PROTECTED BY A 6" CURB OR BOLLARDS WHEN PLACED IN A PAVED AREA.
11. ALL SERVICE LINES MUST BE ONE CONTINUOUS PIECE (NO SPLICED JOINTS) FROM MAIN TO ANGLE STOP.
12. ALL VALVES AND FITTINGS SHALL BE POLY WRAPPED.
13. NO DIRECT TAPS. TAPS SHALL BE MADE USING SERVICE SADDLES. SEE CITY APPROVED MATERIALS LIST.
14. POLY WRAP DUCTILE IRON FITTINGS.
15. ON WATER LINE STUBOUTS, VALVES ARE TO BEanchored TO THE MAIN USING A MJ ANCHOR COUPLING, AT LEAST ONE FULL JOINT OF PIPE SHALL BE EXTENDED BEYOND THE VALVE.
16. MAXIMUM STUBOUT LENGTH SHALL BE 5' PAST WITHOUT VALVE.
17. INSTALL "DAS" CURB MARKER ON CURB FACE NEAREST TO THE WATER VALVE.

SPECIFICATIONS FOR WATER PIPE

POLYVINYL CHLORIDE (P.V.C.) WATER PIPE

UNPLASTICIZED POLYVINYL CHLORIDE (PVC) WATER SHALL MEET OR EXCEED REQUIREMENTS OF AWWA C900, PVC PIPE WITH DUCTILE IRON OUTSIDE DIMENSIONS. PIPE SHALL BE LISTED BY UNDERWRITER LABORATORIES AND SHALL BE APPROVED FOR USE IN CITIES AND TOWNS OF THE STATE OF TEXAS BY THE STATE BOARD OF INSURANCE.

PVC WATER PIPE SHALL BE FURNISHED WITH A RUBBER RING AT EACH JOINT AND IN INTEGRAL THICKENED BELL AS A PART OF EACH JOINT THE PIPE CLASS SHALL BE MINIMUM CLASS 200 DR 14 FOR 6-INCH PIPE AND CLASS 150 DR 18 FOR 8-INCH AND LARGER PIPE WHICH REFERS TO THE MAXIMUM HYDROSTATIC PRESSURE IN NORMAL OPERATIONS. LAYING LENGTHS SHALL BE 20 FEET. PIPE AND FITTINGS MUST BE ASSEMBLED WITH A NONTOXIC LUBRICANT.

FITTINGS FOR PVC WATER PIPE SHALL BE DUCTILE IRON OF THE BELL AND SPIGOT, OR MECHANICAL JOINT TYPE AND SHALL BE CLASS 250 IN ACCORDANCE WITH AWWA C110-77 (ANSI A21.10)
STANDARD CAST IN PLACE MANHOLE

1. KEYWAYS REQUIRED FOR ALL CONSTRUCTION JOINTS.
2. CONCRETE SHALL BE 4200 P.S.I.
3. IF GREATER THAN 18", USE EXTERNAL DROP CONNECTION
M.I.H. RING & COVER TO BE SET TO GRADE OF PROPOSED PAVEMENT, OR FLUSH WITH PROPOSED GROUND GRADE.

STD. C.I.M.H. FRAME & COVER

USE PRECAST CONC. OR RINGS TO RAISE TO GRADE 1" MIN., 18" MAX., AS PER ITEM 2.3.3.

MORTAR COATING

NEOPRENE "O-RING" GASKET AND MASTIC

KOR-N-SEAL OR APPROVED EQUAL Voids TO BE GROUTED.

4'-0" OR 5'-0"

BASE RING VARIOUS

INTERMEDIATE RINGS AVAILABLE IN 1½", 2½", 3½", 4½"

(USE MINIMUM NO. OF RIBBES)

STONE CUSHION FOUNDATION AS PER ITEM 6.3.1 OF THE NCTCOC STANDARD SPECIFICATIONS

PRECAST BASE

ALL PIPES ENTERING & LEAVING A MANHOLE SHALL BE CONCRETE CRADLED FOR A DISTANCE OF 2' OUTSIDE OF MANHOLE FOR FULL WIDTH OF TRENCH

NOTE: IF FALSE MANHOLE BOTTOMS REQUIRED, THEY SHALL BE CONSTRUCTED, INSTALLED, AND REMOVED

CONCRETE CLASS ITEM 7.45
CONCRETE PIPE MATERIAL ITEM 2.12.4
MANHOLE MATERIAL ITEM 2.19
MANHOLE CONST. ITEM 6.7.2.(1) (1)(3)
SANITARY SEWER MANHOLE
ROOF OPTIONS

NOTE A: IF MANHOLE DIAMETER IS LARGER THAN 48" I.D.
PRE-CAST FLAT TOP MANHOLE COVER AS PER ASTM
C478 SHALL BE INSTALLED. FOR HEAVY TRAFFIC, THIS
SPECIAL DESIGN REQUIRED.

NOTE: STUBOUTS TO BE A MIN. OF 5' LONG
w/ CONCRETE CRADLE FROM SAME
POUR AS BASE UNDER ENTIRE LENGTH.
ITEM 6.7.2(1)/(2)/(8)

CONTRACTOR TO BE SET TO GRADE OF PROPOSED
Pavement, or flush with proposed ground grade.

PRESSURE TYPE M.H. FRAME & COVER

M.H. FRAME CAST IN ROOF w/ CONTINUOUS POUR FROM BASE

CONSTRUCTION JOINT WITH KEY WAY WATERSTOP AND
#5's 12" O.C. EXTENDING 9" INTO WALL (NOT REG'D
FOR CONTINUOUS POUR)

SECTION A-A

CONCRETE CONE

2'-0" OR 3'-0"

PRECAST CONCRETE
ADJUSTMENT RINGS
(SET IN MORTAR BED
& BRING TO GRADE)
MAXIMUM RING
ADJUSTMENT 18"

VARIABLE

4000 PSI 6.5 SACK MONOLITHIC POUR

FIRM WELL DRAINED MATERIAL OR
ROCK FOUNDATION PER ITEM 6.3.1

M.H. LID SHOULD BE IN
LINE WITH UPSTREAM PIPE
WHERE POSSIBLE

2" MASTICK (RAMNECK)

ADJUSTMENT OF CAST
IN PLACE CONES

NOTE: CLEANLY SAWCUT EXISTING CONE AS DIRECTED.
DOVING & EPOXY INTO EXISTING MANHOLE WITH
12" #3 DEFORMED BARS ON 18" CENTERS.
INSTALL 2" OF WATER STOP BETWEEN DOVELS
PRIOR TO POURING NEW CONE. WRAP OUTSIDE
JOINT WITH APPROVED SEAL PRIOR TO
BACKFILLING AND WIPE INSIDE WITH APPROVED
GROUT.
(2) CAST PICKBARS

(4) 1" DIAMETER HANDLING HOLES ON A 35 1/2" B.C.

32"

1/2"

32 1/4"

30"

32 1/4"

36"

MANHOLE RING AND COVER
(4) 1" DIAMETER HANDLING HOLES ON A 35 1/2" B.C.

(2) CAST PICKBARS

(4) SS 1/2-13 BOLTS WITH 3/4" STEEL AND RUBBER WASHERS

32"

1 1/2"

32 3/4"

30"

38"

3/4" NEOPRENE GASKET
**Figure 1: Existing Manhole**
1. Install a false bottom in the manhole.
2. Remove the existing ring, cover and any grade rings or bricks.

**Figure 2**
3. Remove the existing manhole cone section to a minimum of 6" below the cone taper to manhole wall.

**Figure 3: Pre-Grading**
4. Form and monolithically pour a new manhole extension with cone section. Use epoxy bonding agent, "Skadur 32, Himot" or approved equal, to bond new concrete to existing concrete. Coat entire outside of the new concrete with a waterproof bituminous coating. Set a new ring and cover on top of the new section with concrete mortar and sealer.

**Figure 4: Pre-Paving**
5. Use precast concrete grade rings to raise manhole frame and cover to final paving grade. (Limited to 18" max. manhole neck extension, as measured from the top taper of the manhole cone to the manhole lid.) When manhole neck extension exceeds 10", then the manhole cone is to be removed and reset in such a manner as to reduce the number of grade rings required to reset manhole frame and cover to final grade. (3 rings max.)
6. Set the new ring and cover in place with non-shrink grout.
7. Once forms are removed and prior to backfilling, wrap outside joints with approved seal and wipe inside joint with approved grout.
8. The false bottom will be removed during the final inspection.
6" 2'-0" WIDE SLAB 3' LONG
2,000 PSI CONCRETE
OR 3,000 P.S.I. IF
LOCATED IN ROADWAY

P.V.C. PIPE

6" CLEAN-OUT STACK

BASS & HAYES
CASTING #339

6" SPIGOT PLUG J.M. MANFG.
CAT#0079012 OR
APPROVED EQUAL

2,000 PSI CONCRETE

3/4" CRUSHED STONE
FOR P.V.C. PIPE

NOT LESS THAN 3"

PLUG

BEND NOT REQ'D IF
MAIN LINE WYE IS P.V.C.
NOTES:

1. IF THE SIDEWALK IS LOCATED AT THE BACK OF THE CURB, THEN THE CLEANOUT IS TO BE PLACED ONE FOOT OFF THE BACK OF THE SIDEWALK.

2. ELIMINATE DOUBLE CLEANOUT IF CLEANOUT WILL BE LOCATED IN DRIVEWAY OR OTHER PAVED AREAS.

3. ELIMINATE COUPLING AND CONCRETE ENCASCMENT IF CONNECTING TO PVC SDR 35.

1. 4" SCH 35 PVC (VARIOUS LENGTHS)
2. 4" TWO WAY SCH40 PVC GASKETED CLEAN OUT (SDR 35 GASKETED HUBS)
3. 4" MODEL 404 LATERAL CLEAN OUT LID W/ GASKET PVC OR ABS IN DIRT
4. FERNCO FLEX-SEAL STANDARD COUPLING OR APPROVED EQUAL
5. 4" PVC SDR 35 OR OTHER EXISTING PIPE
6. APPROVED SADDLE
7. SEWER MAIN
CLASS G EMBEDMENT
CONCRETE ENCASEMENT

NOTE: TYPE OF EMBEDMENT OR ENCASEMENT SHALL BE SHOWN IN THE PROFILES FOR ALL LINES. LOAD CALCULATIONS SHALL BE SUBMITTED TO THE ENGINEERING DEPARTMENT. WIDTH OF TRENCH – W, SHALL BE 24 INCHES PLUS O.D. FOR PIPE GREATER THAN 24" I.D. O.D. PLUS 16" FOR PIPE LESS THAN OR EQUAL TO 24" I.D.

CLASS H EMBEDMENT
P.V.C. PIPE ONLY

STD. P.V.C. SEWER INSTALLATION
STD. P.V.C. RCCP & DUCTILE WATER INSTALLATION.
NOTE: ENGINEERING DESIGN SHALL BE SUBMITTED FOR EACH CROSSING.PIERS SHALL BE PLACED AT MAXIMUM SPAN DISTANCE AS DICTATED BY DESIGN.

NOTE: STEEL PIPE SHALL BE JOINED WITH STEEL COUPLINGS.PIPES COUPLINGS SHALL BE PLACED A MAXIMUM OF 5 FEET FROM CENTERLINE OF PIERS

STEEL PIPE SHALL BE OF THE TYPE SHOWN IN THE SPECIFICATIONS. STEEL PIPE SHALL HAVE THICKNESS REQUIRED FOR SIZE AND SPAN WITH MINIMUM WALL THICKNESS OF 3/8 INCHES

PIERS SHALL EXTEND 6 FEET MINIMUM INTO SHALE OR ROCK

MATERIALS SHALL CONFORM TO THE SPECIAL PROVISIONS AND/OR THE STANDARD SPECIFICATIONS

BANK PROTECTION (TYP.)

N1/2

8'1

8"
AERIAL CROSSING
PIER CAP DETAIL

AERIAL CROSSING
CONCRETE COLLAR DETAIL

NOTE: CONSTRUCT MINIMUM WIDTH
OF COLLAR ALONG PIPE=2'-0"
(1'-0" EACH SIDE OF JOINT)

O.D.*±16"

1/2 O.D.±8"

1/2 O.D.±8"

*O.D. OF LARGEST PIPE AT EACH COLLAR

1'-6" MIN.

3/4" CHAMFER

1'-6" MIN.

3" CHAMFER
GENERAL NOTES

1. ALL SANITARY SEWER PIPE SHALL BE P.V.C. SDR-35 PIPE. OTHER PIPES SHALL BE SUBJECT TO APPROVAL BY THE CITY ENGINEER.

2. SANITARY SEWER PIPE JOINTS SHALL CONFORM TO CURRENT ASTM DESIGNATIONS FOR P.V.C. PIPE.

3. ALL SANITARY SEWER LATERALS SHALL INCLUDE 4" TEE WYE BEND, PIPE AND STOPPER INSTALLED 10 FEET DOWNSTREAM FROM THE WATER MAIN SERVICE ON EACH LOT, UNLESS OTHERWISE INDICATED ON PLANS. 6" LATERALS REQUIRE M.H. AT MAIN SEWER PIPE.

4. UNLESS OTHERWISE NOTED, ALL MATERIAL AND CONSTRUCTION SHALL CONFORM TO THE STANDARD SPECIFICATIONS AND/OR SPECIAL PROVISIONS.

5. IN THE EVENT AN ITEM IS NOT COVERED IN THE CITY OF PLANO SPECIFICATIONS, THE CITY ENGINEER'S DECISION SHALL APPLY.

6. DROP MANHOLE REQUIRED FOR CONNECTION OF 18" OR GREATER.

7. ALL MANHOLES SHALL BE VACUUM TESTED IN ACCORDANCE WITH THE SPECIFICATIONS.

8. ALL PIPES ENTERING & LEAVING A MANHOLE SHALL BE CRADLED FOR A DISTANCE OF 5 FEET OUTSIDE OF M.H. FOR FULL WIDTH OF TRENCH.

9. THE USE OF BRICK MANHOLES IS NOT PERMITTED IN THE CITY OF PLANO.
   BRICK, STONES, CONCRETE RUBBLE, AND CONSTRUCTION DEBRIS SHALL NOT BE USED TO ADJUST MANHOLES TO FINAL GRADE.
   ALL BACKFILL SHALL BE FREE OF ORGANIC MATTER AND ANY OTHER UNSTABLE MATERIAL.
   WHERE SEWER LINES ENTER A MANHOLE MORE THAN 24 INCHES ABOVE THE INVERT, THE INVERT SHALL BE FILLETED TO PREVENT SOLIDS DEPOSITION.
   PROVIDE A U-SHAPED CHANNEL THROUGH ALL MANHOLES:
   • FOR PIPES LESS THAN 15 INCHES DIAMETER, CHANNEL DEPTH MUST BE AT LEAST ONE-HALF THE PIPE DIAMETER;
   • FOR PIPES MORE THAN 15 INCHES BUT LESS THAN 24" DIAMETER, CHANNEL DEPTH MUST BE AT LEAST 3/4 THE PIPE DIAMETER;
   • FOR PIPES GREATER THAN 24 INCHES DIAMETER, CHANNEL DEPTH MUST BE AT LEAST EQUAL TO THE PIPE DIAMETER.
   ALL MANHOLE BENCH AREAS SHALL HAVE A SLOPE OF AT LEAST 0.5 INCHES PER FOOT.
   ALL JOINTS AND SEAMS ON SANITARY SEWER MANHOLES SHALL BE WRAPPED WITH STOMA SEAL OR APPROVED EQUAL.

10. ABANDONMENT OF SEWER MANHOLES:
    1. PLUG INCOMING AND OUTGOING SEWER LINES WITH CONCRETE.
    2. REMOVE TOP OF MANHOLE TO 2' MIN. BELOW TOP OF GROUND ELEVATION. DISPOSE OF MANHOLE TOP.
    3. BACKFILL WITH SELECT FILL AND COMPACT TO TOP OF GROUND.
THE FOLLOWING MANHOLE TESTS ARE ADOPTED BY THE CITY OF PLANO TO COMPLY WITH CHAPTER 317 OF 30 TEXAS ADMINISTRATIVE CODE. THESE TESTS SUPERSEDE THOSE LISTED IN ITEM 6.7.2(c) OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION—NORTH CENTRAL TEXAS.

EXTRATION TEST

1. Plug all lines entering the manhole.
2. For concrete manholes, fill manhole with water 24 hours prior to beginning test. This will allow for saturation of manhole.
3. After the wetting period, maintain the manhole full for one hour.
4. The maximum allowable leakage shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
5. If the manhole exceeds the leakage rate specified above, identify the source of leakage, repair, and retest manhole. Continue with testing and repair until the manhole passes the test.

LOW PRESSURE AIR TESTING OF SANITARY SEWERS

THE FOLLOWING REVISION TO ITEM 6.7.2(h) OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION—NORTH CENTRAL TEXAS IS ADOPTED BY THE CITY OF PLANO TO COMPLY WITH CHAPTER 317 OF 30 TEXAS ADMINISTRATIVE CODE.

When ground water is encountered during sanitary sewer construction, the pipe shall be pressurized to 3.5 psi greater than the pressure exerted by the ground water above the pipe.

