

GENERAL LIGHTING SAFETY ORDERS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649328161

General Lighting Safety Orders by Various

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Edited by Trieste Publishing Pty Ltd.
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VARIOUS

**GENERAL LIGHTING
SAFETY ORDERS**

General Lighting Safety Orders

Issued by the
Industrial Accident Commission
of the
State of California

525 MARKET STREET, SAN FRANCISCO

Effective December 1, 1919

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1919

TK4161
C34
1919

INDUSTRIAL ACCIDENT COMMISSION
OF THE STATE OF CALIFORNIA

525 Market Street, San Francisco
423 Union League Building, Los Angeles

TO VIAL
AUG 20 1919
J. T. HILLBERRY, Chairman
WILLIAM FRENCH
A. M. NAPTAGER,
Commissioners.

H. M. WOLFLIN,
Superintendent of Safety.



SUMMARY OF THE SAFETY PROVISIONS

of the

Workmen's Compensation, Insurance and Safety Act.

Being Chapter 176 of the Laws of 1913 as Amended by Chapter 807 of the Laws of 1915, and Chapter 586 of the Laws of 1917.

Sections 33 to 54, inclusive, of the Workmen's Compensation, Insurance and Safety Act give the Industrial Accident Commission power to make and enforce safety orders, rules and regulations, to prescribe safety devices, and to fix safety standards. It also empowers the Commission to appoint advisers who shall, without compensation, assist the Commission in establishing standards of safety. The Commission may adopt and incorporate in its general orders such safety recommendations as it may receive from such advisers.

The Commission, carrying out its plan of obtaining the best practical ideas to incorporate in its Safety Orders, asked various interests to serve on a committee to draft Tentative General Lighting Safety Orders.

COMMITTEE ON GENERAL LIGHTING SAFETY ORDERS.

- ROMAINE W. MYERS (chairman), consulting engineer (electrical and illuminating), representing the National Council of Defense, Divisional Committee on Lighting.
- L. E. VOYER (vice chairman), illuminating engineer, General Electric Company representing the Association of Electrical Manufacturers and the Lighting Fixture Association.
- W. W. HANSCOM, electrical and mechanical engineer, representing the National Electric Light Association, Pacific Coast Section.
- SMITH O'BRIEN, architect, representing the American Institute of Architects.
- R. H. FENKHAUSEN, electrical engineer, Bethlehem Shipbuilding Corporation, Union Plant, representing the American Institute of Electrical Engineers.
- DANIEL C. MURPHY, president California State Federation of Labor.
- PAUL SCHARENBERG, secretary-treasurer California State Federation of Labor.
- R. S. PRUSSIA, illuminating engineer, Westinghouse Lamp Company, representing the Association of Electrical Manufacturers.
- MILES F. STEEL, Benjamin Electric Manufacturing Company, representing the Association of Electrical Manufacturers.
- S. J. LISBERGER, Engineer, San Francisco District, Pacific Gas and Electric Company, representing the Pacific Coast Gas Association.
- CHAS. M. MASSON, illuminating engineer, Southern California Edison Company, representing the Illuminating Engineering Society.
- CONSTANT MEESE, Meese & Gottfried Company, representing the San Francisco Chamber of Commerce.
- F. DOHRMANN, JR., Nathan-Dohrmann Company, representing the San Francisco Chamber of Commerce.
- HARRY GORMAN, field agent, representing the Bureau of Labor Statistics.
- H. B. WOODHILL, president Woodhill & Hulse Electric Company, Inc., representing the Merchants and Manufacturers Association of Los Angeles.
- W. A. CHOWEN, manager California Inspection Rating Bureau, representing the Casualty Underwriters Board of California.
- D. AYBE, superintendent inspection department, California Inspection Rating Bureau, representing the Casualty Underwriters Board of California.
- HAROLD MESTRE, representing the Industrial Welfare Commission.
- ROBT. L. ELTRINGHAM, electrical engineer, representing the Industrial Accident Commission.
- JOHN R. BROWNELL (secretary), superintendent of safety, Industrial Accident Commission.

