10235	MIS	10235 GENERATOR CAT 1750KW TX
10236	MIS	10236 WATER TOWER TX
10237	MIS	10237 WATER TOWER TX X
10240	MIS	10240 PUMP THOMPSON 6" TX X
10244	MIS	10244 FORK LIFT VARREACH TX
10245	MIS	10245 BARRIER WALL CLAMP TX X
10246	MIS	10246 BARRIER WALL CLAMP TX X
10249	MIS	10249 CONCRETE SAW (WALK BEHIND) X
10250	MIS	10250 GENERATOR WACKER TX X
10253	MIS	10253 PUMP JD X
10255	MIS	10255 SCREEN PLANT PORTABLE TX X
10257	MIS	10257 RADIAL STACKER THOR TX X
10258	MIS	10258 WINDROW ELEVATOR TX X
10262	MIS	10262 WATER STAND TX X
10263	MIS	10263 WATER STAND TX X
10264	MIS	10264 WATER STAND TX X
10267	MIS	10267 PRESSURE WASHER X
10268	MIS	10268 MESSAGE BOARD X
10275	MIS	10275 SKID STEER CAT 299C TX
10276	MIS	10276 WELDER LINCOLN VANTAGE 300 TX X
10278	MIS	10278 PULL PAN IMC X
10279	MIS	10279 MANLIFT GENIE S45 TX
10280	MIS	10280 MANLIFT GENIE S45 TX
10281	MIS	10281 MANLIFT GENIE S60 TX
10282	MIS	10282 MANLIFT GENIE S60 TX
10283	MIS	10283 MANLIFT JLG 120SXJ TX
10288	MIS	10288 WELDER MILLER BOBCAT 225 TX X
10289	MIS	10289 MESSAGE BOARD X
10290	MIS	10290 MESSAGE BOARD X
10291	MIS	10291 ASPHALT CUTTER TX X
10292	MIS	10292 WATER TOWER TX X
10293	MIS	10293 EMULSHION CONTAINMENT X
10297	MIS	10297 PUMP 6" GORMAN 16C2-4045D TX (R)
10301	MIS	10301 STORAGE CONTAINER 8X20 TX X
10302	MIS	10302 CARGO CONTAINER TX X
10303	MIS	10303 CARGO CONTAINER TX X
10304	MIS	10304 SCREED CONCRETE TEREX TX
10310	MIS	10310 CARGO CONTAINER 8X20 TX X
10312	MIS	10312 MESSAGE BOARD X
10313	MIS	10313 MESSAGE BOARD X
10314	MIS	10314 MESSAGE BOARD X
10315	MIS	10315 MESSAGE BOARD X
10322	MIS	10322 SKID STEER CAT 289C TX
10323	MIS	10323 SEEDER GREAT PLAINS TX X
10329	MIS	10329 CONEX CONTAINER X
10333	MIS	10333 ROLLER SCREED
10334	MIS	10334 COMPRESSOR 185 CFM X

10335	MIS	10335 LIGHTTOWER 4KW TEREX RL4000 X
10336	MIS	10336 LIGHTTOWER 4KW TEREX RL400 X
10337	MIS	10337 LIGHTTOWER 4KW TEREX RL4000 X
10338	MIS	10338 DRILL E-Z 210B TX X
10340	MIS	10340 AIR COMPRESSOR SULLAIR 185DPQ X
10341	MIS	10341 MESSAGE BOARD ADDCO X
10342	MIS	10342 RANGER POLARIS R13 X
10346	MIS	10346 TELEHANDLER CAT TL943 TX (R)
10347	MIS	10347 CONTAINER TX X
10348	MIS	10348 BEDDER JD X
10350	MIS	10350 MESSAGE BOARD SOLAR TECH X
10351	ARB	10351 ARROW BOARD ALLMAND TX X
10352	ARB	10352 ARROW BOARD ALLMAND TX X
10353	MIS	10353 MESSAGE BOARD WANCO TX X
10356	MIS	10356 MESSAGE BOARD WANCO TX X
10357	MIS	10357 MESSAGE BOARD WANCO TX X
10358	ARB	10358 ARROW BOARD WANCO TX X
10359	MIS	10359 PORTABLE SILO X
10360	MIS	10360 PORTABLE SILO TX X
10361	MIS	10361 HAMMER NPK TX X
10362	MIS	10362 PORTABLE TRAFFICE SIGNAL W/10362 TX X
10363	MIS	10363 PORTABLE TRAFFICE SIGNAL W/ 10362 TX X
10370	MIS	10370 LIGHT TOWER ALLMAND TX X
10371	MIS	10371 LIGHT TOWER ALLMAND TX X
10372	MIS	10372 GENERATOR LIFAN TX X
10373	MIS	10373 LIGHT TOWER ALLMAND TX X
10374	MIS	10374 LIGHT TOWER ALLMAND TX X
10375	MIS	10375 MESSAGE BOARD ADDCO TX X
10384	MIS	10384 STORAGE CONTAINER 8x20 (DO NOT KEY USAGE) X
10390	MIS	10390 DECK SCREEN X
10391	MIS	10391 GENERATOR TRADE WINDS TP125 TX X
10392	MIS	10392 AIR COMPRESSOR SULLAIR TX X
10395	ARB	10395 ARROW BOARD PRO LINE 15STD TX X
10396	ARB	10396 ARROW BAORD PRO LINE 15STD TX X
10397	ARB	10397 ARROW BOARD PRO LINE 15STD TX X
10398	MIS	10398 MESSAGE BOARD SMC-1000ST TX X
10399	MIS	10399 MESSAGE BOARD SMC-1000ST TX X
10400	MIS	10400 ATTENUATORS TRUCK MOUNTED TX X
10401	MIS	10401 ATTENUATORS TRUCK MOUNTED TX X
10404	MIS	10404 STORAGE CONTAINER X
10408	MIS	10408 WATER PUMP 6" TX X
10411	MIS	10411 TRENC BOX SPEEDSHORE X
10412	MIS	10412 TRENC BOX SPEEDSHORE X
10415	MIS	10415 WINDROW ELEVATOR TX X
10418	ARB	10418 ARROW BOARD 15 LIGHT TX X
10419	ARB	10419 ARROW BOARD 15 LIGHT TX X
10420	ARB	10420 ARROW BOARD 15 LIGHT TX X

10421	MIS	10421 MESSAGE BOARD X
10422	MIS	10422 MESSAGE BOARD TX X
10427	MIS	10427 MESSAGE BOARD THREE LINE TX X
10430	MIS	10430 GENERATOR XQ30N TX X
10458	MIS	10458 LIGHT TOWER X
10459	MIS	10459 BARRIER WALL CLAMP X
10460	MIS	10460 BARRIER WALL CLAMP X
10477	MIS	10477 RAP PROSOZER PLANT TX X
10488	MIS	10488 SKID STEER CAT 299D TX (R)
10494	MIS	10494 SCREEN PORTABLE
10500	MIS	10500 STACKER TX
10501	MIS	10501 STACKER TX
10502	MIS	10502 FEED HOPER TX
10503	MIS	10503 STACKER TX
10504	MIS	10504 STACKER TX
10505	MIS	10505 WASH PLANT TX
10506	MIS	10506 COMPRESSSOR SULAIR
10507	MIS	10507 AUTOMATED FLAGGER
10508	MIS	10508 AUTOMATED FLAGGER
10510	MIS	10510 GENERATOR CAT TX
10514	MIS	10514 SAND SCREW GRAYSTON
10519	MIS	10519 SKIDSTEER CAT 259D TX (R)
10523	MIS	10523 AIR COMPRESSOR
10525	MIS	10525 GENERATOR CAT TX (R)
10526	MIS	10526 SAFETY BOAT
10528	MIS	10528 FEEDER CONVEYOR TX (R)
10529	MIS	10529 WASH PLANT TX (R)
10530	MIS	10530 CRUSHER CHA MOUNTED TX
10531	MIS	10531 VSI CRUSHER CHA MOUNT TX
10532	MIS	10532 SCREEN CHASIS MOUNT TX
10533	MIS	10533 TRACK MOUNT SCREEN TX
10534	MIS	10534 WASH PLANT CHA MOUNT TX
10535	MIS	10535 STACKER KPI TX
10536	MIS	10536 STACKER KPI TX
10537	MIS	10537 STACKER KPI TX
10538	MIS	10538 STACKER TX
10539	MIS	10539 STACKER TX
10540	MIS	10540 STACKER TX
10541	MIS	10541 GENERATOR TX
10542	MIS	10542 TEXAS CRUSHER TX
10543	MIS	10543 CRUSHER KPI TX
10544	MIS	10544 SCREEN CHA MOUNT TX
10545	MIS	10545 SCREEN CHA MOUNT TX
10546	MIS	10546 STACKER KPI TX
10547	MIS	10547 STACKER KPI TX
10548	MIS	10548 STACKER KPI TX
10549	MIS	10549 STACKER KPI TX

10550	MIS	10550 STACKER KPI TX
10551	MIS	10551 STACKER KPI TX
10552	MIS	10552 STACKER KPI TX
10553	MIS	10553 STACKER KPI TX
10554	MIS	10554 GENERATOR CAT TX
10555	MIS	10555 SCREEN KPI TX
10556	MIS	10556 FEEDER BOX TX
10558	MIS	10558 CRASH CUSHION TRUCK TX (R)
10561	MIS	10561 PORTABLE TRAFFIC SIGNALS TX (L)
10562	MIS	10562 PORTABLE TRAFFIC SIGNALS TX (L)
10566	MIS	10566 GENERATOR TX (R)
11018	TRL	11018 FLATBED
11027	TRT	11027 LIQUID TANKER
11048	TRL	11048 TRAILER BOTTOM DUMP
11068	TRL	11068 UTILITY TRAILER
11069	TRL	11069 UTILITY TRAILER
11070	TRL	11070 CARGO TRAILER
11071	TRL	11071 11071 1000 GAL WATER TANK
11072	TRL	11072 5`X 8` TRAILER FOR PRES WASH
11073	TRL	11073 16` ANG TRAILER
11074	TRL	11074 UTILITY TRAILER
11075	TRL	11075 UTILITY TRAILER
11076	TRL	11076 UTILITY TRAILER
11077	TRL	11077 UTILITY TRAILER
11078	TRL	11078 UTILITY TRAILER
11079	TRL	11079 HAUL TRAILER
11080	TRL	11080 GOOSENECK TRAILER
11081	TRL	11081 GOOSENECK TRAILER
11083	TRL	11083 GOOSENECK TRAILER
11084	TRL	11084 LIGHTWEIGHT END DUMP
11085	TRL	11085 LIGHTWEIGHT END DUMP
11086	TRL	11086 GOOSENECK TRAILER
11087	TRL	11087 TRAILER VAN TX
11088	TRL	11088 TRAILER VAN TX
11089	TRL	11089 TRAILER VAN TX
11090	TRL	11090 TRAILER VAN TX
11091	TRL	11091 TRAILER VAN TX
11092	TRL	11092 TRAILER VAN TX
11093	TRL	11093 TRAILER VAN TX
11094	TRL	11094 TRAILER VAN TX
11095	TRL	11095 TRAILER VAN TX
11098	TRL	11098 TRAILER BOTTOM DUMP TX
11099	TRL	11099 TRAILER BOTTOM DUMP TX
11100	TRL	11100 TRAILER BOTTOM DUMP TX
11101	TRL	11101 TRAILER BOTTOM DUMP TX
11102	TRL	11102 TRAILER BOTTOM DUMP TX
11103	TRL	11103 TRAILER BOTTOM DUMP TX

11104	TRL	11104 TRAILER BOTTOM DUMP TX
11105	TRL	11105 TRAILER BOTTOM DUMP TX
11107	TRL	11107 TRAILER VAN TX
11109	TRL	11109 TRAILER GDAN TX
11114	TRL	11114 TRAILER BOTTOM DUMP TX
11115	TRL	11115 TRAILER BOTTOM DUMP TX
11116	TRL	11116 TRAILER BOTTOM DUMP TX
11117	TRL	11117 TRAILER BOTTOM DUMP TX
11118	TRL	11118 TRAILER BOTTOM DUMP TX
11119	TRL	11119 TRAILER BOTTOM DUMP TX
11120	TRL	11120 TRAILER BOTTOM DUMP TX
11123	TRL	11123 UTILITY TRAILER BIG TEX 14' TX
11124	TRL	11124 TRAILER HOME MADE
11134	TRL	11134 TRAILER BELLY DUMP
11135	TRL	11135 TRAILER BELLY DUMP
11136	TRL	11136 TRAILER ASPHALT TANKER
11137	TRL	11137 TRAILER ASPHALT TANKER
11138	TRL	11138 TRAILER BOTTOM DUMP
11139	TRL	11139 TRAILER BOTTOM DUMP
11140	TRL	11140 TRAILER BOTTOM DUMP
11141	TRL	11141 TRAILER BOTTOM DUMP
11142	TRL	11142 TRAILER BOTTOM DUMP
11143	TRL	11143 TRAILER BELLY DUMP
11144	TRL	11144 TRAILER BELLY DUMP
11145	TRL	11145 TRAILER UTILITY
11146	TRL	11146 TRAILER LIDDELL
11148	TRL	11148 TRAILER WATER WYLIE
11150	TRL	11150 TRAILER BIG TEX 12P116
11154	TRL	11154 TRAILER BIG TEX TX
11158	TRL	11158 TANKER TRAILER
11159	TRL	11159 TRAILER BELLY DUMP TX
11160	TRL	11160 TRAILER BELLY DUMP TX
11161	TRL	11161 TRAILER BELLY DUMP TX
11162	TRL	11162 TRAILER BELLY DUMP TX
11163	TRL	11163 TRAILER BELLY DUMP TX
11164	TRL	11164 TRAILER BELLY DUMP TX
11165	TRL	11165 TRAILER BELLY DUMP TX
11166	TRL	11166 TRAILER BELLY DUMP TX
11167	TRL	11167 TRAILER BELLY DUMP TX
11168	TRL	11168 TRAILER BELLY DUMP TX
11172	TRL	11172 TRAILER UTILITY 18'
11175	TRL	11175 TRAILER BIG TEX
11178	TRL	11178 TRAILER BUDD VAN
11189	TRL	11189 TRAILER BIG TEX
11192	TRL	11192 TRAILER TEXAS 82X16
12047	TCD	12047 DOZER KOM D61EX-15 CRAWLER
12048	TCD	12048 DOZER CAT D7G TX

12049	TCD	12049 DOZER CAT D6TWX TX
12050	TCD	12050 DOZER CAT D6T XLVP TX
12052	TCD	12052 DOZER CAT D5G TX
12057	TCD	12057 DOZER CAT D4G TX
12058	TCD	12058 DOZER CAT D5K TRACK TYPETRACTOR TX
12063	TCD	12063 DOZER CAT D6T TX
12080	TCD	12080 DOZER CAT D5K2 TX (R)
20097	POV	20097 POV: LEE GARCIA
20098	POV	20098 POV: GABRIEL ALMAZAN
20099	POV	20099 POV: ARTURO LOPEZ
20100	POV	20100 POV: LORNE JONSSON
20101	POV	20101 POV: SERGIO RAMOS
20102	POV	20102 POV: JOSE INES GARCIA
20104	POV	20104 POV: MARIO GARZA
20105	POV	20105 POV: MARK GARZA
20106	POV	20106 POV: RUBEN NAVARRO
20110	POV	20110 POV: MCDANIEL BARRS
20122	POV	20122 POV: ROBERTO SAENZ
20126	POV	20126 POV: RAYMOND QUIGG
20127	POV	20127 POV: FRANCISCO CISNEROS
20128	POV	20128 POV: ARTURO ESTEVIS
20135	POV	20135 POV: RICHARD LEYENDECKER
20140	POV	20140 POV: LANCE HARTSFIELD
20153	POV	20153 POV: MARTIN GRACIA JR
20161	POV	20161 POV: EDUARDO RAMIREZ
20162	POV	20162 POV: DAVID PADRON
20179	POV	20179 POV: JIM BARKER
20188	POV	20188 POV: ORLANDO TIJERINA
20189	POV	20189 POV: BALDOMERO CANTU
20191	POV	20191 POV: EMIGDIO ESCALANTE JR
20204	POV	20204 POV: RICHARD LEYENDECKER SR
20214	POV	20214 POV: DANIEL HERNANDEZ
20216	POV	20216: POV DONALD KENNEDY
AND001	AND	GENERATOR
JCP016	TKP	JCP016 PICKUP CHEVY K1500 CREW CAB

LIST OF PROPOSED SUBCONTRACTORS

- ACEE CONSTRUCTION, LLC: DRAINAGE, FLATWORK, & METAL BEAM GUARD FENCE.
- HIGHWAY BARRICADES & SERVICES, LLC: BARRICADES / TRAFFIC HANDLING, ROAD SIGNS, & PAVEMENT MARKINGS.
- TEXAS ICON CONSTRUCTION, LLC: EROSION CONTROL.

WEBB COUNTY
MANGANA HEIN ROAD EXTENSION PROJECT
BID SCHEDULE

I. Road Improvements of 1.0 Mile (2-12' Lanes & 2-4' Shoulders w/Drainage Swale) Local Collector (1M ESALS)

Item #	Name of Pay Item with Unit Bid Price Written in Words	Estimated Quantity	Unit	Unit Price	Extended
1	Mobilization & bonding, complete in place at, Two Hundred Ten Thousand Dollars with 00/100 per unit.	1	LS	$ 210,000.00	$210,000.00
2	Clearing & Grubbing, complete in place at, thirteen thousand Dollars with 00/100 per unit.	5.0	AC	$ 13,000.00	$ 65,000.00
3	Demolition of 3 existing drainage crossings (removal & disposal), complete in place at, Sixteen thousand Dollars with 00/100 per unit.	1	LS	$ 16,000.00	$ 16,000.00
4	Demolition of existing truss bridge (removal & disposal), complete in place at, Ten thousand Two Hundred Dollars with 00/100 per unit.	1	LS	$ 10,200.00	$ 10,200.00
5	Remove, reinstall & repaint existing steel bollard fence by propane & natural gas station, complete in place at, Six thousand Two Hundred Dollars with 00/100 per unit.	1	LS	$ 6,200.00	$ 6,200.00
6	Excavation cut (compacted measure), complete in place at, Sixteen Dollars with 00/00 per unit.	12,985	CY	$ 16.00	$ 207,760.00
7	Excavation fill (compacted measure) material from cut, complete in place at, Twenty Four Dollars with 00/00 per unit.	280	CY	$ 24.00	$ 6,720.00
8	8" Subgrade preparation, complete in place at, Two Dollars with 00/00 per unit.	23,500	SY	$ 2.00	$ 47,000.00
9	TX-5 Geogrid, complete in place at, Five Dollars with 00/00 per unit.	18,800	SY	$ 5.00	$ 94,000.00
10	13.5" Flexible base (caliche), complete in place at Thirty One Dollars with 00/00 per unit.	18,800	SY	$ 31.00	$ 582,800.00

Item #	Name of Pay Item with Unit Bid Price Written in Words	Estimated Quantity	Unit	Unit Price	Extended
11	Prime coat MC-30, complete in place at, One Dollar with 40/100 per unit.	18,800	SY	$ 1.40	$ 26,320.00
12	2½" Type D HMAC, complete in place at, Twenty One Dollars with 00/100 per unit.	18,800	SY	$ 21.00	$ 394,800.00
13	Striping, signage & reflectors, complete in place at, Twenty One Thousand Eight Hundred Dollars with 00/100 per unit.	1	LS	$ 21,800.00	$ 21,800.00

Total Road Improvements: $ 1,688,600.00

Total Written in words: One Million, Six Hundred Eighty-Eight Thousand, Six Hundred Dollars with 00/100

II. Storm Drainage Improvements

Item #	Name of Pay Item with Unit Bid Price Written in Words	Estimated Quantity	Unit	Unit Price	Extended
14	24" Ø RCP, complete in place at, One Hundred Fifty Dollars with 00/100 per unit.	92	LF	$ 150.00	$ 13,800.00
15	8' x 3' Box culvert, complete in place at, One thousand Six Hundred Dollars with 00/100 per unit.	48	LF	$ 1,600.00	$ 76,800.00
16	4' x 2' Box culvert, complete in place at, Eight Hundred Ninety Dollars with 00/100 per unit.	94	LF	$ 890.00	$ 83,660.00
17	Concrete Headwall / Wingwall including concrete rip-rap (2-24" pipe), complete in place at, Ten Thousand Three Hundred Dollars with 00/100 per unit.	2	EA	$ 10,300.00	$ 20,600.00
18	Concrete Headwall / Wingwall including concrete rip-rap for 8' x 3' box culvert, complete in place at, Eighteen Thousand Dollars with 00/100 per unit.	2	EA	$ 18,000.00	$ 36,000.00
19	Concrete Headwall / Wingwall including concrete rip-rap for 4' x 2' box culvert, complete in place at, Eighteen Thousand Dollars with 00/100 per unit.	2	EA	$ 18,000.00	$ 36,000.00

Item #	Name of Pay Item with Unit Bid Price Written in Words	Estimated Quantity	Unit	Unit Price	Extended
20	Concrete rip-rap (embankment), complete in place at, Sixteen Dollars with 00/100 per unit.	405	SF	$ 16.00	$ 6,480.00
21	Safety metal beam guard fence including reflectors, end treatment, and impact head, complete in place at, One Hundred Seventy Dollars with 00/100 per unit.	445	LF	$ 170.00	$ 75,650.00
22	Rock gravel filter, complete in place at, One Thousand Five Hundred Dollars with 00/100 per unit.	23	EA	$ 1,500.00	$ 34,500.00
23	Drainage crossings reflectorized object marking, complete in place at, Fifty Dollars with 00/100 per unit.	12	EA	$ 50.00	$ 600.00
24	Silt fence, complete in place at, Nine Dollars with 00/100 per unit.	500	LF	$ 9.00	$ 4,500.00
25	Concrete Wash Pit, complete in place at, Five Hundred Eighty Dollars with 00/100 per unit.	1	EA	$ 580.00	$ 580.00
26	Stabilized construction entrance, complete in place at, Eight Thousand Dollars with 00/100 per unit.	1	EA	$ 8,000.00	$ 8,000.00

Total Road Improvements: $ 397,170.00

Total Written in words: Three Hundred Ninety-Seven Thousand, One Hundred Seventy Dollars with 00/100

III. Site / Miscellaneous Improvements

Item #	Name of Pay Item with Unit Bid Price Written in Words	Estimated Quantity	Unit	Unit Price	Extended
27	Traffic Control, complete in place at, One Hundred Fifty Thousand Dollars with 00/100 per unit.	1	LS	$ 150,000.00	$ 150,000.00

Total Site / Miscellaneous Improvements: $ 150,000.00

Total Written in words: One Hundred Fifty Thousand Dollars with 00/100

SUMMARY			
I.	Road Improvements of 1M (2-12' Lanes & 2-4' Shoulders w/Drainage Swale) Local Collector (1M ESALS)	$	1,688,600.00
II.	Storm Drainage Improvements	$	397,170.00
III.	Site / Miscellaneous Improvements	$	150,000.00
	TOTAL BASE BID	$	2,235,770.00

Total Base Bid Written in words: Two Million, Two Hundred Thirty-Five Thousand, Seven Hundred Seventy Dollars with 00/100

The undersigned bidder certifies that he has currently checked the bid prices contained herein and is entirely satisfied that they are correct and final.

BIDDER: Anderson Columbia Co., Inc.

BY: _____

TITLE: Vice President

ADDRESS: P.O. Box 565

CITY: Weslaco STATE: Texas

ZIP: 78599 PHONE: (956)969-4614

NOTE #1 – PAY ITEMS: All items shall consist of furnishing all materials, labor, equipment, superintendence, and all necessary work to undertake and complete the pay item without any further compensation, adjustment, or consideration.

NOTE #2 – GENERAL NOTE: All bid items will be paid for when complete, in place, tested, and accepted by Webb County.

BID BOND

Project: Mangana Hein Road Extension Project

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

Anderson Columbia Co., Inc.

Travelers Casualty and Surety Company of America and
as Principal, and Berkshire Hathaway Specialty Insurance Company as Surety, are hereby

held and firmly bound unto Webb County, TX as Owner in

the penal sum of Five percent of the amount bid (5% of the amount bid) for payment of which, well and truly to be made, we hereby jointly and severally bid ourselves, our heirs, executors, administrations, successors and assigns.

Signed, this 3rd day of October, 2022.

The condition of the above obligation is such that whereas the Principal has submitted

to Webb County, TX a certain Bid, attached hereto and hereby made a part hereof to enter into a Contract in writing for the

ITB 2022-015, Mangana Hein Road Extension Project, Laredo, TX

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,
(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the Agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that he obligations of said Surety, and its bonds shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals and such of them as are corporations have caused their corporate seals to be hereto

affixed and these presents to be signed by their proper officers, the day and year first set forth herein.

Anderson Columbia Co., Inc.

_____ (L.S.)
Principal

Travelers Casualty and Surety Company of America and
Berkshire Hathaway Specialty Insurance Company

_____
Surety

By: _____
Kevin R. Wojtowicz, Attorney-in-Fact

TRAVELERS

Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **KEVIN R WOJTOWICZ** of **ST PETERSBURG**, **Florida**, their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April, 2021**.

State of Connecticut

City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the **21st** day of **April, 2021**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June, 2026**

_____
Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of each of the Companies, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of each of the Companies, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **3rd** day of **October**, **2022**

_____
Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.

Berkshire Hathaway Specialty Insurance

Power Of Attorney

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY
NATIONAL INDEMNITY COMPANY / NATIONAL LIABILITY & FIRE INSURANCE COMPANY

Know all men by these presents, that **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at One Lincoln Street, 23rd Floor, Boston, Massachusetts 02111, **NATIONAL INDEMNITY COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at 3024 Harney Street, Omaha, Nebraska 68131 and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Connecticut and having an office at 100 First Stamford Place, Stamford, Connecticut 06902 (hereinafter collectively the "Companies"), pursuant to and by the authority granted as set forth herein, do hereby name, constitute and appoint: **Kevin R. Wojtowicz, 1000 Central Avenue, Suite 200 of the city of St. Petersburg, State of Florida,** their true and lawful attorney(s)-in-fact to make, execute, seal, acknowledge, and deliver, for and on their behalf as surety and as their act and deed, any and all undertakings, bonds, or other such writings obligatory in the nature thereof, in pursuance of these presents, the execution of which shall be as binding upon the Companies as if it has been duly signed and executed by their regularly elected officers in their own proper persons. **This authority for the Attorney-in-Fact shall be limited to the execution of the attached bond(s) or other such writings obligatory in the nature thereof.**

In witness whereof, this Power of Attorney has been subscribed by an authorized officer of the Companies, and the corporate seals of the Companies have been affixed hereto this date of December 20, 2018. This Power of Attorney is made and executed pursuant to and by authority of the Bylaws, Resolutions of the Board of Directors, and other Authorizations of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, which are in full force and effect, each reading as appears on the back page of this Power of Attorney, respectively. **The following signature by an authorized officer of the Company may be a facsimile, which shall be deemed the equivalent of and constitute the written signature of such officer of the Company for all purposes regarding this Power of Attorney, including satisfaction of any signature requirements on any and all undertakings, bonds, or other such writings obligatory in the nature thereof, to which this Power of Attorney applies.**

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY,

By: _____
David Fields, Executive Vice President

NATIONAL INDEMNITY COMPANY,
NATIONAL LIABILITY & FIRE INSURANCE COMPANY,

By: _____
David Fields, Vice President

NOTARY
State of Massachusetts, County of Suffolk, ss:
On this 20th day of December, 2018, before me appeared David Fields, Executive Vice President of BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY and Vice President of NATIONAL INDEMNITY COMPANY and NATIONAL LIABILITY & FIRE INSURANCE COMPANY, who being duly sworn, says that his capacity is as designated above for such Companies; that he knows the corporate seals of the Companies; that the seals affixed to the foregoing instrument are such corporate seals; that they were affixed by order of the board of directors or other governing body of said Companies pursuant to its Bylaws, Resolutions and other Authorizations, and that he signed said instrument in that capacity of said Companies.

[Notary Seal]

GEOFFERY A. DELISIO
Notary Public
Commonwealth of Massachusetts
My Comm. Expires November 29, 2024

_____
Notary Public

I, Ralph Tortorella, the undersigned, Officer of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies which is in full force and effect and has not been revoked. IN TESTIMONY WHEREOF, see hereunto affixed the seals of said Companies this October 3, 2022.

_____
Officer

To verify the authenticity of this Power of Attorney please contact us at: BHSI Surety Department, Berkshire Hathaway Specialty Insurance Company, One Lincoln Street, 23rd Floor Boston, MA 02111 | (770) 625-2516 or by email at Jennifer.Porter@bhspecialty.com *THIS POWER OF ATTORNEY IS VOID IF ALTERED*

To notify us of a claim please contact us on our 24-hour toll free number at (855) 453-9675, via email at claimsnotice@bhspecialty.com, via fax to (617) 507-8259, or via mail.

BID BOND

Project: Mangana Hein Road Extension Project

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

Anderson Columbia Co., Inc.

Travelers Casualty and Surety Company of America and
as Principal, and Berkshire Hathaway Specialty Insurance Company as Surety, are hereby

held and firmly bound unto Webb County, TX as Owner in

the penal sum of Five percent of the amount bid (5% of the amount bid) for payment of which, well and truly to be made, we hereby jointly and severally bid ourselves, our heirs, executors, administrations, successors and assigns.

Signed, this 3rd day of October, 2022.

The condition of the above obligation is such that whereas the Principal has submitted

to Webb County, TX a certain Bid, attached hereto and hereby made a part hereof to enter into a Contract in writing for the

ITB 2022-015, Mangana Hein Road Extension Project, Laredo, TX

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,
(b) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the Agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that he obligations of said Surety, and its bonds shall be in no way impaired or affected by any extension of the time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals and such of them as are corporations have caused their corporate seals to be hereto

affixed and these presents to be signed by their proper officers, the day and year first set forth herein.

Anderson Columbia Co., Inc.

_____ (L.S.)
Principal

Travelers Casualty and Surety Company of America and
Berkshire Hathaway Specialty Insurance Company

_____
Surety

By: _____

Kevin R. Wojtowicz, Attorney-in-Fact

TRAVELERS

Travelers Casualty and Surety Company of America
Travelers Casualty and Surety Company
St. Paul Fire and Marine Insurance Company

POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That Travelers Casualty and Surety Company of America, Travelers Casualty and Surety Company, and St. Paul Fire and Marine Insurance Company are corporations duly organized under the laws of the State of Connecticut (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint **KEVIN R WOJTOWICZ** of **ST PETERSBURG**, **Florida**, their true and lawful Attorney(s)-in-Fact to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed, and their corporate seals to be hereto affixed, this **21st** day of **April**, **2021**.

State of Connecticut

City of Hartford ss.