VACUUM TESTING

After the completion of the manhole, the manholes shall be visually inspected by the engineer and the owner before final acceptance. In addition, the contractor shall perform low pressure vacuum testing on each manhole. Each manhole shall be tested separately and independently of the sanitary sewer lines. All sanitary sewer lines coming in to the manhole shall be sealed with an internal pipe plug. The method of testing shall be by means of creating an air vacuum within the manhole, whereby, a 10 Hg (mercury) vacuum will be developed. The air vacuum shall then be monitored once it has reached 10" Hg for a test period of two minutes. The allowance drop in air vacuum shall be no greater than 1" Hg during the two-minute test period.

The air vacuum testing procedures for the rehabilitated manholes shall be according to recommendations of Chemex Industries, Inc. (Air-Loc Vacuum Manhole Tester), or such other manufacturers/suppliers that would have acceptable equipment designed specifically for air vacuum testing manholes.

The contractor shall provide the owner with certified documentation that the test procedures were conducted as recommended by the equipment manufacturers and the test results were actual numbers recorded in the field. The contractor shall record and certify to the following information:

- Date and time of testing.
- Name of contractor's representative performing the tests.
- Equipment used and calibration procedures.
- Manhole location(s).
- Air vacuum maximum (Hg).
- Test period.
- Drop in air vacuum within the test period.
- Other observations at the testing site.

The following tables presents 5% deflection mandrel sizes adopted by the city of Plano to comply with Chapter 317 of 30 Texas Administrative Code.

5 PERCENT DEFLECTION MANRELD

<table>
<thead>
<tr>
<th>NOMINAL D.I., INCHES</th>
<th>MANRELD, D.I., INCHES</th>
<th>NEAREST 1/16 INCHES</th>
<th>MINIMUM RUNNER LENGTH, INCHES</th>
<th>MINIMUM NUMBER OF MANRELD RUNNERS</th>
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<tbody>
<tr>
<td>8</td>
<td>5.75</td>
<td>5-11/16</td>
<td>4-7/8</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>6.65</td>
<td>7-10/16</td>
<td>4-7/8</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>7.60</td>
<td>9-11/16</td>
<td>6-7/8</td>
<td>9</td>
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<tr>
<td>12</td>
<td>11.40</td>
<td>11-13/16</td>
<td>9-7/8</td>
<td>9</td>
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<tr>
<td>15</td>
<td>14.25</td>
<td>14-17/16</td>
<td>11-7/8</td>
<td>9</td>
</tr>
<tr>
<td>18</td>
<td>17.10</td>
<td>17-17/16</td>
<td>13-7/8</td>
<td>9</td>
</tr>
<tr>
<td>21</td>
<td>19.95</td>
<td>19-17/16</td>
<td>15-7/8</td>
<td>9</td>
</tr>
<tr>
<td>24</td>
<td>22.80</td>
<td>22-17/16</td>
<td>18-7/8</td>
<td>9</td>
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<td>27</td>
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<td>25-5/8</td>
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<td>9</td>
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<td>34-3/16</td>
<td>27-7/8</td>
<td>9</td>
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<tr>
<td>42</td>
<td>39.90</td>
<td>39-7/8</td>
<td>31-7/8</td>
<td>9</td>
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</tbody>
</table>

NOTES:
1. Deflection tests shall be done without mechanical pulling devices.
2. Tests shall be done after the backfill has been in place for 30 days.
3. The rigid manreld shall be constructed of a metal or rigid plastic that can withstand 200 psi without deforming.
4. Adjustable or flexible mandrels are prohibited.
5. Mandrels with removable legs or runners may be accepted on a case by case basis.
6. A proving ring shall be provided for each size mandrel used.
SECTION A–A
(DIVERSION RIDGE DETAIL – WHERE GRADE FROM SITE EXCEEDS 4%)

NOTE:
USE SANDBAGS, DIVERSIONS OR OTHER APPROVED METHODS TO CHANNELIZE RUNOFF TO SEDIMENT BARRIER AS REQUIRED.

EXISTING PAVED ROADWAY

FLOW

FLOW

FLOW

SEDIMENT BARRIER
(SILT FENCE TYPE SHOWN)

FLOW

FLOW

FLOW

10' (TYP.)

A

A

3"–5" COURSE AGGREGATE
MIN. 6" THICK

DIVERSION RIDGE WHEN REQUIRED

50' MIN.

15' MIN.

PLAN
DISCHARGE ONTO STABILIZED OUTLET, SEDIMENT TRAPPING DEVICE OR LEVEL SPREADER AS SHOWN ON CONSTRUCTION DRAWINGS

FLOW

DIVERSION INVERT

CUT OR FILL SLOPE OR DISTURBED AREA WITHOUT GROUND COVER

PLAN

COMPACTED FILL

PLACE EROSION CONTROL MATTING WHEN VELOCITY EXCEEDS 4 F.P.S.

18" MAX.

FLOW

NATURAL OR GRADED GROUND SURFACE

SECTION A-A

TEMPORARY DIVERSION
EXTEND FILTER TUBE 24" MIN. ON EACH SIDE

8' MAX. SPACING FOR METAL OR WOODEN STAKES

CENTER ON LOW POINTS OR 300' APART

FILTER TUBE WITH 1/2" FILTER STONE

FLOW

SILT FENCE

H

1/2 H
PLAN VIEW

TYPE B HEADWALL SHOWN, SIMILAR FOR OTHER HEADWALLS OR END OF CONCRETE CHANNEL LINING.

SECTION A–A

WELL GRADED STONE RIP-RAP (TYP.)

WELL GRADED STONE DIAMETERS:

\[ D_{\text{MAX}} = \quad \]
\[ D_{50} = \quad \]
\[ D_{\text{MIN}} = 2" \]

SECTION B–B

FINAL GRADE

FILTER FABRIC

RIP-RAP TO TOP OF CHANNEL BANK OR 1’–0” ABOVE DESIGN FLOW DEPTH
FIGURE 5.6.A

EXAMPLE: PIPE DIAMETER = 24"
DESIGN FLOW = 30 CFS

FROM CHART:  $d_{50} = 0.3$ FT. = 4 IN.
             $d_{\text{MAX}} = (1.5)\times(d_{50}) = 6$ IN.
APRON THICKNESS = $(1.5)\times(d_{\text{MAX}}) = 9$ IN.
FROM CHART $L = 30$ FT.

Curves may not be extrapolated.
V-SHAPE

CROSS-SECTIONAL AREA \( (A) = zd^2 \)
TOP WIDTH \( (T) = 2dz \)
HYDRAULIC RADIUS \( (R) = \frac{zd}{2\sqrt{z^2+1}} \)

PARABOLIC SHAPE

CROSS-SECTIONAL AREA \( (A) = \frac{2}{3}Td \)
TOP WIDTH \( (T) = \frac{1.5A}{d} \)
HYDRAULIC RADIUS \( (R) = \frac{T'd}{1.5T^2+4d^2} \)

TRAPEZOIDAL SHAPE

CROSS-SECTIONAL AREA \( (A) = bd + Zd^2 \)
TOP WIDTH \( (T) = b + 2dZ \)
HYDRAULIC RADIUS \( (R) = \frac{bd + Zd^2}{b + 2d\sqrt{z^2+1}} \)
SECTION A—A
"Y" INLET

*SPECIFIC DESIGN INFORMATION ON THE EROSION CONTROL PLANS IS REQUIRED FOR EACH INSTALLATION

SECTION A—A
DROP INLET

FLOW

PLAN VIEW

EXCAVATED INLET PROTECTION
NOTE: STAKE FILTER TUBE ON DOWNHILL SIDE AS ILLUSTRATED.

25’ MAX.

4:1 TO STEEPER

METAL OR WOODEN STAKES AT 6 TO 8 FOOT INTERVALS

FILTER TUBE

1” - 2”

BEDDING TRENCH

FILTER FABRIC REQUIRED WHEN DIA. ≥ 12”

LAY FILTER FABRIC DOWNSTREAM 1.5D

*SPECIFIED DESIGN INFORMATION ON THE EROSION CONTROL PLANS IS REQUIRED FOR EACH INSTALLATION

*DIAMETER AS SPECIFIED ON PLAN

SECTION A-A

FLOW

A

FLOW

FLOW

FLOW

METAL OR WOODEN STAKES AT 6 TO 8 FOOT INTERVALS

PLAN VIEW

FILTER TUBE SLOPE PROTECTION
SECTION A-A
DROP INLET

SECTION A-A
GRATE INLET

PLAN VIEW

DROP & GRATE INLET PROTECTION
FILTER TUBE
*Diameter = ___
As specified on plan

SECTION A-A

FILTER TUBE

FLOW

TRAFFIC CONTROL VERTICAL PANELS

DROP INLET GRATE

FLOW

PLAN VIEW

FILTER TUBE INLET PROTECTION (PAVING)
ATTACH FILTER FABRIC SECURELY TO 2X4 WOOD FRAME, OVERLAPPING FABRIC TO NEXT STAKE

TOP FRAME NECESSARY FOR STABILITY

2X4 WOOD FRAME 4 SIDES OF DROP INLET

FABRIC ANCHORED IN 6"X6" TRENCH BACKFILLED WITH COMPACTED EARTH

SECTION A-A
DROP INLET

ATTACH FILTER FABRIC SECURELY TO 2X4 WOOD FRAME, OVERLAPPING FABRIC TO NEXT STAKE

TOP FRAME NECESSARY FOR STABILITY

2X4 WOOD FRAME 4 SIDES OF DROP INLET

FABRIC ANCHORED IN 6"X6" TRENCH BACKFILLED WITH COMPACTED EARTH

SECTION A-A
GRATE INLET

FLOW

LESS THAN 5% SLOPE

PLAN VIEW

NOTE: CONCENTRATED DITCH FLOW COMING FROM ONE OR MORE SIDES TOWARD THE INLET MAY REQUIRE A STONE OVERFLOW STRUCTURE TO BE CONSTRUCTED ON ONE SIDE OF THE INLET (SEE DETAIL ER04). HOG WIRE FABRIC BACKING IS REQUIRED FOR INSTALLATIONS USED MORE THAN 90 DAYS.
1. Double wrap of flexible wire mesh with mesh opening 3/4" max., or
2. Plastic netting double wrapped with 1/2" max. opening, or
3. Geosynthetic tubes

**NOTE:** Vertical panel barricades to be placed whenever located on an active street.

**TYPE A CURB INLET PROTECTION**

**ALT. FORM FOR TYPE A CURB INLET PROTECTION**

<table>
<thead>
<tr>
<th>CURB OPENING</th>
<th>MIN. NO. BLOCKS</th>
</tr>
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<tbody>
<tr>
<td>4'-6&quot;</td>
<td>1</td>
</tr>
<tr>
<td>8'-10&quot;</td>
<td>2</td>
</tr>
<tr>
<td>12'-14&quot;</td>
<td>3</td>
</tr>
<tr>
<td>16'-20&quot;</td>
<td>4</td>
</tr>
</tbody>
</table>
FILTER STONE ANCHOR BAGS MAY BE REQUIRED TO HOLD FABRIC AND FRAME

NOT ALLOWED ON ACTIVE CITY STREETS

2" GAP BETWEEN TOP OF FABRIC AND TOP OF INLET OPENING

FILTER STONE ANCHOR BAGS FILLED WITH FILTER STONE. ONE AT EACH END AND ENOUGH IN BETWEEN TO PREVENT GAPS BETWEEN THE PAVEMENT AND THE FILTER FABRIC. LAY BAGS LONGITUdinALLY IN THE GUTTER AT THE ENDS, TRANSVERSE TO GUTTER IN BETWEEN

EXTEND WIRE MESH AND FILTER FABRIC 12" (MIN.) BEYOND CURB OPENING ON BOTH SIDES

CROSS SECTION

PLAN VIEW

TYPE B CURB INLET PROTECTION
SECTION VIEWS

PLAN VIEW

TYPE A PIPE INLET PROTECTION
VIEW LOOKING UPSTREAM

SECTION A-A

'L' = THE DISTANCE SUCH THAT POINTS 'A' AND 'B' ARE OF EQUAL ELEVATION

*SPECIFIC DESIGN INFORMATION ON THE EROSION CONTROL PLANS IS REQUIRED FOR EACH INSTALLATION

SPACING BETWEEN CHECK DAMS

POINT 'A'

POINT 'B'

* 'L' = ___ FT.
NOTE:
1. POINT B MUST BE A MIN. OF 6" TO 12" HIGHER THAN POINT A.
2. STAKE CHECK DAM ON DOWNHILL SIDE AS NECESSARY

SECTION A–A

NOTE: FILTER TUBES MAY BE COMPOST FILTER TUBES, FILTER STONE COIR WATTLE (TUBES) OR STRAW WATTLES (TUBES).

SECTION B–B

PLAN VIEW

FILTER TUBE CHECK DAM

*DIAMETER AS SPECIFIED ON PLAN

METAL OR WOODEN STAKES AT 6 TO 8 FOOT INTERVALS

FILTER TUBE

1"–2"

BEDDING TRENCH

FILTER FABRIC REQUIRED WHEN DIA.>12"

*Diameter as specified on plans

*SHOW SPACING ON PLAN

METAL OR WOODEN STAKES AT 6 TO 8 FOOT INTERVALS

PLAN VIEW

FILTER TUBE CHECK DAM

* Specific design information on the erosion control plans is required for each installation

6'–8' STAKE SPACING

37° TO 2:1 SLOPE

1

FILTER TUBE

POINT A

POINT B

4:1 TO 2:1 SLOPE

*DIAMETER AS SPECIFIED ON PLAN

PLAN VIEW
**SECTION A–A**

- 2" Dia. Steel Pipe on 10' Centers to Anchor or Other Approved Anchoring System

- 1 1/2" Filter Stone

- Required Storage Volume = 1,800 C.F./A.C.

- Flow

- Filter Fabric

**SECTION B–B**

- 1 1/2" Filter Stone

- Flow

- Flow

- Area for Sediment Storage

**PLAN VIEW**

- 2" Dia. Steel Pipe on 10' Centers to Anchor or Other Approved Anchoring System

**NOTE:**
1. Dry Channel Use 3"x3" Basket.
2. Wet Channel—Top of Basket 6" Above Normal Water Level

**CONFINED STONE OUTLET SEDIMENT TRAP**

**Plano Engineering Standard Details**

**ER21**
USE DEPRESSION GRADING BEHIND CURB FOR EROSION CONTROL PRIOR TO SODDING OR INSTALLING BRICK PAVERS

SECTION VIEW

EROSION CONTROL MATTING, MINIMUM REQUIRED AT ALL LOW POINT CURB INLETS ALONG CURB

PLAN VIEW

DEPRESSED BACK OF CURB SEDIMENT TRAP
REMOVE EXISTING PAVEMENT

3:1 SLOPE

BACKFILL AREA REQUIRED IF EXCAVATION LEFT OPEN FOR MORE THAN 48 HOURS

TYPICAL AT BACK OF CURB

BACKFILL TO TOP OF EXISTING PAVEMENT AT SAWCUT LINE ALONG TRAFFIC LANE

3:1 SLOPE

BACKFILL AREA REQUIRED IF EXCAVATION LEFT OPEN FOR MORE THAN 48 HOURS

TYPICAL TRENCH
Type B
Sediment Trap Outlet
At Pavement Low Points
PHASE 1

PHASE 2

FOR PHASE 3, PROVIDE TYPE A, B, OR C INLET PROTECTION ONCE THE INLET TOP AND PAVING ARE COMPLETED

PHASE 3
(4)-1.00" HEX HEAD BOLTS WITH HEX NUTS, FLAT WASHERS & LOCK WASHERS.

0.50" NUT HOLDER WITH FASTENERS FOR GROUNDING

0.19"

1.00"

Transformer Base

11.50" SQUARE

10.00" DIA. BOLT CIRCLE

1.25" DIA. BOLT HOLES

TYPE 3 POLE DATA

<table>
<thead>
<tr>
<th>POLE SERIES</th>
<th>POLE TYPE</th>
<th>DESIGNATION</th>
<th>POLE DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAL</td>
<td>34</td>
<td>15'-0&quot;</td>
<td>5.53&quot;</td>
</tr>
<tr>
<td>DAL</td>
<td>38</td>
<td>10'-0&quot;</td>
<td>4.96&quot;</td>
</tr>
</tbody>
</table>

ANCHOR BOLT

(4)-1.00" DIA. ANCHOR BOLTS WITH (2) HEX NUTS AND (2) WASHERS PER BOLT WITH THREADED END GALVANIZED AT LEAST 12".
ALL STRUCTURES ARE DESIGNED TO THE 1985 (60 MPH) AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR SIGNS, LUMINARIES, AND TRAFFIC SIGNALS.

