References

California Test Method 114.................................................................H-1
California Test Method 342.................................................................H-5
Encroachment Permit Fees.................................................................H-17
Traffic Control System for Lane Closure
on Freeways and Expressways, T-9....................................................H-18
Traffic Control System for Lane Closure
on Freeways and Expressways, T-10....................................................H-19
Traffic Control System for Lane and Complete Closure
on Freeways and Expressways, T-10A..................................................H-20
Traffic Control System for Lane Closure on
Multilane Conventional Highways, T-11............................................H-21
Traffic Control System for Lane Closure on
Multilane Conventional Highways, T-12............................................H-22
Traffic Control System for Lane Closure on
Two Lane Conventional Highways, T-13............................................H-23
Traffic Control System for Ramp Closure, T-14...............................H-24
Uncased High Pressure Natural Gas
Pipelines Crossings (Exception to Policy)..........................................H-25
Controlled Low Strength Material.................................................H-28
AASHTO's "Roadside Design Guide" 3rd Edition, Chapter 11
"Erecting Mailboxes on Streets and Highways".................................H-30
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 ± .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 ± 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
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
HOLDING PLATE FOR SKID RESISTANCE STANDARD TEST SURFACES

NOTE: MATERIALS – 17 GAUGE, GALVANIZED METAL

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

FIGURE 2
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)
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.


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.

<table>
<thead>
<tr>
<th>Test Location</th>
<th>Test Measurement</th>
<th>Grade</th>
<th>Corrected Test Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0+00.0</td>
<td>0.37</td>
<td>+2</td>
<td>0.39</td>
</tr>
<tr>
<td>0+07.5</td>
<td>0.38</td>
<td>+1</td>
<td>0.39</td>
</tr>
<tr>
<td>0+15.0</td>
<td>0.40</td>
<td>+1</td>
<td>0.41</td>
</tr>
<tr>
<td>0+22.5</td>
<td>0.39</td>
<td>+1</td>
<td>0.40</td>
</tr>
<tr>
<td>0+30.0</td>
<td>0.41</td>
<td>+1</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Average Coefficient of Friction = \(
\frac{0.39 + 0.39 + 0.41 + 0.40 + 0.42}{5}
\) = 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)
FIGURE 1 - DIAGRAM OF SKID TESTER
FIGURE 2 - SIDE VIEW OF SKID TESTER

FIGURE 3 - CLOSE-UP VIEW OF SKID TESTER

<table>
<thead>
<tr>
<th>LETTER REFERENCE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TEST TIRE</td>
</tr>
<tr>
<td>B</td>
<td>CARRIAGE COLLAR</td>
</tr>
<tr>
<td>C</td>
<td>CARRIAGE GUIDERCLOSES</td>
</tr>
<tr>
<td>D</td>
<td>BEARING ASSEMBLY</td>
</tr>
<tr>
<td>E</td>
<td>END FRAME BARS</td>
</tr>
<tr>
<td>F</td>
<td>ADJUSTMENT KNOB</td>
</tr>
<tr>
<td>G</td>
<td>RELEASE ARM</td>
</tr>
<tr>
<td>H</td>
<td>MOTOR</td>
</tr>
<tr>
<td>I</td>
<td>POWER CABLES</td>
</tr>
<tr>
<td>J</td>
<td>STARTING SWITCH</td>
</tr>
<tr>
<td>K</td>
<td>TACHOMETER</td>
</tr>
<tr>
<td>L</td>
<td>CALIBRATED SPRINGS</td>
</tr>
<tr>
<td>M</td>
<td>TIRE CIRCUMFERENCE</td>
</tr>
<tr>
<td>N</td>
<td>GAGE</td>
</tr>
<tr>
<td>O</td>
<td>REAR SUPPORT ROD</td>
</tr>
<tr>
<td>P</td>
<td>SLIDING GAGE INDICATOR</td>
</tr>
</tbody>
</table>
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

MEASURED VALUE

CORRECTED VALUE

DOWN GRADE

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
# TRANSPORTATION LABORATORY
## REPORT OF SKID TESTS

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.

