52-7

TRAFFIC SIGNAL INSTALLATION

FOR

THE TOWN OF ADDISON

AT THE INTERSECTION OF

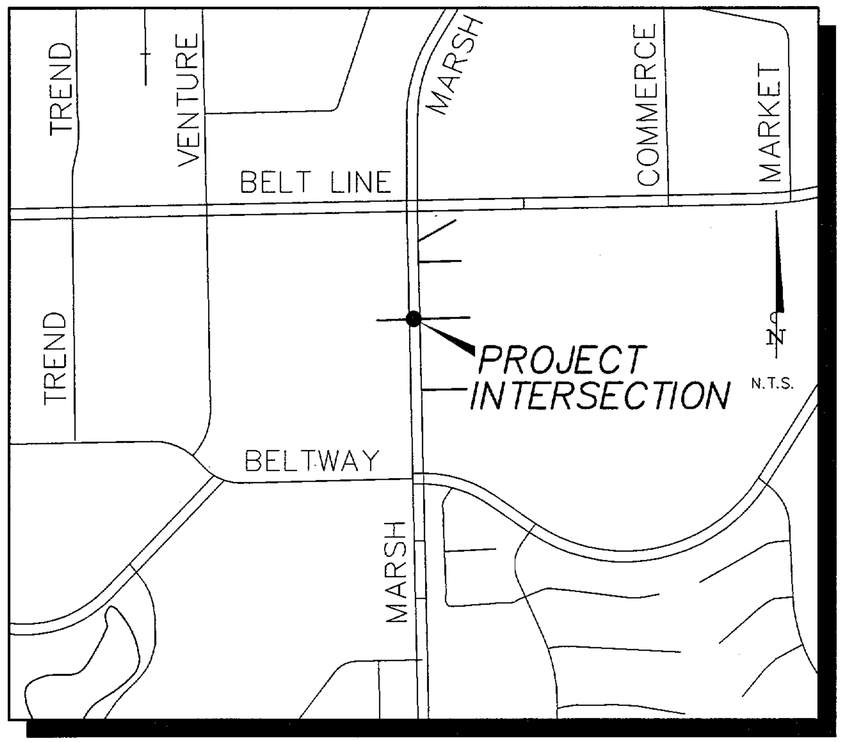
MARSH LANE AND TARGET DRIVEWAY

DECEMBER 2002

TOWN OF ADDISON

APPROVED BY: ____________________

DATE: ____________________



VICINITY MAP

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	COVER SHEET
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3	SIGNAL LAYOUT: MARSH LANE @ TARGET DRIVEWAY SHEET 1
4	SIGNAL LAYOUT: MARSH LANE @ TARGET DRIVEWAY SHEET 2
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7	PEDESTRIAN SIGNAL HEAD IDENTIFICATION (DAL)
8	TRAFFIC SIGNAL CONTROLLER SLAB AND BASE
9	LOOP DETECTOR INSTALLATION DETAILS (DAL)
10	SIGNS (DAL)
11	PAVEMENT MARKING DETAILS (DAL)
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39	MEDIAN DETAILS

PREPARED FOR:

CLIENT:
TOWN OF ADDISON
ADDISON SERVICE CENTER
16801 WESTGROVE DRIVE
ADDISON, TEXAS 75001-5190
TEL. NO. (972) 450-2871
FAX NO. (972) 450-2837

PREPARED BY:
Kimley-Horn and Associates, Inc.
12700 Park Central Drive
Dallas, Texas 75251
Tel. No. (972) 770-1300
Fax No. (972) 239-3820

STATE OF TEXAS
BRIAN K. SHEWSKI
68729
REGISTERED
PROFESSIONAL ENGINEER

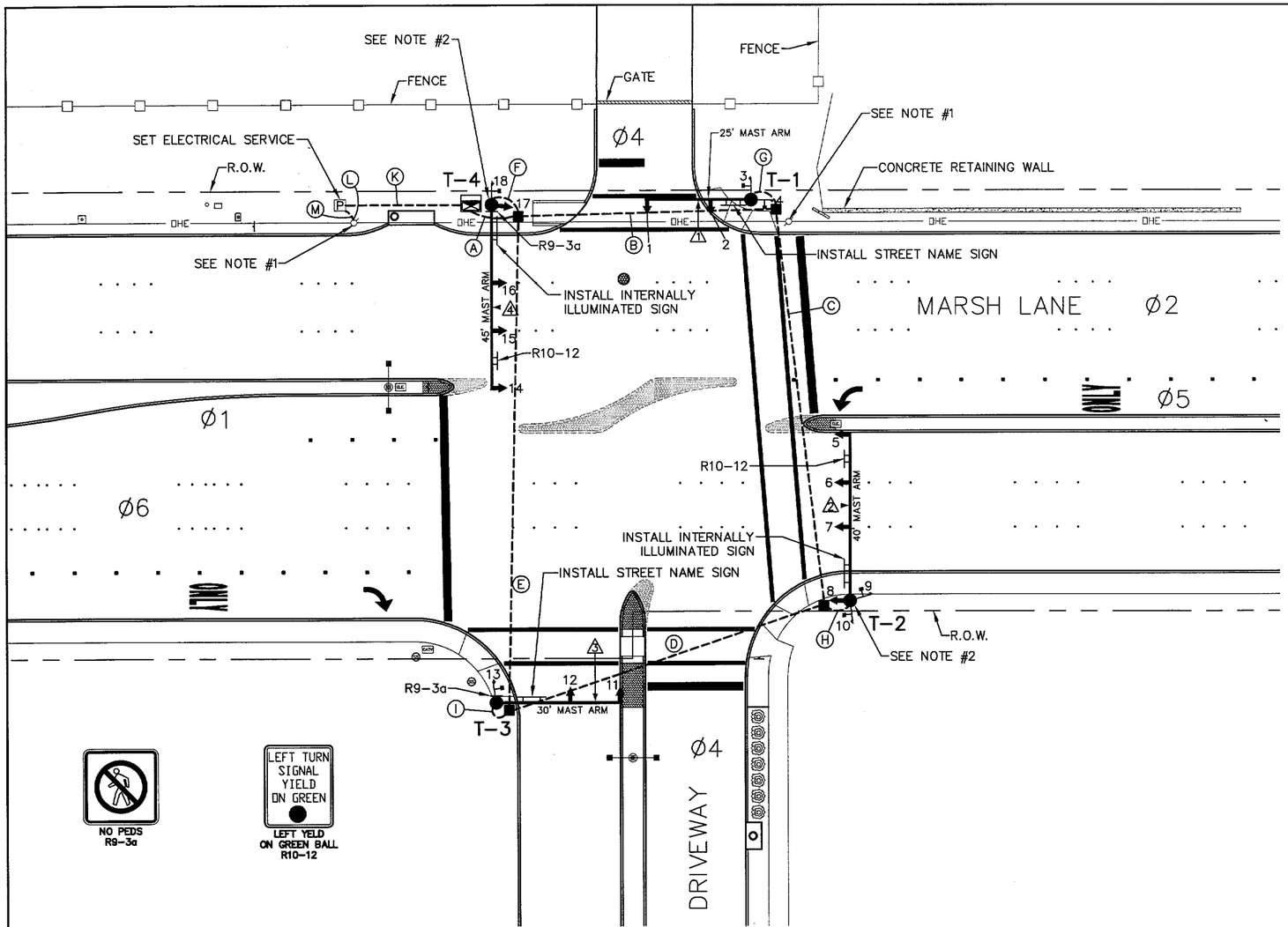
STANDARD SHEETS SPECIFICALLY IDENTIFIED AS SHEET NOS. __-__ HAVE BEEN SELECTED BY ME AND ARE APPLICABLE TO THIS PROJECT.

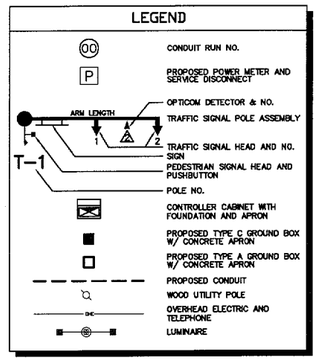
DATE

BRIAN K. SHEWSKI P.E.

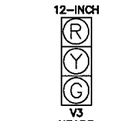
THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY BRIAN K. SHEWSKI, P.E. 68729 ON DECEMBER 20, 2002 ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

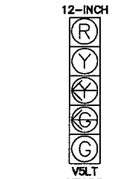
52-7



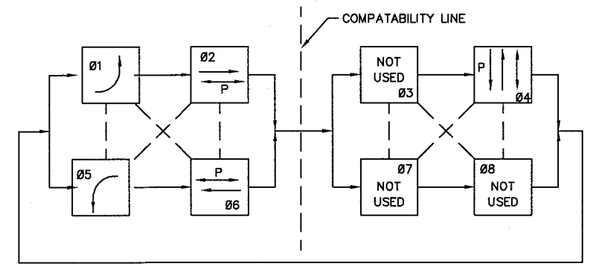


GRAPHIC SCALE
15' 0 10' 20' 30'
(IN FEET)
1 inch = 30 ft.






SH 143C (DUAL)
SH 152A (SINGLE)
HEADS



PHASE SEQUENCE
EIGHT PHASE NEMA CONTROLLER

NOTES

1. CONTRACTOR TO COORDINATE WITH ELECTRIC COMPANY ON INSTALLATION OF ELECTRICAL SERVICE AND ON RAISING THE POLE HEIGHT AT LEAST FIVE FEET. THE MAST ARM OF POLE T-4 MUST MAINTAIN A FOUR FOOT CLEARANCE TO THE BOTTOM OF THE LOWEST CABLE ON THE POLE.
2. CONTRACTOR TO INSTALL AND SET-UP VIDEO DETECTION UNITS ON POLE T-2 FOR THE NORTHBOUND AND WESTBOUND APPROACHES AS WELL AS ON POLE T-4 FOR THE SOUTHBOUND AND EASTBOUND APPROACHES.
3. LEFT TURNS Ø1 AND Ø5 ARE PROTECTED/PERMISSIVE PHASING.
4. THE CONTRACTOR SHALL PROVIDED AND INSTALL A "DISPLAY PANEL" AS DEFINED IN SPECIAL SPECIFICATION 6887, PART 5.

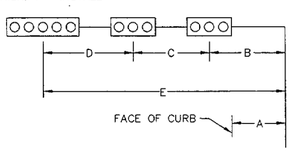
NO PEDS
R9-3a

LEFT YELD
ON GREEN BALL
R10-12

SIGNAL HEAD & POLE PLACEMENT

POLE * NUMBER	STATUS	A	B	C	D	E	POLE HEIGHT	FOUNDATION TYPE	LUMINARE
T-1	I	10	15	–	–	25	19'	30-A	N
T-2	F & I	17	11	12	–	40	19'	36-A	N
T-3	I	18	12	–	–	30	19'	36-A	N
T-4	F & I	19	12	14	–	45	19'	36-A	N

F - FURNISH; I - INSTALL



12-IN SIGNAL HEADS

SIGNAL HEADS NO.	TYPE	BACKPLATES 3 SECT.	BACKPLATES 5 SECT.	VEHICLE SIGNAL SECTIONS	PED. SIGNAL SECTIONS
1, 2, 6, 7, 11, 12, 15, 16, 17	V3	9	–	27	–
5, 14	V5	–	2	10	–
3, 4, 9, 10	143C	–	–	–	4
13, 18	152A	–	–	–	2
TOTAL	–	9	2	37	6

STATE OF TEXAS
BRIAN K. SHEWSKI
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PROFESSIONAL ENGINEER

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BRIAN K. SHEWSKI, P.E. 68729 ON JANUARY 14, 2003
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

TRAFFIC SIGNAL LAYOUT MARSH LANE AT TARGET DRIVEWAY

Kimley-Horn and Associates, Inc.
12700 Park Central Drive, Suite 1800
Dallas, Texas 75251
Tel. No. (972) 770-1300
Fax No. (972) 239-3820

REVISION	DATE

DESIGNED BY:	BKS
DRAWN BY:	DMR
CHECKED BY:	WK
APPROVED BY:	BKS

FED. ROAD DIV. No.	STATE AID PROJECT No.		SHEET No.
6	---		
STATE	STATE DIST. No.	COUNTY	
TEXAS	DALLAS	DALLAS	
CONT.	SECT.	JOB	HIGHWAY
----	--	---	MARSH LN.

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XREF = X1117-TPTO, XROAD, XROAD_MED, XUTIL, XPAVE, XTRAF

CONDUIT AND CABLE CHART

WIRE SIZE AND TYPE

RUN NO.	POLE NO.	CONDUIT STATUS	ITEM 618 CONDUIT SIZE AND TYPE				CABLE STATUS	ITEM 620 ELECTRICAL CONDUCTORS				ITEM 684 SIGNAL CABLE TYPE A							TOTAL LENGTH	RUN NO.
			2" PVC	3" PVC	3" PVC (BORED)	2" RM		NO. 6 XHHW	NO. 6 BARE	NO. 8 XHHW	2/c NO. 8 XHHW	5 CNDR NO. 12	7 CNDR NO. 12	16 CNDR NO. 12	20 CNDR NO. 12	INT. 24 TWP NO. 19	TYPE C DETECT 2/c NO. 18	COAX CABLE		
A		I		2 @ 10			I		20					20				40		
B		I			60		I		60					120				1220		
C		I			95		I		95					95				95		
D		I			80		I		80											
E		I			125		I		125					125				125		
F		I		10			I		10					10				10		
G		I		10			I		10					10				10		
H		I		10			I		10					10				10		
I		I		10			I		10					10				10		
K		I	30				I		30		30									
L	RISER	I				20	I				SERVICE									
M		I	20				I				SERVICE									
	T-1	I					I					100								
	T-2	I					I					115	60							
	T-3	I					I					120								
	T-4	I					I					140	65							
		I					I													
TOTALS			50	70	360	20			450		30	475	125	400				420		

RUN STATUS = E – EXISTING ; I – INSTALL ; A – ABANDON
* PROPOSED CONDUIT BORED BENEATH PAVEMENT SURFACE
* * LENGTH OF TRENCHED CONDUIT
SUBSIDIARY TO ITEM 628

CABLE TERMINATION CHART

CNDR. COLOR	CABLE 1 FROM T-1 TO CNTRL 16 CNDR.	CABLE 2 FROM T-2 TO CNTRL 16 CNDR.	CABLE 3 FROM T-3 TO CNTRL 16 CNDR.	CABLE 4 FROM T-4 TO CNTRL 16 CNDR.
BLACK	SH 1 G ARROW	SH 4 G ARROW	SH 7 G ARROW	SH 10 G ARROW
WHITE	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON	SIGNAL COMMON
RED	SH 1,2,3 R	SH 4,5,6 R	SH 7,8,9 R	SH 10,11,12 R
GREEN	SH 1,2,3 G	SH 4,5,6 G	SH 7,8,9 G	SH 10,11,12 G
ORANGE	SH 1,2,3 Y	SH 4,5,6 Y	SH 7,8,9 Y	SH 10,11,12 Y
BLUE	SH 1 Y ARROW	SH 4 Y ARROW	SH 7 Y ARROW	SH 10 Y ARROW
WHITE / BLACK	PED BTTN COMMON	PED BTTN COMMON	PED BTTN COMMON	PED BTTN COMMON
RED / BLACK	SH 13 W	SH 15 W	SH 17 W	SH 19 W
GREEN / BLACK	SH 13 DW	SH 15 DW	SH 17 DW	SH 19 DW
ORANGE / BLACK	PED CALL PHASE 2	PED CALL PHASE 4	PED CALL PHASE 6	PED CALL PHASE 8
BLUE / BLACK	SH 14 W	SH 16 W	SH 18 W	SH 20 W
BLACK / WHITE	SH 14 DW	SH 16 DW	SH 18 DW	SH 20 DW
RED / WHITE	PED CALL PHASE 4	PED CALL PHASE 6	PED CALL PHASE 8	PED CALL PHASE 2
GREEN / WHITE	SPARE	SPARE	SPARE	SPARE
BLUE / WHITE	SPARE	SPARE	SPARE	SPARE
BLACK / RED	SPARE	SPARE	SPARE	SPARE

DETECTOR DETAILS (ITEM 688)

DETECT LOOP PHASE	DIMENSION *	PED BUTTONS (EA)
Ø1-1	6'X40' QUAD	
Ø2-1	6'X40' QUAD	
Ø2-2	6'X40' QUAD	
Ø2-3	6'X40' QUAD	
Ø2-4	6'X6'	
Ø2-5	6'X6'	
Ø2-6	6'X6'	2
Ø4-1	6'X40' QUAD	
Ø4-2	6'X40' QUAD	
Ø4-3	6'X40' QUAD	2
Ø5-1	6'X40' QUAD	
Ø6-1	6'X40' QUAD	
Ø6-2	6'X40' QUAD	
Ø6-3	6'X40' QUAD	
Ø6-4	6'X6'	
Ø6-5	6'X6'	
Ø6-6	6'X6'	2
	TOTALS	6

* – LOOP LAYOUTS ARE GRAPHICALLY ONLY.

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ED(4))	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)GS(T)EX(D)	1 1/2"	3/#6	N/A	2P/70	30	70	T.S. Lighting	1P/50 2P/15	<7.1

GROUND BOX SUMMARY (ITEM 624)

ITEM CODE	TYPE	DESCRIPTION	UNIT	EST.
624	A	-	EA	1
624	C	-	EA	4
				TOTAL

CONDUIT SUMMARY (ITEM 618)

ITEM CODE	SIZE	DESCRIPTION	UNIT	EST.
618	2"	RM VERTICAL	LF	20'
618	2"	PVC	LF	50'
618	3"	PVC	LF	60'
618	3"	PVC BORED	LF	360'
				TOTAL

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REVISION	DATE

DESIGNED BY:	BKS
DRAWN BY:	DMR
CHECKED BY:	WK
APPROVED BY:	BKS

FED. ROAD DIV. No.	STATE AID PROJECT No.		SHEET No.
6	---		-
STATE	STATE DIST. No.	COUNTY	
TEXAS	DALLAS	DALLAS	
CONT.	SECT.	JOB	HIGHWAY
-----	--	---	MARSH LN.

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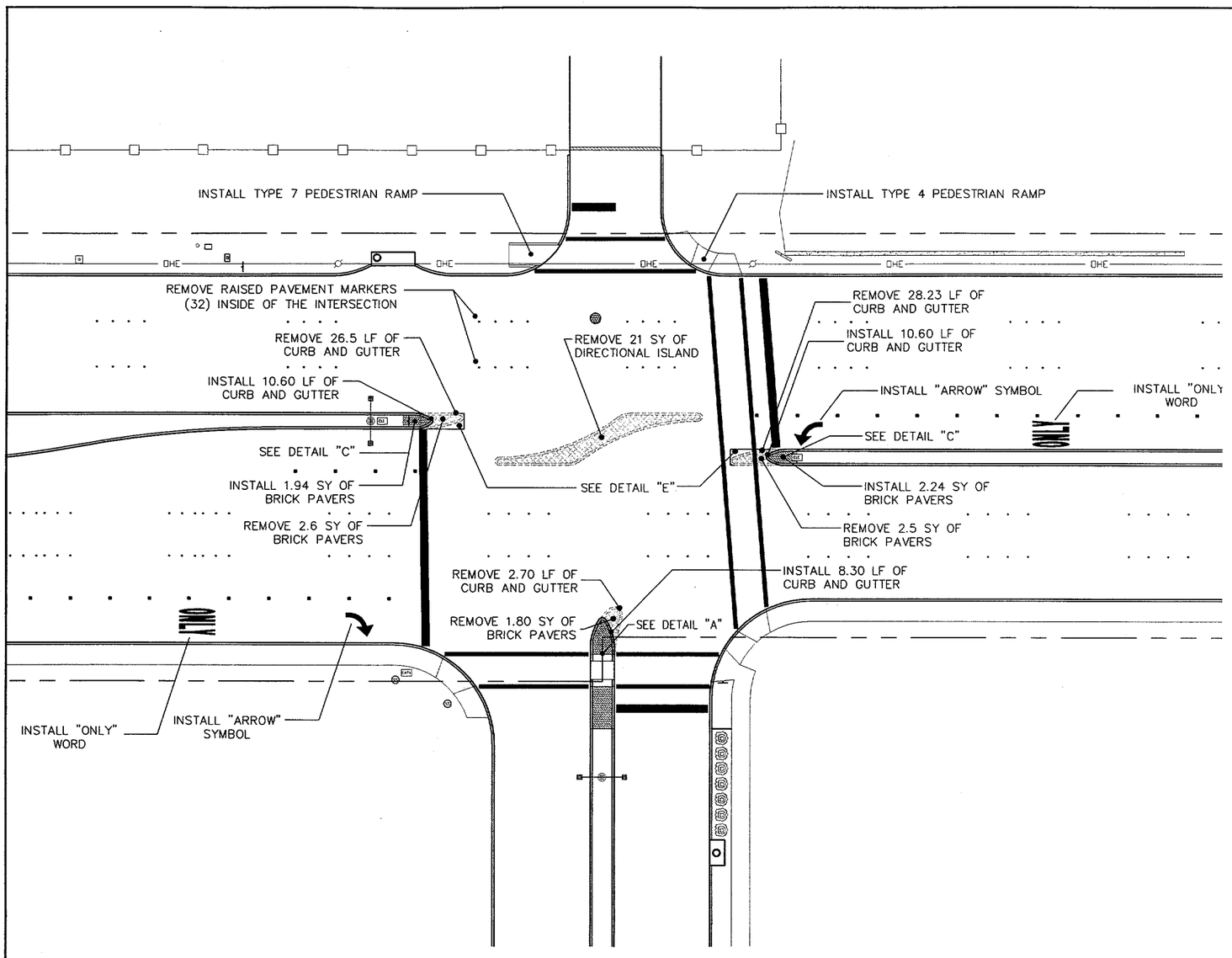
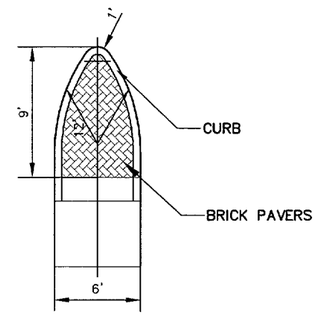
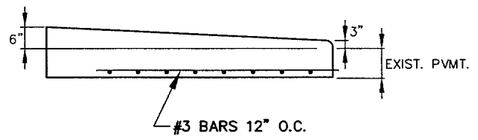


GRAPHIC SCALE
15' 0 10' 20' 30'
(IN FEET)
1 inch = 30 ft.

DETAIL "A" BULLET NOSE

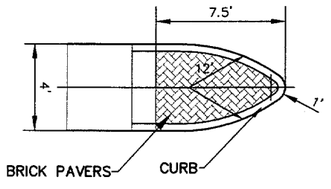


DETAIL "B" BULLET NOSE ELEVATION

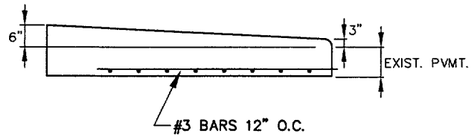


NOTE:
1. ALL UNUSED BRICK PAVERS TO BE SALVAGED AND BROUGHT TO TOWN SERVICE CENTER

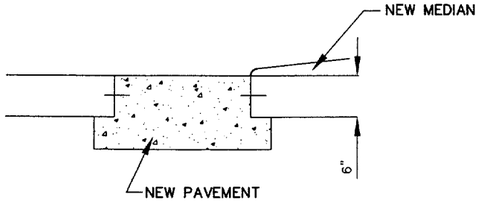
DETAIL "C" BULLET NOSE



DETAIL "D" BULLET NOSE ELEVATION



DETAIL "E" PAVEMENT INSTALLATION



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ROADWAY IMPROVEMENTS MARSH LANE AT TARGET DRIVEWAY

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Tel. No. (972) 770-1300
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REVISION	DATE

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DRAWN BY:	DMR
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APPROVED BY:	BKS

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6	---		
STATE	STATE DIST. No.	COUNTY	
TEXAS	DALLAS	DALLAS	
CONT.	SECT.	JOB	HIGHWAY
-----	--	---	MARSH LN.

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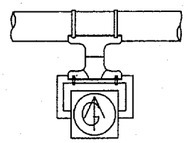

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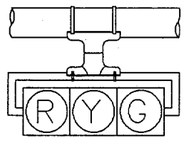

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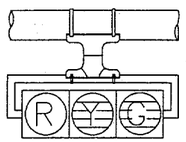

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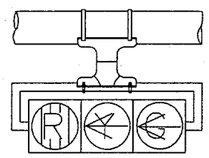

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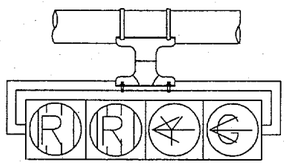

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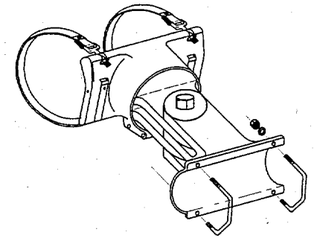
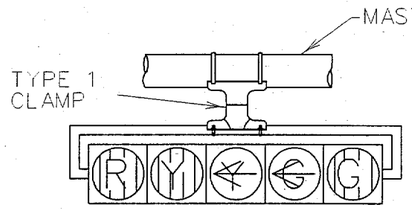


TYPE 2 CLAMP KIT

SHALL BE INSTALLED WHEN ROTATION ABOUT THE HORIZONTAL AND VERTICAL AXES ARE NEEDED.



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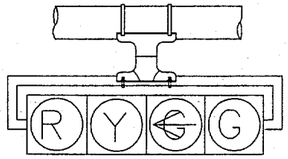

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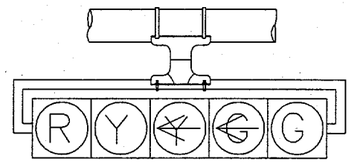

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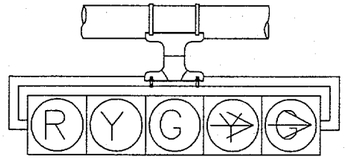

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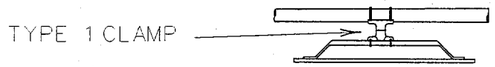
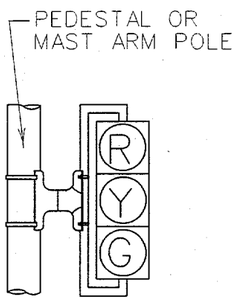


* ONE (1) CLAMP SHALL BE USED ON SIGNS LESS THAN OR EQUAL TO 10'-0" IN LENGTH.

* TWO (2) CLAMPS SHALL BE USED ON SIGNS GREATER THAN 10'-0" IN LENGTH.



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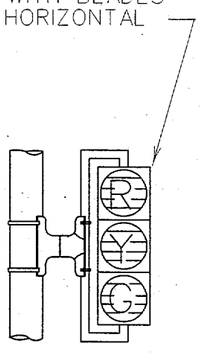
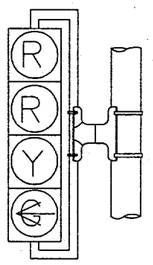
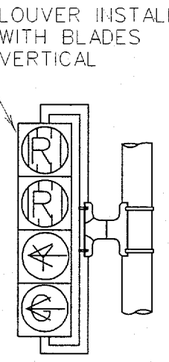


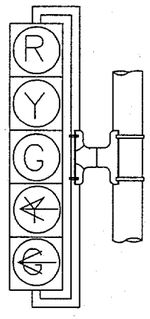
V3L



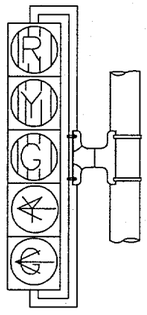
V4LT



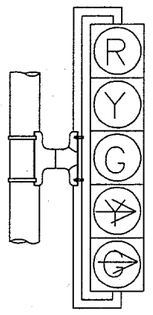
V4LLT



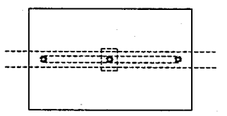
V5LT



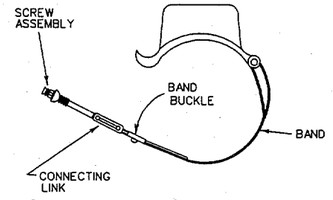
V5LLT



V5RT



SIGN OR DAMPENING DEVICE ATTACHMENT FOR MAST ARMS



NOTES:

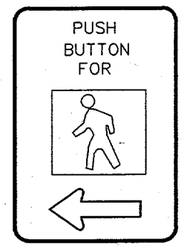
1. VEHICLE SIGNAL HEADS SHALL BE MOUNTED WITH TYPE 1 CLAMP AND APPROPRIATE TUBING.
2. ALL POLE MOUNTED VEHICLE HEADS SHALL BE INSTALLED ON THE AWAY-FROM-TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
3. ALL DAMPING DEVICES SHALL BE 18" TO 2' WIDE BY 4' IN LENGTH.

* REVISED 3-7-97

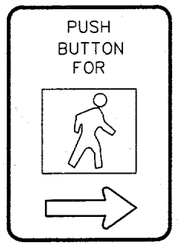
TRAFFIC SIGNAL HEAD IDENTIFICATION

DALLAS DISTRICT STANDARD

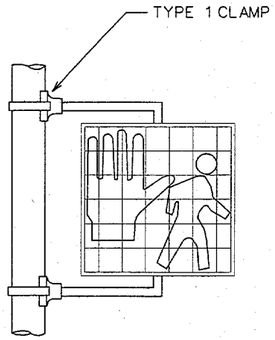
FED.RD. DIV.NO.	STATE PROJECT NO.		SHEET NO.
6			6
STATE	STATE DIST.	COUNTY	
TEXAS	18	COLLIN	
CONT.	SECT	JOBOB	HIGHWAY NO.



PEDESTRIAN PUSHBUTTON
SIGN DETAILS



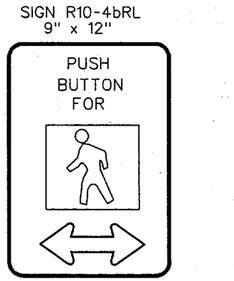
PEDESTRIAN PUSHBUTTON
SIGN DETAILS



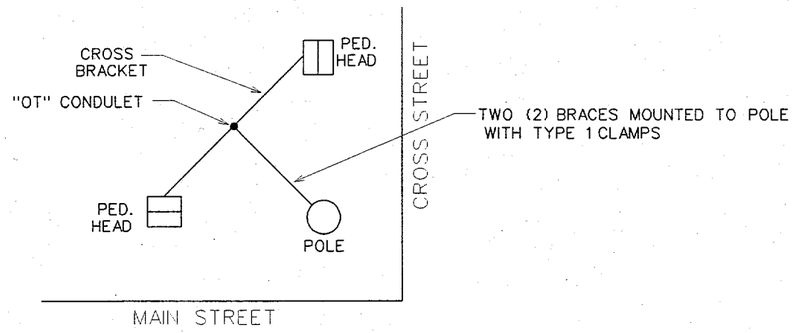
PEDESTRIAN SIGNAL HEAD MOUNTING
FOR ONE PEDESTRIAN SIGNAL HEAD
152A

NOTE:

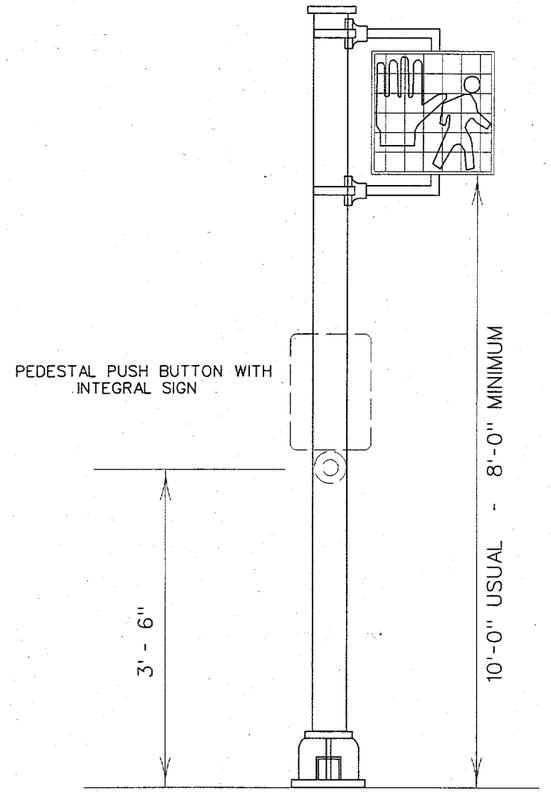
THE POLE ON THIS DRAWING IS SHOWN AS AN EXAMPLE ONLY. POLES OF SIMILAR DESIGN FOR ANY CROSS SECTION WHICH MEET THE SPECIFICATIONS AND REQUIREMENTS SHOWN ON THESE DRAWINGS AND ARE APPROVED BY THE ENGINEER WILL BE DEEMED ACCEPTABLE.



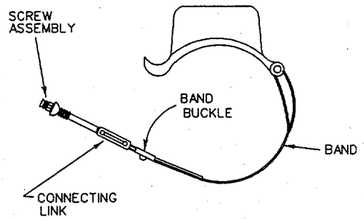
PEDESTRIAN PUSHBUTTON
SIGN DETAILS



PEDESTRIAN SIGNAL HEAD MOUNTING
FOR TWO PEDESTRIAN SIGNAL HEADS
143C



PEDESTAL POLE



TYPE 1 CLAMP

⚠1 NOTE: CLAM SHELL MOUNTING HARDWARE MAY BE USED INSTEAD OF MOUNTING HARDWARE SHOWN ABOVE, AS APPROVED BY THE ENGINEER.
ICC P/N 4805 OR McCAIN QUICKMOUNT OR APPROVED EQUAL.

NOTES:

1. PEDESTRIAN SIGNAL HEADS SHALL BE MOUNTED WITH TYPE 1 CLAMPS AND APPROPRIATE TUBING.
2. ALL PEDESTRIAN SIGNAL HEADS SHALL BE INSTALLED ON THE AWAY-FROM-TRAFFIC SIDE OF THE PEDESTAL OR MAST ARM POLE.
3. ALL WIRING FOR PEDESTRIAN SIGNALS SHALL BE TOTALLY ENCLOSED WITHIN THE SIGNAL MOUNTING HARDWARE.
4. ALL PEDESTRIAN SIGNAL HEADS AND PUSH BUTTON SIGNS SHALL DISPLAY THE SYMBOLIZED MESSAGES SHOWN ABOVE.

⚠1 ALTERNATIVE MOUNTING METHOD
revised 12-92

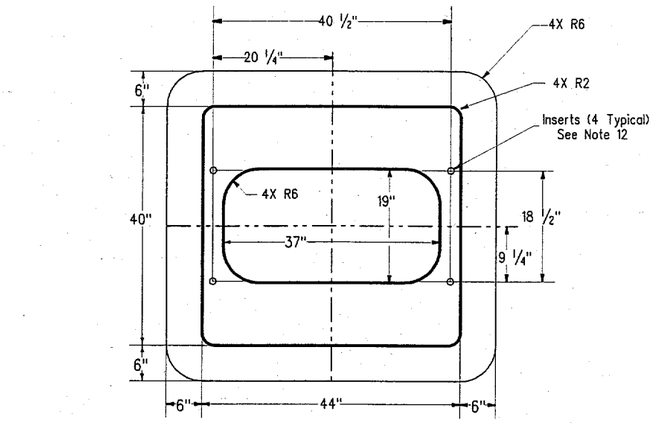
DALLAS DISTRICT STANDARD

FED.RD. DIV.NO.	STATE PROJECT NO.		SHEET NO.
6			7
STATE	STATE DIST.	COUNTY	
TEXAS	DALLAS	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.

