

**THE CITY OF ALVARADO, TEXAS**  
**STREET RECONSTRUCTION PLANS**  
**FOR**  
**NORTH CUMMINGS DRIVE**

**COUNCIL AND STAFF**

**E. DEWAYNE RICHTERS**  
MAYOR

**MICHAEL BENNETT**  
WARD 1

**REFUGIO HERNANDEZ JR.**  
WARD 1

**ARRDEEN VAUGHAN**  
WARD 2

**JOE SAIN**  
MAYOR PRO TEM, WARD 2

**JACOB WHEAT**  
WARD 3

**SHAWN GOULDING**  
WARD 3

**CLINT DAVIS**  
CITY MANAGER

**MICHAEL DWIGGINS**  
DIRECTOR OF PUBLIC WORKS



**PREPARED BY:**

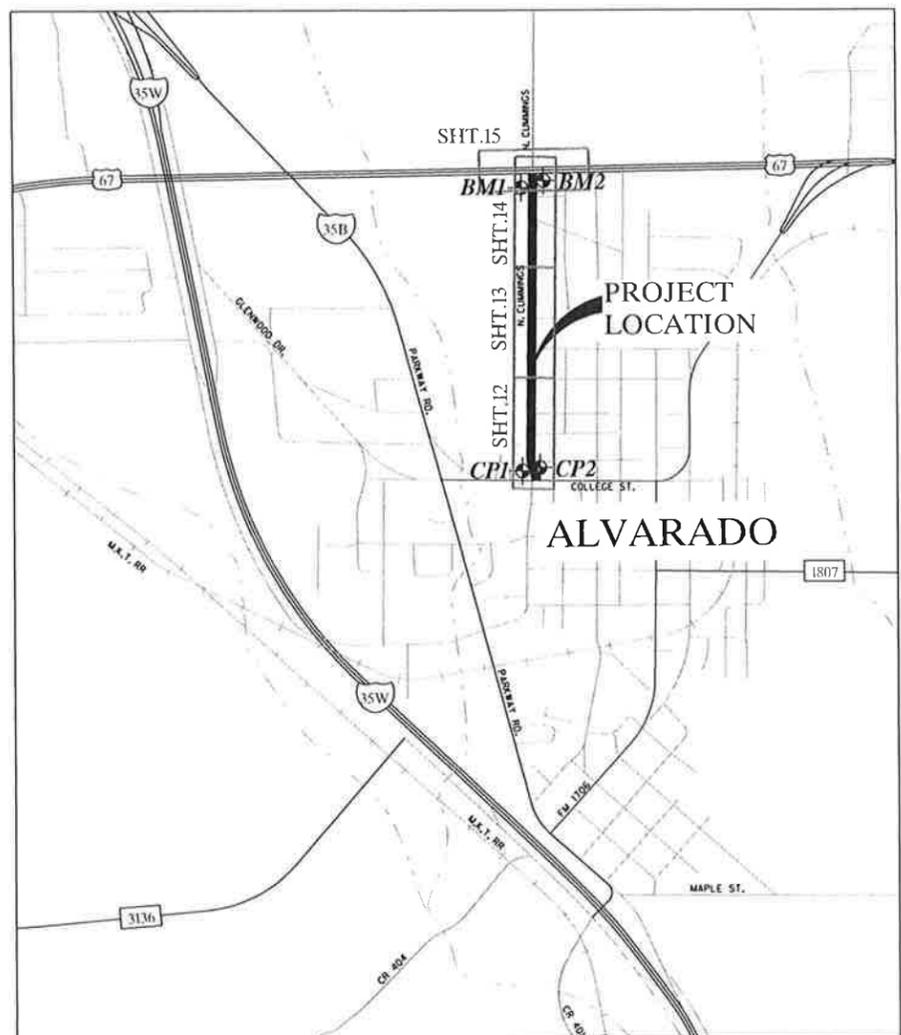
**CE CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS

211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76033  
TEX. REG. NO. F-702

*Benjamin S. Shanklin*  
BENJAMIN S. SHANKLIN, P.E.

4-22-16  
DATE

**2016**



PROJECT LOCATION MAP



SURVEY CONTROL POINTS				
PNT.#	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM1	6836607.39	2365140.66	754.00	1/2" IRON ROD WITH RED CAP
BM2	6836683.08	2365244.81	756.24	*X* CUT ON OLD CONCRETE LIGHT BASE
CP1	6833519.40	2365070.99	722.66	1/2" IRON ROD WITH RED CAP
CP2	6833562.68	2365220.57	734.69	1/2" IRON ROD WITH RED CAP

LEGEND:  
 2 SURVEY CONTROL POINT

GENERAL NOTES:

- THE EXISTING UTILITIES ARE SHOWN FOR REFERENCE ONLY. THEIR LOCATIONS ARE APPROXIMATE AND NOT TO BE CONSIDERED AS ACCURATE NOR ALL INCLUSIVE. THE CONTRACTOR SHALL FIELD VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION.
- THE CONTRACTOR SHALL PREPARE A VIDEO AND TAKE PHOTOGRAPHS OF THE CONSTRUCTION AREA PRIOR TO BEGINNING CONSTRUCTION TO DOCUMENT EXISTING CONDITIONS AND HE SHALL PROVIDE COPIES TO THE ENGINEER AND THE CITY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING ANY DAMAGED EXISTING UTILITIES AT HIS EXPENSE.
- CONSTRUCTION STAKING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTROL POINTS ARE FURNISHED FOR THE CONTRACTOR'S USE TO STAKE THE PROPOSED IMPROVEMENTS. HE SHALL BE RESPONSIBLE FOR PROTECTING THESE POINTS AND TRANSFERRING THEM TO AN AREA OUTSIDE OF THE CONSTRUCTION LIMITS IF NECESSARY.
- COORDINATES ARE PROVIDED FOR THE CONTRACTOR'S USE. HOWEVER, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD CHECK ALL LAYOUT STAKING AND NOTIFY THE ENGINEER IN THE EVENT OF ANY DISCREPANCY.
- THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING A STORM WATER POLLUTION PREVENTION PLAN AND SUBMITTING ALL REQUIRED TPDES DOCUMENTATION, INCLUDING N.O.I. AND N.O.T. FORMS, AND MEETING ALL REQUIREMENTS OF THE TCEQ REGULATIONS.
- THE CONTRACTOR SHALL STRIP AND STOCKPILE 6 INCHES OF TOP SOIL FROM THE CONSTRUCTION AREA PRIOR TO EXCAVATION. UPON COMPLETION OF THE STREET CONSTRUCTION, THE TOP SOIL SHALL BE SPREAD IN A WORKMANLIKE MANNER.
- LARGE ROCKS AND OTHER CONSTRUCTION DEBRIS SHALL BE HAULED OFF SITE AT THE CONTRACTOR'S EXPENSE.
- THE CONTRACTOR SHALL RETURN ALL EXCAVATED AREAS, FENCES, SIDEWALKS, UTILITIES, PAVED AREAS, ETC. TO THEIR PRECONSTRUCTION CONDITION OR BETTER. THIS WORK SHALL BE CONSIDERED INCIDENTAL AND NOT A SEPARATE BID ITEM, UNLESS OTHERWISE SHOWN ON THE BID SCHEDULE.
- THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE AT ALL TIMES AND SHALL BE RESPONSIBLE FOR ALL STORM WATER CONTROL, PUMPING, AND DEWATERING NECESSARY FOR THE CONSTRUCTION OF THIS PROJECT. THIS WORK SHALL BE CONSIDERED INCIDENTAL AND NOT A SEPARATE PAY ITEM.
- ALL DIMENSIONS TO BACK OF CURB UNLESS OTHERWISE NOTED.
- THE CONTRACTOR SHALL CONTACT THE CITY OF ALVARADO A MINIMUM OF 48 HOURS PRIOR TO CONSTRUCTION.
- WATER SHALL NOT BE TAKEN FROM THE CITY'S MAIN WITHOUT PRIOR KNOWLEDGE AND APPROVAL FROM THE CITY.
- THE CONTRACTOR SHALL BACKFILL AND COMPACT THE TOP 8" OF ALL UTILITY DITCHES WITH FLEXIBLE BASE MATERIAL OR 1" CRUSHED STONE AS TEMPORARY PAVEMENT IN AREAS SCHEDULED TO BE REPAVED. AREAS NOT SCHEDULED TO BE REPAVED SHALL BE REPAVED ACCORDING TO THE PLANS AND SPECIFICATIONS.
- THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL HOUSES AND BUSINESSES EACH NIGHT AND SHALL FACILITATE AND DIRECT TRAFFIC DURING CONSTRUCTION ACTIVITIES.
- ALL VALVE BOXES, MANHOLES, CLEAN OUTS OR OTHER APPURTENANCES REMAINING WITHIN THE CONSTRUCTION AREA SHALL BE ADJUSTED FLUSH WITH THE PROPOSED GRADE.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR SEEDING AND ESTABLISHING GRASS IN THE AREAS OF DISTURBED SOIL. HYDROMULCHING OR SODDING MAY BE SUBSTITUTED FOR SEEDING AT THE CONTRACTOR'S OPTION.
- THE CONTRACTOR SHALL INSTALL H-BRACING PRIOR TO CUTTING ANY FENCE. ALL FENCES AND GATES SHALL BE CLOSED DURING PERIODS WHEN CONSTRUCTION ACTIVITIES ARE NOT IN PROGRESS. THE CONTRACTOR SHALL ERECT TEMPORARY FENCING IF NECESSARY AND EXERCISE EXTREME CARE TO INSURE THAT NO LIVESTOCK ARE ALLOWED TO ESCAPE.
- IN THE EVENT OF A DISCREPANCY BETWEEN THE PLANS AND SPECIFICATIONS, THE MOST RESTRICTIVE SHALL GOVERN.
- THE CONTRACTOR SHALL MINIMIZE THE DAMAGE TO AND ENDEAVOR TO PROTECT ALL TREES THAT ARE NOT IN THE IMMEDIATE CONSTRUCTION ZONE. NO TREES SHALL BE REMOVED OUTSIDE OF THE RIGHT OF WAY UNLESS, IN THE OPINION OF THE ENGINEER, REMOVAL IS NECESSARY TO COMPLETE THE PROJECT. TREES SHALL BE TRIMMED AS NECESSARY PRIOR TO CONSTRUCTION.

SHEET INDEX	
NO.	DESCRIPTION
1	PROJECT LOCATION MAP /GENERAL NOTES /SURVEY CONTROL POINTS /SHEET INDEX
2	DRAINAGE AREA MAP
3	EROSION CONTROL PLAN / DETAILS
4	WATER AND SANITARY SEWER IMPROVEMENTS
5	WATER AND SANITARY SEWER IMPROVEMENTS
6	WATER AND SANITARY SEWER IMPROVEMENTS
7	STORM DRAIN PLAN /PROFILE
8	STORM DRAIN PLAN /PROFILE
9	STORM DRAIN PLAN /PROFILE
10	OFFSITE STORM DRAIN PLAN /PROFILE
11	SPECIAL STORM DRAIN STRUCTURE DETAILS
12	STREET PLAN /PROFILE STA. 0+00.00 TO 11+00.00
13	STREET PLAN /PROFILE STA. 11+00.00 TO 23+00.00
14	STREET PLAN /PROFILE STA. 23+00.00 TO 32+92.00
15	TRAFFIC MARKINGS AT U.S. HWY 67
16	WATER DETAILS
17	SANITARY SEWER DETAILS
18	STORM DRAIN CURB INLETS (UP TO 10' LONG)
19	TYPE 1 CURB INLET (20' OPENING)
20	GRATED INLET DETAILS
21	GRATE INLET AND MISCELLANEOUS STORM DRAIN DETAILS
22	STORM DRAIN JUNCTION BOX DETAILS
23	HEADWALL DETAILS - TYPE "B"
24	SAFETY END TREATMENT DETAILS
25	CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS
26	CONCRETE WINGWALLS WITH FLARED WINGS
27	PAVING DETAILS
28	PEDESTRIAN FACILITIES - CURB RAMPS
29	PEDESTRIAN FACILITIES GENERAL NOTES DETECTABLE WARNINGS PED 05
30	TRAFFIC CONTROL PLAN
31	WORKSHEET FOR EDGE CONDITION TREATMENT TYPES
32	BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS (1 OF 12)
33	BARRICADE AND CONSTRUCTION PROJECT LIMIT STANDARD (2 OF 12)
34	BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT STANDARD (3 OF 12)
35	BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES STANDARD (4 OF 12)
36	BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT STANDARD (5 OF 12)
37	BARRICADE AND CONSTRUCTION ARROW & MESSAGE SIGNS, REFLECTORS & WARNING LIGHT STANDARD (6 OF 12)
38	BARRICADE AND CONSTRUCTION PLASTIC DRUM STANDARD (7 OF 12)
39	BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES STANDARD (8 OF 12)
40	BARRICADE AND CONSTRUCTION TYPE III BARRICADE & CONES STANDARD (9 OF 12)
41	BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS STANDARD (10 OF 12)
42	BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS STANDARD (11 OF 12)
43	BARRICADE AND CONSTRUCTION REGULATORY & GUIDE SIGNS STANDARDS (12 OF 12)



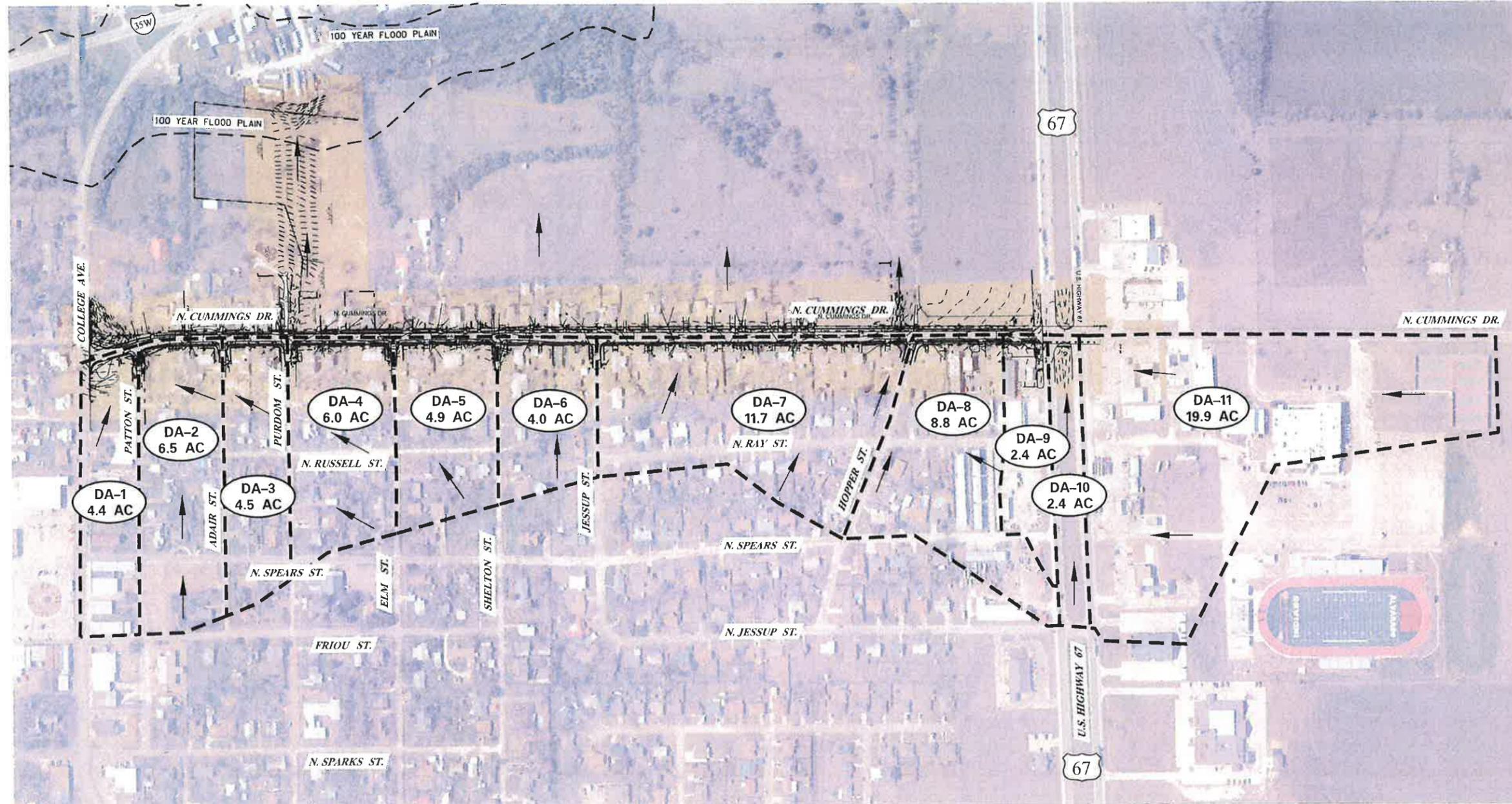
CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

PROJECT LOCATION MAP /GENERAL NOTES  
SURVEY CONTROL POINTS /SHEET INDEX

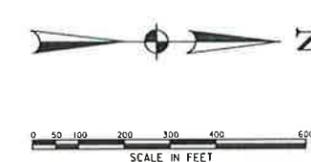
CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76033  
TEX REG. NO. P-710

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DRAWN BY: JDL/MNF		JOB NO: 11056
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**LEGEND**

- ← FLOW ARROW
- SF — DRAINAGE AREA
- - SF - - SILT FENCE
- RED-- ROCK FILTER DAM



DRAINAGE CALCULATIONS										
DRAINAGE AREA NO.	AREA ACRES	Tc MIN.	C	I <sub>10</sub> IN./HR.	Q <sub>10</sub> CFS	I <sub>24</sub> IN./HR.	Q <sub>24</sub> CFS	I <sub>30</sub> IN./HR.	Q <sub>30</sub> CFS	Q <sub>90</sub> CFS
DA-1	4.4	10	0.9	6.4	25.3	7.5	29.7	9.10	36.4	X
DA-2	6.5	10	0.5	6.4	20.8	7.5	24.4	9.10	29.6	
DA-3	4.5	10	0.5	6.4	14.4	7.5	16.9	9.10	20.3	
DA-4	6.0	10	0.5	6.4	19.2	7.5	22.5	9.10	27.5	
DA-5	4.9	10	0.5	6.4	15.7	7.5	18.4	9.10	22.3	
DA-6	4.0	10	0.5	6.4	12.8	7.5	15.0	9.10	18.2	
DA-7	11.7	10	0.5	6.4	37.4	7.5	43.9	9.10	53.2	
DA-8	8.8	10	0.5	6.4	28.1	7.5	33.0	9.10	40.0	
DA-9	2.4	10	0.9	6.4	13.8	7.5	16.2	9.10	19.7	
DA-10	2.4	10	0.9	6.4	13.8	7.5	16.2	9.10	19.7	
DA-11	19.9	10	0.9	6.4	114.6	7.5	134.3	9.10	162.9	

1. TIME OF CONCENTRATION CALCULATED USING THE KIRPICH METHOD WITH A MINIMUM OF 10 MINUTES.
2. RAINFALL INTENSITIES TAKEN FROM THE CITY OF CLEBURNE DRAINAGE RAINFALL INTENSITY CURVE.

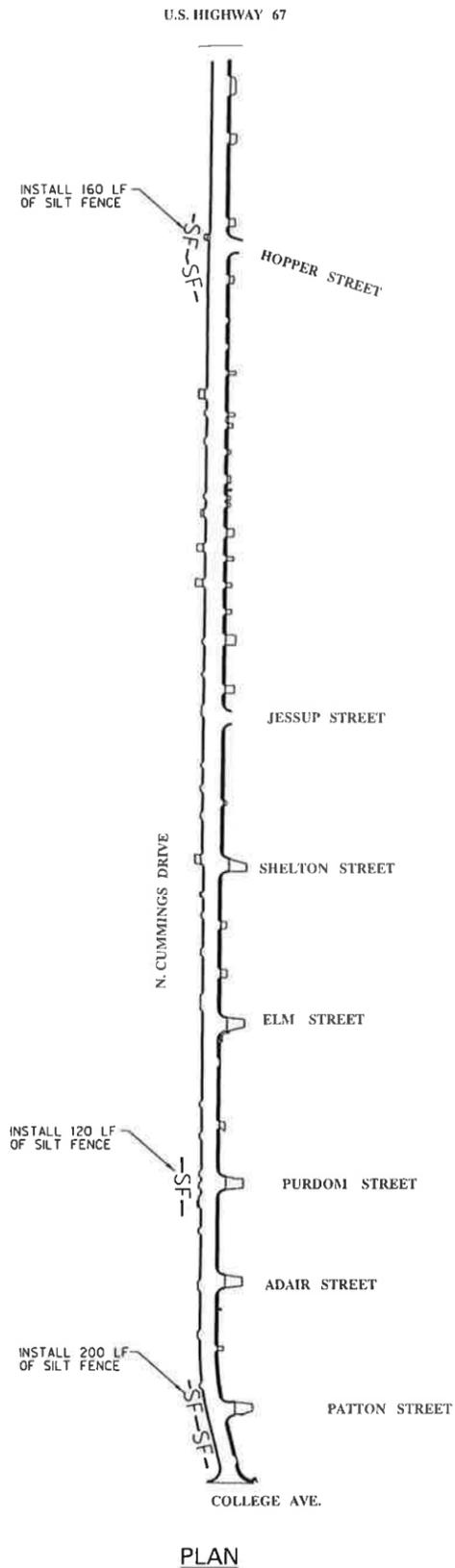


*Benjamin S. Shanklin*  
4-22-16

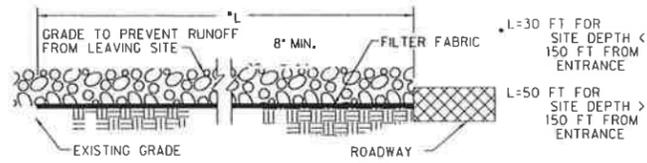
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
DRAINAGE AREA MAP		
<b>CHILDRESS ENGINEERS</b> ENGINEERS & CONSULTANTS 211 N. RIDGWAY DRIVE CLEBURNE, TEXAS 76031 TEX REG. NO. F-702		
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**LEGEND**

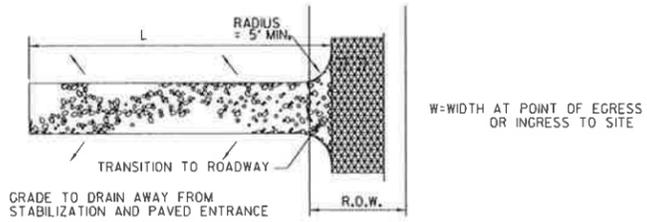
— SF — REINFORCED SILT FENCE



PLAN



PROFILE

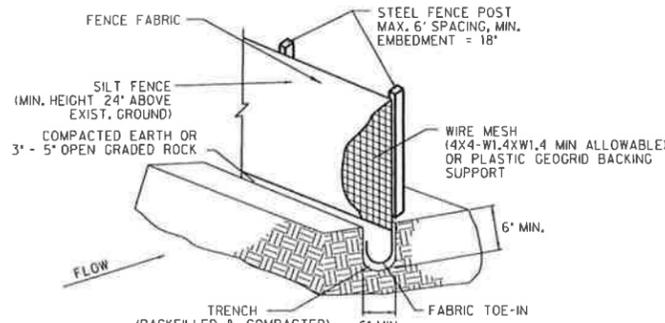


PLAN VIEW

- GENERAL NOTES
1. THE ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
  2. STONE SHALL BE 3 TO 5 INCH DIAMETER CRUSHED ROCK OR ACCEPTABLE CRUSHED PORTLAND CEMENT CONCRETE

**STABILIZED CONSTRUCTION ENTRANCE**

NTS

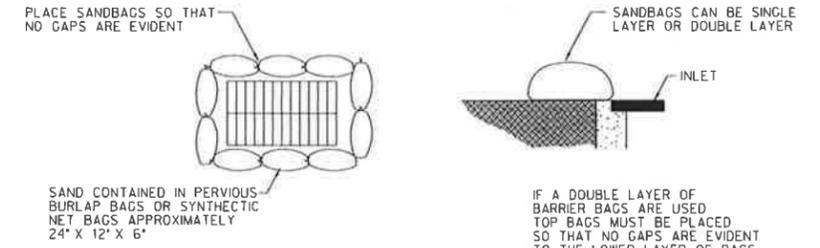


ISOMETRIC VIEW

- GENERAL NOTES:
1. STEEL POSTS WHICH SUPPORT THE SILT FENCE SHALL BE INSTALLED WITH A SLIGHT ANGLE TOWARD THE ANTICIPATED RUNOFF SOURCE. POST MUST BE EMBEDDED A MINIMUM OF 18\".
  2. 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. WHERE FENCE CANNOT BE TRENCHED IN WEIGHT FABRIC FLAP WITH WASHED GRAVEL ON UPHILL SIDE, AS NECESSARY, TO PREVENT FLOW UNDER FENCE.
  3. 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.
  4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH STEEL SUPPORT POST OR TO BACKING SUPPORT, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POST. FABRIC SHALL OVERLAP AT ABUTTING ENDS A MINIMUM OF 3 FEET AND SHALL BE JOINED SUCH THAT NO BYPASS OR LEAKAGE OCCURS.
  5. INSPECTION SHALL BE MADE WEEKLY OR AFTER EACH RAINFALL. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
  6. SILT FENCE SHALL BE REMOVED WHEN THE SITE IS COMPLETELY STABILIZED SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
  7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES. THE SILT SHALL BE DISPOSED OF IN AN APPROVED SITE AND IN SUCH A MANNER AS TO NOT CONTRIBUTE TO ADDITIONAL SILTATION.

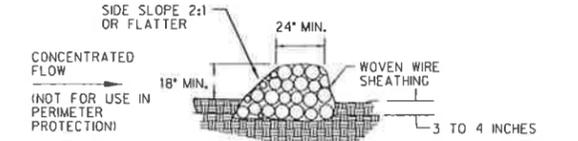
**SILT FENCE DETAILS**

NTS

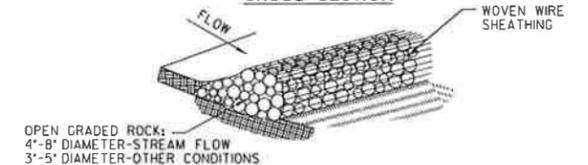


**INLET PROTECTION**

NTS



CROSS SECTION

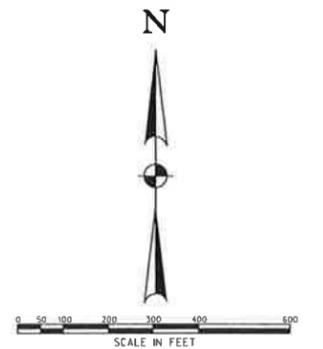


ISOMETRIC VIEW

- GENERAL NOTES:
1. WOVEN WIRE SHEATHING SHALL HAVE MAXIMUM OPENING OF ONE (1) INCH AND A MINIMUM WIRE SIZE OF 20 GAUGE AND SHALL BE SECURED WITH SHOAT RINGS.
  2. THE ROCK BERM SHALL BE INSPECTED WEEKLY OR AFTER EACH RAIN AND SHALL BE REPLACED WHEN THE STRUCTURE CEASES TO FUNCTION PROPERLY.
  3. WHEN SILT REACHES A DEPTH EQUAL TO ONE-THIRD OF THE HEIGHT OF THE BERM OR ONE FOOT, WHICHEVER IS LESS, THE SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.
  4. WHEN THE SITE IS COMPLETELY STABILIZED, THE BERM AND ACCUMULATED SILT SHALL BE REMOVED AND DISPOSED OF IN AN APPROVED MANNER.

**ROCK FILTER DAM DETAILS**

NTS



*Benjamin S. Shanklin*  
4-22-16

CITY OF ALVARADO			
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE			
EROSION CONTROL PLAN AND DETAILS			
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CHILDRESS, TEXAS 79501 TEL: 807.934.5700			
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COLLEGE AVE.

WARNING! UNDERGROUND TELEPHONE CABLE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

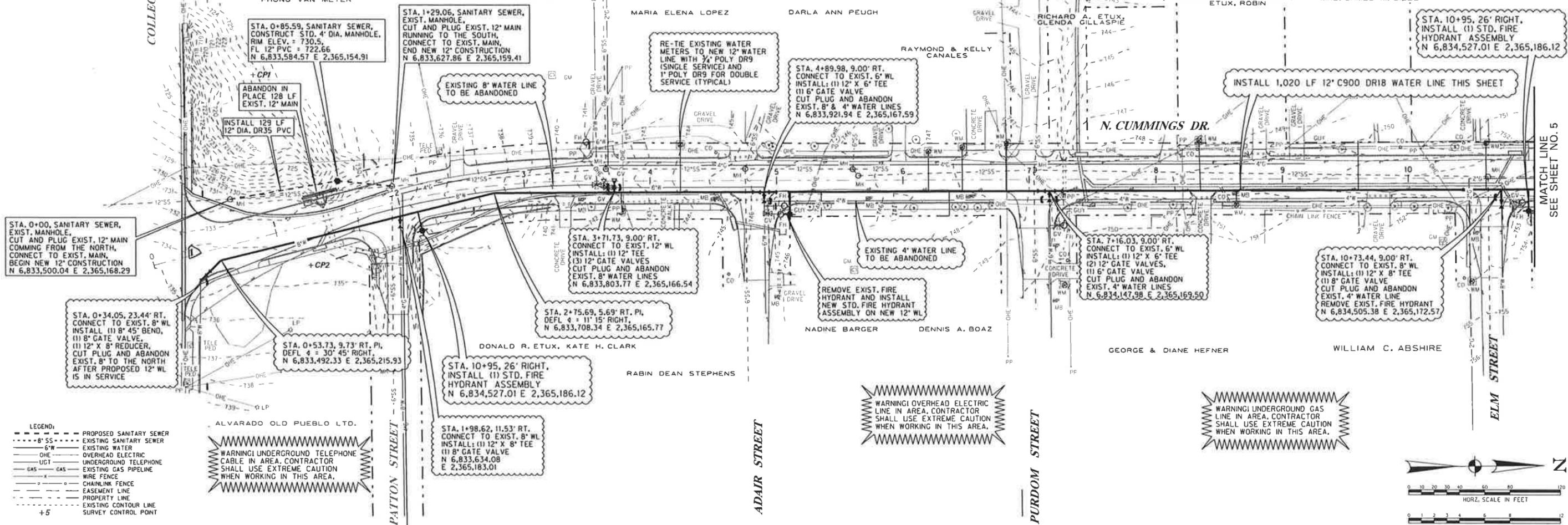
WARNING! UNDERGROUND GAS LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD ELECTRIC LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

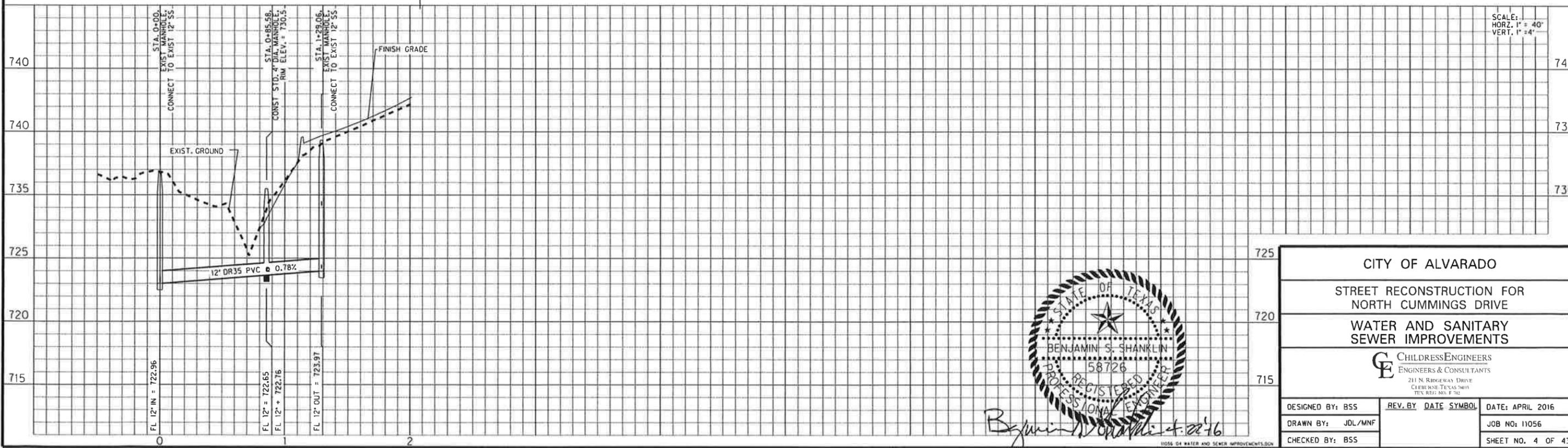
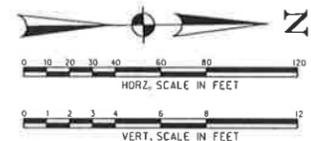
DOUGLAS E. SCARBERRY, ETUX, ROBIN

MRS. JAMES M. GIBBS

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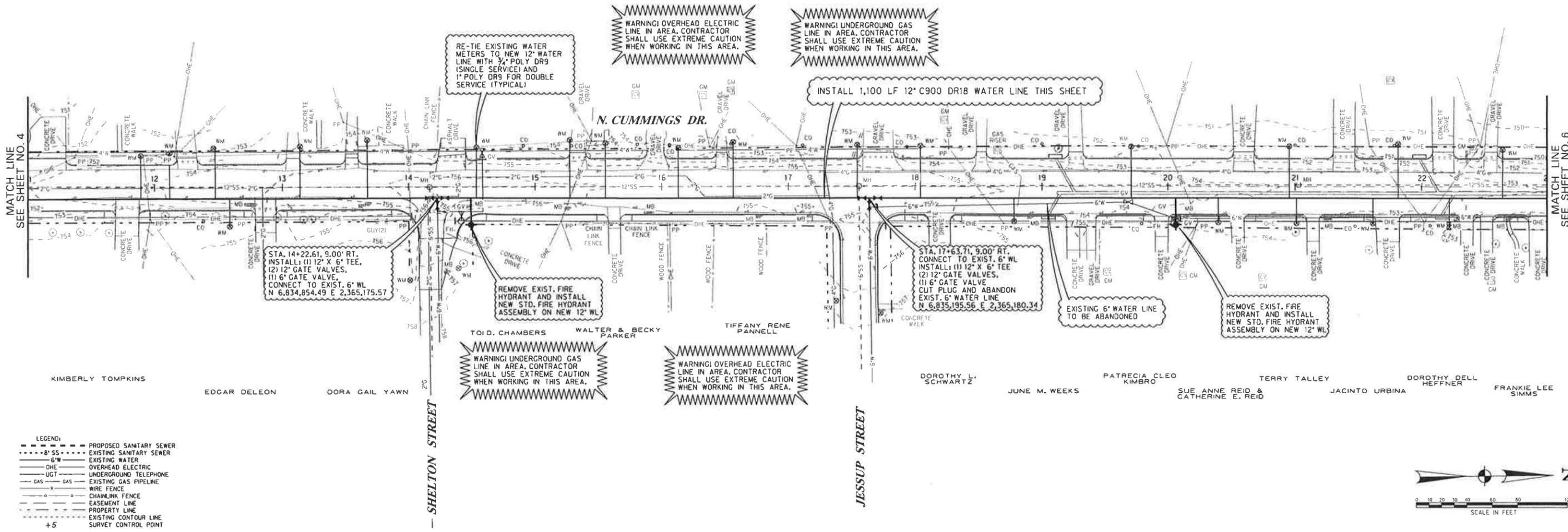
- LEGEND:
- PROPOSED SANITARY SEWER
  - - - EXISTING SANITARY SEWER
  - - - 8" SS - EXISTING WATER
  - - - 6" W - EXISTING WATER
  - - - OHE - OVERHEAD ELECTRIC
  - - - UGT - UNDERGROUND TELEPHONE
  - - - GAS - EXISTING GAS PIPELINE
  - - - W - WIRE FENCE
  - - - C - CHAINLINK FENCE
  - - - E - EASEMENT LINE
  - - - P - PROPERTY LINE
  - - - S - EXISTING CONTOUR LINE
  - +5 - SURVEY CONTROL POINT



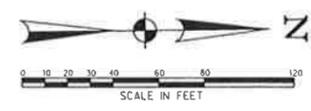
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
WATER AND SANITARY SEWER IMPROVEMENTS		
CHILDRESS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76031 TEL: 817.881.7700		
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CHECKED BY: BSS		SHEET NO. 4 OF 43

*Benjamin S. Shanklin*

MRS. JAMES M. GIBBS    MRS. JAMES M. GIBBS    DONALD RAY UTLEY    HOME N LAND LLC    MARIA ELENA LOPEZ    JEANETTE BUSWOLD    SARAH ELIZABETH BAKER    ROBERT S. BAKER, ETUX    UBALDO C. SALINAS  
 STEVE ROSS    VIRGINIA RIDER    MARIA ELENA LOPEZ    ROBERT S. BAKER, ETUX    ROBERT S. BAKER, ETUX    ALBERT RETANA    BRET A. BULLARD, ETUX AUTUMN D.



- LEGEND:
- PROPOSED SANITARY SEWER
  - - - - - EXISTING SANITARY SEWER
  - EXISTING WATER
  - OVERHEAD ELECTRIC
  - UNDERGROUND TELEPHONE
  - EXISTING GAS PIPELINE
  - WIRE FENCE
  - CHAIN LINK FENCE
  - EASEMENT LINE
  - PROPERTY LINE
  - EXISTING CONTOUR LINE
  - +5 SURVEY CONTROL POINT



CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
WATER AND SANITARY SEWER IMPROVEMENTS		
<b>CHILDRESS ENGINEERS</b> ENGINEERS & CONSULTANTS 211 N. RINGDALE DRIVE CLEBURNE, TEXAS 76031 TEX REG. NO. P-732		
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CHECKED BY: BSS		SHEET NO. 5 OF 43

DANNY MCKINNEY

W S ACQUISITIONS

COMTREN INC.

ANNA S. TAYLOR, ETAL

CHARLES C. HOLMES,  
ETUX WANDA

MATCH LINE  
SEE SHEET NO. 5

WARNING! UNDERGROUND GAS  
LINE IN AREA. CONTRACTOR  
SHALL USE EXTREME CAUTION  
WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD ELECTRIC  
LINE IN AREA. CONTRACTOR  
SHALL USE EXTREME CAUTION  
WHEN WORKING IN THIS AREA.

INSTALL 935 LF 12" C900 DR18 WATER LINE THIS SHEET

REMOVE EXIST. FIRE  
HYDRANT AND INSTALL  
NEW STD. FIRE HYDRANT  
ASSEMBLY ON NEW 12" WL

STA. 32+34.35, 9.00' RT.  
CONNECT TO EXIST. 12" WL  
INSTALL: (1) 12" TEE  
(1) 12" GATE VALVE  
END PROPOSED WATER LINE  
N 6,836,666.06 E 2,365,202.79

CONNECT TO EXIST. 8"  
WATER LINE WITH  
(1) 8" 45' BEND AND  
(1) 12" X 8" REDUCER  
N 6,836,684.44  
E 2,365,211.87

STA. 24+55, 22' RIGHT,  
INSTALL STD. FIRE HYDRANT  
ASSEMBLY ON NEW 12" WL  
N 6,835,886.55 E 2,365,211.53

EXISTING 6" WATER LINE  
TO BE ABANDONED

RE-TIE EXISTING WATER  
METERS TO NEW 12" WATER  
LINE WITH 3/4" POLY DR9  
(SINGLE SERVICE) AND  
1" POLY DR9 FOR DOUBLE  
SERVICE (TYPICAL)

STA. 28+40.61, 9.00' RT.  
INSTALL: (1) 12" X 6" TEE,  
(2) 12" GATE VALVES,  
(1) 6" GATE VALVE,  
CONNECT TO EXIST. 6" WL,  
CUT PLUG AND ABANDON  
EXIST. 6" WATER LINE  
N 6,836,272.31 E 2,365,195.72

ROGER M. GREEN

HENRY SANDLES,  
ETUX KAREN F.  
TRUSTEES

EMMIE L. PRATHER

ABEL M. LOPEZ & MACEDONIO  
JACQUELYN M. KING VALDEZ

HAZEL MARIE  
GILLASPIE

JOYCE G. BROOKS

THOMAS CASTILLO

ADAMO BILLC

E-Z MART STORES INC.

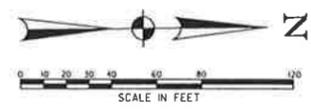
- LEGEND:
- PROPOSED SANITARY SEWER
  - ..... EXISTING SANITARY SEWER
  - 6"W EXISTING WATER
  - OHE OVERHEAD ELECTRIC
  - UGT UNDERGROUND TELEPHONE
  - GAS EXISTING GAS PIPELINE
  - WIRE FENCE
  - CHAIN LINK FENCE
  - EASEMENT LINE
  - PROPERTY LINE
  - EXISTING CONTOUR LINE
  - +5 SURVEY CONTROL POINT

WARNING! UNDERGROUND GAS  
LINE IN AREA. CONTRACTOR  
SHALL USE EXTREME CAUTION  
WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD ELECTRIC  
LINE IN AREA. CONTRACTOR  
SHALL USE EXTREME CAUTION  
WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD TELEPHONE  
LINE IN AREA. CONTRACTOR  
SHALL USE EXTREME CAUTION  
WHEN WORKING IN THIS AREA.

