

Effective Projected Luminous Lens Area (EPLLA)

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FMVSS 108

From FMVSS 108 Definitions:

Effective light-emitting surface means that portion of a lamp that directs light to the photometric test pattern, and does not include transparent lenses, mounting hole bosses, reflex reflector area, beads or rims that may glow or produce small areas of increased intensity as a result of uncontrolled light from an area of ½° radius around a test point.

Effective projected luminous lens area (EPLLA) means the area of the orthogonal projection of the effective light-emitting surface of a lamp on a plane perpendicular to a defined direction relative to the axis of reference. Unless otherwise specified, the direction is coincident with the axis of reference.

From the Dictionary:

Orthogonal Projection: (Noun ENGINEERING) a system of making engineering drawings showing two or more views of an object at right angles to each other on a single drawing.

from FMVSS 108

Table IV-a.

Effective Projected Luminous Lens Area Requirements

Lighting device	Passenger cars, multipurpose passenger vehicles, trucks, trailers, and buses of less than 2032 mm in overall width Minimum effective projected luminous lens area (sq mm)			Multipurpose passenger vehicles, trucks, trailers and buses 2032 mm or more in overall width minimum effective projected luminous lens area each lamp (sq mm)		Motorcycles Minimum effective projected luminous lens area (sq mm)	
	Single compartment lamp	Multiple compartment lamp or multiple lamps				Multiple compartment lamp or multiple lamps	
		Each compartment or lamp	Combined compartments or lamps			Each compartment or lamp	Combined compartments or lamps
Front turn signal lamp	2200	—	2200	7500	2200	2258	
Rear turn signal lamp	5000	2200	5000	7500	2200	2258	
Stop lamp	5000	2200	5000	7500	2200	(1) 5000	

What is EPLLA for?

830638

History of Lighting Test Development

George E. Meese

In Cooperation with the SAE Lighting Committee

Glare considerations at various times in the past have also prompted consideration of minimum effective lens areas to keep intrinsic brightness within reason.

- This along with other evidence supports that Lit Area (EPLLA) was put in place in the early 1970s to control glare complaints
 - The theory being that diluting the lens luminance over a larger area to fulfill a lamp function will result in less perceived glare

How to measure EPLLA - SAE J2999™

- The SAE Lighting Group developed SAE J2999™ “Determination of Effective Projected Luminous Lens Area (EPLLA) by Design Analysis” in 2013
 - New technologies have enabled lamp configurations that were unimagined back in 1970 when EPLLA was defined (LEDs, LED control, optical designs, etc.)
 - Aggressive interpretations for how EPLLA was applied to new designs were creating concerns from the industry and from NHTSA / Transport Canada
 - With this, a former NHTSA individual began SAE discussions to better define EPLLA
 - A SAE task force was created to develop a SAE Recommended Practice
 - SAE published SAE J2999™ in 2013 to guide how EPLLA is determined
 - SAE J2999™ is determined similarly to light emitting surface in R48
 - During the development of J2999™, there was very little disagreement between automakers for what elements should and should not be counted towards lit area
 - The SAE J2999™ method enables manufacturers to accurately predict EPLLA prior to production tooling – low luminance simulations of lamp designs are not accurate
 - Industry is concerned about the ability to predict a design’s measured luminance

SURFACE VEHICLE RECOMMENDED PRACTICE

J2999™

JUN2017

Issued 2013-03
Revised 2017-06

Superseding J2999 MAR2013

Determination of the Effective Projected Luminous Lens Area (EPLLA)
by Design Analysis

3.4 LIGHT SOURCE ELEMENT

Any portion of a light source (including its optical envelope) that generates light.

3.5 REFLECTIVE ELEMENT

Any surface designed to specularly reflect incoming light from a light source element, reflective element, or refractive element towards the lamp function's test pattern. The surface shall be molded, coated, or similar construction from materials which are typical for reflecting light.

3.6 REFRACTIVE ELEMENT

Any portion of a lens surface with optical structures designed to specularly refract incoming light from a light source element, reflective element, or refractive element towards the lamp function's test pattern.