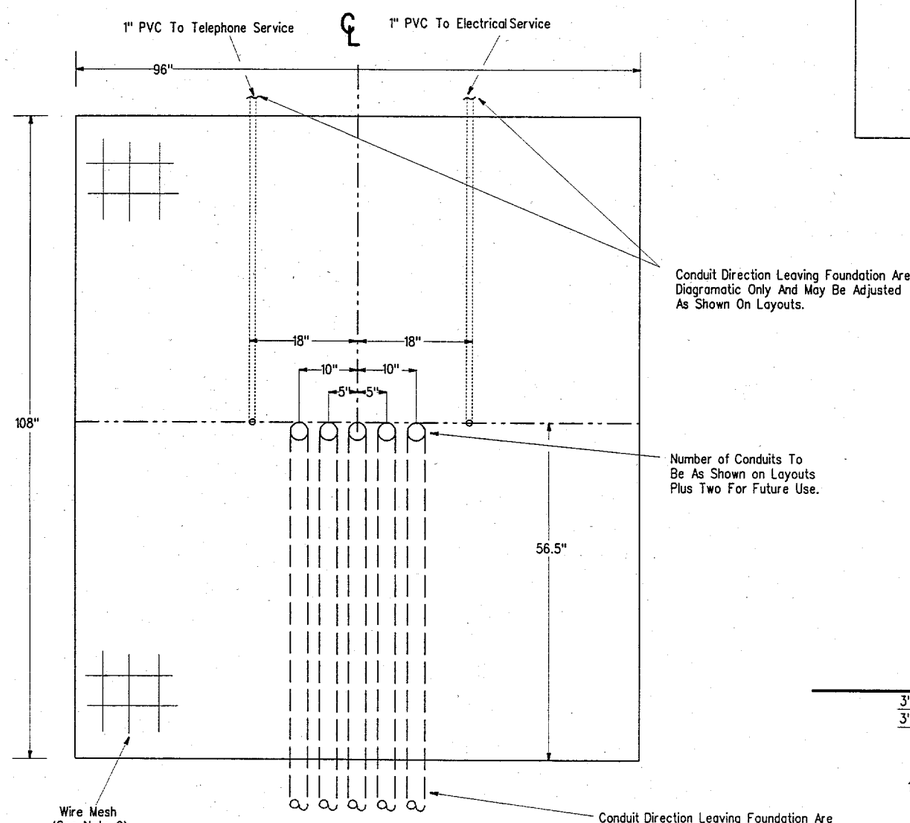
PEDESTRIAN SIGNAL HEAD IDENTIFICATION

LEVELS DISPLAYED

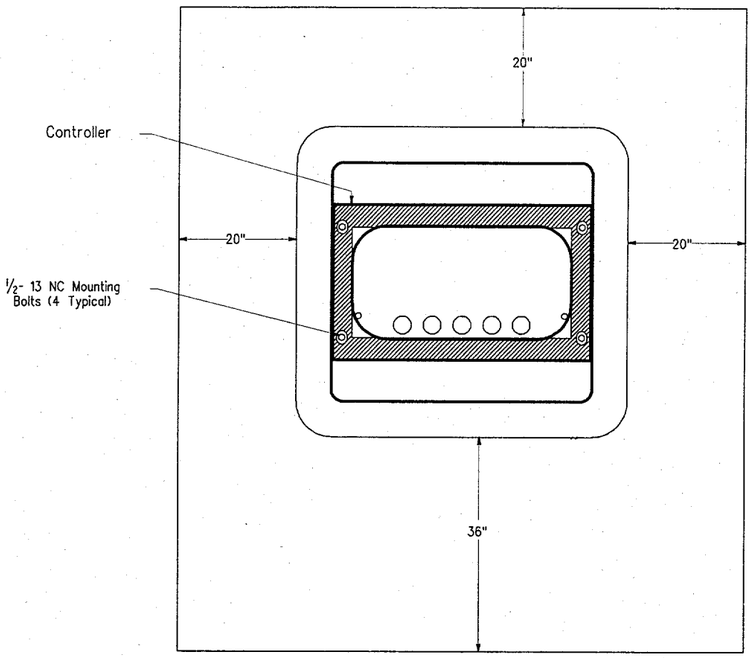
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	ACC
1																	
17																	
33																	
49																	



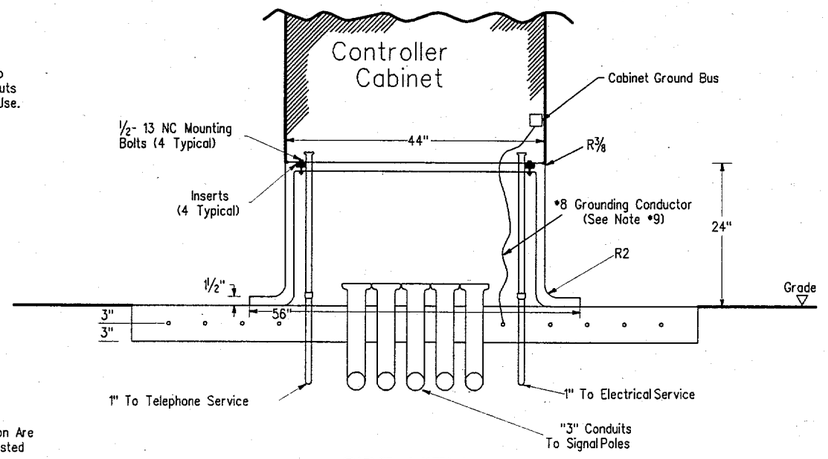
TOP VIEW
(Base Only)



TOP VIEW
(Slab Only)



TOP VIEW
(Slab & Base)



SIDE VIEW
(Slab & Base)

GENERAL NOTES

CONCRETE:
1. Concrete shall be class B minimum in accordance with Item 421. Slab shall be constructed in accordance with Item 531.

2. Reinforcement shall be welded wire mesh 6X6-W2.9 X W2.9. Joints and splices in the mesh shall have a minimum 6-inch overlap.

3. Mesh shall have a minimum 3 inch cover on the edges and shall be centered between top and bottom.

CONDUITS:
4. 3-inch conduits shall be stubbed up through the slab and run to the various traffic signal poles and ground boxes as shown on the layouts. Contractor shall install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Conduits shall be terminated with a bushing between 2 and 4-inches above the slab.

5. Future use conduits shall be extended at least 18-inches from the edge of the slab, shall be terminated underground with a coupling, and shall be capped and sealed so that the seal can be removed without damaging the coupling.

6. Two separate 1-inch conduits shall be stubbed up through the slab from the electrical and telephone services. The conduit for the electrical feed shall be run directly to the electrical service enclosure.

7. The conduit for the telephone line shall be run directly to the telephone service, usually located on the same pole as the electrical service. Telephone shall not under any circumstance share a conduit with any other function. Telephone conduit not used at this time shall be capped and sealed, the same as the 3" future use conduits.

8. Electric and telephone conduits shall terminate above the slab with a coupling. After the base is installed, the conduits shall be extended above the top of the base and shall be secured to the base using a steel one-hole strap or similar suitable substitute.

9. A #8 AWG copper ground wire shall be bonded to the reinforcing mesh by a suitable clamp UL Listed for encasement in concrete and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-4(4) is still required and shall be terminated to the cabinet ground bus.

BASE:
10. The base shall be constructed of reinforced polymer concrete reinforced with continuous strands of borosilicate fiberglass cloth. Concrete shall be made from catalyzed polyester resin and aggregate, and shall have a minimum comprehensive strength of 11,000 psi. Polymer concrete containing chopped fiber or fiber reinforced plastic shall not be acceptable.

11. The base shall be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.

12. The base shall conform to the dimensions shown. Four (4) 1/2-13 NC stainless steel self cleaning inserts shall be provided to secure the controller to the base. Inserts shall withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs. The base, secured to the concrete slab per the manufacturer's instructions and with a controller cabinet attached, shall withstand a minimum wind load of 125 mph. Manufacturer shall supply certification sealed by a Texas Licensed Professional Engineer.

13. The base shall be sealed to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

CONTROLLER CABINET:
14. The controller cabinet shall be anchored to the base using four 1/2-13 NC bolts.

15. The silicone caulk bead specified in Item 680.5 shall be RTV 133.

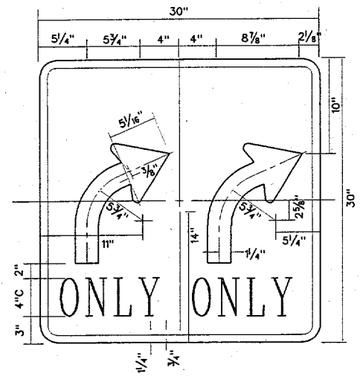
PAYMENT:
16. TS-CF shall be bid as Item 656.

STANDARD PLANS
Texas Department of Transportation
Traffic Operations Division

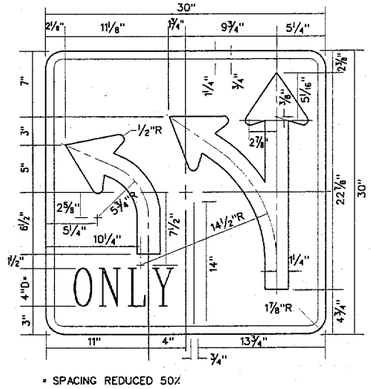
TRAFFIC SIGNAL CONTROLLER SLAB AND BASE

TS-CF

© TxDOT October 2000	DW- JM	CK- JM	DW- FC	CK- CAL
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
	15	6		8
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

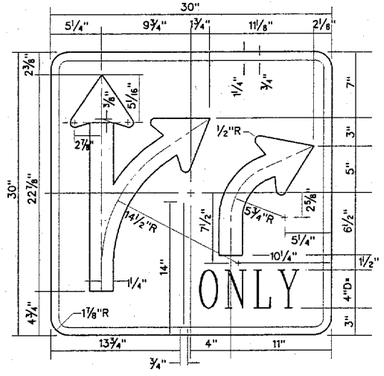


R3-8RR
30"x 30"

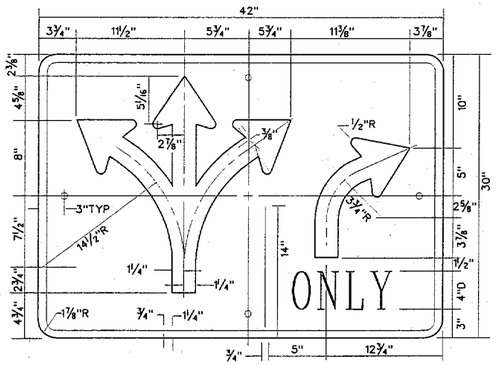


* SPACING REDUCED 50%

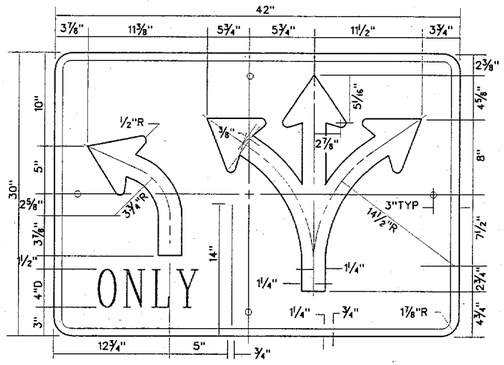
R3-8L
30"x 30"



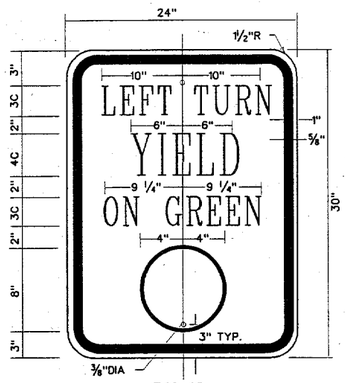
R3-8R
30"x 30"



R3-8R(SPL)
42"x 30"

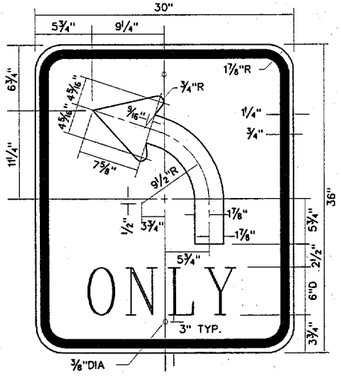


R3-8L(SPL)
42"x 30"

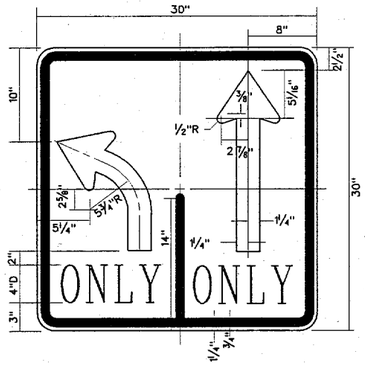


R10-12
24"x 30"

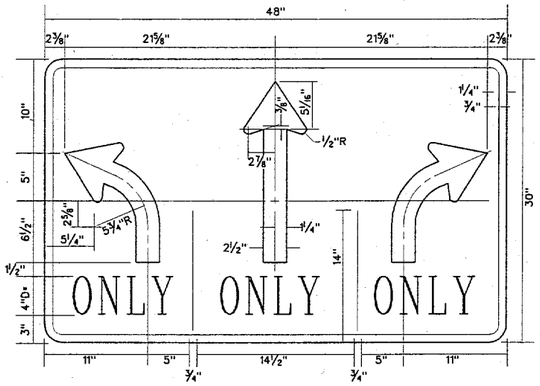
LEGEND BLACK(NON-REFLECTIVE)
BACKGROUND WHITE(REFLECTIVE)
CIRCULAR GREEN(REFLECTIVE)



R3-5L
R3-5R(RT. ARROW)
30"x 36"

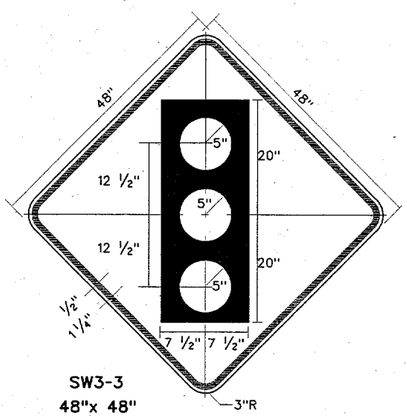


R3-8LS
30"x 30"



R3-8RSL
48"x 30"

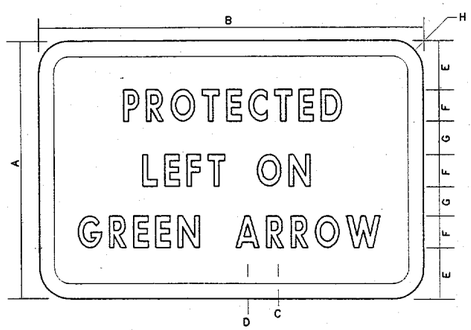
*SPACING REDUCED 50%



SW3-3
48"x 48"

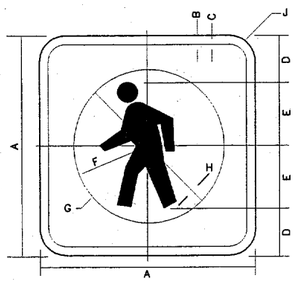
COLORS

SYMBOL & LEGEND- BLACK (NON-REFL.)
TOP CIRCLE - RED (REFL.)
BOTTOM CIRCLE - GREEN (REFL.)
BACKGROUND - YELLOW (REFL.)
TYPE C REFLECTIVE SHEETING

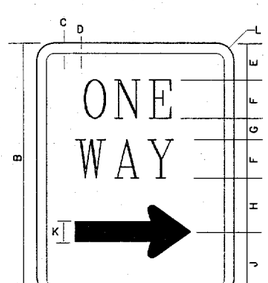


SIGN NO.	SIGN	DIMENSIONS (INCHES)							
		A	B	C	D	E	F	G	H
R10-9	STD.	12	18	3/8	3/4	2	2 C	1	1 1/2
SR10-9S	EXPWY.	18	30	3/8	3/4	3	3 C	1 1/2	1 1/2
SR10-9	FRWY.	24	36	5/8	1	4	4C*	2	1 1/2

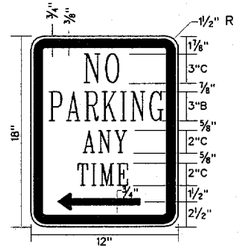
* - REDUCE SPACING 40%



SIGN NO.	SIGN	DIMENSIONS (INCHES)								
		A	B	C	D	E	F	G	H	J
R9-3a	STD.	18	1	5/8	3 1/2	5 1/2	6 3/8	7 7/8	1 1/2	1 1/2
ER9-3a	EXPWY.	24	1	5/8	4 1/2	7 1/2	8 1/2	10 1/2	2	1 1/2
FR9-3a	FRWY.	30	1 1/4	3/4	5 3/4	9 1/4	10 5/8	13 1/8	2 1/2	1 7/8



SIGN NO.	SIGN	DIMENSIONS (INCHES)										
		A	B	C	D	E	F	G	H	J	K	L
R6-2	STD.	18	24	1	5/8	2 1/2	5D	1 1/2	4 1/2	5 1/2	2 1/4	1 1/2
SR6-2	SPEC.	24	30	1	5/8	3	6D	1 7/8	6 1/16	7 1/16	3	1 1/2



R7-1L
R7-1R(RT ARROW)
R7-1LR(DBL ARROW)
12"x 18"

GENERAL NOTES:

ALPHABETS AND LATERAL SPACING BETWEEN LETTERS AND NUMERALS SHALL CONFORM WITH THE FEDERAL HIGHWAY ADMINISTRATION'S "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", LATEST EDITION AND ANY APPROVED CHANGES THERETO. LATERAL SPACING OF TEXT SHALL BE SUCH AS TO PROVIDE A BALANCED APPEARANCE.

SIGN BACKGROUNDS SHALL BE OF FLAT SURFACE REFLECTIVE SHEETING CONFORMING WITH THE SPECIFICATIONS (TYPE A) UNLESS OTHERWISE SPECIFIED IN THE PLANS.

SIGN LEGENDS SHALL BE APPLIED BY THE SCREENING PROCESS.

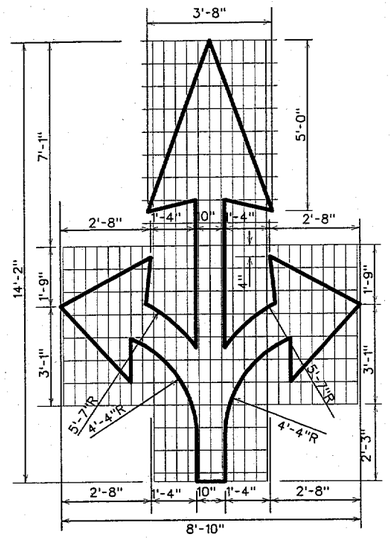
THE SIGN BLANKS SHALL BE ONE PIECE 5/8 INCH THICK PLYWOOD (TYPE A) CONFORMING TO THE SPECIFICATIONS UNLESS ATTACHED TO SIGNAL POLES.

THE SIGN BLANKS SHALL BE ONE PIECE SHEET ALUMINUM ALLOY 0.080 INCH THICK CONFORMING TO THE ITEM "ALUMINUM SIGNS (TYPE A)" WHEN ATTACHED TO SIGNAL POLES.

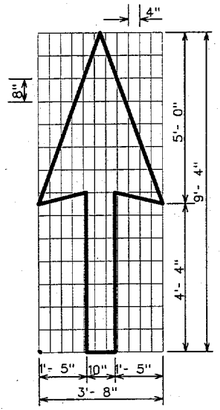
SIGNS

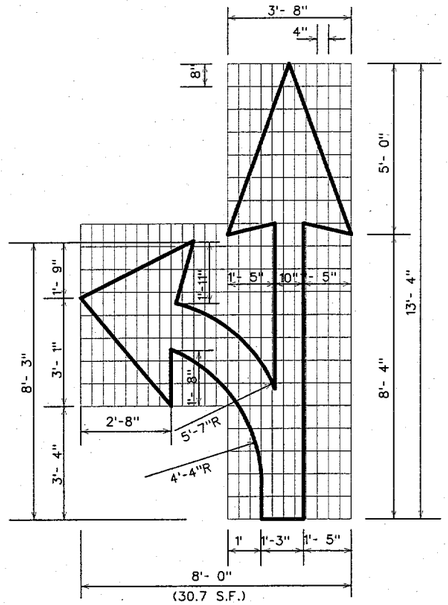
DALLAS DISTRICT STANDARD

FED.RD. DIV.NO.	STATE PROJECT NO.		SHEET NO.
6			10
STATE	STATE DIST.NO.	COUNTY	
TEXAS	18	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.

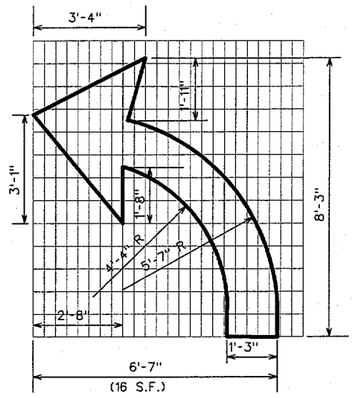


(38.5 S.F.)

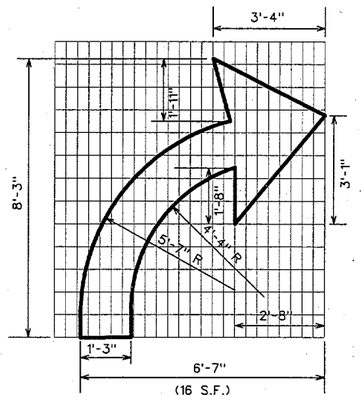




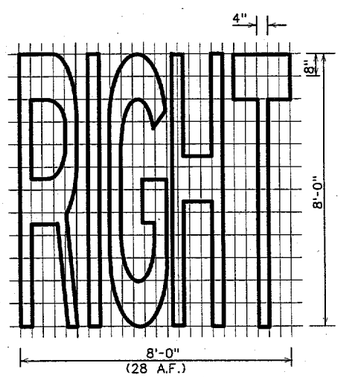
(30.7 S.F.)



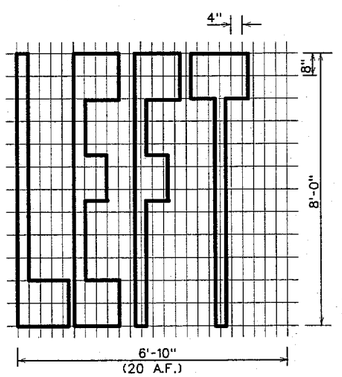
(16 S.F.)



(16 S.F.)



(28 A.F.)



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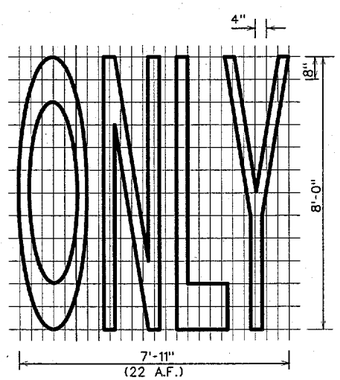

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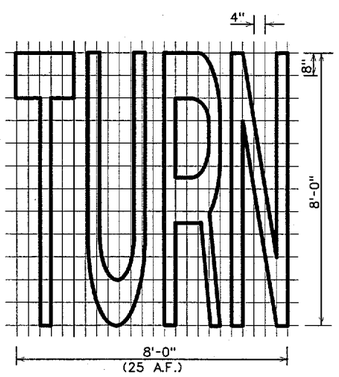


(25 A.F.)

PAVEMENT MARKING DETAILS

DALLAS DISTRICT STANDARD

FED.RD DIV.NO.	FEDERAL AID PROJECT NO.		SHEET NO.
6			11
STATE	STATE DIST.NO.	COUNTY	
TEXAS	DALLAS	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.

I. GENERAL REQUIREMENTS FOR ALL ELECTRICAL WORK

The location of all conductors, conduits, junction boxes, ground boxes, and electrical services is diagrammatic only and may be shifted by the Engineer to accommodate local conditions.

Materials shall be new and unused. Materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC), National Electrical Manufacturers Association (NEMA) standards, and shall be Underwriters Laboratories (UL) Listed unless otherwise shown on the plans or specifications or approved by the Engineer in writing. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection. When reference is made to UL, it can be considered to mean a Nationally Recognized Independent Testing Lab (NRTL). Comparable standards of Canadian Standard Association, Electrical Testing Laboratories or Factory Mutual can be equal to the referenced UL standard. Where reference is made to NEMA listed devices, IEC listed devices shall not be considered to be an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing.

Unless high strength bolts are are specified stainless steel hardware and miscellaneous nuts and bolts may be provided when galvanized is specified by the plans provided that bolts are 1/2 inch or less in diameter. The Contractor shall provide the following electrical test instruments as required by the Engineer to confirm compliance with the contract and the NEC. Those test instruments are voltmeter, amp probe, megger (1000 volt DC) and torque wrenches. All meters shall have been properly calibrated within one year. Calibration certification shall be provided to the Engineer upon request. Calibration certification tag shall also be applied to the meter. The Contractor shall operate meters during inspection as requested by the Engineer. Grounding shall be as shown on the plans and in accordance with the NEC. Metallic conduit, light poles, luminaires on bridge structures, and all metal enclosures shall be bonded to the system-grounding conductor. The ground rod in each ground box or junction box at the bridge ends, and in each ground box installed for underpass lighting will also be bonded to the system grounding conductor. The grounding conductor shall be bare or, if insulated, shall be green. Ground rods, connectors, and bonding jumpers will not be paid for separately, but will be subsidiary to the various bid items.

SUBMITTALS:

The contractor will submit for approval six (6) copies of catalog cut sheets for each of the following three (3) categories.
Category 1. Electrical services including photocell.
Catagory 2. Breakaway disconnects, heat shrink tubing, heat shrink filler tape and ground boxes which will include loading capacity certification.
Category 3. Highmast assembly kits, when applicable. See Item 614 "Texas Standard Specifications". Submittals shall be legible and shall be marked to indicate which product on a cut sheet is to be supplied. Where manufacturers provide warranties and guarantees as a customary trade practice, the Contractor shall furnish to the State such warranties and guarantees.
Any deviation from plans or specifications, including deviations due to plan error shauld be prominently displayed on the submittal.
Any changes not prominently noted in submittal and incorporated into the work without proper authorization will constitute grounds for rejection of that portion of the work.

II. CONDUIT

A. MATERIALS

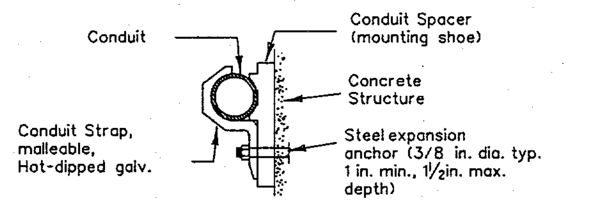
1. Conduit and fittings shall be UL Listed for the intended use shown on plan sheets.
2. Conduit shall be the type shown by descriptive code or shown elsewhere on the plans. Substitution of the various types of conduits will not be permitted. All flexible conduit in rigid metallic conduit systems shall be Liquidtight Flexible Metal (LFMC) conduit. All flexible conduit in PVC systems shall be Liquidtight Flexible Non-metallic conduit. Neither aluminum conduit, electrical metallic tubing (EMT), nor intermediate metal conduit (IMC) shall be permitted.
3. All exposed conduits shall be RMC, unless otherwise specifically shown on the plans. All metal conduit shall be properly grounded.
4. Couplings, connectors, conduit bodies, grounding bushings, and offset nipples for RMC shall be electro-zinc plated steel or hot dipped galvanized malleable iron, threaded or threadless compression type, rain-tight and shall be UL listed for the intended use.
5. Expansion joints for metal conduit shall be provided with an internal or external bonding jumper and shall be UL listed.
6. Unless otherwise shown on the plans, junction box minimum sizes shall be in accordance with the following table which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes are present, the conductors shall be counted as if all are of the larger size. Situations not applicable to the table shall be sized in accordance with NEC 370-28.

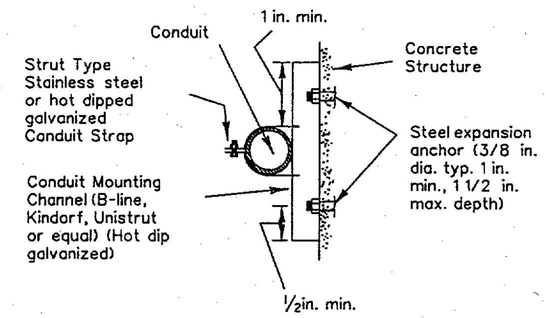
AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
•1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
•2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
•4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
•6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
•8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

7. RMC system junction boxes equal to or smaller, in any dimension, than 12 x 12 x 6 (HxWxD), surface mounted and containing conductors •8 or larger, shall be hot dipped galvanized cast iron with minimum wall thickness of 3/16 inch, shall have external mounting lugs, and shall be UL listed Crouse-Hinds Type WAB, OZ/Gedney Type YS or approved equal. Unless otherwise shown elsewhere on the plans, RMC system junction boxes larger than the aforementioned boxes but equal to or smaller, in any dimension, than 18 x 18 x 6 (HxWxD) shall be 14-ga. stainless steel; RMC system junction boxes larger than 18 x 18 x 6 (HxWxD) shall be 12-ga. stainless steel. All metal junction boxes shall be equipped with a threaded hole or lug for grounding. Stainless steel boxes 12 x 12 x 6 and larger need not be UL Listed but shall meet the other requirements of the NEC and shall have ribs, stiffeners, or thicker metal and shall have external mounting feet. Junction boxes with an internal volume of more than 100 cu. in. may be supported by connection of two or more rigid metal conduits, where specifically shown on the plans or where approved by the Engineer.
8. Junction boxes containing only •10 or •12 AWG conductors shall be Crouse Hinds Type GRFX, Appleton Type JBOX, two-gang FD, or similar approved cast iron box. Boxes shall be sized according to NEC Table 370-16(a).
9. IMC and EMT conduit shall not be used unless specifically required by the plan layout sheets. Junction boxes in EMT conduit systems shall be made from galvanized sheeting and shall be UL listed and approved for outdoor use, unless otherwise noted on the plans. Sheet metal junction boxes shall be sized in accordance with the NEC. Junction boxes for IMC conduit systems shall meet the requirements of boxes used with RMC systems.
10. Junction boxes in PVC conduit systems shall be PVC, intended for outdoor use, unless otherwise noted on plans.
11. Elbows in PVC conduit systems one inch and larger shall be rigid metal, with the exception of traffic signal systems which may have PVC elbows instead of rigid. If any part of the rigid metal elbow is buried less than 18 inches underground the elbow and rigid metal extension will be grounded. Grounding will be accomplished by means of a grounding bushing installed on the extension. Unless specifically shown on the plans, rigid metal elbows containing, or entering ground boxes containing only communications conductors, loop detectors, or other low voltage power limited circuits need not be grounded unless a ground wire is present in the conduit or ground box. The rigid metal elbows located in concrete foundations may be extended with PVC conduit and need not be grounded provided that the end of the elbow nearest the end of the conduit run exiting the foundation is at least 2 inches below the concrete. RMC elbows will not be eliminated.
12. HDPE conduit shall meet the requirements of Item 622, Duct Cable, except that the HDPE conduit, when bid under Item 618, Conduit, shall not contain factory installed conductors. Fittings for HDPE conduit shall be UL listed as an electrical conduit connector or shall be thermally fused using an electrically heated wound wire resistance welding method. HDPE conduit may be substituted for bored schedule 40 or schedule 80 PVC conduit. When such substitution is made, bored HDPE shall be schedule 40 of the size PVC being replaced. The HDPE conduit shall transition back to PVC (or RMC elbow when required) of the size and schedule shown on the plans at the bore pit. Substituted conduit may not be extended to ground boxes or foundations; RMC elbows shall be installed at ground boxes and foundations. RMC elbows will not be eliminated.
13. All conduit support hardware including straps, nuts, bolts, screws, retaining anchors and washers shall be hot dipped galvanized or stainless steel. Strut type conduit straps shall be stainless steel or hot dipped galvanized. Strut type straps need not be made of malleable type material. Stamped-cadmium plated straps will not be allowed. Straps having only one mounting hole shall not be allowed for use on conduits 2 inches and larger. Two piece conduit straps designed to be used with a mounting shoe shall be installed only with the correctly sized shoe.

B. CONSTRUCTION METHODS

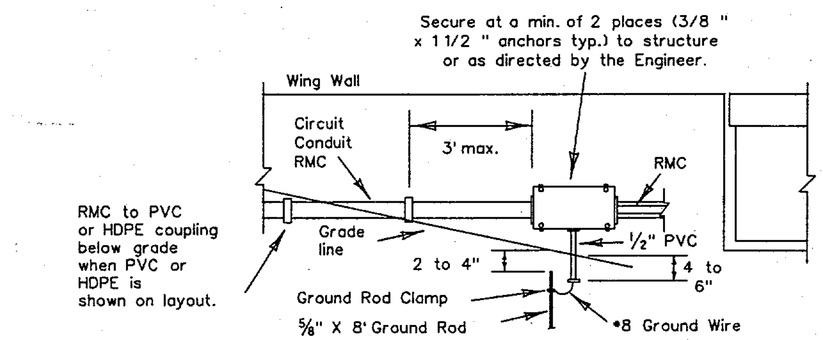
1. Conduit in structures shall have expansion fittings at structure expansion joints. All straight runs of RMC conduit exposed on structures such as bridges shall have expansion joints installed at maximum intervals of 150 feet. Expansion joints shall be installed so they allow for movement of the conduit. Installation of the joint in such a manner that will not allow for movement shall be repaired at no expense to the state. The method of determining the final setting length of the expansion joint shall be provided to the Engineer upon request.
2. Conduit supports shall be spaced at maximum intervals of 5 feet. Conduit spacers shall be used with metal conduit placed on surfaces of concrete structures (See conduit mounting options).
3. Conduit supports shall not be attached directly to prestressed concrete beams except as shown specifically in the plans and approved by the Engineer.
4. Unless otherwise shown on the plans, conduit placed beneath existing roadways, driveways, or sidewalks, or after the base or surfacing operation has begun, shall be accomplished by jacking or boring. The Contractor shall back fill and compact the bore pits to the bottom of the conduit prior to installing connecting conduit or duct cable to prevent bending of the connection.
5. Conduit trenched in the subgrade of new roadways shall be back filled with excavated material, unless otherwise noted on the plans. Conduit trenched in the sub-base of new roadways shall be back filled with cement-stabilized base.
6. Open ends of all conduit and raceways shall be fitted with temporary caps or plugs to prevent entry of dirt, debris and rodents during construction. The temporary cap may be constructed of duct tape, but in all cases shall be tightly fixed to the conduit and shall be durable. The contractor shall clean out the conduit and prove it clear in accordance with Standard Specifications Item 618.3 prior to installing any conductors.
7. Conduit entry into the top of enclosures such as safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes shall be made weatherproof using conduit sealing hubs, or threaded bosses.
8. A bonding jumper shall be installed from each grounding bushing to the nearest grounding rod, grounding lug, and/or equipment grounding conductor. All jumpers shall be the same size as equipment grounding conductor. Conduit used as casing under roadways for duct cable need not be grounded if duct extends full length through the casing. At electrical services, grounding electrode conductor shall be a solid Copper •6 AWG.
9. Metal junction boxes shall be bonded to the grounding conductor in accordance with the NEC.
10. Conduits entering ground boxes shall be placed so that the conduit ends shall be not less than 5 inches nor more than 9 inches from the box cover (See ground box detail on sheet ED (3).
11. Conduit ends shall be sealed with heat shrink boots with waterproof sealant, urethane foam, or by other methods approved by the Engineer. Sealing shall be done after completion of any required pull tests. Duct tape shall not be used as a permanent conduit sealant. Silicone caulking shall not be used as a sealant.
12. All strut mounting material and hardware shall be hot-dip galvanized or shall be stainless steel. The cut ends of strut and non-galvanized rigid metal conduit threads shall be coated with a zinc rich paint (90% or more zinc content). Zinc rich paint may only be used to touch up galvanized material as allowed under item 445.6 galvanizing. The painting of non-galvanized material with a zinc rich paint shall not be considered as an approved alternative for galvanized materials.
13.





CONDUIT MOUNTING OPTIONS

(Attachment to concrete surfaces)
(See para. II.B.2)

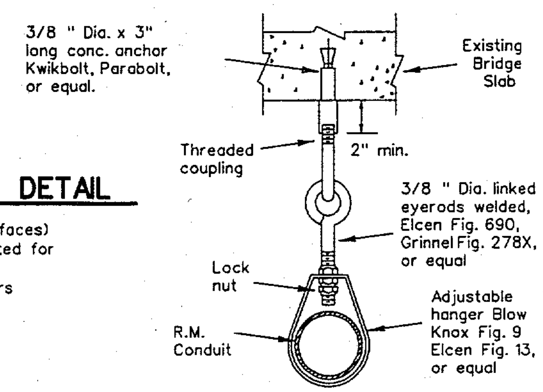


TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

NOTES
1. Ground rod clamp to be Blackburn GG 5/8H, Weaver W5/8 or equal.
2. Surface mounting shown, for conduit to be placed in structure, use flush-mounted box.
3. Bond junction box and metal conduits to equipment grounding conductor and grounding electrode conductor using listed connector.
4. Seal all conduits entering the junction box from underground.
5. Install bell end or bushing on 1/2 " PVC conduit both ends.
6. Ground rod to be driven within 8 inches of 1/2 inch PVC conduit end.

