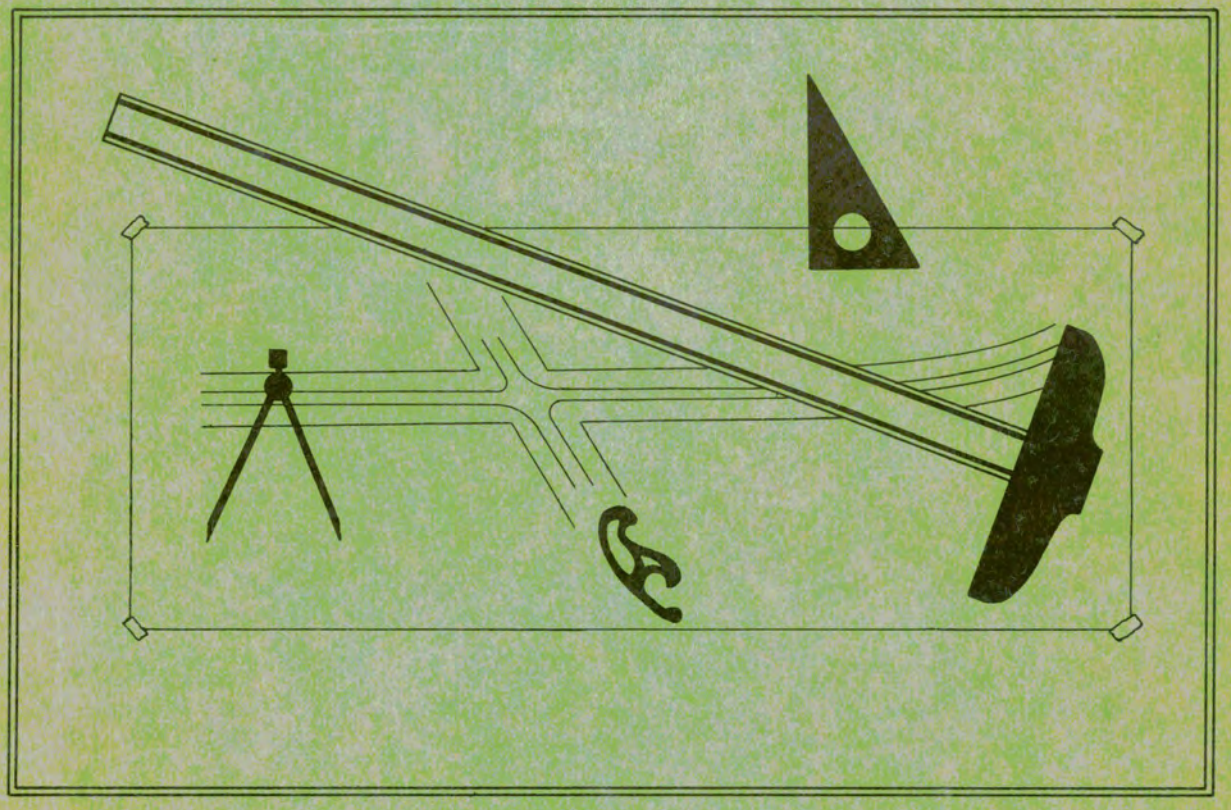
DESIGN STANDARDS

HIGHWAY DESIGN DIVISION



Texas Highway Department

HIGHWAY DESIGN STANDARDS

FOR

NON CONTROLLED ACCESS HIGHWAYS

HIGHWAY DESIGN DIVISION

TEXAS HIGHWAY DEPARTMENT

REVISED ACCORDING TO
ADMINISTRATIVE ORDER No. 31-62
8-15-62 BIL

I HIGHWAY CLASSIFICATION

STANDARDS FOR THE DESIGN

OF TWO LANE AND MULTI LANE HIGHWAYS

The following tables make it possible to arrive at reasonably accurate design standards for two and multi-lane highways based on traffic volumes existing at the time of the design determination. Existing conditions are given ample consideration since the tables provide for both new and existing locations and make allowances for the application of Tolerable Standards which allow the maximum use of material already available.

Since these determinations are based on traffic volumes existing at the time of the design, it was necessary to apply the statewide average traffic volume increase in the development of the tables. This figure will vary at individual locations around the State and the results arrived at through the use of these tables should be checked by traffic projections from the Highway Planning Survey.

IMPORTANT

The designer should enter the tables in the area bounded by the heavy rectangle with an existing traffic volume. In most cases, the possibility of accommodating the traffic on the Existing Location, possibly through the application of Tolerable Standards, should be investigated first. The designer should then determine which of the vertical columns is applicable to his particular situation. Once established in the vertical column, the other design criteria are listed below under the various headings at the side of the page.

TEXAS HIGHWAY DEPARTMENT

STANDARDS OF DESIGN FOR TWO LANE RURAL HIGHWAYS

MAXIMUM PRACTICAL CAPACITY ADT	Class HV				Class MV				Class LV				Traffic increase has been considered in the development of these standards. The designer should use present day traffic volumes.
1. Tolerable Standards	4400 ±												
2. Full Standards	6000 ±												
DESIGN REQUIREMENTS FOR EXISTING ADT	Existing Location		New Location		Existing Location		New Location		Existing Location		New Location		Capacities for tolerable standards for Classes MV & LV will depend upon passing opportunities, grades, climbing lanes, etc.
Two Lane Tolerable Standards	2600-4400				1300-2600				up to 1300				
Two Lanes Full Standards	4400 +		1800-3500		2600-3500		600-1800		600-1800		up to 600		
ROW REQUIREMENTS FOR EXISTING ADT													
Two Lanes Tolerable Standards On Existing ROW	up to 4400				2600				1300				Where Tolerable Standards can not be achieved on existing ROW, requirements for new location should govern.
Where Tolerable Standards are not possible on existing ROW, new ROW Requirements will be:													
Two Lane Full Standards	2600		1800		1300		600		700		Less than 600		Design for tolerable standards shall conform to and become part of ultimate design.
Multi Lane	4400		3500										
Design Speed	Desirable	Tolerable	Desirable	Minimum	Desirable	Tolerable	Desirable	Minimum	Desirable	Tolerable	Desirable	Minimum	Projects on Primary System must meet class HV standards for design speed.
1. Flat	70	50	70	60	70	50	70	60	70	45	70	55	
2. Rolling	60	40	60	50	60	40	60	50	60	40	60	50	** Bridge widths measured to face of curb or rail whichever is narrower.
3. Mountainous (Use AASHO Standards)													
Lane Widths	13	12	13	12	13	11	13	12	12*	11	12	11	*For traffic volumes exceeding 1000 ADT 13' lanes acceptable.
Bridge Widths **	44	28	44	40	44	28	44	40	28	20	30	24	Bridge widths for bridges over 400' long shall be considered as Special Projects.
Shoulders													Minimum effective shoulder for primary Federal projects to be 8'. Slopes 8:1 or flatter will be considered shoulders. Effective shoulder width is distance between guard fence and edge of traffic lane. Bridges to be widened should meet desirable standards.
Widths (Slopes 6:1 or flatter)	9	8	9	8	9	6	9	8	6	4	6	4	
Widths (Slopes steeper than 6:1)	9	8	9	8	9	8	9	8	6	4	6	6	
Right of Way Widths (Basic Design)	120	100	120	120	120	100	120	120	120	90	120	120	

HV - High Volume MV - Medium Volume LV - Low Volume

TEXAS HIGHWAY DEPARTMENT

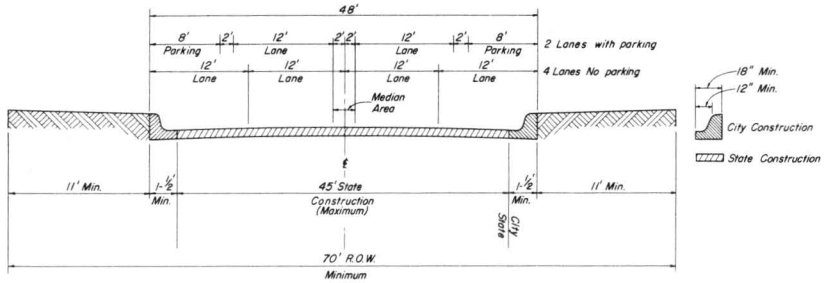
STANDARDS OF DESIGN FOR NON CONTROLLED ACCESS HIGHWAYS

	Class 4L								Class 6L								
	Rural				Urban				Rural				Urban				
MAXIMUM PRACTICAL CAPACITY ADT FULL STANDARDS	Existing Location		New Location		Existing Location		New Location		Existing Location		New Location		Existing Location		New Location		Capacities listed are based on good Design and Operational Controls
	15,000±		15,000±		20,000±		20,000±		25,000±		25,000±		30,000±		30,000±		
EXISTING ADT REQUIRING HIGHER DESIGN THAN:																	Unfavorable Conditions may consist of the following, singularly or in combination: 1. Numerous Traffic Crossings 2. Numerous Roadside Businesses 3. Numerous Turning Maneuvers 4. Restrictive Sight Distances 5. Restrictive Lateral Clearances 6. Restrictive Lane Widths 7. Restrictive Grades 8. Restrictive Passing Opportunities 9. Lack of left turn lanes reduces capacity.
Two Lanes Favorable Conditions	6,000		6,000		7,000		7,000										
Two Lanes Unfavorable Conditions	4,400				5,000												
Four Lanes Favorable Conditions									15,000		15,000		20,000		20,000		
Four Lanes Unfavorable Conditions									10,000				15,000				
EXISTING ADT JUSTIFYING EXPANSION TO ULTIMATE RIGHT OF WAY REQUIREMENT																	
Two Lanes in Place	4,400 to 6,000		3,500		5,000 to 7,000		4,100										
Four Lanes in Place									10,000 to 15,000		8,700		15,000 20,000		11,500		
Design Speed	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	Desirable	Minimum	
Flat	70	40*	70	50	50	40	60	50	70	40*	70	50	50	40	60	50	* Use for heavy betterment
Rolling	60	40*	60	45	50	30	60	40	60	40*	60	45	50	30	60	40	
Mountainous (Use AASHO Standards)																	
Lane Widths	12	11*	12	12	12	11*	12	12	12	11*	12	12	12	11*	12	12	
Median Width	44	6	44	36	30	6	44	6	44	6	44	36	30	6	44	6	Where desirable lane widths are used Minimum shoulder width may be reduced to 8' if desired. (10' minimum on Interstate) * Use for heavy betterment
Shoulder Outside	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	
Shoulder Inside	6		6	4	6		6		6		6	4	6		6		Inside shoulder not necessarily all paved.

4L - Four Lanes for moving traffic

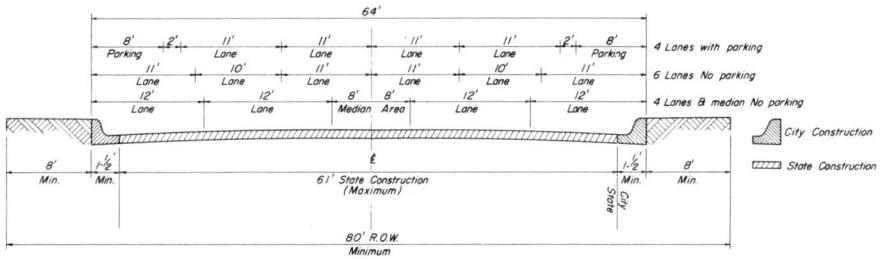
6L - Six Lanes for moving traffic

II TYPICAL CROSS SECTIONS



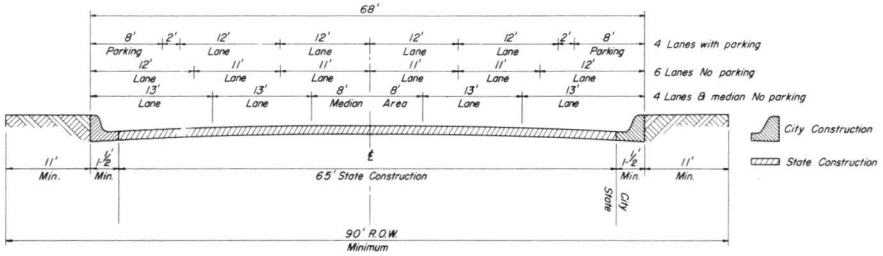
70 FOOT R.O.W. - 45' STATE CONSTRUCTED PAVEMENT

2 LANES WITH PARKING
4 LANES NO PARKING



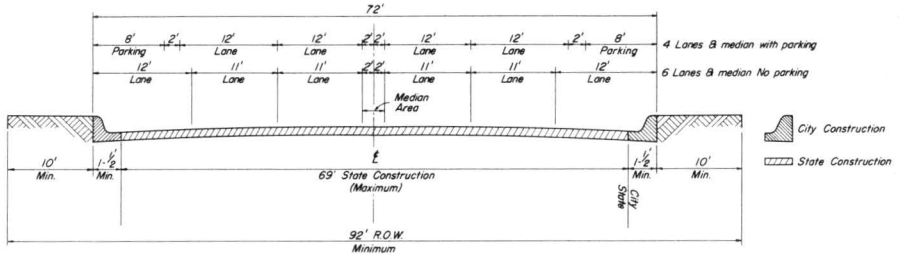
90 FOOT R.O.W. - 61' STATE CONSTRUCTED PAVEMENT

4 LANES WITH PARKING
6 LANES NO PARKING
4 LANES & MEDIAN NO PARKING



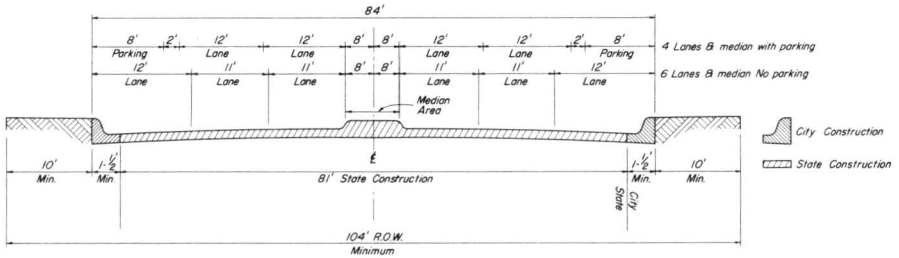
90 FOOT R.O.W. - 65' STATE CONSTRUCTED PAVEMENT

4 LANES WITH PARKING
6 LANES NO PARKING
4 LANES & MEDIAN NO PARKING



100 FOOT R.O.W. 69' STATE CONSTRUCTED PAVEMENT

4 LANES WITH PARKING & MEDIAN
6 LANES & MEDIAN NO PARKING



120 FOOT R.O.W. 81' STATE CONSTRUCTED PAVEMENT

4 LANES WITH PARKING & MEDIAN
6 LANES & MEDIAN NO PARKING

NOTES

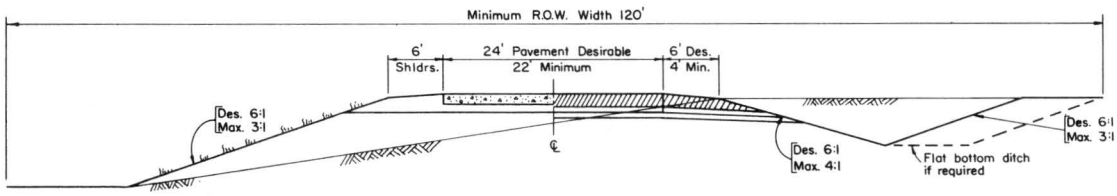
1. The treatment of the narrow Median area will be dependent on the conditions on the particular project.
2. Where parking lanes are provided initially the pavement should be of such width that the parking area can be converted to use as an efficient moving traffic lane if future conditions warrant this.
3. Where narrow 4' median is indicated a wider median and left turn lanes shall be provided at important intersections.

STANDARD CROSS SECTIONS FOR CURB AND GUTTER SECTIONS

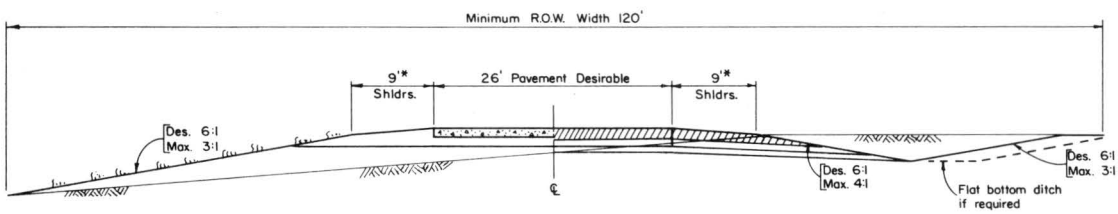
FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
6	TEXAS		
STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO.	HIGHWAY NO.

STANDARDS OF DESIGN FOR TWO LANE & MULTILANE RURAL HIGHWAYS

Full Standards (New Location)

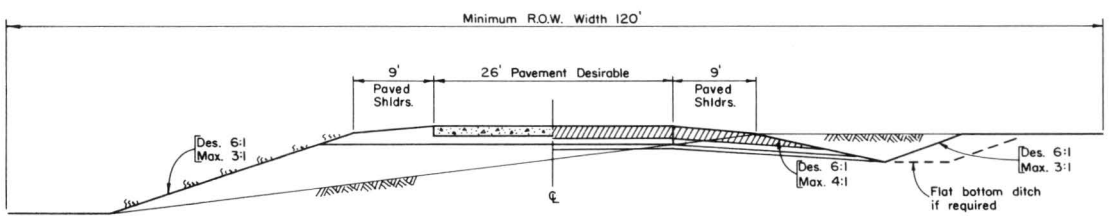


CLASS LV
Existing ADT Under 600

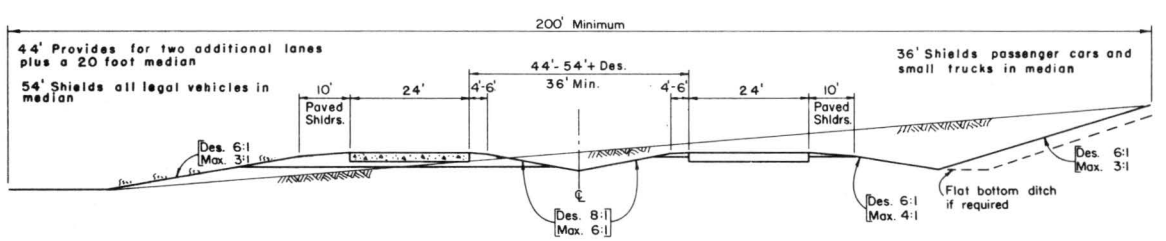


CLASS MV
Existing ADT 600 - 1800

Where 24' roadway is specified on class HV and MV shoulder should be 10'.



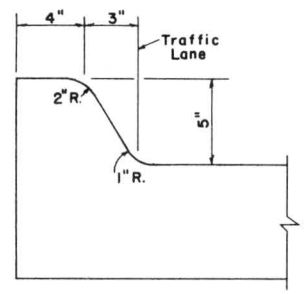
CLASS HV
Existing ADT 1800-3500



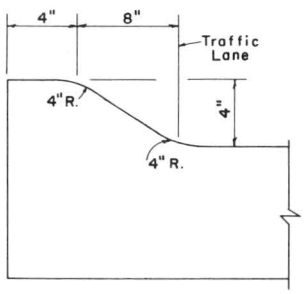
MULTILANE
Existing ADT 3500 And Over

*NOTE: Paved shoulders should be provided where A.D.T. exceeds 1000 V.P.D.

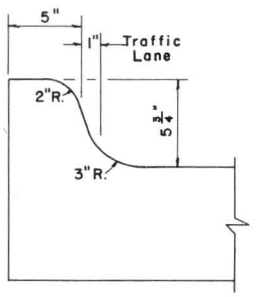
NOTE: Deminsions should be as shown on sheets I-3 and I-4.



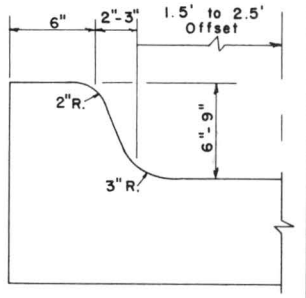
Emergency Mountable I



Mountable II

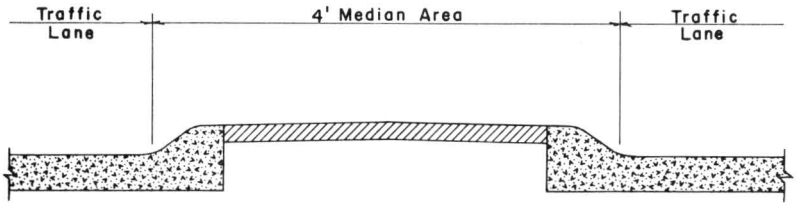


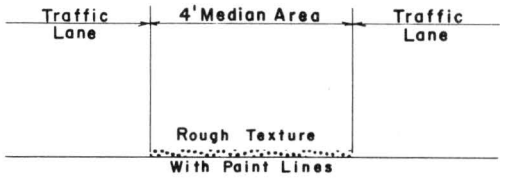
Emergency Mountable III



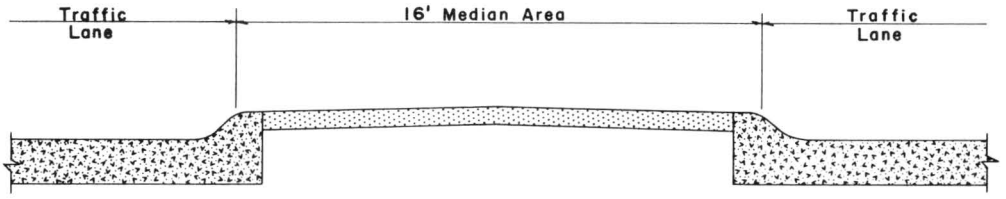
Barrier IV

CURBS





In some cases a flush median area with a rough texture and outlined with paint lines will be permitted but usually is not recommended.



MEDIAN SECTIONS

PLAN VIEW OF MEDIAN SHOWING LEFT TURN LANES

CURB AND MEDIAN TREATMENT

WARRANTS FOR MEDIANS

When these conditions exist in the design of a new arterial street or when an existing arterial street is to be improved, a median which forms a barrier that traffic will not cross intentionally should be included as a part of the design.

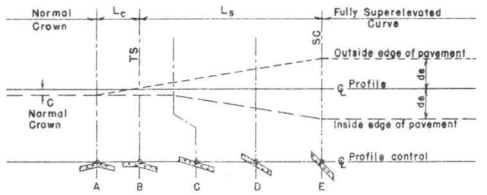
1. The average daily traffic for the design year (usually 20 years in the future) is 9,000 cars or more, regardless of the expected speeds; or
2. (a) Traffic volumes are such that a facility with four or more lanes are needed for moving traffic; and
   (b) The speed which traffic is expected to move during the off-peak periods is 35 miles per hour or higher (speed determination should be based on design operating speed values rather than posted values).

These conditions require a median wide enough to accommodate a lane for left turning traffic at intersections.

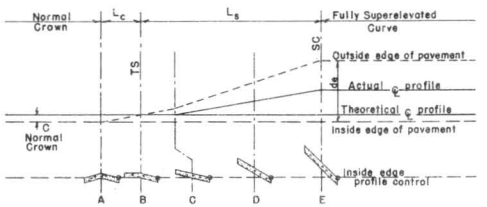
There may be locations where these conditions are not satisfied but where a median is desirable. These locations might be where there are a large number of points of access to the artery, where it is necessary to control unsafe movements, where a large number of pedestrians must cross the thoroughfare, where cross street traffic volumes are unusually high or where one or more other undesirable conditions which might be cured or partially cured by a median exist. These locations should be studied carefully to determine if a median would materially improve the situation.

These warrants were determined by the Texas Highway Department, Texas Municipal League Joint Committee, Median Practices on Highway Routes on City Streets. Copies of the report of this committee, "Why A Median?" are available from File D-16.

