

AIRPORT BEACON L-801A
PHOTOMETRIC TEST



**TESTING AND RESEARCH DIVISION
RESEARCH LABORATORY SECTION**

AIRPORT BEACON L-801A
PHOTOMETRIC TEST

Research Laboratory Section
Testing and Research Division
Research Project 81 TI-726
Research Report No. R-1177

Michigan Transportation Commission
Hannes Meyers, Jr., Chairman; Carl V. Pellonpaa,
Vice-Chairman; Weston E. Vivian, Rodger D. Young,
Lawrence C. Patrick, Jr., William C. Marshall
John P. Woodford, Director
Lansing, August 1981

Airport beacon lamps were tested for intensity and intensity distribution. A method for estimating the effective intensity of rotating beacons was applied. Results indicate that the lamps have intensity deficiencies but they can provide acceptable effective intensities. With reference to W. E. Gehman's December 29, 1980 memo, two lamps were submitted by R. E. Addy on June 10, 1981. The lamps were identified as shown below.

Lamp Identification

Manufacturer:	General Electric
Type:	Q 1000 PAR 64/NSP
Lamp No.:	M-81 and M-84

Each lamp was mounted on a Type A goniometer with the center of the lamp face on the optical axis. The lamps were operated as shown below.

Lamp Test Operation

Lamp No.	Volts	Amp.
M-81	120	8.0
M-84	120	7.8

Intensity measurements were made with a Pacific Instrument's photometer fitted with an IP 22 multiplier phototube which was corrected to the human eye response. The measurements are based on a standard lamp intensity which is traceable to the National Bureau of Standards intensity standard. The test distance was 100 ft.

Measurements were made traversing the horizontal axis with the lamp at a 0° vertical angle. Measurements were also made along the vertical axis with the lamp at a 0° horizontal angle. These horizontal and vertical distributions are shown in the attached figures.

The vertical distribution for both lamps show that the maximum peak intensity occurs at the horizontal axis and at the lamp center.

Effective intensity was calculated according to a method reported by Wohlers and Leupp (1). The method assumes a Gaussian form of distribution and relies on transforming angular width of the intensity beam into time units that are related to the rotational speed of the beacon. This method allowed a trial and error calculation of an intensity maximum that is also the effective intensity. A graphical method reported in the "IES Guide for Calculating the Effective Intensity of Flashing Signal Lights" (2) was not

as sensitive as the direct calculation. Both methods are based on the same assumptions.

Horizontal distributions of maximum intensities were used to calculate the effective intensity and flash duration of each lamp. A constant 12 rpm rotational speed was assumed. Effective intensities and flash durations at those intensities are listed below.

Lamp	Effective Intensity, candela	Flash Duration, seconds
M-81 (white color)	64,600	0.269
M-84 (white color)	62,500	0.272

It should be noted that an additional transmission factor correction for a white cover glass on the beacon would lower the above effective intensity values approximately 10 percent.

The specification for L-801 beacons states that "with the light beam center set at 5 degrees above the horizontal" the minimum effective intensity of the white flash must be 50,000 candelas for an elevation angle between 2 and 8 degrees (3).

The lamps can provide the specified effective intensities, however, they do not provide the 250,000 candela peak intensity shown by the manufacturer's photometric data and do not provide the 180,000 to 200,000 candela central cone intensity claimed by the industry.

REFERENCES

1. Wohlers, M. R. and Leupp, H. A., "Effective Intensity of Certain Types of Rotating Beacons," Illuminating Engineering, July 1959, pp. 412-414.
2. Illuminating Engineering Society, Guide for Calculating the Effective Intensity of Flashing Signal Lights, Illuminating Engineering, November 1964, pp. 747-753.
3. Federal Aviation Administration, Specification for L-801 Beacons, Advisory Circular 150/5345-12B, September 8, 1977.

