CITY OF DENTON, TEXAS

CONSTRUCTION PLANS FOR:

B. SCRIPTURE STREET TRANSMISSION MAIN

- **20" TRANSMISSION MAIN - 826 SERVICE AREA**

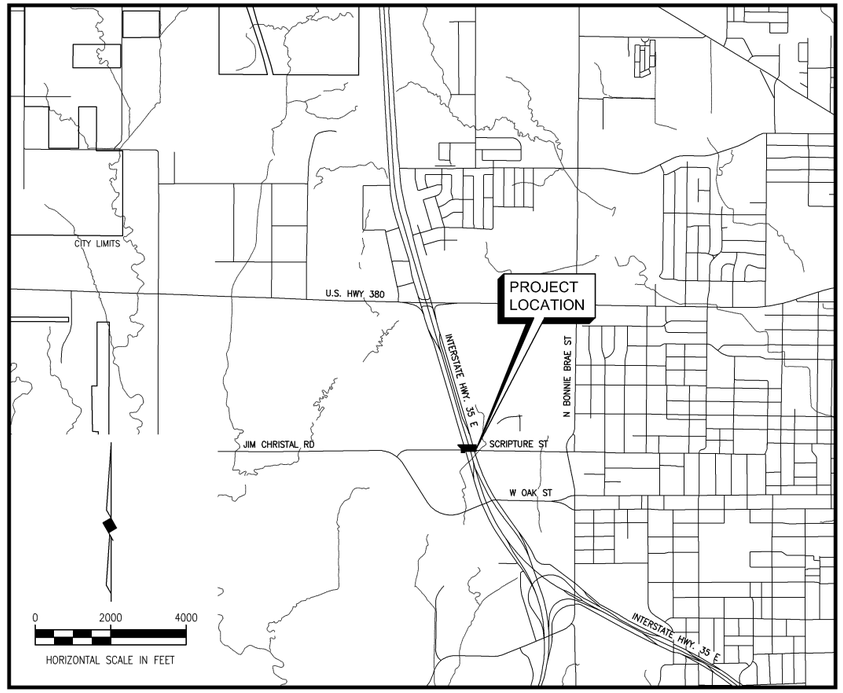
PROJECT NO. PMO 880011
BID NO. 7460

MAYOR
CHRIS WATTS

MAYOR PRO TEM
GERARD HUDSPETH

CITY COUNCIL
GERARD HUDSPETH
KEELY BRIGGS
JESSE DAVIS
JOHN RYAN
DEB ARMINTOR
PAUL MELTZER

ALLOWABLE PIPE MATERIAL:
6"–12" DIA. AWWA C900 PVC, DR14
PIPE >12" DIA. AWWA C151, CL52
AWWA C104, CEMENT MORTAR LINED
AWWA C105, 8MIL AND 4MIL CROSS–LINKED VIRGIN POLYETHYLENE DOUBLE ENCASEMENT
COATING: ISO 8179–1 (ZINC)



LOCATION MAP

SHEET INDEX

CITY OF DENTON

Prepared by:
BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526 TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600, Dallas, TX 75243
Phone: 214-361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED PROFESSIONAL ENGINEER
09/09/2020

September 2020

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REVISED: 9/9/20 – CREINBOLD H:\Projects\Denton\2017145 SH 380 & Scripture Transmission Main\Sheets\2017146 Cover.dwg PLOT SCALE: 1:2 PLOT STYLE: 11x17.ctb PLOTTED BY: COOPER REINBOLD ON 9/9/2020

GENERAL CONSTRUCTION NOTES

1. All construction, materials and workmanship shall conform to Standard Specifications for Public Works Construction, North Central Texas Council of Governments (NCTCOG Standard Specifications) Fourth Edition unless otherwise noted.
2. The Contractor shall provide temporary drainage measures during construction.
3. Bracing of utility poles may be required by utility companies when trenching or excavation is in close proximity to the poles. The cost of bracing poles will borne by the Contractor. There is no separate pay item for this work. The cost shall be considered incidental work.
4. The locations, elevations and dimensions of existing utilities shown on the plans were obtained from Dig Tess and/or available utility company records and plans and are considered approximate. It shall be the Contractor's responsibility to verify locations, elevations, and dimensions of adjacent and/or conflicting utilities sufficiently in advance of construction in order that adjustments can be made to provide adequate clearances. The Contractor shall preserve and protect public utilities at all times during construction. Any damage to utilities resulting from Contractor's operations shall be restored at the Contractor's expenses. The Engineer shall be notified when proposed improvements conflict with utility grades.
5. The Contractor shall immediately repair or replace any physical damage to private property, including, but not limited to fences, walls, pavement, grass, trees, planters and lawn sprinkler and irrigation systems at no cost to the owner. This work shall be subsidiary to the contract, unless otherwise noted.
6. The Contractor shall cut and plug all irrigation lines to be crossed along the project prior to construction. After construction is complete, the Contractor shall reconnect the systems to original or better condition, at no cost to the owner. All work shall be completed by an irrigator licensed in the State of Texas.
7. The. Contractor shall remove and properly dispose of surplus material from the project area. This work shall be subsidiary to the contract and is not a separate pay item.
8. The Contractor shall sawcut, remove and properly dispose of existing pavements, curb and gutter, inlets, driveways and sidewalks. Disposal shall be offsite.
9. The Contractor shall vegetate all areas disturbed by construction. The Contractor shall provide whatever measures are needed, including temporary irrigation and mowing, to ensure establishment of grass. Unless otherwise noted, private lawn areas and parkways in front of private lawn areas disturbed by construction shall be replaced with block sod of a similar grass to that existing. Contractor to water and establish vegetation twice a day for a period of 4 weeks or until grass is established as determined by the City. Work shall be in accordance with NCTCOG Item 202.
10. The Contractor shall protect all trees in the project area and temporary easements during construction. No tree shall be removed unless marked and approved for removal by the City.
11. The Contractor shall be responsible for taking measures to minimize damage to tree limbs, tree trunks, and tree roots along the route of the project. All such measures shall be considered incidental work. Contractor shall inspect the work site in advance and arrange to have any tree limbs pruned that might be damaged by equipment operations. The City shall be notified at least 24 hours prior to any tree trimming work. Nothing shall be stored over the tree root system within the drip line limits of any tree. The Contractor shall employ a qualified landscaper for all work required for tree care to ensure utilization of the best agricultural practices and procedures.
12. All fences to remain in original undisturbed condition unless otherwise noted.
13. It will be the responsibility of the contractor to protect all public utilities in the construction of this project. All manholes, cleanouts, valve boxes, fire hydrants, etc. not shown to be abandoned, must be adjusted to finished grade by the contractor. All utility location and grade adjustment are subsidiary except for those included as pay items.

GENERAL NOTES FOR WATER LINES

1. Fittings shall be ductile iron meeting AWWA Standard C110 or C153 and shall be cement lined inside and bituminous coated on the outside. Where connections are made to pipes of dissimilar materials, suitable bond breakers shall be used.
2. All ductile iron fittings shall be mechanical joint or slip joint type (Class 125 Drilling) and be rated for minimum 250 psi working pressure. Fittings shall be mortar lined and bituminous coated on the exterior.
3. Pipe joints shall be of the push-on type unless otherwise noted.
4. Valves, vault lids, fire hydrants and meter boxes shall be located outside of sidewalk areas, unless otherwise shown in the plans.
5. All trenching, embedment and backfill shall be incidental to the unit cost of pipe.
6. Water line sections crossing wastewater mains or laterals shall be a minimum of 18 feet long and shall be centered over the wastewater main or lateral such that the joints of the water line are equidistance and at least nine feet horizontally from the center line of the wastewater main or lateral. Whenever possible, the crossing shall be centered between the joints of the wastewater main or lateral.
7. Water Lines shall meet AWWA standards as called for in the construction plans.
8. All trench backfill shall be placed in maximum 8-inch loose lifts and mechanically compacted. Testing shall be in accordance with NCTCOG as a minimum.
9. Work to make connections shall be continuous and shall occur during times of low usage.
10. Valves on lines 12-inch and less shall be gate valves. Gate valves on laterals shall be attached to flanged outlet, tee or cross. Gate valves shall conform to AWWA C-509. Butterfly valves shall conform to AWWA C-504.
11. Dewatering of water line trench may be required during construction. Dewatering is subsidiary to pipe installation.
12. Contractor to construct water line to grade shown in the plans. All water lines shall have a minimum cover of 6 feet.
13. During water line testing contractor to dechlorinate in accordance with TCEQ requirements prior to releasing water overland and into storm drainage systems.
14. All exterior surfaces of valves, fire hydrants, pipe, support structures, nuts, bolts and metal appurtenances shall be properly prepared to paint manufacturers specifications and coated with one coat high performance epoxy (3 mils dryfilm thickness) and two coats of high performance polyethylene (2 mils dry film thickness). Hydrants shall be coated by the manufacturer. The hydrant color shall be selected by the City.
15. Contractor to support all existing utilities as construction of new water line crosses these utilities. No separate pay item.
16. All new water services shall be AWWA C901, 1" minimum DR-9 (250 psi) HDPE poly pipe with PE4710 as specified in ASTM F714, from the service tap to the curb stop, 1-inch minimum compression fitting angle stop, and meter box, unless otherwise indicated on the plans. Curb stops will be located within the meter box and facing toward the lot.
17. All water service lines shall shall be embedded with 6-inch sand below and around the pipe and 1-ft of sand over the top of the pipe; from the water main to the meter. Water service lines within City roadway right-of-way shall be compacted to a minimum of the 95% Standard Proctor density with a +/- 3% wet of optimum moisture content.
18. Bolts and nuts for mechanical joints will be of a high-strength low-alloy corrosion resistant steel conforming to ASTM A325 (Type 3).
19. Assembly of pipe to be performed as required by pipe manufacturer. Gaskets shall be clear and lubricated. Do not swing or stab the joint. Align the spigot to the bell, insert spigot into bell and contact gasket. The spigot end is marked with insertion mark. Insert pipe to the mark, do not over-insert.
20. All valve stacks shall be set at finished grade.
21. Contractor shall field locate pipelines at connection points prior to ordering or fabricating proposed pipe. Contractor shall verify pipe size, type, elevation and horizontal location. Contractor shall make all necessary adjustments to connect to existing line after approval from the engineer.

SIDEWALK REPLACEMENT NOTE

1. Sidewalk removal shall be from joint to joint. Sawcut shall be at existing joint. Connection to existing sidewalk shall be with reflex expansion joint material (J D Russell Company). Full panel replacement required.

GENERAL NOTES FOR TRAFFIC CONTROL

1. The temporary traffic control measures shown on these plans are to be considered a minimum. Additional measures shall be furnished when necessary for traffic safety and to meet the latest Texas MUTCD (TMUTCD).
2. When the normal function of the roadway is suspended through closure of any portion of the right-of-way, temporary construction work zone traffic control devices shall be installed to effectively guide the motoring public through the area. Consideration for road user safety, worker safety, and the efficiency of road user flow shall be an integral element of every traffic control zone. All traffic control devices shall be in accordance with the latest TMUTCD.
3. The contractor shall be responsible for maintaining all traffic control devices on an around-the-clock basis, whether or not work is active. Any deficiencies shall be corrected by the contractor immediately, regardless of time of day.
4. Lane closures will not be permitted on arterial roadways before 9:00 am or after 4:00 pm. Violations may result in suspension of all work at the job site for a minimum of 48-hours.
5. All temporary traffic control devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time at the end of the workday, temporary traffic control devices that are no longer appropriate shall be removed or covered. The first violation of this provision will result in a verbal warning to the construction foreman. Subsequent violations will result in suspension of all work at the job site for a minimum of 48-hours.

EROSION CONTROL & VEGETATION NOTES

1. Every soil disturbing activity shall have an accompanying Erosion Control Plan (ECP), and either Construction Site Notice (CSN) for those activities disturbing more than 1 but less than 5 acres, or Notice of Intent (NOI) for those activities disturbing 5 or more acres including those activities less than 5 acres, but are part of a common plan of development totalling 5 or more acres. A copy of the appropriate CSN or NOI shall be provided to the City.
2. The CSN or NOI shall be posted in a location viewable to the public until construction is complete and Notice of Termination (NOT) submitted. The Storm Water Pollution Prevention Plan (SWP3) shall be readily available for review by Federal, State, or local officials.
3. No soil disturbing activities will occur prior to the SWP3, ECP, and associated Best Management Practices (BMP) being fully implemented.
4. The contractor shall employ measures as necessary to prevent dirt, mud, debris from being tracked off site. Any dirt, mud, debris tracked offsite shall be cleaned up by the contractor immediately.
5. The site shall be reviewed by the operator or his representative weekly, and after any major storm. Adjustments/repairs to the erosion control measure will be made as needed.
6. A completed NOT shall be submitted to the State and a copy of this NOT shall be provided to the City prior to final acceptance.

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED
PROFESSIONAL ENGINEER

09/09/2020

CITY OF DENTON, TEXAS
SCRIPTURE STREET TRANSMISSION MAIN

GENERAL NOTES

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. **2**

TREE PROTECTION NOTES

1. Unless shown on the plans to be removed, all trees within the construction area shall be protected during construction with temporary fencing or other measures as needed including pruning of limbs and roots.
2. Protective measures shall be taken prior to the start of any work in the area and shall be maintained throughout the duration of the project.
3. Pruning of limbs to provide clearance for construction equipment shall take place before construction begins to prevent damage to trees by ripping and tearing of branches.
4. It is anticipated that in some instances trenches will encroach in the drip line of protected trees. Encroachment in these instances is permitted. Fencing will be installed outside the trench in such a manner as to limit the amount of encroachment while allowing all necessary trench safety measures.
5. Any roots exposed during construction activities shall be pruned flush with the soil. If exposed root areas are not backfilled with topsoil within two days of initial exposure, they shall be covered with organic material in a manner that reduces the soil temperature and minimizes water loss due to evaporation.
6. No topsoil dressing greater than 4 inches shall be permitted within drip line areas.

PEDESTRIAN ACCESSIBILITY (WITHIN PUBLIC R.O.W.)

1. All newly constructed sidewalks, curb ramps and crosswalks installed shall be considered a pedestrian access route and shall be considered a pedestrian access route and shall conform to the most current "Draft" Guidelines for Public Rights-of-Way created by the United States Access Board. *http://www.access-board.gov/prowac/draft.htm*
2. Curb Ramps shall conform to all federal guidelines, but shall generally adhere to the following criteria:
   a. 8.3% maximum running slope
   b. 2.0% maximum cross slope
   c. Minimum 4.0-ft width
   d. Minimum 4.0-ft x 4.0-ft landings at top and bottom of ramps with 2.0% maximum running slope and cross slope.
   e. Detectable warning surface placed at point of entry into roadway.
3. Detectable warning surface shall be pre-manufactured plates with truncated dome material built in. Only plates from TxDOT approved vendors shall be permitted and shall be installed per manufacturer's specifications. Brick pavers will not be allowed. Final color shall be approved by the City.
4. The contractor shall provide a clear and safe route for pedestrians adjacent to the site for the duration of construction. A temporary pedestrian route shall be provided when any existing sidewalk is closed due to construction activity.
5. Construction materials shall be kept off existing sidewalks and consolidated in areas within the City right-of-way, unless otherwise approved by the City.

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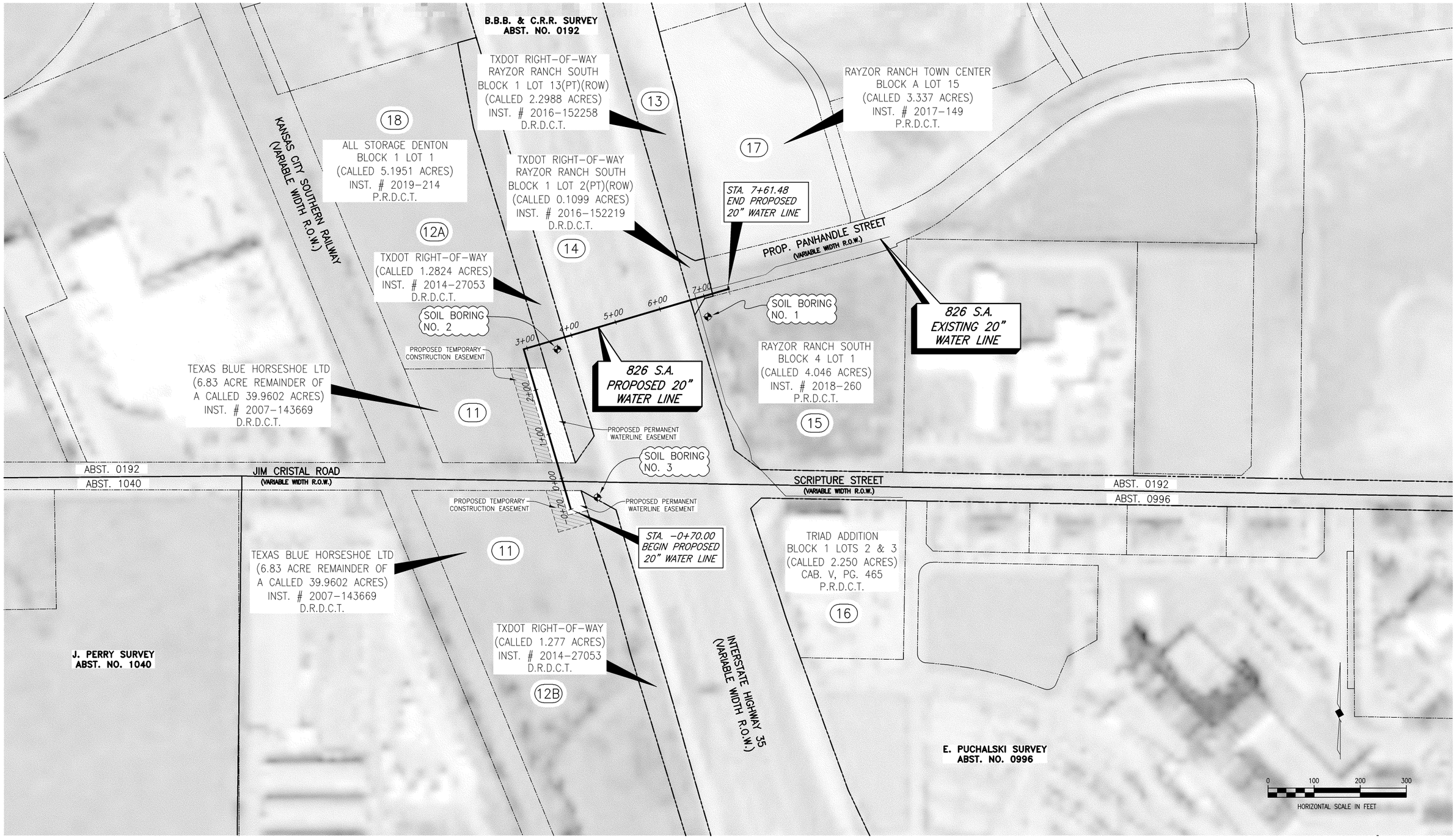
GENERAL NOTES

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. 3



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Dallas, Texas 75243 (214) 361-7900

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CITY OF DENTON, TEXAS

SCRIPTURE STREET TRANSMISSION MAIN

PROPERTY OWNER MAP & PROPOSED WATERLINE ALIGNMENT

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. **4**

REVISED: 9/9/20 – CREINBOLD H:\Projects\Denton\2017145 SH 380 & Scripture Transmission Main\Sheets\2017146 Property Strip Map.dwg PLOT SCALE: 1:2 PLOT STYLE: 11x17.ctb PLOTTED BY: COOPER REINBOLD ON 9/9/2020

N 7129004.2478
E 2374881.1584
STA. −0+70.00
BEGIN PROP. 12" WATER LINE
FURNISH & INSTALL:
1−12" PLUG
1−12"X6" TEE
1−6" GATE VALVE
1−STD. F.H.
7 L.F. 6" W.L.

N 7129071.4006
E 2374861.3971
STA. 0+00.00
CUT, PLUG, & ABANDON:
EXIST 8" W.L. (WEST)
EXIST 8" W.L. (EAST)
FURNISH & INSTALL:
1−20"x20" CROSS
1−20"x8" TEE (WEST)
1−20"x12" REDUCER (SOUTH)
1−20"x8" REDUCER (EAST)
1−20" GATE VALVE (WEST)
1−12" GATE VALVE (SOUTH)
1−20" 11.25° BEND (WEST)
2−8" GATE VALVE (1−WEST, 1−EAST)
1−20" RESTRAINED PLUG (WEST)
1−8" 22.5° BEND (EAST)
1−8" 45° BEND (EAST)
2−8" 90° BEND (1−WEST, 1−EAST)
14 L.F. 20" W.L. (WEST)
6 L.F. 20" W.L. (EAST)
20 L.F. 8" W.L. (WEST)
20 L.F. 8" W.L. (EAST)
CONNECT TO EXIST. 8" W.L. (WEST)
USING FLANGE ISOLATION SETS
CONNECT TO EXIST. 8" W.L. (EAST)
USING FLANGE ISOLATION SETS

TEXAS BLUE
HORSESHOE LTD
INST. # 2007−143669
D.R.D.C.T.

EXISTING 60' PUBLIC UTILITY EASEMENT

EXIST. VALVE LOCATED 270 FEET WEST FROM STA. 0+17

STA. −0+70 TO STA. 3+02
FURNISH & INSTALL:
2557 S.Y. HYDROMULCH
FERTILIZE & WATER

TEXAS BLUE
HORSESHOE LTD
INST. # 2007−143669
D.R.D.C.T.

ALL STORAGE DENTON
BLOCK 1 LOT 1
INST. # 2019−214
P.R.D.C.T.

EXISTING 12" WATER LINE

BEFORE YOU DIG Texas811.com

T.B.M − 3" BRASS DISK TXDOT MONUMENT EAST OF I.H. 35 NORTHBOUND ACCESS ROAD
N=7129021.8430,
E=2375251.4540
ELEV. 683.21
T.B.M − X FOUND IN CONC. INLET AT INTERSECTION OF I.H. 35 AND SCRIPTURE STREET
N. 7129092.1480,
E. 2375243.0410
ELEV. 683.89

WARNING!! GAS LINE IN VICINITY OF STA. 0+49±

NOTE TO CONTRACTOR:
ACCESS TO ALL STORAGE DENTON IS RESTRICTED TO EXISTING 20' WATER EASEMENT.

EXISTING VARIABLE WIDTH DETENTION & DRAINAGE EASEMENT

HEADWALL
24" RCP
HEADWALL
W.V.
12" W.
RIP−RAP

−0+70
0+00
1+00
2+00
3+00

R.O.W.
SMALL TREES
GAS
8" S.S.
8" W.

GEOTECH BORE NO. 3

U.P.
W.V.
3−24" RCP
S.S.M.H.
5/8" I.R.F.
F.H.
VAULT
SIGN
OPTIC
2−8" ELM
SMALL TREES

WARNING!! OVERHEAD ELECTRIC LINES IN VICINITY OF STA. 0+31±

826 S.A.
PROPOSED 20" WATER LINE

PROPOSED 20' PERMANENT EASEMENT
PROPOSED 30' TEMPORARY CONST. ESMT.
1/2" I.R.F.C.
EXISTING 20' WATER EASEMENT
TXDOT PHASE II 60% PLANS
EXISTING 8" SAN. SEWER
S.S.M.H.
8" S.S.
8" W.
DITCH FL
TOP OF BANK
PROPOSED 40'x10' BORE PIT
FIELD LOCATION OF 8" W.L.
15'
50' TO EDGE OF PAVEMENT

N 7129351.7238
E 2374778.9053
P.I. STA. 2+92.21
Δ = 90°00'00"
FURNISH & INSTALL:
1−20"x20" TEE
1−20"x12" TEE (NORTH)
3−20" GATE VALVE (1−NORTH, 1−SOUTH, 1−EAST)
1−20" RESTRAINED PLUG (NORTH)
20 L.F. 20" W.L. (NORTH)
REMOVE EXIST. 12" PLUG (NORTHWEST)
CONNECT TO EXIST. 12" W.L. (NORTHWEST)
USING FLANGE ISOLATION SETS

CONNECT TO EXIST. 8" W.L.
8" G.V.
20" PLUG
20"X8" TEE
20" G.V.
12" W.L.
20"X20" CROSS
8" W.L.
20" W.L.
8" G.V.
20" W.L.
20"X12" REDUCER
12" G.V.
20"X8" REDUCER
8" W.L.
EXIST. 8" W.L. (TO BE ABANDONED)
CONNECT TO EXIST. 8" W.L.
NOT TO SCALE

FIELD LOCATION OF 8" W.L.

N 7129099.0324
E 2374853.2658
STA. 0+28.80
REMOVE & REPLACE:
20 L.F. EXIST. 8" SANITARY SEWER WITH AWWA C900, DR18, COLORED GREEN, 150 PSI PRESSURE CLASS PIPE (10 L.F. ON EITHER SIDE OF 20" W.L.)

REPLACE EXIST. 8" S.S. WITH 150 PSI PIPE

CONCRETE PVMT.
ASPHALT PVMT.
TOP OF BANK
FIELD LOCATION OF 6" GAS LINE
GEOTECH BORE NO. 2

WARNING!! GAS LINE IN VICINITY OF STA. 3+65±

STA. 3+33 TO STA. 4+00
FURNISH & INSTALL:
67 L.F. 20" AWWA C151 CL52 D.I.P. IN 36" STEEL ENCASEMENT PIPE (5/8" THICK) BY BORE

SOUTHBOUND I−35 FRONTAGE ROAD

MATCH LINE STA. 4+00
N 7129382.1537, E 2374882.3121

0 20 40 60
HORIZONTAL SCALE IN FEET

STA. 0+28.80
EXIST. 8" SAN. SEW.
F.L. 681.4±
FIELD VERIFY DEPTH & LOCATION BEFORE CONSTRUCTION

STA. 0+49.46
WARNING!! UNDERGROUND GAS LINE
F.L. 682.5±
FIELD VERIFY DEPTH & LOCATION BEFORE CONSTRUCTION

STA. 0+17.14
EXIST. 8" W.L.
F.L. 681.8
FIELD VERIFIED 8/28/18

EXISTING GROUND LINE

I.H. 35 R.O.W.
HOR. P.I. STA. 2+92.21
TXDOT PHASE II 60% PLANS
SB FRONTAGE ROAD

STA. 3+47.55
EXIST. 8" SAN. SEW.
F.L. 682.4
FIELD VERIFIED 9/12/17
15'
STA. 3+58.20
EXIST. 8" W.L.
F.L. 682.6
FIELD VERIFIED 1/26/18
STA. 3+65.15
WARNING!! UNDERGROUND GAS LINE
F.L. 684.1
FIELD VERIFIED 1/26/18

STA. 0+15.19
12" GATE VALVE
STA. 0+00
20"x20" CROSS
STA. 2+92.21
20"x20" TEE
STA. 2+82.21
20" GATE VALVE
STA. 2+98.46
20" GATE VALVE

12" ON −0.50%
20" ON −0.50%
20" ON −4.50%
20" ON +0.12%

59 L.F. 12" AWWA C900 DR14 PVC w/ CLASS 'B−3' EMBEDMENT BY OPEN CUT
STA. −0+11
313 L.F. 20" AWWA C151 CL52 D.I.P. w/ CLASS 'B−3' EMBEDMENT BY OPEN CUT
STA. 3+02
STA. 3+33
67 L.F. 20" AWWA C151 CL52 D.I.P. IN 36" DIA. STEEL ENCASEMENT PIPE (5/8" THICK) BY BORE
31 L.F. 20" AWWA C151 CL52 D.I.P. IN 36" DIA. STEEL ENCASEMENT PIPE (5/8" THICK) BY OPEN CUT

P.V.I. STA. −0+70.00 F.L. 20" W.L. 676.89
P.V.I. STA. −0+10.62 F.L. 20" W.L. 676.60
F.L. 20" W.L. 676.21
F.L. 20" W.L. 675.71
F.L. 20" W.L. 675.21
P.V.I. STA. 2+25.31 F.L. 20" W.L. 675.08
P.V.I. STA. 2+92.21 F.L. 20" W.L. 672.07
F.L. 20" W.L. 672.08
F.L. 20" W.L. 672.20

690 685 680 675 670 665 660 655
−1+00 0+00 1+00 2+00 3+00 4+00

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CITY OF DENTON, TEXAS

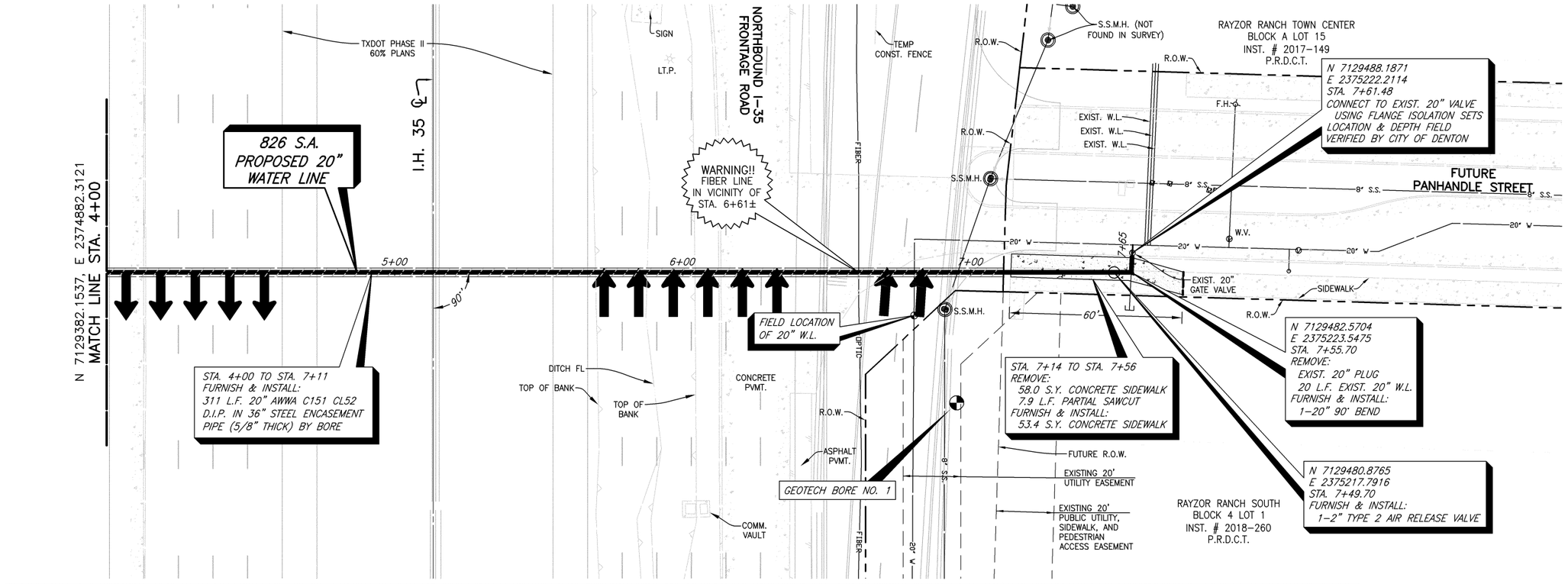
SCRIPTURE STREET TRANSMISSION MAIN

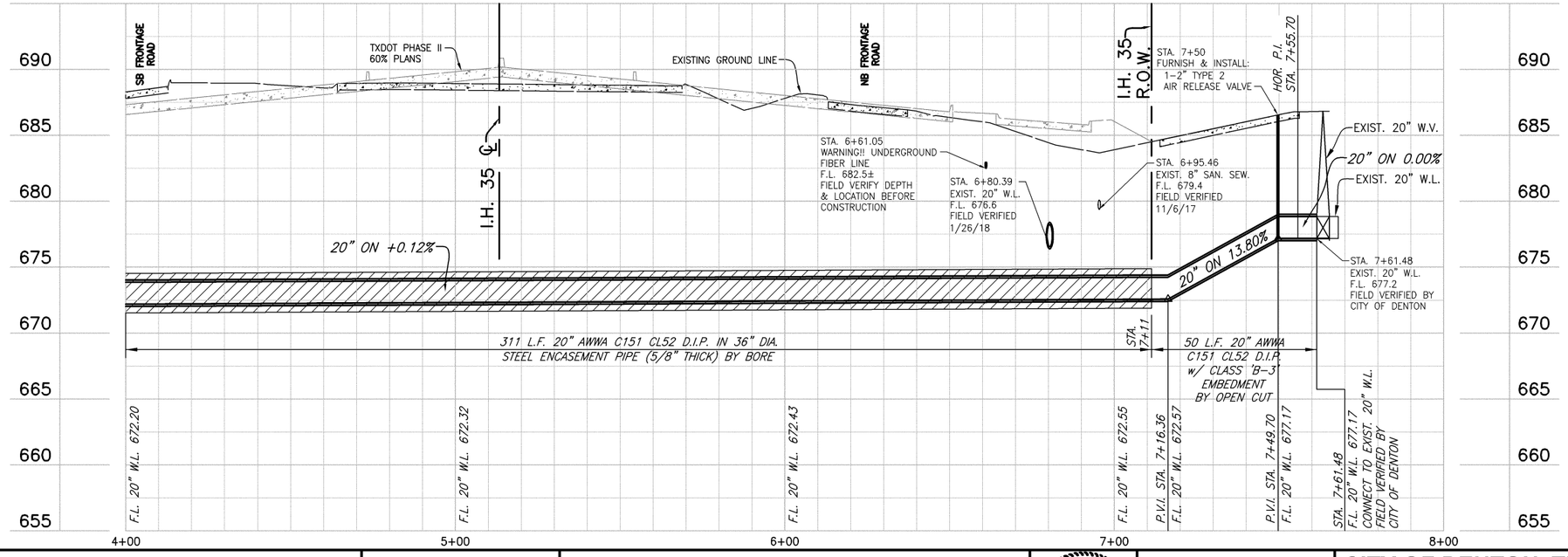
SCRITPURE STREET - 20" WATER LINE (826 SERVICE AREA)
PLAN AND PROFILE
STA. -0+70 TO STA. 4+00

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. 5





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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
85226
REGISTERED
PROFESSIONAL ENGINEER

09/09/2020

CITY OF DENTON, TEXAS

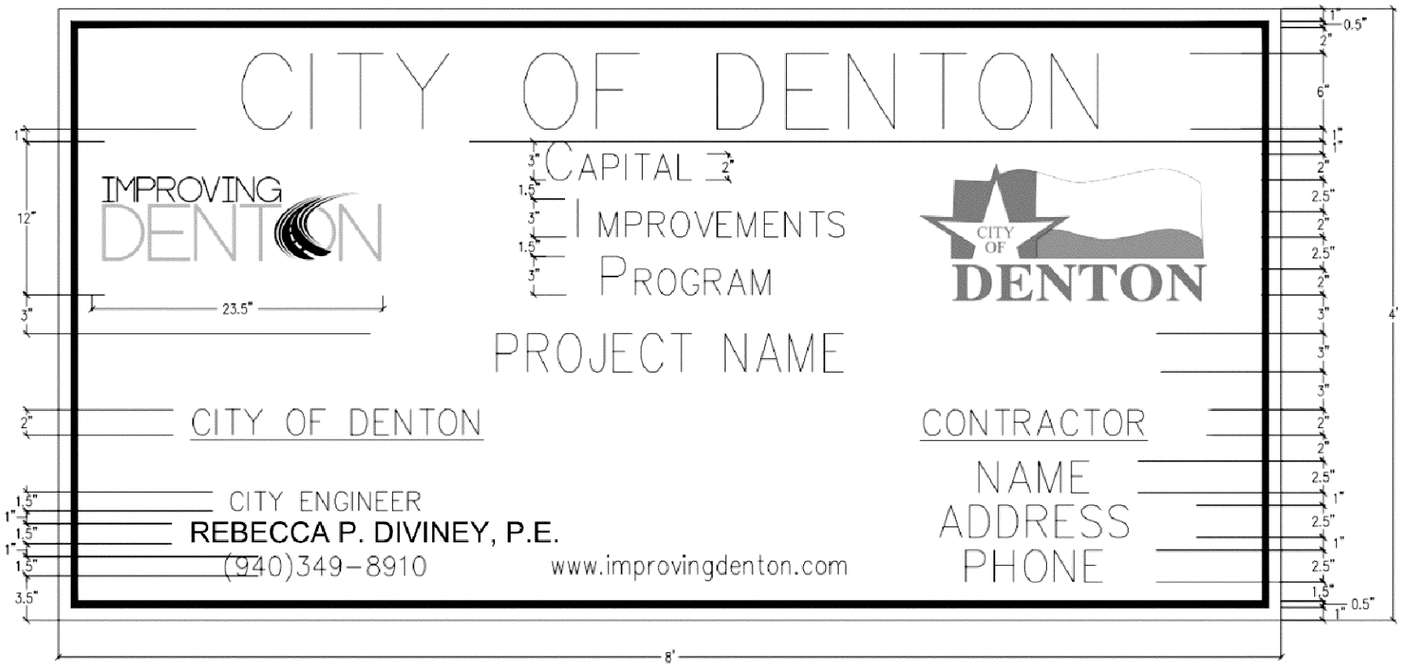
SCRIPTURE STREET TRANSMISSION MAIN

SCRITPURE STREET - 20" WATER LINE (826 SERVICE AREA)
PLAN AND PROFILE
STA. 4+00 TO STA. 7+61.48

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. 6



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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS — GARY C. HENDRICKS — 65226 — REGISTERED PROFESSIONAL ENGINEER

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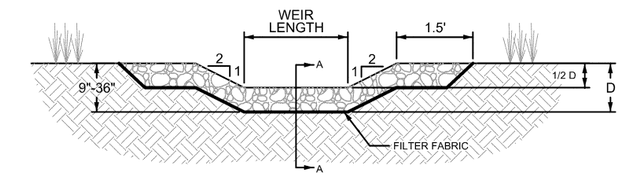
PROJECT SIGN DETAIL

BHC PROJECT NO. 2017-146

September 2020

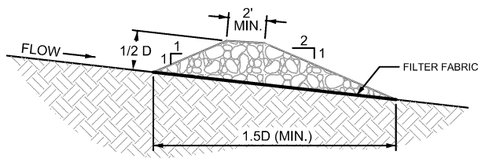
SHEET NO. 7

REVISED: 9/9/20 – CREINBOLD H:\Projects\Denton\2017145 SH 380 & Scripture Transmission Main\Sheets\2017146 PROJECT SIGN.dwg PLOT SCALE: 1:2 PLOT STYLE: 11x17.ctb PLOTTED BY: COOPER REINBOLD ON 9/9/2020



ROCK CHECK DAM VIEW LOOKING UPSTREAM

N.T.S.



CROSS SECTION A-A

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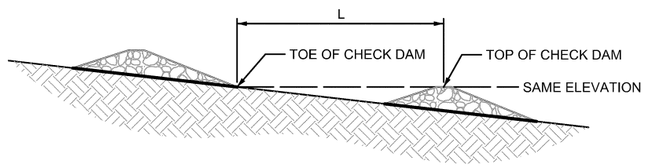

SPACE BETWEEN ROCK CHECK DAMS

N.T.S.

NOTES:
ACTUAL DIMENSIONS OF THE CHECK DAMS SHALL BE DESIGNED BASED ON FLOW CONDITIONS IN THE DRAINAGE SWALE OR DITCH. PROVIDE CALCULATIONS THAT DOCUMENT THE FOLLOWING PARAMETERS USED TO DESIGN THE CHECK DAM.