HOPPER STREET



*Benjamin S. Shanklin*  
4-22-16

CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
WATER AND SANITARY SEWER IMPROVEMENTS		
<b>CHILDRESS ENGINEERS</b> ENGINEERS & CONSULTANTS 211 N. RIDGWAY DRIVE CLEBURNE, TEXAS 76031 TEX REG. NO. F 702		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 6 OF 43

1036 05 WATER AND SEWER IMPROVEMENTS.DWG

COLLEGE AVE.

STA. 1+03.75, SD-1, PI = STA. 0+00.00, LATERAL A BEGIN LATERAL A AND SD-1 EXIST. BOX EXTENSION DEFL 4 = 92' 01' 40" RIGHT FL 24" (OUT) = 727.80 N 6,833,571.42 E 2,365,169.57

INSTALL 728 SF GROUTED ROCK RIP-RAP

STA. 0+07.779, END LATERAL A GRATED CURB INLET TOP, INLET = 734.03 FL 24" (OUT) = 727.84 N 6,833,563.86 E 2,365,171.44

STA. 0+16.99, END LATERAL B CURB INLET TOP, INLET = 734.03 FL 24" (OUT) = 728.99 N 6,833,569.16 E 2,365,205.41

STA. 1+25.59, SD-1, PI = STA. 0+00.00, LATERAL B BEGIN LATERAL B DEFL 4 = 45' 00' 00" RIGHT FL 24" (OUT) = 729.89 N 6,833,571.41 E 2,365,190.56

STA. 4+53.71, SD-1, PI, CONNECT TO JUNCTION BOX DEFL 4 = 60' 00' 00" RIGHT FL 18" (OUT) = 738.63 N 6,833,885.93 E 2,365,168.28

WARNING! UNDERGROUND TELEPHONE CABLE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

WARNING! UNDERGROUND GAS LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD ELECTRIC LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

STA. 1+13.06, SD-2, PI = STA. 0+00.00, BEGIN LATERAL 2A 18" STORM DRAIN FROM 24" STORM DRAIN DEFL 4 = 60' 00' 00" RIGHT FL 18" (OUT) = 747.08 N 6,834,282.81 E 2,365,166.67

STA. 3+31.54, SD-2, PI = STA. 0+00.00, BEGIN LATERAL 2B 18" STORM DRAIN FROM 24" STORM DRAIN DEFL 4 = 60' 00' 00" LEFT FL 18" (OUT) = 749.02 N 6,834,501.29 E 2,365,168.53

STA. 0+32.53, END LATERAL 2B CURB INLET TOP, INLET = 751.90 FL 18" (OUT) = 749.31 N 6,833,563.86 E 2,365,171.44

STORM DRAIN 1

STA. 1+66.37, SD-1, PI = STA. 0+00.00, LATERAL C, BEGIN LATERAL C EXIST. 36" RCP DEFL 4 = 45' 00' 00" RIGHT FL 18" (OUT) = 731.19 N 6,833,612.55 E 2,365,220.38

STA. 0+11.04, END LATERAL C 10' OPEN BACK CURB INLET TOP, INLET = 735.33 FL 18" (OUT) = 731.23 N 6,833,612.55 E 2,365,220.38

STA. 1+75.49, SD-1, PI EXTEND EXIST. 36" RCP 24 LF REMOVE AND RELOCATE EXIST. GRATE INLET TO STA. 2+05.98 DEFL 4 = 30' 00' 00" LEFT FL 36" (OUT) = 728.40 N 6,833,615.72 E 2,365,213.12

STA. 2+73.15, SD-1, PC 18" STORM DRAIN N 6,833,707.00 E 2,365,179.33

STA. 3+35.00, SD-1, PT 18" STORM DRAIN N 6,833,767.22 E 2,365,167.27

STA. 2+05.95, SD-1, PI RELOCATED GRATE INLET DEFL 4 = 23' 08' 19" LEFT TOP, INLET = 735.37 FL 18" (OUT) = 730.89 N 6,833,645.01 E 2,365,204.75

STA. 4+79.55, SD-1, PI, CURB INLET DEFL 4 = 48' 59' 49" LEFT TOP, INLET = 745.64 FL 18" (OUT) = 739.12 N 6,833,898.66 E 2,365,190.77

STA. 5+15.62, SD-1, END SD-1, CONNECT TO GRATE INLET TOP, INLET = 746.00 FL 18" (OUT) = 740.54 N 6,833,934.00 E 2,365,197.95

STA. 0+15.01, END LATERAL 2A CURB INLET TOP, INLET = 750.73 FL 18" (OUT) = 747.35 N 6,834,290.20 E 2,365,179.73

STA. 0+12.27, SD-2, PI, DEFL 4 = 45' 00' 00" LEFT FL 24" (OUT) = 745.32 N 6,834,182.02 E 2,365,165.81

STA. 0+00.00, SD-2, PI, STA. 1+92.83, OFFSITE STORM DRAIN DEFL 4 = 35' 20' 58" LEFT FL 24" (OUT) = 745.13 N 6,834,173.42 E 2,365,157.06

STA. 3+35.84, SD-2, PI, BEGIN 18" STORM DRAIN FROM 24" STORM DRAIN DEFL 4 = 60' 00' 00" RIGHT FL 18" (OUT) = 749.16 N 6,834,505.59 E 2,365,168.57

STA. 3+55.07, SD-2, END SD-2 CURB INLET TOP, INLET = 752.44 FL 18" (OUT) = 749.33 N 6,834,516.61 E 2,365,188.05

STORM DRAIN 1  
CURVE SDCV4  
R = 150.00'  
Δ = 23' 37' 35"  
L = 61.85'  
LC = 61.42'  
N 11' 19' 28" W

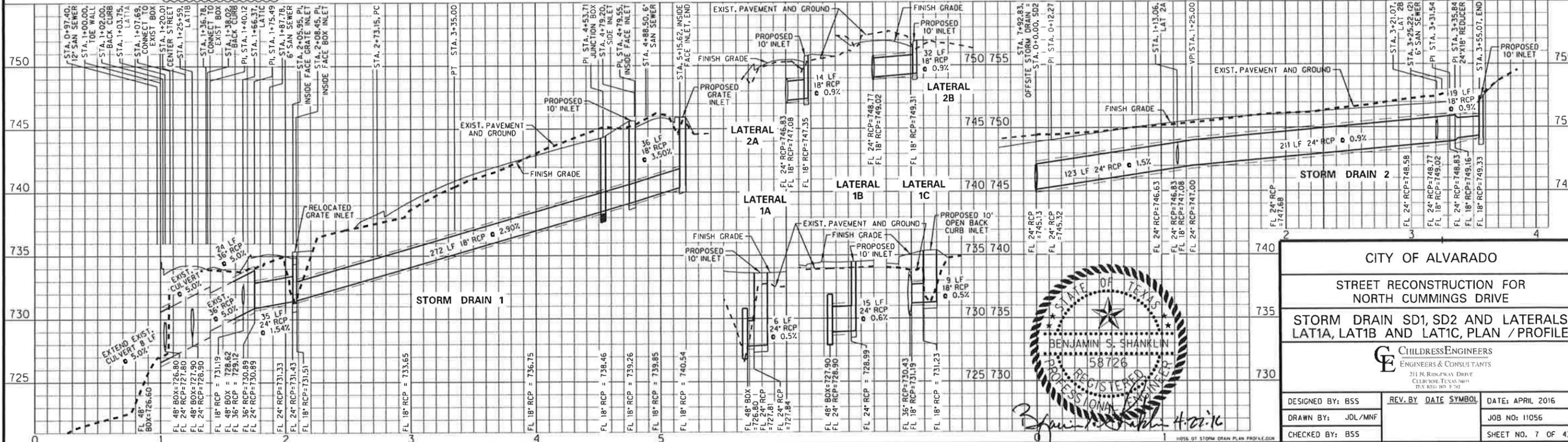
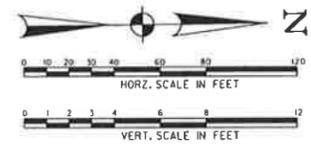
DONALD R. ETUX, KATE H. CLARK RABIN DEAN STEPHENS

WARNING! UNDERGROUND TELEPHONE CABLE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

WARNING! OVERHEAD ELECTRIC LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

WARNING! UNDERGROUND GAS LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.

LEGEND:  
--- 6" S.S. --- PROPOSED SANITARY SEWER  
--- 6" W --- EXISTING WATER  
--- OHE --- OVERHEAD ELECTRIC  
--- UGT --- UNDERGROUND TELEPHONE  
--- GAS --- EXISTING GAS PIPELINE  
--- WIRE --- WIRE FENCE  
--- CHAIN LINK --- CHAIN LINK FENCE  
--- EASEMENT --- EASEMENT LINE  
--- PROPERTY --- PROPERTY LINE  
--- EXISTING --- EXISTING CONTOUR LINE  
--- SURVEY --- SURVEY CONTROL POINT



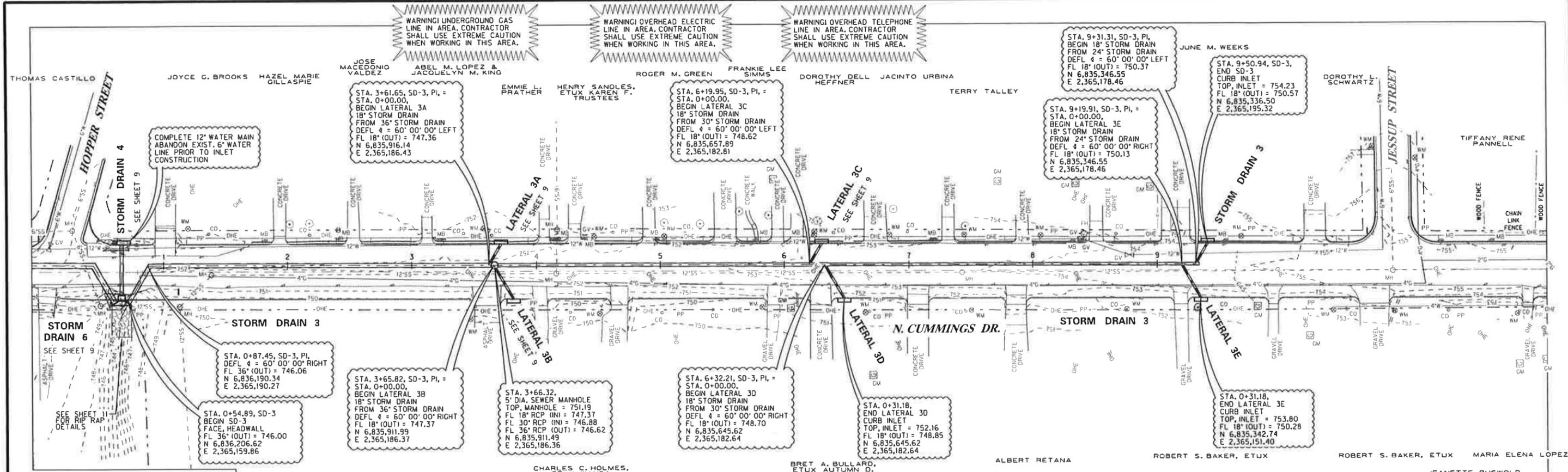
CITY OF ALVARADO

STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE

STORM DRAIN SD1, SD2 AND LATERALS LAT1A, LAT1B AND LAT1C, PLAN / PROFILE

CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS  
211 N. RINDWAY DRIVE  
CLUBBIE, TEXAS 76010  
TEX REG. NO. F-701

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 7 OF 43



**LEGEND:**

- PROPOSED SANITARY SEWER
- - - - - EXISTING SANITARY SEWER
- 6" W EXISTING WATER
- OHE OVERHEAD ELECTRIC
- UGT UNDERGROUND TELEPHONE
- EXISTING GAS PIPELINE
- WIRE FENCE
- CHAIN LINK FENCE
- EASEMENT LINE
- PROPERTY LINE
- EXISTING CONTOUR LINE
- +5 SURVEY CONTROL POINT

**WARNING! UNDERGROUND GAS LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.**

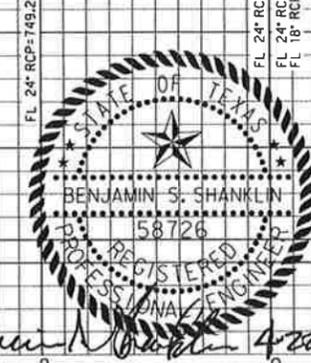
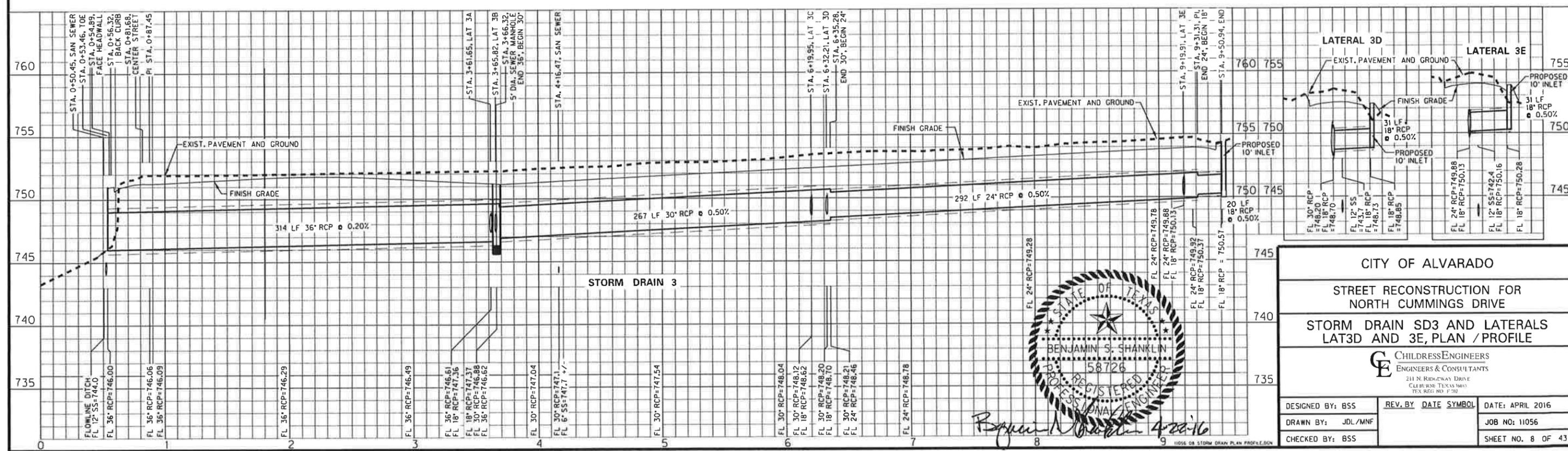
**WARNING! OVERHEAD ELECTRIC LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.**

**WARNING! OVERHEAD TELEPHONE LINE IN AREA. CONTRACTOR SHALL USE EXTREME CAUTION WHEN WORKING IN THIS AREA.**

**STATIONING AND ELEVATION DATA:**

- STA. 3+61.65, SD-3, PI, = STA. 0+00.00, BEGIN LATERAL 3A 18" STORM DRAIN FROM 36" STORM DRAIN DEFL 4 = 60' 00" 00" LEFT FL 18" (OUT) = 747.36 N 6,835,916.14 E 2,365,186.43
- STA. 6+19.95, SD-3, PI, = STA. 0+00.00, BEGIN LATERAL 3C 18" STORM DRAIN FROM 30" STORM DRAIN DEFL 4 = 60' 00" 00" LEFT FL 18" (OUT) = 748.62 N 6,835,657.89 E 2,365,182.81
- STA. 9+31.31, SD-3, PI, BEGIN 18" STORM DRAIN FROM 24" STORM DRAIN DEFL 4 = 60' 00" 00" LEFT FL 18" (OUT) = 750.37 N 6,835,346.55 E 2,365,178.46
- STA. 9+50.94, SD-3, END SD-3 CURB INLET TOP, INLET = 754.23 FL 18" (OUT) = 750.57 N 6,835,336.50 E 2,365,195.32
- STA. 0+87.45, SD-3, PI, DEFL 4 = 60' 00" 00" RIGHT FL 36" (OUT) = 746.06 N 6,836,190.34 E 2,365,190.27
- STA. 0+54.89, SD-3 BEGIN SD-3 FACE, HEADWALL FL 36" (OUT) = 746.00 N 6,836,206.62 E 2,365,159.86
- STA. 3+65.82, SD-3, PI, = STA. 0+00.00, BEGIN LATERAL 3B 18" STORM DRAIN FROM 36" STORM DRAIN DEFL 4 = 60' 00" 00" RIGHT FL 18" (OUT) = 747.37 N 6,835,911.99 E 2,365,186.37
- STA. 3+66.32, 5" DIA. SEWER MANHOLE TOP MANHOLE = 751.19 FL 18" RCP (IN) = 747.37 FL 36" RCP (OUT) = 746.62 N 6,835,911.49 E 2,365,186.36
- STA. 6+32.21, SD-3, PI, = STA. 0+00.00, BEGIN LATERAL 3D 18" STORM DRAIN FROM 30" STORM DRAIN DEFL 4 = 60' 00" 00" RIGHT FL 18" (OUT) = 748.70 N 6,835,645.62 E 2,365,182.64
- STA. 0+31.18, END LATERAL 3D CURB INLET TOP, INLET = 752.16 FL 18" (OUT) = 748.85 N 6,835,645.62 E 2,365,182.64
- STA. 0+31.18, END LATERAL 3E CURB INLET TOP, INLET = 753.80 FL 18" (OUT) = 750.28 N 6,835,342.74 E 2,365,151.40

**PROPERTY OWNERS:** THOMAS CASTILLO, JOYCE G. BROOKS, HAZEL MARIE GILLASPIE, JOSE MACEDO NI VALDEZ, ABEL M. LOPEZ & JACQUELYN M. KING, EMMIE L. PRATHER, HENRY SANDLES, ETUX KAREN F. TRUSTEES, ROGER M. GREEN, FRANKIE LEE SIMMS, DOROTHY DELL HEFFNER, JACINTO URBINA, TERRY TALLEY, JUNE M. WEEKS, DOROTHY L. SCHWARTZ, TIFFANY RENE PANNELL, CHARLES C. HOLMES, ETUX WANDA, DANNY MCKINNEY, BRET A. BULLARD, ETUX AUTUMN D., ALBERT RETANA, ROBERT S. BAKER, ETUX, ROBERT S. BAKER, ETUX, MARIA ELENA LOPEZ, COMTREN INC., W S ACQUISITIONS, UBALDO C. SALINAS, SARAH ELIZABETH BAKER, JEANETTE BUSWOLD.



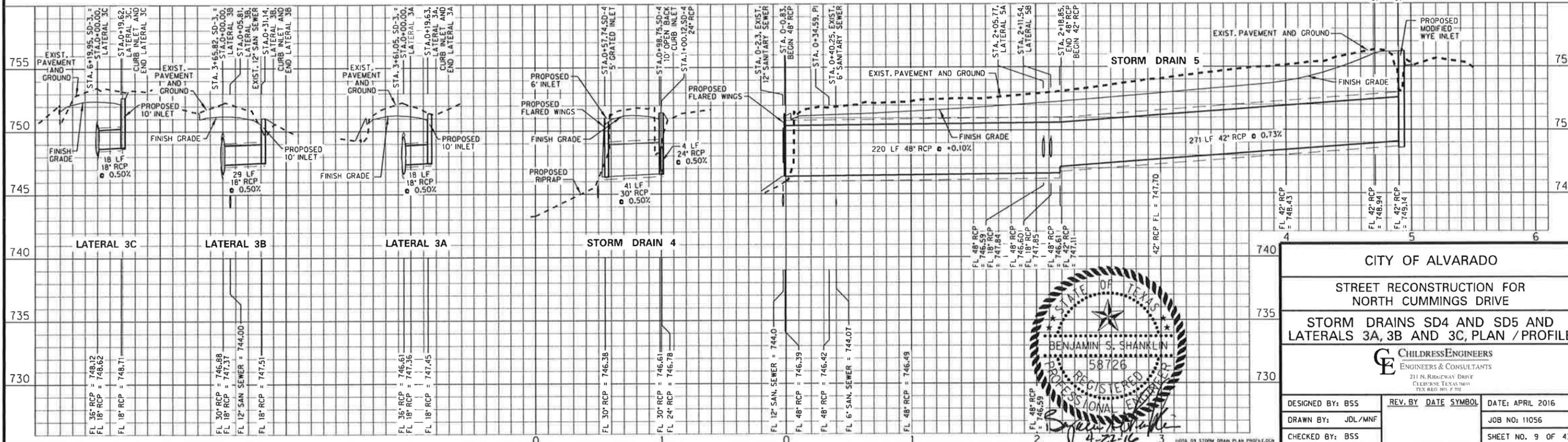
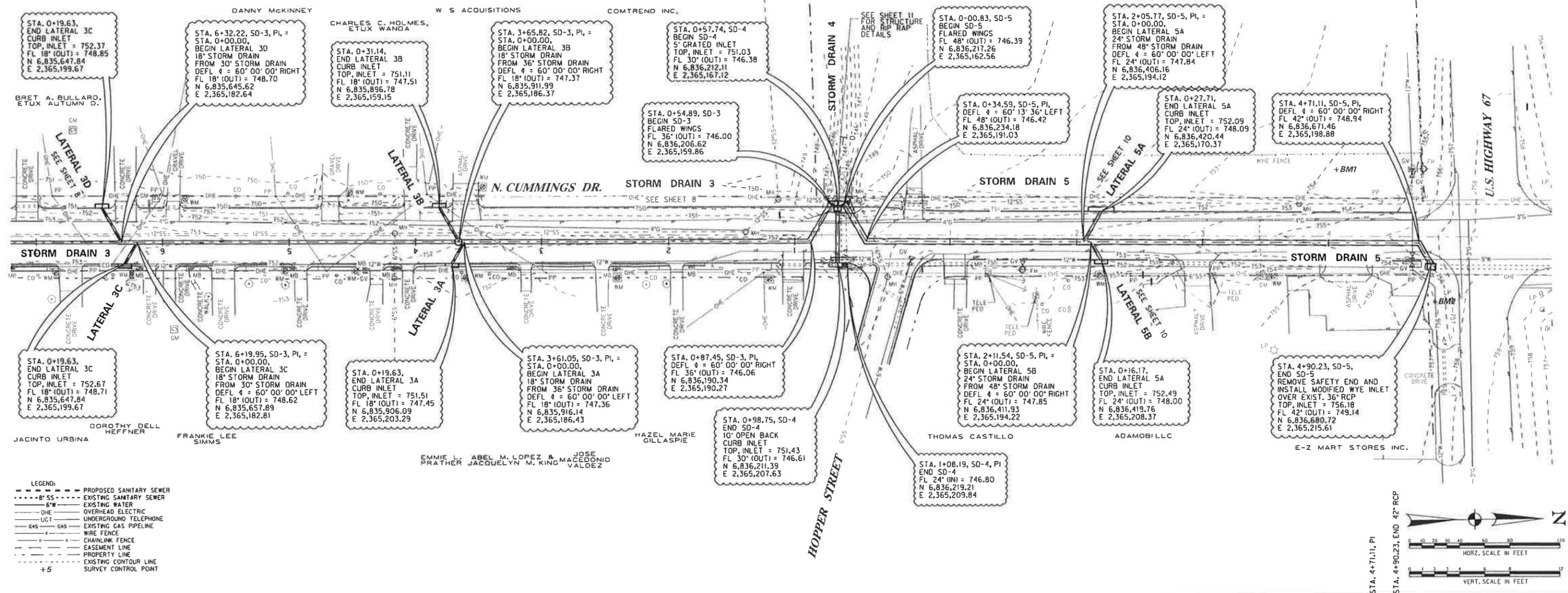
**CITY OF ALVARADO**

**STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE**

**STORM DRAIN SD3 AND LATERALS LAT3D AND 3E, PLAN / PROFILE**

**CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS  
211 N. RIO SANA DRIVE  
COLUMBIA, TEXAS 76903  
TEX REG. NO. F-202

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 8 OF 43



**CITY OF ALVARADO**

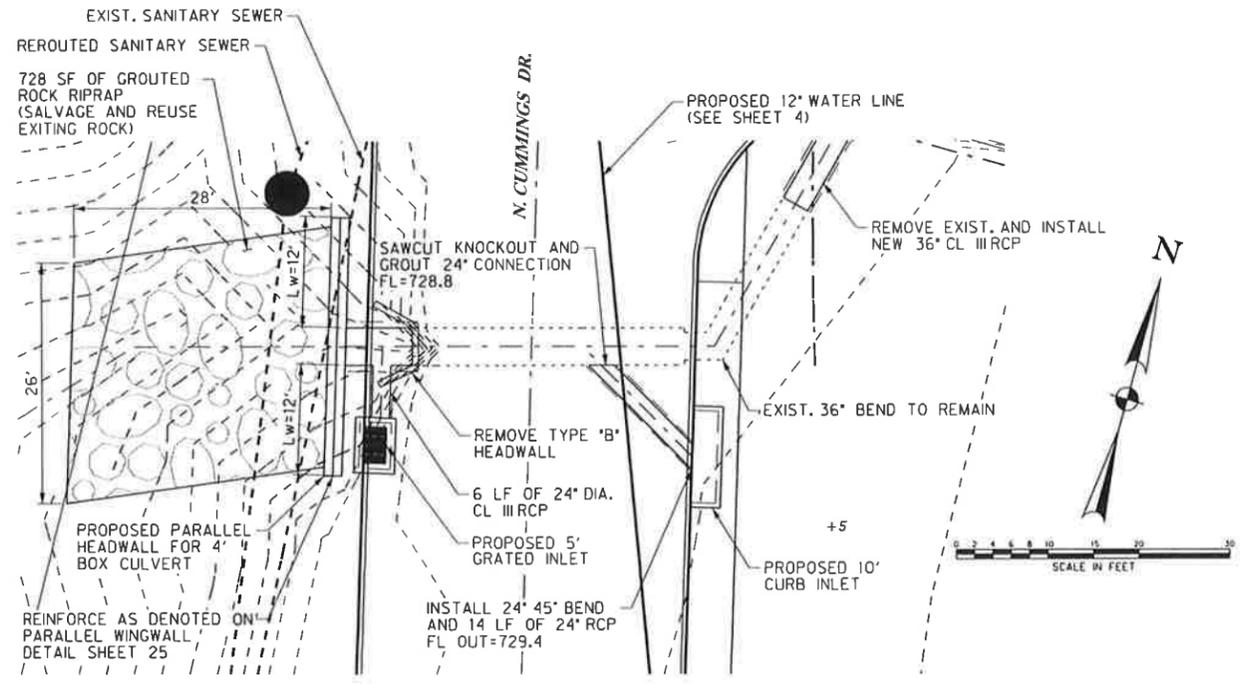
STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

STORM DRAINS SD4 AND SD5 AND  
LATERALS 3A, 3B AND 3C, PLAN / PROFILE

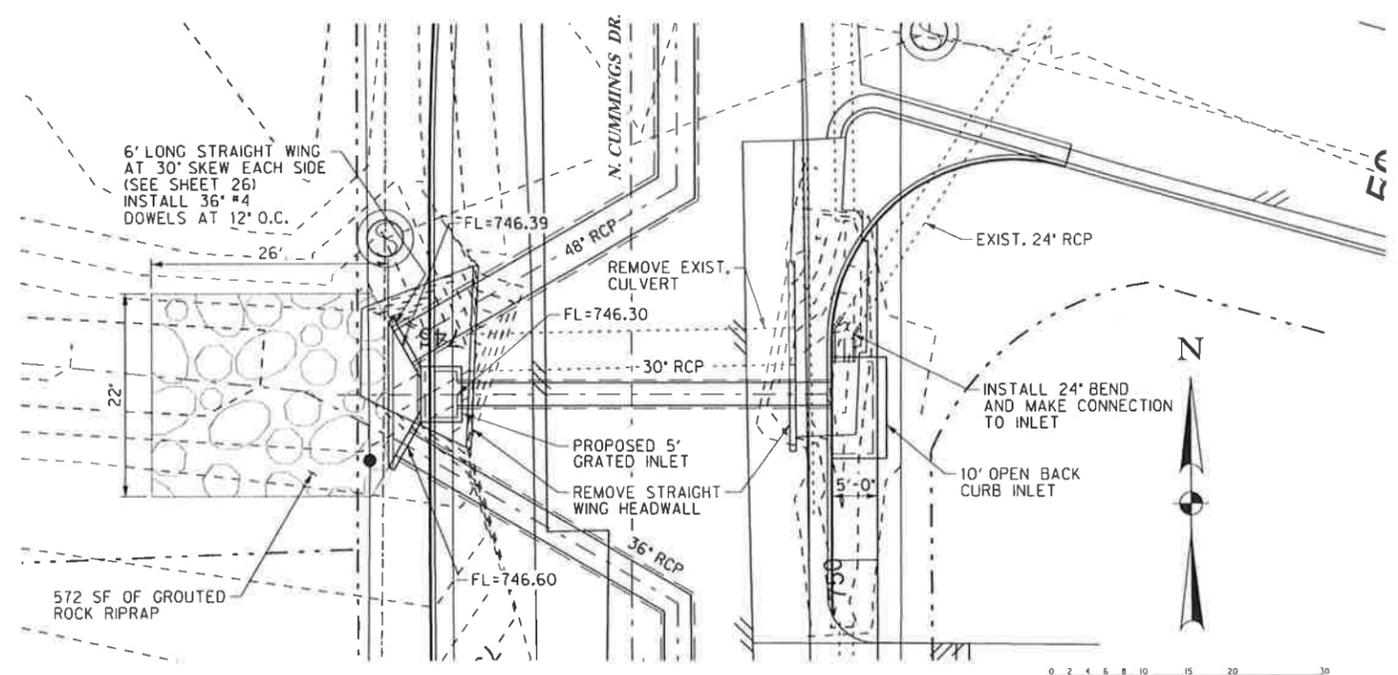
**CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS  
211 N. RINGWAY DRIVE  
CLEBURNE, TEXAS 76031  
TEX REG. NO. F 702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 9 OF 43

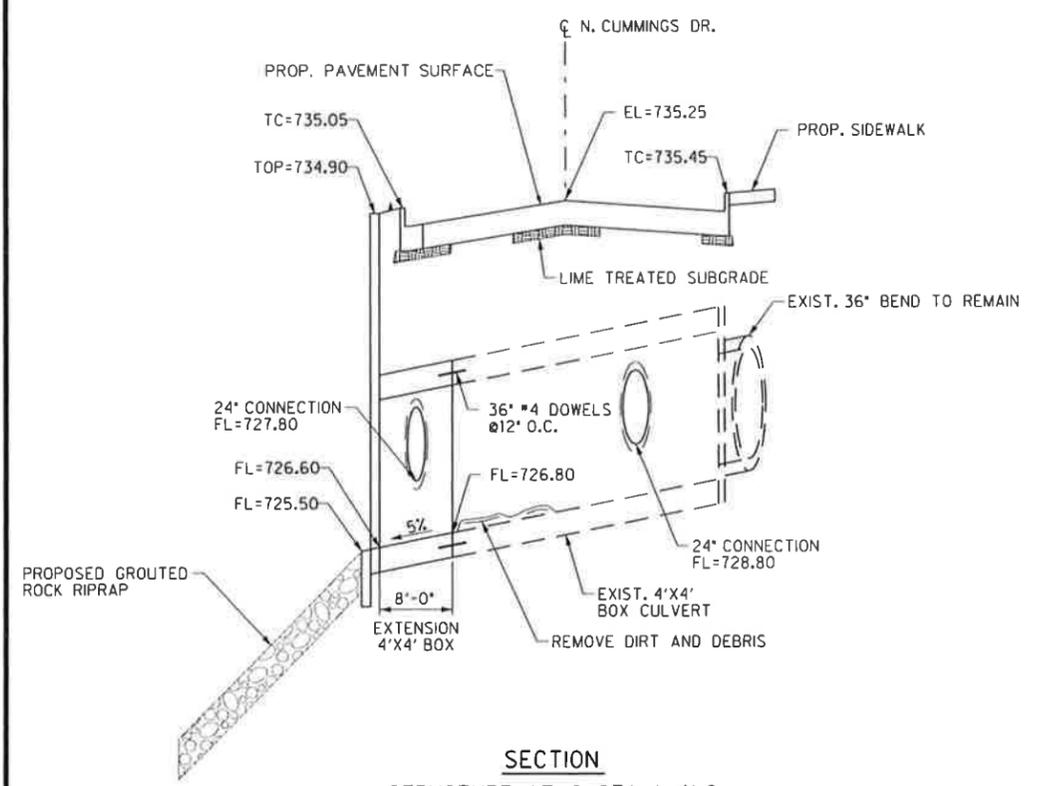




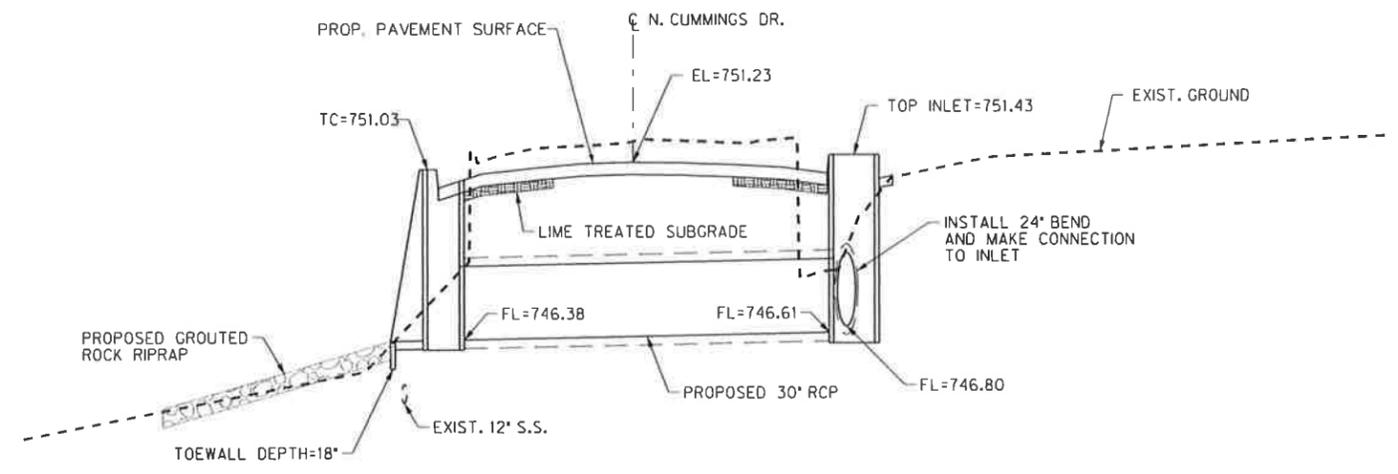
PLAN



PLAN



SECTION  
 STRUCTURE AT  $\bar{C}$  STA. 1+41.2

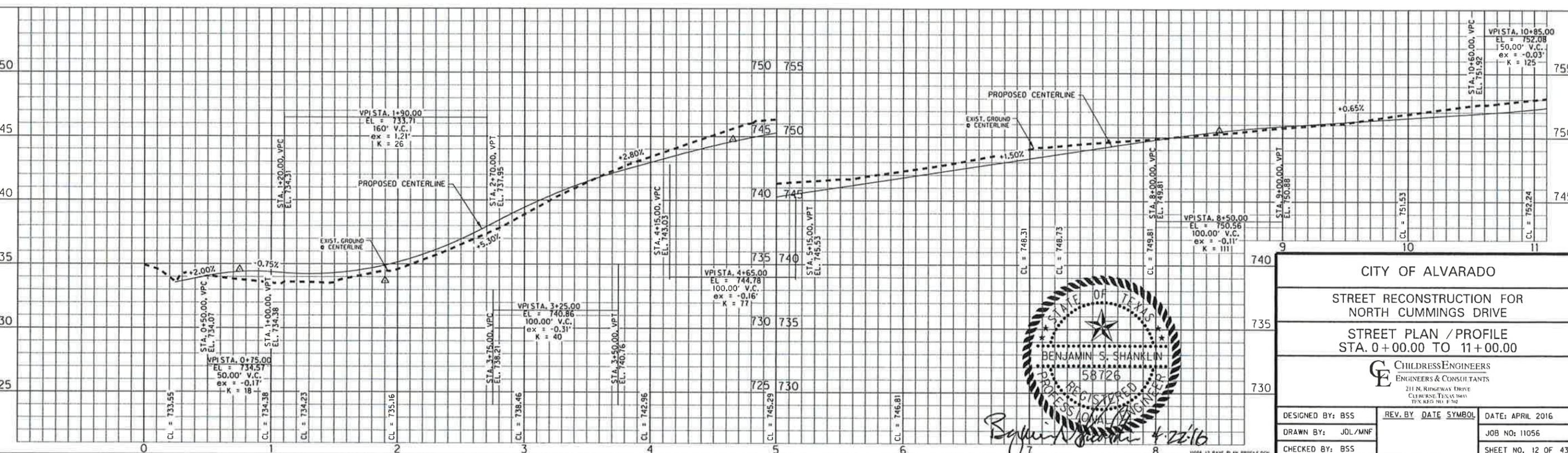
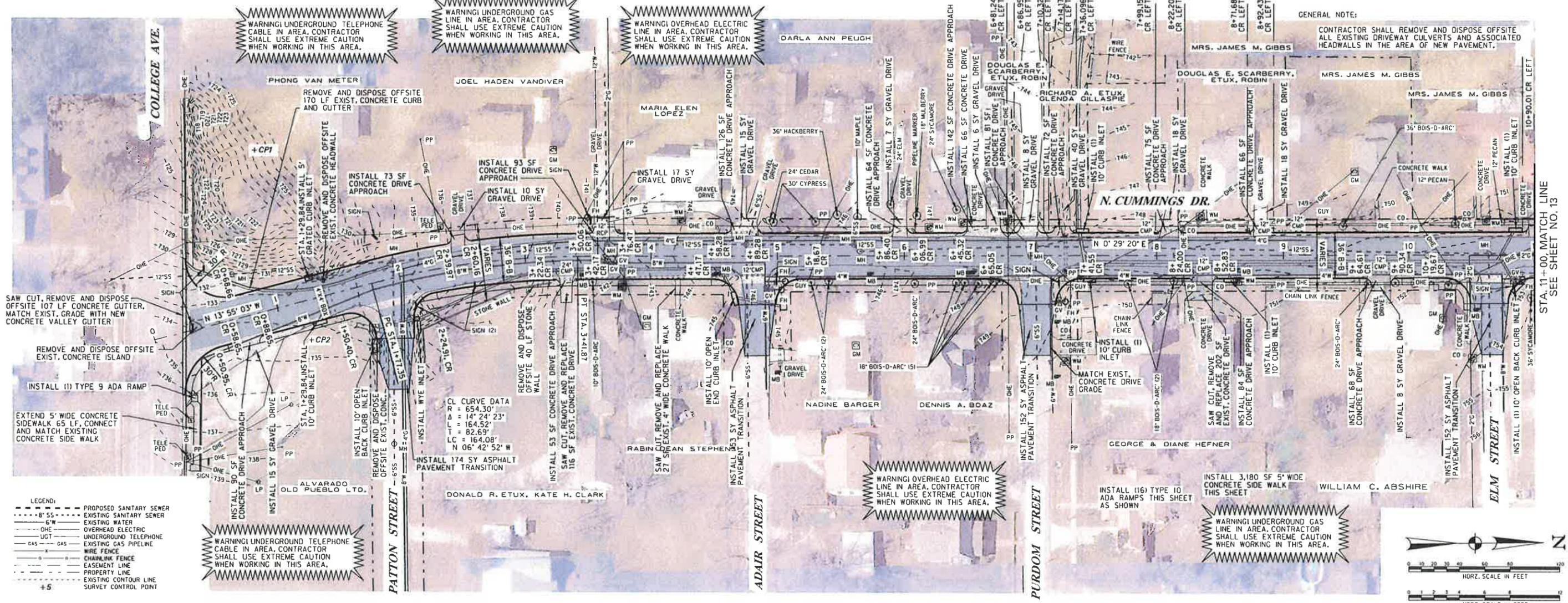


SECTION  
 STRUCTURE AT  $\bar{C}$  STA. 27+80.0

- LEGEND:
- - - - - PROPOSED SANITARY SEWER
  - - - - - EXISTING SANITARY SEWER
  - - - - - EXISTING WATER
  - - - - - OVERHEAD ELECTRIC
  - - - - - UNDERGROUND TELEPHONE
  - - - - - EXISTING GAS PIPELINE
  - - - - - GAS
  - - - - - WIRE FENCE
  - - - - - CHAINLINK FENCE
  - - - - - EASEMENT LINE
  - - - - - PROPERTY LINE
  - - - - - EXISTING CONTOUR LINE
  - +5 SURVEY CONTROL POINT



CITY OF ALVARADO			
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE			
SPECIAL STORM DRAINAGE STRUCTURE DETAILS			
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76031 TEX. REG. NO. F-702			
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016	
DRAWN BY: JDL/MNF		JOB NO: 11056	
CHECKED BY: BSS		SHEET NO. 11 OF 43	