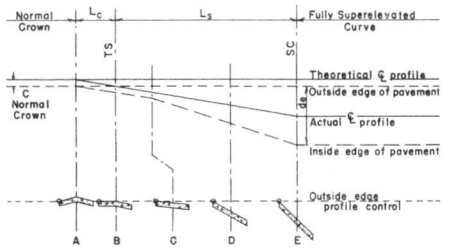
III GENERAL GEOMETRICS



A-PAVEMENT REVOLVED ABOUT CENTER LINE



B-PAVEMENT REVOLVED ABOUT INSIDE EDGE



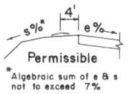
C-PAVEMENT REVOLVED ABOUT OUTSIDE EDGE

DESIGN VALUES FOR RATE OF SUPERELEVATION (e) AND LENGTH REQUIRED TO ATTAIN SUPERELEVATION

D	R	V = 40 m.p.h. e	Transition Length (L_s) V.C. = Approx. 60' d=12' 2 lane	d=24' 4 lane	d=36' 6 lane	d=48' 8 lane	V = 50 m.p.h. e	Transition Length (L_s) V.C. = Approx. 75' d=12' 2 lane	d=24' 4 lane	d=36' 6 lane	d=48' 8 lane	V = 60 m.p.h. e	Transition Length (L_s) V.C. = Approx. 90' d=12' 2 lane	d=24' 4 lane	d=36' 6 lane	d=48' 8 lane	V = 70 m.p.h. e	Transition Length (L_s) V.C. = Approx. 100' d=12' 2 lane	d=24' 4 lane	d=36' 6 lane	d=48' 8 lane
0°15'	22918'	RC	0	0	0	0	RC	0	0	0	0	RC	0	0	0	0	RC	200	200	200	200
0°30'	11459'	RC	0	0	0	0	RC	150	150	150	150	RC	175	175	175	175	RC	200	200	200	200
0°45'	7639'	RC	125	125	125	125	RC	150	150	150	150	.018	175	175	175	175	.021	200	200	200	200
1°00'	5730'	RC	125	125	125	125	.018	150	150	150	150	.022	175	175	175	180	.028	200	200	200	250
1°30'	3820'	.019	125	125	125	125	.027	150	150	150	190	.035	175	175	190	280	.042	200	200	250	380
2°00'	2865'	.025	125	125	125	160	.035	150	150	170	250	.047	175	190	250	380	.056	200	250	340	500
2°30'	2292'	.030	125	125	125	190	.043	150	150	210	310	.057	175	230	310	460	.069	210	310	410	620
3°00'	1910'	.035	125	125	150	220	.050	150	180	240	360	.066	180	270	360	530	.077	230	350	460	690
3°30'	1637'	.040	125	125	170	250	.056	150	200	270	400	.072	190	290	390	580	.080	240	360	480	720
4°00'	1432'	.044	125	140	190	280	.062	150	220	300	450	.076	210	310	410	620	D Max. = 3.5°				
5°00'	1146'	.053	125	170	220	330	.070	170	250	340	500	.080	220	320	430	650					
6°00'	955'	.060	125	190	250	380	.076	180	270	360	550	D Max. = 5.0°									
7°00'	819'	.066	140	210	280	420	.079	190	280	380	570										
8°00'	716'	.071	150	220	300	450	D Max. = 7.6°														
9°00'	637'	.074	160	230	310	470															
10°00'	573'	.077	160	240	320	485															
11°00'	521'	.079	170	250	330	500															
12°00'	477'	.080	170	250	340	500															

D Max. = 12.4°

d = Distance from axis of rotation to edge of pavement.
"e" Max. = 0.08 ft./ft.
R.C. = Remove adverse crown, superelevate at normal crown slope.



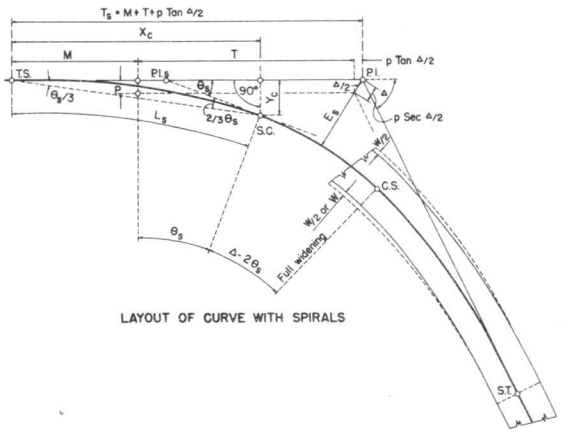
WHERE IT IS NOT FEASIBLE TO EXTEND THE SUPERELEVATION RATE THE FULL WIDTH OF THE SHOULDERS, THE SHOULDER SHALL BE ROUNDED WITH THE GRADE OF THE PAVEMENT CROSS SLOPE AND THE GRADE OF THE SHOULDER CROSS SLOPE NOT TO EXCEED 7% AS SHOWN IN SKETCH.

SYMBOLS & FORMULAE

- Δ = INTERSECTION ANGLE BETWEEN MAIN TANGENTS FOR ENTIRE CURVE.
- D = DEGREE OF THE CIRCULAR CURVE.
- R = RADIUS OF THE CIRCULAR CURVE.
- X_c = $L_s - .00003\ L_s\ (\Theta_s)^2$
- L_s = LENGTH OF SPIRAL.
- T_s = M + T + (p TAN 1/2 Δ).
- Y_c = X_c TAN $(\Theta_s/3)$.
- Θ_s = THE SPIRAL ANGLE = $L_s D/200$.
- T = TANGENT OF CIRCULAR CURVE.
- M = $X_c - R$ SIN Θ_s
- P = .00000727 (L_s) D OR APPROX. 1/4 Y_c.
- E_s = E + p SEC $\Delta/2$.
- l = LENGTH OF SPIRAL FROM T.S. TO ANY POINT.
- α = SPIRAL DEFLECTION ANGLE FROM T.S. (OR S.T.)
- α = 1/3 $\Theta_s\ (l/L_s)^2$
- C = NORMAL VERTICAL CROWN IN FEET.
- d = DISTANCE FROM AXIS OF ROTATION TO EDGE OF PAVEMENT.
- e = FULL SUPERELEVATION PER FOOT OF WIDTH.
- L_c = LENGTH OF CROWN RUNOFF = L_s c/de.
- f = SAFE SIDE FRICTION FACTOR.
- TS & ST = TANGENT TO SPIRAL AND SPIRAL TO TANGENT.
- SC & CS = SPIRAL TO CURVE AND CURVE TO SPIRAL.

DETAILS FOR ATTAINING SUPERELEVATION

SUPERELEVATION VALUES (e) SHOWN IN THE TABLES ARE SUPERELEVATIONS PER FOOT OF PAVEMENT WIDTH TO BE OBTAINED AT THE S.C. AND C.S. AND THROUGHOUT THE CIRCULAR CURVE. SUPERELEVATION FOR ANY POINT ON THE SPIRAL IS TO BE OBTAINED IN ACCORDANCE WITH THE DIAGRAMS SHOWN ABOVE EXCEPT IN CASES WHERE CENTER LINES OF CURVES ARE NOT ON UNIFORM GRADE, IN WHICH CASE A PROFILE OF THE OUTER AND INNER CROWN LINES ARE TO BE PLOTTED AND THE GRADES ADJUSTED TO SECURE A SATISFACTORY RIDING SURFACE AND APPEARANCE.



LAYOUT OF CURVE WITH SPIRALS

GENERAL NOTES

1. MAIN LANE CURVES SHALL BE SPIRALED AS SHOWN HERE OR AS SHOWN ON PLAN PROFILE OR TYPICAL SECTION SHEETS. LENGTH OF SPIRAL (L_s) SHALL BE AS SHOWN IN TABLE.

   EXAMPLE: 2 LANE HIGHWAY ON 2°00' CURVE, DESIGN SPEED 70 M.P.H., PAVEMENT TO BE REVOLVED ABOUT ℄. NORMAL CROWN 3/16 " PER FT. OR C=.19 FROM TABLE L_s=200, e=.056, $L_c = L_s$ c/de=200 (.19)/12×.056 L_c=57'.

2. CURVES WITHOUT SPIRALS SHALL HAVE THE SUPERELEVATION INTRODUCED IN THE SAME MANNER AND OVER THE SAME CALCULATED LENGTH AS FOR SPIRALED CURVES. CURVES WITHOUT SPIRALS SHALL HAVE 2/3 THE TRANSITION LENGTH (L_s) OUTSIDE THE CURVE ON THE TANGENT AND 1/3 ON THE CURVE.

3. VERTICAL CURVES MAY BE INTRODUCED AT THE BEGINNING AND END OF THE TRANSITION IF NEEDED.

4. A STRAIGHT LINE SLOPE SHALL BE USED ON ALL SUPERELEVATED CURVES, EXCEPT FOR RIGID PAVEMENTS ON CURVES OF 1°00' AND LESS, WHERE THE NORMAL PAVEMENT CROWN SHALL BE RETAINED, UNLESS OTHERWISE PROVIDED IN THE PLANS.

5. THE FULL CROWN WIDTH SHALL BE UNIFORMLY SLOPED UNLESS THE NORMAL SHOULDER SLOPE IS GREATER THAN THE SUPERELEVATION IN WHICH CASE THE NORMAL SHOULDER SLOPE SHALL BE MAINTAINED.

6. WHERE ICING CONDITIONS ARE PREVALENT A MAXIMUM e OF 0.06 FT./FT. SHOULD BE USED.

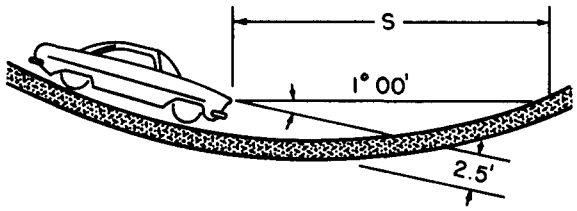
7. COMPOUND CURVES APPROXIMATING A SPIRAL MAY BE USED WHERE THE USE OF A SPIRAL MAKES STRUCTURAL DESIGN UNNECESSARILY COMPLICATED.

CURVE SUPERELEVATION AND TRANSITION STANDARD
Max e = 0.08 ft./ft.

CST 62

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
6	TEXAS		
STATE DIST. NO.	COUNTY	CONTROL NO. SECTION NO. JOB NO.	HIGHWAY NO.

STOPPING SIGHT DISTANCE ON VERTICAL CURVES



Design Speed M.P.H.	Sight Distance Feet	K_1	K_2
40	275	55	35
50	350	75	55
60	475	105	80
70	600	145	105

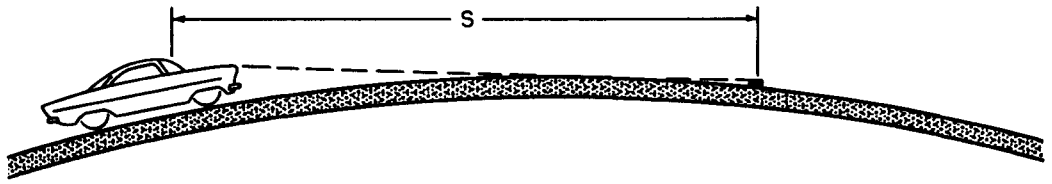
K_1 = Headlight Control
K_2 = Comfort Control

When S > L	When S < L
$L = 2S - \left[\frac{400 + 3.5S}{A}\right]$	$L = \frac{AS^2}{400+3.5S}$

Where :
L = Length of vertical curve in feet
A = Algebraic difference of grades
S = Sight distance in feet
V = Design speed in M.P.H. for "S"

SAG

K = Length of vertical curve per unit of algebraic difference in grade
L = KA



When S > L	When S < L
$L = 2S - \left[\frac{1400}{A}\right]$	$L = \frac{AS^2}{1400}$

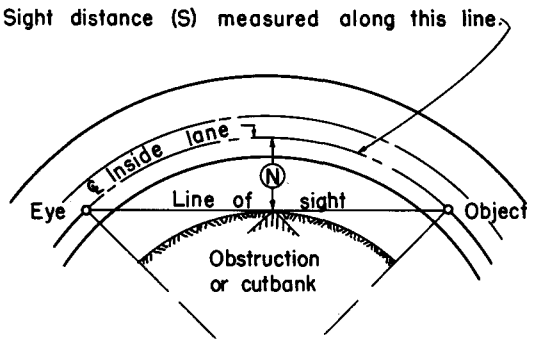
Where :
L = Length of vertical curve in feet
A = Algebraic difference of grades in percent
S = Sight distance in feet
V = Design speed in M.P.H. for "S"

Design Speed M.P.H.	Sight Distance Feet	K
40	275	55
50	350	85
60	475	160
70	600	255

Note :
Height of eye = 3.75 feet
Height of object = 0.5 feet

CREST

STOPPING SIGHT DISTANCE ON HORIZONTAL CURVES



Height of eye 3.75 feet. Height of object 0.5 feet.
At obstruction, line of sight is 2.12 feet
above center of inside lane

S = Sight distance in feet.
R = Radius of ℄ inside lane in feet.
N = Distance from inside lane in feet.
V = Design speed for S in M.P.H.

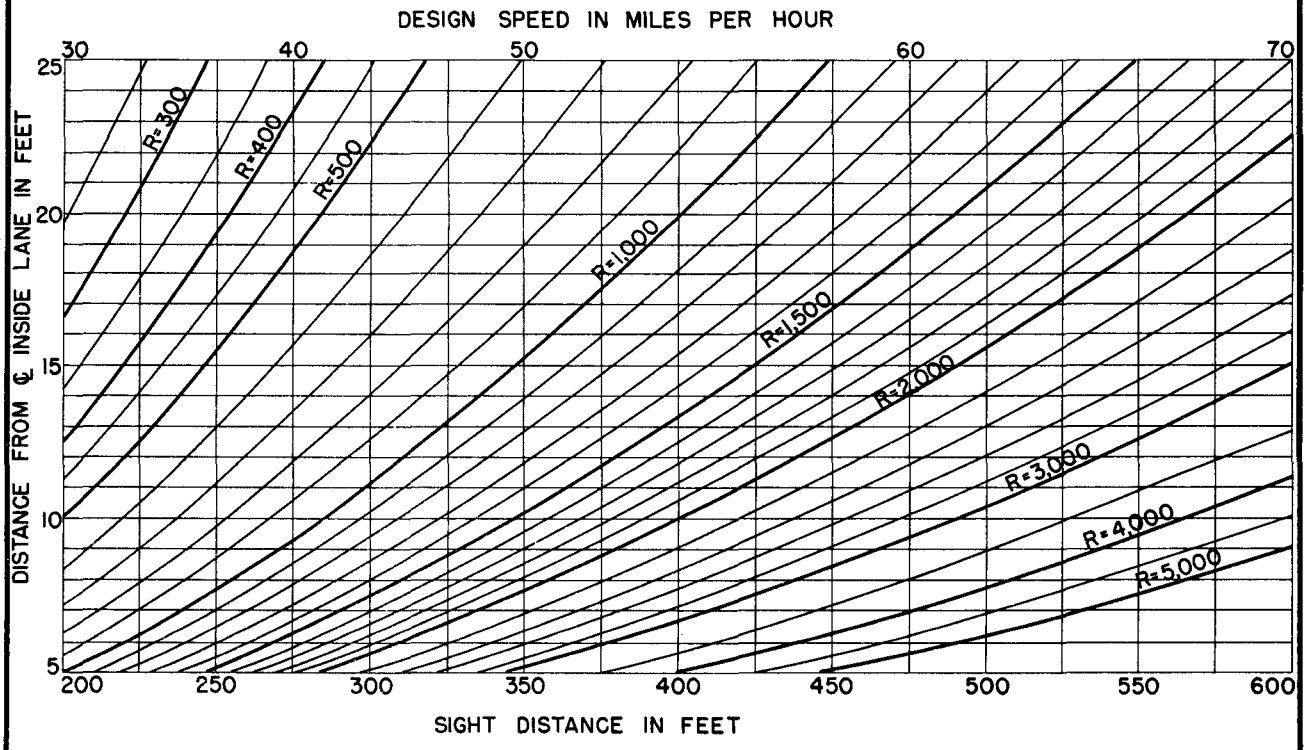
ANGLE IS EXPRESSED IN DEGREES

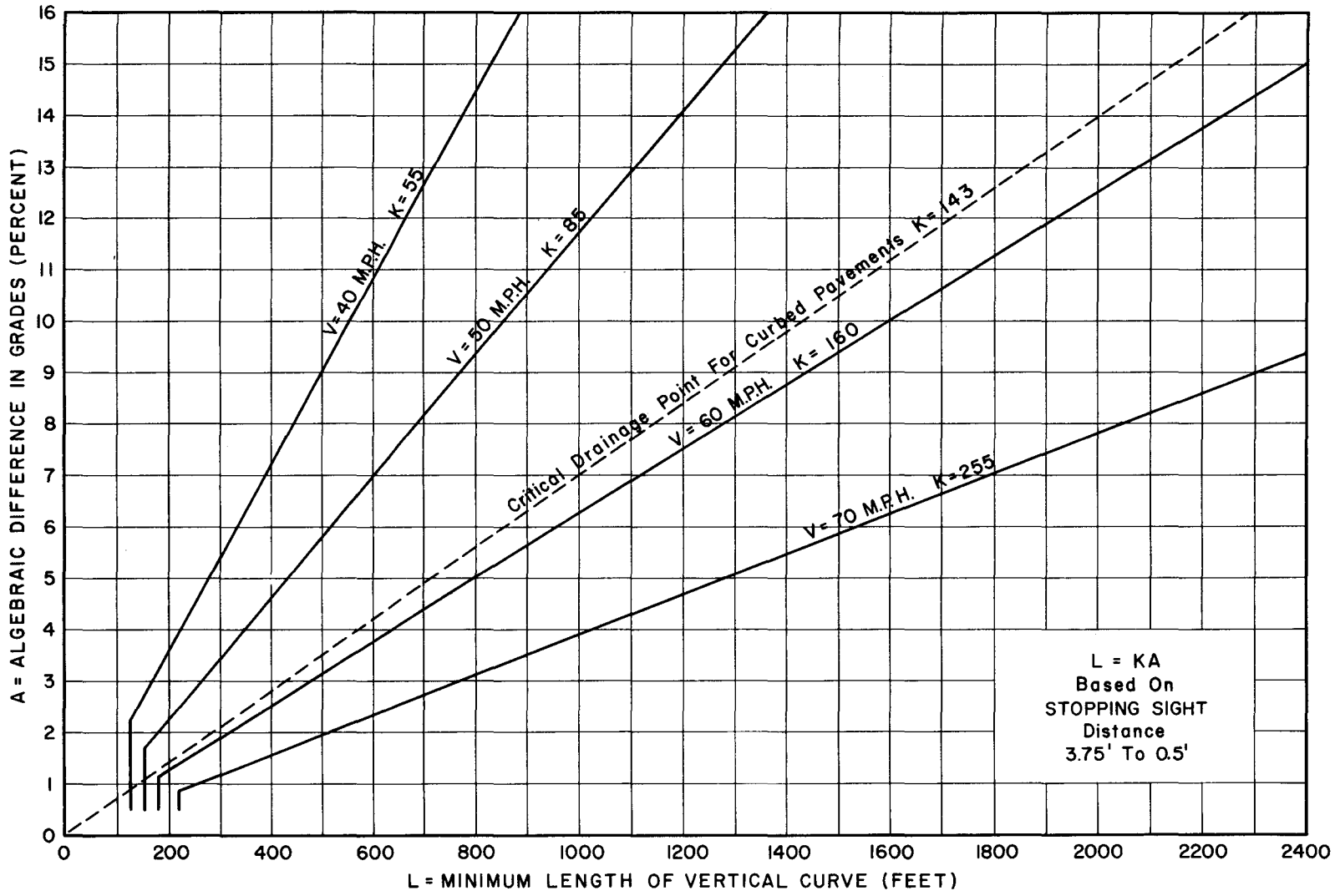
$$N = R\left[\text{vers}\left(\frac{28.65\ S}{R}\right)\right]$$

$$S = \frac{R}{28.65}\left[\cos^{-1}\left(\frac{R-N}{R}\right)\right]$$

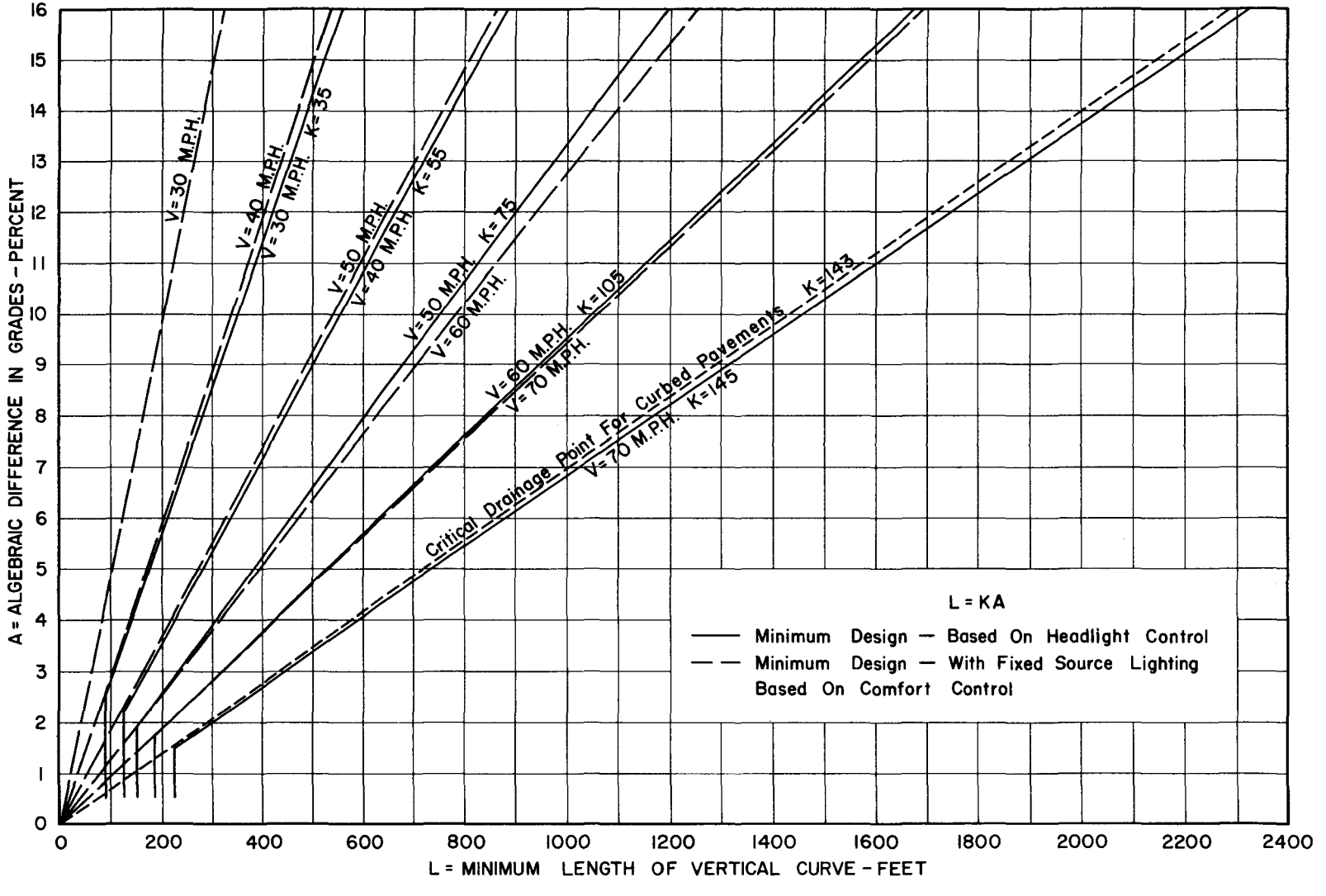
Formula applies only when S is equal to or less than length of curve.

