



### C. PRECAUTIONS

Brackets shall not be permitted to bottom out against the top of mounting bosses when the bolts are tightened. Brackets which have bottomed out may show an erroneously small amount of permanent set. Bracket contact with the tops of the bosses may prevent adequate clamping forces on the mast arm stub from being developed.

### D. REPORTING OF RESULTS

Report test results on Form TL-6052 (see Figure 1).

## PART II: METHOD USED FOR EVALUATING THE FATIGUE DURABILITY OF LUMINAIRES.

### A. APPARATUS

1. Any vibrating fatigue testing machine capable of cycling luminaires with constant acceleration of up to 3.0 g's peak-to-peak (or 1.5 g's peak) in the vertical direction, and be able to keep the vibration frequency under resonant frequency of the test fixture and luminaire.
2. A suitable test fixture with a 50.8-mm pipe tenon (60.3 mm outside diameter) to be used for attaching luminaires to the vibrating machine.
3. Accelerometer.
4. Oscillograph.
5. Counter to determine the number of cycles.
6. Torque wrench.
7. Scale capable of weighing up to 25 kg with an accuracy of  $\pm$  one hundredth of a kg.

### B. CALIBRATION OF APPARATUS

To calibrate the accelerometer, the following steps should be taken:

1. Place the accelerometer on a flat surface and adjust the signal conditioner to obtain a suitable zero point on the oscillograph.
2. Turn the accelerometer over, 180° for 2 g's, and adjust the gain of the signal conditioner so that the oscillograph shows a deflection of 50.8 mm which equals 1 g. per inch.

### C. PREPARATION OF TEST SPECIMENS

1. Obtain the required number of luminaires.
2. Install an approved lamp currently used by Caltrans in each luminaire.
3. Weigh each luminaire head (in kilograms); call this "W".
4. Determine the center of gravity and mark the position on each luminaire on each luminaire head.

### D. TEST PROCEDURES

1. Horizontal Cyclic Loading Test (critical for ground-mounted luminaires).
  - a. Position the slipfitter bracket on the luminaire housing to accept a 50.8-mm pipe tenon.
  - b. Slide the luminaire onto the 50.8-mm diameter pipe tenon of the test fixture. Make sure the luminaire contains an internal ballast. Orient the luminaire head so that the cyclic testing will simulate movement in the horizontal plane perpendicular to the direction of the mast arms. Tighten the slipfitter bolts according to the manufacturer's recommended installment procedure.
  - c. Determine the center of gravity of the luminaire, position the counter

weigh, and attach the accelerometer at the luminaire's center of gravity.

counterweight  
(millimeters).

- d. Turn on the vibration testing machine and adjust the vibrating frequency and displacement until 1.5-g peak-to-peak (or 0.75-g peak) acceleration is obtained.

W = the weight of the luminaire head (kilogram).

- e. Cycle the luminaire until 2 million cycles are reached or failure of a critical part occurs, whichever comes first. If a critical part fails, record the maximum number of cycles attained and note the type of failure.

L = distance between the luminaire's center of gravity and the center of the test fixture (millimeters).

B = the weight of the counterweight (kilograms).

2. Vertical Cyclic Loading Test (critical for Bridge-Mounted Luminaires).

- a. Position the slipfitter bracket on the luminaire housing to accept a 50.8-mm diameter pipe tenon.

- f. Adjust the position of the counterweight.

- b. Remove the internal ballast from the luminaire housing.

- g. Attach the calibrated accelerometer at the luminaire's center of gravity.

- c. Slide the luminaire onto the 50.8-mm pipe tenon of the test fixture and orient the luminaire head so that the lens faces the floor. Tighten the slipfitter bolts according to manufacturer's recommended procedure.

- h. Turn on the testing machine, adjust the vibrating frequency and displacement until 3.0 g's peak-to-peak (or 1.5 g's peak) acceleration is obtained. Be sure the frequency is kept under the resonant frequency of the test fixture and luminaire.

- d. Measure the distance between the luminaire's center of gravity and the center of the test fixture (in millimeters); call this "L".