<table>
<thead>
<tr>
<th>TEST NO.</th>
<th>DATE PLACED</th>
<th>LOCATION</th>
<th>PERCENT GRADE</th>
<th>TEST MEASUREMENT</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>KILOMETER POST</td>
<td>LANE</td>
<td>POSITION</td>
<td>MEASURED</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

* The coefficient of friction value

FORM TL-3111 (Revised 8/95)

FIGURE 10 - REPORT FORM
APPENDIX

COEFFICIENT OF FRICTION VALUES FOR TYPICAL PORTLAND CEMENT CONCRETE SURFACES ILLUSTRATING A RANGE OF TEXTURES

0.15  0.23

0.33  0.41
COEFFICIENT OF FRICTION VALUES FOR VARIOUS ASPHALT CONCRETE SURFACES

- 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
### GENERAL
- **AD**: Advertising displays, marquees, arcades, awnings
- **AH**: Adopt-A-Highway
- **AP**: Transportation Art Program
- **AS**: Airpace Development
- **BR**: Banners, decorations
- **BS**: Bus shelters & benches
- **CC**: City/County issued permits
- **CD**: Commercial Development
- **CH**: Chain Installer
- **CS**: Curb/gutter/sidewalk
- **CU**: Coupon Racks & Newspaper vending machines at SRRAs
- **CP**: Contractor's yard and plant
- **MM**: Blue Star and Memorial Markers
- **MW**: Monitoring Wells
- **OA**: Visibility Improvement Request
- **OP**: Oversight Projects
- **RX**: Railroad Crossing
- **SC**: State Contract – Early entry
- **SI**: Signing
- **SV**: Land, archeological, traffic counts, research project, accident reconstruction, literature distribution
- **TN**: Tunneling (> 30 inches)
- **WL**: Wall

### DRAINAGE
- **DM**: Minor Drainage
- **DD**: Major Drainage

### FILMING
- **FI**: Filming in Facilities
- **FI**: Intermittent Traffic control
- **FL**: Traffic Control
- **FO**: No moving traffic
- **FR**: Film rider
- **FS**: Special

### GEO-PHYSICAL TESTING
- **GC**: Cable crossing
- **GV**: Seismic Vibrator

### LANDSCAPE
- **LC**: Conventional Highway
- **LF**: Freeway
- **LM**: Maintenance
- **LT**: Tree Trim/removal

### RIDER
- **RC**: Caltrans initiated rider
- **RT**: Time extension rider
- **RW**: Modify work rider

### ROAD APPROACH / DRIVEWAY
- **RC**: Commercial
- **RM**: Resurface; reconstruct, reissue
- **RP**: Public/Private
- **RS**: Single family/agricultural

### SPECIAL EVENT
- **SE**: Special Event

### SIGNALS / LIGHTING
- **SN**: Signal – new/modify
- **TK**: Traffic Control, signals, lighting

### ANNUAL / BL.
- **ANNUAL**

### UTILITIES
- **UB**: Utilities in or on a bridge
- **UM**: Bi/Annual Maintenance
- **UC**: Conventional Aerial
- **UE**: Bi/Annual utility & service
- **UF**: Freeway Aerial
- **UJ**: Transverse Bore & Jack
- **UK**: Underground Longitudinal Major
- **UL**: Underground Longitudinal Minor
- **UR**: State required relocation
- **US**: Service, pothole, modify
- **UT**: Open cut road

### 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)
### TABLE 1

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>MINIMUM TAPER LENGTH = FOR NORTHSIDE 12 FEET (m)</th>
<th>MAXIMUM CHANNELIZING DEVICE SPACING</th>
<th>TAPER</th>
<th>TANDEM</th>
<th>CONTINUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>160</td>
<td>80</td>
<td>40</td>
<td>21</td>
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</tr>
<tr>
<td>30</td>
<td>250</td>
<td>125</td>
<td>82</td>
<td>42</td>
<td>25</td>
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<tr>
<td>40</td>
<td>360</td>
<td>180</td>
<td>89</td>
<td>69</td>
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<tr>
<td>100</td>
<td>1440</td>
<td>720</td>
<td>370</td>
<td>215</td>
<td>100</td>
</tr>
</tbody>
</table>

**Notes:**
- For other offsets, use the following taper length formula for L:
  - For speed of 40 mph or less: \( L = \frac{S}{200} \)
  - For speed of 45 mph or more: \( L = \frac{S}{225} \)
- Where \( L \) = Taper length in feet
- \( S \) = Taper or offset in feet
- \( W \) = Width or offset in feet

### TABLE 2

<table>
<thead>
<tr>
<th>SPEED (mph)</th>
<th>MIN 6''</th>
<th>-3%</th>
<th>-6%</th>
<th>-9%</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>155</td>
<td>152</td>
<td>152</td>
<td>152</td>
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<tr>
<td>30</td>
<td>220</td>
<td>210</td>
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<td>40</td>
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<tr>
<td>90</td>
<td>505</td>
<td>505</td>
<td>505</td>
<td>505</td>
</tr>
</tbody>
</table>

**Notes:**
- 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
- Use on sustained downgrade slope of 1 percent or greater than 1 mile.

