

	SURFACE VEHICLE RECOMMENDED PRACTICE	
	SAE	J595 NOV2008
	Issued Revised	1948-12 2008-11
Superseding J595 JAN2005		
Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles		

RATIONALE

- Added SAE J387, SAE J845 and SAE J1330 to Related Publications.
- Minor change to 3.2 Light Source text to match SAE J845.
- Clarified class rating of non-repetitive signals in the Lighting Identification Code section.
- Changed stability language in the photometry test section to match the language in SAE J845.
- Changed 6.2 Photometry text to match SAE J845.
- Deleted previous photometry tables and inserted new photometry figures 1-W, 2-W, 3-W, 1-Y, 2-Y, 3-Y, 1-R/B, 2-R/B, and 3-R/B.
- The zone totals have been "corrected" to be equal to the sum of the test points within the respective zone. This is an approximate 11% increase in the required zone totals.

1. SCOPE

This document provides design guidelines, test procedure references, and performance requirements for directional, single color, flashing optical warning devices used on authorized emergency, maintenance and service vehicles. It is intended to apply to, but not limited to, surface land vehicles.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise specified, the latest issue of the publication shall apply.

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2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J575	Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less than 2032 mm in Overall Width
SAE J576	Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices
SAE J578	Color Specification
SAE J759	Lighting Identification Code
SAE J1889	L.E.D. Signal and Marking Lighting Devices

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J387	Terminology—Motor Vehicle Lighting
SAE J845	Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles
SAE J1330	Photometry Laboratory Accuracy Guidelines
SAE J1690	Flashers
SAE J2498	Minimum Performance of the Warning Light System Used on Emergency Vehicles

3. DEFINITIONS

3.1 Directional Flashing Optical Warning Device

A flashing optical warning device, in which the light source produces flashes of light, which is directionally aimed and will project a signal over a minimum area from 20° right to 20° left in a horizontal plane and from 10° up to 10° down in a vertical plane. The flashes of light may be a repetitive signal or a non-repetitive signal. If a non-repetitive signal is used it shall be a block of repetitive signals that have been characterized.

3.2 Light Source

Any single, independently mounted, light emitting component in the lighting system. A light source may consist of a single optical element or a fixed array of any number of optical elements whose geometric positioning relative to each other is fixed by the manufacturer of the light source and not intended to be modified. To be considered a single source the elements must be adjacent, and operate simultaneously in all modes, if the mode of the device is vehicle operator adjustable.

3.3 Optical Element

Any discrete light emitter such as, but not limited to, an incandescent filament, HID or individual light emitting diode.

3.4 Primary Optical Warning Device

A device or group of devices that are intended to provide the primary visual optical warning signal as called out in each service class. Unless prohibited by law or regulation, a Class 1 device may be used in place of Class 2 device and a Class 1 or 2 device in place of Class 3 device.

3.5 Secondary Optical Warning Device

A device or group of devices of lower performance that can be used to provide supplemental optical warning to that provided by the primary optical warning device or devices.

3.6 Class 1 Optical Warning Device

A primary optical warning device for use on authorized emergency vehicles responding to emergency situations. These devices are utilized to capture the attention of motorists and pedestrians and warn of a potentially hazardous activity or situation.

3.7 Class 2 Optical Warning Device

A primary optical warning device for use on authorized maintenance or service vehicles to warn of traffic hazards such as a lane blockage or a slow moving vehicle.

3.8 Class 3 Optical Warning Device

A primary optical warning device for use on vehicles authorized to display an optical warning device for identification only.

3.9 Light Pulse

A single, visually continuous emission of optical energy. High frequency modulation is permitted.

3.10 Flash

A flash is a light pulse or a train of light pulses, where a dark interval of at least 160 ms separates the light pulse or the last pulse of the train of light pulses from the next pulse or the first pulse of the next train of light pulses. To be considered a train of light pulses, each pulse in the train must begin within 100 ms after the end of the preceding light pulse. Dark interval luminous intensity shall not exceed 2% of the maximum luminous intensity of a flash.

3.11 Optical Power

The integration of the luminous intensity of the flashing light source for a time of 60 seconds (1ldt). Units are Candela·Seconds/Minute.

4. LIGHTING IDENTIFICATION CODE, MARKINGS, AND NOTICES

4.1 In accordance with SAE J759, the optical warning device may be identified by the codes:

"W-1", Class 1
"W-2", Class 2
"W-3", Class 3

A device may only have one class rating if it is vehicle operator adjustable. The rating shall be based on the mode with the lowest performance level. If the signal is non-repetitive then the class rating shall be the lowest performance rating of the block of signals used.