By: _____
Robert L. Raney, Senior Vice President

On this the **21st** day of **April**, **2021**, before me personally appeared **Robert L. Raney**, who acknowledged himself to be the Senior Vice President of each of the Companies, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of said Companies by himself as a duly authorized officer.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission expires the **30th** day of **June**, **2026**

_____
Anna P. Nowik, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of each of the Companies, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, **Kevin E. Hughes**, the undersigned, Assistant Secretary of each of the Companies, do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which remains in full force and effect.

Dated this **3rd** day of **October**, **2022**.

_____
Kevin E. Hughes, Assistant Secretary

To verify the authenticity of this Power of Attorney, please call us at 1-800-421-3880.
Please refer to the above-named Attorney(s)-in-Fact and the details of the bond to which this Power of Attorney is attached.

Berkshire Hathaway Specialty Insurance

Power Of Attorney

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY
NATIONAL INDEMNITY COMPANY / NATIONAL LIABILITY & FIRE INSURANCE COMPANY

Know all men by these presents, that **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at One Lincoln Street, 23rd Floor, Boston, Massachusetts 02111, **NATIONAL INDEMNITY COMPANY**, a corporation existing under and by virtue of the laws of the State of Nebraska and having an office at 3024 Harney Street, Omaha, Nebraska 68131 and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY**, a corporation existing under and by virtue of the laws of the State of Connecticut and having an office at 100 First Stamford Place, Stamford, Connecticut 06902 (hereinafter collectively the "Companies"), pursuant to and by the authority granted as set forth herein, do hereby name, constitute and appoint: **Kevin R. Wojtowicz, 1000 Central Avenue, Suite 200 of the city of St. Petersburg, State of Florida,** their true and lawful attorney(s)-in-fact to make, execute, seal, acknowledge, and deliver, for and on their behalf as surety and as their act and deed, any and all undertakings, bonds, or other such writings obligatory in the nature thereof, in pursuance of these presents, the execution of which shall be as binding upon the Companies as if it has been duly signed and executed by their regularly elected officers in their own proper persons. **This authority for the Attorney-in-Fact shall be limited to the execution of the attached bond(s) or other such writings obligatory in the nature thereof.**

In witness whereof, this Power of Attorney has been subscribed by an authorized officer of the Companies, and the corporate seals of the Companies have been affixed hereto this date of December 20, 2018. This Power of Attorney is made and executed pursuant to and by authority of the Bylaws, Resolutions of the Board of Directors, and other Authorizations of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY,** which are in full force and effect, each reading as appears on the back page of this Power of Attorney, respectively. **The following signature by an authorized officer of the Company may be a facsimile, which shall be deemed the equivalent of and constitute the written signature of such officer of the Company for all purposes regarding this Power of Attorney, including satisfaction of any signature requirements on any and all undertakings, bonds, or other such writings obligatory in the nature thereof, to which this Power of Attorney applies.**

BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY,

By: _____
David Fields, Executive Vice President

NATIONAL INDEMNITY COMPANY, NATIONAL LIABILITY & FIRE INSURANCE COMPANY,

By: _____
David Fields, Vice President

NOTARY
State of Massachusetts, County of Suffolk, ss:
On this 20th day of December, 2018, before me appeared David Fields, Executive Vice President of BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY and Vice President of NATIONAL INDEMNITY COMPANY and NATIONAL LIABILITY & FIRE INSURANCE COMPANY, who being duly sworn, says that his capacity is as designated above for such Companies; that he knows the corporate seals of the Companies; that the seals affixed to the foregoing instrument are such corporate seals; that they were affixed by order of the board of directors or other governing body of said Companies pursuant to its Bylaws, Resolutions and other Authorizations, and that he signed said instrument in that capacity of said Companies.

[Notary Seal]

GEOFFERY A. DELISIO
Notary Public
Commonwealth of Massachusetts
My Comm. Expires November 29, 2024

_____
Notary Public

I, Ralph Tortorella, the undersigned, Officer of **BERKSHIRE HATHAWAY SPECIALTY INSURANCE COMPANY, NATIONAL INDEMNITY COMPANY** and **NATIONAL LIABILITY & FIRE INSURANCE COMPANY,** do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies which is in full force and effect and has not been revoked. IN TESTIMONY WHEREOF, see hereunto affixed the seals of said Companies this October 3, 2022.

_____
Officer

To verify the authenticity of this Power of Attorney please contact us at: BHSI Surety Department, Berkshire Hathaway Specialty Insurance Company, One Lincoln Street, 23rd Floor Boston, MA 02111 | (770) 625-2516 or by email at Jennifer.Porter@bhspecialty.com *THIS POWER OF ATTORNEY IS VOID IF ALTERED*

To notify us of a claim please contact us on our 24-hour toll free number at (855) 453-9675, via email at claimsnotice@bhspecialty.com, via fax to (617) 507-8259, or via mail.

SECTION A-6
CHECKLIST FOR BIDDERS

Project: Mangana Hein Road Extension Project

All information required by the terms of the Bid Documents must be furnished. **MISTAKES OR OMISSIONS CAN BE COSTLY AND CAN RESULT IN THE REJECTION OF YOUR BID.** Important items for you to check are included in but not limited to, those listed below. This checklist is furnished only to assist you in submitting a proper bid. Check as you read.

DO NOT INCLUDE THIS CHECKLIST WITH YOUR BID.

[ ] Have you acknowledged receipt of all addenda to the plans and specifications?

[ ] Is your bid properly signed? (Refer to Bid Documents)

[ ] If a bid guarantee is required, is it included in your bid? (A late bid guarantee is treated the same as a late bid)

[ ] Is your bid guarantee in the proper amount? (Usually 5% of total bid price)

[ ] Your bid guarantee must be in the form of a Bidder's Bond, a Certified Check or Cashier's Check.

[ ] If your bid guarantee is in the form of a Bidder's Bond, is the bond properly signed by both the bidder and surety and are all required seals affixed?

[ ] Is the surety company qualified and licensed by the State of Texas as required by the provisions of the bid documents?

[ ] Is the name in which you submitted the bid the same on your bid proposal as on the Bidder's Bond?

[ ] If required have you entered a unit price for each bid item?

[ ] If required have you entered the unit price or lump sum price in both words and figures? (Unit Price or Lump Sum price in words govern)

[ ] Are decimals in unit prices in the proper places? Are your figures legible?

[ ] Are the extensions of your unit prices, and your total bid price correct?

[ ] Is proposal being submitted complete together with Information from Bidders?

[ ] Are all erasures or corrections initialized by the person signing the bid or by an authorized representative of the person signing the bid.

[ ] Do not restrict your bid by altering any provisions of the Bid Document or by attaching any documents to the Proposal that takes exception to the Bid Documents.

[ ] Have you included all pages of the Proposal with your bid? Are all blanks in the Proposal properly completed (equipment brands, alternate materials, etc.)?

[ ] Is the envelope containing your bid properly identified that it is a sealed bid and does it contain the correct project name and bid opening date?

[ ] Will your bid arrive on time? Late bids will not be considered. Generally, bids must be received by the County Purchasing Agent, 1110 Washington St., Ste. 101 Laredo, Texas 78040 on the date and time specified in the Notice to Bidders. (Other times or dates will be clearly specified in the Notice).

[ ] On Federally Funded Projects, contractor must submit certified weekly payrolls with a copy to County Engineering Files.

Offeror: Complete & Return this Form with Response Submission.

House Bill 89 Verification

I, Berry O'Bryan, the undersigned representative of (company or business name) Anderson Columbia Co., Inc.
(heretofore referred to as company) being an adult over the age of eighteen (18) years of age, after being duly sworn by the undersigned notary, do hereby depose and verify under oath that the company named above, under the provisions of Subtitle F, Title 10, Government Code Chapter 2270:

1. Does not boycott Israel currently; and

2. Will not boycott Israel during the term of the contract.

Pursuant to Section 2270.001, Texas Government Code:

1. "Boycott Israel" means refusing to deal with, terminating business activities with, or otherwise taking any action that is intended to penalize, inflict economic harm on, or limit commercial relations specifically with Israel, or with a person or entity doing business in Israel or in an Israeli-controlled territory, but does not include an action made ordinary business purposes; and

2. "Company" means a for-profit sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, or an limited liability company, including a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate of those entities or business association that exist to make a profit.

Signature of Company Representative

10/03/2022
Date

On this 3rd day of October, 2022, personally appeared

Berry O'Bryan, the above named person, who after by me being duly sworn, did swear and confirm that the above is true and correct.

Notary Seal

Notary Signature

MARIA ALICIA HERNANDEZ
Notary Public, State of Texas
Comm. Expires 08-04-2025
Notary ID 10934616

10/03/2022
Date

Offeror: Complete & Return this Form with Response Submission.
Senate Bill 252 Certification

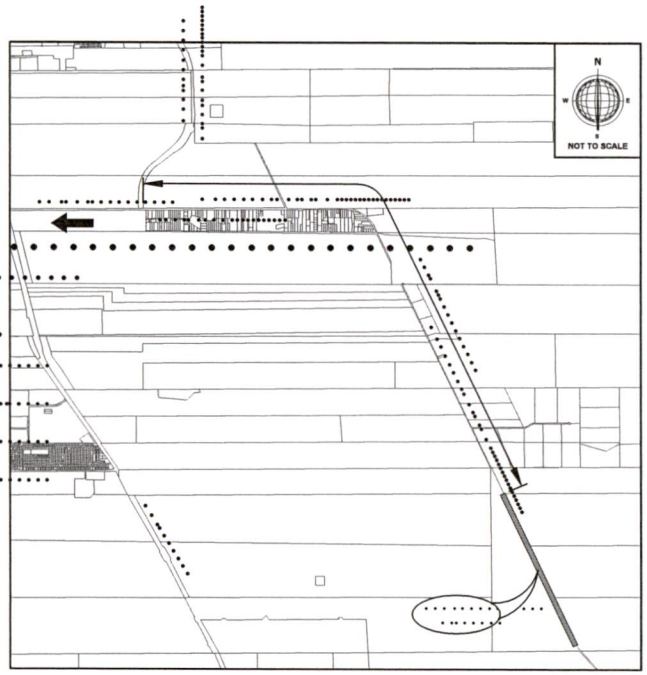
SB 252 CHAPTER 2252 CERTIFICATION I, Berry O'Bryan, the undersigned representative of Anderson Columbia Co., Inc. (Company or business name) being an adult over the age of eighteen (18) years of age, pursuant to Texas Government Code, Chapter 2252, Section 2252.152 and Section 2252.153, certify that the company named above is not listed on the website of the Comptroller of the State of Texas concerning the listing of companies that are identified under Section 806.051, Section 807.051 or Section 2253.153. I further certify that should the above-named company enter into a contract that is on said listing of companies on the website of the Comptroller of the State of Texas which do business with Iran, Sudan or any Foreign Terrorist Organization, I will immediately notify Mr. Jose Angel Lopez III, Webb County Purchasing Agent at (956) 523-4125 or via email at joel@webbcountytx.gov

Anderson Columbia Co., Inc. Name of Company Representative (Print)

Signature of Company Representative

10/03/2022 Date

THE STATE OF TEXAS
COUNTY OF WEBB



Sheet List Table	
Sheet Number	Sheet Title
01	TITLE PAGE-LOCATION MAP-SHEET INDEX
02	TOPO, CONTROL POINTS & DEMOLITION MAP
03	GENERAL NOTES & BASIS OF ESTIMATE
04	BORE LOCATION MAP & BORE LOGS
05	DRAINAGE AREA MAP
06	STORMWATER POLLUTION PREVENTION PLAN
07	STORMWATER MANAGEMENT PLAN & PROFILES
08	STORMWATER MANAGEMENT & SW3P DETAILS
09	ROAD PAVING PLAN & PROFILE - 0+00 - 11+00
10	ROAD PAVING PLAN & PROFILE - 11+00 - 22+00
11	ROAD PAVING PLAN & PROFILE - 22+00 - 32+00
12	ROAD PAVING PLAN & PROFILE - 32+00 - 43+00
13	ROAD PAVING PLAN & PROFILE - 43+00 - 52+81
14	ROAD STRIPING & SIGNAGE PLAN
15	CONSTRUCTION PHASING PLAN
16	TRAFFIC MANAGEMENT PLAN
17	TCP STANDARDS - TCP (1-2)-18
18	TCP STANDARDS - TCP (2-2)-18
19	BARRICADES AND CONSTRUCTION STANDARDS - BC(1)-21
20	BARRICADES AND CONSTRUCTION STANDARDS - BC(2)-21
21	BARRICADES AND CONSTRUCTION STANDARDS - BC(3)-21
22	BARRICADES AND CONSTRUCTION STANDARDS - BC(4)-21
23	BARRICADES AND CONSTRUCTION STANDARDS - BC(5)-21
24	BARRICADES AND CONSTRUCTION STANDARDS - BC(7)-21
25	BARRICADES AND CONSTRUCTION STANDARDS - BC(8)-21
26	BARRICADES AND CONSTRUCTION STANDARDS - BC(10)-21
27	PM-DELINEATOR-OM STANDARDS - PM(1)-20
28	PM-DELINEATOR-OM STANDARDS - PM(2)-20
29	PM-DELINEATOR-OM STANDARDS - DOM (1)-20
30	PM-DELINEATOR-OM STANDARDS - DOM (2)-20
31	PM-DELINEATOR-OM STANDARDS - DOM (3)-20
32	PM-DELINEATOR-OM STANDARDS - DOM (5)-20
33	PM-DELINEATOR-OM STANDARDS - DOM(WA)-20
34	METAL BEAM GUARD FENCE STANDARDS - GF(31)-19
35	METAL BEAM GUARD FENCE STANDARDS - SGT(14W)31-18
36	METAL BEAM GUARD FENCE STANDARDS - BED-14
37	SIGNAGE STANDARDS - SMD(GEN)-08
38	SIGNAGE STANDARDS - SMD(TWT)-08
39	CULVERT AND HEADWALL STANDARDS - MC-4.23-1
40	CULVERT AND HEADWALL STANDARDS - MC-4.23-2
41	CULVERT AND HEADWALL STANDARDS - SCC-8-1
42	CULVERT AND HEADWALL STANDARDS - SCC-8-2
43	CULVERT AND HEADWALL STANDARDS - CH-FW-0
44	CULVERT AND HEADWALL STANDARDS - FW-0
45	EROSION CONTROL STANDARDS - EC(1)-16
46	EROSION CONTROL STANDARDS - EC(2)-16
47	EROSION CONTROL STANDARDS - EC(9)-16

GENERAL NOTES

Construction plans identify existing utilities with Subsurface Utility Engineering (SUE) Quality Level C accuracy.

	# of Tie-ins
Water	0
Sewer	0
Streets	2

ALFREDO MARTINEZ
123303
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS

09-06-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

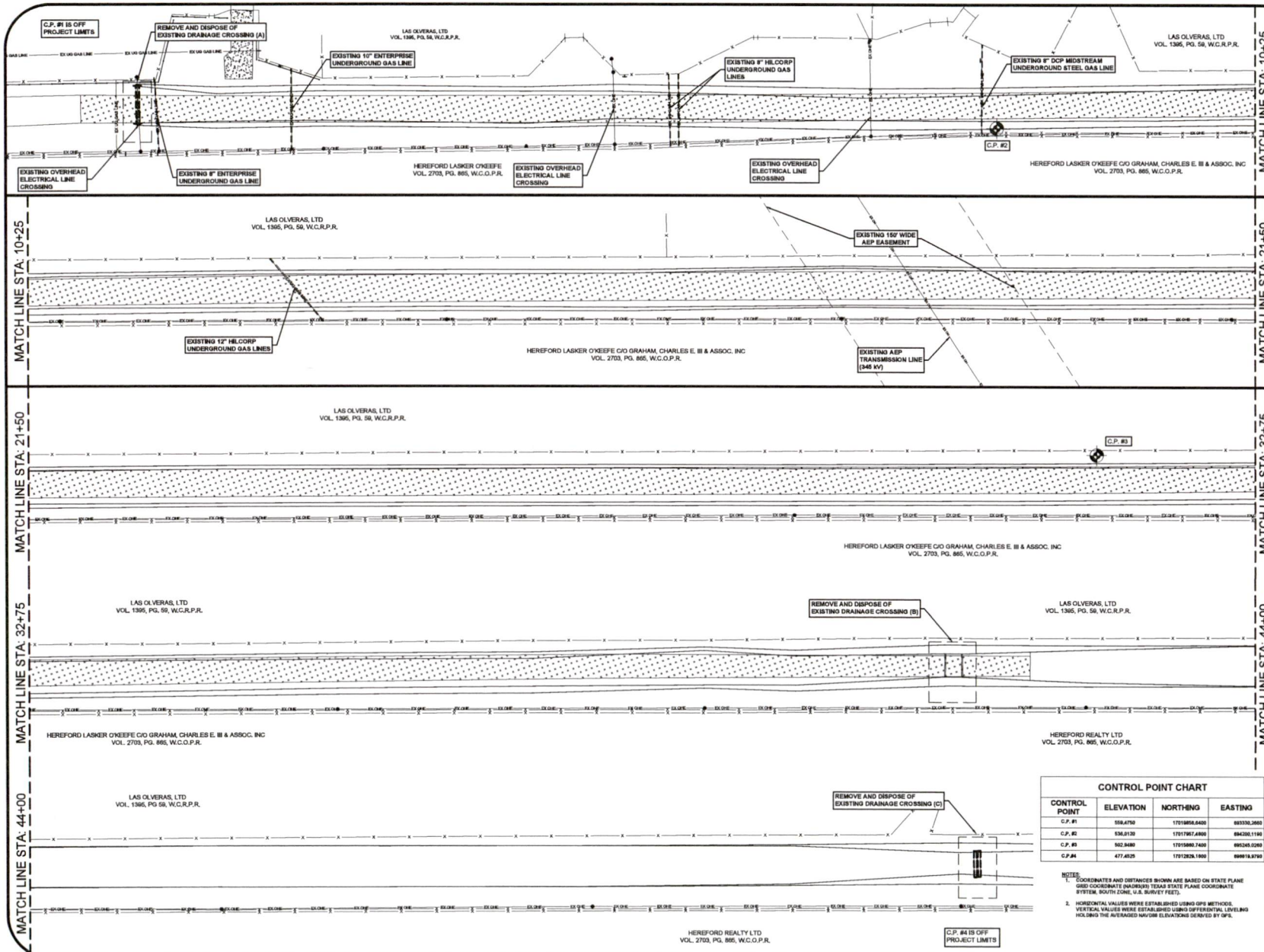
Project Name and Address

MANGANA-HEIN ROAD EXTENSION PROJECT WEBB COUNTY, TEXAS

Sheet Title

TITLE PAGE-LOCATION MAP-SHEET INDEX

Date	Sheet
9/6/2022	01
Scale	
N.T.S.	



CONTROL POINT CHART

CONTROL POINT	ELEVATION	NORTHING	EASTING
C.P. #1	558.4750	17019858.6400	693330.3660
C.P. #2	536.0120	17017957.4900	694200.1190
C.P. #3	502.9480	17015880.7400	695245.0260
C.P.#4	477.4525	17012828.1900	696018.9750

NOTES:
1. COORDINATES AND DISTANCES SHOWN ARE BASED ON STATE PLANE GRID COORDINATE (NAD83(93) TEXAS STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, U.S. SURVEY FEET).
2. HORIZONTAL VALUES WERE ESTABLISHED USING GPS METHODS. VERTICAL VALUES WERE ESTABLISHED USING DIFFERENTIAL LEVELING HOLDING THE AVERAGED NAVD88 ELEVATIONS DERIVED BY GPS.

GENERAL NOTES

DEMOLITION NOTES
1. REMOVE AND DISPOSE OF EXISTING DRAINAGE CROSSINGS INCLUDE PIPE, BOX CULVERT, HEADWALLS, WINGWALLS, AND ANY DEBRIS.
2. CONTRACTOR MUST PROVIDE CONTINUOUS ROAD ACCESS AT ALL TIMES FOR PUBLIC.

LEGEND

- CONTROL POINT SET ON ½" IRON ROD
- REMOVE AND DISPOSE WITHIN LIMITS
- EXISTING ASPHALT MILLING

SCALE 1" = 40'

STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER
09-08-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
TOPO, CONTROL POINTS & DEMOLITION MAP

Date: 9/8/2022
Scale: AS NOTED
Sheet: 02

1. EARTHWORK ON THE PROJECT SHOULD BE OBSERVED AND EVALUATED BY TESTING LAB. THE EVALUATION OF EARTHWORK SHOULD INCLUDE OBSERVATION AND TESTING OF ENGINEERED FILL, SUBGRADE PREPARATION, AND OTHER GEOTECHNICAL CONDITIONS EXPOSED DURING THE CONSTRUCTION OF THE PROJECT.
2. IF THE SUBGRADE CANNOT BE ADEQUATELY COMPACTED TO MINIMUM DENSITIES DUE TO WET CONDITIONS AS DESCRIBED IN THE PLANS, CONTRACTOR TO ALLOW SUBGRADE TO DRY BY NATURAL MEANS IF THE SCHEDULE ALLOWS.
3. PRIOR TO PLACING ANY FILL, ANY VEGETATION, LOOSE TOPSOIL, AND ANY OTHERWISE UNSUITABLE MATERIALS SHOULD BE REMOVED FROM THE PROPOSED ROAD ALIGNMENT. THE STRIPPED MATERIALS CONSISTING OF VEGETATION AND ORGANIC MATERIALS SHOULD BE REMOVED FROM THE SITE, OR USED TO REVEGETATE LANDSCAPED AREAS OR EXPOSED SLOPES AFTER COMPLETION OF GRADING OPERATIONS
4. AFTER STRIPPING AND GRUBBING, THE SUBGRADE SHOULD BE PROOF-ROLLED WHERE POSSIBLE TO AID IN LOCATING LOOSE OR SOFT AREAS.
5. POSITIVE DRAINAGE SHOULD BE PROVIDED DURING CONSTRUCTION TO PREVENT WATER FROM PONDING. INFILTRATION OF WATER INTO UTILITY TRENCHES SHOULD BE PREVENTED DURING CONSTRUCTION.
6. PRIOR TO ANY FILLING OPERATIONS, SAMPLES OF THE PROPOSED BORROW AND ON-SITE MATERIALS SHOULD BE OBTAINED FOR LABORATORY MOISTURE-DENSITY TESTING. THE TESTS WILL PROVIDE A BASIS FOR EVALUATION OF FILL COMPACTION BY IN-PLACE DENSITY TESTING. A QUALIFIED SOIL TECHNICIAN SHOULD PERFORM SUFFICIENT IN-PLACE DENSITY TESTS DURING THE FILLING OPERATIONS TO EVALUATE THAT PROPER LEVELS OF COMPACTION, INCLUDING DRY UNIT WEIGHT AND MOISTURE CONTENT, ARE BEING ATTAINED.
7. ALL FILL SHOULD BE PLACED IN THIN, LOOSE LIFTS NOT TO EXCEED 6" WITHIN STREET SECTION AND 8" ELSEWHERE AND COMPACTED TO AT LEAST 95% OF THE MATERIAL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (TEX-114-E). THE MATERIALS SHOULD BE MOISTURE CONDITIONED BETWEEN -2 AND +2 PERCENTAGE POINTS OF THE OPTIMUM MOISTURE CONTENT
8. COMPACTION OF GRANULAR BASE COURSE SHOULD BE PLACED IN LOOSE LIFTS NOT TO EXCEED 8" AND COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY THE MODIFIED MOISTURE-DENSITY RELATION (TEX-113-E). THE MATERIALS SHOULD BE MOISTURE CONDITIONED BETWEEN -2 AND +2 PERCENTAGE POINTS OF THE OPTIMUM MOISTURE CONTENT

1. ALL TESTING REQUIRED BY THE PLANS, DETAILS, AND TECHNICAL SPECIFICATIONS, INCLUDING MATERIALS TESTING, SOIL DENSITY, SOIL ANALYSIS, CONCRETE TESTING SHALL BE PAID BY THE OWNER FOR THE FIRST TEST. ANY TESTS THAT FAIL SHALL BE RE-PERFORMED UNTIL MEETING PASSING REQUIREMENTS AT THE CONTRACTOR'S EXPENSE.
2. CONTRACTOR SHALL COORDINATE PROJECT CONSTRUCTION TESTING WITH THE COUNTY INSPECTOR. ALL FAILED TESTS SHALL BE PAID FOR BY THE CONTRACTOR.
3. TESTS FOR SUITABILITY OF MATERIALS, PROCTOR, ETC WILL BE PAID BY THE CONTRACTOR.
4. CONTRACTOR SHALL NOTIFY TESTING LAB TWENTY FOUR (24) HOURS PRIOR TO BACKFILL OF ANY UTILITY TRENCH TO SCHEDULE FOR DENSITY TESTS AS REQUIRED.
5. SOIL BORES HAVE BEEN DRILLED AT SELECTED POINTS IN THE PROJECT AREA, IT IS THE CONTRACTOR'S RESPONSIBILITY TO RESEARCH AND VERIFY PRIOR TO BIDDING THE NEED FOR ADDITIONAL GEOPHYSICAL INFORMATION, NO DIRECT PAYMENT SHALL BE MADE FOR COSTS ASSOCIATED WITH OBTAINING SUCH INFORMATION. THERE WILL BE NO ADDITIONAL PAYMENT FOR ROCK EXCAVATION OR TRENCH DEWATERING, IF ENCOUNTERED, NO DIRECT PAYMENT SHALL BE MADE FOR COSTS ASSOCIATED WITH DEWATERING, ALL COSTS IN CONNECTION THERE WITH SHALL BE INCLUDED IN THE APPLICABLE CONTRACT PRICE FOR THE ITEM TO WHICH THE WORK PERTAINS. ALL EXCAVATION FOR THIS PROJECT WILL BE CONSIDERED UNCLASSIFIED AS SPECIFIED IN BID DOCUMENTS, SECTION 102, PARAGRAPH D-102.02. NO ADDITIONAL DIRECT PAYMENT SHALL BE MADE FOR ROCK EXCAVATION

1. ALL R.C.P. SHALL BE A MINIMUM CLASS III.
2. ALL STORM WATER PIPE OR BOX CULVERT SHALL BE BID FOR INSTALLATION IN PLACE TO INCLUDE TRENCHING, INSTALLATION AND BACKFILL.

BASIS OF ESTIMATE

I. Road Improvements of 1.0 Mile (2-12' Lanes & 2-4' Shoulders w/Drainage Swale) Local Collector R-70 (1M ESALS)

Item #	Description	Estimated Quantity	Unit
1	Mobilization & Bonding	1	LS
2	Clearing and Grubbing	5.00	AC
3	Demolition of 3 Existing Drainage Crossings	1	LS
4	Demolition of Exisiting Truss Bridge (Removal & Disposal)	1	LS
5	Remove & Reinstall Existing Steel Bollard Fence by Propane & Natural Gas Station	1	LS
6	Excavation Cut (Compacted Measure)	12,985	CY
7	Excavation Fill (Compacted Measure)	280	CY
8	8" Subgrade Preparation	23,500	SY
9	TX-5 Geogrid	18,800	SY
10	13.5" Flexible Base (Caliche)	18,800	SY
11	Prime Coat MC-30	18,800	SY
12	2.5" Type D HMAC	18,800	SY
13	Striping, Signage & Reflectors	1	LS

II. Storm Drainage Improvements

Item #	Description	Estimated Quantity	Unit
14	24" ⌀ RCP	92	LF
15	8' x 3' Box Culvert	48	LF
16	4' x 2' Box Culvert	84	LF
17	Concrete Headwall / Wingwall including Concrete Rip-Rap (2-24" Pipe)	2	EA
18	Concrete Headwall / Wingwall including Concrete Rip-Rap for 8' x 3' Box Culvert	2	EA
19	Concrete Headwall / Wingwall including Concrete Rip-Rap for 4' x 2' Box Culvert	2	EA
20	Concrete Rip-Rap (Embankment)	405	SF
21	Safety Metal Beam Guard Fence including reflectors End Treatment & Impact Head	445	LF
22	Rock Gravel Filter	23	EA
23	Drainage Crossings Reflectorized Object Marker	12	EA
24	Silt Fence	500	LF
25	Concrete Wash Pit	1	EA
26	Stabilized Construction Entrance	1	EA

III. Site / Miscellaneous Improvements

Item #	Description	Estimated Quantity	Unit
27	Traffic Control	1	LS

Note: 1 - Pavement to existing gates is not included in this estimate

GAS LINE UTILITY COORDINATION CONTACT LIST

Gas Company	Gas Line Size	Gas Line Type	Gas Line Depth	Pressure	Contact
DCP Midstream	8"	steel	4'8"	NA	Lee Zepeda 956-285-2929 LRZepeda@dcpmidstream.com
Energy Transfer	CLEAR	NA	NA	NA	Liberando Molina 956-229-0620
Kinder Morgan	CLEAR	NA	NA	NA	Kinder Morgan Texas Pipeline 1-800-633-0184
Enterprise Products	8"	NA	10' 6"	NA	Leonardo Arias
	10"	NA	5' 8"	NA	LARIAS@eprod.com
Harverst Midstream /Hilcorp	12"	NA	4' 6"	Low	Ricardo Gracia 956-229-0293
	(2) 8"	NA	6' +/-	NA	rgracia@hilcorp.com

NOTE: ALL DEPTHS OF GAS LINES ARE APPROXIMATE; INFORMATION PROVIDED BY EACH RESPECTIVE GAS COMPANY.

UTILITY COORDINATION CONTACT LIST

Company / Department	Name	E-mail Address	Phone #
City UCC Manager	Roland Lozano	rlozano1@ci.laredo.tx.us	956.794.1642
City Utilities Dept.	Humberto Serradell, Jr., P.E.	hserradell@ci.laredo.tx.us	956.721.2000
City Traffic Dept.	Pedro R. Paredes, Jr.	pparedes@ci.laredo.tx.us	956.795-2550
City Fire Dept.	Victor A. Vidaurri	vvidaurri@ci.laredo.tx.us	956.718.6072
City Environmental Dept.	Juan M. Vazquez	jvazquez1@ci.laredo.tx.us	956.794.16.50
AEP	Jose Cuellar	jacuellar@aep.com	956.436.1090
AT&T	Arturo Guerrero	ag4723@att.com	956.286.8929
Alenco	Jerry Selo		956.286.8738
Atenco	Mark Elrod		Office 817.447.0127 Direct 817.484.2652
CenterPoint	Mario Salinas	mario.salinas@centerpointenergy.com	
FiberLight	Aaron Ferdin	aaron.ferdin@fiberlight.com	
FiberLight	Pablo Gonzalez	Pablo.Gonzales@fiberlight.com	
Medina Electric	Oscar Chapa	oscarc@medinaec.org	
Smartcom Telephone	Daniel Chapa	dchapa@smartcomtelephone.com	
	Alejandro	maleiandro@smartcomtelephone.com	
TxDOT	Reynaldo Garza	Reynaldo.Garza@txdot.gov	
Webb County	Mario Santos	Msantos@webbcountytx.gov	

811
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TRENCH EXCAVATION PROTECTION

CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR STRUCTURAL DESIGN/GEOTECHNICAL/SAFETY/EQUIPMENT CONSULTANT, IF ANY, SHALL REVIEW THESE PLANS AND ANY AVAILABLE GEOTECHNICAL INFORMATION AND THE ANTICIPATED INSTALLATION SITE(S) WITHIN THE PROJECT WORK AREA IN ORDER TO DEVELOP THE CONTRACTOR'S PLANS TO IMPLEMENT THE PROJECT DESCRIBED IN THE CONTRACT DOCUMENTS.
THE CONTRACTOR'S PLANS SHALL PROVIDE FOR ADEQUATE TRENCH SAFETY SYSTEMS THAT COMPLY WITH, AS A MINIMUM, OSHA STANDARDS FOR TRENCH EXCAVATIONS. SPECIFICALLY, CONTRACTOR AND/OR CONTRACTOR'S INDEPENDENTLY RETAINED EMPLOYEE OR SAFETY CONSULTANT SHALL DEVELOP AND IMPLEMENT A TRENCH SAFETY PROGRAM IN ACCORDANCE WITH OSHA STANDARDS GOVERNING THE PRESENCE AND ACTIVITIES OF INDIVIDUALS WORKING IN AND AROUND TRENCH EXCAVATION.