### TABLE 3

<table>
<thead>
<tr>
<th>ROAD TYPE</th>
<th>DISTANCE BETWEEN SIGNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>100 150 100</td>
</tr>
<tr>
<td>B</td>
<td>200 250 150</td>
</tr>
<tr>
<td>C</td>
<td>300 350 250</td>
</tr>
</tbody>
</table>

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

---

**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 2000
REVISED STANDARD PLAN RSP T9**
NOTES:

1. 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.

2. 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 12" x 12" in size and shall be orange or fluorescent red-orange in color. Flashing beacons shall be placed at the locations indicated for lane closure during hours of darkness.

3. A C20-2 "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.

4. If the W20-1 sign would follow within 2000' or a Stonyam W2-1 or G20-1 "ROAD WORK NEXT MILES" use a C20A2 sign for the first advance warning sign.

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

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

7. Flashing arrow signs shall be either Type I or Type E.

8. Advisory speed will be determined by the Engineer. The W1-5/IP plaque will not be required when advisory speed is more than the posted or maximum speed limit.

9. Unless otherwise specified in the special provisions, the tangent (L/2) shall be used.

10. 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.
Memorandum

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

From: DEPARTMENT OF TRANSPORTATION
      DIRECTOR'S OFFICE

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

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

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

Attachment
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.

<table>
<thead>
<tr>
<th>Kind of Thoroughfare</th>
<th>Class Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Privately owned roads</td>
<td>0.72</td>
</tr>
<tr>
<td>Unimproved public roads</td>
<td>0.60</td>
</tr>
<tr>
<td>Hard surfaced roads, highways</td>
<td>0.60</td>
</tr>
<tr>
<td>public streets, and railroads</td>
<td></td>
</tr>
</tbody>
</table>

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 Cl 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 replaces the 1994 AASHTO publication *A Guide for Erecting Mailboxes on Highways* and deals with mailboxes and mailbox turnout design. 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 since most record systems do not specifically isolate these types of crashes. However, the data that are available suggest that as many as 70 to 100 people die annually in the United States when colliding with improperly designed mailboxes and their supports. While this number is low, 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 the mailbox 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.

11.1 MAILBOXES

The typical single mailbox installation, shown in Figure 11.1, consists of a light, sheet-metal box mounted on a 100 mm x 100 mm [4 in. x 4 in.] wooden post or a 38 mm [1 1/2 in.] diameter light gage pipe and is not a serious threat to motorists. Improvements to strengthen typical post-to-box mounting details, as 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, as

![Figure 11.1 Typical single mailbox installations](image-url)
shown in Figure 11.2, sometimes turn a single mailbox installation into a roadside obstacle that should be eliminated.

The typical grouped or multiple mailbox installation, shown in Figure 11.3, is also a serious hazard to the motorist who strikes it. This installation consists of two or more posts supporting a horizontal member, usually a timber plank, which supports the group of mailboxes. The horizontal members in these installations are posed at wind shield height and when struck have impaled or decapitated motorists. For safe alternative designs for 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 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.

Only by banishing mailboxes from our highways can mailbox-related traffic accidents be eliminated. However, while elimination 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 are also 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 (see Appendix D) and are presented in the interest of providing the highest degree of safety practicable for the motoring public, mail carriers, and postal
patrons. 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 such as legal institutions and practices, population densities, topography, highway characteristics, snowfall, prevailing vehicle characteristics, etc., are factors to consider in 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 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 document and include the following:

- a reference to pertinent statutes
- 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 one 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

11.2.2 Mail Stop and Mailbox Location

Mailboxes should be placed for maximum convenience to the patron, consistent with safety considerations for highway traffic, the carrier, and the patron. Consideration should be given to: (1) minimum walking distance within the roadway for the patron, (2) available stopping sight distance in advance of the mailbox site, and (3) possible restrictions to corner sight distance 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. Boxes should be placed only on the right-hand side of the highway in the direction of travel of the carrier. An exception is one-way streets where they 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 high-speed and/or 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 the frontage roads. It is undesirable to locate a mailbox that would require a patron to cross the lanes of an expressway to deposit or retrieve mail. Where the U.S. Postal Service deems that service is not warranted on both frontage roads, or where there is a frontage road 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.