5. TESTS

All tests are to be made at 12.8 V dc $\pm$ 0.1 V for 12 V systems, 25.6 V dc $\pm$ 0.2 V for 24 V systems, and 38.4 V $\pm$ 0.3 V for 36 V systems. Tests are to be made using the wiring supplied by the device manufacturer or wire of the minimum size recommended by the device manufacturer. For devices intended to be hard wired into the vehicle electrical system, the voltage shall be measured at 300 mm from the point at which the wiring exits the device. For portable devices equipped with an electrical connector, the voltage shall be measured at the supply side of the connector.

SAE J575 is a part of this report. The following tests are applicable with the modifications as indicated.

5.1 Vibration Test

5.2 Moisture Test

5.3 Dust Test

The change in intensity may be measured at test point H-V.

5.4 Corrosion Test

5.5 Warpage Test for Plastic Component

The device shall be operated in the mode with the highest optical power.

5.6 Photometry

In addition to the test procedures in SAE J575, the photometric performance shall be determined by measuring optical power and through direct measurement or calculation, the peak intensity of each flash. Photometry shall be performed with the light source flashing.

5.6.1 All light sources shall operate until the photometric output is stable prior to testing as defined in SAE J1889.

5.6.2 Photometric measurements shall be made with the device mounted in its normal operating position and all measurements shall be made with the light source of the device at least 18 meters from the photometer sensor. The device shall be tested for the class, type and pattern as defined in Figures 1-W, 2-W, 3-W, 1-Y, 2-Y, 3-Y, 1-R/B, 2-R/B, and 3-R/B.

The device shall be mounted so that the horizontal plane through the photometer axis passes through the center of the light source. The vertical axis through the center of the light source shall be perpendicular to this horizontal plane. If the light source is composed of an array of optical elements, the geometric center of the array shall be used.

5.6.3 An integrating photometer shall be used to determine the optical power projected over 60 seconds. Any measurement period not less than 20 seconds may be used. These measurements shall then be corrected to obtain the optical power in units of Cd-Sec/min. If the flasher or power supply/flasher has more than one flash pattern, the optical power shall be measured and recorded for each pattern.

5.7 Flash Rate

Any device, incorporating an integral flasher, an external flasher or a combined power supply and flasher supplied by the manufacturer of the device, shall be tested with this flasher.

5.7.1 If a flasher is required and no flasher is supplied by the manufacturer of the device, the device shall be tested using a flasher having a flash rate of 1.20 Hz $\pm$ 0.14 Hz with a 50% $\pm$ 2% current on time.

5.7.2 The characteristics, including peak intensities, flash rate, period, number of pulses per flash, on times (electrical), off times (electrical) and pulse separations, shall be measured and recorded. If the flasher or power supply/flasher has more than one flash pattern, the characteristics shall be measured and recorded for each pattern.

5.8 Color Test

SAE J578 is a part of this report. The device shall meet color requirements in each mode and at all times. Incandescent devices may be measured while in a steady-state mode at design voltage.

5.9 Additional Tests

5.9.1 High Temperature Flash Rate Test

The device shall be subjected to an ambient temperature of $50^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for a period of 6 hours. The device shall be off (not operating) during the first hour and shall operate continuously for the next 5 hours of the test. The flash rate shall be measured starting 1 minute after the device is activated and at the conclusion of the test. If the device has multiple flash patterns then the pattern with the highest optical power shall be used. The start time shall be measured at time of activation.