3.7 DIFFUSION ELEMENT

Any surface or material with light scattering features which randomly reflects or refracts light from a light source element, reflective element, or refractive element.

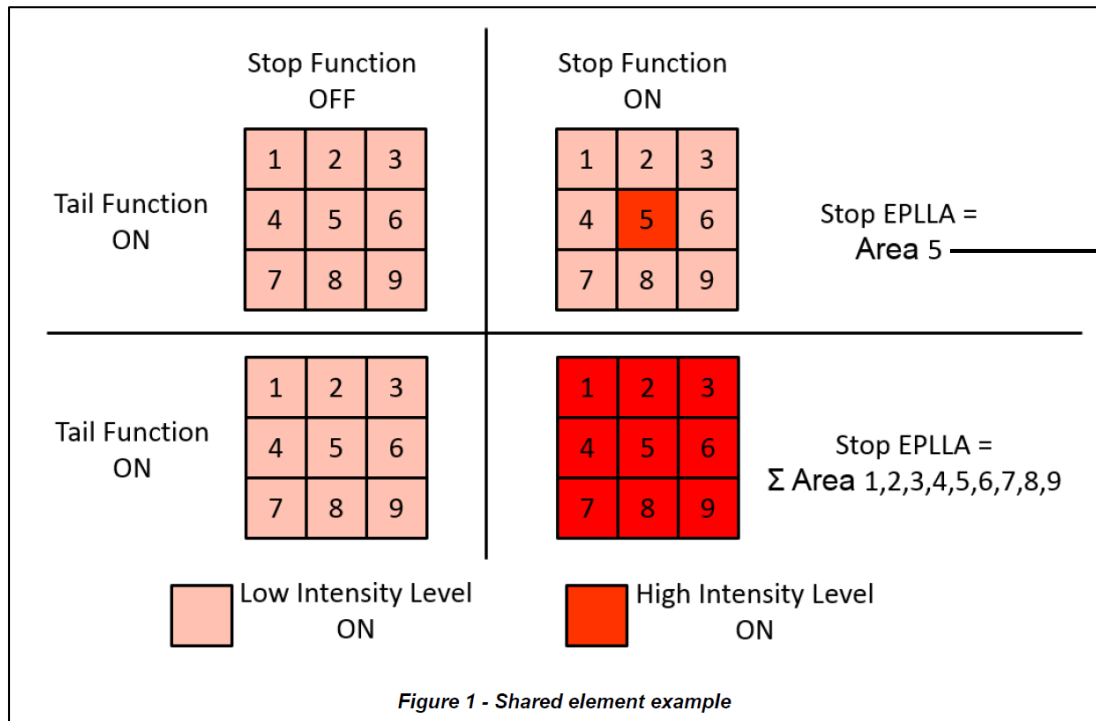
Concerns with the FMVSS 108 Requirement

- While the industry agrees with the method, there are concerns with the relatively large 50 cm² minimum required EPLLA for a stop and rear turn signal lamps
- 50 cm² is large compared to what is common in the market in other regions
 - 25 cm² is a better balance between controlling potential glare and not unduly enlarging lamp sizes

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Updates to SAE J2999™

- A planned update to SAE J2999™ is a 3 to 1 intensity ratio requirement between stop and tail
- i.e., tail intensity must increase more than 3x to be counted as a stop contributor
- This is to prevent creating a stop lamp with an extremely small lit area and adding the tail lamp area to it to comply with the minimum EPLLA requirements without the taillamp sufficiently increasing in intensity when stop is activated



Area 5 would need to be greater than 50cm²

To be able to count Area 1, 2, 3, 4, 6, 7, 8, or 9, each Area's intensity would need to increase by 3x when going from tail to stop

Potential future updates to SAE J2999™

- In the next SAE meetings, we will begin discussing large aspect ratio lamps and if they can create issues with visibility
 - i.e., long but not tall lamps
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Conclusion