-HEIGHT OF CHECK DAMS (D) BASED ON SWALE OR DITCH DIMENSIONS AND FLOW CONDITIONS

-SPACING OF CHECK DAMS BASED ON GRADE OF THE SWALE OR DITCH. TOP OF DOWNSTREAM DAM SHALL BE AT THE SAME ELEVATION AS TOE OF UPSTREAM DAM

FIGURE 2.1 STANDARD CONSTRUCTION DETAIL - ROCK CHECK DAMS (1 OF 2)

iSWM™ TECHNICAL MANUAL CONSTRUCTION CONTROLS

ROCK CHECK DAM GENERAL NOTES:

1. SEE NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.9 CHECK DAM (ROCK).

2. STONE SHALL BE WELL GRADED WITH SIZE RANGE FROM 1 1/2 TO 3 1/2 INCHES IN DIAMETER DEPENDING ON EXPECTED FLOWS.

3. THE CHECK DAM SHALL BE INSPECTED AS SPECIFIED IN THE SWPPP AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION AS INTENDED DUE TO SILT ACCUMULATION AMONG THE ROCKS, WASHOUT, CONSTRUCTION TRAFFIC DAMAGE, ETC.

4. WHEN SILT REACHES A DEPTH EQUAL TO ONE-THIRD OF THE HEIGHT OF THE CHECK DAM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF PROPERLY.

5. WHEN THE SITE HAS ACHIEVED FINAL STABILIZATION OR ANOTHER EROSION OR SEDIMENT CONTROL DEVICE IS EMPLOYED, THE CHECK DAM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

FIGURE 2.1 NOTES ON ROCK CHECK DAM (2 OF 2)

CHECK DAM
REVISED

CHECK DAM
REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED
PROFESSIONAL ENGINEER

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CONSTRUCTION DETAILS

BHC PROJECT NO. 2017-146

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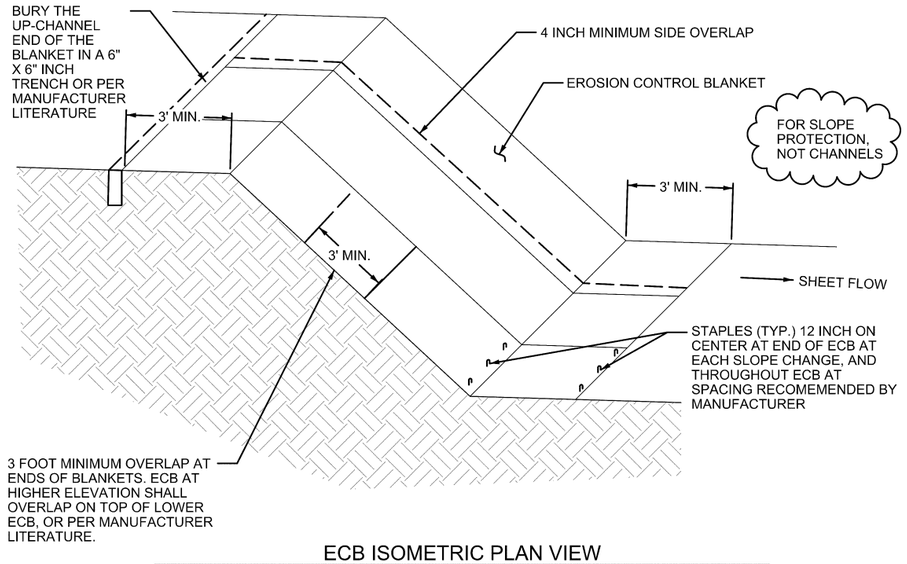
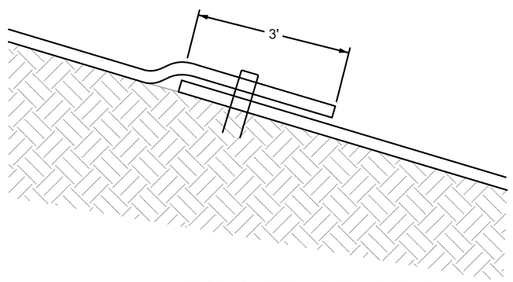


ECB ISOMETRIC PLAN VIEW

N.T.S.



ECB OVERLAP EXAMPLE

N.T.S.

FIGURE 2.7 STANDARD CONSTRUCTION DETAIL - TEMPORARY EROSION CONTROL BLANKETS (1 OF 2)

iSWM™ TECHNICAL MANUAL CONSTRUCTION CONTROLS

EROSION CONTROL BLANKETS GENERAL NOTES:

1. SEE NCTCOG STANDARD SPECIFICATIONS (2017) SECTION 202.15.

2. PRIOR TO THE INSTALLATION OF ANY EROSION CONTROL BLANKETS, ALL ROCKS, DIRT CLODS, STUMPS, ROOTS, TRASH AND ANY OTHER OBSTRUCTIONS THAT WOULD PREVENT THE BLANKET FROM LYING IN DIRECT CONTACT WITH THE SOIL SHALL BE REMOVED. ANCHOR TRENCHING SHALL BE LOCATED ALONG THE ENTIRE PERIMETER OF THE INSTALLATION AREA, EXCEPT FOR SMALL AREAS WITH LESS THAN 2% SLOPE.

3. INSTALLATION AND ANCHORING SHALL CONFORM TO THE RECOMMENDATIONS SHOWN WITHIN THE MANUFACTURER'S PUBLISHED LITERATURE FOR THE APPROVED EROSION CONTROL BLANKET. PARTICULAR ATTENTION MUST BE PAID TO JOINTS AND OVERLAPPING MATERIAL.

4. IN ABSENCE OF MANUFACTURE'S LITERATURE, A MINIMUM 11-GUAGE WIRE STAPLES, 6-INCHES IN LENGTH AND 1-INCH WIDTH WILL BE USED.

5. AFTER APPROPRIATE INSTALLATION, THE BLANKETS SHOULD BE CHECKED FOR UNIFORM CONTACT WITH THE SOIL, SECURITY OF THE LAP JOINTS, AND FLUSHNESS OF THE STAPLES WITH THE GROUND.

6. INSPECTION SHALL BE AS SPECIFIED IN THE SWPPP.

FIGURE 2.7 NOTES ON TEMPORARY EROSION CONTROL BLANKETS (2 OF 2)

EROSION CONTROL BLANKET REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED PROFESSIONAL ENGINEER

09/09/2020

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SCRIPTURE STREET TRANSMISSION MAIN

CONSTRUCTION DETAILS

BHC PROJECT NO. 2017-146

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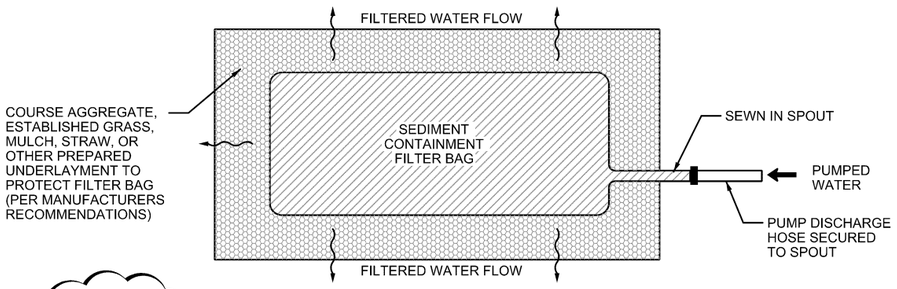
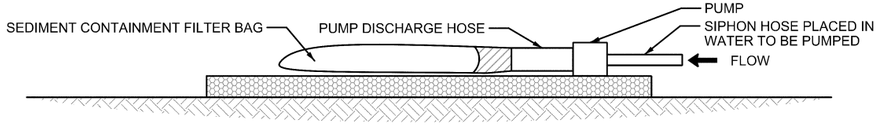
SHEET NO. **9**



SEDIMENT FILTER BAG PLAN VIEW

N.T.S.



SEDIMENT FILTER BAG PROFILE

N.T.S.

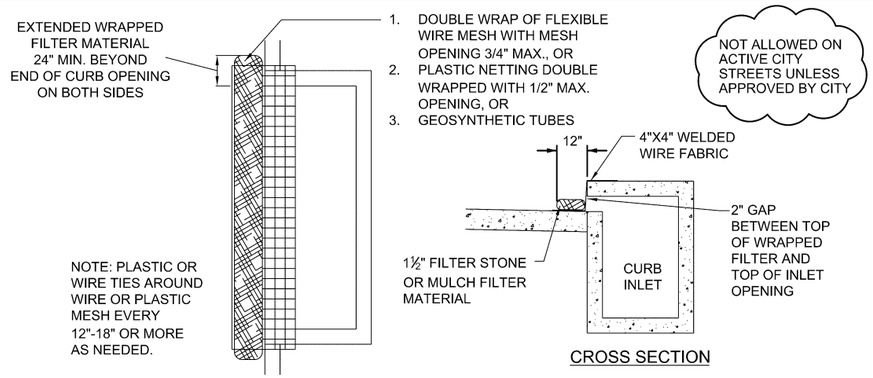
DEWATERING CONTROL GENERAL NOTES:

1. THE BAG SHOULD BE A NON-WOVEN, NEEDLE-PUNCHED, GEOTEXTILE THAT MEETS ASTM CRITERIA-D4632 , D4833, D-3786, D-4355, D-4491, AND D-4751.

2. CAPACITY, INSTALLATION, MAINTENANCE , AND REMOVAL OF BAGS AND PUMPS SHOULD CONFORM TO PUBLISHED MANUFACTURER LITERATURE.

FIGURE 3.4 STANDARD CONSTRUCTION DETAIL - DEWATERING CONTROLS

DEWATERING CONTROLS
REVISED

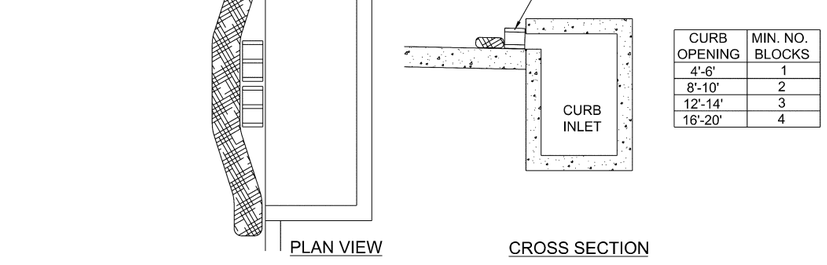


PLAN VIEW

CROSS SECTION

NOTE: VERTICAL PANEL BARRICADES TO BE PLACED WHEN LOCATED ON AN ACTIVE STREET.

TYPE A CURB INLET PROTECTION



CURB OPENING	MIN. NO. BLOCKS
4'-6'	1
8'-10'	2
12'-14'	3
16'-20'	4

PLAN VIEW

CROSS SECTION

NOTE: SEE NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.14 AND 202.18

ALTERNATIVE FORM FOR TYPE A CURB INLET PROTECTION

FIGURE 3.6 STANDARD CONSTRUCTION DETAIL - FILTER TUBE CURB INLET PROTECTION

INLET PROTECTION
REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED PROFESSIONAL ENGINEER

09/09/2020

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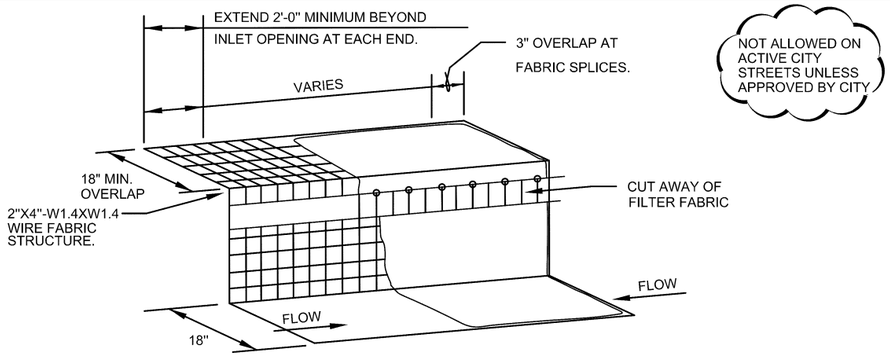
SCRIPTURE STREET TRANSMISSION MAIN

CONSTRUCTION DETAILS

BHC PROJECT NO. 2017-146

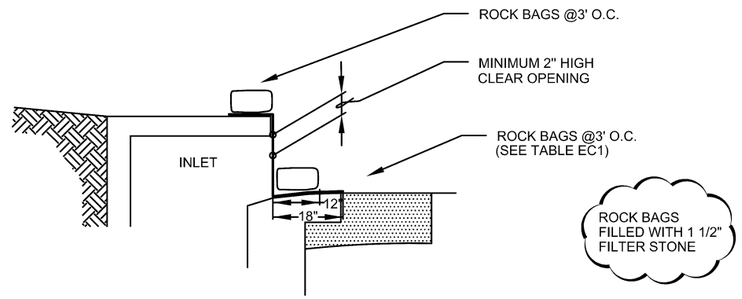
September 2020

SHEET NO. **10**



HOG WIRE WEIR CURB INLET PROTECTION ISOMETRIC VIEW

N.T.S.



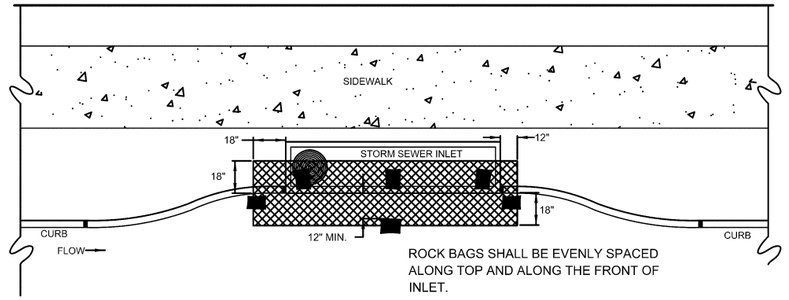
HOG WIRE WEIR CURB INLET PROTECTION CROSS SECTION

N.T.S.

NOTE: THIS CONTROL WILL DECREASE THE CAPACITY OF THE INLET. IT SHALL ONLY BE USED WHEN AN ENGINEER HAS DETERMINED THERE IS ADEQUATE STORAGE OR POSITIVE OVERFLOW.

REFERENCE: NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.14

FIGURE 3.7 STANDARD CONSTRUCTION DETAIL -
HOG WIRE WEIR CURB INLET PROTECTION (1 OF 2)



HOG WIRE WEIR CURB INLET PROTECTION PLAN VIEW

N.T.S.

TABLE EC1

INLET OPENING	MINIMUM NUMBER OF ROCK BAGS	
	TOP	FRONT
5'	2	3
10'	3	3
15'	3	4
20'	4	4

NOTES:

1. A SECTION OF FILTER FABRIC SHALL BE REMOVED AS SHOWN ON THIS DETAIL TO PROVIDE A 2" MINIMUM CLEAR OPENING. FABRIC MUST BE SECURED TO WIRE BACKING WITH CLIPS OR HOG RINGS AT THIS LOCATION.
2. INSPECTION SHALL BE MADE BY THE CONTRACTOR AND SILT ACCUMULATION MUST BE REMOVED WHEN DEPTH REACHES 2".
3. INLET PROTECTIONS SHALL BE REMOVED AS SOON AS THE SOURCE OF SEDIMENT IS STABILIZED.

FIGURE 3.7 STANDARD CONSTRUCTION DETAIL -
HOG WIRE WEIR CURB INLET PROTECTION (2 OF 2)

INLET PROTECTION
REVISED

INLET PROTECTION
REVISED

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PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED
PROFESSIONAL ENGINEER
09/09/2020

CITY OF DENTON, TEXAS
SCRIPTURE STREET TRANSMISSION MAIN

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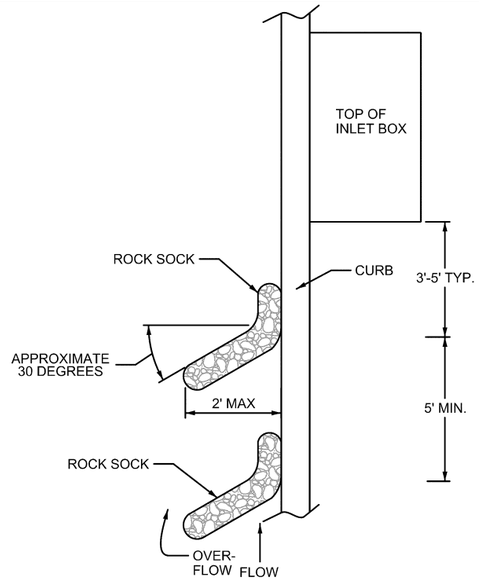
BHC PROJECT NO. 2017-146

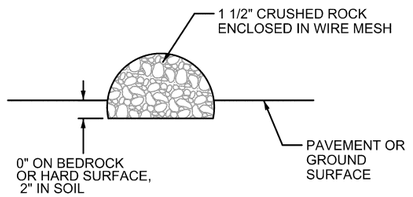
September 2020

SHEET NO. **11**



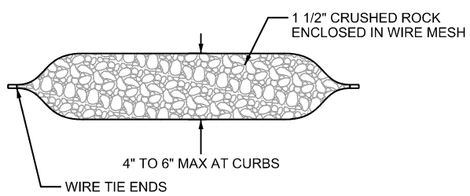
CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION DETAIL

N.T.S.



ROCK SOCK SECTION

N.T.S.



ROCK SOCK PLAN

N.T.S.

FIGURE 3.9 STANDARD CONSTRUCTION DETAIL -
CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION (1 OF 2)

CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION GENERAL NOTES:

1. THIS DETAIL IS INTENDED FOR USE WITH ON-GRADE INLETS (NOT A LOW POINT) TO TRAP SEDIMENT.
2. DO NOT INSTALL ON INLETS WHERE THE ROCK SOCKS WOULD EXTEND INTO AN ACTIVE TRAVEL LANE.
3. ROCK SOCKS MAY BE USED ON PAVED OR UNPAVED SURFACES.
4. MAXIMUM ROCK SOCK DIAMETER 4" TO 6".
5. MINIMUM OF 2 CURB ROCK SOCKS.

FIGURE 3.9 STANDARD CONSTRUCTION DETAIL -
CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION (2 OF 2)

ROCK SOCK
REVISED

ROCK SOCK
REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED
PROFESSIONAL ENGINEER

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BHC PROJECT NO. 2017-146

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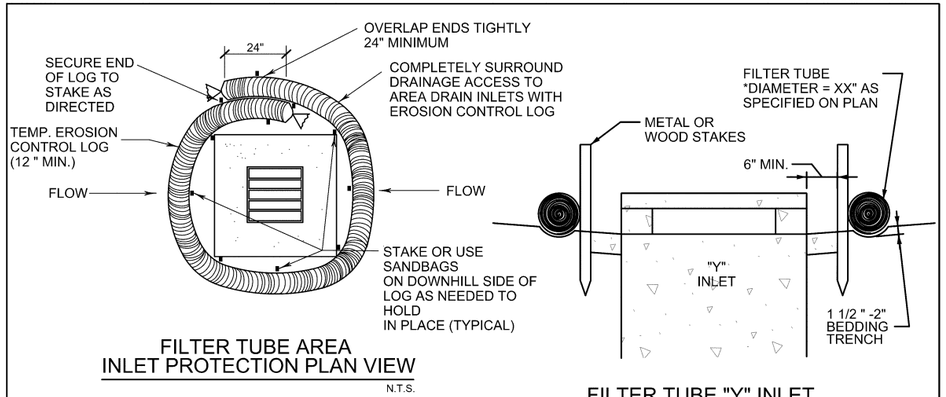
SHEET NO. **12**

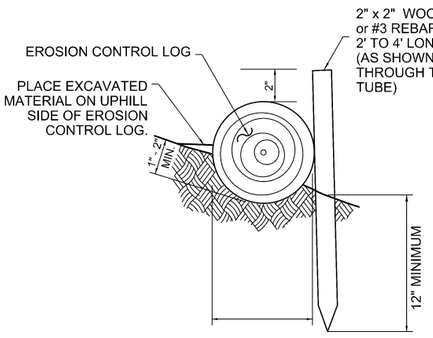


FILTER TUBE AREA
INLET PROTECTION PLAN VIEW

N.T.S.

FILTER TUBE "Y" INLET
PROTECTION CROSS SECTION

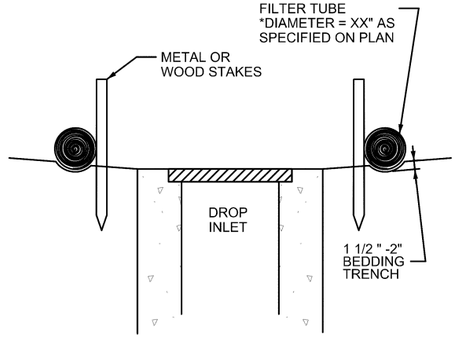
N.T.S.



NOTE: COMPACT EXCAVATED SOIL TO PREVENT UNDERCUTTING.

EMBEDMENT EXAMPLE
FOR FILTER TUBE

N.T.S.

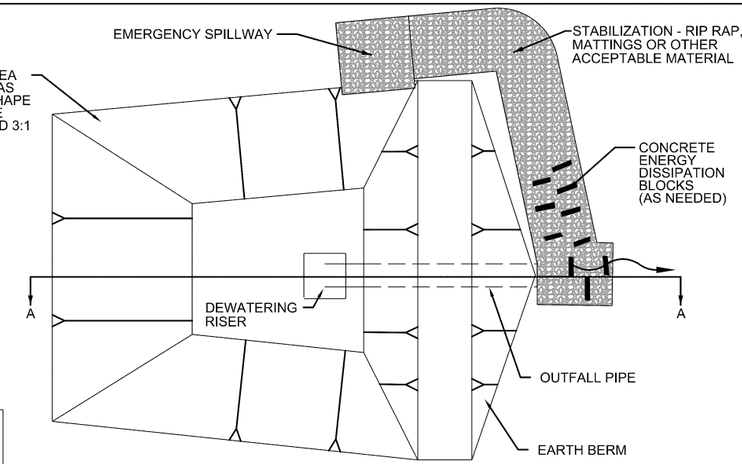


FILTER TUBE DROP INLET
PROTECTION CROSS SECTION

N.T.S.

NOTE: SEE NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.18

FIGURE 3.13 STANDARD CONSTRUCTION DETAIL - FILTER TUBE AREA INLET PROTECTION

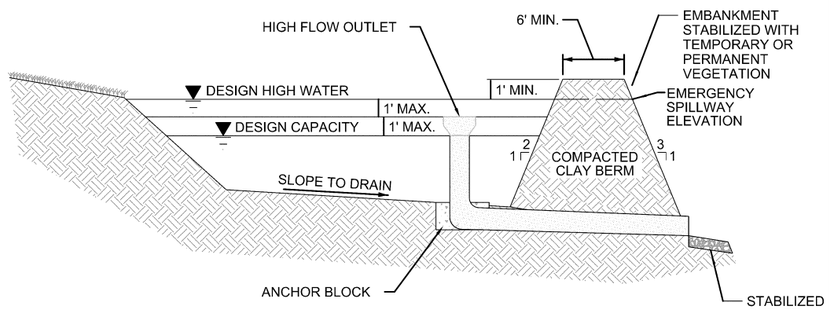


DESIGN COMPUTATION REQUIRED

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

PLAN VIEW

N.T.S.



CROSS SECTION A-A

N.T.S.

REFERENCE: NCTCOG iSWM CRITERIA MANUAL FOR SITE DEVELOPMENT AND CONSTRUCTION, SECTION 3.9 SEDIMENT BASIN.

FIGURE 3.20 STANDARD CONSTRUCTION DETAIL -
SEDIMENT BASIN WITH OVERFLOW RISER

INLET PROTECTION
REVISED

SEDIMENT BASIN
REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED PROFESSIONAL ENGINEER

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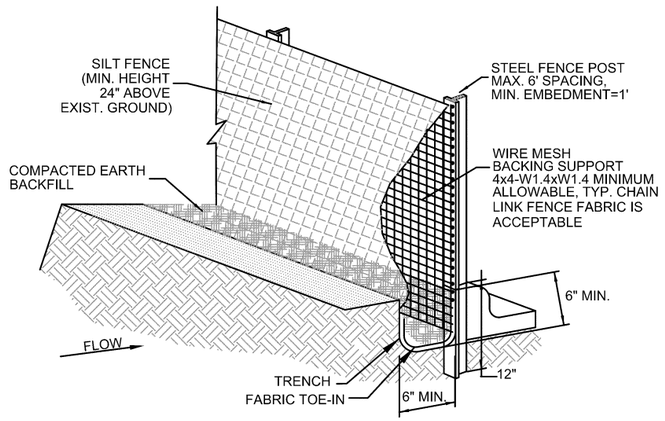
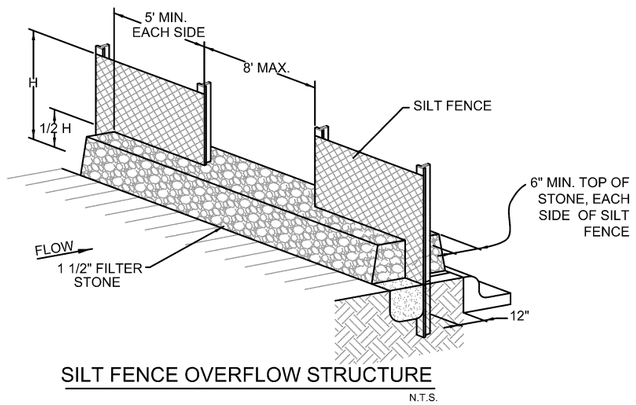


ISOMETRIC PLAN VIEW

N.T.S.



SILT FENCE OVERFLOW STRUCTURE

N.T.S.

FIGURE 3.28 STANDARD CONSTRUCTION DETAIL - FOR SILT FENCE (1 OF 2)

SILT FENCE GENERAL NOTES:

1. DESIGN SHALL SHOW ON THE DRAWINGS THE LOCATIONS WHERE OVERFLOW STRUCTURES SHALL BE INSTALLED. OVERFLOW STRUCTURES ARE REQUIRED AT ALL LOW POINTS AND AT A SPACING OF APPROXIMATELY 300 FEET WHERE NO LOW POINT IS APPARENT.

2. DESIGNER SHALL SHOW ON THE DRAWINGS THE LOCATIONS WHERE SILT FENCE IS TO BE TURNED UPSLOPE AT THE ENDS. UPSLOPE LENGTHS SHALL BE A MINIMUM OF 10 FEET.

3. POST WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED ON A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF ONE FOOT.

4. THE TOE OF THE SILT FENCE SHALL BE TRENCHED IN WITH A SPADE OR MECHANICAL TRENCHER, SO THAT THE DOWNSLOPE FACE OF THE TRENCH IS FLAT AND PERPENDICULAR TO THE LINE OF FLOW.

5. THE TRENCH MUST BE A MINIMUM OF 6 INCHES DEEP AND 6 INCHES WIDE TO ALLOW FOR THE SILT FENCE FABRIC TO BE LAID IN THE GROUND AND BACKFILLED WITH COMPACTED MATERIAL.

6. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH SUPPORT POST OR TO WIRE BACKING, WHICH IN TURN IS ATTACHED TO THE FENCE POST. THERE SHALL BE A 3 FOOT OVERLAP, SECURELY FASTENED WHERE ENDS OF FABRIC MEET.

7. INSPECTION SHALL BE AS SPECIFIED IN THE SWPPP. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

8. SILT FENCE SHALL BE REMOVED WHEN FINAL STABILIZATION IS ACHIEVED OR ANOTHER EROSION OR SEDIMENT CONTROL DEVICE IS EMPLOYED.

9. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF HALF THE HEIGHT OF THE FENCE. THE SILT SHALL BE DISPOSED OF AT AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

10. SEE NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.5

FIGURE 3.28 NOTES FOR SILT FENCE (2 OF 2)

SILT FENCE
REVISED

SILT FENCE
REVISED

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BIRKHOFF, HENDRICKS & CARTER, L.L.P.
PROFESSIONAL ENGINEERS
TBPE Firm No. 526; TBPLS Firm No. 10031800
11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

STATE OF TEXAS
GARY C. HENDRICKS
65226
REGISTERED
PROFESSIONAL ENGINEER

09/09/2020

CITY OF DENTON, TEXAS
SCRIPTURE STREET TRANSMISSION MAIN

CONSTRUCTION DETAILS

BHC PROJECT NO. 2017-146

September 2020

SHEET NO. **14**

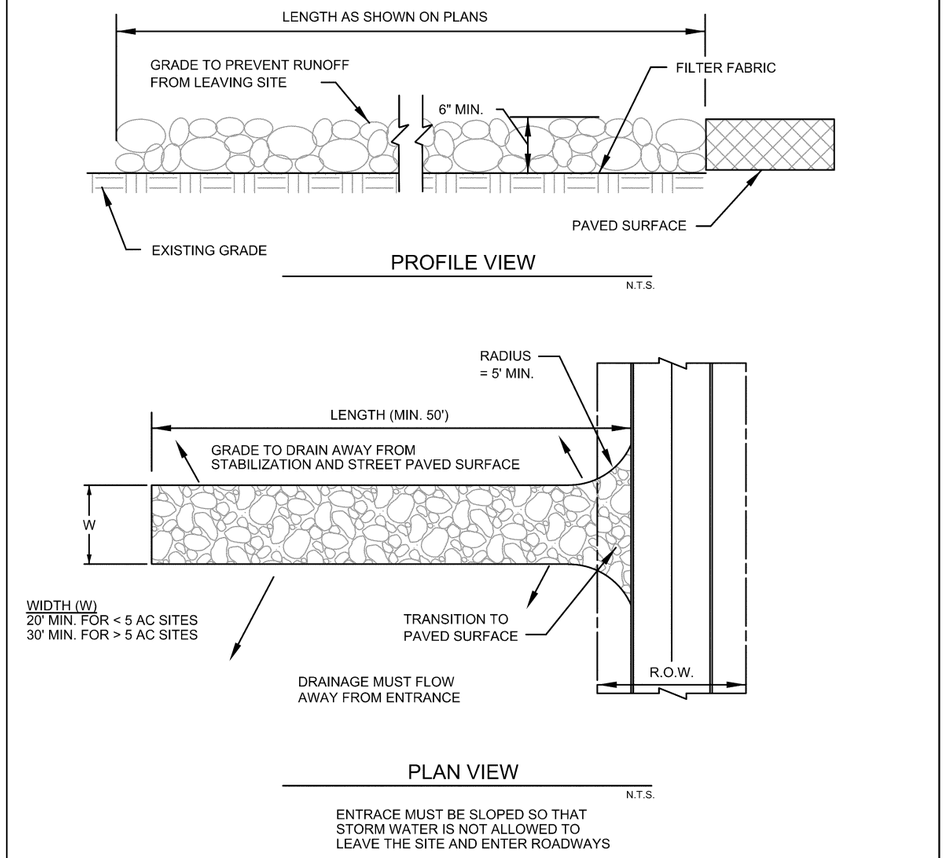

FIGURE 3.29 STANDARD CONSTRUCTION DETAIL - STABILIZED CONSTRUCTION EXIT (1 OF 2)

iSWM™ TECHNICAL MANUAL CONSTRUCTION CONTROLS

STABILIZED CONSTRUCTION ENTRANCE GENERAL NOTES:

1. SEE NCTCOG STANDARD SPECIFICATIONS (2017), SECTION 202.11

2. THE THICKNESS SHALL NOT BE LESS THAN 6 INCHES.

3. STONE SHALL BE 3 TO 5 INCH DIAMETER COURSE AGGREGATE, NO CRUSHED PORTLAND CEMENT CONCRETE ALLOWED.

4. LENGTH SHALL BE SHOWN ON PLANS, WITH A MINIMUM LENGTH OF 50 FEET.

5. THE WIDTH SHALL BE NO LESS THAN 20' FOR SITES LESS THAN 5 AC, AND 30' FOR SITES GREATER THAN 5 AC, AT ALL POINTS OF INGRESS OR EGRESS.

6. WHEN NECESSARY, VEHICLES SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO A PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE WITH DRAINAGE FLOWING AWAY FROM BOTH THE STREET AND THE STABILIZED ENTRANCE. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.

7. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PAVED SURFACES. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO PAVED SURFACES MUST BE REMOVED IMMEDIATELY.

8. THE ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

9. INSPECTION SHALL BE SPECIFIED IN THE SWPPP.

FIGURE 3.29 NOTES FOR STABILIZED CONSTRUCTION EXIT (2 OF 2)

STABILIZED CONSTRUCTION EXIT
REVISED

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11910 Greenville Ave., Suite 600
Dallas, Texas 75243 (214) 361-7900

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CITY OF DENTON, TEXAS
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BHC PROJECT NO. 2017-146

September 2020

SHEET NO. **15**

METER VAULT INSTALLATION NOTES:

1. PIPE, METER SIZE AND VAULT SHALL BE APPROVED BY THE WATER UTILITIES DEPARTMENT DURING REVIEW PROCESS.

2. PREFABRICATED OR POURED IN PLACE VAULTS SHALL HAVE 4,200 PSI CONCRETE, REINFORCED WITH MINIMUM #4 O.C.E.W.

3. METER VAULT MUST BE LOCATED BEHIND CURB AND/OR WALK AND OUT OF VEHICLE/PEDESTRIAN TRAFFIC, IN THE WATER UTILITY EASEMENT OR DEDICATED EASEMENT. METER VAULT TO BE PLACED IN A PROTECTED GRASSY AREA.

4. MAINLINE AND BYPASS VALVES WILL BE RESILIENT SEAT TYPE WITH CORROSION RESISTANT FUSION BONDED EPOXY COATING INSIDE AND OUT, NON-RISING STEM. ALL VALVES IN THE VAULT WILL HAVE HANDWHEELS. CUSTOMER VALVES SHALL BE LOCATED OUTSIDE OF VAULT AND EASEMENTS. ALL VALVES SHALL BE RIGHT-HAND TURN CLOSE.

5. ALL METERS SHALL BE EQUIPPED WITH ENCODER REGISTERS AND HAVE SCHLUMBERGER TOUCH PADS INSTALLED ON THE LID FOR READING PURPOSES. ALL METERS SHALL BE INSTALLED WITH STRAINERS ON THE INLET SIDE OF THE METER.

6. HATCH OPENING WILL BE ¼" ALUMINUM DIAMOND PLATE COVER WITH EXTRUDED ALUMINUM FRAME. HATCH TO BE FURNISHED WITH TYPE 316 STAINLESS STEEL SNAP AND LOCK WITH BRASS HINGES.

7. ALL VAULTS OVER 4 FT. IN DEPTH SHALL HAVE A LADDER INSTALLED AND SECURED TO THE VAULT WALL AT HATCH ENTRY.

8. VAULT BEDDING SHALL BE GRADE 4 STANDARD CRUSHED AGGREGATE, 1 IN. SIEVE.

9. THE TOP OF METER VAULT SHALL BE SET AT AN ELEVATION SUCH THAT THE SURROUNDING GROUND SLOPES AWAY FROM THE VAULT.

10. FOR 3" METERS AND ABOVE ON PROJECTS ON WHICH THE CITY INSTALLS THE TAP IN THE MAINLINE AND STUBS OUT THE SERVICE LINE TO THE BACK OF CURB, THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ALL REMAINING PIPING FROM THE STUBOUT BEHIND THE CURB THROUGH THE VAULT.

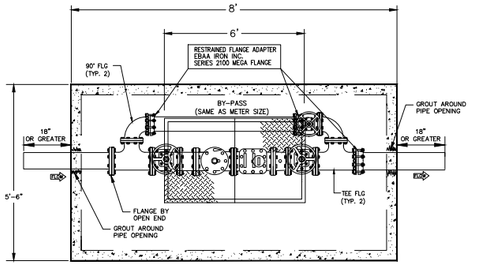
11. FOR WATER METER VAULT INSTALLATIONS WHERE THE METER IS NOT EQUIPPED WITH AN INTEGRAL TEST PORT, A SEPARATE SPOOL PIECE WILL BE PROVIDED BETWEEN THE METER AND THE DOWNSTREAM GATE VALVE. THE SPOOL PIECE WILL BE EQUIPPED WITH A TEST PORT AND THREADED BRASS PLUG SIZED PER THE MANUFACTURER'S REQUIREMENTS OR AS FOLLOWS.

12. WHERE NOT SPECIFICALLY NOTED, ALL FLANGED PIPE SHALL BE DUCTILE IRON PIPE WITH DUCTILE IRON FLANGES THREADED ON.

METER SIZE	TEST PORT
3"	1½"
4"	2"
6"	2"
>8"	3"

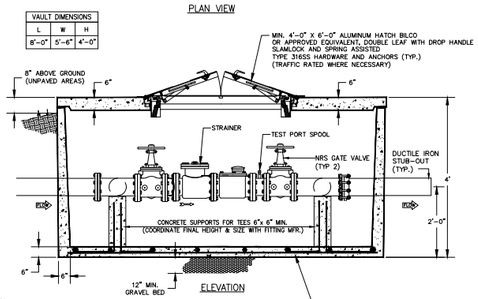
WATER VAULT INSTALLATION NOTES

W100



PLAN VIEW

VAULT DIMENSIONS		
L	W	H
8'-0"	5'-6"	4'-0"



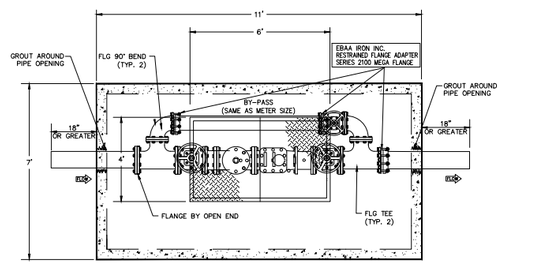
ELEVATION

NOTES:
1. BOX SHALL BE PARKS TYPE OR APPROVED EQUIVALENT, IN GENERAL DIMENSIONS EQUIVALENT TO THAT SHOWN.
2. LEAVE-OUT TO BE GROUTED WITH NON-SHRINK GROUT WHEN SERVICE CONNECTION IS MADE.
3. REFER TO METER VAULT INSTALLATION NOTES

#4 @ 12" O.C.E.W. MIN. (TYP. WALLS AND SLABS)

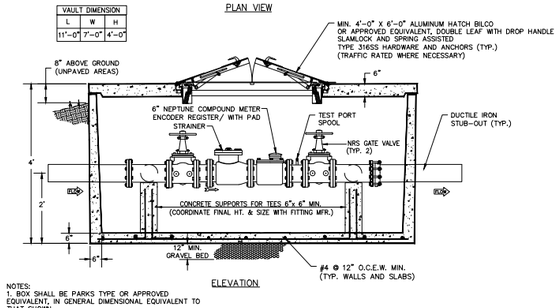
3" AND 4" METER VAULTS

W101



PLAN VIEW

VAULT DIMENSION		
L	W	H
11'-0"	7'-0"	4'-0"



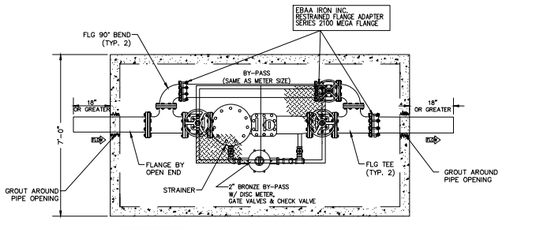
ELEVATION

NOTES:
1. BOX SHALL BE PARKS TYPE OR APPROVED EQUIVALENT, IN GENERAL DIMENSIONAL EQUIVALENT TO THAT SHOWN.
2. LEAVE-OUT TO BE GROUTED WITH NON-SHRINK GROUT WHEN SERVICE CONNECTION IS MADE.
3. REFER TO METER VAULT INSTALLATION NOTES.