CONDUIT HANGER DETAIL

(Attachment to horizontal surfaces)
Hangers need not be UL listed for electrical use
ie: plumber pipe hangers are acceptable



STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

ELECTRICAL DETAILS-CONDUIT

ED(1)-00

DN: KB	CK: JW	DW: DN	CK: GC	NEG NO.:

REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
5-93 10-93 4-98 12-00		6		12

COUNTY	CONTROL	SECTION	JOB	HIGHWAY

LEVELS DISPLAYED																DATE:
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	ACC:
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	FILE:
49	50	51	52	53	54	55	56	57	58	59	60	P	263			

DN:
CK:
DW:
CK:

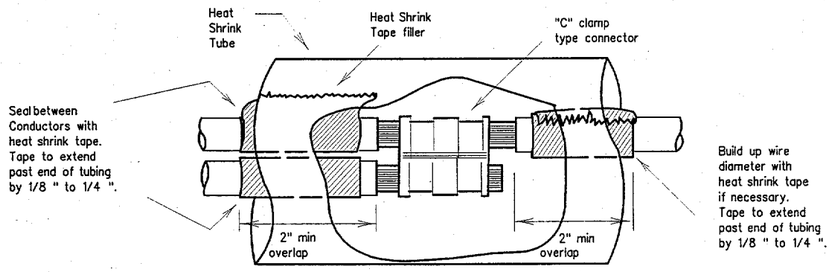
I. ELECTRICAL CONDUCTORS

A. MATERIALS

1. Insulated conductors shall be NEC Type XHHW. Conductors shall be color coded in accordance with the NEC, articles 200, 250, and 310: i.e. Grounded conductors (neutrals) shall be white, Grounding conductors (ground wires) shall be bare or green, Ungrounded conductors (hots) shall be any color except green, white, or gray. Identification of conductors #10 AWG and smaller shall be by continuous jacket color. Color coding of electrical conductors #8 AWG and larger shall be either by continuous color jacket or by colored tape. Colored tape marker shall consist of a half-lap of tape covering a 6-inch length of conductor.
2. Where two or more circuits are present in one conduit or enclosure, the conductors of each circuit shall be identified by a permanent non-metallic tag at each accessible location. The tag shall be fastened to the conductors by two plastic straps. Each tag shall indicate circuit number, letter, or other identification shown in the plans.
3. Grounding electrode conductor #6 AWG for bonding to ground rod at electrical service, shall be solid. Connection of conductor to ground rod shall be made using UL Listed connectors designed for such purposes.
4. Heat Shrink Tape filler shall be used to seal the ends of heat shrink tubing around two or more conductors that are insulated with heat shrink tubing. Tape material shall have a minimum dielectric strength of 225 volts per mil and may be either cross-linked butyl rubber. Tape shall be supplied in rolls and shall have a backing (release paper) to prevent the tape from sticking to itself.
5. Heat shrink tubing shall be heavy wall, UL listed for 600 volts or greater and shall have factory applied internal sealant.
6. Splicing materials, insulating materials, breakaway disconnects and fuse holders will not be paid for directly but shall be subsidiary to various bid items.

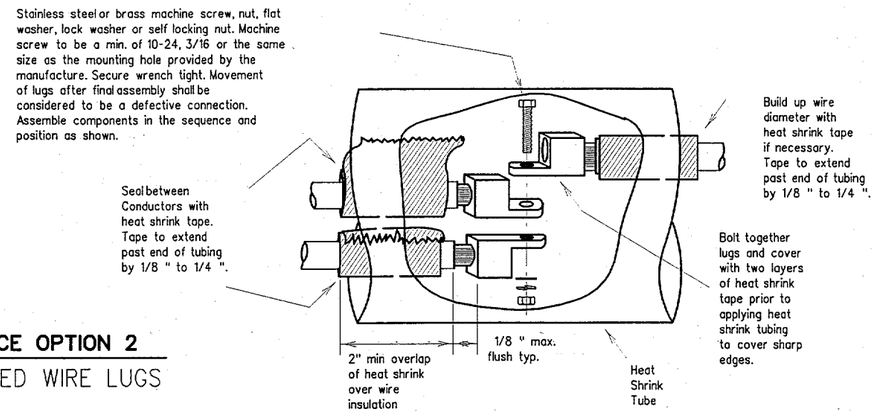
B. CONSTRUCTION METHODS

1. After conductors have been installed in conduit, a pull test will be made on conductors. When any length of conductor cannot be freely pulled, the Contractor shall make any needed alterations or repairs at no expense to the State.
2. The Contractor shall make insulation resistance tests in accordance with Item 620, Conductors. The contractor shall coordinate with the Engineer to witness the tests.
3. A sufficient length of conductor for making up connections shall be left in ground boxes (2 feet minimum, 3 feet maximum, to point of splice, 3 feet minimum, 4 feet maximum, when conductor is pulled through with no splice), enclosures, weatherheads and pole bases (1 foot minimum and typical, 1.5 feet maximum).
4. Splices shall be made only in junction boxes, ground boxes, pole bases, or electrical enclosures and shall be made with listed compression or screw type pressure connectors, terminal blocks, bolted lugs, or split bolt connectors. Splices shall be insulated with heavy wall heat shrink tubing and shall be made so as to provide a watertight splice. Heat shrink sleeve shall overlap conductor insulation a minimum of 2 inches on both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, the contractor shall build up the conductors insulation using heat shrink filler tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Tape shall be visible after completion of all splices. Where filler tape is used but not visible, the Engineer shall approve each individual splice by conducting a physical inspection of each splice. Heat shrink tape shall be either butyl rubber. When it appears the tubing has been burned, or overheated the tubing shall be considered to be defective.
5. Wire nuts may be used for #8 AWG or smaller conductors in above-ground junction boxes, but not in pole bases or ground boxes. Wire nuts shall be positioned upright to prevent the accumulation of water. Wire nuts used at these locations shall have factory applied waterproof sealant (silicone).
6. Conductors in illumination poles shall be supported by a J-hook in the top of the pole.
7. All conductors bid under Item 620 shall have breakaway electrical disconnects installed anytime conductors pass through a break-away support.
8. For terminating the conductors, insulation-jacketing material shall be removed in such a manner as to not nick any of the individual strands of the conductor. When individual conductor strands are removed, the conductor shall be considered to be damaged.
9. When a conductor or cable has been damaged, or fails to pass an insulation resistance test, the conductor will be replaced.
10. Duct tape, black electrical tape, or wire nuts shall not be allowed to repair a damaged conductor.
11. For terminations, no more than one wire may be installed under a single pressure connector unless the device is listed for more than one wire.
12. Conductors connected to break-away in line fuse holders must be installed in accordance with the specific manufactures installation instructions. Where threaded connections are made, they shall be properly torqued. Where crimp type connections are made, crimps shall be made using properly sized crimping pliers. Proper conductor terminations are critical to the safe operation of break-away devices.
13. Waterproofing boots shall be properly trimmed to fit snugly around the conductor so as to provide a water proof connection. No more than one wire may enter a single opening in any one boot. Water proofing boots must provide the correct number of openings. Where only one wire is to be connected to a boot, the boot may not be a two wire type.



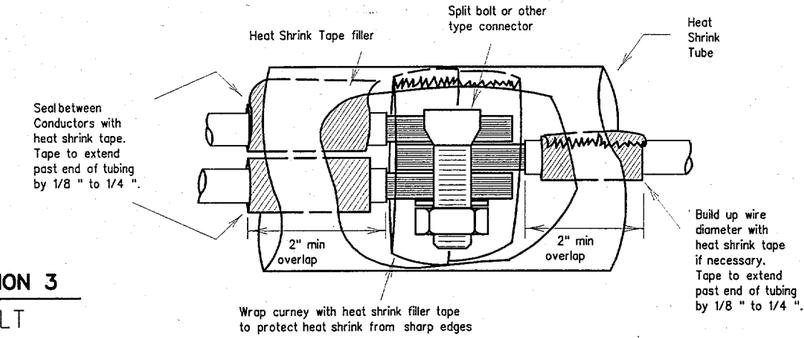
SPLICE OPTION 1

C-CLAMP



SPLICE OPTION 2

BOLTED WIRE LUGS



SPLICE OPTION 3

SPLIT BOLT

C. TEMPORARY WIRING

1. Temporary conductors and electrical equipment to provide power for utilization equipment, shall be installed in accordance with the NEC article 305. All temporary wiring materials and methods shall comply with the standard sheets. All power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located out doors at grade, supplied from a utility power source, shall be provided with a ground fault circuit interrupter.
2. Residual current protective devices (GFCI) may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Where wire nuts are approved for temporary wiring, they shall be of the self-sealing type.
4. All conductor splices must be contained within a listed enclosure, ground box or be more than ten feet above grade vertically and more than five feet horizontally from any metal structure. Where temporary conductors are installed in any area that is likely to be subjected to vehicle traffic, or mobile construction equipment, the vertical clearance to ground shall be a least 18 feet when measured at the lowest point. Where power conductors are to be supported by a span wire, the span wire shall be properly grounded.

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

ELECTRICAL DETAILS-CONDUCTORS

ED(2)-00

 | DN: KB | CK: JW | DW: DN | CK: GC | REG NO.

REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
5-93		6		13
10-93				
4-98	COUNTY		CONTROL SECTION JOB	HIGHWAY
12-00				

II. GROUND RODS

A. MATERIALS

1. All ground rods installed at electrical services, including supplemental lightning protection ground rods specified by the plans in other locations such as pole bases, shall be copper coated steel and listed by a NRTL. Rods shall be a minimum diameter of 5/8 inch. The length shall be a minimum of 8 feet. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets.
2. Ground rod clamps shall be listed to be in direct contact with the soil. Where concrete encasement is required, the clamp shall be listed for concrete encasement.

B. CONSTRUCTION METHODS

1. Ground rods installed in locations such as pole bases, to provide supplemental lightning protection need not be totally in contact with the soil. Where called for by the plans, rods may be encased in soil or concrete or any combination of soil and concrete. When concrete encased, the connection of the conductor to the rod shall be readily accessible for inspection or repairs. When driven into the soil the upper end shall be between 2 to 4 inches below finished grade. Ground rods shall not be placed in the same drilled hole as a timber pole.
2. Ground rods shall be installed such that the end imprinted with the rod's part number is installed as being the upper end.
3. Non-conductive coatings such as concrete splatter shall be removed from the rod at the clamp location.
4. Routing of lightning protection ground rod wires shall be run as short and straight as possible. Where bends are required they shall have a minimum radius of four inches.
5. Unless specifically called for by the plans, conduits used for ground rod wires shall be non-metallic. Where metal conduits are specified, a grounding bushing and properly sized bonding jumper shall be provided and properly installed on each end.
6. Where rocky soil or a solid rock bottom is encountered when driving a ground rod and the horizontal trench placement method is the only viable solution, written authorization from the Engineer must be aquired.

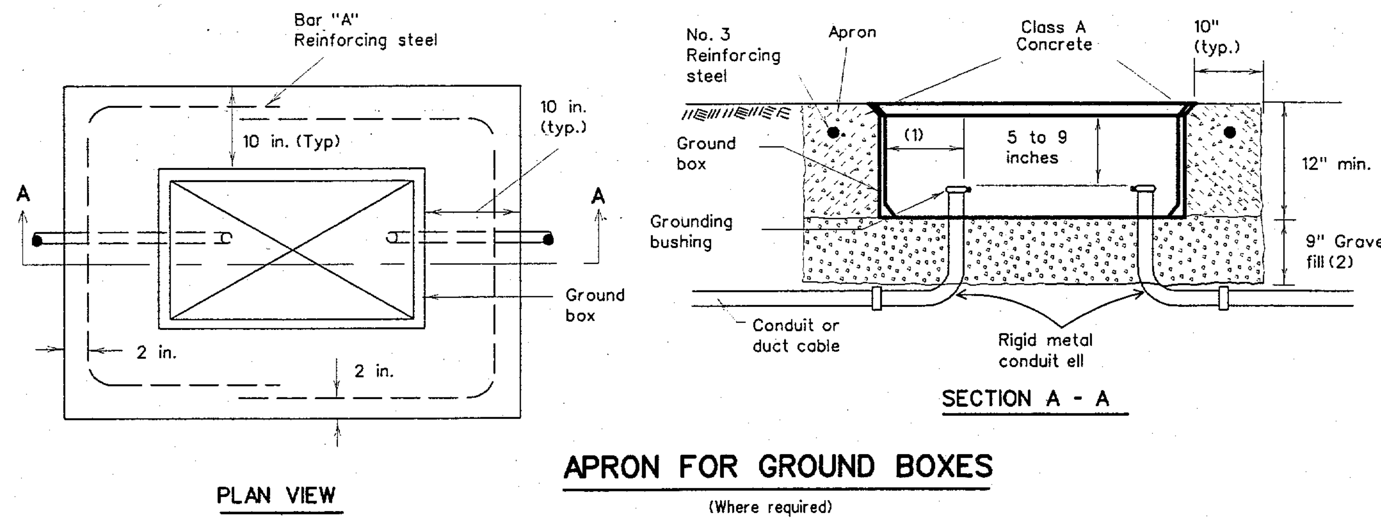
III. GROUND BOX

A. MATERIALS

1. Ground boxes 16x30x24 inches (WxLxD) or smaller shall be polymer concrete of the type required by the descriptive code shown elsewhere. Larger ground boxes shall be as shown elsewhere in the plans.
2. All ground boxes and covers shall be permanently marked either by impress or by permanent ink, with manufacturer's model number and manufacturer's name or logo.
3. Covers shall be bolted down, and bolt holes in the box shall be arranged to drain dirt.
4. Ground box Types A, B, C, D & E shall meet the following requirements:
   a. Ground boxes and covers will be manufactured from polymer concrete reinforced with continuous strands of woven or stitched borosilicate fiberglass cloth. The polymer concrete shall be made from catalyzed polyester resin, sand and aggregate, and shall have a minimum compressive strength of 11,000 psi. Polymer concrete containing chopped fiberglass or fiberglass reinforced plastic is not acceptable.
   b. Minimum inside dimensions shall be as follows (width x length x depth):
      Type A shall be 11.5 inches x 21 inches x 10 inches, (122311)
      Type B shall be 11.5 inches x 21 inches x 20 inches, (122322)
      Type C shall be 15.25 inches x 28.25 inches x 10 inches, (162911)
      Type D shall be 15.25 inches x 28.25 inches x 20 inches, (162922)
      Type E shall be 11.5 inches x 21 inches x 16 inches, (122317)
   c. Bottom edge of box or extension shall be footed with a minimum 1 1/4 inch flange.
   d. Ground boxes shall withstand 600 lbs. per sq. ft. applied over the entire sidewall with less than 1/4 inch deflection per foot length of box. Ground boxes and covers shall withstand a test loading of 20,000 lbs. over a 10 inch by 10 inch area centered on the cover with less than 1/2 inch deflection. Ground boxes and covers shall meet Western Underground Standards 3.6. Manufacturer shall supply certification by an independent laboratory or sealed by a Texas-Licensed Professional Engineer.
   e. Covers shall be 2 inch (nominal) thick polymer concrete. All hardware shall be stainless steel. Cover shall be secured with two 1/2 inch stainless steel bolts. Bolts shall be self-retaining and shall withstand a minimum of 70 ft-lbs. torque and shall have a minimum 750 lbs. straight pull out strength. Nuts shall be floating and shall provide a minimum of 1/2 inch movement from the center of the nut. Covers shall be skid resistant, minimum 0.5 coefficient of friction. Covers shall be interchangeable between manufacturers and shall conform to the dimensions shown herein. Unless otherwise approved by the Engineer, cover shall be legibly imprinted with the following words in minimum 1 inch letters:
      Ground Boxes containing wiring for traffic signals shall be labeled, Danger High Voltage Traffic Signals.
      Ground boxes containing wiring for illumination systems shall be labeled, Danger High Voltage Illumination.
      Ground boxes containing wiring for traffic management systems shall be labeled, Danger High Voltage Traffic Management.
      Ground boxes containing wiring for sign illumination systems shall be labeled, Danger High Voltage Sign Illumination.
      Ground boxes containing wiring for traffic signals that also contain illumination, powered by the signal electrical service, shall be labeled, Danger High Voltage Traffic Signal.

B. CONSTRUCTION METHODS

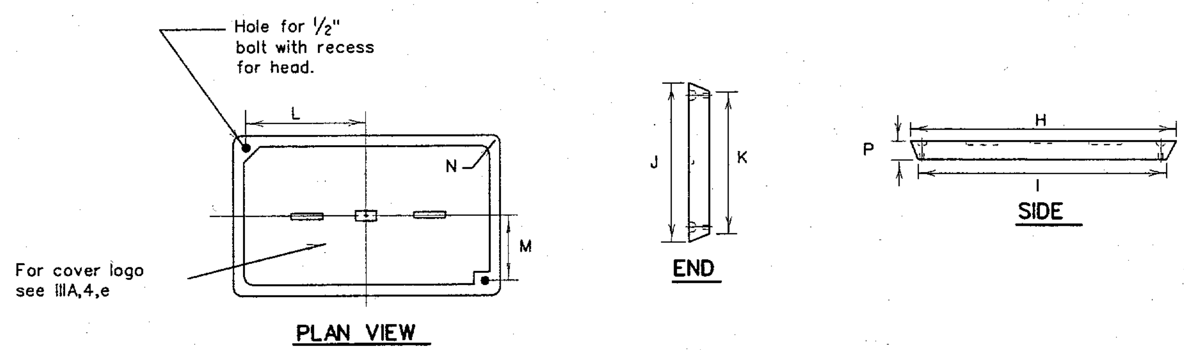
1. Ground boxes shall be set on a 9 inch (minimum) bed of coarse No. 1 aggregate as defined by Item 421. Gravel shall be in place prior to setting box and conduits shall be capped. Any gravel or dirt in conduit shall be removed.
2. When required by Item descriptive code, construction of an apron encasing a ground box including concrete and reinforcing steel shall not be paid for directly but shall be subsidiary to the ground box. Reinforcing steel may be field bent. Concrete for aprons shall be considered miscellaneous concrete for testing purposes. Aprons shall be cast in place.
3. Conduit holes may be cut in the walls of type B & D boxes at least 18 inches beneath the cover.
4. If, within the limits of this project, the Contractor must utilize an existing ground box equipped with a metal cover, the Contractor shall bond the cover to the grounding conductor with a 3 foot long flexible standed jumper the same size as the grounding conductor. Connection of bonding jumper to metal ground cover shall not be paid for directly but shall be subsidiary to various bid items. The box(es) must be clearly shown on the plans with plan notes fully describing the work required.
5. If there are other ground boxes with metal Covers within the project limits but not involved in the contract, the Engineer may direct the Contractor to ground the covers, designating and identifying the specific boxes in writing. This work will be paid for separately.
6. Termination to metal ground box covers shall be made using a tank ground type lug.



APRON FOR GROUND BOXES

(Where required)

(1) Final position of end of conduit shall not exceed one-half the distance to the side of box opposite the conduit entry.
(2) Place gravel "under" the box. not "in" the box. Gravel should not encroach on the interior volume of the box.
(3) Install bushing on the upper end of all ells.
(4) Where a ground rod is present in the ground box, connect it to any and all equipment grounding conductors using a listed connector.
(5) Maintain sufficient space between all conduits so as to allow for proper installation of bushings.
(6) All conduits shall be installed in a neat and workmanlike manner.



GROUND BOX COVER

GROUND BOX COVER DIMENSIONS								
BOX	DIMENSIONS (INCHES)							
SIZE	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

ELECTRICAL DETAILS-GROUND BOXES

ED(3)-00

© TxDOT January 1992	DN: KB	CK: JW	DW: DN	CK: GC	NEG NO.:
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
5-93 10-93 4-98 12-00		6			14
	COUNTY	CONTROL	SECTION	JOB	HIGHWAY

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64

DN: CK: DW: CK: DATE: ACC: FILE:

ELECTRICAL SERVICES NOTES

All work, materials, services, and incidentals, whether or not specifically shown on the plans, which may be necessary for a complete and proper electrical service installation as specified in the plans to obtain electrical power (except extending primary lines to electrical service) shall be paid for, performed, furnished and installed by the Contractor. The Contractor shall contact the Utility for metering and shall comply with all Utility requirements.

Primary line extensions, when required, shall be paid for under Force Account work. The Contractor shall consult with the appropriate Utility to determine costs and requirements, and shall coordinate the Utility's work as approved by the Engineer. The contractor shall be reimbursed only the amount billed by the Utility. No additional amount for supervision of the Utility's work will be paid.

Materials shall be new and unused, materials and installation shall comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards and shall be Underwriters Laboratories (UL) Listed. Electrical Service conduits, conductors, disconnects, contactors, circuit breaker panel sizes, and branch circuit breakers, shall be as shown in the Electrical Service Data elsewhere in the plans. Faulty fabrication or poor workmanship in any material, equipment, or installation shall be justification for rejection.

The Contractor shall submit for approval no less than six (6) copies of catalog cut sheets on electrical service materials. Submittals shall be legible and shall be marked to indicate which product on a cut-sheet is to be supplied. Where manufacturer's provide warranties and guarantees as a customary trade practice, Contractor shall furnish to the State such warranties or guarantees.

The Contractor shall provide locks keyed with Master #2195 for all lockable electrical enclosures. Unless otherwise approved by the Engineer, enclosures shall not be energized until locks are provided and all bolts are installed.

Circuit directories, where provided, shall be filled out. All breakers and components in shop built panels and enclosures shall be labeled with duo-colored plastic labels. Color shall be white letters with red background. Letters shall be a minimum 3/8 " in height.

Enclosures with external disconnects that de-energize all equipment inside the enclosure, need not have dead front trim, except that incoming line terminations shall be protected from incidental contact.

Stainless steel nuts, screws, bolts and miscellaneous hardware may be used when galvanized is specified. All wiring and components shall be rated for 75 degrees C. Minimum size for service entrance conductors shall be #6XHHW.

I. Safety Switch. A safety switch, placed ahead of the meter, shall only be used when specified by the Utility and when shown on the Electrical Service Data. The switch shall be UL Listed, heavy duty type, 600 volt, unfused, with a UL type 3R enclosure and equipped with a solid neutral (s/n) assembly. The switch shall be padlockable in the "on" position.

II. Service Type. Electrical service types A, C, D, and T shall be as schematically detailed on ED(4) or ED(5). Other service types shall be as detailed elsewhere on the plans.

III. Branch Circuit Breakers. Circuit breakers shall be thermal magnetic and have a minimum interrupting capacity of 10,000 amps and a voltage rating compatible with their use. Circuit breakers shall be sized as shown in the electrical service data. Circuit breakers in panelboards and load centers shall be full size and designed exclusively for the panelboard or load center in use. Tandem and half-width breakers shall not be used. All circuit breakers shall be permanently and clearly marked identifying the circuit or device attached. Circuit breakers shall be UL Listed to UL489.

IV. Circuit Breaker Panelboard. Panelboards shall be UL Listed and shall meet Federal Specification W-P-115b, Type 1, Class 1 requirements. Panelboards shall have copper busses, a minimum of 6 one-pole spaces or as required in the electrical service data, and when required will be rated for service equipment. Enclosure shall meet UL type 3R classification. Panelboards shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be bolt-in type only.

V. Circuit Breaker Load Center. Load centers shall be UL Listed, and shall meet Federal Specification W-P-115c, Type 1, Class 2 requirements. Load centers shall have copper busses, a minimum of 4 one-pole spaces, and shall be rated for service equipment. Enclosure shall meet UL type 3R classification. Load centers shall have a threaded hub conduit entry for conduit entering the top of the enclosure. Circuit breakers shall be plug-in type only. Load centers for type T services shall accomodate a maximum of 6 one-pole breakers.

VI. Separate or Auxiliary Enclosure. Separate enclosures for HOA, photocell and lighting contactors for types D & T Services shall be a UL Listed assembly and shall have dead front trim. HOA switch operator shall extend through the dead front trim. Photocell shall be mounted inside the enclosure as described in paragraph XIII, when required by descriptive code. Separate enclosures shall meet the construction requirements of paragraph VII. E. except that separate enclosure shall not have external operating handle, need not have a data pocket and door may latch at only one point. Contractor may install all equipment in one enclosure instead of two, when approved by the Engineer.

VII. Where a Type D or T service is provided, laminated "as built" drawings are required as shown on ED(5) VIII E: shall be delivered before completion of the work, to the Engineer in lieu of placement within these smaller enclosures. Conduit may not enter the back wall of a service enclosure penetrating the equipment mounting panel. Provide grounding bushings on all metal conduits, terminate bonding jumper to grounding bus. Grounding bushing is not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss such as a meter base.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X (XXX/XXX) XXX (XX) XX (X) XX (X)

Example: ELEC SERV TY D(120/240)070(NS)GS(T)TP(O)

Schematic Type

Service Voltage (V / V)

Disconnect Amp Rating
(000 indicates main lug only)

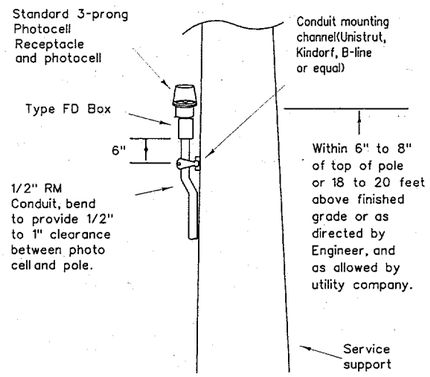
SS= Safety switch ahead of meter
NS= No switch ahead of meter and/or no meter required

Enclosure Type
GS= Galvanized steel
SS= Stainless steel
AL= Aluminum

Photocell Mounting Location
T= Top of pole
E= Inside service/separate enclosure
L= Luminaire mounted
N= None

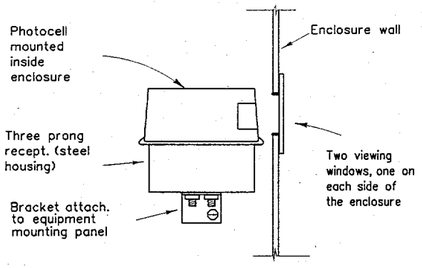
Service Support Type
GC= Granite concrete
OC= Other concrete
TP= Timber pole
SP= Steel pole
SF= Steel frame
OT= Pole by others or paid for separately
EX= Existing pole
TS= Switch gear to be placed on traffic signal pole
RT= Rectangular structural tubing
PS= Pedestal Service

O= Overhead service
U= Underground service



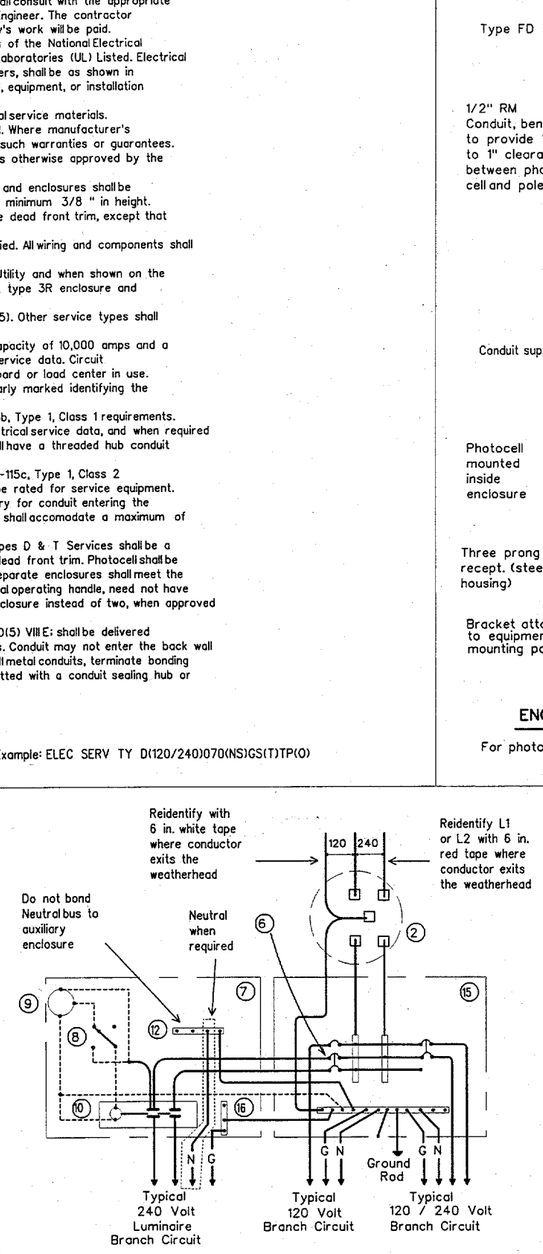
TOP MOUNTED PHOTOCELL

Conduit support spacing 3 feet from enclosure: 5 feet max.



ENCLOSURE MOUNTED PHOTOCELL

For photocell specifications see ED(5),XIII.



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

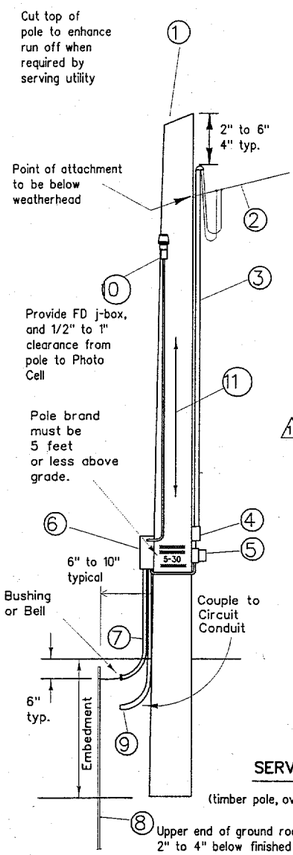
Install photocell and lighting contactor when shown on Electrical Service Data.

SCHEMATIC LEGEND

1 - omitted
2 - Meter (when required)
3 - Service Assembly Enclosure
4 - Main Disconnect Breaker (See Electrical Service Data)
5 - omitted
6 - Circuit Breaker, 15A typical and max. for control circuit wiring
7 - Auxiliary Enclosure
8 - Control Station ("H-O-A" Switch)
9 - Photo Electric Control (enclosure-mounted shown)
10 - Lighting Contactor
11 - Power Distribution Terminal Blocks
12 - Neutral Bus required when 120 v. lights are controlled by lighting contactor
13 - Branch Circuit Breaker (See Electrical Service Data)
14 - Circuit Breaker Panelboard (See Electrical Service Data)
15 - Load Center
16 - Ground Bus

——— Power Wiring
– — – — Control Wiring
——N—— Neutral Conductor (when required-to serve 120 v. loads only)
——G—— Equipment grounding conductor-always required

1 12-22-00 Revision
Modify legend numbers



1 - Class 5 pole, height as required
2 - Service drop from utility company (attached below weatherhead)
3 - Service conduit and service entrance conductors(RMC) (See Electrical Service Data)
4 - Safety switch (when required)
5 - Meter (when required)
6 - Service enclosure
7 - No. 6 bare grounding electrode conductor in 1/2 " PVC to ground rod - extend 1/2 " PVC 6" underground.
8 - 5/8 " x 8' Copper clad ground rod - drive ground rod completely underground unless otherwise approved by the Engineer.
9 - RM conduit - same size as branch circuit conduit.
10 - Photocell and conduit - if top mounted. (See Electrical Service Data)
11 - When required by the serving utility provide bare #6 awg copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor to a height of 8 ft above finish grade.

1 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

(If applicable)

- Liquidtight flexible metal conduit, may be used when meter and service enclosure are mounted 90 to 180 degrees to each other.
- LFMC shall not exceed 3 ft. and shall be securely supported within one ft. of each end.
- Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting.
- A neutral conductor must be installed within the LFMC.
- Bend in liquidtight flexible metal conduit shall not exceed 180 degrees.
- A pull test is required on all installed conductors, at least six inches of free conductor movement shall be demonstrated to the satisfaction of the Engineer.

SERVICE SUPPORT TYPE TP (O)

(timber pole, overhead service, typical arrangement)

8 Upper end of ground rod to be 2" to 4" below finished grade

TIMBER POLE NOTES

1. Conduit and conductors attached to service pole and underground within 12 inches of service pole shall not be paid for directly but shall be subsidiary to the service pole.
2. Pole top mounted photocell, install on north side of pole or in service enclosure as required. See Electrical Service Data.
3. Attach meter and service equipment with stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Gain pole as required to provide flat surfaces for each strut. Paint ends of galvanized channel with zinc rich paint. Gain depth 5/8" max. Gain height 1 7/8" max. Strut to be 1" max. deep, and 1 5/8" wide max. Secure each strut section to timber pole with two galvanized or SS lag bolts, 1/4" diameter min. by 1 1/2" length min. Place flat cut galvanized or SS washer on each lag bolt. Gain pole in a neat and workman-like manner.
4. Embedment depth shall be as required in Item 627 Treated Timber Poles.
5. Poles trimmed for excess length shall be trimmed from the top end only.

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

ELECTRICAL DETAILS- SERVICE SCHEMATICS AND SUPPORT-TYPE TP (OVERHEAD)

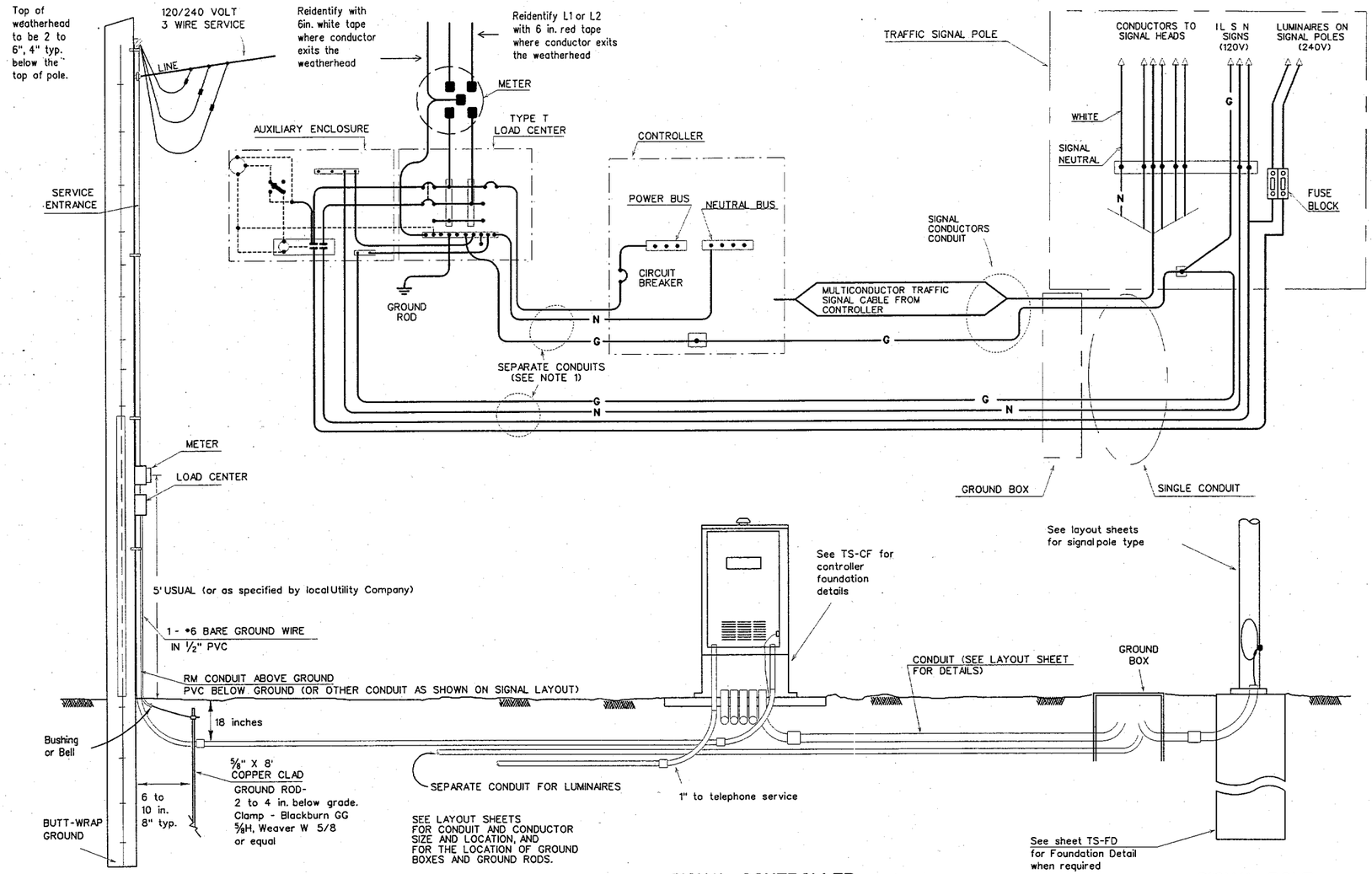
ED(4)-00

© TxDOT April 1998		DN: KB	CK: JW	DW: DN	CK: GC	HCG NO.
REVISIONS 12-00	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT			SHEET
		6				15
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

7.1D

NOTES:

1. Luminaire conductors shall not be looped through controller cabinet.
2. Electrical system to include an equipment grounding conductor noted here as "G". All exposed metal parts are to be bonded to grounding conductor.
3. Photocell, when required, shall be mounted at top of pole or in enclosure as shown on ED(4) and ED(5) and as required by descriptive code.
4. Roadway lighting fixtures, when required, shall be in accordance with the material and construction methods of the Item, "Roadway Illumination Assemblies" except for the test period for proper operation of the luminaires. Installed roadway lighting luminaires and internally lighted street name signs shall be tested for proper operation as a part of the associated traffic signal system.
5. Internally lighted street name signs (ILSN), when required, shall be in accordance with the Item "Internally Lighted Street Name Signs". Because of the electrical isolation of ILSN hinges, a #12 green grounding conductor shall be run to the ILSN fixture.
6. Install ground rod at alternate location when directed by the Engineer. Maintain a minimum of 8 ft in contact with the earth.
7. Liquidtight flexible metal conduit, may be used when meter and service enclosure are mounted 90 to 180 degrees to each other. LFMC shall not exceed 3 ft. and shall be securely supported within one ft. of each end. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. A neutral conductor must be installed within the LFMC. Bend in liquidtight flexible metal conduit shall not exceed 180 degrees.
8. Minimum embedment depth as per item 627 Treated Timber Poles.
9. Pole to be set plumb.
10. Back fill thoroughly tamped in 6 in. lifts. Place 6 inches additional backfill above grade around pole base to allow for settling, as per Item 627.
11. Excess pole length shall be trimmed from the top at a slope to aid water run off.
12. Gain pole two places for each meter, service, separate or auxiliary enclosure. See ED(4) for details.
13. All illumination and power conductors to be pull tested and megged. Do not meg traffic signal cable.
14. Enclosures are to be locked, and ground box covers are to be bolted before power is applied to the circuit.
15. Conduits entering top of enclosures to be fitted with conduit sealing hub or threaded boss, such as meter hub. Off-set nipple, when required, shall not be zinc-die-pressure cast. All metal conduits not connected to conduit sealing hub, or threaded boss must have a grounding bushing. Terminate bonding jumper to ground bus. All conduits entering enclosures shall be sealed. Silicone shall not be allowed.