DESIGN SPEED M.P.H.	SIGHT DISTANCE FEET
40	275
50	350
60	475
70	600

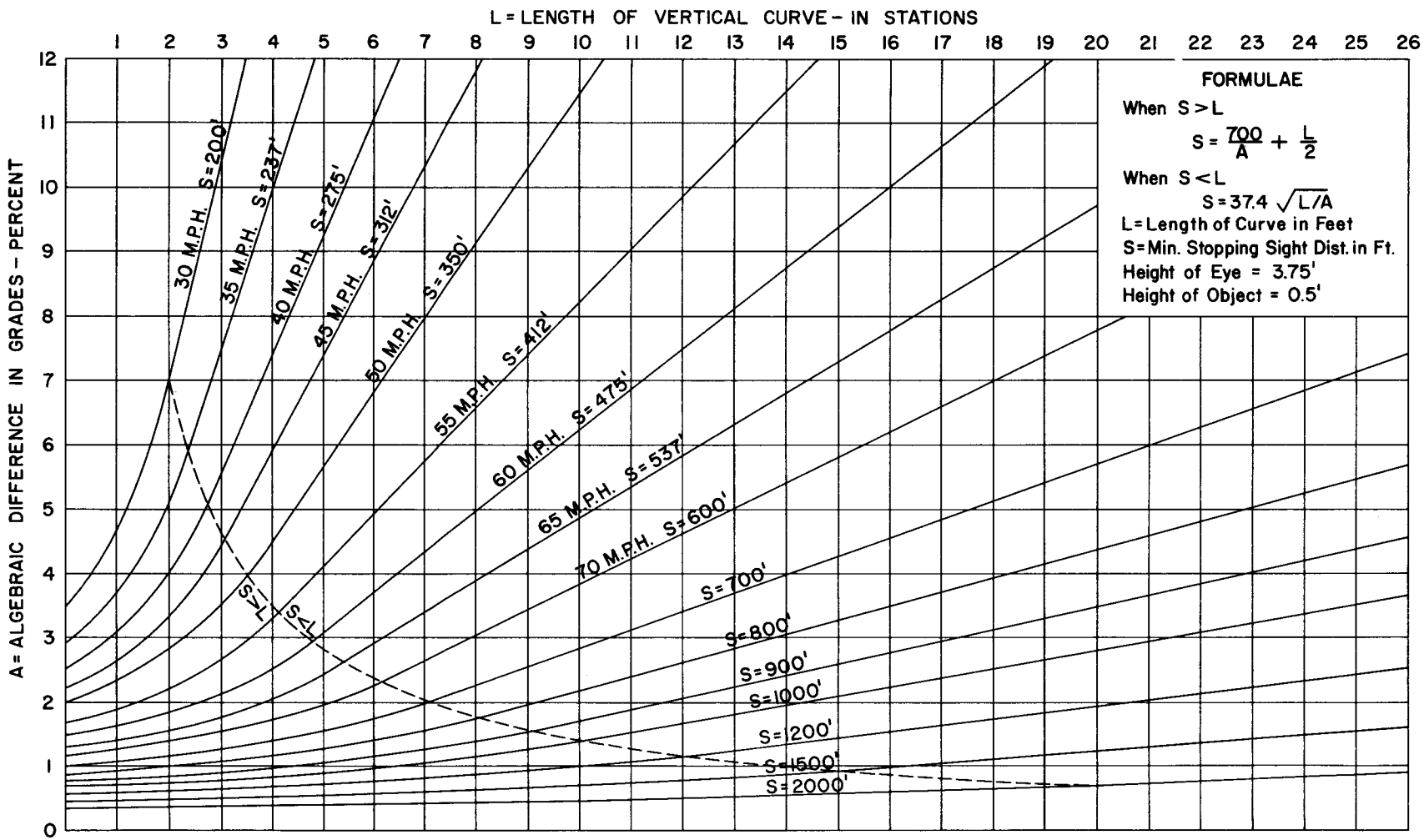




MINIMUM LENGTHS FOR CREST VERTICAL CURVES

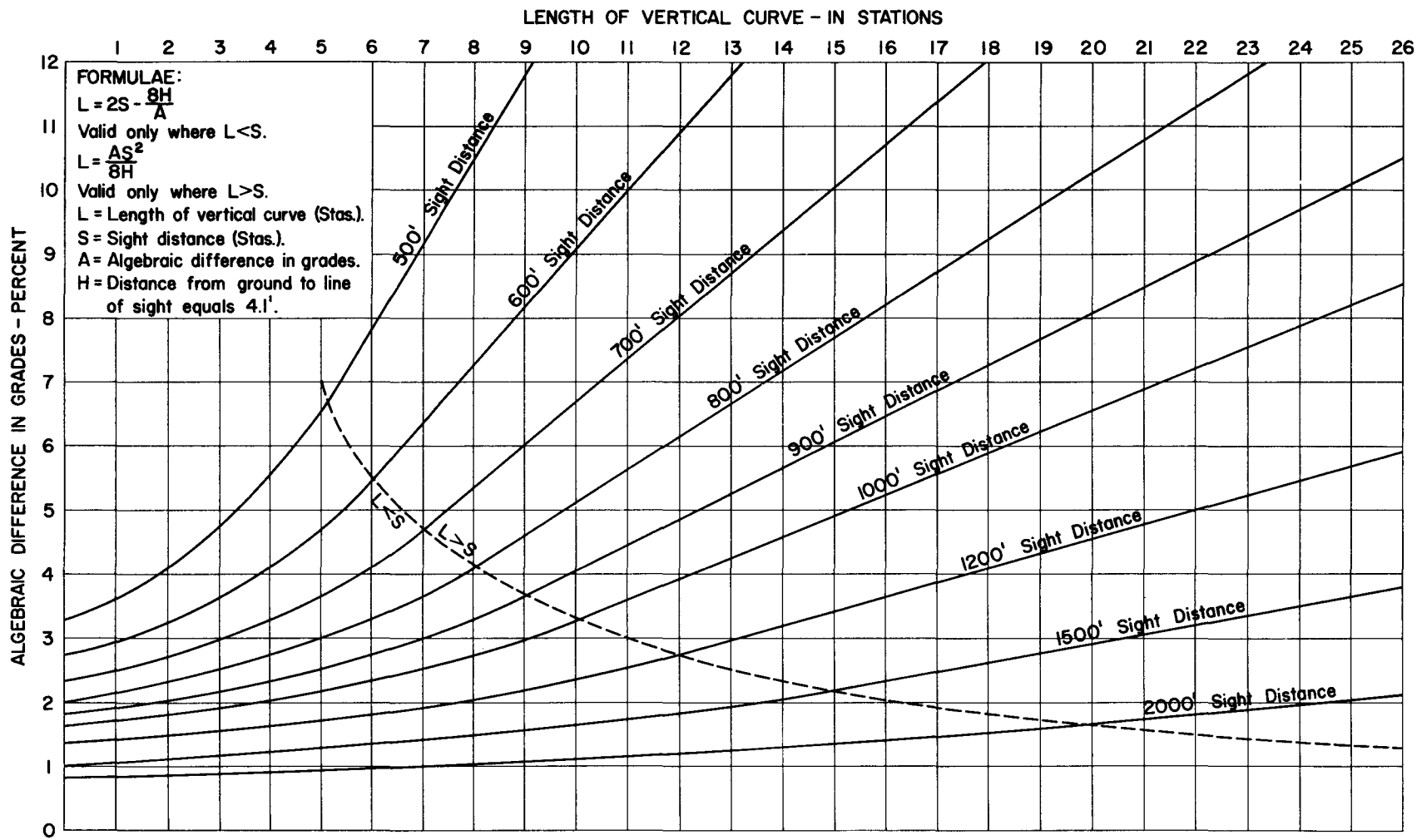


MINIMUM LENGTHS FOR SAG VERTICAL CURVES



STOPPING SIGHT DISTANCE CHART

SHOWING LENGTH OF VERTICAL CURVES
FOR VARIOUS SIGHT DISTANCES



PASSING SIGHT DISTANCE CHART

SHOWING LENGTH OF VERTICAL CURVE FOR VARIOUS SIGHT DISTANCES
BASED ON EYE HEIGHT OF 3.75' AND VEHICLE HEIGHT OF 4.5'

CLASS HV HIGHWAYS - Provide climbing lane and parking shoulder.

CLASS MV HIGHWAYS - Desirable treatment: same as for CLASS HV HIGHWAYS. Minimum treatment: convert shoulder to climbing lane.

CLASS LV HIGHWAYS - Make studies to determine feasibility of converting shoulder to a climbing lane, taking into account:

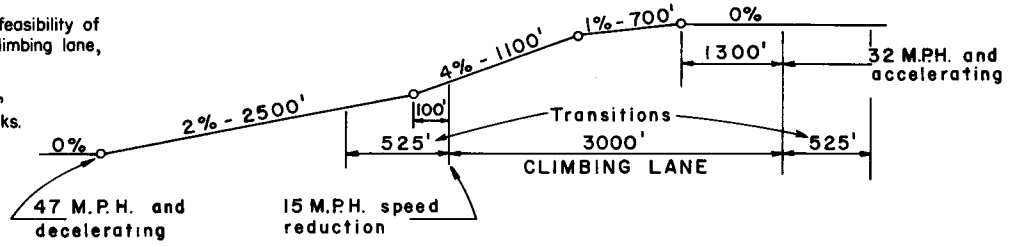
(1) construction cost and,

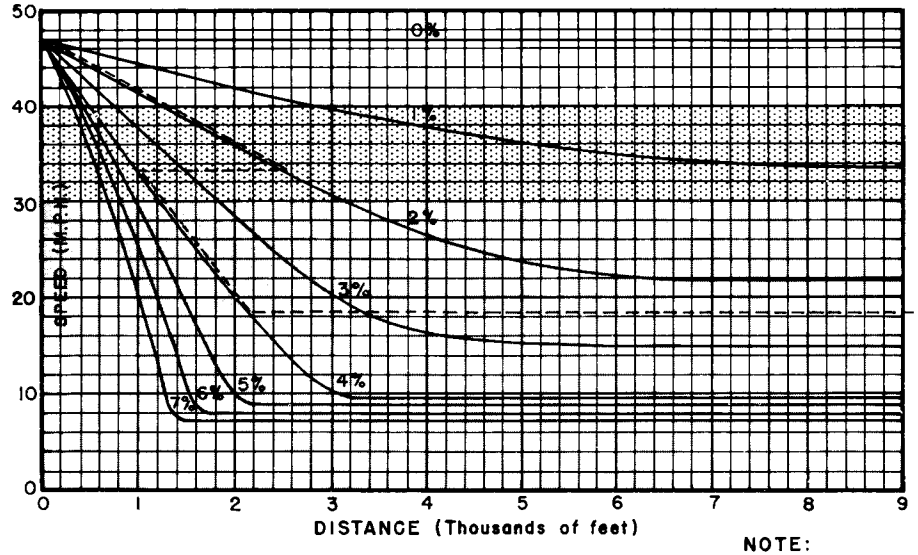
(2) volume of heavy trucks.

Area in which climbing lanes should be considered according to warrants.

Area in which climbing lanes are required according to warrants.

EXAMPLE OF USE OF CURVES

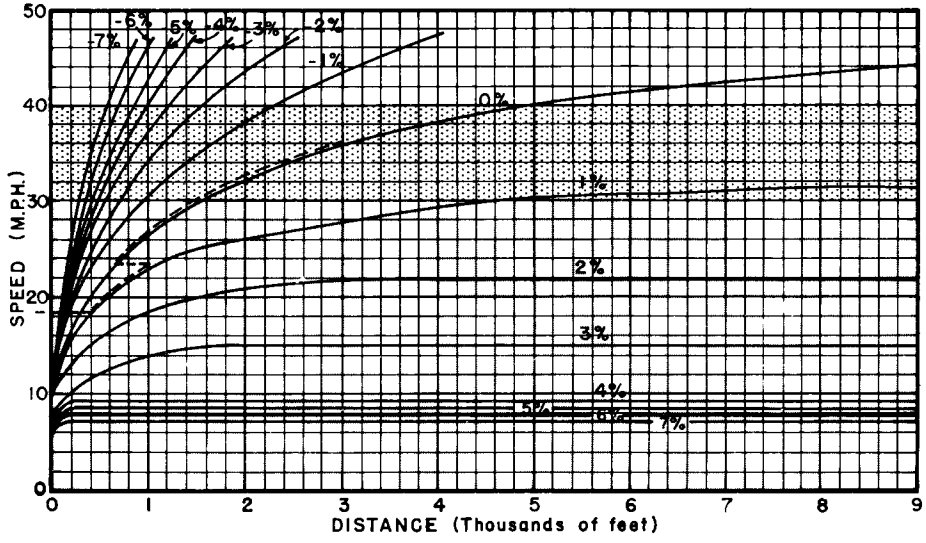




DECELERATION on grades indicated

NOTE:

Dashed lines on graph indicate steps taken in finding proper location for climbing lane shown on sketch.



ACCELERATION on grades indicated

SPEED DISTANCE CURVES

FROM ROAD TEST OF A TYPICAL HEAVY TRUCK OPERATING ON VARIOUS GRADES

March, 1961

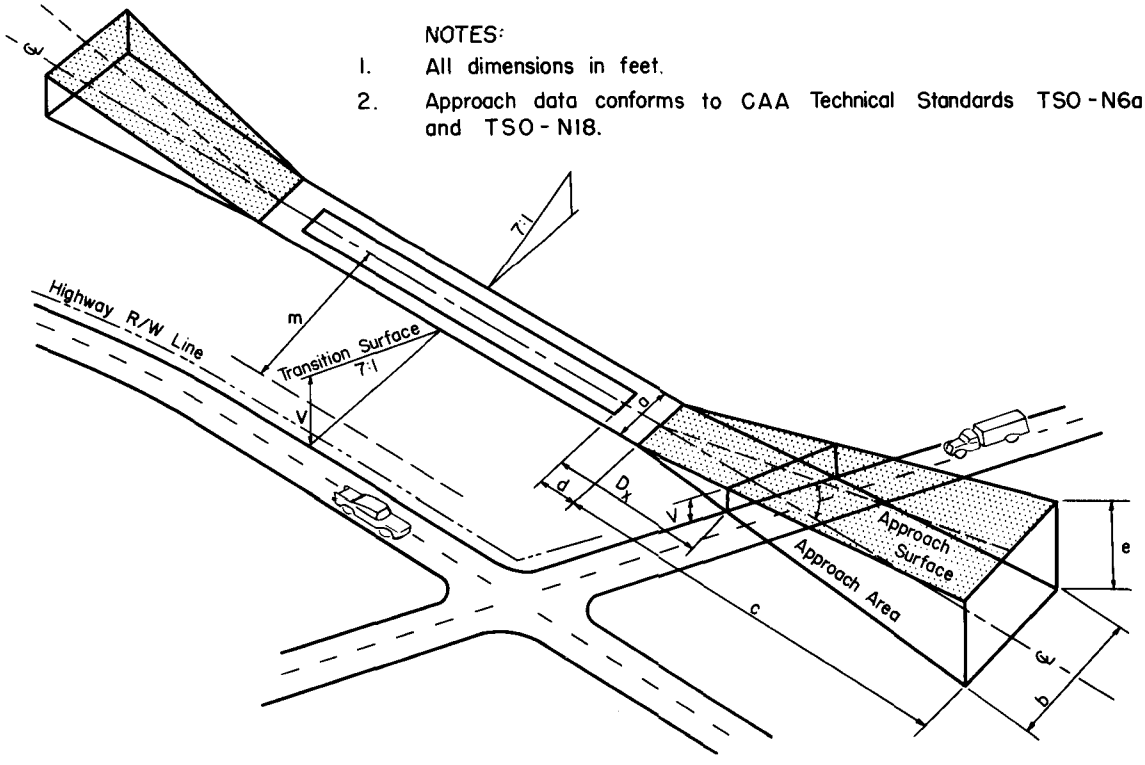
AIRWAY · HIGHWAY CLEARANCE REQUIREMENTS

CIVIL AIRFIELDS

CLASS AND TYPE OF SERVICE	RUNWAY LENGTH AT SEA LEVEL	a	b	c	d	e	c:e (Slope of approach surface)	D_x (Minimum)	m		V (Minimum)
									Non-Instrument (Minimum)	Instrument (Minimum)	
1. Personal	1500 - 2300	200	2,200	10,000	200	500	20:1	200	150	-	15
2. Secondary	2301 - 3000	250	2,250	10,000	200	500	20:1	200	225	-	15
3. Feeder	3001 - 3500	300	2,300	10,000	200	250	40:1	300	300	750	15
3. Trunk Line	3501 - 4200	400	2,400	10,000	200	250	40:1	300	350	750	15
4. Express	4201 - 5000	500	2,500	10,000	200	250	40:1	300	425	750	15
5. Continental	5001 - 5900	500	2,500	10,000	200	250	40:1	300	500	750	15
6. Intercontinental	5901 - 7000	500	2,500	10,000	200	250	40:1	300	575	750	15
7. Intercontinental Express	7001 - 8400	500	2,500	10,000	200	250	40:1	300	650	750	15
Instrument Operations		1,000	4,000	10,000	200	200	50:1	300	-	750	15

a. Width of approach area (and approach surface) at clear zone end.
b. Width of approach area (and approach surface) at approach end.
c. Length of approach area (and approach surface) measured horizontally beyond clear zone.
d. Length of clear zone.
e. Elevation of approach surface above end of runway at distance "c."
D_x Minimum horizontal distance from the end of the runway to the nearest edge of existing or proposed highway pavement. Where paved runways do not exist, this distance should be measured from the end of the landing strip.
m. Minimum transverse clearance distance, centerline of runway to fixed obstacles.
V. Highway clearance, profile at pavement edge. Minimum vertical clearance is 15' anywhere in approach area and under transition surface.
Horizontal angle between runway centerline extended and highway.

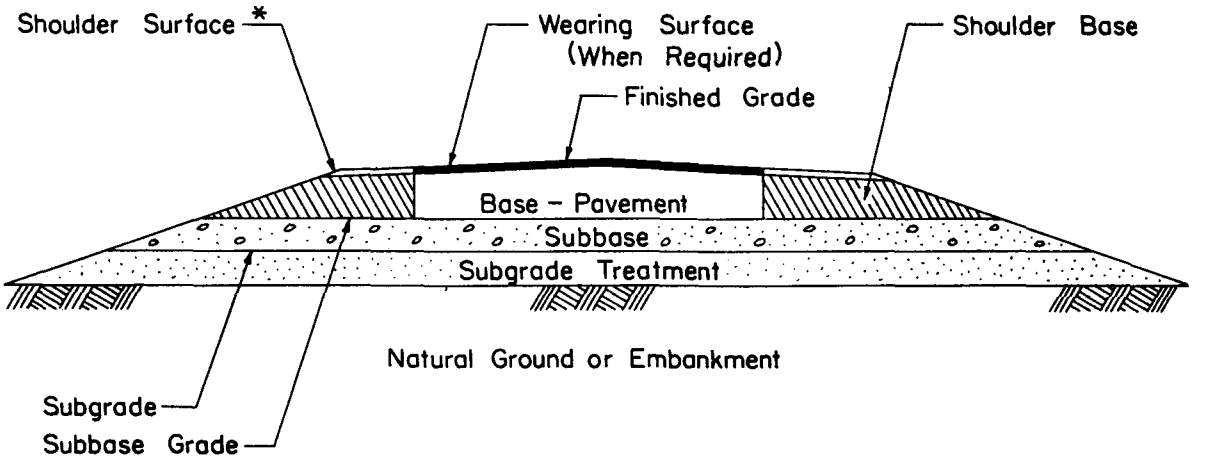
NOTES:
1. All dimensions in feet.
2. Approach data conforms to CAA Technical Standards TSO-N6a and TSO-N18.



COURTESY OF
U.S. BUREAU OF PUBLIC ROADS

IV PAVEMENT DESIGN

PAVEMENT STRUCTURE



* A shoulder surface will not be required where the shoulder material is relatively impervious and has sufficient resistance to wear.

PORTLAND CEMENT CONCRETE PAVEMENT:

Following are the design details currently recommended for the various types of Portland Cement concrete pavements.

CPJR(F)-62	Concrete Pavement, Jointed, Reinforced (Fabric) - 1962
CPJR(B)-62	Concrete Pavement, Jointed, Reinforced (Bar) - 1962
CPCD-61	Concrete Pavement, Contraction Design - 1961
CPCR(B)-62	Concrete Pavement, Continuously Reinforced (Bar) - 1962
TA(CPCR)-62	Terminal Anchorage, Concrete Pavement, Continuously Reinforced - 1962
TA(CPJ)-62	Terminal Anchorage, Concrete Pavement, Jointed - 1962

The supporting material used directly beneath the concrete pavement shall provide for uniform support throughout the life of the pavement. The supporting material shall be of such quality as to restrict pavement deflection such that the induced stress in the slab will be within the working range. Also this material shall be of a non-erosive type when subjected to the hydraulic pressures produced by the pavement deflections. If necessary, a stabilizing agent shall be used to accomplish these objectives.

FLEXIBLE AND SEMIFLEXIBLE PAVEMENT STRUCTURES:

Due to the wide variety of materials used, no standard details for flexible or semiflexible pavement structures are shown. The designer should, using the design criteria shown, develop a suitable pavement structure for the conditions encountered.

CRITERIA FOR MINIMUM LAYER THICKNESS

LAYER DESIGNATION	Minimum Thickness (Inches)		
	HV	MV	LV
Flexible and Semiflexible Pavements:			
Subgrade Treatment	4[1]	4[1]	4[1]
Subbase	4[1]	4[1]	4[1]
Base	8	7	6
Wearing Surface	1½	DST[3]	SST[2]
Shoulder Base	8	7	6
Portland Cement Concrete Pavements:			
Subgrade Treatment	4[1]	4[1]	4[1]
Subbase	4[4]	4[4]	4[4]
Pavement	*	*	*
Shoulder Base	**	**	**

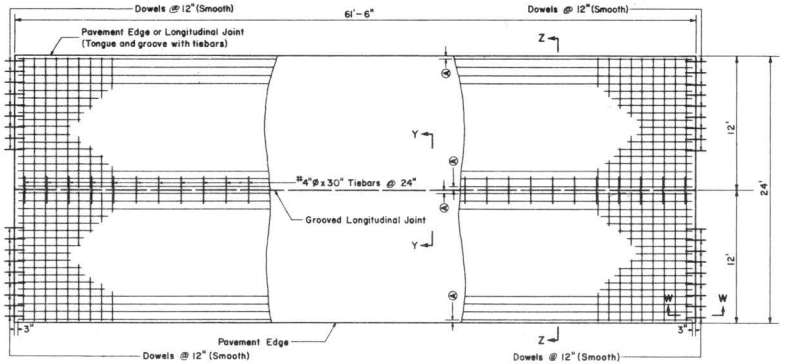
[1] Only when the layer is required
[2] One Course Asphalt Surface Treatment
[3] Two Course Asphalt Surface Treatment
[4] When the layer is required to prevent pumping
*Based upon actual design wheel load encountered with minimum of 12 kips, 10 kips and 6 kips for the HV, MV, and LV highways respectively.
**The minimum shoulder base thickness shall be the selected pavement thickness.