<table>
<thead>
<tr>
<th>DEVICE</th>
<th>DESCRIPTION</th>
<th>PROJ. AREA (FT²)</th>
<th>WEIGHT (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SIGNAL 12&quot;-5 SEC. WITH BACKPLATES</td>
<td>13.33</td>
<td>55</td>
</tr>
<tr>
<td>B</td>
<td>DUAL PEDESTRIAN SIGNAL</td>
<td>8.00</td>
<td>60</td>
</tr>
</tbody>
</table>
THE CONTRACTOR SHALL MOUNT EQUIPMENT ON POLES AS DIRECTED BY THE POWER COMPANY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE ELECTRIC PRIOR TO MAKING CONTACT WITH THEIR POLES.
WIND STABILIZER
PULL BOX INSTALLATION

TRAFFIC CONTROL
(TOP VIEW)

S=17.5"
L=22.0"

S=10.5"
L=12.5"

GROUND LINE

8" MIN.
CLEARANCE

18" MIN.
CONDUIT

PULL BOX OF REINFORCED
CONCRETE MORTAR AND OF MIN.
SPECIFIED DIMENSIONS

6"

STONE DRAIN COARSE CRUSHED
STONE OR GRAVEL

12"

10/1/15
**FOUNDATION DESIGN TABLE**

<table>
<thead>
<tr>
<th>FOUNDATION TYPE</th>
<th>DRILLED SHAFT DIAM</th>
<th>DRILLED SHAFT LENGTH</th>
<th>REINFORCING STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>24-A</td>
<td>24&quot;</td>
<td>3'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
<tr>
<td>30-A</td>
<td>30&quot;</td>
<td>8'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
<tr>
<td>30-B</td>
<td>30&quot;</td>
<td>10'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
<tr>
<td>30-C</td>
<td>30&quot;</td>
<td>12'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
<tr>
<td>36-A</td>
<td>36&quot;</td>
<td>2'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
<tr>
<td>42-A</td>
<td>42&quot;</td>
<td>17'</td>
<td>#3 @ 12&quot; 6:#3</td>
</tr>
</tbody>
</table>

**ANCHOR BOLT & TEMPLATE SIZES**

<table>
<thead>
<tr>
<th>BOLT DIAMETER</th>
<th>BOLT LENGTH</th>
<th>TOP THREAD</th>
<th>BOTTOM THREAD</th>
<th>BOLT CIRCLE</th>
<th>R2</th>
<th>R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot;</td>
<td>3/4&quot;</td>
<td>1&quot;-6&quot;</td>
<td>3&quot;</td>
<td>-</td>
<td>123/4&quot;</td>
<td>7/8&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>13/8&quot;</td>
<td>2.3&quot;-9&quot;</td>
<td>6&quot;</td>
<td>2&quot;</td>
<td>17&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>30&quot;</td>
<td>13/4&quot;</td>
<td>2.3&quot;-9&quot;</td>
<td>6&quot;</td>
<td>2&quot;</td>
<td>17&quot;</td>
<td>10&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>2&quot;</td>
<td>4&quot;-9&quot;</td>
<td>8&quot;</td>
<td>2&quot;</td>
<td>21&quot;</td>
<td>123/8&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>23/8&quot;</td>
<td>4&quot;-9&quot;</td>
<td>8&quot;</td>
<td>2&quot;</td>
<td>23&quot;</td>
<td>153/8&quot;</td>
</tr>
</tbody>
</table>

*Minimum dimensions given, longer bolts are acceptable.

**CIRCULAR STEEL TEMPLATE**

**HEAVY HEX NUT (TYP.)**

**2 FLAT WASHERS & 1 LOCK WASHER PER ANCHOR BOLT**

**NUT ANCHOR (TYPE 2)**

**ANCHOR BOLT ASSEMBLY**
CONDUIT (SEE LAYOUT SHEETS FOR DIAMETER) ORIENT AS DIRECTED BY THE ENGINEER, 1 OR 2 REQUIRED

VERTICAL BARS (SEE DESIGN TABLE FOR SIZE & NUMBER)

BOND ANCHOR BOLTS TO REBAR CAGE. TWO LOCATIONS USING #3 BAR OR #6 COPPER JUMPER. MECHANICAL CONNECTORS SHALL BE UL LISTED FOR CONCRETE ENCASEMENT.

3000 PSI 5 SACK OR 3600 PSI 6 SACK CONCRETE

SPIRAL, 3 FLAT TURNS TOP & 1 FLAT TURN BOTTOM (SEE DESIGN TABLE FOR SIZE & PITCH)

VERTICAL BARS MAY REST ON BOTTOM OF DRILLED HOLE IF MATERIAL IS FIRM ENOUGH TO DO SO WHEN CONCRETE IS PLACED

CIRCULAR STEEL TEMPLATE (TEMPORARY)

18" MIN.

ANCHOR BOLT

CIRCULAR STEEL TEMPLATE

DRILLED SHAFT DIAM

TYP. PERMISSIBLE TEMPLATE SPIKE 60% MIN. PENETRATION

G T I E E L S T E E L TEMPLATE WITH HOLES 1/8" GREATER THAN BOLT DIAMETER

R1 MAY EQUAL R2 IF PLATE IS WELDED OF 3 OR MORE SEGMENTS

TOP VIEW
## Foundation Summary Table

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36-A 42-A</td>
</tr>
</tbody>
</table>

| Total Drilled Shaft Lengths |

### General Notes:


Reinforcing steel shall conform to Item 440.

Concrete shall be Class 3000 PSI 5 Sack or 3600 PSI 6 Sack.

Threads for anchor bolts and nuts shall be rolled or cut threads of Unified National Coarse Thread Series except for A193-B7 bolts which shall have 8 pitch thread series. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are 1” in diameter or less shall conform to ASTM A36. Anchor bolts larger than 1” in diameter shall conform to Special Specification A36M55 or ASTM A193-B7 or A687. Galvanize or coat with zinc-rich paint a minimum of the upper 14 inches of all anchor bolts unless otherwise noted. Nuts for anchor bolts shall conform to ASTM A536 Gr. A or better heavy hex. Exposed nuts shall be galvanized or coated with zinc-rich paint. Washers shall be galvanized. Templates and embedded nuts need not be galvanized.

### Installation Procedure:

Threads of anchor bolts shall be coated with pipe joint compound prior to installation of upper nuts when erecting pole. After pole is plumbed and in permanent alignment, the exposed threads of painted bolts shall be cleaned and an additional coating of zinc-rich paint applied to seal the bolt thread-nut joint.
## Foundation Selection Table for Standard Mast Arm Assembly

<table>
<thead>
<tr>
<th>MAX Single Arm Length</th>
<th>FDN 30-A</th>
<th>FDN 30-B</th>
<th>FDN 36-B</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>36'</td>
<td>48'</td>
<td></td>
</tr>
<tr>
<td>MAXIMUM DOUBLE ARM LENGTH COMBINATIONS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80 MPH DESIGN WIND SPEED</td>
<td>24' x 24'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28' x 28'</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>32' x 28'</td>
<td>32' x 32'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>36' x 36'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>40' x 36'</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>44' x 28'</td>
<td>44' x 36'</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAX Single Arm Length</td>
<td>24'</td>
<td></td>
<td>36'</td>
</tr>
<tr>
<td></td>
<td>28'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXIMUM DOUBLE ARM LENGTH COMBINATIONS</td>
<td>32' x 24'</td>
<td></td>
<td>32' x 32'</td>
</tr>
<tr>
<td>100 MPH DESIGN WIND SPEED</td>
<td></td>
<td></td>
<td>36' x 36'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40' x 36'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>44' x 36'</td>
</tr>
</tbody>
</table>

**Examples:**
1. For 80 MPH Design Wind Speed, Foundation 30-A can support up to a 32' arm with another arm up to 28'.
2. For 100 MPH Design Wind Speed, Foundation 30-B can support a single 35' mast arm.

---

![Typical Mast Arm Assembly](image1)

![Typical Strain Pole Assembly](image2)
(4) A BOLT (SIZE PER CHART) WITH (2) HEX NUTS, (2) PLAT WASHERS, & (1) LOCK WASHER (7" THR'd). AT TOP WITH 14" GAVY, BOTTOM THR'd, 2 1/4"

1/4" x 7/16" FOR 3E-13" POLES

3/16" x 5/16" FOR 7E-10" & 12"

TOP PLATE TO BE REMOVED AFTER BOLTS ARE SET

1/4" THICK STEEL TEMPATES

BOLT CIRCLE

ADJUSTMENT RANGE (PER CHART)
VENT HOLE IN POLE FOR GALV. DRAIN

11GA. COVER WITH 1/16"
THICK GASKET ATTACHED
WITH 1/4" X 1" S.S.
SOCKET BUTTON HD. SCRS

1/2”-13 NUT FOR
GRD CONNECTION ON
HANDHOLE FRAME

7 GA. TERMINAL
COMPARTMENT FRAME
CONT. WELD TO POLE

PROMISE FOR
ATTACHMENT AND
TERMINAL BLOCK BY
OTHERS

4" X 6 1/2" H.H. FRAME
(LESS COVER)

(2) 1/4" TAPPED LUGS
WELDED TO FRAME

3/16" X 5/16"

85% MIN.
PENETRATION

1"/4"
NOMINAL ARM LENGTH – L

NOTE: THE ARM SHALL BE FABRICATED STRAIGHT WITH THE UNLOADED RISE MEASURED AS SHOWN

<table>
<thead>
<tr>
<th>ARM LENGTH</th>
<th>ROUND POLES</th>
<th>Dp</th>
<th>Dp</th>
<th>Dn</th>
<th># THK</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft.</td>
<td>in.</td>
<td>in.</td>
<td>in.</td>
<td>in.</td>
<td></td>
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<tr>
<td>20</td>
<td>10.0</td>
<td>7.5</td>
<td>5.0</td>
<td>3.0</td>
<td>79</td>
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<tr>
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<td>11.0</td>
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<td>6.8</td>
<td>3.0</td>
<td>79</td>
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<tr>
<td>28</td>
<td>11.5</td>
<td>9.0</td>
<td>7.3</td>
<td>3.0</td>
<td>79</td>
</tr>
<tr>
<td>32</td>
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<td>9.5</td>
<td>7.6</td>
<td>3.0</td>
<td>79</td>
</tr>
<tr>
<td>36</td>
<td>12.5</td>
<td>10.0</td>
<td>6.3</td>
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<td>40</td>
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<td>2.69</td>
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<tr>
<td>44</td>
<td>12.5</td>
<td>10.0</td>
<td>8.3</td>
<td>2.69</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>13.0</td>
<td>10.5</td>
<td>8.8</td>
<td>2.69</td>
<td></td>
</tr>
</tbody>
</table>

VIBRATION WARNING:

MAST ARMS OF APPROXIMATELY 40 FT OR LONGER ARE SUBJECT TO POSSIBLE HARMONIC VERTICAL VIBRATIONS IN LIGHT WIND CONDITIONS DUE TO UNUSUAL COMBINATIONS OF SIGNAL NUMBERS, WEIGHTS OR POSITIONS, ARM-WIND ORIENTATION, AND ARM-POLE STIFFNESS. ARMS SHALL BE VISUALLY INSPECTED IN 5 TO 20 MPH WIND CONDITIONS AFTER SIGNAL HEAD INSTALLATION AND, IF VERTICAL MOVEMENTS WITH A TOTAL EXCURSION (MAX. POSITIVE TO MAX. NEGATIVE) OF MORE THAN APPROXIMATELY 8 IN. ARE OBSERVED AT ARM TOP, DAMPING DEVICES OR OTHER MEANS SHALL BE FITTED TO THE ARM(S). THE NECESSARY DAMPING DEVICE(S) OR OTHER REMEDIAL MEASURES SHALL BE AS RECOMMENDED BY THE FABRICATOR. EXCESSIVE VIBRATIONS SHALL NOT BE ALLOWED TO CONTINUE FOR MORE THAN TWO DAYS.

GENERAL NOTES FOR SIGNAL HEADS:

1. ALL HEADS RIGIDLY MOUNTED, LEVEL, AND PLUMB.
2. ALL SIGNAL HEADS, APPROPRIATE MOUNTING HARDWARE, REQUIRED CLAMPS, AND/OR STAINLESS STEEL STRAPPING ARE TO BE FURNISHED BY CITY.
3. VEHICLE HEADS ARE TO BE EQUIPPED WITH STANDARD TUNNEL VISORS AND 5-INCH BACKPLATES.
4. ALL SIGNAL HEADS SHALL BE YELLOW.
5. BACKPLATES SHALL BE FLAT BLACK.
6. SIGNAL HEADS SHALL BE LOCATED OVER CENTER OF LANE UNLESS OTHERWISE CHANGED BY THE ENGINEER OR HIS DUTY AUTHORIZED REPRESENTATIVE.
TABLE OF DIMENSIONS "L"

<table>
<thead>
<tr>
<th>ARM LENGTH</th>
<th>24&quot; 28&quot; 32&quot; 36&quot; 40&quot; 44&quot; 48&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM TYPE II</td>
<td>10' 11' 12' 13' 16' 17' 18'</td>
</tr>
<tr>
<td>ARM TYPE III</td>
<td>10' 11' 12' 12' 12' 12' 12'</td>
</tr>
</tbody>
</table>

GENERAL NOTES:


Poles are designed to support an 8-foot luminaire arm and 1 traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 75 lbs. Vertical dead load plus the horizontal wind load on an effective projected area of 1.5 sq. ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs. Vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq. ft. (Actual area times drag coefficient).

See TxDOT Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "LM-A" for luminaire arm and connection details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with the specifications and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the fabricator must obtain prior to fabrication. Miscellaneous welds which do not call for preapproved weld procedures are nevertheless subject to rejection for poor workmanship. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and the specifications.

Unless otherwise noted, all parts shall be galvanized in accordance with the specifications.

Special designs require submission of shop drawings in accordance with the item "Steel Structures".
SLIP JOINT DETAILS

NOTE: A SLIP JOINT IS PERMISSIBLE FOR ARMS 40° AND GREATER IN LENGTH. THE SLIP JOINT SHALL BE MADE IN THE SHOP, BUT MAY BE MATCH MARKED AND SHIPPED DISASSEMBLED.

4 - \frac{3}{4}" HOLES AND 1-\frac{3}{8}" GALV. A307 BOLT. TACK WELD NUT TO THREAD PROJECTION AFTER MAKING JOINT. REPAIR DAMAGED GALVANIZING IN ACCORDANCE WITH THE SPECIFICATIONS.

COUPLING DETAILS

0.179" THICKNESS IS PERMISSIBLE FOR TIP SECTION.

MIN. LAP EQUALS 1.5 TIMES FEMALE I.D.

6'-0" (MIN.) TO 11'-0" (MAX.)
STAINLESS STEEL BANDS AND CAST BRACKET AS IN "ASTRO-BRAC" WITH 1½" Ø THREADED COUPLING.

PELCO ASTRO-BRAC
AB-3004 CLAMP KIT
AB-4000 ARM KIT
AB-2003 46" OR 74" SUPPORT TUBE
SIGNAL HEADS FOR SPAN WIRE

SH 3H
TYPICAL SPAN WIRE HORIZONTAL MOUNT INSTALLATION

SH 4H
TYPICAL SPAN WIRE HORIZONTAL MOUNT INSTALLATION

SH 5H
TYPICAL SPAN WIRE HORIZONTAL MOUNT INSTALLATION

BOTTOM TETHERED, SPAN WIRE SIGNAL HARDWARE ASSEMBLY
(BACK PANEL NOT SHOWN)
"EGGCRATE" VISOR PEDESTRIAN SIGNAL
WITH ON PIECE REFLECTOR

SIGN R10-4bR
SIGN R10-4bL
9" X 12"

PEDESTRIAN PUSH BUTTON SIGN DETAILS

SIGNAL HEADS FOR SPAN WIRE
FIXED MOUNT TRAFFIC SIGNAL ARM

TABLE OF DIMENSIONS "A"

<table>
<thead>
<tr>
<th>ARM LENGTH</th>
<th>24&quot;</th>
<th>28&quot;</th>
<th>30&quot;</th>
<th>32&quot;</th>
<th>40&quot;</th>
<th>50&quot;</th>
<th>60&quot;</th>
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<td>ARM TYPE II</td>
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<tr>
<td>ARM TYPE III</td>
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<td>12&quot;</td>
<td>12&quot;</td>
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</tr>
</tbody>
</table>

FOUNDATION
SEE DETAIL T07
VIBRATION WARNING

MAST ARMS OF APPROXIMATELY 40'-0" OR LONGER ARE SUBJECT TO POSSIBLE HARMONIC VERTICAL VIBRATIONS IN LIGHT WIND CONDITIONS DUE TO UNUSUAL COMBINATIONS OF SIGNAL NUMBERS, WEIGHTS OR POSITIONS, ARM-WIND ORIENTATION, AND ARMS-POLE STIFFNESS.

ARMS SHALL BE VISUALLY INSPECTED IN 5 TO 20 MPH WIND CONDITIONS AFTER SIGNAL HEAD INSTALLATION AND, IF VERTICAL MOVEMENTS WITH A TOTAL EXCURSION (MAX. POSITIVE TO MAX. NEGATIVE) OF MORE THAN APPROXIMATELY 8" ARE OBSERVED AT ARM TIP, DAMPING DEVICES OR OTHER MEANS SHALL BE FITTED TO THE ARM(S).

THE NECESSARY DAMPING DEVICE(S) OR OTHER REMEDIAL MEASURES SHALL BE AS RECOMMENDED BY THE FABRICATOR. EXCESSIVE VIBRATIONS SHALL NOT BE ALLOWED TO CONTINUE FOR MORE THAN TWO DAYS.

IF DAMPING PLATE IS USED, THE SIZE SHALL BE 16" X 66". THE PLATE MUST BE INSTALLED DIRECTLY ABOVE TRAFFIC LIGHT LOCATED NEAREST THE FREE END.

