American National Standard for Roadway Lighting Equipment—Luminaire Vibration

Accredited Standards Committee on Roadway and Area Lighting, C136

accredited by the

American National Standards Institute

Secretariat

Institute of Electrical and Electronics Engineers, Inc.

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Abstract: The minimum vibration withstand capability and vibration test methods for roadway luminaries are covered.
Keywords: roadway luminaires, vibration test, vibration withstand

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Introduction

(This introduction is not part of ANSI C136.31-2001, American National Standard for Roadway Lighting Equipment—Luminaire Vibration.)

This standard was prepared by the Roadway Luminaire Task Force of Subcommittee C136-1, Subcommittee Luminaires and Light-Sensitive Control Devices.

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American National Standard for Roadway Lighting Equipment—Luminaire Vibration

1. Scope

This standard covers the minimum vibration withstand capability and vibration test methods for roadway luminaires.

2. References

This standard is intended for use in conjunction with the following standards. When these standards are superseded by an approved revision, the latest revision shall apply.

ANSI C136.3-1995, American National Standard for Roadway Lighting—Luminaire Attachments.[1]

ANSI C136.14-1988, American National Standard for Roadway Lighting Equipment—Enclosed Side-Mounted Luminaires for Horizontal-Burning High-Intensity-Discharge Lamps.

ANSI C136.16-1997, American National Standard for Roadway Lighting—Enclosed Post Top-Mounted Luminaires.

ANSI C136.18-1999, American National Standard for High-Mast Side-Mounted Luminaires for Horizontal or Vertical-Burning High-Intensity Discharge Lamps Used in Roadway Lighting Equipment.

3. Definitions

3.1 fundamental resonant frequency: The lowest resonant frequency where the response is in phase with the excitation.

3.2 luminaire: A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamp(s), and to connect the lamp(s) to the power supply.

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[1]ANSI publications are available from the Sales Department, American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036, USA (http://www.ansi.org/).

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4. Types of vibration

Roadway luminaires may experience several types of externally induced vibration. This standard is not intended to cover natural or catastrophic disasters.

4.1 Wind induced vibration

Wind can induce vibration in lighting systems which consists of luminaire, arm, and pole assemblies. The magnitude of this type of vibration is mostly a function of the size, shape, and rigidity of the luminaire and pole system and damping of the system.

4.2 Traffic induced vibration

Traffic induced vibration can be transferred to the luminaire system from a roadway, bridge, or overpass being generated by the passage of vehicles. A similar type of vibration can occur in areas near heavy dynamic equipment.

5. Luminaire vibration test

The luminaire vibration test is designed to determine whether the luminaire is able to withstand vibration conditions which may be encountered in normal installations. The test is a mechanical performance evaluation. Therefore, the luminaire is not normally energized during the test. A lamp may or may not be installed in the luminaire for this test. The test criteria were developed with consideration to the effect of wind- and traffic-induced vibration.

The luminaire shall be attached to a vibration table capable of withstanding the loads and forces encountered during the test and tested in a manner to simulate a normal installation.

The luminaire shall be vibrated at or near fundamental resonant frequency. This frequency shall be determined for each of the three mutually perpendicular planes (x, y, and z) and should be between 5 and 30 hertz. The acceleration intensity measured at the luminaire center of gravity shall be as specified in the corresponding tables. Table 1 should be used for normal roadway applications. Table 2 should be used for bridge and overpass applications. During the vibration test, the frequency and displacement should be monitored. A major change in frequency or displacement is an indication of structural failure. The luminaire shall be capable of withstanding the described vibration for 100,000 cycles in each plane. A separate sample luminaire may be used for each plane to eliminate the effect of conjunctive material fatigue. Other test amplitudes and durations may be negotiated between the specifier and supplier as needed to simulate extreme fatigue. At the test conclusion, there shall be no damage to the enclosure, reduction of electrical spacings, or loosening of any part of the luminaire. Any damage which may result in a safety problem constitutes a test failure. A damaged lamp shall not constitute a test failure.

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Table 1—Vibration test levels—Normal applications

Enclosure material	Test acceleration
Extruded aluminum	1.5 G (14.67 m/s^2)
Die cast aluminum	1.5 G (14.67 m/s^2)
Glass fiber composite	1.5 G (14.67 m/s^2)
Sand cast aluminum	2.0 G (19.56 m/s^2)
Sheet metal aluminum	1.5 G (14.67 m/s^2)
Sheet metal stainless steel	1.5 G (14.67 m/s^2)

Table 2—Vibration test levels—Bridge/overpass applications

Enclosure material	Test acceleration
Extruded aluminum	3.0 G (29.4 m/s^2)
Die cast aluminum	3.0 G (29.4 m/s^2)
Glass fiber composite	3.0 G (29.4 m/s^2)
Sand cast aluminum	3.5 G (34.3 m/s^2)
Sheet metal aluminum	3.0 G (29.4 m/s^2)
Sheet metal stainless steel	3.0 G (29.4 m/s^2)

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