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DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
 Transportation Laboratory
 5900 Folsom Blvd
 Sacramento, California 95819-4612



METHOD FOR CALIBRATION OF CALIFORNIA PORTABLE SKID TESTER

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read **"SAFETY AND HEALTH"** in Section E of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. SCOPE

The Procedure for the direct calibration of the California Portable Skid Tester, which is used in California Test 342, is described in this method.

B. APPARATUS

1. Calibration plate, Grooved metal (Figure 1)
2. Holding plate (Figure 2)

C. CALIBRATION PROCEDURE

1. Anchor the holding plate with hardened nails on a level surface such as an AC driveway.
2. Position the tester over the calibration plate.
3. Block up the large front casters of the tester to the same elevation as the test plate surface.
4. Coat the test plate and test tire with glycerine.

Note: Temperatures near 4.4° C or less will yield low values because the glycerine loses fluidity.

5. Perform test in both directions on the plate using the procedures outlined in California Test 342. Recoat the plate and tire with glycerine before each test. The desired reading against the cut is $0.42 \pm .02$ for all plates. Values desired with the cut vary depending upon the plate used. The friction factor of Plate No.1 (Districts 07 and 11) is 0.27, Plate No. 2 (District 04 and the Transportation Laboratory) is 0.30 and Plate No. 3 (Branch Laboratory in Los Angeles) is

0.32. The diagram (Figure 1a) defines with and against the cut.

6. After completing the tester calibration, thoroughly wash the standard plate with warm water and detergent, dry the plate and replace face down in the box.

D. ADJUSTMENT PROCEDURE

1. Adjustments can be made in the tension of the small coil springs.
2. Large discrepancies may be corrected by adding or removing wheel weights.
3. If wheel weights are necessary, maintain a centrifugal balance by applying equal masses across the axle. Do not loosen more than one bolt at a time while changing weights.

Note: Before making large adjustments, investigate the following common sources of problems: dirty vertical support rod; dirty sliding gauge indicators; speedometer error; improper tire pressure, 1.73 kPa (25 psi \pm 2 psi); cold glycerine and corroded carriage bearings.

E. SAFETY AND HEALTH

Testers are required to wear face protection due to the presence of glycerin mist, and also to read Chapter 12.15 (Face and Eye Protection) and Chapter 15 (Respiratory Protection) of Caltrans Employee Safety Manual.

REFERENCES

California Test 342
End of Text (4 pages) on Calif. 114

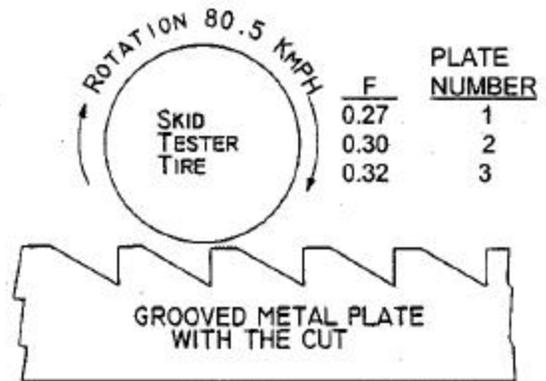
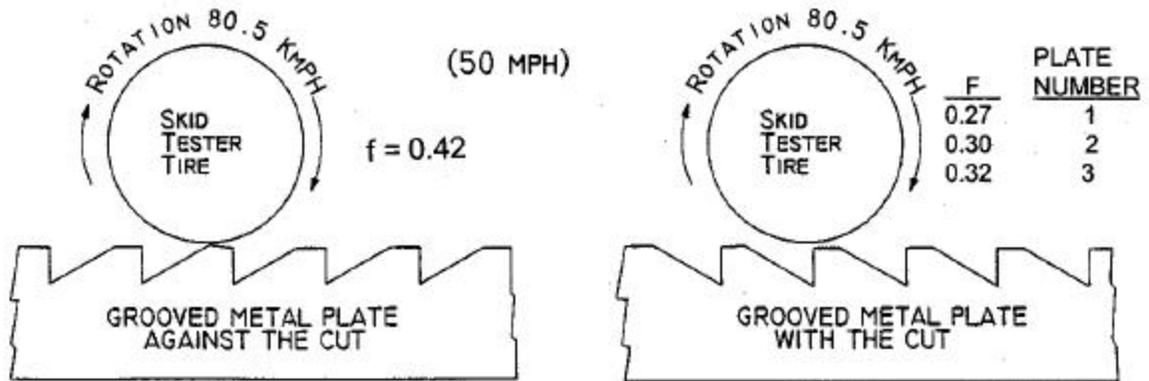
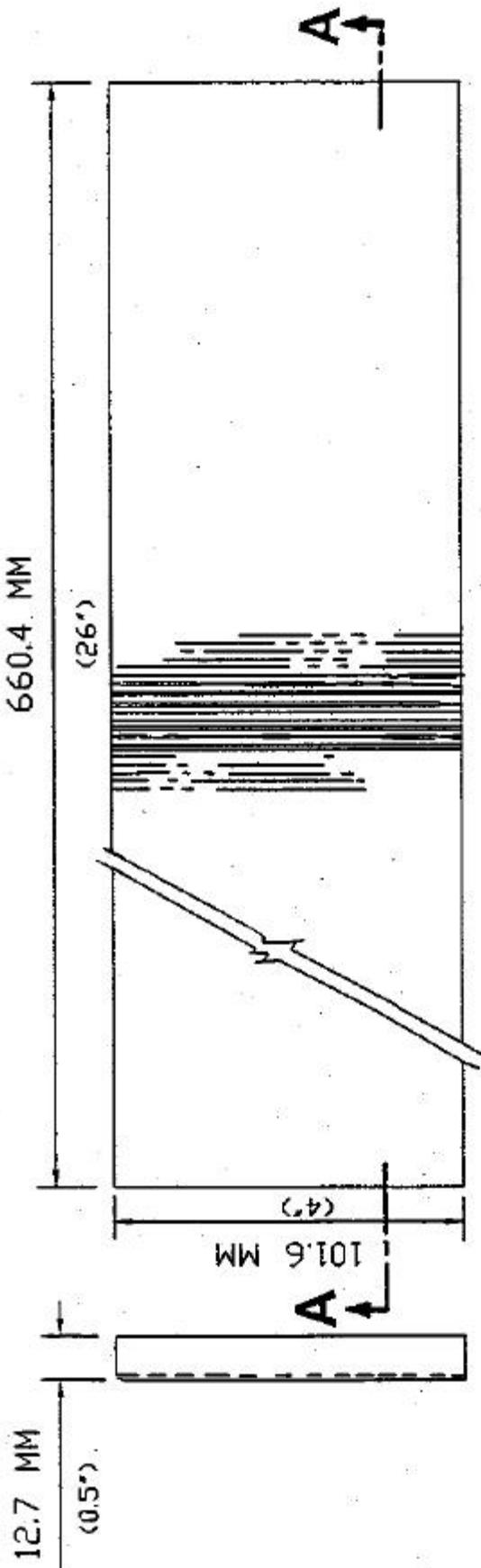
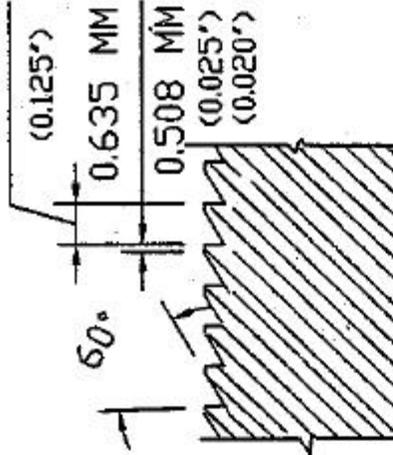


Figure 1a



60° MILL CUT
CONTINUOUS THIS SIDE
(SEE DETAIL) A

3.175 MM



NOTES: 1. MATL. - AIR HARDENING PRECISION GRND

TOOL STL. - AISI - A2

2. HEAT TREAT - 55 - 59 R/C WITHOUT
DISTORTION

3. FINISH - REMOVE ALL BURRS BUT LEAVE
ALL TOOTH EDGES SHARP.

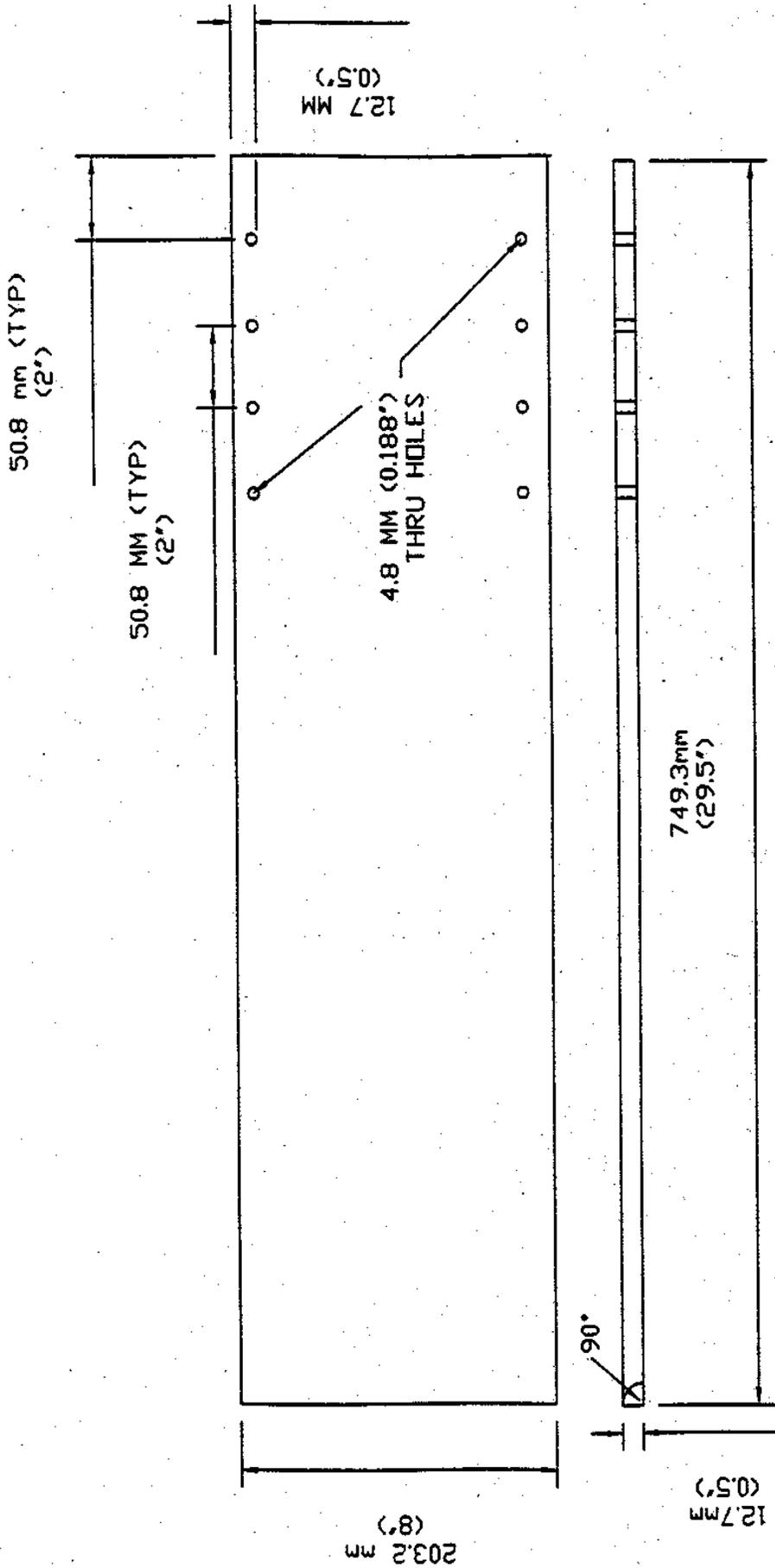
SECTION A-A

MILL CUT DETAIL
SCALE - TWICE SIZE

SKID RESISTANCE
STANDARD TEST SURFACES

SCALE - HALF & NOTED

FIGURE 1



NOTE: MATERIALS - 17 GAUGE,
GALVANIZED METAL

**HOLDING PLATE FOR
SKID RESISTANCE
STANDARD TEST SURFACES**

SCALE 1:4 (1/4" = 1")

FIGURE 2

DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER
Transportation Laboratory
P. O. Box 19128
Sacramento, California 95819



METHOD OF TEST FOR SURFACE SKID RESISTANCE WITH THE CALIFORNIA PORTABLE SKID TESTER

CAUTION: Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read “**SAFETY AND HEALTH**” in Section H of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

A. SCOPE

The apparatus and procedure for obtaining coefficient of friction values of bituminous and portland cement concrete pavements and bridge decks using a portable skid tester are described in this test method.

B. APPARATUS

1. Skid testing unit

A 2-ply tire (200 mm rim height, 95 mm rim width, 425 mm tire height and a maximum overall tire width from 100 to 120 mm) with 170 ± 15 kPa air pressure manufactured with a smooth tread, together with rim, axle, and driving pulley, is mounted to a rigid frame. The tire is brought to the required test speed by a motor. A carriage moves on two parallel guides. Friction is reduced to a low uniform value with three roller bearings fitted at 120° points to bear against the guide rod at each corner of the carriage. Two guide rods are rigidly connected to the end frame bars. The front end of the guide bar frame assembly is firmly fastened to a bumper hitch to restrain forward movement. The bumper hitch provides for swinging the skid tester to the right or left after positioning

the vehicle. The rear end of the frame assembly is raised by an adjustable knob to hold the tire 6 mm above the surface to be tested. This device is constructed so that the tire may be dropped instantaneously to the test surface by tripping the release arm. A tachometer indicates the speed of the tire in kilometers per hour. The springs are calibrated by procedures outlined in California Test 114. See Figures 1, 2 and 3.

2. A trailer hitch is used to fasten the skid testing unit to the test vehicle.
3. A 0.7-m metal carpenter's level, fitted at one end with a movable gage rod, is required. This device is calibrated to determine surface grades, in percent.

C. MATERIALS

1. Glycerin
2. Water
3. Paint brush
(approximately 50 mm wide)
4. Wooden spacer
(6 mm thick, 0.6 m long and 25 mm wide)

5. A stiff fiber broom

D. TEST PROCEDURE

1. Clean loose material from the test surface using the stiff fiber broom.
2. Determine the grade of the test surface.
 - a. Place the metal level on the test surface parallel to direction of traffic with the adjustable end down grade.
 - b. Adjust the level until the bubble is centered.
 - c. The grade is read directly on the calibrated sliding bar. See Figure 4. Record this slope to nearest 0.5 %.
3. Remove the skid testing unit from the vehicle, attach it to the bumper hitch, and connect the power cables as shown in Figure 5.
4. Position the skid tester with the test tire over the pavement surface to be tested. The test tire should be parallel to the direction of traffic.
5. Place the wooden spacer under the test tire and turn the adjustment knob to obtain a distance of 6 mm from the test surface to the bottom of the test tire. Remove the wooden spacer.
6. Wet the full circumference of the test tire and the test surface (from the initial tire contact point to approximately 0.5 m ahead of the contact point) with glycerin, using the paint brush.
7. Release the rebound shock absorber. This device is located in front of the switch, and below the motor.
8. Set the sliding gage indicator against the carriage end.

9. Depress the starting switch and bring the test tire speed to approximately 90 km/h.
10. Release starting switch.
11. Drop the test tire to the pavement surface the instant the tachometer shows 80 km/h. This is performed by engaging the lever arm.
12. Read the gage at the rear edge of indicator and record the test measurement. Obtain a coefficient of friction value for the smoothest appearing surface or surfaces on the project.

For a pavement surface, obtain five test measurements and report the average as the coefficient of friction. Make the tests in a longitudinal direction at 7.5-m intervals, unless any test measurement is less than the specified minimum. If less than the specified minimum, make five test measurements at 0.6-m intervals within or including the smoothest appearing area.

For a bridge deck, obtain the coefficient of friction value by averaging three test measurements. Space each test location for this average no nearer than 0.6 m nor farther than 1.2 m, from any other test location. The spacing may be lateral or longitudinal, but perform the test measurement in a longitudinal direction.

For coefficient of friction values less than the specified minimum, use a combination of visual observations and individual test measurements to define the area of non-compliance.

E. CALCULATIONS

1. Make pavement corrections due to slope changes using Figures 6 and 7.
2. Average the corrected readings for each test location.

Example: The following readings were taken at 7.5 m intervals in a test location.

Test Location	Test Measurement	% Grade	Corrected Test Measurement*
0+00.0	0.37	+2	0.39
0+07.5	0.38	+1	0.39
0+15.0	0.40	+1	0.41
0+22.5	0.39	+1	0.40
0+30.0	0.41	+1	0.42
Average Coefficient of Friction =			0.40

*Corrected values for upgrade measurements were taken from chart in Figure 6.

Examples of coefficient of friction values for different pavement textures are presented in the Appendix.

F. PRECAUTIONS

1. The rear support rod must be cleaned by washing frequently with water and a detergent to prevent sticking. A coating of light oil should be applied.
2. Sliding gage indicator must be kept clean so that it will slide very freely, and adjusted so that it will not shift upon carriage recoil impact.
3. Glycerin remaining on the surface after the test should be flushed off with water.
4. A minimum of seven days should lapse after PCC placement before testing.
5. A minimum of one day should lapse after AC placement before testing.
6. Temperatures less than 4.5°C will cause glycerin to become viscous and yield lower values. For full accuracy, coefficient of friction values must be obtained at temperatures greater than 4.5°C.
7. At the conclusion of a testing period, thoroughly wash the entire tester with

water and carefully dry all parts with a cloth to minimize the corrosive properties of glycerin.

8. Use care when removing and reinserting the test apparatus in the transport vehicle. See Figures 8 and 9.

G. REPORTING OF RESULTS

The report shall include the following data:

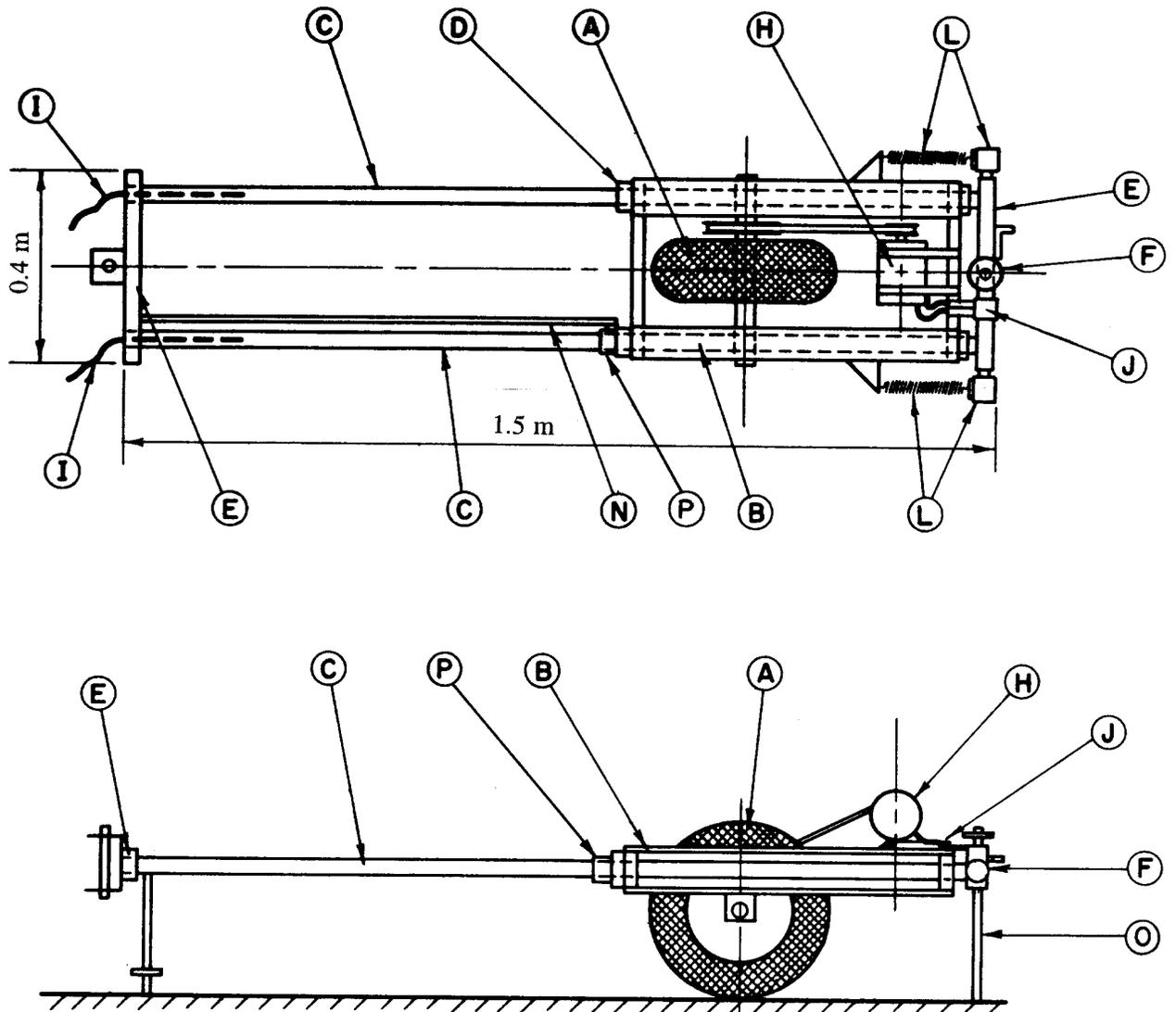
1. The name of the tester and the date when test measurements were recorded
2. The contract number
3. The year when the pavement surface was placed
4. The location of the test measurements
5. The surface grade for each test site
6. The initial and corrected test measurements and the average coefficient of friction value for each test location
7. Average air temperature during testing
8. Form TL-3111 shall be used to report all test results. See Figure 10.