5.9.2 Low Temperature Flash Rate Test

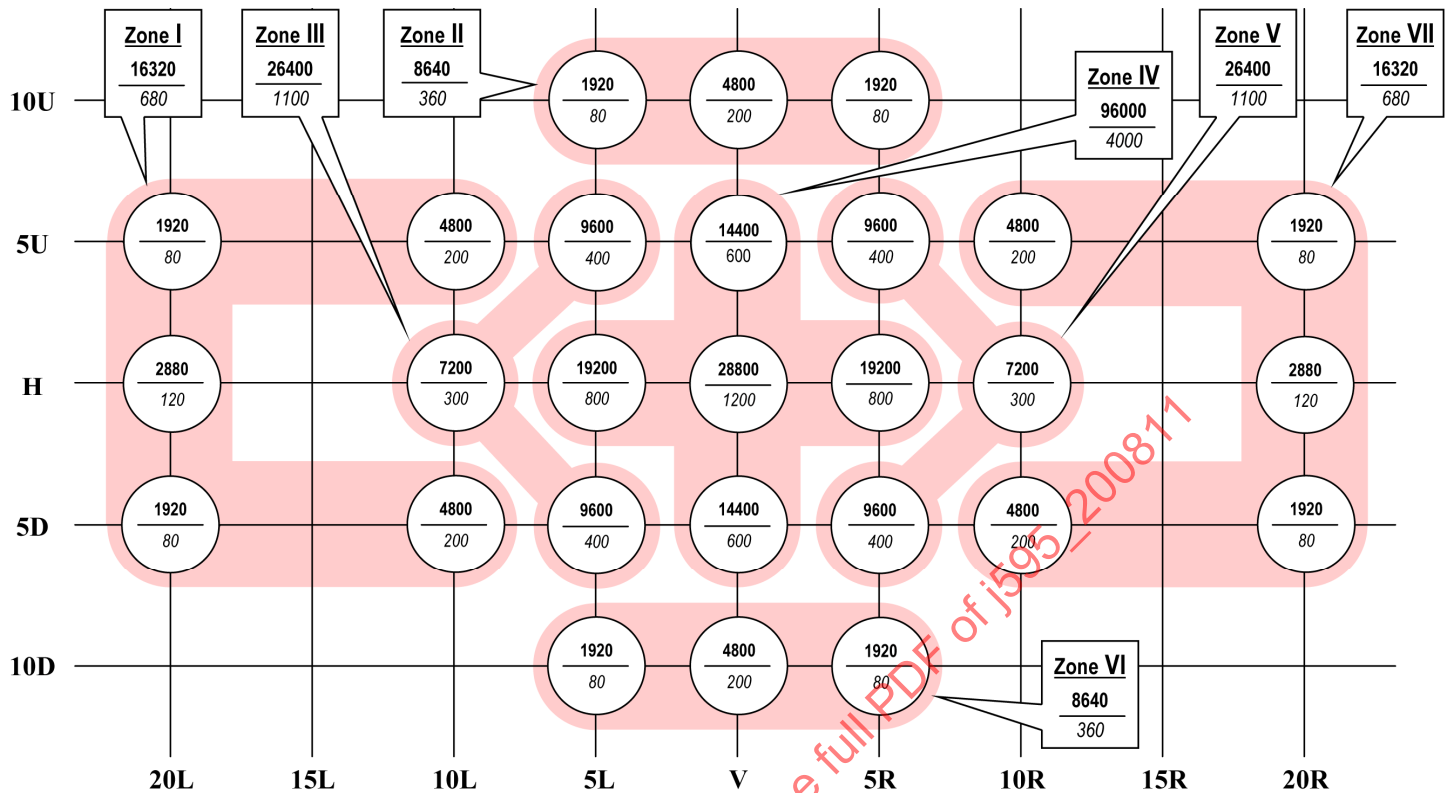
The device shall be subjected to an ambient temperature of $-30^{\circ}\text{C} \pm 3^{\circ}\text{C}$ for a period of 6 hours. The device shall be off (not operating) during the first 5 hours and shall operate continuously for the last hour of the test. The flash rate shall be measured starting 1 minute after the device is activated and at the conclusion of the test. If the device has multiple flash patterns then the pattern with the lowest optical power shall be used. The start time shall be measured at time of activation.

5.9.3 Durability Flash Rate Test

The device shall be operated continuously for 200 hours at an ambient temperature of $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$ in cycles consisting of 50 minutes on and 10 minutes off. The flash rate shall be measured starting 1 minute after the device is activated and at the conclusion of the test. If the device has multiple flash patterns then the pattern with the highest optical power shall be used.