GENERAL NOTES:

DESIGN CONFORMS TO 1994 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS AND INTERIM SPECIFICATIONS THEREOF. DESIGN WIND SPEED CAN BE EITHER 100 MPH OR 80 MPH PLUS A 1.3 GUST FACTOR. IF CLAMP-ON TRAFFIC SIGNAL IS REQUIRED DESIGNS ARE BASED ON AN ARM INCLUDED ANGLE OF 90 DEGREES OR MORE, ANGLES OF LESS THAN APPROXIMATELY 75 DEGREES WILL REQUIRE A SPECIAL DESIGN. POLES ARE DESIGNED TO SUPPORT ONE 8'-0" LUMINAIRE ARM, TWO 9'-0" INTERNALLY LIGHTED STREET NAME SIGNS, AND TWO TRAFFIC SIGNAL ARMS WITH LIMITED LENGTH COMBINATIONS.

THE SPECIFIED LUMINAIRE LOAD APPLIED AT THE END OF LUMINAIRE ARM EQUALS 75 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 1.5 SQ. FT. THE SPECIFIED INTERNALLY LIGHTED STREET NAME SIGN APPLIED 4'-6" FROM THE CENTERLINE OF THE POLE EQUALS 85 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON EFFECTIVE PROJECTED AREA OF 11.5 SQ. FT. FOR 50 FT. TO 65 FT. FIXED-MOUNT MAST ARM THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARM EQUALS 310 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 52.0 SQ. FT. (ACTUAL AREA TIMES DRAG COEFFICIENT). FOR CLAMP-ON MAST ARM, THE SPECIFIED SIGNAL LOAD APPLIED AT THE END OF THE TRAFFIC SIGNAL ARMS EQUAL 180 LBS. VERTICAL DEAD LOAD PLUS THE HORIZONTAL WIND LOAD ON AN EFFECTIVE PROJECTED AREA OF 32.4 SQ. FT. (ACTUAL AREA TIMES DRAG COEFFICIENT).

EXCEPT AS NOTED IN SHEETS 1 THRU 3 OF 3, ALSO REFER TO STANDARD SHEET "MA-D" FOR POLE DETAILS, "LUM-A" FOR LUMINAIRE ARM AND CONNECTION DETAILS, "SNS" FOR INTERNALLY LIGHTED STREET NAME SIGN DETAIL, AND "TS-FD" FOR ANCHOR BOLT AND FOUNDATION DETAILS.

FABRICATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND WITH THE DETAILS, DIMENSIONS, AND WELD PROCEDURES SHOWN HEREIN. WELD REFERENCES CALL FOR PRE-APPROVED WELD PROCEDURES WHICH THE FABRICATOR MUST OBTAIN PRIOR TO FABRICATION. MISCELLANEOUS WELDS WHICH DO NOT CALL FOR PRE-APPROVED WELD PROCEDURES ARE NEVERTHELESS SUBJECT TO REJECTION FOR POOR WORKMANSHIP. MATERIAL, FABRICATION TOLERANCES, AND SHIPPING PRACTICES SHALL MEET THE REQUIREMENTS OF THIS SHEET AND THE SPECIFICATIONS.

UNLESS OTHERWISE NOTED, ALL PARTS SHALL BE GALVANIZED IN ACCORDANCE WITH THE SPECIFICATIONS.

SPECIAL DESIGNS REQUIRE SUBMISSION OF SHOP DRAWINGS IN ACCORDANCE WITH THE ITEM "STEEL STRUCTURES."

DESIGN ALSO CONFORMS TO NCHRP REPORT 412 FOR FATIGUE RESISTANCE EXCEPT THAT THERE ARE NO STIFFENERS AT THE BASE PLATE. TxDOT IS CONDUCTING TESTS TO DETERMINE IF STIFFENERS AT THE BASE PLATE WILL OR WILL NOT RESULT IN OPTIMAL PERFORMANCE, DEPENDING UPON THE RESULTS OF THE TESTS, POLES MAY NEED A RETROFIT TO ENSURE OPTIMAL FATIGUE PERFORMANCE.
MEDIUM EXTRUSION HPN053

127mm ALUMINUM COUPLING
6061-T6

NOTE: ALUMINUM RIVETS SHALL BE USED TO ATTACH THE SIGN TO THE EXTRUDED ALUMINUM.
SPACING OF RIVETS SHALL BE 152mm O.C.

HANGER ASSEMBLY DETAILS

NOTES:
1. FOR SIGNS LESS THAN 1.5m, ONE VERTICAL SUPPORT IS REQUIRED PER SIGN. THIS VERTICAL SUPPORTS SHALL BE USED FOR SIGNS LONGER THAN 1.5m
2. FOR STREET NAME SIGNS, EXTRUDED ALUMINUM SHALL BE MOUNTED FOR HORIZONTAL SUPPORT AS SHOWN.
LEFT TURN YIELD ON GREEN

PROTECTED LEFT ON GREEN ARROW

R10-12

SR10-9

SPAN WIRE CLAMP

914mm EXTENDER

EXTENDER

HANGER ASSEMBLY w/ 25mm BOLTS

SPAN WIRE CLAMP
<table>
<thead>
<tr>
<th>ARM SIZE</th>
<th>A</th>
<th>F</th>
<th>CONN. BOLTS</th>
<th>PIN BOLTS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>DIA</td>
<td>t</td>
<td>No.</td>
<td>Dia.</td>
</tr>
<tr>
<td></td>
<td>in.</td>
<td>in.</td>
<td>ea.</td>
<td>in.</td>
</tr>
<tr>
<td>6.5</td>
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<td>4</td>
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<tr>
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<td>4</td>
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<tr>
<td>10.0</td>
<td>.239</td>
<td>18</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

* 1" # CONNECTION BOLTS ARE PERMISSIBLE

**CLAMP-ON DETAIL 1**

- MC-2
- \(\frac{1}{8}"\) DRAINAGE HOLE
- \(1\frac{1}{4}"\) WIRE OUTLET HOLE
- \(\frac{1}{8}"\) ARM
- \(\frac{3}{4}"\) PIPE
- \(\frac{3}{8}"\) MAY BE BENT INSTEAD OF WELDED
- MIN. 85% PENETRATION
- BASE O.D.
- CONNECTION BOLT WITH HEX NUT, 2 FLAT WASHERS & 2 LOCK WASHERS

Plano
ENGINEERING
STANDARD DETAILS

TRAFFIC DETAILS

T31
10/1/15
<table>
<thead>
<tr>
<th>ARM SIZE</th>
<th>A</th>
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<th>CONN. BOLTS</th>
<th>PIN BOLTS</th>
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<tr>
<td>10</td>
<td>.259</td>
<td>18</td>
<td>12</td>
<td>6</td>
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</tbody>
</table>

CLAMP-ON DETAIL 3

ENGINEERING
STANDARD DETAILS

Plano

TRAFFIC DETAILS

T33

10/1/15
MATERIALS

| ROUND SHAFTS OR POLYGONAL SHAFTS | ASTM A595 GRA, ASTM A570 GR50, ASTM A607 GR50, ASTM A572 GR50, OR A36M50.
| PLATES (1) | ASTM A36 OR A572 GR50 OR A595 (2) OR A36M50
| CONNECTION BOLTS | ASTM A325 EXCEPT WHERE NOTED
| PIN BOLTS | ASTM A325
| PIPE | ASTM A53 OR A OR B, OR A501
| MISC. HARDWARE | GALVANIZED STEEL OR STAINLESS STEEL OR AS NOTED

1. ANY OF THE MATERIALS LISTED FOR PLATES MAY BE USED WHERE THE DRAWINGS DO NOT SPECIFY A PARTICULAR GRADE DESIGNATION.

2. IF A595 MATERIAL IS USED, IT NEEDS NOT BE COLD WORKED TO A595 REQUIREMENTS, BUT MATERIALS MUST HAVE 40 KSI MINIMUM YIELD PRIOR TO FABRICATION.

GENERAL NOTES:

CLAMP-ON DETAILS ARE USED FOR THE SECOND ARM ON DUAL MAST ARM ASSEMBLIES. A MAXIMUM 1-1/2" WIDE VERTICAL SLOTTED HOLE MAY BE CUT IN THE FRONT CLAMP PLATE TO FACILITATE DRAINAGE DURING GALVANIZING. THE SLOT SHALL BE CENTERED BEHIND THE ARM AND SHALL BE NO LONGER THAN THE ARM DIAMETER MINUS 1".

FIXED MOUNT DETAILS ARE USED FOR SINGLE MAST ARM ASSEMBLIES AND FOR THE FIRST ARM ON DUAL MAST ARM ASSEMBLIES.

WHERE DUPLICATE PARTS OCCUR ON A DETAIL, WELDS SHOWN FOR ONE PART SHALL APPLY TO ALL SIMILAR PARTS ON THE DETAIL.

PIN BOLTS ARE REQUIRED TO PREVENT ROTATION OF CLAMP-ON ARMS UNDER DESIGN WIND FORCES.

NOTE:

PIN BOLTS SHALL BE A325 WITH THREADS EXCLUDED FROM THE SHEAR PLANE. PIN BOLT AND 3/4" DIA. PIPE SHALL HAVE 3/16" DIA. HOLES FOR A 1/8" DIA. GALVANIZED COTTER PIN. BACK CLAMP PLATE SHALL BE FURNISHED WITH A 3/4" DIA. HOLE FOR EACH PIN BOLT. AN 11/16" DIA. HOLE FOR EACH PIN BOLT SHALL BE FIELD DRILLED THROUGH THE POLE AFTER ARM ORIENTATIONS HAVE BEEN APPROVED BY THE ENGINEER.
GENERAL NOTES: (TELSPAR DETAIL NOTES)

1. 11.5' SIGN POST 1-3/4" SQUARE, 12 GAUGE, (.105 THICK) WT/FT 2.060 LBS. GALVANIZED PERFORATION 7/16" DIAMETER ON 1" CENTER ON ALL FOUR SIDES OF TUBING. TOLERANCE ON HOLE SIZE IS 1/64TH. TOLERANCE ON HOLES SPACING 1/64TH, IN 11'.

2. 3' ANCHOR POST 2" SQUARE 12 GAUGE (.105 THICK) WT/FT 2.416 LBS. GALVANIZED PERFORATION 7/16" DIAMETER ON 1" CENTER ON ALL SIDES OF TUBING TOLERANCE ON HOLE SIZE IS 1/64TH. TOLERANCE ON HOLES SPACING 1/64TH, IN 3'.

3. 3/8" DIAMETER LARGE HEAD DRIVE RIVETS (THEFT PROOF) CADMIUM PLATED.
4" SQUARE YELLOW RAISED PAVEMENT MARKER (TYP.)

DIRECTION OF TRAVEL

4" SQUARE WHITE RAISED PAVEMENT MARKER (TYP.)

DIRECTION OF TRAVEL

CURB

20'-0"

12"

45° TYP.

4"

YELLOW

WHITE

TYPICAL LAYOUT
DIAGONAL CROSSHATCHES

1/14/16

T39
STANDARD WHITE CROSSWALK MARKINGS

NOTE: REFER TO T43 FOR LAYOUT

CROSSWALK YIELD MARKINGS

4" MIN.

WHITE PAVEMENT MARKINGS

a = 12" MIN. = 24" MAX;
b = 18" MIN. = 36" MAX;
c = 3" MIN. = 12" MAX;
RATIO: b:a=1.5

CROSSWALK MARKINGS

WHITE OR YELLOW STRIPE

DASH LINE ("PUPPY TRACK") MARKINGS

2' 6' 2' 6' 2'

PAVEMENT MARKINGS
TYPICAL LAYOUT
TYPE D THOROUGHFARE
STOP LINE WITH CROSSWALK

TYPICAL LAYOUT
TYPE F&G THOROUGHFARE
CROSSWALK WITH STOP LINE

TYPICAL LAYOUT
TYPE F&G THOROUGHFARE
STOP LINE WITHOUT CROSSWALK
TYPICAL CROSSWALK MARKINGS

MAX BLOCK WIDTH=2'0"
MAX SPACING=6'-0"

TYPICAL LAYOUT
CROSSWALK MARKINGS

CURB LINE

4' MIN.

STANDARD WHITE
YIELD LINE

DIRECTION OF TRAVEL

TYPICAL LAYOUT
CHANNELIZING ISLAND
YIELD LINE WITH CROSSWALK
NOTES:
UNLESS OTHERWISE NOTED, THE FOLLOWING BUTTON TYPES SHALL BE USED:

- ● = 4" ROUND YELLOW CERAMIC NON-REFLECTIVE BUTTON
- ■ = 4" SQUARE YELLOW/YELLOW ACRYLIC REFLECTIVE BUTTON
- ○ = 4" ROUND WHITE CERAMIC NON-REFLECTIVE BUTTON
- □ = 4" SQUARE CLEAR/RED ACRYLIC REFLECTIVE BUTTON

TYPICAL TRAFFIC MARKINGS

BROKEN WHITE LANE LINE
- 10' 30'
- 2.5 2.5 2.5 2.5 15'

BROKEN YELLOW LANE LINE
- 10' 30'
- 2.5 2.5 2.5 2.5 15'

SINGLE WHITE LINE
- 5' 5' 5' 5' 5' 5' 5'

SINGLE YELLOW LINE
- 5' 5' 5' 5' 5' 5' 5'

TURN LANE LINE/WIDE WHITE LINE
- (NO SPACE BETWEEN ADJACENT BUTTONS)

WIDE YELLOW LINE
- (NO SPACE BETWEEN ADJACENT BUTTONS)

DOUBLE WHITE LINE
- (4" SPACE BETWEEN ADJACENT BUTTONS)

DOUBLE YELLOW CENTERLINE
- (4" SPACE BETWEEN ADJACENT BUTTONS)
TYPICAL LEFT LANE CLOSURE

TYPICAL CENTER LANE CLOSURE

TYPICAL RIGHT LANE CLOSURE

(SEE TABLE II FOR SS DISTANCES)
TABLE I

MERGING TAPER LENGTHS

<table>
<thead>
<tr>
<th>SPEED (S)</th>
<th>MINIMUM DESIRABLE TAPER LENGTH (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFFSET WIDTH -&gt;</td>
<td>11'</td>
</tr>
<tr>
<td>30'</td>
<td>165'</td>
</tr>
<tr>
<td>35'</td>
<td>225'</td>
</tr>
<tr>
<td>40'</td>
<td>285'</td>
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<tr>
<td>45'</td>
<td>405'</td>
</tr>
<tr>
<td>50'</td>
<td>550'</td>
</tr>
<tr>
<td>55'</td>
<td>605'</td>
</tr>
</tbody>
</table>

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH

NOTE: TAPER LENGTHS HAVE BEEN ROUNDED TO MULTIPLES OF 5 FEET

TABLE II

ADVANCED WARNING SIGN SPACING

<table>
<thead>
<tr>
<th>POSTED SPEED</th>
<th>MINIMUM SIGN SPACING IN FEET (SS)</th>
</tr>
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<tbody>
<tr>
<td>30'</td>
<td>120'</td>
</tr>
<tr>
<td>35'</td>
<td>160'</td>
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<td>40'</td>
<td>240'</td>
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<tr>
<td>45'</td>
<td>320'</td>
</tr>
<tr>
<td>50'</td>
<td>400'</td>
</tr>
<tr>
<td>55'</td>
<td>500'</td>
</tr>
</tbody>
</table>

L = TAPER LENGTH IN FEET
W = WIDTH OF OFFSET IN FEET
S = POSTED SPEED LIMIT, OR OFF PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED IN MPH

NOTE: TAPER LENGTHS HAVE BEEN ROUNDED TO MULTIPLES OF 5 FEET

TABLE III

SPACING OF DEVICES

<table>
<thead>
<tr>
<th>POSTED SPEED</th>
<th>MAXIMUM DEVICE SPACING ON A TAPER (DS1)</th>
<th>ON A TANGENT* (DS2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30'</td>
<td>30'</td>
<td>60'</td>
</tr>
<tr>
<td>35'</td>
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<td>70'</td>
</tr>
<tr>
<td>40'</td>
<td>40'</td>
<td>80'</td>
</tr>
<tr>
<td>45'</td>
<td>45'</td>
<td>90'</td>
</tr>
<tr>
<td>50'</td>
<td>50'</td>
<td>100'</td>
</tr>
<tr>
<td>55'</td>
<td>55'</td>
<td>110'</td>
</tr>
</tbody>
</table>

*FOR TANGENT LENGTHS LESS THAN 250’, USE THE SPACING FOR DEVICES ON A TAPER.

NOTE: THE VALUES IN THE ABOVE TABLES ARE BASED ON GUIDANCE INFORMATION FROM THE MUTCD AND SHOULD BE USED WHEN CONDITIONS PERMIT. HOWEVER WHEN CONSTRAINED BY PHYSICAL LIMITATIONS, OTHER VALUES MAY BE USED.

CONSTRUCTION SEQUENCE NOTES:

PHASE 1

1. INSTALL ALL CONSTRUCTION WARNING SIGNS AND CHANNELIZING DEVICES ACCORDING TO DIAGRAMS IN PREVIOUS SHEET.
2. CONSTRUCT THE SOUTHERN HALF OF PLANO PKWY, AS WELL AS THE EASTERN HALF OF LOS RIOS BLVD WHILE TRAFFIC IS MAINTAINED TO A MINIMUM OF TWO LANES OF TRAFFIC IN ALL DIRECTIONS.
3. CONSTRUCT THE SOUTH MEDIAN ON LOS RIOS BLVD WHILE TRAFFIC IS MAINTAINED TO A MINIMUM OF TWO LANES OF TRAFFIC IN ALL DIRECTIONS

PHASE 2

1. INSTALL ALL CONSTRUCTION WARNING SIGNS AND CHANNELIZING DEVICES ACCORDING TO DIAGRAMS ON PREVIOUS SHEET.
2. CONSTRUCT BOTH THE EAST AND WEST MEDIANS ON PLANO PKWY WHILE TRAFFIC IS MAINTAINED TO A MINIMUM OF TWO LANES OF TRAFFIC IN ALL DIRECTIONS.
3. CONSTRUCT THE NORTHERN HALF OF PLANO PKWY, AS WELL AS THE WESTERN HALF OF LOS RIOS BLVD WHILE TRAFFIC IS MAINTAINED TO A MINIMUM OF TWO LANES OF TRAFFIC IN ALL DIRECTIONS.