H. SAFETY AND HEALTH

Prior to handling, testing or disposing of any waste materials, testers are required to read: Part A (Section 5.0), Part B (Sections: 5.0, 6.0 and 10.0) and Part C (Section 1.0) of Caltrans Laboratory Safety Manual. Users of this method do so at their own risk.

REFERENCE: California Test 114

End of Text (California Test 342 contains 12 pages)



LETTER REFERENCE	DESCRIPTION
A	TEST TIRE
B	CARRIAGE COLLAR
C	CARRIAGE GUIDE RODS
D	BEARING ASSEMBLY
E	END FRAME BARS
F	ADJUSTMENT KNOB
G	RELEASE ARM
H	MOTOR
I	POWER CABLES
J	STARTING SWITCH
K	TACHOMETER
L	CALIBRATED SPRINGS
M	TIRE CIRCUMFERENCE
N	GAGE
O	REAR SUPPORT ROD
P	SLIDING GAGE INDICATOR

FIGURE 1 - DIAGRAM OF SKID TESTER

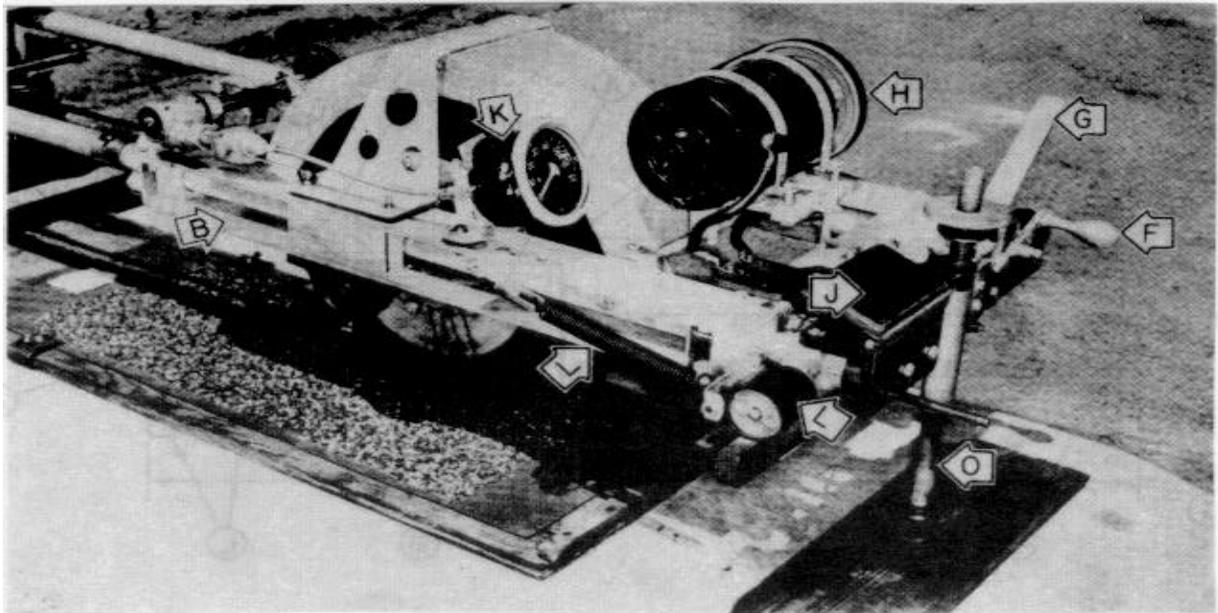


FIGURE 2 - SIDE VIEW OF SKID TESTER

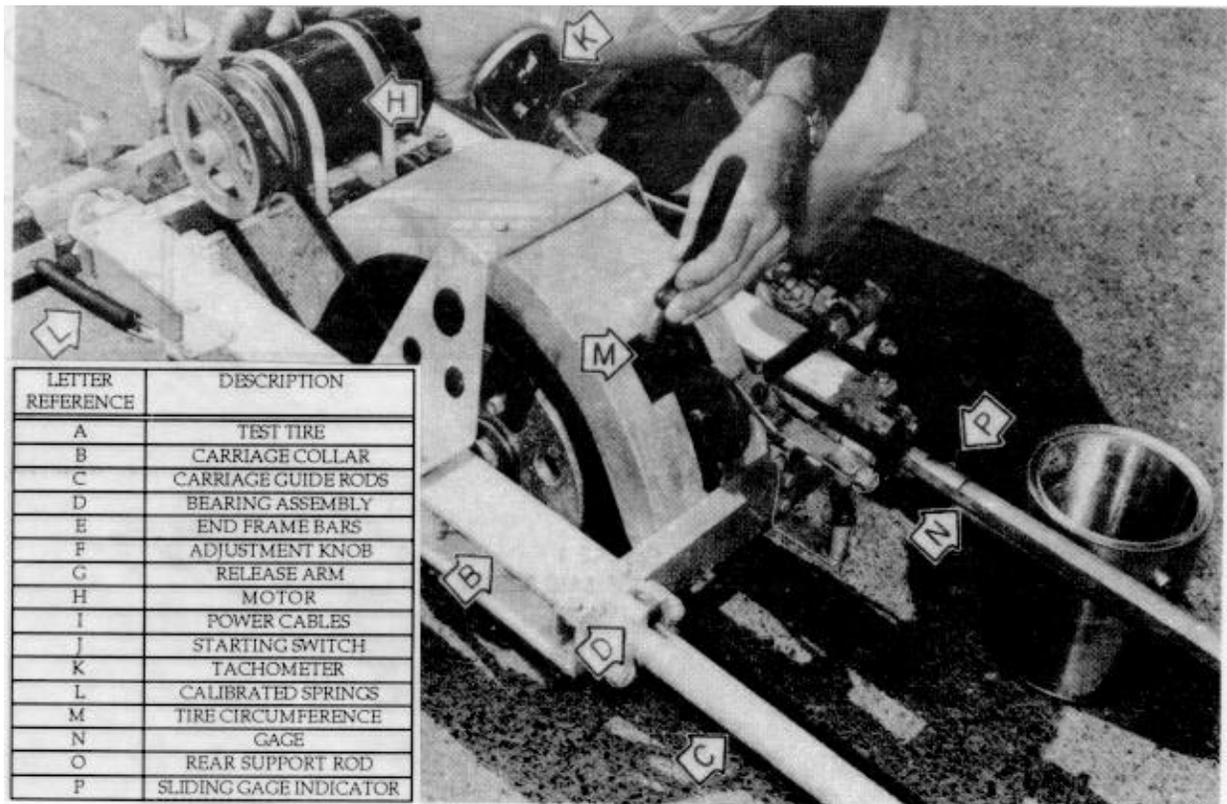


FIGURE 3 - CLOSE-UP VIEW OF SKID TESTER

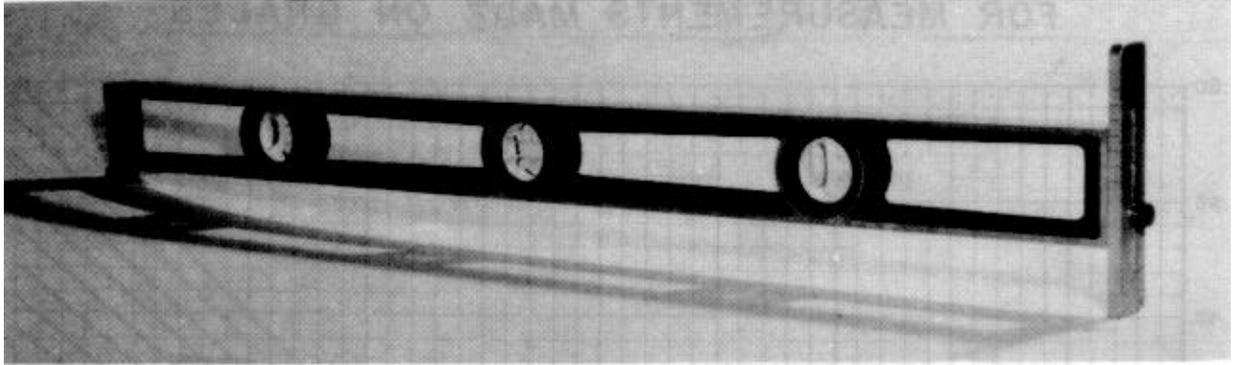


FIGURE 4 - LEVEL FOR MEASURING PAVEMENT SLOPE

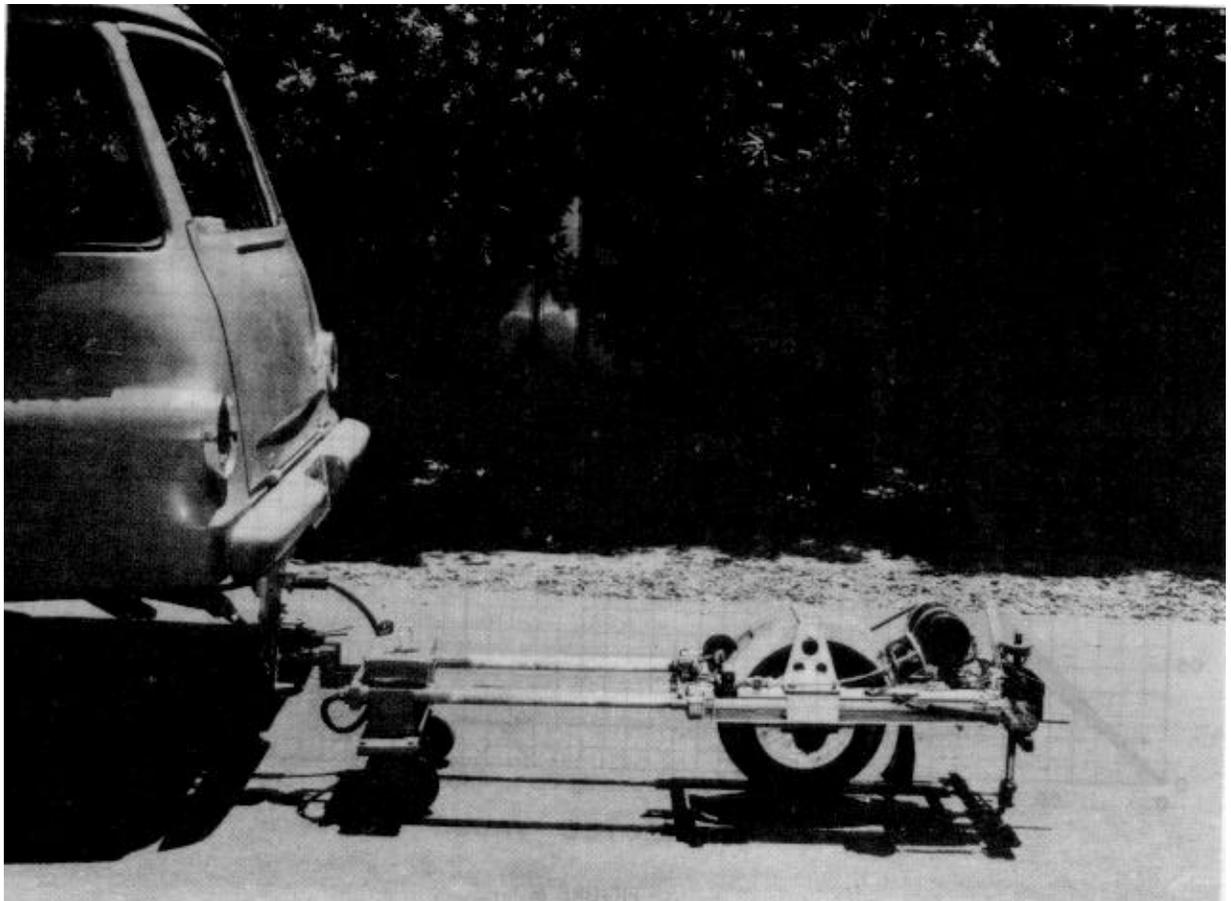


FIGURE 5 - APPARATUS IN TEST POSITION

COEFFICIENT OF FRICTION CORRECTION CHART
FOR MEASUREMENTS MADE ON GRADES

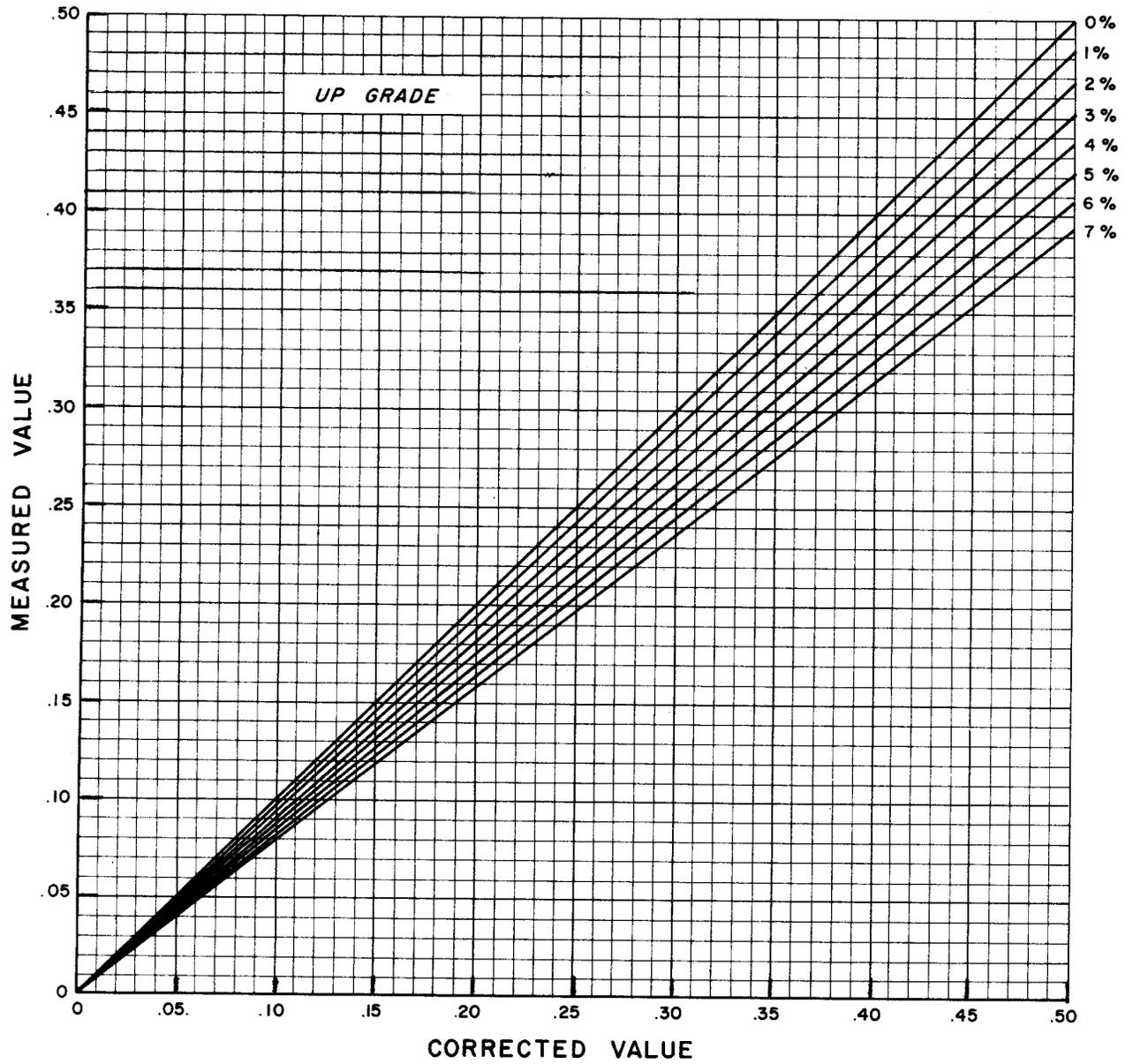


FIGURE 6 - GRADE CORRECTION CHART (UP GRADE)

COEFFICIENT OF FRICTION CORRECTION CHART
FOR MEASUREMENTS MADE ON GRADES

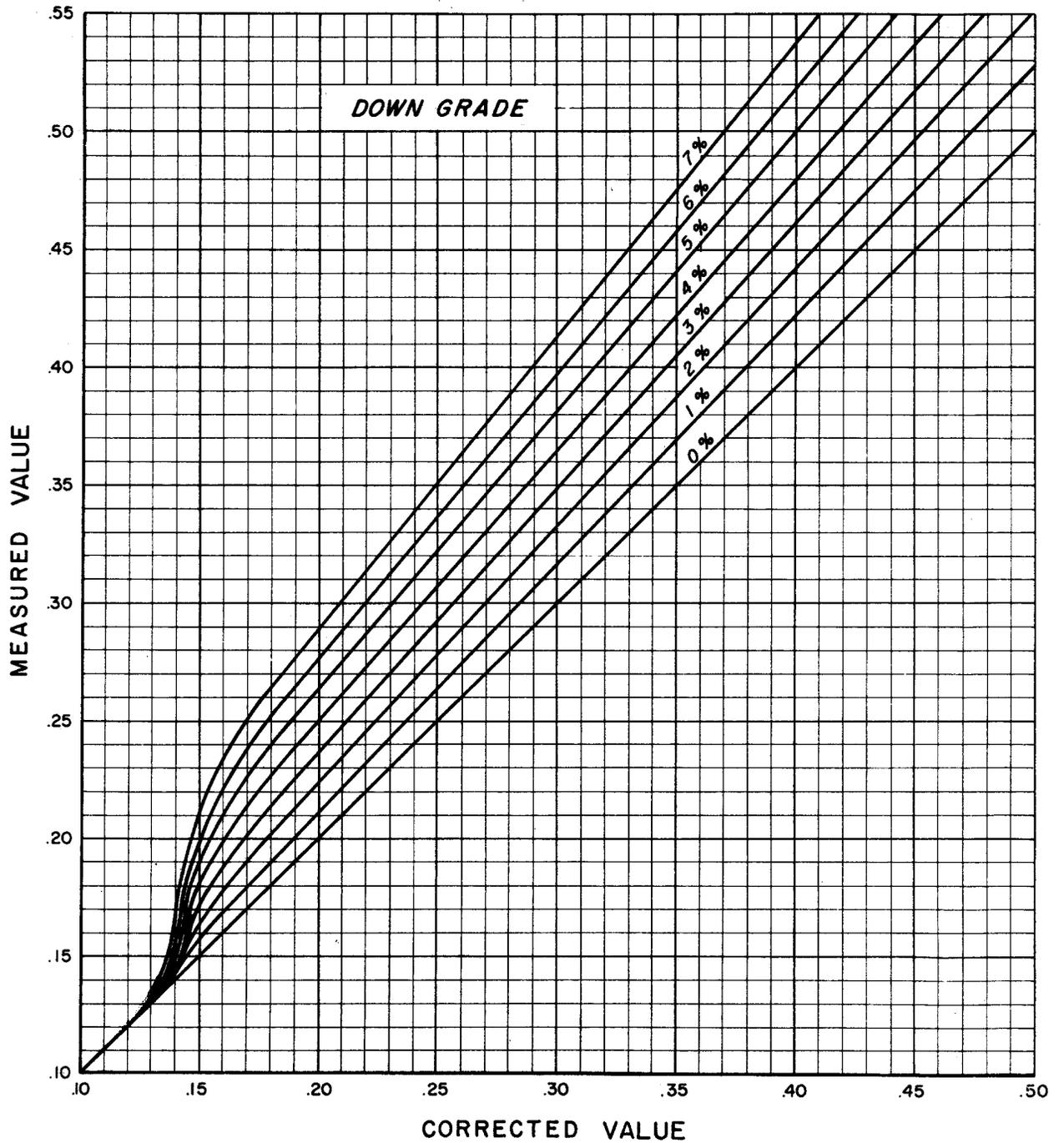


FIGURE 7 - GRADE CORRECTION CHART (DOWN GRADE)

