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DIVISION OF ENGINEERING SERVICES
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METHOD OF TEST FOR THE LUMINOUS INTENSITY OF TRAFFIC SIGNAL SECTIONS

A. SCOPE

This test method describes the procedure to obtain the distribution pattern and the measurement of luminous intensities of traffic signal sections in accordance with the distribution pattern set forth in the FHWA Report RD-77-93 "Recommendations, Tables 25 and 26".

B. REFERENCES

FHWA Report RD–77-93

C. APPARATUS

1. Spectra Scan Photometer, Model PR650.
2. ND2 Filter, x100 Neutral Density Filter.
3. Laptop Personal Computer with Microsoft Windows, Crosstalk and Excel Software.
4. RS232 Cable (75 ft length).
5. Goniometer.
6. Electronic Measurements, DC Power Supply (Model SCR 150-10-DV).
7. Fluke Digital Multimeter (Model 8060A).
8. Fluke 10 AMP. 100 mV shunt (Model 80J-10).
9. 665 Lumen standard lamp (NBS traceable).
10. 1950 Lumen standard lamp (NBS traceable).
11. 642 Candela standard lamp (NBS traceable).
12. Photometric tunnel (100 ft length).

D. TEST PROCEDURE

1. Setup for the traffic signal intensity distribution pattern measurement.

   a. Alignment of Goniometer.

      (1) Place the telescope on the goniometer table using the fixed locating pin to mate with the telescope base and clamp it into position. (Note: A laser may be used in place of the telescope for alignment.)

(2) Level the goniometer table by adjusting the control knob (marked "HORIZONTAL" on the control console) and by observing the carpenter level on the table.

(3) Raise or lower table so the height of centerline of the telescope lens from the floor is 5 ft. The motor switches for the height adjustment are on the side of the goniometer.

(4) Sight through the telescope to the photometer port hole (1.375 in.-diameter) located 50 ft at the opposite end of the light tunnel. Make sure the photometer is in the "PHOTOHEAD POSITION" 0°, as indicated on the control console.

(5) When the telescope is aligned with the photometer port hole, the control knobs for the goniometer (marked HORIZONTAL and VERTICAL) should be adjusted to the 0-0° H.V. position.

b. Mounting of a signal section on the goniometer table.

(1) Remove the hood from the section.

(2) Insert application working standard lamp: 665-Lumen lamp for the 8 in. section; 1950 Lumen lamp for the 12 in. section.

(3) After the lamp is inserted into its socket, rotate both socket and lamp together until the open end of the lamp filament is in the upward or "U" configuration.

(4) With straight edge, square, and marking tool, locate the depth of the filament and make a "mark" on the top of the signal section.

(5) Install the signal section on the goniometer table using scale and square to align the "mark" on the signal section with the centerline cross mark on the table.

(6) Locate center of signal section lens using square, raising or lowering table to exact height, and matching cross marks on the goniometer table for centerline alignment.

(7) Anchor signal section to the table (using care not to misalign) with a larger "C" clamp and a block of wood which will rest on the top of the signal section. When clamping, some method of restricting a sliding motion of the signal section should be used. A built up tape barrier could be used on the table at the rear of the signal section.

(8) Connect the DC power supply and ammeter to traffic signal section.

c. Measurement of luminous intensity (Candelas)

(1) Position the Spectra Scan PR-650 photometer, with ND2 filter, at a distance of 50 ft on the line of sight previously established and at the same height as the signal section light center.

(2) Connect RS232 Cable between PR650 and a laptop computer.

(3) Adjust the lamp current to standard current value to obtain appropriate lumen output of the lamp.

(4) Rotate the goniometerer and record candela/ ft^2 readings for the 44 test points at the 44 angles. Candela values are obtained by multiplying the candela/ ft^2 values by the square of the distance (50 ft). Results are compared to the specified values in FHWA Report RD-77-93. Repeat for all signal sections.

E. CALIBRATION

1. Place candela standard lamp (GE Airway Beacon – Type: 500W, 120VAC NBS Traceable) on goniometer and orient the lamp so that the plane containing the two filament supports is perpendicular to the axis of the PR650 photometer. The small circle on the lamp is positioned away from the photometer. The distance between standard lamp and photometer is 50 ft (height 5 ft).

2. Attach DC power supply and ammeter to candela standard lamp.

3. Adjust lamp current to obtain required candela level for the selected candela standard lamp.

4. Three NBS filters are placed (one at a time) in front of the PR650 Photometer lens and the readings (M_s) with each filter are recorded.

NBS Filters.	T-Factor
Red 4-1-9	0.197
Yellow 7-1-3	0.653
Green 1-1-3	0.269

5. Calculate the correction factor (K) per Section F.

F. CALCULATION

T = Transmittance factor NBS Filters

M_s = PR-650 reading of candela/ft^2 lamp standard through red, yellow and green NBS filters

K = Correction factor

Cd = Candelas

$$K = \frac{(Cd)(T)}{Ms}$$

G. REPORTING OF RESULTS

Report the candela values for the 44 test points at each of the 44 angles.

H. DEFINITIONS:

The following definitions must apply to all California Test Methods that relate to Traffic Signal Heads.

A SIGNAL SECTION is a single light unit consisting of a housing, reflector, lamp receptacle, lamp, lens, door and visor.

A SIGNAL FACE is an arrangement of signal sections, which controls one or more traffic movements in a single direction.

A SINGLE HEAD is an assembly of one or more signal faces.

A STANDARD SIGNAL FACE is composed of all 8 in. or 12 in. sections.

A COMBINATION SIGNAL FACE is composed of all 8 in. or 12 in. sections.

A SIGNAL LENS is that part of the optical unit which redirects the light coming directly from the light source and its reflector.

I. HEALTH AND SAFETY

It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Prior to handling, testing or disposing of any materials, testers must be knowledgeable about safe laboratory practices, hazards and exposure, chemical procurement and storage, and personal protective apparel and equipment.

Caltrans Laboratory Safety Manual is available at:

http://www.dot.ca.gov/hq/esc/ctms/pdf/lab_safety_manual.pdf

End of Text
(California Test 604 contains 4 pages)