ELECTRICAL SERVICE

(TYPE T TIMBER POLE SHOWN AS EXAMPLE, SEE ELECTRICAL DETAILS, LAYOUT SHEETS, AND ELECTRICAL SERVICE DATA SHEET FOR SERVICE REQUIRED AND FOR DETAILS.)

SIGNAL CONTROLLER

SIGNAL POLE

Unless shown elsewhere in the plans, electrical service data for Types D and T shall be as follows.

ELECTRICAL SERVICE DATA

ELECTRICAL SERVICE DESCRIPTION(SEE ED(4))	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN DISCONNECT CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS ***	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	KVA LOAD
TY D (120/240)070(NS)GS(E)**(*)	1½	3/#4	N/A	2P/70	30	70	T.S. Lighting	1P/50 2P/15	<7.1
TY T (120/240)000(NS)GS(E)**(*)	1½	3/#4	N/A	None	30	70	T.S. Lighting	1P/50 2P/15	<7.1

*** Eliminate photocell, contactor and seperate enclosure if lighting, or internally lighted signs are not required by plans
** See descriptive code in estimate for service support type.
* See descriptive code in estimate for overhead or underground service.

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

ELECTRICAL DETAILS- TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(7)-00

DN: KB	CK: JW	DW: DN	CK: GC	REG NO.

REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
5-93		6		16
10-93				
4-98	COUNTY		CONTROL SECTION JOB	HIGHWAY
12-00				

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LEVELS DISPLAYED																ACC: d48hplq:/usr/d482517
1	2	14	15	16	17	18	19	20	21	22	23	24	25	26	27	LV-1.2 for English 1.3 for Metric
7	8	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63		

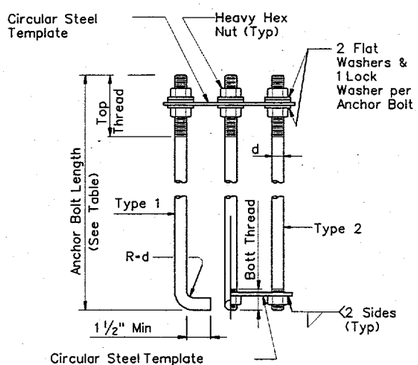
FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		DRILLED SHAFT LENGTH-ft ④,⑤,⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32' ⚠1	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	⚠1	36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'

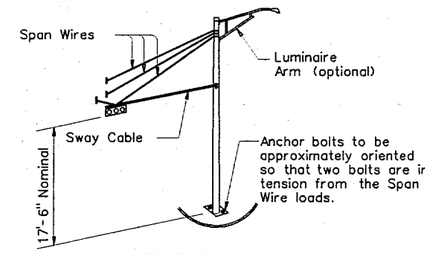
EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



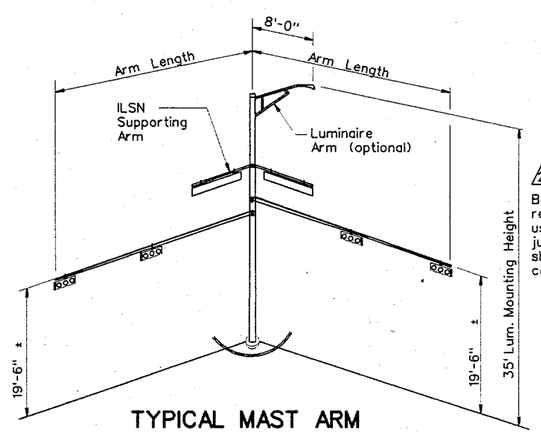
HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

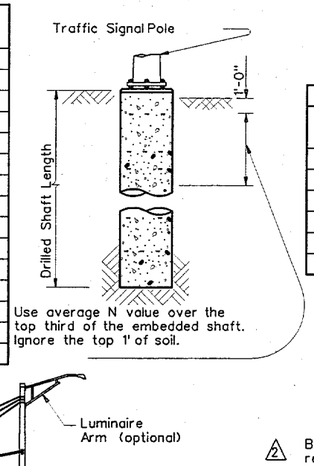
INSTALLATION PROCEDURE :
Threads of anchor bolts shall be coated with pipe joint compound prior to installation of upper nuts when erecting pole. After pole is plumbed and in permanent alignment, the exposed threads of painted bolts shall be cleaned and an additional coating of zinc-rich paint applied to seal the bolt thread-nut joint.



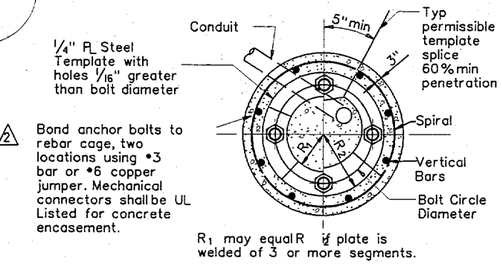
TYPICAL STRAIN POLE ASSEMBLY



TYPICAL MAST ARM ASSEMBLY



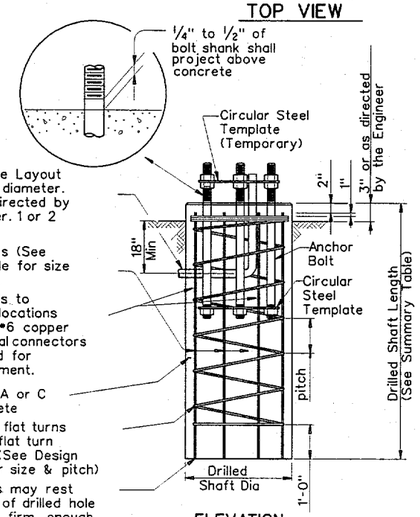
Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.



⚠2 Bond anchor bolts to rebar cage, two locations using #3 bar or #6 copper jumper. Mechanical connectors shall be UL Listed for concrete encasement.

R_1 may equal R_2 if plate is welded of 3 or more segments.

TOP VIEW



Conduit (See Layout Sheets for diameter. Orient as directed by the Engineer. 1 or 2 required)

Vertical Bars (See Design Table for size & number).

⚠2 Bond anchor bolts to rebar cage, two locations using #3 bar or #6 copper jumper. Mechanical connectors shall be UL Listed for concrete encasement.

Class A or C Concrete

Spiral, 3 flat turns top & 1 flat turn bottom. (See Design Table for size & pitch)

Vertical bars may rest on bottom of drilled hole if material is firm enough to do so when concrete is placed.

ELEVATION

FOUNDATION DETAILS

NOTES:
① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed seperately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTT THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	2"	17"	10"	7"
1 ¾"	3'-10"	7"	2 ¼"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	2 ½"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	3"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
MARSH LANE @ DRIVEWAY		36-A	4			48		
TOTAL DRILLED SHAFT LENGTHS						48		

STATE OF TEXAS
BRIAN K. SHEWSKI
68729
REGISTERED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY
BRIAN K. SHEWSKI, P.E. 68729 ON DECEMBER 20, 2002
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

GENERAL NOTES:
Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.
Reinforcing steel shall conform to Item 440.
Concrete shall be Class A or C.
Threads for anchor bolts and nuts shall be rolled or cut threads of unified national coarse thread series except for A193B7 bolts which shall have 8 pitch thread series. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.
Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Anchor bolts larger than 1" in diameter shall conform to A36M55 in accordance with the Item, "Anchor Bolts" or ASTM A193B7 or A687. Galvanize or coat with zinc-rich paint a minimum of the upper 14 inches of all anchor bolts unless otherwise noted. Exposed nuts shall be galvanized or coated with zinc-rich paint. Washers shall be galvanized. Templates and embeded nuts need not be galvanized.

11/99 Revision

⚠1 Changed to Facilitate new terminal strip enclosure

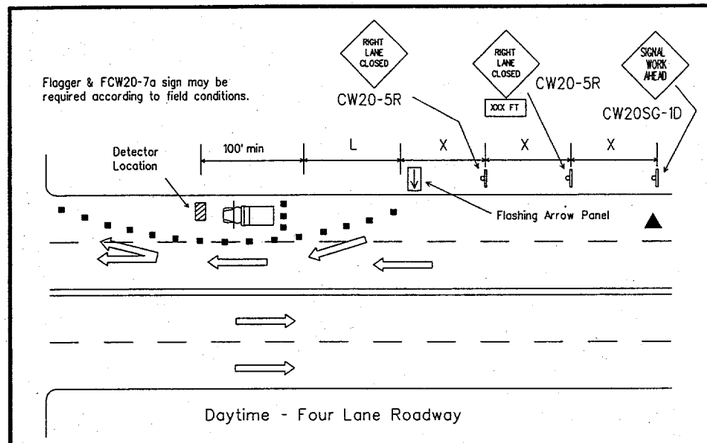
⚠2 Changed from ground rod to UFER ground

STANDARD PLANS
Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-99

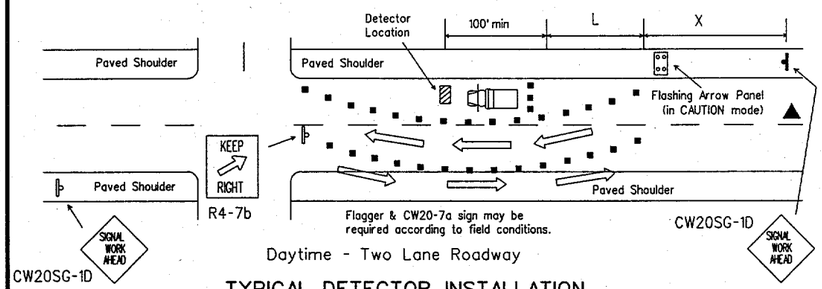
©TxDOT August 1995	DN: NS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
REVISIONS 5-96 11-99	FEDERAL AID PROJECT			SHEET 17
	COUNTY COLLIN	CONTROL	SECTION	JOB / HIGHWAY



Posted Speed x	Formula	Minimum Desirable Taper Lengths x x 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Minimum Sign Spacing X Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'
35		205'	225'	245'	35'	70'-90'	160'
40		265'	295'	320'	40'	80'-100'	240'
45	L=WS	450'	495'	540'	45'	90'-110'	320'
50		500'	550'	600'	50'	100'-125'	400'
55		550'	605'	660'	55'	110'-140'	500'
60		600'	660'	720'	60'	120'-150'	x 600'
65		650'	715'	780'	65'	130'-165'	x 700'
70		700'	770'	840'	70'	140'-175'	x 800'

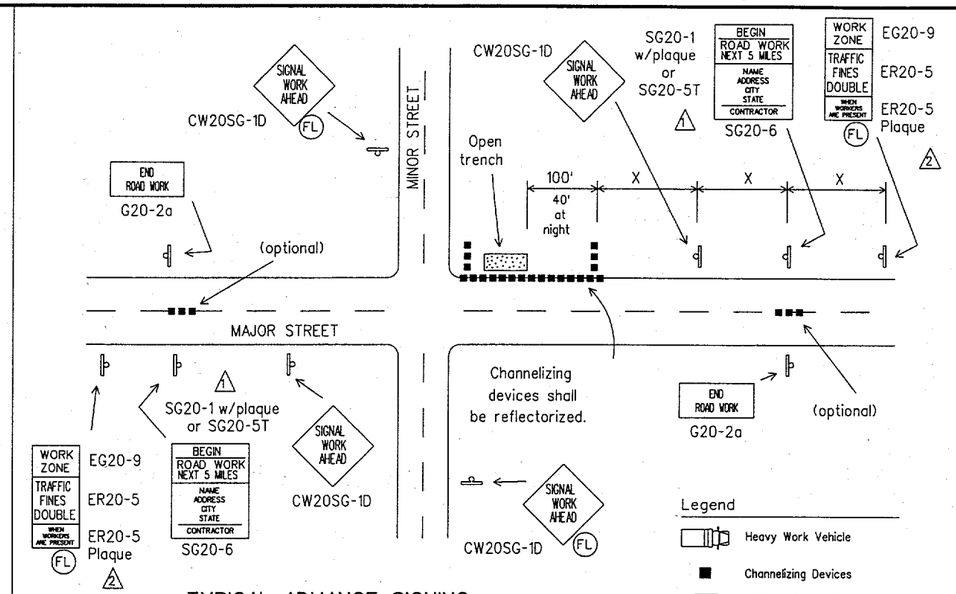
x Conventional Roads Only

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



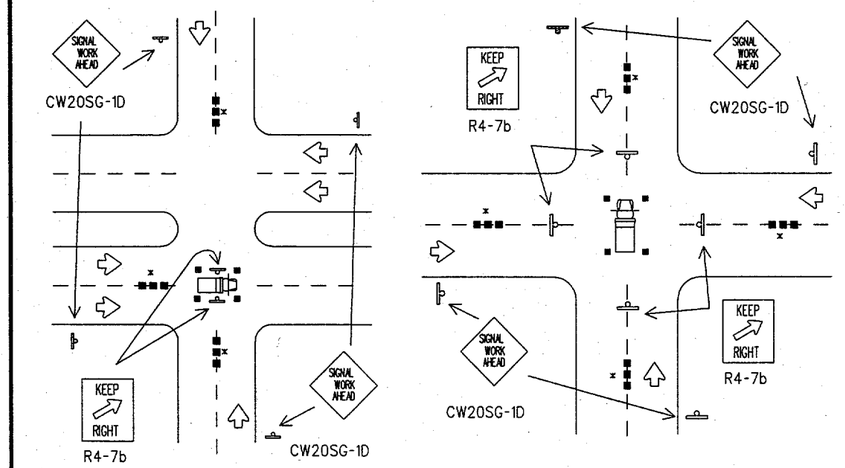
TYPICAL DETECTOR INSTALLATION
OR OTHER WORK OPERATIONS THAT ARE SHORT TERM OR SHORT DURATION

Nighttime Channelizing Devices shall be reflectorized.



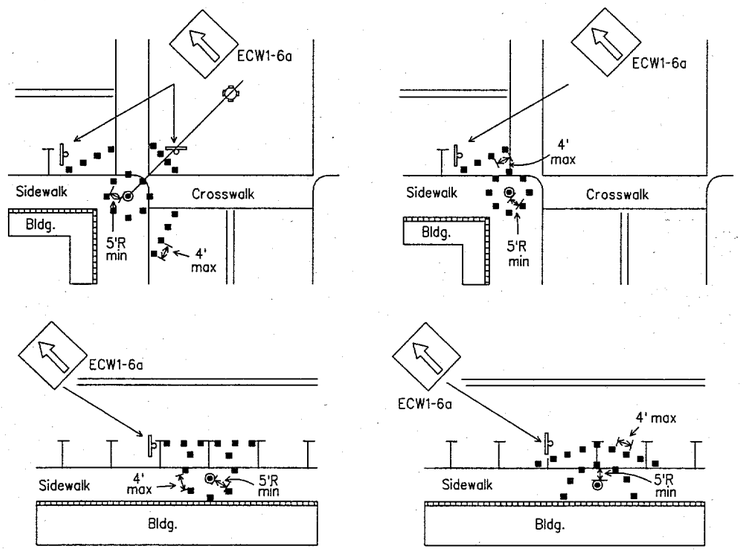
TYPICAL ADVANCE SIGNING
FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

Observe Warning Signs State Law (R20-3) may be required if called for elsewhere in the plans.
Location will be as directed by the Engineer.



TYPICAL HANGING SIGNAL INSTALLATIONS
OR OTHER WORK OPERATIONS THAT ARE SHORT TERM OR SHORT DURATION

x Advance warning channelizing devices are optional.



Channelizing devices should not be placed closer than 5 foot radius (minimum) to signal poles.
Parking may be eliminated by placing channelizing devices in spaces.
If pedestrian walkways are blocked, refer to TMUTCD Part VI.

TYPICAL RESTRICTED PEDESTRIAN MOVEMENTS
FOR ALL WORK OPERATIONS REGARDLESS OF WORK DURATION

▲ The arrow panel may be omitted when stated elsewhere in the plans.

Typical channelizing device is the 28" cone. Plastic drums or vertical panels may be used if approved by the Engineer. Metal drums shall NOT be used as a channelizing device or sign support.

For several closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. See details elsewhere in the plans for advance signing requirements.

Advance signs shall be in place when signal construction operations are in progress. The contractor shall remove advance signs when no construction operations are underway. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.

All holes, trenches or other hazardous areas shall be adequately protected by lights or other protective devices. Trenches shall be covered or surrounded with orange plastic construction fence as directed by the Engineer.

Flagger and FCW20-7a sign may be required according to field conditions. Vehicles parked in roadway shall be equipped with two strobes. High level flags at corners of vehicle may also be used. Work operations that require work vehicle in traveled way 20 minutes or less may use cones, high level flags and strobes as advance warning devices. Cones should only be placed around vehicle. Flaggers may be used on high speed rural intersections.

10/99 Revision

1 Added "BEGIN" to "ROADWORK NEXT XX MILES" sign

2 Added "WHEN WORKERS ARE PRESENT" plaque

STANDARD PLANS
Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL INSTALLATION TYPICAL DETAILS

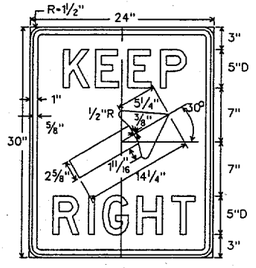
SHEET 1 OF 2 WZ(BTS-1)-99

© TxDOT April 1992	DW: GRB	CK: GRB	DW: FDN	CK: CAL

REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
1-97				
2-98		6		18
4-98	COUNTY	CONTROL	SECTION	JOB
10-99				

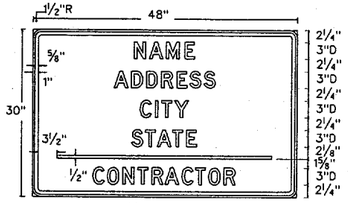
116A

TYPICAL SIGNS USED IN TRAFFIC SIGNAL CONSTRUCTION AREAS



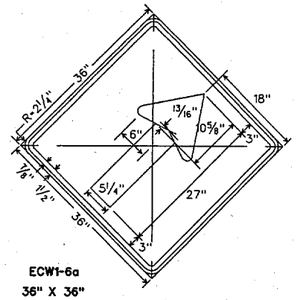
R4-7b
24" X 30"

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



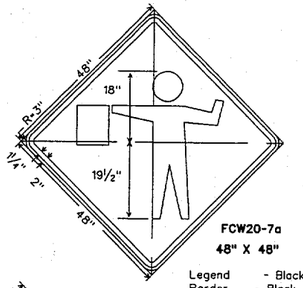
SG20-6
48" X 30"

Letters - Black
Border - Black
Background - Orange or White Refl.



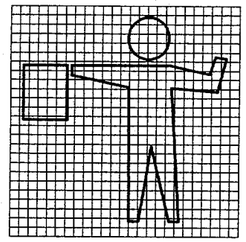
ECW1-6a
36" X 36"

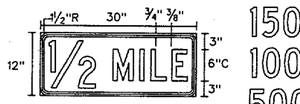
Legend - Black
Border - Black
Background - Orange Refl.



FCW20-7a
48" X 48"

Legend - Black
Border - Black
Background - Orange Refl.

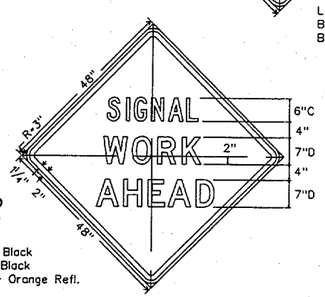




Distance Plaque
30" X 12"

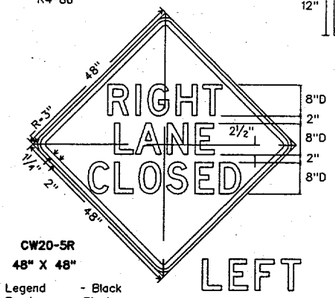
Alternate legends

1500 FT 6"C
1000 FT 6"C
500 FT 6"C
1 MILE 6"C



CW20SG-1D
48" X 48"

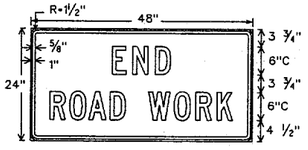
Letters - Black
Border - Black
Background - Orange Refl.



CW20-5R
48" X 48"

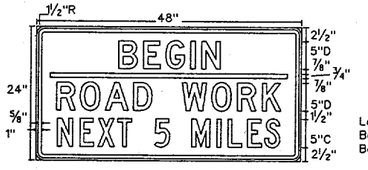
Legend - Black
Border - Black
Background - Orange Refl.

CW20-5L



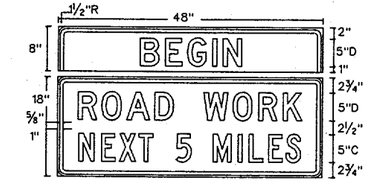
G20-2a
48" X 24"

Letters - Black
Border - Black
Background - Orange Refl.



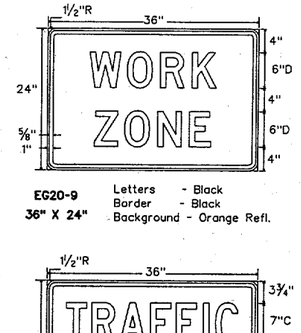
⚠1
SG20-5T
48" X 24"

Letters - Black
Border - Black
Background - Orange Refl.



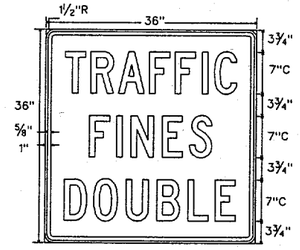
⚠1
SG20-1 w/plaque
48" X 26"

Letters - Black
Border - Black
Background - Orange Refl.



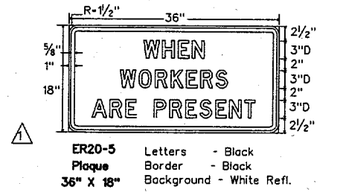
EG20-9
36" X 24"

Letters - Black
Border - Black
Background - Orange Refl.



ER20-5
36" X 36"

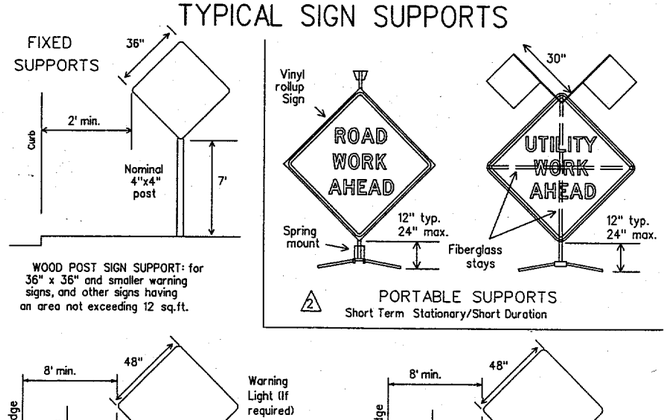
Letters - Black
Border - Black
Background - White Refl.

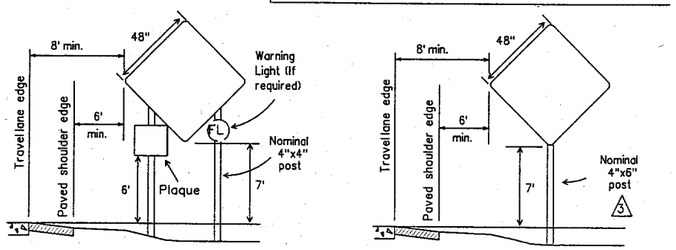


1
ER20-5
Plaque
36" X 18"

Letters - Black
Border - Black
Background - White Refl.

TYPICAL SIGN SUPPORTS

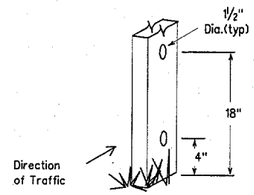




WOOD POST SIGN SUPPORT: for 48" x 48" warning signs.

Signs erected on fixed supports shall be at a minimum height of 7 feet.
Embedment depth for wood sign supports and post type barricades should be 3 feet minimum, unless specified elsewhere in the plans.
Driveable sign supports may be used and shall be installed in accordance with the manufacturer's recommendations.

WOOD POST SYSTEM FOR FIXED SIGN SUPPORTS



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

4

Only pre-qualified products shall be used. A list of compliant products and their sources may be obtained by writing, calling or faxing:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

SPECIFICATION REFERENCE TABLE
MATERIALS AND TESTS DIVISION SPECIFICATIONS

PLYWOOD SIGN BLANKS	DMS 7100
ALUMINUM SIGN BLANKS	DMS 7110
FLAT SURFACE REFLECTIVE SHEETING, TYPE A (ENGINEER GRADE)	DMS 8300
FLAT SURFACE REFLECTIVE SHEETING, TYPE B (SUPER ENGINEER GRADE)	DMS 8300
FLAT SURFACE REFLECTIVE SHEETING, TYPE C (HIGH SPECIFIC INTENSITY)	DMS 8300

GENERAL

Standard signs shall be used as required by the BC Standard sheets, the plans, or as directed by the Engineer to regulate, warn, and guide traffic. All sign usage and erection shall be in strict accordance with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways" (TMUTCD). The Contractor shall maintain each sign as directed by the Engineer.

The Contractor may use either the sign designs shown on the BC Standard Sheets, or those sign designs shown in the "Standard Highway Sign Designs for Texas " (SHSD). All work zone signs provided for in the TMUTCD but not detailed in the plans may be used when directed by the Engineer.

REFLECTIVE SHEETING

Reflectorized signs shall be constructed of retroreflective sheeting meeting the color and reflectivity requirements of Material Specification, DMS 8300 or DMS 8310. Day only is defined as a device that is used only during daylight hours.

Type A, B or C sheeting may be used for all, day only, applications.
Type A sheeting should be used for all, white background, regulatory signs.
Type C sheeting shall be used for all other applications.
The above applications of sheeting grades to different type signs will apply unless otherwise specified in the plans.

TYPE A - Engineer Grade
TYPE B - Super Engineer Grade
TYPE C - High Specific Intensity

WORK DURATION TERMINOLOGY-(as defined by the "Texas Manual on Uniform Traffic Control Devices" Part VI)

Long-term Stationary - occupies a location 3 or more days;
Intermediate-term Stationary - occupies a location from overnight to 3 days;
Short-term Stationary - daylight work that occupies a location from 1 to 12 hours;
Short Duration - occupies a location up to 1 hour.

SUPPORTS AND MOUNTING HEIGHT

The bottom of Long-term / Intermediate-term signs shall be at least 7 feet above the paved surface. The bottom of any supplementary plaques shall be at least 6 feet above the paved surface.

The bottom of Short-term / Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 24" above the ground. Long-term / Intermediate-term Signs may be used in lieu of Short-term / Short Duration signing. Short-term / Short Durations signs shall be used only during daylight and removed at the end of the workday.

Regulatory signs shall be mounted at least 7 feet above the paved surface regardless of work duration.

SIGN SUPPORT WEIGHTS

Where sign supports require the use of weights to keep from turning over, the use of some type of sandbag is recommended. The use of pieces of rock, concrete, iron, steel or other solid objects will not be permitted. 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.

REMOVING OR COVERING

When sign messages may be confusing or no longer apply, the signs and supports shall be removed from roadway and shoulder, or the signs shall be completely covered. Turning signs from motorists view will not be allowed. When signs are covered the material used shall be opaque, such as heavy mil black plastic. Burlap shall not be used to cover signs. Signs shall be removed upon completion of the work.

Duct tape or other adhesive material shall not be affixed to sign face.

10/99 Revision
1 Added new signs
2 Added details of Short Term sign supports
3 Added detail for use of 1 - 4"x6" post
4 Added chart to page

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

TRAFFIC SIGNAL INSTALLATION BARRICADES AND SIGNS

SHEET 2 OF 2 **WZ(BTS-2)-99**

© TxDOT April 1992	DN: GRB	CK: GRB	DW: FDN	CK: CAL
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
1-97				
2-98	5			19
4-98	COUNTY		CONTROL SECTION	JOB HIGHWAY
10-99				

116B

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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.

DN:LR CK:CW DW:DN CK:MT
DATE:
FILE
LEVELS DISPLAYED

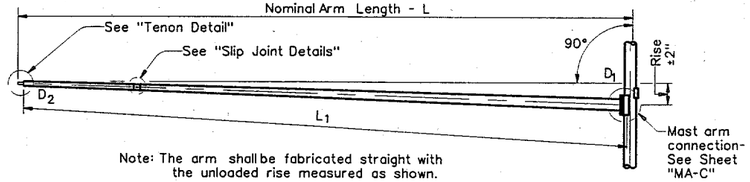
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

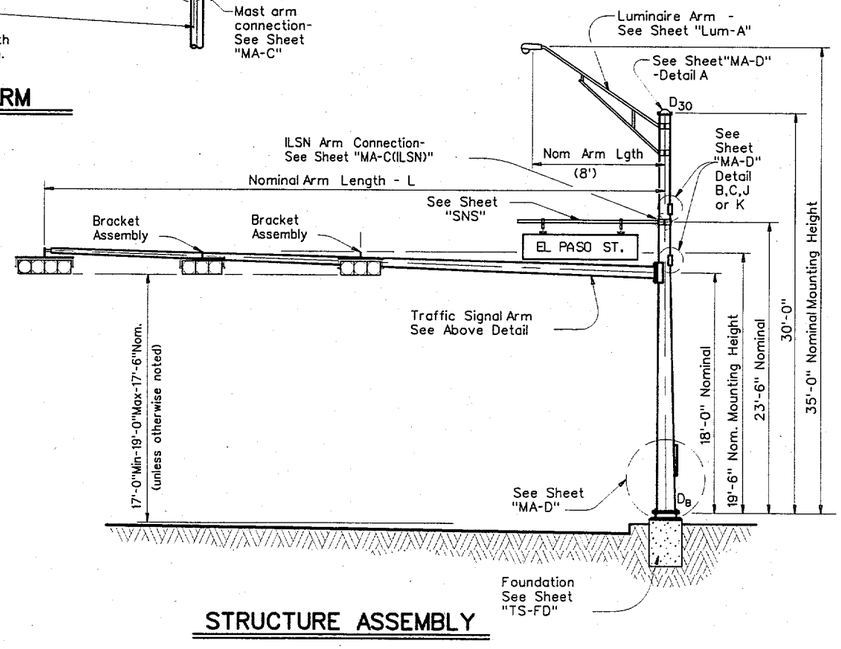
② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)



STRUCTURE ASSEMBLY

VIBRATION WARNING

Mast Arms of approximately 40' or longer are subject to possible harmonic vertical vibrations in light wind conditions due to unusual combinations of signal numbers, weights or positions, arm-wind orientation, and arm-pole stiffness. Arms shall be visually inspected in 5 to 20 mph wind conditions after signal head installation and, if vertical movements with a total excursion (max positive to max negative) of more than approximately 8" are observed at arm tip, damping devices or other means shall be fitted to the arm(s). The necessary damping device(s) or other remedial measures shall be as recommended by the fabricator. Excessive vibrations shall not be allowed to continue for more than two days.

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY
BRIAN K. SHEWSKI, P.E. 68729 ON NOVEMBER 30, 2001
ALTERATION OF A SEALED DOCUMENT WITHOUT PROPER NOTIFICATION TO THE RESPONSIBLE ENGINEER IS AN OFFENSE UNDER THE TEXAS ENGINEERING PRACTICE ACT.

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80		28-80	
32	32L-80		32S-80		32-80	
36	36L-80	1	36S-80		36-80	
40	40L-80		40S-80		40-80	
44	44L-80	1	44S-80		44-80	1
48	48L-80		48S-80		48-80	1

Traffic Signal Arms (1 per Pole) — Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 Bracket Assembly		2 Bracket Assemblies		3 Bracket Assemblies	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80			
32			32II-80		32III-80	
36			36II-80		36III-80	1
40			40II-80		40III-80	
44			44II-80		44III-80	2
48					48III-80	1

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	2

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
¾"	1'-6"	
1 ½"	3'-4"	
1 ¾"	3'-10"	4

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, 4 lock washers and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

④ Supply Option "A" unless otherwise noted

MODIFICATIONS

(A) REMOVED BRACKET ASSEMBLY OPTIONS A AND B
(B) REMOVED CGB CONNECTORS
(C) REMOVED TENON DETAIL
(D) REQUIRE MEASUREMENT OF POLE HEIGHT
(E) MIN. AND MAX. SIGNAL HEAD HEIGHT DISTANCE

11/99 Revision

⚠1 Changed to Facilitate new terminal strip enclosure

SHEET 1 OF 2

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(80 MPH WIND ZONE)

SMA-80(1)-99 (DAL)

FILE: SMA-80.DGN	DN: MS	CK: JSY	DW: MMF	CK: JSY
©TxDOT 2001	DIST	FED REG	FEDERAL AID PROJECT NO.	SHEET
REVISIONS 5-96 11-99	DALLAS	6		20
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	COLLIN					

122A

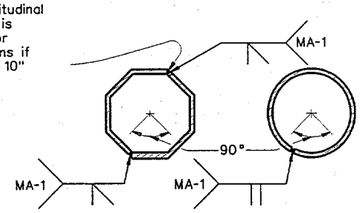
LEVELS DISPLAYED
1 2 4 5 6 7 8 9 10 11 12 13 14 15 16
7 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: d48hp1q:/usr/d482517
LV=4.2 for English 1.3 for Metric

Stainless steel bands and cast bracket as in "Astro-Brac" with 1½" Dia Threaded Coupling.

BRACKET ASSEMBLY OPTION C

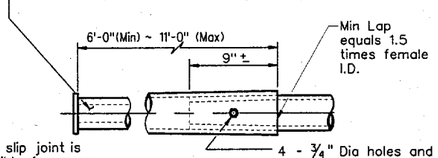
Second longitudinal Seam Weld is permitted for polygonal arms if D_1 exceeds 10"



Longitudinal Seam Weld must be oriented within the lower 90° of the signal arm.

ARM WELD DETAIL

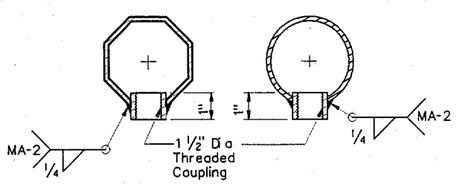
.179" thickness is permissible for Tip Section



Note: A slip joint is permissible for arms 40' and greater in length. The slip joint shall be made in the shop, but may be match marked and shipped disassembled.

4 - ¾" Dia holes and 1- ⅝" Did" galv A307 bolt. Tack weld nut to thread projection after making joint. Repair damaged galvanizing in accordance with the specifications.

SLIP JOINT DETAIL



COUPLING DETAILS

NOTE:
Pole manufacturer shall drill ½" hole in bottom of mast arm at end plate. (for hot-dip galvanizing)

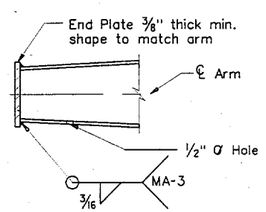


PLATE WELD DETAIL

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 75 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.5 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

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

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

Special design require submission of shop drawings in accordance with the item "Steel Structures".