IMPORTANT PHONE NUMBERS
ONE-CALL BOARD OF TEXAS
Administration : (512) 477-2255
Location Requests 1-800-545-6005
TEXAS EXCAVATION SAFETY SYSTEM
1-800-DIG-TESS
1-800-690-1291 FAX
LONE STAR NOTIFICATION
1-800-669-8344
1-800-999-2344 FAX
TEXAS ONE-CALL
1-800-245-4545
1-800-217-3720 FAX

GENERAL NOTES

STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER
09-06-2022

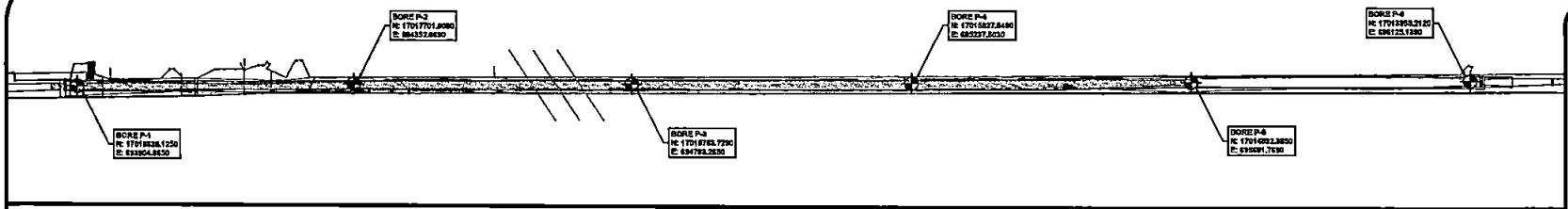
No.	Revision/Issue	Date

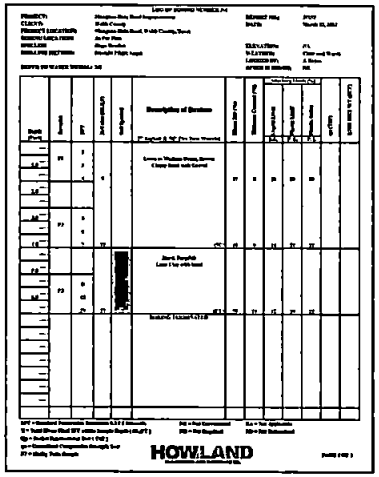
FIRM NAME AND ADDRESS

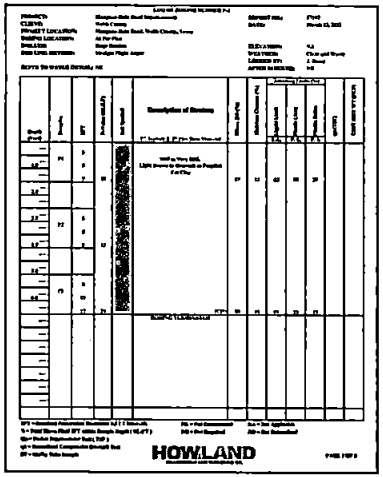
Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

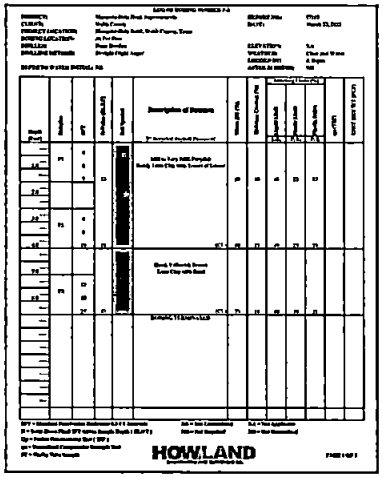
Sheet Title
GENERAL NOTES & BASIS OF ESTIMATE

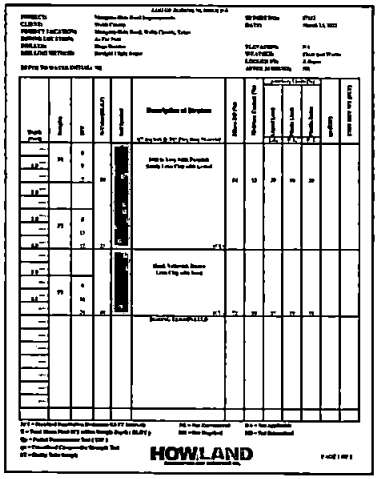
Date 9/6/2022
Sheet 03
Scale N.T.S.

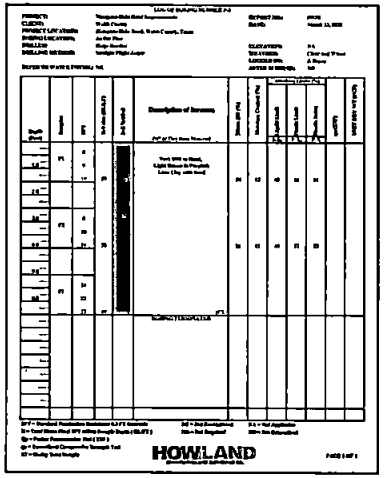


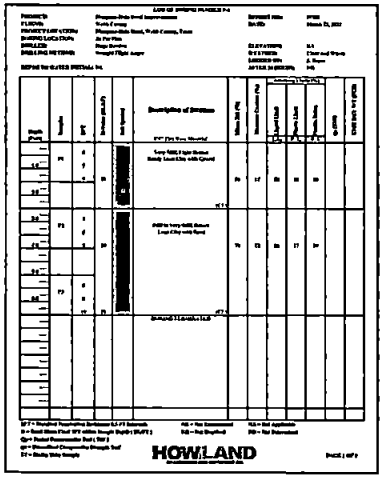












GENERAL NOTES

LEGEND

EXISTING ASPHALT MILLINGS

BORE LOCATIONS

SCALE 1" = 200'

(HOWLAND REPORT #071512)
FINAL CERTIFIED REPORT WAS COMPLETED BY HOWLAND ENGINEERING AND SURVEYING CO.; REFER TO FINAL GEOTECHNICAL REPORT APPROVED ON JUNE 1, 2022

REPORT AVAILABLE FOR REVIEW AT COUNTY ENGINEERING DEPT.

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD
EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
BORE LOCATION MAP & BORE LOGS

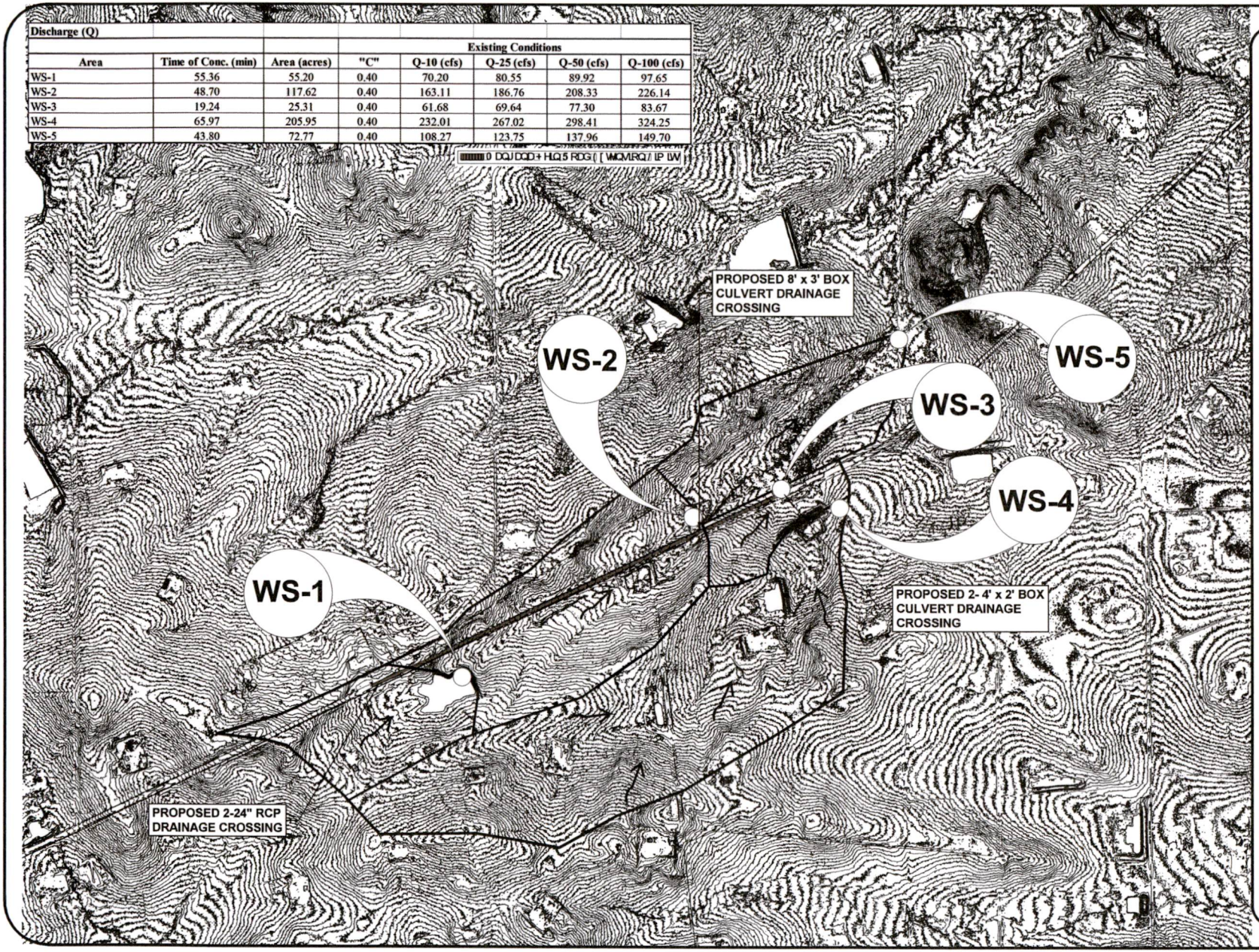
Date
9/7/2022

Scale
AS NOTED

Sheet
04

Discharge (Q)

Area	Time of Conc. (min)	Area (acres)	Existing Conditions "C"	Q-10 (cfs)	Q-25 (cfs)	Q-50 (cfs)	Q-100 (cfs)
WS-1	55.36	55.20	0.40	70.20	80.55	89.92	97.65
WS-2	48.70	117.62	0.40	163.11	186.76	208.33	226.14
WS-3	19.24	25.31	0.40	61.68	69.64	77.30	83.67
WS-4	65.97	205.95	0.40	232.01	267.02	298.41	324.25
WS-5	43.80	72.77	0.40	108.27	123.75	137.96	149.70



GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND COORDINATING ALL RELOCATIONS AND REMOVALS WITH EACH UTILITY COMPANY. CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.

SCALE 1" = 600'

STATE OF TEXAS
ALFREDO MARTINEZ
123981
LICENSED
PROFESSIONAL ENGINEER

08-12-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

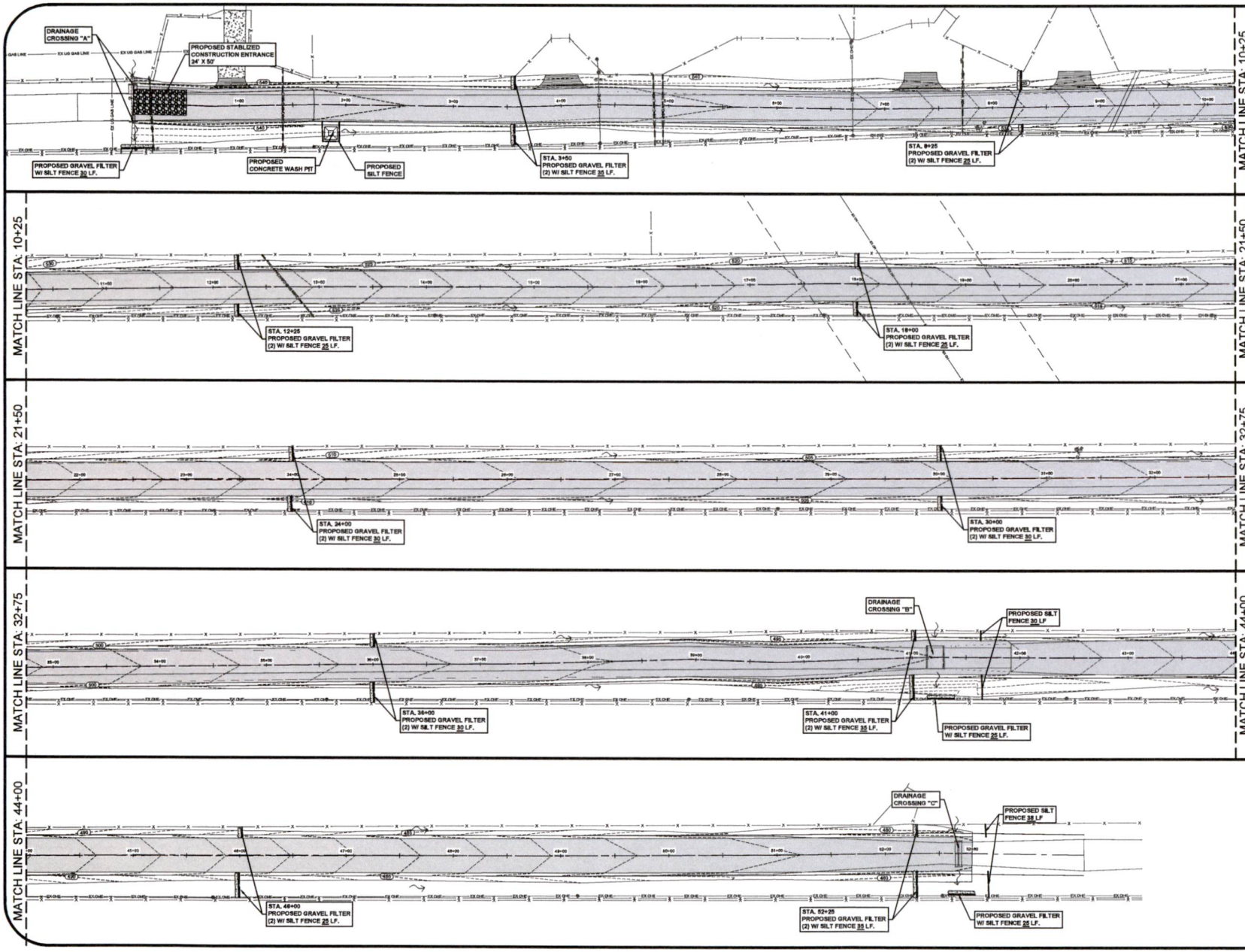
Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
DRAINAGE AREA MAP

Date 8/11/2022

Scale AS NOTED

Sheet 05



GENERAL NOTES

1. SEE EROSION CONTROL STANDARDS SHEET EC(1)-16 FOR SILT FENCE DETAIL.
2. SEE EROSION CONTROL STANDARDS SHEET EC(2)-16 FOR GRAVEL FILTER DETAILS.

SCALE 1" = 40'

ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

08-12-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address

MANGANA-HEIN ROAD EXTENSION PROJECT WEBB COUNTY, TEXAS

Sheet Title

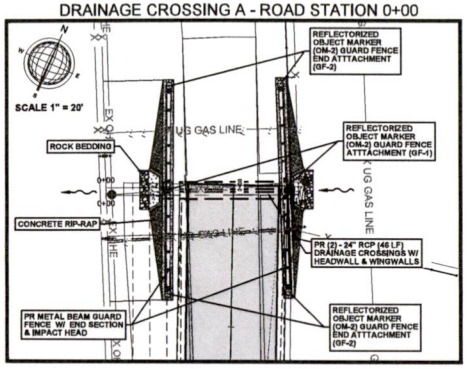
STORMWATER POLLUTION PREVENTION PLAN

Date: 8/12/2022

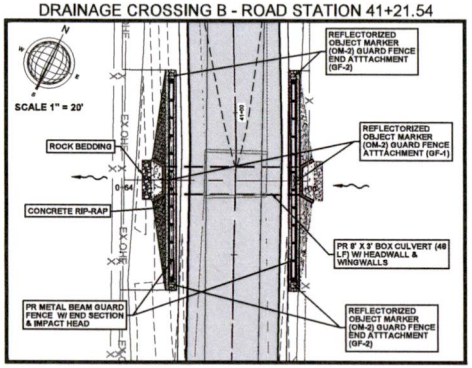
Scale: AS NOTED

Sheet: **06**

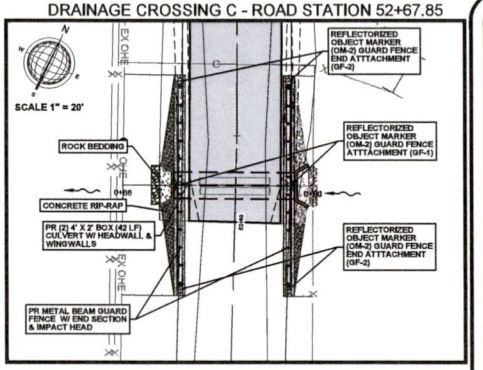
DRAINAGE CROSSING A - ROAD STATION 0+00



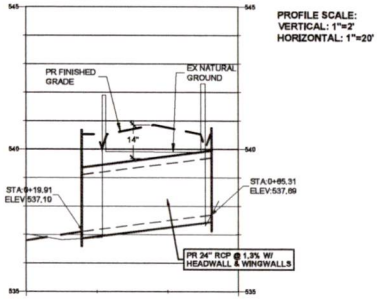
DRAINAGE CROSSING B - ROAD STATION 41+21.54



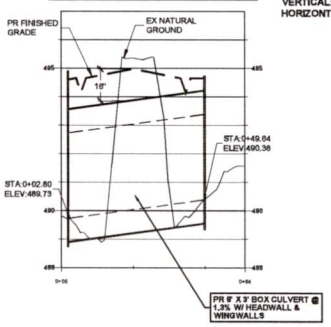
DRAINAGE CROSSING C - ROAD STATION 52+67.85



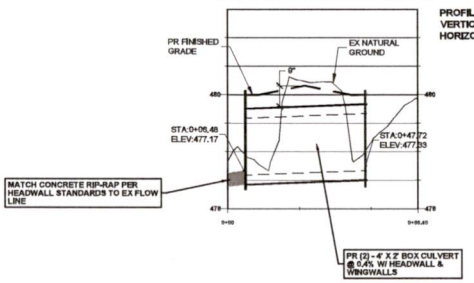
DRAINAGE CROSSING (A-1) PROFILE

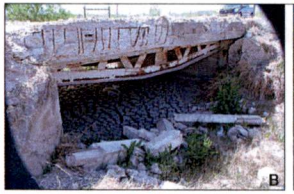


DRAINAGE CROSSING (B) PROFILE



DRAINAGE CROSSING (C) PROFILE





GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND COORDINATING ALL RELOCATION'S AND REMOVALS WITH EACH UTILITY COMPANY. CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
2. SEE SHEET 06 "STORMWATER MANAGEMENT & SWSP DETAILS" AND STANDARD SHEETS 39 THRU 44 FOR CULVERT, HEADWALL, & WINGWALL DETAILS.
3. EXISTING CULVERT STRUCTURE PHOTOS ARE SHOWN AT THE BOTTOM OF THIS SHEET FOR REFERENCE.

STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED
PROFESSIONAL ENGINEER

09-08-2022

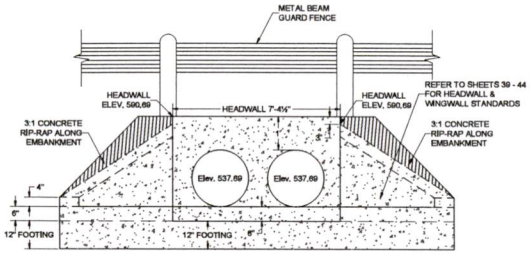
No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

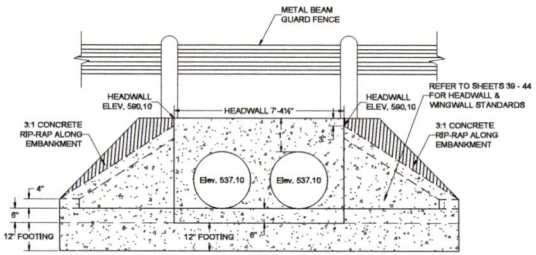
Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
DRAINAGE CROSSINGS PLAN & PROFILE

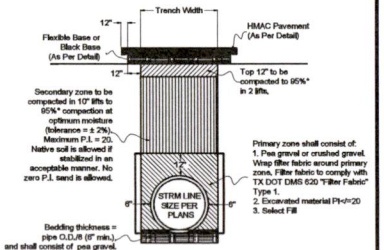
Date: 8/12/2022
Scale: As Noted
Sheet: **07**



UPSTREAM ELEVATION VIEW
(2) 24" RCP DRAINAGE CROSSING
N.T.S.

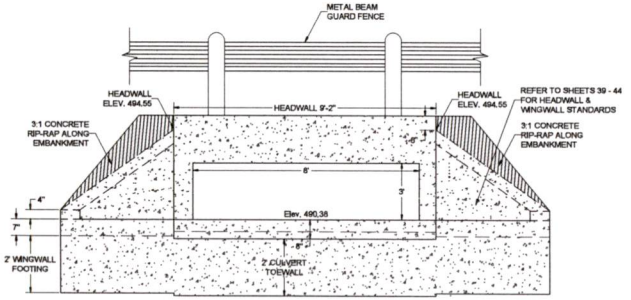


DOWNSTREAM ELEVATION VIEW
(2) 24" RCP DRAINAGE CROSSING
N.T.S.

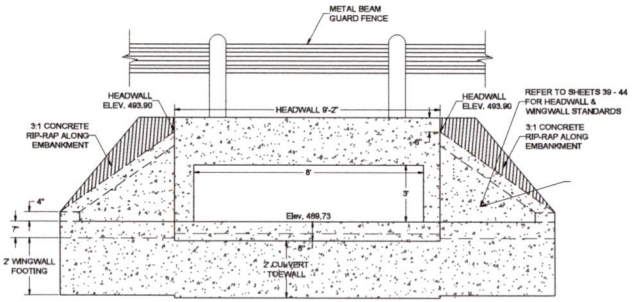


Note: All compaction testing shall be performed as per TEX-113-E. All backfill material shall be free of rocks in excess of 3" in any direction.

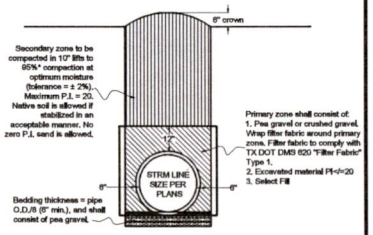
STORM TRENCH CONDITION "A"
WITHIN PAVED AREAS
N.T.S.



UPSTREAM ELEVATION VIEW
(1) 8'X3' BOX CULVERTS
N.T.S.

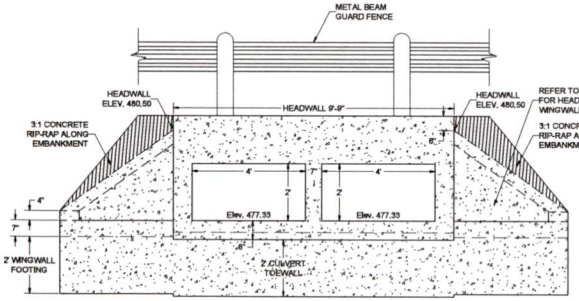


DOWNSTREAM ELEVATION VIEW
(1) 8'X3' BOX CULVERTS
N.T.S.

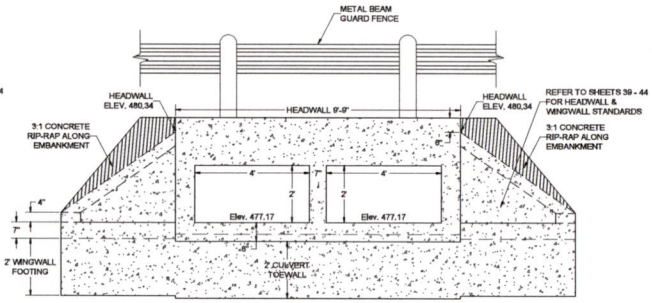


Note: All compaction testing shall be performed as per TEX-113-E. All backfill material shall be free of rocks in excess of 3" in any direction.

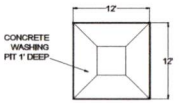
STORM TRENCH CONDITION "B"
WITHIN THE R.O.W., OUTSIDE OF PAVED AREAS
N.T.S.



UPSTREAM ELEVATION VIEW
(2) 4'X2' BOX CULVERTS
N.T.S.



DOWNSTREAM ELEVATION VIEW
(2) 4'X2' BOX CULVERTS
N.T.S.



CONCRETE WASHING PIT DETAIL
N.T.S.

GENERAL NOTES

08-12-2022

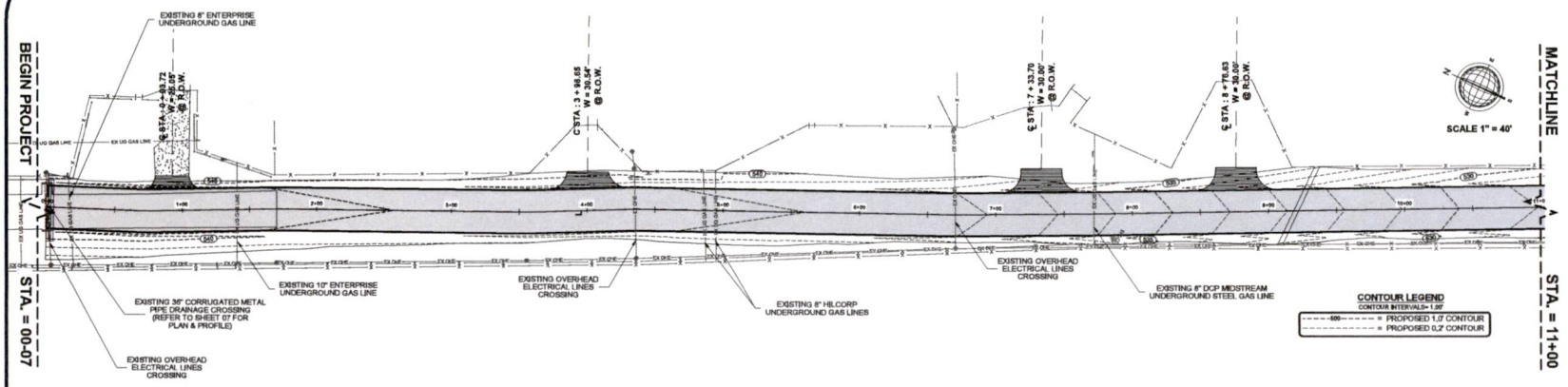
No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

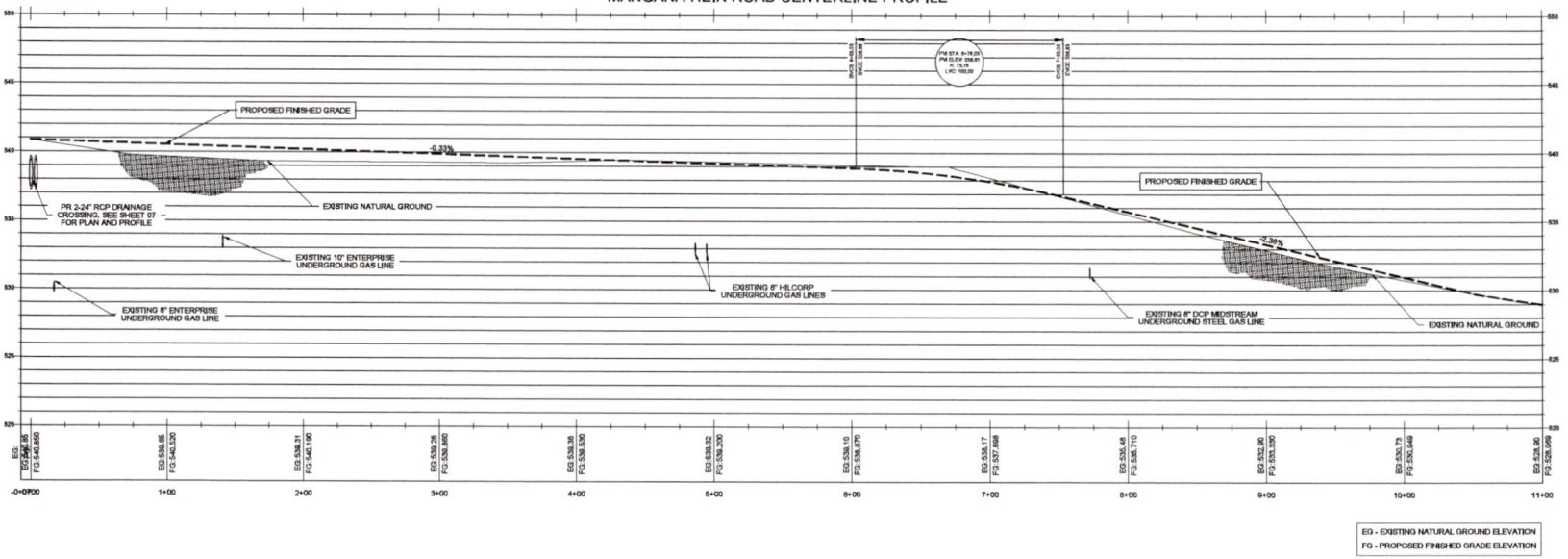
Sheet Title
STORMWATER MANAGEMENT & SW3P DETAILS

Date: 8/12/2022
Scale: N.T.S.
Sheet: **08**



PROFILE SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=40'

MANGANA-HEIN ROAD CENTERLINE PROFILE



EG - EXISTING NATURAL GROUND ELEVATION
FG - PROPOSED FINISHED GRADE ELEVATION

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
2. EXISTING GAS LINES SHOWN ON THIS SHEET WERE OBTAINED FROM EACH RESPECTIVE GAS COMPANY BY COORDINATING WITH EACH COMPANY & EITHER RECEIVING INFORMATION OR MARKINGS IN THE FIELD WITH DEPTHS PROVIDED BY EACH GAS COMPANY.
3. ENGINEER DOES NOT GUARANTEE DEPTH OF GAS LINE.
4. PROPOSED DRIVEWAY CONSTRUCTION STOPS AT RIGHT OF WAY LINE. CONTRACTOR TO PROVIDE BID UNDER ADDITIVE SECTION TO CHANGE PRIVATE LANDOWNERS TO CONSTRUCT DRIVEWAY WITHIN THEIR PROPERTY. CONTRACTOR RESPONSIBLE FOR SECURING PERMISSION FROM EACH LANDOWNER.