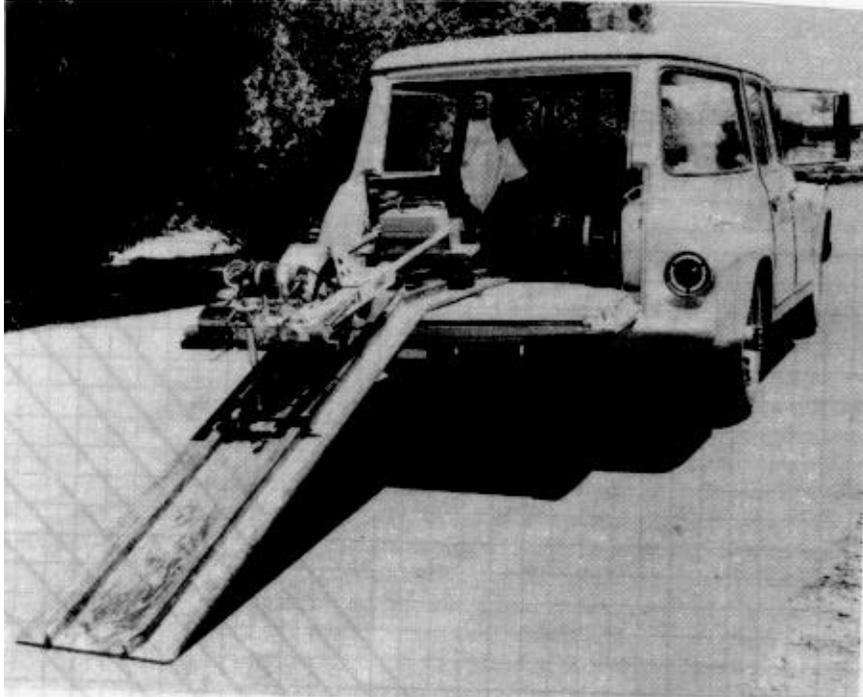


FIGURE 8 - APPARATUS BEING PLACED IN VEHICLE
(NOTE: CABLE AND WINCH FOR MOVING SKID TESTER)

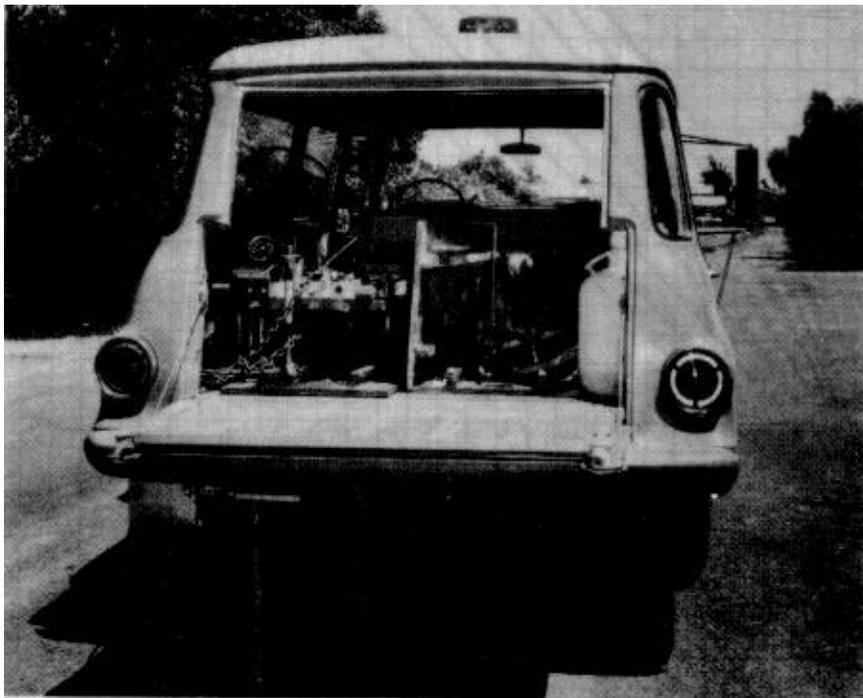


FIGURE 9 - APPARATUS IN POSITION FOR TRANSPORTING

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ENGINEERING SERVICE CENTER

**TRANSPORTATION LABORATORY
REPORT OF SKID TESTS**

DISTRIBUTION	
<input type="checkbox"/>	TRANSLAB
<input type="checkbox"/>	RESIDENT ENGINEER
<input type="checkbox"/>	DISTRICT MATERIALS ENGINEER
<input type="checkbox"/>	OFFICE OF STRUCTURES

District, County, Route, P.M. _____
 Contract Number _____ Number of Lanes _____
 Federal Number _____ Bridge Width _____
 Contract Limits _____
 Tested By _____ Test Date _____ Bridge No. _____
 Lane: _____ Average Air Temperature _____

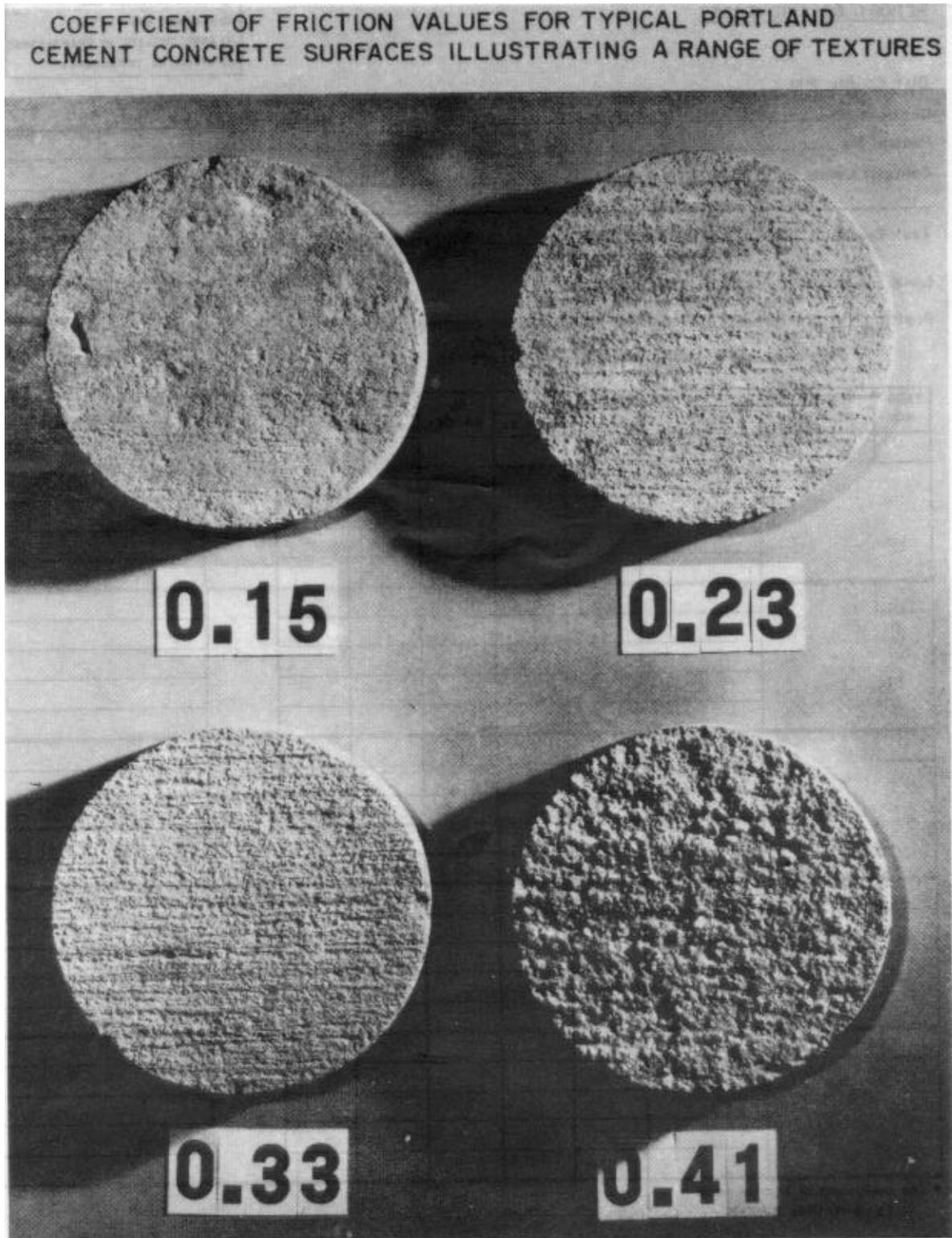
Position: In the direction of flow, position denotes feet to the right of the left edge of pavement or the inside face of the right wheel from the left bridge rail.

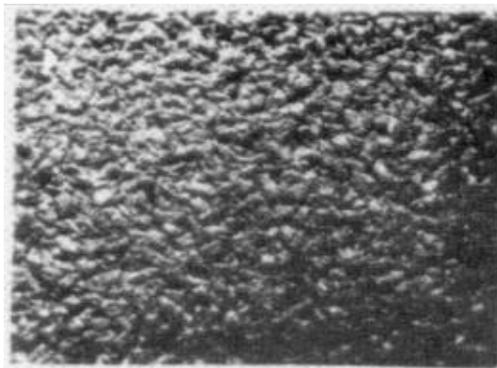
TEST NO.	DATE PLACED	LOCATION			PERCENT GRADE	TEST MEASUREMENT			REMARKS
		KILOMETER POST	LANE	POSITION		MEASURED	CORRECTED	AVERAGE *	
1									
2									
3									
4									
5									

* The coefficient of friction value
FORM TL-3111 (Revised 8/95)

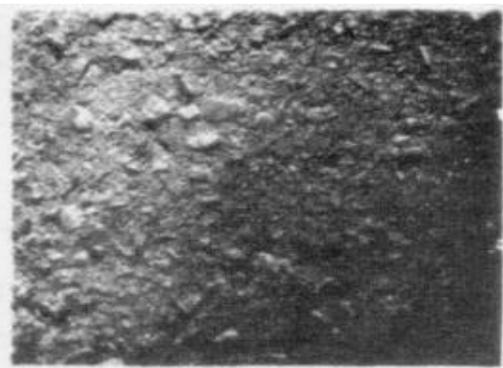
FIGURE 10 - REPORT FORM

APPENDIX

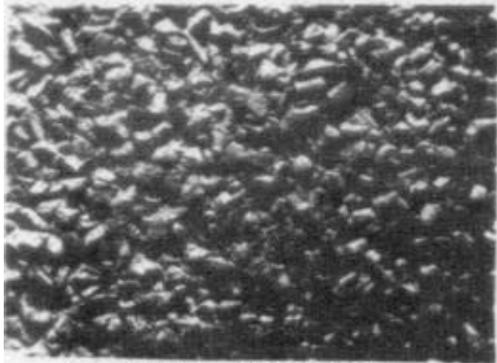




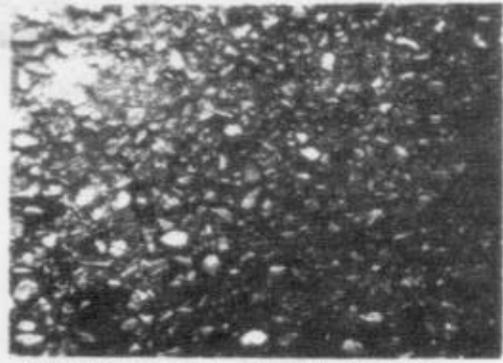
TYPICAL OPEN GRADED
0.39



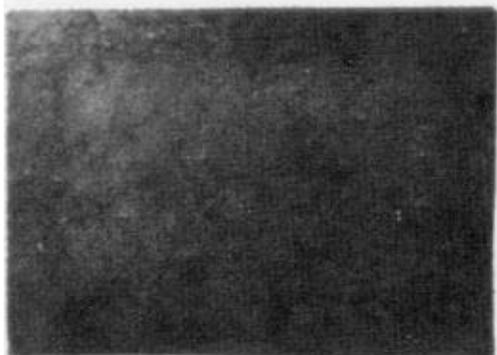
TYPICAL DENSE GRADED
0.37



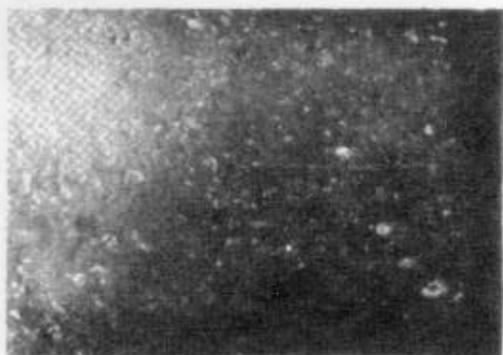
MEDIUM AGGREGATE
CHIP SEAL
0.43



CHIP SEAL WITH SOME
CHIPS IMBEDDED OR MISSING
0.37



EXCESSIVE FOG SEAL
OVER DGAC
0.15



BLEEDING OR FLUSHING
DGAC
0.13

COEFFICIENT OF FRICTION VALUES FOR
VARIOUS ASPHALT CONCRETE SURFACES

STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION
ENCROACHMENT PERMIT FEE SCHEDULE
TR-0166 (REV. 10/2013)

CODE	PERMIT TYPE	DEPOSIT REQUIRED	REVIEW	INSPECTION
	<u>GENERAL</u>			
AD	Advertising displays, marquees, arcades, awnings	6	AX	AX
AH	Adopt-A-Highway	EXEMPT	EXEMPT	EXEMPT
AP	Transportation Art Program	EXEMPT	EXEMPT	EXEMPT
AS	Airspace Development	EXEMPT	EXEMPT	AX
BR	Banners, decorations	6	AX	AX
BS	Bus shelters & benches	EXEMPT	EXEMPT	AX
CC	City/County issued permits	---	---	---
CD	Commercial Development	6	AX	AX
CN	Chain Installer	2 + vest		
CS	Curb/gutter/sidewalk	6	AX	AX
CU	Coupon Racks & Newspaper vending machines at SRRAs	6	AX	AX
CU	Adopt-A-Kiosk (TSIC)	EXEMPT	EXEMPT	EXEMPT
CU	SRRAs Vending Machines	EXEMPT	EXEMPT	EXEMPT
DP	Double Permit	6	2	AX, (#1)
	Double Permit when contractor makes project plan submittal	6	AX	AX, (#1)
	Cooperative Agreements	AD	AD	AD
FN	Fence – New/Modified	6	AX	AX
GM	Gateway Monument	EXEMPT	EXEMPT	EXEMPT
ID	Community Identification	EXEMPT	EXEMPT	EXEMPT
MB	Mailbox	EXEMPT	EXEMPT	EXEMPT
MC	Contractor's yard and plant, Grading, mowing grass, material removal, structures, parking meters, tieback, widening, freeway & conventional striping	6	AX	AX
MM	Blue Star and Memorial Markers	EXEMPT	EXEMPT	EXEMPT
MW	Monitoring Wells	6	AX	AX
OA	Visibility Improvement Request	6	AX	AX
OP	Oversight Projects	AD	AD	AD
RX	Railroad Crossing	EXEMPT	EXEMPT	EXEMPT
SC	State Contract – Early entry	1	1	0
SI	Signs	6	AX	AX
SV	Land, archeological, traffic counts, research project, accident reconstruction, literature distribution	6	AX	AX
TN	Tunneling (> 30 inches)	6	AX	AX
WL	Wall	6	AX	AX
	<u>DRAINAGE</u>			
DM	Minor Drainage	6	AX	AX
DD	Major Drainage	6	AX	AX
	<u>FILMING</u>			
FF	Filming in Facilities	0	AX	AX
FI	Intermittent Traffic control	0	2	0
FL	Traffic Control	0	AX	AX
FO	No moving traffic	0	1	0
FR	Film rider	0	AX	AX
FS	Special	0	AX	AX

CODE	PERMIT TYPE	DEPOSIT REQUIRED	REVIEW	INSPECTION
	<u>GEO-PHYSICAL TESTING</u>			
GC	Cable crossing	6	AX	AX
GV	Seismic Vibrator	6	AX	AX
	<u>LANDSCAPE</u>			
LC	Conventional Highway	6	AX	AX
LF	Freeway	6	AX	AX
LM	Maintenance	6	AX	AX
LT	Tree Trim/removal	6	AX	AX
	<u>RIDER</u>			
RD	Caltrans initiated rider	EXEMPT	EXEMPT	EXEMPT
RT	Time extension rider	2	2	AX
RW	Modify work rider	6	AX	AX
	<u>ROAD APPROACH / DRIVEWAY</u>			
RC	Commercial	6	AX	AX
RM	Resurface, reconstruct, reissue	6	1	AX
RP	Public/Private	6	AX	AX
RS	Single family/agricultural	6	AX	AX
	<u>SPECIAL EVENT</u>			
SE	Special Event	6	AX	AX
	<u>SIGNALS / LIGHTING</u>			
SN	Signal – new/modify	6	AX	AX
TK	Traffic Control, signals, lighting	6	AX	AX
	<u>ANNUAL / BI-ANNUAL</u>			
---	All permits	DEF	2	AX
	<u>UTILITIES</u>			
BB	Broadband	DEF	AX	AX
UB	Utilities in or on a bridge	DEF	AX	AX
UM	Bi/Annual Maintenance	DEF	AX	AX
UC	Conventional Aerial	DEF	AX	AX
UE	Bi/Annual utility & service	DEF	AX	AX
UF	Freeway Aerial	DEF	AX	AX
UJ	Transverse Bore & Jack	DEF	AX	AX
UK	Underground Longitudinal Major	DEF	AX	AX
UL	Underground Longitudinal Minor	DEF	AX	AX
UR	State required relocation	EXEMPT	EXEMPT	EXEMPT
US	Service, pothole, modify	DEF	AX	AX
UT	Open cut road	DEF	AX	AX

NOTES:

MOST PERMITS REQUIRE A 6 HOUR MINIMUM DEPOSIT UNLESS EXEMPT OR NOTED OTHERWISE

(#1) Inspection time will be charged to only one permit, the parent permit or the double permit, not both

AD – As specified in the agreement and/or the “Encroachment Permit Administrative Route Slip” (form TR-0154)

AX – Actual expenditures shall be collected

DEF – Deferred Billing (Utilities only)

PROJECT TOTAL SHEETS: 10
 COUNTY: 0000000000
 ROUTE: 0000000000
 TOTAL PROJECT SHEETS: 10

John M. ...
 REGISTERED CIVIL ENGINEER

JULY 19, 2013
 PLANS APPROVAL DATE

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 DIVISION OF TRAFFIC CONTROL
 DIVISION OF PLANNING AND DESIGN
 DIVISION OF RESEARCH AND INNOVATION
 DIVISION OF SAFETY AND SECURITY
 DIVISION OF SPECIAL SERVICES
 DIVISION OF TECHNICAL SERVICES
 DIVISION OF TRAINING AND EDUCATION
 DIVISION OF UTILITIES AND CONSTRUCTION

TO ACCOMPANY PLANS DATED

TABLE 3

ROAD TYPE	DISTANCE BETWEEN SIGNS *		
	A	B	C
URBAN - 25 mph OR LESS	100	100	100
URBAN - MORE THAN 25 mph TO 40 mph	250	250	250
URBAN - MORE THAN 40 mph	350	350	350
RURAL	500	500	500
EXPRESSWAY / FREEMAY	1000	1500	2640

* - The distances are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted by the Engineer for field conditions, if necessary, by increasing or decreasing the recommended distances.