△ The pole heights are for bidding purposes only. Prior to fabrication, the Contractor in cooperation with the Engineer shall make field measurements to determine the actual pole height necessary to ensure a verticle clearance of 17'-6" min., 19' max.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY (80 MPH WIND ZONE)

SMA-80(2)-96 (DAL)

DALLAS DISTRICT STANDARD

FILE: SMA-80.DGN	DN: MS	CK: JSY	DW: MMF	CK: JSY
© TxDOT 2001	DISTRICT	FED. REG.	FEDERAL AID PROJECT NO.	SHEET
REVISIONS	DALLAS	6		21
6-96	COUNTY		CONTROL SECT. JOB	HIGHWAY
	COLLIN			

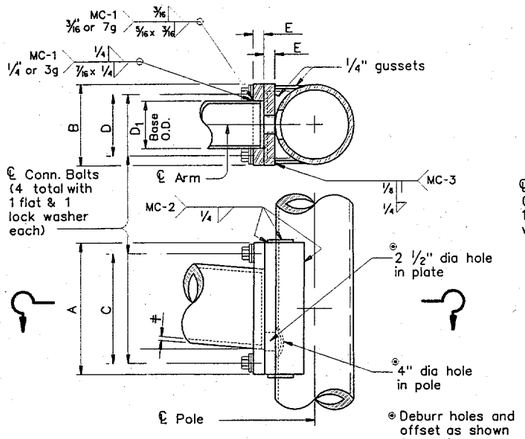
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
7 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 65

ACC: d48hp1q:/usr/d482517

LV-1.2 for English 1.3 for Metric

LEVELS DISPLAYED																ACC: d48hplq:/usr/d4832517
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	V+1.2 for English 1.3 for Metric
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	

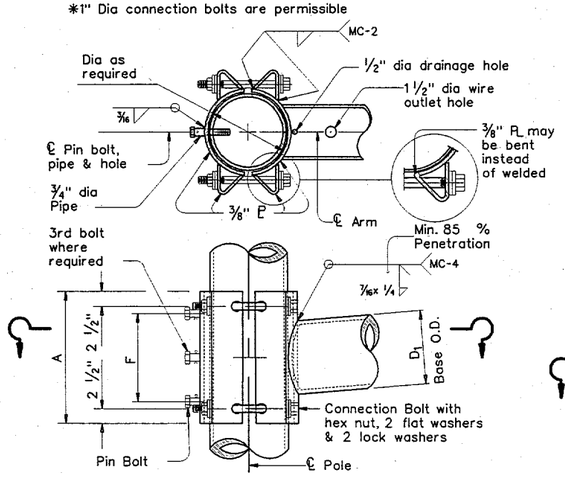
ARM SIZE D_1	ARM SIZE ♯	A	B	C	D	E	CONN BOLT DIA
in.	in.	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1	1
7.5	.179	13	9	10	6	1	1
8.0	.179	14	10	11	7	1¼	1¼
9.0	.179	16	11	13	8	1¼	1¼
9.5	.179	17	12	14	9	1¼	1¼
9.5	.239	18	12	15	9	1¼	1¼
10.0	.239	18	12	15	9	1¼	1¼
10.5	.239	18	13	15	10	1½	1½
11.0	.239	18	13	15	10	1½	1½



FIXED MOUNT DETAIL 1

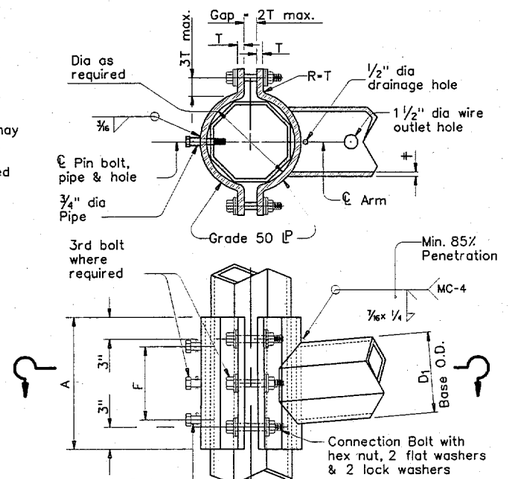
ARM SIZE D_1	ARM SIZE ♯	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	8	4	* 7/8	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1¼	3	5/8
9.5	.239	18	12	4	1¼	3	5/8
10.0	.239	18	12	4	1¼	3	5/8

*1" Dia connection bolts are permissible



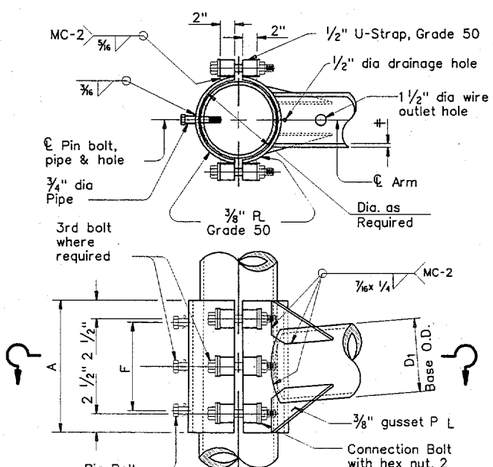
CLAMP-ON DETAIL 1

ARM SIZE D_1	ARM SIZE ♯	A	F	T	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	in.	ea.	in.	ea.	in.
7.0	.179	12	8	¾	4	¾	2	5/8
7.5	.179	14	8	¾	4	¾	2	5/8
8.0	.179	14	8	¾	4	¾	2	5/8
9.0	.179	16	10	⅞	4	1	2	5/8
10.0	.179	18	10	⅞	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

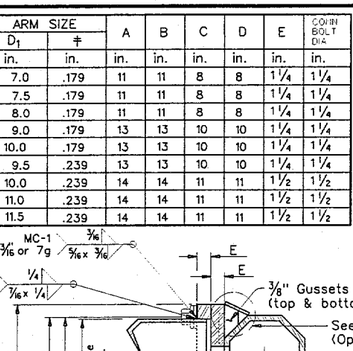


CLAMP-ON DETAIL 2

ARM SIZE D_1	ARM SIZE ♯	A	F	CONN. BOLTS No.	CONN. BOLTS Dia	PIN BOLTS No.	PIN BOLTS Dia
in.	in.	in.	in.	ea.	in.	ea.	in.
6.5	.179	12	8	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



CLAMP-ON DETAIL 3



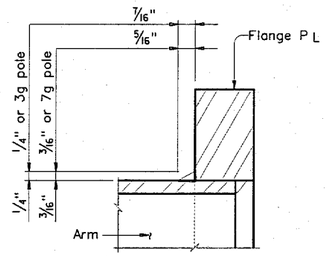
DETAIL A

DETAIL B

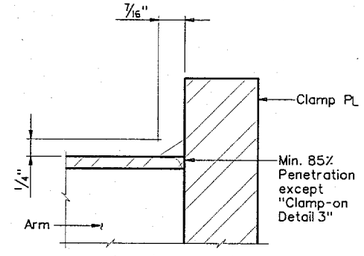
MATERIALS	
Round Shafts or Polygonal Shafts	ASTM A595 GR A, ASTM A570 GR 50, ASTM A607 GR 50, ASTM A572 GR 50 or A36M50
Plates (1)	ASTM A36 OR A572 GR 50 or A595 (2) or A36M50
Connection Bolts	ASTM A325 except where noted
Pin Bolts	ASTM A325
Pipe	ASTM A53 GR A or B, or A501
Misc. Hardware	Galvanized steel or stainless steel or as noted

(1) Any of the materials listed for plates may be used where the drawings do not specify a particular Grade designation.

(2) If A595 material is used, it need not be cold worked to A595 requirments, but material must have 40 ksi minimum yield prior to fabrication.



FIXED MOUNT ARM



CLAMP-ON ARM

ARM BASE WELD DETAILS

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1½" wide vertical slotted hole may be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and ¾" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a ¾" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-96

FILE: MA-C.DGN	DN: MS	CK: JSY	DW: MMF	CK: JSY
©TxDOT August 1995	DIST	FED REG	FEDERAL AID PROJECT	SHEET
REVISIONS		6		22
5-96	COUNTY		CONTROL SECT	JOB HIGHWAY

126A

DISCLAIMER
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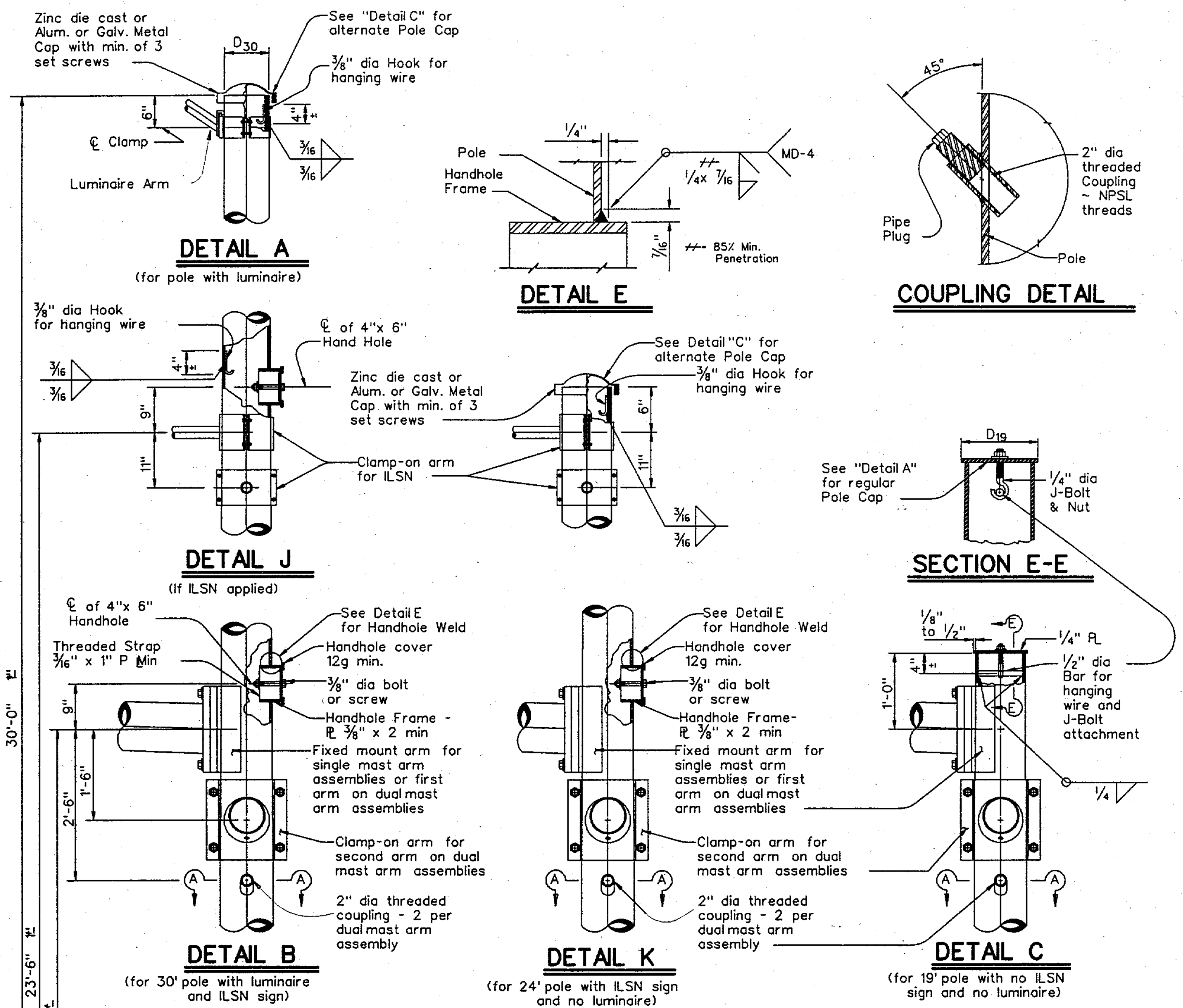
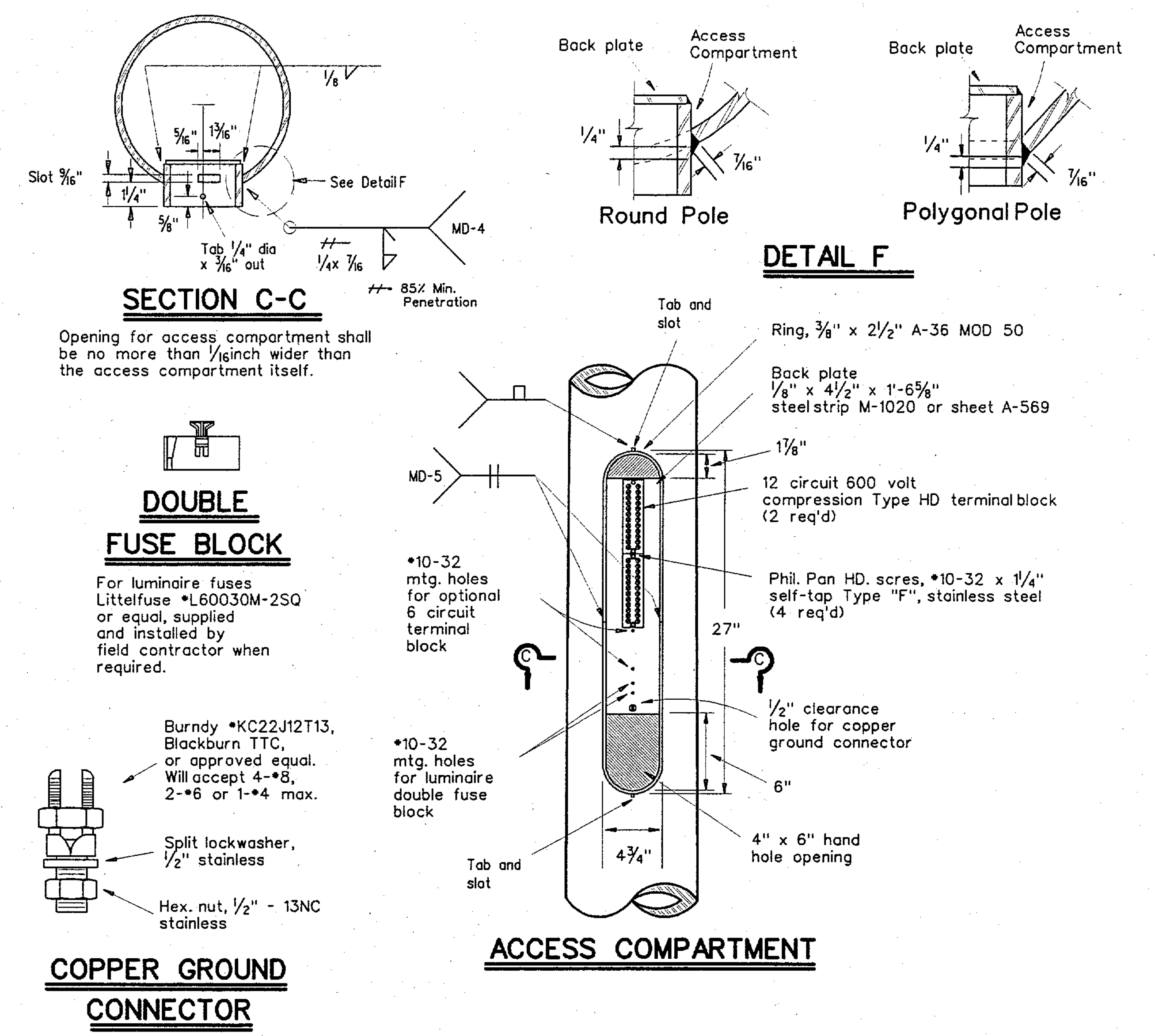
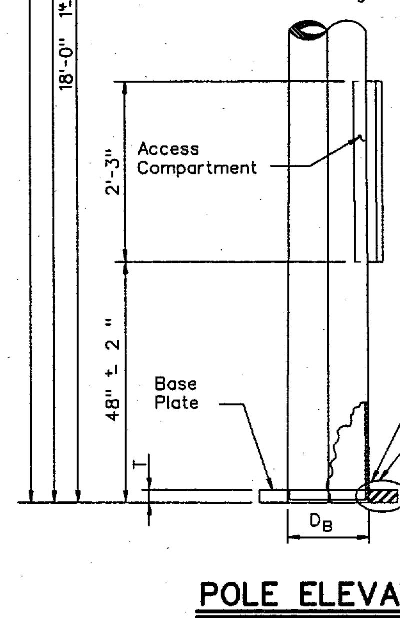
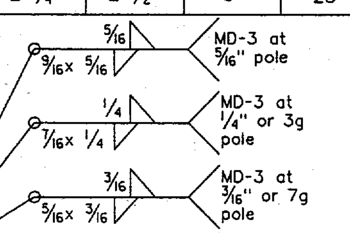


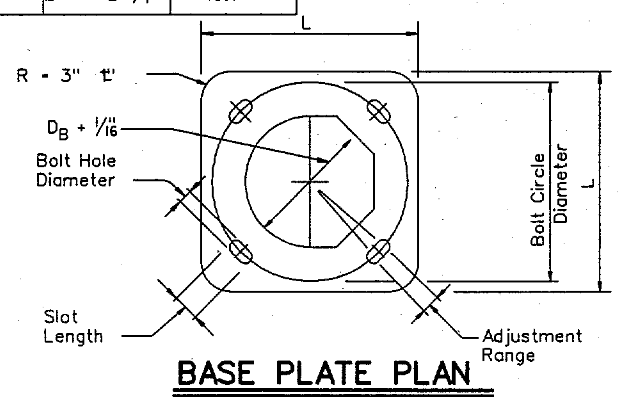


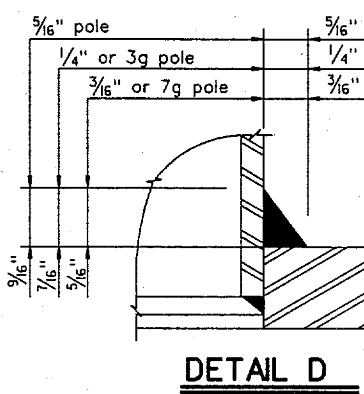
1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon *985GP12CU or approved equal), four *10-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon *985GP12 terminal strips, one Marathon *985GP06CU terminal strip, and one Littelfuse *L60030M-2SQ fuse block. Arrangement of the items shall be as shown in the Access Compartment detail.

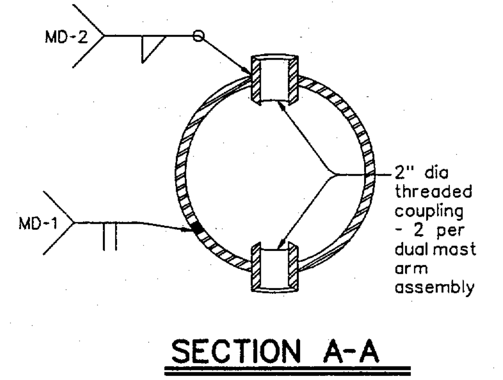


Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base PL Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°









MOD. ACCESS COMPARTMENT MT. HEIGHT

STANDARD PLANS
Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-00 (DAL)

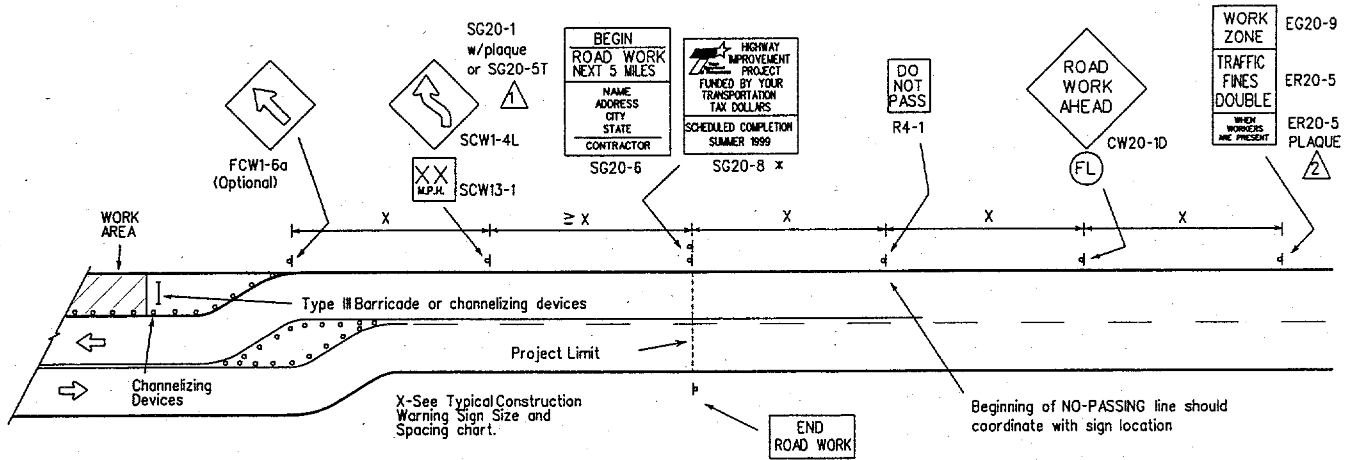
DN: MS	CK: JSY	DW: FDN	CK: CAL	

REVISIONS	STATE DISTRICT	FEDERAL REGION	STATE AID PROJECT NO.	SHEET
7-96 8-99 10-00	18	6		23

COUNTY	CONTROL	SECTION	JOB	HIGHWAY
COLLIN				

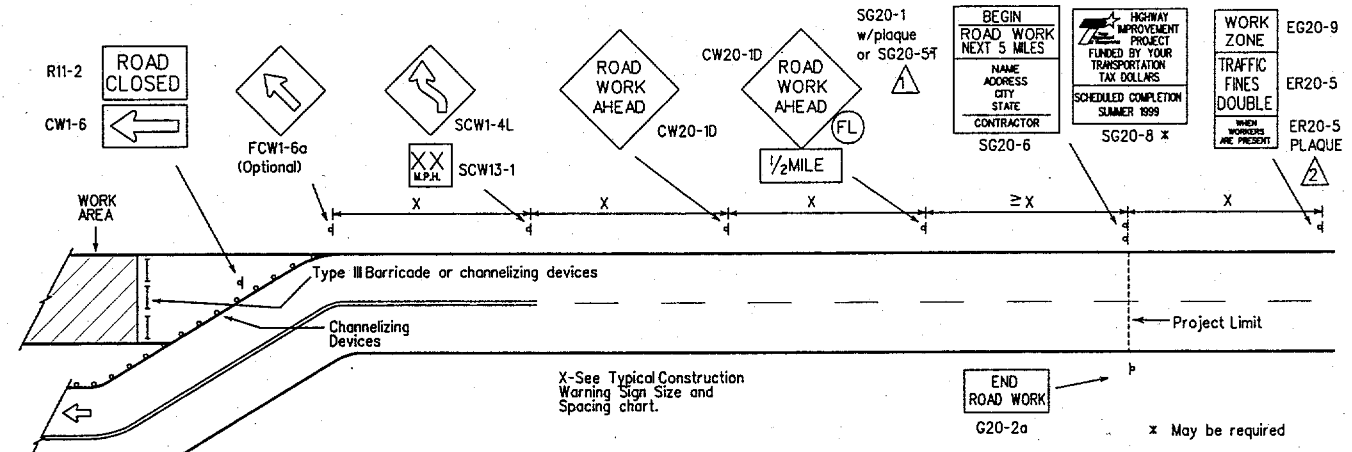
LEVELS DISPLAYED						DATE:	DN:
1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16				ACC:	CK:
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32						FILE:	DW:
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48							CK:
49 50 51 52 53 54 55 56 57 58 59 60	62 63						

PROJECT LIMIT TRAFFIC CONTROL DEVICES



PROJECT LIMITS ADJACENT TO WORK AREA

(Less than 2000 feet between project limits and work area)



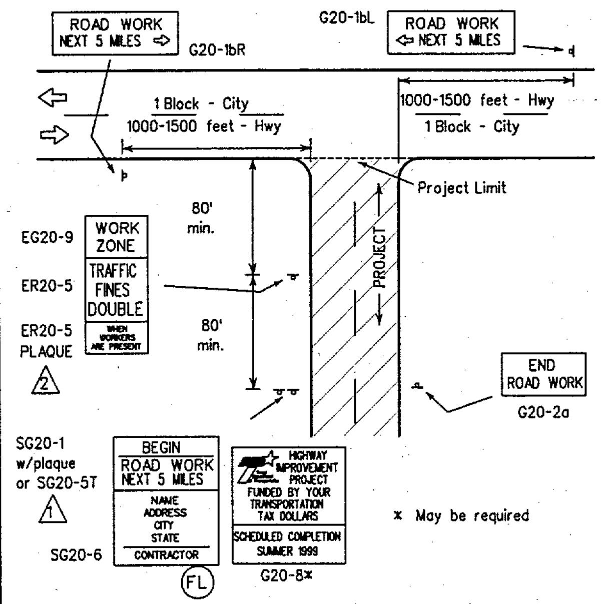
PROJECT LIMITS AWAY FROM WORK AREA

(Greater than 2000 feet but not more than 1 mile between project limits and work area)

PROJECT LIMIT GENERAL NOTES

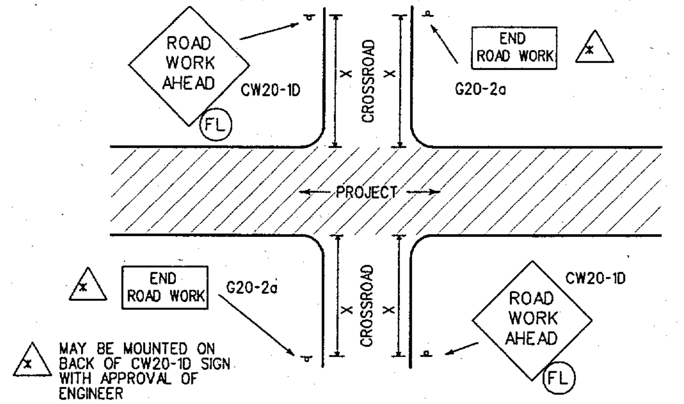
SIGNS AND WARNING LIGHTS

1. When specified on this sheet or other sheets in the plans, warning lights for a sign shall be installed and maintained by the contractor. Warning lights shall be attached to the sign support using a 1/2" bolt (minimum) of sufficient length for three washers, lock washer and a nut.
2. Warning lights shall be maintained as directed by the Engineer.
3. Appropriate standard traffic control devices shall be used as required by the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the contractor's responsible person.
4. As a general rule, additional traffic control devices in advance of the project limits should only be used in those cases where a work area, a detour, or a potentially hazardous location is less than 2000 feet inside the project limits.
5. The traffic control devices used in the above illustrations are examples only. Field conditions and engineering judgement should dictate the most appropriate traffic control devices to be used. Any variation in the plans shall be documented by written agreement between the Engineer and the contractor's responsible person.
6. As detailed above, the BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the project limits and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the project limits. These signs should be adjusted to provide adequate spacing to other signs. The OBSERVE WARNING SIGNS STATE LAW sign shall be installed when required elsewhere in the plans.
7. With the agreement of an adjacent project Engineer, the Engineer(s) may allow the omission of END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the contractor will erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
8. Duplicate construction warning signs should be erected on the median side of divided highways where median width will permit and traffic volumes justifies the signing.
9. Except for devices required by Note 6, traffic control devices should be in place only while work is actually in progress or a definite need exists.
10. Sign size should be based on the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways" (TMUTCD).
11. The Special Public Information sign (SG20-8) shall be installed at the project limits when required elsewhere in the plans. Refer to SMD Standards for approved mounting details.

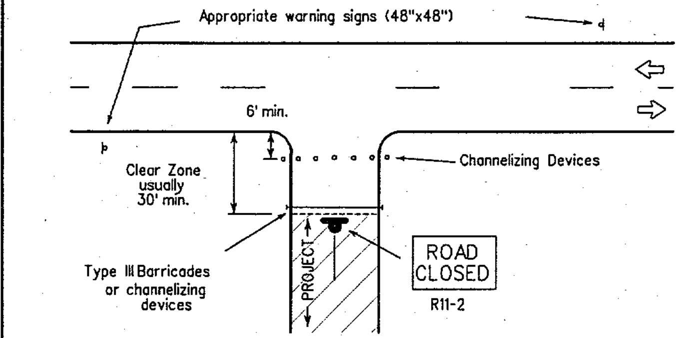


PROJECT LIMITS AT T-INTERSECTION

1. The ROAD WORK NEXT X MILES sign should be erected on the intersected highway as detailed above.
2. On the intersected roadway, additional traffic control devices, such as a flagger and accompanying signs or other signs, should be used when work is being performed at or near the intersection.

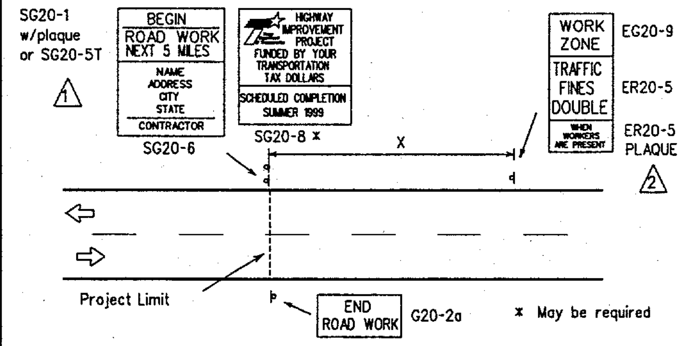


CROSSROAD SIGNING AND BARRICADING



PROJECT LIMITS FOR CLOSED ROADWAY

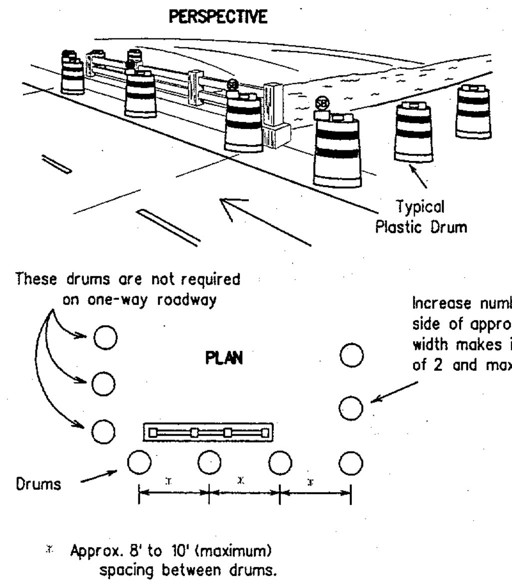
Barricades or channelizing devices shall be erected completely across roadway. Channelizing Devices may be drums, vertical panels or cones as specified in the plans.



PROJECT LIMITS AWAY FROM WORK AREA

(Greater than 1 mile between project limits and work area)

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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 Panel on flexible support may be substituted for drums when shoulder width is less than 4'.
4). When shoulder width is greater than 12', steady-burn lights may be omitted, if drums are used.

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

CROSSROAD SIGNING AND BARRICADING

1. Except as noted elsewhere in plans, the usual minimum signing on a cross-road approach should be one CW20-1D ROAD WORK AHEAD sign and G20-2a END ROAD WORK sign. Where speeds and volumes are relatively low, a smaller ROAD WORK AHEAD sign may be used.

When approved by the Engineer, on low volume crossroads, advance warning signs may be the reduced size 36" x 36" ROAD WORK AHEAD (MCW20-1D) sign mounted back to back with the reduced size 36" x 18" END ROAD WORK (SG20-2a) sign. See the "STANDARD HIGHWAY SIGN DESIGNS for TEXAS" manual and BC(9) thru BC(9C) for sign design details. On low volume crossroads, advance signing may be omitted if approved by the Engineer.

Additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs may be required. When additional signs are required, such signs will be considered part of the minimum requirements.

2. The G20-1a sign shall be required on major crossroads to advise motorists of the length of construction in either direction from the intersection.
3. On higher volume crossroads additional traffic control devices may be noted elsewhere in the plans.
4. When work occurs in the intersection area, appropriate traffic control devices shall be in place.

WARNING LIGHTS

Warning lights shall meet the requirements of the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways."

Warning lights shall NOT be installed on barricades.

Type A-Low Intensity Flashing Warning Lights are commonly used with signs. They are intended to warn of an approaching potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation " FL "( )

Type-C Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation " SB "( )

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

1.5.6

Roadway Classi-fication	Posted Speed	Sign Spacing "X" Δ	Long-term Or Intermediate-term Stationary Approach Warning Signs CW20 Series And CW22-1 Sign		Short-term Stationary Or Short Duration Approach Warning Signs CW21 Series		Other Warning Signs
	MPH	Feet (Apprx.)	Standard inches	Minimum inches [4]	Standard inches [7]	Minimum inches [4] [7]	Standard inches [7]
Conven.	30	120	48 x 48	36 x 36	30 x 30 or 36 x 36	24 x 24 or 30 x 30	30 x 30 or 36 x 36
↓	35	160	↓	↓	↓	↓	↓
↓	40	240	↓	↓	↓	↓	↓
↓	45	320	↓	Use Standard Size	↓	Use Standard Size	↓
↓	50	400	↓	↓	↓	↓	↓
↓	55	500 [2]	↓	↓	↓	↓	↓
↓	60	600 [2]	↓	↓	48 x 48	↓	48 x 48
↓	65	700 [2]	↓	↓	↓	↓	↓
↓	70	800 [2]	↓	↓	↓	↓	↓
Exp or Frwy	x	x [3]	↓	↓	x x	x x	x x

x For typical sign spacings on expressways and freeways, see TMUTCD typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to 1st Advance Warning sign and/or distance between each additional sign.

x x Smaller sign sizes may be used where sign designs have been included in the "Standard Highway Sign Designs for Texas" manual.

General Notes:
1. Special or larger size signs may be used as may be necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. For use only on secondary roads or city streets where speeds are low.
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in TMUTCD, Appendix A for complete list of all available sign design sizes.
7. Where two sizes are listed, see sign size listing in TMUTCD, Appendix A for proper size.

Only pre-qualified products shall be used. A list of compliant products and their sources may be obtained by writing or faxing:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3181
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

10/99 Revision

Δ1 Added "BEGIN" to "ROADWORK NEXT XX MILES" sign

Δ2 Added "WHEN WORKERS ARE PRESENT" plaque

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

ADVANCE SIGNING
CROSSROAD SIGNING
WARNING LIGHTS

BC(1)-99

DN: LR	CK: DTN	DW: DN	CK: GB	REG NO.

REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
10-99		6		24
	COUNTY	CONTROL	SECTION	JOB / HIGHWAY

GENERAL NOTES

FOR TYPE III BARRICADES

Type III Barricades are to be used at each end of construction projects closed to all traffic.

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 for, the chevron striping may slope downward in both directions from the center of the barricade.

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 to the right.

Identification markings may be shown only on back side of barricade rails. Maximum height of letters shall be 1 inch.

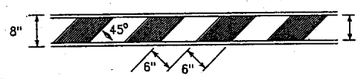
Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided (see BC(1)).

Barricades shall be made using pre-qualified materials. A list of compliant products and their sources may be obtained by writing or faxing:

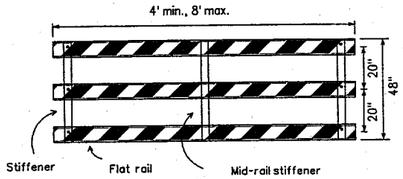
Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

Barricades shall NOT be used as a sign support.

TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



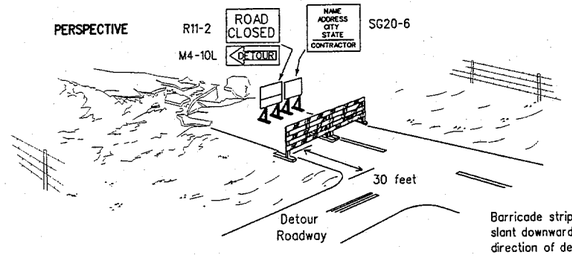
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



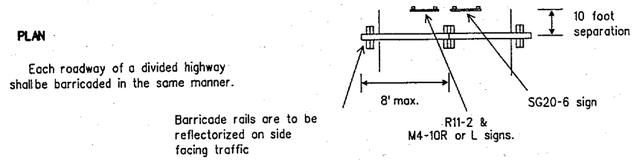
Stiffner may be inside or outside of support.

* For dimensions of components refer to TxDOT approved products list.

TYPE III BARRICADE (SKID)



(Use M4-10R or L sign only when Detour begins at barricade)

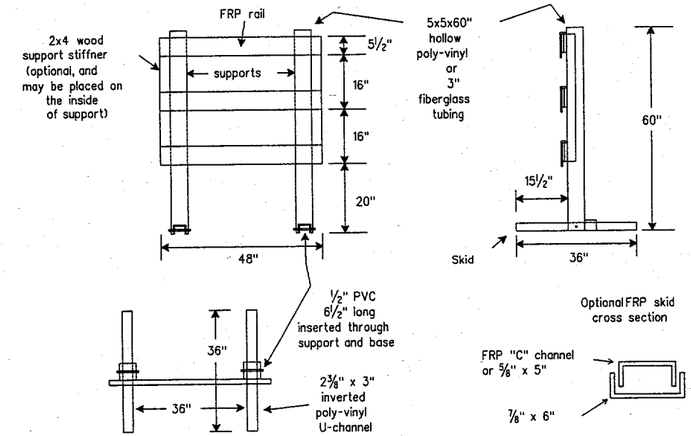


Each roadway of a divided highway shall be barricaded in the same manner.

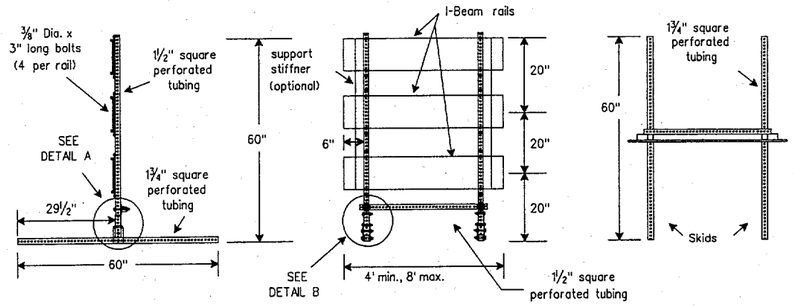
1). R11-2 and M4-10 signs should be mounted on independent supports at 7 foot mounting height in center of roadway.