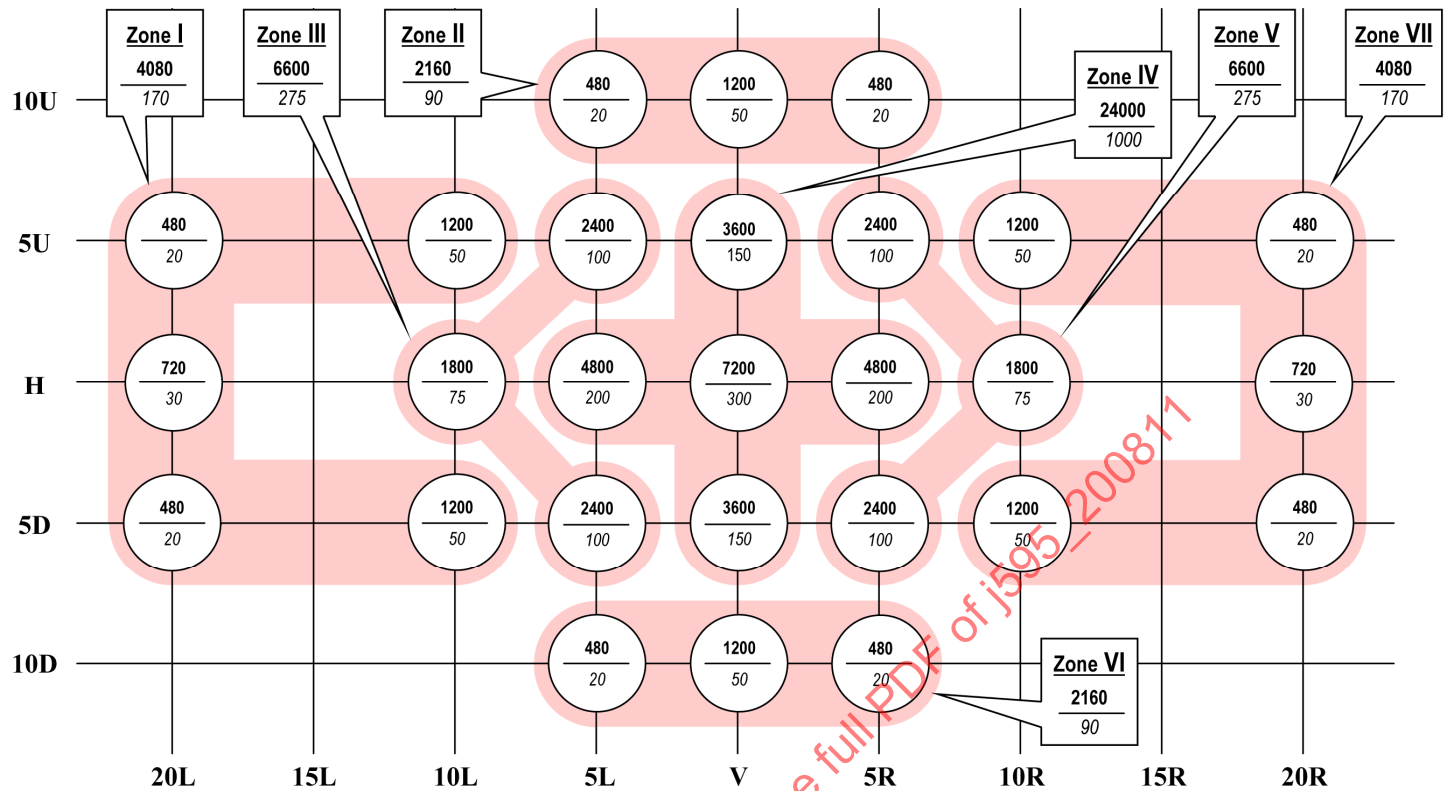
5.10 Materials Test

SAE J576 is a part of this report.



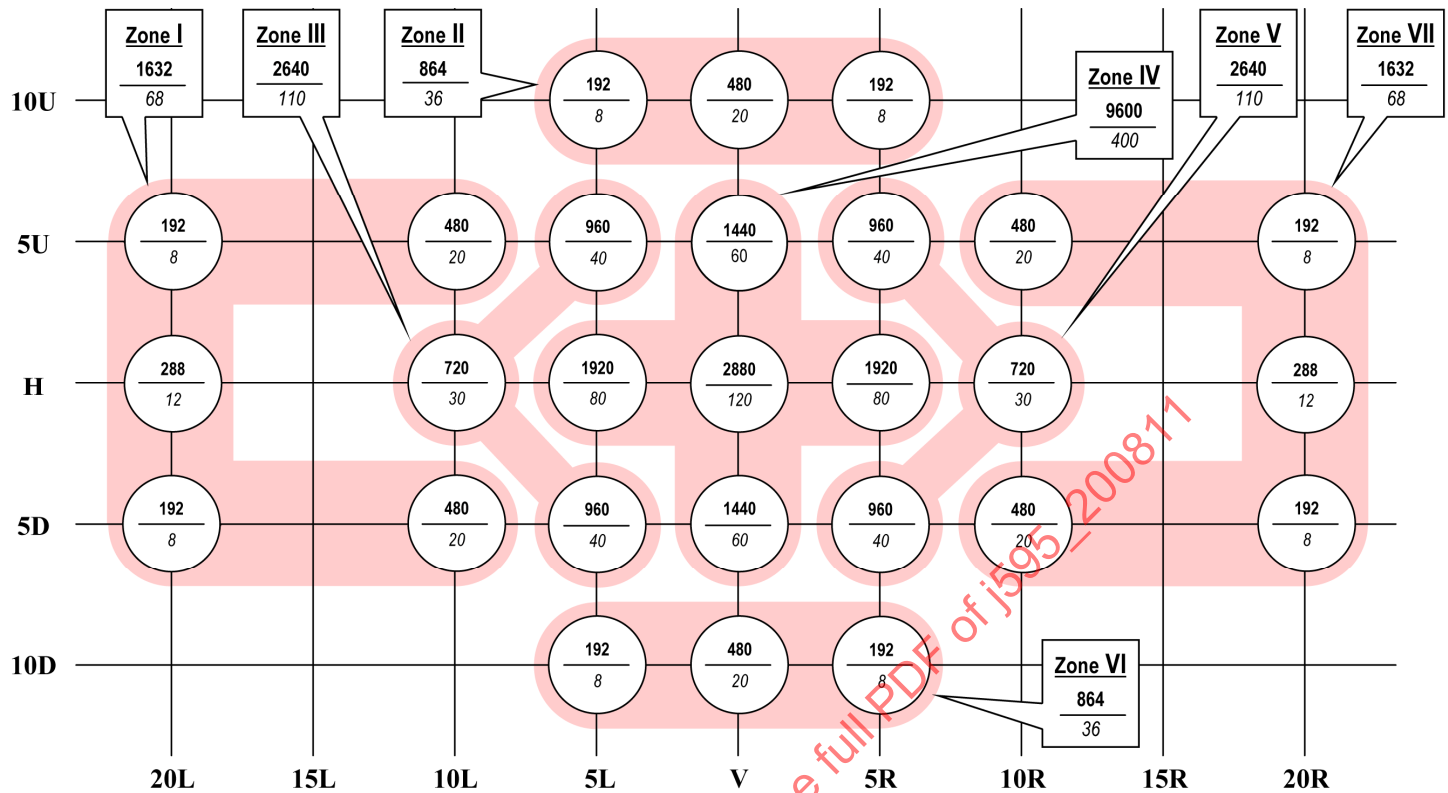
1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 1-W - PHOTOMETRIC REQUIREMENTS CLASS 1-WHITE
 Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