STATE OF TEXAS
ALFREDO MARTINEZ
111111
Licensed
PROFESSIONAL ENGINEER

08-12-2022

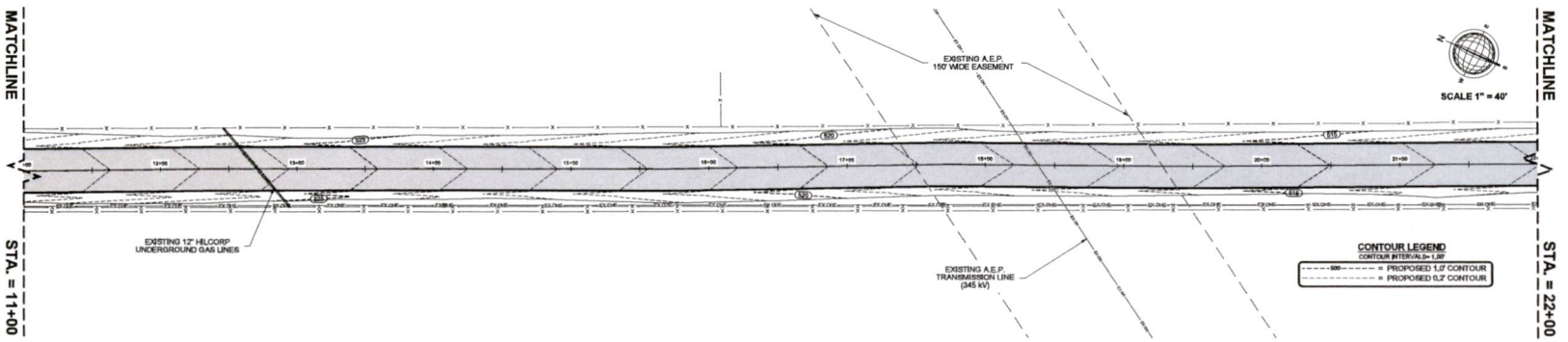
No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

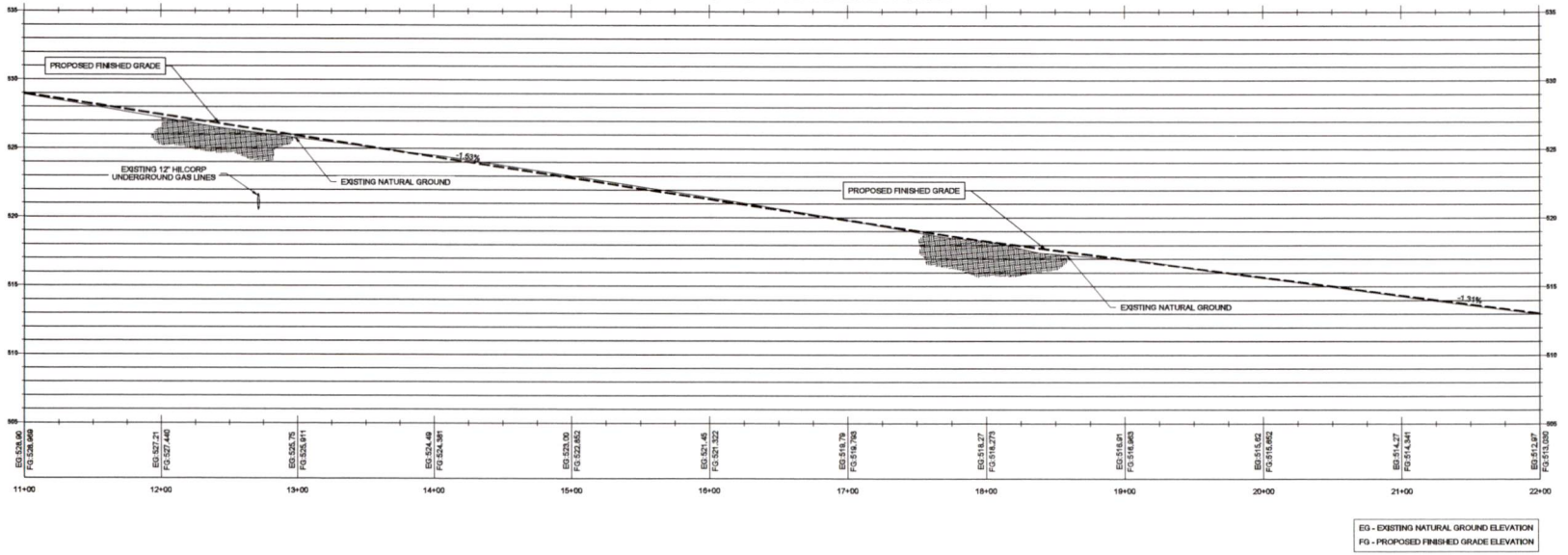
Sheet Title
STREET PAVING PLAN & PROFILE
(STATION : 00-07 - 11+00)

Date: 8/12/2022
Sheet: **09**
Scale: H - 1" = 40' V - 1" = 4'



PROFILE SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=40'

MANGANA-HEIN ROAD CENTERLINE PROFILE



EG - EXISTING NATURAL GROUND ELEVATION
FG - PROPOSED FINISHED GRADE ELEVATION

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
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ALFREDO MARTINEZ
111101
LICENSED PROFESSIONAL ENGINEER
08-12-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

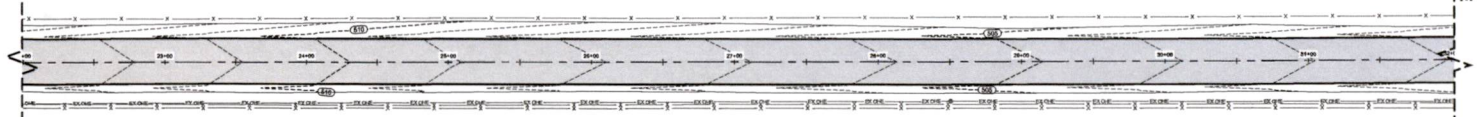
Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
STREET PAVING PLAN & PROFILE
(STATION : 11+00 - 22+00)

Date: 8/12/2022
Sheet: **10**
Scale: H - 1" = 40' V - 1" = 4'

MATCHLINE

STA. = 22+00



MATCHLINE

STA. = 32+00

CONTOUR LEGEND

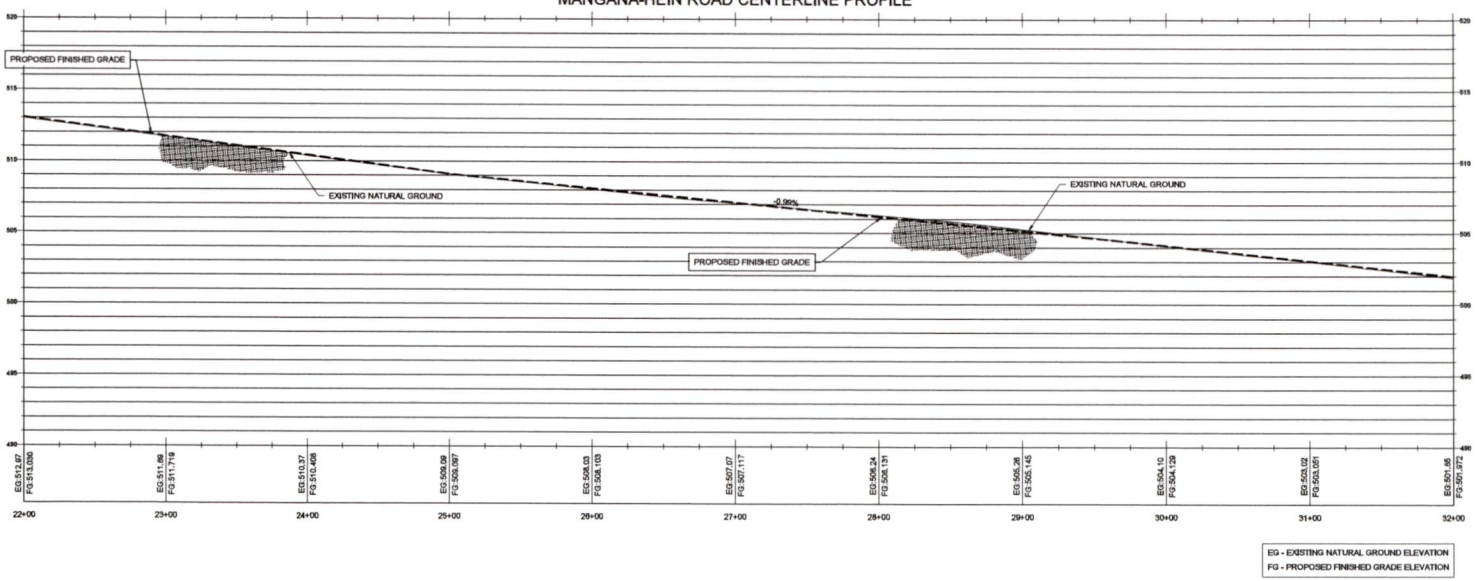
CONTOUR INTERVAL= 1.00'

PROPOSED 1.0' CONTOUR

PROPOSED 0.2' CONTOUR

PROFILE SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=40'

MANGANA-HEIN ROAD CENTERLINE PROFILE



EG - EXISTING NATURAL GROUND ELEVATION
FG - PROPOSED FINISHED GRADE ELEVATION

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
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STATE OF TEXAS
ALFREDO MARTINEZ
123193
LICENSED PROFESSIONAL ENGINEER

08-12-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address

MANGANA-HEIN ROAD EXTENSION PROJECT WEBB COUNTY, TEXAS

Sheet Title

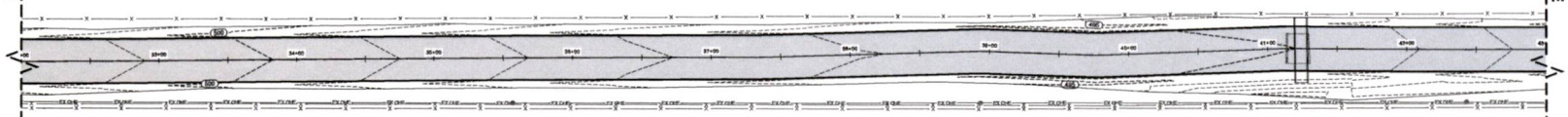
STREET PAVING PLAN & PROFILE (STATION : 22+00 - 32+00)

Date: 8/12/2022

Sheet: **11**

Scale: H - 1" = 40' V - 1" = 4'

MATCHLINE STA. = 32+00



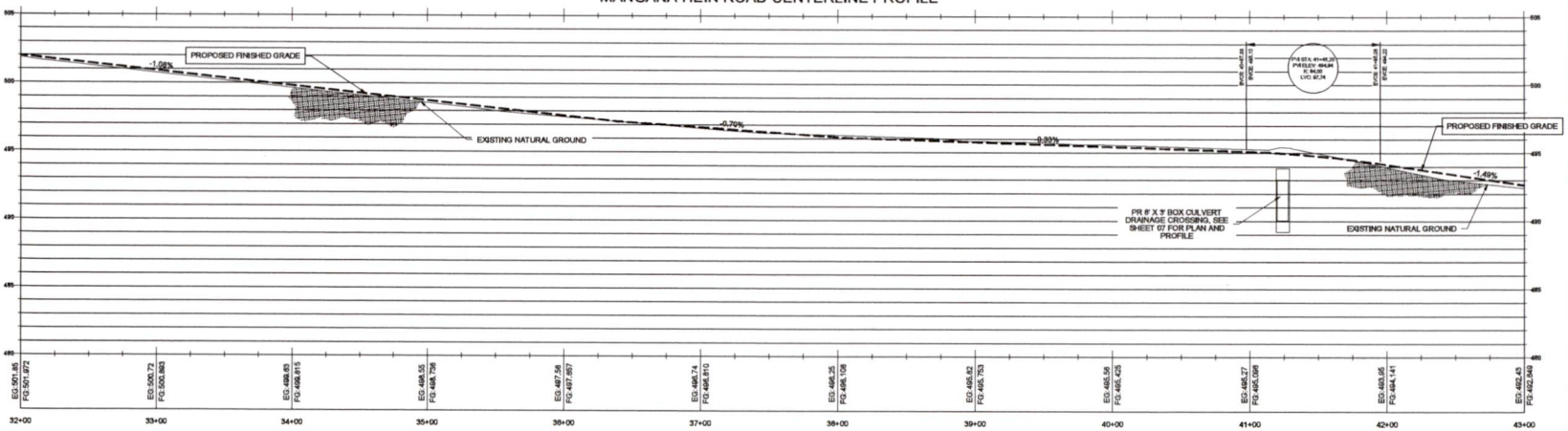
MATCHLINE STA. = 43+00

SCALE 1" = 40'

CONTOUR LEGEND
CONTOUR INTERVALS= 1.00'
500 = PROPOSED 1.0' CONTOUR
= PROPOSED 0.2' CONTOUR

PROFILE SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=40'

MANGANA-HEIN ROAD CENTERLINE PROFILE



EG - EXISTING NATURAL GROUND ELEVATION
FG - PROPOSED FINISHED GRADE ELEVATION

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
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STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER
08-12-2022

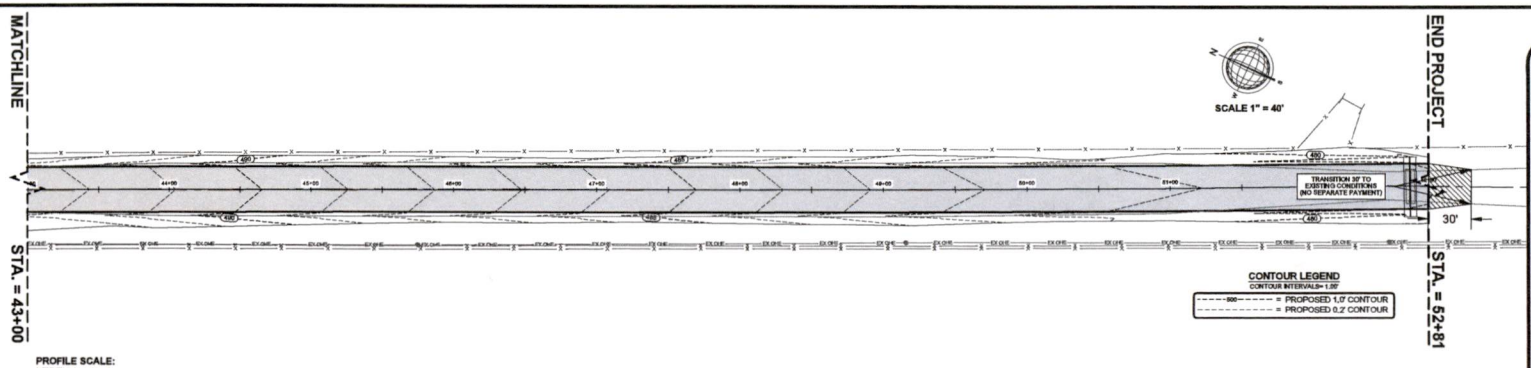
No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

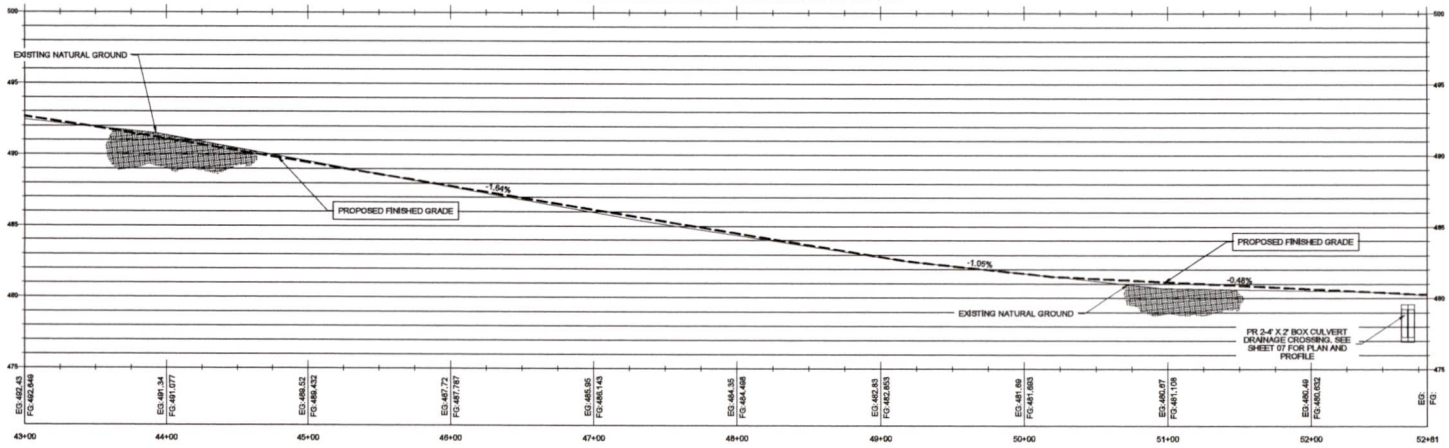
Sheet Title
STREET PAVING PLAN & PROFILE (STATION : 32+00 - 43+00)

Date: 8/12/2022
Scale: H - 1" = 40' V - 1" = 4'
Sheet: **12**

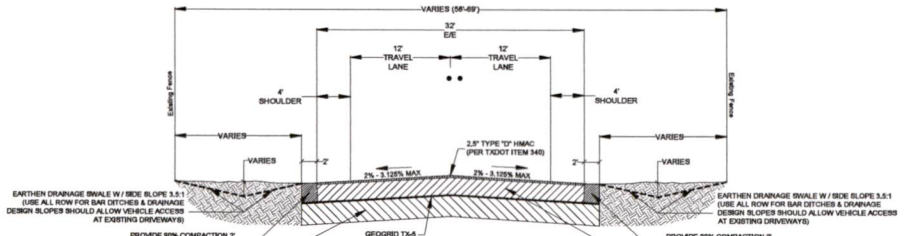


PROFILE SCALE:
VERTICAL: 1"=4'
HORIZONTAL: 1"=40'

MANGANA-HEIN ROAD CENTERLINE PROFILE



EG - EXISTING NATURAL GROUND ELEVATION
FG - PROPOSED FINISHED GRADE ELEVATION



1M ESAL STREET PAVEMENT X-SECTION
VARIABLE WIDTH R.O.W. (32' E/E)
N.T.S.

GENERAL NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING AND LOCATING ALL EXISTING UTILITY LINES AND SHALL BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES CAUSED BY FAILURE TO LOCATE AND PRESERVE UNDERGROUND UTILITIES.
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ALFREDO MARTINEZ
131101
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
08-12-2022

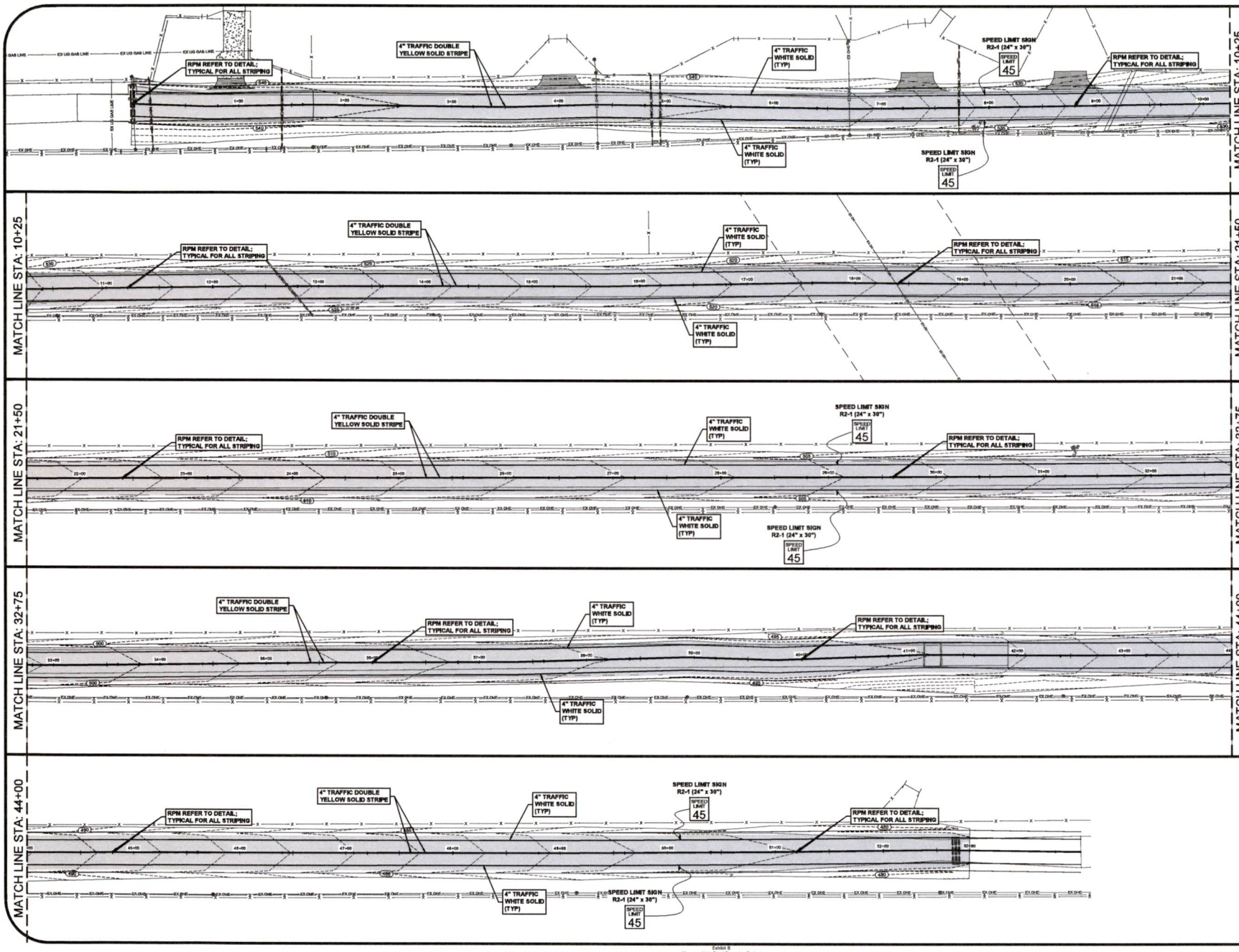
No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

Sheet Title
STREET PAVING PLAN & PROFILE
(STATION : 43+00 - 52+81)

Date: 8/12/2022
Scale: H - 1" = 40' V - 1" = 4'
Sheet: **13**



GENERAL NOTES

1. ALL TRAFFIC MARKINGS AND SIGNAGE TO COMPLY WITH MUTCD LATEST EDITION AND TXDOT STANDARDS.
2. 4' SPACING PROPOSED FROM SOLID WHITE TRAFFIC LINE TO END OF SHOULDER.
3. 80 LF SPACING BETWEEN RPM'S.
4. PROPOSED SPEED LIMIT SIGNS TO BE AT 0.4 MI.
5. REFER TO PAVEMENT MARKING STANDARD SHEETS PM(1)-20 & PM(2)-20.
6. FOR SIGNAGE, REFER TO SIGNAGE STANDARDS SHEETS SMD(GEN)-08 & SMD(TWT)-08.

SCALE 1" = 40'

STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER

08-12-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address

MANGANA-HEIN ROAD EXTENSION PROJECT
WEBB COUNTY, TEXAS

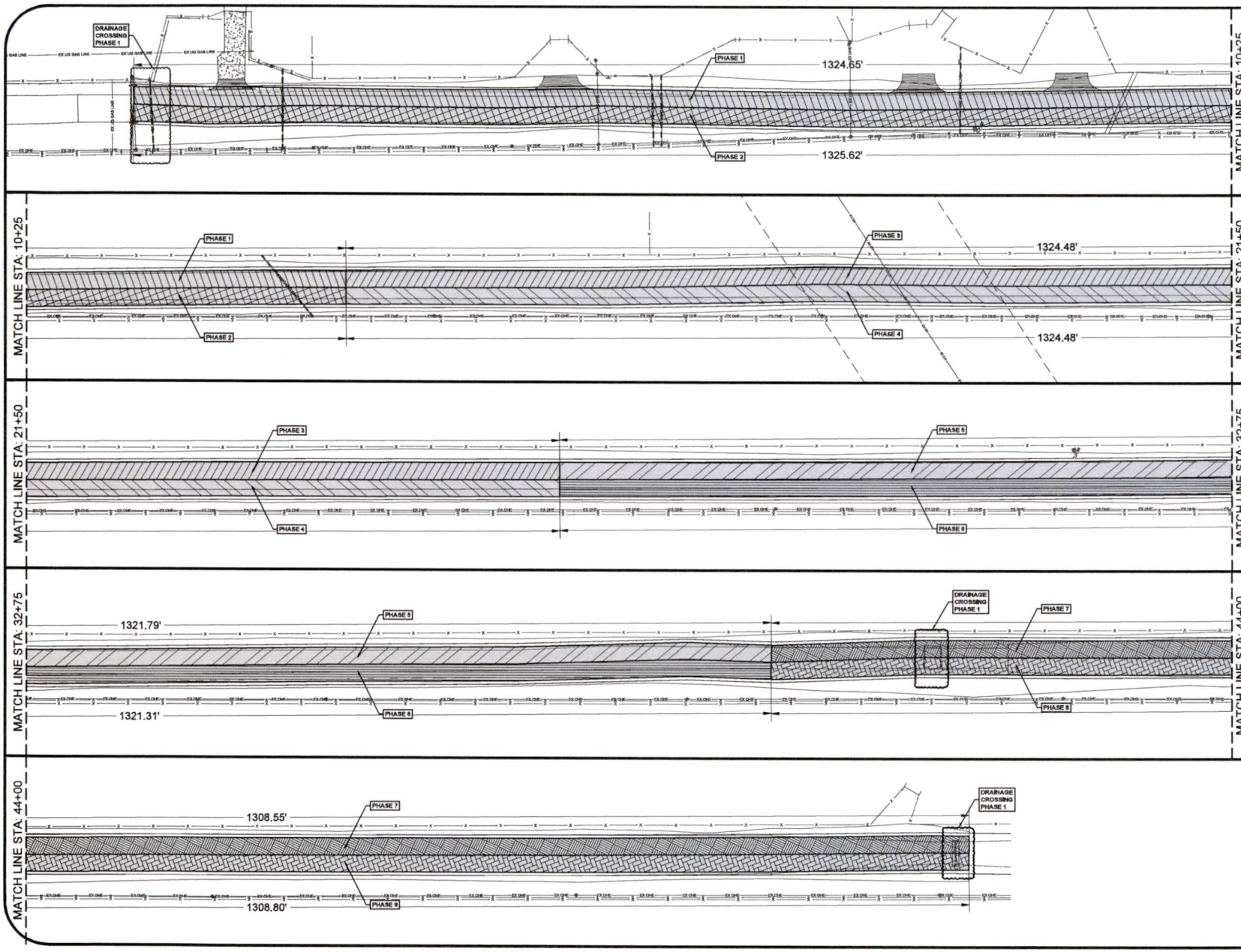
Sheet Title

ROAD STRIPING & SIGNAGE PLAN

Date: 8/12/2022

Scale: NOTED

Sheet: 14



GENERAL NOTES

- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6
- PHASE 7
- PHASE 8

ALL DRAINAGE IS PHASE 1 & PHASE 2

SCALE 1" = 40'