2). Advance signing, including construction warning signs, and detour signing shall be as specified elsewhere in the plans.

PLASTIC/FIBERGLASS TYPE III BARRICADE OPTION

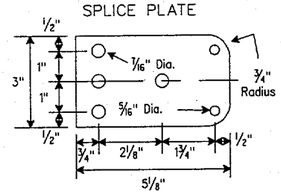


PERFORATED STEEL/WOOD/PLASTIC TYPE III BARRICADE OPTION

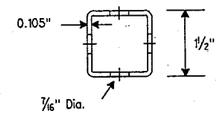


NOTE: If flat rails are used, refer to Wood/Plastic Option for vertical placement of rails

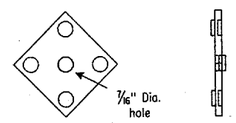
SPLICE PLATE



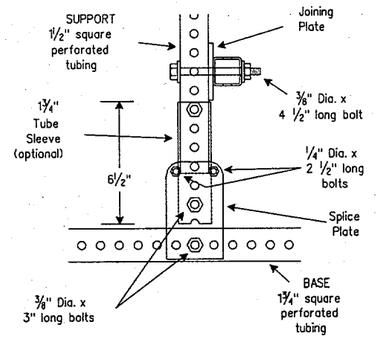
1½" PERFORATED SQUARE STEEL TUBE



JOINING PLATE

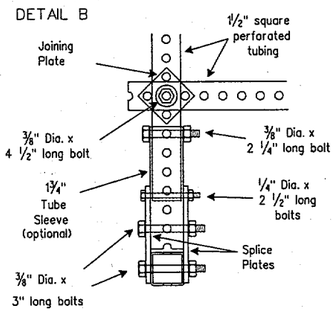


DETAIL A

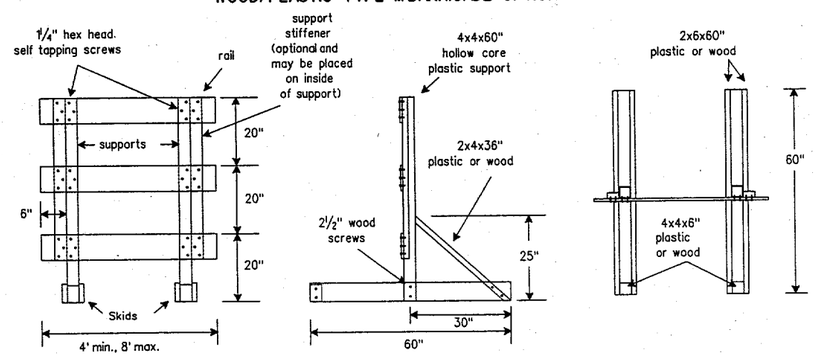


(Option: tube sleeve and base may be welded)

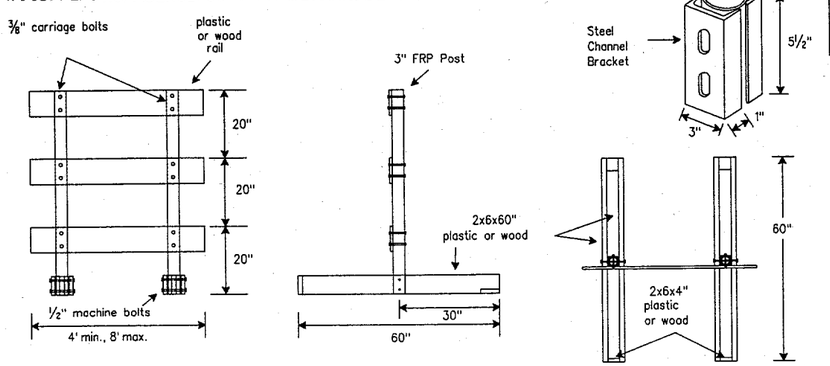
DETAIL B



WOOD/PLASTIC TYPE III BARRICADE OPTION



WOOD/PLASTIC/FIBERGLASS TYPE III BARRICADE OPTION



STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

BARRICADES (SKID MOUNT TYPE)

BC(2)-98

LEVELS DISPLAYED																DATE:
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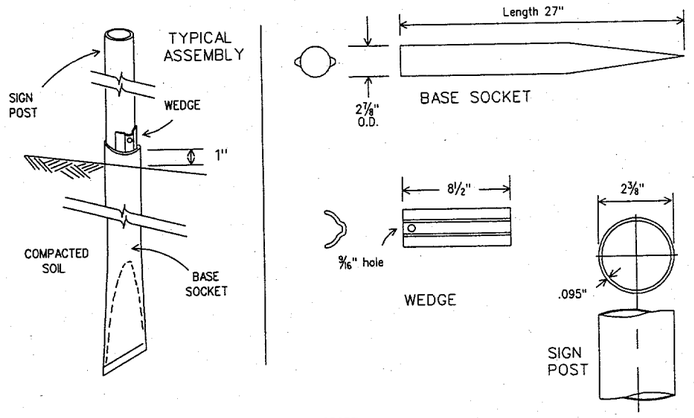
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63		

DI:
CK:
DW:
CK:

DGN: LR	CK: DTN	DW: DN	CK: GB	REQ. NO.:
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
	6			25
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

TYPE III BARRICADE (POST TYPE)

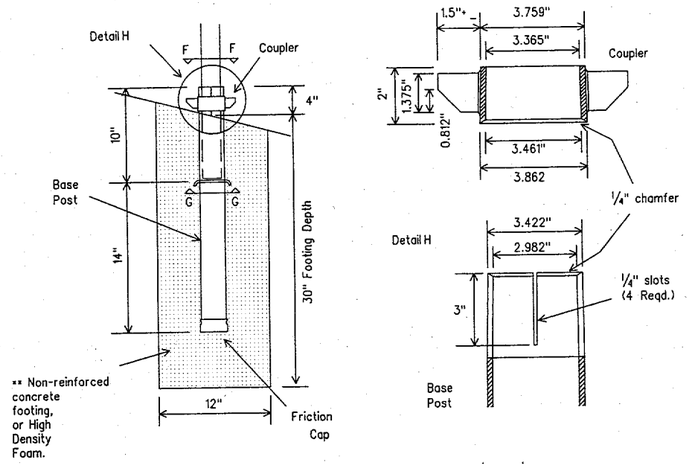
POZ-LOC
(Driveable)



GENERAL NOTES FOR THIN WALL TUBE TYPE SIGN SUPPORT:

1. The BASE SOCKET is formed from 2⅞" O.D. x 12 gauge galvanized pipe.
2. The WEDGE is formed from 11 gauge steel galvanized per ASTM A525.
3. The SIGN POST is 2.375" O.D. x 0.095" thin wall steel tubing.
4. Steel Supports shall be made from new material and shall be corrosion resistant. Steel supports shall be galvanized in accordance with ASTM Designations A123 or A525 (G-90 or better).
5. Supports shall be straight within ¼" per 5 feet of length and shall have a smooth, uniform finish free from defects affecting strength or appearance. Any bolt holes and sheared ends shall be free from burrs. Bases of multisection supports shall not extend more than 5 inches above ground when installed.
6. Bolts, nuts, screws, washers and other miscellaneous hardware shall be galvanized in accordance to ASTM Designation: A153 Class C or D, or B695 Class 50.
7. Barricade supports systems used on this sheet may be suitable for only certain soil types. The contractor is responsible for selecting the appropriate support system for soil conditions on each project.

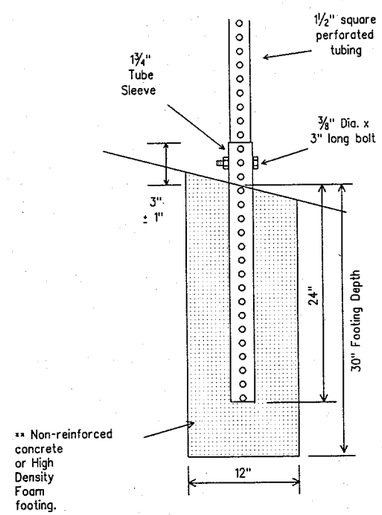
UNIVERSAL ANCHOR SYSTEM



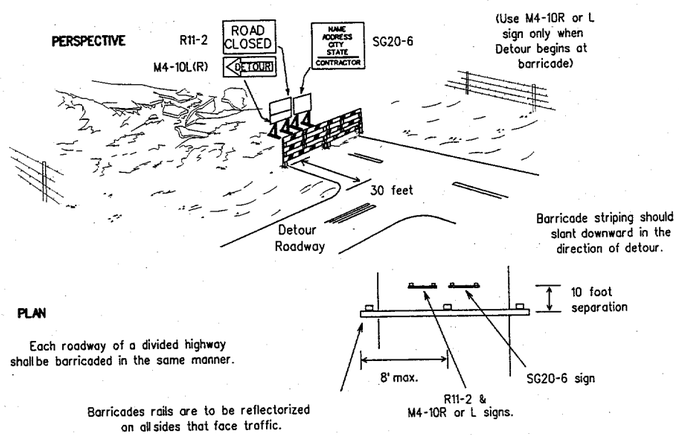
* Plastic insert must be used with 1/16" thin wall tubing.

** Footing shall be removed and backfilled when barricade is removed.

SQUARE TUBING



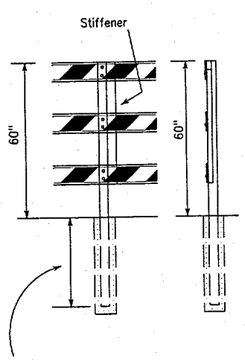
TYPE III BARRICADE (POST TYPE) TYPICAL APPLICATION



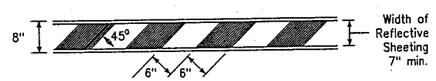
1). R11-2 and M4-10 signs should be mounted on independent supports at 7 foot mounting height in center of roadway.

2). Advance signing, including construction warning signs, and detour signing shall be as specified elsewhere in the plans.

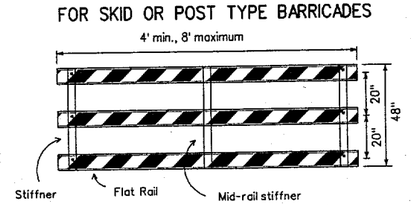
TYPE III BARRICADE (POST)



TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



Stiffner may be inside or outside of support.

* For dimensions of components refer to TxDOT approved products list.

Barricades shall NOT be used as a sign support.

Barricades shall be made using pre-qualified materials. A list of compliant products and their sources may be obtained by writing or faxing:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

BARRICADES
(POST TYPE)

BC(3)-98

©TxDOT February 1998	DN: LR	CK: DTN	DW: DN	CK: GB	REV. NO.
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
		6			26
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

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.

LEVELS DISPLAYED																DN:
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	CK:
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49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	

DATE:
ACC:
FILE:

LEVELS DISPLAYED
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33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64

DN:
CK:
DW:
CK:
DATE:
ACC:
FILE:

GENERAL NOTES:

1. Sign Supports detailed on this sheet have been crash tested and are approved breakaway systems. TxDOT acceptance of these breakaway systems does not cover the structural features of the sign support systems.
2. Sign support systems approved by FHWA may be used as approved fixed sign supports, as long as they meet TxDOT minimum sign height requirements. The contractor shall provide documentation from FHWA approving sign support systems not shown on this sheet.
3. Sign support systems listed on this sheet may be suitable for only certain soil types. The contractor is responsible for selecting appropriate sign support systems for soil conditions on each project.
4. Barricades shall NOT be used as sign supports.

WORK ZONE SIGNS

GENERAL

Standard signs shall be used as required by the BC Standard sheets, the plans, or as directed by the Engineer to regulate, warn, and guide traffic. All sign usage and erection shall be in strict accordance with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways" (TMUTCD). The Contractor shall maintain each sign as directed by the Engineer.

The Contractor may use either the sign designs shown on the BC Standard Sheets, or those sign designs shown in the "Standard Highway Sign Designs for Texas" (SHSD). All work zone signs provided for in the TMUTCD but not detailed in the plans may be used when directed by the Engineer.

SIZE OF SIGNS

On secondary roads or city streets where speeds are low, smaller size construction warning signs may be used with the written approval of the Engineer and if the sign size is in accordance with the "Typical Construction Warning Sign Size and Spacing Chart" shown on page 6C-11 of the TMUTCD, Part VI.

SPLICES

All wooden sign panels fabricated from 2 or more pieces shall have one or more plywood cleats, 1/2 inch thick by 6 inches wide, fastened to the back of the sign and extending fully across the sign.

Wood Sign posts shall not be spliced.

REFLECTIVE SHEETING

Reflectorized signs shall be constructed of retroreflective sheeting meeting the color and reflectivity requirements of TxDOT Material Specification DMS 8300 or DMS 8310. Day only is defined as a device that is used only during daylight hours.

Type A, B or C sheeting may be used for all day only applications. Type A sheeting should be used for all white background regulatory signs. Type C sheeting shall be used for all other applications.

The above applications of sheeting grades to different type signs will apply unless otherwise specified in the plans.

TYPE A - Engineer Grade, TYPE B - Super Engineer Grade, TYPE C - High Specific Intensity

SIGN LETTERS

All sign lettering shall be clear, open rounded type capital letters as approved by and as published by the Federal Highway Administration (FHWA). Signs and lettering shall be of first class workmanship equivalent to that of the Department standard signs.

WORK DURATION TERMINOLOGY-(as defined by the "Texas Manual on Uniform Traffic Control Devices" Part VI)

Long-term Stationary - occupies a location 3 or more days;
Intermediate-term Stationary - occupies a location from overnight to 3 days;
Short-term Stationary - daylight work that occupies a location from 1 to 12 hours;
Short Duration - occupies a location up to 1 hour.

SUPPORTS AND MOUNTING HEIGHT

The bottom of Long-term / Intermediate-term signs shall be at least 7 feet above the paved surface. The bottom of any supplementary plaques shall be at least 6 feet above the paved surface.

The bottom of Short-term / Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground. Long-term / Intermediate-term Signs may be used in lieu of Short-term / Short Duration signing. Short-term / Short Durations signs shall be used only during daylight and removed at the end of the workday.

Regulatory signs shall be mounted at least 7 feet above the paved surface regardless of work duration.

Wood sign supports shall be painted white.

SIGN SUPPORT WEIGHTS

Where sign supports require the use of weights to keep from turning over, the use of some type of sandbag is recommended. The use of pieces of rock, concrete, iron, steel or other solid objects will not be permitted.

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.

REMOVING OR COVERING

When sign messages may be confusing or no longer apply, the signs shall be removed or completely covered. When signs are covered the material used shall be opaque, such as heavy mil black plastic. Burlap shall not be used to cover signs. Signs shall be removed upon completion of the work.

Duct tape or other adhesive material shall not be affixed to sign face.

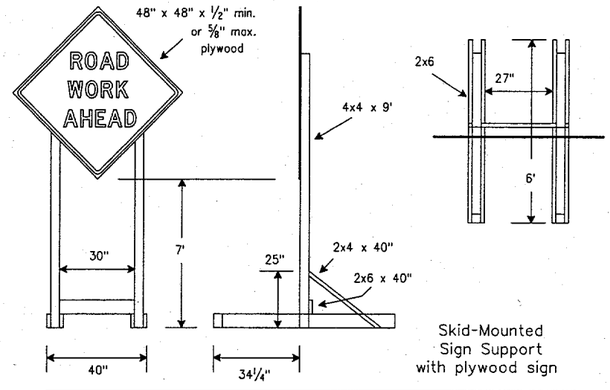
Only pre-qualified products shall be used. A list of compliant products and their sources may be obtained by writing or faxing:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

LONG/INTERMEDIATE TERM STATIONARY PORTABLE SIGN SUPPORTS

7 Foot Mounting Height

(SKID MOUNTED)



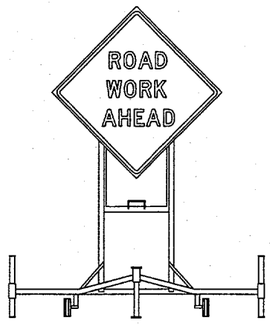
Skid-Mounted Sign Support with plywood sign

(POST TYPE)

Refer to acceptable products list.

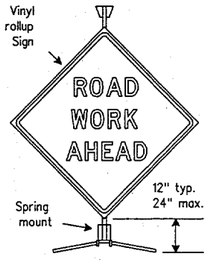
WHEELED PORTABLE SIGN SUPPORT

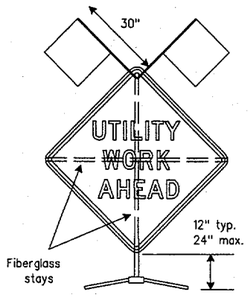
with plywood sign
(Minimum thickness 1/2inch)
TxDOT Design



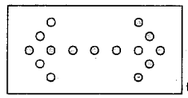
SHORT TERM STATIONARY/SHORT DURATION PORTABLE SIGN SUPPORTS

1 Foot Mounting Height





TYPICAL FLASHING ARROW PANEL



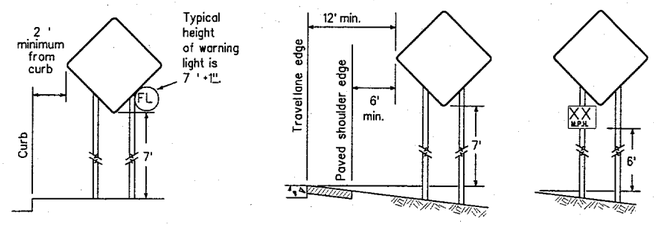
For traffic to move right.

ATTENTION: Arrow panels shall be equipped with automatic dimming devices.

1. The Advance Warning Flashing Arrow Panel should be used for all lane closures (multilane roadway), or slow moving maintenance or construction activities on the traveled way. Arrow panels should not be used on two-lane roadways, detours, diversions or work on shoulders unless the CAUTION mode is used.
2. Necessary signs, barricades or other traffic control devices should be used in conjunction with the Advance Warning Arrow Panel.
3. The Arrow panel should have the capability of the following display selections: LEFT ARROW, RIGHT ARROW, LEFT and RIGHT ARROW and CAUTION. The CAUTION mode consists of four corner lamps flashing simultaneously.
4. The Arrow panel shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 times per minute nor more than 40 flashes per minute. The Advance Warning Flashing Arrow Panel shall be mounted on a vehicle, trailer or other suitable support.
5. Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and 25 percent for the sequential chevron.
6. The TxDOT standard is the flashing arrow, however, the sequential chevron may be used during daylight operations. The sequential arrow should NOT be used.

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

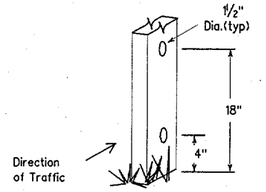
TYPICAL MINIMUM CLEARANCES FOR LONG/INTERMEDIATE TERM SIGNS



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

WOOD POST SYSTEM FOR FIXED SIGN SUPPORTS

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



10/99 Revision

1 Added 2 post - 4 x 6 sign support

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

SIGN SUPPORTS

BC(4)-99

©TxDOT February 1998	DN: LR	CK: DTN	DW: DN	CK: GB	FED. NO.
REVISIONS 10-99	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
		6			27
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

DATE:
FILE:
DN:
CK:
DW:
CK:

GENERAL NOTES

Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

Only pre-qualified products shall be used. A list of compliant products and their sources may be obtained by writing or faxing:

Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD@mailgw.dot.state.tx.us

Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects which would adversely affect their appearance or serviceability.

After drums and other traffic control devices are placed, the work zone should be driven through both during the day and after dark to be certain that these devices are functioning as intended.

PLASTIC DRUM - Prequalified plastic drums shall meet the following requirements.

GENERAL DESIGN REQUIREMENTS

Plastic drums shall be of a two-piece design: the "body" of the drum shall be the top portion of the drum and the "base" shall be the bottom of the drum.

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 35 km/h or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles. Plastic drums that have been in use for more than two years generally do not have enough locking strength to prevent accidental separation. Plastic drums identified for replacement by the project engineer, inspector or their designee shall be replaced within 24 hours with an approved device.

Plastic drums shall be constructed of lightweight flexible, and deformable materials. Use of metal drums or single piece plastic drums as channelization devices or sign supports shall not be allowed.

Drums shall present a profile that is a minimum of 18 inches in width at the 36 inches 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.

Drums shall be tapered to allow nesting of a minimum of 5 drum bodies for ease in transport.

The top of 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 14mm diameter holes to allow attachment of a warning light, delineator reflector unit or sign.

The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches in width nor greater than 8 inches. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.

Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.

Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.

Drum body shall have a minimum unballasted weight of 7.7 lbs. and maximum unballasted weight of 11 lbs. The wall of the drum body shall be a minimum of 0.07 inch in thickness. Weight of any drum supplied shall not vary more than 0.5 lb. from that of the prequalified sample.

Drum and base shall be marked with manufacture's name, model number, and year and month of construction.

RETROREFLECTIVE SHEETING

The retroreflective stripes used on drums shall be constructed of retroreflective sheeting meeting the color and reflectivity requirements of Departmental Materials Specification D-9-8300: Flat Surface Reflective Sheeting, Type C unless otherwise specified in the plans.

Drums used only during daylight hours may use any type of sheeting meeting the color and retroreflective color requirements of Departmental Materials Specification D-9-8300.

The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, checking, cracking, or loss of reflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

Unballasted bases shall be large enough to hold up to 50 lbs. of sand. Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs.

The ballasted base should weigh between 35 (minimum) and 75 lbs. (maximum). The ballast may be sand in one to three sand bags separate from the base, sand in a sand-filled plastic base, a integral crumb rubber base and ballast or other ballasting devices as approved by the Engineer. Stacking of sand bags will be allowed, however height of sand bags above pavement surface may not exceed 12 inches.

The ballasts shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle. When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle. Ballast shall not be placed on top of drums

Adhesives may be used to secure base of drums to pavement.

SIGNS, CHEVRONS, AND VERTICAL PANELS

Signs used on plastic drums shall be manufactured using substrates listed on the Compliant Products List.

Chevrons and other work zone signs with an orange background shall be manufactured with Type C (high intensity grade) retroreflective sheeting meeting the color and reflectivity requirements of "Departmental Materials Specification D-9-8300: Flat Surface Reflective Sheeting, Type C" unless otherwise specified in the plans.

Signs with white backgrounds, such as the KEEP RIGHT sign (R4-8 series), shall be manufactured with Type A (engineer grade) sheeting.

Approved sign messages for signs mounted on plastic drums are the Chevron (CW1-8), the KEEP RIGHT/LEFT sign (R4-7 or R4-8 series), the Vertical Panel, and the Opposing Lane Divider. 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. Refer to acceptable materials list for approved substrate materials. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled way.

Signs shall be installed using one 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than ½" beyond nuts. The hardware used for the mounting of signs onto plastic drums shall be of adequate quality for this use.

WARNING LIGHTS, WARNING REFLECTORS, AND DELINEATORS

Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area. Type A flashing warning lights are not intended for delineation and shall not be used in a series.

Type B warning lights shall not be attached to a drum.

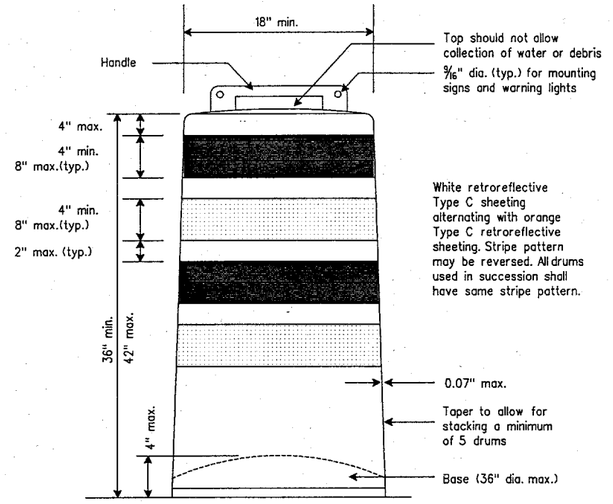
Type C steady-burn warning lights are intended to be used in a series to delineate the edge of the traveled way on detours, on lane changes, on lane closures, and on other similar conditions. Type A and Type C warning lights shall be installed at locations as detailed on other sheets in the plans.

A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, Steady Burn Warning Light at the discretion of the contractor unless otherwise noted in the plans. The warning reflector shall be manufactured from a sign substrate from the approved list for use on plastic drums. The warning reflector shall have a retroreflective surface area (one-side) no less than 30 square inches.

The side of the warning reflector facing approaching traffic shall be fully reflectorized using retroreflective sheeting meeting the color and reflectivity requirements for ASTM Type 4 retroreflective sheeting as described in ASTM Design Standard 4956-93B. When used near two-way traffic, both sides of the warning reflector shall be fully reflectorized. The warning reflector should be mounted on the side of the handle that faces approaching traffic so that the maximum amount of reflective sheeting is visible to traffic approaching in the adjacent lane. Delineators may be used as directed by the Engineer. Delineators may not be used to substitute for warning lights. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.

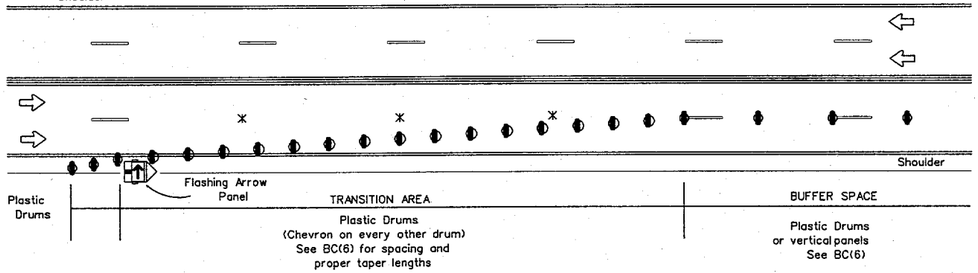
Type(A) Class(1), Type(A) Class(2), or Type(B) Reflector Units (D & OM Standard) may be attached to drums to delineate the intended vehicular path. The color of the reflector unit shall correspond to the marking it is supplementing or for which it is substituting. The reflective unit shall be attached to the handle of the drum using the mounting hole nearest the traveled way and shall be aligned perpendicular to approaching traffic.

Contractor shall provide, on request from project engineer, a letter from the drum manfacturer certifying the plastic drum model number, the year and month of construction and that it meets the specifications on this standard sheet.

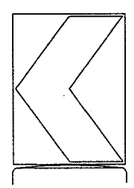


Color sequence of reflective sheeting may be reversed.

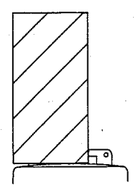
TYPICAL LANE CLOSURE



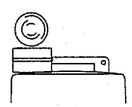
* NOTE: For Long Term Stationary Duration - Lane lines shall be removed.



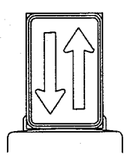
18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8,
Driveway sign D70a,
Keep Right R4 series
or other sign as approved
by Engineer



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



Warning Light or approved substitute
mount towards travel way



12" x 18" Sign
Opposing Lane Divider

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

PLASTIC DRUMS **BC(5)-98**

©TxDOT February 1998	DN: LR	CK: DTN	DW: DN	CK: DN	REC NO.:
REVISIONS 4-98	STATE DISTRICT: 6	FEDERAL ROAD DIVISION	FEDERAL AID PROJECT		SHEET: 28
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64

DN: DATE:
CK: DW: ACC:
CK: FILE:

GENERAL NOTES:

SELF-RIGHTING SUPPORTS

1. Channelizing devices on self-righting supports may be a vertical panel, opposing lane divider or chevron.
2. Channelizing devices on self-righting supports shall be used at locations detailed elsewhere in the plans. These devices shall conform to the "Texas Manual on Uniform Traffic Control Devices". Type of base will be as directed by the Engineer.
3. Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles. Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. Devices should not be placed within 12 inches of the traveled way. Spacing and placement shall be uniform and in accordance with the "Texas MUTCD".
4. The contractor shall maintain devices in a clean condition and replace damaged, non-reflective, faded, or broken devices and bases as necessary.
5. Devices shall be erected by method shown on this sheet and as approved by the Engineer.
6. Portable bases shall be fabricated from virgin and/or recycled rubber. Approximate weight of portable bases shall be 35 lbs.
7. Pavement surfaces shall be prepared in a manner that will ensure proper bonding of adhesives and fixed mount bases to the pavement surfaces when required. Adhesives shall be prepared and applied as per manufacturers recommendations.
8. Application and removal of devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface intregity. Driveable bases shall not be permitted on final pavement surfaces. All application and removal procedures of fixed bases shall be approved by the Engineer.
9. These devices shall not be paid for directly but shall be considered subsidiary to the Item "Barricades, Signs, and Traffic Handling."

CONES

1. Traffic cones and tubular markers shall be a minimum of 28 inches in height when used on freeways or used at nighttime. Orange shall be the predominant color of cones and tubular markers. They should be kept clean and bright for maximum visibility. Cones shall have a minimum weight of 9½lbs.
2. For nighttime use, cones shall be reflectorized. Reflectorized material shall have a smooth, sealed outer surface which will display the same approximate color day and night. When used at night, appropriate personnel shall be present at all times to ensure cones and tubular markers remain in their proper location and in an upright position.
3. Reflectorization of cones shall be a minimum 6 inch band placed at least 3 inches but not more than 4 inches from the top, supplemented by a minimum 4 inch band spaced a minimum of 2 inches below the 6 inch band. Reflectorization of tubular markers shall be a minimum of two 3 inch bands placed a maximum of 2 inches from the top with a maximum of 6 inches between bands.
4. One-piece cones or tubular markers are generally suitable for temporary usage (up to 8 hours) with other channelization devices such as vertical panels, drums or two-piece cones for long term usage. Care should be taken to ensure that they remain in their proper location and in an upright position.
5. *-SPRAF (stacking/placement/removal assistance feature) may be designed as a handle, hook or other shape, fabricated from non-rigid materials similar to the cone material, and may extend up to a maximum of 8 inches above the top of cone. The length of the SPRAF shall not be considered with regard to the 28 inch minimum height.

DRUMS

Refer to BC(5).

SPECIFICATION REFERENCE TABLE
MATERIALS AND TEST SPECIFICATIONS (D-9)

FLAT SURFACE REFLECTIVE SHEETING, TYPE C (HIGH SPECIFIC INTENSITY)	D-9-8300

Only pre-qualified products shall be used. A List of compliant products and their sources may be obtained by writing, calling or faxing:

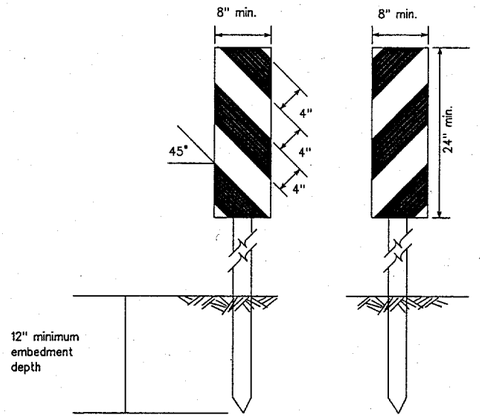
Standards Engineer
Traffic Operations Division - TE
Texas Department of Transportation (TxDOT)
125 East 11th Street
Austin, Texas 78701-2483
Phone (512) 416-3120
Fax (512) 416-3161
E-mail TRF-STANDARD @ mailgw.dot.state.tx.us

Posted Speed x	Formula	Minimum Desirable Taper Lengths x x 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Device On a Taper	On a Tangent	Minimum Sign Spacing X Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'-75'	120'
35		205'	225'	245'	35'	70'-90'	160'
40		265'	295'	320'	40'	80'-100'	240'
45	L=WS	450'	495'	540'	45'	90'-110'	320'
50		500'	550'	600'	50'	100'-125'	400'
55		550'	605'	660'	55'	110'-140'	500'
60		600'	660'	720'	60'	120'-150'	x 600'
65		650'	715'	780'	65'	130'-165'	x 700'
70		700'	770'	840'	70'	140'-175'	x 800'

x Conventional Roads Only

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

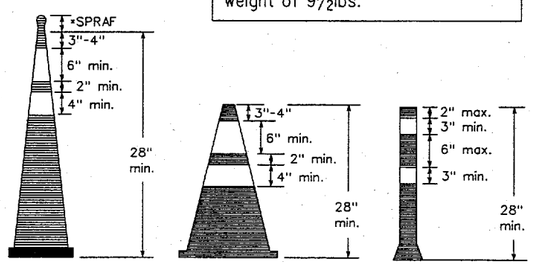
DRIVEABLE RIGID VERTICAL PANEL



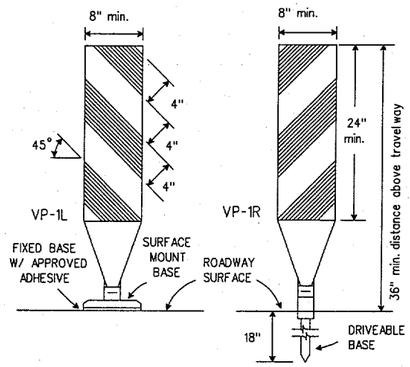
See Compliant Products List for supports and panel substrates

CONES

Cones shall have a minimum weight of 9½lbs.



SELF-RIGHTING SUPPORTS



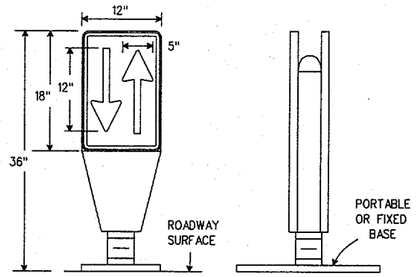
VERTICAL PANELS

Vertical Panels are normally used as channelizing devices to indicate tangent or nearly tangent roadway alignment where good target value of a device is needed in daytime as well as nighttime. In addition, vertical panels should be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation may be required. Vertical panels should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the traveled way. Vertical Panels used on expressways, freeways, and other high speed roadways shall have a minimum of 2 square feet of retroreflective area facing traffic.

Self-righting supports are available with portable base. See Compliant Products List.

OPPOSING LANE DIVIDER

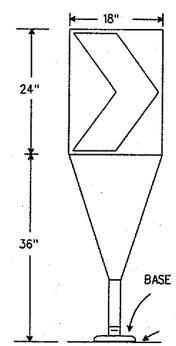
with Portable or Fixed Base Support



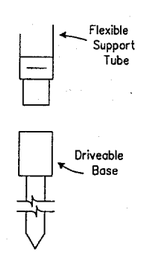
REFLECTIVE ORANGE BACKGROUND WITH BLACK ARROWS AND BORDER.

CHEVRON

with Flexible Support

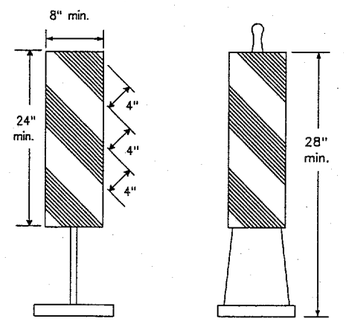


DRIVEABLE BASE



Driveable Support for Vertical Panel VP(F)-1 or Chevron CW1-8(F).

PORTABLE RIGID VERTICAL PANEL



See Compliant Products List for alternate designs.

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

CHANNELIZING DEVICES
CONES

BC(6)-98

©TxDOT February 1998	DN: LR	CK: DTN	DW: DN	CK: GB	FILE NO.
REVISIONS	STATE DISTRICT	FEDERAL ROADWAY	FEDERAL AID PROJECT		SHEET
	6				29
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

WORK ZONE PAVEMENT MARKINGS

GENERAL

The Contractor shall be responsible for maintaining work zone and existing pavement markings on all roadways open to traffic within the projects limits unless otherwise stated in the plans. Color, patterns, and dimensions shall be in conformance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Additional supplemental pavement marking details may be found in the plans or specifications.

Work zone pavement markings shall consist of guidemarks, short term markings and/or standard pavement markings. Unless otherwise shown in the plans, materials used for work zone pavement markings shall be thermoplastic, raised pavement markers, prefabricated pavement marking material, temporary flexible-reflective roadway marker tabs or other materials approved by the Engineer. Thermoplastic shall not be used for removable markings.

All roadways to be opened to traffic shall be marked with short term markings or standard markings as shown in the plans, at the end of each day's operation. Unless otherwise shown in the plans or approved in writing by the Engineer, all concrete surfaces shall have standard markings in place prior to opening to traffic.

Standard pavement markings shall be installed in accordance with the Texas Manual on Uniform Traffic Control Devices (TMUTCD) and as shown on the plans. When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard WZ(STPM).

All asphaltic surfaces which are to be opened to traffic shall be marked with guidemarks immediately following placement and final rolling of any course. Guidemarks shall consist of a single temporary flexible-reflective roadway marker tab or a single temporary construction raised pavement marker at 40 foot spacing.