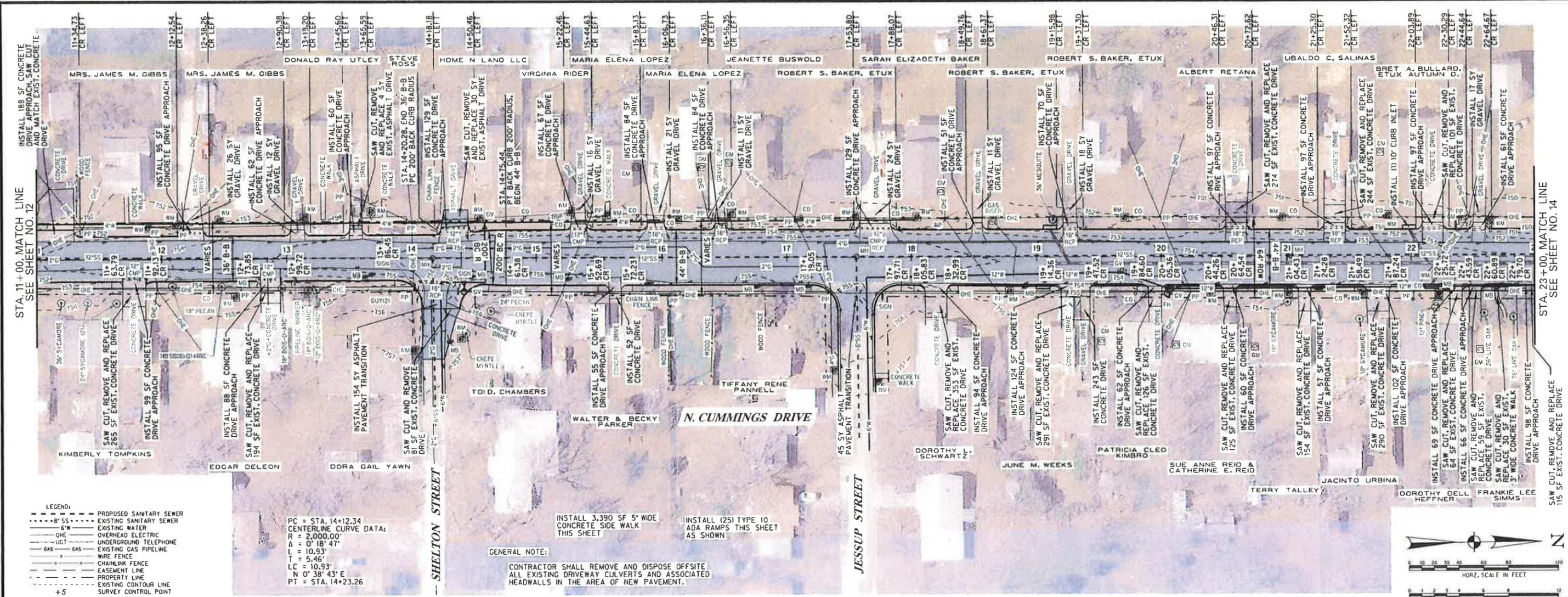
**CITY OF ALVARADO**

**STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE**

**STREET PLAN / PROFILE  
STA. 0+00.00 TO 11+00.00**

**CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS  
211 N. RIDGEMAN DRIVE  
CULVERSE, TEXAS 76033  
TEL: 817.424.8300

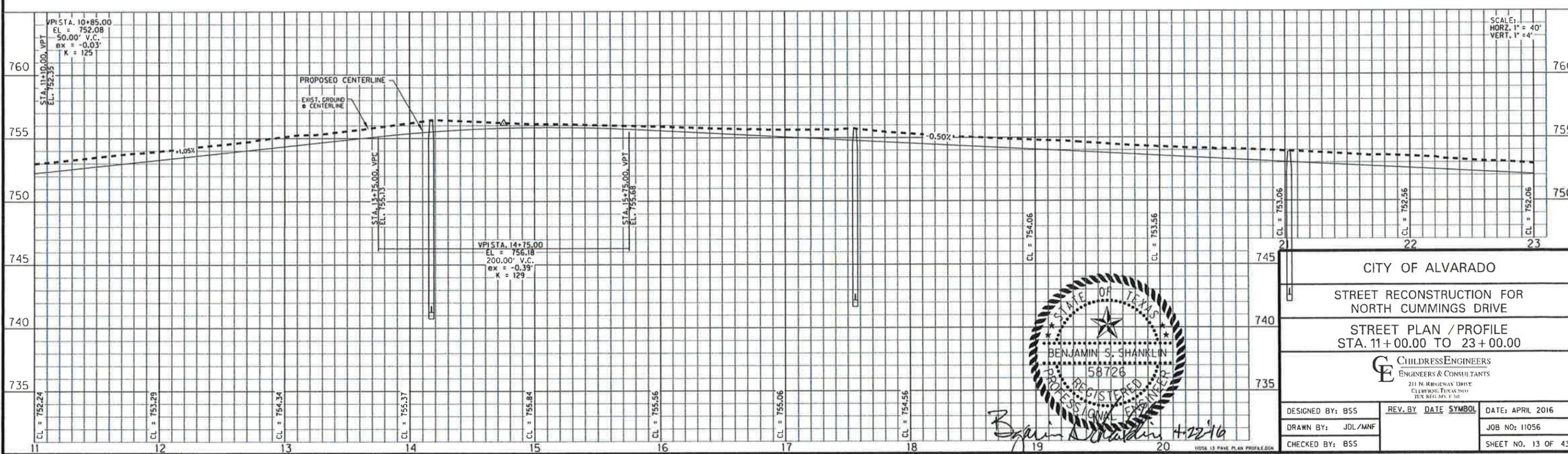
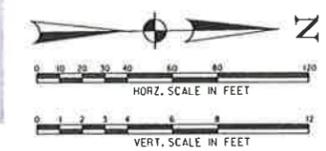
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 12 OF 43



- LEGEND:**
- PROPOSED SANITARY SEWER
  - - - - - EXISTING SANITARY SEWER
  - 6" W --- EXISTING WATER
  - OHE --- OVERHEAD ELECTRIC
  - UGT --- UNDERGROUND TELEPHONE
  - GAS --- EXISTING GAS PIPELINE
  - WIRE FENCE
  - CHAINLINK FENCE
  - EASEMENT LINE
  - PROPERTY LINE
  - EXISTING CONTOUR LINE
  - +5 SURVEY CONTROL POINT

INSTALL 3,390 SF 5' WIDE CONCRETE SIDE WALK THIS SHEET

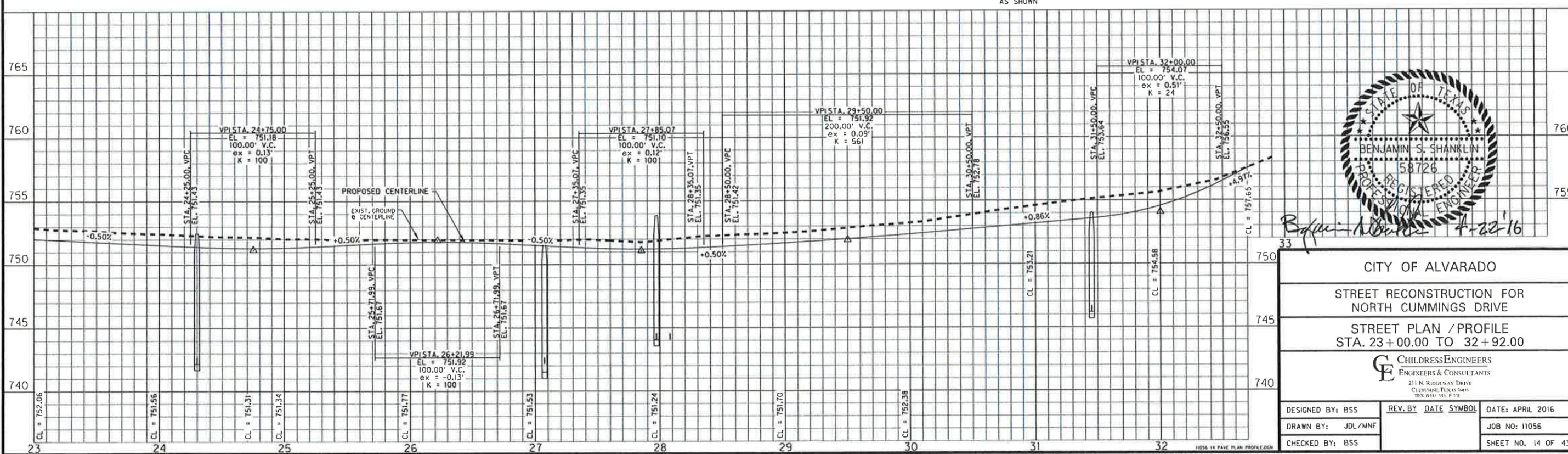
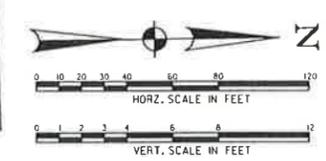
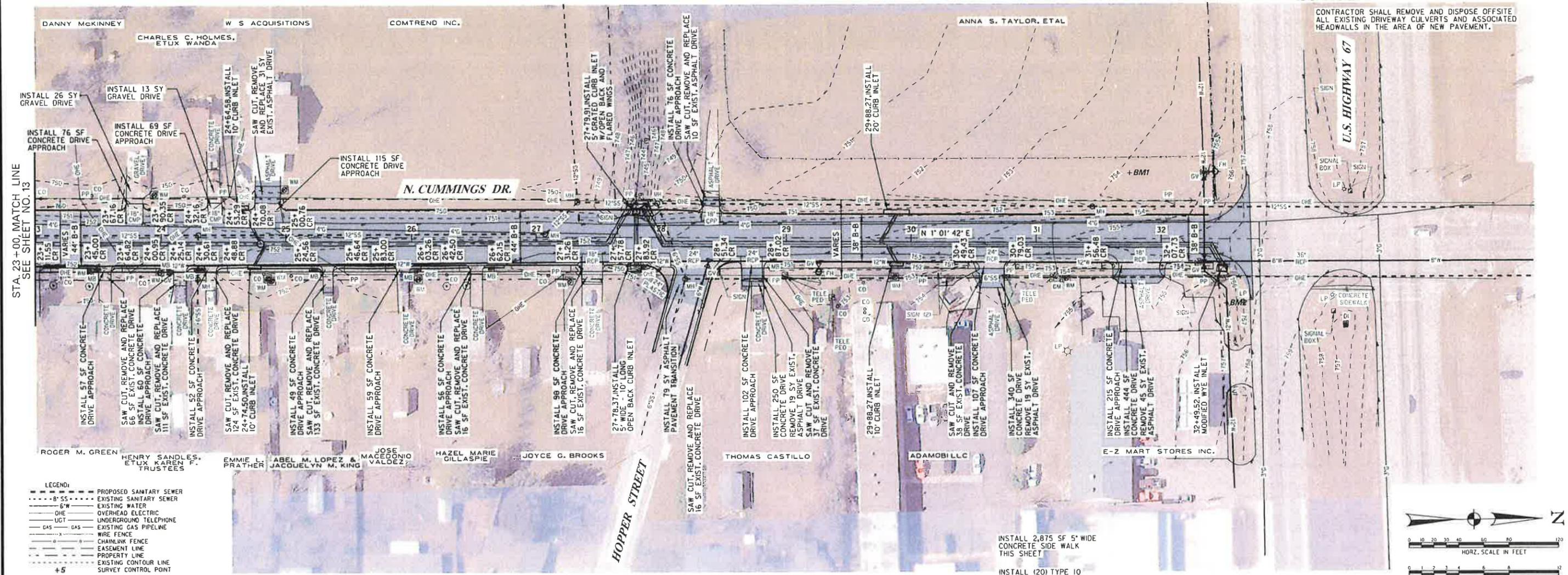
INSTALL (25) TYPE 10 ADA RAMPS THIS SHEET AS SHOWN



CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
STREET PLAN / PROFILE STA. 11+00.00 TO 23+00.00		
<b>CHILDRESS ENGINEERS</b> ENGINEERS & CONSULTANTS 211 N. RINEWAY DRIVE CLUBBROOK, TEXAS 75011 TX REG. NO. E 38		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 13 OF 43

GENERAL NOTE:

CONTRACTOR SHALL REMOVE AND DISPOSE OFFSITE ALL EXISTING DRIVEWAY CULVERTS AND ASSOCIATED HEADWALLS IN THE AREA OF NEW PAVEMENT.

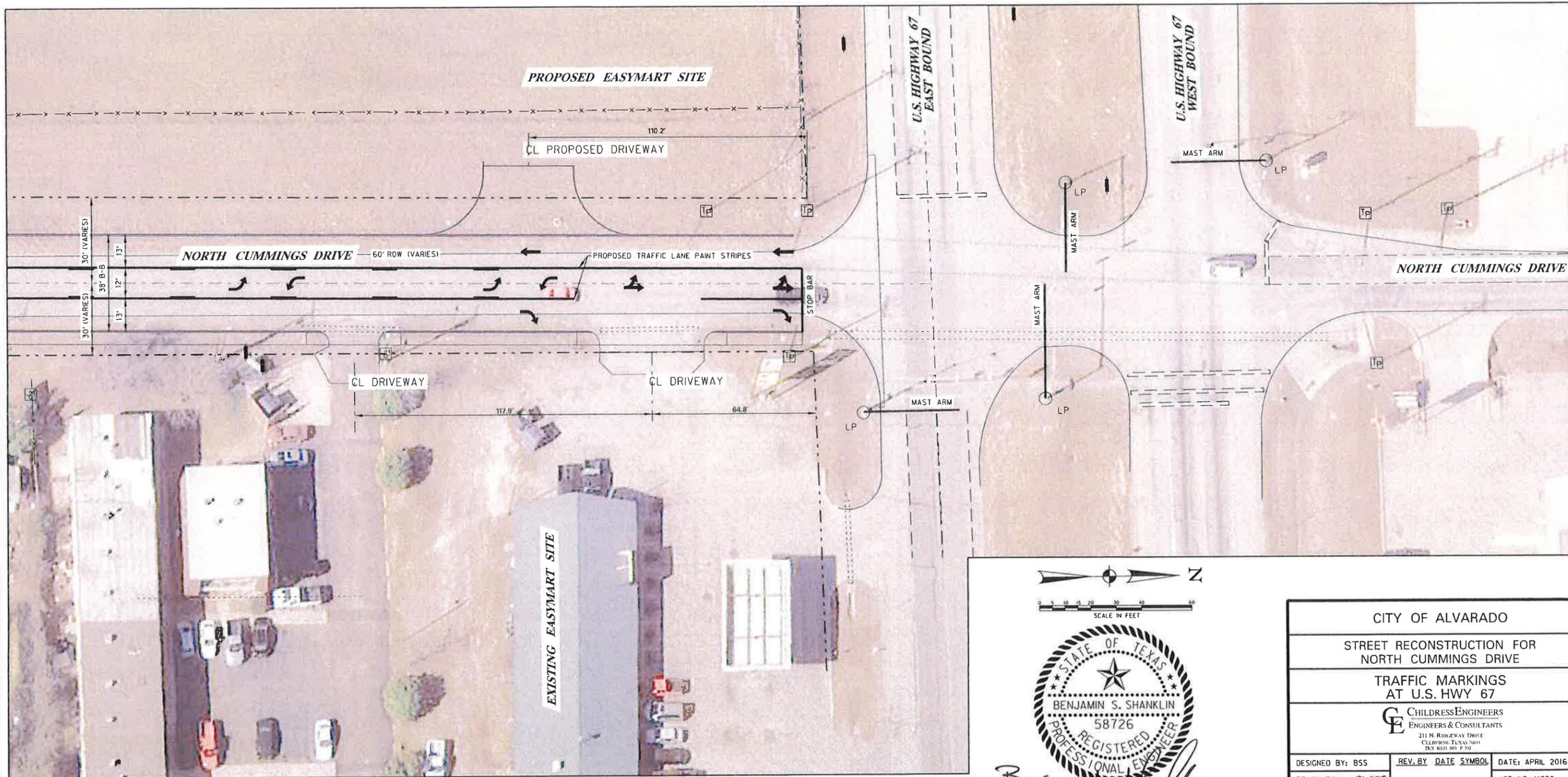
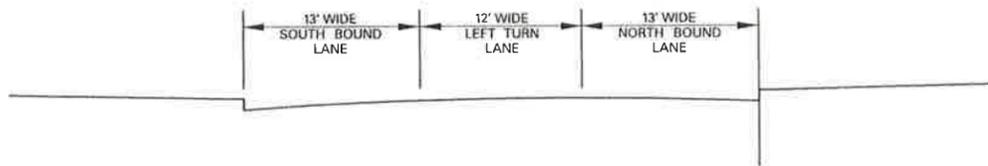


CITY OF ALVARADO  
 STREET RECONSTRUCTION FOR  
 NORTH CUMMINGS DRIVE  
 STREET PLAN / PROFILE  
 STA. 23+00.00 TO 32+92.00

CHILDRESS ENGINEERS  
 ENGINEERS & CONSULTANTS  
 211 N. RINGBAY DRIVE  
 CLUTE, TEXAS 75941  
 TEX. REG. NO. F 202

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 14 OF 43

38' WIDE ROADWAY  
(STA. 29+00 TO HWY. 67)

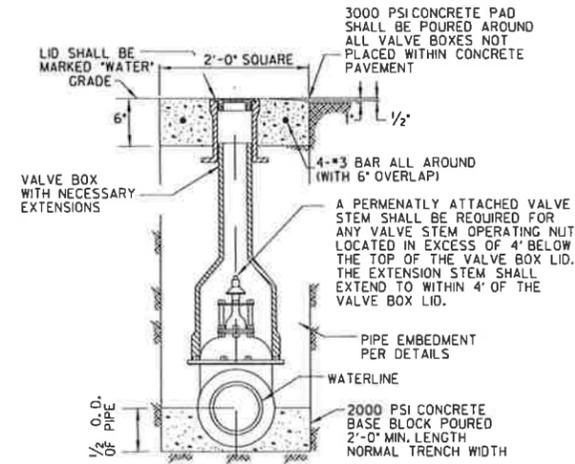


SCALE IN FEET

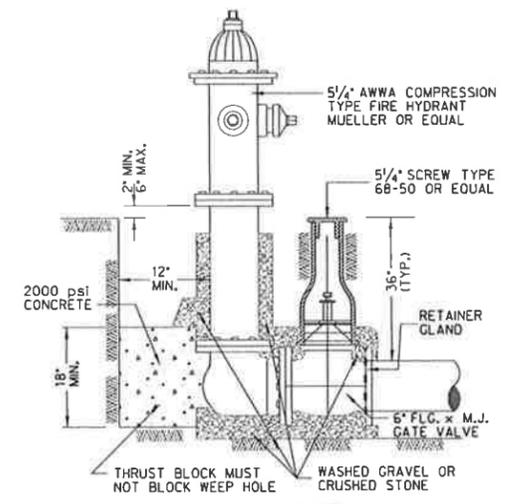


*Benjamin S. Shanklin*  
4-22-16

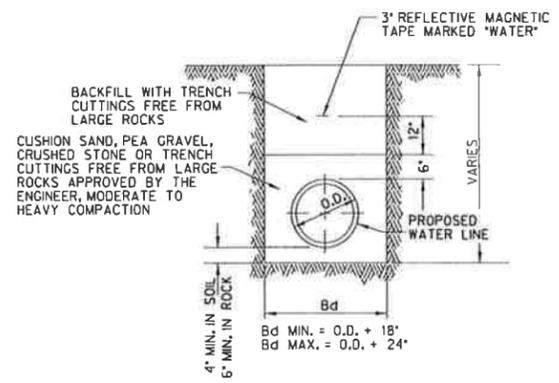
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
TRAFFIC MARKINGS AT U.S. HWY 67		
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLUBBURN, TEXAS 79111 TEX REG NO. F 702		
DESIGNED BY: BSS	REV. BY DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 15 OF 43



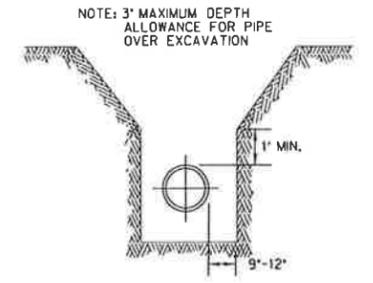
**GATE VALVE AND BOX**  
N.T.S.



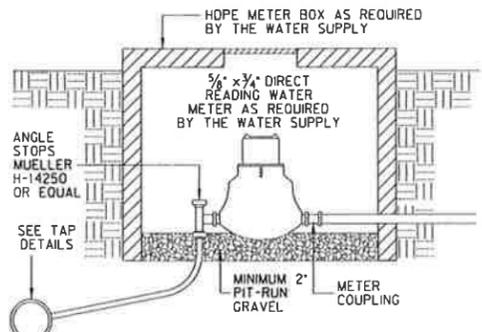
**FIRE HYDRANT**



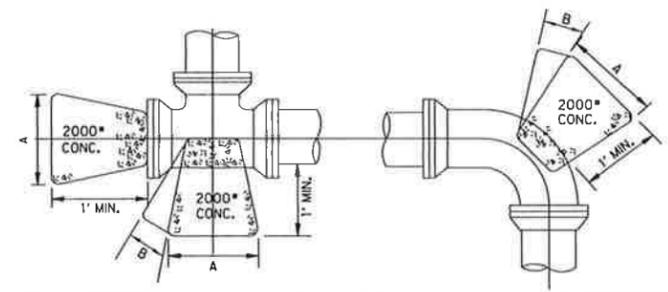
**WATER PIPE EMBEDMENT DETAIL**



**TRENCH DETAIL**



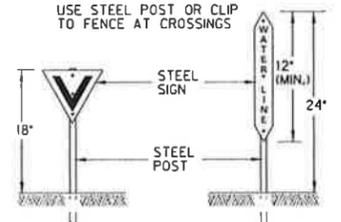
**WATER METER**



PIPE SIZE	TEES & PLUGS		90° BENDS		45° BENDS		22.5° BENDS	
	A	B	A	B	A	B	A	B
3"	18"	12"	18"	12"	12"	12"	12"	6"
4"	24"	18"	24"	18"	18"	12"	12"	12"
6"	36"	24"	36"	24"	24"	18"	18"	12"
8"	36"	24"	36"	24"	36"	24"	24"	18"
10"	42"	30"	42"	30"	40"	24"	30"	24"
12"	60"	36"	60"	45"	40"	30"	30"	24"

DIMENSIONS OF CONCRETE FOR THRUST BLOCKS AT FITTINGS

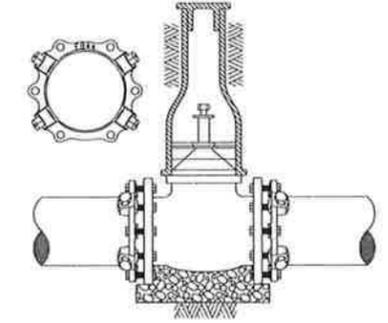
**TYPICAL THRUST BLOCK DETAILS**  
NOT TO SCALE



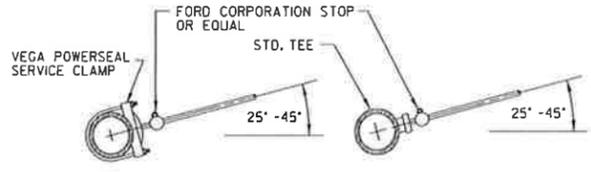
**VALVE MARKER LINE MARKER**

(FURNISH ONE VALVE MARKER PER VALVE, AND FURNISH TWO LINE MARKERS PER ROAD CROSSING, TYPICAL).

MECHANICAL JOINT/PUSH-ON VALVES AND FITTINGS SHALL BE EQUIPPED WITH JOINT RESTRAINT DEVICES. RESTRAINT DEVICES SHALL BE EBRA IRON, 2000 PV SERIES OR APPROVED EQUAL.



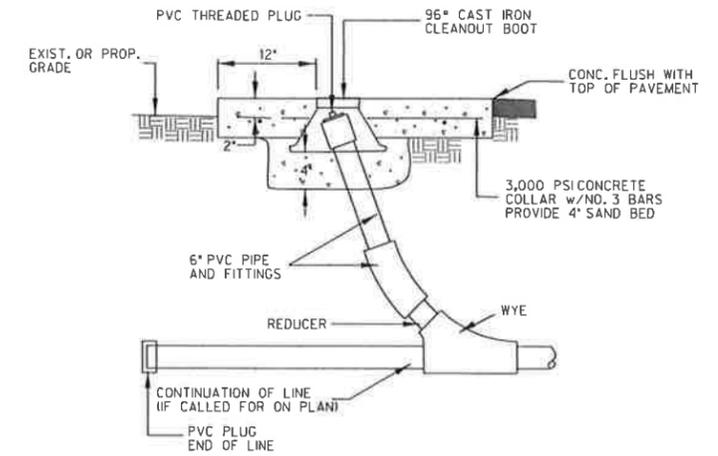
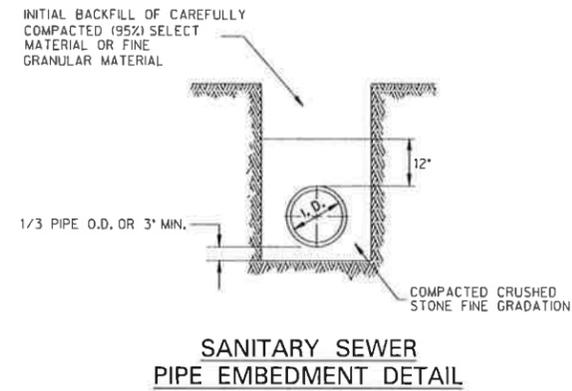
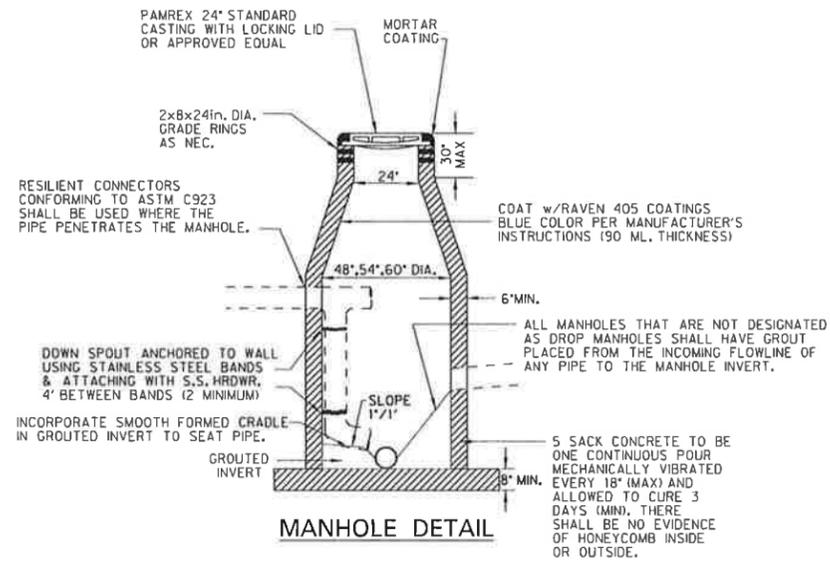
**JOINT RESTRAINT DETAIL**



**DUCTILE IRON, STEEL OR PVC SERVICE TAPS**



CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
WATER DETAILS		
<b>CHILDRESS ENGINEERS</b> ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76031 TEX REG. NO. F-702		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 16 OF 43



**SANITARY SEWER CLEANOUT DETAIL**

N.T.S.

MANHOLE COVER AND FRAME SHALL BE CALLED PAMREX OR APPROVED EQUAL. COVER AND FRAME SHALL BE MANUFACTURED FROM DUCTILE IRON.

COVERS SHALL BE HINGED AND INCORPORATE A 90 DEGREE BLOCKING SYSTEM TO PREVENT ACCIDENTAL CLOSURE. COVERS SHALL BE ONE MAN OPERABLE USING STANDARD TOOLS AND SHALL BE CAPABLE OF WITHSTANDING A TEST LOAD OF 80,000 LBS.

FRAMES SHALL BE CIRCULAR, INCORPORATE A SEATING RING AND A FITTED PLUG IN THE HINGE HOUSING, AND BE AVAILABLE IN A 24 INCH CLEAR OPENING. THE FRAME DEPTH SHALL NOT EXCEED 4 INCHES, AND THE FLANGE SHALL INCORPORATE BEDDING SLOTS, BOLT HOLES, AND LIFTING EYES.

ALL COMPONENTS SHALL BE BLACK COATED.

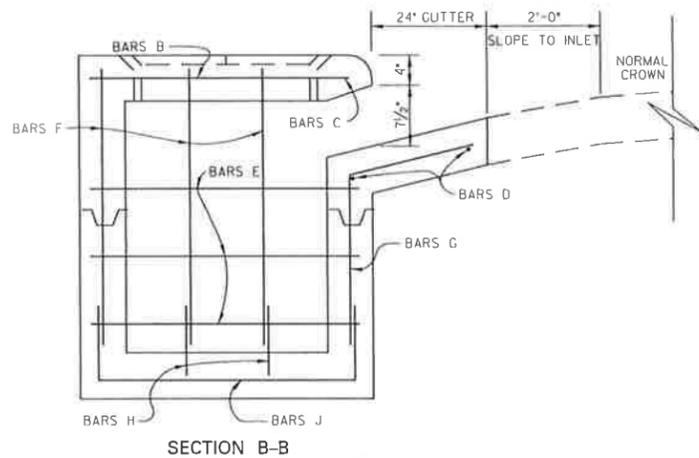
FRAME WEIGHT: 73 LBS.  
COVER WEIGHT: 122 LBS.  
TOTAL WEIGHT: 195 LBS.

PAMREX IS AVAILABLE FROM JIM COX SALES, INC. (800) 838-7377.

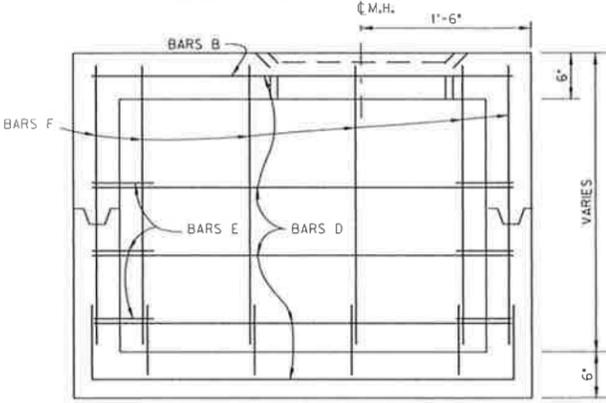
DIMENSIONS (INCHES)			WEIGHT (lbs)		REFERENCE
A	O	H	COVER AND FRAME	COVER ONLY	
33	24	4	195	122	RE 60 R8 FD



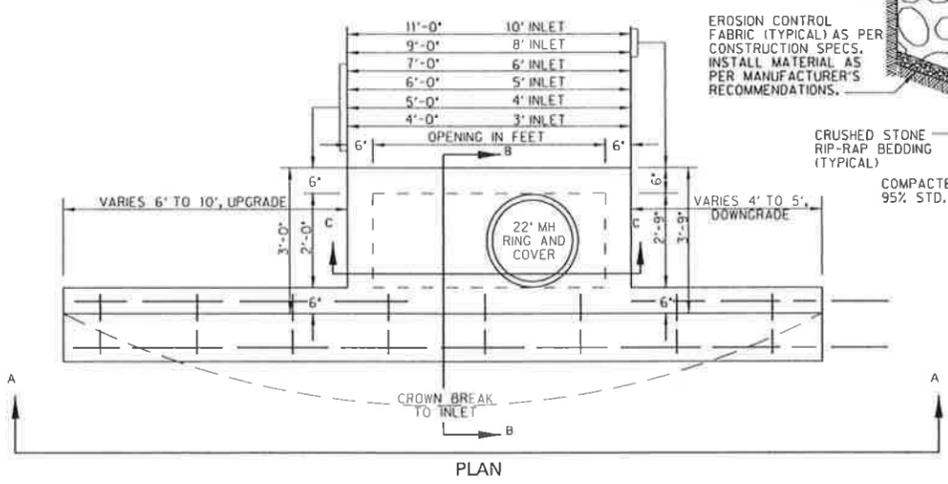
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
SANITARY SEWER DETAILS		
 CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76031 TEX. REG. NO. 8732		
DESIGNED BY: BSS	REV. BY DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 17 OF 43



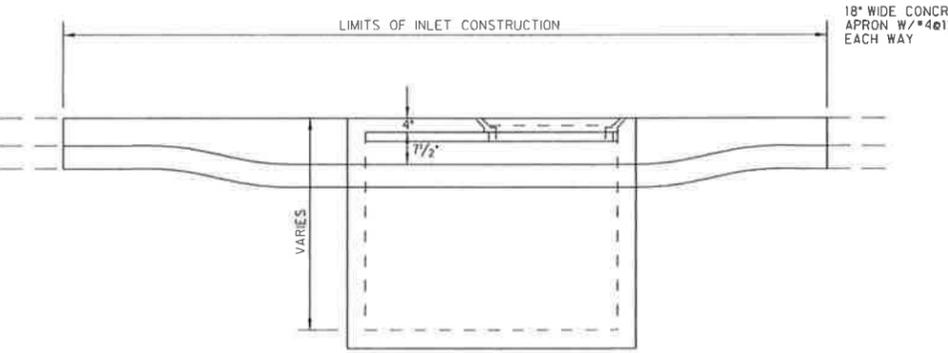
SECTION B-B



SECTION C-C

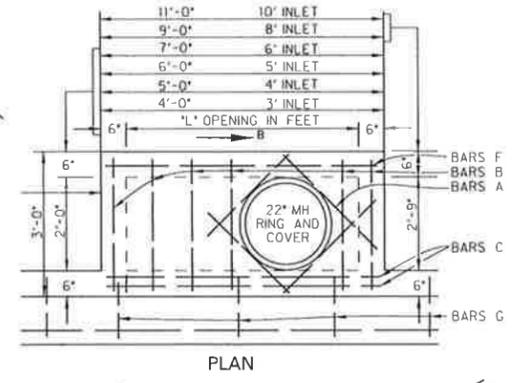


PLAN

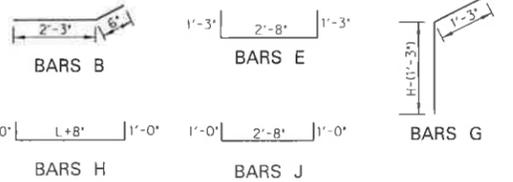


SECTION A-A

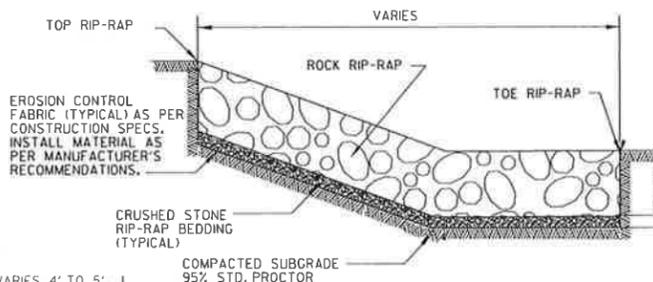
CURB INLET DETAILS  
NTS



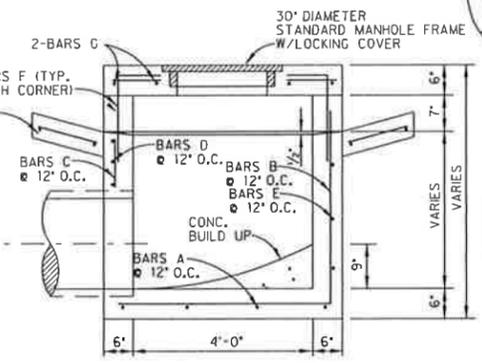
PLAN



MARK	L	3' INLET		4' INLET		5' INLET		6' INLET		8' INLET		10' INLET	
		SIZE	REQ'D	SIZE	REQ'D								
A	2'-7"	NO. 4	4	NO. 5	4								
B	2'-8"	NO. 4	4	NO. 4	5	NO. 4	6	NO. 4	6	NO. 5	7	NO. 5	8
C	L+8"	NO. 4	2	NO. 5	2	NO. 6	2	NO. 7	2	NO. 8	2	NO. 9	2
D	L+8"	NO. 3	8	NO. 3	8								
E	5'-12"	NO. 3	6	NO. 3	6								
F	H'-12"	NO. 3	6	NO. 3	7	NO. 3	8	NO. 3	8	NO. 3	9	NO. 3	10
G	H	NO. 3	3	NO. 3	3	NO. 3	4	NO. 3	4	NO. 3	4	NO. 3	4
H	L+12'-8"	NO. 3	2	NO. 3	2								
J	4'-8"	NO. 3	2	NO. 3	3	NO. 3	4	NO. 3	4	NO. 3	9	NO. 3	10

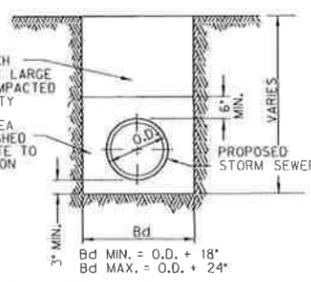


TYPICAL ROCK RIP-RAP DETAIL  
NTS

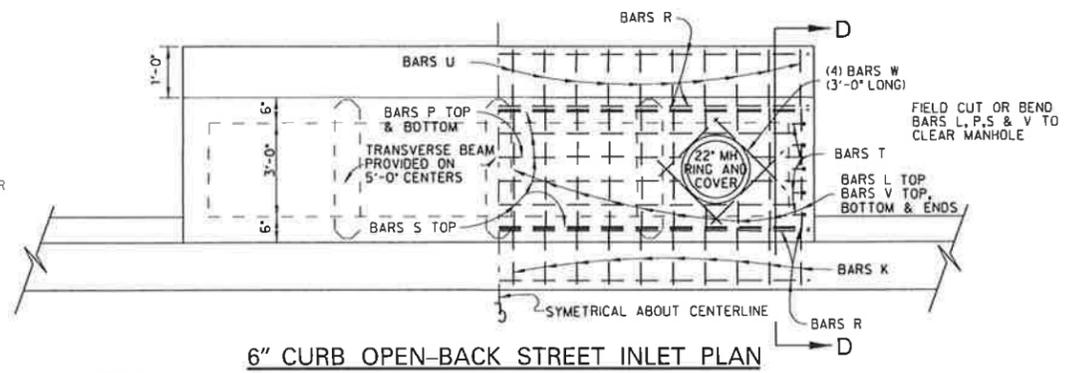


"Y" INLET SECT. A-A  
N. T. S.