Acknowledgment is made of the assistance rendered by the Illuminating Engineering Society in the preparation of these General Lighting Safety Orders, and for the use of the various cuts which they kindly loaned.

GENERAL LIGHTING SAFETY ORDERS.

Order 1500. Definitions.

(a) *Candle* (or candlepower) means the unit of luminous intensity maintained by the national laboratories of the United States, France and Great Britain.

(b) *Lumen* means the unit of luminous flux, and is the quantity of light necessary to produce an average intensity of illumination of one foot-candle over an area of one square foot.

(c) *Foot-candle* means the unit of illumination equal to one lumen per square foot. It is the lighting effect produced upon an object by a lamp of one candlepower at a distance of one foot.

(d) *Photometer* means a standardized instrument suitable for making illumination measurements.

(e) *Lamp* means that part of the lighting equipment from which the light originates.

(f) *Local lamps* (or lighting) means lighting units located close to the work, and intended to illuminate only a limited area about the work.

(g) *Overhead lamps* (or lighting) means lighting units installed above ordinary head-level to secure a general illumination over a considerable area.

(h) *Brightness* means the intensity of light per unit area emitted from, or reflected by, a body; and in these Orders is expressed in candlepower per square inch.

(i) *Glare* means any brightness within the field of vision of such a character as to cause discomfort, annoyance, interference with vision, or eye fatigue.

(j) *Eyestrain* means a physiological condition of the eye resulting in discomfort, poor vision, or fatigue.

(k) *Shaded* means that the lamp is equipped with a reflector, shade, enclosing globe, or other accessory for reducing the brightness in certain directions, or otherwise altering or changing the distribution of light from the lamp.

(l) *Illumination* means the quantity of light received upon a surface; it is measured in foot-candles or in lumens per square foot of area.

(m) *Intensity of illumination* means the quantity of light received upon a surface, expressed in foot-candles or in lumens per square foot of area.

(n) *Foot-candles at the work* means the intensity of illumination on the object upon which work is being performed.

(o) *Foot-candles at floor-level* means the intensity of illumination on the floor of the space specified.

Order 1501. **General Requirements.**

(a) Working or traversed spaces in buildings or grounds of places of employment shall be supplied during the time of use, with either natural or artificial light in accordance with the following Orders (1502-1509).

Order 1502. **Natural Lighting.**

(a) Windows, skylights or other roof-lighting construction of buildings shall be arranged with the glass area so apportioned that at the darkest part of any working space, when normal exterior daylight conditions obtain (sky brightness of 1.50 candlepower per square inch) there will be available a minimum intensity equal to twice that of Order 1503, otherwise artificial light of intensities specified in Order 1503 shall be provided.

(b) Awnings, shades, diffusive or refractive window glass shall be used for the purpose of improving daylight conditions or for the avoidance of eyestrain wherever the location of the work is such that the worker must face large window areas through which excessively bright light may at times enter the building.

NOTE.—The intensity requirements for adequate day lighting are much higher than those for adequate night lighting, because in general under daylight conditions the light reaching the eye from all surroundings in the field of vision is much brighter than at night, and hence a correspondingly more intense light must fall on the object viewed.

Order 1503. **Artificial Light.**

(a) When the natural light is less than twice the minimum permissible intensities of illumination set forth in the following table, artificial light shall be supplied and maintained in accordance with the table.

NOTE.—See Appendix for intensities recommended for best working conditions.

