

Evaluating Interior Lighting Schemes

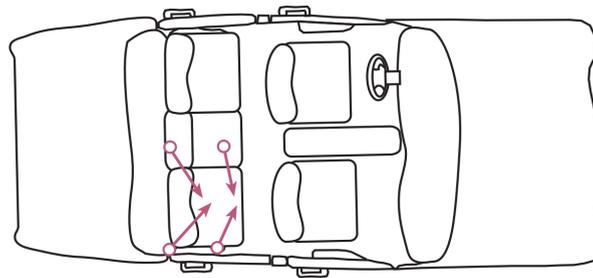
General Motors Automobile Study

General Motors Corporation (GM) asked the LRC to produce a lighting specification for automobile interiors. We responded to the request with four documents:

- I An Evaluation of Interior Lighting Schemes for Automobiles. This document included a human factors evaluation of various lighting schemes for the major visual tasks in an automobile interior. We recruited subjects from the Clifton Park Senior Center to experience lighting mocked up in a Cadillac Seville STS and give us feedback on how well different lighting schemes worked.
- I A Specification for Interior Lighting. The specification listed task illuminance, illuminance uniformity, luminance of the light source, illuminance at the driver's eye, and Color Rendering Index, and included guidelines for the seven major visual tasks performed in automobile interiors. (See specification table.)



C Reading map in rear passenger seat.



C Recommended locations for rear seat reading light.

- I Measurement Protocols. This document showed GM how to measure consistently the seven lighting performance characteristics in the specification so that measurements from different lighting vendors could be compared to the specification.

G Specification for automobile interior lighting

Activity	Average Luminance	Uniformity (max/min)	Source Luminance (cd/m ²) (while driving only)	Maximum vertical illuminance at driver's eye (lx)	CIE Color Rendering Index	Comments
Map reading	80	3/1	<75	<.3	>70	limited to 300 mm diameter circle, less than 20 lx outside 300 mm diameter circle
Reading in rear seats	50	3/1	<75	<.3	>70	limited to 300 mm diameter circle, less than 20 lx outside 300 mm diameter circle
Finding controls while driving	1	15/1	0	<.3	>70 if color coded icons used	limited to control clusters
Finding dropped coins (footwell lighting)	10	15/1	0	<.3	>70	applies to whole footwell of both front and rear seats
Looking in glove box	20	NA	<50	<.3	>70	measured on front edge of glove box
Entering the automobile (general lighting)	5	15/1	NA	NA	>70	covers both horizontal and vertical surfaces inside vehicle
Exiting the automobile (puddle lighting)	10	15/1	<50	NA	NA	

- I Best Practices. What is the best way to light a map for easy reading? This section included general principles for enhancing visibility and reducing glare, as well as specific recommendations for optical systems and luminaire locations that would produce the best results.

What did we learn?

The amount of stray light at the driver's eye (from a map light, footwell light, or glove box light, for example) is an excellent predictor of whether the driver will find that light disturbing while driving at night. (See chart below.)

We also learned that auto manufacturers could make many simple optical changes that would dramatically improve both the performance and appearance of the interior lighting.

Percentage of participants who consider the lighting disturbing vs. vertical illuminance at the driver's eye (log plot).