- i. Cycle the luminaire until 2 million cycles are reached or failure of a critical part occurs, whichever comes first. If a critical part fails, record the maximum number of cycles attained and note the type of failure.

- e. Determine the distance from the center of the test fixture to the center of the counter weigh (see Figure 3) using the following equation:

$$d = \frac{W * L}{B}$$

Where:

d = distance between the center of the fixture and the center of the

## E. REPORTING OF RESULTS

Report test results from horizontal cyclic loading (perpendicular to the direction of the mast arm) on Form TL-6053 (see Figure 3). Report test results from vertical cyclic loading on Form TL-6054 (see Figure 4).

If the slipfitter clamping bracket or bolts fail in either test, note the type of failure in the Remarks column of this form. Also note any other parts of the luminaire which have failed or show signs of failure in the Remarks column.

**F. SAFETY AND HEALTH**

Prior to handling, testing or disposing of any materials, testers are required to read Caltrans Laboratory Safety Manual-Part A, Section 5.0, Hazards and Employee Exposure; Part B, Sections: 5.0, Safe Laboratory Practices; 6.0, Chemical Procurement Distribution and Storage; and 10.0, Personal Protective Apparel and Equipment; and Part C, Section 1.0; Safe Laboratory Practices.

**G. APPENDIX**

Figure 1. Required form for recording permanent set of slipfitter bracket(s).

Figure 2. Copy of photograph of test fixture for cyclic loading luminaire.

Figure 3. Positioning of counterweight on fatigue test fixture to balance system.

Figure 4. Test data sheet for cyclic loading of luminaire - Horizontal direction.

**End of Test (California Test 611 contains 8 pages)**

TRANSPORTATION LABORATORY  
TEST DATA SHEET FOR RECORDING PERMANENT  
SET OF SLIPFITTER BRACKET(S)

MANUFACTURER \_\_\_\_\_

LUMINAIRE MODEL NUMBER \_\_\_\_\_

SIZE AND NUMBER OF MOUNTING BOLTS \_\_\_\_\_

CLAMPING BOLT TORQUE  
(EACH) NEWTON \_\_\_\_\_

DATE TESTED \_\_\_\_\_

THICKNESS / GAGE OF STEEL  
IN CLAMPING BRACKET(S) \_\_\_\_\_

ROCKWELL HARDNESS OF BRACKET(S) \_\_\_\_\_

POINT ON BRACKET	INITIAL MEASUREMENT (mm)	FINAL MEASUREMENT (mm)	PERMANENT SET (mm)	REMARKS

NOTE: Include picture/profile of clamping bracket(s).

TL-6052 (Original 3/89)

Figure 1  
Required form for recording permanent set of slipfitter bracket(s).