TABLE 2

SPEED *	Min D **	DOWNGRADE Min D ***		
		-3%	-6%	-9%
20	115	116	120	126
25	155	158	165	173
30	200	205	215	227
35	250	257	271	287
40	305	315	333	354
45	360	378	400	427
50	425	446	474	507
55	495	520	555	593
60	570	598	638	686
65	645	682	728	785
70	730	771	825	891

* - Speed is posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

** - Longitudinal buffer space or flagger station spacing and longer than 1 mile.

*** - Use on sustained downgrade steeper than -3 percent

TABLE 1

SPEED (S)	MINIMUM TAPER LENGTH * FOR WIDTH OF OFFSET 12 FEET (ft)				MAXIMUM CHANNELIZING DEVICE SPACING			
	TANGENT		SHIFTING		TAPER		TANGENT	
	L	L/2	L/2	L/3	X	Y	Z	**
20	160	80	40	27	20	40	10	10
25	250	125	63	42	25	50	12	12
30	350	180	90	60	30	60	15	15
35	480	240	123	82	35	70	17	17
40	640	320	160	107	40	80	20	20
45	1080	540	270	180	45	90	22	22
50	1200	600	300	200	50	100	25	25
55	1320	660	330	220	55	110	27	27
60	1440	720	360	240	60	120	30	30
65	1560	780	390	260	65	130	32	32
70	1680	840	420	280	70	140	35	35

* - For other offsets, use the following merging taper length formula for L:
 For speed of 40 mph or less, $L = WS^2/60$
 For speed of 45 mph or more, $L = WS$

Where: L = Taper length in feet
 W = Width of offset in feet
 S = Posted speed limit, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

** - Use for taper and tangent sections where there are no pavement markings or where there is a conflict between existing pavement markings and channelizers (CA).

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION

**TRAFFIC CONTROL SYSTEM TABLES
 FOR LANE AND RAMP CLOSURES**

NO SCALE

RSP T9 DATED JULY 19, 2013 SUPERSEDES RSP T9 DATED APRIL 19, 2013 THAT SUPPLEMENTS THE STANDARD PLANS BOOK DATED 2010.

REVISED STANDARD PLAN RSP T9

OVERLAY (AS APPROPRIATE)

ROUTE _____ COUNTY _____

DATE: APRIL 19, 2013

REGISTERED CIVIL ENGINEER

APPROVAL DATE: _____

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

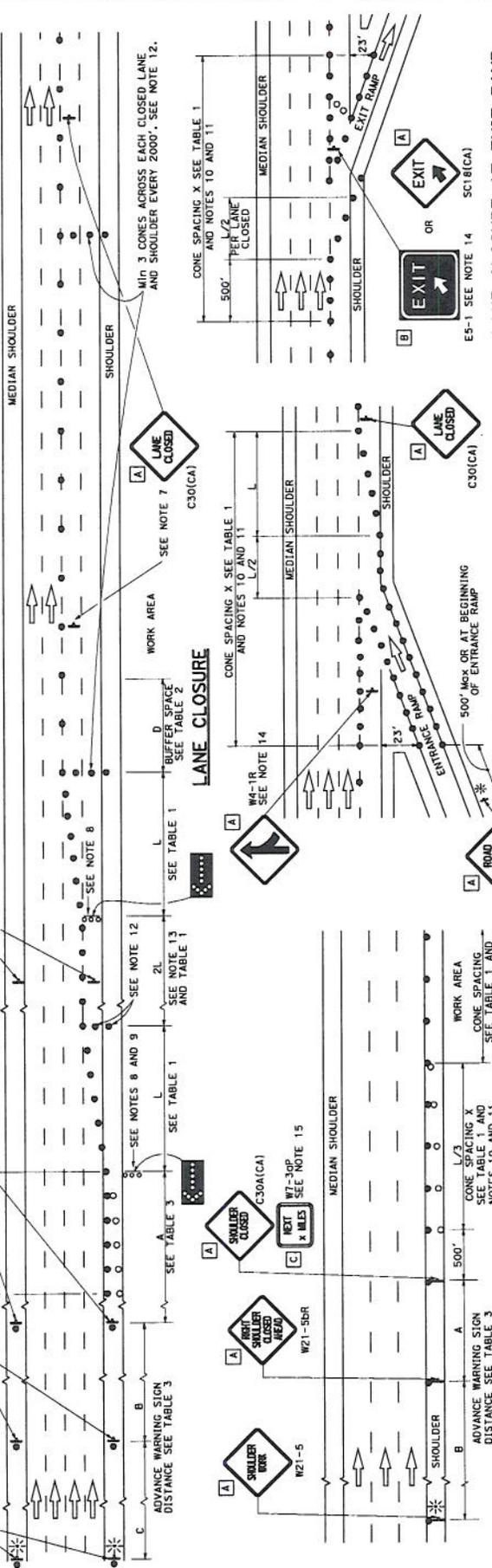
NO. _____ SHEET _____ OF _____ SHEETS

NOTES:

See Revised Standard Plan RSP T9 for tables.

Use cone spacing X for taper segment, Y for tangent segment or Z for cone conflict situations, as appropriate, per Table 1, unless X, Y, or Z cone spacing is shown on this sheet.

Unless otherwise specified in the special provisions, all temporary warning signs shall have black legend on fluorescent orange background. California codes are designated by (CA). Otherwise, Federal (MUTCD) codes are shown.



LANE CLOSURE AT ENTRANCE RAMP

W20-1 SEE NOTE 4

W4-1R SEE NOTE 14

C30(CA)

LANE CLOSED

LANE CLOSURE AT ENTRANCE RAMP

500' (MAX OR AT BEGINNING OF ENTRANCE RAMP)

CONES SPACING X SEE TABLE 1 AND NOTES 10 AND 11

WORK AREA

LANE CLOSURE

LANE CLOSURE AT EXIT RAMP

ES-1 SEE NOTE 14

SC18(CA)

EXIT

EXIT

EXIT

CONES SPACING X SEE TABLE 1 AND NOTES 10 AND 11

PER LANE CLOSED

SHOULDER

MEDIAN SHOULDER

EXIT RAMP

23'

LANE CLOSURE AT EXIT RAMP

ES-1 SEE NOTE 14

SC18(CA)

EXIT

EXIT

EXIT

CONES SPACING X SEE TABLE 1 AND NOTES 10 AND 11

PER LANE CLOSED

SHOULDER

MEDIAN SHOULDER

EXIT RAMP

23'

SHOULDER CLOSURE

W21-5

W21-5BR

W21-3OP

C30(CA)

W4-1R

W20-1

C30(CA)

LANE CLOSED

LANE CLOSURE AT ENTRANCE RAMP

500' (MAX OR AT BEGINNING OF ENTRANCE RAMP)

CONES SPACING X SEE TABLE 1 AND NOTES 10 AND 11

WORK AREA

LANE CLOSURE

LANE CLOSURE AT EXIT RAMP

ES-1 SEE NOTE 14

SC18(CA)

EXIT

EXIT

EXIT

CONES SPACING X SEE TABLE 1 AND NOTES 10 AND 11

PER LANE CLOSED

SHOULDER

MEDIAN SHOULDER

EXIT RAMP

23'

LEGEND

● TRAFFIC CONE

○ TRAFFIC CONE (OPTIONAL TAPER)

⬇ TEMPORARY TRAFFIC CONTROL SIGN

⬆ FLASHING ARROW SIGN (FAS)

⬆ FAS SUPPORT OR TRAILER

⬆ PORTABLE FLASHING BEACON

NOTES:

- Median lane closures shall conform to the details as shown except that C20(CA) and W4-2L signs shall be used.
- At least one person shall be assigned to provide maintenance of traffic control devices for lane closures.
- Duplicate sign installations are not required:
 - On opposite shoulder if at least one-half of the portable cones in the median are to be used.
 - In the median if the width of the median shoulder is less than 8' and the outside lanes are to be closed.
- Each advance warning sign on each side of the roadway shall be equipped with at least two flags for daytime closure. Each flag shall be at least 16" x 16" in size and have a fluorescent red-orange background. Flashing beacons shall be placed at the locations indicated for lane closure during hours of darkness.
- A C20-2 "END ROAD WORK" sign, with minimum size of 48" x 24" as appropriate, shall be placed at the end of the lane closure unless otherwise specified in the special provisions at a larger project's limits.
- If the W20-1 sign would follow within 2000' of a stationary W20-1 or C20-1 "ROAD WORK NEXT MILES" sign, use a C20(CA) sign for the first advance warning sign.
- Place a C30(CA) sign every 2000' throughout length of lane closure.
- One flashing arrow sign for each lane closed.
- The flashing arrow sign shall be Type 1.
- A minimum 1500' of sight distance shall be provided where possible for vehicles in the median.
- Lane closures shall not begin at top of crest vertical curve or on a horizontal curve.
- All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves) as specified in the specifications.
- Portable delineators, placed at one-half the spacing indicated for traffic cones may be used instead of cones for daytime closures only.

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON FREEWAYS AND EXPRESSWAYS

NO SCALE

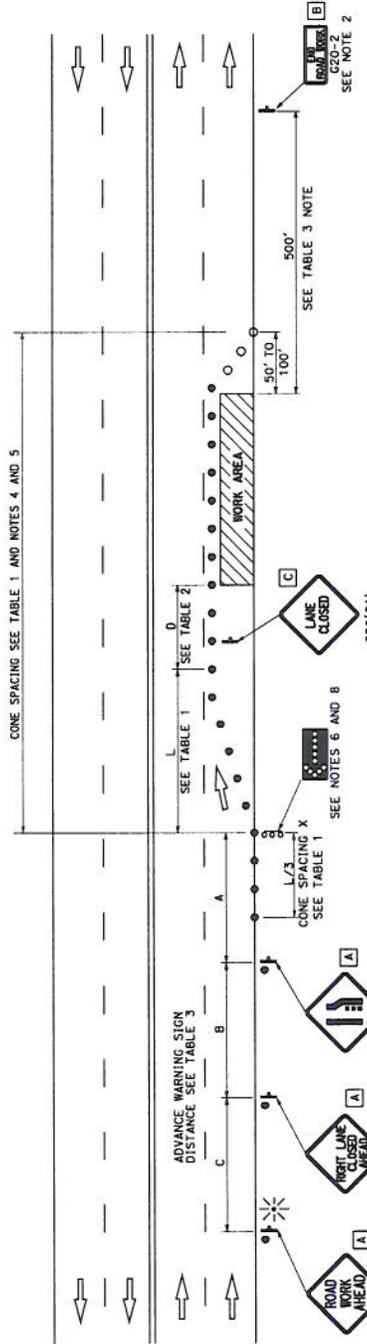
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

RSP T10 DATED APRIL 19, 2013 SUPERSEDES STANDARD PLAN T10 DATED MAY 20, 2011 - PAGE 237 OF THE STANDARD PLANS BOOK DATED 2010.

REVISED STANDARD PLAN RSP T10

SHEET NO. _____ TOTAL SHEETS _____
 COUNTY ROUTE PROJECT TOTAL PROJECT SHEETS TOTAL SHEETS
 REGISTERED CIVIL ENGINEER
 APRIL 19, 2013
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 FOR THE ACCURACY AND COMPLETENESS OF DRAWINGS
 I HEREBY CERTIFY THAT I AM THE REGISTERED PROFESSIONAL ENGINEER WHO HAS PREPARED THESE PLANS.

TO ACCOMPANY PLANS DATED _____



NOTES:

See Revised Standard Plan RSP T9 for tables. Use cone spacing X for taper segment, Y for tangent segment or Z for conflict situations, as appropriate, per Table 1, unless X, Y, or Z cone spacing is shown on this sheet. Unless otherwise specified in the special provisions, all temporary warning signs shall have black legend on fluorescent orange background. California codes are designated by (CA). Otherwise, Federal (MUTCD) codes are shown.

TYPICAL LANE CLOSURE

1. Each advance warning sign shall be equipped with at least two flags for daytime closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent red-orange in color. During nighttime closure, the flags shall be indicated for lane closure during hours of darkness.

2. A W20-1 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project's limits.

3. If the W20-1 sign would follow within 2000' of a stationary W20-1 or G20-1 "ROAD WORK NEXT MILES" sign, use a C20(CA) sign for the first advance warning sign.

4. All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves) as specified in the specifications.

5. Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daytime closures only.

LEGEND

- TRAFFIC CONE
- TRAFFIC CONE (OPTIONAL TAPER)
- ⊥ TEMPORARY TRAFFIC CONTROL SIGN
- FLASHING ARROW SIGN (FAS)
- FAS SUPPORT OR TRAILER
- PORTABLE FLASHING BEACON

SIGN PANEL SIZE (MIN)

- A 48" x 48"
- B 36" x 16"
- C 30" x 30"

6. Flashing arrow sign shall be either Type I or Type II.
7. For approach speeds over 50 mph, use the "Traffic Control System for Lane Closure on Freeways and Expressways" plan for lane closure details and requirements.
8. A minimum 1500' of sight distance shall be provided where possible for vehicles approaching the first closure or flashing arrow sign, measured at the top of crest vertical curve or on a horizontal curve.
9. Place a C30(CA) sign every 2000' throughout length of lane closure.
10. Median lane closures shall conform to the details as shown except that C20(CA)I and W4-2L signs shall be used.
11. At least one person shall be assigned to provide full time maintenance of traffic control devices in closure unless, otherwise directed by the Engineer.

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
**TRAFFIC CONTROL SYSTEM
 FOR LANE CLOSURE ON
 MULTILANE CONVENTIONAL
 HIGHWAYS**
 NO SCALE

RSP T11 DATED APRIL 19, 2013. SUPERSEDES STANDARD PLAN T11 DATED MAY 20, 2011 - PAGE 239 OF THE STANDARD PLANS BOOK DATED 2010.

REVISED STANDARD PLAN RSP T11

POST MILES TOTAL PROJECT SHEET TOTAL NO. SHEETS

COUNTY ROUTE

REGISTERED CIVIL ENGINEER

APRIL 19, 2013

PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF THIS PLAN SHEET.

TO ACCOMPANY PLANS DATED _____

NOTES:

See Revised Standard Plan RSP T9 for tables.

Use cone spacing X for taper segment, Y for tangent segment or Z for conflict situations, as appropriate, per Table 1, unless X₁, Y₁, or Z cone spacing is shown on this sheet.

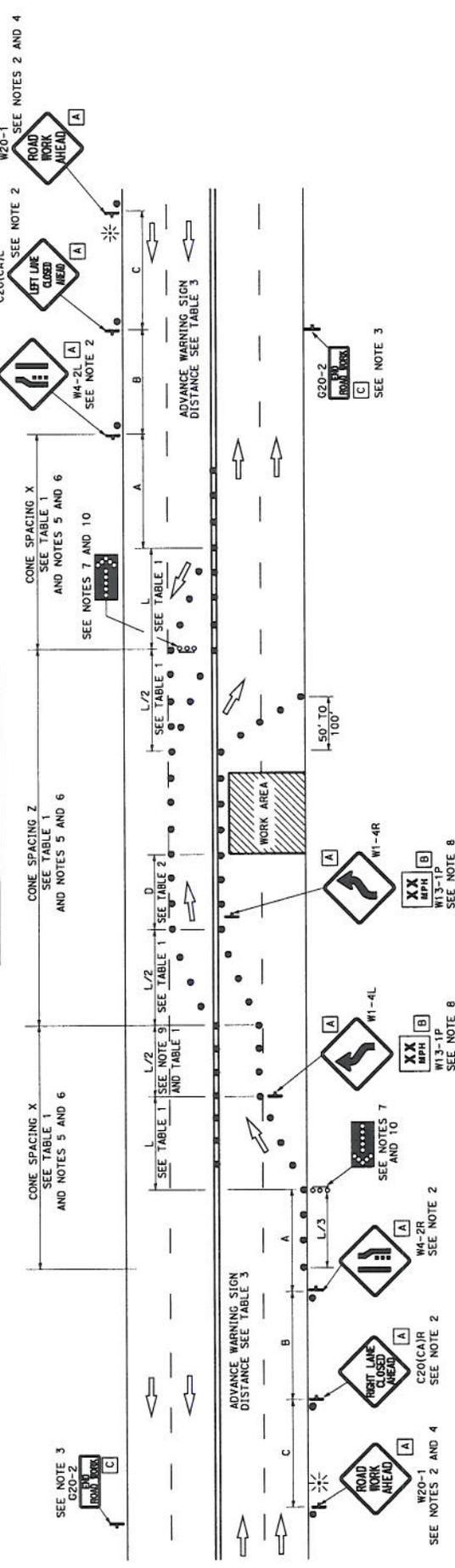
Unless otherwise specified in the special provisions, all temporary warning signs shall have black legend on fluorescent orange background. California codes are designated by (CA). Otherwise, Federal (MUTCD) codes are shown.

SIGN PANEL SIZE (Min)

A	48" x 48"
B	24" x 24"
C	36" x 18"

- LEGEND**
- TRAFFIC CONE
 - TEMPORARY TRAFFIC CONTROL SIGN
 - FLASHING ARROW SIGN (FAS)
 - FAS SUPPORT OR TRAILER
 - PORTABLE FLASHING BEACON

TYPICAL HALF ROAD CLOSURE



- NOTES:**
- At least one person shall be assigned to provide full time maintenance of traffic control devices for lane closure unless, otherwise directed by the Engineer.
 - Each advance warning sign in each direction of travel shall be equipped with at least two flags for daytime closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent red-orange in color. Flashing beacons shall be placed at the locations specified for lane closure during hours of darkness.
 - A G20-2 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane closure unless the end of work area is obvious, or ends within a larger project's limits.
 - If the W20-1 sign would follow within 2000' or a stationary W20-1 or G20-1 "ROAD WORK NEXT MILES", use a C20(CA) sign for the first advance warning sign.
 - All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves) as specified in the specifications.
 - Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daytime closures only.
 - Flashing arrow signs shall be either Type I or Type II.
 - Advisory speed will be determined by the Engineer. The W1-3-TP plaque will not be required when advisory speed is more than the posted or maximum speed limit.
 - Unless otherwise specified in the special provisions, the tangent (L/2) shall be used.
 - A minimum 1500' of sight distance shall be provided where possible for vehicles approaching the first flashing arrow sign. Lane closures shall not begin at the top of crest vertical curve or on a horizontal curve.