PAVEMENT STRUCTURE DESIGN CRITERIA

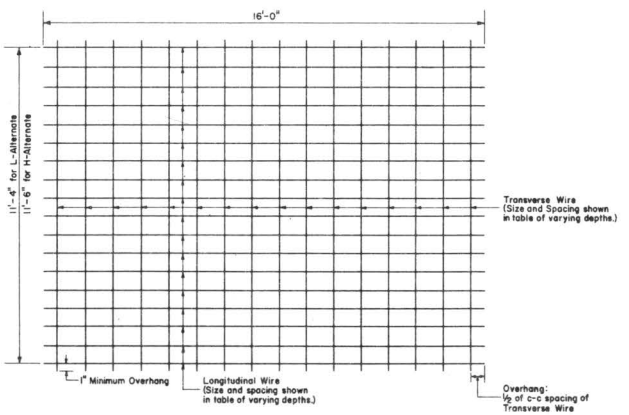
The design procedures for the various types of pavement structures may be found in the Design Manual for Controlled Access Highways, published by the Texas Highway Department as follows:

Portland Cement Concrete Pavement Design Procedures	Topic 3-300
Flexible and Semiflexible Base Design Procedures	Topic 3-400
Evaluation of Existing Pavement Structure for Overlays	Topic 3-600

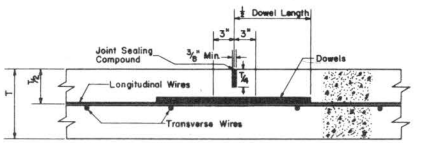
March, 1961



PAVEMENT PLAN

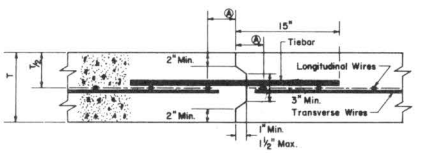


TYPICAL SHEET OF WELDED WIRE FABRIC



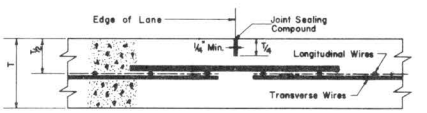
CONTRACTION JOINT

Section W-W



LONGITUDINAL CONSTRUCTION JOINT

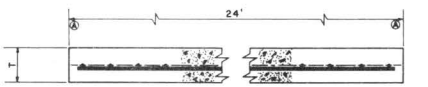
(Tongue and Groove with Tiebars)



GROOVED LONGITUDINAL JOINT

(Sawed or Formed with Tiebars)

Section Y-Y



TYPICAL SECTION

Section Z-Z

GENERAL NOTES

1. ALL GROOVED JOINTS SHALL BE FORMED OR SAWED VERTICAL AND TRUE TO LINE BY AN APPROVED METHOD AND FILLED WITH JOINT SEALING COMPOUND.
2. CONSTRUCTION JOINTS MAY BE FORMED BY THE USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE NOMINAL DEPTH OF THE PAVEMENT, OR BY OTHER MEANS WHICH HAVE BEEN APPROVED BY THE ENGINEER PRIOR TO THEIR USE.
3. TREATMENT OF PAVEMENT ENDS AT STRUCTURES OR AT FIXED OBJECTS WILL BE SHOWN ELSEWHERE IN THE PLANS.
4. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCEMENT REFER TO THE GOVERNING SPECIFICATIONS FOR "CONCRETE PAVEMENT".
5. DETAILS AS TO PAVEMENT WIDTH, PAVEMENT THICKNESS, AND THE CROWN CROSS--SLOPE SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
6. THE MINIMUM TRANSVERSE LAP OF THE WELDED WIRE FABRIC SHALL BE 12 INCHES LONG. THE MINIMUM LONGITUDINAL LAP, IF USED, SHALL BE EQUAL TO THE CENTER TO CENTER SPACING OF THE LONGITUDINAL WIRE.
7. IT IS THE INTENT OF THIS DESIGN THAT THE LONGITUDINAL STEEL BE AT THE CENTER OF THE SLAB. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO TAKE ALL NECESSARY PRECAUTIONS TO INSURE THAT THE FINAL POSITION OF THE STEEL IS WITHIN 1/2 INCH OF THE SLAB CENTER.
8. CONCRETE SHALL NOT BE DISCHARGED FROM THE MIXER DIRECTLY ON TOP OF OR ON THE SIDES OF THE JOINT ASSEMBLY.
9. THE CONTRACTOR SHALL HOLD AND SAVE THE STATE, ITS OFFICERS, ITS AGENTS, AND ITS EMPLOYEES HARMLESS TO LIABILITY OF ANY NATURE OR KIND, INCLUDING COST AND EXPENSES FOR OR ON ACCOUNT OF ANY PATENT OR UNPATENTED INVENTION, ARTICLE OR APPLIANCE MANUFACTURED OR USED IN ACCORDANCE WITH THE DETAILS OF THESE PLANS.

TABLE OF VARYING DEPTHS

Alternate Designs[1]	(T) Pavement Thickness (inches)	Steel Welded Wire Fabric* Style No.	Edge Spacing (A)	Weight[2] lb/sy	Dowels (Smooth Bars) Size	Dowels (Smooth Bars) Average Spacing (in.)	Dowels (Smooth Bars) Weight lb/ft	Tiebars (Deformed Bars) Size	Tiebars (Deformed Bars) Average Spacing (in.)	Tiebars (Deformed Bars) Weight lb/ft
L	10	812-½-1	4	5.58	1½"ø x 22"	12	7.89	#4 x 30"	24	0.84
	9	812-⅛-1	4	5.58	1⅛"ø x 20"	12	5.66	#4 x 30"	26½	0.75
	8	812-12	4	4.71	1"ø x 18"	12	4.01	#4 x 30"	30	0.67
H	10	68-½-1	3	7.66	1¼"ø x 22"	12	7.89	#4 x 30"	18	1.11
	9	68-⅛-1	3	7.66	1⅛"ø x 20"	12	5.66	#4 x 30"	20	1.00
	8	68-13	3	6.20	1"ø x 18"	12	4.01	#4 x 30"	22	0.91

1. One of the alternate designs must be crossed out.
   a. L alternate — to be used with subbases having a low friction factor.
   b. H alternate — to be used with subbases having a high friction factor.
2. Steel weights are for contractors information only.

*Code for welded wire fabric

8 | 12 | ½ | 1
- 8 — Gauge of transverse wire
- 12 — Gauge of longitudinal wire
- ½ — Spacing of transverse wire (in)
- 1 — Spacing of longitudinal wire (in)

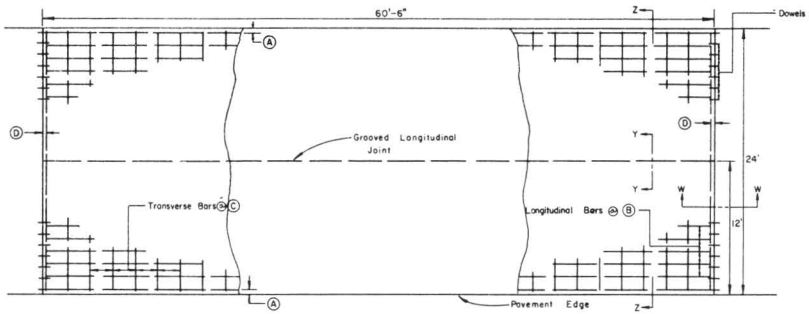
TEXAS HIGHWAY DEPARTMENT

CONCRETE PAVEMENT DETAILS
JOINTED REINFORCED
WELDED WIRE FABRIC
CPJR (F) — 62

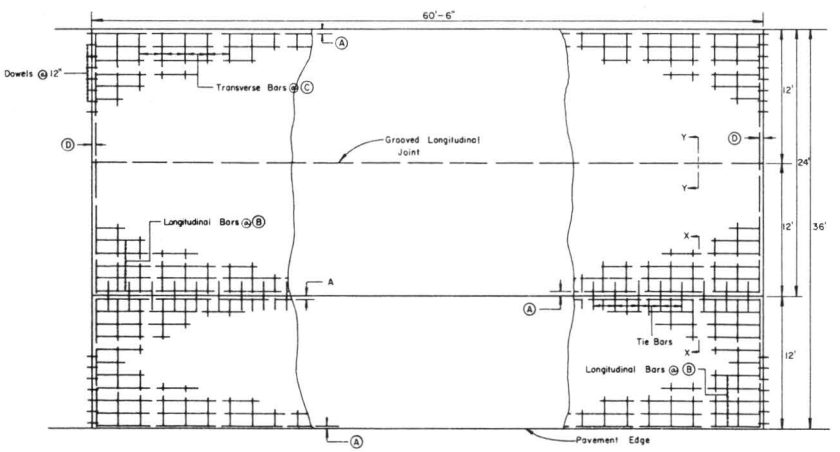
Dn.	Drawing	Date	Fed. Hwy. Div. No.	State	Federal Aid Project No.	Sheet No.
Ck. Dn.			6	Texas		
Dw.			State Dist. No.	County	Control No. / Section No. / Job No. / Highway No.	
Ck. Dw.						
Tr.						
Ck. Tr.						

IV-4

August 1962

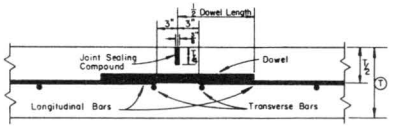


TWO LANE PAVEMENT PLAN
(24 ft. Placement)[6]

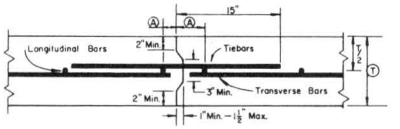


THREE LANE PAVEMENT PLAN
(12 ft. and 24 ft. Placement)[6]

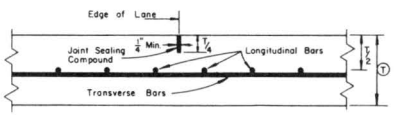
[6] Lane widths are for illustrative purposes only and should not be used if in conflict with typical cross sections shown elsewhere in the plans.



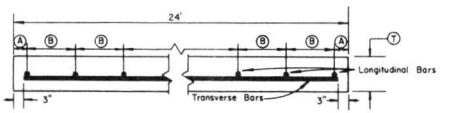
CONTRACTION JOINT
Section W – W



LONGITUDINAL CONSTRUCTION JOINT
(Tongue and Groove with Tie Bars)
Section X – X



GROOVED LONGITUDINAL JOINT
(Sawed or Formed with Tie Bars)
Section Y – Y



TYPICAL SECTION
Section Z – Z

GENERAL NOTES

1. ALL GROOVED JOINTS SHALL BE FORMED OR SAWED VERTICAL AND TRUE TO LINE BY AN APPROVED METHOD AND FILLED WITH JOINT SEALING COMPOUND.
2. CONSTRUCTION JOINTS MAY BE FORMED BY THE USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE NOMINAL DEPTH OF THE PAVEMENT, OR BY OTHER MEANS WHICH HAVE BEEN APPROVED BY THE ENGINEER PRIOR TO THEIR USE.
3. TREATMENT OF PAVEMENT ENDS AT STRUCTURES OR AT FIXED OBJECTS WILL BE SHOWN ELSEWHERE IN THE PLANS.
4. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCEMENT REFER TO THE GOVERNING SPECIFICATIONS FOR "CONCRETE PAVEMENT".
5. DETAILS AS TO PAVEMENT WIDTH, PAVEMENT THICKNESS, AND THE CROWN CROSS--SLOPE SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
6. LONGITUDINAL BARS AND TRANSVERSE BARS SHALL BE INTERMEDIATE GRADE, HARD GRADE, OR HIGH YIELD STEEL IN ACCORDANCE WITH THE SIZE AND SPACING SHOWN IN THE TABLE, EXCEPT THAT ONLY INTERMEDIATE GRADE STEEL SHALL BE USED WHERE BARS ARE TO BE BENT.
7. IT IS THE INTENT OF THIS DESIGN THAT THE LONGITUDINAL STEEL BE AT THE CENTER OF THE SLAB. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO TAKE ALL NECESSARY PRECAUTIONS TO INSURE THAT THE FINAL POSITION OF THE STEEL IS WITHIN 1/2 INCH OF THE SLAB CENTER.
8. CONCRETE SHALL NOT BE DISCHARGED FROM THE MIXER DIRECTLY ON TOP OF OR ON THE SIDES OF THE JOINT ASSEMBLY.
9. ANY APPROVED METAL CHAIR TYPE OR DESIGN, WHICH WILL SATISFY THE REQUIREMENTS NOTED HEREON, WILL BE PERMITTED. CHAIR SPACINGS SHALL NOT BE GREATER THAN 40" C-C MEASURED PARALLEL TO THE PAVEMENT CENTER LINE AND 30" C-C MEASURED PERPENDICULAR TO THE PAVEMENT CENTER LINE. ADDITIONAL CHAIRS SHALL BE USED IF NECESSARY TO MEET THE STEEL PLACEMENT REQUIREMENTS.
10. THE CONTRACTOR SHALL HOLD AND SAVE THE STATE, ITS OFFICERS, ITS AGENTS, AND ITS EMPLOYEES HARMLESS TO LIABILITY OF ANY NATURE OR KIND, INCLUDING COST AND EXPENSES FOR OR ON ACCOUNT OF ANY PATENT OR UNPATENTED INVENTION, ARTICLE OR APPLIANCE MANUFACTURED OR USED IN ACCORDANCE WITH THE DETAILS OF THESE PLANS.

TABLE OF REINFORCING STEEL SIZES, SPACINGS AND ESTIMATED QUANTITIES

ALTERNATE DESIGNS (1)	PAVEMENT THICKNESS (T) (INCHES)	24' PLACEMENT WIDTH							12' PLACEMENT WIDTH							DOWELS (SMOOTH BARS)			TIE BARS (DEFORMED)		
		LONGITUDINAL			TRANSVERSE			(2) STEEL	LONGITUDINAL			TRANSVERSE			(2) STEEL		AVG. WT.			AVG. WT.	
		BAR #	SPAC (A) (IN.)	SPAC (B) (IN.)	BAR #	SPAC (C) (IN.)	SPAC (D) (IN.)	#/SY	BAR #	SPAC (A) (IN.)	SPAC (B) (IN.)	BAR #	SPAC (C) (IN.)	SPAC (D) (IN.)	#/SY	SIZE	SPAC (IN.)	#/FT. OF JT.	SIZE	SPAC (IN.)	#/FT. OF JT.
L	10	3	4	8	4	24	3	8.05	3	4	8	4	24	3	7.71	1½" ø x 20"	12	7.89	#4 x 30"	24	0.84
	9	3	4	8½	4	26½	5½	7.48	3	4	8½	4	26½	5½	7.14	1½" ø x 20"	12	5.66	#4 x 30"	26½	0.75
	8	3	4	10	4	30	3	6.48	3	2	10	4	30	3	6.30	1" ø x 18"	12	4.01	#4 x 30"	30	0.67
H	10	4	4½	10½	4	18	3	10.70	4	7½	10½	4	18	3	10.84	1½" ø x 20"	12	7.89	#4 x 30"	18	1.11
	9	4	6	12	4	20	3	9.57	4	6	12	4	20	3	9.48	1½" ø x 20"	12	5.66	#4 x 30"	20	1.00
	8	4	2½	13½	4	22	11	8.68	4	4½	13½	4	22	11	8.60	1" ø x 18"	12	4.01	#4 x 30"	22	0.91

NOTE:
(1) One of the alternate designs must be crossed out.
a. L alternate – to be used with subbases having a low friction factor.
b. H alternate – to be used with subbases having a high friction factor.
(2) Steel weights are for contractor's use only and include weights of longitudinal and transverse bars.

TEXAS HIGHWAY DEPARTMENT

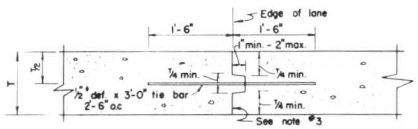
CONCRETE PAVEMENT DETAILS
JOINTED REINFORCED
STEEL BARS

CPJR (B) – 62

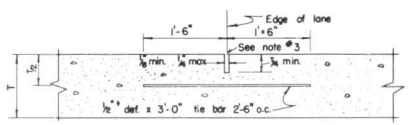
DN: B.F.M.	DRAWING	DATE	FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.	SHEET NO.
CK: DN: M.D.S.	ORIGINAL		6	TEXAS		
DW: J.F.C.	REVISED		STATE DIST. NO.	COUNTY	CONT. SECT. JOB	HIGHWAY NO.
CK: DW:						
TR:						
CK: TR: B.F.M.						

August 1962

LONGITUDINAL JOINTS

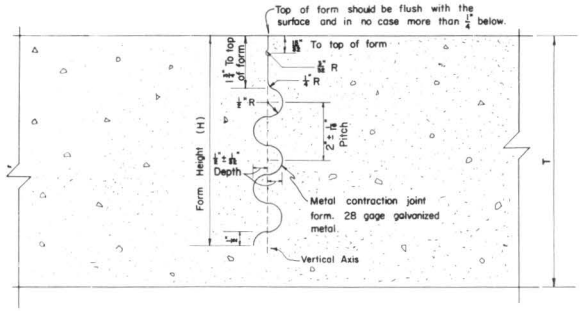


TYPE 1 – CONSTRUCTION
(Tongue and Groove with Tie Bars)



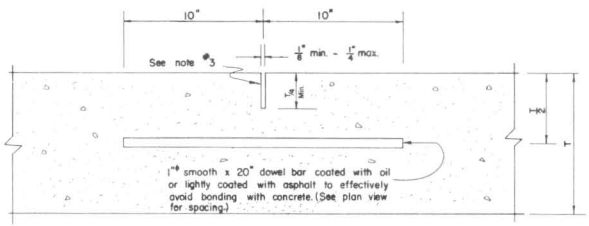
TYPE 2 – GROOVED
(Sawed or Formed with Tie Bars)

TRANSVERSE CONTRACTION JOINTS

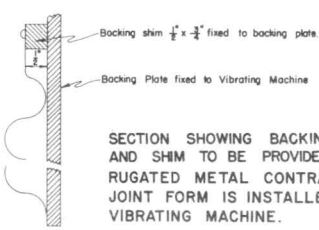


TYPE A – CORRUGATED METAL

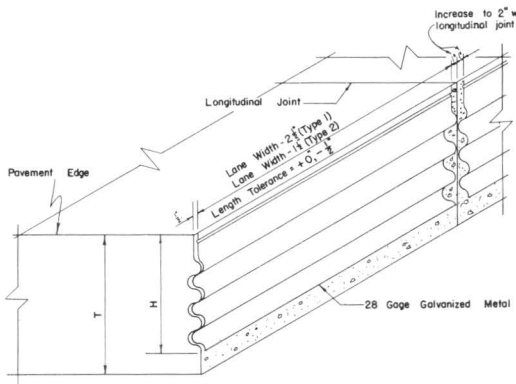
NOTE.
Permissible Fabrication Tolerance — The semicircular segments shall be connected at a common point of tangency on the vertical axis of the joint or by a segment not exceeding one fourth of one inch (¼") in length at right angles to and symmetrical with the vertical axis of the joint.



TYPE B – GROOVED
(Sawed or Formed with Coated Dowels)



SECTION SHOWING BACKING PLATE AND SHIM TO BE PROVIDED IF CORRUGATED METAL CONTRACTION JOINT FORM IS INSTALLED BY VIBRATING MACHINE.

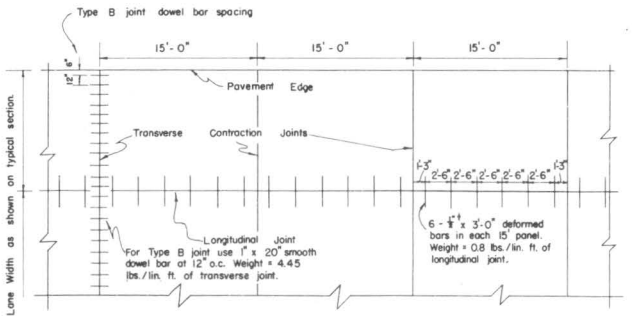


OBLIQUE SECTION SHOWING CORRUGATED METAL CONTRACTION JOINT FORM IN PLACE.

TABLE OF FORM HEIGHTS (H)

SLAB THICKNESS (T)(in)	6	7	8	9	10	11	12
FORM HEIGHT (H) (in.)	5 ½*	5 ½*	5 ½	6 ½	7 ½	8 ½	9 ½

The values shown above are applicable when form is installed by machine. When form is staked out in advance of concrete placement, these values are to be considered as minimum heights.
* *Cannot be placed by machine*



PLAN VIEW OF LONGITUDINAL AND TRANSVERSE CONTRACTION JOINTS.

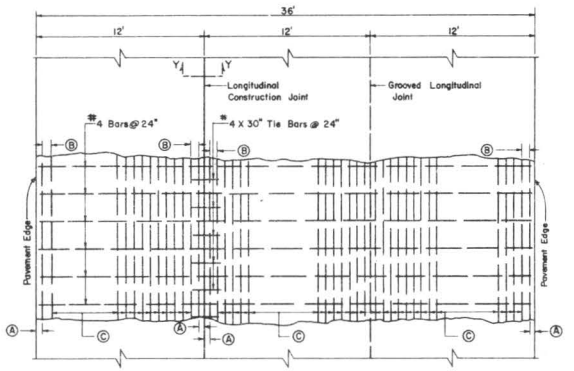
General Notes:

1. Crown, pavement width, and pavement thickness shall be as shown on typical sections elsewhere in plans. Where more than two lanes are shown on the typical sections, the Type 1 longitudinal joint shall be used as a construction joint.
2. The use of Types A & B transverse contraction joints is optional. Other means of load transfer may be used when approved by the Engineer.
3. The weakened plane in Types 1, 2, A, and B shall be true to line, vertical, and of depth shown. For Types 2 and B, the weakened plane may be formed by (a) sawing by an approved machine and filling with rubber joint sealing compound, or (b) an asphalt board strip held in an approved continuous metal shield and placed continuously in a groove cut in the concrete by an approved mechanical device operating in advance of the longitudinal float, or (c) an asphalt impregnated felt strip, or (d) any alternate method which, prior to its use, has been approved by the Engineer. The minimum thickness of the weakened plane as shown in Types 2 & B does not apply to (b) and (c) above.
4. Type 1 longitudinal joint may be formed by a metal form, wood form, or other means, which prior to its use, has been approved by the Engineer.
5. The Contractor will be required to vibrate the Metal Contraction Joint Form or concrete adjacent to the form to the extent necessary that all corrugations are filled with concrete. Over vibration shall be avoided in all cases.
6. Tie bars shall be secured parallel to the pavement surface and perpendicular to the center line by a bar chair or accurately placed in position on the screeded concrete by means of an approved template and forced to the proper position with suitable tool, or any other means, which prior to its use, has been approved by the Engineer.
7. Dowel bars shall be secured parallel to the pavement surface and centerline by a dowel bar chair or placed by a machine which will accurately position the bars by vibrating them into the full depth concrete slab prior to the pass of the final finishing equipment.
8. When work is stopped due to breakdown or other cause, concrete shall be removed beyond last contraction joint in place and header installed.
9. Where monolithic curb is specified, the joint in the curb shall coincide with pavement joints and be formed by any means which, prior to its use, has been approved by the Engineer.
10. On two lane pavements where circular or parabolic crown is specified, the Metal Contraction Joint Form shall be placed with ends flush with pavement surface. Cutting crown in top of form is not necessary.
11. Unless otherwise specified by the Engineer, the minimum length of Metal Contraction Joint Form shall be lane width minus 1". Where shorter lengths are permitted, they shall be held together by any means which holds adjoining sheets in line and which is approved by the Engineer.
12. Expansion joints shall be provided only at structure ends as shown elsewhere in plans.
13. The contractor shall hold and save the State, its officers, its agents, and its employees harmless to liability of any nature or kind, including costs and expenses, for or on account of any patent or unpatented invention, article or appliance manufactured or used in accordance with the details of these plans.

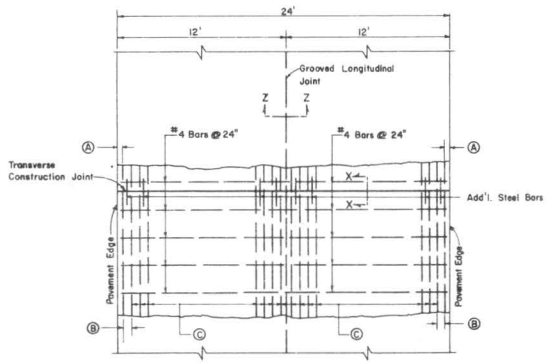
TEXAS HIGHWAY DEPARTMENT

CONCRETE PAVEMENT CONTRACTION DESIGN CPCD-61

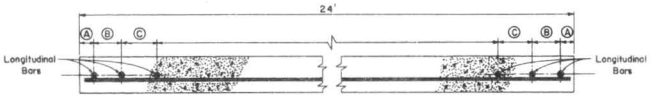
FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.	SHEET NO.
6	TEXAS		
STATE DIST. NO.	COUNTY	CONT. SECT. JOB	HIGHWAY NO.



