

---

## Light, health and well-being in the job places

by Valeria Marchesin

Tutor: Chiara Aghemo

This thesis examines initially the relevant scientific studies to the effects of the visible light on the man, with a follow-up on a critical analysis of the D.Lgs. 81/08 in matter of protection of the workers from the optical craft cancellation (ROA). In the end it defines the guide lines to the luminous planning of job atmospheres. From studies of COMMISSION INTERNATIONALE DE ECLAIRAGE (CIE) it has turned out that the lighting system has repercussions to visual level, it moves them d biological on the individual and it represents one of the fundamental parameters in order to guarantee the visual well-being.

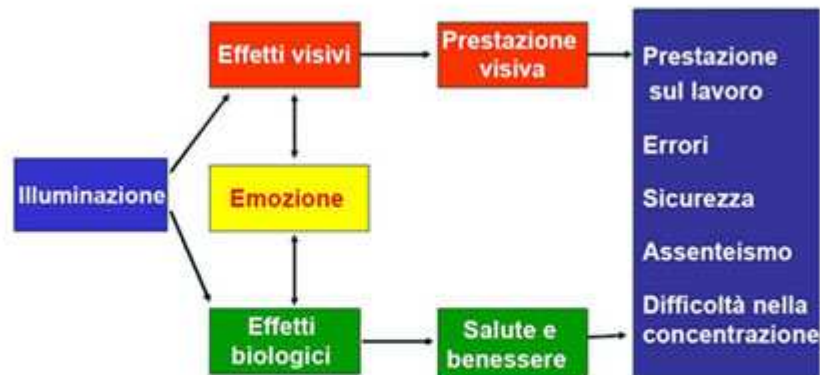


Figura 1. Schema degli effetti dell'illuminazione sull'uomo.

This last one can be obtained arranging the quality of the lighting system with the comfort visual, that it depends from the characteristics and the distribution of the light. The effects of the light on the health can be of photochemical nature, due to the phantom of ultraviolet (the 100-400 nm) and to the visible phantom of (400-700nm), and the thermal one, had to the infrared spectrum (700 nm-1 mm) and to that one of the visible one.

A cohabit of thermal and photochemical effects is found in the visible phantom, particularly between the 380 and 520 nm defined “blue light” that is emitted from luminous sources of common use like: lamps to fluorescence, lamps HID and lamps to metallic haloids.

**Sorgenti di radiazione ottica con riferimento al rischio di luce blu  
(400-500 nm., CIE 138/2000)**

Sorgenti	Potenza (W)	Emissione (W)	Radianza (W/m <sup>2</sup> sr-1)	Lunghezza d'onda (nm)	% di luce blu
Radiazione solare	-	(1kW/m <sup>2</sup> )	2.2 · 10 <sup>7</sup>	300 - 2500	5 - 10
Lampade ad incandescenza	10 - 2000	9 - 1800	1.0 · 10 <sup>2</sup>	300 - 2500	0.5 - 2.0
Lampade alogene a tungsteno	500 - 20000	450 - 9000	1.0 · 10 <sup>4</sup>	270 - 2500	1.0 - 4.0
Lampade ad arco allo xenon	500 - 20000	250 - 10000	10 <sup>5</sup> - 10 <sup>6</sup>	250 - 3500	6 - 10
Lampade a mercurio ad alta pressione	40 - 2000	25 - 1200	10 <sup>3</sup> - 10 <sup>5</sup>	300 - 1000	8 - 20
Alogenuri metallici	100 - 2000	80 - 1500	10 <sup>3</sup> - 10 <sup>7</sup>	300 - 1000	8 - 22
Saldature ad arco	-	-	10 <sup>6</sup> - 10 <sup>14</sup>	200 - 1000	5 - 40

**Figura 2. Tabella CIE. Confronto tra le caratteristiche di diversi tipi di sorgenti luminose che evidenzia un picco di emissione di luce blu nelle lampade af alogenuri metallici.**

The Italian norm, through the D.Lgs. 81/08 supply limits, measures instruments and classifies luminous sources craft based on the health hazard of the exposed individual. Such norm previews the respect of the values limit of exposure of artificial to the optical cancellation, ROA, in reference to the injurious effects on eyes and cute.