TRAFFIC CONTROL GENERAL NOTES:

CONTRACTOR SHALL ONLY WORK DURING THE TIMES APPROVED BY THE CITY OF PLANO POLICY. ANY VARIANCE MUST BE APPROVED BY THE CITY OF PLANO ENGINEERING DEPARTMENT. NORMAL LANE CLOSURES FOR WORKING HOURS ARE FROM 9:00 A.M. TO 4:00 P.M.
THIN WALL BRICK SCREENING WALL -
GRADE BEAM OPTION

CITY OF PLANO, TEXAS
DEPARTMENT OF ENGINEERING
STANDARD CONSTRUCTION DETAILS
KING COLUMNS
INTERMEDIATE COLUMNS

SECTION - TYPICAL
BRICK MORTAR JOINT

CAST STONE CAP DETAILS
SCALE = 1" = 1'-0"
1. PRIOR TO THE BEGINNING OF DEMOLITION WORK, VERIFY ALL UTILITIES WITHIN THE AREA OF DEMOLITION HAVE BEEN LOCATED, LAYOUT, ELEVATION, PIER TYPE/LOCATION INFORMATION AND MASONRY REQUIREMENTS AND THE CITY SHALL BE PROVIDED WITH ONE COPY SUBMITTED FOR REVIEW AND APPROVAL.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER DISPOSAL OF DEBRIS RESULTING FROM DEMOLITION AND EXCAVATION. ALL DEBRIS SHALL BE LIMITED TO THE FOLLOWING:
   a. DEBRIS FROM THE EXCAVATION
   b. DEBRIS FROM THE DEMOLITION
   c. DEBRIS FROM THE EXCAVATION AND DEMOLITION

5. VERTICAL REINFORCING STEEL FOR COLUMNS SHALL CONFORM TO ASTM A615, GRADE 60, INCLUDING SUPPLEMENTARY REQUIREMENTS. THE DESIGN AND DETAIL OF CAST STONE UNIT REINFORCEMENT SHALL BE IN ACCORDANCE WITH ASTM C1194.

6. THE Contractors shall supply brick specimens for compressive strength test in accordance with ASTM C270 or C297, and for reflective cracking test in accordance with ASTM C173 or C231.

7. CONDUCT AIR CONTENT TEST, ASTM C173 OR ASTM C231

8. CONDUCT MORTAR COMPRESSIVE STRENGTH TEST, ASTM C270

9. MAINTAIN AN ACCURATE BORING LOG OF THE OVERALL DEPTH, BEARING, BOUNDARY LINES, AND SITES OF PLANT AND CONSTRUCTION LINE FOR THE CONTRACTOR'S USE.

10. ALL BRICK MASONRY UNITS SHALL BE LAID PLUMB AND TRUE IN FULL HEAD AND BED MORTAR JOINTS. THE ENDS OF BRICK UNITS SHALL BE BUTTERED WITH SUITABLE MATERIALS TO SUPPORT THE WEIGHT OF THE UNIT AND TO SUPPRESS VOID FORMATION. THE ALTERNATE DESIGN SHALL BE PERFORMED BY A LICENSED (TEXAS) STRUCTURAL ENGINEER.

11. ALL WORK SHALL BE DONE IN CONFORMANCE WITH THE LOCAL GOVERNING BUILDING CODE AND OSHA REGULATIONS.

12. DESIGN WIND PRESSURE (PER CODE) ...................................17.3 PSF
   VELOCITY PRESSURE, gh ..........................................................15 PSF
   GUST EFFECT FACTOR, G .........................................................0.85
   WIND VELOCITY (3sec. GUST) ...................................................90 MPH

13. CLEAN MASONRY OF EXCESS MORTAR BY FREQUENTLY BRUSHING SURFACE SIDE OF A THOROUGHFARE FOR THE ENTIRE LENGTH BETWEEN INTERSECTION POINTS. USE A SUITABLE FRP OR METAL REINFORCEMENT, AND ARE READILY AVAILABLE TO THE PLANO AREA. USED BROKEN WILL NOT BE ALLOWED. ACCEPTABLE MANUFACTURERS INCLUDE:

14. ABANDON ANY METHOD OF CLEANING MASONRY SHOWING DETRIMENTAL EFFECTS ON THE MASONRY OR VISIBLE CORROSION IS CAUSE FOR REJECTION OF REINFORCEMENT.

15. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO THE "MANUAL OF REINFORCED CONCRETE DESIGN AND PRACTICE" (ACI 318). ALL WORKSHEET MECHANICAL DEVICES MADE OF MASONRY SHALL CONFORM TO "ASSTD. CODE" (ACI 318). MASONRY CONCRETE IS DEFINED TO BE 3,000 PSI OR MORE.

16. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO "ASSTD. CODE" (ACI 318). MASONRY CONCRETE IS DEFINED TO BE 3,000 PSI OR MORE.

17. NO MURIATIC ACID SOLUTIONS WILL BE PERMITTED FOR CLEANING ANY BRICK WORK UNLESS APPROVED IN WRITING BY THE CITY OF PLANO.

18. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO "ASSTD. CODE" (ACI 318). MASONRY CONCRETE IS DEFINED TO BE 3,000 PSI OR MORE.

19. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO "ASSTD. CODE" (ACI 318). MASONRY CONCRETE IS DEFINED TO BE 3,000 PSI OR MORE.

20. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING STEEL SHALL CONFORM TO "ASSTD. CODE" (ACI 318). MASONRY CONCRETE IS DEFINED TO BE 3,000 PSI OR MORE.
**General Notes:**
1. The detail shown is the minimum length of need (LOD) for a DAT connected to a concrete rail.
2. The rail section at the end post is supported by the shelf angle bracket. The rail element is not attached to the end post.
3. The foundation tube shall not project more than 3½ above the finished grade.
4. All hardware for DAT shall be ASTM A307 unless otherwise specified.
5. Refer to GF(311) sheet for terminal connection details.

**Non-Strip Installation:**
A non-strip system requires the DAT to be installed separately. A 2½" round steel tube is used around the steel foundation tube and the two channel brackets may be omitted. This will require a full pour at the foundation tubes.

**DAT Parts List:**
- Steel Foundation Tube: 1
- DAT Terminal Post: 1
- Channel Bracket: 2
- Terminal Rail Element: 1
- Shelf Angle Bracket: 1
- BCT Bearing Plate: 1
- BCT Post: 1
- Guardrail Anchor Bracket: 1
- Round Welded Beam End Section: 1
- BCT Cable Anchor: 1
- Rebar, Guardrail: 20
- 3½" Galvanized Nut Bolt: 4
- 3½" Shoulder Bolt: 1
- 5/8" x 2½" Max. Shoulder Bolt: 4
- 5/8" x 10" Max. Shoulder Bolt: 1
- 5½" Tie Wrench: 1

**Metal Beam Guard Fence (Downstream Anchor Terminal) GF(31)DAT-14**

**Steel Foundation Tube:**
- OD: 2½" Wall: 1½"
- 3½" Welded Beam End Section

**DAT Terminal Post:**
- 3½" x 3½" x 4½"

**Steel Beam:**
- 9" x 3½" x 4½"

**Shelf Angle Bracket:**
- 9½" x 5½" x 4½"

**End Plate:**
- 6" x 6" x 6"

**Guardrail Anchor Bracket:**
- 3½" x 3½" x 6½"

**BCT Post End Section:**
- 2½" x 5½"

**BCT Cable Anchor:**
- 3½" x 3½"

**Overview Diagram:**
- Plan View
- Elevation View
- Section View
1. The type of line post used on pole, rectangular wood post, or steel post will be as shown in the plans, the exact position of the transitions shall be as shown in the plans. Steel posts to be galvanized in accordance with Item 443, "Galvanizing."  

2. Roll element shall meet all requirements of Item 549, "Metal Beam Guard Fences" except as modified on the plans. The Contractor may furnish roll elements of 12 1/8 or 25 feet nominal length.  

3. Roll post holes are offset 2 1/2" from standard guardrail to accommodate the in-drawn building.  

4. Button head post bolts (AISI A325) shall be of sufficient length to extend through the full thickness of the rail (AISI A352) and no more than 1/8" beyond it. Button head splice bolts (AISI A325) are 5/8" x 1 1/2" with a 5/8" double recessed nut (AISI A352). Galvanized fittings bolts, nuts, and washers shall be in accordance with Item, "Metal for Structural." Fittings shall be subsidiary to the old item requiring construction of transition.  

5. Where solid rock is encountered or where shown on the plans, the diameter of the holes shall be approximately 12 inches, the postfilling shall be with a compressible material, and embedment depth shall be 1" - 6" or more as directed by the Engineer.  

6. Holes shall not be let in concrete, of any depth.  

7. Refer to Item 311 Standard Sheet for additional details.

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**METAL BEAM GUARD FENCE**  
**Long Span (GF 311 LS-14)**
**GENERAL NOTES**

1. The type of post (round wood, rectangular wood, or steel post) shall be shown in the plans. The blank space for the transition shall be as shown in the plans or directed by the Engineer.

2. Nails shall meet the requirements of the Metal Beam Guard Fence, except as modified in the plans.

3. Button head bolts (A574, A490) shall be of sufficient length to provide through the full thickness of the post and to accept the full thickness of the post. Fittings shall be in accordance with AASHTO (A531). All fittings shall be galvanized in accordance with AASHTO (A531). All fittings shall be in accordance with AASHTO (A531). All fittings shall be in accordance with AASHTO (A531).

4. Bolt, nuts, and washers shall be galvanized in accordance with AASHTO (A531). All fittings shall be in accordance with AASHTO (A531).

5. Crown will be abandoned to accommodate transitions.

6. If solid wood is encountered, see the (A531) standard sheet for the proper installation guidance.

7. Posts shall not be set in concrete, if any depth.

8. Unless otherwise shown in the plans, a composite material post and/or base that meets the requirements of the Metal Beam Guard Fence, Composite Material Posts, and/or Blocks of similar dimensions. The Construction Division (AASHTO) is responsible for providing the material for the composite material post and/or block transition.

9. Refer to (A531) standard sheet for additional details.

**TERMINAL CONNECTION NOTE**

To ensure a positive connection, (12) HDG. 5/16" x 1 1/2" washers, with a 2 1/2" G.D. (Grade D) screw shall be of sufficient length to provide through the full thickness of the post, washer, and nut. Install with bolt heads on traffic face.

**NON-SYMMETRICAL (10 GA.) TRANSITION SECTION**

**THREE-BEAM TERMINAL CONNECTION**

Special instructions for connection to the steel post and/or block transition.

**ROUND WOOD POST & BLOCK**

For solid wood, only use standard blocks.

**WOOD BLOCK TO RECTANGULAR WOOD POST**

For solid wood, only use standard blocks.

**STEEL POST & BLOCK**

For steel post, use standard blocks.
GENERAL NOTES

1. The type of post anchor wood post, rectangular wood post, or steel post will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.

2. Rail elements shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on this plan.

3. Button head "post" bolts (ASTM A325) shall be of sufficient length to extend through the full thickness of the rail (ASTM A563) and the type A 1/4" O.D. washer and not more than 1" beyond the button head. Button head "splice" bolts (ASTM A325) are 3/8" x 2" (triplex rail assembly) with a 1/4" double recessed washer (ASTM A563).

4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 407, "Galvanizing." Fittings shall be supplied to the bid item requiring construction of the transition.

5. Crown will be widened to accommodate transitions.

6. If solid rock is encountered, see the GF31 standard sheet for proper installation guidance.

7. Posts shall not be set in concrete.

8. Unless otherwise shown in the plans, composite material posts and blocks for Metal Beam Guard Fence may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, requires a Material Producer List (MPL) for producers of materials conforming to TxDOT standards. Only producers on the MPL can furnish composite material posts and blocks.

9. Refer to GF31 and Type T101 Standard Sheet for additional details.

METAL BEAM GUARD FENCE TRANSITION (T101)

GF (31) T101-13
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS

Notes:
- See STC standard sheets for proper installation and length of need requirements.
- Minimum 1'-10" beyond guard fence post.
- Approx. 5'-10"
- 50' approach taper of grading or mow strip

Length varies, adjust mow strip width accordingly when offset is used. (offset "option" shown)

Notes:
- Site conditions may affect where grading is required for the proper installation of metal guard fence end treatments.
- Approach grading or mow strip may be decreased or eliminated, as directed by the engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence treatments. (See STC standards for proper STC installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (precast or non-precast). The plan shown on the plans and will be paid for under the pertinent bid item. Asphalitic pavement shall meet the requirements of this item, and be placed in accordance with TRB 12.1-2012. Reinforced concrete shall be placed in accordance with TRB 12.1-2012. The use of the sprayer panel in lieu of an asphalt finish is acceptable provided the sprayer panel is on the Department Materiel Producer list NPS, maintained by TxDOT, Construction Division.
3. The MOW strip behind the post shall be a minimum of 1'.
4. The type of approved post will be as shown in the plans. See the applicable standard sheets for additional details and information.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid items.
6. Thickness of the mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include face outs for the posts.
8. The face outs shall be filled with no more than a Proack grout mixture and placed in accordance with TxDOT Standard for Curb 12.1. Mortar and Grout. Payment for furnishing and placing the grout mixture will be subject to the bid items of asphaltic pavement or reinforced concrete.

METAL BEAM GUARD FENCE (MOW STRIP)

GF (31) MS-11

Curb Option (1): This option will increase the post embedment through out the system.
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DATE:

FILE:

Miter Joints

End of ramp

drainage and venting.

ramp / sidewalk. Provide holes as needed in 1" Dia. pipe for galvanizing.

1" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ground.

for each 30" rise if grade exceeds 5 percent.

See Ramp Details located elsewhere in plans for ramp slope and dimensions.

The weld may be square groove or single vee groove. Grind smooth.

Shop splice is permitted with minimum 85 percent penetration.

One shop splice per panel is permitted with minimum 85 percent penetration.

Parallel to ground.

3/3° dropoff, or along Bike Path.

The weld may be square groove or single vee groove. Grind smooth.

One shop splice per panel is permitted with minimum 85 percent penetration.

See "Typical Post Base Plate Detail" for crimping and trimming post to fit.

See "General Notes" for anchor bolt information.

Not to be used on bridges.

PEDESTRIAN HANDRAIL DETAILS

RECOMMENDED USAGE

Dropper Weight/Condition

Recommended Rail Options

= 30° dropper

TY A, TY B, TY C, or TY D

2.30° dropoff, or along Bike Path

TY E or TY F

SECTION A-A

(Typ)

SECTION B-B

(Showing Handrail)

SECTION C-C

(Showing Handrail)

SECTION D-D

(Showing Handrail)

5'" Dia. Round Bar equal spacing at 4" Max. Plumb all pickets.

Limit of Payment (Typ)

Max Length = 30'-10" minus …"
GENERAL NOTES

Designed according to ADAAC, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Post will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM A36. Bolts for wall-mounted handrails will conform to ASTM A307 Grade A. Bolts for post-base plate anchors will be 1/2" Dia. ASTM A307 Grade A bolts unless directed otherwise by Engineer.

Epoxy anchor bolts for wall mount and post base plate will be 1/2" Dia. ASTM A307 Grade A using one hex nut and one hardened steel washer at each bolt. Embedment depth for wall mounts is 3 1/2" and embedment depth for post base plate is 5''.

Embed threaded rods into concrete with a Type III Class C1 epoxy meeting the requirements of NE最重要5-100. The epoxy adhesive may be polyurethane or equivalent.

Threaded rod embedment depth for post base plate is 5''.

Concrete for foundations will be in accordance with Item 531 "Sidewalk." All reinforcing steel will be A500. Galvanized steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM-A53. All other steel will conform to ASTM-A500. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 ft. Roof runoff for select structure types. See appropriate details elsewhere in plans for these modifications.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Shop drawings will show handrail mount locations with bolts setking, spacing, rod stacks, and washer configuration. Handrail lengths with identification showing where each handrail goes on the layout.

Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 501 "Sidewalk." Payment for all items shown is to be included in unit price bid in accordance with Item 501 "Sidewalk." All exposed edges will be rounded or chamfered to approximately 1/8" by grinding.
**Curb Ramps**

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. If shall drain properly should be used. Adjust curb ramp length or grade of approach sidewalk as directed.
3. The minimum side slope is 2. The side slope is adjacent to the back of curb, a 5' side slope is desirable. Where 5' sidewalk cannot be provided due to site constraints, side slope may be reduced to 4. For short distances, 5' x 5' paving areas of intervals not to exceed 200 are required.
4. Landings shall be 5' x 5' minimum with a maximum 25% slope in any direction.
5. Maneuvering space of the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicle travel-path.
6. Maximum allowable cross slope on sidewalk and curb ramp surface is 2.5%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be at 90° maximum, measured perpendicular to the curb. Reference curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective surface, and features may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 Tac 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curb. Medians should be designed to provide accessible passage over or through them.
10. Small-channelization islands, which do not provide a minimum 5' side slope at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings, and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalks are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever an accessible route crosses a curb.
13. Curb ramps and landings shall be constructed and poured in accordance with TSS Sidewalks.
14. Place concrete at a minimum depth of 5" for ramps, flares, and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete, curb, or combined curb and gutter.
17. Existing features that comply with TSS may remain in place unless otherwise shown on the plans.