#4 @ 12" O.C.E.W. MIN. (TYP. WALLS AND SLABS)

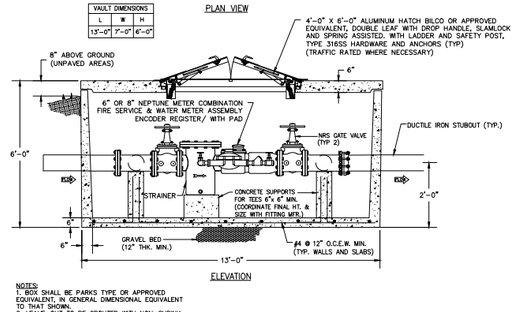
6" METER VAULT

W102



PLAN VIEW

VAULT DIMENSIONS		
L	W	H
13'-0"	7'-0"	6'-0"

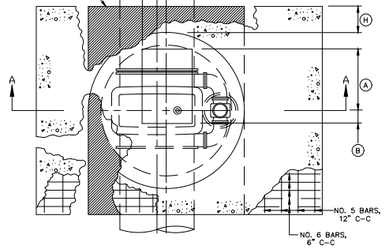


ELEVATION

NOTES:
1. BOX SHALL BE PARKS TYPE OR APPROVED EQUIVALENT, IN GENERAL DIMENSIONAL EQUIVALENT TO THAT SHOWN.
2. LEAVE-OUT TO BE GROUTED WITH NON-SHRINK GROUT WHEN SERVICE CONNECTION IS MADE.
3. REFER TO METER VAULT INSTALLATION NOTES

6" AND 8" FIRE SERVICE METER VAULTS

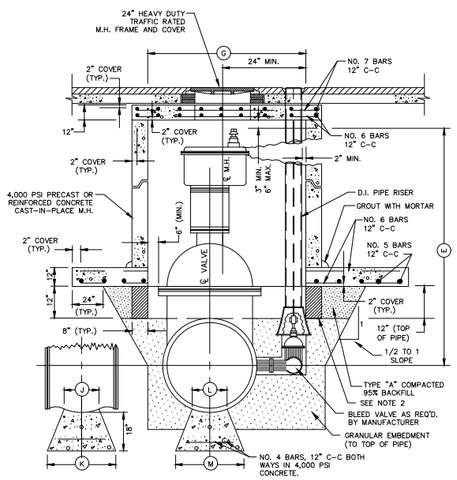
W103



PLAN VIEW
(LESS MANHOLE FRAME & COVER INSTALLATION)

GATE VALVE SIZE	DIMENSION TABLE A	B	C	D	E	F	G	H	J	K	L	M
16"	20"	20"	12"	12"	44 1/2"	1"	48"	12"	10"	24"	12"	16"
18"	20"	20"	12"	12"	51 3/8"	2"	48"	12"	12"	24"	12"	18"
20"	22"	18"	12"	12"	56 5/8"	1"	54"	12"	12"	24"	16"	20"
24"	26"	14"	12"	12"	64 3/8"	1"	60"	18"	14"	30"	18"	24"
30"	28"	12"	12"	12"	80 5/8"	3"	66"	18"	18"	30"	20"	30"
36"	32"	8"	12"	12"	90 1/16"	4"	72"	18"	18"	36"	24"	36"
42"	34"	6"	15"	9"	107 3/4"	5"	78"	24"	20"	36"	30"	42"
48"	36"	4"	14"	10"	121 5/8"	4"	90"	24"	26"	42"	36"	48"
54"	36"	4"	9"	15"	142 1/2"	3"	102"	24"	32"	46"	40"	54"

NOTES:
1. POLYURETHANE CUSHION PAD.
2. FOR 24" AND 30" VALVES, CITY REQUIRES GEAR OPERATOR, VAULT, AND BYPASS.

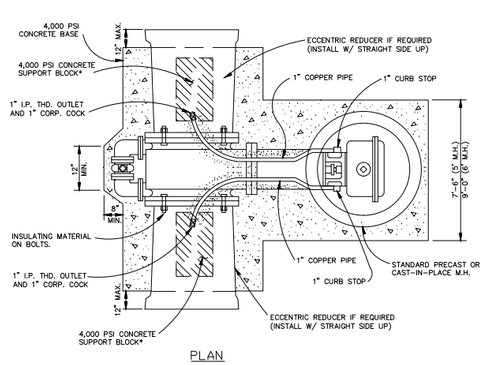


SECTION A-A

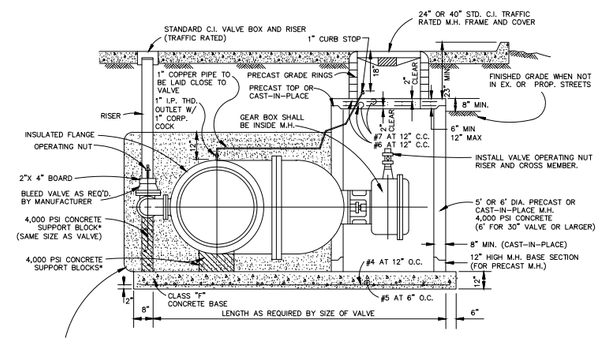
VAULT CONSTRUCTION VERTICAL GATE VALVE

W104

W105



PLAN



PROFILE

NOTES:
1. COORDINATE DIMENSIONS NOTED WITH "*" WITH VALVE MFR.
2. FOR 24" AND 30" VALVES, CITY REQUIRES GEAR OPERATOR, VAULT, AND BYPASS.

VAULT CONSTRUCTION HORIZONTAL GATE VALVE

W106A

W106B

ENTERED BY	PROJECT #	
DESIGNED BY	DATE	REVISION
CHECKED BY		
PROJ. ENGR.		
PATH S:\Water Engineering\Engr\Design\Projects\Standard Details\water details\Water Details Sheet 1-3.dwg		

CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

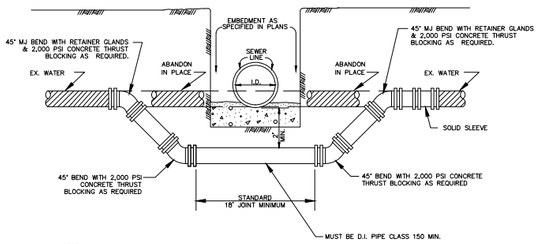
WATER DETAILS

DATE
DEC. 2018

SHEET No.
1 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N/A

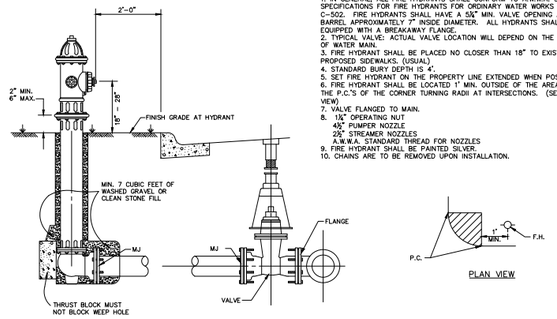
CERTIFICATION:
THIS CITY OF DENTON STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS HEREON, AND WHO CERTIFIES THE CONTENT OF THE DETAILS AND NOTES HEREIN HAVE NOT BEEN ALTERED AND ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THE STANDARDS WITHIN THIS SHEET.



NOTES:
1. ONE SEGMENT OF THE WASTEWATER LINE SHALL BE CENTERED OVER THE WATER LINE SUCH THAT THE JOINTS OF THE WASTEWATER LINE ARE EQUIDISTANT AND AT LEAST NINE FEET HORIZONTALLY FROM THE CENTERLINE OF THE WATER LINE.
2. WATER AND WASTEWATER LINES MUST PASS A PRESSURE AND LEAKAGE TEST AS SPECIFIED IN AWWA C600 STANDARDS.

ABANDONING & LOWERING EXISTING WATER MAIN AT CROSSING

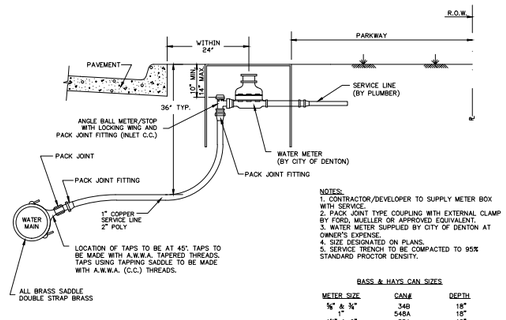
W301



NOTES:
1. IN GENERAL, ALL FIRE HYDRANTS SHALL CONFORM TO A.W.W.A. STANDARD SPECIFICATIONS FOR FIRE HYDRANTS FOR ORDINARY WATER WORKS SERVICE, C-502. FIRE HYDRANTS SHALL HAVE A 5½" MIN. VALVE OPENING AND A BARREL APPROXIMATELY 7" INSIDE DIAMETER. ALL HYDRANTS SHALL BE EQUIPPED WITH A BREAKAWAY FLANGE.
2. TYPICAL VALVE: ACTUAL VALVE LOCATION WILL DEPEND ON THE LOCATION OF WATER MAIN.
3. FIRE HYDRANT SHALL BE PLACED NO CLOSER THAN 18" TO EXISTING OR PROPOSED SIDEWALKS. (USUAL)
4. STANDARD BURY DEPTH IS 4'.
5. SET FIRE HYDRANT ON THE PROPERTY LINE EXTENDED WHEN POSSIBLE.
6. FIRE HYDRANT SHALL BE LOCATED 1' MIN. OUTSIDE OF THE AREA BETWEEN THE P.C.'S OF THE CORNER TURNING RADII AT INTERSECTIONS. (SEE PLAN VIEW)
7. VALVE FLANGED TO MAIN.
8. 1¼" OPERATING NUT
   4½" PUMPER NOZZLE
   2½" STREAMER NOZZLES
   A.W.W.A. STANDARD THREAD FOR NOZZLES
9. FIRE HYDRANT SHALL BE PAINTED SILVER.
10. CHAINS ARE TO BE REMOVED UPON INSTALLATION.

FIRE HYDRANT INSTALLATION

W401



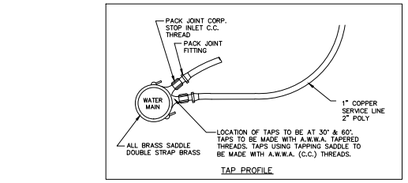
NOTES:
1. CONTRACTOR/DEVELOPER TO SUPPLY METER BOX WITH SERVICE.
2. PACK JOINT TYPE COUPLING WITH EXTERNAL CLAMP BY FORD, MUELLER OR APPROVED EQUIVALENT.
3. WATER METER SUPPLIED BY CITY OF DENTON AT OWNER'S EXPENSE.
4. SIZE DESIGNATED ON PLANS.
5. SERVICE TRENCH TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.

BASS & HAYS CAN SIZES

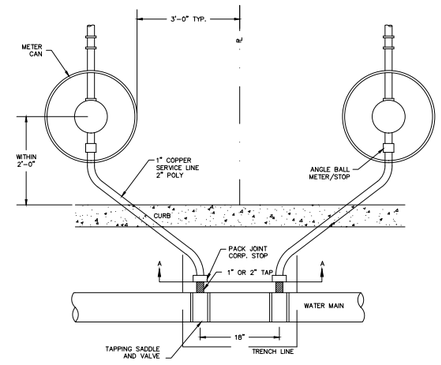
METER SIZE	CAN#	DEPTH
⅝" & ¾"	34B	18"
1"	548A	18"
1½" & 2"	55A	18"

TYPICAL WATER SERVICE CONNECTION

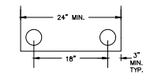
W501A



TAP PROFILE



NOTES:
1. THIS ALTERNATIVE DESIGN IS ONLY FOR CERTAIN FIELD SITUATIONS AND IS ONLY ALLOWABLE WITH CITY APPROVAL.
2. MINIMUM TRENCH WIDTH IS 24" WITH MINIMUM CENTERLINE TO CENTERLINE SPACING OF 12" MIN. AND 18" MAX.
3. ALTERNATE METHOD – TWO SEPARATE TRENCHES SPACED 18" OR MORE TO MATCH METER BOX SPACING.
4. NO SERVICES ALLOWED IN CONCRETE.
5. SERVICE LINES SHALL HAVE ALL BRASS FITTINGS.
6. WATER METER SUPPLIED BY CITY OF DENTON AT OWNER'S EXPENSE.
7. CONTRACTOR/DEVELOPER TO SUPPLY METER BOX WITH SERVICE.
8. ANGLE METER STOP IS TO BE 10"–14" DEEP.
9. METERS ARE TO BE SET 3' FROM THE SIDE PROPERTY LINE.
10. USE OF DUAL SERVICE TO BE APPROVED ON CASE BY CASE BASIS BY THE DIRECTOR OF WATER UTILITIES; NORMALLY ONLY FOR SUBDIVISIONS WITH LOTS 50' WIDE OR LESS.
11. SERVICE TRENCH TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.
12. PACK JOINT TYPE COUPLING WITH EXTERNAL CLAMP BY FORD, MUELLER OR APPROVED EQUIVALENT.



SECTION 'A' SERVICE LINE TRENCH

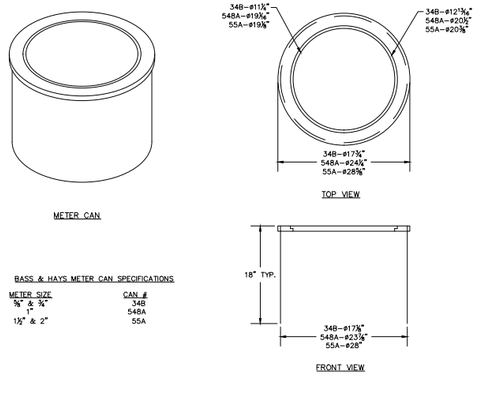
BASS & HAYS CAN SIZES

METER SIZE	CAN#	DEPTH
⅝" & ¾"	34B	18"
1"	548A	18"
1½" & 2"	55A	18"

DUAL WATER SERVICE CONNECTION WITH 1" INSTALLATION

* WITH CITY APPROVAL ONLY

W501B



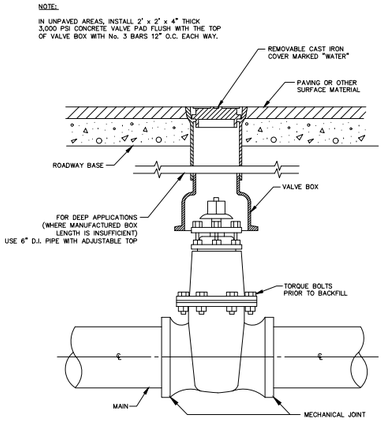
METER CAN

BASS & HAYS METER CAN SPECIFICATIONS

METER SIZE	CAN #
⅝" & ¾"	34B
1"	548A
1½" & 2"	55A

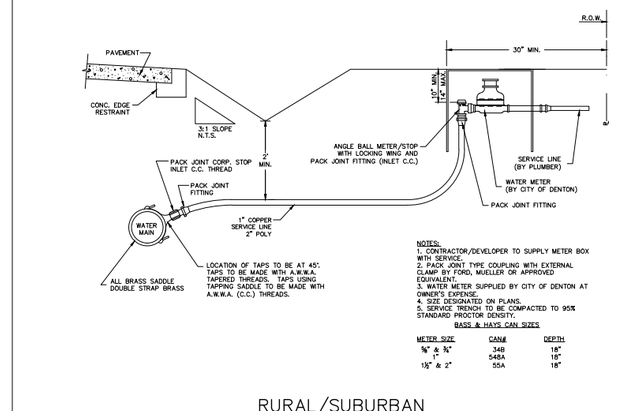
WATER METER CAN

W502



GATE VALVE (4" TO 20") BOX

W601



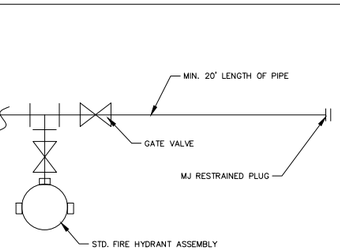
NOTES:
1. CONTRACTOR/DEVELOPER TO SUPPLY METER BOX WITH SERVICE.
2. PACK JOINT TYPE COUPLING WITH EXTERNAL CLAMP BY FORD, MUELLER OR APPROVED EQUIVALENT.
3. WATER METER SUPPLIED BY CITY OF DENTON AT OWNER'S EXPENSE.
4. SIZE DESIGNATED ON PLANS.
5. SERVICE TRENCH TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY.

BASS & HAYS CAN SIZES

METER SIZE	CAN#	DEPTH
⅝" & ¾"	34B	18"
1"	548A	18"
1½" & 2"	55A	18"

RURAL/SUBURBAN WATER SERVICE INSTALLATION

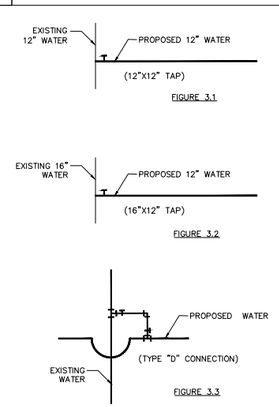
W501C



NOTE:
LAST WATER SERVICE TAP SHALL BE UPSTREAM OF FIRE HYDRANT ASSEMBLY.

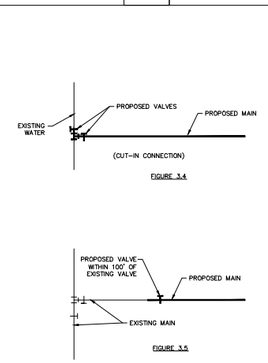
WATER MAIN TERMINATION ASSEMBLY

W603



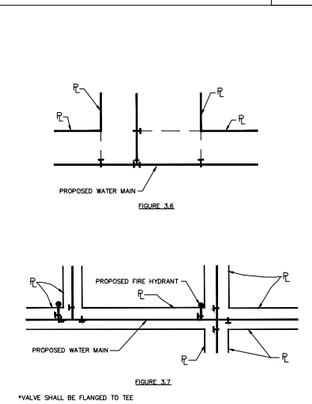
TYPICAL TAPPING SLEEVE AND VALVE AND "D" CONNECTION

PIAZ13



TYPICAL CUT–IN CONNECTIONS

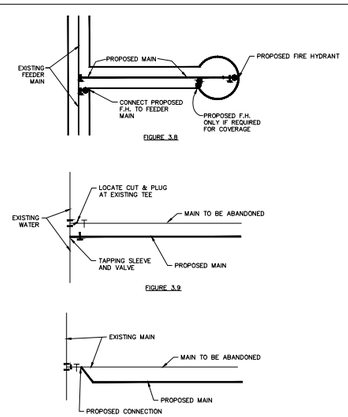
PIAZ14



*VALVE SHALL BE FLANGED TO TEE

TYPICAL VALVE PLACEMENT

PIAZ15



TYPICAL LINE REPLACEMENT OR EXTENSION

PIAZ16

ENTERED BY	PROJECT #	
DESIGNED BY	DATE	REVISION
CHECKED BY		
PROJ. ENGR.		
PATH S:\Water Engineering\Engr\Design\Projects\Standard Details\water details\Water Details Sheet 1-3.dwg		

CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

WATER DETAILS

DATE
DEC. 2018

SHEET No.
2 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N/A

CERTIFICATION:
THIS CITY OF DENTON STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS HEREON, AND WHO CERTIFIES THE CONTENT OF THE DETAILS AND NOTES HEREIN HAVE NOT BEEN ALTERED AND ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THE STANDARDS WITHIN THIS SHEET.

GENERAL NOTES FOR ALL THRUST BLOCKS:

1. JOINT RESTRAINTS SHALL BE USED FOR WATER MAINS 16" OR GREATER. AN ENGINEER SHALL PROVIDE A JOINT RESTRAINT PLAN FOR EACH SIDE OF THE FITTING, IN ADDITION TO THE REQUIRED THRUST BLOCKING.

2. CONCRETE FOR BLOCKING SHALL BE 2,000 PSI.

3. ALL CALCULATIONS ARE BASED ON INTERNAL PRESSURE OF 200 PSI FOR DUCTILE IRON, P.V.C., AND 150 PSI FOR CONCRETE PIPE.

4. VOLUMES OF THRUST BLOCKS ARE NET VOLUMES OF CONCRETE TO BE FURNISHED. THE CORRESPONDING WEIGHT OF THE CONCRETE (2,000 PSI) IS EQUAL TO OR GREATER THAN THE VERTICAL COMPONENT OF THE THRUST ON THE VERTICAL BEND.

5. WALL THICKNESS (T) ASSUMED HERE FOR ESTIMATING PURPOSES ONLY.

6. THE SOIL BEARING PRESSURES ARE BASED ON 1,000 LBS./S.F. IN SOIL AND 2,000 LBS./S.F. IN ROCK.

7. POUR CONCRETE FOR BLOCK AGAINST UNDISTURBED EARTH.

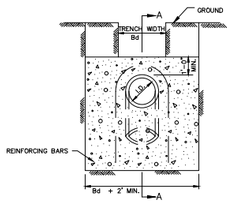
8. DIMENSIONS MAY BE VARIED AS REQUIRED BY FIELD CONDITIONS WHERE AND AS DIRECTED BY THE ENGINEER. THE VOLUME OF CONCRETE BLOCKING SHALL NOT BE LESS THAN SHOWN HERE.

9. USE POLYETHYLENE WRAP OR EQUAL AS BOND BREAKER BETWEEN CONCRETE AND BEND, TEE, OR PLUG.

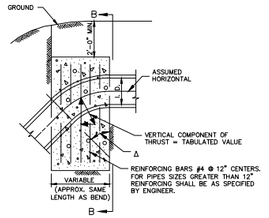
10. CONCRETE SHALL NOT EXTEND BEYOND JOINTS.

THRUST BLOCK GENERAL NOTES

W700



ELEVATION "B-B"



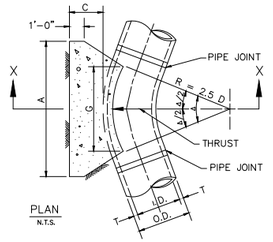
SECTION "A-A"

NOTES:
1. EXTEND CONCRETE THRUST BLOCK HORIZONTALLY INTO UNDISTURBED SOIL 2' MIN. ON EACH SIDE.
2. HORIZONTAL EXTENSION OF THRUST BLOCK MAY REQUIRE ADDITIONAL STEEL REINFORCEMENT. DETERMINATION TO BE MADE BY CITY ENGINEERING STAFF.

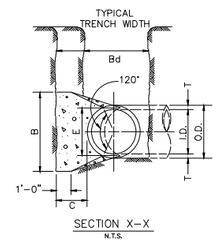
Δ →	11.25°		22.50°		30°		45°		67.50°		90°		← Δ
I.D. (IN.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	THRUST (TONS)	VOL. (C.Y.)	I.D. (IN.)
4,6,8	1.0	0.5	2.0	1.0	2.5	1.3	3.6	1.8	4.6	2.3	5.0	2.5	4,6,8
10,12	2.2	1.1	4.3	2.2	5.7	2.8	8.0	4.0	10.5	5.2	11.3	5.7	10,12
16,18	3.0	2.5	9.7	4.9	12.7	6.4	18.0	9.0	23.5	11.8	25.5	12.7	16,18
20	6.1	3.1	12.0	6.0	15.7	7.9	22.2	11.1	29.2	14.5	31.4	15.7	20
24	8.2	4.4	17.3	8.7	22.6	11.3	32.0	16.0	41.8	20.9	45.2	22.6	24
30	10.5	5.2	20.3	10.1	26.5	13.3	37.5	18.8	49.0	24.5	53.1	26.5	30
36	14.9	7.5	29.2	14.6	38.2	19.1	54.0	27.0	70.5	35.3	76.4	38.2	36
42	20.3	10.1	39.8	19.9	52.0	26.0	73.5	36.7	96.0	48.0	104.0	52.0	42
48	26.5	13.2	51.9	26.0	67.9	33.9	96.0	48.0	126.0	62.7	136.0	67.9	48
54	33.5	16.8	65.7	32.9	85.9	42.9	122.0	60.7	159.0	79.4	172.0	85.9	54
60	41.4	20.7	81.2	40.6	106.0	53.0	150.0	75.0	196.0	98.0	212.0	106.0	60
66	50.1	25.0	98.2	49.1	128.0	64.2	182.0	90.7	237.0	119.0	257.0	128.0	66
72	59.6	29.8	117.0	58.4	153.0	76.3	216.0	108.0	282.0	141.0	305.0	153.0	72
78	69.9	35.0	137.0	68.6	179.0	90.0	254.0	127.0	331.0	166.0	358.0	179.0	78
84	81.1	40.5	159.0	79.5	208.0	104.0	294.0	147.0	384.0	192.0	416.0	208.0	84
90	93.1	46.5	183.0	91.3	239.0	119.0	337.0	169.0	441.0	221.0	477.0	239.0	90
96	106.0	53.0	208.0	104.0	272.0	136.0	384.0	192.0	502.0	251.0	543.0	272.0	96

VERTICAL THRUST BLOCK AT PIPE BEND

W701



I.D. (IN.)	T (IN.)	Δ = 11.25° (FT.)	Δ = 22.50° (FT.)	E (FT.)
4,6,8	0.4	1.5	1.5	0.9
10,12	0.5	1.5	1.5	1.2
16,18	0.6	1.5	1.5	1.6
20	0.7	1.5	1.5	1.8
24	0.9	1.5	1.5	2.1
30	2.9	1.5	1.9	2.6
36	4.5	1.5	2.3	3.3
42	5.0	1.8	2.6	3.8
48	5.5	2.0	3.0	4.3
54	6.0	2.3	3.4	4.8
60	6.5	2.5	3.8	5.3
66	6.8	2.8	4.1	5.7
72	7.5	3.0	4.5	6.3
78	7.5	3.3	4.9	6.7
84	8.0	3.5	5.3	7.2
90	8.5	3.8	5.6	7.7
96	9.0	4.0	6.0	8.2



I.D. (IN.)	Δ = 11.25°						I.D. (IN.)	Δ = 22.50°					
	G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)		G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	0.4	1.0	1.0	1.5	0.1	1.0	1.0	0.1	4,6,8	0.8	2.0	1.5	1.5	0.1	1.0	1.0	0.1
10,12	0.6	2.2	1.5	1.5	0.1	1.0	1.5	0.1	10,12	1.1	4.4	2.0	2.5	0.3	1.5	1.5	0.1
16,18	0.8	5.0	2.0	2.5	0.3	1.5	2.0	0.2	16,18	1.6	9.9	3.5	3.5	0.6	2.0	2.5	0.3
20	0.9	6.2	2.0	3.5	0.4	1.5	3.0	0.3	20	1.8	12.3	3.5	3.5	0.7	2.0	3.0	0.4
24	1.1	8.9	3.0	3.5	0.5	1.5	3.0	0.3	24	2.2	17.7	4.0	4.5	1.0	3.0	3.5	0.5
30	1.4	10.4	3.0	3.5	0.6	2.0	3.5	0.4	30	2.7	20.7	5.0	4.5	1.5	3.0	4.0	0.8
36	1.7	15.0	3.5	4.5	0.9	2.0	4.0	0.5	36	3.3	29.8	5.5	5.5	2.3	4.0	4.0	1.3
42	1.9	20.4	4.5	5.0	1.5	2.5	5.0	0.8	42	3.8	40.5	7.0	6.0	3.9	4.5	5.0	2.1
48	2.2	26.6	4.5	6.0	2.0	2.5	6.0	1.1	48	4.4	52.9	8.0	7.0	5.7	4.5	6.0	2.8
54	2.5	33.7	6.0	6.0	3.0	3.0	6.0	1.4	54	4.9	67.0	9.0	8.0	8.0	6.0	6.0	4.1
60	2.7	41.6	6.0	7.0	3.8	3.0	7.0	1.8	60	5.5	82.7	9.5	9.0	10.6	6.0	7.0	5.3
66	3.0	50.3	6.5	8.0	5.1	3.5	8.0	2.7	66	6.0	100.1	10.5	10.0	14.1	6.5	8.0	7.2
72	3.3	59.9	7.5	8.0	6.3	4.0	8.0	3.3	72	6.6	119.1	11.0	11.0	17.6	7.5	8.0	9.1
78	3.6	70.2	8.0	9.0	8.1	4.0	9.0	3.9	78	7.1	139.8	12.0	12.0	22.5	8.0	9.0	11.7
84	3.8	81.5	8.5	10.0	10.3	4.5	10.0	5.3	84	7.6	162.1	13.0	12.5	27.2	8.5	10.0	14.8
90	4.1	93.5	9.5	10.0	12.2	5.0	10.0	6.3	90	8.2	186.1	14.0	13.5	33.7	9.5	10.0	17.7
96	4.4	106.4	10.0	11.0	15.0	5.0	11.0	7.4	96	8.7	211.7	15.0	14.5	41.2	10.0	11.0	21.8

TABLES OF DIMENSIONS AND QUANTITIES

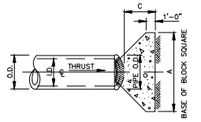
HORIZONTAL THRUST BLOCK AT PIPE BEND

W702A W702B

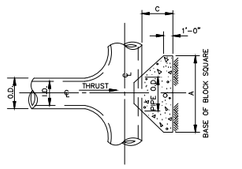
I.D. (IN.)	Δ = 30°							I.D. (IN.)	Δ = 45°						
	G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)		G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	1.0	2.6	2.0	1.5	0.2	1.0	1.5	0.1	4,6,8	1.5	3.9	2.0	2.0	0.2	1.5	1.5	0.1
10,12	1.5	5.9	2.5	2.5	0.3	2.0	1.5	0.2	10,12	2.2	8.7	3.5	2.5	0.5	2.0	2.5	0.3
16,18	2.2	13.2	3.5	4.0	0.8	2.5	3.0	0.4	16,18	3.2	19.5	4.5	4.5	1.2	3.0	3.5	0.6
20	2.4	16.3	4.5	4.0	1.0	3.0	3.0	0.5	20	3.6	24.1	5.5	4.5	1.5	3.5	3.5	0.7
24	2.9	23.4	6.0	4.0	1.4	3.5	3.5	0.7	24	4.3	34.6	8.0	4.5	2.3	4.5	4.0	1.1
30	3.6	27.5	6.5	5.0	1.9	3.5	4.0	0.9	30	5.4	40.6	8.5	5.0	3.2	5.5	4.0	1.6
36	4.4	39.5	7.0	6.0	3.4	4.5	4.5	1.6	36	6.5	58.5	10.0	6.0	5.3	6.5	4.5	2.6
42	5.1	53.8	8.0	7.0	5.1	5.5	5.0	2.5	42	7.5	79.6	11.5	7.0	8.1	8.0	5.0	4.2
48	5.8	70.3	9.0	8.0	7.4	6.0	6.0	3.7	48	8.6	104.0	13.0	8.0	11.9	9.0	6.0	6.3
54	6.5	89.0	10.0	9.0	10.3	7.0	6.5	5.3	54	9.7	131.5	15.0	9.0	17.1	10.5	6.5	8.9
60	7.3	110.0	11.0	10.0	13.9	7.5	7.5	7.3	60	10.7	162.4	16.5	10.0	23.1	11.0	7.5	12.0
66	8.0	132.9	12.5	11.0	18.9	8.5	8.0	9.6	66	11.8	196.5	18.0	11.0	30.1	12.0	8.5	16.2
72	8.7	158.2	13.5	12.0	24.0	9.0	9.0	12.3	72	12.9	233.9	19.5	12.0	38.6	14.0	8.5	20.7
78	9.4	185.6	14.5	13.0	30.0	10.0	9.5	15.6	78	13.9	274.5	21.5	13.0	49.8	14.5	9.5	25.9
84	10.1	215.3	15.5	14.0	37.1	10.5	10.5	19.5	84	15.0	318.4	23.0	14.0	61.2	15.5	10.5	32.6
90	10.9	247.1	16.5	15.0	45.0	11.5	11.0	23.9	90	16.1	365.5	24.5	15.0	74.5	17.5	10.5	39.6
96	11.6	281.2	18.0	16.0	55.5	12.5	11.5	28.9	96	17.1	415.6	26.0	16.0	89.5	18.5	11.5	48.5

I.D. (IN.)	Δ = 67.50°							I.D. (IN.)	Δ = 90°						
	G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)		G (FT.)	THRUST (TONS)	EARTH A (FT.)	EARTH B (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK B (FT.)	ROCK VOL. (C.Y.)
4,6,8	2.1	5.6	3.0	2.0	0.3	2.0	1.5	0.2	4,6,8	2.7	7.1	5.0	1.5	0.4	2.0	2.0	0.2
10,12	3.1	12.6	5.5	2.5	0.8	3.5	2.0	0.4	10,12	4.0	16.0	6.5	2.5	1.0	3.5	2.5	0.5
16,18	4.7	28.3	7.5	4.0	1.9	5.5	3.0	0.9	16,18	6.0	36.0	9.0	4.0	2.4	4.5	4.0	1.0
20	5.2	34.9	9.0	4.0	2.3	5.5	3.5	1.2	20	6.6	44.4	10.0	4.5	3.1	6.0	4.0	1.5
24	6.2	50.3	11.5	4.5	3.5	6.5	4.0	1.6	24	7.9	64.0	14.5	4.5	5.0	8.0	4.0	2.1
30	7.8	58.9	12.0	5.0	4.8	7.5	4.0	2.2	30	9.9	75.0	15.0	5.0	6.7	10.0	4.0	3.3
36	9.4	84.9	14.5	6.0	8.2	9.5	4.5	3.8	36	11.9	108.0	18.0	6.0	11.4	12.0	4.5	5.3
42	10.9	115.5	17.0	7.0	12.8	11.0	5.5	6.3	42	13.9	147.0	21.0	7.0	17.8	14.0	5.5	8.7
48	12.5	150.9	19.0	8.0	18.4	13.0	6.0	9.2	48	15.9	192.0	24.0	8.0	26.2	16.0	6.0	12.4
54	14.0	191.0	21.5	9.0	26.0	15.0	6.5	12.9	54	17.9	243.0	27.0	9.0	36.9	18.0	7.0	18.1
60	15.6	235.8	24.0	10.0	35.6	16.0	7.5	17.6	60	19.9	299.8	30.0	10.0	50.3	20.0	7.5	24.0
66	17.1	285.3	26.0	11.0	46.0	18.0	8.0	23.0	66	21.8	362.8	33.0	11.0	66.2	22.0	8.5	32.5
72	18.7	339.5	28.5	12.0	57.8	19.0	9.0	28.4	72	23.8	431.8	36.0	12.0	85.6	24.0	9.0	41.0
78	20.2	398.5	31.0	13.0	75.7	21.0	9.5	37.4	78	25.7	506.7	39.0	13.0	108.2	26.0	10.0	53.2
84	21.8	462.1	33.5	14.0	94.7	22.0	10.5	46.5	84	27.7	587.7	42.0	14.0	134.4	28.0	10.5	64.8
90	23.3	530.5	35.5	15.0	114.4	24.5	11.0	58.2	90	29.0	674.6	45.0	15.0	164.9	30.0	11.5	81.2
96	24.9	603.6	38.0	16.0	138.9	25.5	12.0	70.0	96	31.6	767.5	48.0	16.0	199.0	32.0	12.0	99.1

TABLES OF DIMENSIONS AND QUANTITIES



PLAN OF PLUG THRUST BLOCK

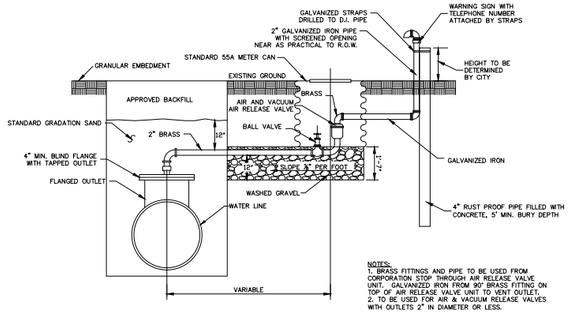


PLAN OF TEE THRUST BLOCK

I.D. (IN.)	THRUST (TONS)	C (FT.)	EARTH A (FT.)	EARTH VOL. (C.Y.)	ROCK A (FT.)	ROCK VOL. (C.Y.)
4,6,8	5.1	1.5	2.5	0.3	2.0	0.2
10,12	11.3	1.5	3.5	0.6	2.5	0.3
16,18	25.5	2.0	5.5	1.6	4.0	0.9
20	31.5	2.0	6.0	1.9	4.0	0.9
24	45.2	2.5	7.0	3.1	5.0	1.7
30	53.0	3.0	7.5	4.1	5.5	2.4
36	76.3	4.0	9.0	7.3	6.5	4.2
42	104.0	4.5	10.5	11.0	7.5	6.2
48	136.0	5.0	12.0	15.9	8.5	9.7
54	172.0	5.5	13.5	21.4	9.5	11.9
60	212.0	6.0	15.0	28.4	10.5	15.7
66	257.0	6.5	16.5	36.8	11.5	20.5
72	305.0	7.5	17.5	47.2	12.5	27.2
78	358.0	8.0	19.0	58.9	13.5	33.7
84	416.0	8.5	20.5	72.3	14.5	41.2
90	477.0	9.0	22.0	87.7	15.5	49.7
96	543.0	9.5	23.5	104.8	16.5	61.0

HORIZONTAL THRUST BLOCK AT TEES AND PLUGS

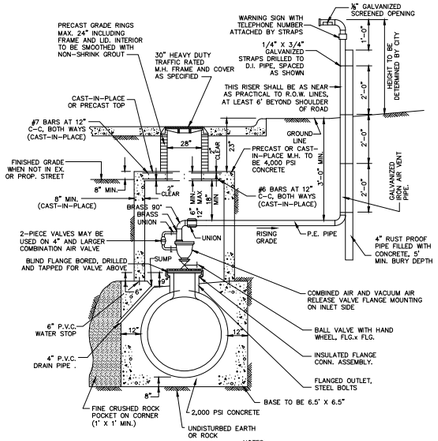
W703



NOTES:
1. BRASS FITTINGS AND PIPE TO BE USED FROM CORPORATION STOP THROUGH AIR RELEASE VALVE UNIT. GALVANIZED IRON FROM 90° BRASS FITTING ON TOP OF AIR RELEASE VALVE UNIT TO VENT OUTLET.
2. TO BE USED FOR AIR & VACUUM RELEASE VALVES WITH OUTLETS 2" IN DIAMETER OR LESS.

AIR AND VACUUM RELEASE VALVE-TYPE 1 FOR WATER MAINS

W801



NOTES:
1. ON 4" AND LARGER TWO PIECE COMBINATION AIR VALVES, THE OUTLET PIPING OF THE SMALL VALVE SHALL BE VENTED INTO THE SIDE OF THE LARGER VENT PIPE THAT GOES ABOVE GROUND.
2. WHEN NOT IN PAVING OR WALK, A 4,000 PSI CONCRETE PAD REINFORCED W/#3 BARS AT 12" C-C EACH WAY, SHALL EXTEND A MINIMUM OF 2" AROUND THE M.H. AND SHALL BE A MINIMUM OF 3" THICK.
3. GALVANIZED IRON PIPE AND FITTINGS TO BE USED FROM BRASS 90° FITTING ON TOP OF AIR RELEASE VALVE UNIT TO VENT OUTLET.
4. VENT PIPE SIZE TO EQUAL OUTLET SIZE OF AIR/VACUUM RELEASE VALVE.
5. MINIMUM M.H. DIA. TO BE 5'. 6' DIA. M.H. REQUIRED FOR VALVES 8" OR GREATER.