The ROA is comprised between 100 nm and 1 millimeter and it is subdivided in not coherent optical cancellation, that it comprises UV, VIS, and IR and coherent radiation for the laser.

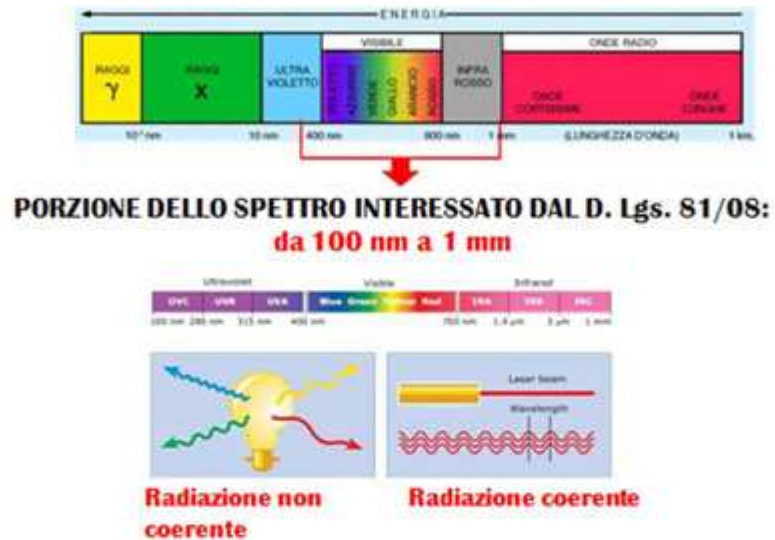


Figura 3. Schema della porzione di spettro elettromagnetico interessato dal D. Lgs. 81/08 e distinzione tra radiazione coerente emessa dal laser e radiazione incoerente emessa dagli altri tipi di soegente.

The values limit of exposure to ROA, coherent from the biophysical point of view, can be calculate by means of formulas brought back in attached the XXXVII of the D.Lgs. 81/08.

The risk assessment, according to the D.Lgs. 81/08, are based on:

1) Acquaintance of sources, in order to take a census sources ROA and to acquire the data, to use the classification of sources second the specific technical norms or the conformity to technical standards allows the "justification" (art.181, codicil 3). It justifies herself, that is to avoid the instrumental measurement, for the equipment that belong to the category 0 according to the standard ONES EN 12198:2009 for blot some to them, lamps or systems of lamps, also to technology LED, classified in "the Free" group from norm CEI EN 62471:2009. They are considered free: the lighting system standard for domestic use and of office, the monitor of computer, display and photocopiers, lamps and trusts of luminous signaling, and analogous sources, also in lack of the aforesaid classification, in corrected use conditions can be justified.

2) Acquaintance of the expositive modalities, location of the typologies of sources, the modalities of employment and the places in which they are operating and to acquire the times of permanence, the distances and the modalities of exposure and the eventual photosensitivity of the worker exposed.

3) Execution of the measurements orchestrates them the technical norms.

4) Execution of the calculations, from the technical data obtain the width for the comparison with the limits.

5) Comparison with the values of Attached the XXXVII of the D.Lgs. 81/2008.

Currently the references for the measurements of the not coherent ROA are: ONES EN 14255-1: 2005 for UV, ONES EN 14255-2: 2006 for VISIBLE and INFRARED, ONES EN 14255-4: 2007 for terminology and width to use in the measurements. The D.Lgs. 81/08 regarding the ROA appear limited because of the complexity of the demanded procedures of measure, and of the absence of indications on the redevelop participations.

For further information, e-mail:

Valeria Marchesin: [vale.arch@libero.it](mailto:vale.arch@libero.it)