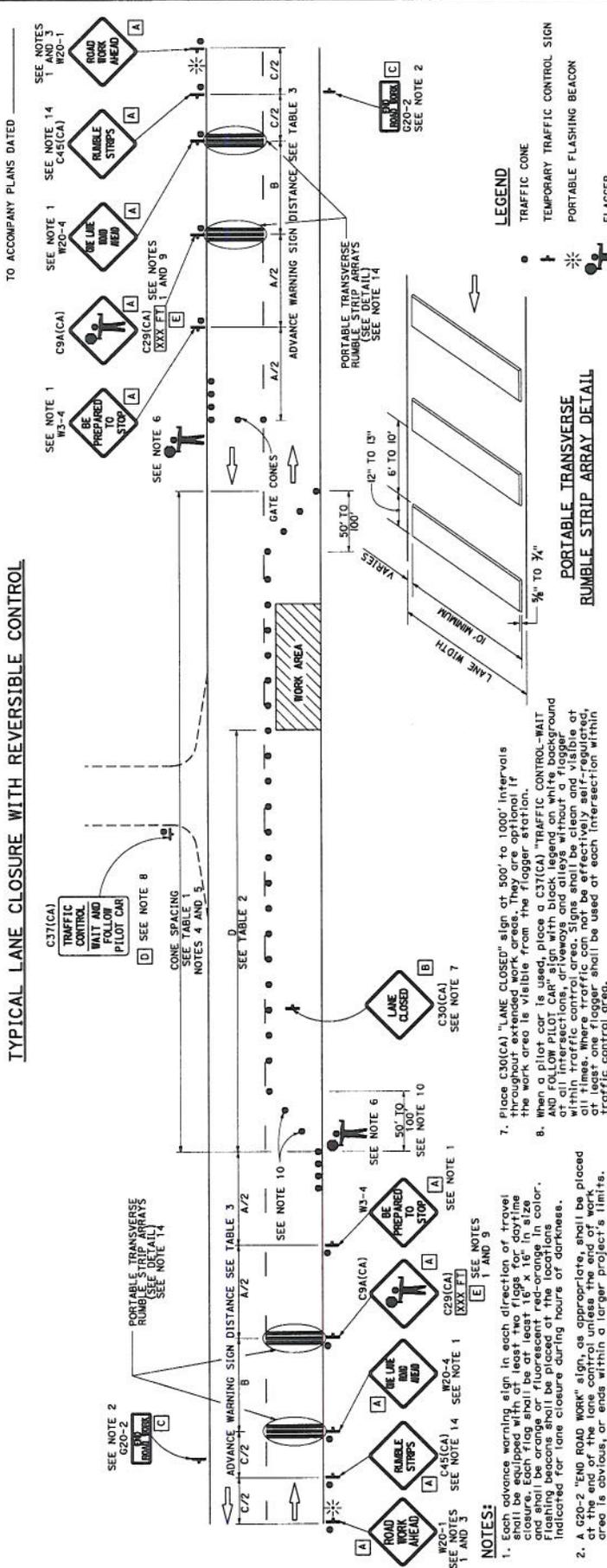
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

**TRAFFIC CONTROL SYSTEM
FOR HALF ROAD CLOSURE ON
MULTILANE CONVENTIONAL
HIGHWAYS AND EXPRESSWAYS**

NO SCALE

PROJECT SHEETS TOTAL SHEETS
 COUNTY ROUTE
 REGISTERED CIVIL ENGINEER
 October 17, 2014
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA OFFICE OF THE REGISTERED PROFESSIONAL ENGINEERS
 FOR THE COUNTY OF CALIFORNIA
 REGISTERED CIVIL ENGINEER
 DEVELOPER SIGNATURE
 No. 62-26-13
 STATE OF CALIFORNIA
 REGISTERED CIVIL ENGINEER

TYPICAL LANE CLOSURE WITH REVERSIBLE CONTROL



LEGEND

- TRAFFIC CONE
- TEMPORARY TRAFFIC CONTROL SIGN
- PORTABLE FLASHING BEACON
- FLAGGER

PORTABLE TRANSVERSE RUMBLE STRIP ARRAY DETAIL

NO SCALE

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION

TRAFFIC CONTROL SYSTEM FOR LANE CLOSURE ON TWO LANE CONVENTIONAL HIGHWAYS

SIGN PANEL SIZE (MIN)

A	48" x 48"
B	30" x 30"
C	36" x 18"
D	36" x 42"
E	20" x 7"

RSP T13 DATED OCTOBER 17, 2014 SUPERSEDES RSP T13 DATED JULY 18, 2014 AND RSP T13 DATED APRIL 19, 2013 AND STANDARD PLAN T13 DATED MAY 20, 2011 - PAGE 241 OF THE STANDARD PLANS BOOK DATED 2010.

REVISED STANDARD PLAN RSP T13

NOTES:

See Revised Standard Plan RSP T9 for tables.

Use cone spacing X for taper segment, Y for tangent segment or Z for conflict situations, as appropriate, per Table 1, unless X, Y, or Z cone spacing is shown on this sheet.

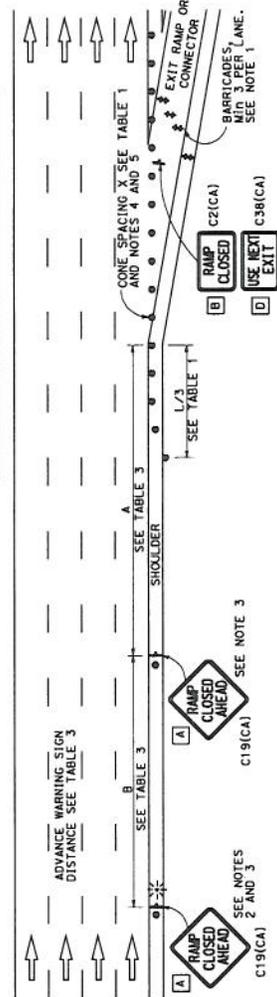
Unless otherwise specified in the special provisions, all temporary warning signs shall have black legend on fluorescent orange background. California codes are designated by (CA). Otherwise, Federal (MUTCD) codes are shown.

NOTES:

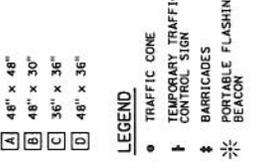
- Each advance warning sign in each direction of travel shall be equipped with at least two flags for daytime closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent red-orange in color. Lighting beacon signs shall be placed in the work area as indicated for lane closure during hours of darkness.
- A G20-2 "END ROAD WORK" sign, as appropriate, shall be placed at the end of the lane control unless the end of work area is obvious, or ends within a larger project's limits.
- If the W20-1 sign would fall within 2000' of a stationary sign for the first advance warning sign.
- All cones used for lane closures during the hours of darkness shall be fitted with retroreflective bands (or sleeves) as specified in the specifications.
- Portable delineators, placed at one-half the spacing of cones for daytime closures only.
- Additional advance flaggers may be required. Flagger should stand in a conspicuous place, be visible to approaching traffic as well as approaching vehicles after the first cone which has been approached. Flagger shall be illuminated and clearly visible to approaching traffic. The illumination footprint of the lighting on the ground shall be at least 20' in diameter. Place a minimum of 100' intervals in advance of flagger station as shown.
- Place C30(CA) "LANE CLOSED" sign at 500' to 1000' intervals throughout extended work areas. They are optional if the work area is visible from the flagger station.
- When a pilot car is used, place a C37(CA) "TRAFFIC CONTROL-WAIT AND FOLLOW PILOT CAR" sign with black legend on white background in plain traffic control. Sign shall be clean and visible at all times. Where traffic can not be effectively self-regulated, at least one flagger shall be used at each intersection within traffic control area.
- An optional C29(CA) sign may be placed below the C9A(CA) sign.
- Either traffic cones or barricades shall be placed on the taper. Barricades shall be Type I, II, or III.
- The color of the portable transverse rumble strips shall be as specified in the specifications. Use 2 arrays, each array shall consist of 5 rumble strips.
- Portable transverse rumble strips shall not be placed on sharp horizontal or vertical curves nor shall they be placed through pedestrian crossings.
- If the portable transverse rumble strips become out of alignment (skewed) by more than 6 inches, measured from one end back to the original location.
- Portable transverse rumble strips are not required if any one of the following conditions is satisfied:
 - Work duration occupies a location for four hours or less
 - Posted speed limit is below 45 MPH
 - Work zone is in snow or icy weather conditions
 - Work zone is in snow or icy weather conditions

COUNTY ROUTE SHEET NO. PROJECT NO. SHEET NO. OF SHEETS
 REGISTERED CIVIL ENGINEER
 APRIL 19, 2013
 PLANS APPROVAL DATE
 THE STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
 DIVISION OF HIGHWAYS
 THE UNIVERSITY MICROFILMS INTERNATIONAL
 COPIES OF THIS PLAN SHEET

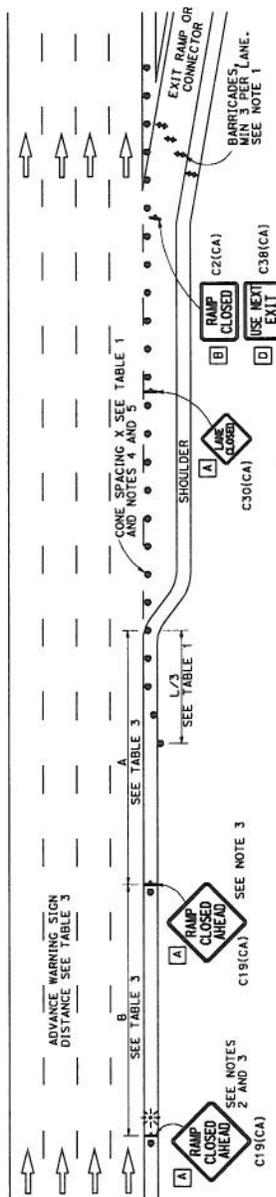
TYPICAL RAMP CLOSURES



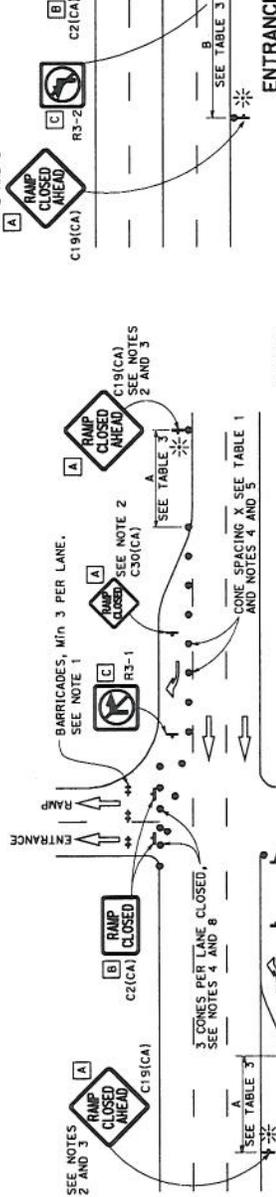
EXIT RAMP OR CONNECTOR



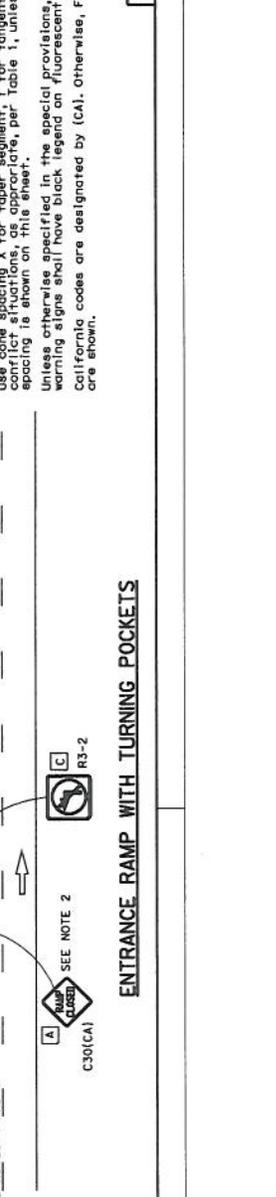
EXIT RAMP OR CONNECTOR WITH ADDITIONAL LANE



ENTRANCE RAMP WITHOUT TURNING POCKETS



ENTRANCE RAMP WITH TURNING POCKETS



SIGN PANEL SIZE (MIN)

A	48" x 48"
B	48" x 30"
C	36" x 36"
D	48" x 36"

LEGEND

●	TRAFFIC CONE
⬇	TEMPORARY TRAFFIC CONTROL SIGN
⚡	BARRICADES
⚡	PORTABLE FLASHING BEACON

- NOTES:**
- Barricades shall be Type I, II, or III for closures lasting one week or less and Type III for closures lasting longer than one week.
 - In addition to placing the C19(CA) "RAMP CLOSED AHEAD" and C30(CA) "RAMP CLOSED" signs, black overlay plates with the word "CLOSED" may be mounted, as directed by the Engineer, on all guide signs that refer to the closed ramp. The letter size on the overlay shall be the same as the guide sign.
 - Each advance C19(CA) "RAMP CLOSED AHEAD" sign shall be equipped with at least two flags for daytime closure. Each flag shall be at least 16" x 16" in size and shall be orange or fluorescent red. The flags shall be placed on top of the sign. The first C19(CA) sign during hours of darkness shall be fitted with reflective bands (or sleeves) as specified in the specifications.
 - All cones used for ramp closures during the hours of darkness shall be fitted with reflective bands (or sleeves) as specified in the specifications.
 - Portable delineators, placed at one-half the spacing indicated for traffic cones, may be used instead of cones for daytime ramp closures only.
 - At least one person shall be assigned to provide full time maintenance of traffic control devices, unless otherwise directed by the Engineer.
 - The existing "EXIT" signs shall be covered during ramp closures.
 - A minimum of 3 cones shall be placed transversely across each closed lane and shoulder.

TO ACCOMPANY PLANS DATED _____

ACCOMPANY PLANS DATED _____

STATE OF CALIFORNIA
 DEPARTMENT OF TRANSPORTATION
TRAFFIC CONTROL SYSTEM
FOR RAMP CLOSURE
 NO SCALE

RSP T14 DATED APRIL 19, 2013 SUPERSEDES STANDARD PLAN T14
 DATED MAY 20, 2011 - PAGE 242 OF THE STANDARD PLANS BOOK DATED 2010.
REVISED STANDARD PLAN RSP T14

Memorandum

To: ALL DISTRICT DIRECTORS
Attention Deputy District Directors
District Permit Engineers

Date: November 9, 1994
File No.: 617
Encroachment Permits

From: DEPARTMENT OF TRANSPORTATION
DIRECTOR'S OFFICE

Subject: Exception to Policy - Uncased High-pressure Natural Gas Pipeline Crossings

Encroachment Permits Manual Section 623, entitled "Transverse Boring and Jacking", requires that all new pipeline installations six inches and larger that cross a State highway must be placed within a casing that is bored and jacked under the highway.

Having examined the pros and cons of cased versus uncased natural gas transmission pipelines, Caltrans will now allow uncased natural gas pipeline crossings in specific circumstances. Because our primary concerns are for public safety, the integrity of the highway facility and the mechanical protection of the pipeline itself, it is necessary to limit requests for transverse natural gas transmission line crossings without casings to locations where the following conditions are met:

- 1) The pipeline owner agrees that the crossing will be designed for construction in accordance with the Code of Federal Regulations, Title 49, Part 192, and/or the California Public Utilities Commission General Orders No. 112-D with respect to natural gas pipelines. The crossing design shall be comprehensive in all respects including but not limited to material specification, pipe wall thickness determination, coating selection, and cathodic protection. Soil conditions at each site shall be analyzed for characteristics that may prove harmful to the protective pipe coating. This analysis shall be used by the pipeline owner in selecting a protective pipe coating sufficient to withstand the potential for gouging or peeling during the boring and jacking operation, or other methods approved by Caltrans. The final condition of the coating will be determined by the pipeline owner through monitoring of the boring and jacking operation, visually inspecting the exiting initial pipe segment, and electrical testing by an engineer or technician with expertise in cathodic protection. The test data shall be noted on the as-built drawings. Remedial action will be taken if the condition of the coating is such that cathodic protection is not practical.
- 2) The minimum depth of cover within State highway right of way, from the final ground line (finished grade or original ground) to the top of the proposed gas carrier pipeline, is two and one-quarter meters (7' - 6"). If the location is such that it is not practical to achieve the above depth of cover, then an engineered protective cover (such as a reinforced concrete structure) may be provided outside of pavement areas in lieu of casing. At

no time shall the minimum depth of cover be less than one and one-tenth meters (42").

- 3) The permit specifies that the uncased gas carrier pipeline shall, as a minimum, be designed for a Class 3 Location (Code of Federal Regulations referenced above) for hard surfaced roads, highways, public streets, and railroads. (See attached *Excerpts From Code of Federal Regulations, Design Factor to be Used for Natural Gas Pipelines.*)
- 4) The existence of the crossing is adequately identified by signing at the right-of-way line, with at least one identifying sign which is visible from the roadway in each direction of travel.
- 5) The pipeline owner agrees to provide as-built drawings at completion of the pipeline crossing, with a letter certifying that the pipeline was installed properly and in accordance with the permit plans (including approved changes to the permit plans), and meets industry and regulatory standards for such installation.
- 6) All other applicable requirements of Section 623 of the Encroachment Permits Manual are satisfied.

All permit applications requesting installations of such uncased natural gas pipeline crossings six inches or larger in diameter and meeting the above requirements may be approved by the highway district. All permit applications for uncased pipeline crossings deviating from the above requirements shall be submitted to the Chief of the Office of Project Planning and Design for exception approval in the usual manner.



R. P. WEAVER
Deputy Director
Project Development

Attachment

JCHaggard:jl
bcc:
DHBenjamin
WPSmith
GPeck
JVan Berkel
DLeFevre
JHaggard
DParks - NTM&R
AGugino - Structures Maint.
WMorehead - Structures
PCotter - Structures
DHBenjamin's Pend
WPSmith's Pend
Director's Office Chron
Director's Office Read
OPPD File

EXCERPTS FROM CODE OF FEDERAL REGULATIONS,

DESIGN FACTOR TO BE USED FOR NATURAL GAS PIPELINES

In the design of steel natural gas pipelines the Minimum Yield Strength for the grade of steel used is reduced by a Design Factor (F). This Design Factor is determined by the type of road being crossed by the pipeline and a Class Location established by Code of Federal Regulations, Title 49, Part 192 (Office of the Federal Register, 1990)

The Class Location depends on the occupancy of buildings or activities within an area that extends 660 feet (200 m) either side of the pipeline centerline for a continuous 1 mile (1.6 km) segment of the pipeline. There are four Class Locations as follows:

- Class 1. Location that has 10 or less buildings intended for human occupancy.
- Class 2. Location that has more than 10 but less than 46 buildings intended for human occupancy.
- Class 3. a) Any location that has 46 or more buildings intended for human occupancy ; or
b) Area where pipeline lies less than 300 feet (91 m) of either a building or a small well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period. (The days or weeks need not to be consecutive).
- Class 4. Location where buildings of four or more stories are prevalent.

The design factor used for a specific Class Location also depends on the kind of road involved as indicated on the following Table.

Design Factor (F)

Kind of Thoroughfare	Class Location			
	1	2	3	4
Privately owned roads	0.72	0.60	0.50	0.40
Unimproved public roads	0.60	0.60	0.50	0.40
Hard surfaced roads, highways public streets, and railroads	0.60	0.50	0.50	0.40

Example: A pipe made of X42 grade of steel which has a Minimum Yield Strength (MYS) of 42,000 psi used in a Class 4 location at a hard surface road crossing would be designed using a reduced Minimum Yield Strength, by applying a Design Factor of 0.4, of 16,800 psi.

CONTROLLED LOW STRENGTH MATERIAL

Controlled low strength material (CLSM) shall consist of a workable mixture of aggregate, cementitious materials, and water. Controlled low strength material shall conform to the provisions in Section 19-3, "Structure Excavation and Backfill," of the Standard Specifications and these special provisions.

At the option of the Contractor, controlled low strength material may be used as structural backfill for pipe culverts within trenches.

When controlled low strength material is used for structure backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of 6 inches except that 12 inches shall be required for pipes 42 inches and greater in diameter or span when height of cover is greater than 20 feet. Controlled low strength material shall not be used with underground structures having a span greater than 20 feet.

Controlled low strength material in new construction shall not be permanently placed higher than the basement soil. For trenches in existing pavements, permanent placement shall be no higher than the bottom of any existing pavement permeable drainage layer; if no drainage layer(s) are present, permanent placement in existing pavements shall be no higher than: a) 1 inch below the bottom of the existing asphalt concrete, or b) no higher than the top of base below existing Portland cement concrete pavements. When used, the minimum height that controlled low strength material placed relative to the pipe invert shall be: 0.5 d (diameter) for rigid pipe and 0.7 d for flexible pipe.