AIR AND VACUUM RELEASE VALVE-TYPE 2 FOR WATER MAINS

W802

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

WATER DETAILS

DATE
DEC. 2018

SHEET No.
3 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N/A

CERTIFICATION:
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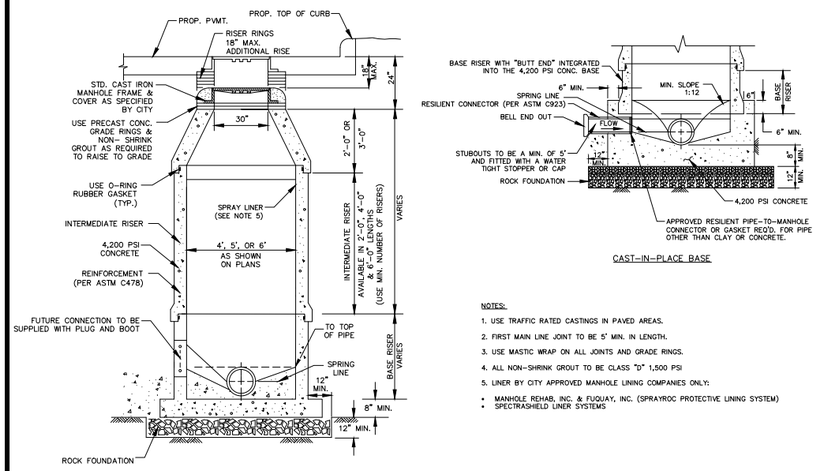


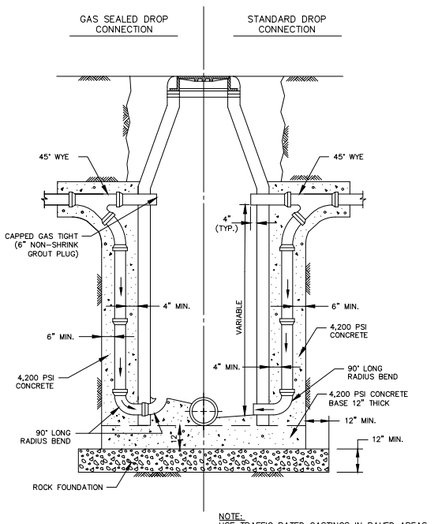
CAST-IN-PLACE BASE

NOTES:

1. USE TRAFFIC RATED CASTINGS IN PAVED AREAS.
2. FIRST MAIN LINE JOINT TO BE 5' MIN. IN LENGTH.
3. USE MASTIC WRAP ON ALL JOINTS AND GRADE RINGS.
4. ALL NON-SHRINK GROUT TO BE CLASS "D" 1,500 PSI
5. LINER BY CITY APPROVED MANHOLE LINING COMPANIES ONLY:
   - MANHOLE REHAB, INC. & FUQUAY, INC. (SPRAYROC PROTECTIVE LINING SYSTEM)
   - SPECTRASHIELD LINER SYSTEMS

PRE-CAST MANHOLE WITH LINING

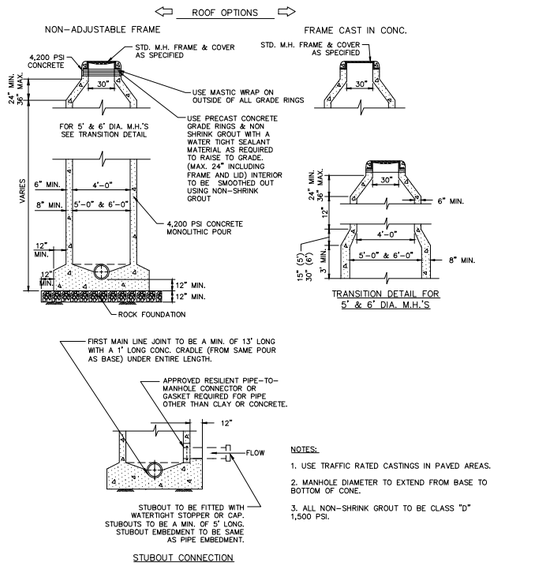
S101



NOTE:
USE TRAFFIC RATED CASTINGS IN PAVED AREAS

DROP MANHOLE

S102



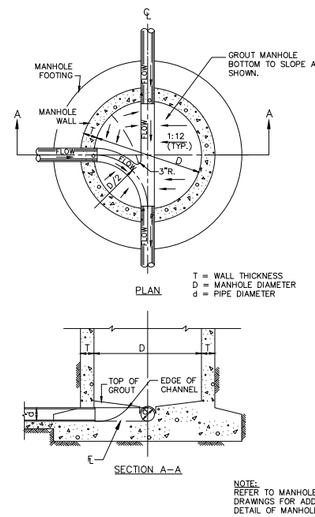
STUBOUT CONNECTION

NOTES:

1. USE TRAFFIC RATED CASTINGS IN PAVED AREAS.
2. MANHOLE DIAMETER TO EXTEND FROM BASE TO BOTTOM OF CONE.
3. ALL NON-SHRINK GROUT TO BE CLASS "D" 1,500 PSI.

CAST-IN-PLACE MANHOLE

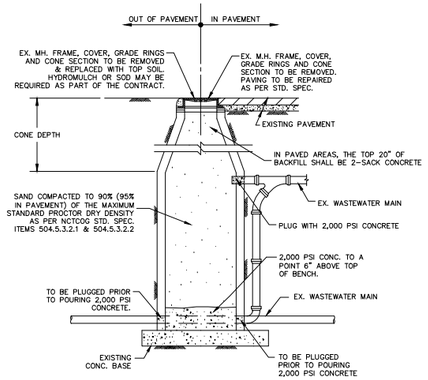
S103



NOTE:
REFER TO MANHOLE STANDARD DRAWINGS FOR ADDITIONAL DETAIL OF MANHOLE

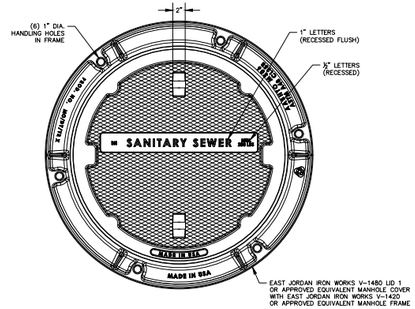
SEWERLINE INTERSECTION

S104

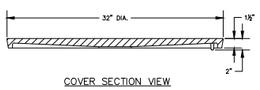


ABANDONMENT OF MANHOLE

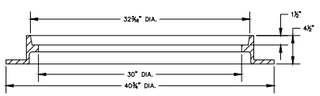
S105



ASSEMBLY PLAN VIEW



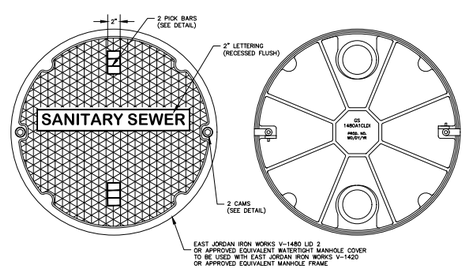
COVER SECTION VIEW



FRAME SECTION VIEW

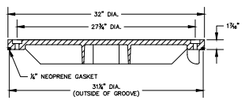
MANHOLE FRAME AND COVER

S106A

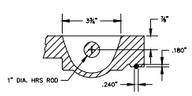


COVER PLAN VIEW

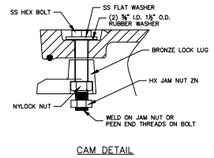
COVER BOTTOM VIEW



COVER SECTION VIEW



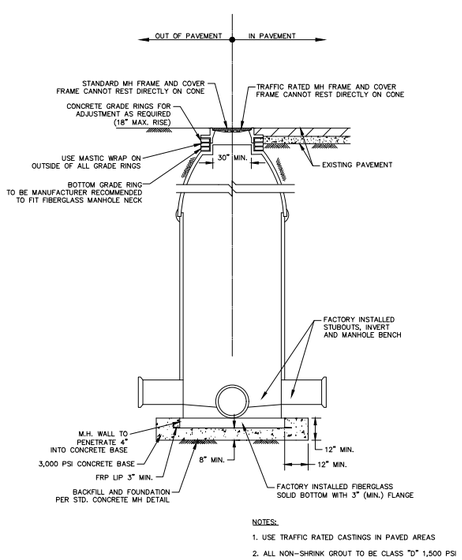
PICKBAR & GASKET GROOVE DETAIL



CAM DETAIL

WATERTIGHT MANHOLE COVER WITH CAM LOCKS AND GASKET

S106B



NOTES:

1. USE TRAFFIC RATED CASTINGS IN PAVED AREAS
2. ALL NON-SHRINK GROUT TO BE CLASS "D" 1,500 PSI

FIBERGLASS MANHOLE WITH STUBOUTS

S107B

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DESIGNED BY	DATE	REVISION
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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

WASTEWATER DETAILS

DATE
DEC. 2018

SHEET No.
4 OF 16

SCALE
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VER 1"= N/A

CERTIFICATION:
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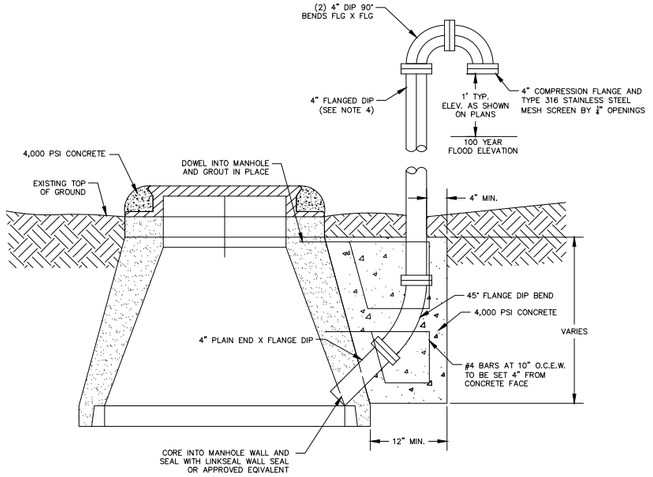
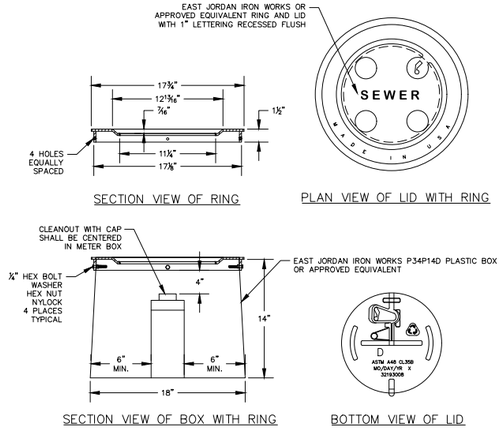


NOTES:
1. DUCTILE IRON PIPE AND FITTINGS SHALL HAVE 40 MIL POLYETHYLENE INTERIOR COATING.
2. ALL BOLTS AND NUTS TO BE TYPE 316 STAINLESS STEEL.
3. FINISH COATING
   A. WIRE BRUSH TO REMOVE ALL DIRT AND CONC. AND TO ROUGH UP FINISH
   B. APPLY ONE PRIME COAT OF TNEMEC SERIES 37 CHEM PRIME (GRAY) TO 3 MILS DRY THICKNESS. GIVE SPECIAL ATTENTION AND SECOND COAT TO CORNERS AND BOLTS.
   C. APPLY ONE FINISH COAT OF TNEMEC SERIES 48-38 ALKYD ALUMINUM TO 2 MILS DRY THICKNESS.
4. VENT PIPES LONGER THAN 6' TO BE 6" DUCTILE IRON PIPE AND FITTINGS.
5. REFLECTIVE TAPE TO BE PLACED ON VENT 4.25 FEET ABOVE FINAL GRADE.

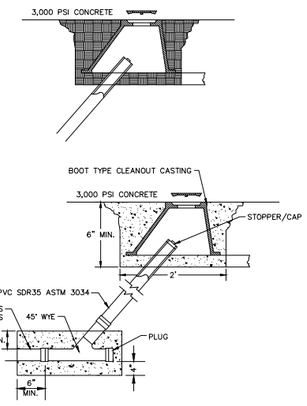
VENT MANHOLE

S108



18" X 14" PLASTIC BOX WITH SEWER LID

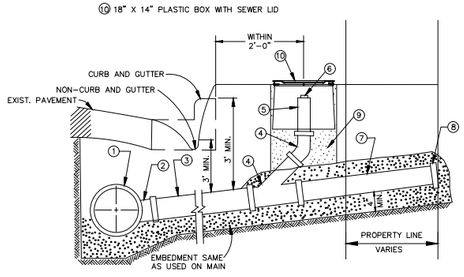
S201



SANITARY SEWER MAINLINE CLEANOUT

S402

KEY:
1. WASTERWATER MAIN
2. WYE PLACED BETWEEN 3 & 9 POSITION (4" RESIDENTIAL–6" COMMERCIAL)
3. WASTEWATER LAT. (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
4. WYE AND 45° BEND FOR RISER AS REQ'D BY CITY (4" RESIDENTIAL–6" COMMERCIAL)
5. STACK (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
6. WASTEWATER RISER WITH CLEANOUT CAP (4" RESIDENTIAL–6" COMMERCIAL)
7. WASTEWATER PIPE (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
8. END CAP EXTEND TO EASEMENT LINE AND END CAP
9. NATURAL FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY
10. 18" X 14" PLASTIC BOX WITH SEWER LID

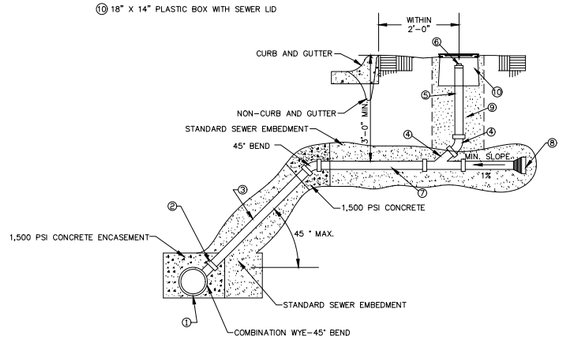


NOTES:
1. CLEANOUT CASTING TO BE FURNISHED AND PLACED PER SPECIAL CONDITIONS. IN VEHICLE TRAFFIC AREAS AND FOR COMMERCIAL MAINLINE LATERALS, WASTEWATER CLEANOUT CASTING SHALL BE OF CAST IRON CONFORMING TO ASTM A48 CLASS 35B.
2. SLOPE OF LATERAL TO BE 1% MIN., 2% MAX. UNLESS INSTRUCTED OTHERWISE BY CITY.
3. THE WASTEWATER LATERAL SHALL BE CONSTRUCTED FOR BUILDING LATERAL AND CONSTRUCTED TO CLEAR EXISTING UTILITES AND PROPOSED FACILITIES SUCH AS STORM SEWER MAINS, PAVING, SIDEWALKS, RETAINING WALLS, ETC. VERTICAL BENDS (22.5° MAX.) MAY BE USED IF APPROVED BY CITY.
4. THE MAINLINE LATERAL CONNECTION TO THE PRIVATE BUILDING LATERAL SHALL BE AS CLOSE TO THE PROPERTY LINE AS POSSIBLE.
5. INSTALL STOPPER OR CAP AT PROPERTY LINE IF BUILDING LATERAL DOES NOT EXIST.
6. THE CLEANOUT STACK & CASTING MAY BE PLACED IN THE PARKWAY, VEHICLE TRAFFIC AREAS, OR SIDEWALK, IF NECESSARY.
7. THE CLEANOUT SHALL BE CENTERED IN PLASTIC BOX.
8. CENTER OF CLEANOUT TO BE LOCATED NO FURTHER THAN 2'–0" BEHIND BACK OF CURB OR TOP OF SLOPE FOR NON–CURB AND GUTTER SECTION.

SANITARY SEWER SERVICE WITH SINGLE CLEANOUT

S403

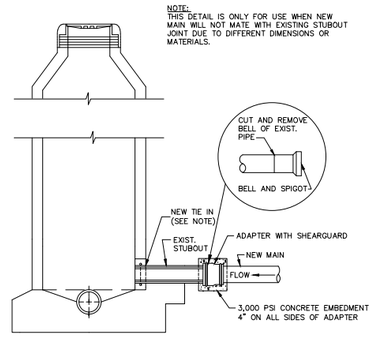
KEY:
1. WASTERWATER MAIN
2. WYE PLACED BETWEEN 3 & 9 POSITION (4" RESIDENTIAL–6" COMMERCIAL)
3. WASTEWATER LAT. (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
4. WYE AND 45° BEND FOR RISER AS REQ'D BY CITY (4" RESIDENTIAL–6" COMMERCIAL)
5. STACK (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
6. WASTEWATER RISER WITH CLEANOUT CAP (4" RESIDENTIAL–6" COMMERCIAL)
7. WASTEWATER PIPE (LENGTH VARIES) (4" RESIDENTIAL–6" COMMERCIAL)
8. END CAP EXTEND TO EASEMENT LINE AND END CAP
9. NATURAL FILL COMPACTED TO 95% STANDARD PROCTOR DENSITY
10. 18" X 14" PLASTIC BOX WITH SEWER LID



1. CLEANOUT CASTING TO BE FURNISHED AND PLACED PER SPECIAL CONDITIONS. IN VEHICLE TRAFFIC AREAS AND FOR COMMERCIAL MAINLINE LATERALS, WASTEWATER CLEANOUT CASTING SHALL BE OF CAST IRON CONFORMING TO ASTM A48 CLASS 35B.
2. SLOPE OF SHALLOW LATERAL SECTION TO BE 1% MIN., 2% MAX. UNLESS INSTRUCTED OTHERWISE BY CITY.
3. THE WASTEWATER LATERAL SHALL BE CONSTRUCTED FOR BUILDING LATERAL AND CONSTRUCTED TO CLEAR EXISTING UTILITIES AND PROPOSED FACILITIES SUCH AS STORM SEWER MAINS, PAVING, SIDEWALKS, RETAINING WALLS, ETC. VERTICAL BENDS (22.5° MAX.) MAY BE USED IF APPROVED BY CITY.
4. THE MAINLINE LATERAL CONNECTION TO THE PRIVATE BUILDING LATERAL SHALL BE AS CLOSE TO THE PROPERTY LINE AS POSSIBLE.
5. INSTALL STOPPER OR CAP AT PROPERTY LINE IF BUILDING LATERAL DOES NOT EXIST.
6. THE CLEANOUT STACK & CASTING MAY BE PLACED IN THE PARKWAY, VEHICLE TRAFFIC AREAS, OR SIDEWALK, IF NECESSARY.
7. CONNECTION FITTING TO MAIN TO BE ENCASED IN 1,500 PSI CONCRETE.
8. THE CLEANOUT SHALL BE CENTERED IN PLASTIC BOX.
9. CENTER OF CLEANOUT TO BE LOCATED NO FURTHER THAN 2'–0" BEHIND BACK OF CURB OR TOP OF SLOPE FOR NON–CURB AND GUTTER SECTION.

SANITARY SEWER SERVICE WITH SINGLE CLEANOUT 12' DEEP OR GREATER

S404



SANITARY SEWER MAIN TIE–IN WITH STUBOUT OF DISSIMILAR SIZE OR TYPE

S405

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

WASTEWATER DETAILS

DATE
DEC. 2018

SHEET No.
5 OF 16

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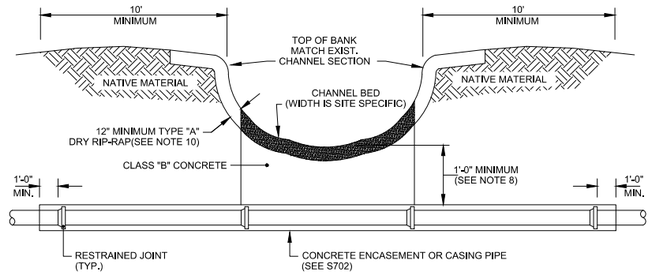


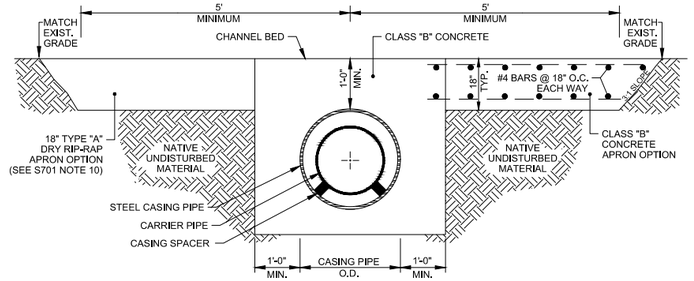
CROSSING RAMPS (10 FT. WIDE) SHALL BE PROVIDED ON BOTH SIDES OF THE CHANNEL FOR A MOVING TRACTOR TO NAVIGATE.

NOTES:

1. THIS STANDARD DETAIL IS FOR USE BY THE DESIGN ENGINEER. THE DIMENSIONS, NOTES & MATERIALS MUST BE CHECKED BASED ON SITE SPECIFIC CONDITIONS INCLUDING: PIPE MATERIAL, PIPE DIAMETER, STATIC & DYNAMIC CONDITIONS.
2. LOW WATER AND CREEK CROSSINGS MAY BE CONSTRUCTED EITHER IN THE DRY THROUGH THE USE OF COFFERDAMS AND DIVERSION CHANNELS OR SUBAQUEOUSLY. IF CONSTRUCTED IN THE DRY, PLANNING AND SCHEDULING OF CONSTRUCTION SHOULD BE SUCH THAT COMPLETED PORTIONS OF THE LINE ARE NOT SUBJECT TO DAMAGE IN THE EVENT OF COFFERDAM OVERTOPPING. CONCRETE ENCASEMENT SHOULD BE PLACED WITH CONSTRUCTION JOINTS AT 30-40 FT INTERVALS TO COINCIDE WITH PIPE JOINTS.
3. PIPE BUOYANCY MUST BE CHECKED BY THE ENGINEER TO ENSURE THE PIPE WILL NOT FLOAT WHEN EMPTY. HEAVIER WALL THICKNESS OR ADDITIONAL ENCASEMENT MAY BE REQUIRED.
4. EROSION CONTROL – A STORMWATER POLLUTION PREVENTION PLAN MUST BE DESIGNED AND IMPLEMENTED TO MITIGATE THE IMPACT OF CONSTRUCTION ACTIVITIES ON THE FEATURE BEING CROSSED.
5. PIPE SHOULD BE FULLY RESTRAINED AND PRESSURE RATED AS DETERMINED BY THE ENGINEER.
6. ACCESS TO THE BANKS ON EITHER SIDE OF THE CROSSING MUST BE AVAILABLE AS WELL AS ADEQUATE ROOM FOR ASSEMBLY AND EQUIPMENT. BANK GRADE AND STABILITY MUST BE ADEQUATE. A GEOTECHNICAL ENGINEER SHOULD BE CONSULTED TO ASSIST WITH BANK ANALYSIS AND STREAM BED ANALYSIS TO PROVIDE ADDITIONAL DATA AND RECOMMENDATIONS ON THE VIABILITY OF OPEN-CUT VS TRENCHLESS CROSSINGS.
7. PIPE USED FOR LOW WATER CROSSINGS SHALL BE RESTRAINED FOR A MINIMUM OF 20 FT BEYOND TOP OF BANK ON EACH SIDE OF CREEK.
8. CASING PIPE IS REQUIRED WHEN DEPTH OF COVER IS LESS THAN 3 FT.
9. PLACE STONE RIP-RAP A MINIMUM OF 5 FT UPSTREAM & 5 FT DOWNSTREAM FROM CENTERLINE OF PIPE ALONG LOW WATER CROSSING BED.
10. STONES SHALL WEIGH BETWEEN 50 LBS & 150 LBS EACH, AND AT LEAST 60% SHALL WEIGH MORE THAN 100 LBS.
11. REFER TO STEEL CASING DETAIL FOR ADDITIONAL PIPE INFORMATION.

LOW WATER CHANNEL CROSSING
DETAIL SECTION I

S701

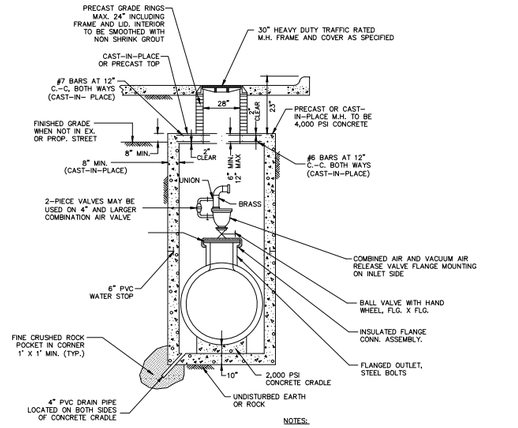


NOTES:

1. ENGINEER MAY SPECIFY EITHER RIP-RAP OR CONCRETE OPTION BASED ON SITE CONDITIONS.
2. APRON & PIPE TRENCH MUST HAVE A CONSTANT UPSTREAM TO DOWNSTREAM SLOPE TO MATCH PRE-CONSTRUCTION CHANNEL BED.
3. FOR CARRIER PIPE LESS THAN 36".
4. REFER TO STEEL CASING DETAIL FOR ADDITIONAL PIPE INFORMATION.

LOW WATER CHANNEL CROSSING
DETAIL SECTION II

S702



NOTES:

1. ON 4" AND LARGER TWO PIECE COMBINATION AIR VALVES, THE OUTLET PIPING OF THE SMALL VALVE SHALL BE VENTED INTO THE SIDE OF THE LARGER VENT PIPE.
2. WHEN NOT IN PAVING OR WALK, A 4,000 PSI CONCRETE PAD REINFORCED W/#3 BARS AT 12" C-C EACH WAY, SHALL EXTEND A MINIMUM OF 2' AROUND THE M.H. AND SHALL BE A MINIMUM OF 3" THICK.
3. BRASS PIPE AND FITTINGS TO BE USED FROM BRASS 90° FITTING ON TOP OF AIR RELEASE VALVE UNIT TO VENT OUTLET.
4. VENT PIPE SIZE TO EQUAL OUTLET SIZE OF AIR/VACUUM RELEASE VALVE.
5. MINIMUM M.H. DIA. TO BE 5'. 6' DIA. M.H. REQUIRED FOR VALVES 8" OR GREATER.

AIR AND VACUUM RELEASE VALVE-TYPE 2
FOR SEWER FORCE MAINS

S803

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DESIGNED BY	DATE	REVISION
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CITY OF DENTON
ENGINEERING SERVICES

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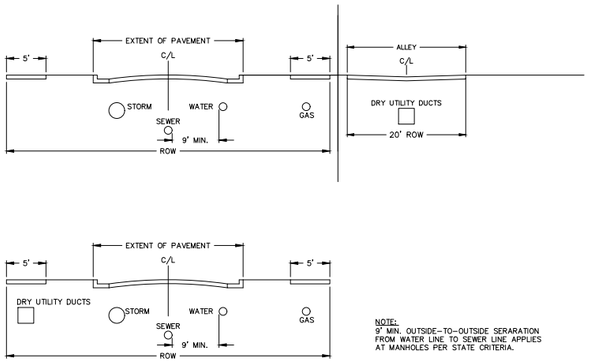
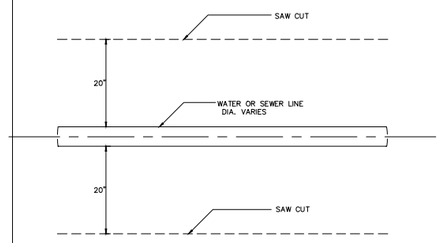


NOTE:
9' MIN. OUTSIDE-TO-OUTSIDE SERARATION FROM WATER LINE TO SEWER LINE APPLIES AT MANHOLES PER STATE CRITERIA.

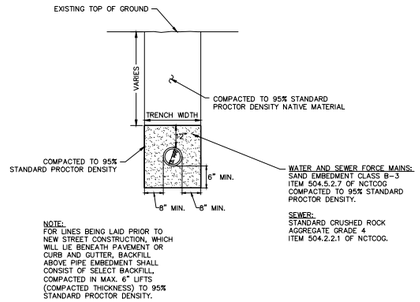
TYPICAL UTILITY PLACEMENTS

U101



TYPICAL SAW-CUT

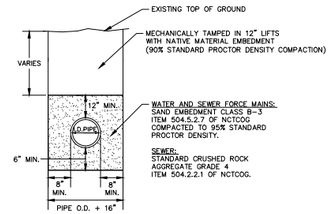
U102



NOTE:
FOR LINES BEING LAID PRIOR TO NEW STREET CONSTRUCTION, WHICH WILL LIE BENEATH PAVEMENT OR CURB AND GUTTER, BACKFILL ABOVE PIPE EMBEDMENT SHALL CONSIST OF SELECT BACKFILL, COMPACTED IN MAX. 6" LIFTS (COMPACTED THICKNESS) TO 95% STANDARD PROCTOR DENSITY.

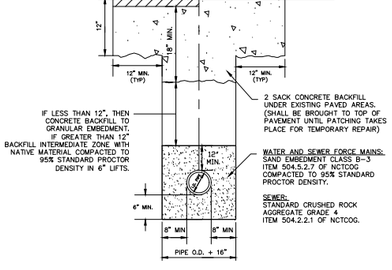
PROPOSED PAVEMENT TRENCH

U201



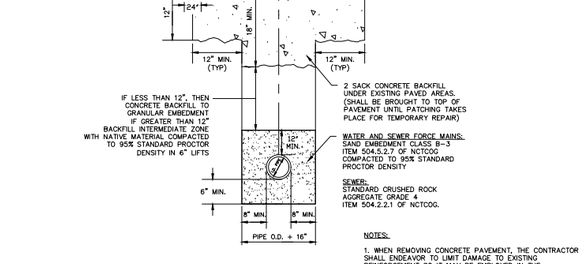
UNPAVED TRENCH

U202



EXISTING PAVEMENT TRENCH ASPHALT

U203A



NOTES:

1. WHEN REMOVING CONCRETE PAVEMENT, THE CONTRACTOR SHALL ENDEAVOR TO LIMIT DAMAGE TO EXISTING REINFORCEMENT SO IT MAY BE EMPLOYED IN THE REPLACEMENT OPERATION. IF ORIGINAL REINFORCEMENT IS CUT OR BROKEN, REPLACEMENT BARS OF THE SAME SIZE SHALL BE INSTALLED BY DRILLING AND DOWELING.

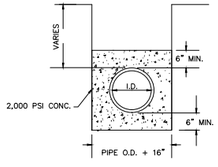
2. IF DRILLING AND DOWELING IS REQUIRED, DOWELED BARS SHALL BE DRILLED INTO PAVEMENT HORIZONTALLY BY USE OF A MECHANICAL RIG. DRILLING BY HAND IS NOT ALLOWED. DRILLED HOLES SHALL BE BLOWN CLEAN AND DOWELS COATED WITH EPOXY RESIN. MINIMUM EMBEDMENT IS TO BE 12 INCHES.

3. USE SAND TO SMOOTH AND LEVEL SUBGRADE PRIOR TO CONCRETE POUR.

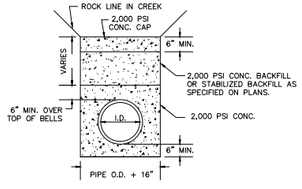
4. ALL CONCRETE REPAIRS MUST BE FULL PANELS.

EXISTING PAVEMENT TRENCH CONCRETE

U203C



CLASS "G"



CLASS "G-1"
(FOR ROCK DITCHES IN CREEKS)

CLASS "G" EMBEDMENT

U204

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CITY OF DENTON
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STANDARD DETAILS

WATER/WASTEWATER SHARED DETAILS

DATE
DEC. 2018

SHEET No.
7 OF 16

SCALE
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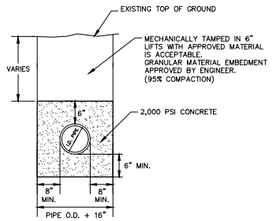
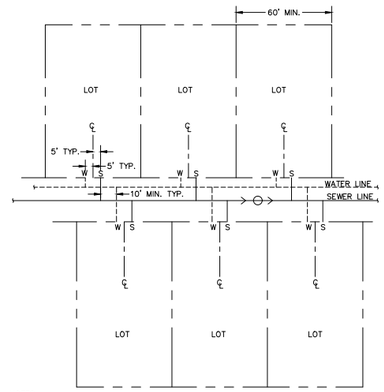


CONCRETE ENCASEMENT

U205



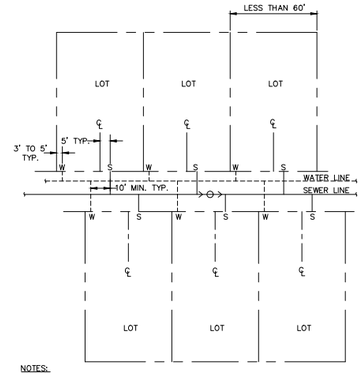
NOTES:

1. WATER METERS PLACED IN UNPAVED PUBLIC R.O.W. OR UTILITY EASEMENT.

2. IF WIDTH OF LOT IS LESS THAN 60' WIDE, USE DETAIL U206B.

TYPICAL SERVICE LINE LAYOUT

U206A



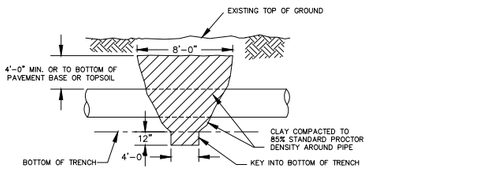
NOTES:

1. WATER METERS PLACED IN UNPAVED PUBLIC R.O.W. OR UTILITY EASEMENT.

2. IF WIDTH OF LOT IS 60' OR GREATER, USE DETAIL U206A.

ALTERNATE SERVICE LINE LAYOUT
*(FOR LOTS LESS THAN 60' WIDE)

U206B



NOTES:

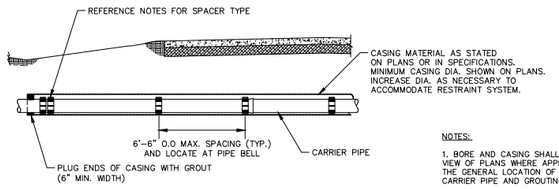
1. CLAY SHALL SERVE AS A WATER STOP.

2. CLAY SHALL HAVE A HIGH P.I. (NOT LESS THAN 18)

3. SEE PLAN AND PROFILE SHEETS FOR LOCATION OF CLAY DAMS.

CLAY DAM

U207



NOTES:

1. BORE AND CASING SHALL BE INSTALLED AS SHOWN IN PROFILE VIEW OF PLANS WHERE APPLICABLE. THIS DETAIL ILLUSTRATES THE GENERAL LOCATION OF CASING SPACERS FOR SUPPORTING CARRIER PIPE AND GROUTING ENDS OF CASING PIPE.

2. FOR PRESSURIZED PIPE, ALL INTERIOR JOINTS SHALL BE RESTRAINED BY A DUCTILE IRON PIPE RESTRAINING HARNESS. FOR NON-PRESSURIZED PIPE, ALL INTERIOR JOINTS SHALL BE RESTRAINED BY A DUCTILE IRON PIPE RESTRAINING HARNESS, LOCKING GASKETS OR AN APPROVED MECHANICAL JOINT SYSTEM.

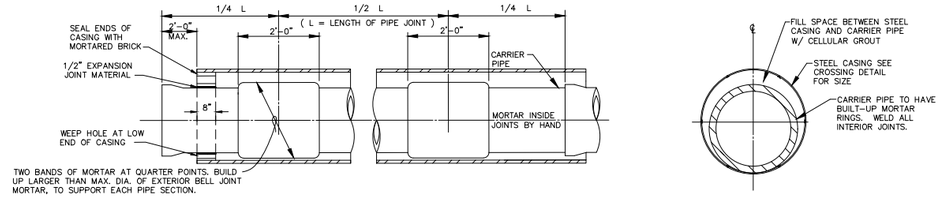
3. FOR BORES 150 LF OR LONGER: 12" WIDE 304 STAINLESS BAND AND 2" WIDE PLASTIC OR POLYETHYLENE RUNNERS, PIPELINE SEAL & INSULATOR, INC., MODEL S126-2 OR APPROVED EQUIVALENT. FOR BORES LESS THAN 150 LF: RECON "RACI" CASING SPACERS OR APPROVED EQUIVALENT AND DOUBLE SPACERS AT EACH END.