**Detectable Warning Material**

- Curb ramps must contain a detectable warning surface that consists of raised concrete dots complying with Section 135 of the TAS. The surface must contrast visually with adjoining surfaces, including side floors. Furnish and install an aggregate cost-saving dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
- Detectable Warning Materials must meet TxDOT Department Materials Specification 1690 and be listed on the Material Producer List. Install product in accordance with manufacturer’s specifications.
- Detectable warning surfaces shall be slip resistant and not allow water to accumulate.
- Detectable warning surfaces shall be a minimum of 2" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
- Detectable warning surfaces shall be located so that the edge extends at least 2" beyond the curb ramp and the street. Detectable warning surfaces may be curved along the corner radius.
- Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

**Detectable Warning Pavers**

- Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-135, Lay in a bed of two unit ballast mixed with or as directed.
- Lay full size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a saber saw.

**Sidewalks**

- Provide clear ground space or accessible areas, including pedestrian push buttons. Operable parts will be placed within one or more reach ranges specified in TAS 106.
- Place traffic signal or illumination pole, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
- Street grades and curb slopes shall be as shown elsewhere in the plans.
- Changes in level greater than 1/8" inch are not permitted.
- The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. There is a continuous grade greater than 3% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 502.
- Handrail extensions shall not protrude into the usable landing areas or into intersecting pedestrian routes.
- Drive ways and turnouts shall be constructed and paved for in accordance with Items "Intersections, Drives and Turnouts", sidewalks shall be constructed and paved for in accordance with Items "Sidewalks."
- Sidewalk details are shown elsewhere in the plans.

**Detectable Warning Surface on Landings at Street Edge**

**Detectable Warning Surface on Landings at Street Edge**

**Detectable Warning Surface on Landings at Street Edge**

**Detectable Warning Surface on Landings at Street Edge**
SKewed intersection with "large" radius

SKewed intersection with "small" radius

AT intersection w/free right turn & island

Mid-block placement perpendicular ramps

Normal intersection with "small" radius

Typical crossing layouts
SECTION GALVANIZED BARBED WIRE FENCE WITH WOOD POSTS

TYPE "A" FENCE
See General Note B1

Metal gate shall consist of 5 panels not less than 4'-0" high and shall be galvanized or galvanized wrought iron of good quality. Gate and hardware shall meet the approval of the Engineer.

DETAIL TYPE 1 GATE

CORNER OR PULL POST ASSEMBLY

DETAIL TYPE 2 GATE

DETAIL OF FENCE TREATMENT AT STRUCTURES

DETAIL OF FENCE SAG

DETAIL OF EYE BOLT

SECTION GALVANIZED WOVEN WIRE FENCE WITH WOOD POSTS

TYPE "B" FENCE
See General Note B1

DETAIL TYPE 3 GATE

DETAIL FASTENER TYPE 3 GATE

BARBED WIRE AND WOVEN WIRE FENCE (WOOD POSTS)

WF (1) - 10

TABLE OF EQUIVALENT SIZES FOR THE SAME SHAPE

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<thead>
<tr>
<th>Post Diameter (inches)</th>
<th>Equivalent Post Diameter (inches)</th>
<th>Equivalent Post Diameter (inches)</th>
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For skewed ends:
1. For box culverts with less than 3' of fill, the top slab shall be broken back 1' from the existing top slab to provide a minimum 1'-6" slab thickness. The extensions shall be cut to avoid fouling in the walls of the Box Culvert.
2. When the spacing between Bars B and D is less than half the normal spacing, Bars B shall be cut to avoid fouling.
3. The length of Bars B and D will be 0.5 x (Width of Box Culvert + Length of Bars B and D) to prevent the possibility of the extension leg of Bars B and D being shortened to a minimum of 1'-6" for skewed sections.
4. For skewed sections, the contractor has the option of maintaining an uninterrupted flow line. Existing reinforcing shall be field bent into transition sections and new reinforcing shall be field bent into transition sections. The use of permanent forms is not allowed.

**GENERAL NOTES:**
- Designed according to AASHTO LRFD Specifications.
- All reinforcing steel shall be Grade 60.
- All concrete shall be Class "C" with these exceptions:
  - Use Class "S" for top slabs of culverts with overlay, with 1-1/2" course surface treatment, or with the top slab as the final riding surface.
  - Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
- All reinforcing steel weight by dividing the values shown on the standards by the cosine of the skew angle.

For box culverts with dimensions different than current standard dimensions, horizontal and vertical transitions shall be formed as directed by the Engineer. Bottom slabs shall be bent to accommodate the skew.

**Single Box Culverts Cast-in-Place Standard**

- Single Box Culverts Cast-in-Place Standard for details of straight sections of culvert. For skewed sections and angle sections refer to Single Box Culverts Cast-in-Place Standard for details of straight sections.
- Refer to Single Box Culverts Cast-in-Place Standard for details of straight sections of culvert. For skewed sections and angle sections refer to Single Box Culverts Cast-in-Place Standard for details of straight sections.
GENERAL NOTES:
- Designed according to AASHTO LRFD Specifications.
- Designed to the maximum fill height shown.
- All reinforcing steel shall be Grade 60.
- All reinforcing steel shall be in accordance with these specifications except as otherwise noted in the plans.
- For curbs less than 1'-0" high, bars K may be omitted.
- For curbs less than 1'-0" high, tilt bars K or reduce bar height as necessary to maintain cover.
- For curbs less than 1'-0" high, bars K may be cut off or reduced in length as necessary to maintain cover.
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### Bills of Reinforcing Steel (For Box Length = 40 feet)

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<th>Reinf (Lb)</th>
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<th>Reinf (Lb)</th>
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<td>7&quot;</td>
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<td>7&quot;</td>
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<tr>
<td></td>
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<td>2'-0&quot;</td>
<td>7&quot;</td>
<td>7&quot;</td>
<td>30'</td>
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Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown on the Contractor's plans. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4.5" min and 16" max. When required, provide top soffits in the WWR of the same length as the equivalent bar size, rounded up for wire sizes between 6.5" and 8.5" clear. Example: Conversion of No. 6 to 60 of 6" WWR.

- For structures with bridge rail, curbs shall be flush with finished grade.
- For structures without bridge rail, curbs shall project no more than 3" above finished grade.
- For structures with an inside bridge rail, curbs shall be flush with finished grade.
- For vehicle safety, the following requirements must be met: (See standard SCC-MD for skewed ends, angle sections.
- If this option is used, Bars E may be cut off or raised a maximum of 6" at the Contractor's option. Construction joints shown at the flow line may be reduced a minimum of 1" clear cover. No changes will be made in quantities or re-estimated dimension will not be allowed for this work.
- For curbs less than 3'-0" high, 3/4" bars may be used. For curbs less than 3'-0" high, bars K may be omitted.

GENERAL NOTES:
- Designers according to AASHTO LRFD Specifications. Designed to the maximum fill height shown.
- All reinforcing steel shall be Grade 60.
- All reinforcing steel shall be Grade 60.
- The use of temporary forms is not allowed.
- Class "S" concrete shall have a minimum compressive strength of 3,000 psi. Class "C" concrete shall have a minimum compressive strength of 4,000 psi.
- All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
- All reinforcing steel shall be Grade 60.
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Example Conversion: Replacement of No. 6 Gr 60 at 6" spacing with WWR.

WWR required = 0.754 sq in/ft x 0.51 x (60 ksi / 70 ksi) x 0.754 sq in/ft.

If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in / 0.754 sq in/ft / 12 in/ft) = 4.87".

Example: Conversion of No. 6 to WWR.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown on the Contractor's plans. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4.5" min and 16" max. When required, provide top soffits in the WWR of the same length as the equivalent bar size, rounded up for wire sizes between 6.5" and 8.5" clear. Example: Conversion of No. 6 to 60 of 6" WWR.

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Example Conversion: Replacement of No. 6 Gr 60 at 6" spacing with WWR.

WWR required = 0.754 sq in/ft x 0.51 x (60 ksi / 70 ksi) x 0.754 sq in/ft.

If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in / 0.754 sq in/ft / 12 in/ft) = 4.87".

Example Conversion of No. 6 to WWR.
### BILLS OF REINFORCING STEEL (For Box Length - 40 feet)

<table>
<thead>
<tr>
<th>SECTION DIMENSIONS</th>
<th>FULL HEIGHT</th>
<th>BARS B</th>
<th>BARS C</th>
<th>BARS D</th>
<th>BARS E-K</th>
<th>BARS F1-K</th>
<th>BARS F2-K</th>
<th>BARS G-K</th>
<th>BARS H-K</th>
<th>BARS I-K</th>
<th>Conc (Cf)</th>
<th>Retaint (Qb)</th>
<th>Conc (Cf)</th>
<th>Retaint (Qb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>W</td>
<td>H</td>
<td>No. 1</td>
<td>Dia 1</td>
<td>No. 2</td>
<td>Dia 2</td>
<td>No. 3</td>
<td>Dia 3</td>
<td>No. 4</td>
<td>Dia 4</td>
<td>No. 5</td>
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<td>261</td>
<td>#4</td>
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<td>6&quot;</td>
<td>261</td>
<td>#4</td>
<td>30'</td>
<td>6&quot;</td>
<td>261</td>
<td>#4</td>
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<td>6&quot;</td>
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<td>3'-0&quot;</td>
<td>9&quot;</td>
<td>261</td>
<td>#4</td>
<td>30'</td>
<td>6&quot;</td>
<td>261</td>
<td>#4</td>
<td>30'</td>
<td>6&quot;</td>
<td>261</td>
<td>#4</td>
<td>30'</td>
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<td>9&quot;</td>
<td>261</td>
<td>#4</td>
<td>30'</td>
<td>6&quot;</td>
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<td>#4</td>
<td>30'</td>
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<td>30'</td>
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<td>261</td>
<td>#4</td>
<td>30'</td>
<td>6&quot;</td>
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### QUANTITIES

<table>
<thead>
<tr>
<th>PER FOOT OF BARREL</th>
<th>CURB</th>
<th>TOTAL</th>
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</thead>
<tbody>
<tr>
<td>Conc (Cf)</td>
<td>Retaint (Qb)</td>
<td>Conc (Cf)</td>
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<td>0.459</td>
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<td>0.484</td>
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<td>0.506</td>
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<td>0.757</td>
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<td>1.172</td>
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<tr>
<td>1.208</td>
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<tr>
<td>1.380</td>
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</tr>
<tr>
<td>1.380</td>
<td>7.0</td>
<td>0.63</td>
</tr>
</tbody>
</table>

### Notes:
- For each box size, minimum fill height shown shall be used for all culverts with less than 2'-0" of fill.

**Example Conversion:**
- Replacement of No. 6 Gr 60 at 6" used for all culverts with less than 2'-0" of fill.

**Deformed wire:**
- Wire with greater yield strength than that specified may be used provided the area of wire used is not less than the area required for the specified yield strength.

**WWR Requirement:**
- The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of bars in WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length as the member. Total length of WWR shall not exceed the limit specified in the project specification.

**Example:**
- Replacement of No. 6 Gr 60 at 6" used for all culverts with less than 2'-0" of fill.
<table>
<thead>
<tr>
<th>SECTION</th>
<th>DIMENSIONS</th>
<th>FILL HEIGHT</th>
<th>FULL HEIGHT</th>
<th>CONCRETE</th>
<th>REINFORCING STEEL (For Box Length = 40 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Size</td>
<td>Spacing</td>
<td>BARS</td>
<td>BARS</td>
<td>BARS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BARS E=4d</td>
<td>BARS F1=4d</td>
<td>BARS H=4d</td>
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<td></td>
<td>at 18&quot; Max</td>
<td>at 18&quot; Max</td>
<td>at 18&quot; Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Notes:**
- For each box size, minimum fill height shown should be used for all culverts with less than 6" of fill.
- Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A666 may be used in lieu of conventional rebar as shown on the Contractor's plans. Area of deformed welded wire reinforcement shall be determined by the WWR area at a given depth by (0.306 sq in/0.754 sq in/ft) x 12 in/ft = 4.87".
- Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A666 may be used in lieu of conventional deformed rebar as shown on the Contractor's plans. Area of deformed welded wire reinforcement shall be determined by the WWR area at a given depth by (0.44 sq in/0.5') x (60 ksi/70 ksi).
- Example Conversion: Replacement of No. 6 Gr 60 at 6" followed by 28.8" = (0.306 sq in/0.754 sq in/ft) x 12 in/ft = 4.87" x 28.8" = 140.7 sq in.

**Example:**
- For a culvert box length of 40 feet, the required area of deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A666 shall be determined by (0.44 sq in/0.5') x (60 ksi/70 ksi) x 40 ft = 28.8" = 140.7 sq in.

**Deformed Welded Wire Reinforcement (WWR):**
- The area of required reinforcement may be determined by the contractor in accordance with the requirements of U.S. customary units or SI units.

**SCC-7**

**Texas Department of Transportation**

**Single Box Culverts**

**CAST-IN-PLACE**

**8' TO 30' FILL**

**HL93 LOADING**

**SHEET 2 OF 2**

**R E I N F O R C I N G  S T E E L**

**L O A D I N G**

**C U S T O M E R  S T A N D A R D**

**11/11/1985**

**11/12/1985**

**11/13/1985**

**11/14/1985**

**11/15/1985**

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**12/29/1985**

**12/30/1985**

**12/31/1985**
0'-6" min to 5'-0" max. As required by the AASHTO LRFD Specifications. Structures with rail include bridge rail or bridge rail. Use 1'-0" as shown on the structure. Structures with traffic rail, other than T6, refer to ECD standard. For structures with T6 bridge rail, refer to T6 standard.

For vehicle safety, the following requirements must be met:

- For structures with bridge rail, curbs shall be flush with the bridge rail, curbs shall be flush with finished grade.
- Curbs heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities or additional compensation will not be allowed for this work.
- Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities or additional compensation will not be allowed for this work.
- For curbs less than 1'-0" high, fill bars may be omitted. 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

For structures without bridge rail, curbs shall project at least 1" above finished grade. For structures with bridge rail, curbs shall be flush with finished grade. Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities or additional compensation will not be allowed for this work.

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<table>
<thead>
<tr>
<th>SECTION</th>
<th>DIMENSIONS</th>
<th>BILLS OF REINFORCING STEEL (For Box Length = 40 feet)</th>
<th>QUANTITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>T</td>
<td>H</td>
<td>SECT</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>9&quot;</td>
<td>30'</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>10&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>8'-0&quot;</td>
<td>8'-0&quot;</td>
<td>11&quot;</td>
<td>8&quot;</td>
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<td>8'-0&quot;</td>
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<td>8'-0&quot;</td>
<td>5'-0&quot;</td>
<td>11&quot;</td>
<td>9&quot;</td>
</tr>
</tbody>
</table>

For each box size, minimum fill height shown shall be used for all outers with less than 2' of fill.
Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown in the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 3" min and 18" max. When required, provide top surface in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between 0.306 sq in/ft and 0.365 sq in/ft.

Example Conversion: Replacement of No. 6 or 80 of 6" Spacing with WWR.

- WWR required = (0.306 sq in/ft) x 6" / 0.754 sq in/ft = 4.87" spacing.
- Example: 12 ft length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as required lap length for the provided D30.6 wire is 2'-2".

GENERAL NOTES:
- Designed according to AASHTO LRFD Specifications. Designed to the maximum fill height shown.
- Construction joints shall be designed with these exceptions:
  - Cast-in-place box culverts with porphyry, 1-1/2" to 2" course surface treatment, or with the top slab as the finish riding surface.
  - Class "C" concrete shall have a minimum compressive strength of 3,600 psi.
  - The use of permanent forms is not allowed.

For vehicle safety, the following requirements must be met:
- For structures with bridge rail, curbs shall be flush with the finished grade.
- For structures without bridge rail, curbs shall project no more than 4" and be chamfered 3" at the entrance.

For structures with bridge rail, curbs shall be flush with the finished grade. Curbs shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities once the additional compensation is allowed for this work.

The use of permanent forms is not allowed. Reinforcing bars shall be adjusted to provide a minimum of 1" above finished grade.

The use of temporary forms is not allowed. Curbs shall project no more than 2" and shall be chamfered 3" at the entrance.

Reinforcing bars shall be adjusted to provide a minimum of 1" above finished grade.

Construction joints shown on the flow line may be raised a minimum of 6" at the Contractor's option. If this option is used, bars K may be cut off or extended to meet additional compensation as allowed for this work. No changes will be made in quantities once the additional compensation is allowed for this work.
### Dimensions

<table>
<thead>
<tr>
<th>Section</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
<th>Concrete</th>
<th>Steel</th>
<th>Notes</th>
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<tr>
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### Bills of Reinforcing Steel

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**DISCLAIMER:** The use of this standard is governed by the "Texas Engineering Practice Act." No warranty of any kind is made by TxDOT for any data or information contained herein. TxDOT assumes no responsibility for the accuracy of this data or the interpretation of this data. This data is provided for informational purposes only and may not be used for any other purpose. The data is subject to change without notice. The user is responsible for the use of this data and must verify all data before using it for any purpose.