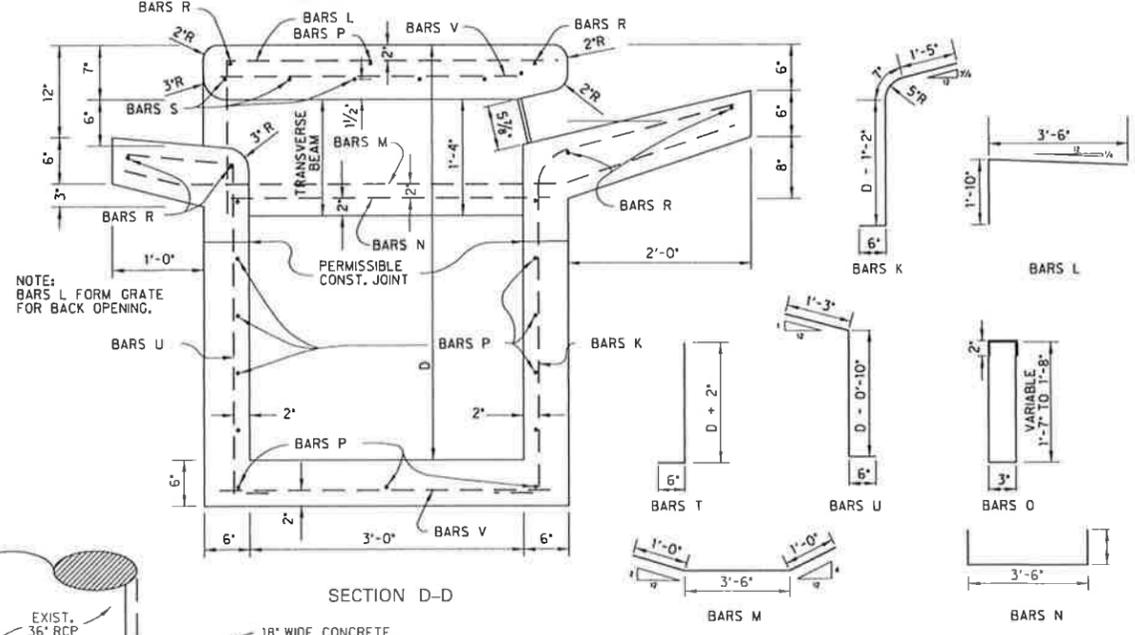
MODIFIED "Y" INLET DETAILS



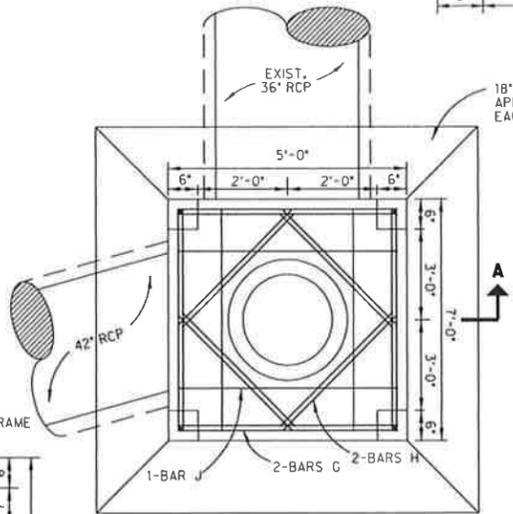
STORM SEWER  
PIPE EMBEDMENT DETAIL  
NTS



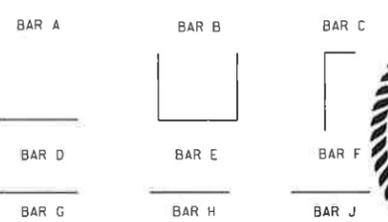
6" CURB OPEN-BACK STREET INLET PLAN



SECTION D-D

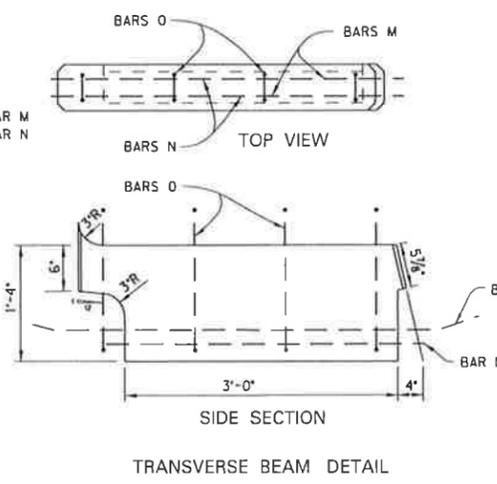
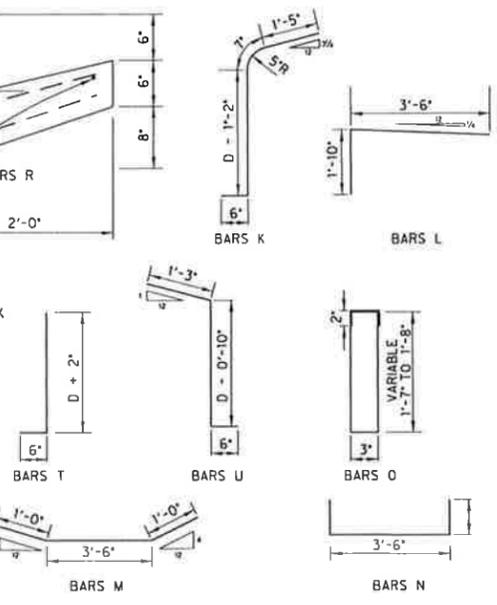


"Y" INLET PLAN  
N. T. S.



BAR A  
BAR B  
BAR C  
BAR D  
BAR E  
BAR F  
BAR G  
BAR H  
BAR J

BAR \*A\* & \*E\* ARE USED IN THE WALLS PARALLEL TO THE R.C.P. BAR \*B\* ARE IN THE WALL OPPOSITE THE R.C.P.



TRANSVERSE BEAM DETAIL

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

10' STORM DRAIN CURB INLETS  
AND MODIFIED WYE INLETS

CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76033  
TEX. REG. NO. F-702

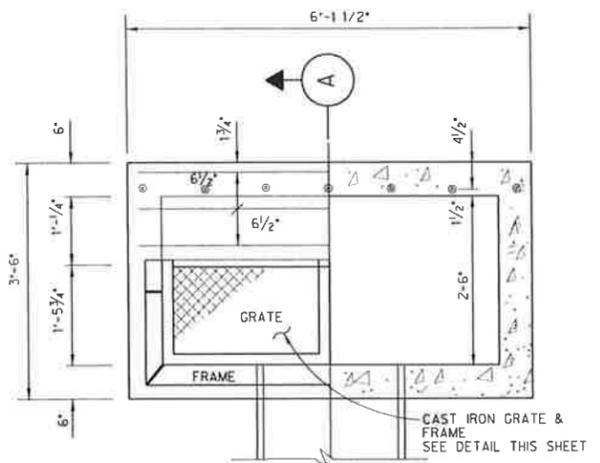
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 18 OF 43

**BILL OF REINFORCING STEEL**

Depth 'D'	Opening Length 'L' = 5 ft															Opening Length 'L' = 10 ft															Opening Length 'L' = 15 ft															Opening Length 'L' = 20 ft														
	Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'																								
	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft																				
3'-6"	17	3	2	4	20	24	28	10	10	20	28	32	36	18	18	28	36	40	44	26	26	36	44	48	52	34	34	44	52	56	60	44	44	54	62	66	70	54	54	64	72	76	80	64	64	74														
3'-9"	18	-	-	-	20	24	28	10	10	20	28	32	36	18	18	28	36	40	44	26	26	36	44	48	52	34	34	44	52	56	60	44	44	54	62	66	70	54	54	64	72	76	80	64	64	74														
4'-0"	19	-	-	-	22	26	30	12	12	22	30	34	38	20	20	30	38	42	46	28	28	38	46	50	54	38	38	48	56	60	64	48	48	58	66	70	74	58	58	68	76	80	84	68	68	78														
4'-3"	19	-	-	-	24	28	32	14	14	24	32	36	40	22	22	32	40	44	48	30	30	40	48	52	56	40	40	50	58	62	66	50	50	60	68	72	76	60	60	70	78	82	86	70	70	80														
4'-6"	21	-	-	-	26	30	34	16	16	26	34	38	42	24	24	34	42	46	50	32	32	42	50	54	58	42	42	52	60	64	68	52	52	62	70	74	78	62	62	72	80	84	88	72	72	82														
4'-9"	21	-	-	-	28	32	36	18	18	28	36	40	44	26	26	36	44	48	52	34	34	44	52	56	60	44	44	54	62	66	70	54	54	64	72	76	80	64	64	74	82	86	90	74	74	84														
5'-0"	21	-	-	-	30	34	38	20	20	30	38	42	46	28	28	38	46	50	54	36	36	46	54	58	62	46	46	56	64	68	72	56	56	66	74	78	82	66	66	76	84	88	92	76	76	86														
5'-3"	23	-	-	-	32	36	40	22	22	32	40	44	48	30	30	40	48	52	56	38	38	48	56	60	64	48	48	58	66	70	74	58	58	68	76	80	84	68	68	78	86	90	94	78	78	88														
5'-6"	23	-	-	-	34	38	42	24	24	34	42	46	50	32	32	42	50	54	58	40	40	50	58	62	66	50	50	60	68	72	76	60	60	70	78	82	86	70	70	80	88	92	96	80	80	90														
6'-0"	25	-	-	-	36	40	44	26	26	36	44	48	52	34	34	44	52	56	60	42	42	52	60	64	68	52	52	62	70	74	78	62	62	72	80	84	88	72	72	82	90	94	98	82	82	92														
6'-6"	25	-	-	-	38	42	46	28	28	38	46	50	54	36	36	46	54	58	62	44	44	54	62	66	70	54	54	64	72	76	80	64	64	74	82	86	90	74	74	84	92	96	100	84	84	94														
7'-0"	29	-	-	-	40	44	48	30	30	40	48	52	56	38	38	48	56	60	64	46	46	56	64	68	72	56	56	66	74	78	82	66	66	76	84	88	92	76	76	86	94	98	102	86	86	96														
8'-0"	31	-	-	-	42	46	50	32	32	42	50	54	58	40	40	50	58	62	66	48	48	58	66	70	74	58	58	68	76	80	84	68	68	78	86	90	94	78	78	88	96	100	104	88	88	98														
9'-0"	35	-	-	-	44	48	52	34	34	44	52	56	60	42	42	52	60	64	68	50	50	60	68	72	76	60	60	70	78	82	86	70	70	80	88	92	96	80	80	90	98	102	106	90	90	100														
0'-0"	38	-	-	-	46	50	54	36	36	46	54	58	62	44	44	54	62	66	70	52	52	62	70	74	78	62	62	72	80	84	88	72	72	82	90	94	98	82	82	92	100	104	108	92	92	102														

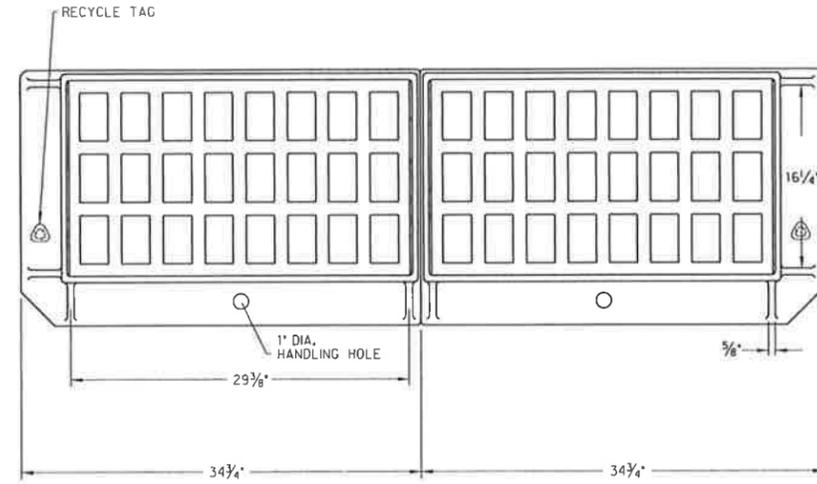
**SUMMARY OF QUANTITIES FOR STREET INLETS**

Depth 'D'	5'-0" Opening 'L'															10'-0" Opening 'L'															15'-0" Opening 'L'															20'-0" Opening 'L'														
	Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'					Widths 'W'																			
	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft	3ft	4ft	5ft	6ft	7ft															
3'-6"	2.62	3.06	2.95	3.32	3.28	3.73	4.12	4.79	4.64	5.21	5.64	5.69	6.67	6.40	7.10	7.75	7.20	8.46	8.11	9.09	9.76	9.27	10.10	9.51	10.46	11.15	10.61	11.51	10.94	11.84	12.58	12.08	13.04	12.51	13.44	14.19	13.71	14.68	14.16	15.08	15.81	15.35	16.33	15.81	16.72															
3'-9"	2.70	3.09	3.04	3.41	3.39	3.73	4.12	4.79	4.64	5.21	5.64	5.69	6.67	6.40	7.10	7.75	7.20	8.46	8.11	9.09	9.76	9.27	10.10	9.51	10.46	11.15	10.61	11.51	10.94	11.84	12.58	12.08	13.04	12.51	13.44	14.19	13.71	14.68	14.16	15.08	15.81	15.35	16.33	15.81	16.72															
4'-0"	2.78	3.28	3.14	3.64	3.49	3.99	4.38	5.18	4.92	5.65	6.09	6.10	7.18	6.77	7.76	8.35	7.64	9.09	8.58	9.76	10.46	9.94	10.84	10.27	11.24	11.94	11.39	12.34	11.79	12.74	13.49	12.99	13.94	13.41	14.34	15.04	14.54	15.51	14.99	15.94	16.64	16.14	17.11	16.59	17.54															
4'-3"	2.87	3.34	3.23	3.70	3.59	4.06	4.51	5.26	5.06	5.73	6.19	6.22	7.29	6.95	7.87	8.47	7.87	9.27	8.81	9.90	10.61	10.09	10.94	10.43	11.39	12.09	11.54	12.49	11.94	12.89	13.59	13.09	14.04	13.51	14.44	15.14	14.64	15.61	15.09	16.04	16.74	16.24	17.21	16.69	17.64															
4'-6"	2.95	3.56	3.32	3.94	3.69	4.31	4.64	5.58	5.20	6.07	6.56	6.40	7.70	7.14	8.30	8.89	8.09	9.73	9.04	10.43	11.15	10.61	11.51	10.94	11.84	12.58	12.08	13.04	12.51	13.44	14.19	13.71	14.68	14.16	15.08	15.81	15.35	16.33	15.81	16.72																				
4'-9"	3.03	3.61	3.41	4.10	3.79	4.38	4.77	5.66	5.34	6.16	6.65	6.57	7.80	7.32	8.41	8.97	8.03	9.83	9.14	10.53	11.24	10.71	11.61	11.04	11.94	12.64	12.14	13.09	12.54	13.49	14.19	13.71	14.68	14.16	15.08	15.81	15.35	16.33	15.81	16.72																				
5'-0"	3.12	3.67	3.51	4.16	3.90	4.45	4.90	5.74	5.47	6.24	6.69	6.75	7.91	7.51	8.53	9.09	8.27	9.99	9.50	10.70	11.41	10.87	11.74	11.17	12.07	12.77	12.27	13.22	12.67	13.62	14.32	13.82	14.79	14.24	15.14	15.84	15.34	16.31	15.79	16.74																				
5'-3"	3.20	3.83	3.60	4.24	4.00	4.65	5.03	6.00	5.61	6.52	6.93	6.93	8.27	7.69	8.90	9.46	8.55	10.44	9.73	11.12	11.84	11.30	12.17	11.60	12.50	13.20	12.70	13.65	13.10	14.04	14.74	14.24	15.21	14.69	15.64	16.34	15.84	16.81	16.29	17.24																				
5'-6"	3.28	3.89	3.69	4.30	4.10	4.72	5.16	6.08	5.75	6.61	7.03	7.11	8.37	7.88	9.01	9.57	8.66	10.57	9.97	11.31	12.02	11.48	12.35	11.78	12.68	13.38	12.88	13.83	13.28	14.22	14.92	14.42	15.39	14.87	15.82	16.52	16.02	17.00	16.48	17.43																				
5'-9"	3.37	4.05	3.78	4.51	4.20	4.95	5.29	6.35	5.89	6.90	7.33	7.44	8.74	8.07	9.40	9.96	9.05	10.97	10.27	11.60	12.31	11.77	12.64	12.07	12.97	13.67	13.17	14.12	13.57	14.51	15.21	14.71	15.68	15.14	16.09	16.79	16.29	17.26	16.74	17.69																				
6'-0"	3.45	4.15	3.88	4.60	4.30	5.04	5.42	6.46	6.03	7.02	7.45	7.57	8.88	8.25	9.54	10.10	9.05	11.02	10.32	11.65	12.36	11.82	12.69	12.12	13.02	13.72	13.22	14.17	13.62	14.56	15.26	14.76	15.73	15.19	16.14	16.84	16.34	17.31	16.79	17.74																				
6'-6"	3.78	4.60	4.25	5.10	4.71	5.60	5.94	7.16	6.59	7.71	8.17	8.37	9.86	9.19	10.53	11.09	9.82	11.82	11.12	12.45	13.16	12.62	13.49	12.92	13.82	14.52	14.02	15.00	14.45	15.39	16.09	15.59	16.56	16.02	16.97	17.67	17.17	18.14	17.60	18.55																				
7'-0"	4.12	4.96	4.62	5.50	5.12	6.04	6.46	7.70	7.14	8.34	8.89	9.09	10.68	9.93	11.27	11.83	10.66	12.66	11.96	13.29	13.99	13.45	14.32	13.75	14.65	15.35	14.85	15.83	15.28	16.22	16.92	16.42	17.39	16.85	17.80																									
8'-0"	4.45	5.45	4.99	6.05	5.53	6.64	6.97	8.42	7.70	9.12	9.68	9.82	11.48	10.67	12.31	12.87	11.70	13.70	13.00	14.33	15.03	14.49	15.36	14.79	15.69	16.39	15.89	16.87	16.32	17.26	17.96	17.46	18.43	17.89	18.84																									
9'-0"	4.78	5.82	5.36	6.45	5.93	7.08	7.49	9.00	8.11	9.74	10.30	10.48	12.14	11.21	13.12	13.68	12.51	14.51	13.81	15.14	15.84	15.30	16.																																					

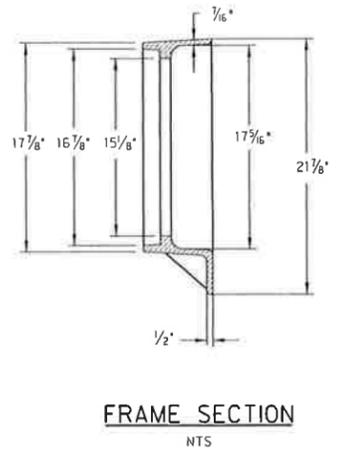


HALF PLAN HALF SECT PLAN  
NTS

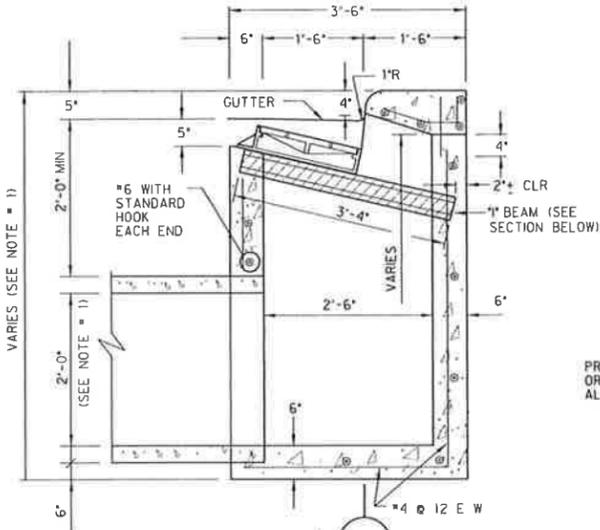
- NOTES:
1. DIMENSION VARIES BASED ON PIPE DIAMETER AND WALL THICKNESS.
  2. CENTER REINFORCING IN SLAB AND WALLS.
  3. CENTER STEEL BEAM ON INLET AND CAST INTO WALLS AS SHOWN.
  4. TO ACHIEVE DESIRED OPENING LENGTH, CAST INLETS IN SERIES.
  5. WHEN CAST IN SERIES, INCREASE INTERIOR WALL THICKNESS TO 8" AND PROVIDE A 24" DIA. ORIFICE THROUGH WALL.



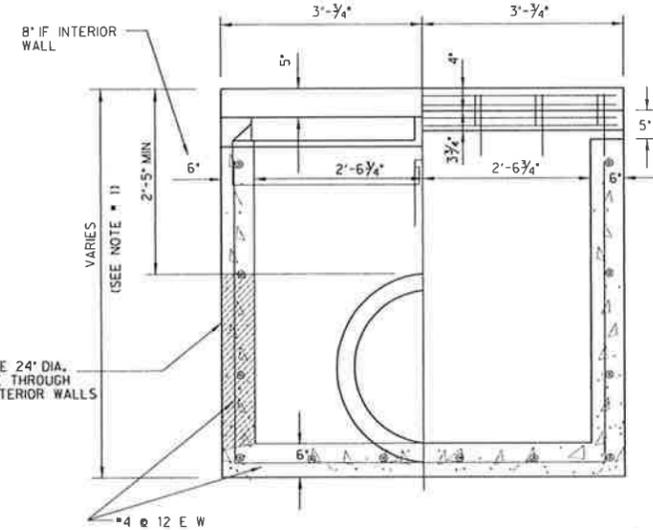
GRATE SECTION  
NTS



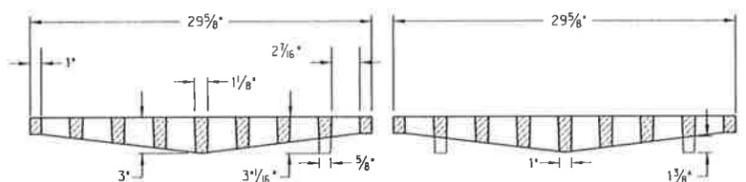
FRAME SECTION  
NTS



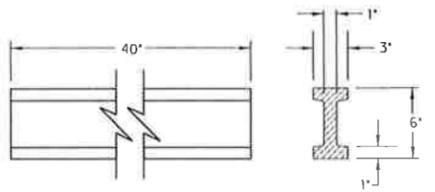
SECTION A  
NTS



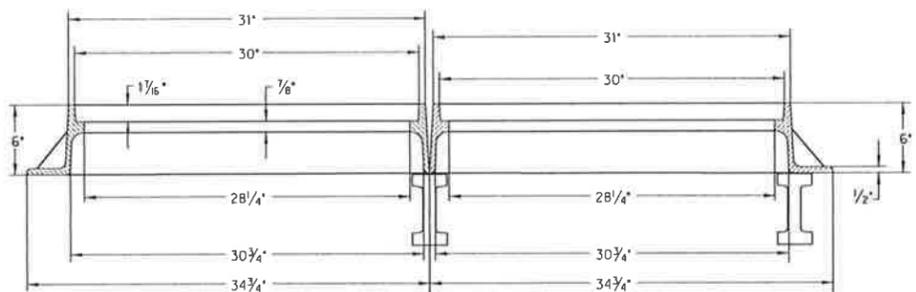
HALF FRONT ELEV HALF SECT B  
NTS



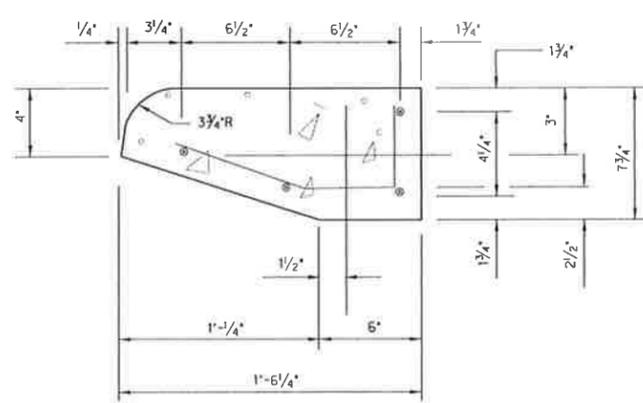
GRATE SECTION  
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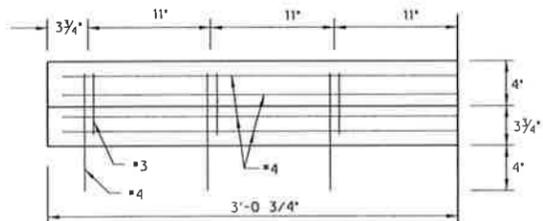
I-BEAM DETAIL  
NTS



FRAME SECTION  
NTS



TRANS SECTION  
NTS



HALF FRONT ELEV  
NTS

- GENERAL NOTES:
1. ALL CONCRETE SHALL BE 3600 PSI (5-SACK) CONCRETE.
  2. CHAMFER ALL EXPOSED CORNERS 3/4" EXCEPT WHERE OTHERWISE NOTED.
  3. DIMENSIONS RELATED TO REINFORCING STEEL ARE TO THE CENTERS OF BARS.
  4. FIELD CUT AND BEND BARS AS NECESSARY TO ACCOMMODATE STORM DRAIN PIPE.
  5. DURING STAGE ONE CONSTRUCTION, INSERTS WILL NOT BE CONSTRUCTED ABOVE SUBGRADE ELEVATION UNLESS PERMISSION IS GRANTED BY THE ENGINEER.
  6. A TEMPORARY WOOD COVER SHALL BE INSTALLED AFTER STAGE ONE IS COMPLETED, AND WILL REMAIN IN PLACE UNTIL STAGE TWO BEGINS.
  7. THE LOCATION OF INLET AS SHOWN IN PLANS REFERS TO THE CONTROL POINT AT THE FACE OF CURB AND MIDPOINT OF THE INLET.
  8. A SEALED 1/2" EXPANSION JOINT SHALL BE PLACED ALONG ALL VERTICAL FACES ABUTTING CONCRETE PAVEMENT, CLASS 3, 4, 5 OR 7 JOINT SEALANT SHALL BE USED TO SEAL JOINT.
  9. USE STD. CAST IRON FRAME AND GRATES.



SECTION THRU BEAM  
NTS

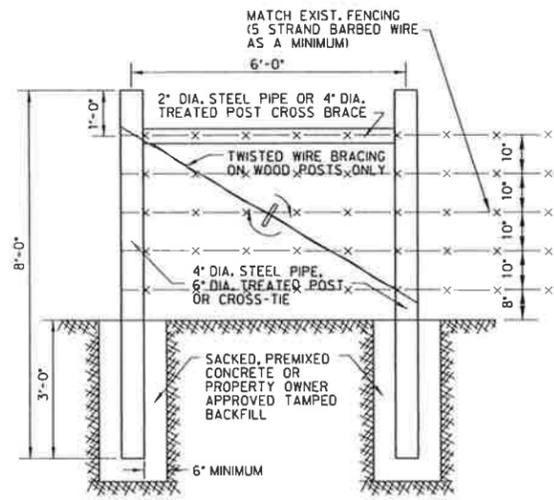
CURB BEAM BAR LIST				
NO	SIZE	LENGTH	SHAPE	LOC
4	*4	5'-10"	ST	HOR
7	*4	0'-10"	ST	VERT
7	*3	1'-6"	BT	

PRECAST CURB BEAM  
NTS

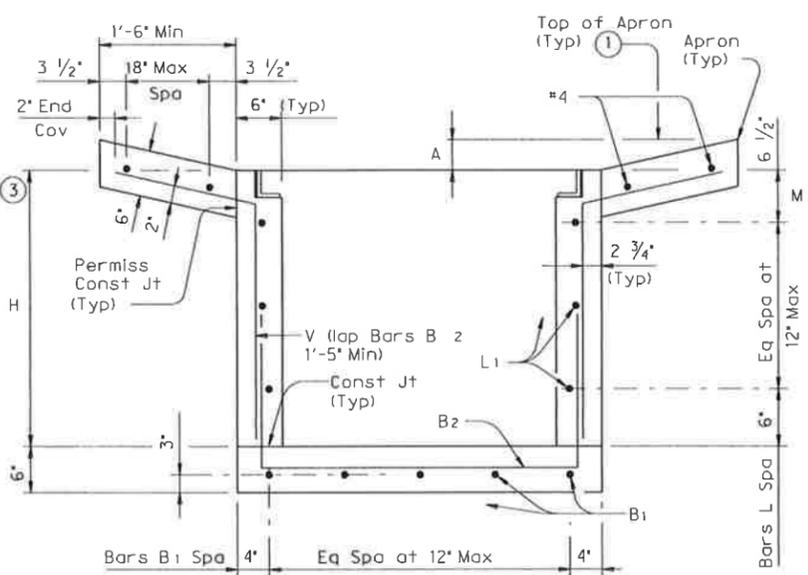


*Benjamin S. Shanklin*  
4-22-16

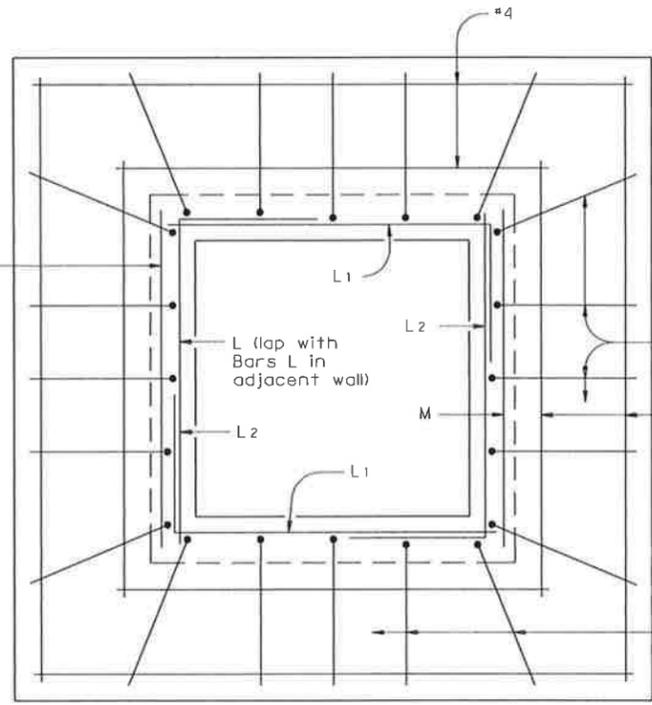
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
GRATED INLET DETAILS		
 CHILDRESS ENGINEERS & CONSULTANTS 211 N. RIDGEMAY DRIVE CLEBURNE, TEXAS 76033 TEX REG NO. P-212		
DESIGNED BY: BSS	REV. BY DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 20 OF 43



**WIRE FENCE & H-BRACE DETAIL**  
NTS

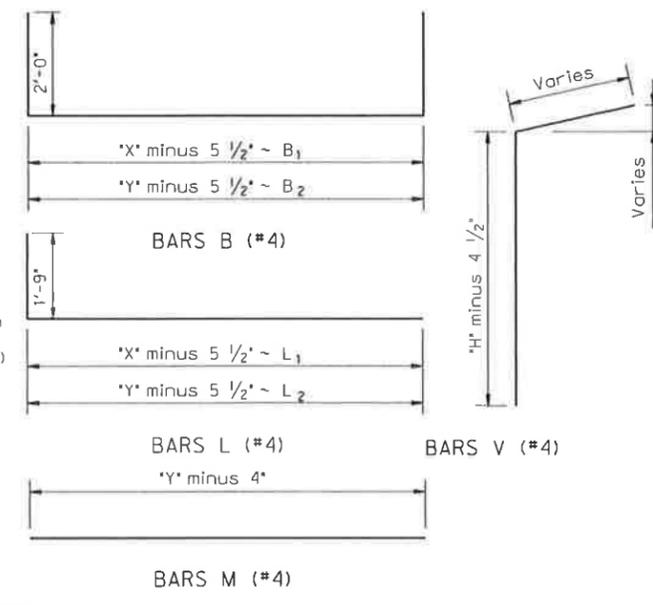


**SECTION B-B**  
NTS



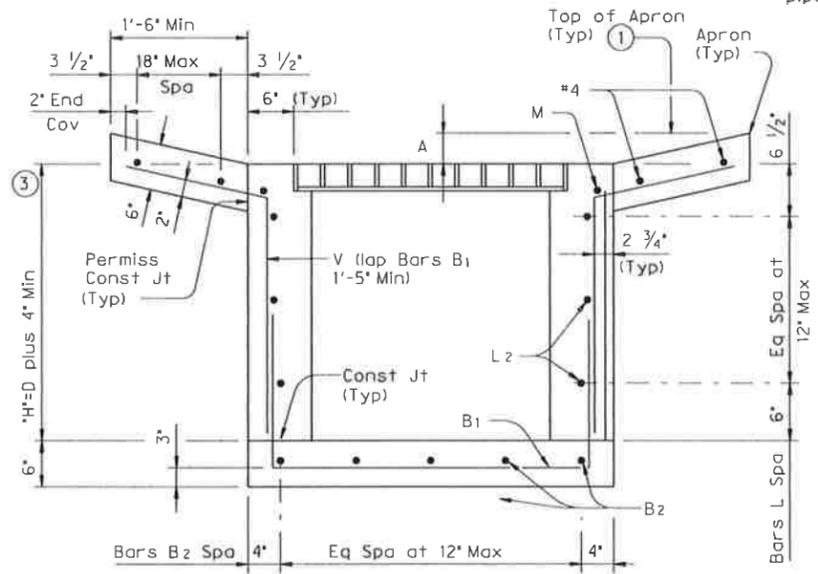
**TYPICAL APRON PLAN**

(Showing reinforcing in walls and in apron)  
NTS

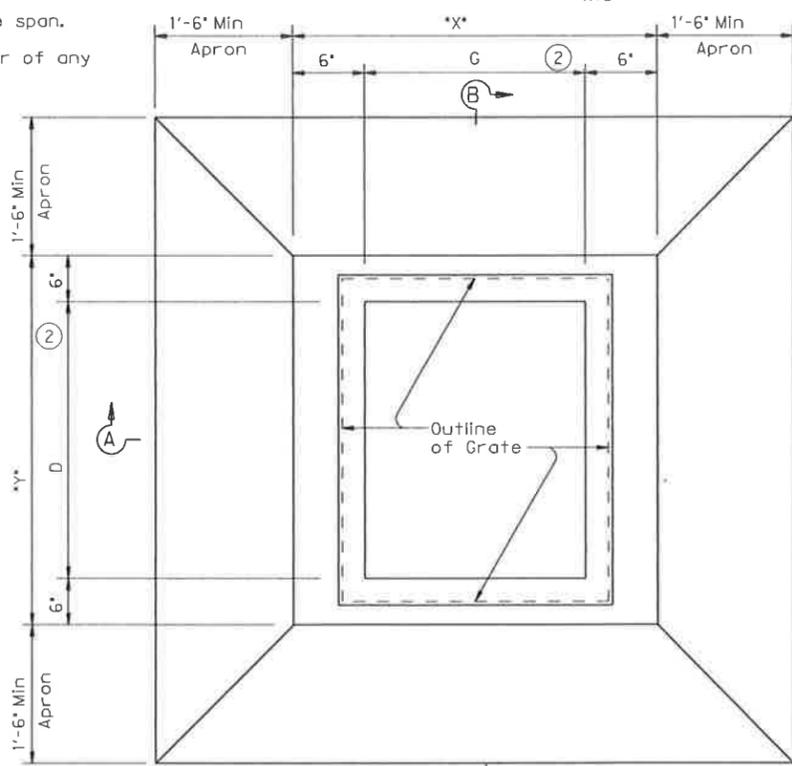


- ① May be changed as directed by the Engineer.
- ② G equals the maximum interior grate span.
- ③ D equals the maximum inside diameter of any pipe entering the inlet.

A	G	D	H	GRATE AND FRAME
2'	31 3/4'	31 3/4'	2'-7 1/2'	NEENAH R48B2-A OR APPROVED EQUAL
NOTE 1	36'	36'	4'-0"	NEENAH R3807-K OR APPROVED EQUAL
2'	22'	22'	3'-10"	NEENAH R4826-A OR APPROVED EQUAL
6'	40 3/4'	24'	7'-9"	NEENAH R3808-1 OR APPROVED EQUAL



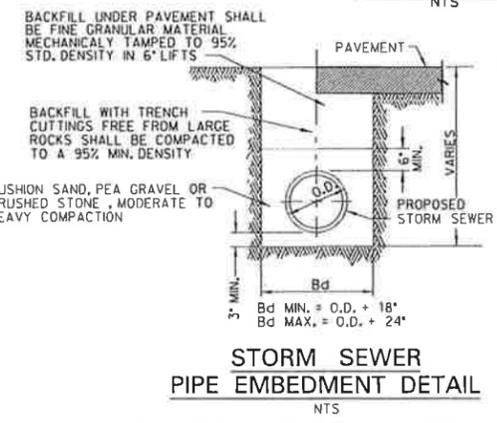
**SECTION A-A**  
NTS



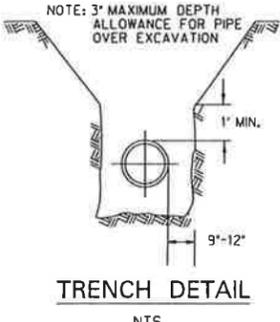
**TYPICAL ROCK RIP-RAP DETAIL**  
NTS

**GENERAL NOTES:**

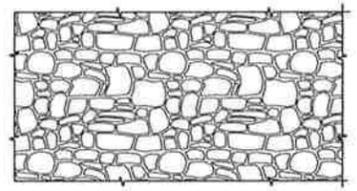
1. WHEN APPROVED, PRECAST INLETS WITH EQUIVALENT STRUCTURAL CAPACITY MAY BE FURNISHED. SEALED ENGINEERING CALCULATIONS AND DRAWINGS SHALL BE SUBMITTED FOR APPROVAL PRIOR TO CONSTRUCTION.
2. SHOP DRAWINGS WILL NOT BE REQUIRED.
3. APRON SHALL BE CAST-IN-PLACE.
4. IN AREAS OF CONFLICT BETWEEN REINFORCING STEEL, BLOCKOUTS, PIPES, ANCHOR BOLTS OR OTHER REINFORCING STEEL, THE REINFORCEMENT SHALL BE BENT OR ADJUSTED TO CLEAR AS DIRECTED BY THE ENGINEER.
5. STRUCTURAL STEEL FOR GRATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM DESIGNATION A-36 OR AISI DESIGNATION M1010-M1020.
6. ALL REINFORCING STEEL SHALL BE GRADE 60 UNLESS OTHERWISE NOTED.
7. ALL CONCRETE SHALL BE A (5) SACK MIX AND HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,600 PSI AT 28 DAYS.



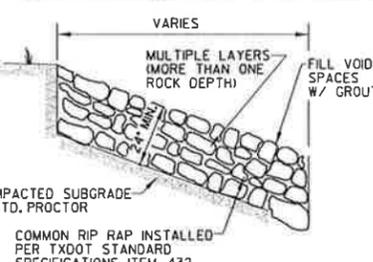
**STORM SEWER PIPE EMBEDMENT DETAIL**  
NTS



**TRENCH DETAIL**  
NTS



**PLAN**

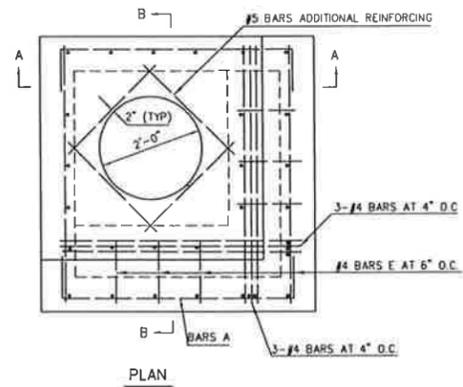


**PROFILE**

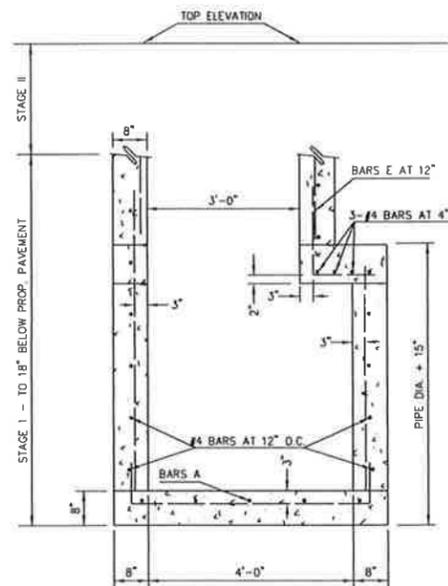
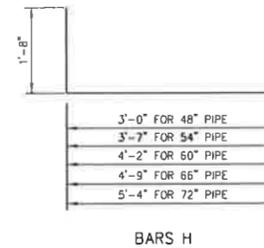
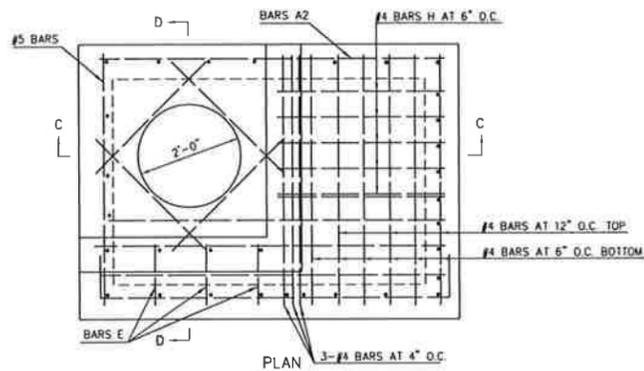
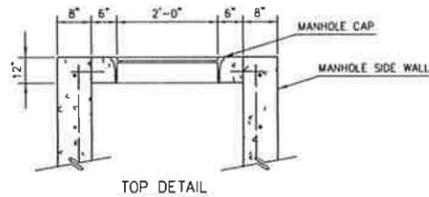


*Benjamin S. Shanklin* 4-22-16

<b>CITY OF ALVARADO</b>			
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE			
GRATE INLET AND MISCELLANEOUS STORM DRAIN DETAILS			
 CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEMAY DRIVE CLEBURNE, TEXAS 76011 TEX REG NO. F 702			
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016	
DRAWN BY: JDL/MNF		JOB NO: 11056	
CHECKED BY: BSS		SHEET NO. 21 OF 43	

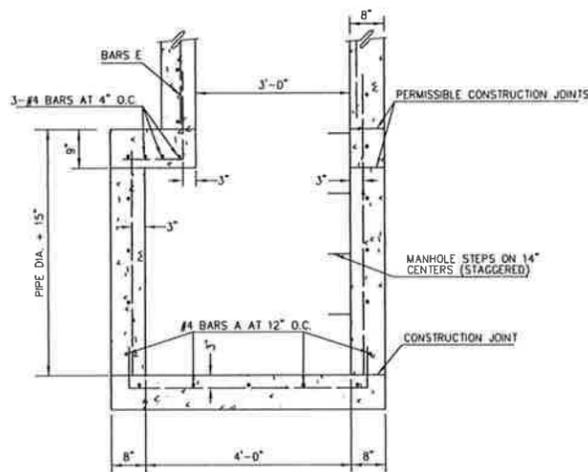


- NOTES:
- 2-#4 BARS TO EXTEND INTO MANHOLE CAP 4" AND SIDE WALL 6" PER SECTION (3" COVER BETWEEN BARS AND BETWEEN EDGE OF CONCRETE.) THESE BARS ARE TO BE SPACED ON 6" O.C. AROUND ENTIRE MANHOLE RING AND COVER.
  - STAGE II CONSTRUCTION OF THE MANHOLES WILL NOT BE BUILT UNTIL PAVEMENT PREPARATIONS ARE COMPLETE.