LAMP ID.: General Electric
No. M-81

LAMP OPERATION:
120 V, 8.0A
positioned on
optical axis

0—0 horizontal trace on axis
0--0 vertical trace on axis

DATE: 6-11-81

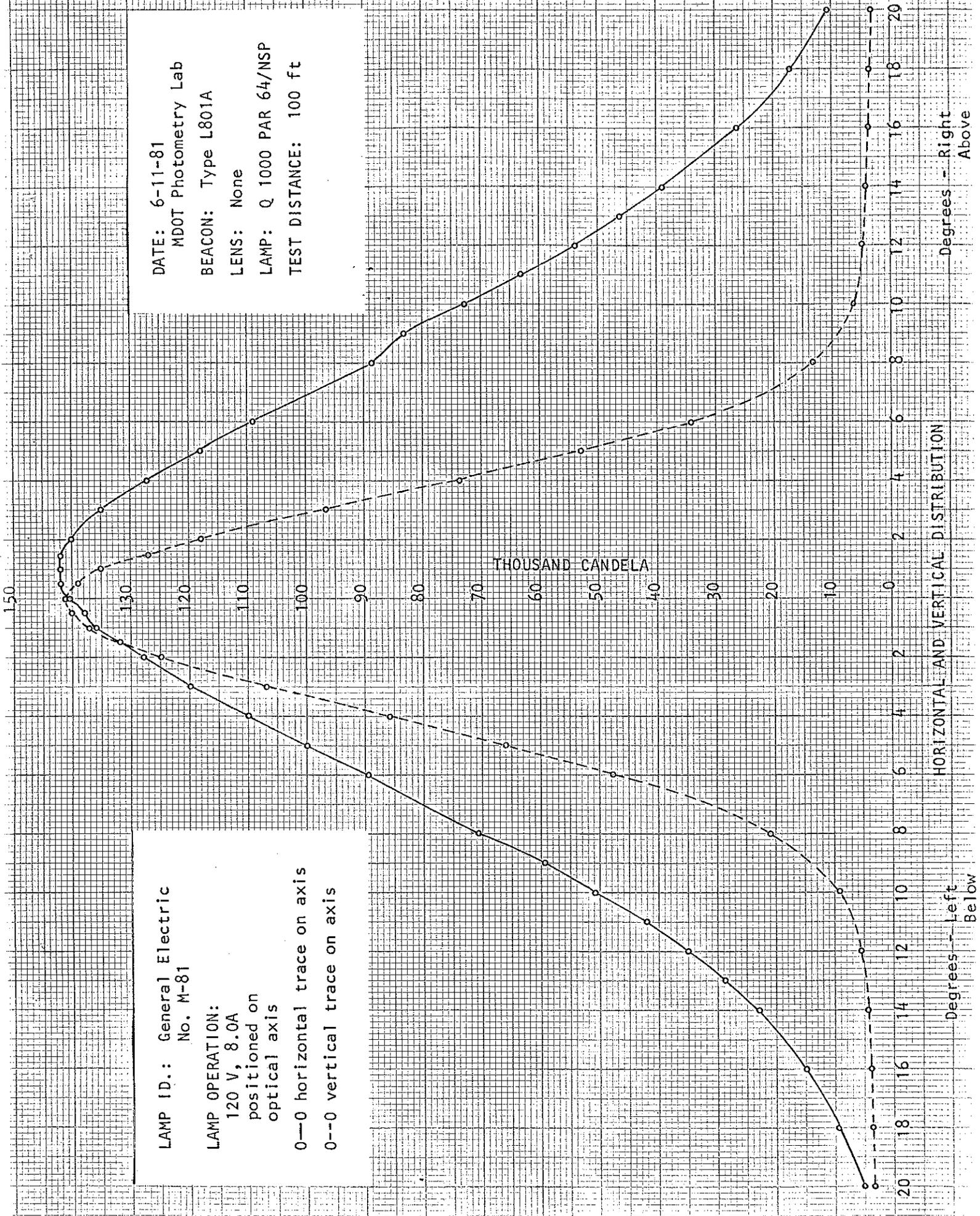
MDOT Photometry Lab

BEACON: Type L801A

LENS: None

LAMP: Q 1000 PAR 64/NSP

TEST DISTANCE: 100 ft

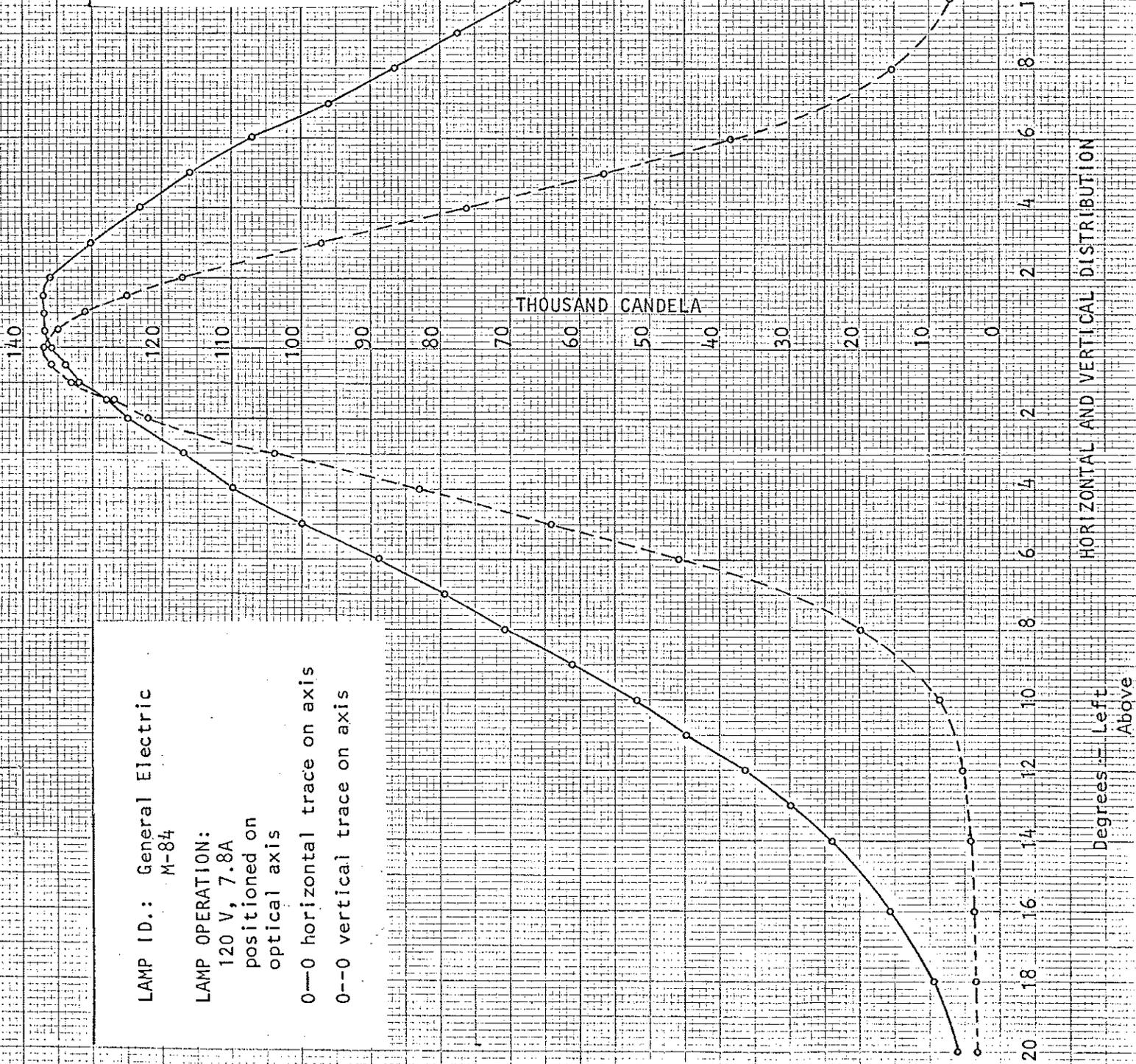


DATE: 6-12-81
 MDOT Photometry Lab
 BEACON: Type L801A
 LENS: None
 LAMP: Q 1000 PAR 64/NSP
 TEST DISTANCE: 100 ft

LAMP ID.: General Electric
 M-84

LAMP OPERATION:
 120 V, 7.8A
 positioned on
 optical axis

0---0 horizontal trace on axis
 0--0 vertical trace on axis



HORIZONTAL AND VERTICAL DISTRIBUTION

Degrees - Left Above

Degrees - Right Above