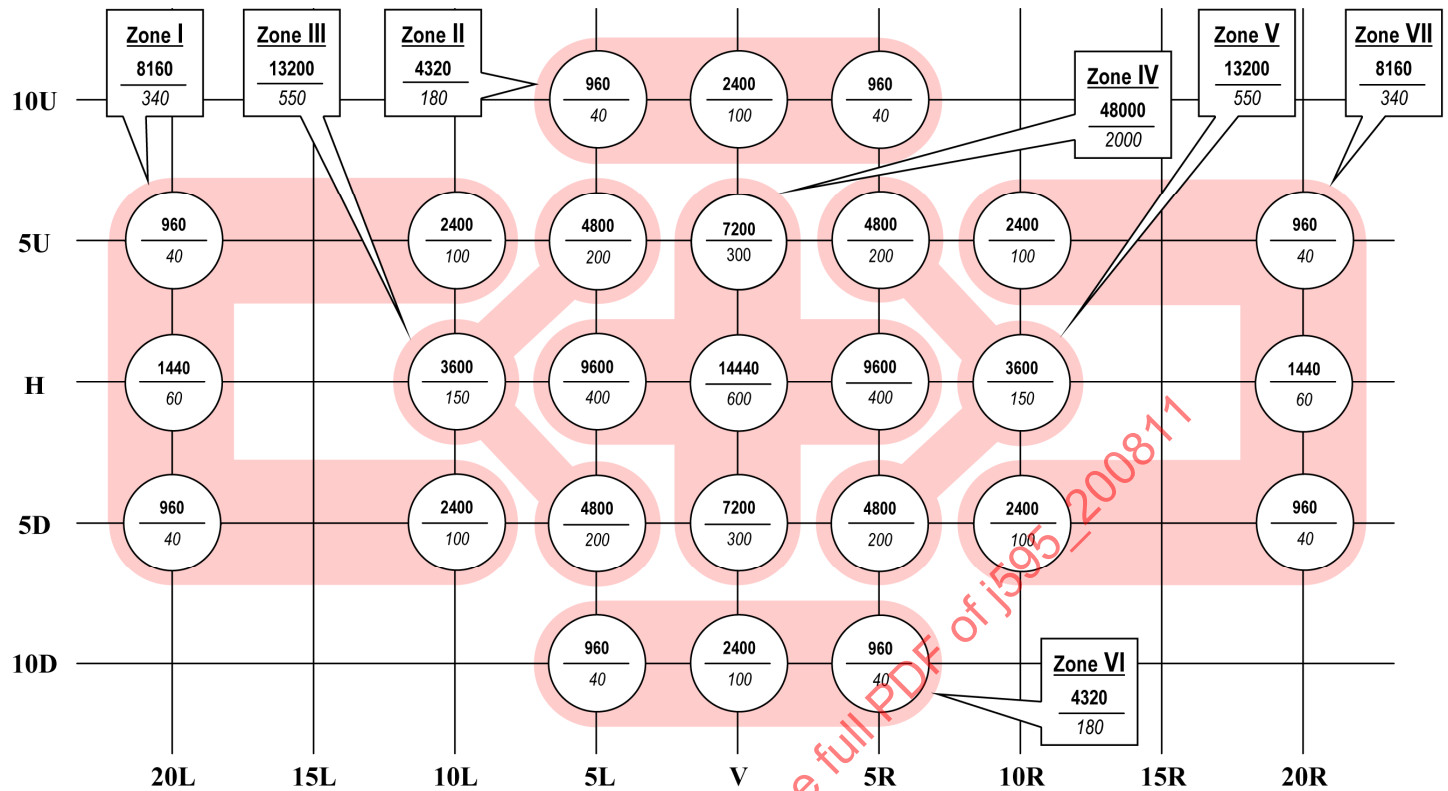
1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 2-W - PHOTOMETRIC REQUIREMENTS CLASS 2-WHITE
 Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