4. PIPE INSTALLATION INTO BORE CASING SHALL BE PULLED OR PUSHED PER MANUFACTURERS RECOMMENDATION.

5. REFER TO CITY STANDARD TRENCH DETAILS FOR CASING EMBEDMENT.

INSTALLATION IN STEEL CASING
FOR PVC AND DIP

U208A



INSTALLATION IN STEEL CASING
FOR CONCRETE CYLINDER PIPE

U208B

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CITY OF DENTON
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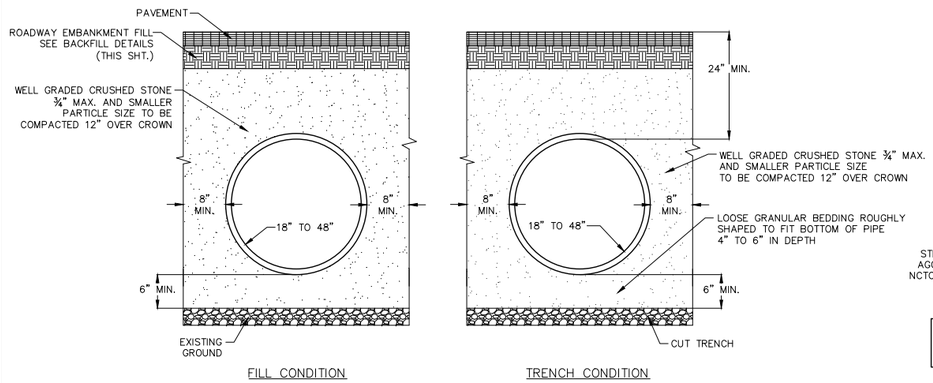
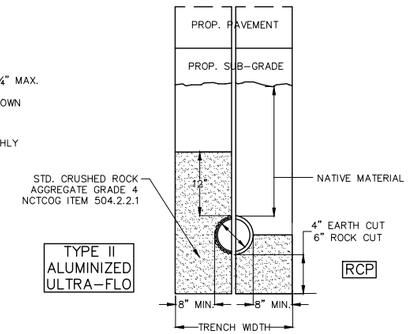


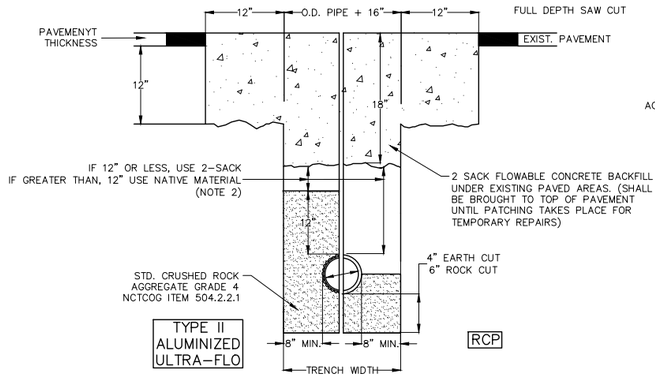
NOTE:

CONSIDER THE USE OF FABRIC BETWEEN SOIL ZONES IF MIGRATION IS A CONCERN

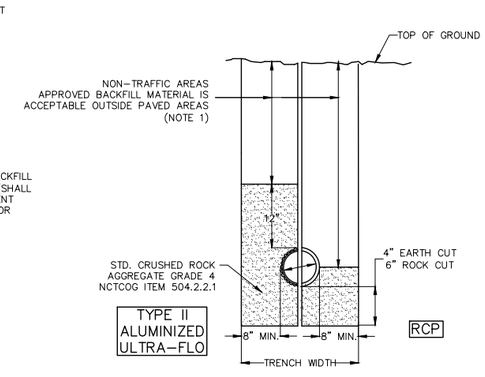
ULTRA–FLO STANDARD ROUND BACKFILL/INSTALLATION DETAIL



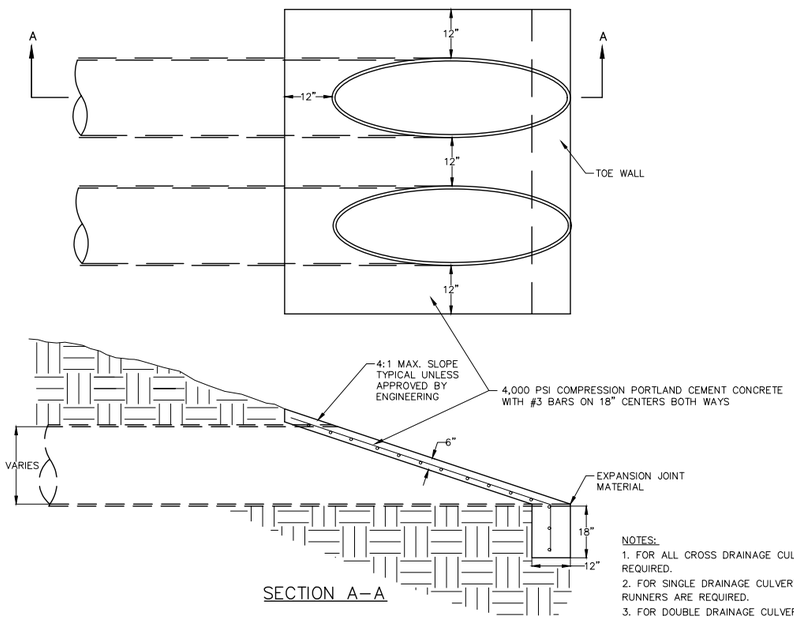
PROPOSED PAVEMENT STORM DRAIN BACKFILL DETAIL



EXISTING PAVEMENT STORM DRAIN BACKFILL DETAIL



UNPAVED STORM DRAIN BACKFILL DETAIL

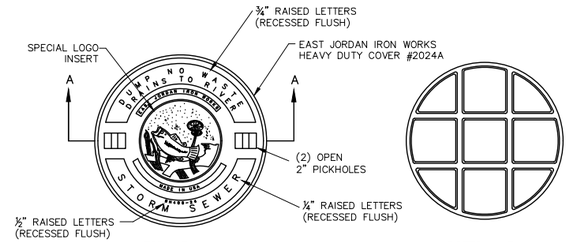


SECTION A–A

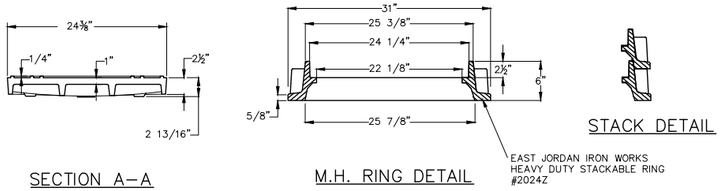
NOTES:

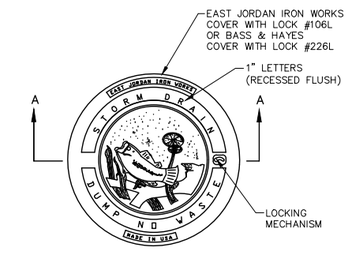
1. FOR ALL CROSS DRAINAGE CULVERTS 24" DIA. OR GREATER, SAFETY PIPE RUNNERS ARE REQUIRED.
2. FOR SINGLE DRAINAGE CULVERTS PARALLEL TO ROAD 33" DIA. OR GREATER, SAFETY PIPE RUNNERS ARE REQUIRED.
3. FOR DOUBLE DRAINAGE CULVERTS PARALLEL TO ROAD 30" DIA. OR GREATER, SAFETY PIPE RUNNERS ARE REQUIRED.
4. FOR 3 OR MORE DRAINAGE CULVERTS PARALLEL TO ROAD 12" DIA. OR GREATER, SAFETY PIPE RUNNERS ARE REQUIRED.
5. REFER TO TXDOT SAFETY END TREATMENT DETAILS FOR SAFETY PIPE RUNNER SPECIFICATIONS AND INSTALLATION.

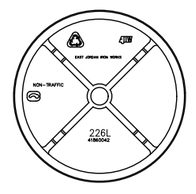
SAFETY END TREATMENT



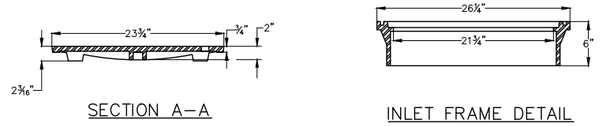
JUNCTION BOX AND MANHOLE COVER DETAIL







INLET COVER DETAIL WITH LOCKING MECHANISM



GENERAL NOTES:

1. COMPACT BACKFILL MATERIAL TO MINIMUM 95% STANDARD PROCTOR DENSITY – MAXIMUM 12" LOOSE LIFTS.
2. COMPACT BACKFILL MATERIAL TO MINIMUM 95% STANDARD PROCTOR DENSITY – MAXIMUM 8" LOOSE LIFTS.
3. HEAVY DUTY MANHOLE COVERS ON JUNCTION BOXES AND MANHOLES AS SPECIFIED. LOCK NOT REQUIRED.
4. LIGHT DUTY INLET COVERS ON INLETS AS SPECIFIED. LOCK REQUIRED

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CITY OF DENTON
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STANDARD DETAILS

STORM DRAINAGE DETAILS

DATE
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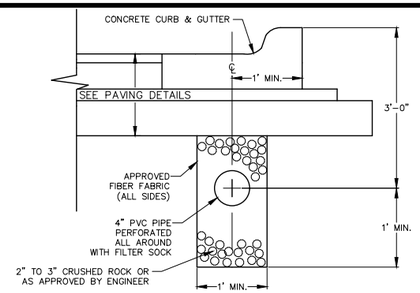
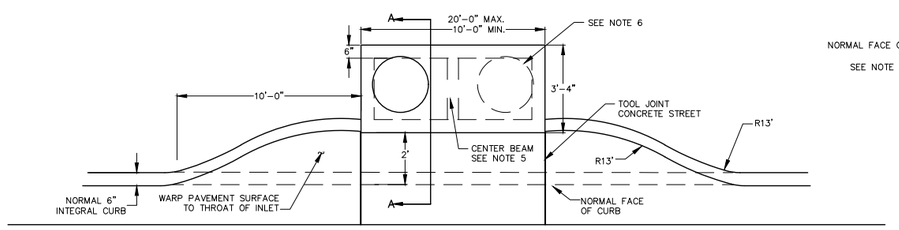
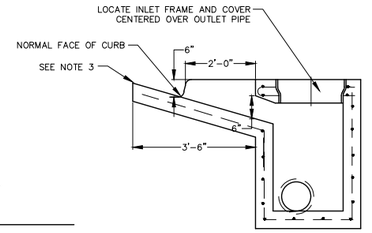


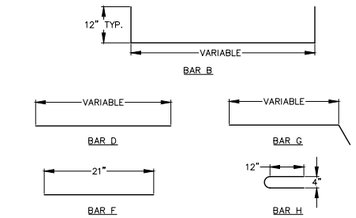
FRENCH DRAIN SECTION



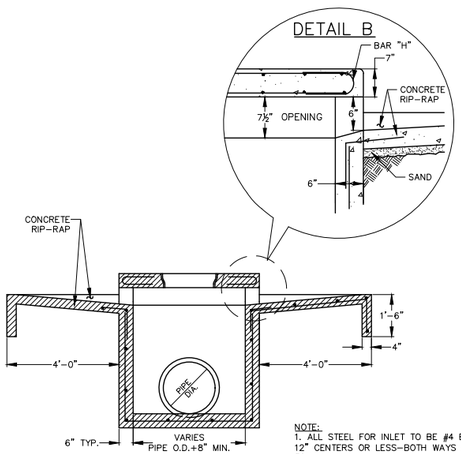
RECESSED INLET DETAIL (PLAN)



SECTION A–A

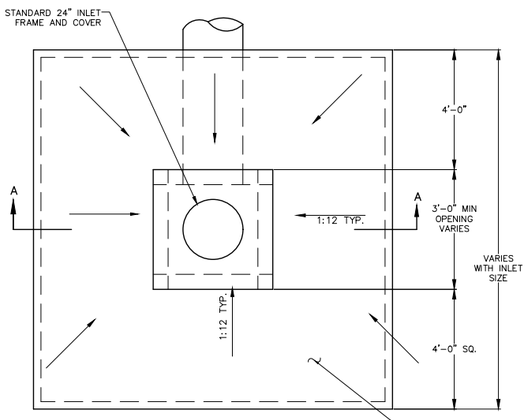


BAR DETAIL

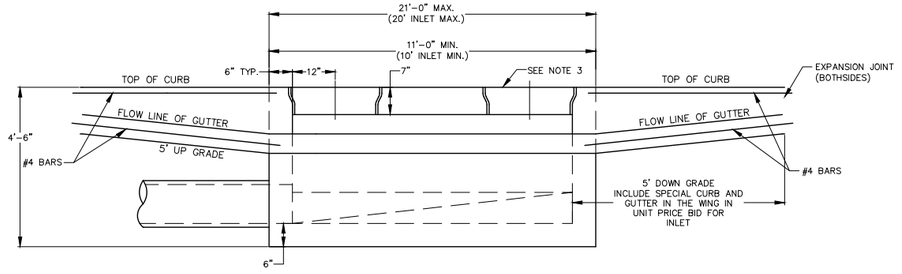


NOTE:
1. ALL STEEL FOR INLET TO BE #4 BARS ON 12" CENTERS OR LESS–BOTH WAYS SPACED EQUALLY.
2. CONCRETE RIP–RAP TO HAVE #3 BARS ON 18" CENTERS.

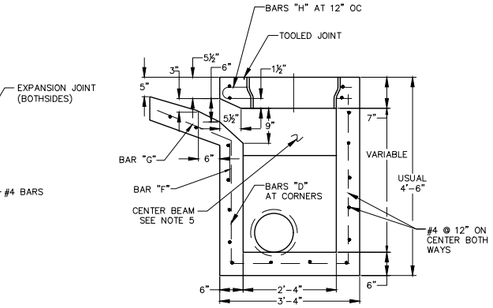
SECTION A–A



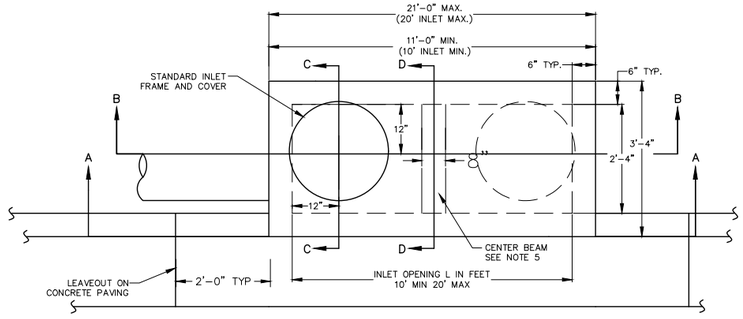
YARD INLET DETAIL (PLAN)



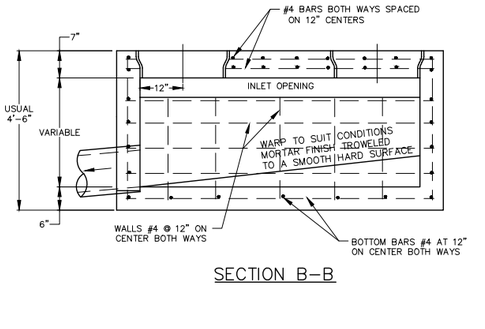
PROFILE



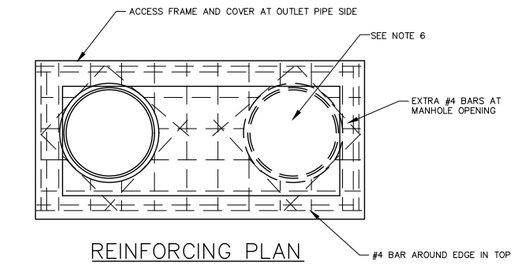
SECTION C–C



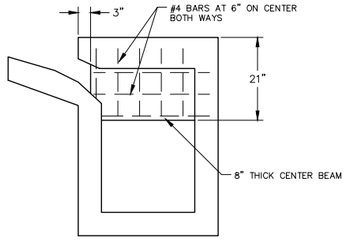
STANDARD CURB INLET (PLAN)



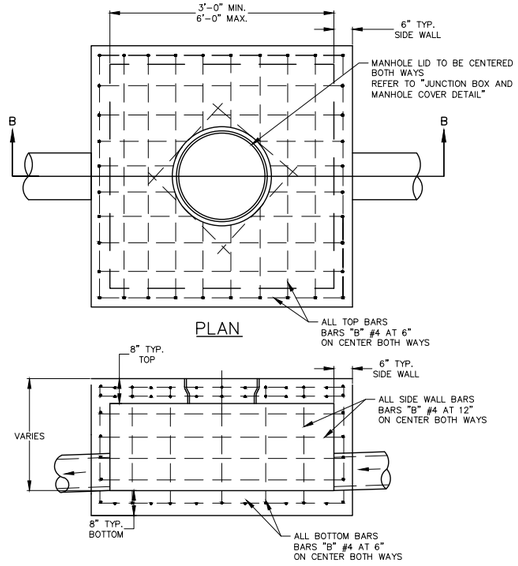
SECTION B–B



REINFORCING PLAN



SECTION D–D



PLAN

SECTION B–B

JUNCTION BOX DETAIL

GENERAL NOTES:

1. ALL STEEL REINFORCING BARS TO BE GRADE 60 #4 STEEL BARS ON 12" CENTER.
2. ALL EXPOSED EDGES TO BE CHAMFERED ¾".
3. TOOLED JOINT 6" FROM FACE.
4. PROVIDE MINIMUM 2" CONCRETE COVER MEASURED FROM CENTER OF REINFORCEMENT.
5. INLETS OVER 10 FEET OPENING IN LENGTH SHALL HAVE A CENTER BEAM.
6. INLETS OVER 12 FEET OPENING IN LENGTH SHALL HAVE TWO ACCESS COVERS.
7. ALL CONCRETE SHALL BE CLASS A.

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STANDARD DETAILS

STORM DRAINAGE DETAILS

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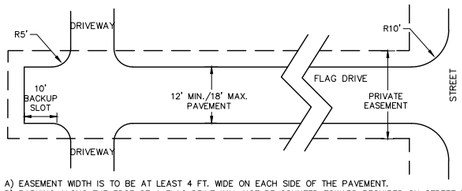
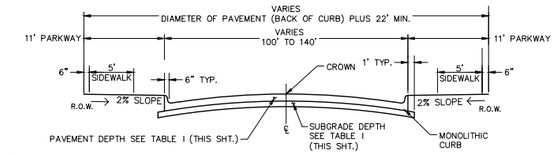


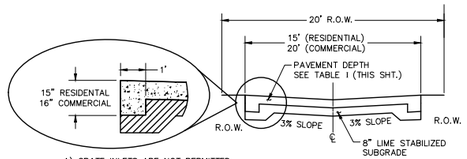
A) EASEMENT WIDTH IS TO BE AT LEAST 4 FT. WIDE ON EACH SIDE OF THE PAVEMENT.
B) PARKING ALONG THE EDGE OF A FLAG DRIVE WILL NOT BE COUNTED TOWARD REQUIRED ON STREET PARKING.
C) PAVEMENT DEPTH MINIMUM IS 6 IN. WITH COMPACTED NATURAL SOIL SUBBASE.

FLAG DRIVE PLAN VIEW



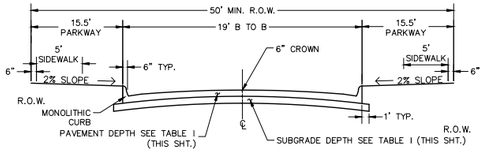
A) CROWN SHALL BE A MINIMUM OF 8 IN. ABOVE THE HIGHEST GUTTER ELEVATION AND SHALL ENSURE THAT DRAINAGE FROM CENTER COLLECTS TO NEAREST GUTTER.
B) 30 FT. RADIUS WILL BE PROVIDED AT THE JUNCTION OF THE STREET WITH THE CUL-DE-SAC.

CUL-DE-SAC SECTION



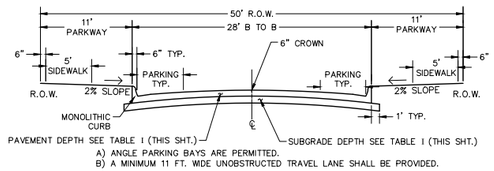
A) GRATE INLETS ARE NOT PERMITTED.
B) ANY INLET MUST BE PLACED OUTSIDE OF THE PAVEMENT.
C) TRANSITION SHALL BE GRADUAL FROM STANDARD SECTION TO INLET SECTION TO PROPERLY ACCOMMODATE DRAINAGE.
D) A DRAINAGE EASEMENT SHALL BE DEDICATED TO COMPLETELY CONTAIN THE INLET STRUCTURE PLUS SUFFICIENT ROOM FOR MAINTENANCE.

ALLEY SECTION



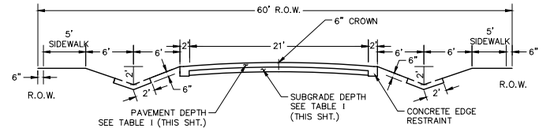
A) STANDARD PARKING IS ALLOWED ON ONE SIDE OF THE STREET FOR CROSS-SECTION SHOWN.
B) A NO PARKING RESTRICTION IS REQUIRED OPPOSITE THE SIDE OF THE STREET WHERE PARKING IS ALLOWED, UNLESS PARKING BAYS ARE PROVIDED WHERE THE NO PARKING PARKING RESTRICTION WOULD BE.
C) ANGLE PARKING BAYS ARE PERMITTED.
D) A MINIMUM 10 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.

RESIDENTIAL LANE SECTION



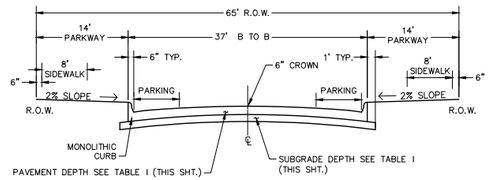
A) ANGLE PARKING BAYS ARE PERMITTED.
B) A MINIMUM 11 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.

RESIDENTIAL STREET SECTION



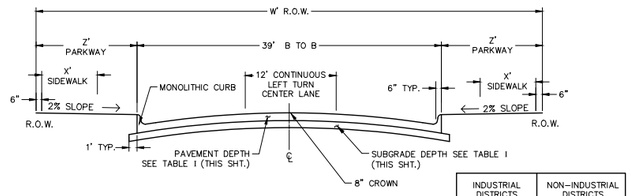
A) PILOT CHANNEL TO BE INSTALLED AT BOTTOM OF DITCH LINE.
B) PILOT CHANNEL CONCRETE SHALL BE 3,000 PSI COMPRESSION AND SHALL USE CITY APPROVED REINFORCEMENT.
C) REFER TO DENTON DEVELOPMENT CODE (DDC) FOR SIDEWALK REQUIREMENTS. IF SIDEWALK IS NOT REQUIRED, R.O.W. MAY BE REDUCED BY THE APPLICABLE AMOUNT UPON APPROVAL BY THE CITY ENGINEER.
D) ALL BORROW DITCH SLOPES 4:1 MINIMUM.
E) DITCH SHALL FULLY CONTAIN 100 YR. FLOOD. R.O.W. WIDTH SHALL BE INCREASED ACCORDINGLY TO ACCOMMODATE ANY ADDITIONAL DITCH CAPACITY WIDTH REQUIREMENTS.
F) AN UNDERGROUND DRAINAGE SYSTEM MAY BE USED IN LIEU OF LARGE BORROW DITCHES.
G) CONCRETE EDGE RESTRAINTS ARE REQUIRED.
H) NO PARKING RESTRICTION IS REQUIRED ON BOTH SIDES.

RURAL/SUBURBAN RESIDENTIAL STREET SECTION



A) ANGLE PARKING BAYS ARE PERMITTED.
B) A MINIMUM 20 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.
C) ON-STREET PARKING CAN BE REMOVED IF LEFT TURN POCKETS ARE REQUIRED.

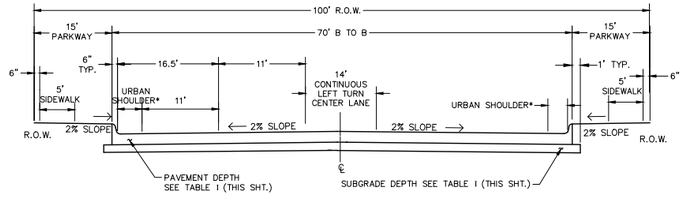
RESIDENTIAL STREET COLLECTOR SECTION



A) PARKING IS NOT ALLOWED ON EITHER SIDE.
B) PARKING BAYS ARE NOT ALLOWED ON EITHER SIDE.

	INDUSTRIAL DISTRICTS	NON-INDUSTRIAL DISTRICTS
	ROW WIDTH	
W	59 FT.	65 FT.
	PARKWAY WIDTH	
Z	10 FT.	13 FT.
	SIDEWALK	
X	5 FT.	8 FT.

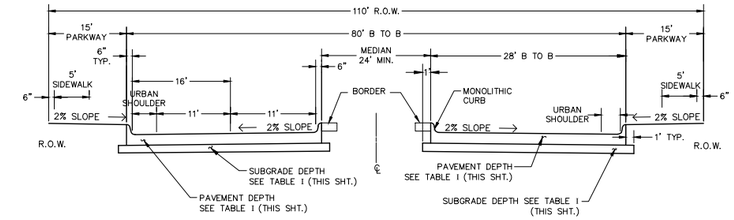
COMMERCIAL STREET COLLECTOR SECTION



A) FOR USE IN INFILL AREAS ONLY AND UPON WRITTEN APPROVAL BY THE CITY ENGINEER
B) AN ADDITIONAL 10 FT. OF ROW SHALL BE DEDICATED FOR A RIGHT TURN BAY/LANE OR BUS BAY, WHERE REQUIRED
C) URBAN SHOULDER SHALL BE DESIGNATED BY USING A 4" WHITE PAVEMENT MARKING

* IF STREET IS DESIGNATED ON BIKE PLAN, ADD 1' FOOT TO URBAN SHOULDER FROM PARKWAY WIDTH AS NEEDED TO CREATE A 5.5 MIN. BIKE LANE.

MODIFIED SECONDARY ARTERIAL SECTION



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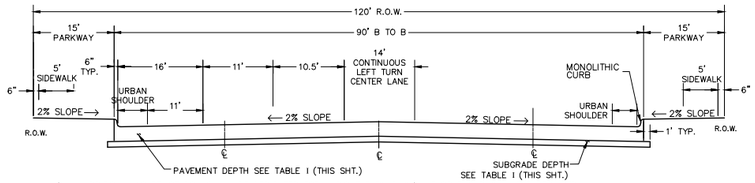
B) URBAN SHOULDER SHALL BE DESIGNATED BY USING A 4" WHITE PAVEMENT MARKING
C) ROW AT THE INTERSECTION WITH ANOTHER ARTERIAL SHALL BE A MIN. OF 112 FT. IN WIDTH FOR A MIN. DISTANCE OF 150 FT PRIOR TO THE CROSS-STREET'S ROW IN ORDER TO ACCOMMODATE A RIGHT TURN BAY/LANE AND A MIN. 6 FT WIDE PEDESTRIAN REFUGE ISLAND. THE TAPER PRIOR TO THIS WIDENING SHALL BE A MIN. OF 10:1 TO MATCH THE 100 FT ROW. ALL ADDITIONAL ROW AND PAVEMENT SHALL BE ON THE APPROACH SIDE (OF THE STREET) TO THE INTERSECTION.
D) BORDER SHALL BE A MIN. OF 18" IN WIDTH, PATTERNED 3,000 PSI COMPRESSION, PORTLAND CEMENT CONCRETE RIP-RAP, COLORED TERRA COTTA; AND MIN. 4" DEEP. PATTERN SHALL BE APPROVED BY CITY ENGINEER PRIOR TO INSTALLATION.

* IF STREET IS DESIGNATED ON BIKE PLAN, ADD 1' FOOT TO URBAN SHOULDER FROM PARKWAY WIDTH AS NEEDED TO CREATE A 5.5 MIN. BIKE LANE.

SECONDARY ARTERIAL SECTION



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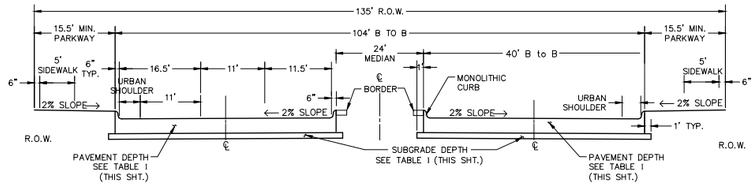
MODIFIED PRIMARY ARTERIAL SECTION



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C) ROW AT THE INTERSECTION WITH ANOTHER ARTERIAL SHALL BE A MIN. OF 134 FT. FOR A MIN. DISTANCE OF 150 FT PRIOR TO THE CROSS-STREET'S ROW TO ACCOMMODATE A RIGHT TURN BAY LANE AND A MIN. 6 FT WIDE PEDESTRIAN REFUGE ISLAND. THE TAPER PRIOR TO THIS WIDENING SHALL BE A MIN. OF 10:1 TO MATCH THE 122 FT ROW. ALL ADDITIONAL ROW AND PAVEMENT SHALL BE ON THE APPROACH SIDE (OF THE STREET) TO THE INTERSECTION.
D) BORDER SHALL BE A MIN. OF 18" IN WIDTH, PATTERNED 3,000 PSI COMPRESSION, PORTLAND CEMENT CONCRETE RIP-RAP, COLORED TERRA COTTA; AND MIN. 4" DEEP. PATTERN SHALL BE APPROVED BY CITY ENGINEER PRIOR TO INSTALLATION.

* IF STREET IS DESIGNATED ON BIKE PLAN, ADD 1' FOOT TO URBAN SHOULDER FROM PARKWAY WIDTH AS NEEDED TO CREATE A 5.5 MIN. BIKE LANE.

PRIMARY ARTERIAL SECTION

TABLE I

PORTLAND CEMENT CONCRETE (RIGID) PAVEMENT SECTION				
PAVEMENT SECTION	DESIGN VALUE			
	ARTERIAL	COMMERCIAL COLLECTOR	RESIDENTIAL COLLECTOR	ALL RESIDENTIAL
JOINT REINFORCEMENT PAVEMENT DEPTH (INCHES)	11	10	8	7
STABILIZED SUBGRADE DEPTH (INCHES)	12	12	8	8
MINIMUM CONTINUOUS REINFORCING STEEL	#4 ON 18" CENTERS BOTH WAYS		#3 ON 18" CENTERS BOTH WAYS	

A) DEPTHS PROVIDED ARE MIN. CITY REQUIREMENTS. ENGINEER OF RECORD IS RESPONSIBLE FOR ENSURING THIS MIN. DESIGN MEETS DESIGN REQUIREMENTS FOR THE SPECIFIC PROJECT AND MAY BE REQUIRED TO PROVIDE ADDITIONAL ANALYSIS DEPENDING ON LOCAL SOIL AND MOISTURE CONDITIONS AS WELL AS HIGHER THAN EXPECTED TRAFFIC VOLUMES AND/OR TRUCK MIX.
B) REFERENCE PAVEMENT DESIGN GUIDELINES AND TYPICAL PAVEMENT SECTIONS BY MICHAEL P. BATUNA P.E. OF CTL/THOMPSON TEXAS LLC FOR THE CITY OF DENTON. DATED MAY 6, 2010.

GENERAL NOTES:

1) ALL REBAR TO BE SUPPORTED ON APPROVED PLASTIC CHAIRS.
2) APPROVED CURING COMPOUND SHALL BE APPLIED TO THE FINISHED SLAB AS SOON AS POSSIBLE AFTER PLACEMENT OF CONCRETE.
3) JOINTS ARE TO BE SAWED AS SOON AS THE SETTING OF THE CONCRETE WILL PERMIT WITHOUT SPALLING OR MARKING THE SLAB.
4) REFER TO TABLE I FOR STEEL REINFORCEMENT.
5) STANDARD DIVIDED STREET CROSS SLOPE (2% AVERAGE) MAY VARY UPON CITY ENGINEER'S APPROVAL.
6) CONCRETE SHALL BE MINIMUM 4,000 PSI COMPRESSION.
7) REFER TO THE CITY OF DENTON'S DRAINAGE CRITERIA MANUAL FOR DRAINAGE STANDARDS FOR ROADWAY DESIGNS.
8) A MAXIMUM OF 25% FLY ASH MAY BE USED.
9) ALL DIMENSIONS PROVIDED ARE MINIMUM.
10) ALTERNATE DESIGN OF STREET SECTION MAY BE CONSIDERED BY THE CITY UPON SUBMITTAL OF SEALED DESIGN PLANS AND A WRITTEN EXPLANATION FOR THE DESIGN VARIANCE FOR APPROVAL BY THE CITY ENGINEER.
11) STANDARD PARKING ANGLE IS PARALLEL. PARKING BAYS ARE REQUIRED WHEN PARKING IS NOT PARALLEL. ANGLE PARKING SHALL NOT EXCEED 60°.
12) WHEN PARKING BAYS ARE PROVIDED. A MINIMUM UNOBSTRUCTED TRAVEL LANE WIDTH SHALL BE PROVIDED AND, UNLESS OTHERWISE NOTED FOR THE STREET TYPE, SHALL BE IN ACCORDANCE WITH THE DRIVE AISLE REQUIREMENT OF THE PARKING DESIGN SECTION OF THE CURRENT TRANSPORTATION DESIGN CRITERIA MANUAL. APPROPRIATE ADDITIONAL ROW IS REQUIRED TO PROVIDE THE MINIMUM PARKWAY WIDTH INDICATED FOR THE STREET TYPE.
13) SEE OTHER STANDARD DETAIL SHEETS FOR APPROPRIATE APPURTENANCES.
14) IF LAND CONTOURS REQUIRE ALTERNATE SLOPE DESIGN, ENGINEER OF RECORD SHALL SUBMIT INFORMATION SUFFICIENT FOR REVIEW AND APPROVAL BY CITY ENGINEER PRIOR TO FINAL DESIGN SUBMITTAL.
15) PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE CITY OF DENTON'S SCHEMATICS M&S 004 AND/OR 005 SERIES.
16) ALL CONCRETE SHALL BE MACHINE PLACED UNLESS APPROVED BY CITY ENGINEER.
17) ONE WAY COUPLET SECTION WILL BE CONSISTENT WITH RESIDENTIAL STREET COLLECTOR. WIDTH AND DEPTH OF PAVEMENT SHALL BE IN ACCORDANCE WITH STREET CLASSIFICATION ON THIS DETAIL SHEET.

ENTERED BY	PROJECT #	
DESIGNED BY	DATE	REVISION
CHECKED BY		
PROJ. ENGR.		
PATH S:\Water Engineering\Engr\Design\Projects\Standard Details\concrete X-Sections\Concrete x-sec.dwg		

CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

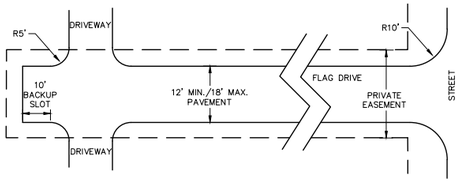
CONCRETE PAVING CROSS SECTION DETAILS

DATE
DEC. 2018

SHEET No.
11 OF 16

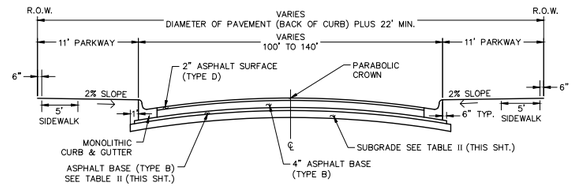
SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

CERTIFICATION:
THIS CITY OF DENTON STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS HEREON, AND WHO CERTIFIES THE CONTENT OF THE DETAILS AND NOTES HEREIN HAVE NOT BEEN ALTERED AND ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THE STANDARDS WITHIN THIS SHEET.



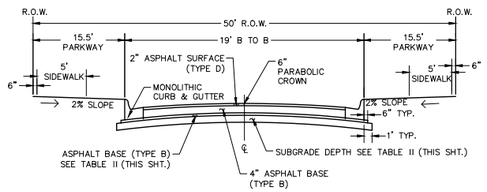
A) EASEMENT WIDTH IS TO BE AT LEAST 4 FT. WIDE ON EACH SIDE OF THE PAVEMENT.
B) PARKING ALONG THE EDGE OF A FLAG DRIVE WILL NOT BE COUNTED TOWARD REQUIRED ON-STREET PARKING.
C) PAVEMENT DEPTH MINIMUM IS 6"- TOP 2" TYPE D; BOTTOM 4" TYPE B WITH 6" MIN. LIME STABILIZED SUBGRADE

FLAG DRIVE PLAN VIEW



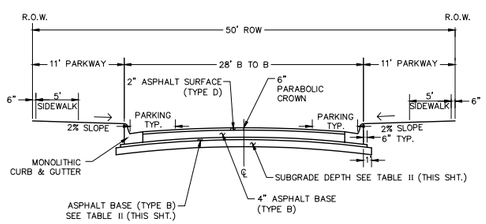
A) CROWN SHALL BE A MINIMUM OF 8 IN. ABOVE THE HIGHEST GUTTER ELEVATION AND SHALL ENSURE THAT DRAINAGE FROM CENTER COLLECTS TO NEAREST GUTTER.
B) 30 FT. RADIUS WILL BE PROVIDED AT THE JUNCTION OF THE STREET WITH THE CUL-DE-SAC.

CUL-DE-SAC SECTION



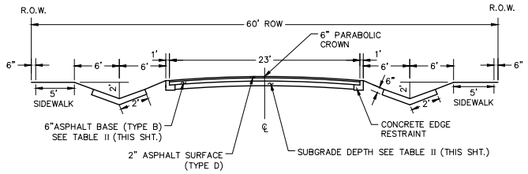
A) STANDARD PARKING IS ALLOWED ON ONE SIDE OF THE STREET FOR CROSS-SECTION SHOWN.
B) A NO PARKING RESTRICTION IS REQUIRED OPPOSITE THE SIDE OF THE STREET WHERE PARKING IS ALLOWED, UNLESS PARKING BAYS ARE PROVIDED WHERE THE NO PARKING RESTRICTION WOULD BE.
C) ANGLE PARKING BAYS ARE PERMITTED.
D) A MINIMUM 10 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.

RESIDENTIAL LANE SECTION



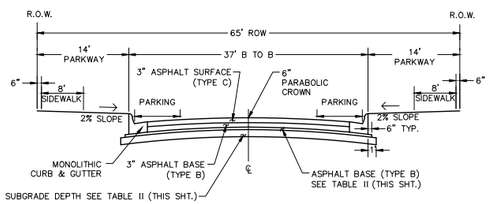
A) ANGLE PARKING BAYS ARE PERMITTED.
B) A MINIMUM 11 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.

RESIDENTIAL STREET SECTION



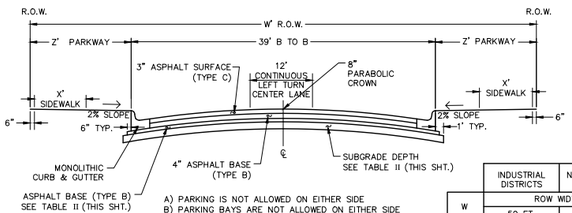
A) PILOT CHANNEL TO BE INSTALLED AT BOTTOM OF DITCH LINE.
B) PILOT CHANNEL CONCRETE SHALL BE 3,000 PSI COMPRESSION AND SHALL USE CITY APPROVED REINFORCEMENT.
C) REFER TO DENTON DEVELOPMENT CODE (DDC) FOR SIDEWALK REQUIREMENTS. IF SIDEWALK IS NOT REQUIRED, R.O.W. MAY BE REDUCED BY THE APPLICABLE AMOUNT UPON APPROVAL BY THE CITY ENGINEER.
D) ALL BORROW DITCH SLOPES 4:1 MINIMUM.
E) DITCH SHALL FULLY CONTAIN 100 YR. FLOOD. R.O.W. WIDTH SHALL BE INCREASED ACCORDINGLY TO ACCOMMODATE ANY ADDITIONAL DITCH CAPACITY WIDTH REQUIREMENTS.
F) AN UNDERGROUND DRAINAGE SYSTEM MAY BE USED IN LIEU OF LARGE BORROW DITCHES.
G) CONCRETE EDGE RESTRAINTS ARE REQUIRED.
H) NO PARKING RESTRICTION IS REQUIRED ON BOTH SIDES.

RURAL/SUBURBAN RESIDENTIAL STREET SECTION



A) ANGLE PARKING BAYS ARE PERMITTED.
B) A MINIMUM 20 FT. WIDE UNOBSTRUCTED TRAVEL LANE SHALL BE PROVIDED.
C) ON-STREET PARKING CAN BE REMOVED IF LEFT TURN POCKETS ARE REQUIRED.

RESIDENTIAL STREET COLLECTOR SECTION



A) PARKING IS NOT ALLOWED ON EITHER SIDE
B) PARKING BAYS ARE NOT ALLOWED ON EITHER SIDE

	INDUSTRIAL DISTRICTS	NON-INDUSTRIAL DISTRICTS
W	ROW WIDTH	
	59 FT.	65 FT.
Z	PARKWAY WIDTH	
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X	SIDEWALK	
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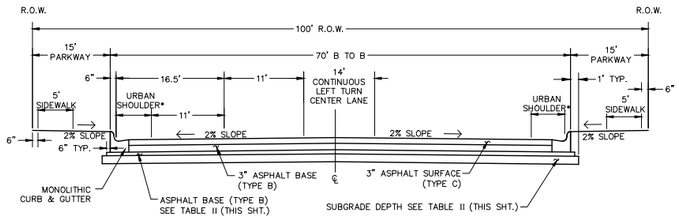
COMMERCIAL STREET COLLECTOR SECTION



A) FOR USE IN INFILL AREAS ONLY AND UPON WRITTEN APPROVAL BY THE CITY ENGINEER
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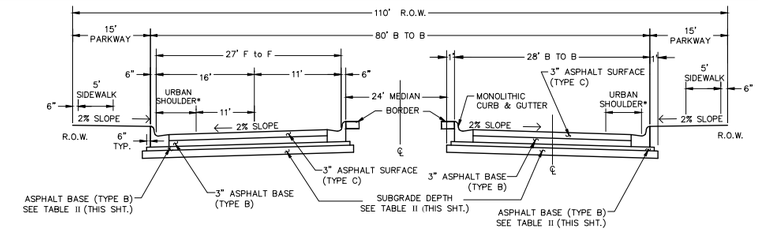

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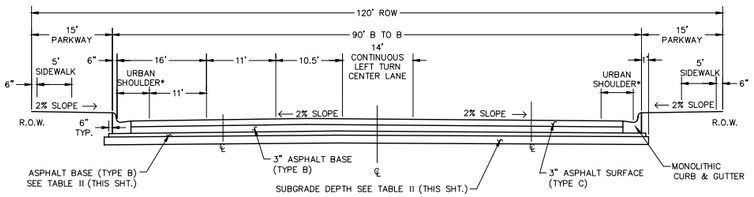

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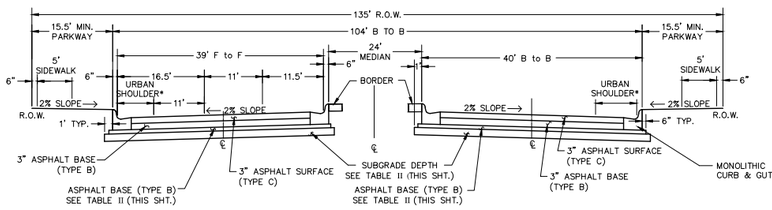
MODIFIED PRIMARY ARTERIAL SECTION



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PRIMARY ARTERIAL SECTION

TABLE II

PAVEMENT SECTION	ASPHALTIC CONCRETE (FLEXIBLE) PAVEMENT SECTION			
	DESIGN VALUE			
	ARTERIAL	COMMERCIAL COLLECTOR	RESIDENTIAL COLLECTOR	ALL RESIDENTIAL
ASPHALT SURFACE (INCHES)	3	3	3	2
ASPHALT BASE BETWEEN CURBS (INCHES)	3	4	3	4
ASPHALT BASE DEPTH EXTENDING BENEATH & UNDER CURB (INCHES)	6	5	3	2
STABILIZED SUBGRADE DEPTH (INCHES)	12	12	12	12

A) DEPTHS PROVIDED ARE MIN. CITY REQUIREMENTS. ENGINEER OF RECORD IS RESPONSIBLE FOR ENSURING THIS MIN. DESIGN MEETS DESIGN REQUIREMENTS FOR THE SPECIFIC PROJECT AND MAY BE REQUIRED TO PROVIDE ADDITIONAL ANALYSIS DEPENDING ON LOCAL SOIL AND MOISTURE CONDITIONS AS WELL AS HIGHER THAN EXPECTED TRAFFIC VOLUMES AND/OR TRUCK MIX.
B) REFERENCE PAVEMENT DESIGN GUIDELINES AND TYPICAL PAVEMENT SECTIONS BY MICHAEL P. BATUNA P.E. OF CTL/THOMPSON TEXAS LLC FOR THE CITY OF DENTON DATED MAY 6, 2010.