---

**SECTION:**
- **Length:** Measurement of the length of the section.
- **Width:** Measurement of the width of the section.
- **Height:** Measurement of the height of the section.
- **Concrete:** Weight of the concrete in pounds.
- **Steel:** Weight of the reinforcing steel in pounds.
The use of this standard to other formats or incorrect results or damages resulting from its use.

The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for whatever purpose. TxDOT assumes no responsibility for the conversion.

**DISCLAIMER:**

Note: See GENERAL NOTES:

1. Finished grade - 3" Chamfer (Roadway Slope) - For structures without bridge roll, bars shall be flush with finished grade.

2. Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, 414 bars may be reduced bar height or necessary to form 3/4" thick cover. For curbs less than 3'-0" high, bars K may be omitted.

4. 1'-0" typical, 2'-2" when RAC standard is referred to elsewhere in the plans.

**GENERAL NOTES:**

- Designed according to AASHTO LRFD Specifications, designed to the maximum fill height shown.
- All reinforcing steel shall be Grade 60. All reinforcing steel shall be Grade 60 except for the WWR as shown.
- All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with traffic rail or with the top slab as the final riding surface.
- Permissible strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi. Class "C" concrete shall have a minimum compressive strength of 3,600 psi.
- Reinforcing bars shall be adjusted to provide a minimum of 1" clear cover. Construction joints shown on the flow line may be raised a minimum of 6" at the Contractor's option. If this option is used, bars E may be cut off or extended as necessary to maintain cover. For curbs less than 1'-0" high, Bars K may be omitted. For curbs less than 3'-0" high, Bars K may be reversed. If this option is used, Bars E may be cut off or extended as necessary to maintain cover. For curbs less than 1'-0" high, Bars K may be omitted. For curbs less than 3'-0" high, Bars K may be reversed. If this option is used, Bars E may be cut off or extended as necessary to maintain cover. For curbs less than 1'-0" high, Bars K may be omitted. For curbs less than 3'-0" high, Bars K may be reversed. If this option is used, Bars E may be cut off or extended as necessary to maintain cover. For curbs less than 1'-0" high, Bars K may be omitted. For curbs less than 3'-0" high, Bars K may be reversed.
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<th>Bars D</th>
<th>Bars E &amp;-#</th>
<th>Bars F &amp;-#</th>
<th>Bars G &amp;-#</th>
<th>Bars H &amp;-#</th>
<th>Bars I &amp;-#</th>
<th>Bars J &amp;-#</th>
<th>Bars K &amp;-#</th>
<th>Per foot of Barrel</th>
<th>Curb</th>
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Deformed welded wire reinforcement (DWR) meeting the requirements of ASNA 350 may be used to replace conventional reinforcement shown on the Contractor's plans. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of bars is limited to 40" o.c. in 8" boxes, when required. See standard for the equivalent bar size required for the required area of DWR, if used.

For each box size, maximum fill shown shall be used for all culverts with less than 2'-0" of fill.

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FILE: scpmdsts.dgn
February 2010

PRECAST MISCELLANEOUS DETAILS

WINGWALL CONNECTION
(Also applies to Safety End Treatment)

SECTION THRU CURB

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<thead>
<tr>
<th>QUANTITIES PER FOOT OF CURB</th>
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<tr>
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<tr>
<td>Concrete</td>
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<tr>
<td>4.18 Lb</td>
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ANGLE DETAIL

Concrete Closure
8" wide band
Exposed reinforcing inside and outside face
Concrete Closure
8" wide band
Exposed reinforcing inside and outside face

SECTION B-B

CAST-IN-PLACE CONCRETE BOX (Typ)

Concrete Stabilized Backfill between boxes is considered part of the Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

SECTION THRU CURB

CAST-IN-PLACE CONCRETE BOX (Typ)

Concrete Stabilized Backfill between boxes is considered part of the Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

ANGLE DETAIL

Concrete Closure
8" wide band
Exposed reinforcing inside and outside face
Concrete Closure
8" wide band
Exposed reinforcing inside and outside face

SECTION A-A

CAST-IN-PLACE CONCRETE BOX (Typ)

Concrete Stabilized Backfill between boxes is considered part of the Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.

PLAN OF SKewed ENDS

(Highlighting mUlti-BoX PLACEMENT)

GENERAL NOTES:

4.18 Lb
Concrete

For curbs less than 1'-0" high, tilt Bar K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bar K may be omitted.

Concrete Box Culvert for payment.

For curbs less than 1'-0" high, tilt Bar K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bar K may be omitted.

Concrete Box Culvert for payment.

For curbs less than 1'-0" high, tilt Bar K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bar K may be omitted.

Concrete Box Culvert for payment.

For curbs less than 1'-0" high, tilt Bar K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bar K may be omitted.

Concrete Box Culvert for payment.

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Concrete Box Culvert for payment.

For curbs less than 1'-0" high, tilt Bar K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bar K may be omitted.

Concrete Box Culvert for payment.
GENERAL NOTES:

1. Designs shown conform to ASTM C1577.
2. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
3. Designs shown conform to ASTM C1577.
4. Refer to ASTM C1577 for information on supplementary requirements.
5. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
6. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
7. Designs shown conform to ASTM C1577.
8. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
9. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
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12. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
13. Designs shown conform to ASTM C1577.
14. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
15. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
16. Designs shown conform to ASTM C1577.
17. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
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29. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
30. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
31. Designs shown conform to ASTM C1577.
32. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
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53. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
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56. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
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58. Designs shown conform to ASTM C1577.
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77. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
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81. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
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83. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
84. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
85. Designs shown conform to ASTM C1577.
86. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
87. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
88. Designs shown conform to ASTM C1577.
89. Joint reinforcement shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
90. All concrete shall be Class "H" Concrete with a minimum compressive strength noted otherwise.
### BOX DATA

**SECTION DIMENSIONS**

<table>
<thead>
<tr>
<th>M Width</th>
<th>H Height</th>
<th>M Height</th>
<th>A</th>
<th>4 d Min.</th>
<th>3 1/2&quot; Min.</th>
<th>2 1/2&quot; Min.</th>
<th>2 1/2&quot; Min.</th>
<th>1/2&quot; Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
</tr>
</tbody>
</table>

- M Width: Measurement of the box's width.
- H Height: Measurement of the box's height.
- M Height: Measurement of the box's thickness.

**REINFORCING (in 

<table>
<thead>
<tr>
<th>H Height</th>
<th>M Width</th>
<th>M Height</th>
<th>A</th>
<th>4 d Min.</th>
<th>3 1/2&quot; Min.</th>
<th>2 1/2&quot; Min.</th>
<th>2 1/2&quot; Min.</th>
<th>1/2&quot; Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
<td>12 4</td>
<td>2 5 5 12 4</td>
</tr>
</tbody>
</table>

- M Width: Measurement of the box's width.
- H Height: Measurement of the box's height.
- M Height: Measurement of the box's thickness.

**FILL HEIGHT 2 FT AND GREATER**

- Corner Options:
  - Corner Option "A" for reinforcement on the top and bottom slab.
  - Corner Option "B" for reinforcement on the top or bottom slab.

**FILL HEIGHT LESS THAN 2 FT**

- Reinforcement:
  - For T 6":
    - 4" Min (Radial Typ) for T 6".
    - 2" Max (Radial Typ) for T 9".

**GENERAL NOTES:**

- Designs shown are for T 6".
- Reinforcement shall be of Class "H" Concrete with a minimum compressive strength of 5,000 psi.
- See SCP-MD standard sheet for miscellaneous details not shown.
- Refer to ASTM C1577 for information or changes.
- In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the designs shown.

**SECTION A-A**

- Top and bottom slab joint reinforcement requirements.
- Reinforcement details and notes not shown.

**SECT JOB**

- SINGLE BOX CULVERTS
- PRECAST
- 4'-0" SPAN

**REVISIONS**

- FOR BOX SPAN A'-A'
- FOR BOX SPAN B'-B'

- Joint reinforcement requirements.
- Details and notes not shown.
**GENERAL NOTES:**

- Designs shown conform to ASTM C1577.
- Refer to ASTM C1577 for information or details not shown.
- All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.
- All joint reinforcement shall be submitted in accordance with Item SCP-59 standard sheet for miscellaneous details and notes not shown.
- All shop plans for alternate design shall be submitted in accordance with Item SCP-59 standard sheet for miscellaneous details and notes not shown.
- General notes shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
- Refer to ASTM C1577 for information or details not shown.

**SECTION A-A**

<table>
<thead>
<tr>
<th>(Top and Bottom Slab) Joint Reinforcement</th>
</tr>
</thead>
</table>

**SECTION DIMENSIONS**

<table>
<thead>
<tr>
<th>Section</th>
<th>FILL HEIGHT 2 FT AND GREATER</th>
<th>FILL HEIGHT LESS THAN 2 FT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BOX DATA**

<table>
<thead>
<tr>
<th>BOX</th>
<th>FILL HEIGHT</th>
<th>SECTION 1</th>
<th>SECTION 2</th>
<th>SECTION 3</th>
<th>SECTION 4</th>
<th>SECTION 5</th>
<th>SECTION 6</th>
<th>SECTION 7</th>
<th>SECTION 8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**REINFORCING LAYOUT**

<table>
<thead>
<tr>
<th>Linear foot of box length</th>
<th>Longitudinal reinforcement</th>
<th>Circumferential reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**JOINT REINFORCEMENT**

<table>
<thead>
<tr>
<th>Corner Option</th>
<th>Longitudinal Reinforcement</th>
<th>Circumferential Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SECTIONS**

- **SECTION A-A**
- **SECTION B-B**

**FILL HEIGHT 2 FT AND GREATER**

- Minimum length is equal to spacing of longitudinal reinforcing plus 2" (Typ)

**FILL HEIGHT LESS THAN 2 FT**

- Minimum length is equal to spacing of longitudinal reinforcing plus 2" (Typ)

**CORNER OPTION "A"**

- Longitudinal bars at female end.

**CORNER OPTION "B"**

- Longitudinal bars at female end.

**CONTACTS**

- C TxDOT
- CORNER OPTION "B"
- SINGLE BOX CULVERTS
- SCP-5

**REVISIONS**

- SCP-5

**IMPLEMENTATION**

- GENERAL NOTES:
  - Designs shown conform to ASTM C1577.
  - Refer to ASTM C1577 for information or details not shown.
  - All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.
  - Joint reinforcement shall be submitted in accordance with Item SCP-59 standard sheet for miscellaneous details and notes not shown.
  - General notes shall be submitted in accordance with Item SCP-MD standard sheet for miscellaneous details and notes not shown.
  - Refer to ASTM C1577 for information or details not shown.

**HIGHWAY DIVISION**

- Bridge Division

**SCP-5**

- SINGLE BOX CULVERTS
- 5'-0" SPAN
- PRECAST
**GENERAL NOTES:**

- Designs shown conform to ASCE C1577.
- Refer to ASCE C1577 for information on design and construction.
- All concrete exposed to corrosive environment shall be Class C Concrete.
- See CSD-051d standard for miscellaneous details and notes not shown.
- For all reinforcing and materials shown on this sheet, the contractor shall furnish an alternate design that is equal to or exceeds the box design for the design fill height in the alternate design. Plans and details not shown.
- Refer to ASTM C1577 for information on reinforced concrete structural members fabricated in accordance with these plans and details.
BOX DATA

8

8

(ft)

<2

-

8

8

2<3

7

4

8

8

8

3-5

43

0.19

7

4

8

8

8

10

43

7

4

8

8

8

15

7

4

8

8

8

20

7

4

8

8

8

25

8

8

43

0.34

8

8

30

S3

A

S4

A

A

A

S7

S6

S5

A

S8

0.23

0.25

0.19

0.19

0.19

0.19

-

-

-

-

10.4

4 d Min

0.22

0.19

0.19

-

-

-

-

10.4

radius(Typ)

0.19

0.23

0.23

0.19

-

-

-

-

10.4

41

0.24

0.30

0.30

0.19

-

-

-

-

10.4

41

0.31

0.38

0.39

0.19

-

-

-

-

10.4

41

0.38

0.47

0.48

0.19

-

-

-

-

10.4

0.57

0.57

0.19

-

-

-

-

A

4" Min

A S4(side)

3

4" Min

for TS >6"
-

A S3(bott)

10.4

8

8

8

<2

-

0.19

0.36

0.27

0.19

0.19

0.19

0.19

0.19

for TS >6"
-

1" (Typ unless
noted otherwise)

1"
(Typ)

1"

Minimum length is equal to
AS4

spacing of longitudinal

(Typ)
TS

2" Max

TS

11.2

for TS <5"
-

A S4

for TS <5"
-

A S2(top)

1"

1" Max

A S5

radius(Typ)

reinforcing plus 2" (Typ)
5

A S7

4 d Min
1 •" Max

2" Max
radius(Typ)

A S1

(Typ)
7

A S2

10.4

0.19

0.46

0.28

0.19
0.28

41

2"

A

A S6

(Tons)

(in)
0.21

4

4

A

S2

A S1

radius
8

2<3

7

5

8

8

8

3-5

43

0.19

0.24

0.21

0.19

-

-

-

-

11.2

7

5

8

8

8

10

43

0.19

0.25

0.26

0.19

-

-

-

-

11.2

7

5

8

8

8

15

41

0.21

0.32

0.33

0.19

-

-

-

-

11.2

7

5

8

8

8

20

41

0.27

0.41

0.42

0.19

-

-

-

-

11.2

7

5

8

8

8

25

41

0.33

0.51

0.52

0.19

-

-

-

-

11.2

7

5

8

8

8

47

30

41

0.21

0.40

0.31

0.61

0.31

0.62

0.19

0.19

-

-

-

-

-

-

-

-

11.2

(Typ)

A

Longitudinal

6

8

8

8

<2

-

0.19

6

8

8

8

2<3

0.19

7

6

8

8

8

3-5

47

0.19

7

6

8

8

8

10

43

7

6

8

8

8

15

41

7

6

8

8

8

20

7

6

8

8

8

7

6

8

8

8

0.30

0.33

0.19

0.19

0.19

0.19

0.19

7

8

8

8

0.19

-

-

-

-

12.0

0.25

0.23

0.19

-

-

-

-

12.0

0.19

0.26

0.27

0.19

-

-

-

-

12.0

0.19

0.34

0.35

0.19

-

-

-

-

12.0

41

0.24

0.43

0.45

0.19

-

-

-

-

12.0

25

41

0.29

0.53

0.55

0.19

-

-

-

-

12.0

30

41

0.35

0.64

0.65

0.19

-

-

-

-

12.0

7

7

8

8

8

2<3

7

7

8

8

8

3-5

-

0.19
59
59

0.40

0.19
0.19

0.33

0.36
0.27

0.19

0.19

0.19

0.19

0.19

CORNER OPTION "B"

CORNER OPTION "A"

Min

CORNER OPTION "B"

12.0

0.34

<2

10"

space plus 2"

FILL HEIGHT 2 FT AND GREATER

4
6" Min

2" Max (Typ)

GENERAL NOTES:

Longitudinal
reinforcement

12.8

0.37

0.19

-

-

-

-

12.8

0.25

0.19

-

-

-

-

12.8

7

7

8

8

8

10

47

0.19

0.27

0.29

0.19

-

-

-

-

12.8

7

7

8

8

8

15

43

0.19

0.35

0.37

0.19

-

-

-

-

12.8

7

7

8

8

8

20

43

0.22

0.44

0.46

0.19

-

-

-

-

12.8

7

7

8

8

8

25

43

0.27

0.54

0.57

0.19

-

-

-

-

12.8

7

7

8

8

8

30

41

0.32

0.65

0.67

0.19

-

-

-

-

12.8

FILL HEIGHT LESS THAN 2 FT

•" Min (Typ)

Designs shown conform to ASTM C1577.
Refer to ASTM C1577 for information or

1"

7

1 longitudinal bar

11.2

1"

59

0.38

7

A S3

A S8

A

reinforcing

CORNER OPTION "A"
7

TS

8

TB

8

TS

5

TB

7

details not shown.
All concrete shall be Class "H" Concrete
with a minimum compressive strength
of 5,000 psi.

A S2(top)
A S3(bott)

4

Outer cage
circumferential
reinforcement
at female end.

See SCP-MD standard sheet for miscellaneous
A S2 (top)
A S3 (bott)

details and notes not shown.
In lieu of furnishing the designs shown on
this sheet, the contractor may furnish an
alternate design that is equal to or exceeds

SECTION A-A
(TOP AND BOTTOM SLAB

the box design for the design fill height in
the table.

Shop plans for alternate designs

"Precast Concrete Structural Members
(Fabrication)".

JOINT REINFORCEMENT)
7

3

8

8

8

<2

-

0.28

0.36

0.24

0.19

0.21

0.19

0.19

0.19

9.6
5

7

3

8

8

8

30

58

0.53

0.49

0.50

0.19

-

-

-

-

9.6

HL93 LOADING
Bridge
Division
Standard

SINGLE BOX CULVERTS
PRECAST
7'-0" SPAN
1

For Box Length = 8'-0"

5

These designs were created by TxDOT and
are not shown in the ASTM Specifications.