STATE OF TEXAS
ALFREDO MARTINEZ
123303
LICENSED PROFESSIONAL ENGINEER

09-08-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address

MANGANA-HEIN ROAD
EXTENSION PROJECT
WEBB COUNTY, TEXAS

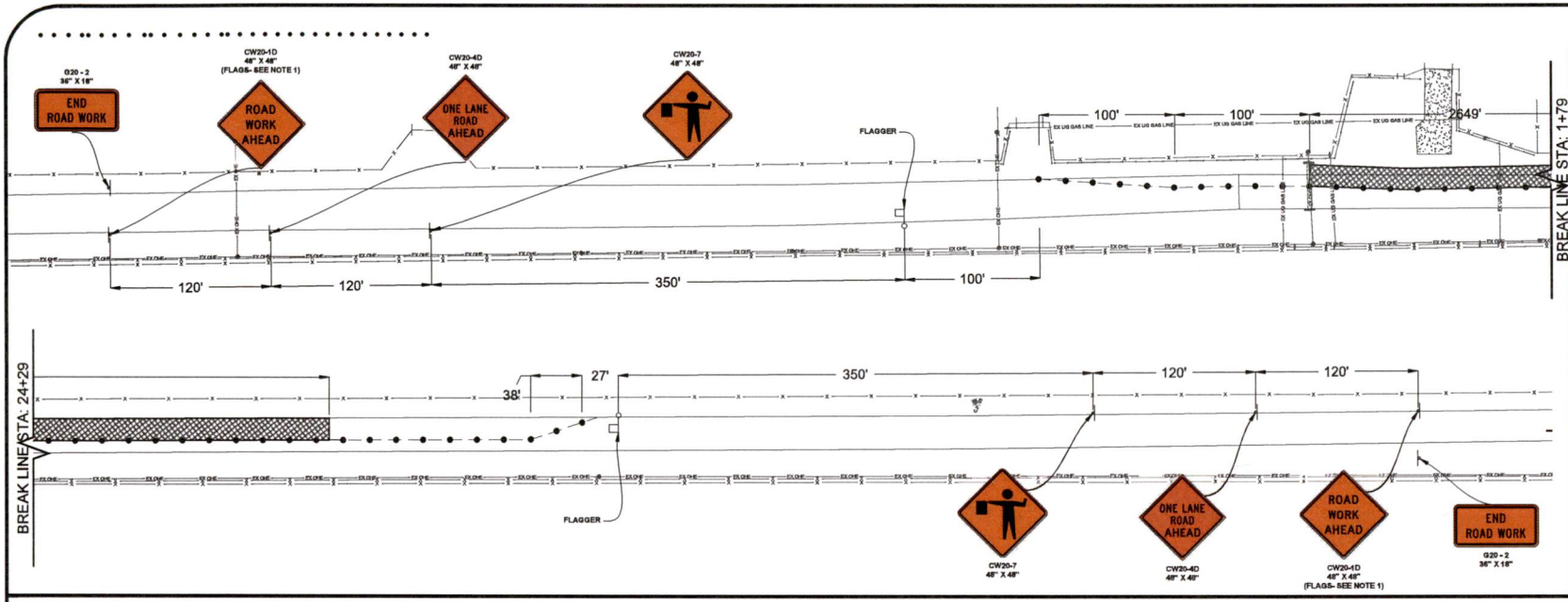
Sheet Title

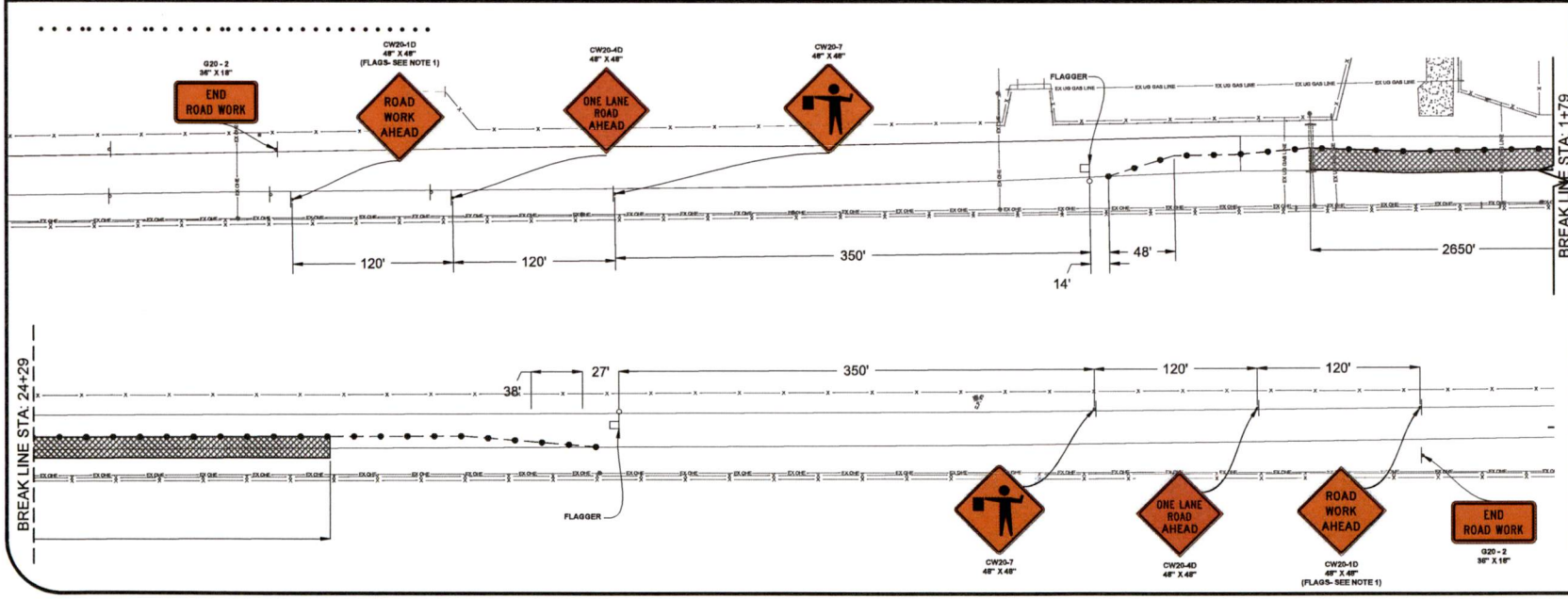
CONSTRUCTION PHASING PLAN

Date: 9/6/2022

Scale: AS NOTED

Sheet: 15





GENERAL NOTES

1. APPLY TCP TO PHASES 3-8 SEE SHEET 15 CONSTRUCTION PHASING PLAN.
2. SEE TCP STANDARDS SHEET 17-18

SCALE 1" = 40'

ALFREDO MARTINEZ
111111
LICENSED
PROFESSIONAL ENGINEER
09-06-2022

No.	Revision/Issue	Date

FIRM NAME AND ADDRESS

Project Name and Address
MANGANA-HEIN ROAD
EXTENSION PROJECT
WEBB COUNTY, TEXAS

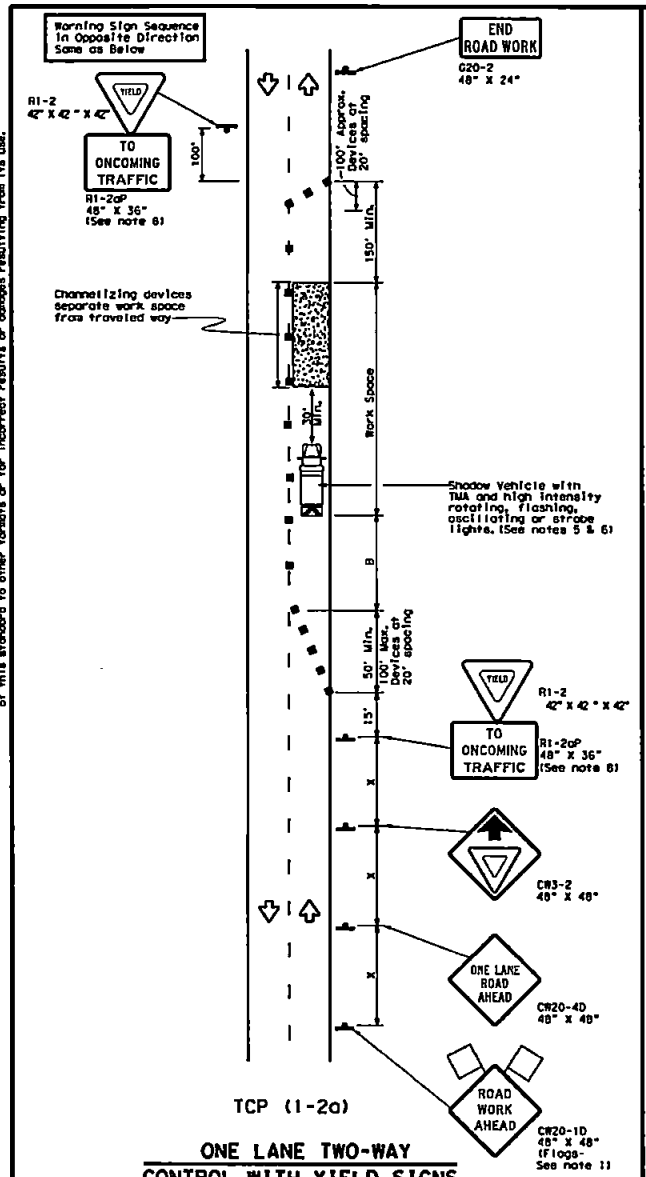
Sheet Title
TRAFFIC MANAGEMENT PLAN

Date
9/2/2022

Scale
N.T.S.

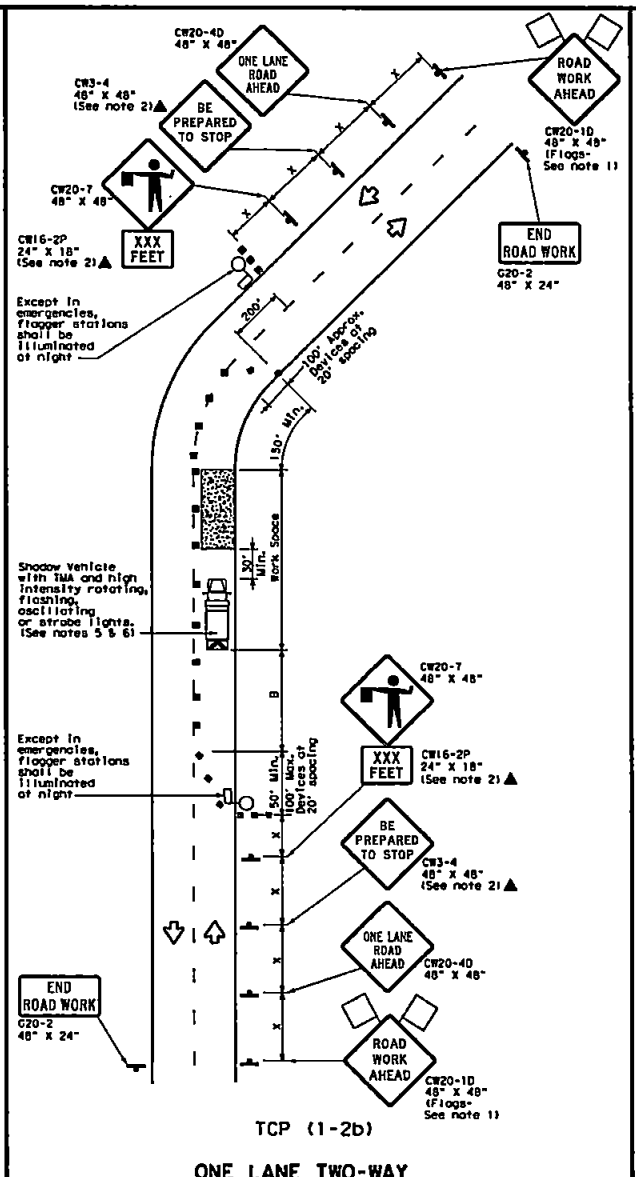
Sheet
16

DATE:
FILE:



TCP (1-2a)

ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	L = WS²/60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
4. Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
5. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
6. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-2a)

7. R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
8. R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

TCP (1-2b)

9. Flaggers should use two-way radios or other methods of communication to control traffic.
10. Length of work space should be based on the ability of flaggers to communicate.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
12. Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
13. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation — Traffic Operations Division Standard

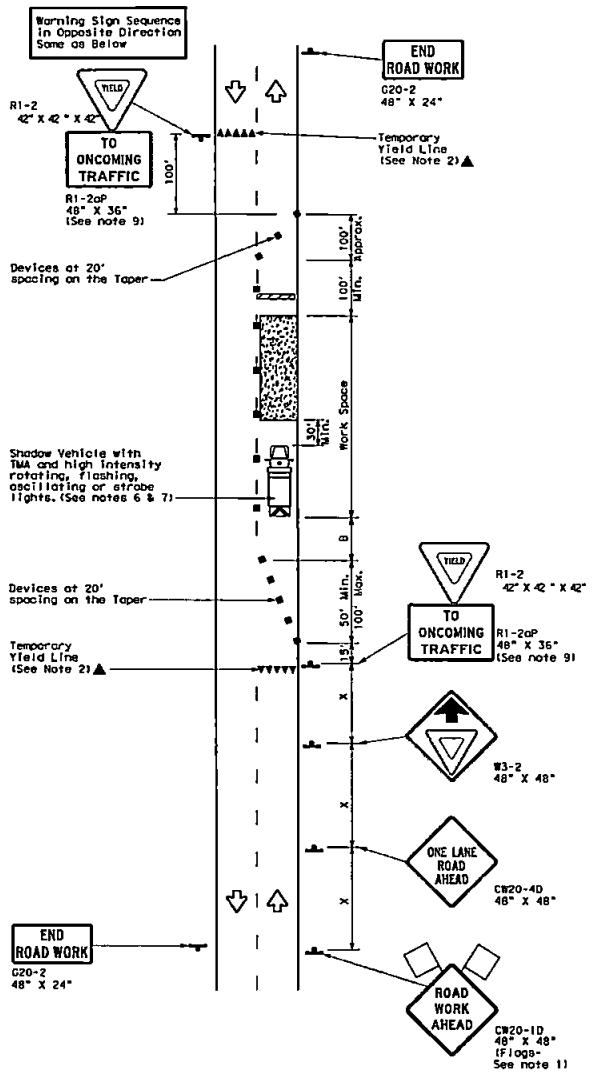
TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

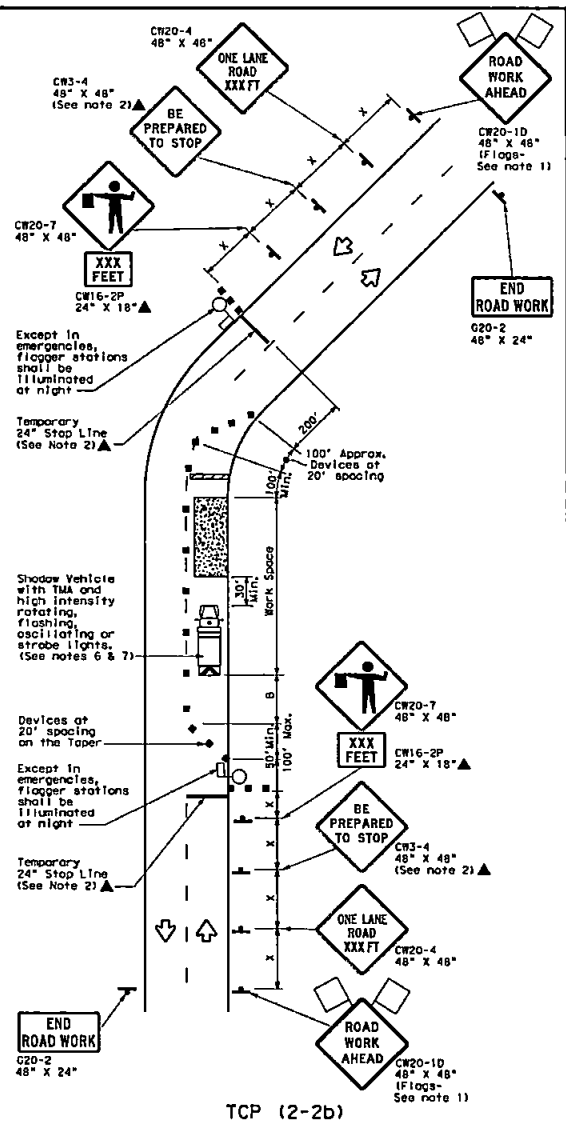
FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	DIST	COUNTY		SHEET NO. 17

(152)

DATE:
FILE:



TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths * * 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45		450'	495'	540'	45'	90'	320'	195'	360'
50	L=WS	500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

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152

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
11. Traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY NOTES:

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
2. Work zone traffic control devices shall be compliant with the Manual for Assessing Safety Hardware (MASH).

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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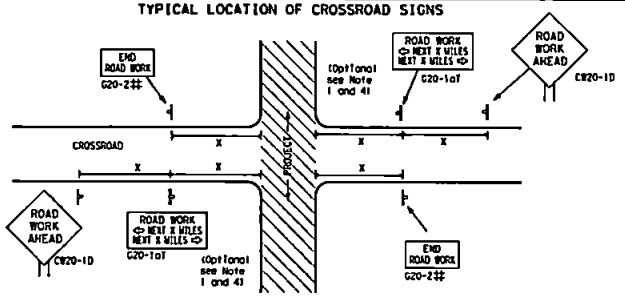
REVISIONS 4-03 7-13				
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21				19

92

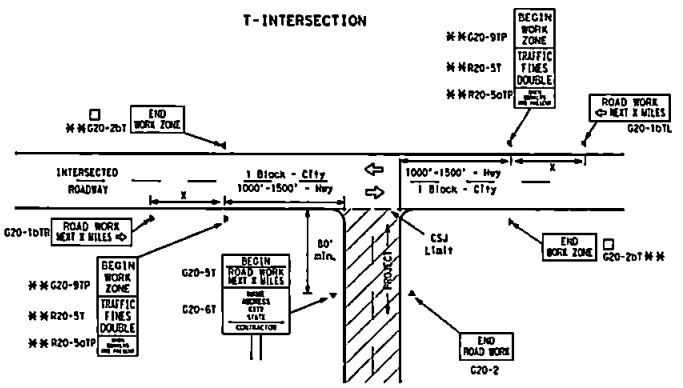
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[4,5,6]

SIZE

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

SPACING

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

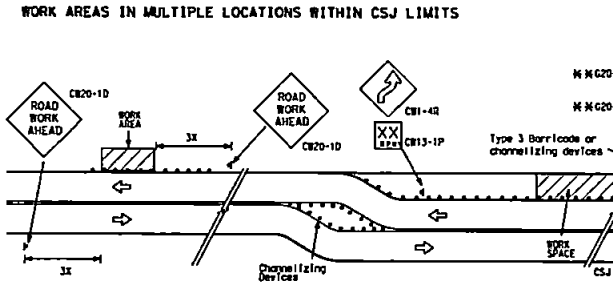
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

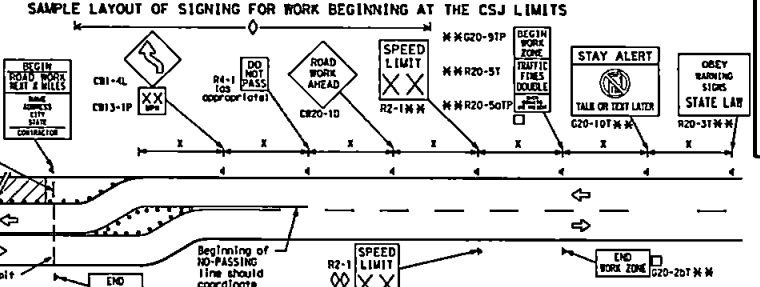
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

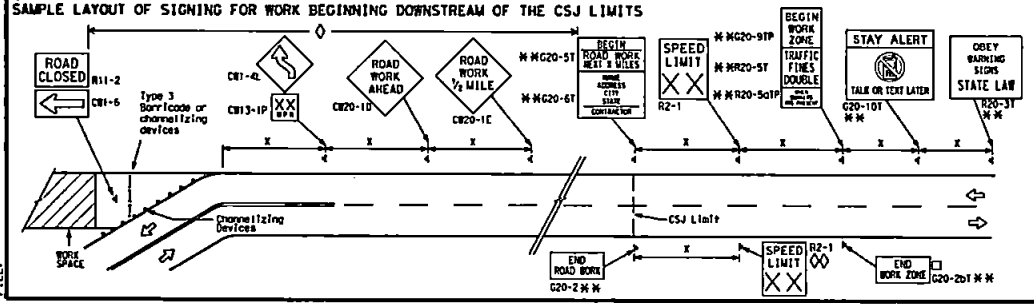


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

‡‡ CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

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

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

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

SHEET 2 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21				20

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Exhibit B
Mariposa Haven Road Extension Project

DATE:
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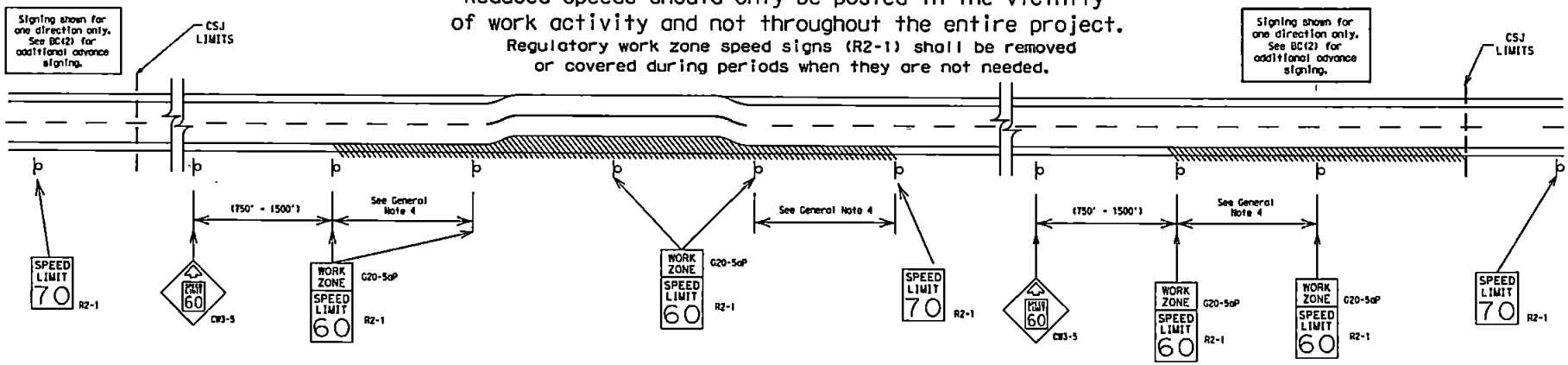
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.
Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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97

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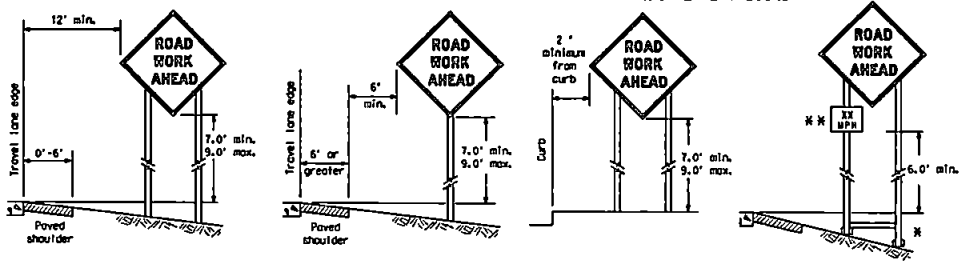
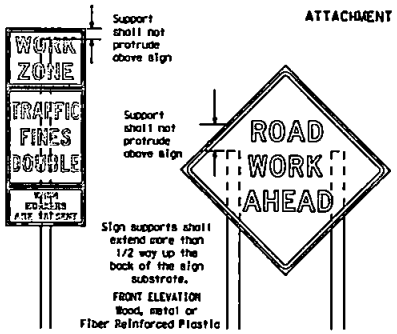
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



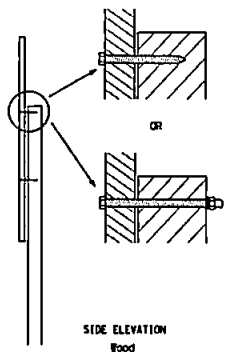
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS



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

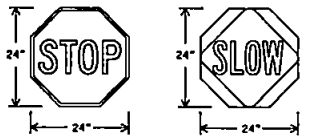


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

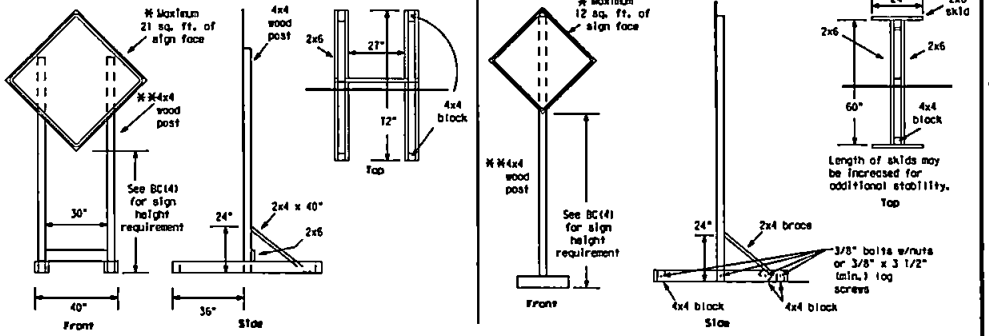
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 9-21				22

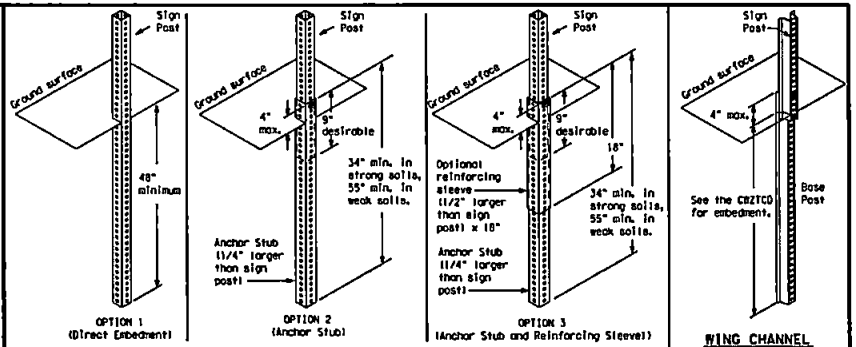
98

DATE:
FILE:



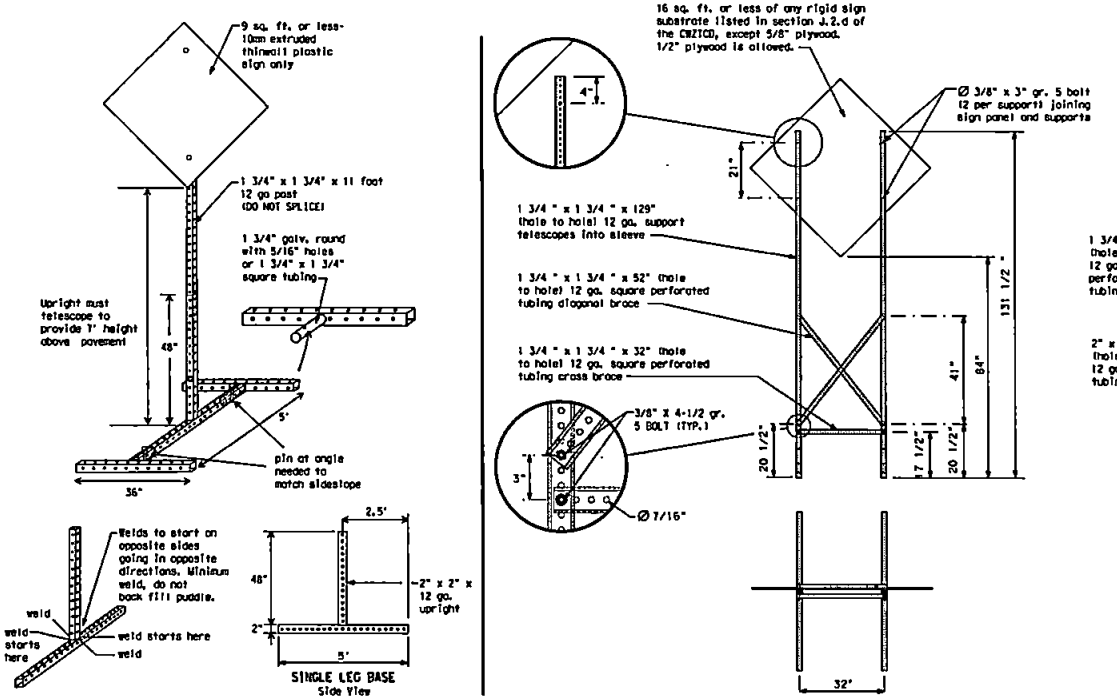
SKID MOUNTED WOOD SIGN SUPPORTS

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



GROUND MOUNTED SIGN SUPPORTS

Refer to the CMUTCD 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.



SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

□ See the CMUTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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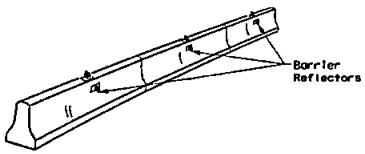
REVISIONS				
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21				23

99

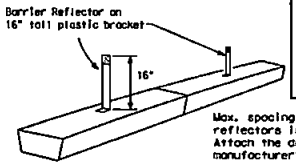
DATE:
FILE:

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



CONCRETE TRAFFIC BARRIER (CTB)

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

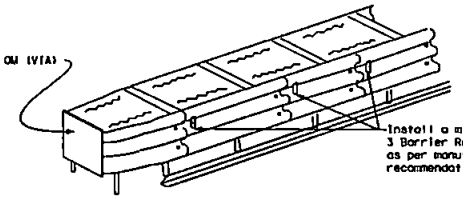


Max. spacing of barrier reflectors is 20 feet.
Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

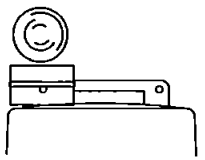


DELINEATION OF END TREATMENTS

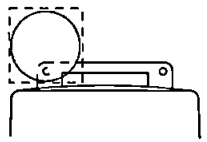
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

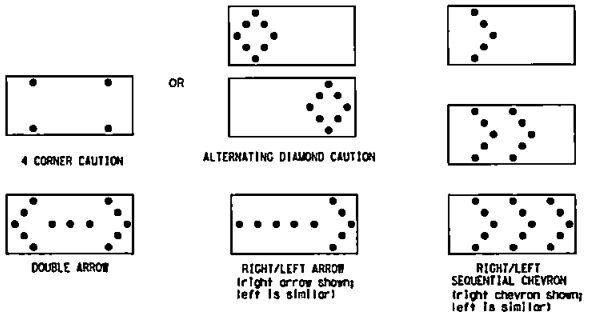
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is on extended distance from the TMA.

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.cgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21				24

101

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

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

RETROREFLECTIVE SHEETING

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

BALLAST

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

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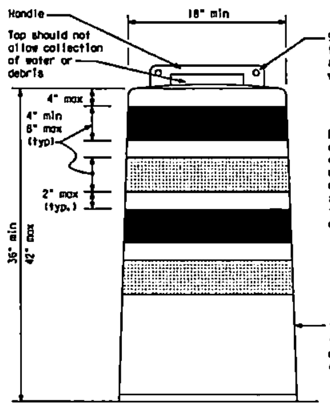
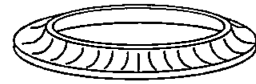
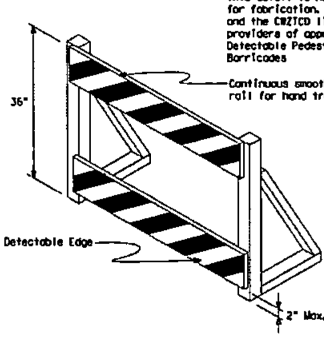
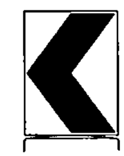




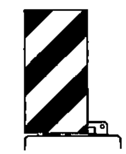


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS 4-03 8-14 9-07 5-21 7-13	DIST	COUNTY		SHEET NO. 25

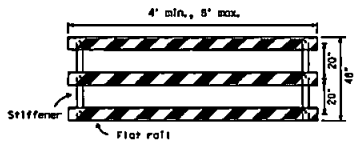
102

TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.