GENERAL NOTES:

1) SEE "ASPHALT/CONCRETE STANDARD DETAILS" SHEET FOR APPROPRIATE APPURTENANCES.
2) IF LAND CONTOURS REQUIRE ALTERNATE SLOPE DESIGN, ENGINEER OF RECORD SHALL SUBMIT INFORMATION SUFFICIENT FOR REVIEW AND APPROVAL BY CITY ENGINEER PRIOR TO FINAL DESIGN SUBMITTAL INFORMATION.
3) REFER TO THE CITY OF DENTON'S DRAINAGE CRITERIA MANUAL FOR DRAINAGE STANDARDS FOR ROADWAY DESIGN.
4) ALL DIMENSIONS PROVIDED ARE MINIMUM.
5) ALTERNATE DESIGNS OF STREET SECTIONS MAY BE CONSIDERED BY THE CITY UPON SUBMITTAL OF DESIGN PLANS AND A WRITTEN EXPLANATION FOR THE DESIGN VARIANCE FOR APPROVAL BY THE CITY ENGINEER.
6) THE STANDARD PARKING ANGLE IS PARALLEL. PARKING BAYS ARE REQUIRED WHEN PARKING IS NOT PARALLEL. ANGLE PARKING SHALL NOT EXCEED 60°.
7) WHEN PARKING BAYS ARE PROVIDED, A MINIMUM UNOBSTRUCTED TRAVEL LANE WIDTH SHALL BE PROVIDED AND, UNLESS OTHERWISE NOTED FOR THE STREET TYPE, SHALL BE IN ACCORDANCE WITH THE DRIVE AISLE REQUIREMENT OF THE PARKING DESIGN SECTION OF THE CURRENT TRANSPORTATION DESIGN CRITERIA MANUAL. APPROPRIATE ADDITIONAL ROW IS REQUIRED TO PROVIDE THE MINIMUM PARKWAY WIDTH INDICATED FOR THE STREET TYPE.
8) STANDARD DIVIDED STREET CROSS SLOPE (2% AVERAGE) MAY VARY UPON CITY ENGINEER'S APPROVAL.
9) PAVEMENT MARKINGS SHALL BE IN ACCORDANCE WITH THE CITY OF DENTON'S SCHEMATICS M & S 004 AND/OR 005 SERIES, AS MAY APPLY.
10) ONE WAY COUPLET SECTION WILL BE CONSISTENT WITH RESIDENTIAL STREET COLLECTOR. WIDTH AND DEPTH OF PAVEMENT SHALL BE IN ACCORDANCE WITH STREET CLASSIFICATION ON THIS DETAIL SHEET.

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

ASPHALT PAVING CROSS SECTION DETAILS

DATE
DEC. 2018

SHEET No.
12 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

CERTIFICATION:
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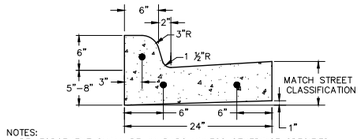
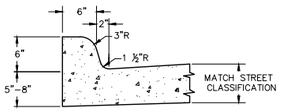


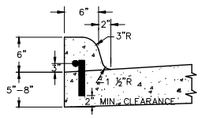
NOTES:
1. REINFORCEMENT SHALL BE #4 BARS UNLESS OTHERWISE SPECIFIED
2. USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE

STANDARD CURB AND GUTTER SECTION
WITH ASPHALT PAVING



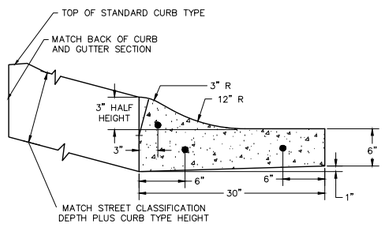
NOTE:
USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE

STANDARD MONOLITHIC CURB AND GUTTER SECTION
WITH CONCRETE PAVING



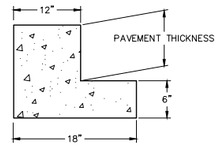
NOTES:
1. #4 STEEL BARS ON HORIZONTAL
2. 6" LONG ½" STEEL BARS ON VERTICAL 24" CENTERS
3. USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE
4. WHEN ATTACHING NEW CURB TO EXISTING CONCRETE, DRILL ¾" DIA. HOLES INTO EXISITNG CONCRETE. BLOW HOLES CLEAN AND SECURE REBAR OF CORRECT SIZE AS REQUIRED FOR PAVEMENT WITH EPOXY GROUT.

CONCRETE PAVEMENT ALTERNATE CURB DOWELED CURB SECTION
(UPON APPROVAL BY CITY ENGINEER)



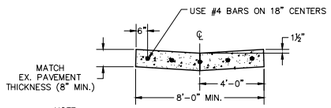
NOTES:
1. REINFORCEMENT SHALL BE #4 BARS UNLESS OTHERWISE SPECIFIED
2. USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE

SURMOUNTABLE TRAFFIC CALMING CURB AND GUTTER WITH TRANSITION TO FULL HEIGHT CURB



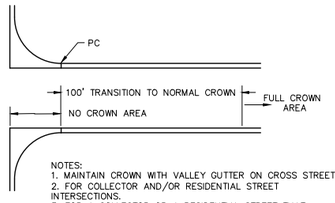
NOTES:
1. USE CITY APPROVED 1½" LONG FIBERS AT 1½ LBS./CU.YD.
2. USE MINIMUM 3,000 PSI COMPRESSION CONCRETE.
3. PAVEMENT THICKNESS SHALL BE IN ACCORDANCE WITH TABLE ON "ASPHALT CONCRETE PAVING" STANDARD DETAIL SHEET PER STREET TYPE.

PORTLAND CEMENT CONCRETE EDGE RESTRAINT FOR RURAL/SUBURBAN ASPHALT STREET



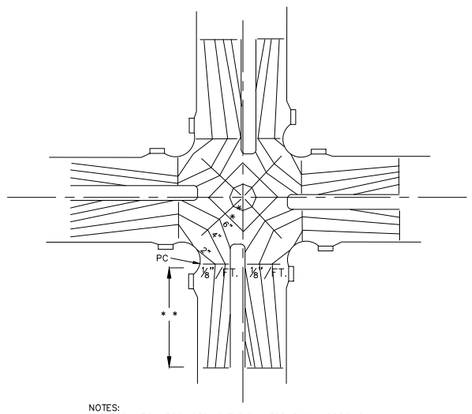
NOTE:
REFER TO CONC. PAVEMENT DETAIL SHT. FOR JOINT DETAILS

VALLEY GUTTER



NOTES:
1. MAINTAIN CROWN WITH VALLEY GUTTER ON CROSS STREET.
2. FOR COLLECTOR AND/OR RESIDENTIAL STREET INTERSECTIONS.
3. FOR A COLLECTOR OR A RESIDENTIAL STREET THAT INTERSECTS WITH AN ARTERIAL.

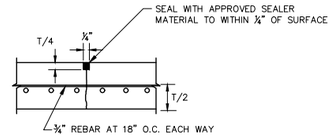
CROWN DETAIL FOR RESIDENTIAL OR COLLECTOR APPROACHES TO AN INTERSECTION



NOTES:
1. INFORMATION PROVIDED IS TYPICAL FOR EACH APPROACH.
2. INLETS REQUIRED WHEN DRAINAGE IS TOWARD INTERSECTION.
3. INTENT OF SLOPE CONFIGURATION TO BE MAINTAINED IF ONE OR BOTH ARTERIAL STREETS ARE UNDIVIDED.

* ADDITIONAL 2 INCH INCREMENT TYPICAL WHEN REQUIRED/APPLICABLE.
* * MINIMUM 130' PER ⅛" REDUCTION IN CROSS-SLOPE.

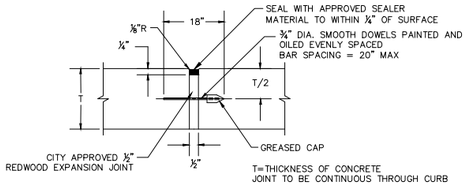
CROWN DETAIL TYPICAL CONTOURS FOR INTERSECTION OF ARTERIAL STREETS



T=THICKNESS OF CONCRETE

NOTE:
1. FOR PAVEMENT OUTSIDE AN INTERSECTION'S PCs
(a) TRANVERSE/LATERAL SAWED JOINT SHALL BE PLACED EVERY 20' EXCEPT AT EXPANSION JOINT OR CONSTRUCTION JOINT.
(b) LONGITUDINAL SAWED JOINT SHALL BE PLACED AT CENTER OF PAVEMENT WHEN THERE IS NO CONSTRUCTION JOINT.
2. FOR PAVEMENT INSIDE AN INTERSECTION'S PCs, BOTH TRANSVERSE/LATERAL AS WELL AS LONGITUDINAL SAW JOINTS SHALL BE PLACED EVERY 20' OR AT AN AVERAGE AS CLOSE TO 20' AS REASONABLY POSSIBLE
3. SAW JOINT IS TO BE CONTINUOUS THROUGH CURB, WHEN APPLICABLE.

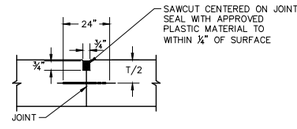
SAWED JOINT FOR CONCRETE PAVEMENT



T=THICKNESS OF CONCRETE JOINT TO BE CONTINUOUS THROUGH CURB

NOTES:
1. TO BE PLACED AT THE PC'S OF AN INTERSECTION AND THEN EVERY 200' MAXIMUM THEREAFTER AWAY FROM THE INTERSECTION (EXCEPT AS NOTED)
2. IF THE LAST PROPOSED EXPANSION JOINT PRIOR TO THE NEXT INTERSECTION'S PC'S EXPANSION JOINT IS LESS THAN 50', THEN NO EXPANSION JOINT (THE LAST PANEL WILL BE GREATER THAN 200' BUT LESS THAN 250')
3. IF THE LAST PROPOSED EXPANSION JOINT PRIOR TO THE NEXT INTERSECTION'S PC'S EXPANSION JOINT IS 50' OR GREATER BUT LESS THAN 200', THEN PLACE THE LAST EXPANSION JOINT SUCH THAT EACH CONCRETE PANEL (ON EACH SIDE OF SAID EXPANSION JOINT) ARE EQUAL TO EACH OTHER (AND EACH IS LESS THAN 200')

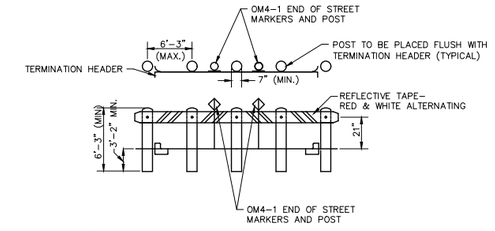
EXPANSION JOINT FOR CONCRETE PAVEMENT



T=THICKNESS OF LESSER OF TWO (IF DIFFERENT) PAVEMENT DEPTHS.

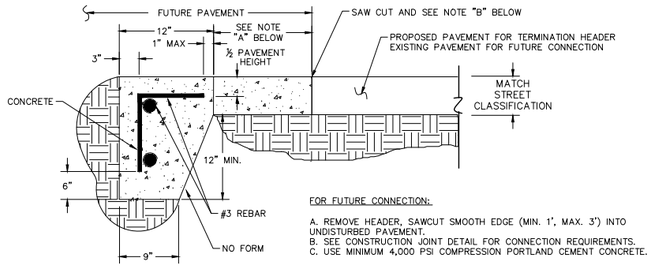
NOTES:
1. FOR NEW PORTLAND CEMENT CONCRETE PAVEMENT TO EXISTING ASPHALTIC CONCRETE PAVEMENT, REBAR IS REQUIRED IF ASPHALT DEPTH IS 5 ½" OR GREATER.
2. FOR NEW ASPHALTIC CONCRETE PAVEMENT TO EXISTING PORTLAND CEMENT CONCRETE, REBAR IS REQUIRED. 5'x4" KEY IS REQUIRED FOR ASPHALTIC CONCRETE PAVEMENT SECTION.
3. FOR NEW ASPHALTIC CONCRETE PAVEMENT TO EXISTING ASPHALTIC CONCRETE PAVEMENT, REBAR IS NOT REQUIRED.
4. FOR NEW PORTLAND CEMENT CONCRETE TO EXISTING PORTLAND CEMENT CONCRETE, REBAR IS REQUIRED.
5. IF REBAR IS REQUIRED AS NOTED ABOVE:
(a) DRILL, DOWEL AND EPOXY #3 REBAR INTO EXISTING PAVEMENT
(b) #3 REBAR TO EXTEND A MINIMUM OF 12" INTO BOTH PAVEMENTS
(c) #3 REBAR TO BE A MAXIMUM OF 18" ON CENTER

CONSTRUCTION JOINT



NOTE:
REFER TO TMUTCD FIGURE 2C–13 FOR OM4–1 END OF STREET MARKER AND POST.

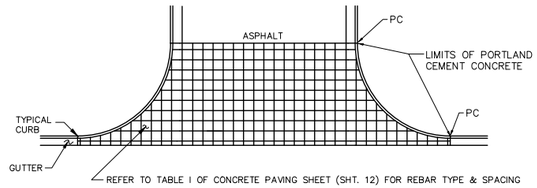
DEAD END BARRICADE



FOR FUTURE CONNECTION:

A. REMOVE HEADER, SAWCUT SMOOTH EDGE (MIN. 1', MAX. 3') INTO UNDISTURBED PAVEMENT.
B. SEE CONSTRUCTION JOINT DETAIL FOR CONNECTION REQUIREMENTS.
C. USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE.

STREET TERMINATION HEADER SECTION



REFER TO TABLE I OF CONCRETE PAVING SHEET (SHT. 12) FOR REBAR TYPE & SPACING

NOTES:
1. PORTLAND CEMENT CONCRETE DEPTH TO MATCH STREET'S FULL DEPTH ASPHALTIC CONCRETE PAVEMENT.
2. SUBBASE DEPTH TO MATCH.
3. USE MINIMUM 4,000 PSI COMPRESSION PORTLAND CONCRETE CEMENT WITHIN LIMITS SHOWN.
4. LIMITS SHOWN ARE FOR EACH APPROACH FOR WHICH THE STREETS PAVEMENT IS ASPHALTIC CONCRETE.
5. REBAR GRID/PORTLAND CEMENT CONCRETE TO INCLUDE ALL OF INTERSECTION.

INTERSECTION APPROACH (FOR ASPHALT STREET)

GENERAL NOTES:

1. PAVEMENT DEPTH(S) INDICATED ARE MINIMUM AND MAY BE INCREASED UPON RECOMMENDATION OF ENGINEER OF RECORD. PAVEMENT DEPTH SHALL BE CONSISTENT FOR ALL APPLICABLE DETAILS.

2. #3 REBAR INDICATED ARE MINIMUM AND MAY BE INCREASED UPON RECOMMENDATION OF ENGINEER OF RECORD. REBAR SIZE SHALL BE CONSISTENT FOR ALL APPLICABLE DETAILS.

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS
CURB & GUTTER/JOINT/INTERSECTION/HEADER DETAILS

DATE
DEC. 2018

SHEET No.
13 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

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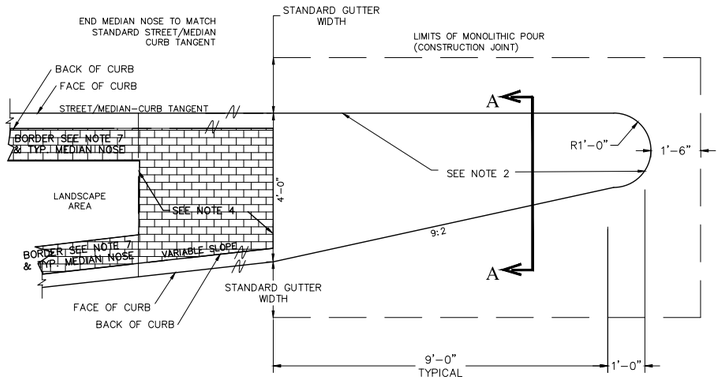
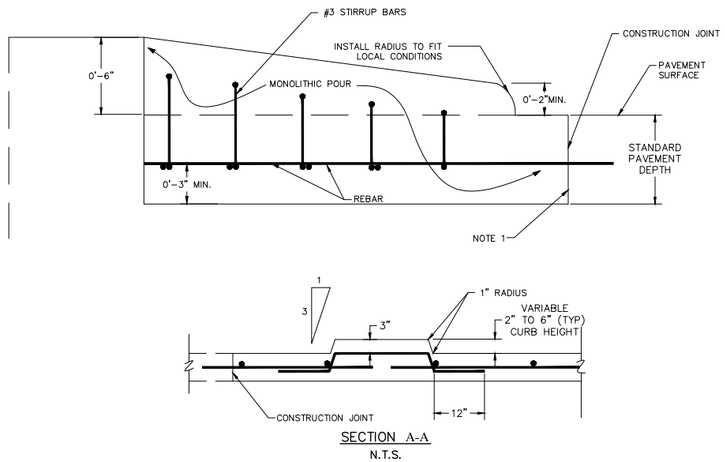
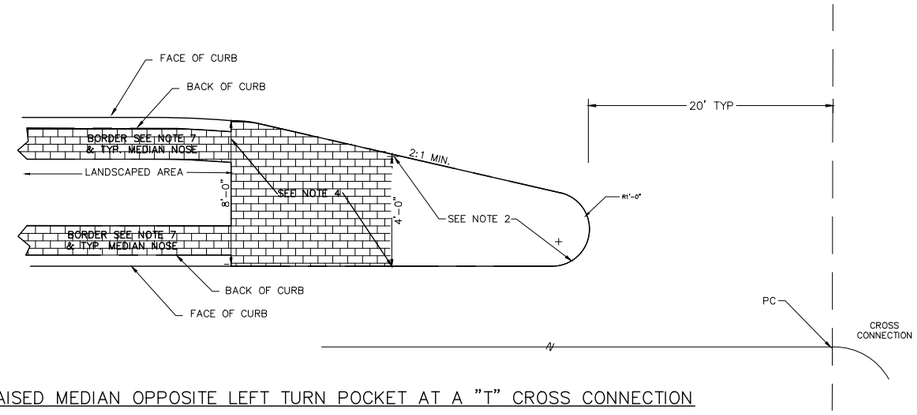


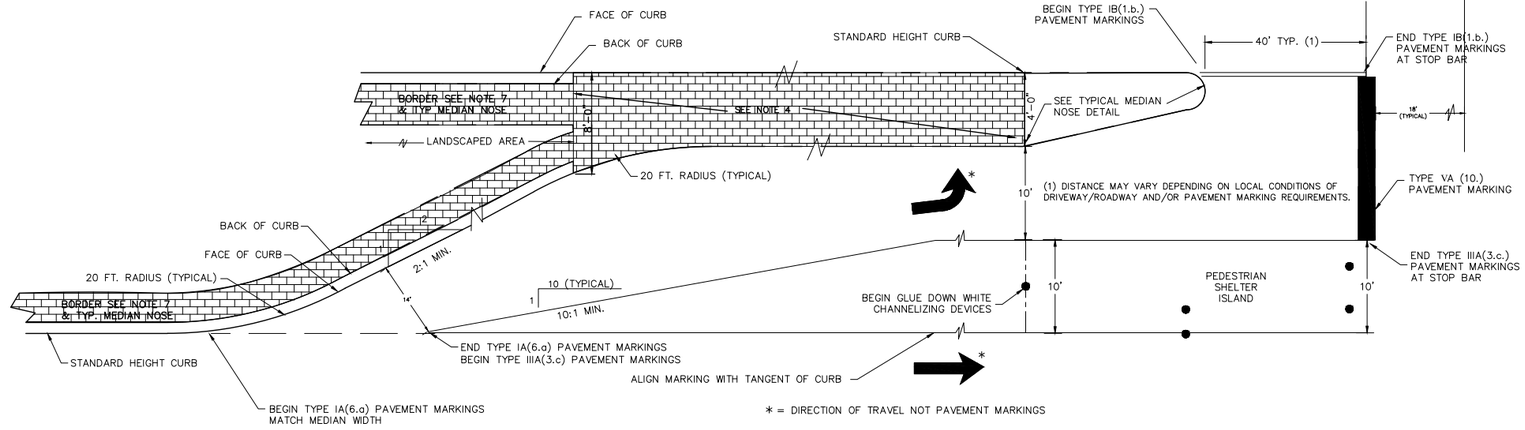


SECTION A-A
N.T.S.

TYPICAL MEDIAN NOSE



TYPICAL RAISED MEDIAN OPPOSITE LEFT TURN POCKET AT A "T" CROSS CONNECTION



TYPICAL RAISED MEDIAN LEFT TURN LANE/MEDIAN OPENING
FOR AN ARTERIAL STREET WITH 24 FT. WIDE MEDIAN AND SINGLE LEFT TURN LANE

NOTES:
APPLY TO ALL CONCRETE MEDIANS

1. WHEN MATCHING EXISTING PAVEMENT WITH NEW MEDIAN NOSE
   A. MATCHING CONCRETE:
      i. WHEN MEDIAN NOSE IS POURED FIRST AND THEN ADJACENT PAVEMENT:
         REBAR WITHIN MONOLITHIC POUR AREA SHALL EXTEND A MINIMUM OF 18 IN. BEYOND LIMITS OF MONOLITHIC POUR.
      ii. WHEN ADJACENT PAVEMENT IS POURED FIRST AND THEN NOSE MEDIAN:
         REBAR THAT IS WITHIN ADJACENT PAVEMENT SHALL EXTEND A MINIMUM OF 18 INCHES INTO MONOLITHIC POUR AREA.
      iii. WHEN ATTACHING NEW MEDIAN NOSE TO EXISTING CONCRETE, DRILL ¾ IN. DIAMETER HOLES, A MINIMUM OF 18 INCHES INTO EXISTING PAVEMENT, BLOW HOLES CLEAN AND SECURE REBAR OF SAME SIZE AS REQUIRED FOR PAVEMENT WITH EPOXY GROUT
   B. MATCHING EXISTING ASPHALT:
      REBAR WITHIN THE MONOLITHIC POUR AREA TO EXTEND TO FACE OF ASPHALT PAVEMENT
2. CONCRETE FOR MONOLITHIC POUR PORTION TO BE OF SAME DEPTH REQUIREMENT IN ADDITION TO NOTED PORTION ABOVE THE PAVEMENT SURFACE AS ADJOINING PAVEMENT REQUIREMENTS AS IF PAVEMENT WERE CONCRETE.
3. REINFORCEMENT BARS FOR THE MEDIAN NOSE SHALL MATCH THOSE IN PAVEMENT FOR SIZE AND SEPARATION UNLESS OTHERWISE NOTED HEREIN.
4. PATTERNED CONCRETE RIP-RAP IS REQUIRED FOR THE PORTION OF THE MEDIAN LESS THAN OR EQUAL TO 8 FT. WIDE AND GREATER THAN OR EQUAL TO 4 FT. WIDE. FACE OF CURB TO FACE OF CURB AS DIRECTED BY THE CITY. IT SHALL BE COLORED TERRA COTTA, MINIMUM DEPTH SHALL BE 6 INCHES WITH #3 REBAR ON 18 IN. CENTERS. CONCRETE PATTERN SHALL BE $\frac{1}{10}$th IN. DEEP AND APPROVED BY CITY ENGINEER PRIOR TO INSTALLATION.
5. FOR THE MEDIAN NOSE, STIRRUP BARS SHALL MATCH THOSE IN PAVEMENT FOR SIZE AND SEPARATION.
6. FOR THE MEDIAN NOSE, STIRRUP BARS SHALL EXTEND WITHIN 1 FT. OF LIMITS OF MONOLITHIC POUR.
7. MEDIAN BORDER SHALL BE 18 IN. MIN. IN WIDTH PATTERNED CONCRETE RIP-RAP, COLORED TERRA COTTA, MINIMUM 4 IN. DEPTH WITH APPROVED REINFORCEMENT. CONCRETE PATTERN SHALL BE 1/10TH INCH DEEP AND THE STYLE SHALL BE APPROVED BY CITY PRIOR TO INSTALLATION.
8. PAVEMENT MARKINGS IN OR DOWNSTREAM OF INTERSECTION:
   A. IMMEDIATELY DOWNSTREAM OF THE INTERSECTION, THE LANE CONFIGURATION WILL BE: INSIDE VEHICLE LANE=13 FEET WIDE; MIDDLE VEHICLE LANE=11 FEET WIDE (FOR A 6-LANE DIVIDED ARTERIAL); OUTSIDE LANE-FOR A PORTLAND CEMENT CONCRETE PAVEMENT STREET WITH INTEGRAL CURB AND GUTTER=11 FEET WIDE VEHICLE LANE WITH BALANCE BEING A MARKED URBAN SHOULDER OR FOR A ASPHALTIC CONCRETE PAVEMENT STREET WITH SEPARATE PORTLAND CEMENT CONCRETE PAVEMENT CURB AND GUTTER=THE BALANCE OF THE WIDTH OF PAVEMENT BEING THE VEHICLE LANE WITH NO MARKED URBAN SHOULDER. THE VEHICLE LANES SHALL BE DEFINED BY THE INSTALLATION OF A TYPE IIA(3.A) PAVEMENT MARKING; THE URBAN SHOULDER (WHEN INSTALLED) SHALL BE A TYPE IA(2.A) PAVEMENT MARKING. SAID LANE CONFIGURATION/PAVEMENT MARKINGS SHALL CONTINUE, AS NOTED, TO (AND THEN BE SUSPENDED AT) THE UPSTREAM EDGE OF THE TYPE VA(14.) PEDESTRIAN CROSSWALK PAVEMENT MARKING. SAID TYPE IA(3.A) PAVEMENT MARKINGS SHALL THEN CONTINUE AS NOTED, BEGINNING AT THE DOWNSTREAM EDGE OF THE TYPE VA(14.) PEDESTRIAN CROSSWALK PAVEMENT MARKING AND IMMEDIATELY BEGIN A TAPER OF 40:1 FOR 80 FEET SUCH THAT THE INSIDE LANE=11 FEET; MIDDLE VEHICLE LANE=11 FEET WIDE; OUTSIDE VEHICLE LANE=11 FEET WIDE, WITH THE BALANCE BEING A MARKED URBAN SHOULDER. THIS CONFIGURATION WILL CONTINUE FOR 40 FEET AT WHICH TIME THE NOTED VEHICLE TYPE IA(3.A) PAVEMENT MARKING SHALL END AND TYPE IA(5.A) PAVEMENT MARKINGS SHALL BEGIN.
   B. OR USE TYPE IA(6.a.) PAVEMENT MARKINGS TO CONNECT UPSTREAM WITH DOWN STEAM LANE LINES. THE AMOUNT OF THIS TYPE OF PAVEMENT MARKING SHOULD BE USED SPARINGLY SO AS TO NOT COMPLICATE THE VISUAL EFFECTS IN THE INTERSECTION
   C. OR USE A COMBINATION OF "A" AND "B" ABOVE
   D. OTHER CONFIGURATIONS AS APPROVED, BY THE CITY
9. GLUE DOWN WHITE CHANNELIZING DEVICES ARE TO BE A MINIMUM OF 2¾ IN. IN DIAMETER, A MINIMUM OF 30 IN. IN HEIGHT, AND HAVE A MINIMUM OF 2 WHITE REFLECTOR BANDS NEAR THE TOP. THEY ARE TO BE APPROVED BY CITY ENGINEER PRIOR TO PURCHASE.
10. PAVEMENT MARKING TYPE AND (CODE): REFERENCE M&S 004 AND 005 SERIES.

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS
MEDIAN DETAILS

DATE
DEC. 2018

SHEET No.
14 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

CERTIFICATION:
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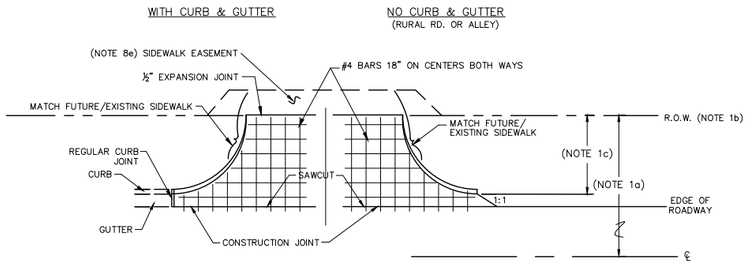
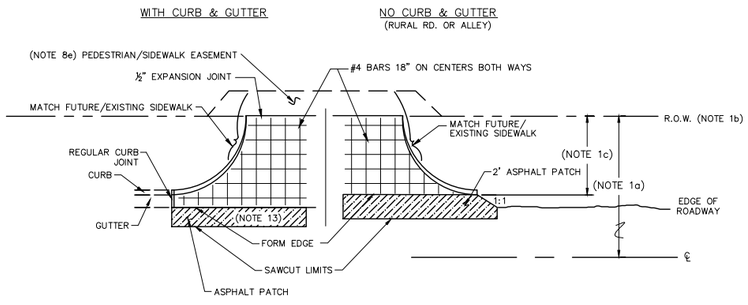


STANDARD DRIVE APPROACH–REINFORCEMENT PLAN
EXISTING CONCRETE STREET



STANDARD DRIVE APPROACH–REINFORCEMENT PLAN
EXISTING ASPHALT STREET

STANDARD DRIVE APPROACH–DIMENSION TABLE

DRIVE APPROACH			
USE	WIDTH	RADIUS	MIN. THICKNESS*
SINGLE FAMILY & DUPLEX RESIDENTIAL	MIN. WIDTH = 12 FEET MAX. WIDTH = 20 FEET	5 FEET	6 INCHES
MULTI–FAMILY RESIDENTIAL	MIN. WIDTH = 24 FEET MAX. WIDTH = 38 FEET	10 TO 20 FEET	8 INCHES
COMMERCIAL & INDUSTRIAL	MIN. WIDTH = 30 FEET MAX. WIDTH = 38 FEET	20 TO 25 FEET	8 INCHES

* THICKNESS AND REINFORCEMENT TO BE DESIGNED BY ENGINEER OF RECORD. MATERIAL TO BE 4,000 PSI (MIN.) REINFORCED CONCERETE WITH A MINIMUM OF #4 BARS ON 18" CENTERS BOTH WAYS.

GENERAL NOTES:

NOTES:
1. IF ROW IS UNDETERMINED OR ULTIMATE STREET ROW HAS NOT BEEN OBTAINED:
 (a) HALF PROPOSED R.O.W. WIDTH FOR "ASPHALT PAVING" OR "CONCRETE PAVING" IN ACCORDANCE WITH CITY DESIGNATION OF STREET CLASSIFICATION.
 (b) R.O.W. LINE AS DETERMINED IN 1a.
 (c) PARKWAY WIDTH IN ACCORDANCE WITH CITY DESIGNATION OF STREET CLASSIFICATION.
2. JOINTS ARE TO BE SAWED AS SOON AS THE SETTING OF THE CONCRETE WILL PERMIT WITHOUT SPALLING OR MARKING THE SLAB. AN APPROVED CURING COMPOUND SHALL BE APPLIED TO THE FINISHED SLAB AS SOON AS POSSIBLE AFTER PLACEMENT OF CONCRETE.
3. SUBGRADE FOR DRIVE APPROACH SHALL HAVE 95% COMPACTION. SUBGRADE SHALL HAVE LIME STABILIZATION IN ACCORDANCE WITH CITY STANDARD FOR HEAVY DUTY DRIVE AISLE.
4. DRIVE APPROACH GREATER THAN 12' IN WIDTH SHALL HAVE A TOOLED JOINT PERPENDICULAR TO THE CURB LINE, FROM THE FRONT OF THE GUTTER TO THE BACK OF THE DRIVE APPROACH, AT THE MIDPOINT. DRIVE APPROACHES WITH A WIDTH GREATER THAN 24' SHALL HAVE TWO OR MORE PERPENDICULAR TOOLED JOINTS PLACED AT THE DIRECTION OF THE ENGINEER OF RECORD.
5. DRIVE APPROACHES SHALL END AT THE ROW AND SHALL HAVE A ½" REDWOOD BOARD EXPANSION JOINT.
6. ASPHALT PATCH ONLY WHEN ROADWAY IS ASPHALT.
7. ALL JOINTS SHALL BE SEALED.
8. DRIVE APPROACH SLOPE REQUIREMENTS:
 (a) MAXIMUM SIDEWALK CROSS SLOPE WITHIN THE LIMITS OF THE DRIVE APPROACH SHALL BE 2%
 (b) MINIMUM DRIVE APPROACH SLOPE SHALL BE DETERMINED BY: S=(6+[0.02xWx12])/(Wx12) WHERE W=THE WIDTH OF THE PARKWAY IN FEET.
 (c) MAXIMUM DRIVE APPROACH SLOPE WITHIN THE ROW SHALL BE 8%
 (d) THE DRIVE APPROACH SLOPE FROM THE BOTTOM OF THE GUTTER TO THE NEAREST EDGE OF THE SIDEWALK (WITHIN THE LIMITS OF THE ROW) SHALL NOT EXCEED THE DRIVEWAY/DRIVE AISLE SLOPE BEGINNING AT THE FURTHERMOST EDGE OF THE SIDEWALK (FROM THE BOTTOM OF THE GUTTER). IT SHALL ALSO NOT BE LESS THAN THE MINIMUM SLOPE NOR BE GREATER THAN THE MAXIMUM SLOPE AS NOTED HEREIN.
 (e) WHERE THE PARKWAY WIDTH IS INSUFFICIENT TO PROVIDE APPROPRIATE DRIVE APPROACH SLOPE, THEN A SIDEWALK EASEMENT EQUAL TO THE BALANCE OF THE SIDEWALK WIDTH NEEDED OUTSIDE THE ROW PLUS 2' SHALL BE PROVIDED FOR SIDEWALK INSTALLATION/MAINTENANCE PURPOSES. NOTE: BECAUSE OF BOTH VARIABLE PARKWAY AND SIDEWALK WIDTHS, THE MINIMUM SLOPE IS DETERMINED WITHOUT CONSIDERATION OF ANY SIDEWALK WHICH MIGHT BE PARTIALLY OR WHOLLY CONTAINED WITHIN THE ROW. THE INCLUSION OF MAX. 2% CROSS–SLOPE REQUIREMENT FOR THE SIDEWALK WIDTH, RELATIVE TO THE PARKWAY'S WIDTH, SHALL BE MANDATORY WHEN DETERMINING THE POTENTIAL SLOPE NEEDS OF ANY DRIVE APPROACH FOR ANY SITE AND THUS ANY NEED FOR A SIDEWALK EASEMENT. CALCULATIONS WILL BE PROVIDED BY THE PERSON IN CHARGE OF THE DESIGN OF THE DRIVE APPROACH CHANGE AT THE TIME OF PLATTING, OR PRIOR TO THE DRIVE APPROACH'S CONSTRUCTION (WHICHEVER IS FIRST) TO DETERMINE THE NEED OF A SIDEWALK EASEMENT. IF NEEDED, THE PERSON IN CHARGE OF THE DESIGN OF THE DRIVE APPROACH CHANGE SHALL INDICATE THE MINIMUM WIDTH OF SAID SIDEWALK EASEMENT'S REQUIREMENTS ON THE APPLICABLE DOCUMENTS IN ACCORDANCE WITH THE REQUIREMENTS OF THIS NOTE (8a–e).
9. REMOVE AND REPLACE ALL CURB AND GUTTER WITHIN THE LIMITS OF CONSTRUCTION.
10. NEW CURB AND GUTTER SHALL BE POURED MONOLITHIC WITH THE DRIVE APPROACH.
11. FOR RESIDENTIAL DRIVE APPROACHES:
 (a) USE 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE; MIN. 6" DEPTH.
 (b) USE #4 BARS ON 18" CENTERS BOTH WAYS.
12. FOR ALL OTHER DRIVE APPROACHES, INCLUDING APARTMENTS.
 (a) USE 4,000 PSI COMPRESSION PORTLAND CEMENT CONCRETE; MIN. 8" DEPTH.
 (b) USE #4 BARS ON 18" CENTERS, BOTH WAYS.
13. SAWCUT SMOOTH EDGE (1' MIN.–3' MAX.) INTO UNDISTURBED PAVEMENT. THE SAWCUT IS TO BE CONTINUOUS AND FOLLOW IN A LINEAR MANNER WITHOUT SHARP–CUT ANGLES. THE SAWCUT SHALL BE FULL PENETRATION OF THE PAVEMENT, FOR THE ENTIRE DEPTH OF THE PAVEMENT. THE SAWCUT AT THE PAVEMENT'S FACE SHALL BE SMOOTH AND VERTICAL, WITH A MINIMUM OF SPOILS FOR THE ENTIRE DEPTH OF THE SAWCUT AND SHALL BE SO MAINTAINED UNTIL AT SUCH TIME AS THE JOINING OF THE NEW PAVEMENT TO IT. IF THE EXISTING PAVEMENT'S FACE AT THE SAWCUT, IS NOT SMOOTH AND VERTICAL AND WITH A MINIMUM OF SPALLS AT THE TIME OF JOINING OF NEW PAVEMENT, ADDITIONAL SAWCUTTING TO STABLE PAVEMENT AND IN ACCORDANCE WITH THE CONDITIONS NOTED HEREIN CAN BE REQUIRED BY THE CITY INSPECTOR AT SAID INSPECTOR'S DISCRETION. APPROPRIATE JOINTING MATERIAL(S) AND METHODS SHALL BE USED AT THE JUNCTION OF EXISTING AND NEW PAVEMENT, IN ACCORDANCE WITH THE CITY REQUIREMENTS. REMOVE PAVEMENT WITHIN SAW LIMITS. INSTALL SUBBASE AND PAVEMENT IN ACCORDANCE WITH DRIVE APPROACH REQUIREMENTS.
14. THE DRIVE APPROACH SLOPE WITHIN THE SIDEWALK EASEMENT (IF PROVIDED) AND/OR WITHIN THE SITE SHALL NOT CHANGE FROM PLUS TO MINUS WITHOUT HAVING A TRANSITIONAL AREA (NEARLY FLAT) OF NOT LESS THAN 3' OR AS APPROVED BY THE CITY ENGINEER IN WRITING PRIOR TO CONSTRUCTION.
15. DRIVEWAY OR DRIVE AISLE CONSTRUCTION WHICH EXTENDS INTO THE PROPERTY AND/OR PAST THE DRIVE APPROACH RADIUS SHALL HAVE A TRANSVERSE TOOLED JOINT AT THE RADIUS POINT AND A ½" ASPHALT BOARD EXPANSION JOINT AT THE OTHER CONNECTION (PROPERTY LINE, ETC.).
16. PAVEMENT DEPTHS INDICATED ARE MINIMUM AND MAYBE INCREASED UPON RECOMMENDATION OF ENGINEER OF RECORD–PAVEMENT DEPTH SHALL BE CONSISTENT FOR ALL APPLICABLE DETAILS.
17. #3 BARS INDICATED ARE MINIMUM AND MAY BE INCREASED UPON RECOMMENDATION OF ENGINEER OF RECORD–REBAR SIZE SHALL BE CONSISTENT FOR ALL APPLICABLE DETAILS.
18. ALL REBAR TO BE SUPPORTED ON APPROVED PLASTIC CHAIRS.