Guidemarks shall be placed in proper alignment with the final location of future pavement markings. Any guidemarks not in alignment with pavement markings shall be removed by the Contractor at the Contractor's expense. Guidemarks shall not be used to simulate edgelines.

When inclement weather prohibits the application of short term markings or standard markings as called for on the plans, upon approval of the Engineer, guidemarks may be considered as temporary short term markings for asphaltic surfaces. The placement of pavement markings as shown on the plans may be delayed until such time that weather permits application of pavement markings.

When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of the sections where passing is permitted.

RAISED PAVEMENT MARKERS

Raised pavement markers are to be placed according to the patterns on BC(8). Raised pavement markers used as standard pavement markings or to supplement removable markings shall meet the requirements of Item "RAISED PAVEMENT MARKERS".

Unless otherwise shown on the plans, raised pavement markers will not be allowed for words, symbols, and shapes, diagonal or transverse lines.

PREFABRICATED PAVEMENT MARKINGS

Removable prefabricated pavement markings shall be a material of manufacture and product code or designation shown on the list of approved materials covered by the Department Materials Specification D-9-8241.

Non-removable prefabricated pavement markings (foil back) shall be a material of manufacture and product code or designation shown on the list of approved materials covered by the Specification TxDOT 550-74-01.

The lists of approved prefabricated work zone pavement marking materials may be obtained from TxDOT General Services Division.

MAINTENANCE

The Contractor will be responsible for maintaining work zone pavement markings within the project limits. Work Zone Pavement Markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections. The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 165 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics. Markings failing to meet this criteria shall be replaced as required by the Engineer.

REMOVAL OF PAVEMENT MARKINGS

Removal of pavement markings includes centerline, channelizing lines, lane lines, edge lines, words, arrows, symbols and raised pavement markers.

Pavement markings that are no longer applicable and which may create confusion or direct a motorist toward or into the closed portion of the roadway, shall be removed or obliterated before the roadway is open to traffic. The above shall not apply to detours of a short duration of a few hours, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route and the detour is not to be maintained during nighttime.

Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernible marking, by any method that does not materially damage the surface or texture of the pavement. The removal of pavement markings may require resurfacing or seal coating portions of the roadway, normally full lane widths. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used. Blast cleaning may be used but will not be required unless specifically shown in the plans. Over-painting of the markings SHALL NOT BE permitted. Removal of raised pavement markers shall be as directed by the Engineer.

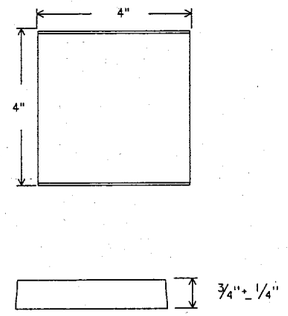
Removal of existing pavement markings and markers will be paid for directly in accordance with the Item "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS" unless otherwise stated elsewhere in the plans.

SPECIFICATION REFERENCE TABLE	
MATERIALS AND TESTS DIVISION SPECIFICATIONS	
JIGGLE BAR TILE	D-9-4100
PAVEMENT MARKERS (REFLECTORIZED)	D-9-4200
TRAFFIC BUTTONS	D-9-4300
EPOXY	D-9-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	D-9-6130
PREFABRICATED PAVEMENT MARKINGS - REMOVABLE	D-9-8241
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS	D-9-8242

PREQUALIFICATION PROCEDURES MAY BE OBTAINED BY WRITING:

GENERAL SERVICES DIVISION
TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT)
125 EAST 11th STREET
AUSTIN, TX 78701-2483

Temporary Construction Raised Pavement Markers used as Guidemarks:



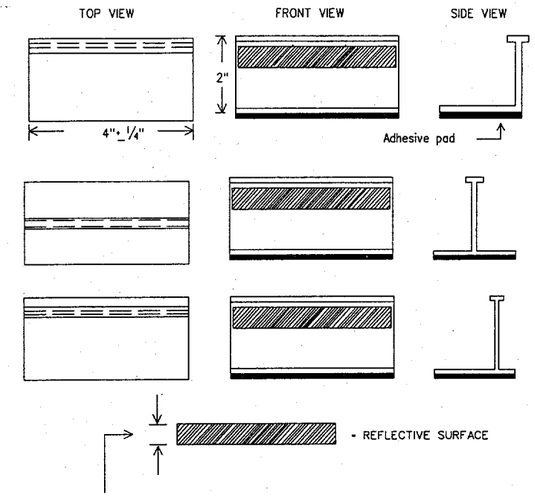
The above temporary construction raised pavement marker is shown for illustration purposes only and not intended to specify any particular product.

Temporary construction raised pavement markers used as guidemarks shall be of design and manufacture approved by the Engineer.

All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.

Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Temporary Flexible-Reflective Roadway Marker Tabs



Height of sheeting will be determined by notes under MAINTENANCE.
(Usually more than 1/4inch and less than 1 inch.)

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

Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of Departmental Material Specification D-9-8242.

Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.

A) Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Tests section to determine specification compliance.

B) Select five (5) tabs and submit to the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with front and rear wheels at a speed of 35 to 40 miles per hour, four times in each direction. No more than one (1) out of five reflective surfaces shall be lost or displaced as a result of this test.

Guidemarks shall be designated as:

YELLOW - (two amber reflective surfaces with yellow body).
WHITE - (one silver reflective surface with white body).

Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4inch, unless otherwise noted.

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

PAVEMENT MARKINGS **BC(7)-98**

©TxDOT April 1992	DW: LR	CK: DTN	DW: DN	CK: GB	REQ NO.:
REVISIONS 2-94 1-97 2-98	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
		6			30
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

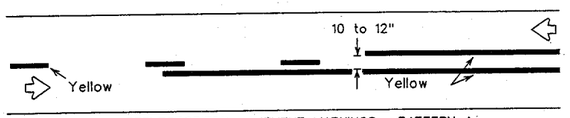
DN:
CK:
DW:
CK:
DATE:
ACC:
FILE:

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

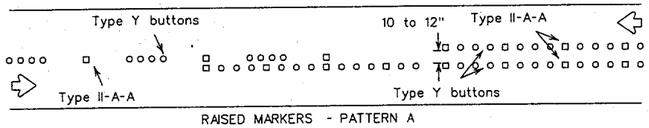
DN: CK: DW: CK:
DATE:
ACC:
FILE:

PAVEMENT MARKING PATTERNS

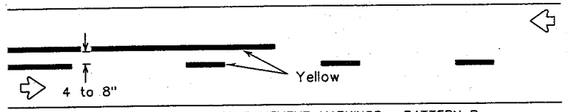
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



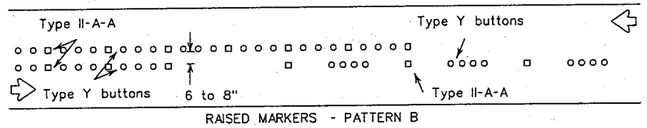
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED MARKERS - PATTERN A

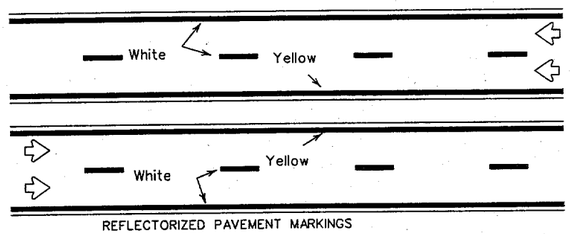


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

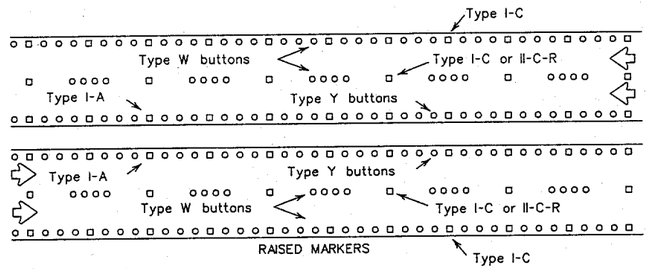


RAISED MARKERS - PATTERN B

EDGE & LANE LINES FOR DIVIDED HIGHWAY

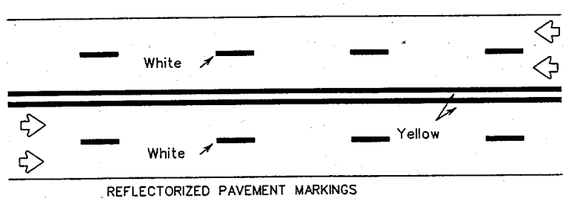


REFLECTORIZED PAVEMENT MARKINGS

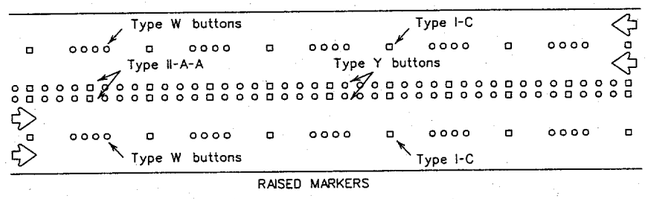


RAISED MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS

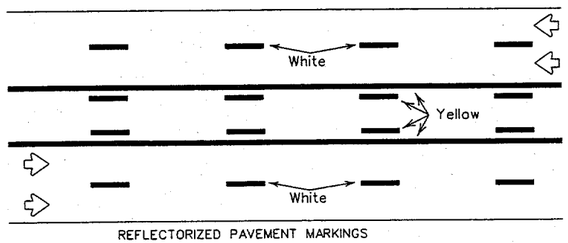


REFLECTORIZED PAVEMENT MARKINGS

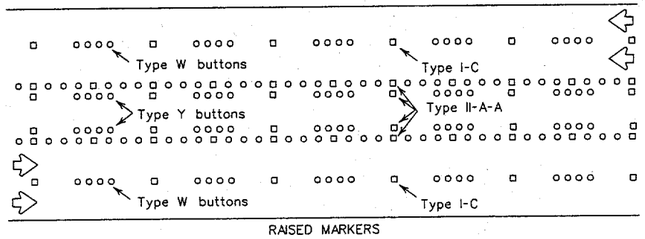


RAISED MARKERS

TWO-WAY LEFT TURN LANE



REFLECTORIZED PAVEMENT MARKINGS

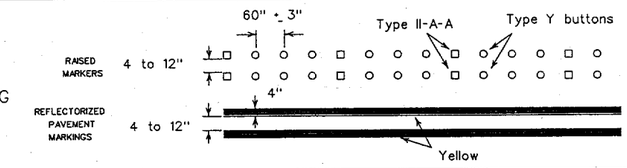


RAISED MARKERS

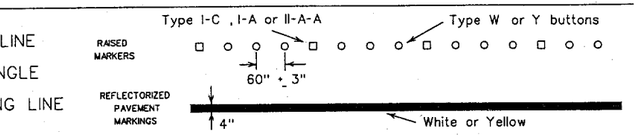
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

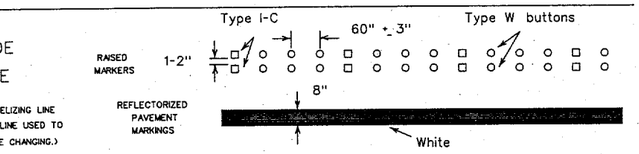


EDGE LINE OR SINGLE NO-PASSING LINE



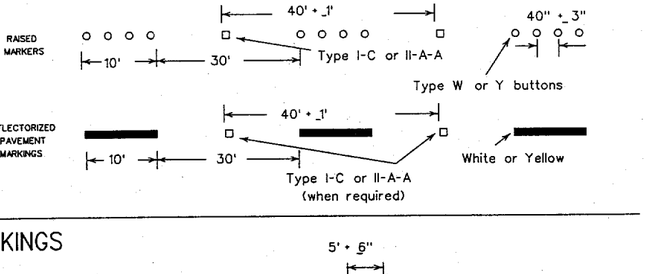
WIDE LINE

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



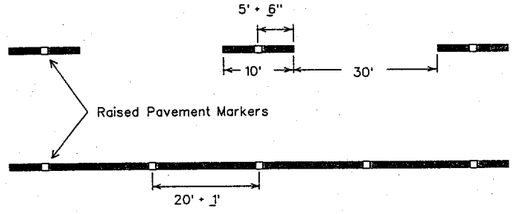
BROKEN LINE

(FOR CENTER LINE OR LANE LINE.)



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



NOTES:
Pattern A is the Department Standard, however Pattern B may be used if approved by the Engineer.
Prefabricated markings may be subsitituted for reflectorized pavement markings.

Raised pavement markers used as standard pavement markings shall meet the requirements of items "RAISED PAVEMENT MARKERS" and "EPOXY AND ADHESIVES."

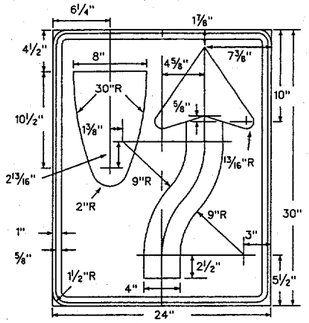
STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

PAVEMENT MARKINGS

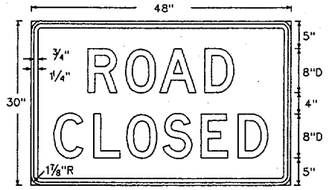
BC(8)-98

©TxDOT April 1992	DN: LR	CK: DTN	DW: DN	CK: GB	REQ NO.
REVISIONS	STATE DISTRICT	FEDERAL FEDERAL	FEDERAL AID PROJECT		SHEET
2-94		6			31
1-97	COUNTY		CONTROL	SECTION	JOB	HIGHWAY
2-98						



R4-7 (R4-8)
24" X 30"

Symbol - Black
Border - Black
Background - White Refl.

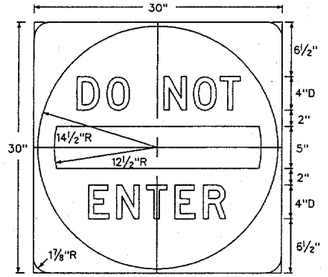


R11-2
48" X 30"

Letters - Black
Border - Black
Background - White Refl.

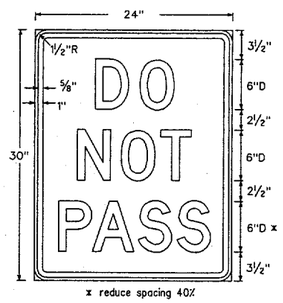
Alternate 1st line legend

STREET I 8"D — R11-2S
RAMP I 8"D — R11-2R
BRIDGE I 8"D — R11-2B



R5-1
30" X 30"

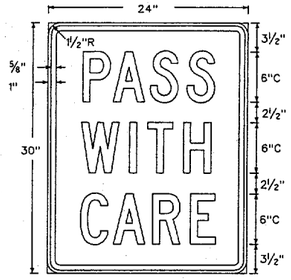
Letters - White Refl.
Bar - White Refl.
Border - White Refl.
Background - Red Refl.



x reduce spacing 40%

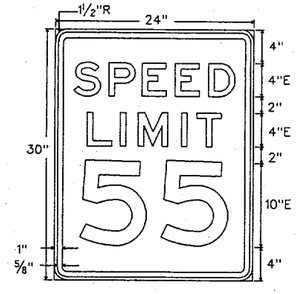
R4-1
24" X 30"

Letters - Black
Border - Black
Background - White Refl.



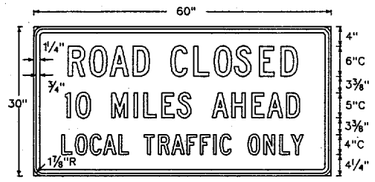
R4-2
24" X 30"

Letters - Black
Border - Black
Background - White Refl.



R2-1
24" X 30"

Letters - Black
Border - Black
Background - White Refl.

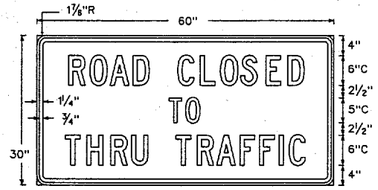


R11-3a
60" X 30"

Letters - Black
Numerals - Black
Border - Black
Background - White Refl.

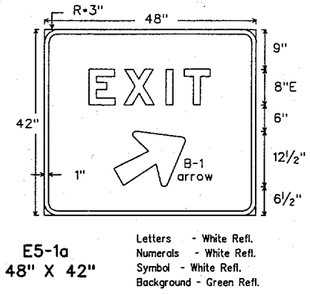
Alternate 1st line legend

BRIDGE OUT I 6"C — R11-3b



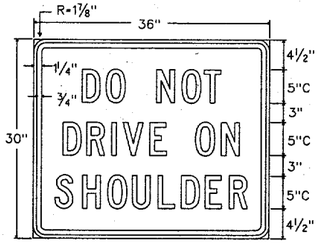
R11-4
60" X 30"

Letters - Black
Border - Black
Background - White Refl.



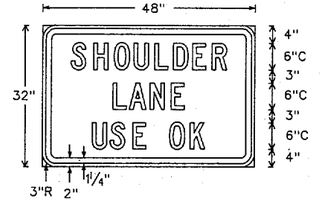
E5-1a
48" X 42"

Letters - White Refl.
Numerals - White Refl.
Symbol - White Refl.
Background - Green Refl.



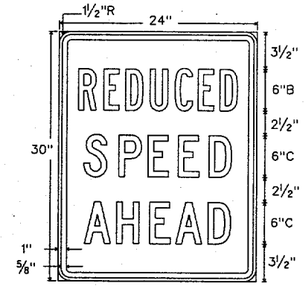
R4-3a
36" X 30"

Letters - Black
Border - Black
Background - White Refl.



R4-3d
48" X 32"

Letters - Black
Border - Black
Background - White Refl.



R2-5a
24" X 30"

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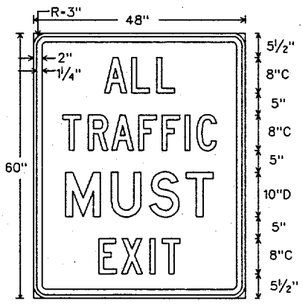
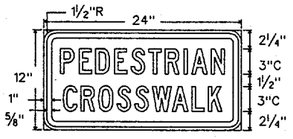
Border - Black
Background - White Refl.



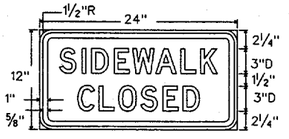
R3-22
48" X 60"

Letters - Black
Border - Black
Background - White Refl.



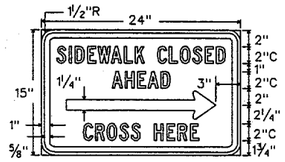
R5-7
24" X 12"

Letters - Black
Border - Black
Background - White Refl.



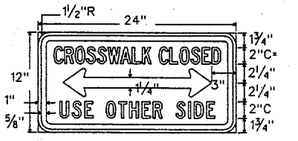
R5-8
24" X 12"

Letters - Black
Border - Black
Background - White Refl.



R5-9a
24" X 15"

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



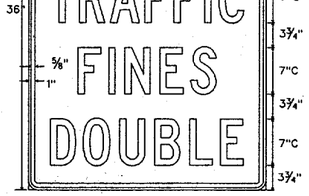
x reduce spacing 40%

R5-9
24" X 12"

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

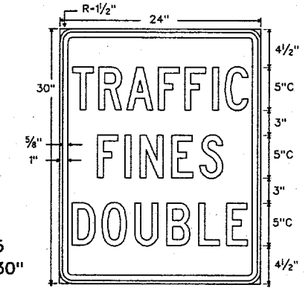
ER20-5
36" X 36"

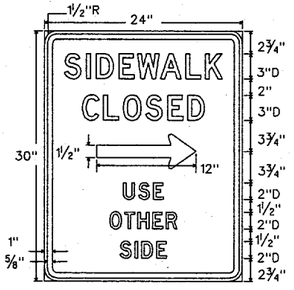
Letters - Black
Border - Black
Background - White Refl.



R20-5
24" X 30"

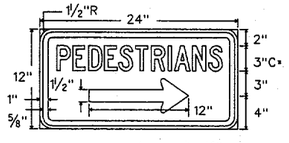
Letters - Black
Border - Black
Background - White Refl.





R5-8T
24" X 30"

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



x reduce spacing 40%

R5-7T
24" X 12"

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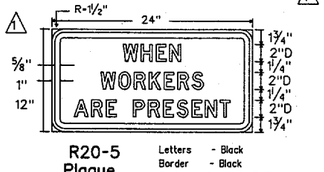
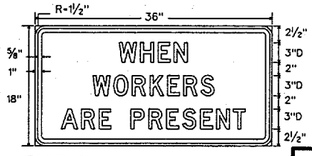
Symbol - Black
Border - Black
Background - White Refl.



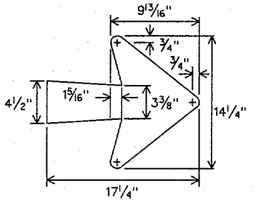
R20-5 Plaque
24" X 12"

Letters - Black
Border - Black
Background - White Refl.

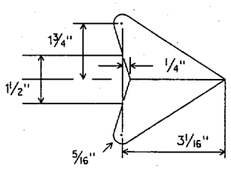


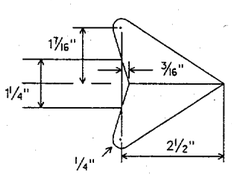
ER20-5 Plaque
36" X 18"

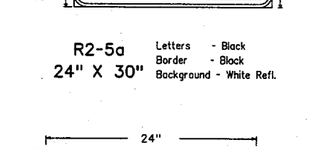
Letters - Black
Border - Black
Background - White Refl.

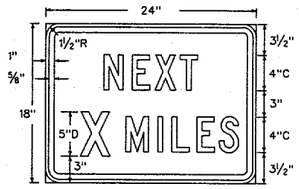


B-1 Arrow Detail









R20-1
24" X 18"

Letters - Black
Border - Black
Background - White Refl.

10/99 Revision
1 Added new sign

LEVELS DISPLAYED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60				

DATE:
ACC:
FILE: B2B3

DI:
CK:
DW:
CK:

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

REGULATORY AND GUIDE SIGNS

BC(9)-99

DN: GB	CK: DTN	DW: DN	CK: GB	DES RSP:

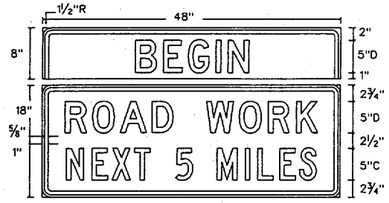
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
10-99		6		32
	COUNTY		CONTROL SECTION JOB	HIGHWAY

LEVELS DISPLAYED

1		4	5	6	7	8	9	10	11	12	13	14	15	16	DATE:	
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	ACC:
33	34	35	55	56	57	58	59	39	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60					FILE:

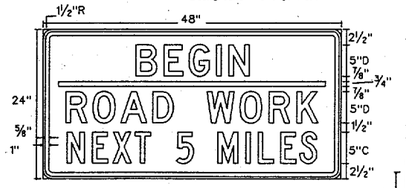
DN:
CK:
DW:
CK:

SG20-1 w/plaque
48" X 26"



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

SG20-5T
48" X 24"

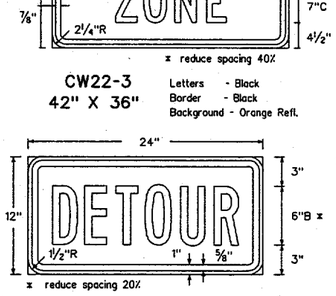


Letters - Black
Numbers - Black
Border - Black
Background - Orange Refl.

CW22-2a
60" X 36"

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

CW22-3
42" X 36"

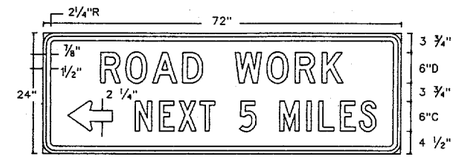


Letters - Black
Border - Black
Background - Orange Refl.

M4-8
24" X 12"

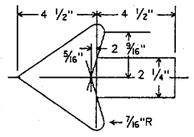
Letters - Black
Border - Black
Background - Orange Refl.

G20-1bL(R)
72" X 24"

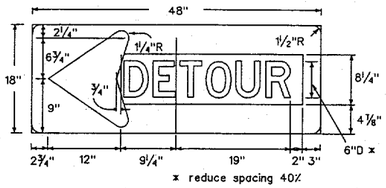


Letters - Black
Numbers - Black
Border - Black
Background - Orange Refl.

NOTE:
G20-1 Series signs shall show distances rounded to nearest whole mile. Fractions and decimal miles will not be used.

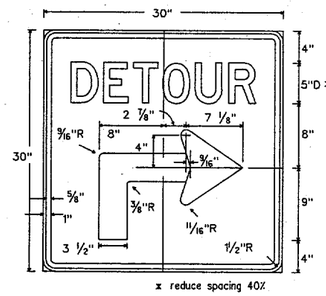


M4-10L(R)
48" X 18"



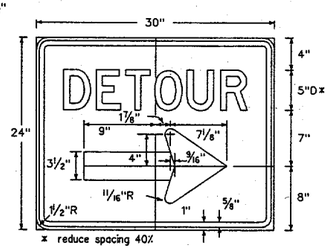
Letters - Black
Arrow - Orange Refl.
Background - Black

M4-9AR(L)
30" X 30"



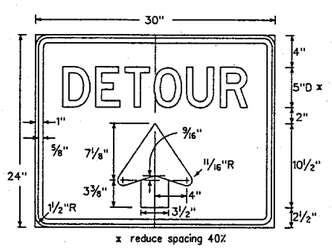
Letters - Black
Symbol - Black
Border - Black
Background - Orange Refl.

M4-9R(L)
30" X 24"



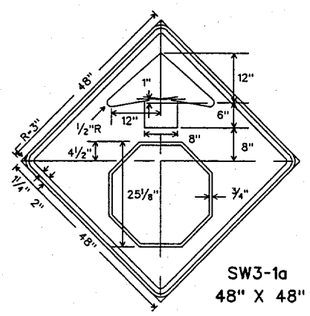
Letters - Black
Symbol - Black
Border - Black
Background - Orange Refl.

M4-9S
30" X 24"



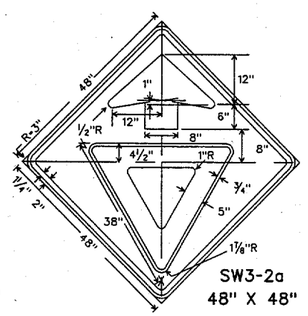
Letters - Black
Symbol - Black
Border - Black
Background - Orange Refl.

SW3-1a
48" X 48"



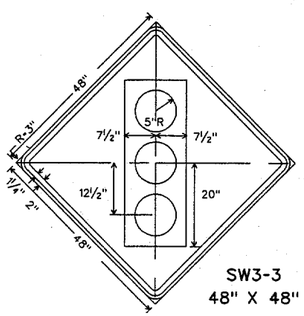
Border and Arrow - Black
Symbol - White Border on Red Background (Refl)
Background - Yellow Reflective

SW3-2a
48" X 48"



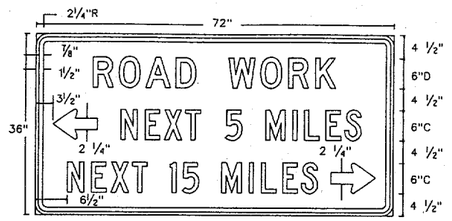
Border and Arrow - Black
Symbol - Red Border Band on White Background (Refl)
Background - Yellow Reflective

SW3-3
48" X 48"



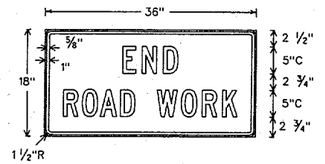
Symbol and Border - Black
Top Circle - Red Reflective
Bottom Circle - Green Reflective
Background - Yellow Reflective

G20-1a
72" X 36"



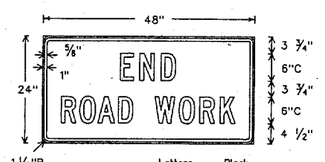
Letters - Black
Numbers - Black
Border - Black
Background - Orange Refl.

SG20-2a
36" X 18"



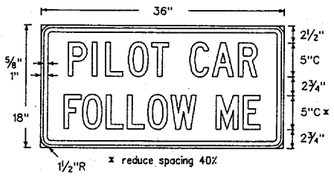
Letters - Black
Border - Black
Background - Orange Refl.

G20-2a
48" X 24"



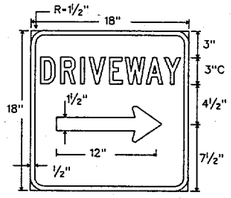
Letters - Black
Border - Black
Background - Orange Refl.

G20-4
36" X 18"



Letters - Black
Border - Black
Background - Orange (Refl. Optional)

D-70a
18" X 18"

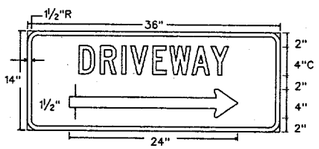


Letters - White Refl.
Symbol - White Refl.
Border - White Refl.
Background - Blue Refl.

D-70S
42" X 14"

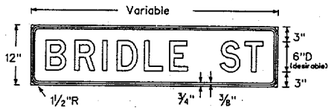
Letters - White Refl.
Symbol - White Refl.
Border - White Refl.
Background - Blue Refl.

D-70
36" X 14"



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

M4-9N
Variable X 12"

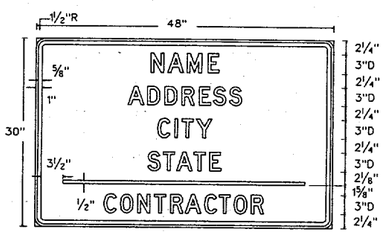


Letters - Black
Border - Black
Background - Orange Refl.

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

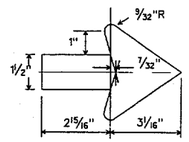
Also, when the M4-9R,L or S sign is used, a sign (M4-9N) with the name of the street being detoured may be mounted above it.

SG20-6
48" X 30"



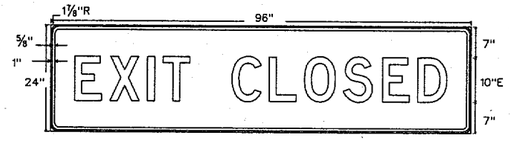
Letters - Black
Border - Black
Background - Orange Refl. or White Refl. (optional)

G20-6
36" X 18"



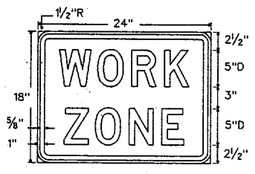
Letters - Black
Border - Black
Background - Orange Refl.

CW26-1T
96" X 24"



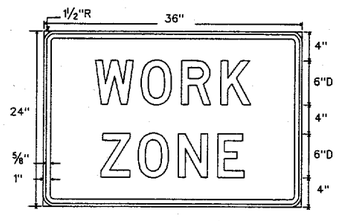
Letters - Black
Border - Black
Background - Orange Refl.

G20-9
24" X 18"



Letters - Black
Border - Black
Background - Orange Refl.

EG20-9
36" X 24"



Letters - Black
Border - Black
Background - Orange Refl.

x Alternate first line legend for D-70S

RESTAURANT | D70R 4"C
BUSINESS | D70B 4"C
MOTEL | D70M 4"C
GAS | D70G 4"C

10/99 Revision
⚠ Added new sign

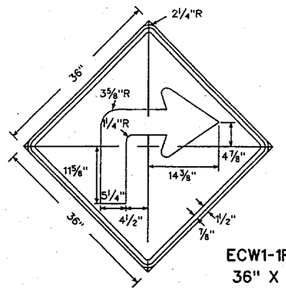
STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

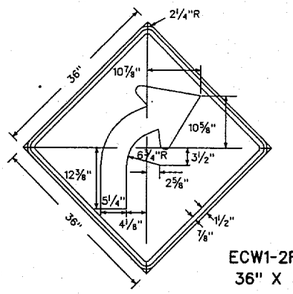
CONTRACTOR INFORMATION, DETOURS & WARNING SIGNS

BC(9A)-99

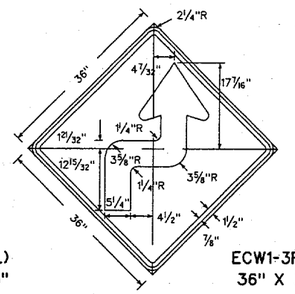
©TxDOT February 1998	DN: GB	CK: DTN	DW: DN	CK: GB	REQ. NO.
REVISIONS 10-99	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
		6			33
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY



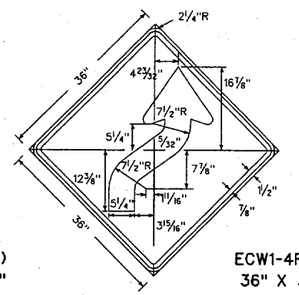
ECW1-1R(L)
36" X 36"



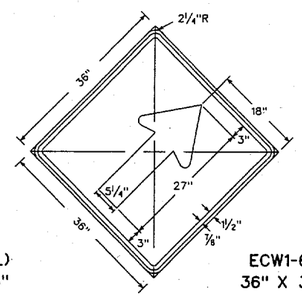
ECW1-2R(L)
36" X 36"



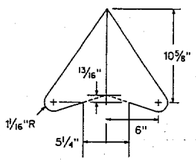
ECW1-3R(L)
36" X 36"



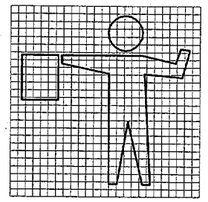
ECW1-4R(L)
36" X 36"

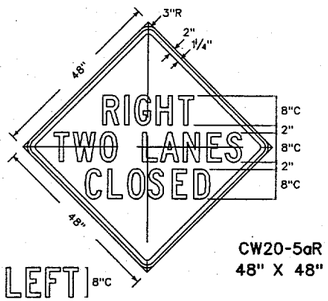


ECW1-6a
36" X 36"



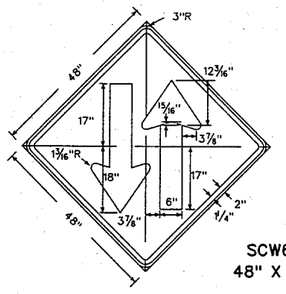
ARROW DETAIL FOR
ECW1-1, ECW1-2, ECW1-3,
ECW1-4 AND ECW1-6a.



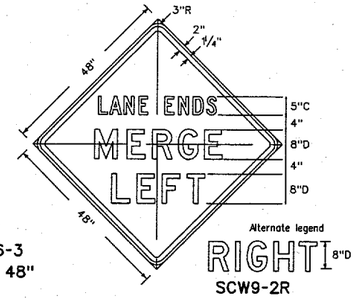


CW20-5aR
48" X 48"

CW20-5aL



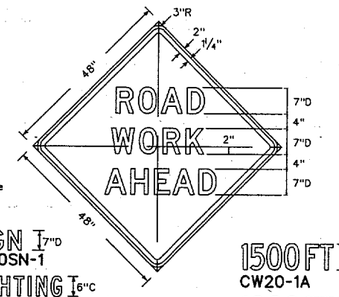
SCW6-3
48" X 48"



SCW9-2L
48" X 48"

Alternate legend
RIGHT 8"D

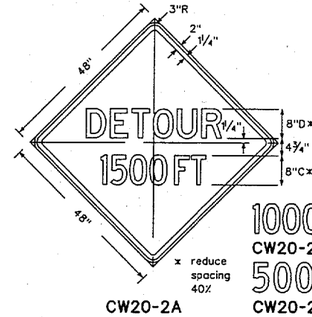
SCW9-2R



Alternate
1st line
legend

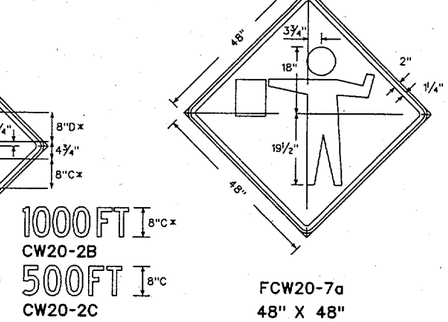
SIGN 7"D
CW20SN-1
LIGHTING 6"C
CW20LT-1
BRIDGE 6"C
CW20BR-1
RAMP 7"D
CW20RP-1
SIGNAL 6"C
CW20SG-1
STREET 7"C
CW20ST-1

CW20-1D
48" X 48"

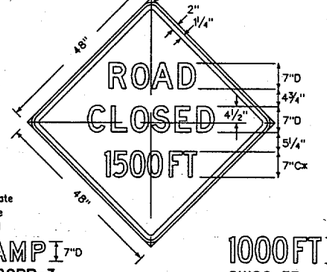


x reduce
spacing
40%

CW20-2A
48" X 48"



FCW20-7a
48" X 48"

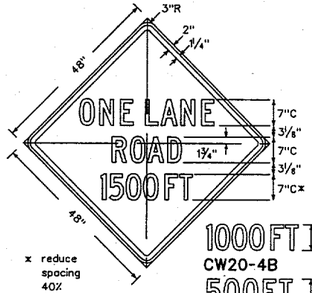


Alternate
1st line
legend

RAMP 7"D
CW20RP-3
FRWY 7"D
CW20FY-3
STREET 7"C
CW20ST-3

CW20-3A
48" X 48"

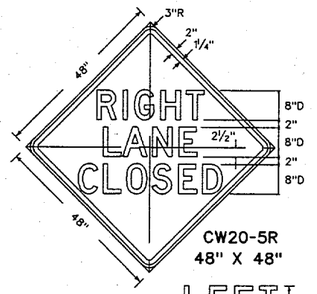
1000FT 7"C x
CW20-3B
500FT 7"C
CW20-3C
AHEAD 7"D
CW20-3D



x reduce
spacing
40%

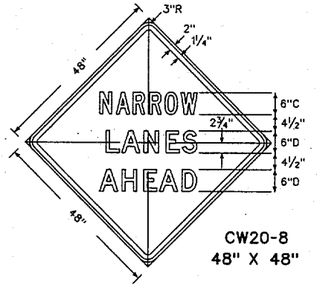
CW20-4A
48" X 48"

1000FT 7"C x
CW20-4B
500FT 7"C
CW20-4C
AHEAD 7"C
CW20-4D

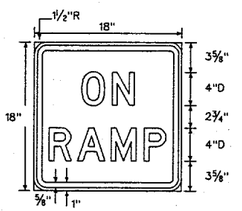


CW20-5R
48" X 48"

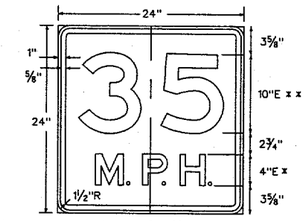
LEFT 8"D
CW20-5L



CW20-8
48" X 48"



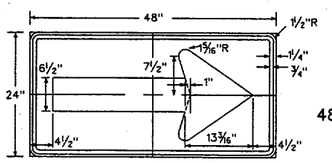
CW13-4
18" X 18"



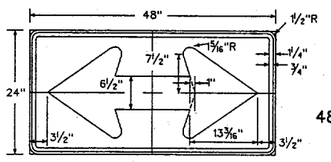
x increase spacing 100%
x x optically space numerals about vert. centerline

SCW13-1
24" X 24"

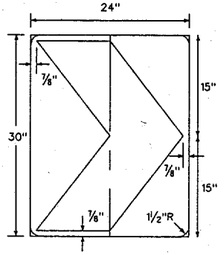
Speed value to be determined at the
site by the Engineer.