THREE LANE PAVEMENT PLAN
(12 ft. and 24 ft. Placement)*

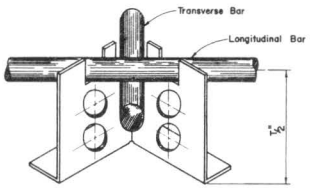


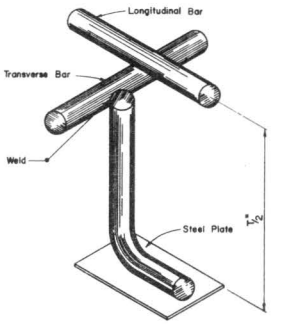
TWO LANE PAVEMENT PLAN
(24 ft. Placement)*



TYPICAL SECTION
(24 ft. Placement)*

* LANE WIDTHS ARE FOR ILLUSTRATIVE PURPOSES ONLY AND SHOULD NOT BE USED IF IN CONFLICT WITH TYPICAL CROSS SECTIONS SHOWN ELSEWHERE IN THE PLANS.





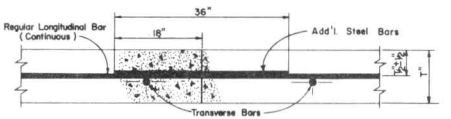
SUGGESTED CHAIR DETAILS

GENERAL NOTES

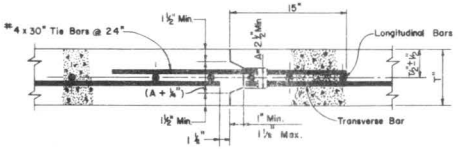
1. NO EXPANSION JOINTS WILL BE USED EXCEPT AT STRUCTURAL ENDS OR FIXED OBJECTS AS SHOWN ELSEWHERE IN THE PLANS.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCEMENT REFER TO THE GOVERNING SPECIFICATIONS FOR "CONCRETE PAVEMENT".
3. DETAILS AS TO PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
4. WITHIN ANY AREA BOUNDED BY TWO FEET OF PAVEMENT LENGTH, MEASURED PARALLEL TO THE CENTERLINE; AND TWELVE FEET OF PAVEMENT WIDTH, MEASURED PERPENDICULAR TO THE PAVEMENT CENTERLINE, NOT OVER 33% OF THE REGULAR LONGITUDINAL STEEL SHALL BE SPLICED.
5. MINIMUM SPLICE REQUIREMENTS:

   HIGH YIELD STEEL (MINIMUM 60,000 PSI YIELD):
   24 TIMES THE NOMINAL DIAMETER OF THE BAR.

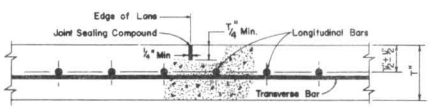
   HARD GRADE STEEL (MINIMUM 50,000 PSI YIELD):
   20 TIMES THE NOMINAL DIAMETER OF THE BAR
6. AT TRANSVERSE CONSTRUCTION JOINTS THE REGULAR LONGITUDINAL BARS SHALL EXTEND BEYOND THE JOINT SUCH THAT THE BAR SPLICES FOR THE REGULAR LONGITUDINAL BARS SHALL BE A MINIMUM OF FOUR FEET FROM THE CONSTRUCTION JOINT. AT LONGITUDINAL CONSTRUCTION JOINTS, IF THE CONTRACTOR ELECTS TO CONTINUE THE REGULAR TRANSVERSE STEEL THROUGH THE JOINT, THE #4 @ TIE BARS SHOWN HEREON MAY BE DELETED. HAND VIBRATION OF THE CONCRETE WILL BE REQUIRED AT ALL TRANSVERSE CONSTRUCTION JOINTS.
7. CHAIR DETAILS SHOWN HEREON ARE EXAMPLES ONLY; OTHER APPROVED TYPES WHICH WILL SATISFY THE REQUIREMENTS NOTED HEREIN, WILL BE PERMITTED. CHAIR SPACINGS SHALL NOT BE GREATER THAN 48" C-C (LONGITUDINAL) AND 30" C-C (TRANSVERSE). ADDITIONAL CHAIRS SHALL BE USED IF NECESSARY TO MEET THE STEEL PLACEMENT REQUIREMENTS.



TRANSVERSE CONSTRUCTION JOINT
Section X-X



LONGITUDINAL CONSTRUCTION JOINT
(Tongue and Groove with Tie Bars)
Section Y-Y



GROOVED LONGITUDINAL JOINT
(Sawed or Formed)
Section Z-Z

JOINT DETAILS

TABLE OF EQUIVALENT LONGITUDINAL REINFORCEMENT

Pavement Thickness "T" in.	Steel Grade	Bar Size	24ft Placement Width: Spacing C-C Ⓐ in	Ⓑ in	Ⓒ in	Bars per placement	① Steel #s/ft	12 ft. Placement Width: Spacing C-C Ⓐ in	Ⓑ in	Ⓒ in	Bars per placement	① Steel #s/ft	Add'l. Steel @ Const. Jt.: Size	Aggregate spacing in	② No. Bar per Lane	Weight #s/ft	REMARKS
8	High Yield	No. 5	3	6	7½	39	18.26	3	5¼	7½	20	18.65	⅝"@x36"	12½	12	3.13	
	Hard Grade	No. 5	3½	4	6½	45	20.61	3	4	6½	23	21.00	⅝"@x36"	14	10	2.61	Alt. Design
7	High Yield	No.5	3	5	8⅛	35	16.70	4	8¼	8½	17	16.30	⅝"@x36"	12½	12	3.13	
	Hard Grade	No.5	3	6	7⅛	39	18.26	3	5¼	7⅛	20	18.65	⅝"@x36"	14	10	2.61	Alt. Design
6	High Yield	No.4	3	4½	7	42	13.52	3	6	7	21	13.52	½"@x36"	8	18	3.01	
	Hard Grade	No.5	3	5	8⅛	35	16.70	4	8¼	8⅛	17	16.30	⅝"@x36"	14	10	2.61	Alt. Design

NOTE: THE SPACINGS Ⓑ SHOWN IN THE ABOVE PLACEMENT TABLE ARE THE MAXIMUM ALLOWABLE SPACINGS. WHERE THE PROPOSED PLACEMENT WIDTHS VARY FROM THE BASIC DESIGN WIDTH SHOWN, THE SPACING Ⓑ AND THE ADJACENT SPACING Ⓒ SHALL BE ADJUSTED TO ACCOMMODATE A REINFORCEMENT ARRANGEMENT EQUAL TO OR SLIGHTLY HEAVIER THAN THAT SHOWN AS DIRECTED BY THE ENGINEER.

① INCLUDES BOTH REGULAR LONGITUDINAL AND TRANSVERSE BARS, BASED UPON 1 FOOT PAVEMENT FOR THE WIDTH INDICATED. ALL TRANSVERSE STEEL IS #4 BARS AT 24" CENTERS.

② THIS SHALL BE THE MINIMUM NUMBER OF ADDITIONAL STEEL BARS TO BE PLACED PER LANE. THE SPACING OF THE ADDITIONAL STEEL BARS SHALL BE VARIED AS DIRECTED IN ORDER TO PROVIDE A MINIMUM CLEARANCE OF 2 1/2" FROM EACH REGULAR LONGITUDINAL REINFORCING BAR.

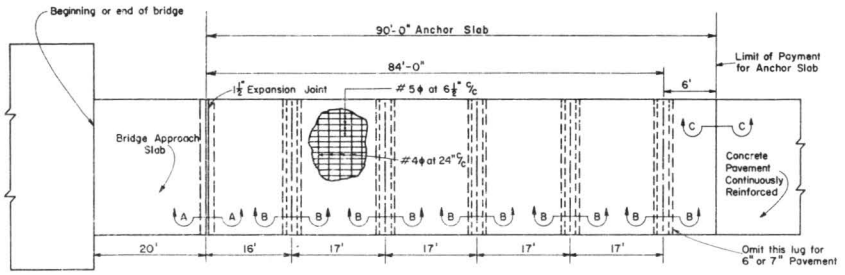
SPECIAL NOTE
THE CONTRACTOR SHALL HOLD AND SAVE THE STATE, ITS OFFICERS, ITS AGENTS, AND ITS EMPLOYEES HARMLESS TO LIABILITY OF ANY NATURE OR KIND, INCLUDING COST AND EXPENSES FOR OR ON ACCOUNT OF ANY PATENT OR UNPATENTED INVENTION, ARTICLE OR APPLICANCE MANUFACTURED OR USED IN ACCORDANCE WITH THE DETAILS OF THESE PLANS.

TEXAS HIGHWAY DEPARTMENT

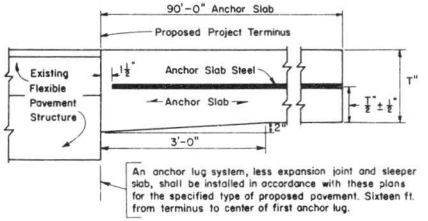
CONCRETE PAVEMENT DETAILS CONTINUOUSLY REINFORCED STEEL BARS

CPCR (B)-62

DRAWING	DATE	FED. AID PROJ. NO.	STATE	FEDERAL PROJECT NO.	SHEET NO.
ORIGINAL	JAN 1961				
Revised	AUG 1962		TEXAS		
		STATE PROJ. NO.	COUNTY	CONT. SECT. JOB	HIGHWAY NO.

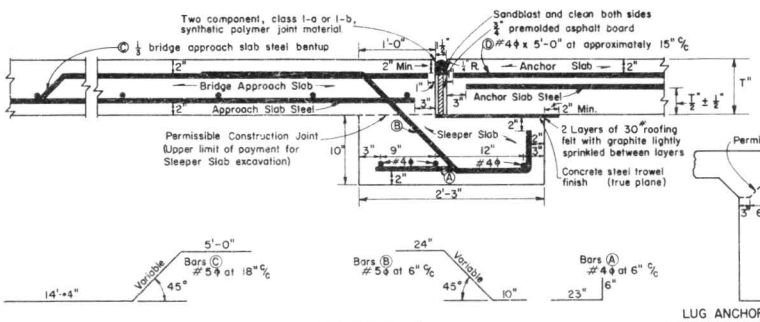


PLAN VIEW



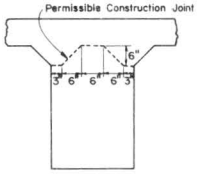
PAVEMENT TERMINUS DETAIL FOR JUNCTURE WITH EXISTING FLEXIBLE TYPE PAVEMENT STRUCTURE

NOTE: Details of junctures with existing concrete pavements (if applicable) shall be as shown elsewhere in the plans.

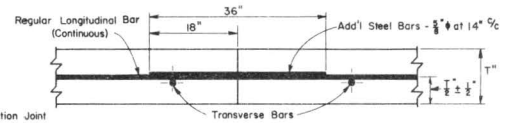


SECTION "A-A"

EXPANSION JOINT AND SLEEPER SLAB DETAIL

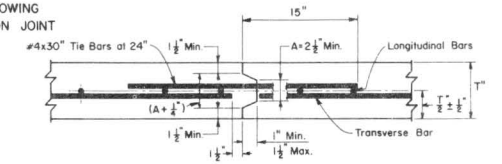


LUG ANCHOR DETAIL SHOWING PERMISSIBLE CONSTRUCTION JOINT



SECTION "C-C"

PERMISSIBLE TRANSVERSE CONSTRUCTION JOINT



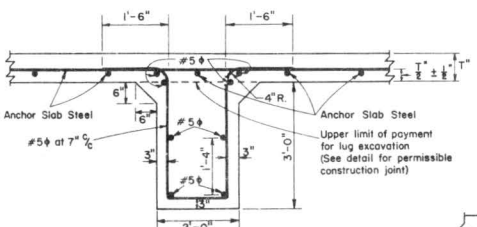
LONGITUDINAL CONSTRUCTION JOINT

(Tongue and Groove with Tie Bars)

ESTIMATED QUANTITIES FOR ONE 24 FOOT WIDE TERMINAL ANCHORAGE

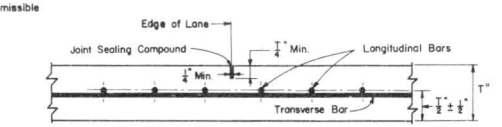
ITEM	PAVEMENT THICKNESS T(IN.)	CONCRETE (CU. YD.)	STEEL (LBS.)	EXCAVATION (CU. YD.)
SLEEPER SLAB	8	1.67	349	1.67
	7	1.67	343	1.67
	6	1.67	338	1.67
LUG ANCHORS	8 [a]	27.8	3318	27.8
	7 b	22.2	2624	22.2
	6 b	22.2	2624	22.2
ANCHOR SLAB	8	53.3 [c]	5001	—
	7	46.7 [c]	5001	—
	6	40.0 [c]	5001	—

a. Five lug anchors required
b. Four lug anchors required
c. For pavement terminus with existing flexible pavement structure, the concrete quantity should be increased by 0.2 C.Y. to include the thickened end detail.



SECTION "B-B"

LUG ANCHOR DETAIL



GROOVED LONGITUDINAL JOINT

(Sawed or Formed)

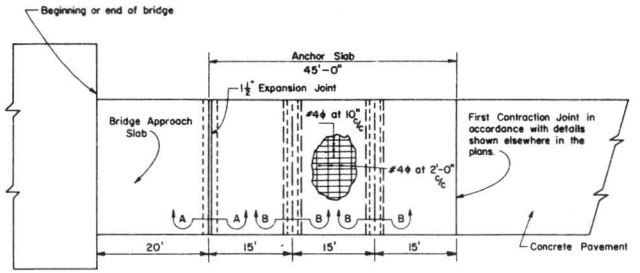
GENERAL NOTES

1. THE REQUIREMENTS OF THE BRIDGE APPROACH SLAB DESIGN AND THICKNESS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCING STEEL REFER TO THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)".
3. DETAILS AS TO ANCHOR SLAB WIDTH, THICKNESS, CROWN CROSS-SLOPE, AND LOCATION AND TYPE OF LONGITUDINAL JOINTS SHALL BE AS SHOWN ELSEWHERE ON THE PLANS.
4. ALL CONCRETE, REINFORCING STEEL, AND REQUIRED EXCAVATION FOR THE SLEEPER SLAB, LUG ANCHORS, AND ANCHOR SLAB SHALL BE MEASURED AND PAID FOR UNDER THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)" EXCEPT THAT PAYMENT WILL NOT BE MADE FOR CONCRETE USED IN BACK FILLING OVER-EXCAVATED AREAS OF LUG ANCHORS OR SLEEPER SLABS.
5. THE USE OF THIS DESIGN INVOLVES THE MODIFICATION OF THE BRIDGE APPROACH SLAB DETAIL AS SHOWN HEREON.
6. THE CONTRACTOR SHALL HOLD AND SAVE THE STATE, ITS OFFICERS, ITS AGENTS, AND ITS EMPLOYEES HARMLESS TO LIABILITY OF ANY NATURE OR KIND, INCLUDING COSTS AND EXPENSES, FOR OR ON ACCOUNT OF ANY PATENTED OR UNPATENTED INVENTION, ARTICLE OR APPLIANCE MANUFACTURED OR USED IN ACCORDANCE WITH THE DETAILS OF THESE PLANS.
7. THE LOCATIONS OF THE TERMINAL ANCHORAGE SYSTEMS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
8. REINFORCING STEEL BARS SHALL BE OF THE SIZE AND SPACING AS DETAILED HEREON AND MAY BE ANY OF THE APPROVED GRADES OF REINFORCING STEEL AS SPECIFIED IN THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)", WITH THE PROVISION THAT BARS THAT REQUIRE FIELD BENDING SHALL BE OF STRUCTURAL OR INTERMEDIATE GRADE.
9. WITHIN ANY AREA BOUNDED BY TWO FEET OF PAVEMENT LENGTH, MEASURED PARALLEL TO BE CENTER LINE; AND TWELVE FEET OF PAVEMENT WIDTH, MEASURED PERPENDICULAR TO THE CENTER LINE, NOT OVER 33% OF THE REGULAR LONGITUDINAL STEEL SHALL BE SPLICED.
10. MINIMUM SPLICE REQUIREMENT: 20 TIMES THE NOMINAL DIAMETER OF THE BAR.
11. TRANSVERSE CONSTRUCTION JOINTS IN THE ANCHOR SLAB WILL NOT BE ALLOWED EXCEPT IN AN EMERGENCY STOPPAGE OF THE CONCRETE PLACEMENT AND WITH THE APPROVAL OF THE ENGINEER. AT TRANSVERSE CONSTRUCTION JOINTS THE REGULAR LONGITUDINAL BARS SHALL EXTEND BEYOND THE JOINT SUCH THAT THE BAR SPLICES FOR THE REGULAR LONGITUDINAL BARS SHALL BE A MINIMUM OF FOUR FEET FROM THE CONSTRUCTION JOINT. (IF THE CONTRACTOR ELECTS TO OMIT THE CONSTRUCTION JOINT IN SECTION "C-C", THE ADDITIONAL STEEL BAR SHOWN HEREON MAY BE DELETED.)
12. AT LONGITUDINAL CONSTRUCTION JOINTS, IF THE CONTRACTOR ELECTS TO CONTINUE THE REGULAR TRANSVERSE STEEL THROUGH THE JOINT THE #4 TIE BARS SHOWN HEREON MAY BE DELETED.
13. ANY APPROVED METAL CHAIR TYPE OR DESIGN, WHICH WILL SATISFY THE REQUIREMENTS NOTED HEREON, WILL BE PERMITTED. CHAIR SPACINGS SHALL NOT BE GREATER THAN 48" C-C MEASURED PARALLEL TO THE PAVEMENT CENTER LINE AND 30" C-C MEASURED PERPENDICULAR TO THE PAVEMENT CENTER LINE. ADDITIONAL CHAIRS SHALL BE USED IF NECESSARY TO MEET THE STEEL PLACEMENT REQUIREMENTS.
14. FOR SKEWED BRIDGES, THE APPROACH SLAB AND EXPANSION JOINT WILL BE SKEWED AS PER BRIDGE. LONGITUDINAL DIMENSION OF APPROACH SLAB, ANCHOR SLAB, AND ANCHOR LUG SPACINGS SHALL BE MEASURED ALONG THE CENTER LINE OF PAVEMENT.

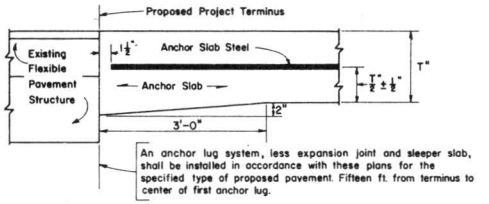
TEXAS HIGHWAY DEPARTMENT
TERMINAL ANCHORAGE FOR CONCRETE PAVEMENT CONTINUOUSLY REINFORCED
TA(CPCR) - 62

ON WBL / CK ON MDS / DW / CK DW / TR / CK TR	DRAWING: Original	DATE: July 1961	FED. RD. DIV. NO.	STATE: TEXAS	FEDERAL PROJECT NO.	SHEET NO.
			STATE DIST. NO.	COUNTY	CONT. / SECT. / JOB	HIGHWAY NO.

August 1962

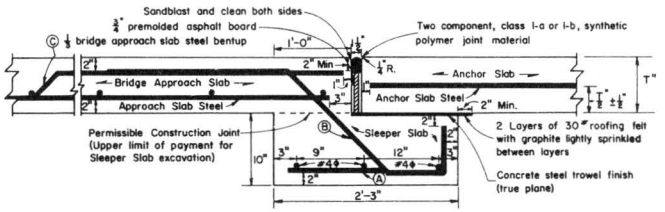


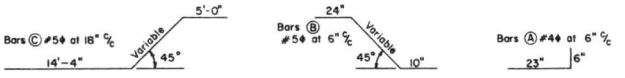
PLAN VIEW



PAVEMENT TERMINUS DETAIL FOR JUNCTURE WITH EXISTING FLEXIBLE TYPE PAVEMENT STRUCTURE

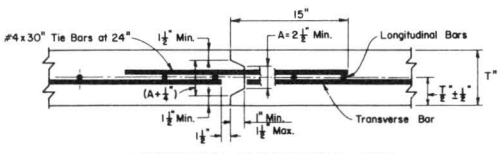
NOTE: Details of juncture with existing concrete pavements (if applicable) shall be as shown elsewhere in the plans.





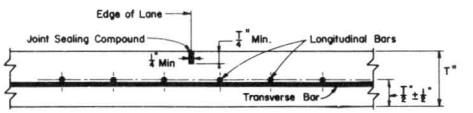
SECTION "A-A"

EXPANSION JOINT AND SLEEPER SLAB DETAIL



LONGITUDINAL CONSTRUCTION JOINT

(Tongue and Groove with Tie Bars)



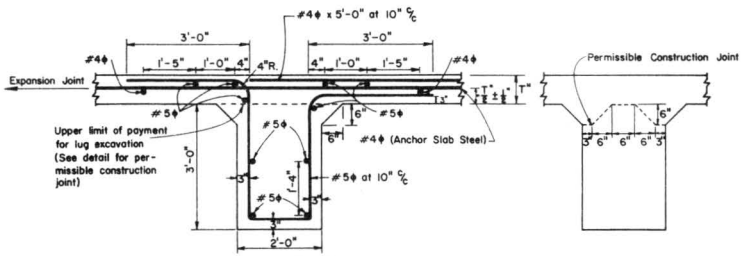
GROOVED LONGITUDINAL JOINT

(Sawed or Formed)

ESTIMATED QUANTITIES FOR ONE 24 FOOT WIDE TERMINAL ANCHORAGE

ITEM	PAVEMENT THICKNESS T(IN.)	CONCRETE (CU. YD.)	STEEL (LBS.)	EXCAVATION (CU. YD.)
SLEEPER SLAB	8	1.67	349	1.67
	9	1.67	355	1.67
	10	1.67	361	1.67
LUG ANCHORS(2)	ALL	11.1	1535	11.1
ANCHOR SLAB	8	26.7*	1168	0
	9	30.0*	1168	0
	10	33.3*	1168	0

* For pavement terminus with existing flexible pavement structure, the concrete quantity should be increased by 0.2 C.Y. to include the thickened end detail.