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

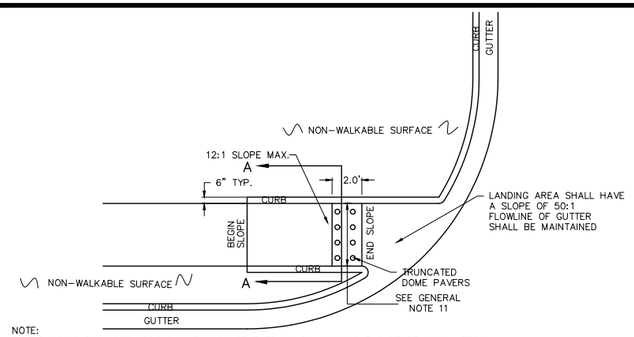
DRIVE APPROACH DETAILS

DATE
DEC. 2018

SHEET No.
15 OF 16

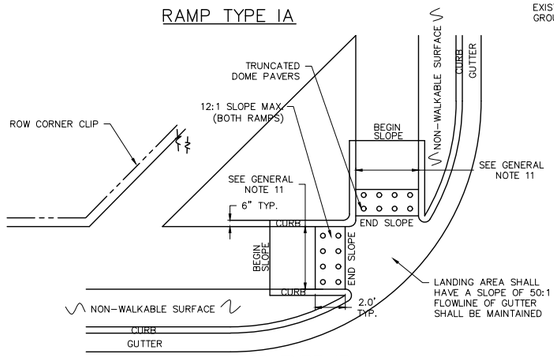
SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

CERTIFICATION:
THIS CITY OF DENTON STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS HEREON, AND WHO CERTIFIES THE CONTENT OF THE DETAILS AND NOTES HEREIN HAVE NOT BEEN ALTERED AND ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THE STANDARDS WITHIN THIS SHEET.

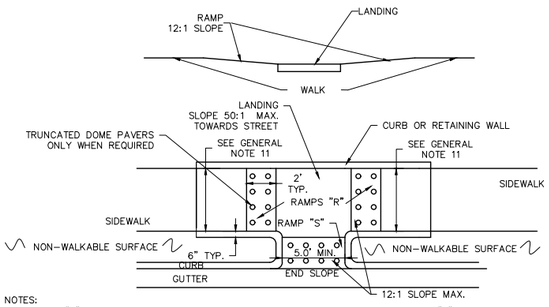


NOTE:
THIS RAMP IS ONLY PERMISSIBLE WHEN ADJACENT TO A NON-WALKABLE SURFACE (WALL, ETC.) THAT PROHIBITS THE CONCURRENT (2ND) RAMP/SIDEWALK OF RAMP TYPE 1B

RAMP TYPE IA

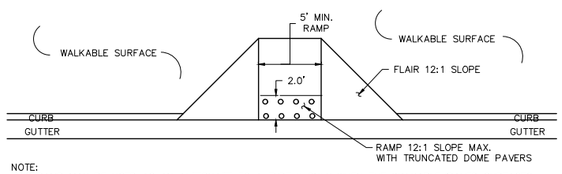


RAMP TYPE IB



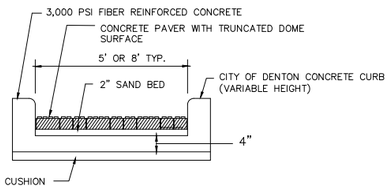
NOTES:
A. IF RAMP "S" IS LESS THAN 2 FT., THEN NO TRUNCATED DOME SURFACE FOR RAMP "S" AND 2 FT. TRUNCATED DOME SURFACE IS REQUIRED ON EACH RAMP "R" AND "R"+"S"=6 FT. WHEN CURB HEIGHT IS 6 IN. IF CURB IS OTHER THAN 6 IN., USE 12(H):1(V) RATIO TO DETERMINE MINIMUM RAMP LENGTH.
B. IF RAMP "S" IS 2 FT. OR GREATER BUT LESS THAN 6 FT., INSTALL TRUNCATED DOMES ONLY ON RAMP "S" AND "S"+"R"=6 FT. WHEN CURB HEIGHT IS 6 IN. IF CURB HEIGHT IS OTHER THAN 6 IN., USE 12(H):1(V) RATIO TO DETERMINE RAMP LENGTH.
C. IF LENGTH OF RAMP "S" IS 6 FT. OR GREATER AND CURB HEIGHT IS 6 IN., THEN USE FULL, STANDARD "S" RAMP WITH TRUNCATED DOME PAVERS IN LIEU OF LANDING AND WITH NO "R" RAMPS. IF CURB HEIGHT IS OTHER THAN 6 IN., USE 12(H):1(V) RATIO TO DETERMINE RAMP LENGTH AND THE NEED FOR "R" RAMPS AND A LANDING.

RAMP TYPE II

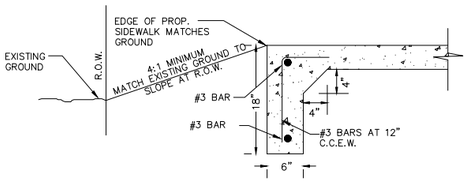


NOTE:
THIS RAMP MAY BE USED AS AN ALTERNATE TO A TYPE II ONLY WHEN THE WALKABLE/PAVED SURFACES ARE ADJACENT TO THE CURB.

RAMP TYPE III

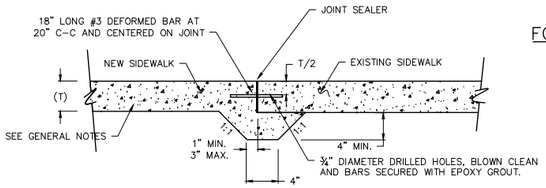


RAMP – SECTION A–A



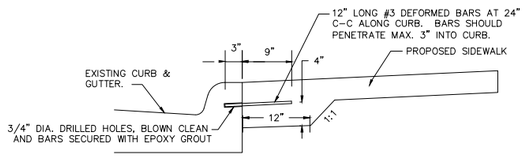
NOTES
A. FOR USE ONLY UPON WRITTEN APPROVAL BY CITY ENGINEER
B. FOR USE WHEN GROUND SLOPES AWAY FROM SIDEWALK

TURNED DOWN FOOTING AT EDGE OF PROPOSED SIDEWALK

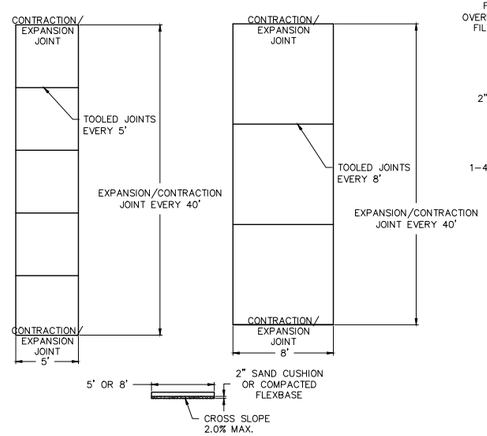


NOTE:
CURB AND SIDEWALK REPAIRS TO MADE FROM EXISTING JOINT, UNLESS DIRECTED OTHERWISE FROM CITY ENGINEER.

NEW TO EXISTING SIDEWALK CONNECTION



SIDEWALK ALONG EXISTING BACK OF CURB



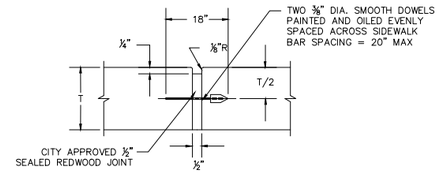
NOTES – SIDEWALK AND BIKE/PEDESTRIAN FACILITIES:
VIRGIN POLY FIBER TO BE 1½" LONG AT 1½ LBS./CU.YD.

1. NOT SUBJECT TO VEHICLE LOADS
a) IF 5' WIDE, THEN 4" DEPTH–3,000 PSI FIBER REINFORCED PORTLAND CEMENT CONCRETE
b) IF 8' WIDE, THEN 5" DEPTH–3,000 PSI FIBER REINFORCED PORTLAND CEMENT CONCRETE
c) ADD 1" ADDITIONAL DEPTH WHEN USING REBAR REINFORCEMENT

2. IF SUBJECTED TO VEHICLE LOAD
FOR EITHER WIDTH OF SIDEWALK NOTED ABOVE: 6" DEPTH–3,000 PSI COMPRESSION CEMENT, REINFORCED WITH #3 BARS ON 18" CENTERS.

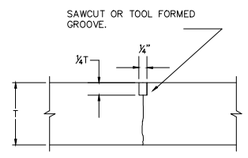
SIDEWALK FACILITY FOR NON–COLLECTOR STREETS

BIKE/PEDESTRIAN FACILITY FOR COLLECTOR STREETS

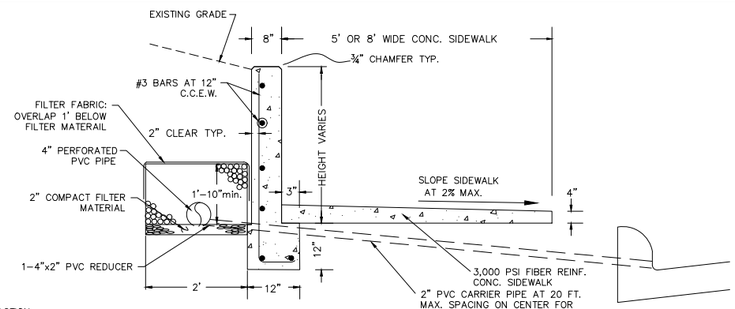


*AT DRIVEWAY OR AS REQUIRED BY CITY BECAUSE OF LENGTH

CONTRACTION/EXPANSION JOINT

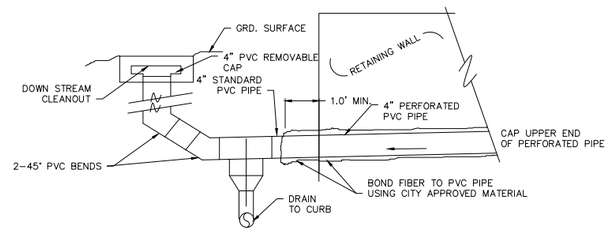


SAWED JOINT

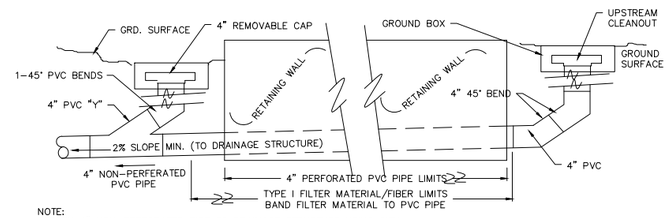


NOTES:
A. CONSTRUCT CONTINUOUS POUR/MONOLITHIC STANDARD CONCRETE CURB CENTERED ON FOOTING AS SHOWN AND AT EDGE OF SEPARATELY POURED SIDEWALK IN LIEU OF RETAINING WALL IF WALL HEIGHT IS LESS THAN 7". CONCRETE CURB SHALL BE 3,000 PSI COMPRESSION WITH 1½" LONG VIRGIN POLY FIBERS AT 1½ LBS./CUYD
B. IF HEIGHT OF WALL IS GREATER THAN 30", THEN PROVIDE ENGINEERING SEALED PLANS FOR WALL DESIGN. DESIGN WILL NOT CONTAIN WEEP HOLES BUT WILL CONTAIN A DRAIN SYSTEM SIMILAR TO THAT SHOWN ON THIS SHEET
C. WALL TO BE CENTERED ON 12"x12" FOOTING
D. WALL AND FOOTING TO BE POURED CONTINUOUS (MONOLITHIC)
E. SIDEWALK TO BE POURED SEPARATE FROM WALL AND/OR FOOTING
F. PIPE SIZING SHOWN IS MINIMUM. DEPENDING ON WALL LENGTH AND/OR WALL HEIGHT, PIPE SIZE TO BE DESIGNED ACCORDINGLY
G. MINIMUM SLOPE OF CARRIER PIPE IS 2% MAXIMUM SLOPE IS 4%
H. MINIMUM SLOPE OF PERFORATED PIPE IS 2%
I. AT JUNCTION OF CARRIER PIPE WITH PERFORATED PIPE THE BOTTOM OF THE PERFORATED PIPE SHALL BE AS CLOSE TO THE BOTTOM OF THE FOOTING AS POSSIBLE WITHOUT VIOLATING THE SLOPE REQUIREMENTS OF THE CARRIER PIPE
J. DEPENDING ON THE FINAL ELEVATION OF THE PERFORATED PIPE AT THE CARRIER PIPE, WITHOUT VIOLATING THE SLOPE REQUIREMENTS OF THE CARRIER PIPE, ADDITIONAL BENDS WILL BE INSTALLED SO THAT THE 4"X2" REDUCER IS AS CLOSE TO VERTICAL AS POSSIBLE IN ORDER FOR THE PERFORATED PIPE TO DRAIN AND/OR FOR THE CARRIER PIPE TO NOT NEEDLESSLY ENCROACH INTO THE BOTTOM OF THE SIDEWALK

SIDEWALK WITH RETAINING WALL AND/OR CONCRETE CURB



DRAINAGE TO CURB



NOTE:
ATTACH 4" NON–PERFORATED PIPE TO DRAINAGE STRUCTURE USING CITY APPROVED CONSTRUCTION TECHNIQUES AND REPAIR MATERIALS.

DRAINAGE TO EXISTING DRAINAGE STRUCTURE

GENERAL NOTES:

1. CONCRETE PAVER UNITS FOR TYPICAL SIDEWALKS OR BIKE/PEDESTRIAN FACILITIES SHALL MEET ALL REQUIREMENTS OF ASTM C–936, C–33, AND SHALL BE LAID IN A TWO BY TWO UNIT BASKET WEAVE PATTERN, UNLESS SHOWN OTHERWISE IN THE PLANS.
2. IF CONCRETE PAVERS ARE NOT USED, ANY PROPOSED ALTERNATE SHALL ONLY BE PER THE CITY APPROVED LISTING AND THEN ONLY UPON WRITTEN APPROVAL BY THE CITY ENGINEER PRIOR TO INSTALLATION FOR EACH LOCATION.
3. PARTIAL PAVERS OR ACCEPTABLE EQUIVALENT SHALL BE SAW–CUT ONLY WITH SMOOTH, VERTICAL FACE AND WITHOUT SPALLS AND BE NO LESS THAN 25% OF A FULL UNIT.
4. PAVERS SHALL BE INSTALLED TO BE EDGE TO EDGE OF EACH PAVER. VIBRATED SAND TO BE USED TO FILL VOIDS.
5. THE RAMP AREA SHALL HAVE A UNIFORMLY FLAT CROSS SLOPE.
6. STANDARD CONCRETE SIDEWALK SHALL RECEIVE AN APPROVED WHITE PIGMENTED CURING COMPOUND AND A LIGHT BROOM FINISH.
7. COLOR OF WARNING DEVICES SHALL CONTRAST WITH ADJACENT WALKABLE PATH. COLOR SHALL BE TERRA COTTA RED. LANDINGS SHALL NOT BE COLORED OR TEXTURED.
8. DIRECTION OF THE RAMP SHOULD PROJECT TO AND IN THE SAME DIRECTION AS THE CROSS WALK.
9. UNLESS OTHERWISE NOTED HEREIN, ALL RAMPS, LANDINGS, FLAIRS AND SIDEWALKS SHALL COMPLY WITH LATEST TEXAS ACCESSIBILITY STANDARDS (TAS). ANY PROPOSED ALTERNATE SHALL COMPLY WITH U.S. ARCHITECTURAL AND TRANSPORTATION BARRIERS COMPLIANCE BOARD; AMERICANS WITH DISABILITIES ACCESSIBILITY GUIDELINES; PROWAG; AND ALL OTHER APPLICABLE LOCAL, STATE AND FEDERAL REQUIREMENTS GOVERNING ACCESSIBILITY.
10. CROSS SLOPE OF RAMP SHALL BE SAME AS SIDEWALK.
11. RAMP SHALL BE 5' OR 8' WIDE TO MATCH APPLICABLE SIDEWALK FOR STREET TYPE. IF EXISTING SIDEWALK IS MORE OR LESS THAN RAMP WIDTH, A TRANSITIONAL SECTION (TYPICALLY THE PANEL PRIOR TO THE ADA RAMP) SHALL BE INSTALLED TO MATCH THE SIDEWALK'S WIDTH TO THE RAMP'S WIDTH.
12. HANDRAILS REQUIRED ON SIDEWALK OR RAMP RISES OVER 6" PER PROWAG.

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CITY OF DENTON
ENGINEERING SERVICES

STANDARD DETAILS

SIDEWALK DETAILS

DATE
DEC. 2018

SHEET No.
16 OF 16

SCALE
HOR 1"= N.T.S.
VER 1"= N.T.S.

CERTIFICATION:
THIS CITY OF DENTON STANDARD DETAIL SHEET IS AUTHORIZED FOR USE IN THIS PROJECT BY THE ENGINEER WHOSE SEAL APPEARS HEREON, AND WHO CERTIFIES THE CONTENT OF THE DETAILS AND NOTES HEREIN HAVE NOT BEEN ALTERED AND ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THE STANDARDS WITHIN THIS SHEET.

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DATE:
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

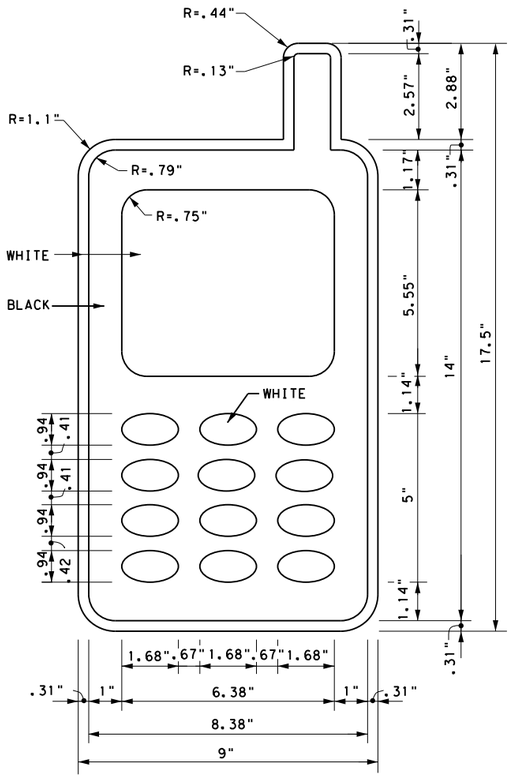
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

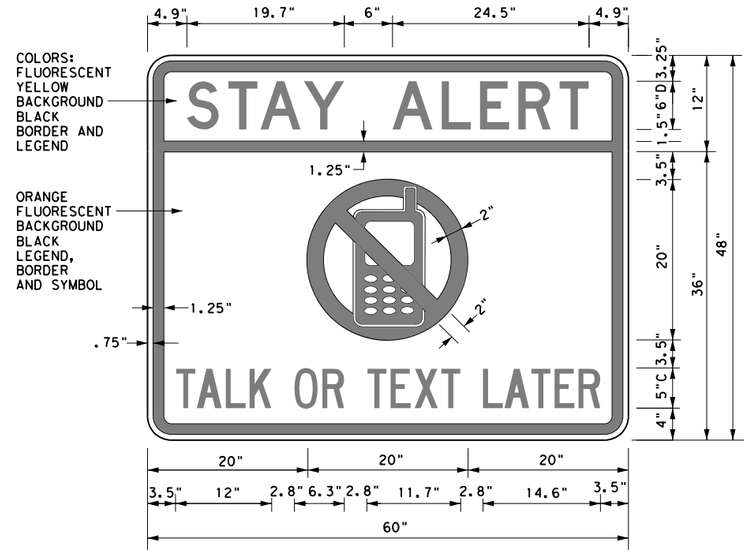
12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.





3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)
TRAFFIC ENGINEERING STANDARD SHEETS

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 4-03 5-10 8-14 9-07 7-13	DIST	COUNTY		SHEET NO.

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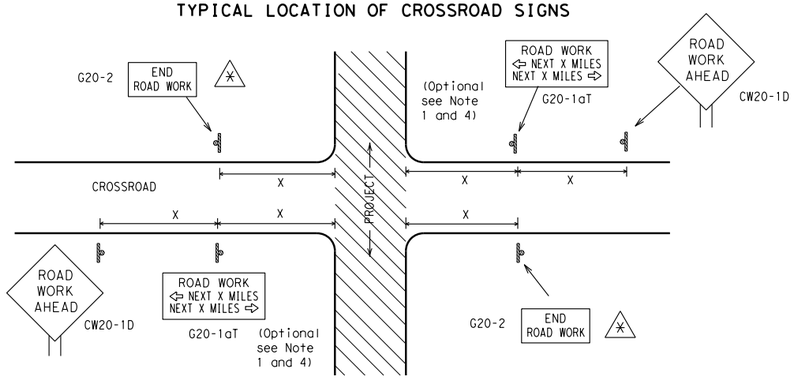
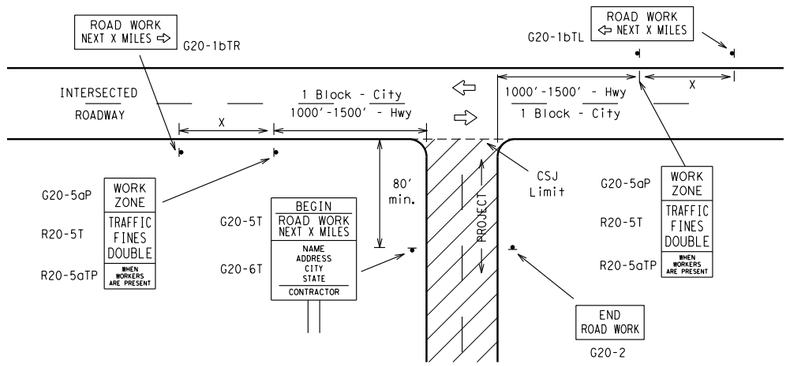
TYPICAL LOCATION OF CROSSROAD SIGNS



✳ May be mounted on back of "ROAD WORK AHEAD"(CW20-1D) sign with approval of Engineer. (See note 2 below)

1. The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D)sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
4. The "ROAD WORK NEXT X MILES"(G20-1aT)sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

1. The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
2. If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME"(G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow(G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR)" signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign Spacing "X" △
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

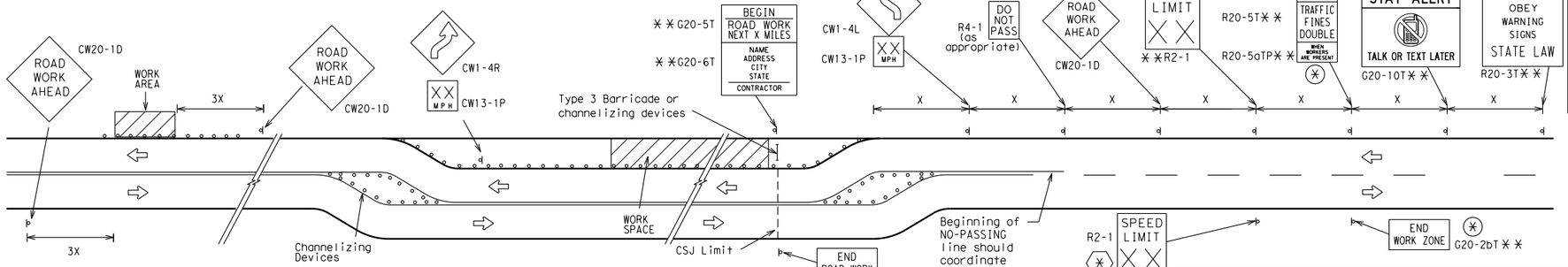
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

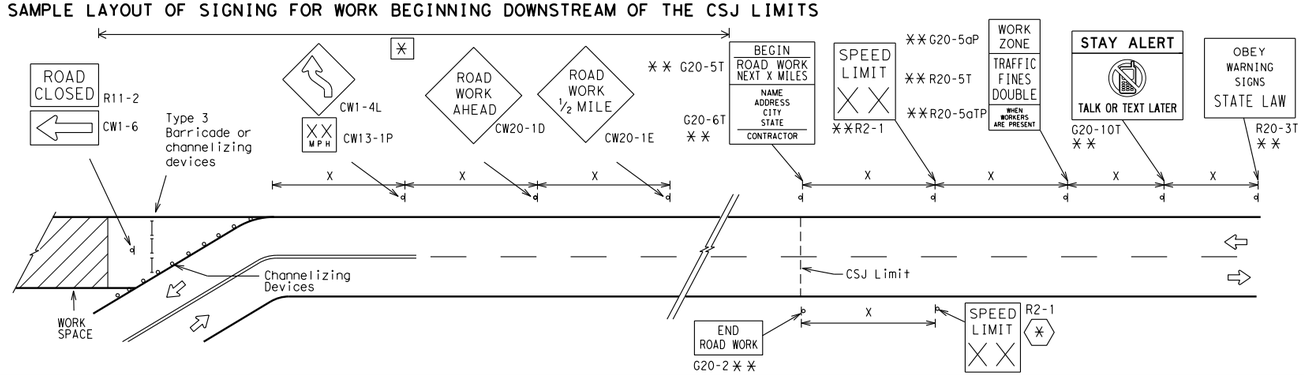
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

✳ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

✳ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

✳ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

⊢⊣	Type 3 Barricade
○ ○ ○	Channelizing Devices
▬	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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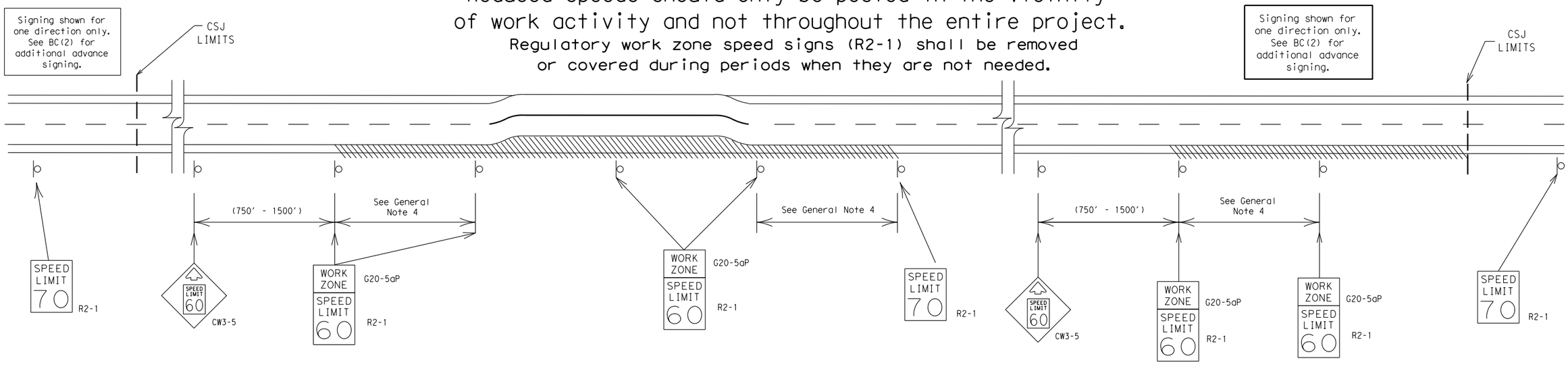
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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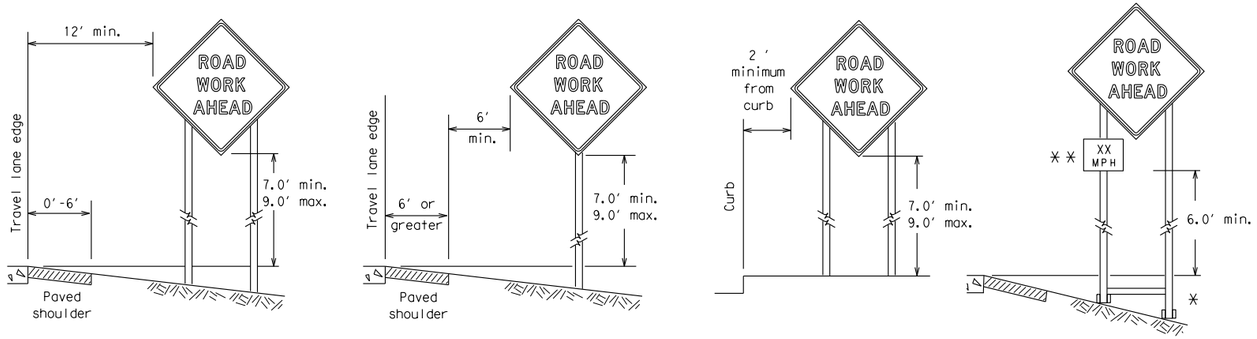
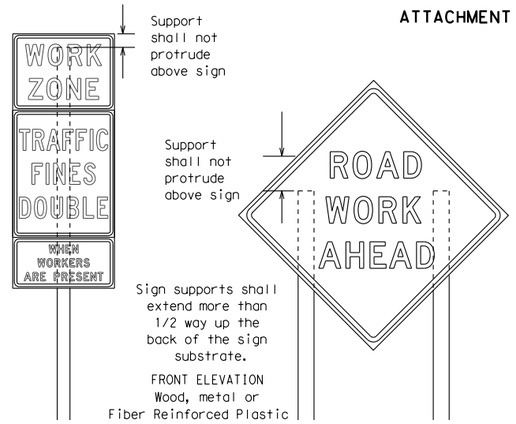
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

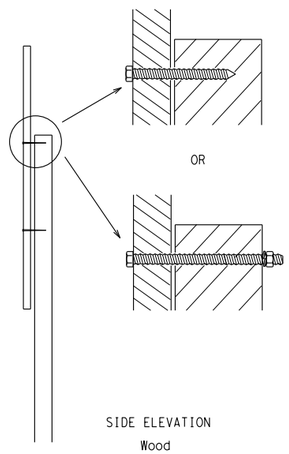


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS





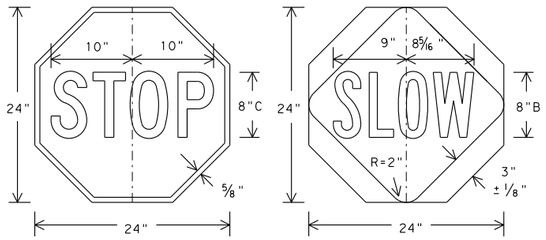
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6′ to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
   a. Long-term stationary - work that occupies a location more than 3 days.
   b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
   c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
   d. Short, duration - work that occupies a location up to 1 hour.
   e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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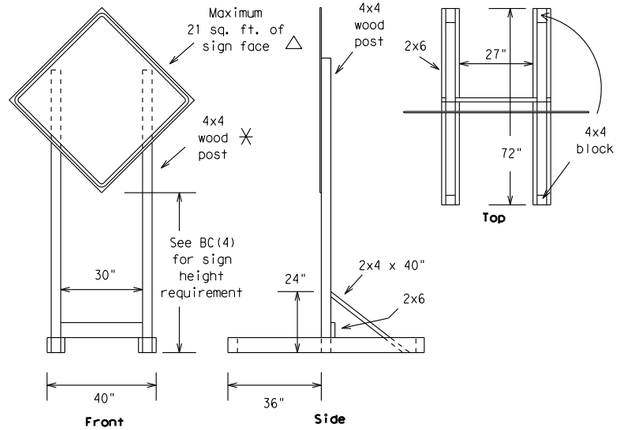
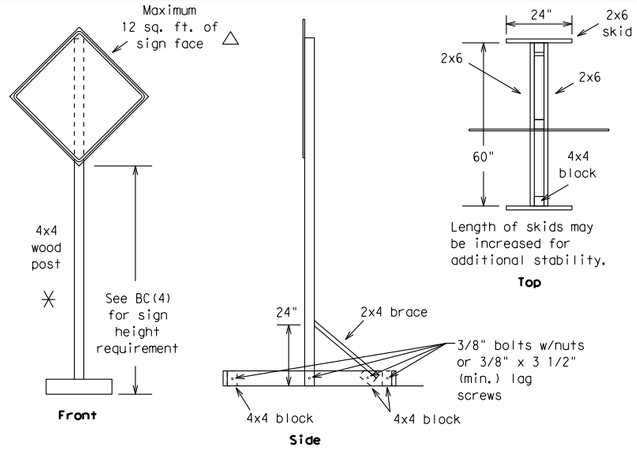
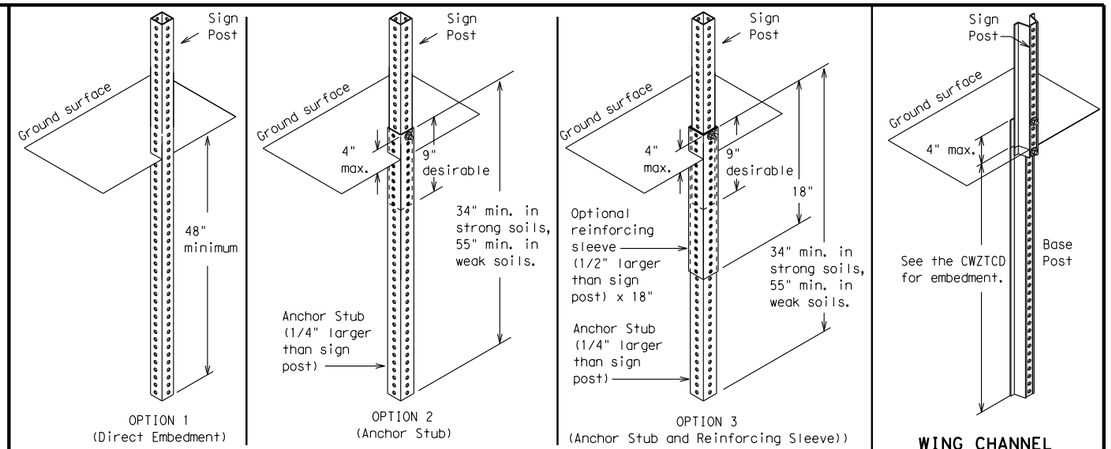




SKID MOUNTED WOOD SIGN SUPPORTS

LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

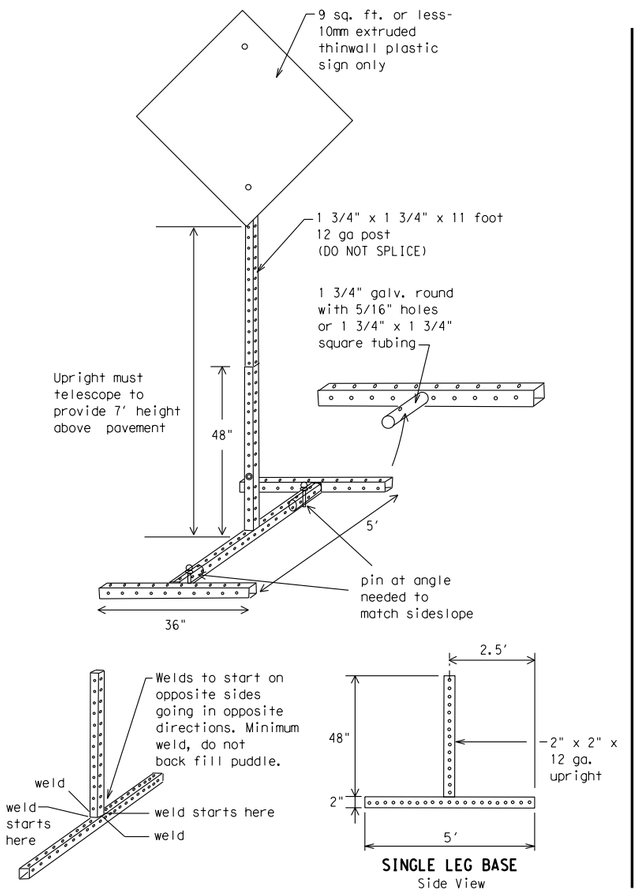


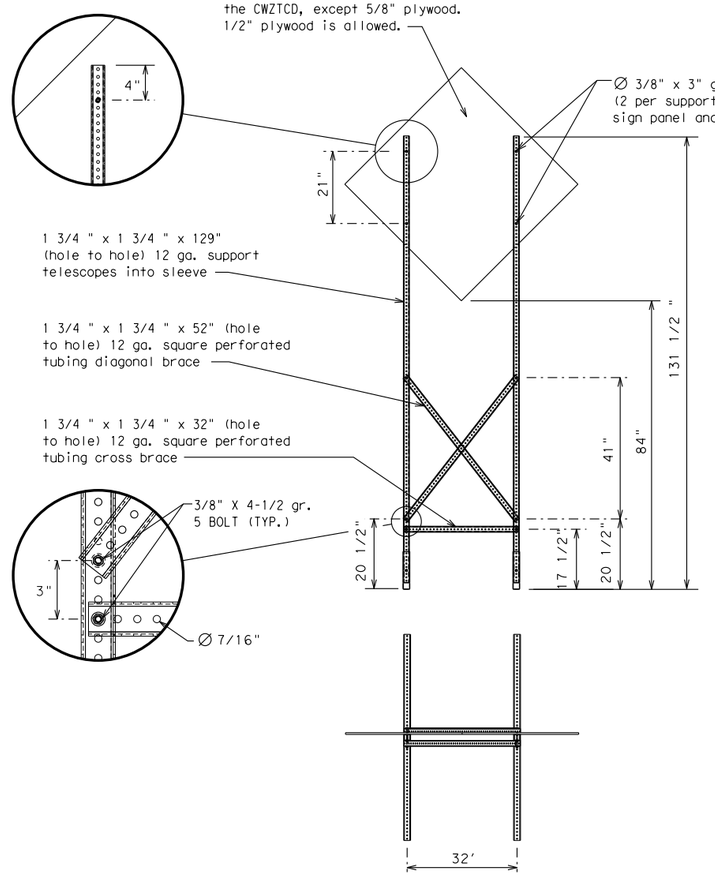
PERFORATED SQUARE METAL TUBING

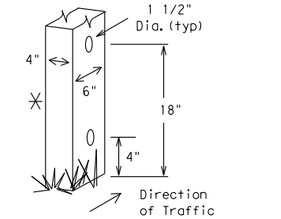
WING CHANNEL
Lap-splice/base bolted anchor

GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.