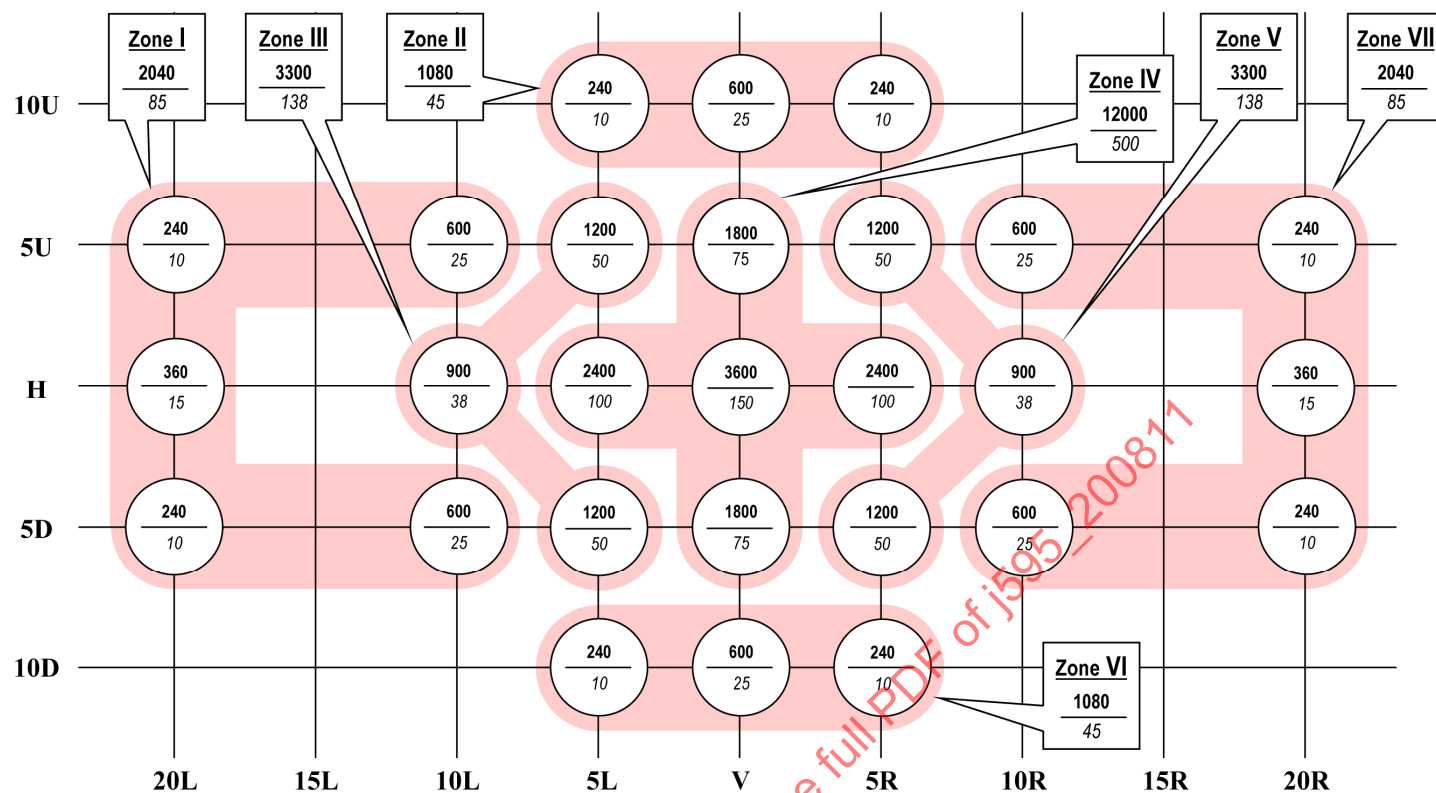
FIGURE 3-W - PHOTOMETRIC REQUIREMENTS CLASS 3-WHITE
 Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 1-Y - PHOTOMETRIC REQUIREMENTS CLASS 1-YELLOW