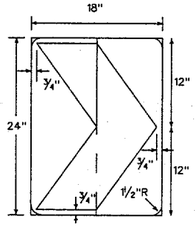
CW1-6
48" X 24"



CW1-7
48" X 24"

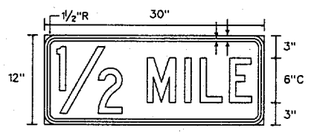


SCW1-8
24" X 30"



CW1-8
18" X 24"

GENERAL NOTES:
All signs detailed on this sheet shall have Black border, legend and/or symbol on an orange Type C reflective background.



Distance Plaque
30" X 12"

Alternate legends
1 MILE 6"C
1000 FT 6"C
1500 FT 6"C
500 FT 6"C

STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

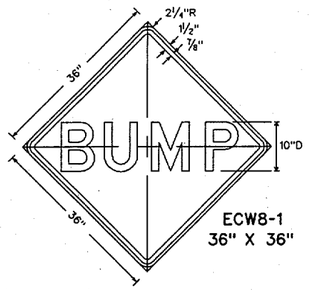
CONSTRUCTION WARNING SIGNS **BC(9B)-98**

©TxDOT February 1998	DN: GB	CK: DTN	DW: DN	CK: GB	REQ NO:
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
	6				34
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

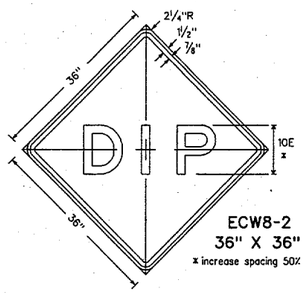
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

DN:
CK:
DW:
CK:

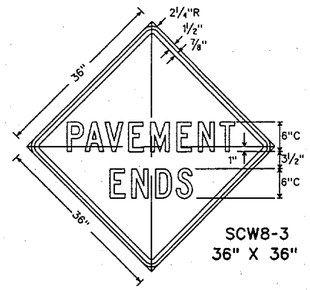
DATE:
ACC:
FILE:



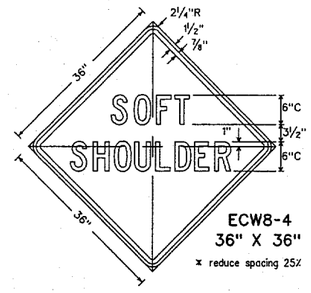
ECW8-1
36" X 36"



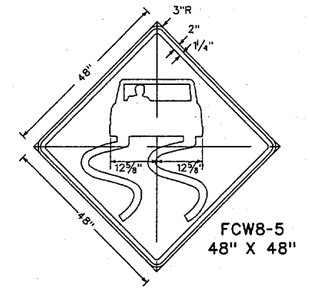
ECW8-2
36" X 36"
x increase spacing 50%



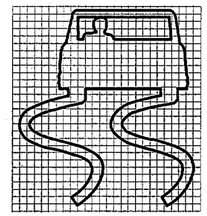
SCW8-3
36" X 36"

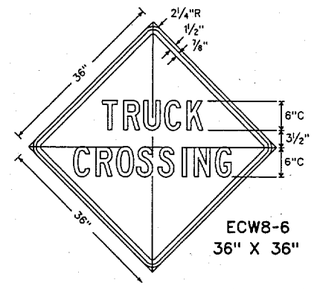


ECW8-4
36" X 36"
x reduce spacing 25%

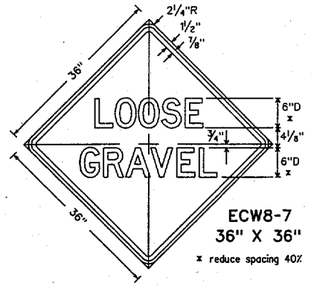


FCW8-5
48" X 48"

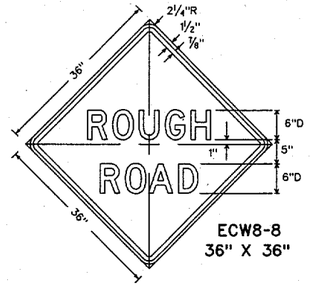




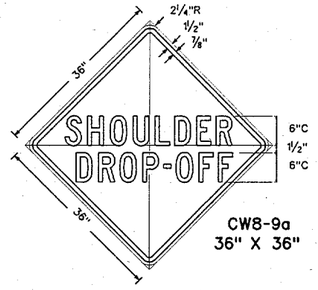
ECW8-6
36" X 36"



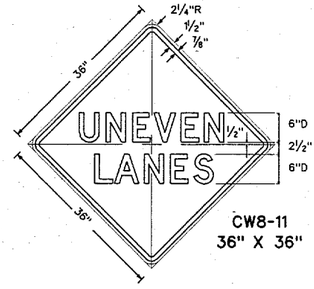
ECW8-7
36" X 36"
x reduce spacing 40%



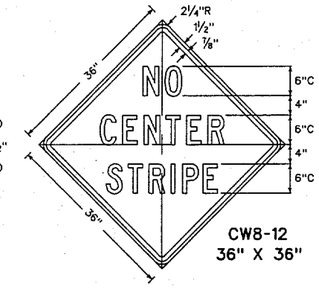
ECW8-8
36" X 36"



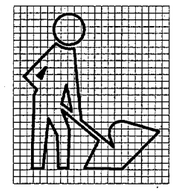
CW8-9a
36" X 36"

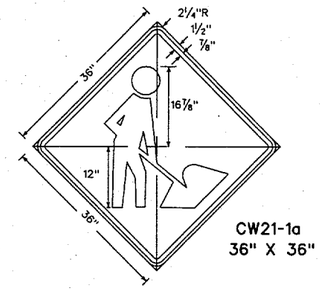


CW8-11
36" X 36"

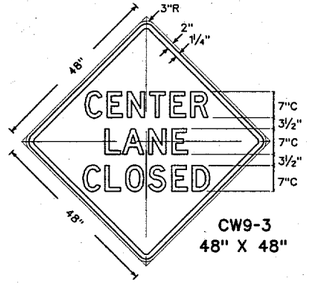


CW8-12
36" X 36"

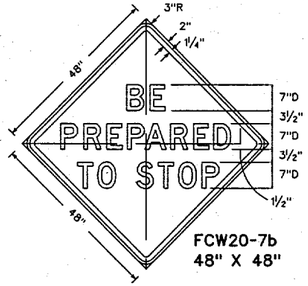




CW21-1a
36" X 36"

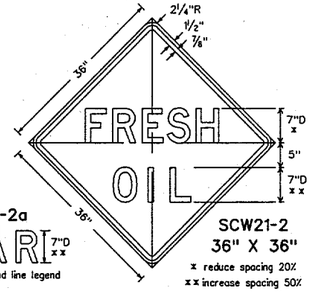


CW9-3
48" X 48"

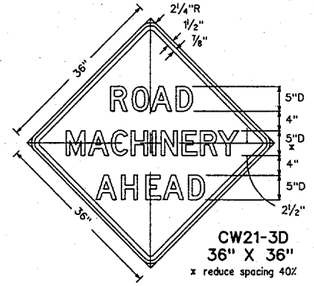


FCW20-7b
48" X 48"

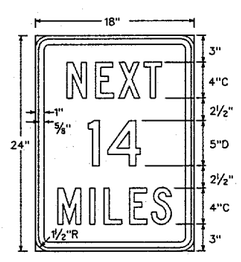
SCW21-2a
TARI 7"D xx
Alternate 2nd line legend



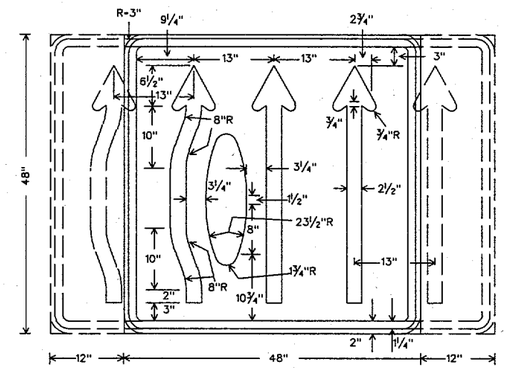
SCW21-2
36" X 36"
x reduce spacing 20%
xx increase spacing 50%



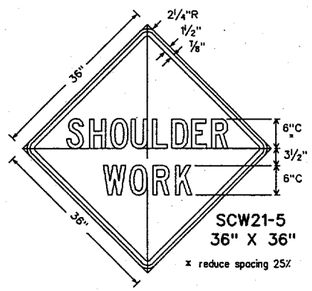
CW21-3D
36" X 36"
x reduce spacing 40%



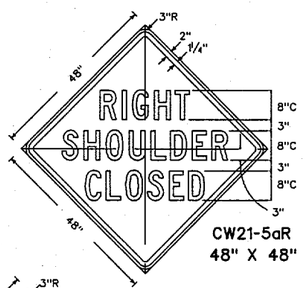
CW21-16
18" X 24"



CW24-2
Var. X 48"
A mirror image may be used to show proper lane alignment.

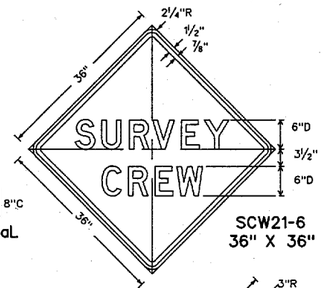


SCW21-5
36" X 36"
x reduce spacing 25%

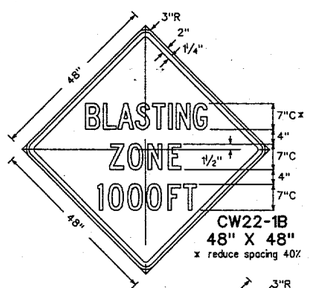


CW21-5aR
48" X 48"

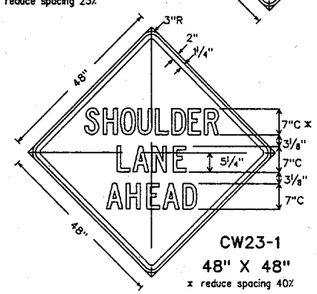
LEFT 8"C
CW21-5aL



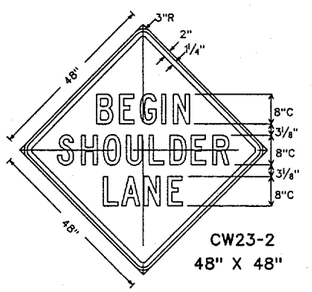
SCW21-6
36" X 36"



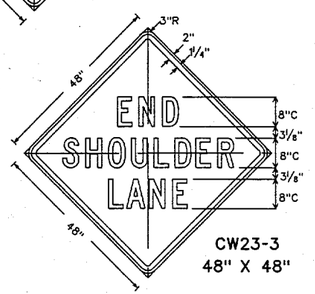
CW22-1B
48" X 48"
x reduce spacing 40%



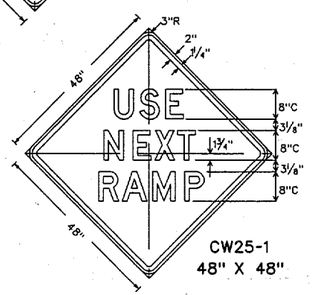
CW23-1
48" X 48"
x reduce spacing 40%



CW23-2
48" X 48"



CW23-3
48" X 48"



CW25-1
48" X 48"

GENERAL NOTES:
All signs detailed on this sheet shall have Black border, legend and/or symbol on an orange Type C reflective background.

LEVELS DISPLAYED

1		4	5	6	7	8	9	10	11	12	13	14	15	16	DATE:	
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	ACC:
33	34	35	45	56	57	58	59	60	41	42	43	44	45	46	47	DW:
49	50	51	52	53	54	55	56	57	58	59	60		62	63		CK:

DN:
CK:
DW:
CK:
FILE:

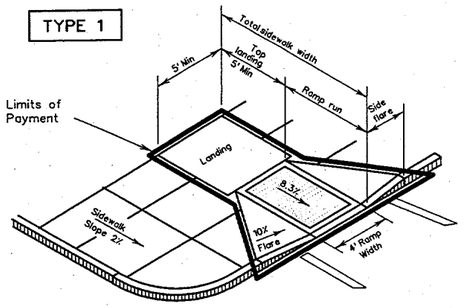
STANDARD PLANS
TEXAS DEPARTMENT OF TRANSPORTATION
Traffic Operations Division

BARRICADE AND CONSTRUCTION STANDARDS

CONSTRUCTION WARNING SIGNS **BC(9C)-98**

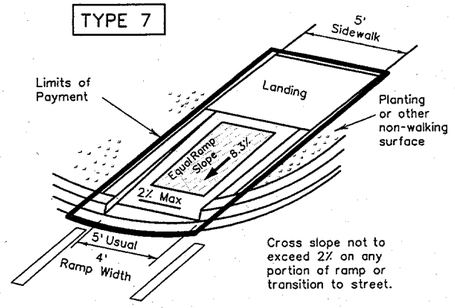
©TxDOT February 1998	DN: GB	CK: DTN	DW: DN	CK: GB	REV NO
REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT		SHEET
	6				35
	COUNTY		CONTROL	SECTION	JOB	HIGHWAY

TYPE 1



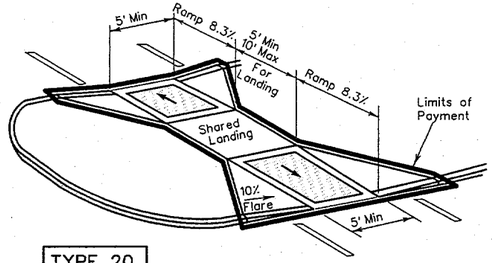
PERPENDICULAR CURB RAMP

TYPE 7

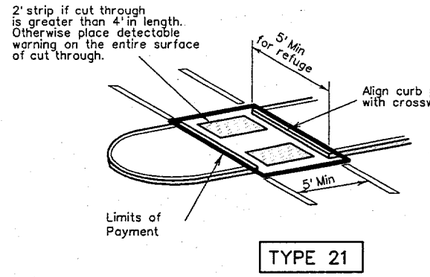


Cross slope not to exceed 2% on any portion of ramp or transition to street.

DIRECTIONAL RAMP WITHIN RADIUS



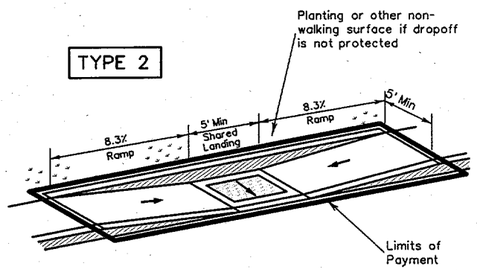
TYPE 20



TYPE 21

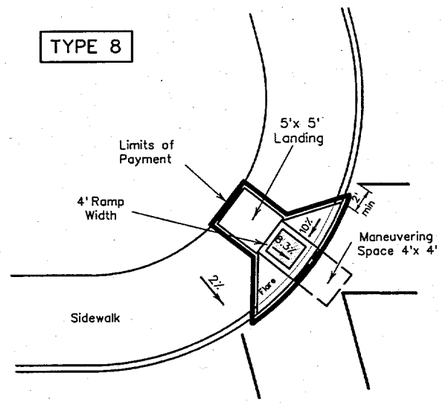
CURB RAMPS AT MEDIAN ISLANDS

TYPE 2

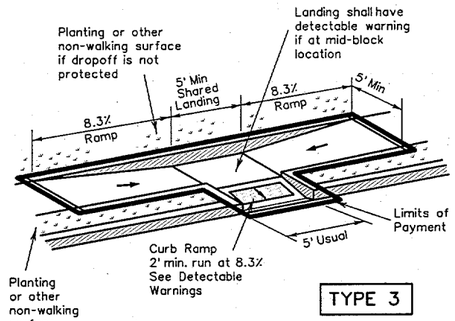


PARALLEL CURB RAMP

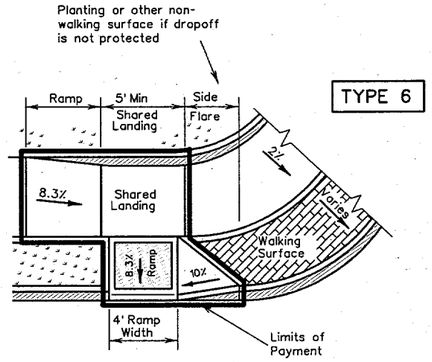
TYPE 8



DIAGONAL CURB RAMP (FLARED SIDES)



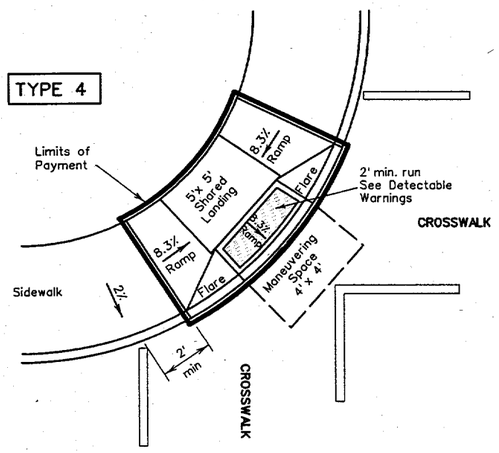
TYPE 3



TYPE 6

COMBINATION CURB RAMPS

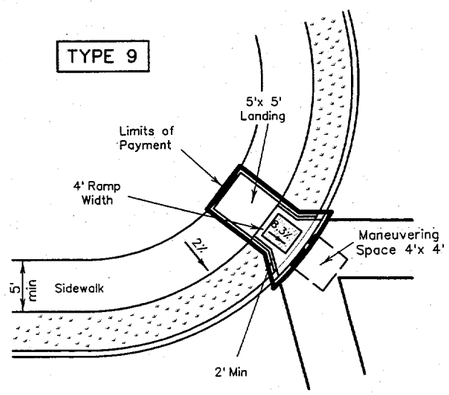
TYPE 4



DIAGONAL COMBINATION CURB RAMP

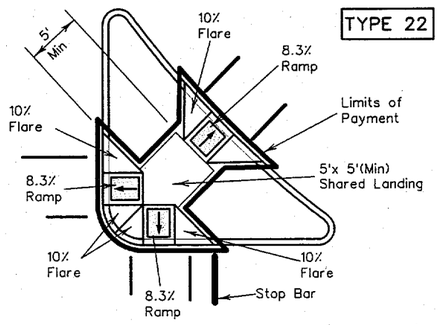
Perpendicular to the Tangent of the Curb Radius and Contained in Crosswalk

TYPE 9



DIAGONAL CURB RAMP (RETURNED CURB)

TYPE 22



COMBINATION ISLAND RAMPS

General Notes

All slopes are maximum allowable. The least possible slope that will still drain properly should be used. Ramp length or grade of approach sidewalks may be adjusted as directed by the Engineer.

The minimum sidewalk width is 5'. Where a 5' sidewalk can not be provided due to site constraints, a minimum 3' sidewalk with 5'x 5' passing areas at intervals not to exceed 200 ft is required.

Landings shall be 5'x 5' minimum with a maximum 2% slope in any direction.

Maneuvering space at the bottom of curb ramps shall be a minimum of 4'x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.

Maximum allowable cross slope on sidewalk and ramp surfaces is 2%.

Curb ramps with returned curbs may be used only where pedestrians would not normally walk across the ramp. Otherwise, flared sides shall be provided.

All concrete surfaces shall receive a light broom finish unless noted otherwise in the plans.

Ramp textures must consist of truncated domed surfaces. Textures are required to be detectable underfoot. Surfaces that would allow water to accumulate are prohibited.

Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) prepared and administered by the Texas Department of Licensing and Regulation (TDLR).

Raised medians separate opposing directions of traffic and provide a refuge area for pedestrians unable to cross the entire roadway in the allotted signal phase. To serve as a refuge area, the median should be a minimum of 5' wide. Medians should be designed to provide accessible passage over or through them.

Small channelization islands, which can not provide a minimum 5'x 5' landing at the top of ramps, shall be cut through level with the surface of the street.

Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, ramps shall be aligned with theoretical crosswalks, or as directed by the Engineer.

Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

Handrails are not required on curb ramps. Curb ramps shall be provided wherever on accessible route crosses (penetrates) a curb.

Shaded areas indicate locations of detectable warnings. (Color / light reflective value and texture contrast)

Curb ramps and landings shall be constructed and paid for in accordance with Item, "Curb ramp and Landing". Street curb transitions and curb bevels will be paid for in accordance with Item, "Concrete Curb, Gutter and Combined Curb and Gutter".

LEVELS DISPLAYED

Texas Department of Transportation
Design Division (Roadway)

PEDESTRIAN FACILITIES
CURB RAMPS
PED-02

SHEET 1 OF 3

FILE	ped02.dgn	DN: MAM	CK: MAM	DW: BGD	CK:
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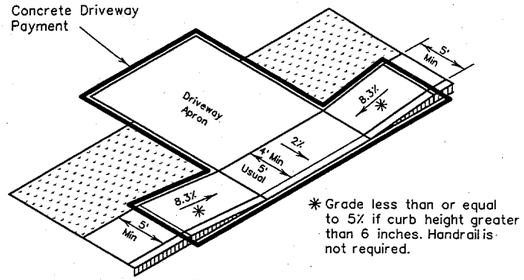
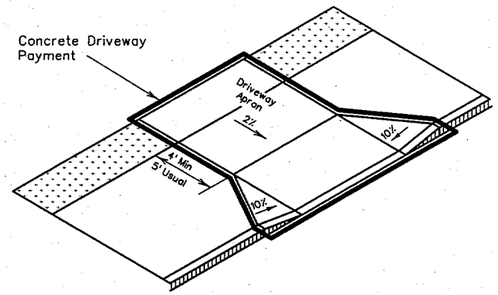
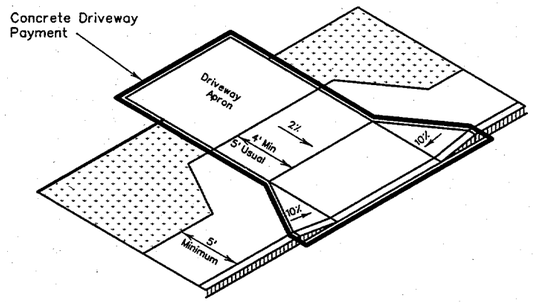
REVISIONS		6			36
	COUNTY		CONTROL	SECT	JOB	HIGHWAY



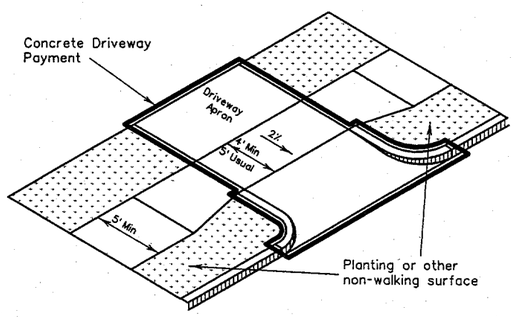
Ramp sidewalk



Wide sidewalk

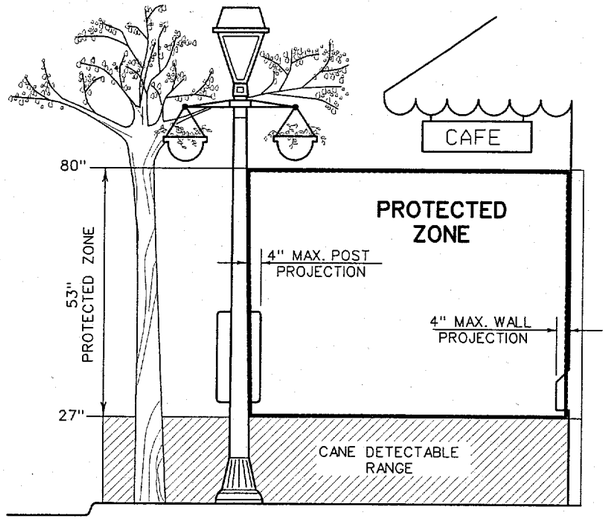


Apron offset sidewalk



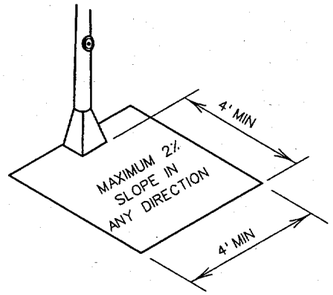
Setback sidewalk

SIDEWALK TREATMENT AT DRIVEWAYS

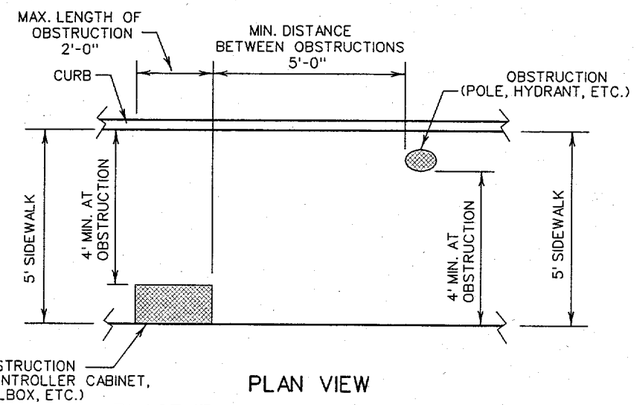


PROTECTED ZONE

In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27"and 80" above the surface.



CLEAR GROUND SPACE AT PEDESTRIAN PUSH BUTTON



PLAN VIEW

PLACEMENT OF STREET FIXTURES

(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)

General Notes

All slopes are maximum allowable. The least possible slope that will still drain properly should be used.

Traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items shall be placed so not to obstruct the accessible route.

Usual sidewalk cross slope equals 1.5%. The maximum allowable sidewalk cross slope equals 2%.

Street grades and cross slopes shall be as shown elsewhere in the plans.

Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

Changes in level greater than ¼ inch are not permitted.

Any part of the accessible route with a slope greater than 1:20 (5%) shall be considered a ramp. If a ramp has a rise greater than 6 inches or a horizontal projection greater than 72 inches, then it shall have handrails on both sides, with the following exceptions:

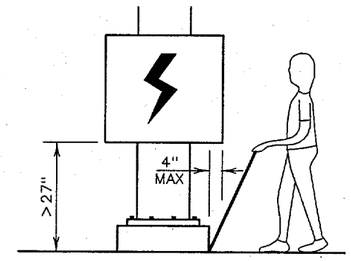
At ramp sidewalks shown at far left.

Handrails are not required on curb ramps. Curb ramps shall be provided wherever an accessible route crosses (penetrates) a curb.

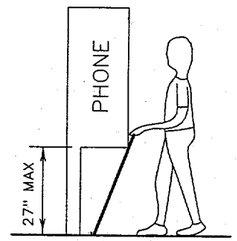
The least possible grade should be used to maximize accessibility. Where structurally impractical to achieve TAS compliance, the running slope of sidewalks and crosswalks, within the public right of way, may follow the grade of the parallel roadway without invoking Texas Accessibility Standards (TAS) variances for landings or handrails. Where a continuous grade greater than 5% must be provided, handrails may be desirable on one or both sides of the sidewalk to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions.

Parabolic crowns may require adjustment in crosswalk areas to limit the crosswalk grade to 5%.

Driveways and turnouts shall be constructed and paid for in accordance with Item, "Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.



Protruding objects of a height 27" are detectable by cane and do not require additional treatment.

DETECTION BARRIER FOR VERTICAL CLEARANCE <80"

LEVELS DISPLAYED

Texas Department of Transportation
Design Division (Roadway)

PEDESTRIAN FACILITIES
SIDEWALKS

PED-02

SHEET 2 OF 3

FILE: ped02.dgn	DN: MAM	CK: MAM	DW: BGD	CK:	
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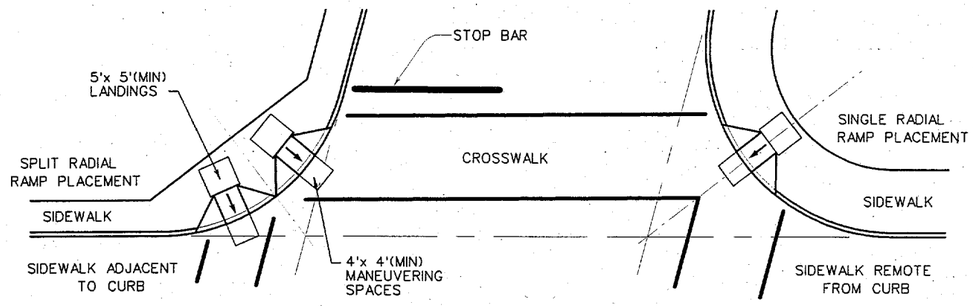
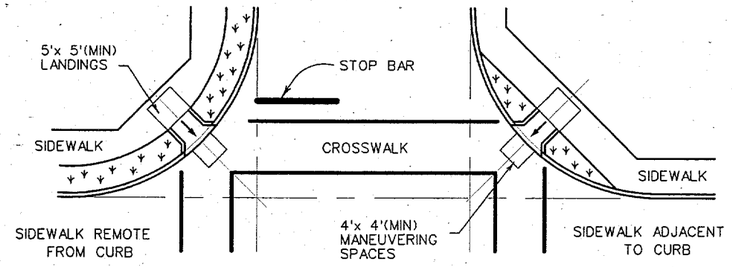
	COUNTY		CONTROL	SECT	JOB	HIGHWAY

LEVELS DISPLAYED



SKEWED INTERSECTION WITH "LARGE" RADIUS



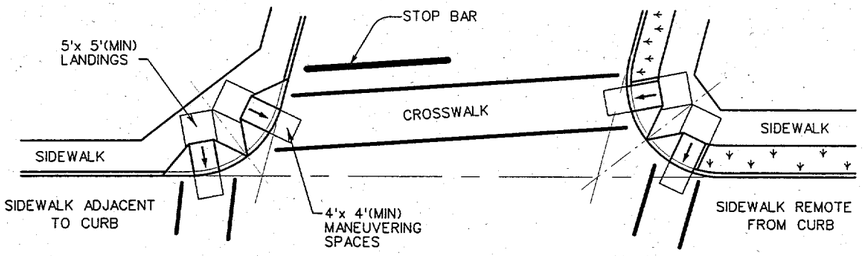
NORMAL INTERSECTION WITH "LARGE" RADIUS

General Notes

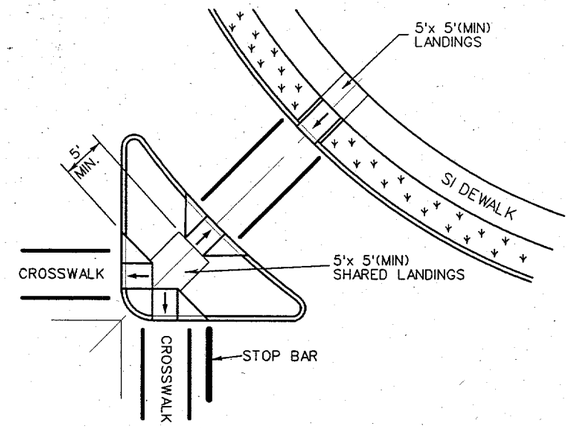
Street grades and cross slopes shall be as shown elsewhere in the plans.

Ramps are shown here without detectable warnings for simplicity. Detectable warnings are required at the locations shown on the PED Standard (Sheet 1 of 3) and in accordance with the details shown below.

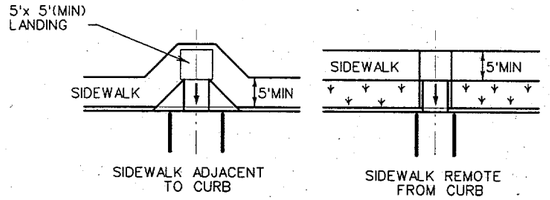
Small channelization islands, which can not provide a minimum 5' x 5' landing at the top of ramps, shall be cut through level with the surface of the street.



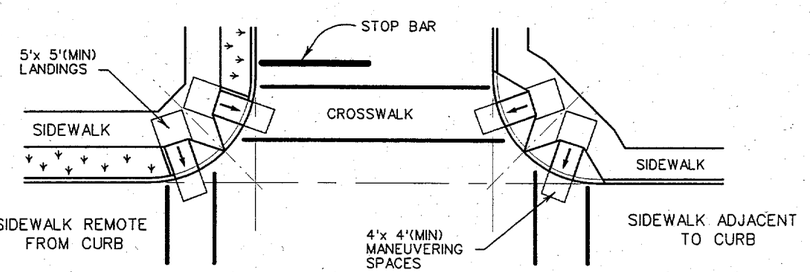
SKEWED INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



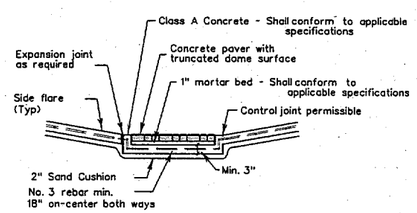
MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS



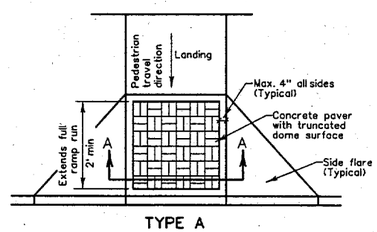
NORMAL INTERSECTION WITH "SMALL" RADIUS

TYPICAL CROSSING LAYOUTS

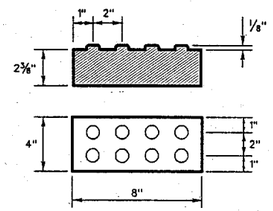
SEE SHEET 1 OF 3 FOR DETAILS AND DIMENSIONS



Section A-A



TYPE A
Truncated Dome Pattern Curb Ramp



Concrete paver with truncated dome surface

DETECTABLE WARNINGS

General Notes

Concrete paver units shall meet all requirements of ASTM C-936, C-33, and shall be laid in a two by two unit basket weave pattern, unless shown otherwise in the plans.

Domes shall be aligned in the direction of pedestrian travel.

Concrete paver units shall have a truncated dome top surface for detectable warning to pedestrians.

Concrete paver unit color for the ramp shall be a contrasting color that provides a light reflective value that significantly contrasts with the adjacent surfaces. The color of the concrete paver units shall be shown elsewhere in the plans. (Adjacent surfaces include side flares).

Concrete paver units shall be saw cut only and any cut unit shall not be less than 25 percent of a full unit.

Texas Department of Transportation
Design Division (Roadway)

PEDESTRIAN FACILITIES

INTERSECTION LAYOUTS
AND
DETECTABLE WARNINGS

PED-02

SHEET 3 OF 3

FILE: ped02.dgn	DN: MAM	CK: MAM	DW: BGD	CK:	
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