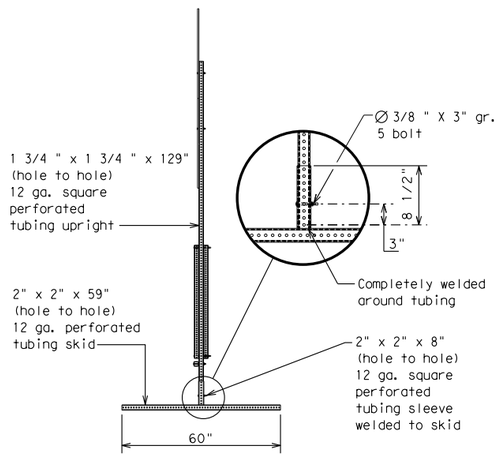






Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

GENERAL NOTES

1. Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
3. Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
8. The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
15. PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXX TO XXXXXXX
US XXX TO FM XXXX

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM- X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM- XX AM

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
6. For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

1. When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
2. When symbol signs, such as the "Flagger Symbol"(CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
3. When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
4. A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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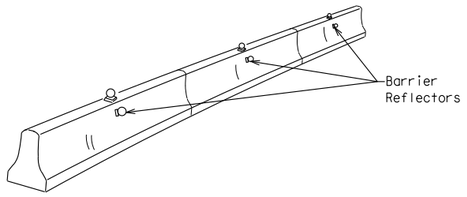
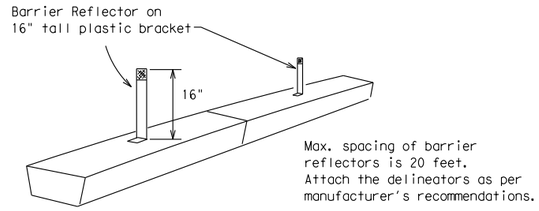
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

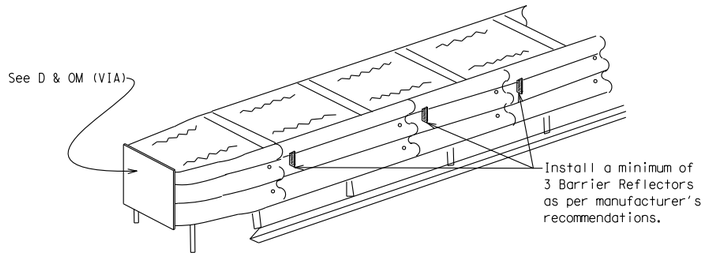


CONCRETE TRAFFIC BARRIER (CTB)

3. Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
4. Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional)while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)

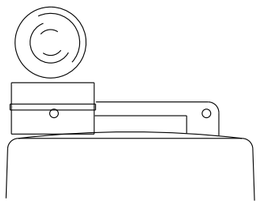


DELINEATION OF END TREATMENTS

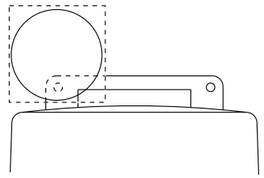
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square.Must have a yellow reflective surface area of at least 30 square inches

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

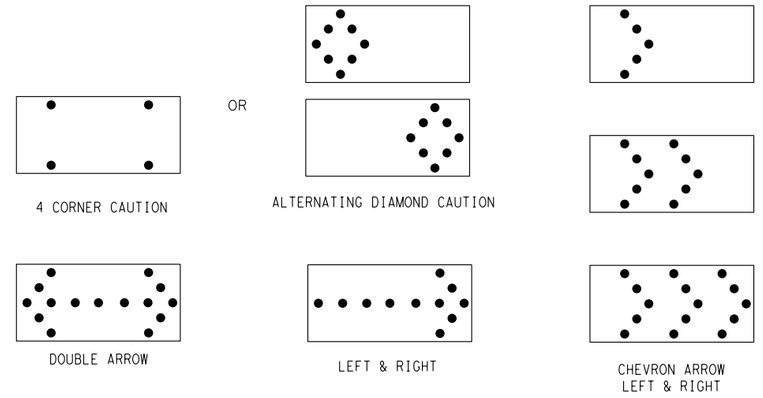
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
4. Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

1. A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
2. The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
6. The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
2. Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
3. The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
8. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC(7)-14

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
3. For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
4. Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
5. Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
6. The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

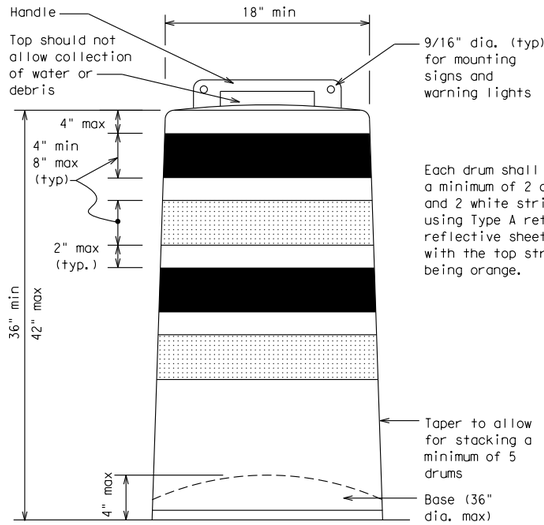
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
4. Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
5. The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
6. The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
7. Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

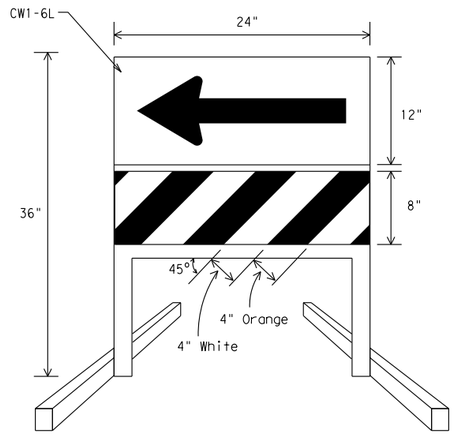
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
2. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
5. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.

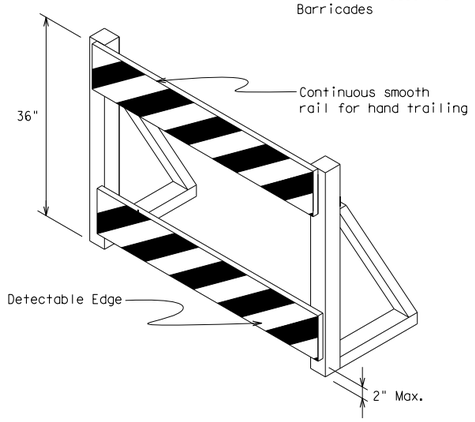




DIRECTION INDICATOR BARRICADE

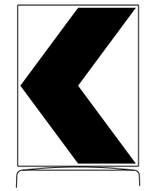
1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

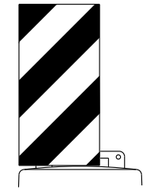


DETECTABLE PEDESTRIAN BARRICADES

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
3. Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
8. R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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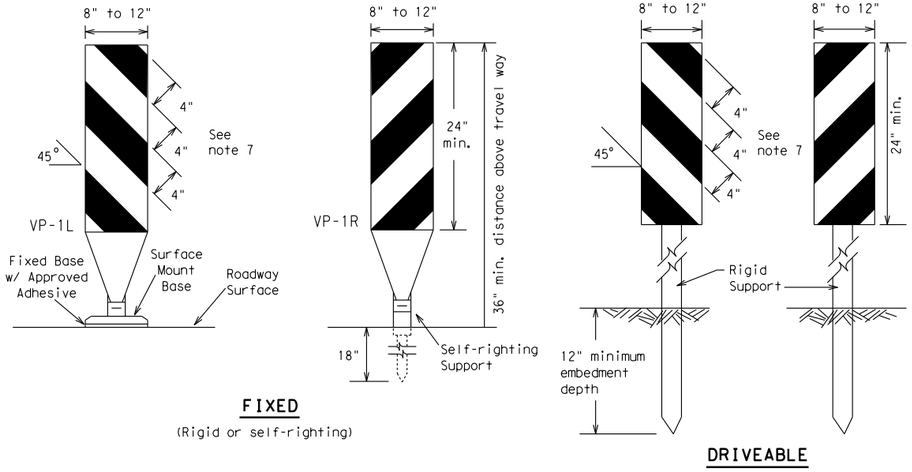
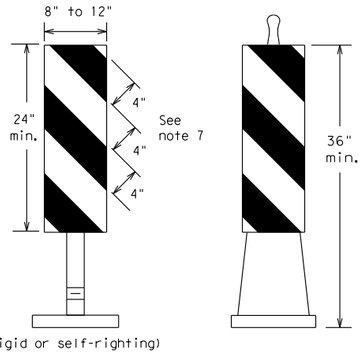


FIXED
(Rigid or self-righting)

DRIVEABLE

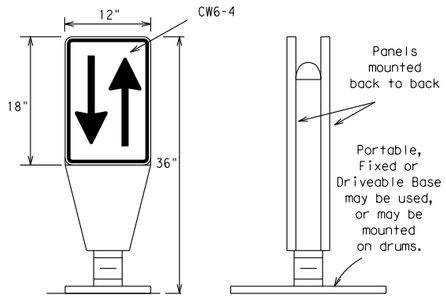


(Rigid or self-righting)

PORTABLE

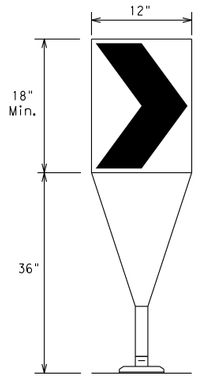
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



1. Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



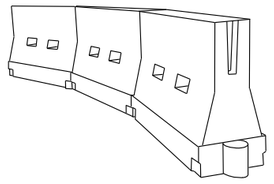
Fixed Base w/ Approved Adhesive
(Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
3. Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

CHEVRONS

GENERAL NOTES

1. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
4. The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
7. The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

1. Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
2. Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
3. Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

Posted Speed *	Formula	Minimum Desirable Taper Lengths * * 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

* * Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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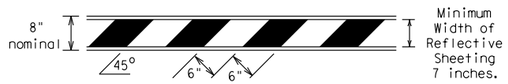
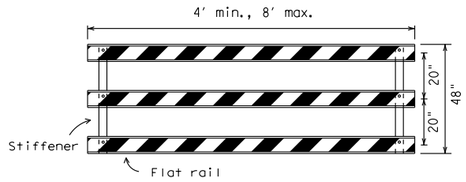
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



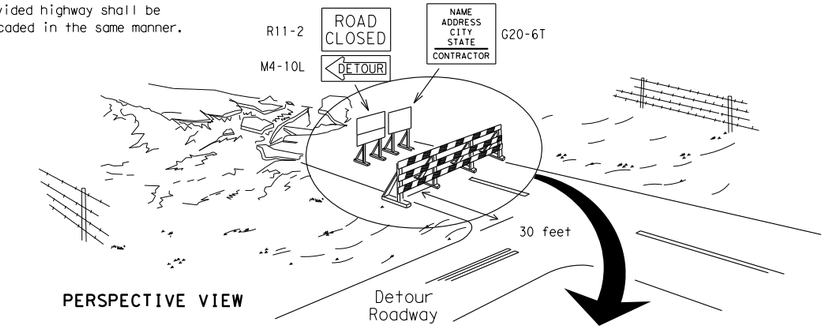
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

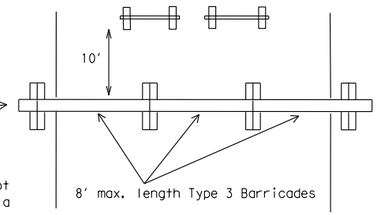
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

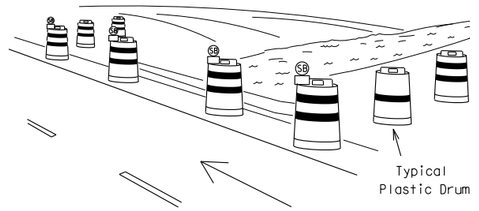
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

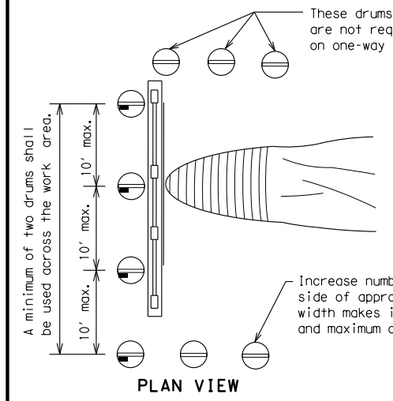
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

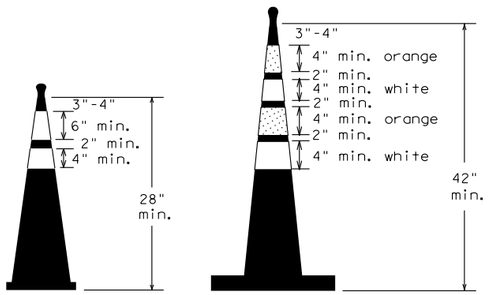
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.



PLAN VIEW

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
SB	Steady burn warning light or yellow warning reflector

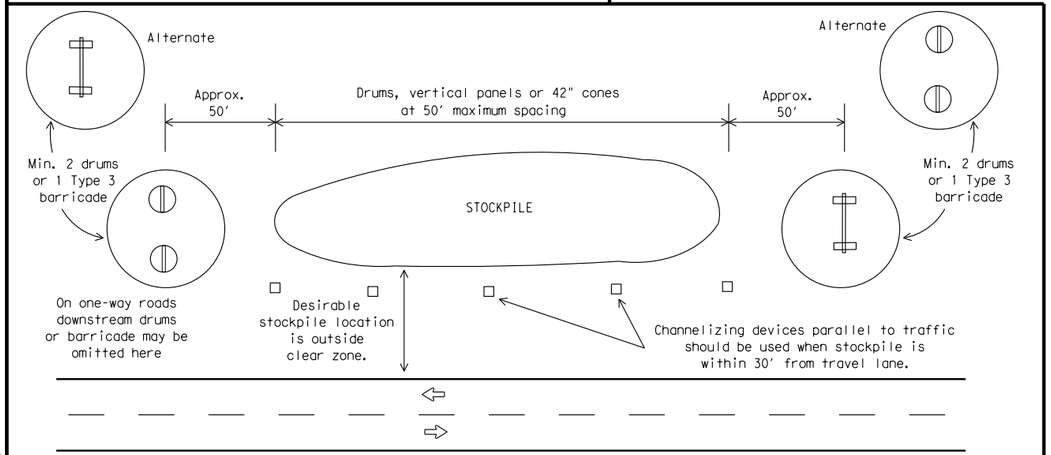
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

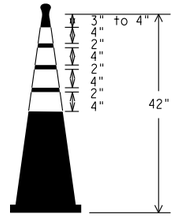
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

1. The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
6. When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(12).
2. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

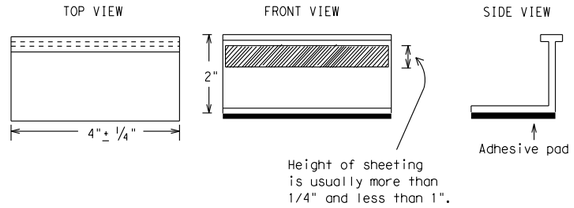
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
3. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
4. Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



STAPLES OR NAILS SHALL NOT BE USED TO SECURE TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS TO THE PAVEMENT SURFACE

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

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105

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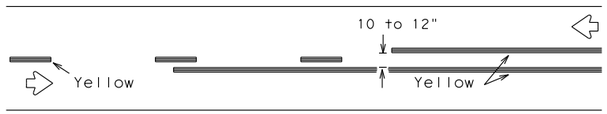
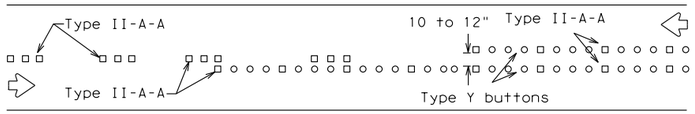
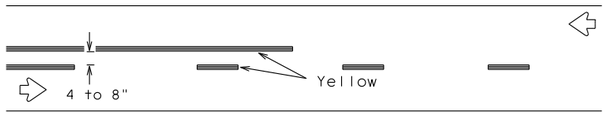
PAVEMENT MARKING PATTERNS



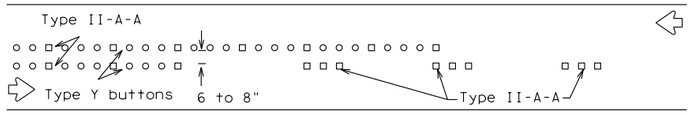
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



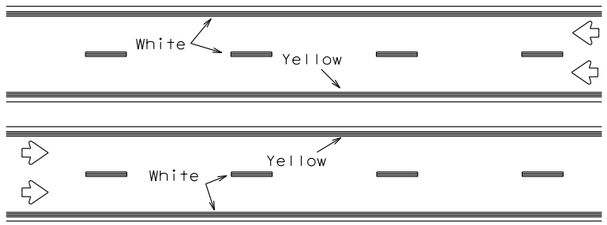
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



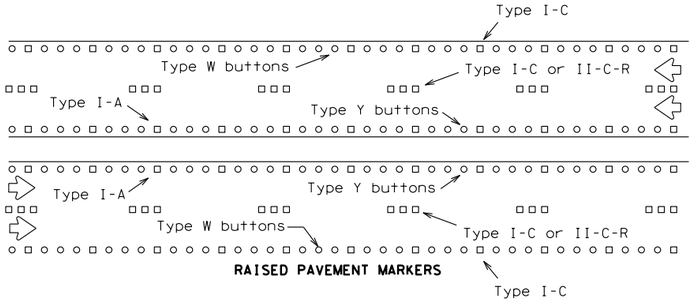
RAISED PAVEMENT MARKERS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



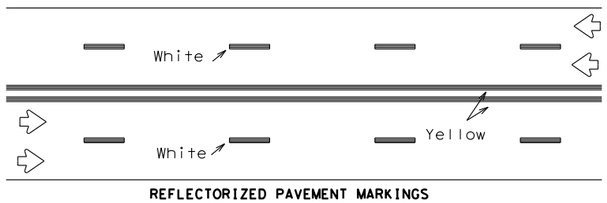
REFLECTORIZED PAVEMENT MARKINGS



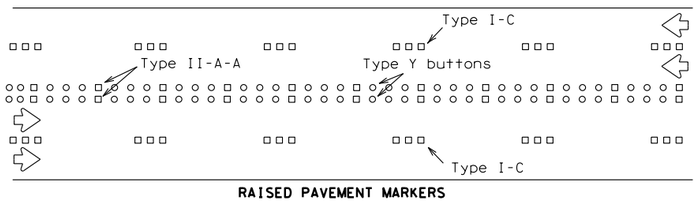
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



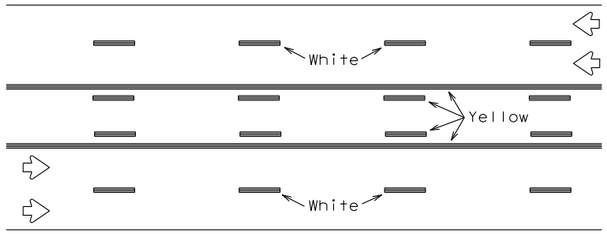
REFLECTORIZED PAVEMENT MARKINGS



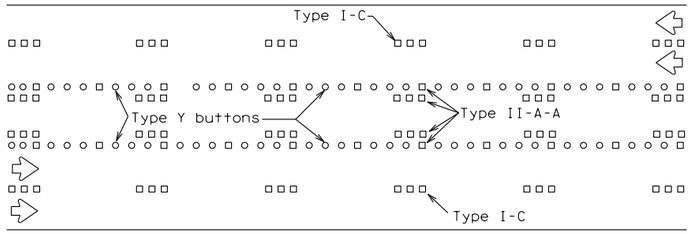
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

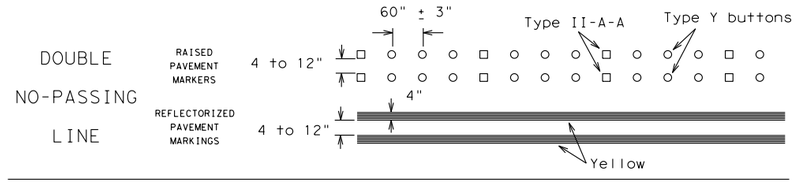
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

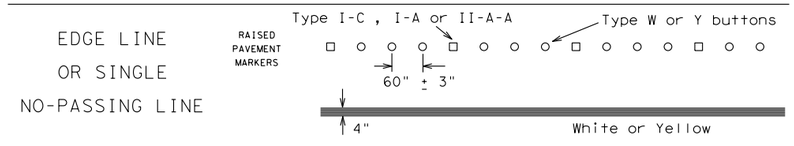
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

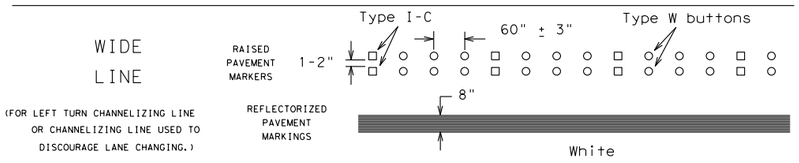


EDGE LINE OR SINGLE NO-PASSING LINE



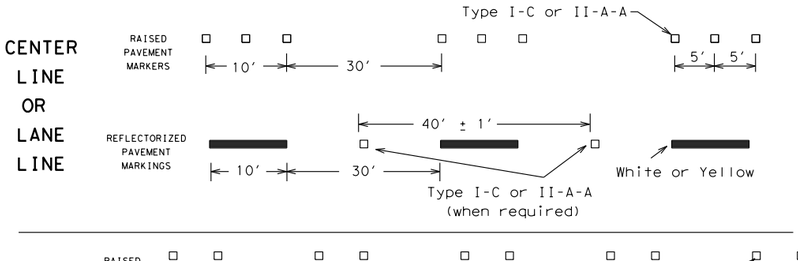
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

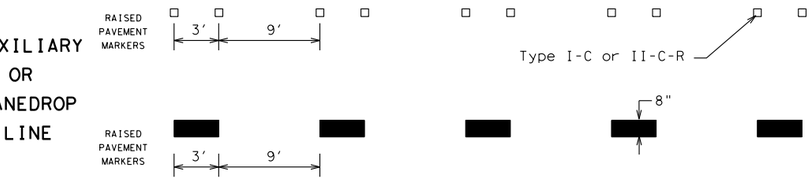


BROKEN LINES

CENTER LINE OR LANE LINE

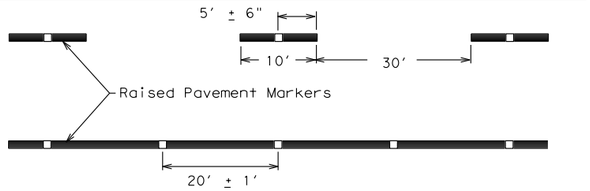


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Centerline only - not to be used on edge lines

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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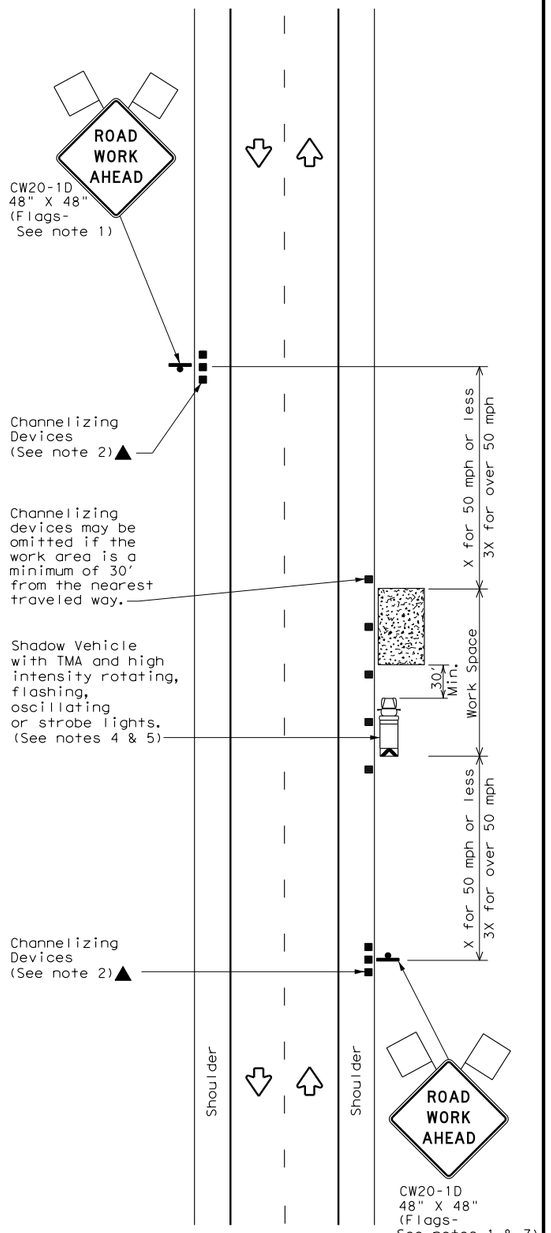
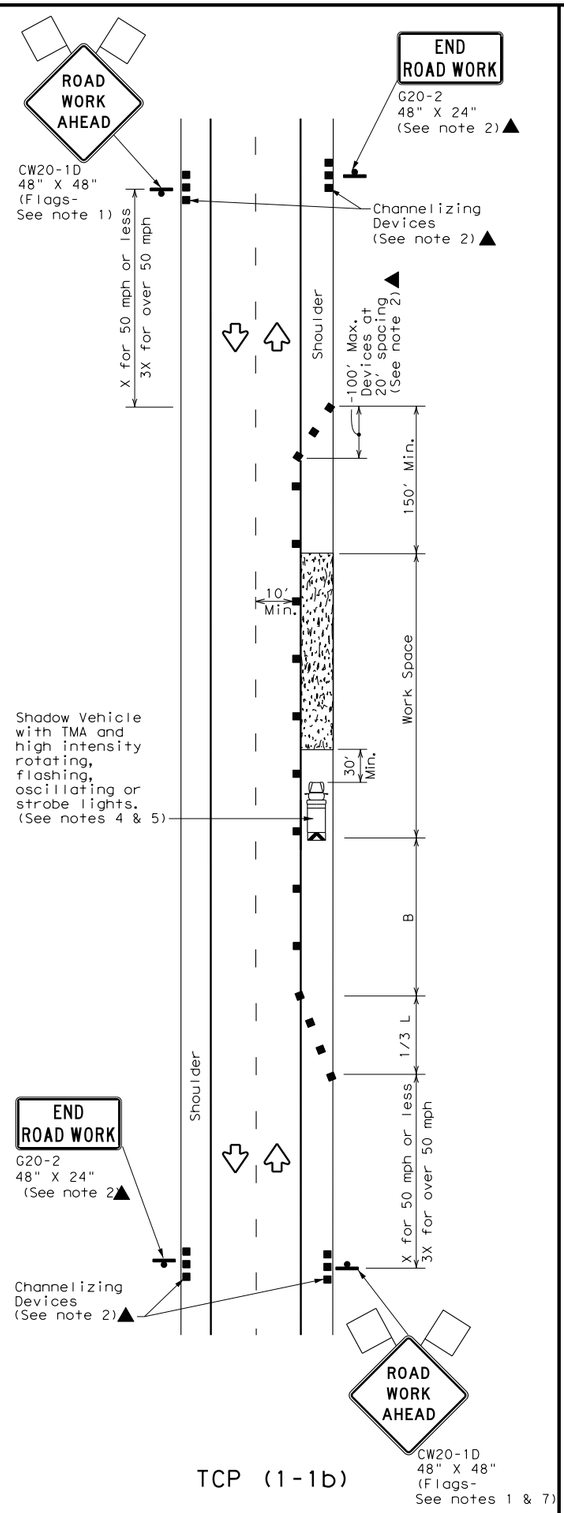


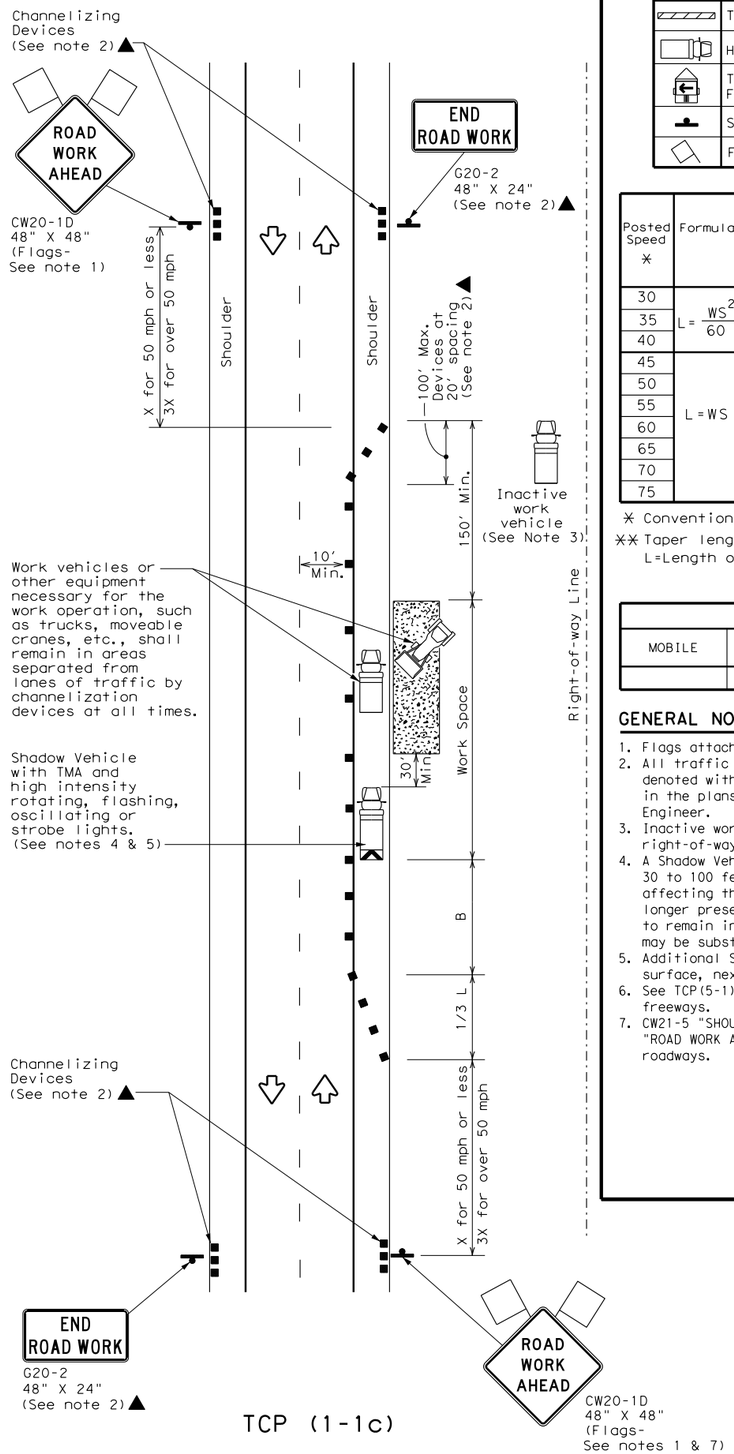
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
6. See TCP(5-1)for shoulder work on divided highways, expressways and freeways.
7. CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

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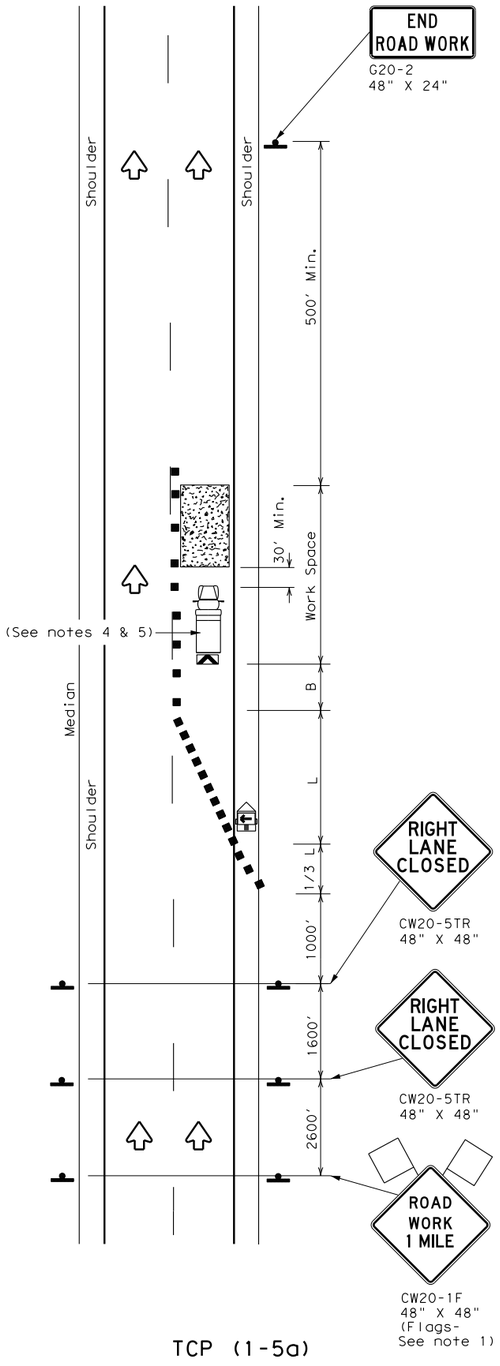
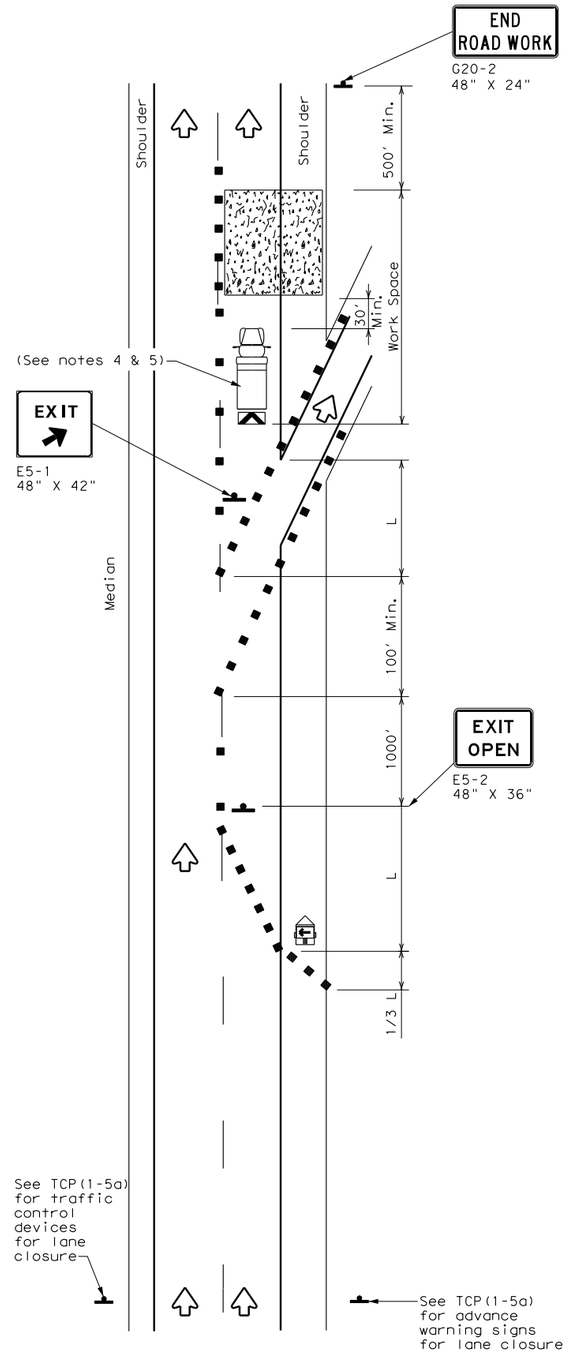


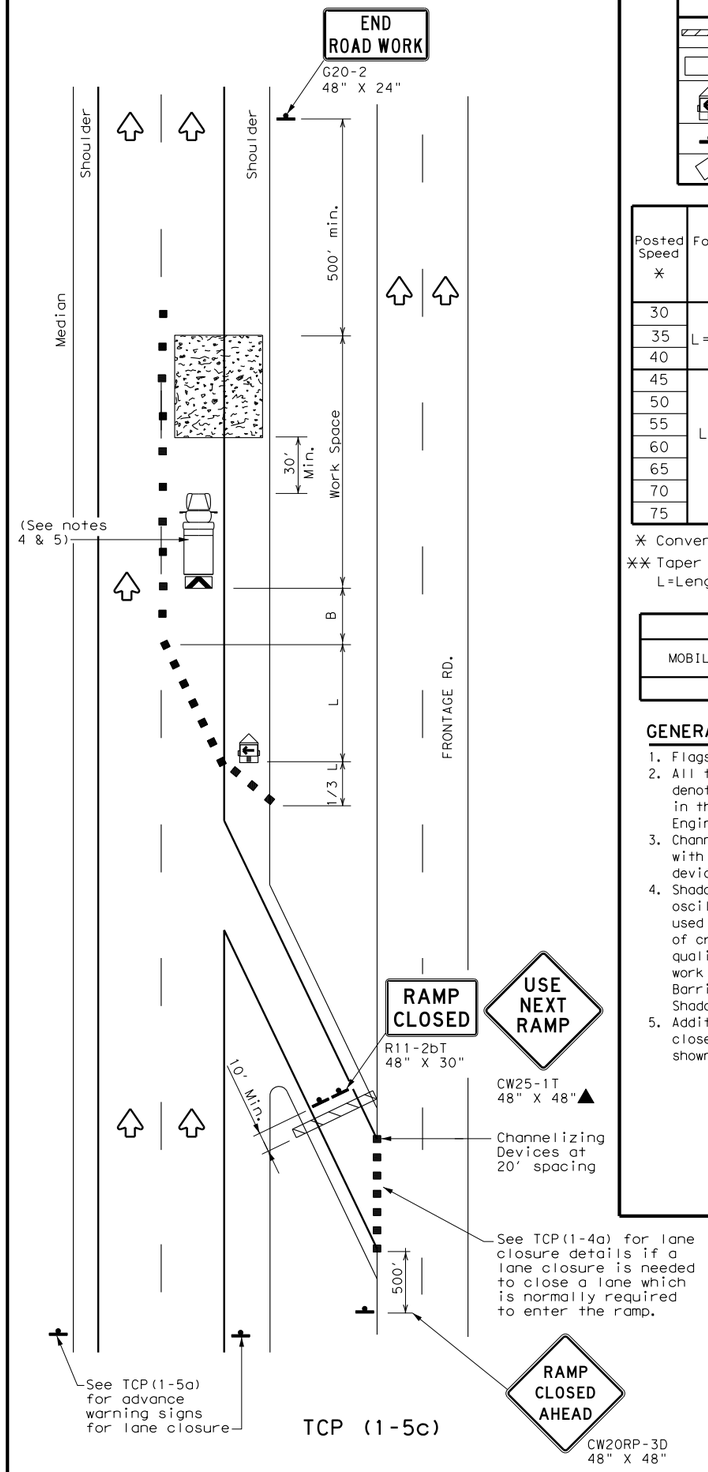
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.
L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓		

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

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