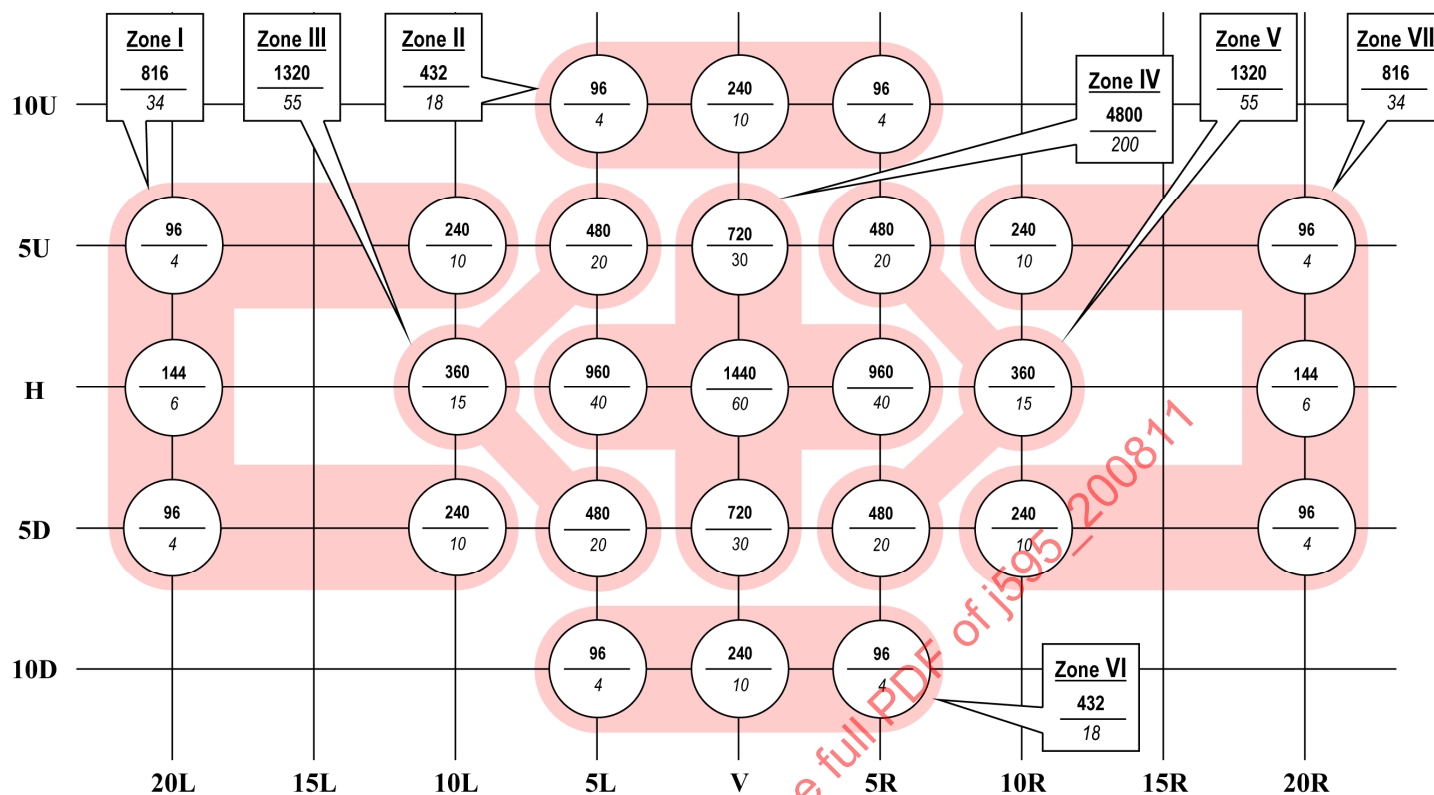
Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 2-Y - PHOTOMETRIC REQUIREMENTS CLASS 2-YELLOW