	<i>Foot-candles at the floor level</i>
1. Roadways and yard thoroughfares.....	0.02
2. Storage spaces, stairs, stairways, halls, hallways, passageways, aisles, exits and elevator en- trances	0.25
3. Water-closet compartments, toilet rooms, wash- rooms, dressing rooms and elevator cars.....	0.50

	Foot-candles at the work
4. Work not requiring discrimination of detail, such as handling material of a coarse nature, and performing operations not requiring close visual application	0.50
5. Rough manufacturing requiring discrimination of detail, such as rough machining, rough assembling, rough bench work, also work in basements of mercantile establishments requiring discrimination of detail.....	1.00
6. Rough manufacturing requiring closer discrimination of detail, such as machining, assembly and bench work, also work in basements of mercantile establishments requiring closer discrimination of detail, intermediate between 5 and 7.....	2.00
7. Fine manufacturing, such as fine lathe work, pattern and tool making, also office work, such as accounting and typewriting.....	3.00
8. Special cases of fine work, such as watchmaking, engraving and drafting	5.00
9. Processes otherwise safeguarded in which light is detrimental	0.00

NOTE.—Some exceptions to the intensity rule:

(a) There are some operations that are performed in comparative darkness, as for example, photographic processes in the dark room.

(b) There are some operations that are best observed by their own light, as in parts of the process of working glass.

(c) Some operations are best observed by the "silhouette" method of lighting in which the work is seen against a lighted background in a comparatively dark room, as in some processes of working with dark threads and lamp filaments.

In all such cases in which work is of necessity carried on in comparative darkness, special precautions should be taken to properly safeguard the workmen.

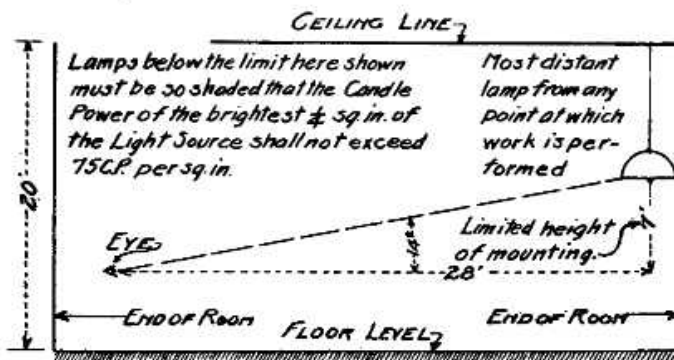
Order 1504. **Measurements.**

(a) For the purpose of light measurements, a standardized photometer, certified by the Industrial Accident Commission of the State of California, shall be used, and such measurements shall be made at the locations specified in the table.

Order 1505. **Shading of Lamps for Overhead Lighting.**

(a) Lamps suspended at elevations above eye level less than one-quarter their distance from any positions at which work is performed, or where places are traversed, must be shaded in such a manner that the intensity of the brightest one-quarter square inch of visible light source shall not exceed seventy-five candlepower per square inch.

NOTE.—The following diagram illustrates the application of the above rule, the distances being explanatory and representing the ratio between the height of the lamp above the eye level and its horizontal distance from the eye.



Exception. Lamps suspended at elevations greater than twenty feet above the floor are not subject to this requirement.

NOTE 1.—Glare from lamps or unduly bright surfaces produces eye-strain and increases the accident hazard. The brightness limit specified in this Order is an absolute maximum. Very much lower brightness limits are necessary in many interiors illuminated by overhead lamps, if the illumination is to be satisfactory. In some cases the maximum brightness should not exceed that of the sky (two to three candlepower per square inch).

NOTE 2.—Where the principal work is done on polished surfaces, such as polished metal, celluloid, varnished wood, etc., it is desirable to limit the brightness of the lamps in all downward directions to the amount specified in this Order.

NOTE 3.—For method of measuring brightness, see Appendix, paragraph 88.

Order 1506. **Shading of Lamps for Local Lighting.**

(a) Lamps for local lighting must be shaded in such a manner that the intensity of the brightest square inch presented to view from any position at which work is performed, shall not exceed three candlepower.

NOTE.—In the case of lamps used for local lighting, at or near eye level, the limits of permissible brightness are much lower than for lamps used for overhead lighting, because the eyes are more sensitive to strong light received from below, and because such light sources are more constantly in the field of view.

Order 1507. **Distribution of Light on the Work.**

(a) The reflectors or other accessories, mounting heights and spacings employed with lamps shall be such as to secure a reasonably uniform distribution of illumination, avoiding