SECTION "B-B"

LUG ANCHOR DETAIL

LUG ANCHOR DETAIL SHOWING PERMISSIBLE CONSTRUCTION JOINT

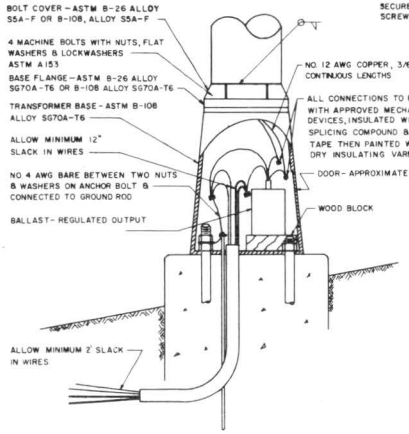
GENERAL NOTES

1. THE REQUIREMENTS OF THE BRIDGE APPROACH SLAB DESIGN AND THICKNESS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCING STEEL REFER TO THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)".
3. DETAILS AS TO ANCHOR SLAB WIDTH, THICKNESS, CROWN CROSS-SLOPE, AND LOCATION AND TYPE OF LONGITUDINAL JOINTS SHALL BE AS SHOWN ELSEWHERE ON THE PLANS.
4. ALL CONCRETE, REINFORCING STEEL AND REQUIRED EXCAVATION FOR THE SLEEPER SLAB, LUG ANCHORS, AND ANCHOR SLAB SHALL BE MEASURED AND PAID FOR UNDER THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)" EXCEPT THAT PAYMENT WILL NOT BE MADE FOR CONCRETE USED IN BACK FILLING OVER-EXCAVATED AREAS OF LUG ANCHORS OR SLEEPER SLABS.
5. THE USE OF THIS DESIGN INVOLVES THE MODIFICATION OF THE BRIDGE APPROACH SLAB DETAIL AS SHOWN HEREON.
6. THE CONTRACTOR SHALL HOLD AND SAVE THE STATE, ITS OFFICERS, ITS AGENTS, AND ITS EMPLOYEES HARMLESS TO LIABILITY OF ANY NATURE OR KIND, INCLUDING COSTS AND EXPENSES, FOR OR ON ACCOUNT OF ANY PATENTED OR UNPATENTED INVENTION, ARTICLE OR APPLICANCE MANUFACTURED OR USED IN ACCORDANCE WITH THE DETAILS OF THESE PLANS.
7. THE LOCATIONS OF THE TERMINAL ANCHORAGE SYSTEM SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
8. REINFORCING STEEL BARS SHALL BE OF THE SIZE AND SPACING AS DETAILED HEREON AND MAY BE ANY OF THE APPROVED GRADES OF REINFORCING STEEL AS SPECIFIED IN THE ITEM "TERMINAL ANCHORAGE (CONCRETE PAVEMENT)" WITH THE PROVISION THAT BARS THAT REQUIRE FIELD BENDING SHALL BE OF STRUCTURAL OR INTERMEDIATE GRADE.
9. TRANSVERSE CONSTRUCTION JOINTS IN THE ANCHOR SLAB WILL NOT BE ALLOWED EXCEPT IN AN EMERGENCY STOPPAGE OF THE CONCRETE PLACEMENT AND WITH THE APPROVAL OF THE ENGINEER. AT TRANSVERSE CONSTRUCTION JOINTS THE REGULAR LONGITUDINAL BARS SHALL EXTEND BEYOND THE JOINT SUCH THAT THE BAR SPLICES FOR THE REGULAR LONGITUDINAL BARS SHALL BE A MINIMUM OF FOUR FEET FROM THE CONSTRUCTION JOINT.
10. AT LONGITUDINAL CONSTRUCTION JOINTS, IF THE CONTRACTOR ELECTS TO CONTINUE THE REGULAR TRANSVERSE STEEL THROUGH THE JOINT, THE #4 # TIE BARS SHOWN HEREON MAY BE DELETED.
11. ANY APPROVED METAL CHAIR TYPE OR DESIGN, WHICH WILL SATISFY THE REQUIREMENTS NOTED HEREON, WILL BE PERMITTED. CHAIR SPACINGS SHALL NOT BE GREATER THAN 48" C-C MEASURED PARALLEL TO THE PAVEMENT CENTER LINE AND 30" C-C MEASURED PERPENDICULAR TO THE PAVEMENT CENTER LINE. ADDITIONAL CHAIRS SHALL BE USED IF NECESSARY TO MEET THE STEEL PLACEMENT REQUIREMENTS.
12. FOR SKEWED BRIDGES, THE APPROACH SLAB AND EXPANSION JOINT WILL BE SKEWED AS PER BRIDGE. LONGITUDINAL DIMENSION OF APPROACH SLAB, ANCHOR SLAB, AND ANCHOR LUG SPACINGS SHALL BE MEASURED ALONG THE CENTER LINE OF PAVEMENT.

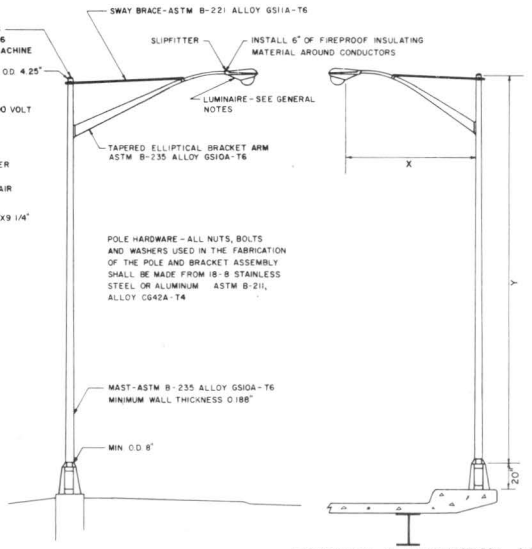
TEXAS HIGHWAY DEPARTMENT
TERMINAL ANCHORAGE FOR CONCRETE PAVEMENT JOINTED
TA(CPJ) – 62

DN: WBL	DRAWING	DATE	FED. NO. DIV. NO.	STATE	FEDERAL PROJECT NO.	SHEET NO.
CK. DN: MDS	Original	July 1961	6	TEXAS		
DW:			STATE DIST. NO.	COUNTY	CONT. SECT. JOB	HIGHWAY NO.
CK. DW:						
TR:						
CK. TR:						

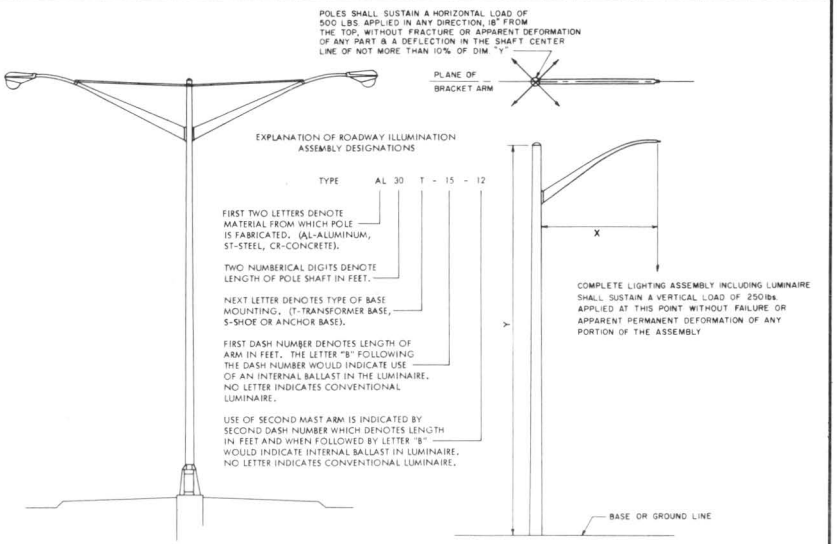
V ROADWAY ILLUMINATION



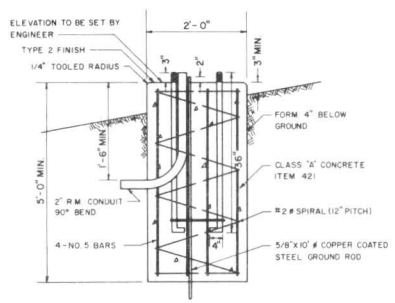
TRANSFORMER BASE DETAIL

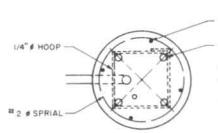


ROADWAY ILLUMINATION ASSEMBLIES



STRENGTH REQUIREMENTS

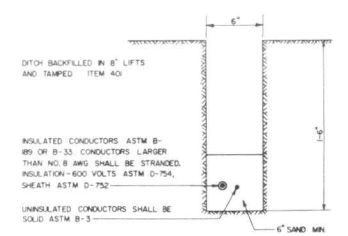




FOUNDATION DETAIL (TYPE A)

GENERAL NOTES:

1. ALL WORK, MATERIALS AND SERVICES NOT SHOWN ON THE PLANS WHICH MAY BE NECESSARY FOR COMPLETE AND PROPER CONSTRUCTION SHALL BE PERFORMED, FURNISHED AND INSTALLED BY THE CONTRACTOR.
2. THE DETAILS AND DIMENSIONS AS INDICATED ON THIS SHEET SHALL APPLY UNLESS SHOWN OTHERWISE WITHIN THE BODY OF THESE PLANS.
3. ALL TESTING WILL BE DONE IN ACCORDANCE WITH PROCEDURES DEVELOPED OR APPROVED BY THE TEXAS HIGHWAY DEPARTMENT.
4. THE LOCATION OF CONDUCTOR, CONDUIT, JUNCTION BOXES, TRANSFORMER STATIONS AND SERVICE POLES IS DIAGRAMMATIC ONLY AND MAY BE SHIFTED BY THE ENGINEER TO ACCOMMODATE LOCAL CONDITIONS.
5. BALLAST SHALL BE DESIGNED TO OPERATE 400 WATT MERCURY VAPOR LAMPS. THE BALLAST WILL MAINTAIN LAMP RATED WATTAGE WITHIN PLUS OR MINUS 3% DURING FLUCTUATIONS OF THE PRIMARY VOLTAGE UP TO PLUS OR MINUS 13%. THE BALLAST SHALL OPERATE WITH A POWER FACTOR OF NOT LESS THAN 95% WHEN THE CIRCUIT VOLTAGE INDICATED ON THE FACE OF THESE PLANS IS APPLIED. THE BALLAST SHALL BE CONSTRUCTED IN A WATER TIGHT ALUMINUM OR GALVANIZED STEEL CASE AND BE PROVIDED WITH LEGIBLE DIE STAMPED OR ETCHED MARKINGS TO PERMANENTLY INDICATE THE FOLLOWING: TYPE, CATALOG NUMBER, VOLTAGE RATING, AND CONNECTION DIAGRAM.
6. LUMINAIRES
   - A. THE LUMINAIRE HOUSING SHALL BE CAST OR DRAWN FROM A NON-FERROUS ALLOY AND THE EXTERIOR SURFACE SHALL HAVE AN UNPAINTED, UNIFORM NATURAL ALUMINUM FINISH.
   - B. THE SLIPFITTER SHALL SECURELY CLAMP THE LUMINAIRE TO THE MAST ARM. VERTICAL ADJUSTMENT SHALL BE ACCOMPLISHED BY LEVELING SCREWS INDEPENDENT OF THE CLAMPING DEVICE.
   - C. THE OPTIC ASSEMBLY SHALL BE PROVIDED WITH RESILIENT GASKETS AND SO CONSTRUCTED THAT A POSITIVE SEAL AGAINST WEATHER AND OTHER CONTAMINATES WILL BE MAINTAINED.
   - D. THE HINGE SHALL BE DESIGNED SO THAT REMOVAL OF THE REFRACTOR RETAINER MAY BE ACCOMPLISHED ONLY BY SWINGING BEYOND THE NORMAL OPEN POSITION AND LIFTING. A KEEPER SHALL BE PROVIDED TO PREVENT UNINTENTIONAL SEPARATION OF THE HINGE.
   - E. THE LATCH SHALL BE AUTOMATIC TYPE AND DESIGNED SUCH THAT A SPRING FAILURE WILL NOT CAUSE THE REFRACTOR ASSEMBLY TO OPEN.
   - F. THE REFLECTOR SHALL BE PROCESSED TO A HIGHLY SPECULAR FINISH. IT SHALL BE SECURED IN SUCH A MANNER THAT NO TOOLS WILL BE NECESSARY FOR REMOVAL OR PLACEMENT. THE EDGES OF THE REFLECTOR, IF NOT COVERED BY A GASKET, SHALL BE SMOOTH AND ALL CORNERS ROUNDED TO PREVENT INJURY TO BARE HANDS. THE REFLECTOR SHALL HAVE SUFFICIENT STRENGTH TO PREVENT BEING DISTORTED DURING ROUTINE OPERATIONS.
   - G. THE REFRACTOR SHALL BE CRYSTAL-CLEAR PRESSED GLASS WITH REFRACTING PRISMS.
   - H. THE SOCKET SHALL BE NICKEL PLATED COPPER AND SHALL BE RIGIDLY ATTACHED TO A HIGH GRADE PORCELAIN BASE WHICH SHALL EXTEND AND COMPLETELY ENCLOSE THE METAL SHELL. A LOCKING MEANS SHALL BE INCORPORATED IN THE SOCKET TO POSITIVELY RESIST THE REMOVAL OF THE LAMP.
   - J. THE LUMINAIRE WHEN MOUNTED THIRTY FEET ABOVE THE MIDPOINT OF EITHER LONG SIDE OF A RECTANGULAR AREA MEASURING 160 FEET BY 45 FEET SHALL PROVIDE A MEASURED MINIMUM INTENSITY OF 0.1 FOOT CANDLE AT ANY POINT ON THE SURFACE OF THIS AREA THE LIGHT PROJECTED UPON THE ROADWAY SHALL APPEAR TO DECREASE UNIFORMLY AND WITHOUT EXCESSIVE STRIATIONS AS THE DISTANCE IS INCREASED FROM A POINT DIRECTLY BENEATH THE LUMINAIRE.
   - K. MERCURY VAPOR LAMPS SHALL BE HORIZONTAL BURNING 400 WATT, 20,300 LUMEN WITH A RATED AVERAGE LIFE OF 9000 HOURS.
   - L. BEFORE PLACEMENT, AN ADEQUATE NUMBER OF LUMINAIRES RECEIVED FOR THE PROJECT WILL BE SELECTED AT RANDOM BY A REPRESENTATIVE OF THE TEXAS HIGHWAY DEPARTMENT AND TESTED. AFTER THE TEST RESULTS HAVE BEEN EVALUATED, THE ENGINEER WILL BE NOTIFIED WHETHER THE LUMINAIRES DO, OR DO NOT MEET THE REQUIREMENTS SET FORTH IN THESE PLANS AND SPECIFICATIONS. THE LUMINAIRES WILL THEN BE RETURNED, FREIGHT PREPAID, TO THE JOB. IT IS NOT INTENDED THAT THE LUMINAIRES WILL BE DAMAGED BY THE TEST PROCEDURE. ALL LUMINAIRES WILL BE INSPECTED AND EVALUATED AFTER THE SYSTEM IS ENERGIZED AND ADJUSTED, TO DETERMINE FINAL ACCEPTANCE OF THE UNITS.
7. FOUR CERTIFIED PRINTS SHOWING THE PHYSICAL DIMENSIONS OF THE LIGHTING STANDARDS SHALL BE FURNISHED TO THE TEXAS HIGHWAY DEPARTMENT AND NO LIGHTING STANDARDS WILL BE INSTALLED UNTIL THESE PRINTS HAVE BEEN RECEIVED AND APPROVED. THE SUPPLIER SHALL ALSO FURNISH FOUR (4) COPIES OF CERTIFICATE OF ANALYSIS EXECUTED BY THE PRODUCERS OF THE COMPONENT PARTS GUARANTEEING THE CHEMICAL QUALITY AND FINAL TEMPER.
8. ALL POLES SHALL BE FABRICATED IN SUCH A MANNER THAT EACH POLE WILL ACCOMMODATE EITHER OF THE VARIOUS LENGTH BRACKETS.
9. ALL BRACKET ARMS SHALL BE DESIGNED SO THAT THE ELEVATION OF THE POINT OF LUMINAIRE ATTACHMENT WILL APPROXIMATE THE SAME ELEVATION AS THE POLE TOP.
10. ALL WELDING SHALL BE PERFORMED BY THE INERT GAS SHIELDED ARC METHOD USING ALUMINUM ALLOY FILLER WIRE CONFORMING TO THE LATEST REVISION OF ASTM DESIGNATION B-285 CLASSIFICATION ER-4043. ALL WELDS SHALL BE FREE OF CRACKS AND POROSITY.
11. THE STATE HIGHWAY DEPARTMENT MAY AT ANY TIME PRIOR TO FINAL ACCEPTANCE, SUBJECT THE LIGHTING STANDARDS TO TEST LOADING. FAILURE OF THE LIGHTING STANDARDS TO MEET THE REQUIREMENTS AS OUTLINED IN THESE PLANS SHALL CONSTITUTE CAUSE FOR REJECTION.
12. BREAKERS USED IN THE SECONDARY CIRCUIT PROTECTOR ASSEMBLY, SERVICE POLE OR TRANSFORMER STATION, SHALL BE FULLY MAGNETIC WITH A VOLTAGE RATING OF 240 VOLTS A. C. PHASE TO GROUND. THE TRIPPING MEANS AND THE TIME DELAY CHARACTERISTICS SHALL BE ACTUATED BY CHANGES IN THE MAGNETIC FLUX ONLY AND SHALL NOT BE AFFECTED BY CHANGES IN AMBIENT TEMPERATURE. THE OPERATING HANDLE SHALL BE TRIP-FREE SO THAT CONTACT CANNOT BE HELD AGAINST SHORT CIRCUIT OR ABNORMAL OVERLOAD.
13. ALL ENCLOSURES HOUSING ELECTRICAL EQUIPMENT SHALL BE RAINTIGHT AND APPROVED FOR OUTDOOR INSTALLATIONS.



CABLE TRENCH DETAILS

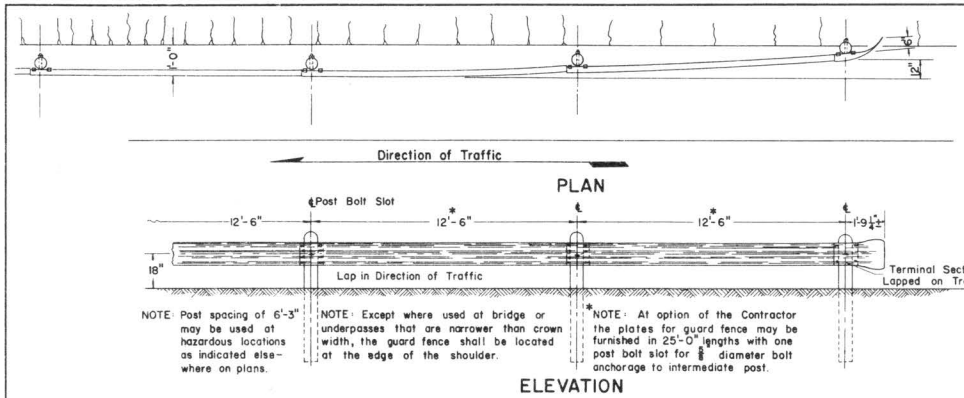
TEXAS HIGHWAY DEPARTMENT

ROADWAY ILLUMINATION DETAILS

RID - 61 - I

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.				SHEET NO.
6	TEXAS					
STATE DIST. NO.	COUNTY		CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.

VI GUARD FENCE, POST AND FENCE STANDARDS

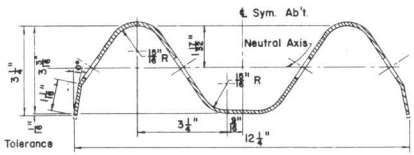


NOTE: Post spacing of 6'-3" may be used at hazardous locations as indicated elsewhere on plans.

NOTE: Except where used at bridge or underpasses that are narrower than crown width, the guard fence shall be located at the edge of the shoulder.

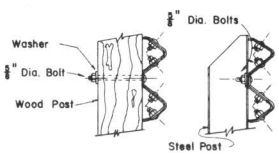
*NOTE: At option of the Contractor the plates for guard fence may be furnished in 25'-0" lengths with one post bolt slot for 5/8" diameter bolt anchorage to intermediate post.

ELEVATION



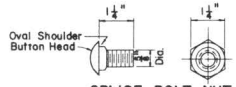
SECTION THRU RAIL ELEMENT

NOTE: All dimensions subject to manufacturing tolerances



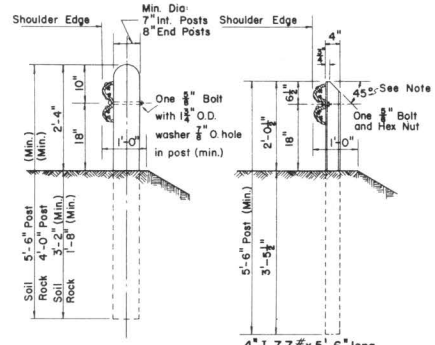
ARRANGEMENT AT POSTS

Bolts used in attaching rail to post shall be of sufficient length to extend through the full thickness of the nut and no more than 1/4" beyond it. Square washers, of not less than 1 3/4" on a side, will be permitted in lieu of the round washer shown.



SPLICE BOLT NUT

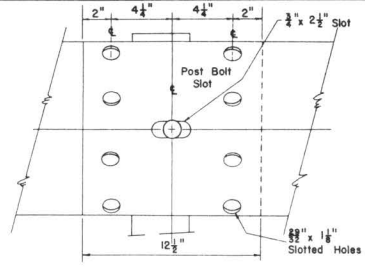
POST BOLT: Similar except length



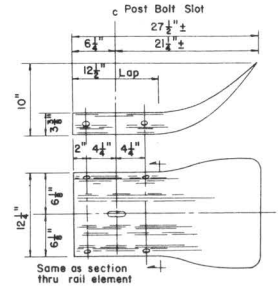
WOOD POST

STEEL POST

Square top steel posts may be used in lieu of beveled posts.



RAIL SPLICE



TERMINAL SECTION

NOTE: See specification for material requirements and construction methods.
Detail drawings and samples of plates and fittings must be submitted to and approved by the Texas Highway Department.
Special fabrication will be required in installations having a curvature of less than 150' radius.
Sections of comparable strength may be substituted if approved by the Engineer.

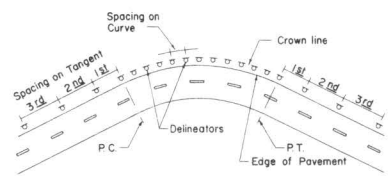
METAL BEAM GUARD FENCE

SPACING FOR HIGHWAY DELINEATORS ON HORIZONTAL CURVES

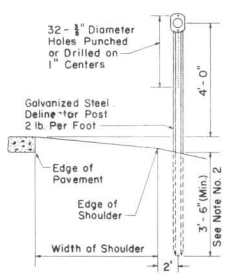
Degree of Curve	Spacing on Curve	Spacing in Advance of and Beyond Curve		
		First Space	Second Space	Third Space
	Feet	Feet	Feet	Feet
1	152	200	200	200
2	106	191	200	200
3	86	155	200	200
4	74	133	200	200
5	66	119	198	200
6 & 7	55	99	165	200
9	48	86	144	200
12	41	74	123	200

Other spacing as indicated elsewhere in these plans

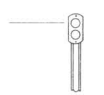
The spacing S on the curve is found from the formula $S = 2\sqrt{R-50}$ where R is the radius of the curve in feet. The spacing to the first delineator in advance of and beyond the curve is 1.8 S, to the next delineator 3 S, and to the next 6S, but not to exceed 200 feet.
Minimum Spacing = 10 feet



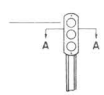
DELINEATORS FOR CURVES OR TANGENT SECTIONS



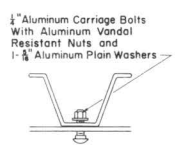
TYPE I
SINGLE WHITE REFLECTOR



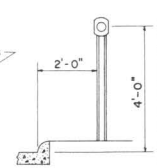
TYPE 2
DOUBLE YELLOW REFLECTOR



TYPE 3
TRIPLE YELLOW REFLECTOR



SECTION A-A



CURB MOUNTING DETAILS

GENERAL NOTES

1. DELINEATORS SHALL BE PLACED ALONG THE RIGHT SIDE OF THE THROUGH INTERSTATE ROADWAYS, TWO FEET BEYOND THE OUTER EDGE OF THE ROADWAY SHOULDER OR THE FACE OF AN UNMOUNTABLE CURB, OR IN THE LINE OF THE GUARD RAIL. DELINEATOR POSTS SHALL BE DRIVEN USING AN APPROVED DRIVING CAP. POSTS SHALL BE DRIVEN PRIOR TO INSTALLATION OF THE REFLECTIVE UNITS.
2. IF ROCK IS ENCOUNTERED AT A DEPTH LESS THAN 3' 6" BELOW THE GROUND SURFACE, A SIX INCH OR LARGER DIAMETER HOLE SHALL BE DRILLED FOR THE CHANNEL AND THE POST SHALL BE SET IN CLASS "A" CONCRETE. IF ROCK IS ENCOUNTERED AT A DEPTH OF 1' 6" OR MORE BELOW THE GROUND SURFACE, THE HOLE SHALL BE DRILLED TO A DEPTH OF 3' 6". IF ROCK IS ENCOUNTERED AT A DEPTH LESS THAN 1' 6" BELOW THE GROUND SURFACE, THE HOLES SHALL BE DRILLED A MINIMUM OF 2' 0" INTO THE ROCK.
3. SEE SPECIFICATIONS FOR MATERIAL REQUIREMENTS AND CONSTRUCTION METHODS.