When controlled low strength material is proposed for use, the Contractor shall submit a mix design and test data to the Engineer for approval prior to excavating the trench for which controlled low strength material is proposed for use. The test data shall demonstrate that the mix design provides:

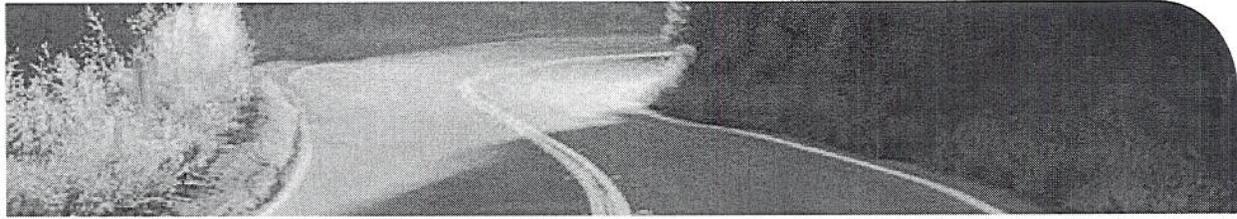
- a) For pipe culverts having a height of cover of 20 feet or less, a 28-day compressive strength between 50 and 100 psi is required; for height of cover greater than 20 feet, a minimum 28-day compressive strength of 100 psi is required. Compressive strength shall be determined by ASTM Test Method D4832, "Preparation of Testing of Soil-Cement Slurry Test Cylinders."
- b) When controlled low strength material is used as structure backfill for pipe culverts, the sections of pipe culvert in contact with the controlled low strength material shall meet the requirements of Chapter 850 of the Highway Design Manual using the minimum resistivity, pH, chloride content, and sulfate content of the hardened controlled low strength material. Minimum resistivity and pH shall be determined by California Test 643, the chloride content shall be determined by California Test 422, and the sulfate content shall be determined by California Test 417.
- c) Cement shall be: any type of Portland cement conforming to the provisions of ASTM Designation C 150; any type blended hydraulic cement conforming to ASTM C 595M; or any type blended hydraulic cement conforming to the physical requirements of ASTM C 1157M. Testing will not be required.
- d) Admixtures may be used in conformance with Section 90-4 of the Standard Specifications and the following: Chemical admixtures containing chlorides as CI in excess of 1 percent by mass of admixture, as determined by California Test 415, shall not be used.

Materials for controlled low strength material shall be thoroughly machine-mixed in a pugmill, rotary drum, or other approved mixer. Mixing shall continue until the cementitious material and water are thoroughly dispersed throughout the material. Controlled low strength material shall be placed in the work within 3 hours after mixing.

Controlled low strength material shall be placed in a uniform manner that will prevent voids in, or segregation of, the backfill, and will not float or shift the culvert. Foreign material that falls into the trench prior to or during placing of the controlled low strength material shall be immediately removed.

When controlled low strength material is to be placed within the traveled way or otherwise to be covered by paving or embankment materials, it shall achieve a maximum indentation diameter of 3 inches prior to covering and opening to traffic. Penetration resistance shall be as measured by ASTM Test Method C 6024, "Standard Test Method for Ball Drop on Controlled Low Strength Material to Determine Suitability for Load Application."

Controlled low strength material used as structure backfill for pipe culverts will be considered structure backfill for compensation purposes.



Chapter 11

Erecting Mailboxes on Streets and Highways

11.0 OVERVIEW

This chapter deals with privately owned mailboxes, mailbox supports, and mailbox turnout designs. Highway safety is the primary reason for a transportation agency to become involved in this type of design. Limited data exist for vehicle–mailbox collisions because most record systems do not specifically isolate these types of crashes. However, the *Fatality Analysis Reporting System (FARS)* (5) showed 294 deaths in 2008 in which an impact with a mailbox was the first harmful event. Although this number includes crashes in which the mailbox may not have been the direct cause of the fatal injuries, it is significant because it is associated with an unnecessary hazard.

A point that makes this a sensitive issue is that postal patrons may view their mailboxes as an extension of themselves and part of their domain. They may resent and even resist design directions concerning their mailboxes. An extra measure of diplomacy and public relations may be needed to effect changes in the design and location of mailbox installations. In recent years, commercially available secure (lockable) and heavy, vandal-resistant mailboxes have become popular to prevent identity theft and reduce vandalism.

11.1 MAILBOXES

The typical single mailbox installation, shown in Figure 11-1, consists of a light-weight, sheet-metal box mounted on a 100-mm-by-100-mm [4-in.-by-4-in.] wooden post or a 38-mm [1½-in.] diameter light-gage pipe, and it is not a serious threat to motorists. Improvements to strengthen typical post-to-box mounting details, discussed in Section 11.2.4, would further reduce its threat. Mailboxes supported by structures such as masonry columns, railroad rails and ties, tractor wheels, plow blades, and concrete-filled barrels (see Figure 11-2) sometimes turn a single mailbox installation into a roadside hazard that should be eliminated. Newer plastic, vandal-resistant steel and secure mailboxes are discussed in Section 11.2.4.

The typical grouped or multiple mailbox installation, shown in Figure 11-3, also is a serious hazard to the motorist who strikes it. This installation consists of one or more posts supporting a horizontal member, usually a timber plank, which supports a group of mailboxes. The horizontal members in these installations are poised at windshield height and have the potential to seriously injure motorists when struck. For safe alternative designs of grouped mailbox installations, see Section 11.2.4.

Injury from striking a mailbox is not the only risk associated with mailboxes. The mail carrier's maneuvers in collecting and delivering mail and the patron's activities, either as a pedestrian or motorist, in collecting and depositing mail, create opportunities for traffic conflict and human error. Reducing the number and severity of these conflicts is an important objective of this chapter.

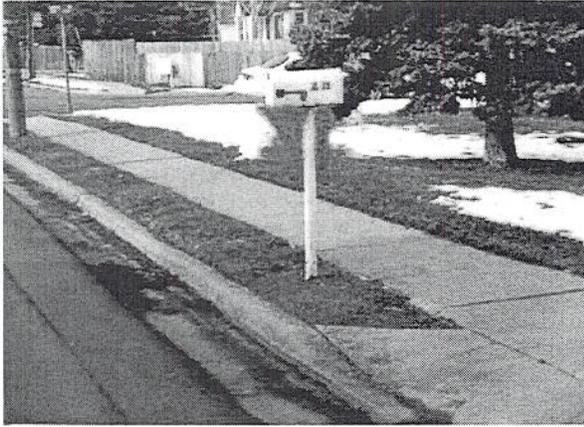


Figure 11-1. Typical Single Mailbox Installations

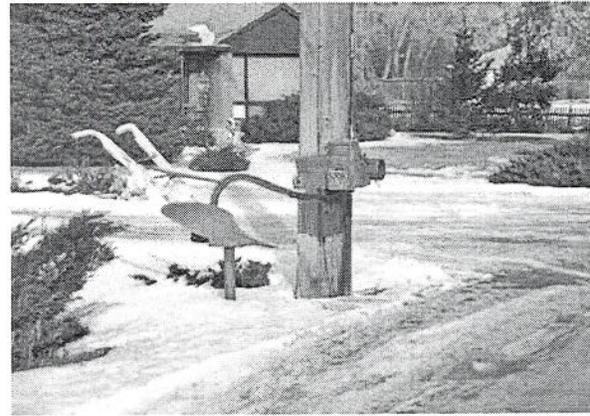
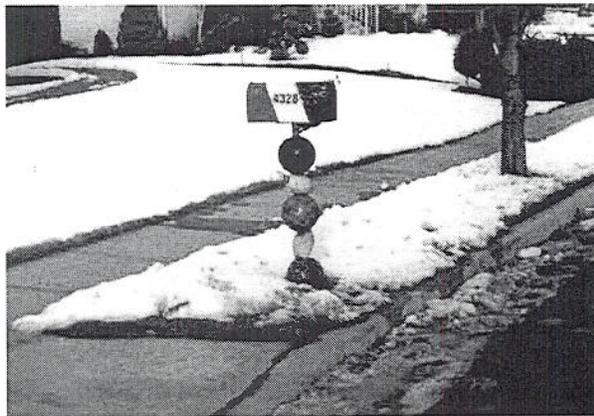


Figure 11-2. Examples of Hazardous Single Mailbox Installations

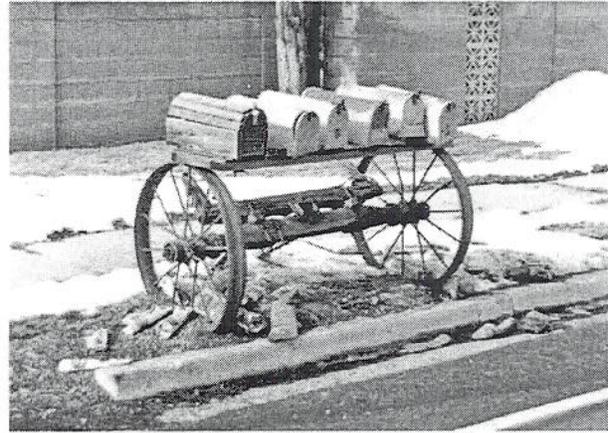
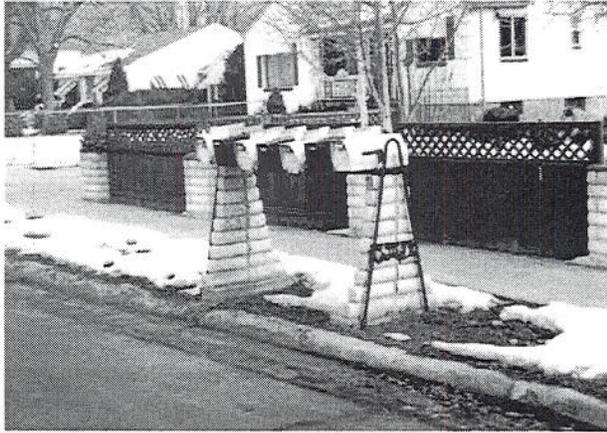


Figure 11-3. Examples of Hazardous Multiple Mailbox Installations

Only by removing mailboxes from our highways can mailbox-related traffic crashes be eliminated. Although removal is impractical, many identifiable problems can be corrected. Through cooperation among transportation agencies, the U.S. Postal Service, and postal patrons, good design practices in mailbox installation and location can be implemented when mailboxes are installed or replaced. This should incur little or no cost increase, with a typical mailbox lasting an average of about 10 years. Furthermore, when highways are rebuilt or undergo significant upgrading, there may be opportunities to incorporate relatively inexpensive mailbox improvements.

The general principles and guidelines contained in this chapter also are applicable to newspaper delivery boxes and similar devices located along public highways. These guidelines are compatible with the requirements of the U.S. Postal Service. Highway agencies and local entities are encouraged to use these guidelines in developing their own mailbox and installation policies and standards. It should be understood that these are general guidelines and that local conditions, including legal institutions and practices, population densities, topography, highway characteristics, snowfall, and prevailing vehicle characteristics, are factors to consider when developing regulations and standards.

11.2 GENERAL PRINCIPLES AND GUIDELINES

This section deals with regulations and design. Regulations are needed to establish consistency in acceptable mailbox turnouts and design.

11.2.1 Regulations

It is recommended that each highway agency adopt regulations for the design and placement of mailboxes and newspaper boxes within the right-of-way of public highways. Correlation of these regulations with those for the granting of driveway entrance permits should be considered. Mailbox and newspaper box control regulations should follow the principles and guidance contained in this chapter and includes the following:

- A reference to pertinent statutes and ordinances.
- A statement that all mailbox installations must meet the requirements of the U.S. Postal Service.
- A requirement that all mailbox and newspaper box installations conform to the current policies and standards of the highway agency regarding location, geometry, and structure of such installations.
- Information on where postal patrons can obtain copies of the current policies and standards.
- A statement on permits, if required.

- A statement on how approval of exceptions can be obtained.
- A description of the highway agency's and the postal patron's responsibilities regarding new and replacement installations.
- A description of the distribution of responsibilities and the procedures to be followed in removing unsafe or nonconforming installations.

Some local jurisdictions have reduced the number of non-conforming mailboxes by requiring the mailbox owners to obtain a waiver from their property insurance company if they want to obtain a permit to construct a massive mailbox installation on the public right-of-way.

11.2.2 Mail Stop and Mailbox Location

Mailboxes should be placed for maximum convenience to the patron and should be consistent with safety considerations for highway traffic, the carrier, and the patron. Consideration should be given to

- Minimizing walking distance within the roadway for the patron,
- Available stopping sight distance in advance of the mailbox site, and
- Possible restrictions to corner sight distances at intersections and driveway entrances. Where feasible, new installations should be located on the far right side of an intersection with a road or driveway entrance.

Mailboxes should be placed only on the right-hand side of the highway in the carrier's direction of travel. An exception is one-way streets, where mailboxes may be placed on either side. It is undesirable to require pedestrian travel along the shoulder to access the mailbox; however, this may be the preferred solution when compared to alternatives such as constructing a turnout in a deep cut, placing a mailbox just beyond a sharp crest vertical curve, or constructing two or more closely spaced turnouts.

The placing of mailboxes along both high-speed and high-volume highways should be avoided if other practical locations are available. Mailboxes should not be located where access is from the lanes of an expressway or where access, stopping, or parking is otherwise prohibited by law or regulation. Where there are frontage roads, the abutting property owners may be served by boxes located along them. It is highly undesirable to locate a mailbox that would require a patron to cross the lanes of an expressway to deposit or retrieve mail. When the U.S. Postal Service deems that service is not warranted on both frontage roads or when a frontage road is only on one side, patrons not served directly should be accommodated by mailboxes at a suitable and safe location in the vicinity of the crossroad nearest the patron's property.

In addition, placing a mail stop near an intersection could have an effect on the operation of the intersection. The nature and magnitude of this effect depends on traffic speeds and volumes on each of the intersecting roadways, the number of mailboxes at the stop, type of traffic control, how the stop is located relative to the traffic control, and the distance the stop is from the intersection.

At intersections where one roadway has the right-of-way and the other is stop-controlled, a vehicle at a mail stop on the through roadway approach may restrict the view of a vehicle entering the intersection from the right. A mail stop on the far side of a through road's intersection may increase the chance of driver in the crossroad pulling into the path of a vehicle on the through road and headed for the mail stop. A mail stop in advance of a stop sign creates the potential for a vehicle at the mail stop to block the view of the stop sign. The least troublesome location for a mail stop at these intersections is adjacent to a crossroad lane leaving the intersection. Nevertheless, there is still a chance that a driver re-entering traffic from the mail stop will not see or be seen from a vehicle turning onto the crossroad. Figure 11-4 shows the suggested minimum clearance distance to the nearest mailbox for mail stops at intersections. Using the mail stop location dimensions in the figure will minimize the effect on the intersection's operation and the hazard to persons using the mail stop.

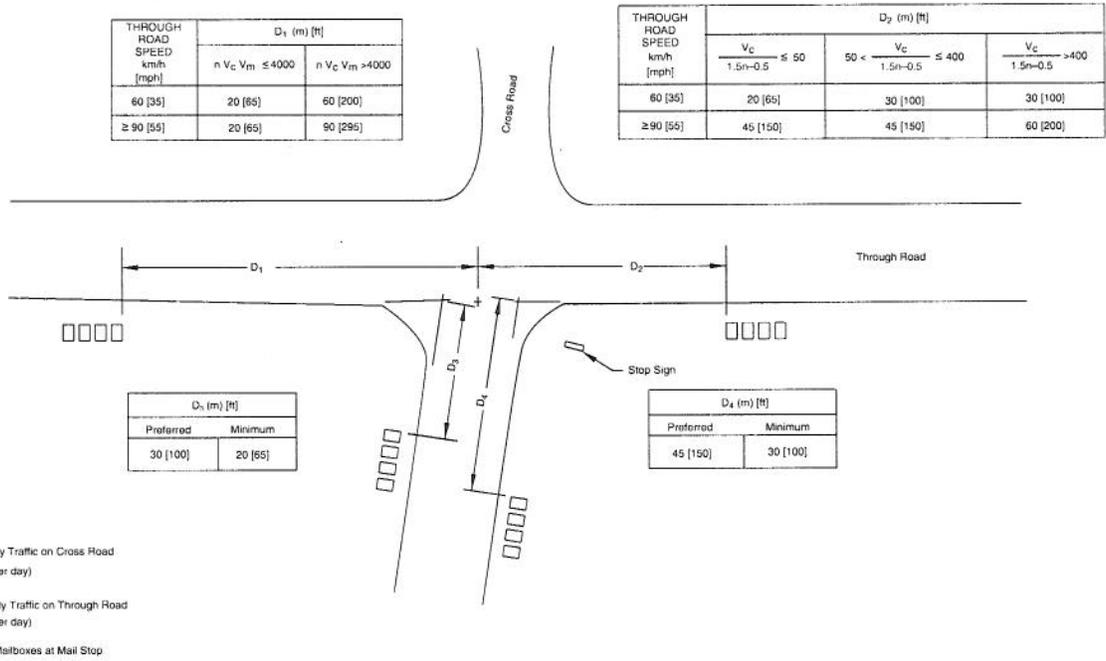


Figure 11-4. Suggested Minimum Clearance Distance to Nearest Mailbox for Mail Stops at Intersections

Mailbox heights usually are set to accommodate the mail carrier. Typically, the bottom of the mailbox is located 1,040 mm to 1,140 mm [41 in. to 45 in.] above the mail stop surface. Mailboxes should be located so that a vehicle stopped at it is clear of the adjacent traveled way. The higher the traffic volume or speed, the greater the clearance should be. A reasonable exception to this principle may be on low-volume and low-speed streets and roads.

Most vehicles stopped at a mailbox should be clear of the traveled way when the mailbox is placed outside a 2.4-m [8-ft] wide usable shoulder or turnout. This location is recommended for most rural highways. Although a 2.7-m [9-ft] minimum shoulder width is acceptable, a minimum 3-m [10-ft] turnout should be provided when practical. Where conditions justify, 3.6-m [12-ft] turnouts should be provided. However, it may not be reasonable to require even a 2.4-m [8-ft] shoulder or turnout on very low-volume, low-speed roads or streets. To provide space outside of the all-weather surface to open the mailbox door, it is recommended that the roadside face of a mailbox be set 150 mm to 200 mm [6 in. to 8 in.] outside the all-weather surface of the shoulder or turnout. Table 11-1 shows suggested guidelines for the placement of mailboxes that are based on experience and design judgment. When a mailbox is installed in the vicinity of an existing guardrail, it should, wherever practical, be placed behind the guardrail.

11.2.3 Mailbox Turnout Design

Shoulder or turnout widths suitable to safely accommodate vehicles stopped at mailboxes are discussed in Section 11.2.2 and shown in Table 11-1.

Table 11-1. Suggested Guidelines for Lateral Placement of Mailboxes

Highway Type and ADT (vpd)	Width of All-Weather Surface Turnout or Available Shoulder at Mailbox* (m) [ft]		Distance Roadside Face of Mailbox is to be Offset Behind Edge of Turnout or Usable Shoulder (mm) [in.]	
	Preferred	Minimum	Preferred	Minimum
Rural Highway Over 10,000	> 3.6 [12]	2.4 [8]	150 to 200 [6 to 8]	0
Rural Highway 1,500 to 10,000	3.6 [12]	2.4 [8]		
Rural Highway 400 to 1,500	3.0 [10]	2.4 [8]		
Rural Road Under 400	2.4 [8]	1.8 [6] ^b		150 [6] ^c
Residential Street Without Curb or All-Weather Shoulder	1.8 [6]	0.0 [0.0]		
Curbed Residential Street	Not Applicable		200 to 305 [8 to 12] ^d	150 [6] ^d

Notes: ADT = average daily traffic
vpd = vehicles per day

- a) If increased access is needed, the following may be considered in conjunction with the local postmaster:
 - Provide a level clear space 760 mm by 1220 mm [30 in. by 48 in.] centered on the box for either side or forward approach.
 - Provide an accessible passage to and from the mailbox and projection into a circulation route—no more than 100 mm [4 in.] if between 710 mm [28 in.] and 2,030 mm [80 in.]—so that the mailbox does not become a protruding object for pedestrians with impaired vision.
- b) Provide an accessible passage to and from the mailbox. The mailbox projection into a circulation route shall not be more than 100 mm [4 in.], so that the mailbox does not become a protruding object for pedestrians with impaired vision.
- c) If a turnout is provided, this may be reduced to zero.
- d) Behind traffic-face of curb.

The surface over which a vehicle is maneuvered to and from a mailbox must be sufficiently stable to support passenger cars stopping regularly during all weather conditions. When shoulder surface strength or width is not sufficient for this purpose, the shoulder should be modified to provide a suitable all-weather mailbox turnout. In most instances, adequate surface stabilization can be obtained by the addition of select materials to the in-situ soils. A mailbox turnout for grouped mailboxes may require greater stabilization or possibly a

surface treatment course to accommodate multiple patron use. Special measures also may be needed where highway traffic conditions encourage hard braking or high acceleration by vehicles entering or exiting the mailbox turnout.