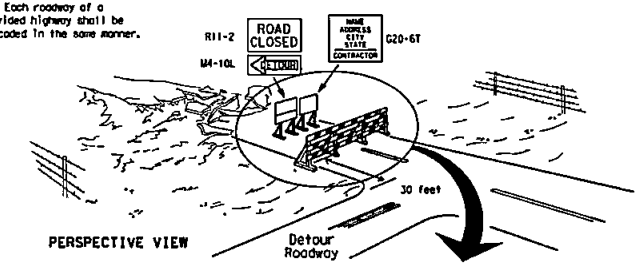
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

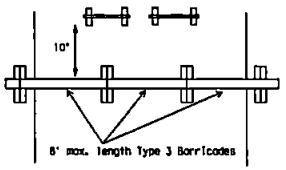
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

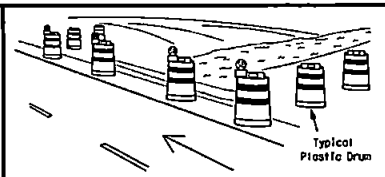
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



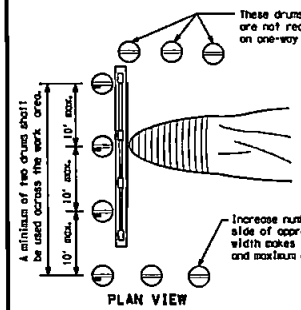
PLAN VIEW

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

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

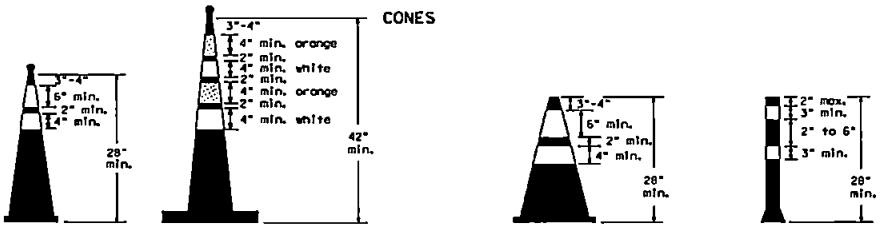


PLAN VIEW

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

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

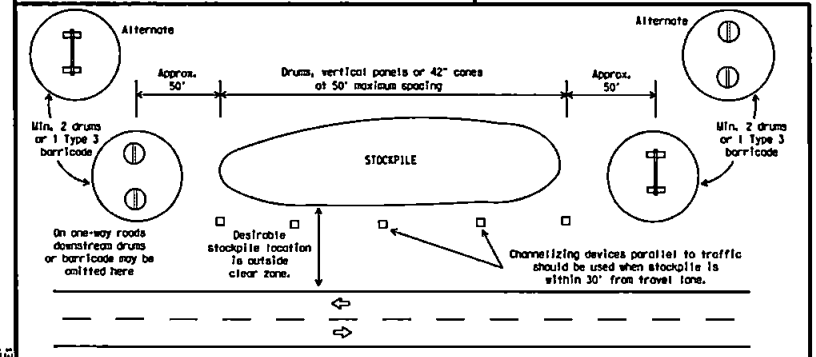


Two-Piece cones | One-Piece cones | Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
9-07 6-14	DIST	COUNTY		SHEET NO.
7-13 5-21				26

104

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DATE:
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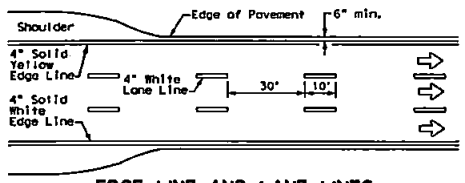
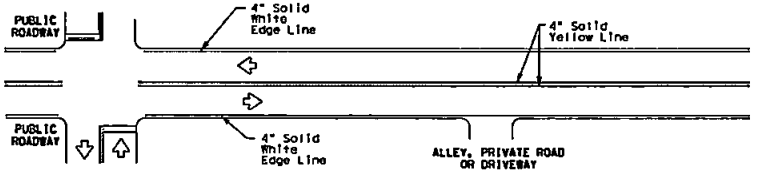
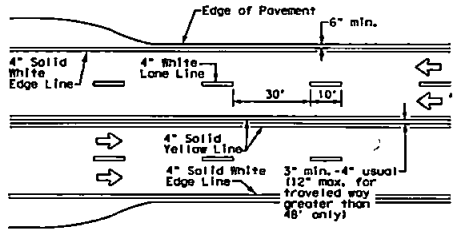


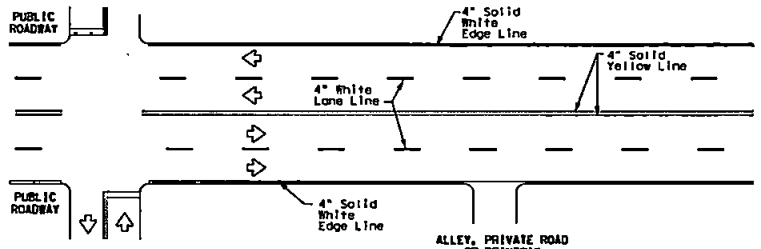
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



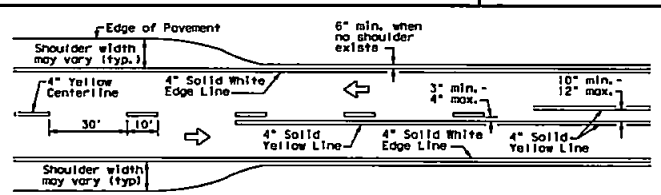
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



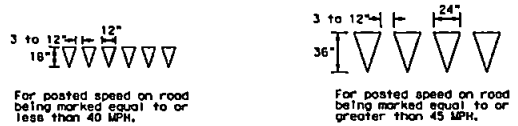
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



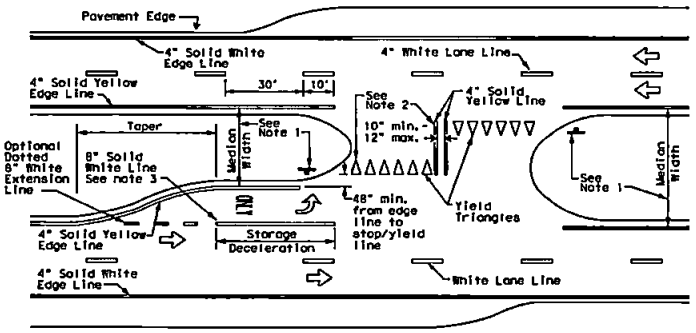
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

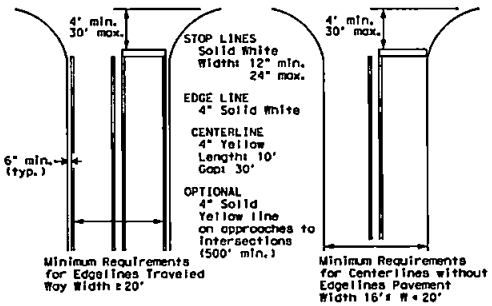
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE:	pm1-20.dgn	DN:	CK:	DW:	CK:
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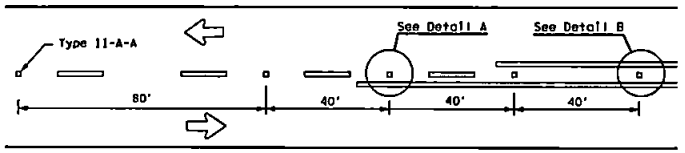
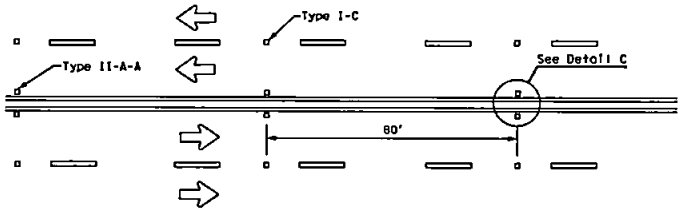
8-95	3-03 REVISIONS				
5-00	2-12	DIST	COUNTY		SHEET NO.
8-00	6-20				27

22A

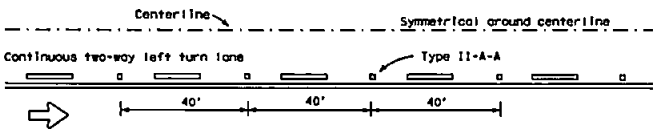
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



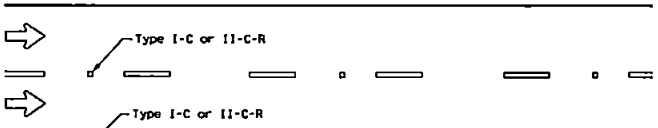
CENTERLINE FOR ALL TWO LANE ROADWAYS



CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS

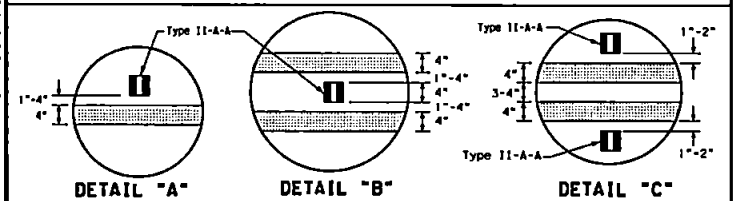


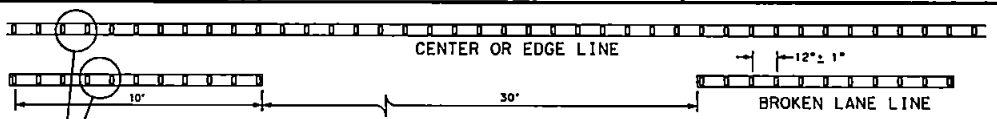
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

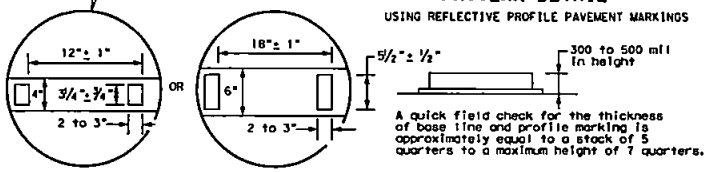
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.





REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE

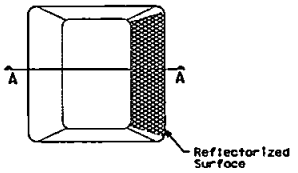
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

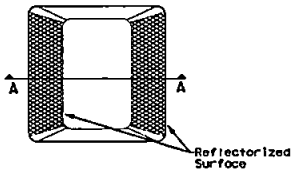
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

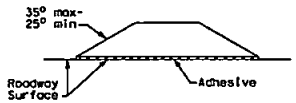
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILES: pm2-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10				
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8-00 6-20				28

228

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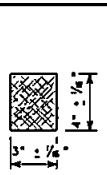
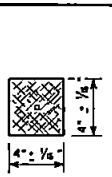
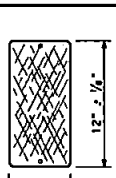
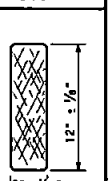
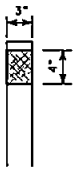
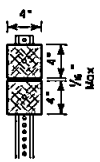
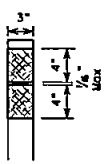
FILE:

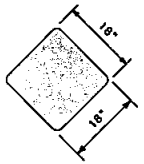
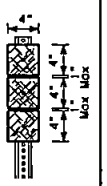
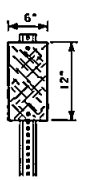
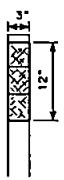
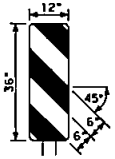
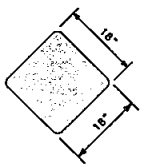
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX) SZ X (XXXX) XXX (XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX) XXX (XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector units (Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

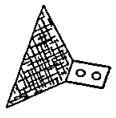
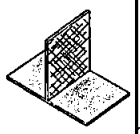
TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

DEPARTMENTAL MATERIAL SPECIFICATIONS

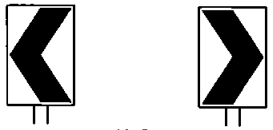
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



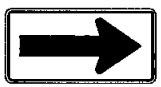
WI-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (WI-8) signs and ONE DIRECTION LARGE ARROW (WI-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (WI-9T) may be used instead of the ONE DIRECTION LARGE ARROW (WI-6).

ONE DIRECTION LARGE ARROW

DEVICE



WI-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DW: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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4-10 7-20				29
20A				

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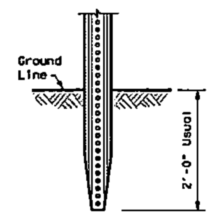
Exhibit B
Mangum Hem Road Extension Project

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

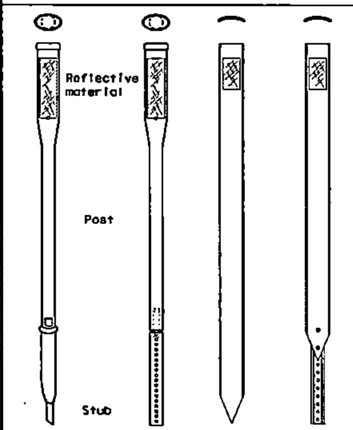


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

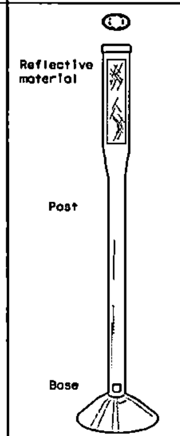
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



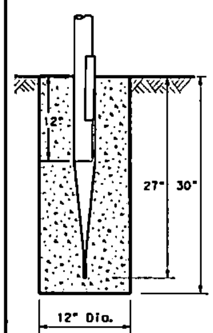
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

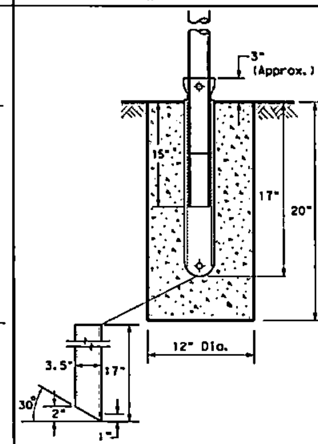
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

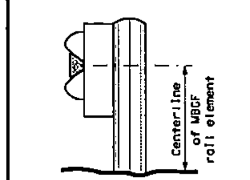
NOTE

1. Install per manufacturer's recommendations.

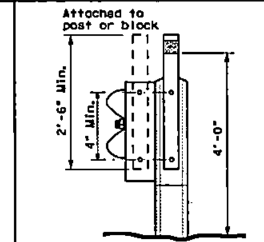
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

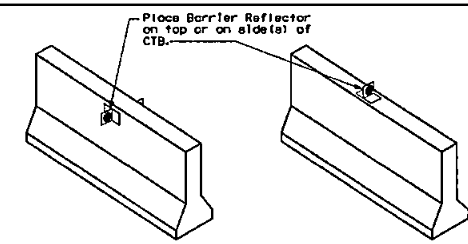
GF1



GF2



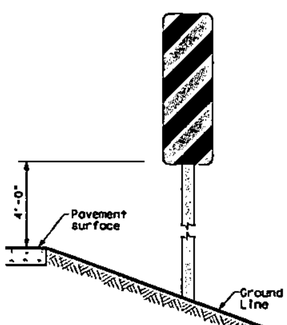
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

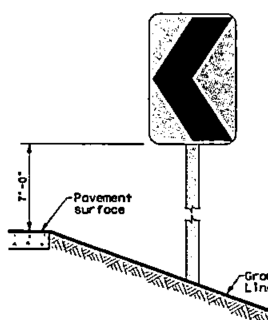
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

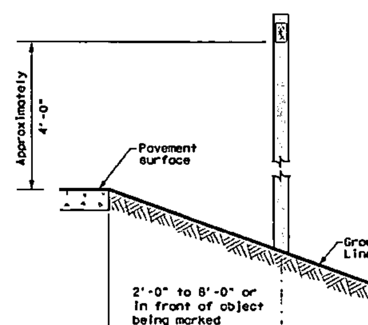
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under Item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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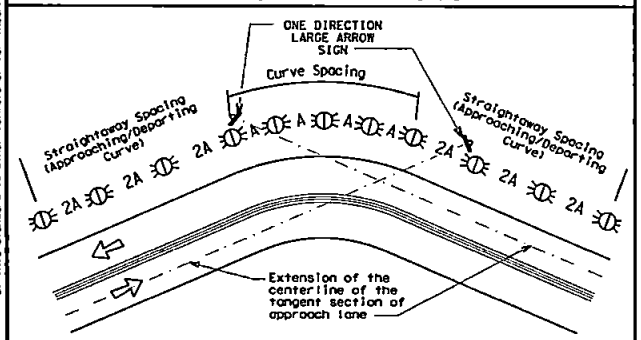
208

DATE:
FILE:

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

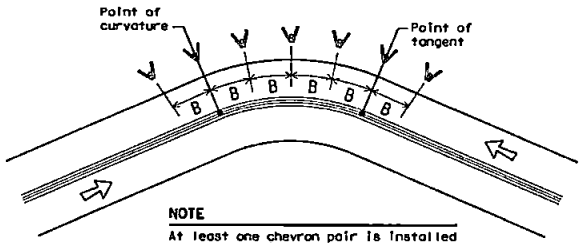
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE:	dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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8-15 7-20					31

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DATE:
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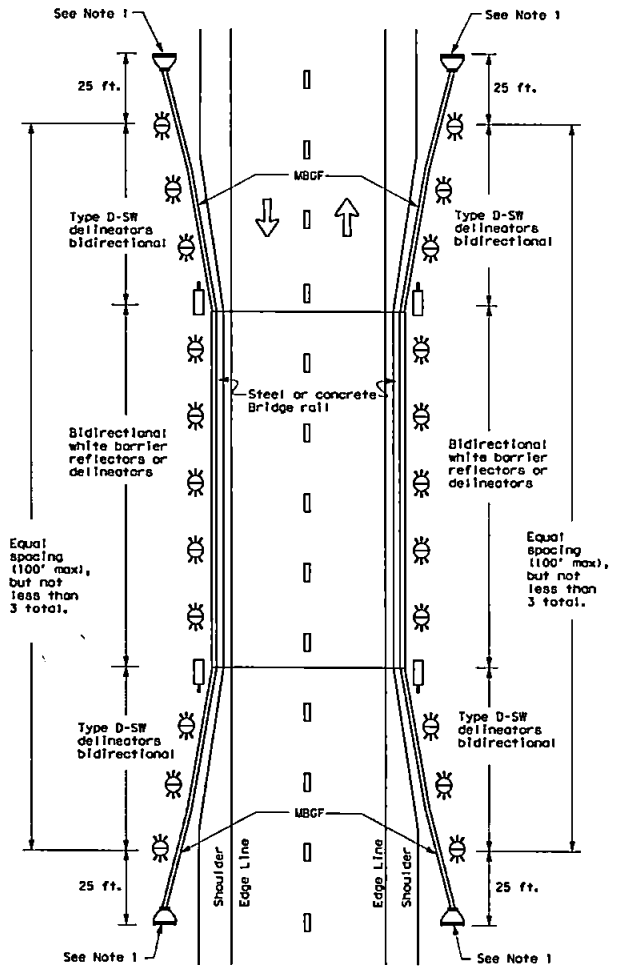
DATE:
FILE:

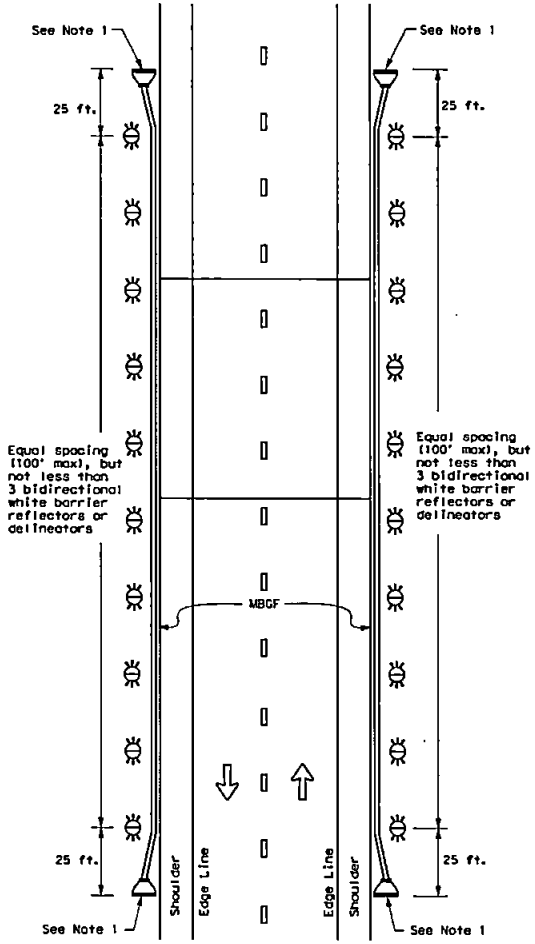
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

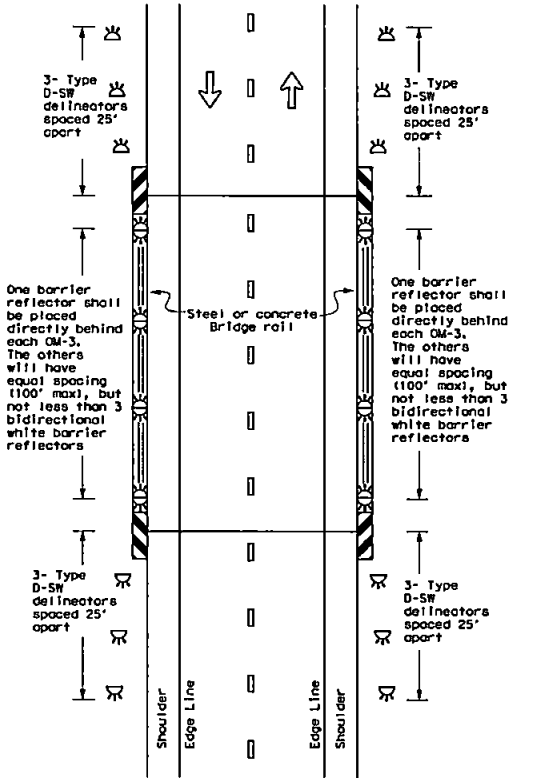
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-20	DIST	COUNTY		SHEET NO. 32

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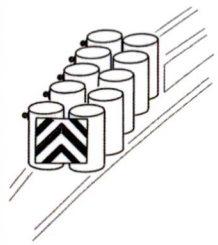
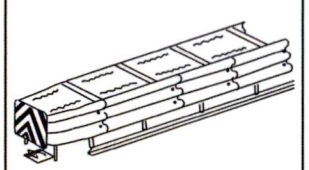
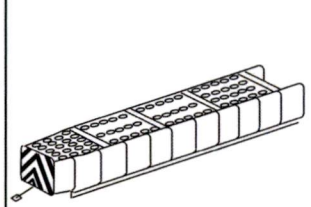
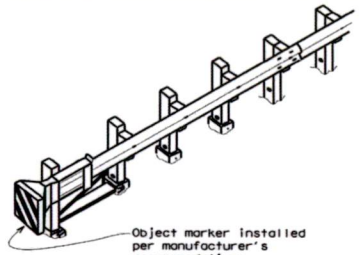
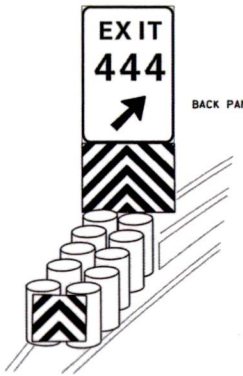


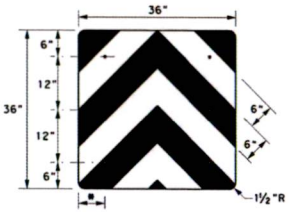


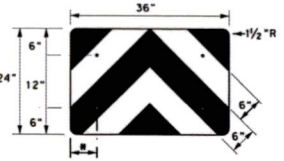




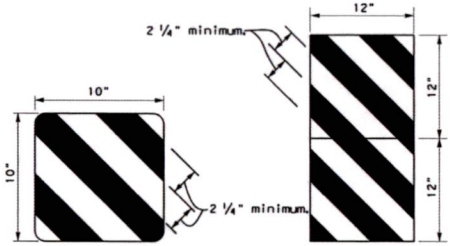


BACK PANEL (OPTIONAL)

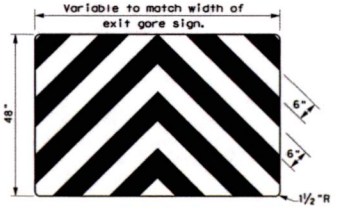


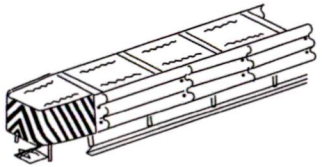


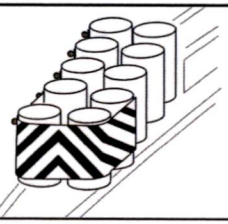
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

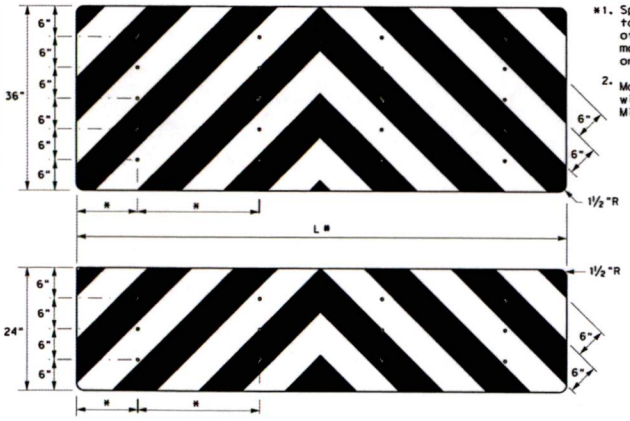


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE:	dmvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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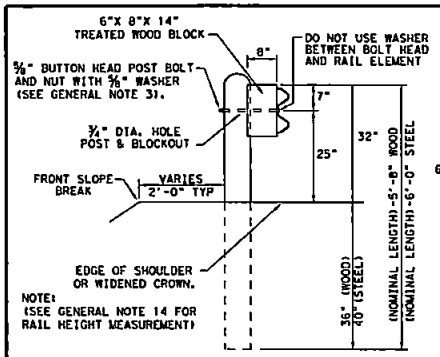
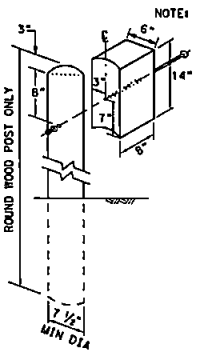
4-92 8-04		DIST	COUNTY		SHEET NO.
8-95 3-15					
4-98 7-20					33
2006					

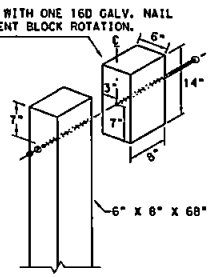
DATE:
FILE:



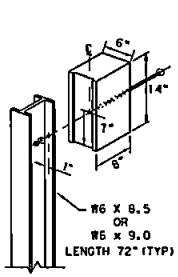
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

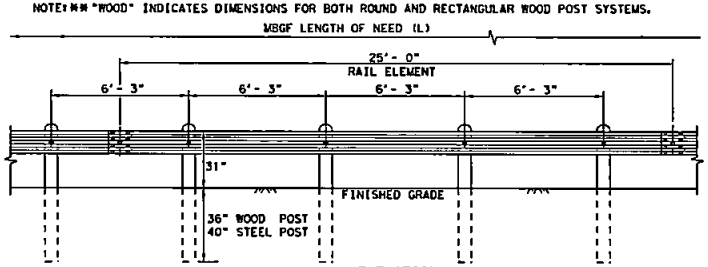


WOOD BLOCK TO RECTANGULAR WOOD POST



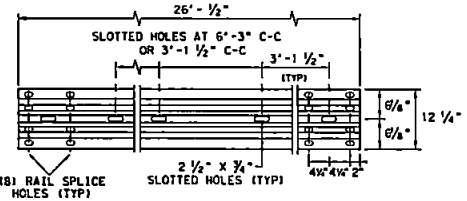
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

NOTE: ## "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



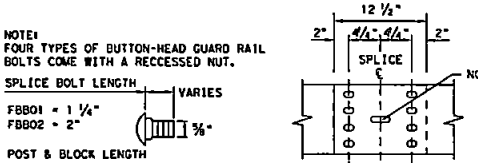
ELEVATION
MID-SPAN RAIL SPLICE

SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



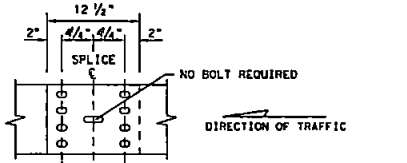
ELEVATION 25'- 0" (NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.



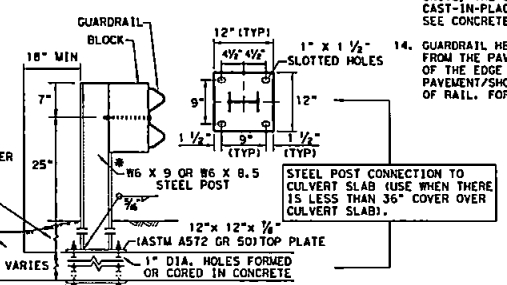
BUTTON HEAD BOLT

NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31)1, MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



*POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

STEEL POST CONNECTION TO CULVERT SLAB (USE WHEN THERE IS LESS THAN 36" COVER OVER CULVERT SLAB).