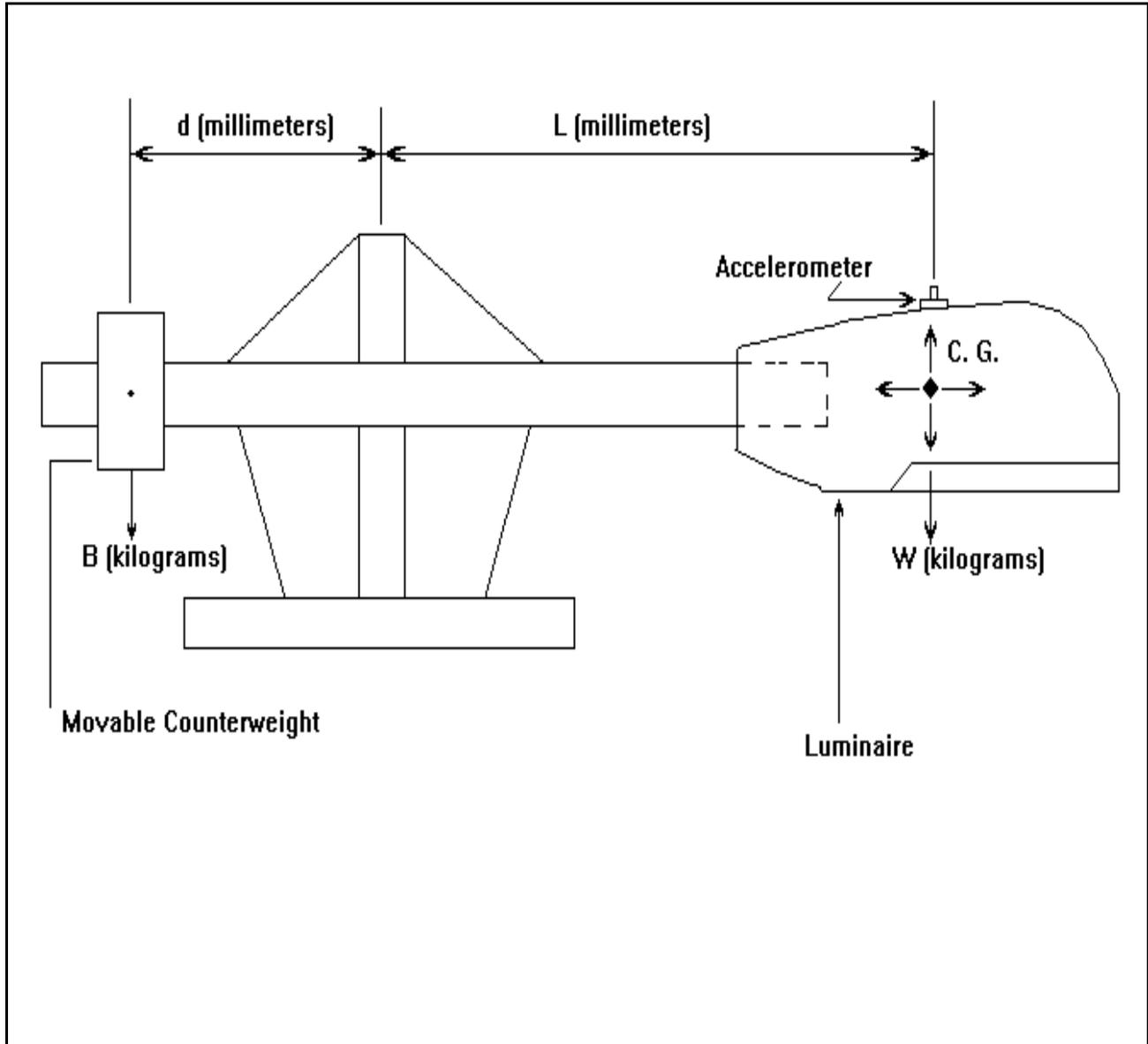


Figure 2  
Positioning of counterweight on fatigue test  
fixture to balance system

**TRANSPORTATION LABORATORY**  
**TEST DATA SHEET FOR CYCLIC LOADING OF LUMINAIRE - HORIZONTAL**  
**DIRECTION**

MANUFACTURER \_\_\_\_\_

LUMINAIRE MODEL NO. \_\_\_\_\_

DATE TESTED \_\_\_\_\_

Drawing of Specimen

TEST NO.	TORQUE ON SLIPFITTER BRACKET BOLTS (N)	TEST ACCELERATION g's (Pk-to-Pk)	TEST FREQUENCY (HZ)	NO. OF CYCLES TESTED	DISPLACEMENT OF C. G. OF LUMINAIRE TEST TABLE (millimeters)	REMARKS

Figure 3

**TRANSPORTATION LABORATORY**  
**TEST DATA SHEET FOR CYCLIC LOADING OF LUMINAIRE - VERTICAL DIRECTION**

MANUFACTURER \_\_\_\_\_

LUMINAIRE MODEL NO. \_\_\_\_\_

DATE TESTED \_\_\_\_\_

Drawing of Specimen

TEST NO.	TORQUE ON SLIPFITTER BRACKET BOLTS (N)	TEST ACCELERATION g's (Pk-to-Pk)	TEST FREQUENCY (HZ)	NO. OF CYCLES TESTED	DISPLACEMENT OF C. G. OF LUMINAIRE TEST TABLE (millimeters)	REMARKS

Figure 4