Edge dropoffs often are found at rural mailbox locations. The daily use by the delivery vehicles may loosen the soil at the edge of the pavement. When the soil at the edge is eroded, a drop of 100 mm [4 in.] or more may result. These edge dropoffs can make it difficult for drivers to safely return to the pavement if the vehicle strays onto the unstable soil. The use of paved turnouts is one solution. Another approach is a recent paving innovation called the Safety Edge, which shapes the edge of the traveled way into a 30 degree angle rather than a vertical drop. This new angle is optimal in allowing motorists to return their vehicle to the pavement without overcorrecting or losing control.

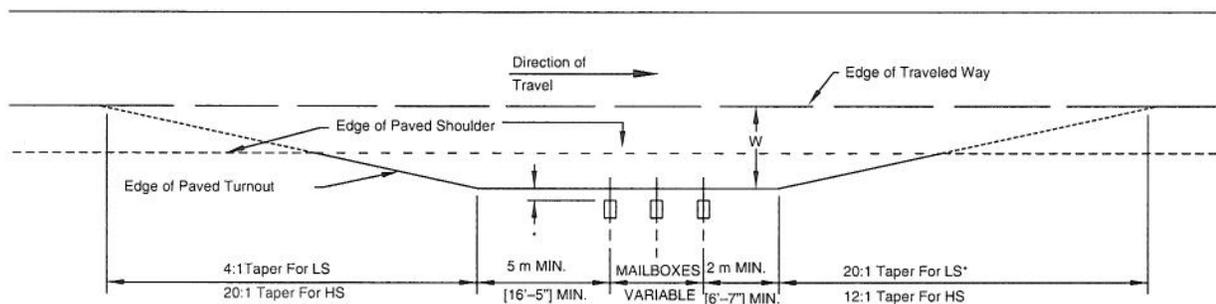
Drivers usually are required to slow their vehicles in traffic, which increases the risk of a crash. The ideal way to minimize this risk is to provide a speed-change lane. A wide surface-treated shoulder is ideal for this purpose. Unfortunately, suitable shoulders are not available at most mailbox turnout locations and it would be far too expensive to provide shoulders or turnouts that would allow a speed change outside the traveled way. Figure 11-5 presents a mailbox turnout layout considered appropriate for different traffic conditions.

The minimum space needed for maneuvering to a parallel position in and out of traffic also is shown in Figure 11-5. However, when only the minimum space is provided, the typical driver probably would slow considerably before starting into the low-speed turnout. This tendency renders such minimum space unsuitable for high-speed highways where driver expectancy does not include such slow-moving traffic.

Before entering a 2.4-m [8-ft] wide turnout with a 20:1 taper for high-speed traffic, as shown in Figure 11-5, a driver probably would not slow as much before clearing the traveled way. Although this is not an ideal exit maneuver, it probably would not create an unacceptable hazard on most rural highways for the few stops generated by a single mailbox.

Increasing the width of the turnout to 3.6 m [12 ft] and maintaining the 20:1 taper rate suggested in Figure 11-5 would induce a driver using the turnout to enter it at a fair rate of speed, but it will not be as fast as the through speed. Although this still is not ideal, it should be acceptable for most sites. The exception may be found on highways operating at high speeds and carrying more than 3,000 vehicles per day, with a high percentage of them on long trips. For these conditions, mail stops should be kept to a minimum and consideration should be given to providing shoulders or turnouts at the mail stops to facilitate greater speed-change opportunities outside the traffic stream.

The tapers shown in Figure 11-5 represent theoretical layouts. It may be more practical to square the ends of the turnout or to provide a stepped layout by strengthening and widening the shoulder to the full width of the turnout for the entire length of the taper. It also may be simpler to construct a continuous turnout-width shoulder rather than individual turnouts where mailbox turnouts are closely spaced.



LS = A Minimum Design for Roads Carrying Low-Speed Traffic and for Local and Collector Roads.
 HS = For Roads Carrying High-Speed Traffic.
 W = For Suggested Widths, see Table 11-1.
 MAILBOXES = For Mailbox Spacing and Variable Length, see Section 11.2.4, Mailbox Support and Attachment Design.
 * = For Mailbox Face Offset, see Table 11-1, 0 mm to 300 mm [0" to 12"].

Figure 11-5. Mailbox Turnout

11.2.4 Mailbox Support and Attachment Design

All exposed conventional mailboxes should be firmly attached to supports that would yield or break away safely if struck by a vehicle. The *Manual for Assessing Safety Hardware* (MASH) (1) from the American Association of State Highway and Transportation Officials (AASHTO) contains current performance criteria for testing mailbox supports when subjected to impact with an automobile. The criteria can be summarized as follows:

- Mailbox supports should be, with a minor qualification, no more substantial than required to resist service loads and to reasonably minimize vandalism. Nominal 100-mm-by-100-mm [4-in.-by-4-in.] or 100-mm [4-in.] diameter wood posts or 38-mm to 50-mm [1½-in. to 2-in.] diameter standard steel or aluminum pipe posts are acceptable. The steel or aluminum pipes should be embedded no more than 610 mm [24 in.] into the ground. Lower strength supports, such as light-weight, flanged-channel steel posts, have provided satisfactory service in most environments. A metal post should not be fitted with an anchor plate. However, an anti-twist device that extends no more than 254 mm [10 in.] below the ground surface is acceptable. The minor qualification to the criterion of minimizing post strength is that the support must break rather than bend under impact. Also, the support should have sufficient strength for the box to be accelerated to a speed approaching that of the impacting vehicle before breaking to minimize the chance of the box penetrating the vehicle's windshield. Test results indicate that 100-mm-by-100-mm [4-in.-by-4-in.] or 100-mm [4-in.] diameter wood supports should be both the minimum and maximum post dimensions (2).
- Mailbox-to-post attachments should prevent mailboxes from separating from their supports when struck by a vehicle. The lighter the mailbox, the easier it will be to meet this criterion. Conversely, given sufficient post attachment strength, the less sensitive the safety of an installation will be to the mass of the mailbox. Acceptable attachment and support details are shown in Figures 11-6 through 11-10. The exact support hardware dimensions and design may vary, such as having a two-piece platform bracket or alternative slot-and-hole locations. However, the product must result in a satisfactory attachment of the mailbox to the post and all components must fit together properly (7).
- Multiple mailbox installations must meet the same criteria as single mailbox installations. This requirement precludes the use of a heavy horizontal support member, such as the one shown in Figure 11-3. Figures 11-7 through 11-10 show acceptable multiple mailbox support systems. The use of a series of such installations or of individually supported boxes is acceptable. However, vehicle rollover occurred in a high-speed crash test involving a small car impacting off-center of a row of eight closely spaced mailboxes individually supported with 3 kg/m [2 lb/ft] channel post supports (9).
- Review of the crash test film from this test and results from other tests suggest that this ramping phenomenon is caused by the closely spaced mailboxes piling up. To avoid this problem, it is recommended that the mailbox supports be separated by a distance of no less than ¾ their full heights above ground. It also is preferred that multiple mailbox installations be located outside of the highway clear zone, such as on a service road or a minor intersecting road.

In addition to the general criteria for single and multiple mailbox installations, specific types of mailbox designs have been crash tested and need to have their own installation criteria:

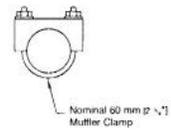
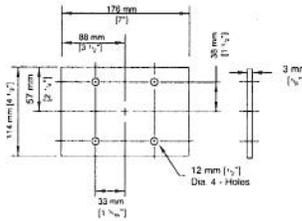
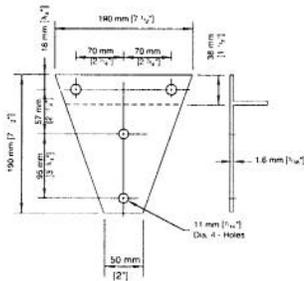
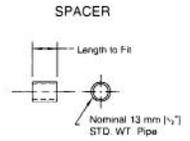
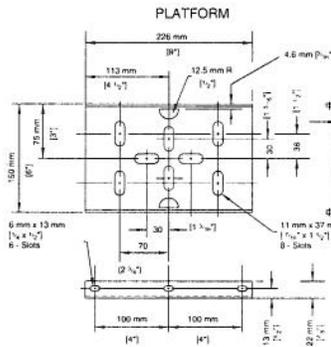
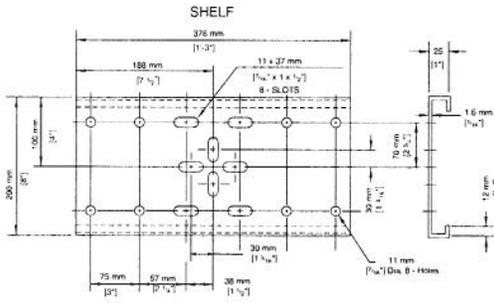
- The Neighborhood Delivery and Collection Box Unit (NDCBU) is a specialized type of multiple mailbox installation, shown in Figure 11-11. The NDCBU is a cluster of 8 to 16 locked boxes mounted on a pedestal or within a framework, the combination of which generally has a mass of between 45 kg and 90 kg [100 lb and 200 lb]. Although the NDCBU usually serves a limited number of single-family residences in urban areas, their use has been observed in rural areas. A crash test of one of these units at 100 km/h [62 mph] showed that it failed to meet safety requirements (4).
- Therefore, an NDCBU should be located outside the clear zone to allow for safe recovery of errant vehicles and for safe access by postal patrons and carriers. Postmasters and designers responsible for the location of an NDCBU should be instructed to contact local government authorities, including the appropriate highway officials (e.g., state, county, township, municipal) prior to installation. This communication can lead to a safer location of the NDCBU.
- A variety of plastic mailboxes with integral supports are available (see Figure 11-12 for an example). One of the heavier plastic mailboxes (10.9 kg [24 lb]) consists of two components: an upper section contains the mailbox, while a lower section incorporates two newspaper delivery slots and a housing that covers the supporting post. The two sections are connected using four sheet metal screws. Crash tests at 100 km/h [62 mph] were conducted using three different support posts: a 100-mm-by-100-mm [4-in.-by-4-in.] wood post, a 3-kg/m [2-lb/ft] steel U-channel, and a 75-mm [3-in.] steel pipe. In all three tests, the upper section

of the mailbox separated from the lower section on impact, causing only minor damage. All three support designs met NCHRP Report 350 criteria (2, 8).

- Vandal-resistant mailboxes typically are shaped like conventional rural mailboxes but are fabricated from heavy gage sheet steel or other substantial materials and have been designed and sold as deterrents to theft or vandalism. These massive boxes, more 5 kg [11 lb] in weight, meet U.S. Postal Service requirements for minimum size, material durability, ease of access, etc., and are quite resistant to deformation. However, full-scale crash testing has shown that these boxes separate from their support on impact and penetrate the passenger compartment easily (7). Thus, they should not be used within the clear zone of high-speed highways. Vandal-resistant mailboxes, decorative cast-metal boxes (see Figure 11-13), and other massive proprietary or custom-made mailbox supports are only appropriate for use on very low-speed, low-volume residential streets characterized by trees between the curbs and sidewalks, frequent driveway openings, on-street parking, or other features that indicate to drivers that they are in a low-speed environment, and where the minimum horizontal clearance is not an issue.
- Secure mailboxes are unlike traditional tunnel-shaped mailboxes; they have a box-like shape and consist of two main compartments (see Figure 11-14). The top compartment has a hinged door in front of the mailbox (facing the street). This section is used by the mail carrier for incoming mail delivery and outgoing mail pickup. The lower compartment, which has a lockable door, is used for mail pickup. Because no regulations are imposed on the height, weight, or material used for secure mailboxes, significant variations exist. Their heights vary from 280 to 910 mm [11 to 36 in.], and their weights range from 6.4 to 22.7 kg [14 to 50 lb]. The materials include stainless steel, galvanized steel, and aluminum, and they range in thickness from 12 to 20 gage. Supports for secure mailboxes also vary and include square and round posts of steel and aluminum of up to 100 mm [4 in.] across. All posts are available in two mounting configurations: a ground mount in that embeds the post in the soil and a surface mount that bolts the post to a concrete foundation. A study (10) using full-scale crash testing, pendulum testing, and finite-element modeling showed that these secure mailboxes would pass NCHRP Report 350 evaluation criteria and did not show potential for intruding into the occupant compartment if they were securely attached to the provided support posts and if the posts were either embedded 300 to 700 mm [12 to 24 in.] in the ground or were surface-mounted to concrete.

In areas of heavy snowfall, some highway agencies have found cantilever mailbox supports advantageous. Although such designs do permit windshield contact with the box without the vehicle first contacting the support, tests of the design shown in Figures 11-15 and 11-16 did not reveal serious consequences. The operational advantage of these supports is that snow can be plowed close to the mailbox without the snow windrow pushing the support over.

The State of Minnesota has developed and tested a swing-away mailbox that is not patented and will not penetrate a vehicle windshield (3, 6). This type of mailbox support is designed to swing back and out of the way when a snowplow truck goes by. Light-weight newspaper boxes may be mounted below the box on the mailbox support.



SEE ALTERNATE BRACKET DESIGN
IN FIGURES 11.8 & 11.9.

NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE INDICATED.
ALL DIMENSIONS IN BRACKETS ARE IN U.S. CUSTOMARY UNITS.

Figure 11-6. Mailbox Support Hardware, Series A

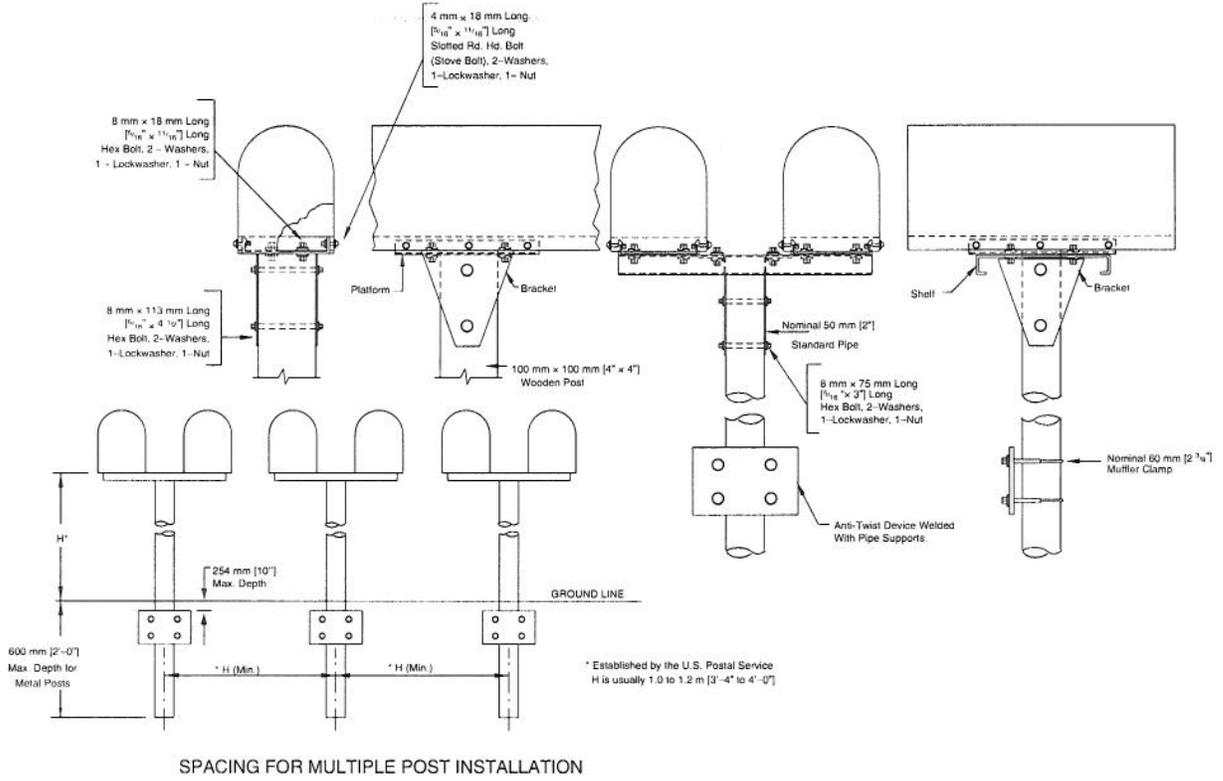
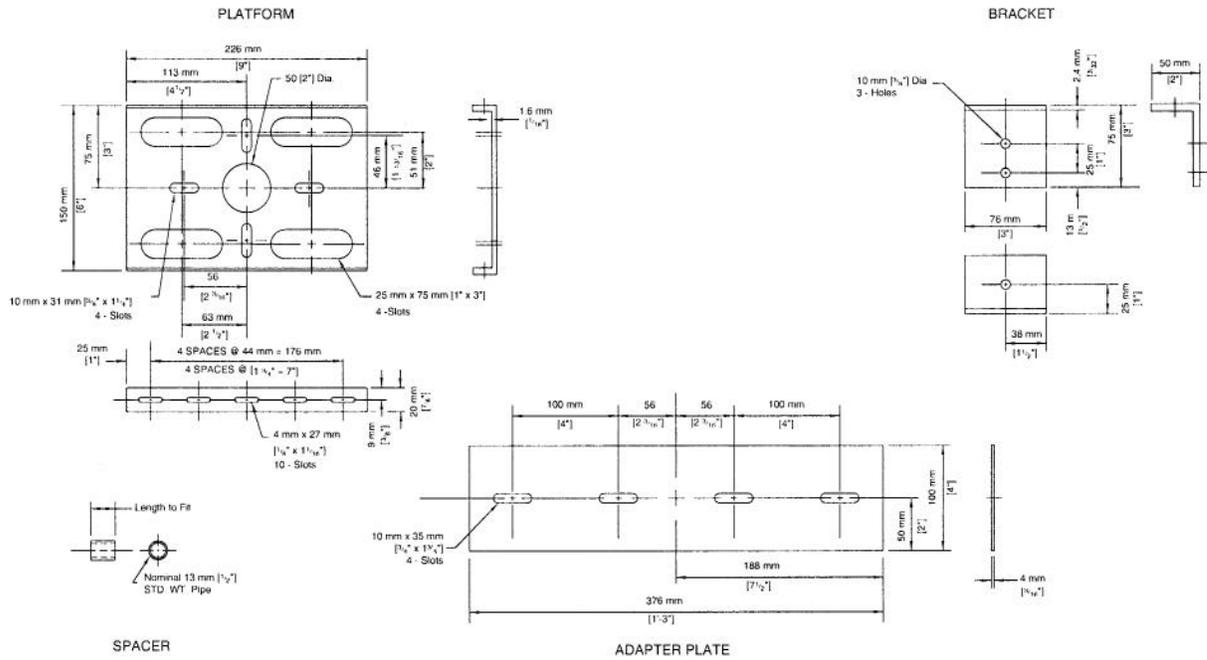


Figure 11-7. Single and Double Mailbox Assemblies, Series A



NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE INDICATED.
 ALL DIMENSIONS IN BRACKETS ARE IN U.S. CUSTOMARY UNITS.