- EPLLA is a US requirement that has been in existence in FMVSS for 50+ years and is well understood by FMVSS experienced OEMs and set-makers
 - New technologies have enabled unforeseen challenges to the EPLLA requirements, but the SAE has worked to remedy those challenges
- EPLLA is a known, understood, and simple method to ensure that a signal lamp is not judged to create too much glare
 - The only exception is that the FMVSS 108 EPLLA requirements for Stop and Rear Turn Signal (50cm^2) are too large
 - 25cm^2 is more in-line with today's requirements
 - This may even be smaller for UN, since the photometric intensity requirements are lower in UN for these functions

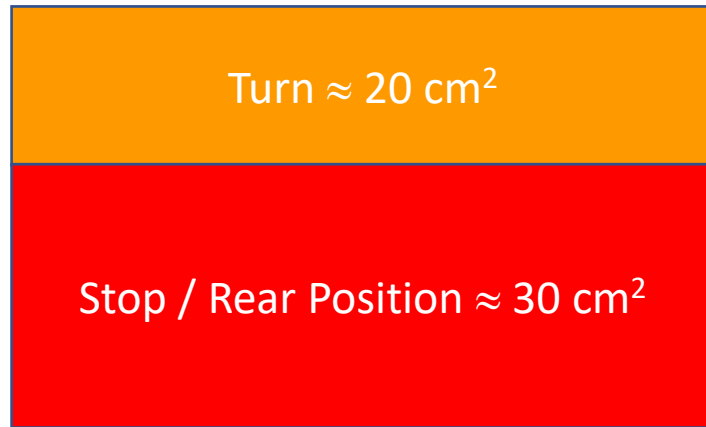
Questions?

Michael Larsen

Backup

Common Practice

UN



FMVSS



EPLLA Origins – minutes from SAE meetings in 1970

BUSINESS MEETING - MORNING, JUNE 10, 1970

The Lighting Committee business session was reconvened at 9 a.m. Agenda Items which had been deferred from the previous day were the first order of business.

- 3.3 Proposed Revisions to SAE J585d, J586c, J588e, and J575e (Circulated March 7, 1970) - Mr. Murphy reported that the letter ballot had indicated Lighting Committee acceptance, with one exception of the proposed revised standards J585d, J586c, J588e, and J575e. The sole disapproval was directed at the warpage requirement in J586c. On the other hand, a number of disapprovals had been directed at a separate item which proposed text for recognition of two Class "A" signal lamps for vehicles 80" or more in width. This proposal had been submitted by Mr. Scully and a statement supporting his views had been circulated to the Lighting Committee on April 8, 1970. At the meeting, Mr. Scully noted that he basically wanted to permit truckers to continue to have separate lamp arrangements, recognizing the unique circumstances of operation of commercial vehicles, e. g., greater voltage drop at the lamp, greater exposure of the lamps to adverse conditions, etc. On the other hand, objections were expressed that the proposal could result in increased glare. Mr. Meese suggested that following the meeting an effort be made to work out a compromise statement for review by the Lighting Committee at the June 10 meeting.

Further discussion of these proposals was deferred until the June 10 session. (See Page 9.)

- 3.3 Proposed Revised SAE Standards J585d, J586c, J588e, and J575e (Letter Ballot March 7, 1970) (Continued) - Mr. Murphy reported that an Ad Hoc Group had met the previous evening and had developed the following text to be included as a new second paragraph under 3.1 in SAE J585d:

"For vehicles of 80 inches or more in overall width a maximum of two lamps or compartments per side may be mounted closer together than 22 inches, provided that each compartment and/or lamp meets the single photometric requirements listed in Table 1. Each lamp and/or compartment utilized in this manner shall meet the one lighted section values for all functions for which it is designed."

This paragraph would also be put in J586c and J588e with the addition of the phrase:

"... and has a minimum effective projected luminous lens area of 12 square inches."

After a brief discussion, the Committee unanimously approved a motion by Mr. Heath, supported by Mr. Scully, approving the addition of this paragraph to the three reports.