12" X 12" X 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 5/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 5/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

NOTE: TRANSITIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 5/8" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL. MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.
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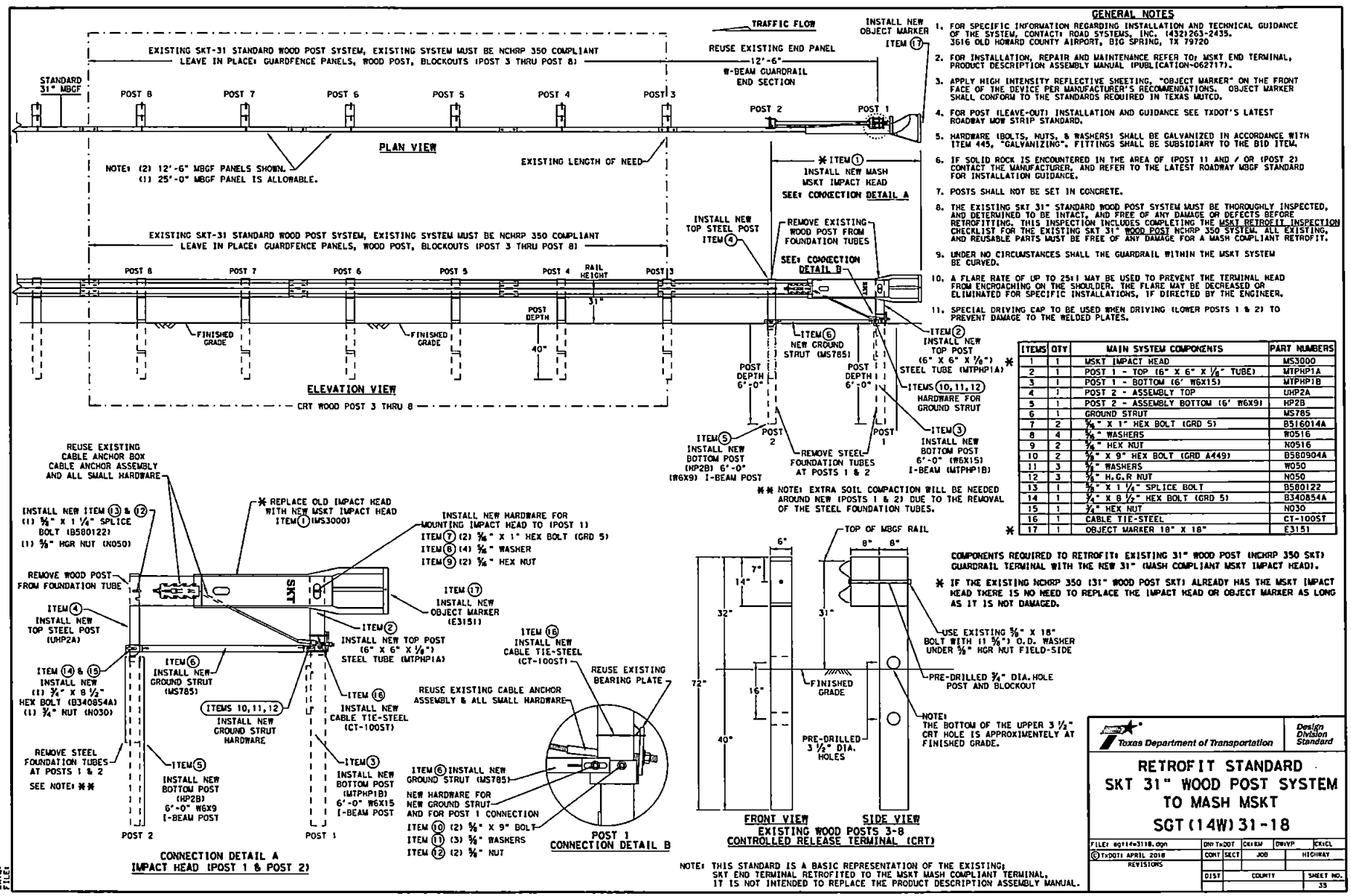

GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 11 AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. THE EXISTING SKT 31" STANDARD WOOD POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" WOOD POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
9. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
10. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
11. SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
1	1	MSKT IMPACT HEAD	MS3000
2	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
3	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
4	1	POST 2 - ASSEMBLY TOP	UHP2A
5	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
6	1	GROUND STRUT	MS785
7	2	5/8" X 1" HEX BOLT (GRD 5)	B516014A
8	4	5/8" WASHERS	W0516
9	2	5/8" HEX NUT	N0516
10	2	5/8" X 9" HEX BOLT (GRD A449)	B5809044A
11	3	5/8" WASHERS	W050
12	3	5/8" H.G.R NUT	N050
13	1	5/8" X 1 1/4" SPLICE BOLT	B580122
14	1	3/4" X 8 1/2" HEX BOLT (GRD 5)	B340854A
15	1	3/4" HEX NUT	N030
16	1	CABLE TIE-STEEL	CT-100ST
* 17	1	OBJECT MARKER 18" X 18"	E3151

COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" WOOD POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).

* IF THE EXISTING NCHRP 350 (31" WOOD POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE EXISTING; SKT END TERMINAL RETROFITED TO THE MSKT MASH COMPLIANT TERMINAL. IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE:
FILE:

Texas Department of Transportation

Design Division Standard

RETROFIT STANDARD SKT 31" WOOD POST SYSTEM TO MASH MSKT

SGT(14W)31-18

FILE: sgt14w3118.dgn	DN: TxDOT	CK: RM	DW: VP	CK: CL
©TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	DIST	COUNTY		SHEET NO.
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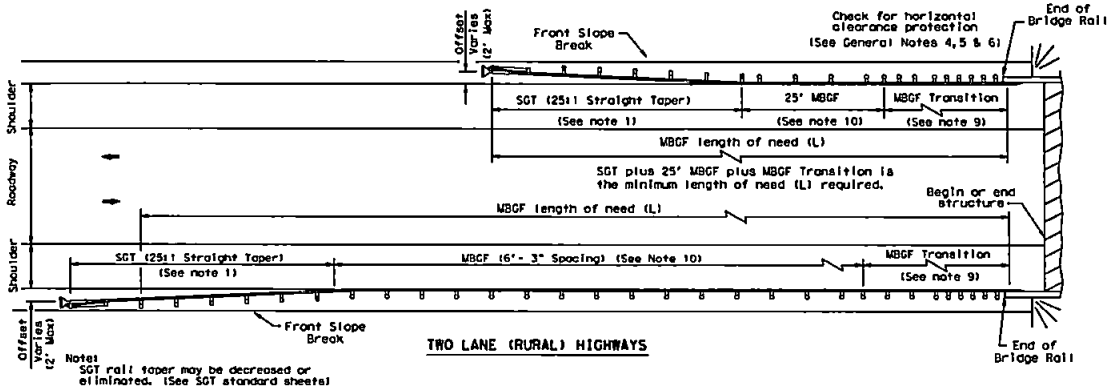
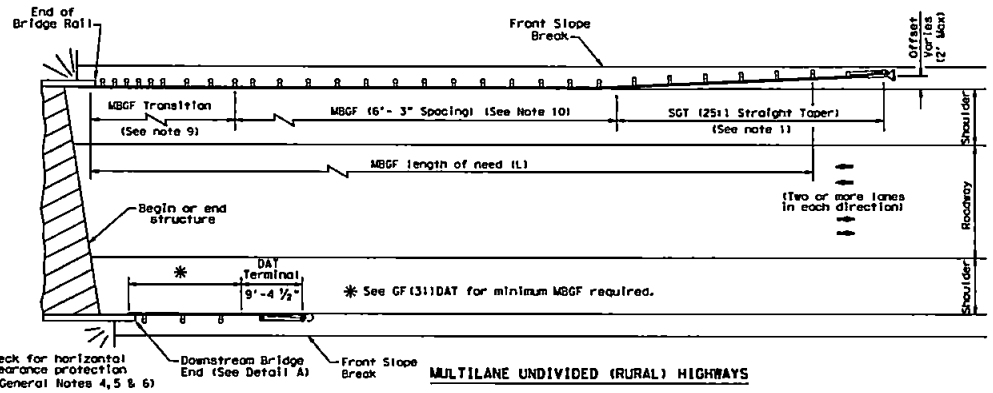
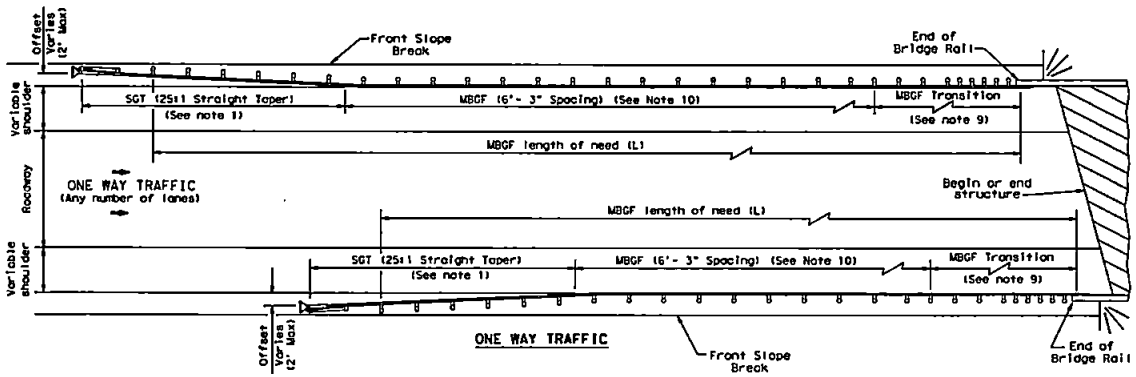


TWO LANE (RURAL) HIGHWAYS

Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)



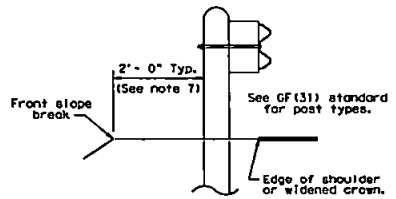
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



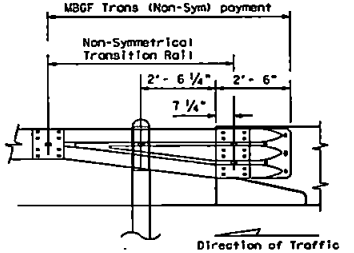
ONE WAY TRAFFIC

GENERAL NOTES

1. For more details See GF(31), SGT( )31, GF(31)TR, and GF(31)TL2 standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
3. Use average daily traffic (ADT) for the current year to determine MBGF length of need in accordance with the Roadway Design Manual unless otherwise specified. Where significant traffic volume growth is anticipated on low volume (0-750 ADT) highways, use length determinations for the higher volume category.
4. MBGF may not be required to shield departure end of bridge unless other obstacles within the horizontal clearance limits or opposing traffic indicate a MBGF consideration.
5. Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF to concrete rails are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (This requires a minimum of three standard line posts plus the DAT terminal, See Detail A)
7. The crown shall be widened to accommodate MBGF. Typically the "front slope" break should be 2'- 0" from the back of the MBGF post. This applies to new construction on new alignment or where existing roadway cross section is to be widened to increase roadway width. This does not apply to rehabilitation work where existing roadway crown width is to be retained (See Typical Cross Section at MBGF).
8. For restrictive bridge widths: The MBGF should be properly transitioned from the existing bridge rail to the adjoining MBGF (See MBGF Transition Standards). Metal beam guard fence at these bridge location(s) shall be flared at the rate of 25:1 or flatter, and be of the length necessary to locate the terminal end at the 2 ft."maximum" offset from the shoulder edge in the approach direction.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
10. A minimum 25' length of MBGF will be required.



TYPICAL CROSS SECTION AT MBGF



Note:
All rail elements shall be lapped in the direction of adjacent traffic.

DETAIL A
Showing Downstream Rail Attachment

Texas Department of Transportation | Design Division Standard

BRIDGE END DETAILS
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)
BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL	
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY	
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DATE:
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

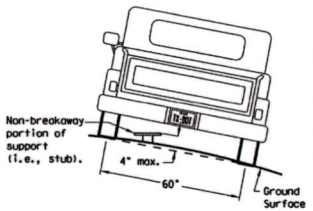
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

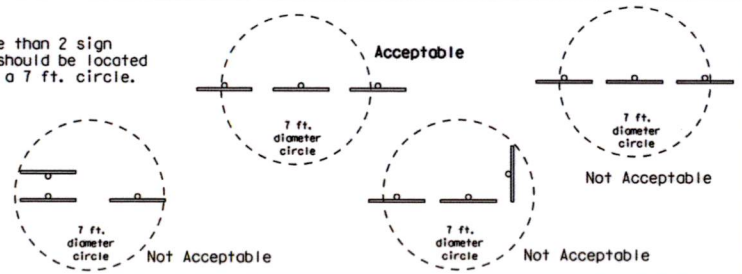
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1) to (SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



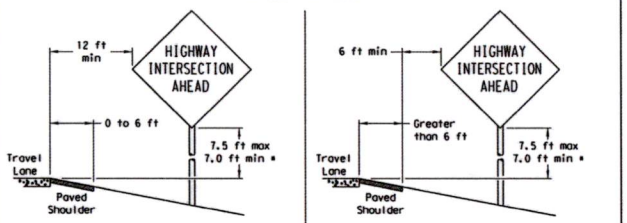
§ To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



SIGN LOCATION

PAVED SHOULDERS



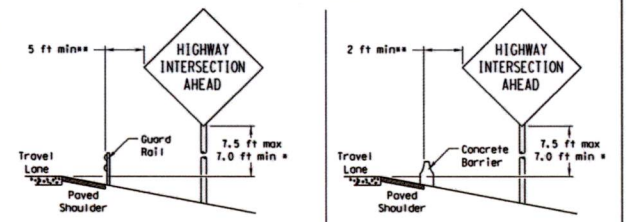
LESS THAN 6 FT. WIDE

When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.

GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER

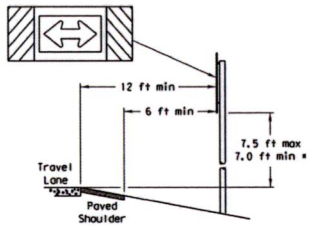


BEHIND GUARDRAIL

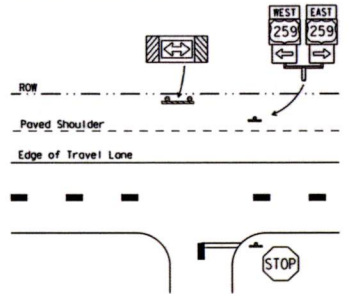
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

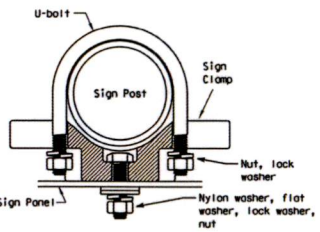
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

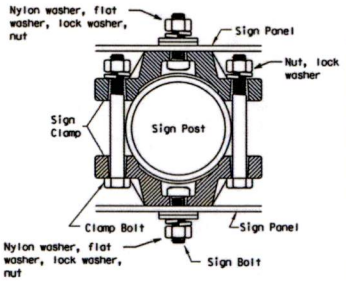


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

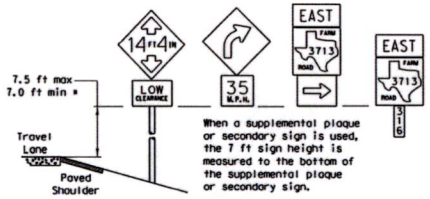
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



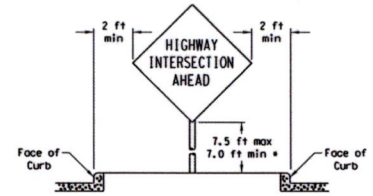
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



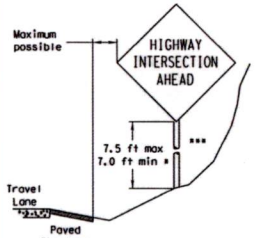
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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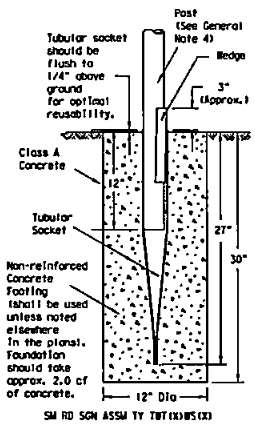
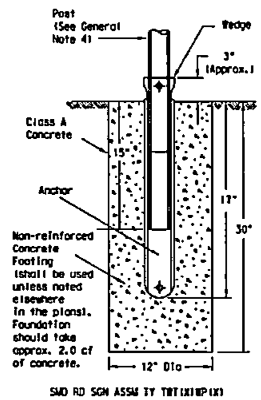
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
				37

26A

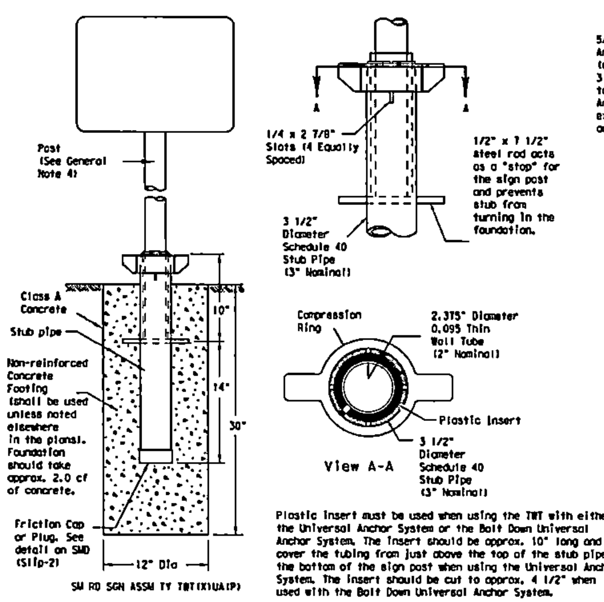
Wedge Anchor Steel System



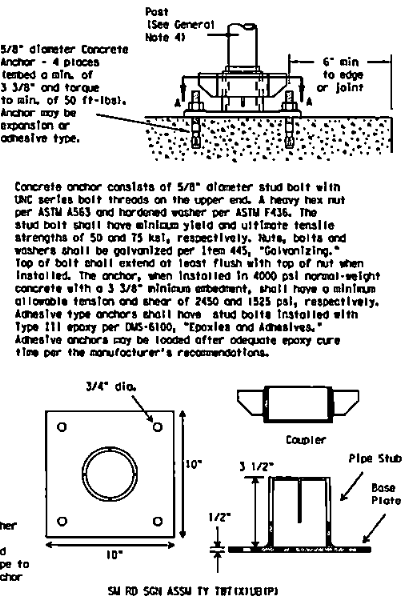
Wedge Anchor High Density Polyethylene (HDPE) System



Universal Anchor System with Thin-Walled Tubing Post

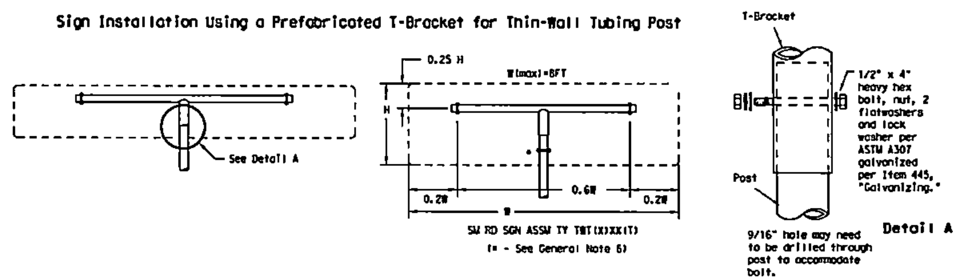


Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   - 13 BWG Tubing (2.375" outside diameter) (TWT)
     - 0.095" nominal wall thickness
     - Seamless or electric-resistance welded steel tubing
     - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
     - Other steels may be used if they meet the following:
       - 55,000 PSI minimum yield strength
       - 70,000 PSI minimum tensile strength
       - 18% minimum elongation in 2"
     - Wall thickness (uncoated) shall be within the range of .083" to .099"
     - Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
     - Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY		SHEET NO.
				38

26E

DATE:
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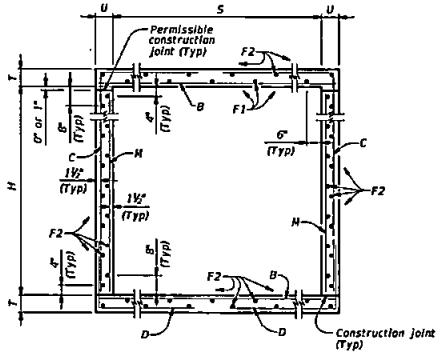
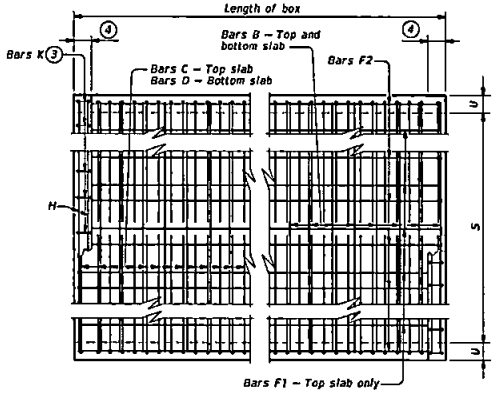
Exhibit B
Mangana Hein Road Extension Project

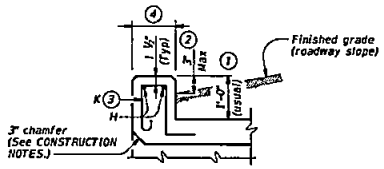
DATE:
FILE:



TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CH) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct 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.

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

4 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, H, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

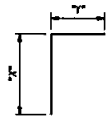
CONSTRUCTION NOTES:
Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars H may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized – #4 = 1'-8" Min
- Uncoated or galvanized – #5 = 2'-1" Min
- Uncoated or galvanized – #6 = 2'-6" Min

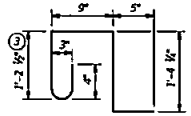
GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-in-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C

BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BRP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
04/2021 Updated K sheet	DIST	COUNTY		SHEET NO.	
				39	

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																		QUANTITIES					
					Bars B					Bars C & D								Bars E					Bars F1 – #4				Bars F2 – #4				Bars M – #4				Bars Y & Z – #4								Bars H 4 – #4		Bars K		Per Foot of Barrel		Curb		Total	
												Bars C		Bars D																				Bars Y		Bars Z													
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
2	4'-0"	2'-0"	8"	7"	108	#5	9"	9'-6"	1,070	162	#4	6"	5'-8"	613	5'-4"	577	108	#5	9"	7'-4"	826	6	18"	39'-9"	159	36	18"	39'-9"	956	108	9"	2'-0"	144	54	9"	4'-7"	165	5'-3"	189	9'-6"	25	22	61	0.611	117.5	0.7	86	25.2	4,765
3	4'-0"	2'-0"	8"	7"	108	#5	9"	14'-1"	1,586	162	#4	6"	5'-8"	613	5'-4"	577	108	#5	9"	11'-11"	1,342	9	18"	39'-9"	239	51	18"	39'-9"	1,354	108	9"	2'-0"	144	108	9"	4'-7"	331	5'-3"	379	14'-1"	38	32	89	0.881	164.1	1.1	127	36.3	6,692
4	4'-0"	2'-0"	8"	7"	108	#5	9"	18'-8"	2,103	162	#4	6"	5'-8"	613	5'-4"	577	108	#5	9"	16'-6"	1,859	12	18"	39'-9"	319	66	18"	39'-9"	1,752	108	9"	2'-0"	144	162	9"	4'-7"	496	5'-3"	568	18'-8"	50	40	111	1.150	210.8	1.4	161	47.4	8,592
5	4'-0"	2'-0"	8"	7"	108	#5	9"	23'-3"	2,619	162	#4	6"	5'-8"	613	5'-4"	577	108	#5	9"	21'-1"	2,375	15	18"	39'-9"	398	81	18"	39'-9"	2,151	108	9"	2'-0"	144	216	9"	4'-7"	661	5'-3"	758	23'-3"	62	50	139	1.420	257.4	1.7	201	58.5	10,497
6	4'-0"	2'-0"	8"	7"	108	#5	9"	27'-10"	3,135	162	#4	6"	5'-8"	613	5'-4"	577	108	#5	9"	25'-8"	2,891	18	18"	39'-9"	478	96	18"	39'-9"	2,549	108	9"	2'-0"	144	270	9"	4'-7"	827	5'-3"	947	27'-10"	74	58	161	1.689	304.0	2.1	235	69.6	12,396
2	4'-0"	3'-0"	8"	7"	108	#5	9"	9'-6"	1,070	162	#4	6"	6'-8"	721	5'-4"	577	108	#5	9"	7'-4"	826	6	18"	39'-9"	159	42	18"	39'-9"	1,115	108	9"	3'-0"	216	54	9"	4'-7"	165	7'-3"	262	9'-6"	25	22	61	0.676	127.8	0.7	86	27.8	5,197
3	4'-0"	3'-0"	8"	7"	108	#5	9"	14'-1"	1,586	162	#4	6"	6'-8"	721	5'-4"	577	108	#5	9"	11'-11"	1,342	9	18"	39'-9"	239	59	18"	39'-9"	1,567	108	9"	3'-0"	216	108	9"	4'-7"	331	7'-3"	523	14'-1"	38	32	89	0.967	177.6	1.1	127	39.7	7,229
4	4'-0"	3'-0"	8"	7"	108	#5	9"	18'-8"	2,103	162	#4	6"	6'-8"	721	5'-4"	577	108	#5	9"	16'-6"	1,859	12	18"	39'-9"	319	76	18"	39'-9"	2,018	108	9"	3'-0"	216	162	9"	4'-7"	496	7'-3"	785	18'-8"	50	40	111	1.258	227.4	1.4	161	51.7	9,255
5	4'-0"	3'-0"	8"	7"	108	#5	9"	23'-3"	2,619	162	#4	6"	6'-8"	721	5'-4"	577	108	#5	9"	21'-1"	2,375	15	18"	39'-9"	398	93	18"	39'-9"	2,469	108	9"	3'-0"	216	216	9"	4'-7"	661	7'-3"	1,046	23'-3"	62	50	139	1.549	277.1	1.7	201	63.7	11,283
6	4'-0"	3'-0"	8"	7"	108	#5	9"	27'-10"	3,135	162	#4	6"	6'-8"	721	5'-4"	577	108	#5	9"	25'-8"	2,891	18	18"	39'-9"	478	110	18"	39'-9"	2,921	108	9"	3'-0"	216	270	9"	4'-7"	827	7'-3"	1,308	27'-10"	74	58	161	1.841	326.9	2.1	235	75.7	13,309
2	4'-0"	4'-0"	8"	7"	108	#5	9"	9'-6"	1,070	162	#4	6"	7'-8"	830	5'-4"	577	108	#5	9"	7'-4"	826	6	18"	39'-9"	159	42	18"	39'-9"	1,115	108	9"	4'-0"	289	54	9"	4'-7"	165	9'-3"	334	9'-6"	25	22	61	0.741	134.1	0.7	86	30.4	5,451
3	4'-0"	4'-0"	8"	7"	108	#5	9"	14'-1"	1,586	162	#4	6"	7'-8"	830	5'-4"	577	108	#5	9"	11'-11"	1,342	9	18"	39'-9"	239	59	18"	39'-9"	1,567	108	9"	4'-0"	289	108	9"	4'-7"	331	9'-3"	667	14'-1"	38	32	89	1.053	185.7	1.1	127	43.2	7,555
4	4'-0"	4'-0"	8"	7"	108	#5	9"	18'-8"	2,103	162	#4	6"	7'-8"	830	5'-4"	577	108	#5	9"	16'-6"	1,859	12	18"	39'-9"	319	76	18"	39'-9"	2,018	108	9"	4'-0"	289	162	9"	4'-7"	496	9'-3"	1,001	18'-8"	50	40	111	1.366	237.3	1.4	161	56.0	9,653
5	4'-0"	4'-0"	8"	7"	108	#5	9"	23'-3"	2,619	162	#4	6"	7'-8"	830	5'-4"	577	108	#5	9"	21'-1"	2,375	15	18"	39'-9"	398	93	18"	39'-9"	2,469	108	9"	4'-0"	289	216	9"	4'-7"	661	9'-3"	1,335	23'-3"	62	50	139	1.679	288.8	1.7	201	68.9	11,754
6	4'-0"	4'-0"	8"	7"	108	#5	9"	27'-10"	3,135	162	#4	6"	7'-8"	830	5'-4"	577	108	#5	9"	25'-8"	2,891	18	18"	39'-9"	478	110	18"	39'-9"	2,921	108	9"	4'-0"	289	270	9"	4'-7"	827	9'-3"	1,668	27'-10"	74	58	161	1.992	340.4	2.1	235	81.8	13,851

DATE:
FILE:

Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS
CAST-IN-PLACE
4'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY
MC-4-23

FILE: mc423ste-20.dgn	DN: TxDOT	CK: BWP	DW: TxDOT	CK: TxDOT
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REVISIONS	DIST	COUNTY		SHEET NO.
				40

DATE:
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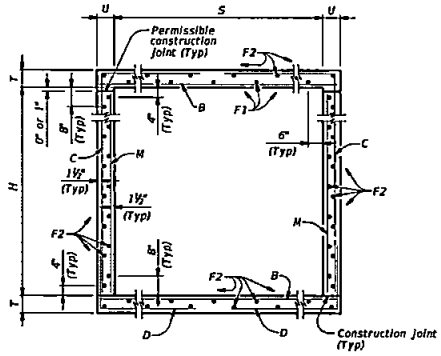
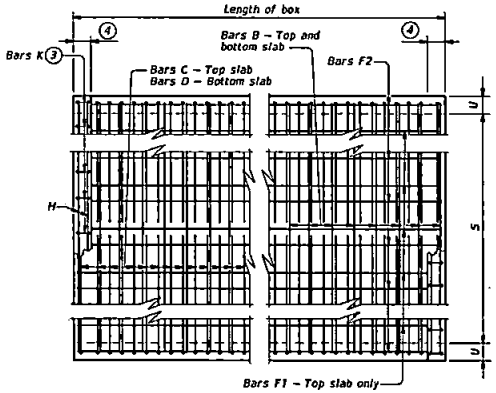
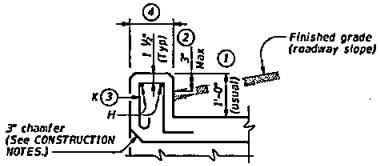


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct 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.