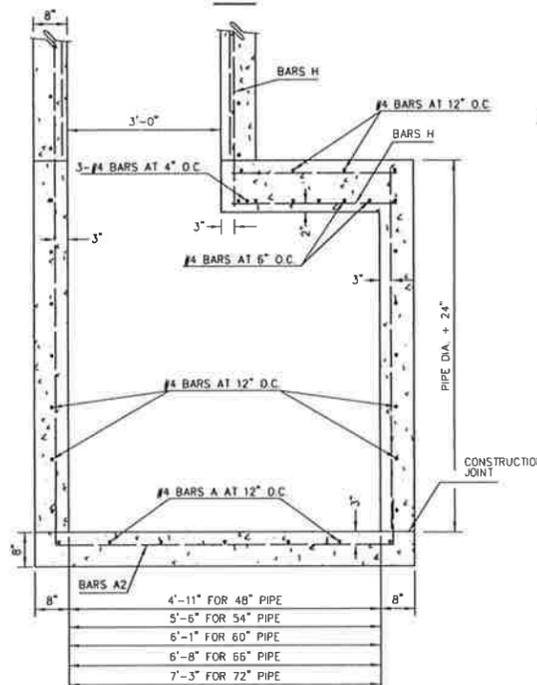


SECTION A-A

NOTE:  
FOR PIPES 36" AND UNDER, 48" DIAMETER CIRCULAR MANHOLES MAY BE SUBSTITUTED.

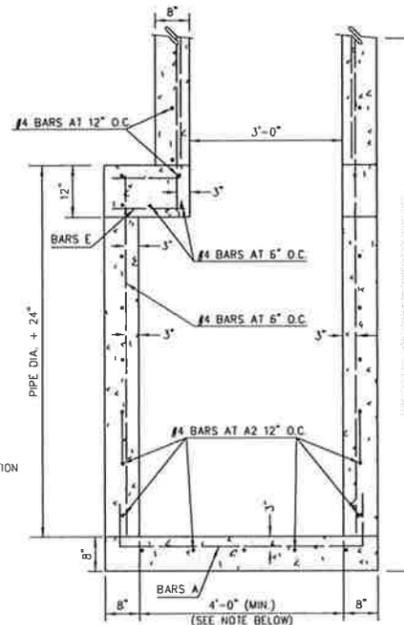


SECTION B-B



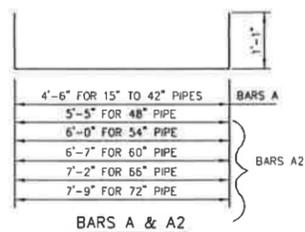
SECTION C-C

NOTE:  
IF STORM PIPE ENTERS MANHOLE IN SECTION D-D, 4'-0" DIAMETER TO BE VARIED BASED ON SECTION C-C.

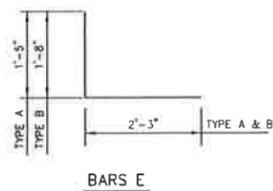


SECTION D-D

1 TYPE "A" JUNCTION BOX  
FOR 18" THRU 42" PIPES



BARS A & A2



BARS E

3 GENERAL NOTES:

- A TEMPORARY WOOD COVER SHALL BE INSTALLED AFTER STAGE 1 IS COMPLETED AND WILL REMAIN IN PLACE UNTIL STAGE II IS BEGUN. STAGE II WILL NOT BE BUILT UNTIL APPROVED BY THE CITY ENGINEER.
- APPROVAL WILL NOT BE NORMALLY GIVEN UNTIL THE SHOULDER BASE HAS BEEN COMPACTED.
- FIELD BEND OR CUT BARS AS REQUIRED TO ACCOMMODATE STORM PIPES.
- DIMENSION RELATING TO REINFORCING STEEL ARE TO CENTERS OF BARS.
- ADJUST LENGTH OF VERTICAL STEEL AS REQUIRED BY THE FLOW LINE CONSTRUCTION JOINT, TO PROVIDE A 20 DIAMETER LAP.
- CHAMFER ALL EXPOSED CORNERS 3/4" EXCEPT WHERE OTHERWISE NOTED.
- INVERTS WILL BE SHAPED WITH GROUT TO CONFORM TO THE SHAPE OF THE PIPES, BUT QUANTITIES USED SHALL NOT BE MEASURED FOR PAYMENT.
- ALL CONCRETE SHALL BE CLASS "A, 3000 P.S.I. MINIMUM.
- LOCATION GIVEN IN PLANS IS TO CENTROID OF BOTTOM STRUCTURE.
- SEE CURB INLET DETAILS FOR MANHOLE RING AND COVER DETAILS.

2 TYPE "B" JUNCTION BOX  
FOR 48" THRU 72" PIPES

NOTE: THIS IS SHT. 50-10 OF THE STANDARD CONSTRUCTION DETAILS, ORDINANCE NO. 2013-51, EFFECTIVE DATE: JANUARY 1, 2014



CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
JUNCTION BOX DETAILS		
 CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. HIGHWAY DRIVE CLEBURNE TEXAS 76031 TEL: 817.353.9700		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 22 OF 43

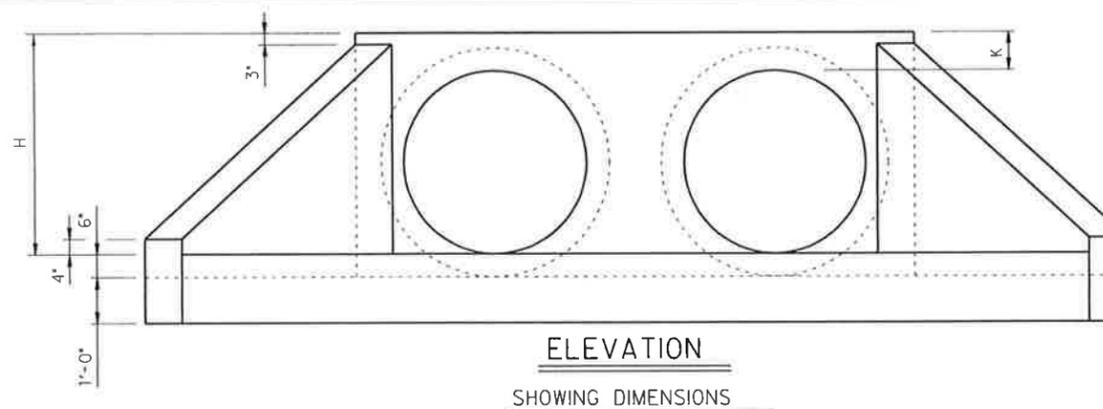
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL

SLOPE	DIA OF PIPE, D	Values for one Pipe				Values to be added for each add'l Pipe			
		W	X	Y	L	Reinf (Lbs)	Conc (CY)	X and W	Reinf (Lbs)
12"	6'-3"	2'-6"	4'-3"	4'-11"	114	0.8	1'-9"	22	0.2
15"	7'-5"	2'-9 1/2"	5'-0"	5'-9 1/4"	133	1.1	2'-2"	28	0.3
18"	8'-6 3/4"	3'-1"	5'-9"	6'-7 3/4"	166	1.3	2'-8"	37	0.5
21"	9'-8 3/4"	3'-4 1/2"	6'-6"	7'-6"	189	1.6	3'-1"	48	0.6
24"	11'-0"	3'-9 1/2"	7'-3"	8'-4 1/2"	221	2.0	3'-7"	58	0.7
27"	12'-2"	4'-1"	8'-0"	9'-2 3/4"	245	2.3	3'-11"	67	0.8
30"	13'-4"	4'-4 1/2"	8'-9"	10'-1 1/4"	287	2.7	4'-4"	77	1.0
33"	14'-5 3/4"	4'-8"	9'-6"	10'-11 3/4"	310	3.1	4'-8"	84	1.2
36"	15'-7 3/4"	4'-11 1/2"	10'-3"	11'-10"	343	3.5	5'-1"	96	1.4
42"	17'-11 1/2"	5'-6 1/2"	11'-9"	13'-6 3/4"	424	4.5	5'-10"	119	1.7
48"	21'-1 3/4"	6'-1 1/2"	14'-0"	16'-2"	527	6.1	6'-7"	146	2.3
54"	23'-5 1/2"	6'-8 1/2"	15'-6"	17'-10 3/4"	618	7.3	7'-6"	186	2.9
60"	25'-9 1/4"	7'-3 1/2"	17'-0"	19'-7 1/2"	707	8.7	8'-3"	219	3.4
66"	28'-1"	7'-10 1/2"	18'-6"	21'-4 1/4"	797	10.1	8'-9"	242	3.9
72"	30'-4 3/4"	8'-5 1/2"	20'-0"	23'-1 1/4"	910	11.7	9'-4"	272	4.4

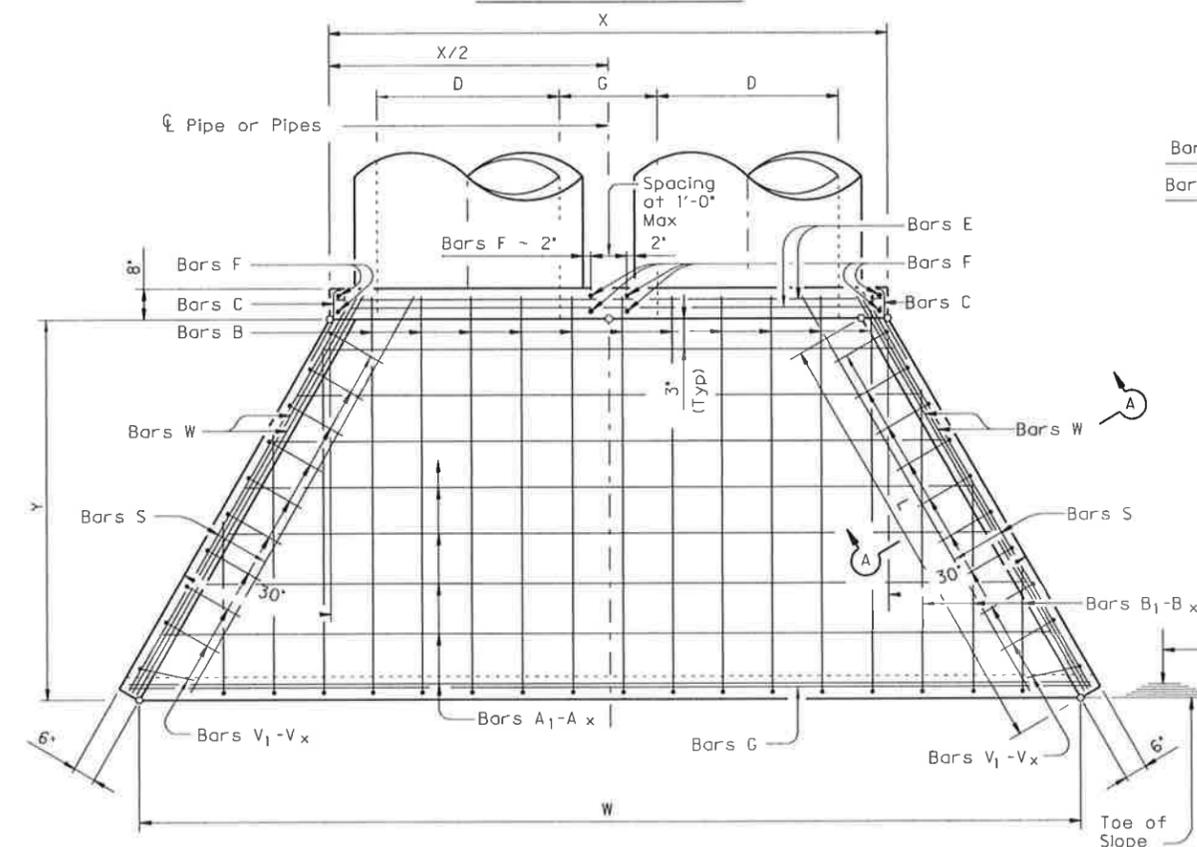
PIPE RUNNERS, CROSS PIPES, AND ANCHOR PIPES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A53 (TYPE E OR S, GRADE B), ASTM A500 (GRADE B), OR API 5LX52.

BOLTS AND NUTS SHALL CONFORM TO ASTM A307.

ALL STEEL COMPONENTS, EXCEPT THE CONCRETE REINFORCING, SHALL BE GALVANIZED AFTER FABRICATION. GALVANIZING DAMAGED DURING TRANSPORT OR CONSTRUCTION SHALL BE REPAIRED IN ACCORDANCE WITH THE SPECIFICATIONS.



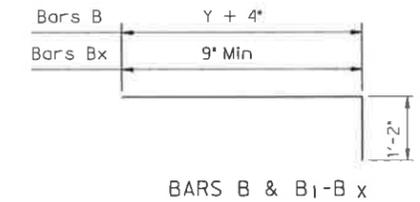
ELEVATION SHOWING DIMENSIONS



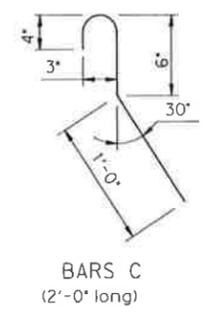
PLAN

TABLE OF REINFORCING STEEL				TABLE OF CONSTANT DIMENSIONS			
Bar	Size	Spa	No.	DIA OF PIPE, D	G	K	H
A	# 4	1'-0"	~	12"	0'-9"	1'-0"	2'-0"
B	# 3	1'-6"	~	15"	0'-11"	1'-0"	2'-3"
C	# 4	1'-0"	~	18"	1'-2"	1'-0"	2'-6"
D	# 3	1'-0"	~	21"	1'-4"	1'-0"	2'-9"
E	# 5	~	4	24"	1'-7"	1'-0"	3'-0"
F	# 5	~	~	27"	1'-8"	1'-0"	3'-3"
G	# 3	~	2	30"	1'-10"	1'-0"	3'-6"
S	# 4	~	6	33"	1'-11"	1'-0"	3'-9"
V	# 4	1'-0"	~	36"	2'-1"	1'-0"	4'-0"
W	# 5	~	4	42"	2'-4"	1'-0"	4'-6"
				48"	2'-7"	1'-3"	5'-3"
				54"	3'-0"	1'-3"	5'-9"
				60"	3'-3"	1'-3"	6'-3"
				66"	3'-3"	1'-3"	6'-9"
				72"	3'-4"	1'-3"	7'-3"

Quantities shown are for one structure end. (One headwall)

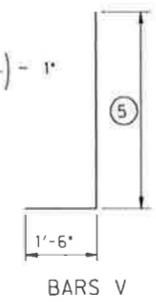


BARS B & B1-Bx



BARS C (2'-0\"/>

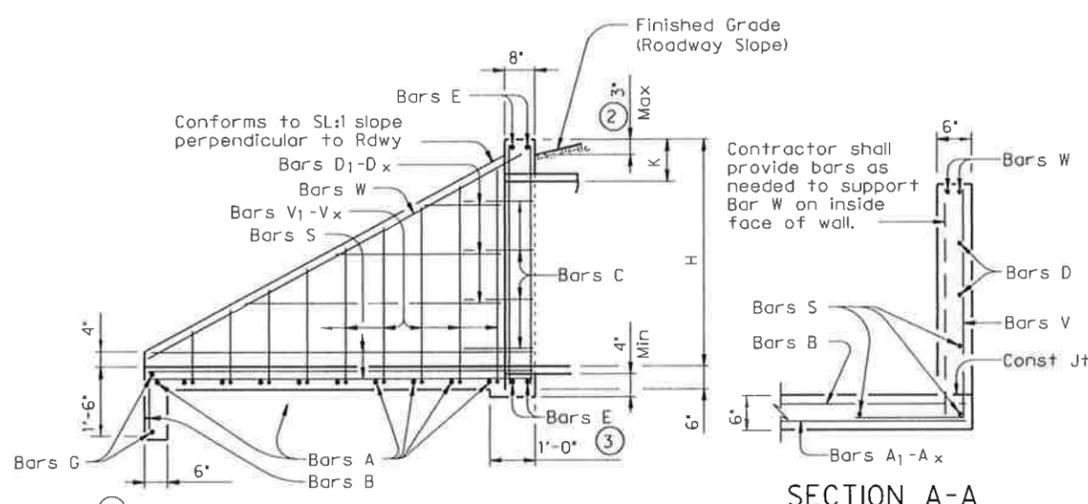
Min Length =  $6' + 3 \times \frac{12 \times H - 7}{12 \times L}$   
 Max Length =  $12 \times H - 3' \times \frac{12 \times H - 7}{12 \times L} - 1'$



BARS V

For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3' projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

GENERAL NOTES:  
 Designed according to current AASHTO Standard and Interim Specifications. Reinforcing steel shall be placed with the center of the outside layer of bars 2' from the surface of the concrete. All reinforcing steel shall be Grade 60. All concrete shall be Class 'C' and shall have a minimum 28 day compressive strength of 3600 psi.



SECTION A-A

Provide a 1'-0" footing as shown where required to maintain 4" Min cover for pipes.

TYPICAL WING ELEVATION



CH-FW-0

Texas Department of Transportation  
 Bridge Division

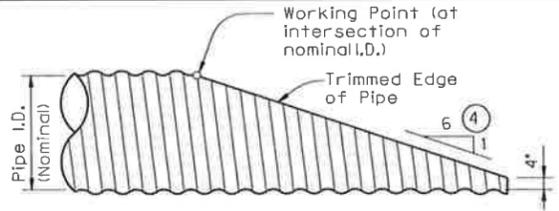
CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
 NORTH CUMMINGS DRIVE

HEADWALL DETAILS - TYPE "B"

CHILDRESS ENGINEERS  
 ENGINEERS & CONSULTANTS  
 211 N. RIDGEMAN DRIVE  
 CLEBURNE, TEXAS 76031  
 TEX REG NO. F-702

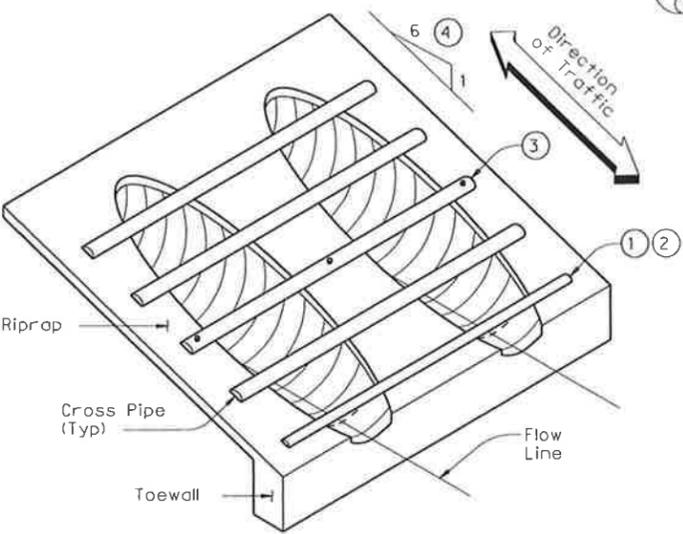
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 23 OF 43



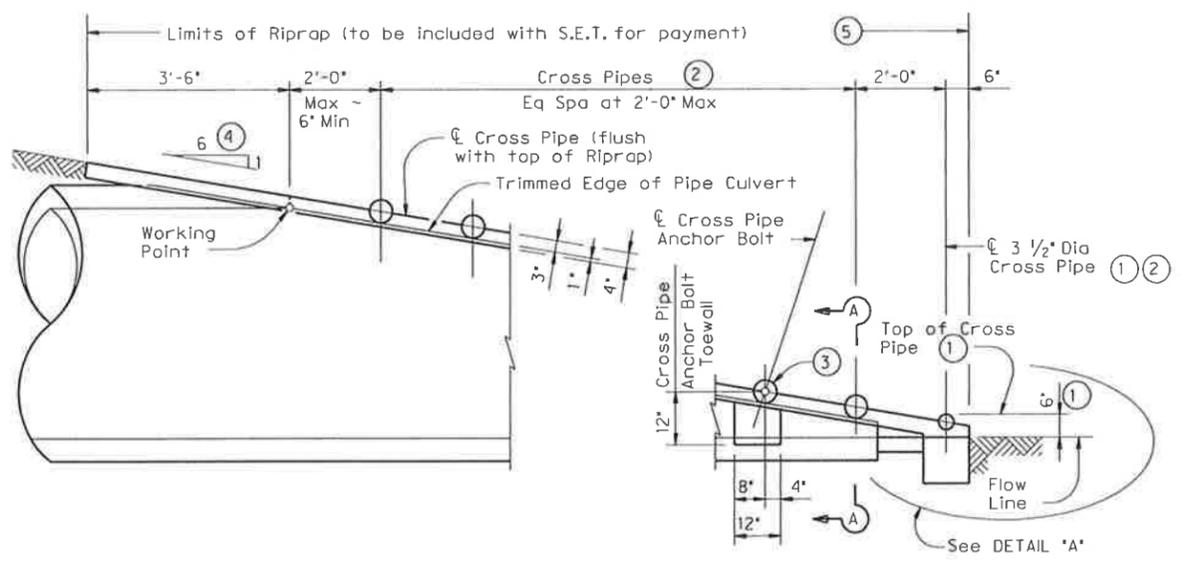
NOTE: All Cross Pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

**SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER**

(Showing Corrugated Metal Pipe Culvert.)  
(Details at Concrete Pipe Culvert are similar.)

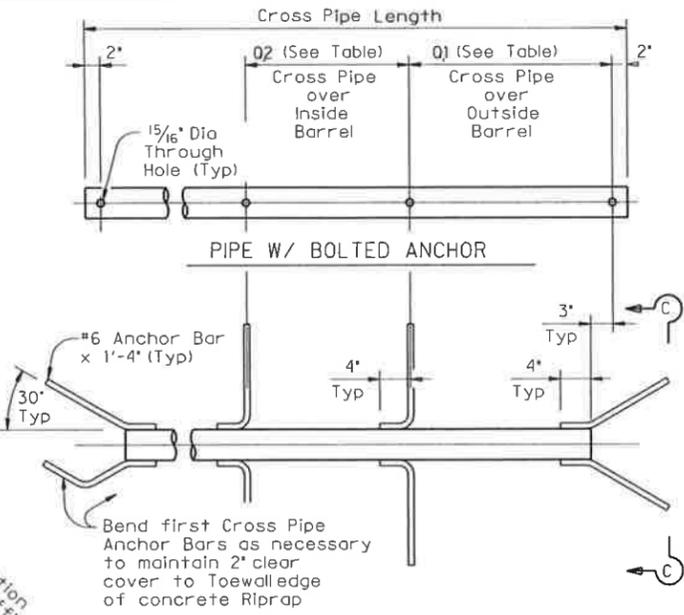


**ISOMETRIC VIEW OF TYPICAL INSTALLATION**

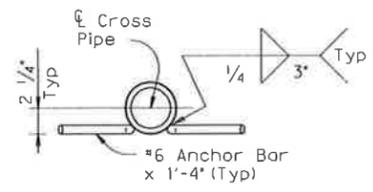


**SIDE ELEVATION OF CAST-IN-PLACE CONCRETE**

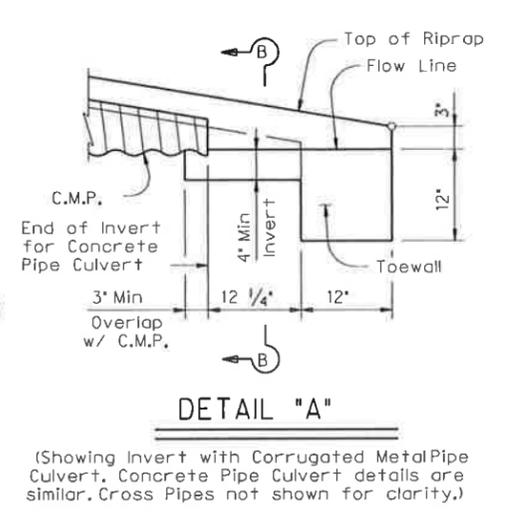
(Showing Concrete Pipe Culvert.)  
(Details at Corrugated Metal Pipe Culvert are similar.)



**PIPE W/ ANCHOR BARS**

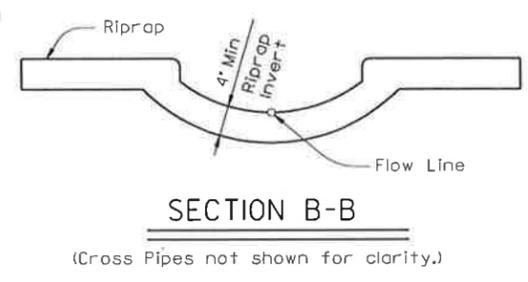


**CROSS PIPE DETAILS**



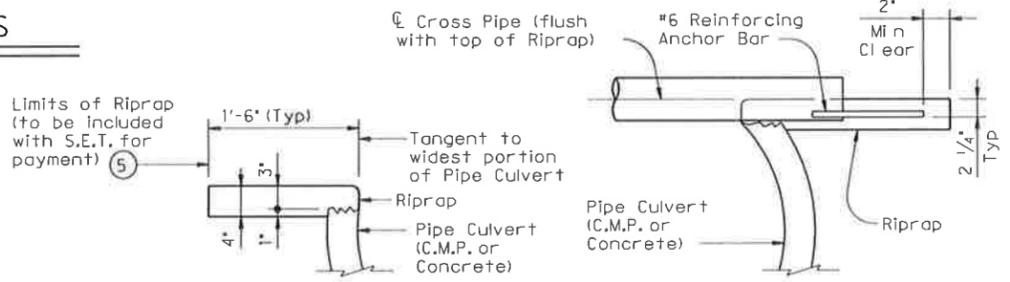
**DETAIL "A"**

(Showing invert with Corrugated Metal Pipe Culvert. Concrete Pipe Culvert details are similar. Cross Pipes not shown for clarity.)



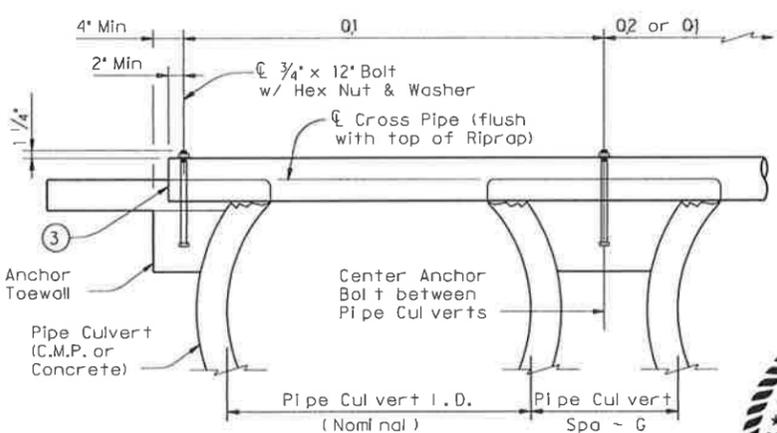
**SECTION B-B**

(Cross Pipes not shown for clarity.)



**SHOWING TYPICAL PIPE CULVERT & RIPRAP**

**SHOWING CROSS PIPE WITH ANCHOR BAR**



**SHOWING CROSS PIPE WITH BOLTED ANCHOR**

**SECTION A-A**

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, & RIPRAP QUANTITIES							Conditions for use of Cross Pipes	Cross Pipe Size
Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Q2		
12"	0.6	9'	N/A	2'-1"	1'-9"	3 or more Pipe Culverts	3' Std (3,500' O.D.)	
15"	0.7	11'	N/A	2'-5"	2'-2"			
18"	0.8	1'-2"	N/A	2'-10"	2'-8"			
21"	0.9	1'-4"	N/A	3'-2"	3'-1"			
24"	0.9	1'-7"	N/A	3'-6"	3'-7"			
27"	1.0	1'-8"	N/A	3'-10"	3'-11"	3 or more Pipe Culverts	3 1/2' Std (4,000' O.D.)	
30"	1.1	1'-10"	N/A	4'-2"	4'-4"	2 or more Pipe Culverts		
33"	1.2	1'-11"	4'-2"	4'-5"	4'-8"	All Pipe Culverts	4' Std (4,500' O.D.)	
36"	1.3	2'-1"	4'-5"	4'-9"	5'-1"			
42"	1.5	2'-4"	4'-11"	5'-5"	5'-10"			
48"	1.7	2'-7"	5'-5"	6'-0"	6'-7"	All Pipe Culverts	5' Std (5,563' O.D.)	
54"	2.0	3'-0"	5'-11"	6'-9"	7'-6"			
60"	2.2	3'-3"	6'-5"	7'-4"	8'-3"			
66"	2.4	3'-3"	6'-11"	7'-10"	8'-9"			
72"	2.7	3'-4"	7'-5"	8'-5"	9'-4"			

- The proper installation of the first Cross Pipe is critical for vehicle safety. The top of the first Cross Pipe must be placed at no more than 6' above the flow line.
- Size of Cross Pipes, except the first bottom pipe, shall be as shown in the PIPE SIZE table. The first bottom pipe shall be 3 1/2' Standard Pipe (4' O.D.).
- The third Cross Pipe from the bottom of the Culvert shall always be installed using a bolted connection. Care shall be taken to ensure that Riprap concrete does not flow into the Cross Pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, all other Cross Pipes may also be installed using the bolted connection details.
- Match Cross Slope as shown elsewhere in the plans. Cross Slope of 6:1 or flatter is required for vehicle safety.
- Riprap placed beyond the limits shown will be paid as Concrete Riprap in accordance with Item 432, 'Riprap'.
- Quantities shown are for one end of one reinforced Concrete Pipe Culvert. For multiple pipe culverts or for Corrugated Metal Pipe Culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

**GENERAL NOTES:**

Cross Pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, 'Safety Treatment of Roadside Parallel-Drainage Structures', Texas Transportation Institute, March 1981.

Safety End Treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the Cross Pipes.

Riprap and all necessary inverts shall be Concrete Riprap conforming to the requirements of Item 432, 'Riprap'.

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment. Cross Pipes shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Bolts and nuts shall conform to ASTM A307. All steel components, except concrete reinforcing, shall be galvanized after fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

**SETP-PD**

Texas Department of Transportation  
Bridge Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

SAFETY END TREATMENT DETAILS

CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEMAN DRIVE  
CLEBURNE, TEXAS 76031  
TEX. REG. NO. F-702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 24 OF 43



*Benjamin S. Shanklin*  
4-22-16

TABLE OF DIMENSIONS & REINFORCING STEEL  
(Wings for One Structure End)

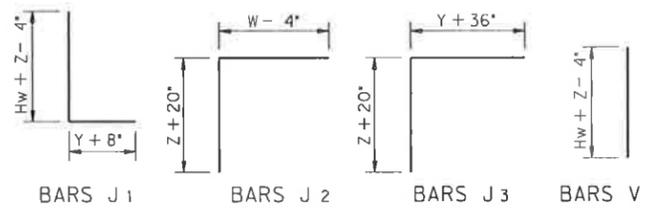
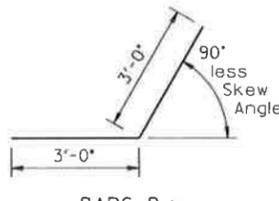
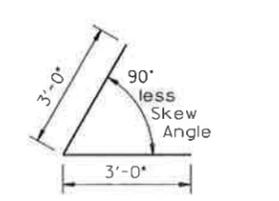
Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing (2-Wings)		Estimated Quantities per ft of Toewall (1-Toewall)	
	W	X	Y	Z	Bars J1	Bars J2	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	#4	1'-0"	#4	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	#4	1'-0"	#4	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	#4	1'-0"	#4	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	#4	1'-0"	#4	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	#4	1'-0"	#4	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	#4	1'-0"	#4	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	#4	1'-0"	#4	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	#4	1'-0"	#4	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	#4	1'-0"	#4	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	#5	1'-0"	#5	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	#5	1'-0"	#5	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	#5	1'-0"	#5	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	#5	1'-0"	#5	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	#5	6"	#5	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	#5	6"	#5	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	#5	6"	#5	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	#5	6"	#5	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	#6	6"	#6	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	11"	#6	#6	6"	#6	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	#6	6"	#6	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	#6	6"	#6	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	#6	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	#6	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING (2-Wings)

Bar	Size	No.	Spa
D1	#6	-	1'-0"
D2	#6	-	1'-0"
E1	#4	-	1'-0"
F	#4	-	1'-0"
G	#6	-	8"
M1	#4	4	-
P	#4	-	1'-0"
V	#4	-	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	-	1'-0"
M2	#4	2	-
E2	#4	-	1'-0"



WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

Hw = H + T + C  
 Lw = (Hw)(SL) Cosine θ for Ty PW-1  
 = (Hw - 1')(SL) Cosine θ for Ty PW-2 and Hw 4' ≥  
 = (Hw - 0.5')(SL) Cosine θ for Ty PW-2 and Hw 4' <

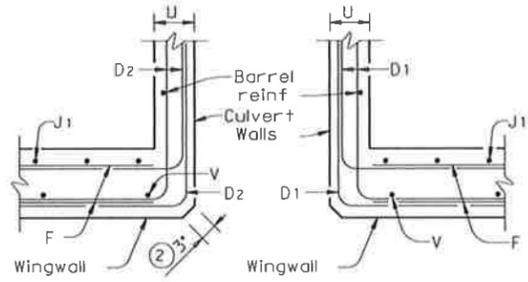
For Cast-in-place culverts:  
 Ltw = [(N)(S) + (N + 1)(U)] Cosine θ

For Precast culverts:  
 Ltw = [(N)(2U + S) + (N + 1)(0.5')] Cosine θ

Total Wingwall Area (Two Wings ~ SF)  
 = (2)(Hw)(Lw) for Ty PW-1  
 = (2)(Hw)(Lw) - 6 SF for Ty PW-2 and Hw 4' ≥  
 = (2)(Hw)(Lw) - 1.5 SF for Ty PW-2 and Hw 4' <

Hw = Height of Wingwall  
 Lw = Length of Wingwall  
 Ltw = Culvert Toewall Length  
 N = Number of Culvert Spans  
 SL:1 = Channel Slope ratio, (Horizontal:1 Vertical, Usual value is 2:1)  
 θ = Culvert Skew

See applicable box culvert standard for S, H, T and U values.



SECTION C-C

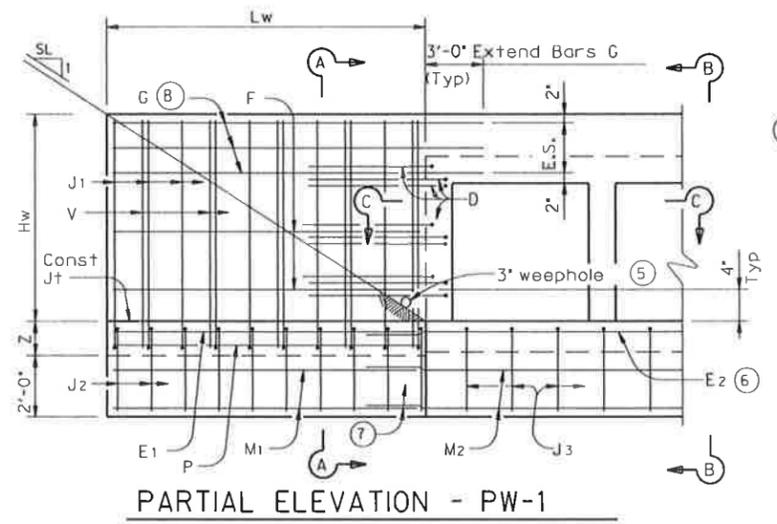
- Skew Angle = 0°
- At discharge end, chamfer may be 3/4".
- For 15° Skew ~ 1'  
For 30° Skew ~ 2'  
For 45° Skew ~ 3'
- Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
- Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
- Extend Bars E 2'-6" minimum into the wingwall footing.
- Lap Bars M1 1'-6" minimum with Bars M2
- Bars G equally spaced at 8" maximum, place as shown. Provide at least two pair Bars G per wing.
- 0' min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- For vehicle safety, the following requirements must be met:  
 - For structures without bridge rail, curbs cannot project more than 3' above finished grade.  
 - For structures with bridge rail, build curbs flush with finished grade.  
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- 1'-0" typical, 2'-0" typical when RAC standard is referenced elsewhere in the plans.
- 3'-0" for Hw < 4'.
- 6" for Hw < 4'.

GENERAL NOTES:

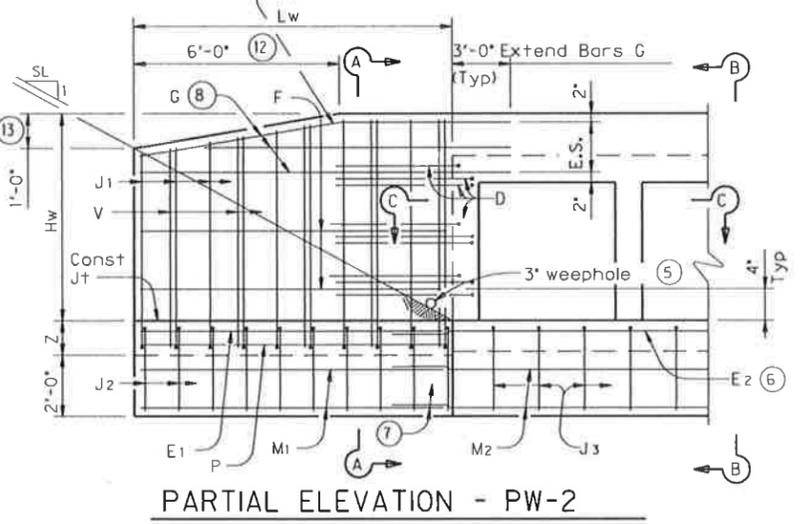
Designed in accordance with AASHTO LRFD Bridge Design Specifications.  
 Provide Class 'C' Concrete (f'c = 3,600 psi Min) and Grade 60 reinforcing steel.  
 Provide 1/4" Min clear cover to reinforcing steel.  
 Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.  
 See BCS sheet for wingwall type and additional dimensions and information.  
 The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

DESIGNER NOTES:

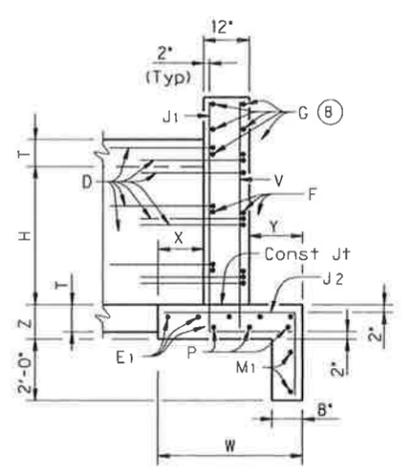
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.  
 Type PW-2 can only be used for applications without a railing mounted to the wingwall.



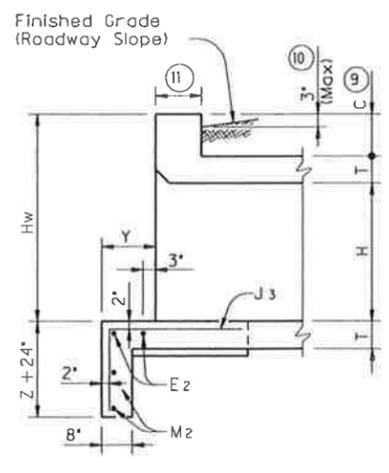
PARTIAL ELEVATION - PW-1



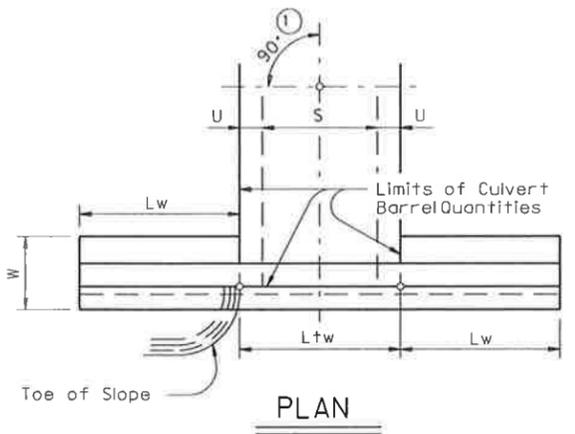
PARTIAL ELEVATION - PW-2



SECTION A-A  
(Showing Wing Reinf)



SECTION B-B  
(Showing Wing Reinf)



DETAILS FOR NON-SKEWED BOX CULVERTS



		Bridge Division Standard
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS		
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLUBHOUSE, TEXAS 76033 TEX. REG. NO. F-300		
DESIGNED BY: BSS	REV. BY: JDL/MNF	DATE: APRIL 2016
DRAWN BY: JDL/MNF	CHECKED BY: BSS	JOB NO: 11056
		SHEET NO. 25 OF 43

TABLE OF DIMENSIONS & REINFORCING STEEL  
(Wings for One Structure End)

Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing length (2-Wings)	
	W	X	Y	Z	Bars J1		Bars J2		Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	2'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING (2-Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

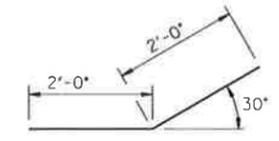
Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION CALCULATIONS:

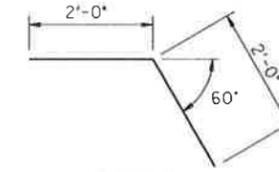
Formulas: (All values are in Feet)  
 $H_w = H + T + C - 0.250'$   
 $A = (H_w - 0.333') (SL)$   
 $B = (A) \text{Tangent } (30^\circ)$   
 $L_w = (A) \text{Cosine } (30^\circ)$   
 For Cast-in-place culverts:  
 $L_{tw} = (N) (S) (N + 1) (U)$   
 For Precast culverts:  
 $L_{tw} = (N) (2U) S + (N + 1) (0.500')$   
 Total Wingwall Area (Two Wings ~ S.F.) =  $(H_w - 0.333') (L_w)$

$H_w$  = Height of Wingwall  
 $SL:1$  = Side Slope Ratio (Horizontal:1 Vertical)  
 $L_w$  = Length of Wingwall  
 $L_{tw}$  = Culvert Toewall Length  
 $N$  = Number of Culvert Spans  
 See applicable box culvert standard for H, S, T, and U values.