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, extent 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 is given the right-of-way and the other is controlled, a vehicle at a mail stop on the through roadway approach may restrict the view from a vehicle entering the intersection from the right to through traffic behind the mail stop. A mail stop on the through road on the far side of the crossroad increases the chance the crossroad driver will pull into the path of the vehicle on the through road that is 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 suggested minimum clearance distance to nearest mailbox in mail stops at intersections. Using the mail stop location dimensions in the figure will minimize the effect a stop will have on an intersection’s operation and minimize the hazard to persons using the mail stop.

Mailbox heights are usually set to accommodate the mail carrier. Typically, the bottom of the mailbox is located 1.0 m to 1.2 m [39 in. to 47 in.] above the mail stop surface.

Mailboxes should be located so that a vehicle stopped at a mailbox 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 will 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 2.8 m [9 ft] minimum shoulder is acceptable, a minimum 3 m [10 ft] turn out 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 the all-weather surface for opening the mailbox door, it is recommended that the roadside face of a mailbox be set 200 mm to 300 mm [8 in. to 12 in.] outside the all-weather surface of the shoulder or turnout. Suggested guidelines for the placement of mailboxes are shown in Table 11.1. These 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.

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. Where 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-place soils. A mailbox turnout for grouped mailboxes may require greater stabilization or possibly a surface treatment course to accommodate multiple patron use. Special measures may also be needed where highway traffic conditions encourage hard braking or high acceleration of vehicles in a mailbox turnout.

Drivers are usually 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 expen-
FIGURE 11.4 Suggested minimum clearance distance to nearest mailbox in mail stops at intersections

$V_C$ = Average Daily Traffic on Cross Road
(vehicles per day)

$V_m$ = Average Daily Traffic on Through Road
(vehicles per day)

$n$ = Number of Mailboxes at Mail Stop
TABLE 11.1 Suggested guidelines for lateral placement of mailboxes

<table>
<thead>
<tr>
<th>Highway Type and ADT, (vpd)</th>
<th>Width of All-Weather Surface, Turnout or Available Shoulder at Mailbox, (^1) (m) [ft]</th>
<th>Distance Roadside Face of Mailbox Is to Be Offset Behind Edge of Turnout or Usable Shoulder, (mm) [in.]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Preferred</td>
<td>Minimum</td>
</tr>
<tr>
<td>Rural Highway Over 10,000</td>
<td>&gt; 3.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Rural Highway 1,500 to 10,000</td>
<td>3.6</td>
<td>2.4</td>
</tr>
<tr>
<td>Rural Highway 400 to 1,500</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Rural Road Under 400</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Residential Street Without Curb or All-Weather Shoulder</td>
<td>1.8</td>
<td>0.00</td>
</tr>
<tr>
<td>Curbed Residential Street</td>
<td>Not Applicable</td>
<td></td>
</tr>
</tbody>
</table>

ADT = Average Daily Traffic  
vpd = vehicles per day

\(^1\) If there is a need to provide for increased access, the following may be considered in conjunction with the local Postmaster:

a. Provide a level clear floor space 0.75 m x 1.2 m [30 in. x 48 in.] centered on the box for either side or forward approach.

b. Provide an accessible passage to and from the mailbox and projection into a circulation route (no more than 100 mm [4 in.] if between 0.7 m [28 in.] and 2.0 m [80 in.] AFP) so that the mailbox does not become a protruding object for pedestrians with impaired vision.

\(^2\) Strive for a 1.8 m [6 ft] minimum; however, in some situations this may not be practical. In those cases, provide as much as possible.

\(^3\) If a turnout is provided, this may reduce to zero.

\(^4\) Behind traffic-face of curb.
sive to provide shoulders or turnouts that would allow a speed change outside the traveled way. Figure 11.5 shows 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 is also shown in Figure 11.5. The typical driver would probably slow considerably before starting into the low-speed turnout. This tendency makes it 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 would probably not slow as much before clearing the traveled way. While this is not an ideal exit maneuver, it would probably 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. While this is still not ideal, it should be quite acceptable for most sites. The exception may be found on highways operating at high speeds and carrying over 3,000 to 4,000 vehicles per day and with a high percentage of vehicles on long trips. For these conditions, consideration should be given to providing shoulders or turnouts at unavoidable mail stops that will provide for greater speed change opportunity 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 may also be simpler to construct a continuous turnout-width shoulder rather than individual turnouts where mailbox turnouts are closely spaced.