DELINEATOR ASSEMBLIES

TEXAS HIGHWAY DEPARTMENT

METAL BEAM GUARD FENCE AND DELINEATOR ASSEMBLIES

GF & DA-62

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

VI-2

August 1962

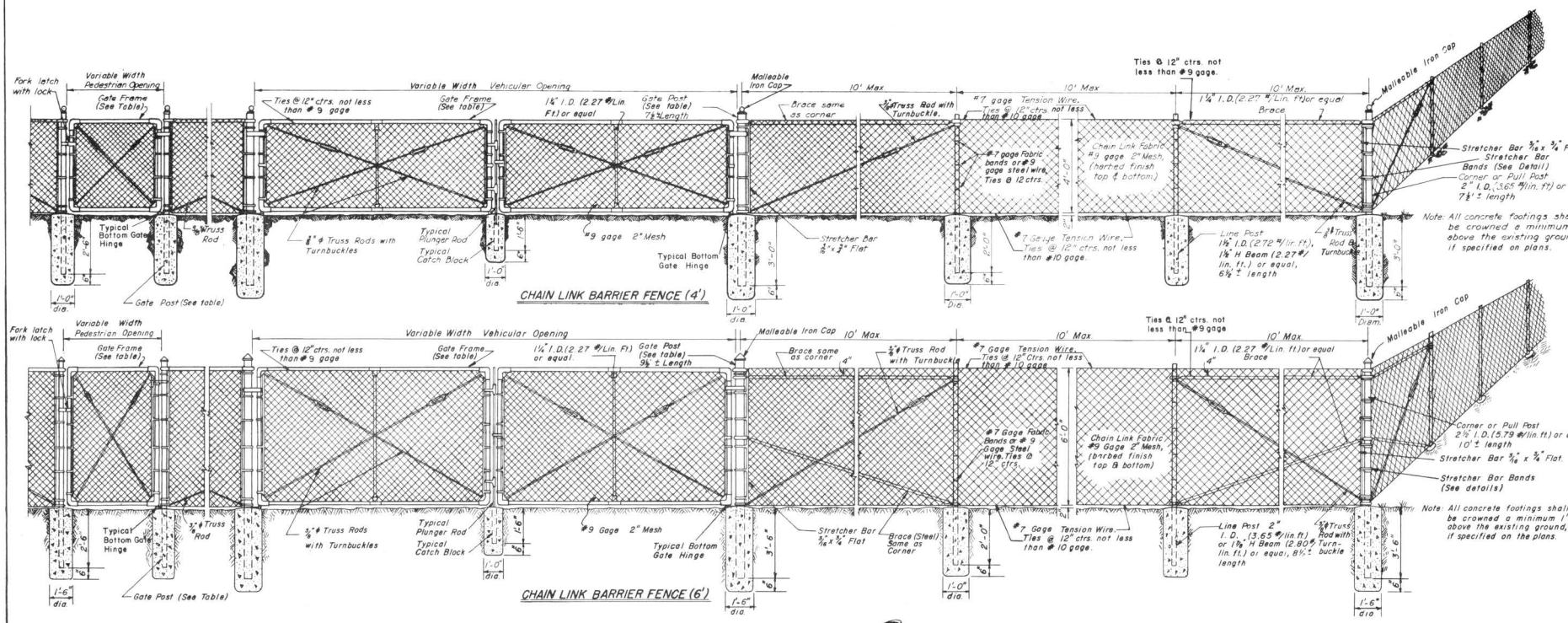
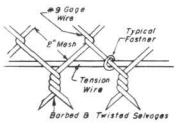
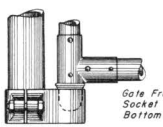


TABLE OF MINIMUM SIZES & WEIGHTS

GATE OPENING TYPE		GATE FRAME		GATE POSTS	
SINGLE, INCLUSIVE	DOUBLE, INCLUSIVE	SIZE	WT./LIN. FT.	SIZE	WT./LIN. FT.
UP to 6' Over 6' to 12' Over 12' to 18' Over 18'	UP to 12' Over 12' to 26' Over 26' to 36' Over 36'	1⅝" I.D. or Equal	2.72 Lbs. 2.72 Lbs. 2.72 Lbs. 2.72 Lbs.	2½" I.D. or equal 3½" I.D. or equal 6" I.D. 8" I.D.	5.79 Lbs. 9.11 Lbs. 18.97 Lbs. 24.70 Lbs.

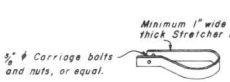


Fabric & Tension Wire Detail Top & Bottom

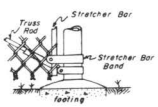


Gate Frame And Socket Ball For Bottom Gate Hinge

Typical Bottom Gate Hinge



Typical Stretcher Bar Band



Terminal Post Detail

GENERAL NOTE:

Typical Installation plan may vary as shown on the plans or as directed by the Engineer. Location of gates to be shown on plans.

TEXAS HIGHWAY DEPARTMENT

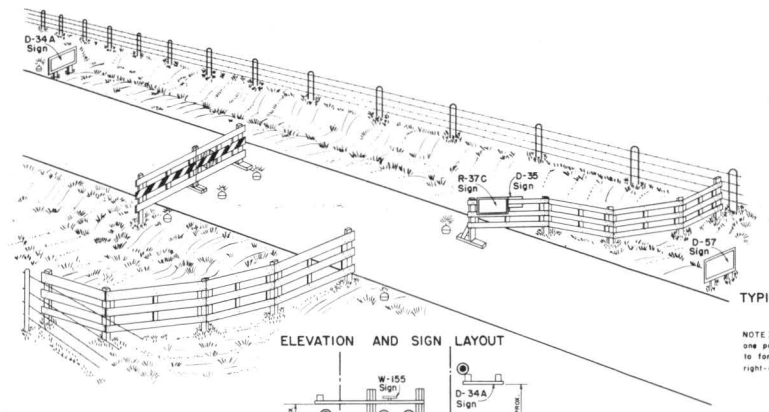
CHAIN LINK BARRIER FENCE

4' AND 6' FEET HIGH

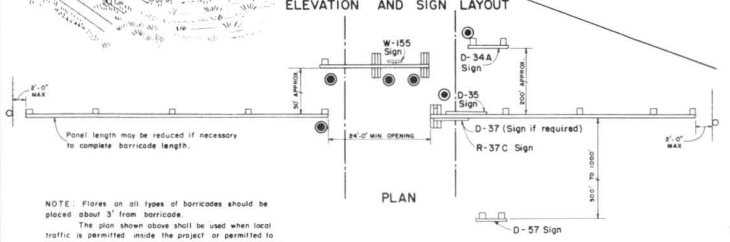
CLF - 61

DN.	S.H.D.	DRAWING	DATE	FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.				SHEET NO.
CK. DN.	E.W.D.	Original	Jan. 1961							
DW	O.M.W.	Prepared By	Hwy. Design		6 TEXAS					
CK. DW	P.G.	D-8			STATE DIST. NO.	COUNTY	CONT.	SECT.	JOB	HIGHWAY NO.
TR	O.M.W.									
CK. TR	P.G.									

VIII MISCELLANEOUS STANDARDS



ELEVATION AND SIGN LAYOUT



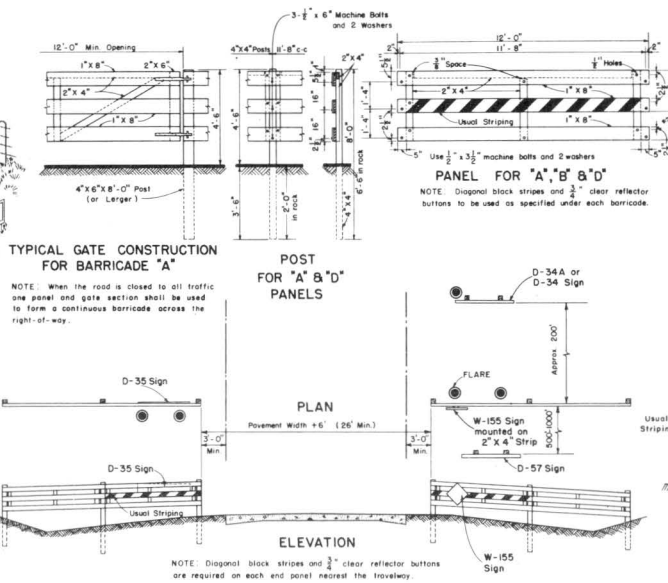
PLAN

NOTE: Flares on all types of barricades should be placed about 3' from barricade.

The plan shown above shall be used when local traffic is permitted inside the project or permitted to use the road beyond the intersection with the temporary route.

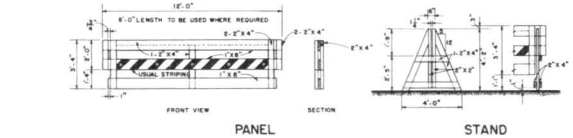
Diagonal black stripes and $\frac{3}{4}$" clear reflector buttons are required only on panels and gates across the travelway.

BARRICADE "A"



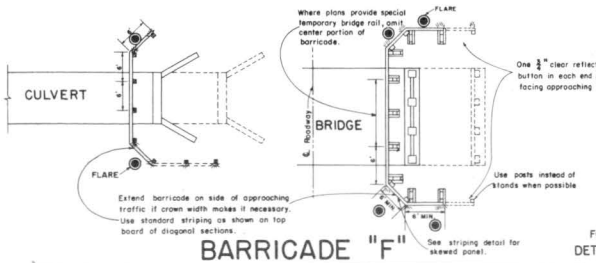
NOTE: Diagonal black stripes and $\frac{3}{4}$" clear reflector buttons are required on each end panel nearest the travelway.

BARRICADE "D"



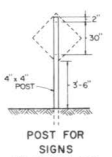
NOTE: Sign W-155 shall be used in advance of barricade and flagman shall be used to direct traffic while work is in progress. Flares shall be used to outline travelway and mark hazards at night.

BARRICADE "C"

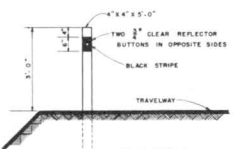


BARRICADE "F"

ASSEMBLY

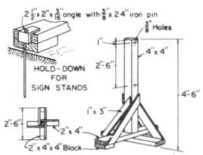


POST FOR SIGNS W-134 & W-155 AND SIGN D-57 USING 2 POSTS

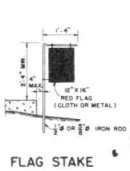


POST BARRICADE

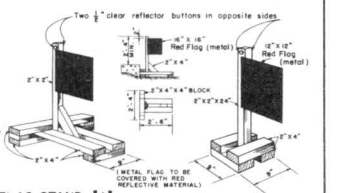
NOTE: Maximum post spacing 30' to 60' as directed. To be placed where shown on plans or as directed be the Engineer for protection of traffic on roadways adjacent to slopes or similar hazards.



PORTABLE STAND FOR SIGNS W-134, W-147 & W-155

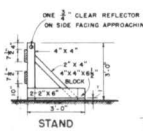


FLAG STAKE

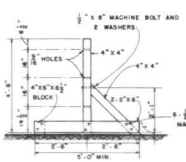


FLAG STAND "A" FLAG STAND "B"

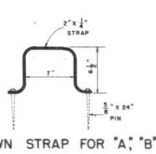
GENERAL NOTES:
The plan of lighting shown on this sheet is based on the use of flares. Should the Contractor desire to use flashing lights they shall be placed as directed by the Engineer.



DETAILS FOR BARRICADE "F"

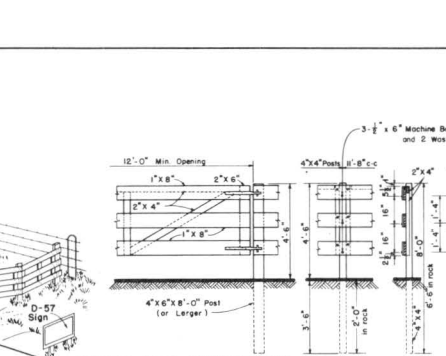


STAND FOR "B" (OPTIONAL FOR "A" & "D")



HOLD-DOWN STRAP FOR "A", "B" & "D"

DETAILS OF STRIPING



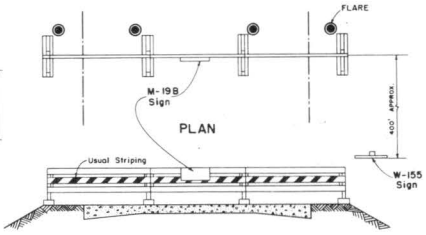
TYPICAL GATE CONSTRUCTION FOR BARRICADE "A"

NOTE: When the road is closed to all traffic one panel and gate section shall be used to form a continuous barricade across the right-of-way.

POST FOR "A" & "D" PANELS

PANEL FOR "A", "B" & "D"

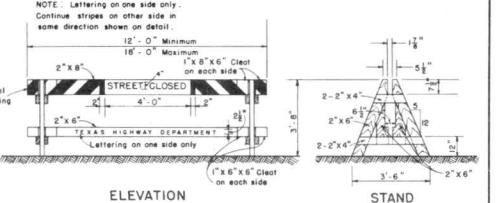
NOTE: Diagonal black stripes and $\frac{3}{4}$" clear reflector buttons to be used as specified under each barricade.



ELEVATION

NOTE: Diagonal black stripes and $\frac{3}{4}$" clear reflector buttons are required on each panel.

BARRICADE "B"



ELEVATION STAND

BARRICADE "E"

TEXAS HIGHWAY DEPARTMENT

BARRICADE & WARNING SIGNS

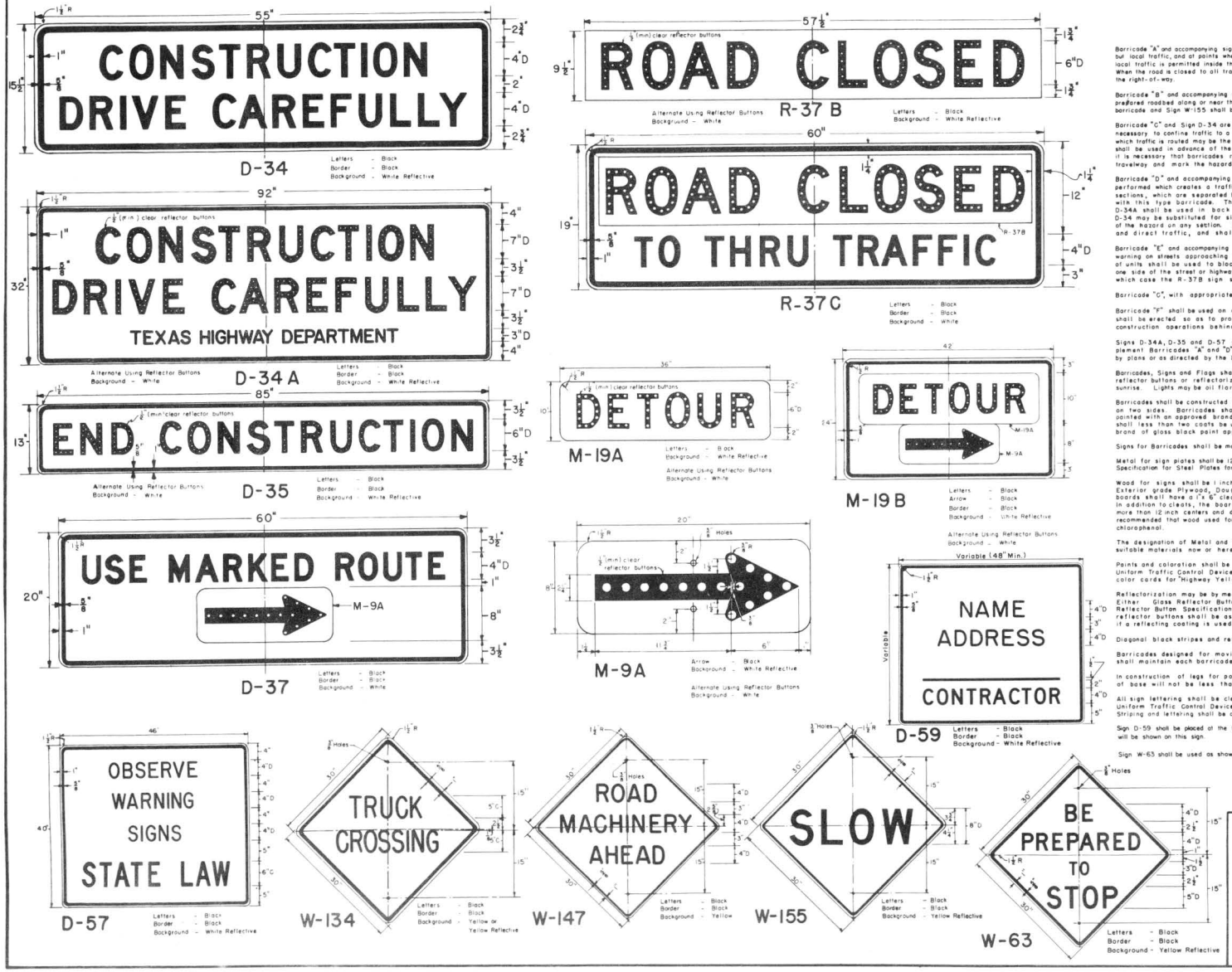
SHEET 1 OF 2

BW-61-(1)

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

VIII - 2

March, 1961



GENERAL NOTES

Barricade "A" and accompanying signs shall be used at each end of construction projects closed to all traffic, or closed to all but local traffic, and at points where through traffic is turned onto a temporary route. The plan on sheet I shall be used when local traffic is permitted inside the project or permitted to use the road beyond the intersection with the temporary route. When the road is closed to all traffic, one panel and gate section shall be used to form a continuous barricade across the right-of-way.

Barricade "B" and accompanying signs shall be used at the beginning of detours to divert traffic onto the specially prepared roadbed along or near the edge of the right-of-way or around a structure. Sign M-198 shall be used on the barricade and Sign W-155 shall be used in advance of the barricade as indicated on barricade layout.

Barricade "C" and Sign D-34 are for temporary use to control traffic within the limits of a project whenever it is necessary to confine traffic to a specific area on account of some particular construction operation. The areas through which traffic is routed may be the shoulders, ditches, around windrows of materials, excavated trenches, etc. Sign W-155 shall be used in advance of the barricade and flagmen shall be used to direct traffic while work is in progress. If it is necessary that barricades remain in place at night, a sufficient number of lights shall be used to outline the travelway and mark the hazards.

Barricade "D" and accompanying signs shall be used at each end of project only when some form of work is being performed which creates a traffic hazard throughout the entire length of the project. In case of several short sections, which are separated by intervals of considerable distance, each individual section shall be barricaded with this type barricade. This type barricade may also be used at important county road approaches. Sign D-34A shall be used in back of the barricade. When there are a number of short sections barricaded, sign D-34 may be substituted for sign D-34A. Barricades shall be removed upon completion of work and elimination of the hazard on any section. In all cases the barricade shall be so located as to most advantageously warn and direct traffic, and shall be within 1,000 feet of the terminus of such section.

Barricade "E" and accompanying sign shall be used on city streets which are closed to traffic and as advance warning on streets approaching closed areas. When this barricade is used to close a street, a sufficient number of units shall be used to block the entire street. This barricade may also be used to confine traffic to one side of the street or highway for the protection of workmen, maintenance repairs, open trenches, etc., in which case the R-37B sign shall be omitted.

Barricade "C", with appropriate standard signs, may be substituted for Barricade "E" if desirable.

Barricade "F" shall be used on culvert or bridge widening jobs when traffic is routed over the structure. It shall be erected so as to provide maximum roadway width for traffic and allow sufficient space for efficient construction operations behind the barricade.

Signs D-34A, D-35 and D-57 shall be used at each end of all projects open to any public travel, and to supplement Barricades "A" and "D". Other standard signs, Post Barricades, and Flags shall be used as required by plans or as directed by the Engineer to protect and direct traffic.

Barricades, Signs and Flags shall be supplemented by lights placed so as not to interfere with the visibility of reflector buttons or reflectorized surfaces, and lights shall be maintained in continuous operation from sunset to sunrise. Lights may be oil flares or flashing electric type.

Barricades shall be constructed of clean, sound lumber cut to the nominal dimensions shown on these details and surfaced on two sides. Barricades shall be of first-class workmanship, and all surfaces above ground shall be painted with an approved brand of white paint to secure thorough coverage and a uniform white color. In no case shall less than two coats be used. The paint for barricade stripes (and Barricade "E") shall be an approved brand of gloss black paint applied to secure uniform coverage.

Signs for Barricades shall be made from wood or metal conforming with the requirements specified below.

Metal for sign plates shall be 12, 14 or 16 gauge steel which conforms with Texas Highway Department "Special Specification for Steel Plates for Highway Markers."

Wood for signs shall be 1 inch stock B and B grade kiln dried lumber or equal, or water-proof resinbonded Exterior grade Plywood, Douglas Fir Plywood Association or equal. All wooden signs made up of two or more boards shall have a 1"x 6" cleat fastened to back of the sign at each end and extending full depth of the sign. In addition to cleats, the boards shall be fastened together with $\frac{1}{2}$ inch corrugated fasteners spaced at not more than 12 inch centers and driven from the back of the sign. In localities where untreated wood rots rapidly, it is recommended that wood used for signs be treated with either Chromated Zinc Chloride, Wolman Salts, or Pentachlorophenol.

The designation of Metal and Wood as primary materials for signs shall not be interpreted to exclude other suitable materials now or hereafter available.

Paints and coloration shall be similar to Texas Highway Department standards as outlined in Texas Manual on Uniform Traffic Control Devices for Streets and Highways. Where Yellow is specified it shall conform with color cards for "Highway Yellow" available from U.S. Bureau of Public Roads.

Reflectorization may be by means of approved reflective coatings on the sign background.
Either Glass Reflector Buttons or Crystal Plastic Reflector Buttons conforming with Texas Highway Department Reflector Button Specifications may be used as an alternate means of reflectorization. Size and spacing of reflector buttons shall be as shown on details. All reflecting elements shall reflect white light, except that if a reflecting coating is used as a background of a yellow sign, it shall reflect yellow light.

Diagonal black stripes and reflector buttons shall be as indicated on plans or on these details.

Barricades designed for moving or reuse, except "C" and "E", shall be erected with bolts. The Contractor shall maintain each barricade and sign in a condition equal to that required by these details.

In construction of legs for portable barricades, steel may be substituted for timber, provided that the width of base will not be less than that shown on the standard detail.

All sign lettering shall be clear, open rounded type capital letters as approved by the Joint Committee on Uniform Traffic Control Devices, its sponsoring agencies and as published by the Bureau of Public Roads. Striping and lettering shall be of first class workmanship equivalent to that of Highway Department standard signs.

Sign D-59 shall be placed at the beginning and end of construction projects. The name and address of the General Contractor will be shown on this sign.

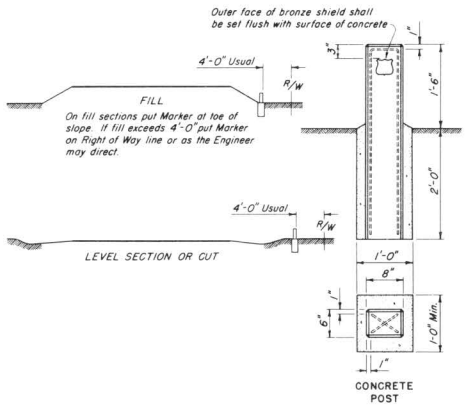
Sign W-63 shall be used as shown on the plans and as directed by the Engineer.

TEXAS HIGHWAY DEPARTMENT

BARRICADES & WARNING SIGNS
Sheet 2 of 2

BW-61-(2)

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
6	TEXAS		
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.