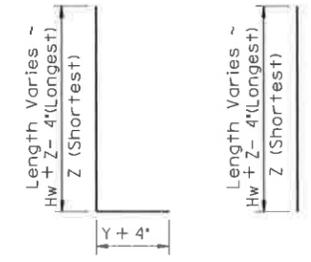
- Extend Bars P 3'-0" minimum into bottom slab of Box Culvert.
- Adjust to fit as necessary to maintain 1/4" clear cover and 4" minimum between bars.
- Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.
- Recommended values of Slope are: 2:1, 3:1, 4:1, & 6:1.
- When shown elsewhere on the plans, a 5' deep concrete riprap shall be constructed. Payment for riprap shall be as required by Item 432, 'Riprap'. Unless otherwise shown on the plans or directed by the Engineer, the riprap shall have a 6" wide by 1'-6" deep reinforced concrete toewall along all edges adjacent to natural ground; the toewall shall be reinforced by extending typical riprap reinforcing into the toewall; construction joints or grooved joints, oriented in the direction of flow, shall extend across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.
- At Contractor's option, Culvert Toewall may be ended flush with Wingwall Toewall. Adjust reinforcing from that shown as necessary.
- 0' min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- For vehicle safety, curb heights and wall heights shall be reduced, if necessary, to provide a maximum 3' projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.



BARS D

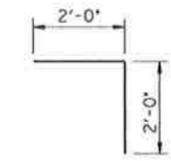


BARS R

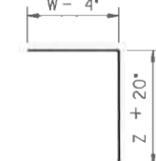


BARS J1

BARS V



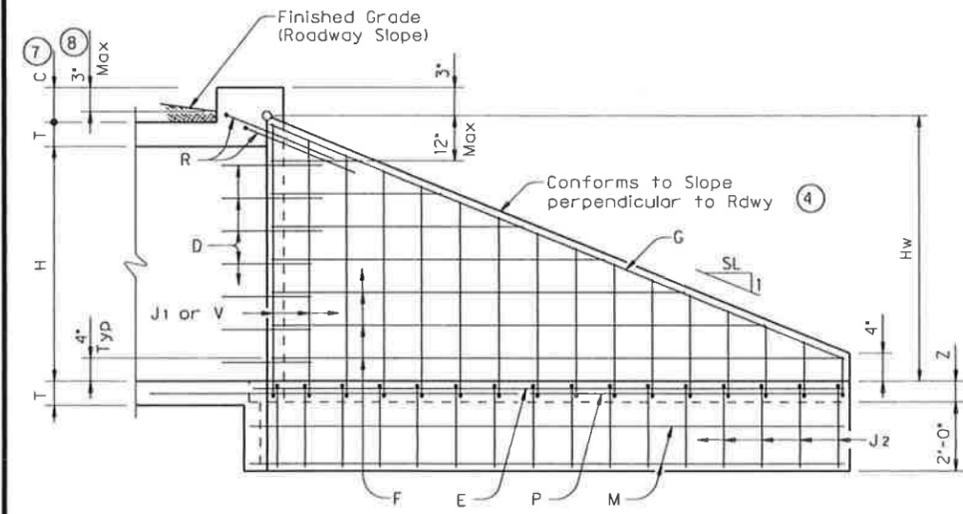
BARS L



BARS J2

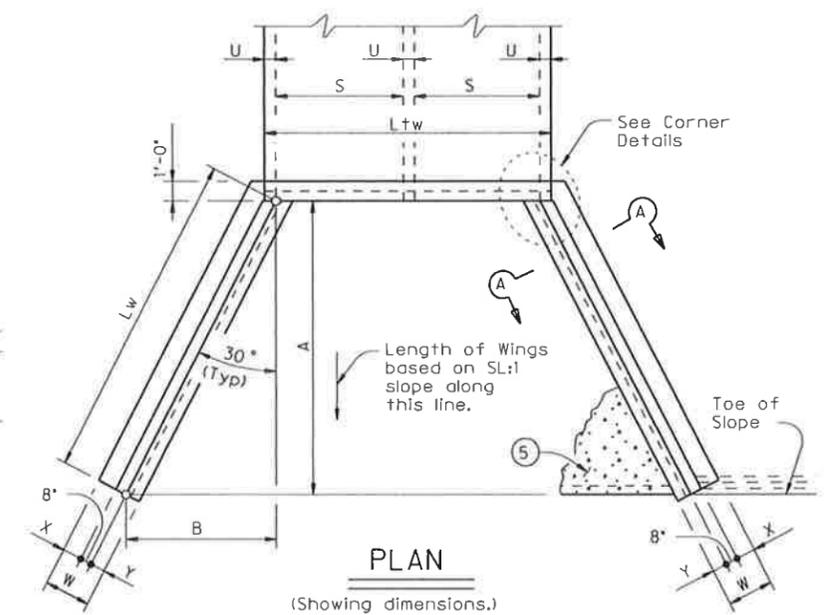
GENERAL NOTES:

Designed according to AASHTO LRFD Specifications. All reinforcing steel shall be Grade 60. Synthetic fibers listed on the 'Fibers for Concrete' Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. All concrete shall be Class 'C' and shall have a minimum compressive strength of 3600 psi. All reinforcing bars shall be adjusted to provide a minimum of 1/4" clear cover. When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer. See BCS sheet for additional dimensions and information. The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.



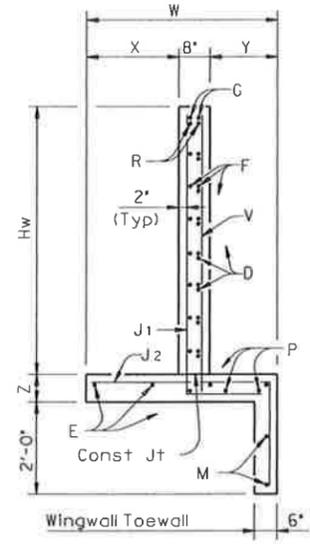
INSIDE ELEVATION

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

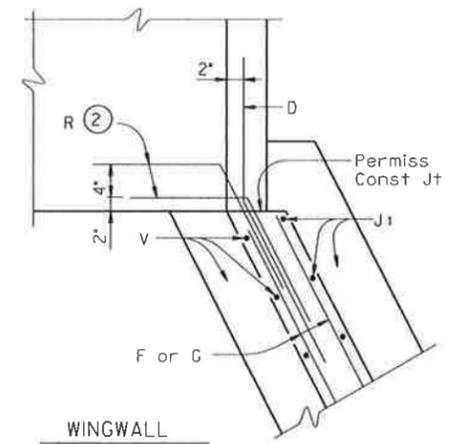


PLAN

(Showing dimensions.)



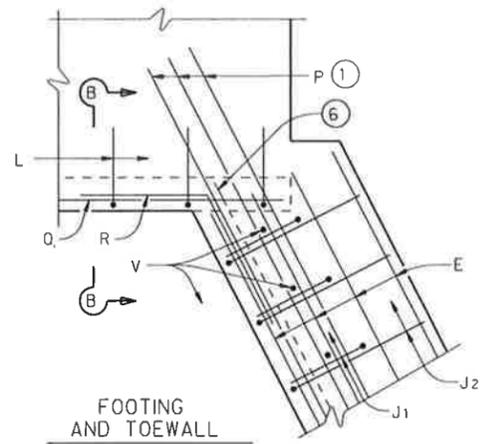
SECTION A-A



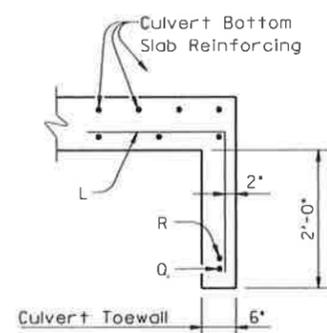
WINGWALL

CORNER DETAILS

(Culvert and Culvert Toewall reinforcing not shown for clarity.)



FOOTING AND TOEWALL



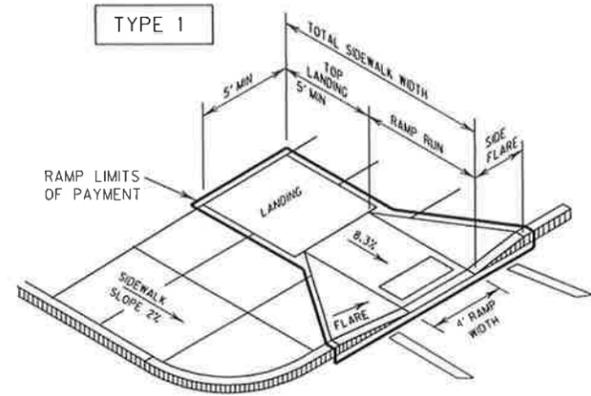
SECTION B-B



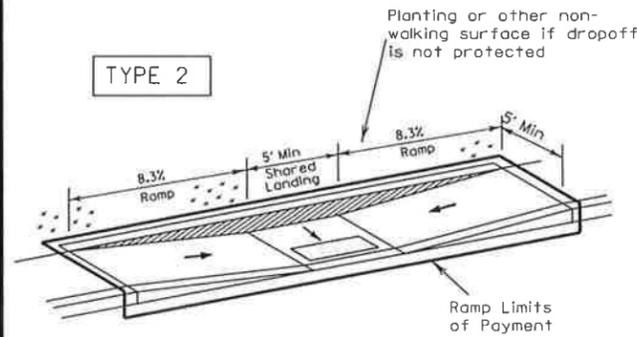
Benjamin S. Shanklin  
4-22-10

		Bridge Division Standard
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
CONCRETE WINGWALLS WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS		
CHILDRESS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE TEXAS 76031 TEX REG NO. P-712		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 26 OF 43

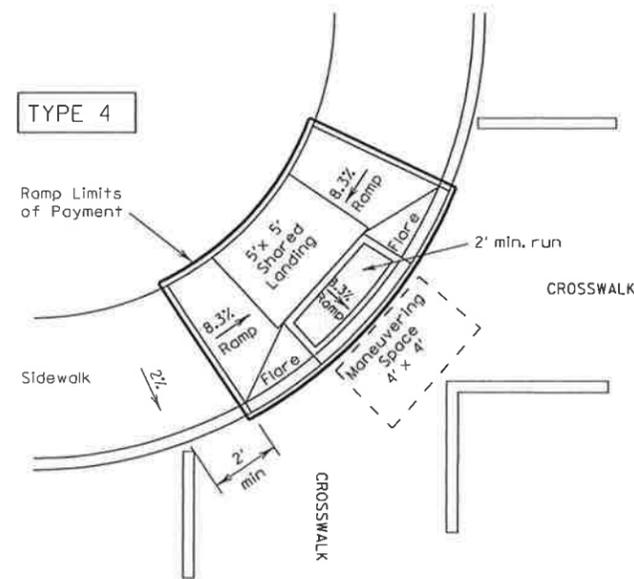




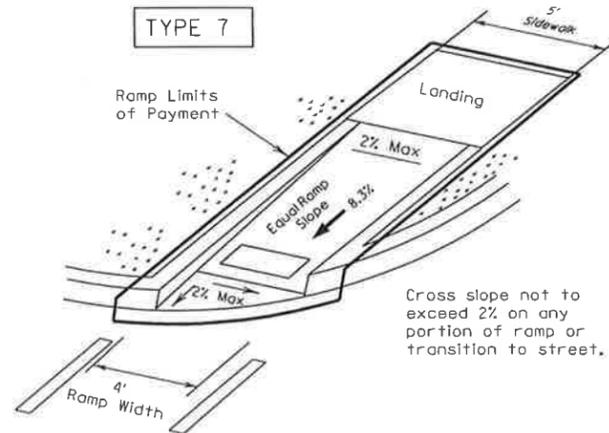
PERPENDICULAR CURB RAMP



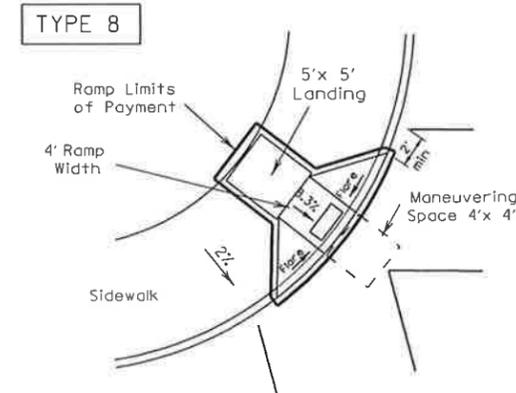
PARALLEL CURB RAMP  
(Use only where water will not pond in the landing.)



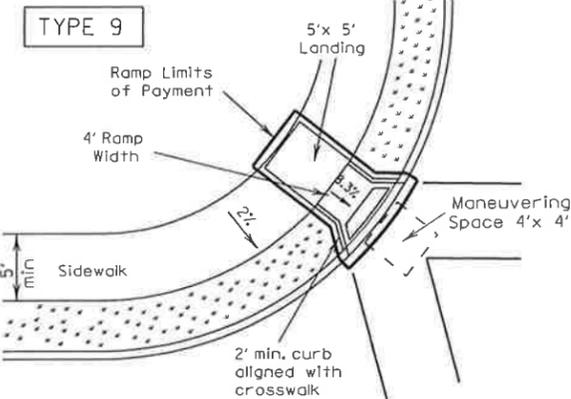
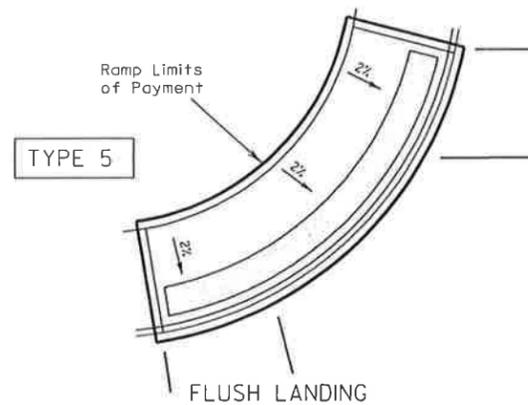
DIAGONAL COMBINATION CURB RAMP  
Perpendicular to the Tangent of the Curb Radius and Contained in Crosswalk



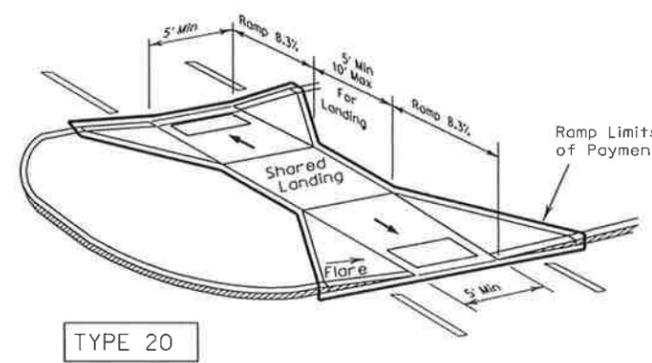
DIRECTIONAL RAMP WITHIN RADIUS  
(Sidewalk set back from curb)



DIAGONAL CURB RAMP (FLARED SIDES)

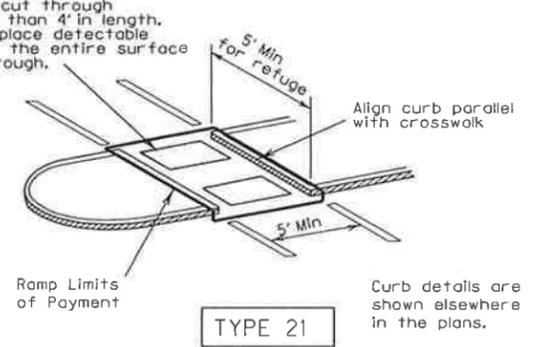


DIAGONAL CURB RAMP (RETURNED CURB)



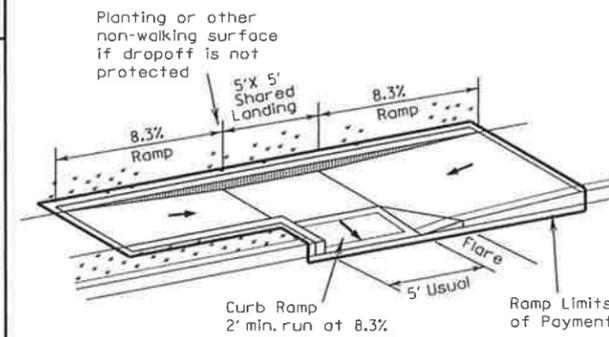
TYPE 20

CURB RAMPS AT MEDIAN ISLANDS

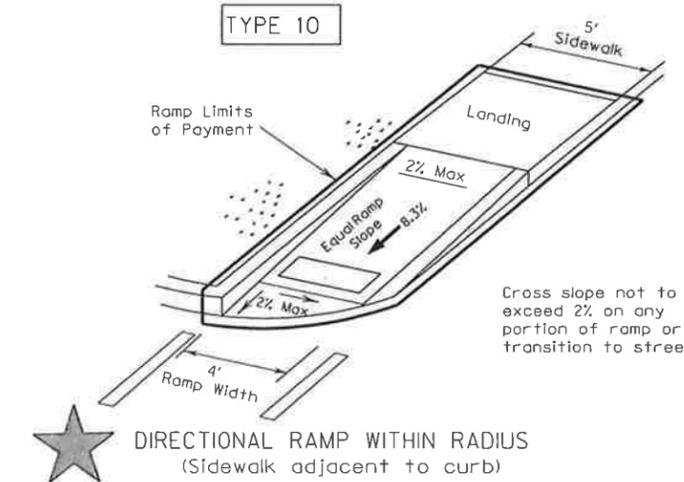


TYPE 21

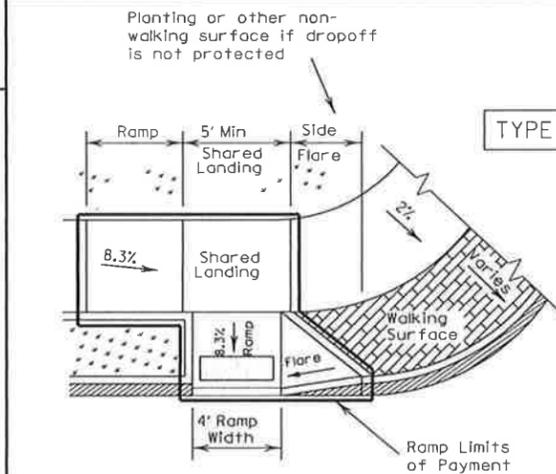
Curb details are shown elsewhere in the plans.



TYPE 3

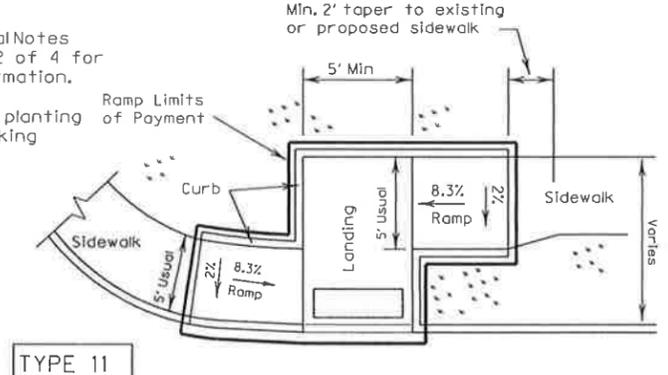


DIRECTIONAL RAMP WITHIN RADIUS  
(Sidewalk adjacent to curb)

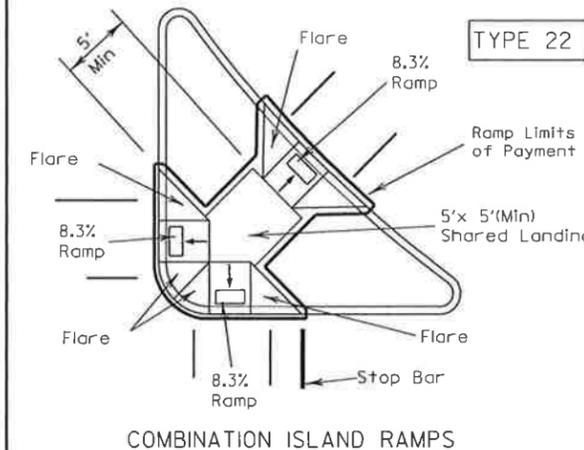


COMBINATION CURB RAMPS

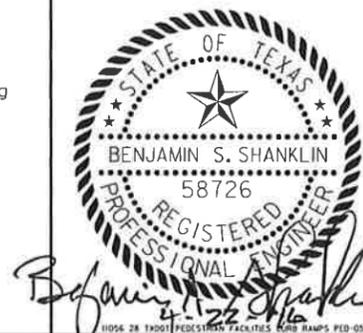
NOTES:  
See General Notes on sheet 2 of 4 for more information.  
\* Denotes planting or non-walking surface.



OFFSET PARALLEL CURB RAMP



COMBINATION ISLAND RAMPS

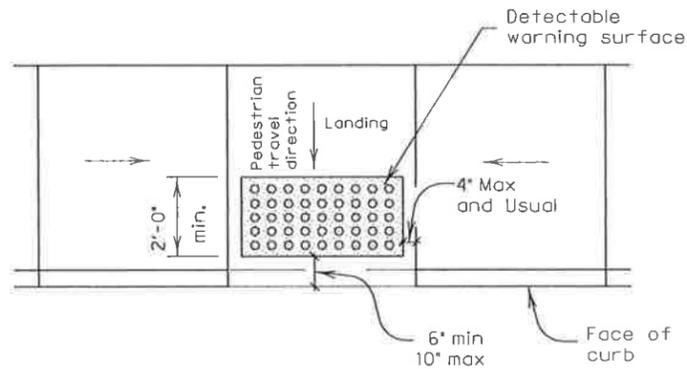


CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
PEDESTRIAN FACILITIES CURB RAMPS - PED-05		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 28 OF 43

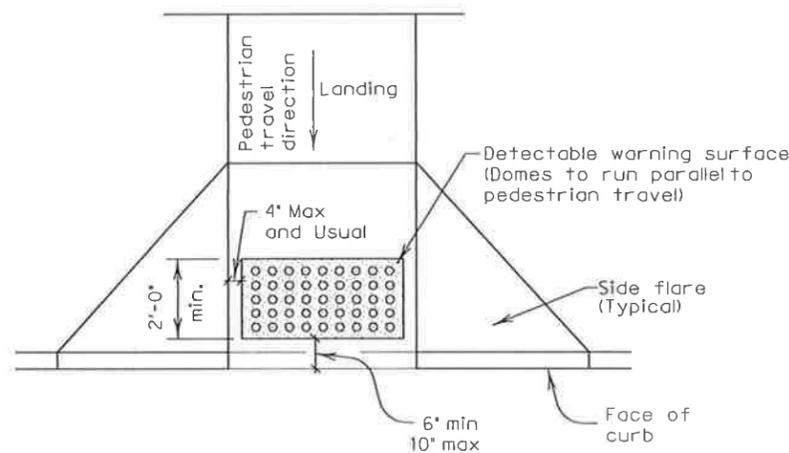
**DETECTABLE WARNINGS**

**General Notes for Detectable Warnings**

1. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 4.29 of the Texas Accessibility Standards (TAS). The surface must contrast visually with adjoining surfaces, including side flares. Furnish dark brown or dark red detectable warning surface adjacent to uncolored concrete, unless specified elsewhere in the plans.
2. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
3. Align truncated domes in the direction of pedestrian travel when entering the street.
4. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.
5. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the fullwidth of the curb ramp or landing where the pedestrian access route enters the street.
6. Detectable warning surfaces shall be located so that the edge nearest the curb line is a minimum of 6" and a maximum of 10" from the extension of the face of curb. Detectable warning surfaces may be curved along the corner radius.
7. TxDOT maintains a list of Qualified Detectable Warning Materials. Details are provided herein for the placement of landscape pavers. For other materials, refer to the manufacturer's product manual for proper installation.



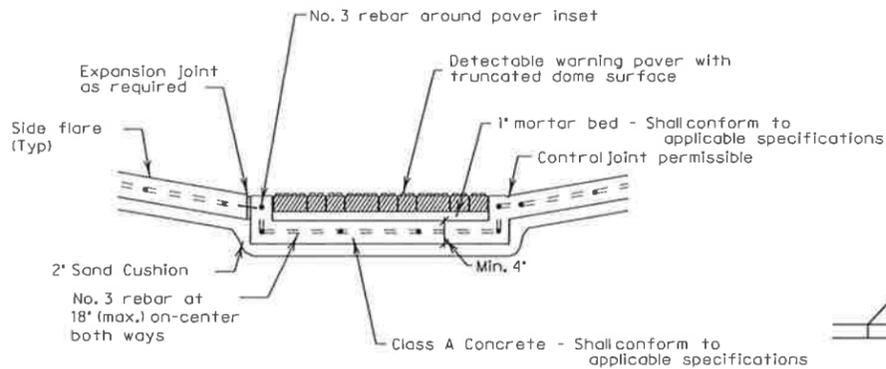
Typical placement of detectable warning surface on landing at street edge.



Typical placement of detectable warning surface on sloping ramp run.

**Pedestrian Facilities General Notes**

1. All slopes are maximum allowable. The least possible slope that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
2. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is encouraged. Where a 5' sidewalk can not be provided due to site constraints, a minimum 3' sidewalk with 5' x 5' passing areas at intervals not to exceed 200' is required.
3. Landings shall be 5' x 5' minimum with a maximum 2% slope in any direction.
4. Maneuvering space at the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
5. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
6. Curb ramps with returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planting or other non-walking surface or because the side approach is substantially obstructed. Otherwise, provide flared sides.
7. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68102.
8. To serve as a pedestrian refuge area, the median should be a minimum of 5' wide. Medians should be designed to provide accessible passage over or through them.
9. Small channelization islands, which do not provide a minimum 5' x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
10. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall be aligned with theoretical crosswalks, or as directed by the Engineer.
11. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.
12. Handrails are not required on curb ramps. Provide curb ramps wherever on accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 'Sidewalks'.
14. Separate curb ramp and landings from adjacent sidewalk and any other elements with pre-mold or board joint of 3/4" unless otherwise directed by the Engineer.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Flare slope shall not exceed 10% measured along curb line.

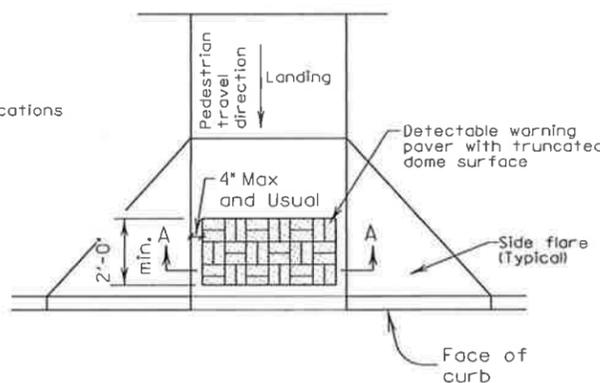


Section A-A

**General Notes (Pavers)**

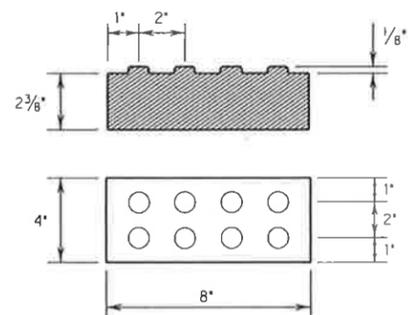
Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.

Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.



Truncated Dome Pattern Curb Ramp

**DETECTABLE WARNING PAVER (OPTION)**



Detectable Warning Paver



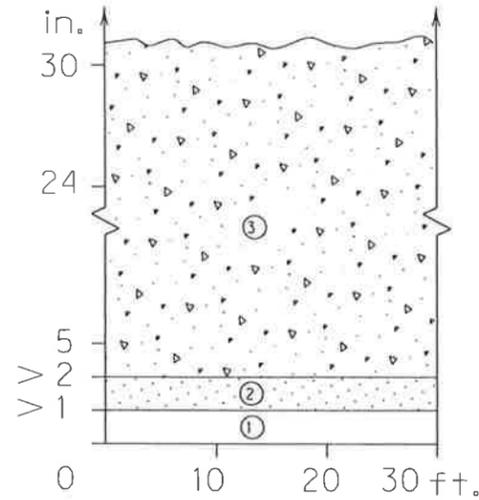
*Benjamin S. Shanklin*  
4-22-16

CITY OF ALVARADO STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
PEDESTRIAN FACILITIES GENERAL NOTES DETECTABLE WARNINGS PED-05		
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76033 TEX. REG. NO. P-702		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 29 OF 43

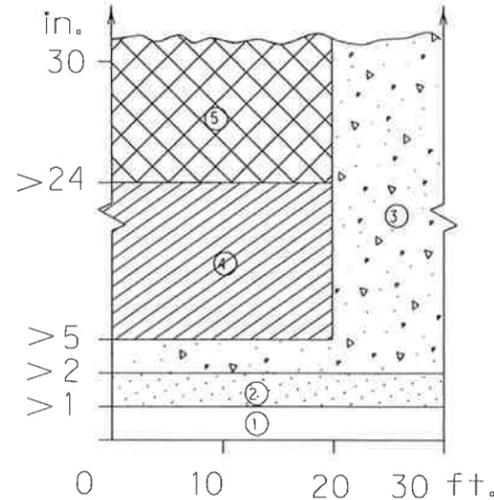
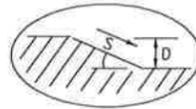


DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

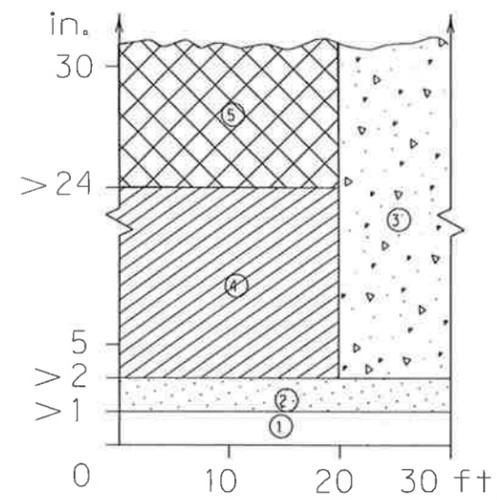
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



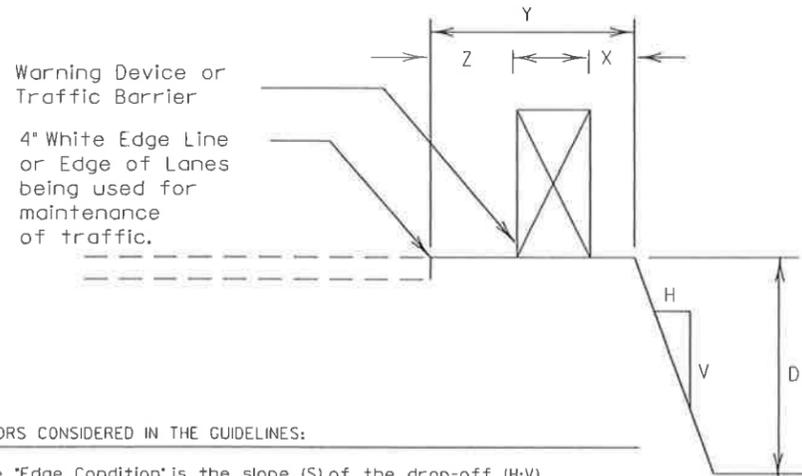
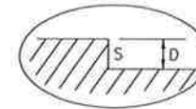
Edge Condition I  
S = (3:1) (or flatter)



Edge Condition II  
S = ((2.99):1) to (1:1)



Edge Condition III  
S is steeper than (1:1)



FACTORS CONSIDERED IN THE GUIDELINES:

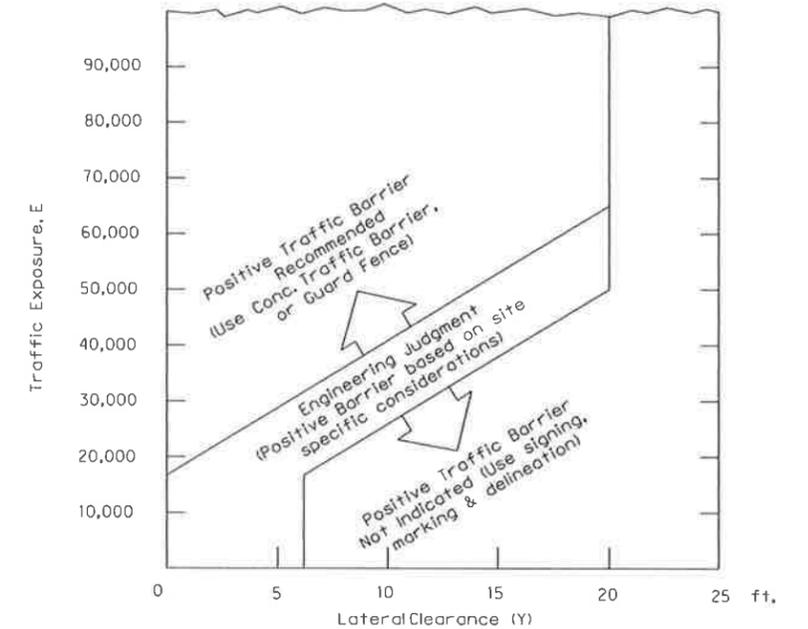
- The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
- Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
- In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
- The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
- If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Zone	Treatment Types Guidelines:
①	No treatment.
②	CW 8-11 "Uneven Lanes" signs.
③	CW 8-9a "Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
④	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check Indications (Figure-1) for positive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

Edge Condition Notes:

- Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
- Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exceeds 24 inches, the possibility for rollover is greater in most vehicles.
- Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
- Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ( )



- $E = ADT \times T$   
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
- An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exist parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.



Texas Department of Transportation

CITY OF ALVARADO

STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE

WORKSHEET FOR EDGE CONDITION TREATMENT TYPES

CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76033  
TEX REG. NO. F-302

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 31 OF 43

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 traffic control devices, construction pavement markings, and typical construction 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) "Policy on the Geometric Design of Highways and Streets" or the TxDOT "Roadway Design Manual".
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 will 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 will be revised to show appropriate work zone distance.
7. The Engineer may require duplicate construction 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 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 OBSERVE WARNING SIGNS STATE LAW, BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of 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.

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
 Traffic Operations Division - TE  
 Texas Department of Transportation  
 125 East 11th Street  
 Austin, Texas 78701-2483  
 Phone (512) 416-3120  
 Fax (512) 416-3299

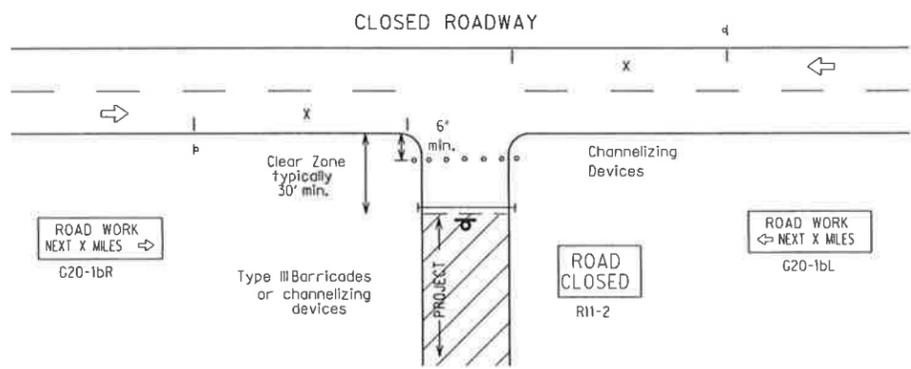
Instructions to locate the "CWZTCD" on TxDOT website are:

Start at website - [www.dot.state.tx.us](http://www.dot.state.tx.us)  
 Click on "About TxDOT",  
 Click on "Organizational Chart",  
 Click on Traffic Operations Box,  
 Click on "Compliant Work Zone Traffic Control Devices",  
 Click on "View PDF".  
 This site is printable.

1 of 12 BC(1)-03

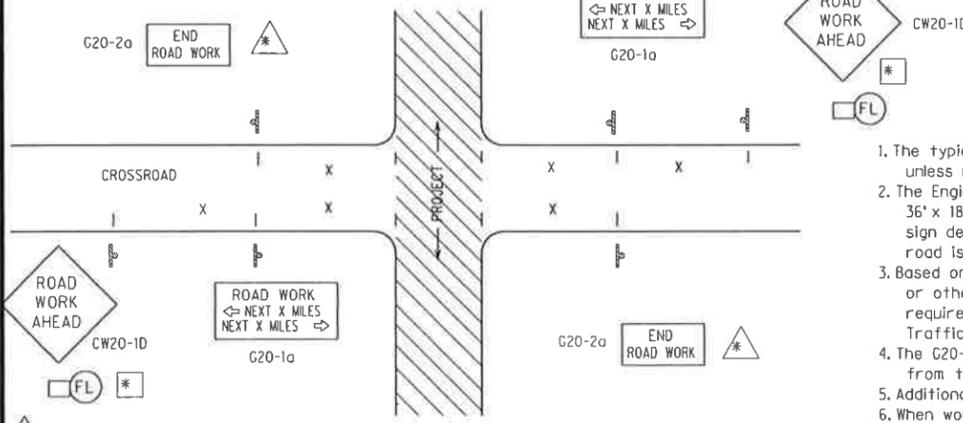


 STANDARD PLANS TEXAS DEPARTMENT OF TRANSPORTATION <i>Traffic Operations Division</i>		
CITY OF ALVARADO		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS		
 CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEMAN DRIVE CLEBURNE, TEXAS 76033 TEX. REG. NO. P 702		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 32 OF 43

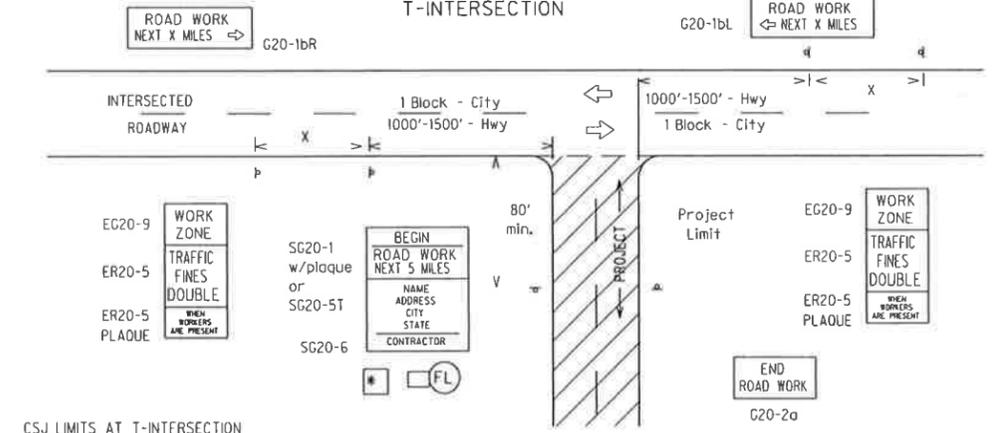


Barricades or channelizing devices shall be erected completely across roadway. Drums, vertical panels or cones shall be used in place of Type III Barricades when shown in plans or as specified by the Engineer.

TYPICAL LOCATION OF CROSSROAD SIGNS



May be mounted on back of CW20-1D sign with approval of engineer. (See note 2 at right)

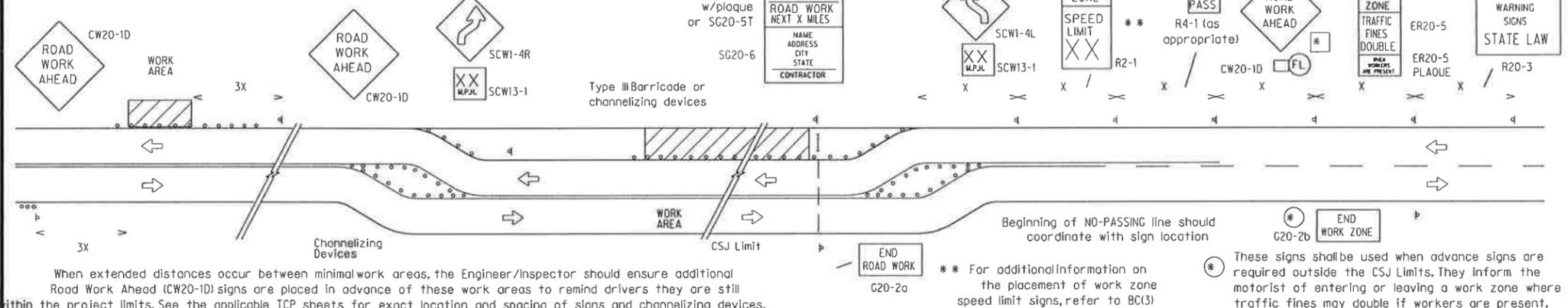


CSJ LIMITS AT T-INTERSECTION

1. A ROAD WORK NEXT X MILES (G20-1bR(L)) sign should be erected on the intersected highway as shown above.
2. 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.
3. The Engineer/Inspector shall ensure that construction work zone signs are installed with adequate spacing between the signs so the legibility of existing permanent and other work zone signs is not obstructed.