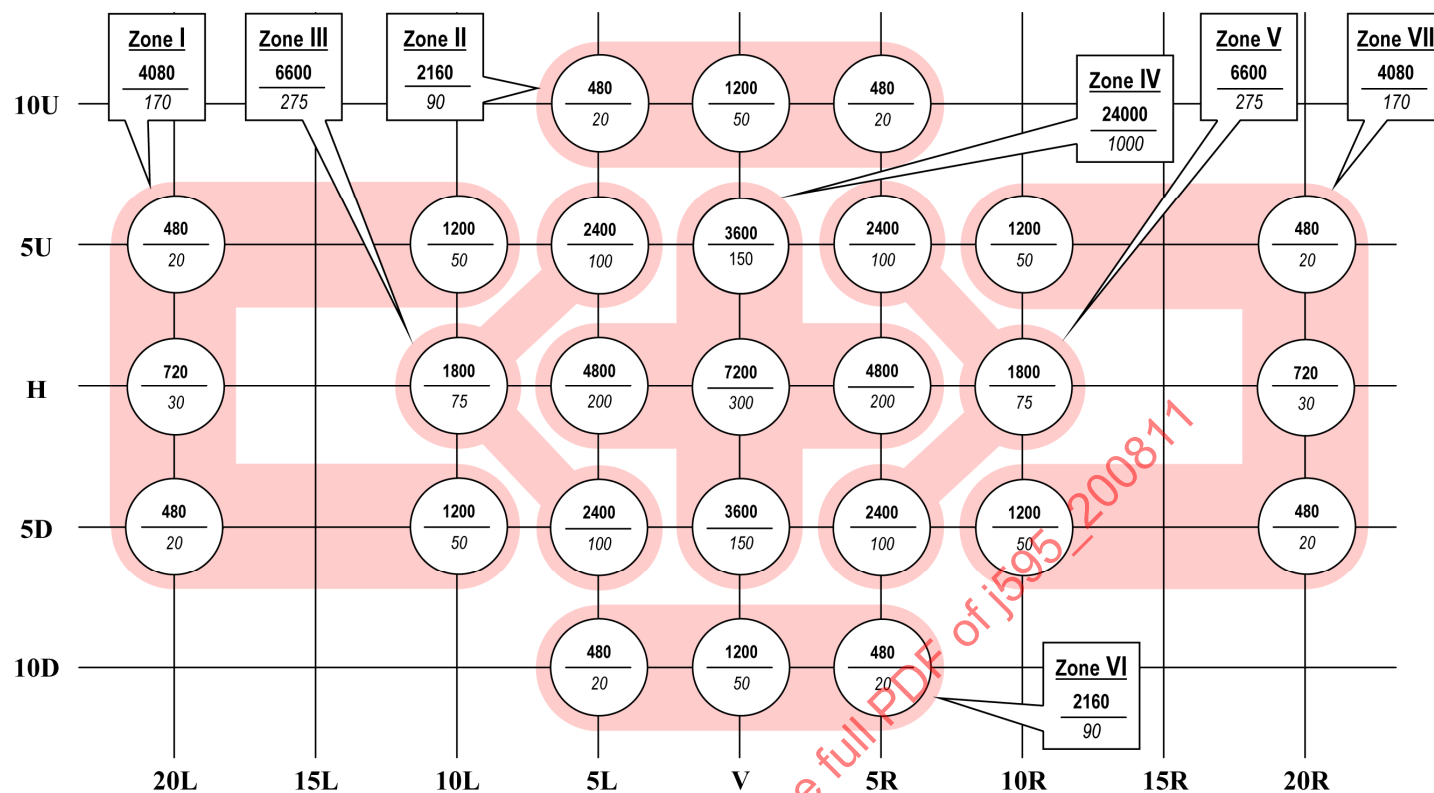
Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 3-Y - PHOTOMETRIC REQUIREMENTS CLASS 3-YELLOW

Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)



1. For each test point and zone total, the value shown in **bold** (top value) is the optical power requirement and the value shown in *italics* (bottom value) is the peak luminous intensity requirement.
2. The Measured values at each test point shall not be less than 60% of the required minimum values shown for that individual test point location.
3. The sum of the optical power measurements and the sum of the peak luminous intensity measurements for each test point within a zone, shall not be less than the corresponding zone total requirements shown. The measurements at each discrete test point shown within the corresponding zone are the values used to calculate the specified zone total.
4. An adjustment in device orientation from the design position may be made in determining compliance to the optical power and peak luminous intensity requirements, provided such adjustment does not exceed 1 degree in any direction. All zone totals must comply after reaim.

FIGURE 1-R/B - PHOTOMETRIC REQUIREMENTS CLASS 1-RED/BLUE
 Optical Power (Cd-seconds/Minute) Shown in **Bold** (top value)
 Peak Luminous Intensity (Candela) Shown in *Italics* (bottom value)