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

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, H, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

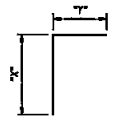
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'_c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'_c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized – #4 = 1'-8" Min
- Uncoated or galvanized – #5 = 2'-1" Min
- Uncoated or galvanized – #6 = 2'-6" Min

GENERAL NOTES:

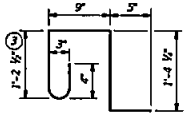
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-in-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C

BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TxDOT	CK: BWP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
04/2021 Updated 'F' values	DIST	COUNTY		SHEET NO.	
				41	

SECTION DIMENSIONS				FILL HEIGHT ⑤	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M – #4				Bars F1 – #4 at 18" Spa			Bars F2 – #4 at 18" Spa			Bars H 4 – #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	"X"	"Y"	No.	Size	Spa	Length	Weight	"Y"	"Z"	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8'-0"	3'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	8'-8"	1,406	3'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	3'-0"	216	6	39'-9"	159	32	39'-9"	850	8'-11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8'-0"	3'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	108	#6	9"	8'-8"	1,406	3'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	3'-0"	216	6	39'-9"	159	32	39'-9"	850	8'-11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8'-0"	3'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	108	#6	9"	8'-10"	1,433	3'-8"	5'-2"	108	#6	9"	8'-5"	1,365	5'-2"	3'-3"	82	12"	3'-0"	164	6	39'-9"	159	32	39'-9"	850	9'-1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8'-0"	3'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	108	#6	9"	8'-11"	1,446	3'-9"	5'-2"	108	#6	9"	8'-6"	1,379	5'-2"	3'-4"	82	12"	3'-0"	164	6	39'-9"	159	32	39'-9"	850	9'-1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8'-0"	3'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	108	#6	9"	9'-2"	1,487	3'-11"	5'-3"	108	#6	9"	8'-9"	1,419	5'-3"	3'-6"	108	9"	3'-0"	216	6	39'-9"	159	32	39'-9"	850	9'-3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8'-0"	4'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	9'-8"	1,568	4'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	4'-0"	289	6	39'-9"	159	32	39'-9"	850	8'-11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8'-0"	4'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	108	#6	9"	9'-8"	1,568	4'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	4'-0"	289	6	39'-9"	159	32	39'-9"	850	8'-11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8'-0"	4'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	108	#6	9"	9'-10"	1,595	4'-8"	5'-2"	108	#6	9"	8'-5"	1,365	5'-2"	3'-3"	82	12"	4'-0"	219	6	39'-9"	159	32	39'-9"	850	9'-1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8'-0"	4'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	108	#6	9"	9'-11"	1,609	4'-9"	5'-2"	108	#6	9"	8'-6"	1,379	5'-2"	3'-4"	82	12"	4'-0"	219	6	39'-9"	159	32	39'-9"	850	9'-1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8'-0"	4'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	108	#6	9"	10'-2"	1,649	4'-11"	5'-3"	108	#6	9"	8'-9"	1,419	5'-3"	3'-6"	108	9"	4'-0"	289	6	39'-9"	159	32	39'-9"	850	9'-3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8'-0"	5'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	10'-8"	1,730	5'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	5'-0"	361	6	39'-9"	159	36	39'-9"	956	8'-11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8'-0"	5'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	108	#6	9"	10'-8"	1,730	5'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	5'-0"	361	6	39'-9"	159	36	39'-9"	956	8'-11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8'-0"	5'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	108	#6	9"	10'-10"	1,757	5'-8"	5'-2"	108	#6	9"	8'-5"	1,365	5'-2"	3'-3"	82	12"	5'-0"	274	6	39'-9"	159	36	39'-9"	956	9'-1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8'-0"	5'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	108	#6	9"	10'-11"	1,771	5'-9"	5'-2"	108	#6	9"	8'-6"	1,379	5'-2"	3'-4"	82	12"	5'-0"	274	6	39'-9"	159	36	39'-9"	956	9'-1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8'-0"	5'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	108	#6	9"	11'-2"	1,811	5'-11"	5'-3"	108	#6	9"	8'-9"	1,419	5'-3"	3'-6"	108	9"	5'-0"	361	6	39'-9"	159	36	39'-9"	956	9'-3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8'-0"	6'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	11'-8"	1,893	6'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	6'-0"	433	6	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8'-0"	6'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	108	#6	9"	11'-8"	1,893	6'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	6'-0"	433	6	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8'-0"	6'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	108	#6	9"	11'-10"	1,920	6'-8"	5'-2"	108	#6	9"	8'-5"	1,365	5'-2"	3'-3"	82	12"	6'-0"	329	6	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8'-0"	6'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	108	#6	9"	11'-11"	1,933	6'-9"	5'-2"	108	#6	9"	8'-6"	1,379	5'-2"	3'-4"	82	12"	6'-0"	329	6	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8'-0"	6'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	108	#6	9"	12'-2"	1,974	6'-11"	5'-3"	108	#6	9"	8'-9"	1,419	5'-3"	3'-6"	108	9"	6'-0"	433	6	39'-9"	159	40	39'-9"	1,062	9'-3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8'-0"	7'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	12'-8"	2,055	7'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	7'-0"	505	6	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8'-0"	7'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	162	#6	6"	12'-8"	3,082	7'-6"	5'-2"	162	#6	6"	8'-3"	2,007	5'-2"	3'-1"	108	9"	7'-0"	505	6	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8'-0"	7'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	162	#6	6"	12'-10"	3,123	7'-8"	5'-2"	162	#6	6"	8'-5"	2,048	5'-2"	3'-3"	82	12"	7'-0"	383	6	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8'-0"	7'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	162	#6	6"	12'-11"	3,143	7'-9"	5'-2"	162	#6	6"	8'-6"	2,068	5'-2"	3'-4"	82	12"	7'-0"	383	6	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8'-0"	7'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	162	#6	6"	13'-2"	3,204	7'-11"	5'-3"	162	#6	6"	8'-9"	2,129	5'-3"	3'-6"	108	9"	7'-0"	505	6	39'-9"	159	40	39'-9"	1,062	9'-3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8'-0"	8'-0"	8"	7"	13'	162	#6	6"	8'-11"	2,170	108	#6	9"	13'-8"	2,217	8'-6"	5'-2"	108	#6	9"	8'-3"	1,338	5'-2"	3'-1"	108	9"	8'-0"	577	6	39'-9"	159	44	39'-9"	1,168	8'-11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8'-0"	8'-0"	8"	7"	16'	162	#6	6"	8'-11"	2,170	162	#6	6"	13'-8"	3,325	8'-6"	5'-2"	162	#6	6"	8'-3"	2,007	5'-2"	3'-1"	108	9"	8'-0"	577	6	39'-9"	159	44	39'-9"	1,168	8'-11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8'-0"	8'-0"	10"	8"	20'	162	#6	6"	9'-1"	2,210	162	#6	6"	13'-10"	3,366	8'-8"	5'-2"	162	#6	6"	8'-5"	2,048	5'-2"	3'-3"	108	9"	8'-0"	577	6	39'-9"	159	44	39'-9"	1,168	9'-1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8'-0"	8'-0"	11"	8"	23'	162	#6	6"	9'-1"	2,210	162	#6	6"	13'-11"	3,386	8'-9"	5'-2"	162	#6	6"	8'-6"	2,068	5'-2"	3'-4"	162	6"	8'-0"	866	6	39'-9"	159	44	39'-9"	1,168	9'-1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8'-0"	8'-0"	13"	9"	30'	162	#6	6"	9'-3"	2,251	162	#6	6"	14'-2"	3,447	8'-11"	5'-3"	162	#6	6"	8'-9"	2,129	5'-3"	3'-6"	162	6"	8'-0"	866	6	39'-9"	159	44	39'-9"	1,168	9'-3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE:
FILE:

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

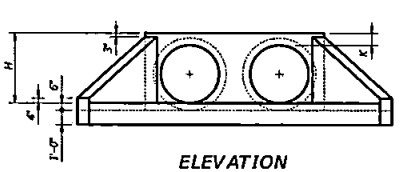
SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-8

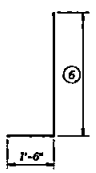
FILE: scc08ste-21.dgn	DN: TxDOT	CK: DRP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 04/2021 Updated 2 values.	DIST	COUNTY		SHEET NO. 42

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

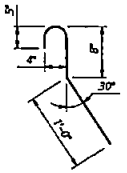
Slope	Dia of Pipe (D)	Values for One Pipe						Values to be Added for Each Addt'l Pipe		
		W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4'-7 1/2"	2'-6"	2'-10"	3'-3 1/4"	88	0.6	1'-9"	20	0.2
	15"	5'-5 3/4"	2'-9 1/2"	3'-4"	3'-10 1/2"	103	0.7	2'-2"	24	0.3
	18"	6'-4 1/2"	3'-1"	3'-10"	4'-5"	124	0.9	2'-8"	32	0.3
	21"	7'-2 3/4"	3'-4 1/2"	4'-4"	5'-0"	143	1.1	3'-1"	43	0.4
	24"	8'-2 1/2"	3'-9 1/2"	4'-10"	5'-7"	164	1.3	3'-7"	50	0.5
	27"	9'-1"	4'-1"	5'-4"	6'-2"	179	1.5	3'-11"	56	0.6
	30"	9'-11 1/2"	4'-4 1/2"	5'-10"	6'-8 3/4"	203	1.7	4'-4"	65	0.8
	33"	10'-10"	4'-8"	6'-4"	7'-3 3/4"	224	2.0	4'-8"	71	0.9
	36"	11'-8 1/4"	4'-11 1/2"	6'-10"	7'-10 3/4"	249	2.2	5'-1"	81	1.0
	42"	13'-5 1/2"	5'-6 1/2"	7'-10"	9'-0 1/2"	298	2.8	5'-10"	97	1.3
	48"	15'-9"	6'-1 1/2"	9'-4"	10'-9 1/2"	360	3.8	6'-7"	117	1.7
	54"	17'-5 3/4"	6'-8 1/2"	10'-4"	11'-11 1/2"	427	4.5	7'-6"	151	2.1
	60"	19'-2 3/4"	7'-3 1/2"	11'-4"	13'-1"	481	5.3	8'-3"	174	2.5
	66"	20'-11 1/2"	7'-10 1/2"	12'-4"	14'-3"	544	6.2	8'-9"	194	2.9
	72"	22'-8 1/2"	8'-5 1/2"	13'-4"	15'-4 3/4"	601	7.1	9'-6"	213	3.3
3:1	12"	6'-3"	2'-6"	4'-3"	4'-11"	110	0.8	1'-9"	22	0.2
	15"	7'-5"	2'-9 1/2"	5'-0"	5'-9 1/4"	137	1.1	2'-2"	28	0.3
	18"	8'-6 3/4"	3'-1"	5'-9"	6'-7 3/4"	170	1.3	2'-8"	37	0.5
	21"	9'-8 3/4"	3'-4 1/2"	6'-6"	7'-6"	195	1.6	3'-1"	48	0.6
	24"	11'-0"	3'-9 1/2"	7'-3"	8'-4 1/2"	227	2.0	3'-7"	58	0.7
	27"	12'-2"	4'-1"	8'-0"	9'-2 3/4"	251	2.3	3'-11"	67	0.8
	30"	13'-4"	4'-4 1/2"	8'-9"	10'-1 1/4"	293	2.7	4'-4"	77	1.0
	33"	14'-5 3/4"	4'-8"	9'-6"	10'-11 3/4"	318	3.1	4'-8"	84	1.2
	36"	15'-7 3/4"	4'-11 1/2"	10'-3"	11'-10"	351	3.5	5'-1"	96	1.4
	42"	17'-11 1/2"	5'-6 1/2"	11'-9"	13'-6 3/4"	432	4.5	5'-10"	119	1.7
	48"	21'-1 3/4"	6'-1 1/2"	14'-0"	16'-2"	537	6.1	6'-7"	146	2.3
	54"	23'-5 1/2"	6'-8 1/2"	15'-6"	17'-10 3/4"	630	7.3	7'-6"	186	2.9
	60"	25'-9 1/4"	7'-3 1/2"	17'-0"	19'-7 1/2"	719	8.7	8'-3"	219	3.4
	66"	28'-1"	7'-10 1/2"	18'-6"	21'-4 1/4"	811	10.1	8'-9"	242	3.9
	72"	30'-4 3/4"	8'-5 1/2"	20'-0"	23'-1 1/2"	924	11.7	9'-6"	272	4.4
4:1	12"	7'-10 3/4"	2'-6"	5'-6"	6'-6 1/2"	148	1.1	1'-9"	24	0.3
	15"	9'-6"	2'-9 1/2"	6'-8"	7'-8 1/2"	181	1.5	2'-2"	32	0.4
	18"	10'-9 1/2"	3'-1"	7'-6"	8'-10 1/4"	221	1.9	2'-8"	42	0.5
	21"	12'-2 3/4"	3'-4 1/2"	8'-6"	10'-0"	260	2.3	3'-1"	57	0.7
	24"	13'-9 1/2"	3'-9 1/2"	9'-6"	11'-2"	301	2.8	3'-7"	67	0.9
	27"	15'-3"	4'-1"	10'-6"	12'-3 3/4"	334	3.3	3'-11"	77	1.0
	30"	16'-8 1/4"	4'-4 1/2"	11'-6"	13'-5 3/4"	385	3.8	4'-4"	89	1.3
	33"	18'-1 3/4"	4'-8"	12'-6"	14'-7 1/2"	425	4.5	4'-8"	101	1.4
	36"	19'-7"	4'-11 1/2"	13'-6"	15'-9 1/2"	472	5.1	5'-1"	115	1.7
	42"	22'-5 3/4"	5'-6 1/2"	15'-6"	18'-1"	583	6.5	5'-10"	141	2.1
	48"	26'-6 1/4"	6'-1 1/2"	18'-6"	21'-6 3/4"	730	8.9	6'-7"	175	2.8
	54"	29'-5"	6'-8 1/2"	20'-8"	23'-10 1/2"	875	10.7	7'-6"	226	3.6
	60"	32'-3 3/4"	7'-3 1/2"	22'-8"	26'-2"	996	12.7	8'-3"	264	4.3
	66"	35'-2 1/2"	7'-10 1/2"	24'-8"	28'-5 3/4"	1,140	14.9	8'-9"	300	4.9
	72"	38'-1 1/4"	8'-5 1/2"	26'-8"	30'-9 1/2"	1,297	17.3	9'-6"	334	5.6
6:1	12"	11'-2"	2'-6"	8'-6"	9'-9 3/4"	224	1.9	1'-9"	28	0.4
	15"	13'-2 1/4"	2'-9 1/2"	10'-0"	11'-6 1/2"	268	2.5	2'-2"	37	0.5
	18"	15'-2 1/2"	3'-1"	11'-6"	13'-3 1/2"	330	3.2	2'-8"	50	0.7
	21"	17'-2 3/4"	3'-4 1/2"	13'-0"	15'-0 1/4"	387	3.9	3'-1"	69	0.9
	24"	19'-4 1/2"	3'-9 1/2"	14'-6"	16'-9"	453	4.8	3'-7"	80	1.2
	27"	21'-4 3/4"	4'-1"	16'-0"	18'-5 3/4"	512	5.7	3'-11"	96	1.4
	30"	23'-5 1/4"	4'-4 1/2"	17'-6"	20'-2 1/2"	593	6.7	4'-4"	110	1.7
	33"	25'-5 1/2"	4'-8"	19'-0"	21'-11 1/2"	675	7.8	4'-8"	127	2.0
	36"	27'-5 3/4"	4'-11 1/2"	20'-6"	23'-8"	735	9.0	5'-1"	144	2.3
	42"	31'-6 1/4"	5'-6 1/2"	23'-6"	27'-1 1/2"	922	11.5	5'-10"	179	3.0
	48"	37'-3 1/2"	6'-1 1/2"	28'-0"	32'-6"	1,191	15.9	6'-7"	231	4.0
	54"	41'-4 1/4"	6'-8 1/2"	31'-0"	35'-9 1/2"	1,424	19.2	7'-6"	300	5.0
	60"	45'-4 3/4"	7'-3 1/2"	34'-0"	39'-3"	1,631	22.9	8'-3"	353	6.0



ELEVATION
(Showing dimensions.)



BARS V



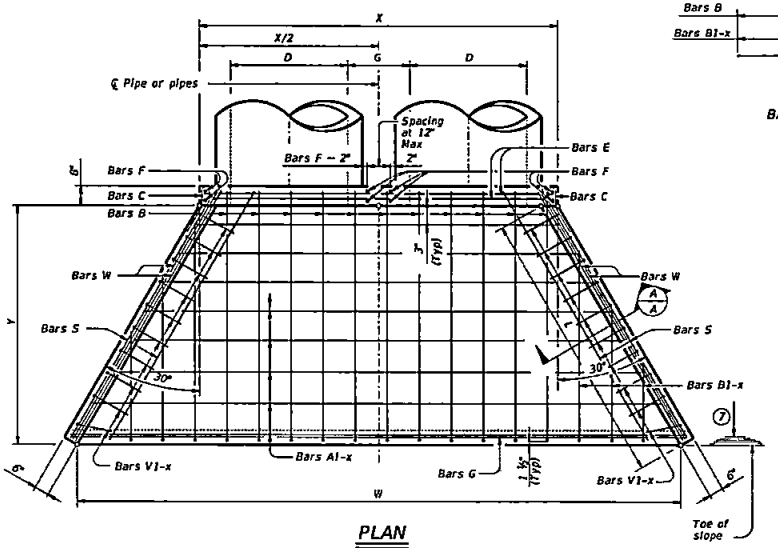
BARS CL
(Length = 2'-5")

TABLE OF (5) REINFORCING STEEL

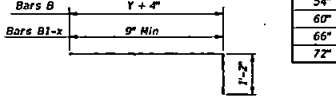
Bar	Size	Spa	No.
A	#4	1'-0"	–
B	#3	1'-6"	–
C	#4	1'-0"	–
D	#3	1'-0"	–
E	#5	–	4
F	#5	–	–
G	#3	–	2
S	#4	–	6
V	#4	1'-0"	–
W	#5	–	4

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (4)	H
12"	0'-9"	1'-0"	2'-0"
15"	0'-11"	1'-0"	2'-3"
18"	1'-2"	1'-0"	2'-6"
21"	1'-4"	1'-0"	2'-9"
24"	1'-7"	1'-0"	3'-0"
27"	1'-8"	1'-0"	3'-3"
30"	1'-10"	1'-0"	3'-6"
33"	1'-11"	1'-0"	3'-9"
36"	2'-1"	1'-0"	4'-0"
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'-6"	1'-3"	7'-3"



PLAN



BARS B and B1-x

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 2" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = $6" + 3" \times \left\{\frac{12 \times H - 7}{12 \times L}\right\}$

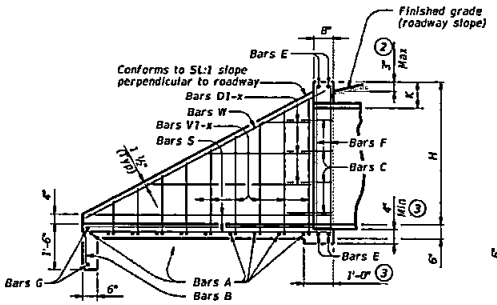
Max Length = $12 \times H - 3" \times \left\{\frac{12 \times H - 7}{12 \times L}\right\} - 1"$

(7) Lengths of wings based on SL:1 slope along this line.

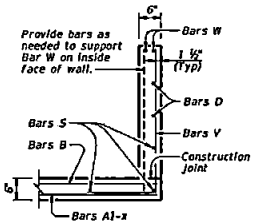
MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



TYPICAL WING ELEVATION



SECTION A-A

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities (3) per ft of wing length (2-wings)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	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"	1'-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	–
N	#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 FORMULAS:
(All values are in feet.)

Hw = H + T + C – 0.250'
A = (Hw – 0.333') (SL)
B = (A) tangent (30°)
Lw = (A) ÷ cosine (30°)

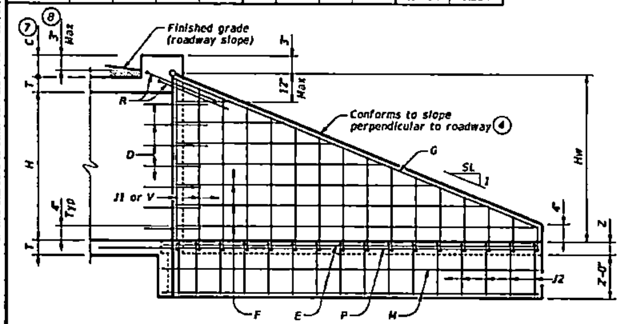
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1).(U)

For precast culverts:
Ltw = (N) (2U + S) + (N – 1) (0.5')

Total wingwall area (two wings – SF) = (Hw + 0.333') (Lw)

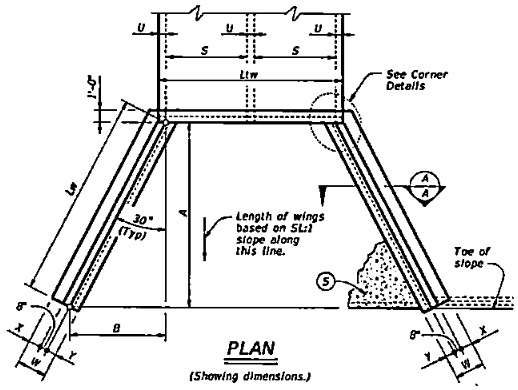
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

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



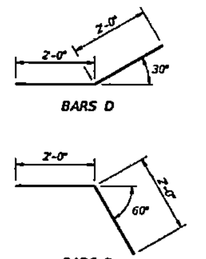
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)



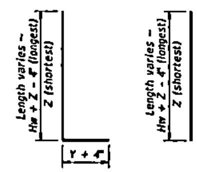
PLAN

(Showing dimensions.)



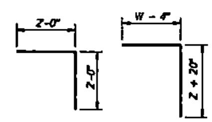
BARS D

BARS R



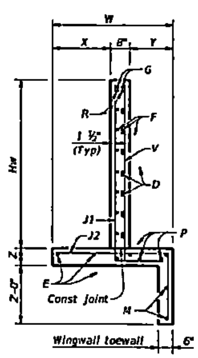
BARS J1

BARS V

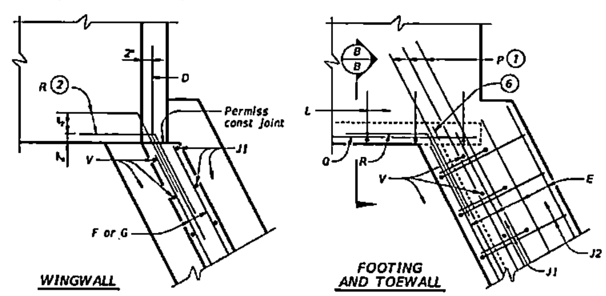


BARS L

BARS J2



SECTION A-A

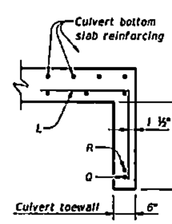


WINGWALL

FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)

(1) Extend Bars P 3'-0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) 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.

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow 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.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(8) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct 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.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
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 Box Culvert Supplement (BCS) standard 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.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation — Bridge Division Standard

CONCRETE WINGWALLS WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

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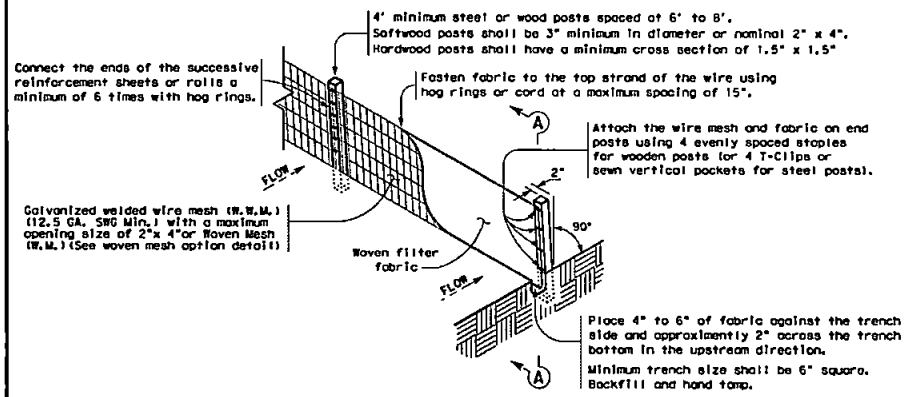
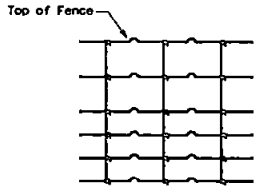
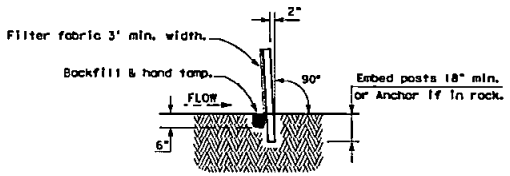


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

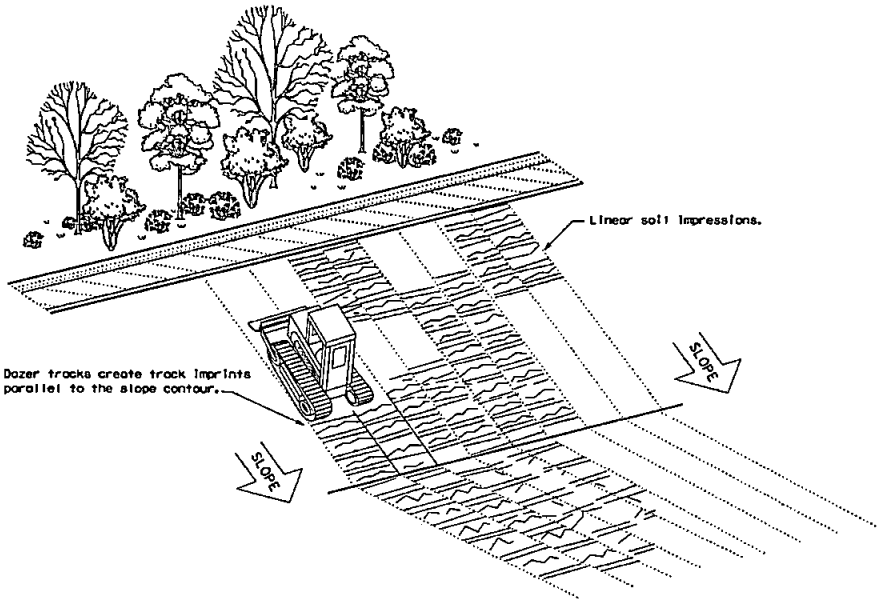
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

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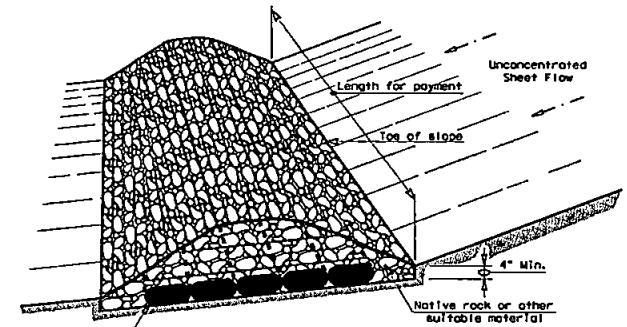
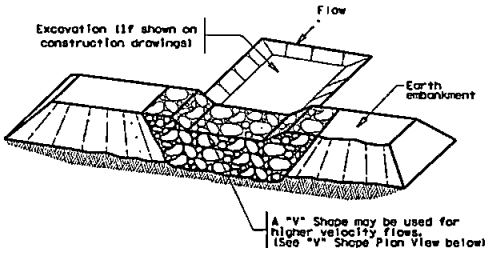


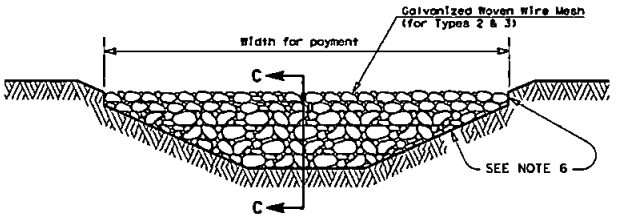
FILTER DAM AT TOE OF SLOPE

RFD1



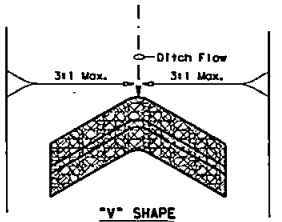
FILTER DAM AT SEDIMENT TRAP

RFD1 — OR — RFD2

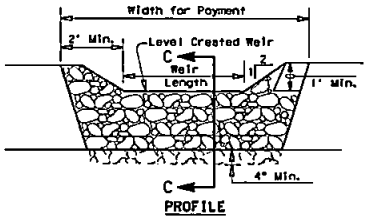


FILTER DAM AT CHANNEL SECTIONS

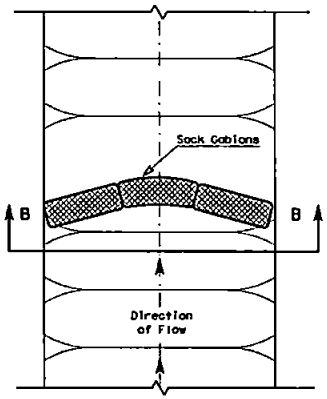
RFD1 — OR — RFD2 — OR — RFD3



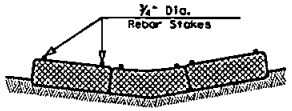
"V" SHAPE PLAN VIEW



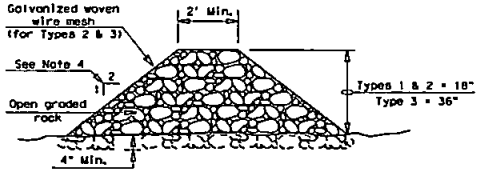
PROFILE



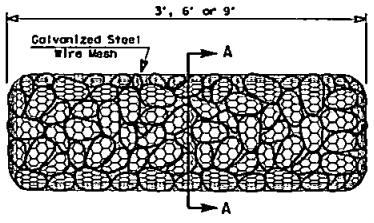
PLAN VIEW



SECTION B-B

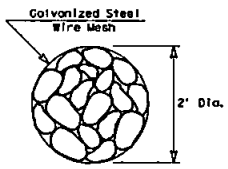


SECTION C-C



TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sock gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sock Gabions should be staked down with ⅜" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼".
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam — RFD1
Type 2 Rock Filter Dam — RFD2
Type 3 Rock Filter Dam — RFD3
Type 4 Rock Filter Dam — RFD4

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: RM	DW: VP	CK: LS
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REVISIONS	DIST	COUNTY		SHEET NO. 46

DATE:
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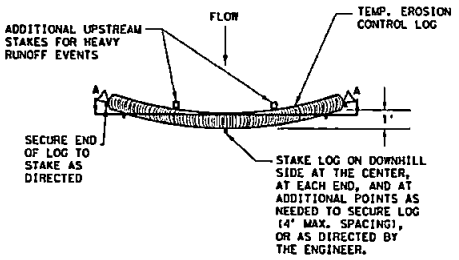
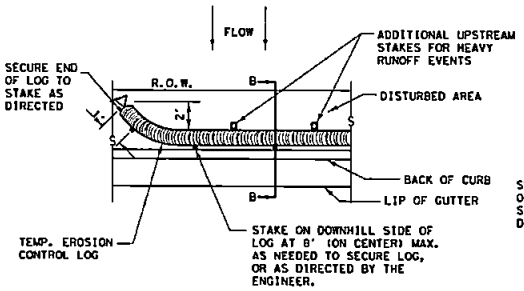
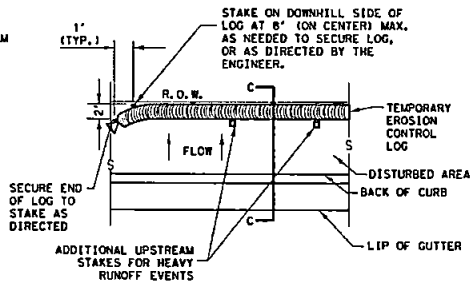


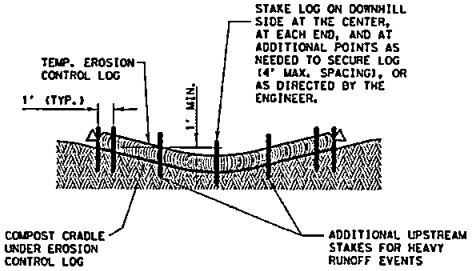
PLAN VIEW



PLAN VIEW



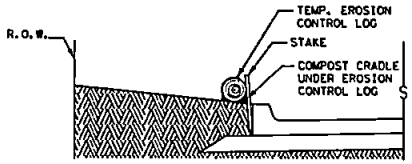
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

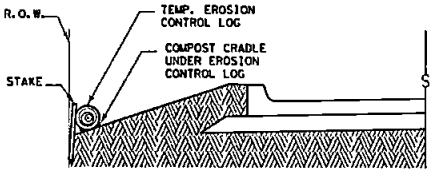
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

CL-BOC



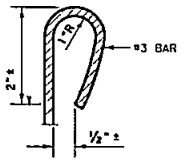
SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW

LEGEND

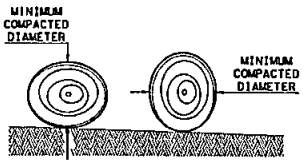
- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET



REBAR STAKE DETAIL

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT	CK: KM	CK: LS/PT	CK: LS
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