1. The typical minimum signing on a crossroad approach should be a CW20-1D ROAD WORK AHEAD sign and a G20-2a END ROAD WORK sign, unless noted otherwise in plans.
2. The Engineer may use the reduced size 36' x 36' ROAD WORK AHEAD (MCW20-1D) sign mounted back to back with the reduced size 36' x 18' END ROAD WORK (SG20-2a) sign on low volume crossroads. 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 G20-1a sign shall be required on major 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.

TYPICAL DETAILS FOR WORK AREAS IN VARIOUS LOCATION WITHIN CSJ LIMITS

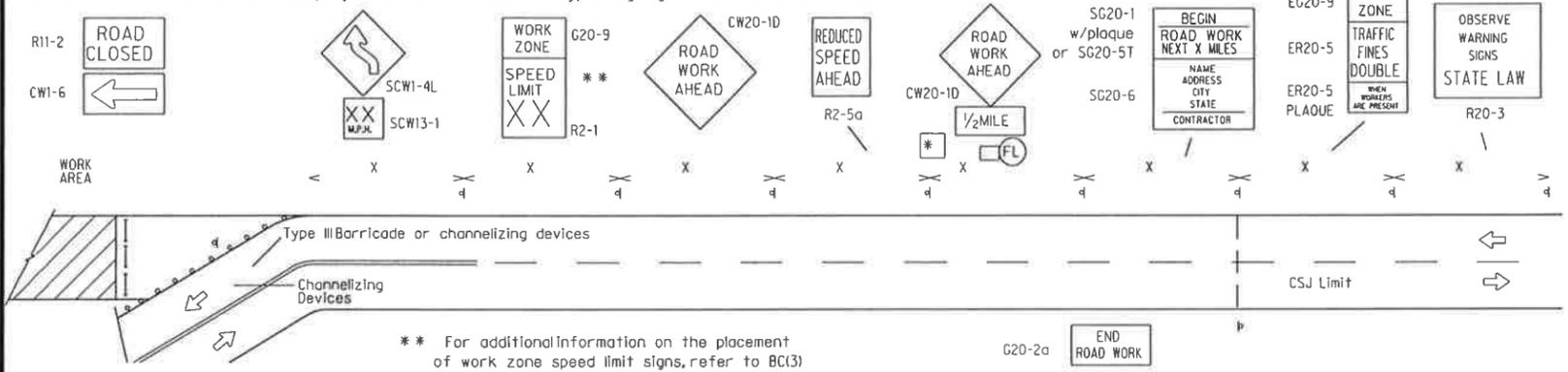


When extended distances occur between minimal work areas, the Engineer/Inspector should ensure additional Road Work Ahead (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

\*\* For additional information on the placement of work zone speed limit signs, refer to BC(3)

These signs shall be used when advance signs are required outside the CSJ limits. They inform the motorist of entering or leaving a work zone where traffic fines may double if workers are present.

TYPICAL DETAIL FOR PROJECT LIMIT AWAY FROM WORK AREA



\*\* For additional information on the placement of work zone speed limit signs, refer to BC(3)

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

Posted Speed	Sign Spacing 'X'	Long-term Or Intermediate-term Stationary Approach Warning Signs CW20 and CW21 Series		Short-term Stationary Or Short Duration Approach Warning Signs CW21 Series		Other Warning Signs
		Standard inches	Minimum inches	Standard inches	Minimum inches	
MPH	Feet (Approx.)					
30	120	48 x 48	36 x 36	30 x 30 or 36 x 36	24 x 24 or 30 x 30	30 x 30 or 36 x 36
35	160	Use Standard Size	Use Standard Size	Use Standard Size	Use Standard Size	Use Standard Size
40	240					
45	320					
50	400					
55	500 <sup>2</sup>					
60	600 <sup>2</sup>			48 x 48		48 x 48
65	700 <sup>2</sup>					
70	800 <sup>2</sup>					
75	900 <sup>2</sup>					
*	*					

\* For typical sign spacings on expressways and freeways, see Part VI of the 'Texas Manual on Uniform Traffic Control Devices' (TMUTCD) typical application diagrams or TCP Standard Sheets.  
 Δ Minimum distance from work area to first Advance Warning sign 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. For use only on secondary roads or city streets where speeds are low.
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in 'TMUTCD', Appendix A or the 'Standard Highway Sign Design' manual for complete list of available sign design sizes.
7. Where two sizes are listed, see sign size listing in 'TMUTCD', Appendix A or the 'Standard Highway Sign Design' manual for proper size.

Only pre-qualified products shall be used. A copy of the 'Compliant Work Zone Traffic Control Devices List' (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
 Traffic Operations Division - TE  
 Texas Department of Transportation  
 125 East 11th Street  
 Austin, Texas 78701-2483  
 Phone (512) 416-3120  
 Fax (512) 416-3299

Instructions to locate the 'CWZTCD' on TxDOT website are:

Start at website - [www.dot.state.tx.us](http://www.dot.state.tx.us)  
 Click on 'About TxDOT',  
 Click on 'Organizational Chart',  
 Click on 'Traffic Operations Box',  
 Click on 'Compliant Work Zone Traffic Control Devices',  
 Click on 'View PDF'.  
 This site is printable.



Benjamin S. Shanklin  
 4-22-16

STANDARD PLANS  
 TEXAS DEPARTMENT OF TRANSPORTATION  
 Traffic Operations Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
 NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
 PROJECT LIMIT STANDARD

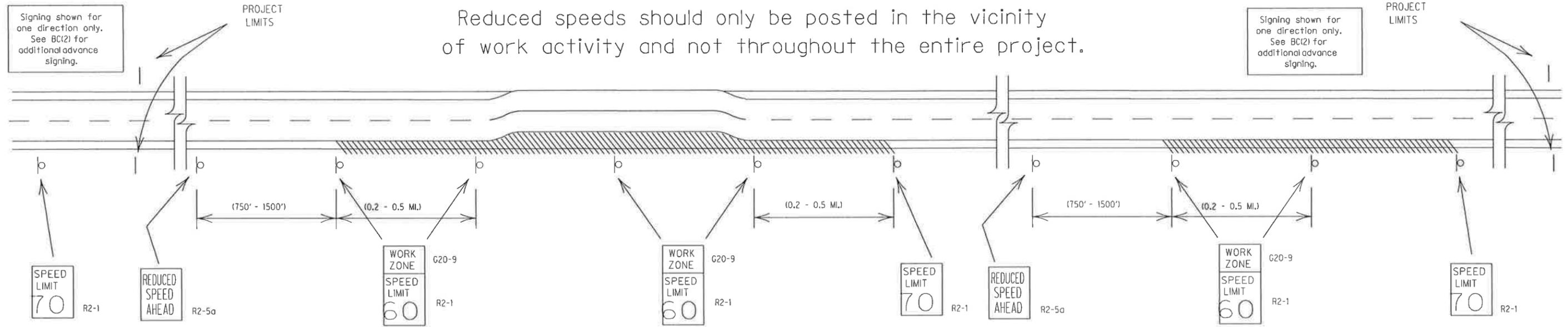
CHILDRESS ENGINEERS  
 ENGINEERS & CONSULTANTS  
 211 N. RIDGEWAY DRIVE  
 CLEBURNE, TEXAS 76033  
 TEX. REG. NO. F-702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 33 OF 43

# 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.

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



## 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 should be posted and visible to the motorists at all times. Work activity in the area of reduced speed zone should be greater than 12 consecutive hours per day. 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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- 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 should be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, work activity is within 15 feet of pavement edge or actually on the pavement.

SHORT TERM WORK ZONE SPEED LIMIT signs should be posted and visible to the motorists only when work activity is present. Work activity in the area of reduced speed should be less than 12 consecutive hours. When work activity is not present, signs should be covered with an approved sign cover or removed from work area.

## GENERAL NOTES:

- Regulatory work zone speed limits should be used only for sections of construction projects where speed controls of major importance. Regulatory work zone speed signs (R2-1) should be removed during periods when they are not needed to minimize interference with traffic.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of speed limit signs should be:
  - 40 mph and greater 0.2 to 2 miles
  - 35 mph and less 0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background.
- Fabrication, erection and maintenance of REDUCED SPEED AHEAD sign, WORK ZONE plaque and SPEED LIMIT signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless otherwise noted.
- Techniques that may help reduce traffic speeds. (In order of effectiveness.)
  - A. Flagger stationed next to sign.
  - B. Law enforcement.
  - C. Portable changeable message sign (PCMS).
  - D. Low-power radar transmitter.
- Refer to "Work Zone Speed Limit Work Sheets 1 and 2" to determine when a construction speed zone should be required.

3 of 12

BC(3)-03

STANDARD PLANS  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

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STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
WORK ZONE SPEED LIMIT STANDARD

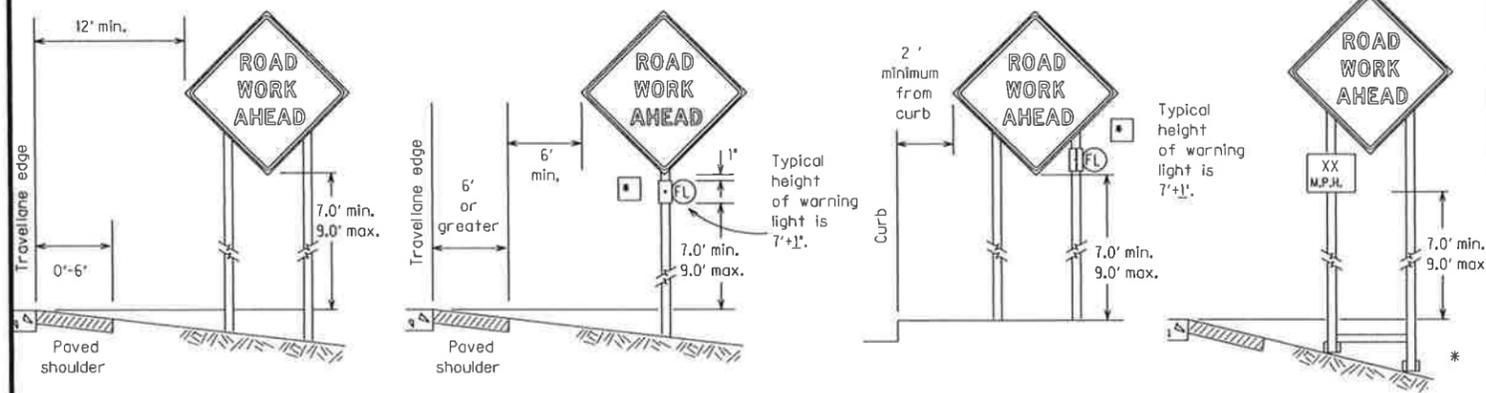
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TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



It is the intent of these plans to provide positive guidance to motorists throughout the project limits by the use of signs, pavement markings, delineation and/or channelizing devices. All traffic control devices shall conform with the 'Texas Manual on Uniform Traffic Control Devices for Streets and Highways' (TMUTCD) and the 'Compliant Work Zone Traffic Control Devices List' (CWZTCD).

\* 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.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
  - Wooden sign posts shall be painted white.
  - Barricades shall NOT be used as sign supports.
  - Nails shall NOT be used to attach signs to any support.
  - 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.
  - 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. The additional signs requested by the Engineer/Inspector shall not be subsidiary.
  - 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 that the Engineer can verify the correct procedures are being followed.
  - The contractor is responsible for sign installations and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
  - 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'.
  - 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 VII)
- The types of sign supports, 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 that the sign support and substrate meets crashworthiness and length of work requirements.
    - Long-term stationary - work that occupies a location more than 3 days.
    - Intermediate-term stationary - work that occupies a location from overnight to 3 days.
    - Short-term stationary - daytime work that occupies a location from 1 to 12 hours.
    - Short, duration - work that occupies a location up to 1 hour.
    - Mobile - work that moves intermittently or continuously. Does not stop for more than 15 minutes at a time.

SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9.0 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

- The Engineer may allow the use of smaller size construction warning signs on secondary roads or city streets where speeds are low if the sign size is listed as an option on the 'Typical Construction Warning Sign Size and Spacing' chart shown on BC(2).
- The Contractor shall furnish the sign sizes shown in plans, the BC Sheets, the TCP sheets or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure that the sign substrate is allowed 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.
- 'Mesh' type materials are NOT an approved sign substrate.
- 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 faces.

REFLECTIVE SHEETING

- Reflectorized signs shall be constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 or DMS-8310. The DMS specifications can be accessed from the following web address: <http://manuals.dot.state.tx.us:80/dynaweb/calmates/eGeneric/CollectionView;cs=default;ts=default>
- White sheeting, meeting the requirements of DMS-8300 Type C (High Specific Intensity), shall be used for signs with white background and channelizing devices.
- Orange sheeting, meeting the requirements of DMS-8300 Type E (Fluorescent Prismatic), shall be used for signs with orange backgrounds.

SIGN LETTERS

- 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 first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- 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 type of sign support meets the crashworthiness standards regardless of the direction of impact. 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.

- Signs installed on skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.

- When signs are covered, the material used shall be opaque, such as heavy mil black plastic.

- Burlap shall NOT be used to cover signs.

- Duct tape or other adhesive material shall NOT be affixed to a sign face.

These materials can damage the retroreflectivity of sign sheeting.

- Signs shall be removed upon completion of the work.

SIGN SUPPORT WEIGHTS

- Where sign supports 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.

- Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.

- 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.

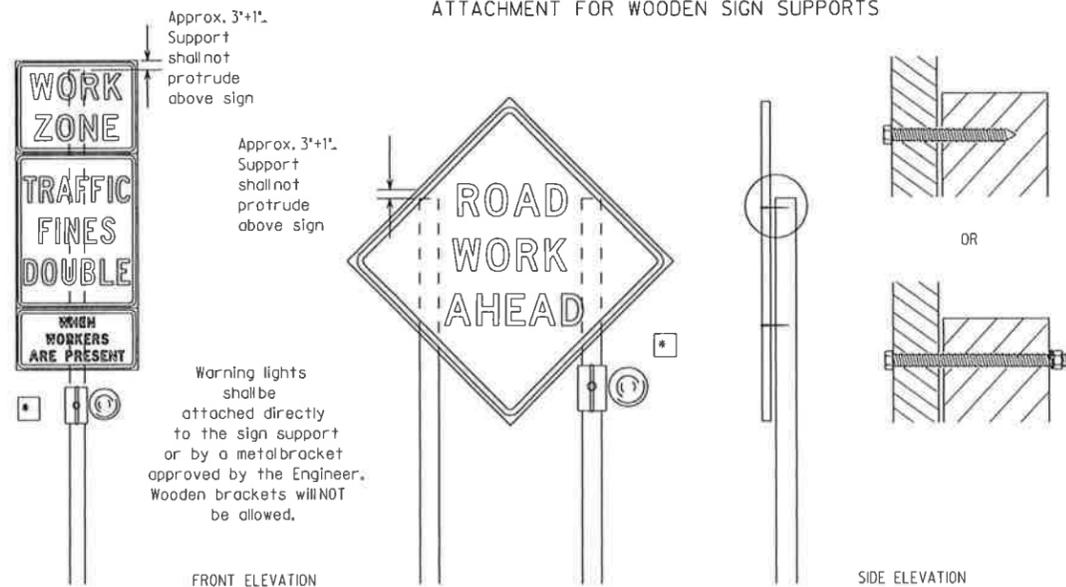
- Rubber (such as tire inner tubes) shall NOT be used for sandbags.

- Rubber ballasts (such as those used with cones or edgeline channelizers) shall NOT be used as sign support weights.

- 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.

- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

ATTACHMENT FOR WOODEN 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 will NOT be allowed.

Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Supports shall not be extended or repaired by splicing or other means.

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- 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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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.

Only pre-qualified products shall be used. A copy of the 'Compliant Work Zone Traffic Control Devices List' (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
Traffic Operations Division - TE  
Texas Department of Transportation  
125 East 11th Street  
Austin, Texas 78701-2483  
Phone (512) 416-3120  
Fax (512) 416-3299

Instructions to locate the 'CWZTCD' on TxDOT website are:

Start at website - [www.dot.state.tx.us](http://www.dot.state.tx.us)  
Click on 'About TxDOT',  
Click on 'Organizational Chart',  
Click on 'Traffic Operations Box',  
Click on 'Compliant Work Zone Traffic Control Devices',  
Click on 'View PDF'.  
This site is printable.

(L) Flashing Type A - Low Intensity Warning Light

■ The Type A Warning lights shall not be used with Type E Sheeting (Fluorescent Prismatic) meeting the requirements of DMS-8300.



4 of 42 4-22-16 BC(4)-03

STANDARD PLANS  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

CITY OF ALVARADO

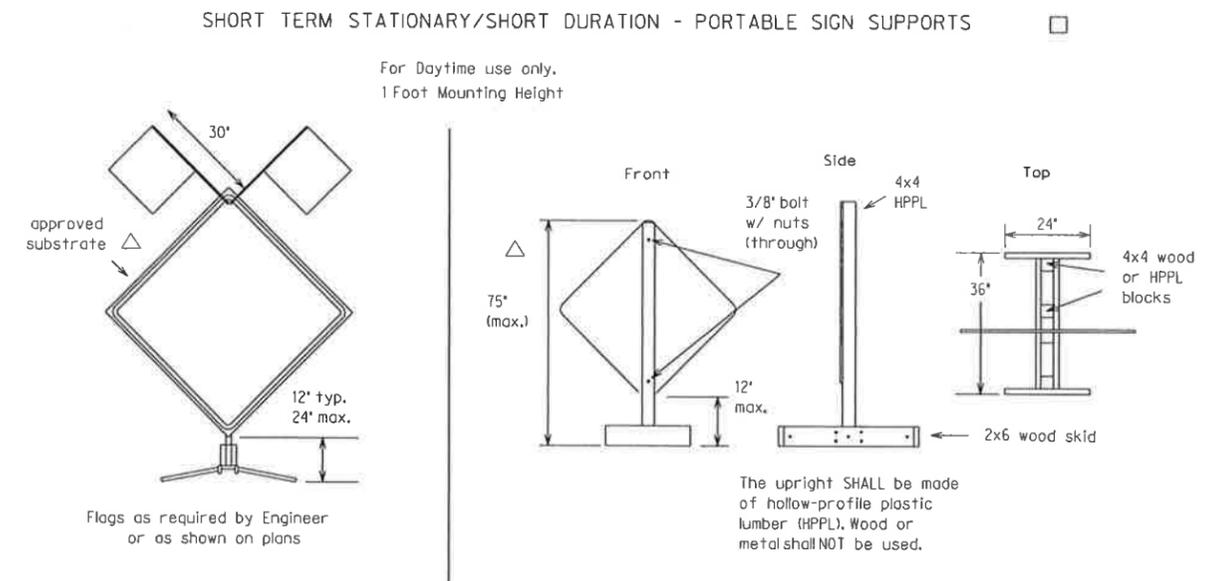
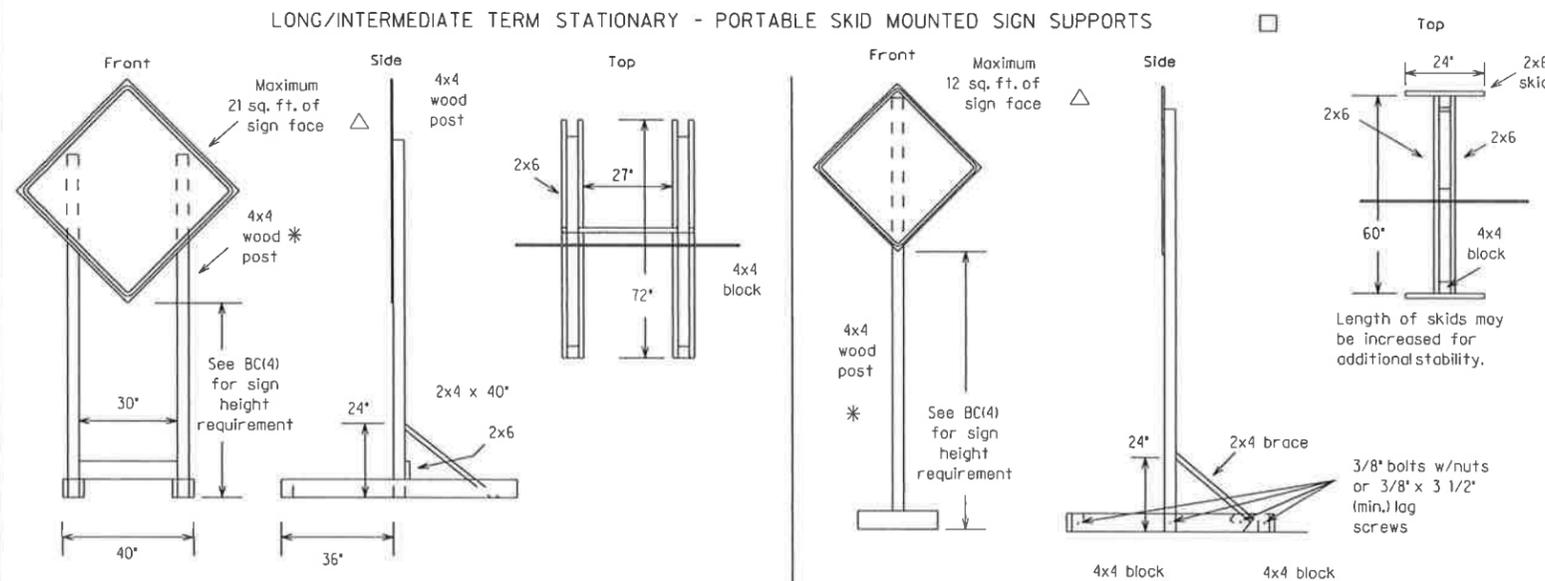
STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
TEMPORARY SIGN NOTES STANDARD

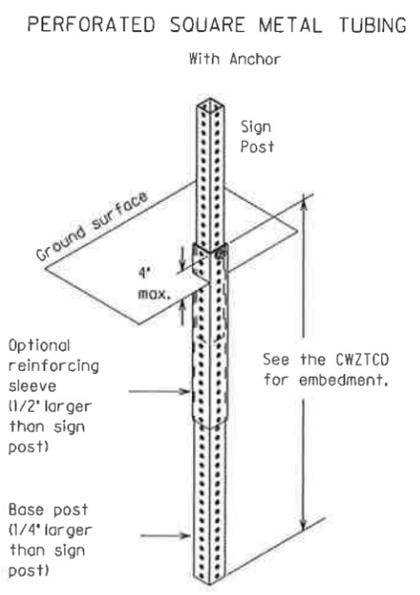
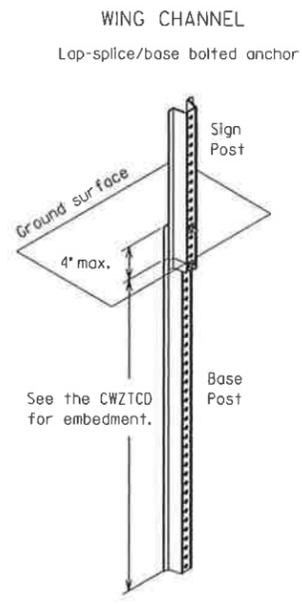
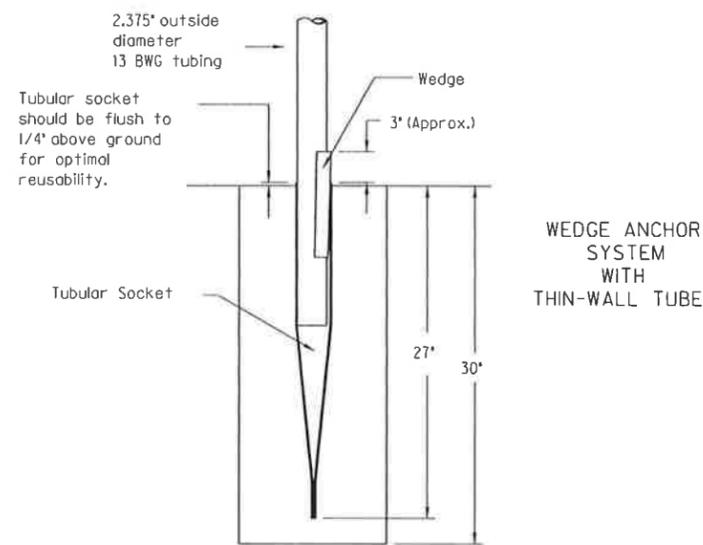
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ENGINEERS & CONSULTANTS  
211 N. RIDGEMAN DRIVE  
CLEBURNE, TEXAS 76033  
TEX. REG. NO. 17702

DESIGNED BY: BSS	REV. BY DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
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## EXAMPLES OF SKID MOUNTED SIGN SUPPORTS



## EXAMPLES OF GROUND MOUNTED SIGN SUPPORTS

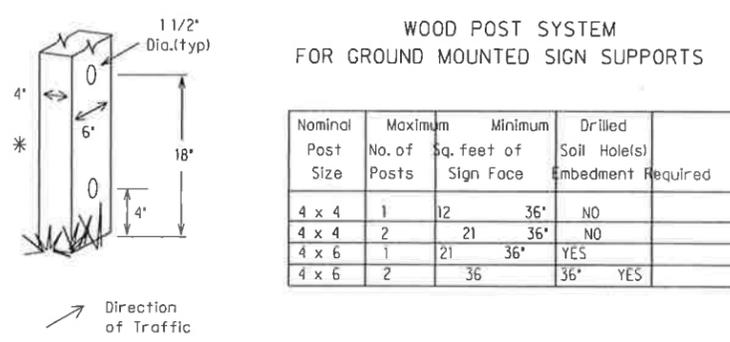


The wedge anchor system with thin wall tubing may be used to support up to 10 sq. ft. of sign area.

Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18 inches. When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18 inches or provide a minimum foundation depth of 30 inches. If solid rock is encountered, the socket/stub may be reduced in length as required to a min. length of 18 inches. Any material removed from the socket/stub shall be from the bottom and the clearance requirements shown above must still be adhered to. The inner surfaces of the socket/stub must remain free of debris. Install Wedge Anchor System per manufacturer recommendations. Attach the sign to the sign post. Insert the sign post into the socket and align the sign face with the roadway. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

Supports shall be straight within 1/4 inch per 5 feet of length and shall have a smooth, uniform finish free from defects affecting strength or appearance. Any bolt holes and sheared ends shall be free from burrs.

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.



Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

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Traffic Operations Division - TE  
Texas Department of Transportation  
125 East 11th Street  
Austin, Texas 78701-2483  
Phone (512) 416-3120  
Fax (512) 416-3299

Instructions to locate the "CWZTCD" on TxDOT website are:  
Start at website - [www.dot.state.tx.us](http://www.dot.state.tx.us)  
Click on "About TxDOT".  
Click on "Organizational Chart".  
Click on "Traffic Operations Box".  
Click on "Compliant Work Zone Traffic Control Devices".  
Click on "View PDF".  
This site is printable.

No more than 2 sign posts shall be mounted within a 7 ft. circle.

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."

\* 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.



<b>STANDARD PLANS</b> TEXAS DEPARTMENT OF TRANSPORTATION <i>Traffic Operations Division</i>		
<b>CITY OF ALVARADO</b>		
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE		
<b>BARRICADE AND CONSTRUCTION                  TYPICAL SIGN SUPPORT STANDARD</b>		
CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEWAY DRIVE CLEBURNE, TEXAS 76031 TEX REG. NO. 4776		
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
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# PORTABLE CHANGEABLE MESSAGE SIGNS

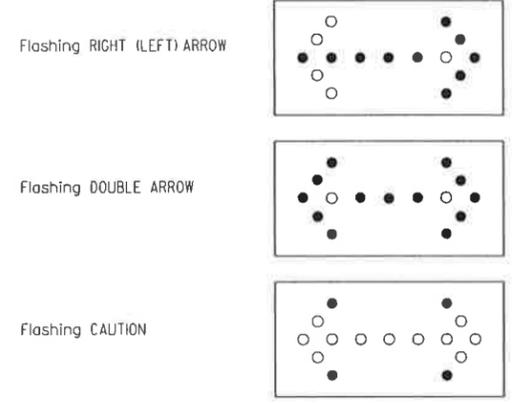
- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- PCMS placed on the shoulder or within the R-0-W, but are not behind a concrete traffic barrier shall have a minimum of four plastic drums placed perpendicular to traffic, on the upstream side of the PCMS.
- Messages on PCMS should contain no more than 8 words (four to eight characters per word), not including simple words such as 'TO,' 'FOR,' 'AT,' etc.
- 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.
- Use the word 'EXIT' to refer to an exit ramp on a freeway; i.e., 'EXIT CLOSED.' Do not use the term 'RAMP.'
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- Specify the actual days of the week; e.g., TUES THROUGH FRI or TUES-FRI in the coming week that work activity will occur.
- 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.
- 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 two seconds each.
- Do not 'flash' messages or words included in a message. The message should be steady burn or continuous while displayed.
- 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.
- Do not use the words 'Danger' or 'Caution' in message.
- Do not display the message 'LANES SHIFT LEFT' or 'LANES SHIFT RIGHT' on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- 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.

Word or Phrase	Abbreviation	Word or Phrase	Abbreviation
Access Road	ACCES RD	Miles	MI
Air Quality	AIR QULTY	Miles Per Hour	MPH
Avenue	AVE	Time Minutes	Time MIN
Best Route	BEST RTE	Monday	MON
Boulevard	BLVD	Normal	NORM
Bridge	BRDG	North	N
Cannot	CANT	Parking	PKING
Center	CNTR	Parking Lot	PRK LOT
Construction Ahead	CONST AHEAD	Road	RD
Detour Route	DETOUR RTE	Right Lane	RGT LN
East	E	Saturday	SAT
Emergency	EMER	Service Road	SERV RD
Emergency Vehicle	EMER VEH	Shoulder	SHLDR
Entrance, Enter	ENT	Slippery	SLIP
Express Lanes	EXP LANE	South	S
Expressway	EXPWY	Speed	SPD
Distance Feet	Distance FT	Street	ST
Fog Ahead	FOG AHD	Sunday	SUN
Freeway	FRWY, FWY	Telephone	PHONE
Freeway Blocked	FWY BLKD	Thursday	HURS
Friday	FRI	To Downtown	TO DWNTH
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Highway	HWY	Travelers	TRVLRS
Hours	HR	Tuesday	TUES
Information	INFO	Turnpike	NAME TRNPK
Left	LFT	Upper Level	UPPR LVL
Left Lane	LFT LN	Warning	WARN
Lane Closed	LN CLSD	Wednesday	WED
Lower Level	LOWR LVL	Weight Limit	WT LIMIT
Maintenance	MAINT	Wet Pavement	WET PVMT
Roadway designation *	IH-number, US-number, SH-number, FM-number	West	W

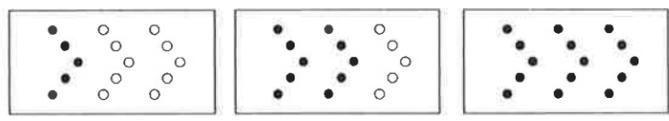
WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND CONCRETE TRAFFIC BARRIER.

# TYPICAL FLASHING ARROW PANEL

- The Flashing Arrow Panel should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Panels 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.
- 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 Panel.
- The Flashing Arrow Panel should be able to display the following symbols:



- The 'CAUTION' display consists of four corner lamps flashing simultaneously.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Panel 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.
- Minimum lamp 'on time' shall be approximately 50 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.



- The Flashing Arrow Panel shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Panel SHOULD NOT BE USED to laterally shift all lanes of traffic on a multi-lane roadway at once.

### 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 Panels shall be equipped with automatic dimming devices.

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

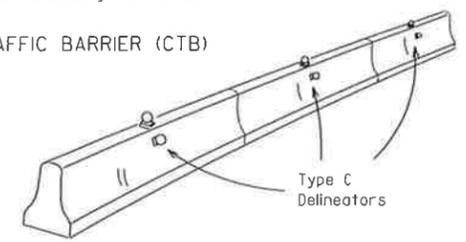
### TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the dates shown in the CWZTCD to ensure that the TMA meets the age requirements and the crashworthiness criteria established by the Federal Highway Administration (FHWA) for TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned approximately 100 feet or less in advance of the area of crew exposure without adversely affecting the work performance.
- 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.

# TYPE C DELINEATORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

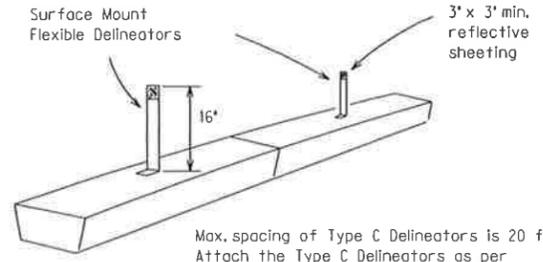
- Type C Delineators shall be prequalified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Type C Delineators can be found at the following Web site: <http://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/dms8600preq.pdf>.
- Color of delineators shall be as specified in the 'Texas Manual on Uniform Traffic Control Devices' (TMUTCD). The cost of the Type C Delineators shall be considered subsidiary to Item 502.

### CONCRETE TRAFFIC BARRIER (CTB)

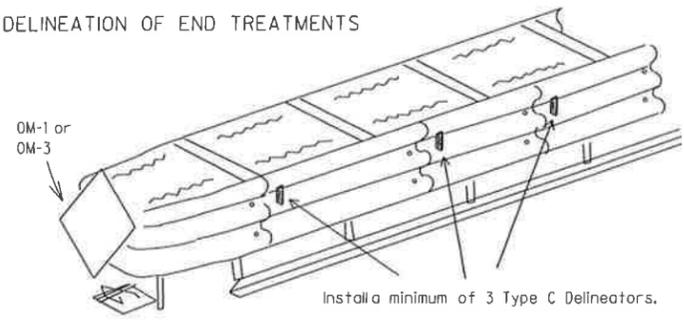


- Two (2) Type C Delineators should be mounted on each section of CTB in approximately the midsection of the CTB. The Type C Delineator on the side of the CTB shall be installed directly below the Type C Delineator mounted on top of the CTB.
- Maximum spacing of Type C Delineators is 40 feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attach Type C Delineators on CTB as per manufacturer's recommendations.
- Missing or damaged Type C Delineators shall be replaced as directed by the Engineer.

### LOW PROFILE CONCRETE BARRIER (LPCB)



### DELINEATION OF END TREATMENTS



DELINEATION	APPROACHING TRAFFIC	
	BOTH SIDES	ONE SIDE
	OM-1	OM-3 or Vertical Panel

Attach the Type C Delineators as per manufacturer's recommendations.



# WARNING LIGHTS

- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with signs. They are intended to warn of an approaching 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 E Sheeting (Fluorescent Prismatic) meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C 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'.
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.

# 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.

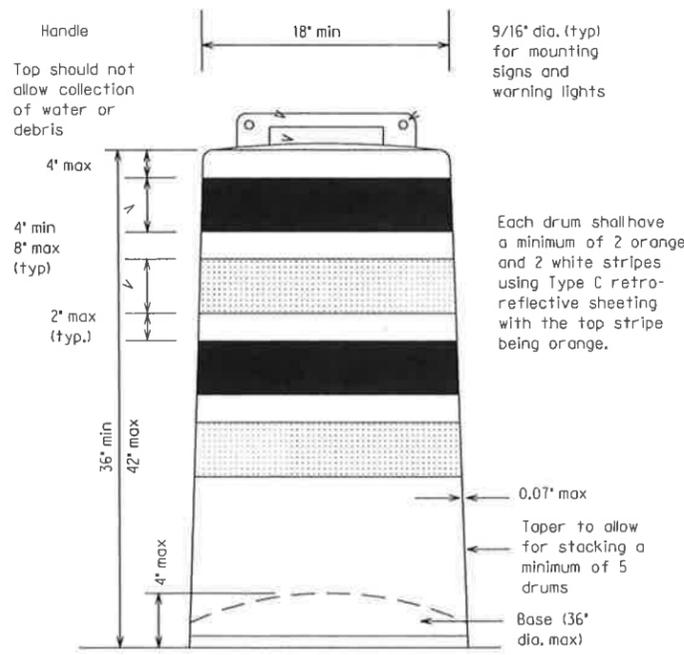
Only pre-qualified products shall be used. A copy of the 'Compliant Work Zone Traffic Control Devices List' (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
Traffic Operations Division - TE  
Texas Department of Transportation  
125 East 11th Street  
Austin, Texas 78701-2483  
Phone (512) 416-3120  
Fax (512) 416-3299

Instructions to locate the 'CWZTCD' on TxDOT website are:

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This site is printable.

 STANDARD PLANS TEXAS DEPARTMENT OF TRANSPORTATION Traffic Operations Division			
CITY OF ALVARADO			
STREET RECONSTRUCTION FOR NORTH CUMMINGS DRIVE			
BARRICADE AND CONSTRUCTION ARROW & MESSAGE SIGNS, REFLECTORS & WARNING LIGHT STANDARD			
 CHILDRESS ENGINEERS ENGINEERS & CONSULTANTS 211 N. RIDGEMAN DRIVE CLEBURNE, TEXAS 76033 TEX. REG. NO. F-702			
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016	
DRAWN BY: JDL/MNF		JOB NO: 11056	
CHECKED BY: BSS		SHEET NO. 37 OF 43	



**GENERAL NOTES**

- 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).
- 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.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums or other traffic control devices identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

Prequalified plastic drums shall meet the following requirements:

**GENERAL DESIGN REQUIREMENTS**

- 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.
- 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.
- 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.
- 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.
- 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, delineator reflector unit or non-plywood sign.
- 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.
- 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.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a minimum unballasted weight of 7.7 lbs. and maximum unballasted weight of 11 lbs. The wall of the drum

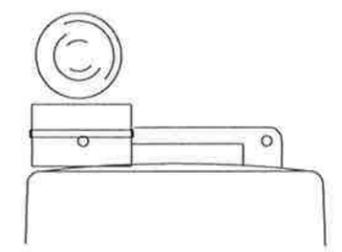
body shall be a minimum of 0.07 inch in thickness. Weight of any drum supplied shall not vary more than 0.5 lb. from that of the prequalified sample.  
 10. Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, 'Flat Surface Reflective Sheeting,' High Specific Intensity (Type C) retro-reflective sheeting shall be supplied unless otherwise specified in the plans.
- 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, checking, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

**BALLAST**

- 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.
- 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.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

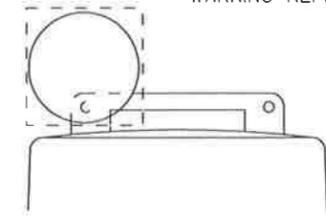


Type C Warning Light or approved substitute mounted adjacent to the travelway.

**WARNING LIGHTS AND DELINEATORS MOUNTED ON PLASTIC DRUMS**

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A flashing warning lights are not intended for delineation and shall not be used in a series.
- Type C steady-burn warning lights are intended to be used in a series to delineate the edge of the travelway on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A and Type C warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- Type A Class 1, Type A Class 2, or Type B Reflector Units (D & OM Standard) may be attached to drums to delineate the intended vehicular path. The color of the reflector unit shall correspond to the pavement marking it is supplementing or for which it is substituting (left edgeline-yellow or right edgeline-white). The reflective unit shall be attached to the handle of the drum using the mounting hole nearest the travelway and shall be aligned perpendicular to approaching traffic.
- Delineators may be used as directed by the Engineer. Delineators may not be used as a substitute for warning lights.

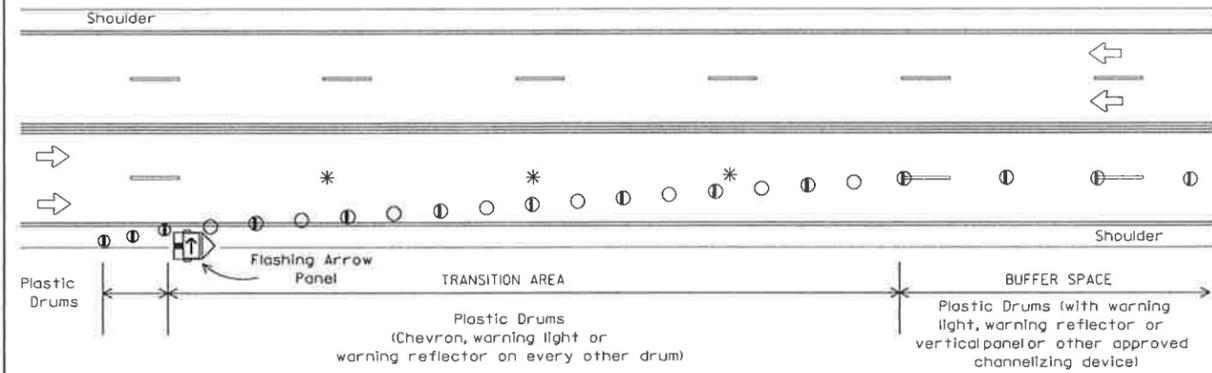
**WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C WARNING LIGHTS**



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

- 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.
- The warning reflector shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectORIZED, including the area where attached to the drum.
- 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.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type D (Non-fluorescent Prismatic).
- When used near two-way traffic, both sides of the warning reflector shall be reflectORIZED.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.