2

SCP-7

AS1 thru A S4
,A S7
and A S8
are minimum
required areas of reinforcement per
linear foot of box length. A S6and A S5
are minimum required areas of reinforcement

FILE:

The use of this standard is governed by the "
Texas Engineering Practice Act"
. No warranty of any

8

S

7

7
of this standard to other form ats or for incorrect results or dam ages resulting from its use.

kind is m ade by TxDOT for any purpose whatsoever. TxDOT assum es no responsibility for the conversion

4

A

TS

S

Weight
A

S1

(in) (in)

TS

M

shall be submitted in accordance with Item

DATE:

DISCLAIM ER:

7

(Min)

T

B

T

(in)

Height

3

Lift

TT

(ft)

T

TS

S

1

2

H

(ft)

T

M

TT

H

REINFORCING (in /ft)
Fill

H

S

TS

2

SECTION DIMENSIONS

FILE:

C TxDOT

scp07sts.dgn
February 2010

DN: GAF
CONT

CK: LMW
SECT

DW:BWH/TxDOT CK:

JOB

GAF

HIGHWAY

REVISIONS

per linear foot of box width.
DIST

COUNTY

SHEET NO.


### BOX DATA

#### SECTION DIMENSIONS

<table>
<thead>
<tr>
<th>Fill Height (ft)</th>
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<th>M (cm)</th>
<th>H (in)</th>
<th>H (cm)</th>
<th>M (in)</th>
<th>M (cm)</th>
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#### REINFORCING (Typ)

- **1**" Minimum
- **2**" Max (Typ)
- **4**" Min (Typ)

#### WEIGHT

<table>
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<th>Fill Height (ft)</th>
<th>Fill Area (sq ft/ft)</th>
<th>Weight (Tons)</th>
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#### GENERAL NOTES:

- Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
- All concrete shall be Class 'H' concrete with a minimum compressive strength as noted otherwise on plans.
- See SCP-MD standard sheet for miscellaneous details and notes not shown.

**SECTION A-A**

- **TOP AND BOTTOM SLAB JOINT REINFORCEMENT**

**CORNER OPTION "A"**

- Longitudinal reinforcing

**CORNER OPTION "B"**

- Longitudinal reinforcing

**FILL HEIGHT 2 FT AND GREATER**

- 1/2" min (Typ)

**FILL HEIGHT LESS THAN 2 FT**

- 1/2" Min (Typ)

**REGULAR DESIGN**

- 2" Max (Typ)

- Minimum length is equal to spacing of longitudinal reinforcing plus 2" (Typ)

**SHOP PLANS**

- 1" Typ unless noted otherwise

**CONSTRUCTION**

- 2" Max (Typ)

- Minimum length is equal to spacing of longitudinal reinforcing plus 2" (Typ)

**MINIMUM REINFORCEMENT**

- 1" min (Typ)

**MINIMUM DEPTH**

- 2" Min (Typ)

**MINIMUM LENGTH**

- 2" Max (Typ)
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion.
**BOX DATA**

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<td>0.26</td>
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</table>

**GENERAL NOTES:**
- Designs shown conform to ASTM C1577.
- Refer to ASTM C1577 for information on cement and water.
- Concrete shall be (less "C" Concrete except for T 6" or T 8" minimum compressive strength for T 6" or T 6" concrete shown.
- See TxDOT standard sheet for miscellaneous details and notes not shown.
- In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in this sheet. The alternate design shall be submitted in accordance with Item.
- This sheet is intended for use in the fabrication of concrete box culverts.

**FILL HEIGHT 2 FT AND GREATER**

**FILL HEIGHT LESS THAN 2 FT**

**SECTION A-A**

**(TOP AND BOTTOM SLAB)**

**JOINT REINFORCEMENT**

---

1. For box spans up to 11'-0".
2. All, all, and all are minimum required areas of reinforcement per linear foot of box length. All, all, and all are minimum required areas of reinforcement per linear foot of box length. All, all, and all are minimum required areas of reinforcement per linear foot of box length.
### BOX DATA

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<th>THE HEIGHT</th>
<th>M (in)</th>
<th>REINFORCING (in²/ft)</th>
<th>L/T HEIGHT</th>
<th>GAF</th>
<th>MIN (ft)</th>
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</table>

### FILL HEIGHT 2 FT AND GREATER

- CORNER OPTION "A"
- CORNER OPTION "B"

### FILL HEIGHT LESS THAN 2 FT

- CORNER OPTION "A"
- CORNER OPTION "B"

### GENERAL NOTES:
- Designs shown conform to ASTM C1577.
- Refer to ASTM C1577 for information on core compressive strength.
- All core concrete shall be (less than) 4,500 psi.
- See SCP-MD standard sheet for miscellaneous details not shown.
- Reinforcement plus 2" (Typ) spacing of longitudinal reinforcing.
- Minimum length is equal to spacing of longitudinal reinforcing plus 2" (Typ).

### SCCP-12

**SINGLE BOX CULVERTS**

**PRECAST**

**12'-0" SPAN**

**Texas Department of Transportation**

**Bridge Division Standard**

**SCCP-12**

**hl93 loading**

**Division**

**Bridge**

**HIGHWAY**

**SPC-12/102**

**scp12sts.dgn**

**February 2010**

**REVISIONS**

**CONT**

**DIST**

**LMW**

**GAF**

**COUNTY**

**DIVISION**

**SYSTEM**

**HL93**

**LOADING**
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion.

### TABLE OF DIMENSIONS & REINFORCING STEEL

<table>
<thead>
<tr>
<th>Wing Dimension Calculations</th>
<th>Formulas (all values are in feet)</th>
</tr>
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<tbody>
<tr>
<td>Hw</td>
<td>Height of Approach Slope</td>
</tr>
<tr>
<td>Z</td>
<td>Flat Plate Slope (Horizontal Version)</td>
</tr>
<tr>
<td>Lw</td>
<td>Length of Approach Slope</td>
</tr>
<tr>
<td>N</td>
<td>Number of Culvert Spans</td>
</tr>
<tr>
<td>U</td>
<td>Approach Slope</td>
</tr>
<tr>
<td>Sp</td>
<td>Spacing</td>
</tr>
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### TABLE OF WINGWALL REINFORCING (2-Wings)

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<th>Formulas (all values are in feet)</th>
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<td>Hw</td>
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<td>Length of Approach Slope</td>
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<tr>
<td>N</td>
<td>Number of Culvert Spans</td>
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<tr>
<td>U</td>
<td>Approach Slope</td>
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<tr>
<td>Sp</td>
<td>Spacing</td>
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### TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Maximum Reinforcing Bar Size (E)</th>
<th>Minimum Reinforcing Bar Size (D)</th>
<th>Spacing (F)</th>
<th>Code-Profile Concrete</th>
<th>Plain Reinforcement Concrete</th>
<th>Concrete Type</th>
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<tr>
<td>15' 0&quot;</td>
<td>7&quot; (No. 5)</td>
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<td>1' 0&quot;</td>
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<tr>
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<td>3&quot; (No. 1)</td>
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### CORNER DETAILS

- **SECTION A-A**

  - **CONCRETE WINGWALLS WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS**

- **SECTION B-B**

  - **CONCRETE WINGWALLS WITH STRAIGHT WINGS FOR 0° SKEW BOX CULVERTS**

### GENERAL NOTES:

- Design according to MASH URO Specifications.
- All reinforcing steel shall be Grade 50.
- Synthetic fibers listed on the Fiber & Concrete Producer List (FPL) may be used in lieu of steel reinforcing in concrete unless noted otherwise.
- All concrete shall be Class "C" and shall have a minimum compressive strength of 3000 psi.
- All reinforcing bars shall be adjusted to provide a minimum of 1 1/2" clear cover.
- When structure is founded on solid rocks, depth of baseplates for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
- See EIS sheet for additional dimensions and information.
- The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

---

*Texas Department of Transportation Bridge Design Standard*
WING WALL DIMENSION CALCULATIONS:

- **Formulas:** (All values are in Feet)
  - Height of Wingwall: \( H_w = H - 0.250' \)
  - Length of Short Wingwall: \( L_w = 0.333' \)
  - Length of Long Wingwall: \( L = 0.667' \)
  - Total Wingwall Area (Two Wings): \( A = (0.5)(H_w)(L + L_w) \)

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES:

<table>
<thead>
<tr>
<th>Section</th>
<th>Number</th>
<th>Wingwall Area</th>
<th>Wingwall Reinforcement</th>
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<td>(2) #5 4'</td>
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<td>(2) #5 4'</td>
</tr>
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<td>(2) #5 4'</td>
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<td>(2) #5 4'</td>
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<td>10</td>
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<td>(2) #5 4'</td>
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**Concrete Wingwalls with Flared Wings for Skewed Box Culverts**

- **Section A-A:** (Culvert and Culvert Toewall reinforcing not shown for clarity.)
- **Section B-B:** (Showing dimensions and 30° Skew.)

**INSIDE ELEVATION:**

- (Showing reinforcing, Culvert and Culvert Toewall reinforcing not shown for clarity.)

**PLAN:**

- (Showing dimensions and 30° Skew)

**FOOTING AND TOEWALL:**

- (Culvert Toewall)

**GENERAL NOTES:**

- Designed according to AASHTO LRFD Specifications.
- All reinforcing steel shall be Grade 60.

**WINGWALL CORNER DETAILS:**

- (Concrete, and reinforcing steel)

**WINGWALL FOOTING DETAILS:**

- (Concrete, and reinforcing steel)

**SECTION B-B:**

- (Showing reinforcing, Culvert and Culvert Toewall reinforcing not shown for clarity.)

**FINISHED GRADE ROUGHWAY SKIPS:**

- (Concrete, and reinforcing steel)

**CONCRETE WINGWALLS WITH FLARED WINGS FOR SKewed BOX Culverts**

- **Extend Bars P 3° 45° minimum length for minimum cover and 4° minimum between bars:**

- **Quantities shown are based on average wing height:**
  - For two wings, one structure end.

- **Quantities for two wings:**
  - Multiply the calculated volume by 0.5 x [Lw].

- **Recommended values of Slew are:**
  - 3°, 4°, 6° & 9°

- **Concrete Toewall for sag walls:**
  - The quantity shown elsewhere on the plans is the quantity for concrete Toewall along all edges adjacent to natural ground, but concrete Toewall shall be reduced if necessary, to provide sufficient Toewall.

- **Concrete Toewall for sag walls:**
  - All reinforcing bars shall be adjusted to provide minimum compressive strength of 3600 psi.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

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  - 2:1, 3:1, 4:1, & 6:1.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.

- **Recommended values of Slope are:**
  - 2:1, 3:1, 4:1, & 6:1.
### TABLE OF DIMENSIONS & REINFORCING STEEL

(Wings for One Structure End)

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<th>Conc麻辣</th>
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### TABLE OF WINNWALL REINFORCING (2-Wings)

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<td>6&quot;</td>
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<tr>
<td>#6</td>
<td>6&quot;</td>
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</tbody>
</table>

### WING DIMENSION CALCULATIONS:

- **Formulas:** (All values are in Feet)
  - \( Lw = (Hw)(SL) \) for Ty PW-1
  - \( Lw = (N)(2U + S) + (N - 1)(0.5') \) for Ty PW-2
  - \( Lw = (N)(S) + (N + 1)(U) \) for Ty PW-3
- **For 45° Skew** (Typ)
  - \( Lw = (Hw)(SL) \) for Ty PW-1
  - \( Lw = (N)(2U + S) + (N - 1)(0.5') \) for Ty PW-2
  - \( Lw = (N)(S) + (N + 1)(U) \) for Ty PW-3
- **For 15° Skew** (Typ)
  - \( Lw = (Hw)(SL) \) for Ty PW-1
  - \( Lw = (N)(2U + S) + (N - 1)(0.5') \) for Ty PW-2
  - \( Lw = (N)(S) + (N + 1)(U) \) for Ty PW-3

### TABLE OF TOTAL REINFORCING

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### GENERAL NOTES:

- **Concrete翼墙与平行翼墙为箱形管**
- **Concrete翼墙与平行翼墙为箱形管**
- **Concrete翼墙与平行翼墙为箱形管**

### SECTION A-A

- **Details for Non-Skewed Box Culverts**
- **View Showing Wing**

### SECTION B-B

- **Details for Skewed Box Culverts**
- **View Showing Wing**

### SECTION C-C

- **View Showing Wing**
- **View Showing Wing**

### SECTION D-D

- **View Showing Wing**
- **View Showing Wing**

### DESIGNER NOTES:

- **Type PW-1 can only be used for applications without foundation requirements**
- **Type PW-2 can only be used for applications with foundation requirements**

### CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS

**Types PW-1 and PW-2**
General Notes:
1. Designed conforming to AASHTO LRFD Bridge Design Specifications.
2. Reinforcing steel shall be placed with the center of the outside layer of bars 2" from the surface of the concrete.
3. All reinforcing steel shall be grade 60. All concrete shall be Class "C" and shall have a minimum compressive strength of 3,000 psi.
4. No bridge rails of any type may be mounted directly to these curbed headwalls.

Concrete headwalls with flared wings for 45° skew pipe culverts

CH-FW-45

Contractor shall provide necessary lengths of pipe and pipe connections to meet the limits of construction.

Terex Corporation

Texas Department of Transportation

Bridge Design Standards
**TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Bars A</th>
<th>Bars C</th>
<th>Bars E</th>
<th>Bars F</th>
<th>Bars T</th>
<th>No. of</th>
<th>L</th>
<th>D</th>
<th>G</th>
<th>Reinf</th>
<th>Quantities</th>
<th>Values to be added</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

- **Bars E**
- **Bars F**
- **Bars A**
- **Bars C**
- **Bars T**

**NOTES**

- Reinforcing steel shall be Grade 60.
- Indicated slope is perpendicular to centerline.
- Concrete shall be placed directly to these culvert headwalls.
- All reinforcing steel shall be Grade 60.

**GENERAL NOTES**

- Designed according to AASHTO LRFD.
- **BARS**
  - All reinforcing steel shall be Grade 60.

**TABLE OF CONSTANT DIMENSIONS**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Bars A</th>
<th>Bars C</th>
<th>Bars E</th>
<th>Bars F</th>
<th>Bars T</th>
<th>No. of</th>
<th>L</th>
<th>D</th>
<th>G</th>
<th>Reinf</th>
<th>Quantities</th>
<th>Values to be added</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
</tbody>
</table>

- **BARS**
- **Bars A**
- **Bars C**
- **Bars E**
- **Bars F**
- **Bars T**

**CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS**

**CH-PW-0**

**SHORT DEPTH**

- **BARS**
  - **Bars A**
  - **Bars C**
  - **Bars E**
  - **Bars F**
  - **Bars T**

**GENERAL NOTES**

- Designed according to AASHTO LRFD.
- **BARS**
  - All reinforcing steel shall be Grade 60.

**TABLE OF REINFORCING STEEL**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Bars A</th>
<th>Bars C</th>
<th>Bars E</th>
<th>Bars F</th>
<th>Bars T</th>
<th>No. of</th>
<th>L</th>
<th>D</th>
<th>G</th>
<th>Reinf</th>
<th>Quantities</th>
<th>Values to be added</th>
</tr>
</thead>
<tbody>
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</tr>
</tbody>
</table>

- **BARS**
- **Bars A**
- **Bars C**
- **Bars E**
- **Bars F**
- **Bars T**

**CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS**

**CH-PW-0**

**SHORT DEPTH**

- **BARS**
  - **Bars A**
  - **Bars C**
  - **Bars E**
  - **Bars F**
  - **Bars T**

**GENERAL NOTES**

- Designed according to AASHTO LRFD.
- **BARS**
  - All reinforcing steel shall be Grade 60.
### TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL

<table>
<thead>
<tr>
<th>SHEET NO.</th>
<th>15 Degrees</th>
<th>45 Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>Values for one Pipe</td>
<td>Values to be added</td>
</tr>
<tr>
<td>W</td>
<td>Values (W)</td>
<td>Slope (S)</td>
</tr>
<tr>
<td>1</td>
<td>5 - 3.5</td>
<td>36”</td>
</tr>
<tr>
<td>2</td>
<td>5 - 3.5</td>
<td>36”</td>
</tr>
<tr>
<td>3</td>
<td>5 - 3.5</td>
<td>36”</td>
</tr>
<tr>
<td>4</td>
<td>5 - 3.5</td>
<td>36”</td>
</tr>
</tbody>
</table>

### TABLE OF CONSTANT DIMENSIONS

<table>
<thead>
<tr>
<th>Bar Size</th>
<th>3'</th>
<th>6'</th>
<th>9'</th>
<th>12'</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

### TABLE OF REINFORCING STEEL

<table>
<thead>
<tr>
<th>Bars A</th>
<th>Bars A1</th>
<th>Bars A2</th>
<th>Bars A3</th>
<th>Bars A4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

### GENERAL NOTES

- Designed according to AASHTO LRFD Specifications.
- All details are for concrete pipe with the center of the outside face of bars 2" from the surface of the pipe.
- All reinforcing steel shall be Grade 60 grade.
- All concrete shall be Class C and shall have a minimum compressive strength of 3000 psi.
- All grade rates of any pipe may be rounded directly to these cylinder headers.

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**Concrete Headwalls with Parallel Wings for Skewed Pipe Culverts**

CH-PW-S

[Diagram and table details]