Figure 11-8. Mailbox Support Hardware, Series B

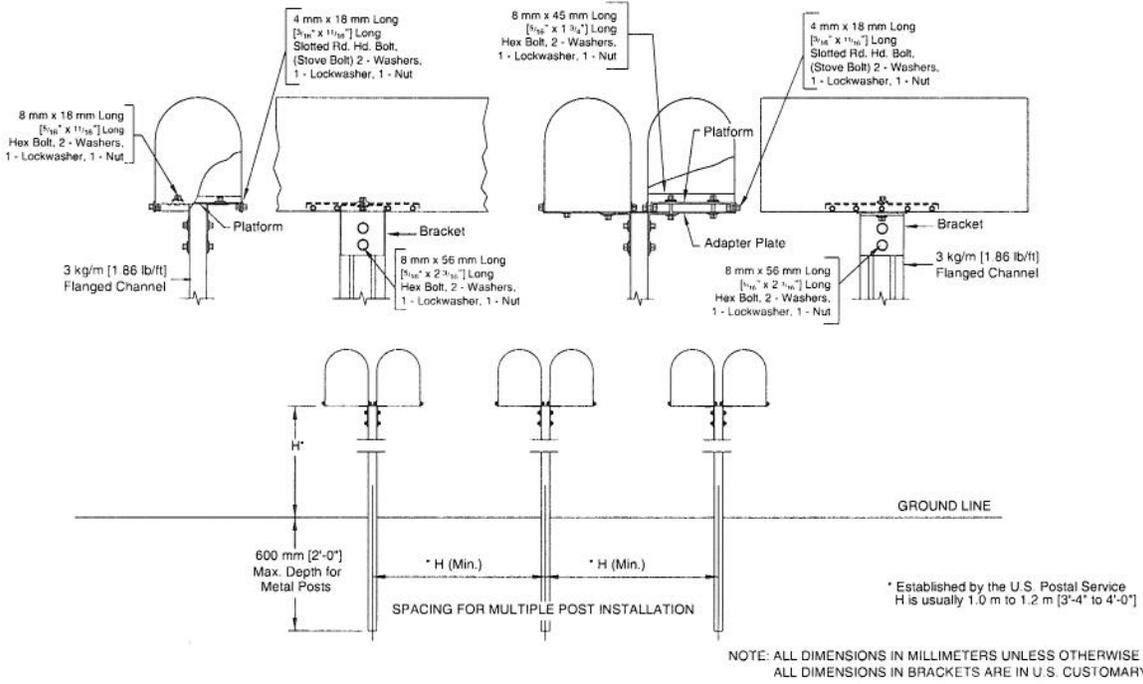
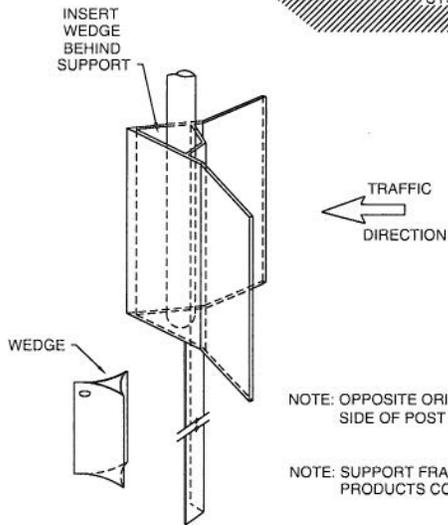
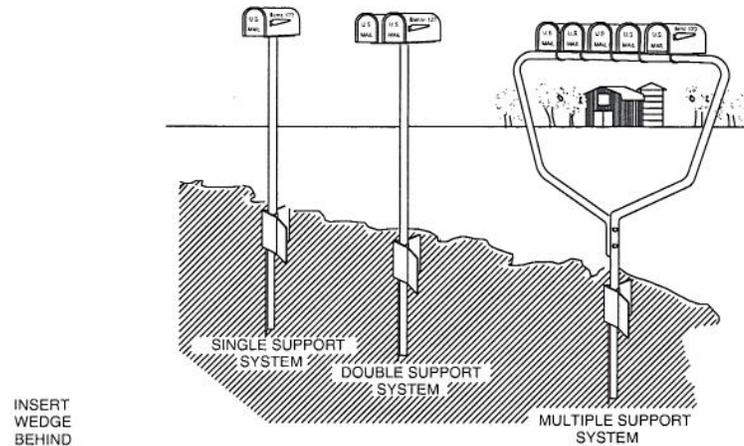
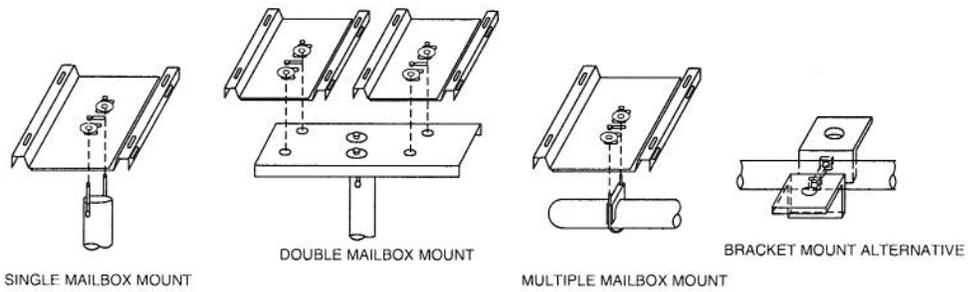


Figure 11-9. Single and Double Mailbox Assemblies, Series B



NOTE: OPPOSITE ORIENTATION WITH WEDGE ON TRAFFIC APPROACH SIDE OF POST IS ALLOWABLE BUT NOT PREFERRED.

NOTE: SUPPORT FRAME AND FOUNDATION ARE PROPRIETARY PRODUCTS COMMERCIALY AVAILABLE.

Figure 11-10. Single and Double Mailbox Assemblies, Series C



Figure 11-11. Collection Unit on Auxiliary Lane (left) and Neighborhood Delivery and Collection Box Units



Figure 11-12. Plastic Mailbox with Integral Support

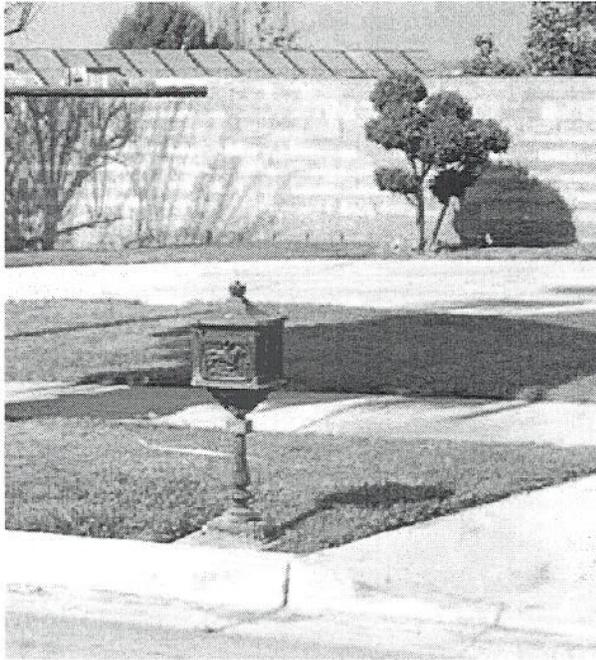


Figure 11-13. Vandal-Resistant Decorative Mailbox

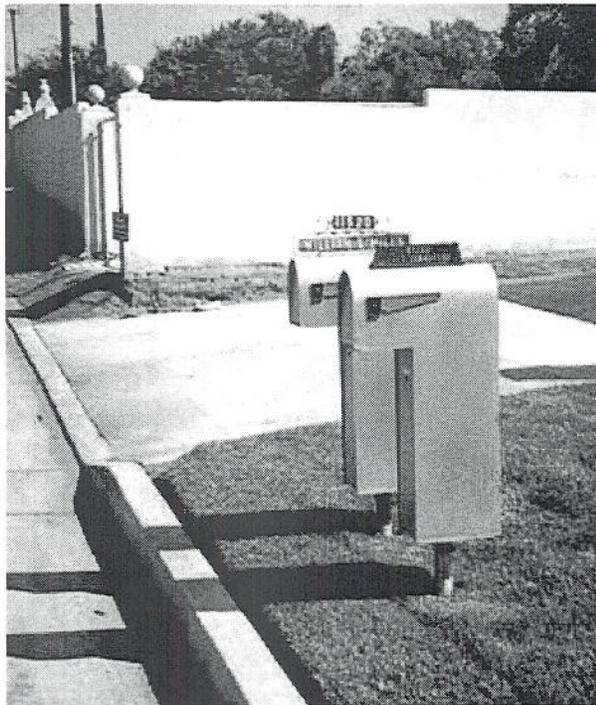


Figure 11-14. Secure Mailboxes

11.3 U.S. POSTAL SERVICE GUIDANCE AND MODEL MAILBOX REGULATION

11.3.1 U.S. Postal Service Guidance

For more details on U.S. Postal Service requirements on mailboxes, refer to their *Domestic Mail Manual* (DMM), specifically 508 Recipient Services: Customer Mail Receptacles (<http://pe.usps.com/text/dmm300/508.htm#w1051804>), as well as USPS-STD-7B Mailboxes—Residential Mailbox Standards (<http://www.usps.com/receive/mailboxstandards.htm>), and Notice 209 <http://uspsnotices.lettercarriernetwork.info/not209.pdf>.

11.3.2 Model Mailbox Regulation

This section provides a generic model regulation for mailboxes and newspaper delivery boxes on public highway right-of-ways. The model is intended only as an example. States and municipalities can and should tailor the model to fit their own particular needs.

11.3.2.1 Scope

No mailbox or newspaper delivery box, hereinafter referred to as mailbox, will be allowed to exist on the Agency's right-of-ways if it interferes with the safety of the traveling public or the function, maintenance, or operation of the highway system. A mailbox installation not conforming to the provisions of this regulation is an unauthorized encroachment under State Code Section _____.

The location and construction of mailboxes shall conform to the rules and regulations of the U. S. Postal Service as well as to standards established by the Agency. Agency standards for the location and construction of mailboxes are available from:

- Highway Agency
- Street Address or P.O. Box
- City, State Zip Code
- Telephone number

A mailbox installation that conforms to the following criteria will be considered acceptable unless, in the judgment of the Chief Engineer of the Agency, the installation interferes with the safety of the traveling public or the function, maintenance, or operation of the highway system.

11.3.2.2 Location

No mailbox will be permitted where access is obtained from a freeway or where access is otherwise prohibited by law or regulation.

Mailboxes shall be located on the right-hand side of the roadway in the carrier's direction of travel route except on one-way streets, where they may be placed on the left-hand side. The bottom of the box shall be set at a height established by the U. S. Postal Service, usually between 1.0 m [39 in.] and 1.2 m [48 in.] above the roadway surface. The roadside face of the box shall be offset from the edge of the traveled way a distance no less than the greater of the following:

- 2.4 m [8 ft] (where no paved shoulder exists and shoulder cross slope is 13 percent or flatter), or
- the width of the all-weather shoulder present plus 200 mm to 300 mm [8 in. to 12 in.], or
- the width of an all-weather turnout specified by the Agency plus 200 mm to 300 mm [8 in. to 12 in.].

Exceptions to these placement criteria will exist on residential streets and certain designated rural roads where the Agency deems it in the public interest to permit lesser clearances or to require greater clearances. On curbed streets, the roadside face of the mailbox shall be set back from the face of the curb at a distance of between 150 mm and 300 mm [6 in. and 12 in.]. On residential streets without curbs or all-weather shoulders that carry low traffic volumes operating at low speeds, the roadside face of the mailbox shall be offset between 200 mm and 300 mm [8 in. and 12 in.] behind the edge of the pavement. On very low-volume rural roads with low operating

speeds, the Agency may find it acceptable to offset mailboxes a minimum of 2 m [6 ft] from the traveled way and under some low-volume, low-speed conditions may accept clearances as low as 800 mm [32 in.].

- Where a mailbox is located at a driveway entrance, it shall be placed on the far side of the driveway in the carrier's direction of travel.
- Where a mailbox is located at an intersecting road, it shall be located a minimum of 30 m [100 ft] beyond the center of the intersection road in the carrier's direction of travel. This distance shall be increased to 60 m [200 ft] when the average daily traffic on the intersection road exceeds 400 vehicles per day.
- When a mailbox is installed in the vicinity of an existing guardrail, it should, when practical, be placed behind the guardrail.

11.3.2.3 Structure

Design and/or location criteria for the mailbox support structure should consist of the following:

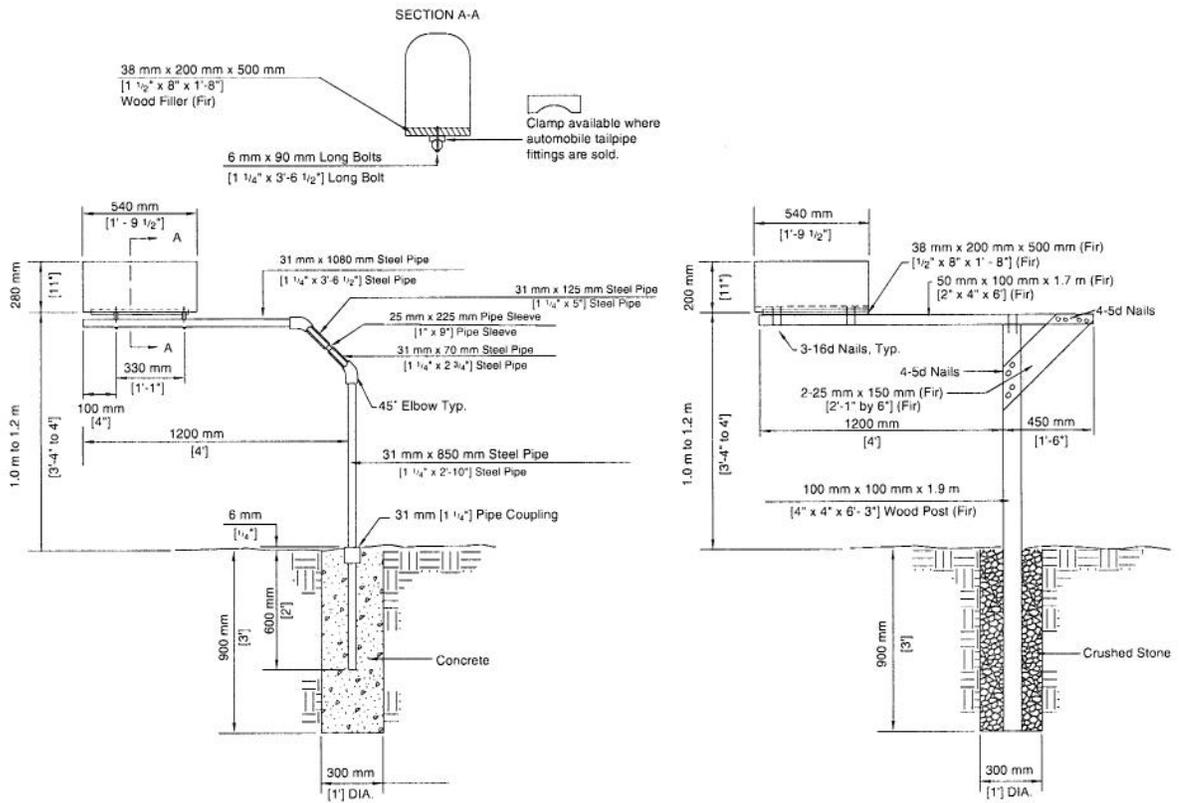
- Mailboxes shall be of light sheet metal or plastic construction conforming to the requirements of the U. S. Postal Service. Newspaper delivery boxes shall be of light metal or plastic construction of minimum dimensions suitable for holding a newspaper.
- No more than two mailboxes may be mounted on a support structure unless crash tests have shown the support structure and mailbox arrangement to be safe. However, light-weight newspaper boxes may be mounted below the mailbox on the side of the mailbox support.
- Mailbox supports shall not be set in concrete unless crash tests have shown the support design to be safe.
- A single 100-mm-by-100-mm [4-in.-by-4-in.] square or 100-mm [4-in.] diameter wooden post; or metal post, Schedule 40, 50 mm [2 in.] (normal size IPS (external diameter 60 mm [$2\frac{3}{8}$ in.]) (wall thickness 4 mm [0.154 in.] or smaller), embedded no more than 600 mm [24 in.] into the ground, shall be acceptable as a mailbox support. A metal post shall not be fitted with an anchor plate, but it may have an anti-twist device that extends no more than 254 mm [10 in.] below the ground surface.
- The post-to-box attachment details should be of sufficient strength to prevent the box from separating from the post top if the installation is struck by a vehicle. The exact support hardware dimension and design may vary, such as having a two-piece platform bracket or alternative slot-and-hole locations. The product must result in a satisfactory attachment of the mailbox to the post, and all components must fit together properly.
- The minimum spacing between the centers of support posts shall be the height of the posts above the ground line. Mailbox support designs not described in this regulation are acceptable if approved by the Chief Engineer of the Agency.
- Where snow plowing operations cause damage to fixed mailbox installations, the swing-away designs in Figures 11-15 and 11-16 may be used.

11.3.2.4 Shoulder and Parking Area Construction

It shall be the responsibility of the postal patron to inform the Agency of any new or existing mailbox installations where shoulder construction is inadequate to permit all-weather vehicular access to the mailbox.

11.3.2.5 Removal of Nonconforming or Unsafe Mailboxes

Any mailbox that is found to violate the intent of this regulation shall be removed by the postal patron upon notification by the Agency. At the discretion of the Agency, based on an assessment of hazard to the public, the patron shall be granted not less than 24 hours and no more than 30 days to remove an unacceptable mailbox. After the specified period has expired, the unacceptable mailbox will be removed by the Agency at the postal patron's expense.



Note: Mailbox support shall not be set in concrete unless crash tests have shown the support design to be safe.

Figure 11-15. Cantilever Mailbox Supports

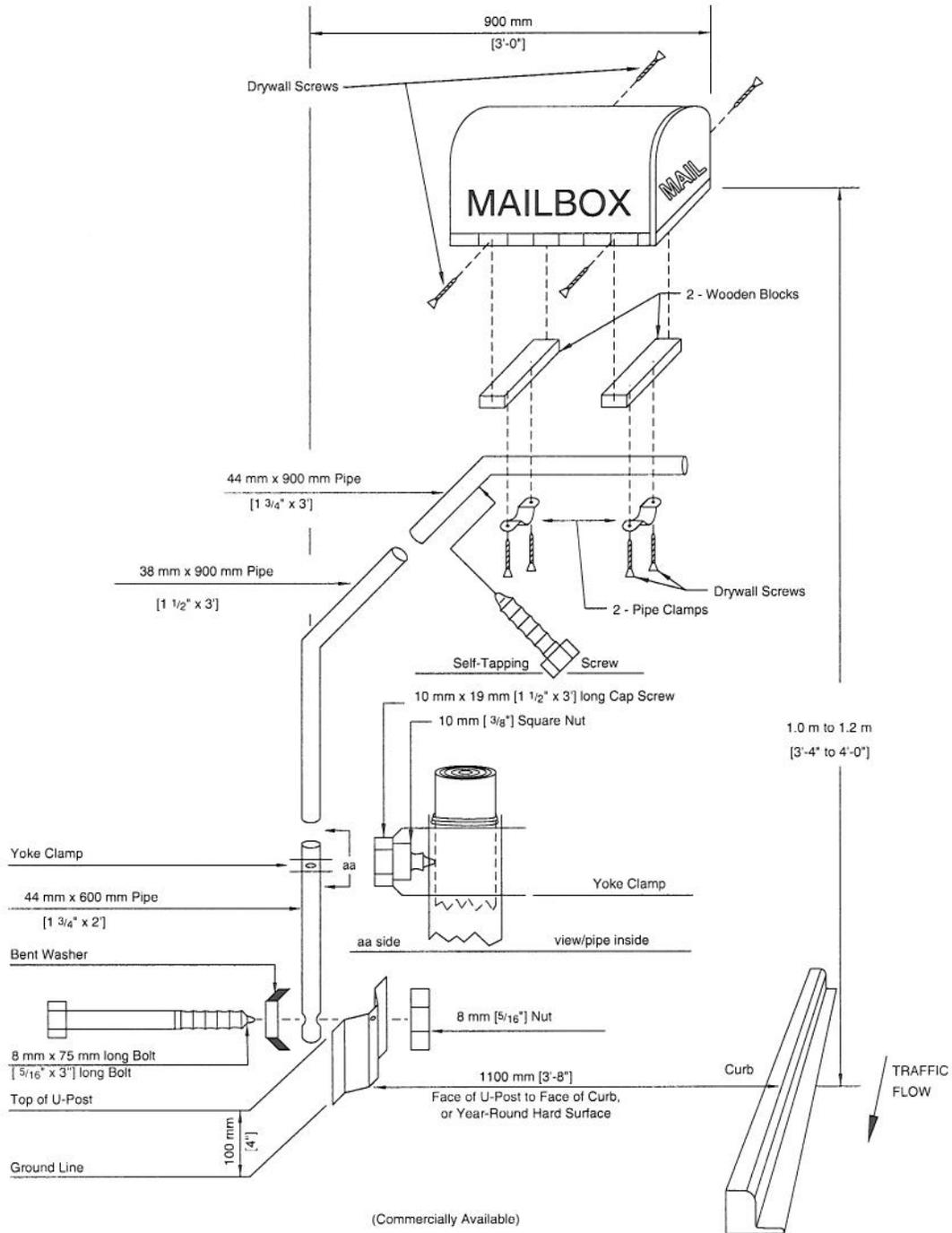


Figure 11-16. Breakaway Cantilever/Swing-Away Mailbox Support

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