**TYPICAL DETAIL OF LANE CLOSURE USING PLASTIC DRUMS AS CHANNELIZING DEVICES**

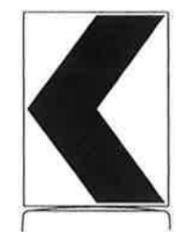


Provide adequate sight distance when placing lane closures. Do not place lane closures in vertical or horizontal curves. See BC(8) for table showing the spacing of channelizing devices in the taper and tangent section.

\* NOTE: Lane lines shall be removed when the lane closure occupies a location for longer than 2 weeks.

**LEGEND**

- Flashing Arrow Panel
- Plastic Drum
- Plastic Drum w/ approved channelizing device



18' x 24' Sign (Maximum Sign Dimension) Chevron CW1-8, 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 travelway

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

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type E (Fluorescent Prismatic) sheeting meeting the color and retroreflectivity requirements of DMS-8300, 'Flat Surface Reflective Sheeting,' unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type C (High Specific Intensity). Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- 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.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.

Only pre-qualified products shall be used. A copy of the 'Compliant Work Zone Traffic Control Devices List' (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

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 Traffic Operations Division - TE  
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 125 East 11th Street  
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STANDARD PLANS  
 TEXAS DEPARTMENT OF TRANSPORTATION  
 Traffic Operations Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
 NORTH CUMMINGS DRIVE

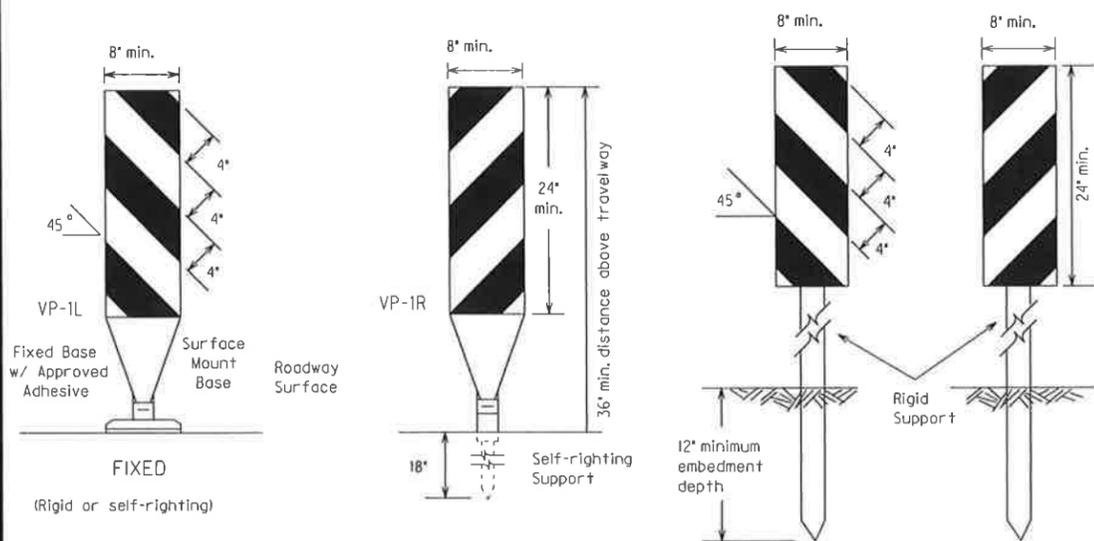
BARRICADE AND CONSTRUCTION  
 PLASTIC DRUM STANDARD

CHILDRESS ENGINEERS  
 ENGINEERS & CONSULTANTS  
 211 N. RIDGEWAY DRIVE  
 CLEBURNE, TEXAS 76039  
 TEX. REG. NO. F 702

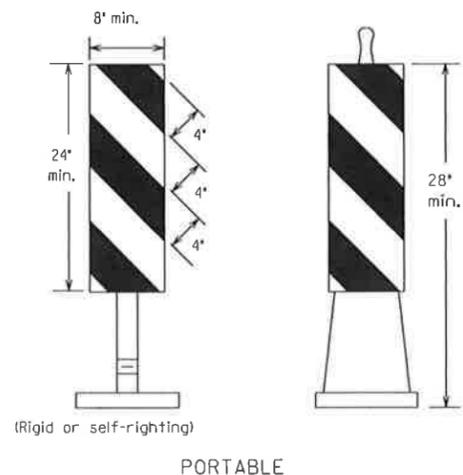
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 38 OF 43

# CHANNELIZING DEVICES

## VERTICAL PANELS

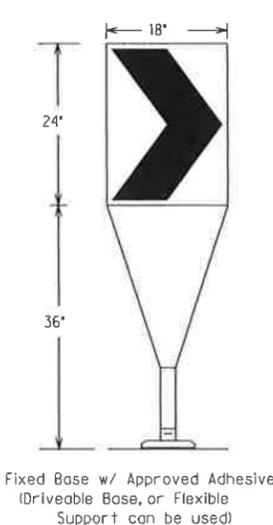


## DRIVEABLE



- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- 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.
- 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.
- VP's used on expressways, freeways, and on high speed roadways shall have a minimum of 2 square feet of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless noted otherwise.

## CHEVRONS



- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- 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.
- 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.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black non-reflective legend. Sheeting for the chevron shall be retroreflective Type E (Fluorescent Prismatic) conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall be black vinyl non-reflective decal sheeting meeting the requirements of DMS-8320.

## GENERAL NOTES:

- 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).
- 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.
- 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).
- The contractor shall maintain devices in a clean condition and replace damaged, non-reflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh approximately 35 lbs.
- 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.
- 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.
- Examples on this sheet are the most commonly used channelizing devices in work zones. For other devices, refer to the CWZTCD.

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
Traffic Operations Division - TE  
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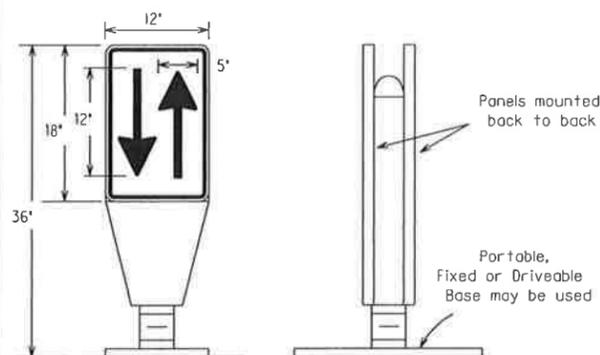
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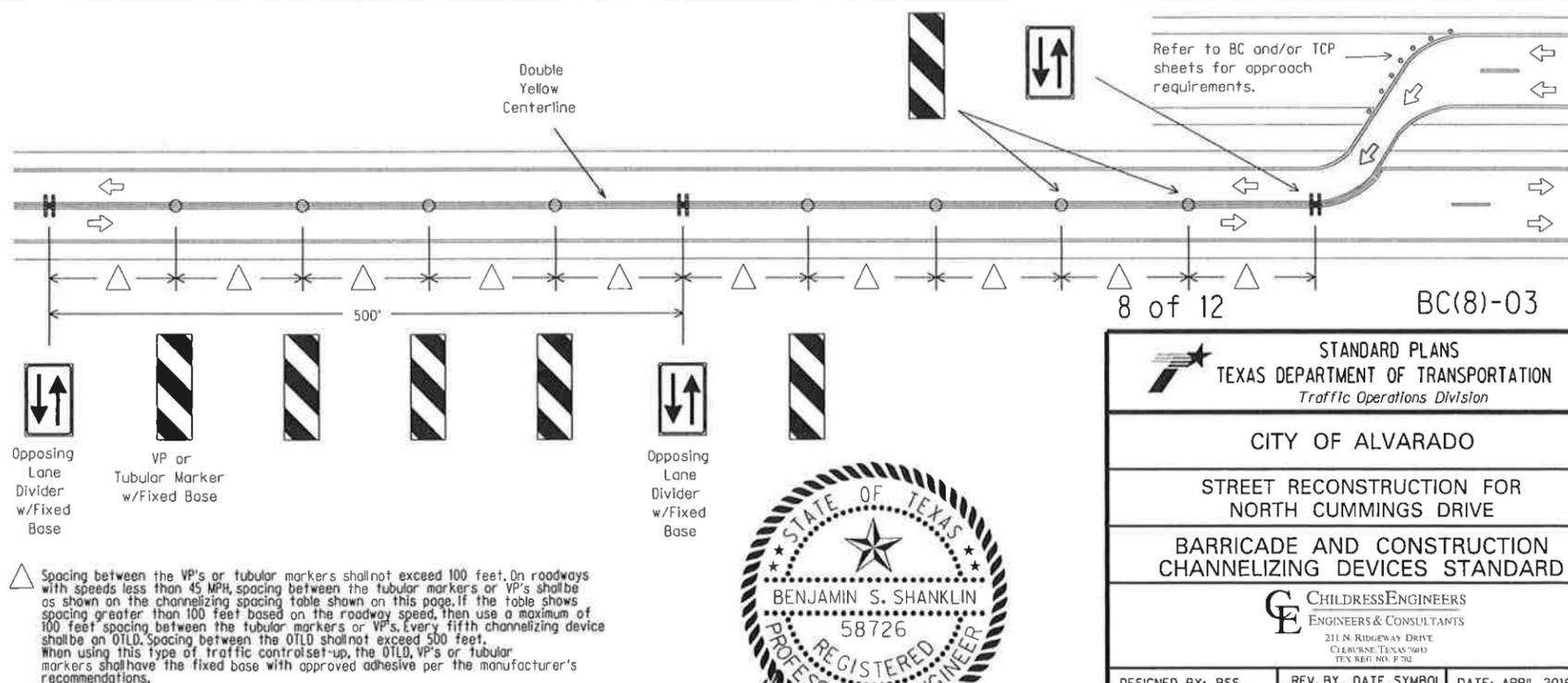
Posted Speed	Formula	Minimum Desirable Taper Lengths * *			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'
35		205'	225'	245'	35'	70'-90'
40		265'	295'	320'	40'	80'-100'
45	L=WS	450'	495'	540'	45'	90'-110'
50		500'	550'	600'	50'	100'-125'
55		550'	605'	660'	55'	110'-140'
60		600'	660'	720'	60'	120'-150'
65		650'	715'	780'	65'	130'-165'
70		700'	770'	840'	70'	140'-175'
75		750'	825'	900'	75'	150'-185'

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

## OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



- 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. The OTLD is placed on a flexible self-righting support that returns to an upright position when impacted by a vehicle.
- The OTLD may be used in combination with simple tubular markers or vertical panels (vp's).
- Spacing between the OTLD shall not exceed 500 feet. Tubular markers or vp's placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type E (Fluorescent Prismatic) conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall be black vinyl non-reflective decal sheeting meeting the requirements of DMS-8320.



Spacing between the VP's or tubular markers shall not exceed 100 feet. On roadways with speeds less than 45 MPH, spacing between the tubular markers or VP's shall be as shown on the channelizing spacing table shown on this page. If the table shows spacing greater than 100 feet based on the roadway speed, then use a maximum of 100 feet spacing between the tubular markers or VP's. Every fifth channelizing device shall be an OTLD. Spacing between the OTLD shall not exceed 500 feet. When using this type of traffic control set-up, the OTLD, VP's or tubular markers shall have the fixed base with approved adhesive per the manufacturer's recommendations.



*Benjamin S. Shanklin* 4-22-16  
1056 31 TXDOT BC(8)-03.00

STANDARD PLANS  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
CHANNELIZING DEVICES STANDARD

CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76033  
TEX. REG. NO. F-702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 39 OF 43

**TYPE III BARRICADES**

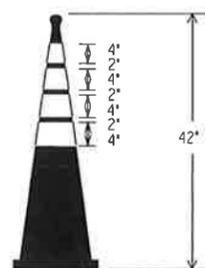
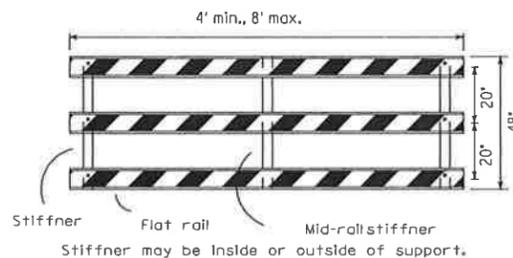
1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type III Barricades and a list of all materials used in the construction of Type III Barricades.
2. Type III Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades 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.
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. 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.

Barricades shall NOT be used as a sign support.

**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

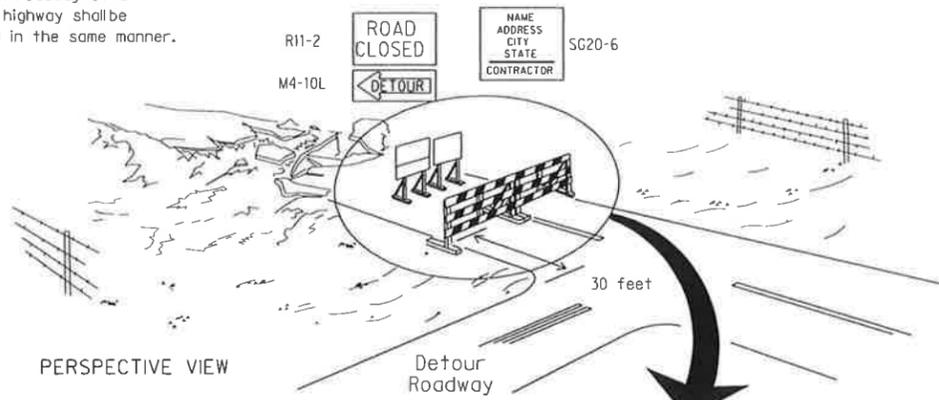


**EDGE LINE CHANNELIZER**

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.
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 C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

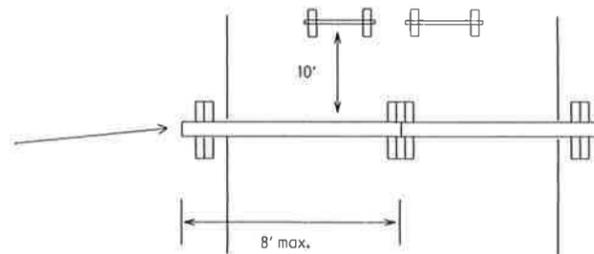
**TYPE III BARRICADE (POST AND SKID) TYPICAL APPLICATION**

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



**PERSPECTIVE VIEW**

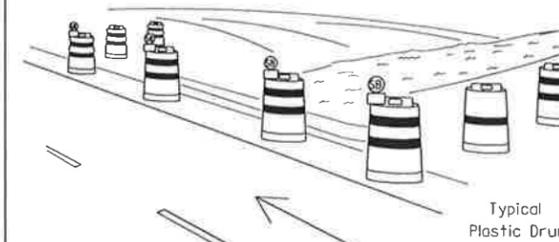
The three rails on Type III barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



**PLAN VIEW**

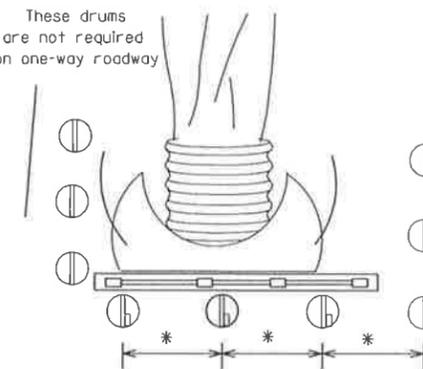
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type III Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**



**PERSPECTIVE VIEW**

These drums are not required on one-way roadway



**Legend**

- Plastic drum
- Plastic drum with steady burn light

**PLAN VIEW**

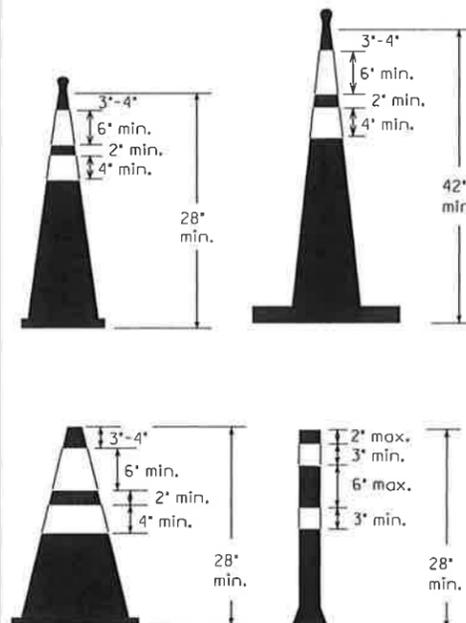
1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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.

Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

\* Maximum spacing between drums shall be 10 feet. A minimum of two drums shall be used across the work area.

28" Cones shall have a minimum weight of 9 1/2 lbs.  
42" 2-piece cones shall have a minimum weight of 30 lbs.

**CONES**



1. Traffic cones and tubular markers shall be a minimum of 28 inches in height when used either on freeways or at nighttime.
2. Cones or tubular markers shall be predominantly orange, fluorescent red-orange, or fluorescent yellow-orange. They should be kept clean and bright for maximum visibility.
3. Cones used only for daytime operations do not require the reflectorized bands.
4. Cones used for nighttime operations shall be reflectorized. Reflectorized material shall have a smooth, sealed outer surface that displays the same approximate color during the day and night. The reflectorized bands shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
5. When used at night, appropriate personnel shall ensure that cones and tubular markers remain in their proper location and in an upright position.
6. Reflectorization of cones shall consist of a minimum 6 inch band placed at least 3 inches but not more than 4 inches from the top, supplemented by a minimum 4 inch band spaced a minimum of 2 inches below the 6 inch band.
7. Reflectorization of tubular markers shall be a minimum of two 3 inch bands placed a maximum of 2 inches from the top with a maximum of 6 inches between bands. The reflectorized bands shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
8. One-piece cones or tubular markers are generally suitable for temporary usage (up to 8 hours) with other channelization devices such as vertical panels, drums or two-piece cones for long term usage. Care should be taken to ensure they remain in their proper location and in an upright position.
9. Cones or tubular markers used on each project shall be of the same size and shape.
10. The handle may be designed as a hook or other shape, fabricated from non-rigid materials similar to the cone material, and may extend up to a maximum of 8 inches above the top of cone. Length of the handle shall not be considered with regard to the overall height of the cone.

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
Traffic Operations Division - TE  
Texas Department of Transportation  
125 East 11th Street  
Austin, Texas 78701-2483  
Phone (512) 416-3120  
Fax (512) 416-3299

Instructions to locate the "CWZTCD" on TxDOT website are:

Start at website - [www.dot.state.tx.us](http://www.dot.state.tx.us)  
Click on "About TxDOT",  
Click on "Organizational Chart",  
Click on Traffic Operations Box,  
Click on "Compliant Work Zone Traffic Control Devices",  
Click on "View PDF".  
This site is printable.

**STANDARD PLANS**  
**TEXAS DEPARTMENT OF TRANSPORTATION**  
*Traffic Operations Division*

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**CITY OF ALVARADO**

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**STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE**

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**BARRICADE AND CONSTRUCTION  
TYPE III BARRICADE & CONES STANDARD**

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**CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76031  
TEX. REG. NO. F-502

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 40 OF 43



*Benjamin S. Shanklin 4-22-16*

**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 the 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(11).
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.
3. A list of prequalified reflective raised pavement markers can be found at the following web site:  
<ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/dms4200preg.pdf>
4. A list of prequalified non-reflective traffic buttons can be found at the following web site:  
<ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/4300preg.pdf>

**PREFABRICATED PAVEMENT MARKINGS**

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241. A list of prequalified products can be found at the following web site:  
<ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/pavemark.pdf>
2. Non-removable prefabricated pavement markings (foilback) shall meet the requirements of DMS-8240 or the TXDOT Purchase Specification No. 550-74-89. A list of prequalified products and a copy of the TXDOT Purchase Specifications can be found at web sites:  
<ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/pavement.pdf>  
<ftp://ftp.dot.state.tx.us/pub/txdot-info/gsd/pdf/tss/tss377.pdf>

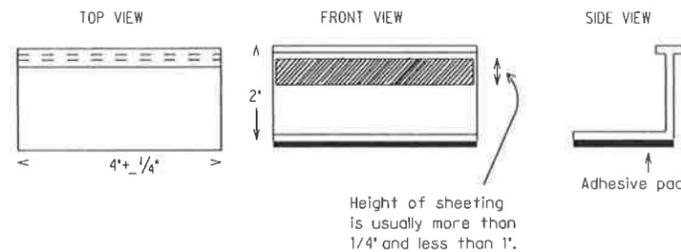
**MAINTAINING WORK ZONE PAVEMENT MARKINGS**

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 150 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 shall be replaced as required by the Engineer at the expense of the Contractor.

**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 two weeks, 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 discernible marking, by any method that does not materially damage the surface or texture of the pavement.
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway.
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.

**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.

**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
PREFABRICATED PAVEMENT MARKINGS-PERMANENT	DMS-8240
PREFABRICATED PAVEMENT MARKINGS-REMOVABLE	DMS-8241
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS	DMS-8242

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

Standards Engineer  
Traffic Operations Division - TE  
Texas Department of Transportation  
125 East 11th Street  
Austin, Texas 78701-2483  
Phone (512) 416-3120  
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Click on Traffic Operations Box,  
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This site is printable.

**STANDARD PLANS**  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
PAVEMENT MARKINGS STANDARD

**CHILDRESS ENGINEERS**  
ENGINEERS & CONSULTANTS  
211 N. RIDGEWAY DRIVE  
CLEBURNE, TEXAS 76031  
TEX. REG. NO. F 702

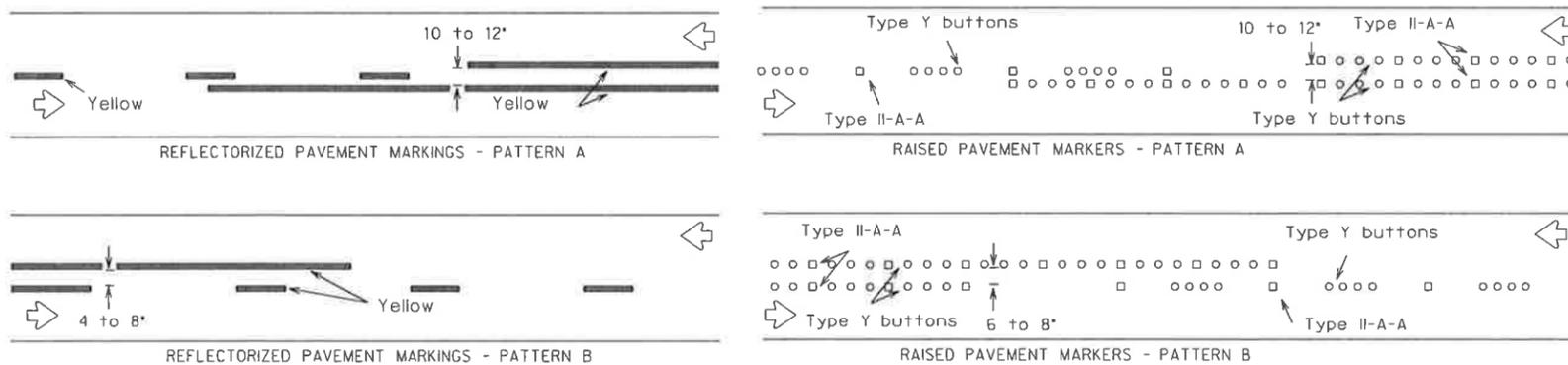
DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 41 OF 43



*Benjamin S. Shanklin*  
4-22-16

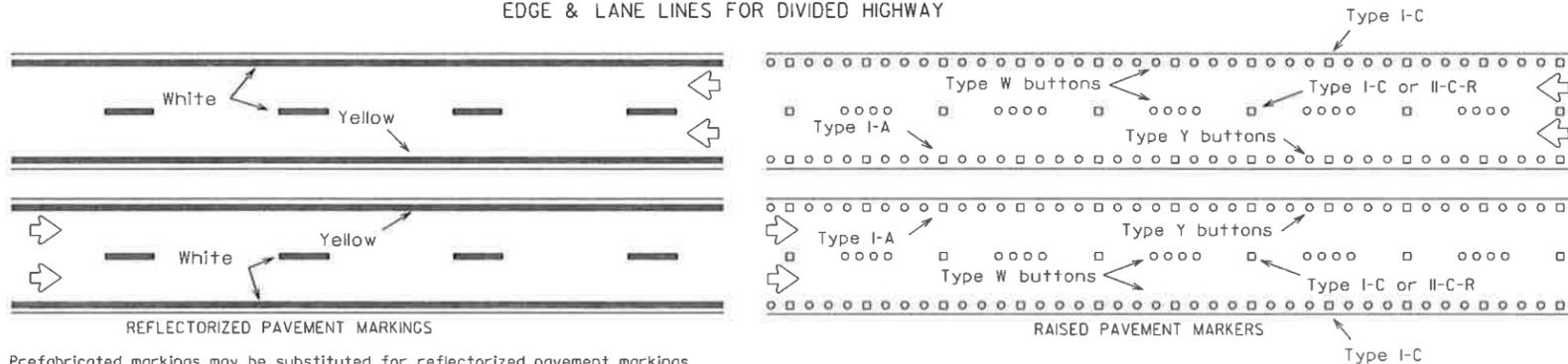
# PAVEMENT MARKING PATTERNS

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



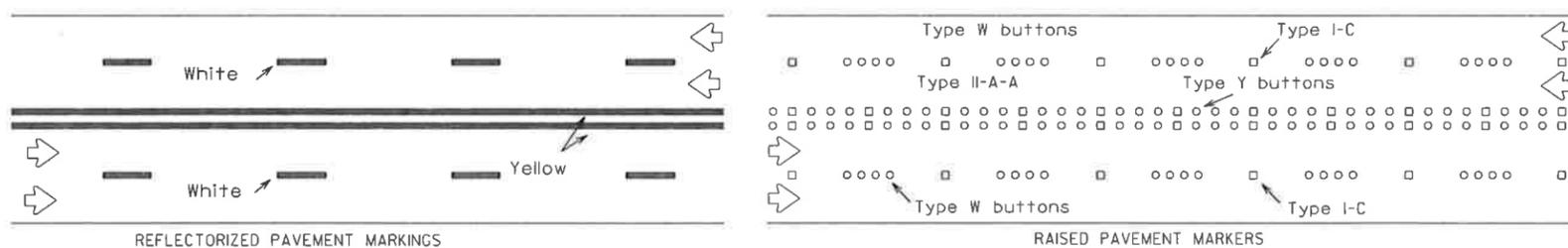
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



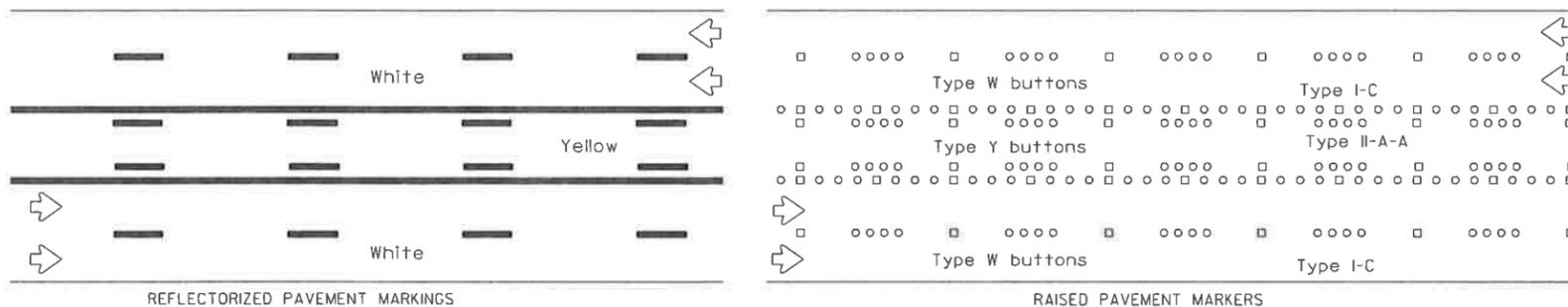
Prefabricated markings may be substituted for reflectorized pavement markings.

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



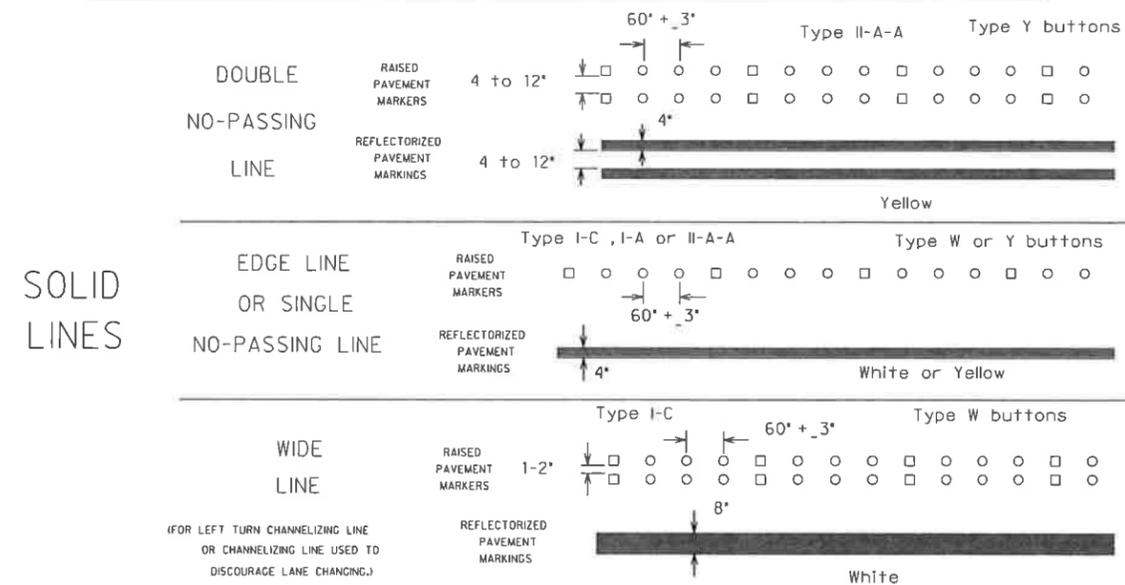
Prefabricated markings may be substituted for reflectorized pavement markings.

## TWO-WAY LEFT TURN LANE



Prefabricated markings may be substituted for reflectorized pavement markings.

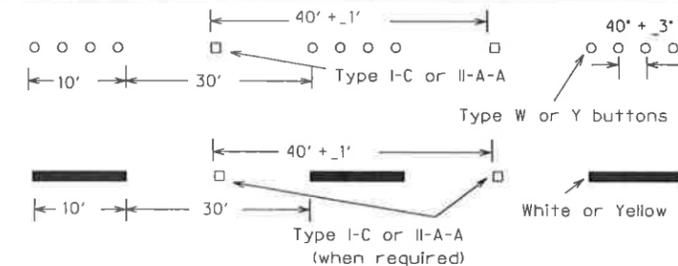
# STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



## BROKEN LINE

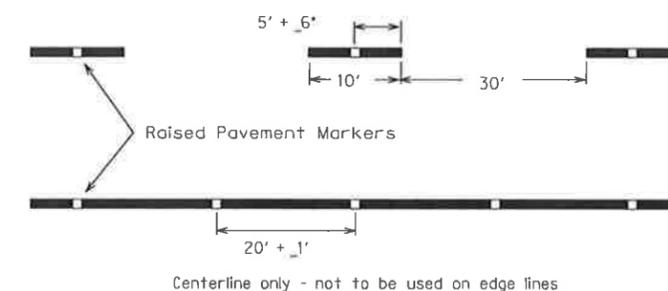
(FOR CENTER LINE OR LANE LINE.)

REFLECTORIZED PAVEMENT MARKINGS



## 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.



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



*Benjamin S. Shanklin* 4-22-16

STANDARD PLANS  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

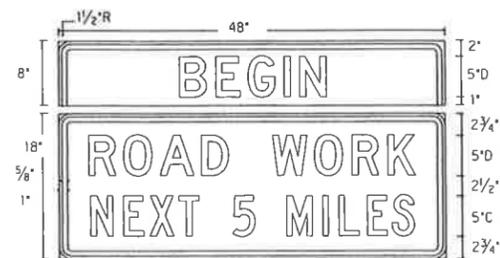
CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
PAVEMENT MARKING PATTERNS STANDARD

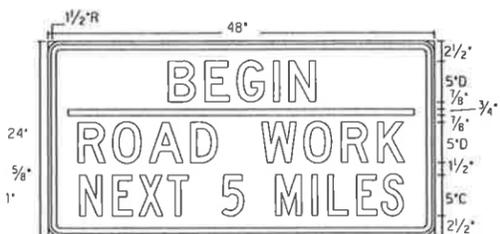
CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEMAN DRIVE  
CLEBURNE, TEXAS 76033  
TEX. REG. NO. F 702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 42 OF 43



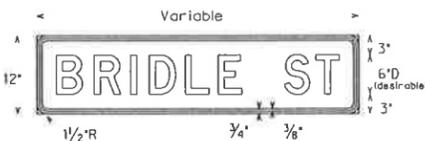
SG20-1 w/plaque  
48" X 26"

Letters - Black  
Numbers - Black  
Border - Black  
Background - Orange Refl.



SG20-5T  
48" X 24"

Letters - Black  
Numbers - Black  
Border - Black  
Background - Orange Refl.

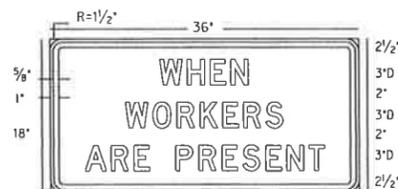


M4-9N  
Variable X 12"

Letters - Black  
Border - Black  
Background - Orange Refl.

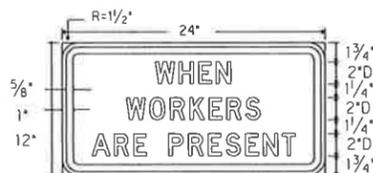
The M4-9R, L or S sign is to be used to detour local streets or roads that are not a State or Federal numbered highway; however, it should not be used in lieu of the M4-10 sign at the beginning of the de-

four or to detour State or Federal numbered routes. Also, when the M4-9R, L or S sign is used, a sign (M4-9N) with the name of the street being detoured may be mounted above it.



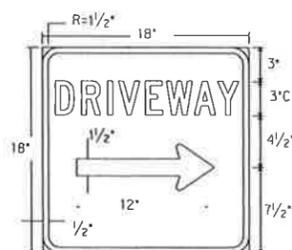
ER20-5  
Plaque  
36" X 18"

Letters - Black  
Border - Black  
Background - White Refl.



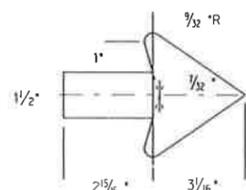
R20-5  
Plaque  
24" X 12"

Letters - Black  
Border - Black  
Background - White Refl.



D-70a  
18" X 18"

Letters - White Refl.  
Symbol - White Refl.  
Border - White Refl.  
Background - Blue Refl.



B-1 Arrow Detail

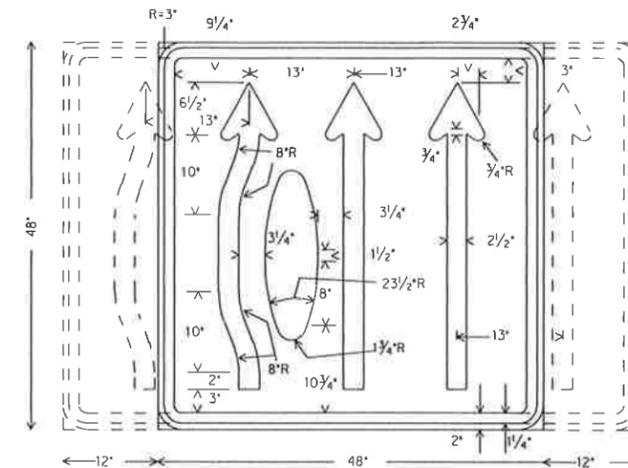


D-70S  
42" X 14"

Letters - White Refl.  
Symbol - White Refl.  
Border - White Refl.  
Background - Blue Refl.

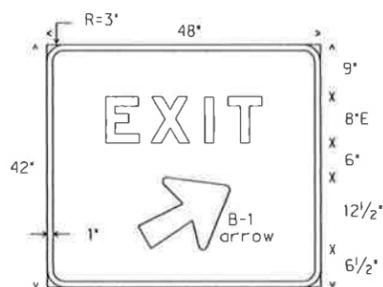
\* Alternate first line legend for D-70S

- RESTAURANT | D70R 4°C
- BUSINESS | D70B 4°C
- MOTEL | D70M 4°C
- GAS | D70G 4°C



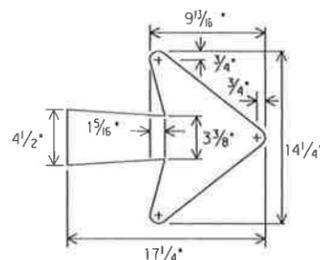
CW24-2  
Var. X 48"

A mirror image may be used to show proper lane alignment.

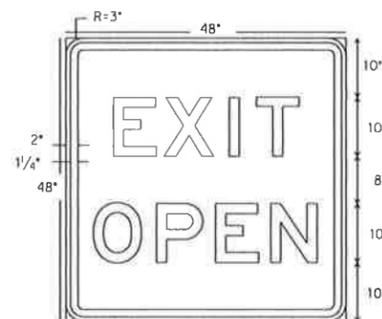


E5-1a  
48" X 42"

Letters - White Refl.  
Arrow - White Refl.  
Border - White Refl.  
Background - Green Refl.

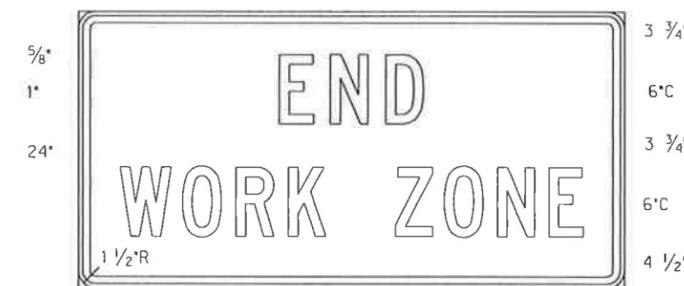


B-1 Arrow Detail



E5-2  
48" X 48"

Letters - Black  
Border - Black  
Background - Orange Refl.



G20-2b  
48" X 24"

Letters - Black  
Border - Black  
Background - Orange Refl.

DEPARTMENT MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
FLAT SURFACE REFLECTIVE SHEETING	DMS-8300
VINYL NON-REFLECTIVE DECAL SHEETING	DMS-8320

COLOR	USAGE	REFLECTIVE SHEETING OR OTHER MATERIAL
BLUE	BACKGROUND	TYPE C (HIGH SPECIFIC INTENSITY)
RED	BACKGROUND	TYPE C (HIGH SPECIFIC INTENSITY)
GREEN	BACKGROUND	TYPE C (HIGH SPECIFIC INTENSITY)
ORANGE	BACKGROUND	TYPE E (FLUORESCENT PRISMATIC)
WHITE	BACKGROUND	TYPE C (HIGH SPECIFIC INTENSITY)
YELLOW	BACKGROUND	TYPE C (HIGH SPECIFIC INTENSITY)
BLACK	LEGEND & BORDERS	VINYL NON-REFLECTIVE DECAL SHEETING
WHITE	LEGEND & BORDERS	TYPE C (HIGH SPECIFIC INTENSITY)

12 of 12

BC(12)-03

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be obtained by contacting:

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Traffic Operations Division - TE  
Texas Department of Transportation  
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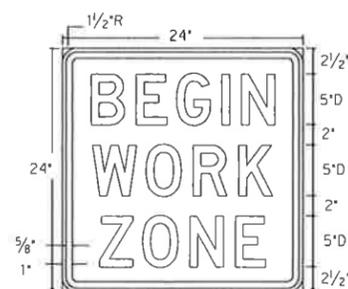
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Click on "Organizational Chart".  
Click on "Traffic Operations Box".  
Click on "Compliant Work Zone Traffic Control Devices".  
Click on "View PDF".  
This site is printable.



EG20-9T  
36" X 30"

Letters - Black  
Border - Black  
Background - Orange Refl.



G20-9T  
24" X 24"

Letters - Black  
Border - Black  
Background - Orange Refl.



Benjamin S. Shanklin  
4-28-16

STANDARD PLANS  
TEXAS DEPARTMENT OF TRANSPORTATION  
Traffic Operations Division

CITY OF ALVARADO

STREET RECONSTRUCTION FOR  
NORTH CUMMINGS DRIVE

BARRICADE AND CONSTRUCTION  
REGULATORY & GUIDE SIGNS STANDARDS

CHILDRESS ENGINEERS  
ENGINEERS & CONSULTANTS  
211 N. RIDGEMAY DRIVE  
CLEBURNE, TEXAS 76031  
TEX. REG. NO. F-702

DESIGNED BY: BSS	REV. BY: DATE SYMBOL	DATE: APRIL 2016
DRAWN BY: JDL/MNF		JOB NO: 11056
CHECKED BY: BSS		SHEET NO. 43 OF 43