11.2.4 Mailbox Support and Attachment Design

All exposed mailboxes should be firmly attached to supports that yield or break away safely if struck by a vehicle. The NCHRP Report 350 contains performance criteria for mailbox supports when subjected to crash testing with an automobile. The criteria can be summarized as follows:

- Mailbox supports should, with a minor qualification, be no more substantial than required to resist service loads and to reasonably minimize vandalism. Nominal 100 mm x 100 mm [4 in. x 4 in.] or 100 mm [4 in.] diameter wood posts or 38 mm to 50 mm [1.5 in. to 2 in.] diameter standard steel or aluminum pipe posts, embedded no more than 600 mm [24 in.] into the ground, should be the maximum strength supports considered. Lower strength supports, such as lightweight 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 250 mm [10 in.] below the ground surface is acceptable. The minor qualification to the criterion of minimizing post strength is for the support to break rather than to bend under impact, and for the support to have sufficient strength to accelerate the box to a speed approaching that of the impacting vehicle so the chances of the box penetrating the vehicle’s windshield are minimized. Test results indicate 100 mm x 100 mm [4 in. x 4 in.] or 100 mm [4 in.] diameter wood supports should be both minimum and maximum post dimensions.

- Mailbox to post attachments should prevent mailboxes from separating from their supports under vehicle impacts. The lighter the mailbox, the easier it will be to meet this criterion or, conversely, given sufficient post attachment strength, the less sensitive the safety of an installation will be to the mass of the mailbox. Figures 11.6 through 11.10 show acceptable attachment and support details. 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.

- 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, 11.9, and 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 when crash tested with a small car at high speed impacting off-center of a row of eight closely spaced mailboxes individually supported with 3 kg/m [2 lb/ft] channel post supports. Review of a film from this test and results from other tests suggest that the reason for this performance was a ramping caused by the closely spaced mailboxes piling up. To avoid this problem, it is recommended the mailbox supports be separated a distance at least equal to three-
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
FIGURE 11.6 Mailbox support hardware, Series A

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 11.8 Mailbox support hardware, Series B

NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE INDICATED.
ALL DIMENSIONS IN BRACKETS ARE IN U.S. CUSTOMARY UNITS.
FIGURE 11.9 Single and double mailbox assemblies, Series B

NOTE: ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE INDICATED. ALL DIMENSIONS IN BRACKETS ARE IN U.S. CUSTOMARY UNITS.
FIGURE 11.10 Single and double mailbox assemblies, Series C

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

NOTE: SUPPORT FRAME AND FOUNDATION ARE PROPRIETARY PRODUCTS COMMERCIALLY AVAILABLE.
fourths of their heights and preferably their full heights above ground. It is also preferred that multiple mailbox installations be located outside the highway clear zone, such as on a service road or a minor intersecting road.

- The Neighborhood Delivery and Collection Box Unit (NDCBU) is a specialized type of multiple mailbox installation, as 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 between 45 kg and 90 kg [100 lb and 200 lb]. While 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 [60 mph] showed that it failed to meet safety requirements. 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 (state, county, township, municipal, etc.) prior to installation. This communication will help to ensure the safe location of the NDCBU.

In areas of high snowfall, some highway agencies have found cantilever mailbox supports advantageous. While such designs do permit windshield contact with the box without the vehicle first contacting the support, tests of the design shown in Figures 11.12 and 11.13 did not reveal serious consequences. The operational advantage of these supports is that snow can be plowed close to the mailbox without the snow window 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. This type of a mailbox support is designed to swing back out of the way when a snowplow truck goes by. (See Figure 11.14.)

Lightweight newspaper boxes may be mounted below the mailbox on the mailbox support.

Recently, mailboxes of heavy gage steel or other substantial materials have been designed and sold as deterrents to vandalism. These massive boxes, over 5 kg [11 lb], meet U.S. Postal Service requirements for minimum size, material durability, ease of access, etc., and are quite resistant to deformation. However, these boxes are potentially hazardous to occupants of errant vehicles regardless of the support used. They should be restricted to use only along low-speed, low-volume streets in residential areas.

11.3 MODEL MAILBOX REGULATION

A generic model regulation for mailboxes and newspaper delivery boxes on public highway rights-of-way is provided in Appendix E. The model is intended only as an example. States and municipalities can and should tailor the model to fit their own particular needs.
FIGURE 11.12 Cantilever mailbox supports
FIGURE 11.13 Breakaway cantilever mailbox supports
FIGURE 11.14 Minnesota swing-away mailbox