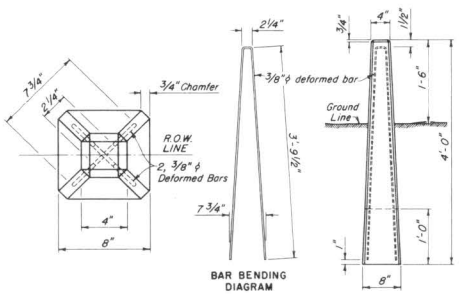
FEDERAL AID MARKER

Markers shall be placed as directed.

The bronze shield will be furnished to the Contractor without charge on application to the Texas Highway Department through the Resident Engineer.

Posts shall be precast concrete with all corners chamfered 1/2". All reinforcing bars shall be 1/2" in diameter.

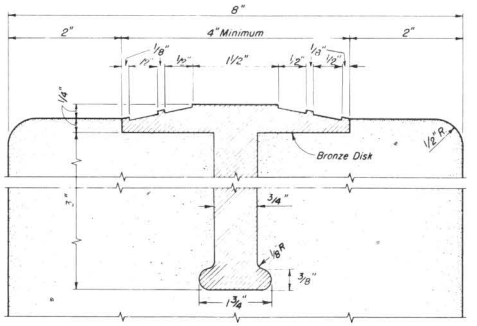
Work and materials involved in furnishing and placing posts and bases and installing bronze markers shall be considered as subsidiary to the various pay items of the contract, and no direct compensation will be made therefor.



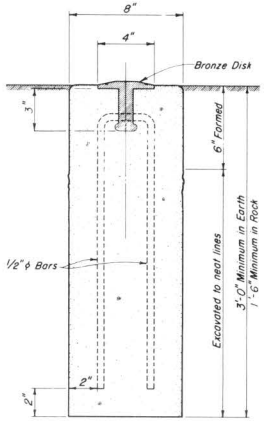
RIGHT-OF-WAY MARKER - TYPE I

Type I Right-of-Way Markers shall be precast concrete, and shall be installed at designated points to the depth, lines, and grades established by the Engineer.

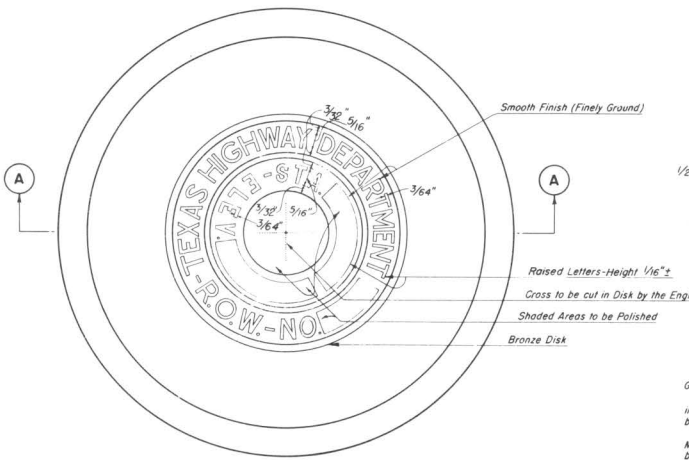
In case the material to be excavated consists of rock or hard clay, this Marker may be shortened 12" if so directed by the Engineer.



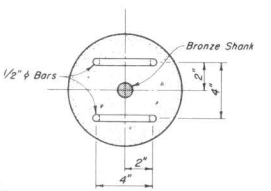
SECTION THRU TOP OF MARKER



SECTION AA



TOP VIEW OF MARKER



CROSS SECTION THRU MARKER

RIGHT-OF-WAY MARKER - TYPE II

Type II Right-of-Way Markers shall be poured in place concrete, and bronze disks shall be set to correct line and grade as directed by the Engineer.

Bronze disks shall be of Architectural Bronze having the following composition: Copper 85%, Tin 5%, Lead 5%, Zinc 5%. Excavation for Markers shall be made to neat lines except for the top 6" of the Marker which shall be formed with removable forms of sheet metal or other suitable material. The top part of the Marker around the bronze disk shall receive a steel trowel finish. The bronze disk will be furnished to the Contractor without charge on application to the Engineer.

After the concrete has taken its final set, the Engineer will stencil required survey data and, with chisel or center punch, cut cross marking exact location of Right-of-Way Line in the bronze disk.

GENERAL NOTES:

The requirements for the absolute volume mix design and the weighing of the ingredients for the concrete in all Markers will be waived. Mixing of concrete may be accomplished in any manner satisfactory to the Engineer.

The work performed and materials furnished in constructing Right-of-Way Markers, measured as provided in Item 550 of the Standard Specifications, shall be paid for at contract unit price bid for "Right-of-Way Markers (Type I)," or "Right-of-Way Markers (Type II)"

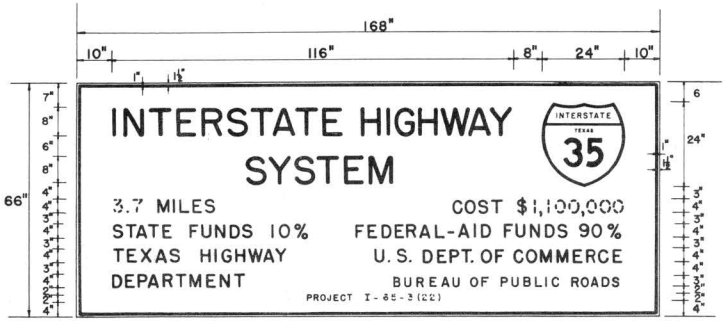
Federal Project Markers will not be paid for directly, but shall be considered subsidiary to the various pay items of the contract.

TEXAS HIGHWAY DEPARTMENT

RIGHT-OF-WAY & PROJECT MARKERS

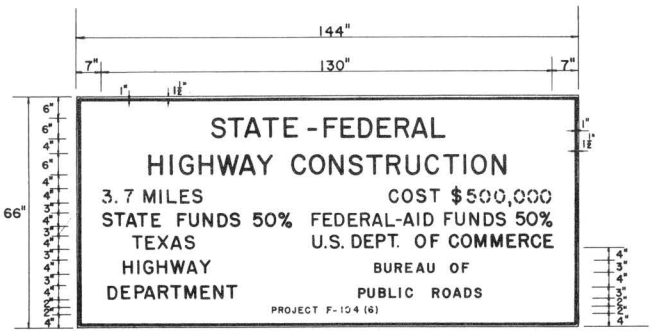
M-61

1-61 ROAD DIST. NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
6	TEXAS		
STATE DIST. NO.	COUNTY	CONTROL NO. / SECTION NO. / JOB NO. / HIGHWAY NO.	



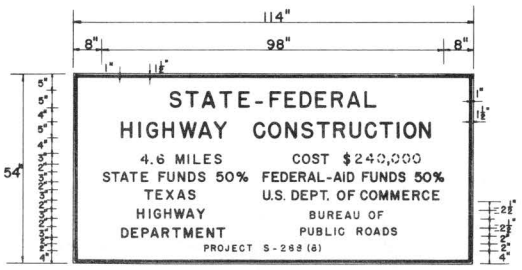
D-62

Legends and border — Black
Background — White Non-Reflectorized
All letters and numerals shall be series D



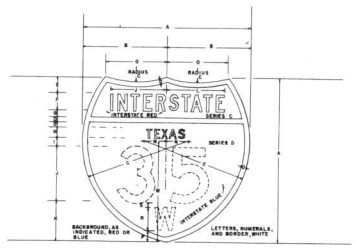
D-61

Legends and border — Black
Background — White Non-Reflectorized
All letters and numerals shall be series D



D-60

Legends and border — Black
Background — White Non-Reflectorized
All letters and numerals shall be series D



NON-REFLECTORIZED

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S
IM-1F	24	12	15	2	2½	2½	1	¼	1½	8	5½	8½	16½	3	6½	1½	3½	2

NOTE: Omit P,R,S, when "W" or "E" are not used

GENERAL NOTES

Signs D-60 for Secondary Projects, D-61 for Primary Projects or D-62 for Interstate Projects as the case may be, shall be placed at each end of the project and at other locations of major intersecting crossroads as indicated on the plans.

Construction identification signs are to be furnished in addition to the normal warning and regulatory signs required and are not to be used as a part of such control measures. These signs shall be located so as not to obscure or detract from the effectiveness of other official signs.

Construction identification signs are to be erected prior to beginning of actual construction.

Each sign shall be in accordance with the details indicated. The length in miles shall be the overall length of the project to the nearest one tenth of a mile. If the sign is for a single structure or interchange a recognizable identification may be substituted for the length, such as "Buffalo Creek Bridge". The project cost shall be the cost of the contract, rounded to the nearest $10,000. The percent of costs shown shall be that actually borne by the State and Federal Governments. No highway names or other information may be indicated on the signs.

Construction identification signs shall be made of wood conforming to the requirements specified below.

Wood for signs shall be 1-inch stock B and B grade kiln dried lumber or equal on 3/4-inch waterproof resin bonded Exterior grade plywood, Douglas Fir Plywood Association or equal.

When the signs are made up of two or more pieces of 1-inch lumber, they shall have 1" x 6" cleats fastened to the back of the sign and extending from top to bottom of the sign. For signs 9' - 6" or 12' - 0" in width, there shall be three cleats, one at each end of the sign and one midway between the two end cleats. For signs 14' - 0" in width, there shall be four cleats, one at each end of the sign and two cleats at equal spaces between the two end cleats. In addition to the cleats, the pieces of lumber shall be fastened together with 1/2-inch corrugated fasteners spaced at not more than 12-inch centers and driven from the back of the sign. In localities where untreated wood rots rapidly, the 1-inch B and B grade lumber shall be treated with either Chromated Zinc Chloride, Wolman Salts or Pentachlorophenol.

When the signs are made up of two or more pieces of 3/4-inch plywood, there shall be a 1" x 4" cleat fastened to the back of the sign around its entire perimeter and over the entire length of each joint.

On signs requiring the Interstate Route Marker shield, the shield may be painted on the sign face background, or it may be an independent unit bolted to the sign face background.

The front and back side of sign blanks shall be painted with white enamel with a minimum dry film thickness of 2 mils. The finish shall be smooth, glossy, tight adhering and free of runs, sags, streaks or pin holes. The white enamel shall meet all the requirements of Federal Specification TT-E-489. Black sign paint for letters, numerals and borders shall meet the requirements of Federal Specification TT-P-98.

The colors used for the Interstate shield shall conform to those specified in the Manual for Signing and Pavement Marking of the National System of Interstate and Defense Highways approved by the U. S. Bureau of Public Roads.

The signs are not to be reflectorized or illuminated.

Mounting, transverse location, height and other similar features shall be consistent with other construction signs.

Alphabets and lateral spacing between letters and words shall conform to U. S. Bureau of Public Roads standard rounded capital letter alphabets. Lateral spacing of text shall be such as to provide a balanced appearance.

Upon completion of the project and acceptance of same by the State, the construction identification signs shall become the property of the contractor and shall be removed.

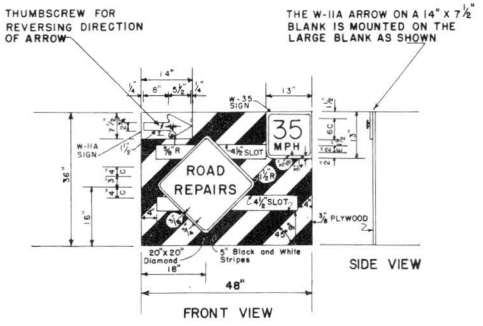
Payment for furnishing, erecting, maintaining and removing construction identification signs will not be made directly. Such costs shall be included in the overall bid submitted.

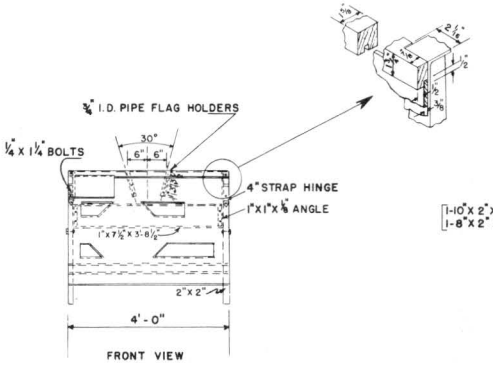
TEXAS HIGHWAY DEPARTMENT

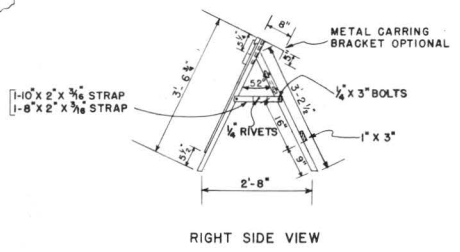
CONSTRUCTION IDENTIFICATION SIGNS FEDERAL AID PROJECTS CIS-61

FED. ROAD DIV. NO.	STATE	FEDERAL AID PROJECT NO.			SHEET NO.
6	TEXAS				
STATE DIST. NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	HIGHWAY NO.

March, 1961







ALL SIGN LETTERS, NUMERALS, ARROWS AND BORDERS ARE BLACK. BACKGROUNDS ARE YELLOW OR YELLOW REFLECTIVE EXCEPT WHERE SHOWN OTHERWISE.

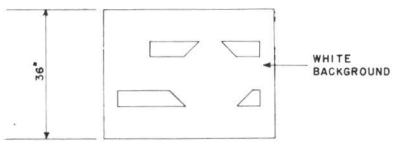
THE W-35 SIGN AND THE 20"X 20" DIAMOND SIGN SHALL BE STENCILED ON THE 48"X 36" PLYWOOD BLANK.

NOTE:
SPEED POSTED ON W-35 SIGN SHALL BE DETERMINED ON THE BASIS OF A TRAFFIC AND ENGINEERING INVESTIGATION MADE BY THE HIGHWAY DEPARTMENT.

GENERAL NOTES

Barricade "H" shall be used only in conjunction with Barricade "D" and accompanying signs, see BW 54 (1) & (2) Barricade "H" shall be used at each end of the actual construction operations. Barricades "H" shall be placed prior to beginning work each day and shall be removed when the days work is terminated.

Workmanship and materials for Barricade "H" shall conform to General Notes of BW 54 (2).

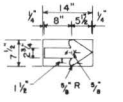


REAR VIEW

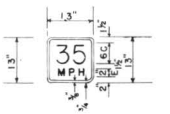
BARRICADE "H"

TYPE OF STAND OPTIONAL

BARRICADE "H"



Border – Black
Arrow – Black
Background – Yellow



Letters – Black
Border – Black
Background – Yellow

Letters – Black
Border – Black
Background – Yellow

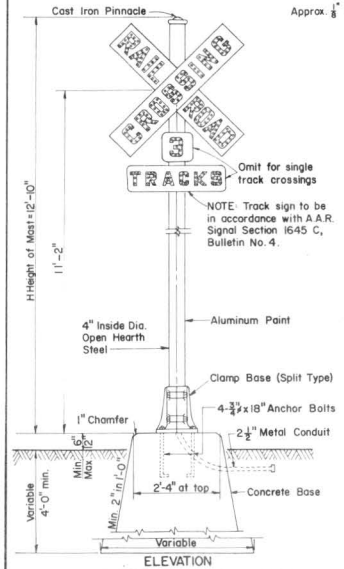
TEXAS HIGHWAY DEPARTMENT

BARRICADES & WARNING SIGNS

SHEET 1 of 1

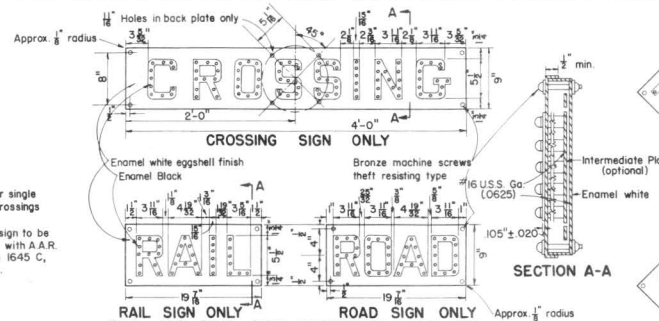
BW 57

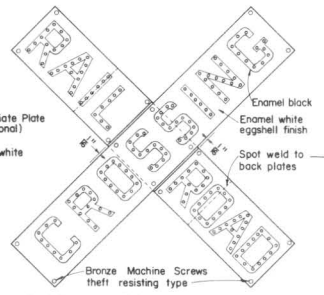
FED. RD. DIV. NO.	STATE	FEDERAL PROJECT NO.				SHEET NO.
6	TEXAS					
STATE DIST. NO.	COUNTY		CONT.	SECT.	JOB	HIGHWAY NO.



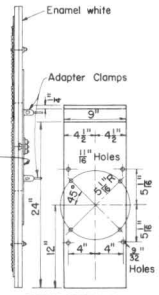
ELEVATION

REFLECTOR CROSSBUCK SIGN

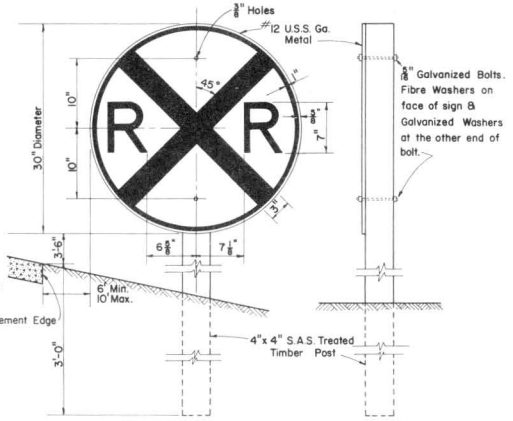




RAILROAD CROSSING SIGN ONLY



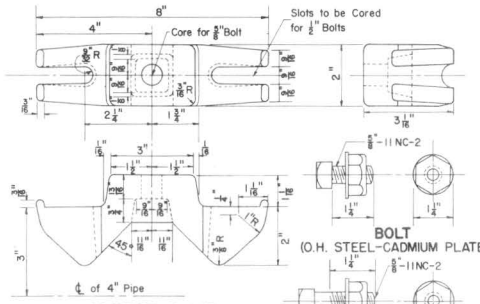
SUPPORTING PLATE



ELEVATION SECTION

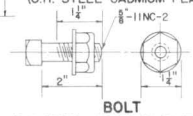
The letters, symbol and border shall be black, and the background shall be of yellow reflective material except that reflector button signs now on hand may be used.

ADVANCE WARNING RAILROAD CROSSING SIGN

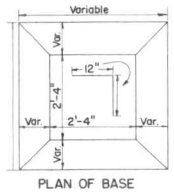


ADAPTER CLAMP (CAST IRON)

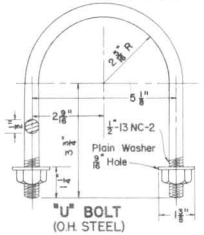
BOLT (O.H. STEEL-CADMIUM PLATED)



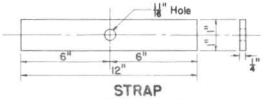
BOLT (O.H. STEEL-CADMIUM PLATED)



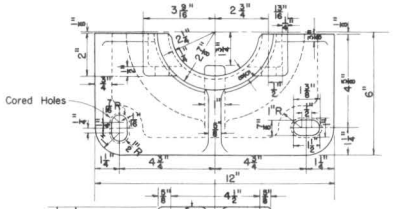
PLAN OF BASE

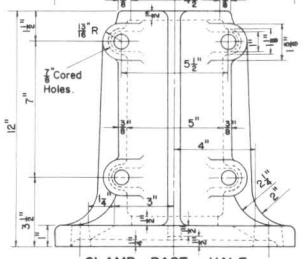


"U" BOLT (O.H. STEEL)



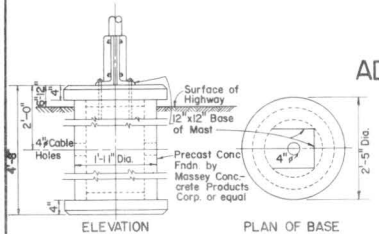
STRAP (O.H. STEEL)



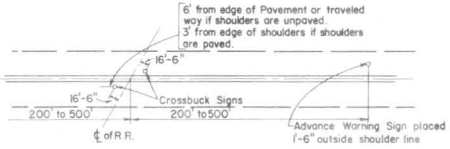


CLAMP BASE – HALF (CAST IRON)

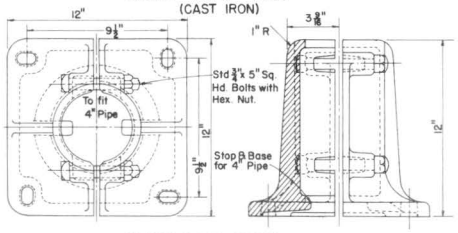
ADAPTER CLAMP AND DETAILS FOR SIGNS



ALTERNATE FOUNDATION



TYPICAL LOCATION SKETCH
METAL SERIES RAILROAD CROSSING SIGNS



CLAMP BASE COMPL.
BASE FOR 4" MAST

GENERAL NOTES

CROSSBUCK SIGNS TO BE USED AT LOCATIONS INDICATED ON THE PLANS. CROSSBUCK SIGNS SHALL DISPLAY THE WORDS "RAILROAD CROSSING" IN BLACK LETTERS WITH WHITE REFLECTOR BUTTONS. THE BLACK LETTERS SHALL BE ON A WHITE BACKGROUND TOWARD HIGHWAY TRAFFIC APPROACHING THE NEAR SIDE OF THE CROSSING. ONE SIGN SHALL BE PLACED ON EACH SIDE OF THE RAILROAD CROSSING, UNLESS LOCAL CONDITIONS MAKE IT IMPRACTICAL EACH SIGN MAST SHALL HAVE A MINIMUM HORIZONTAL CLEARANCE TO & OF MAST OF 6 FT., FROM THE EDGE OF PAVEMENT OR TRAVELED WAY AND 16'-6" FROM CENTER OF TRACK.

THE TYPICAL LOCATION SKETCH SHOWN HEREON IS INTENDED TO INDICATE MINIMUM ACCEPTABLE CLEARANCES TO RAILROAD AND HIGHWAY. THE EXACT LOCATION SHALL BE AS SHOWN ELSEWHERE ON THESE PLANS OR AS DIRECTED BY THE ENGINEER.

ADVANCE WARNING RAILROAD CROSSING SIGNS TO BE USED AT LOCATIONS INDICATED ON THE PLANS. ADVANCE WARNING SIGNS SHALL GENERALLY BE LOCATED FROM 200 FT. TO 500 FT. FROM THE RAILROAD CROSSING, THE LOCATION BEING GOVERNED BY THE ANTICIPATED MAXIMUM VEHICULAR SPEED, PROXIMITY OF OTHER SIGNS AND HAZARDS AND VISIBILITY. ADVANCE WARNING SIGNS TO BE LOCATED A MIN. OF 6' AND A MAX. OF 10' FROM THE EDGE OF PAVEMENT UNLESS OTHERWISE SPECIFIED ON THE PLANS.

ALL CONCRETE SHALL BE CLASS A. ALL EXPOSED SURFACES OF CONCRETE SHALL RECEIVE A SURFACE FINISH.

"METAL SERIES RAILROAD CROSSING SIGNS" WILL CONSIST OF TWO CROSSBUCK SIGNS AND TWO ADVANCE WARNING RAILROAD CROSSING SIGNS.

WHITE LETTERS WITH WHITE REFLECTOR LENSES ON A BLACK BACKGROUND DISPLAYING THE NUMBER OF TRACKS (2 OR MORE TRACKS) SHALL BE USED WHERE THERE ARE TWO OR MORE TRACKS.

REFLEX-REFLECTING SHEET MATERIAL MAY BE USED IN LIEU OF REFLECTOR BUTTONS, AND SHALL CONFORM TO THE REQUIREMENTS GOVERNING THE MATERIAL AND ITS APPLICATION AS OUTLINED IN THE ASSOCIATION OF AMERICAN RAILROAD SIGNAL SPECIFICATION 255 MANUAL PART 276.

ADVANCE WARNING SIGN WILL BE INSTALLED BY HIGHWAY DEPARTMENT MAINTENANCE FORCES.

TEXAS HIGHWAY DEPARTMENT

METAL SERIES RAILROAD CROSSING SIGNS

(REFLECTORIZED)

MXS-61

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