

Life at Sea: Parts 3 and 4 (Lighting)

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Combined Bibliography, Life at Sea, Parts 3 and 4 (Lighting)
by Iver P. Cooper

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Notes

A 19th century attempt was made to build up a parabolic mirror with so-called meniscus rings, but it proved too difficult to line them up to have the same focus. (Baird)

. Immediately after Ring of Fire, the power plant management plans to gear-down within 18-24 months to a steam power plant supplying 10-15 megawatts. Jones, Power to the People, Ring of Fire. Later, they are building fourteen steam engines, each putting out 1000 hp -- a total of 10.4 megawatts. Jones, "Power Play," Grantville Gazette 24.

Quantifying Light

Light sources may be compared in terms of their intensity (light output over a unit solid angle, one steradian, measured in candelas; one old candlepower equaled 0.981 candelas, but the terms are now synonymous), or their total light output (also called luminous flux, measured in lumens).

If a light source is radiating one candela in all directions, then the total light output is 12.56 lumens..

The luminance of a light source is measured in candela/square meter (or foot-lamberts, 1fL=3.426 candela/square meter). It is.

The illumination of a target surface provided by a given light source is dependent on its output in the relevant direction, the distance between them (inverse square law applies), atmospheric clarity and the angle of incidence. Illuminance is measured in lumens/square meter, also called lux, or in foot-candles; 1 fc = 10.764 lux. The illumination provided by direct sunlight can be as high as 100,000 lux, while that provided by the moon on a clear night is not more than one lux. The lighting inside a modern home might be 50 lux and inside an office as much as 500 lux. (Wikipedia/Lux).

The luminance of a surface from which light is reflected is measured in candela/square meter and is dependent on the illuminance received, the spectral distribution of the incident light, the reflectivity of the surface for different wavelengths, etc. The Bureau of Mines requires 0.06 foot lamberts (2.06 candela/square meter) as the minimum reflected light level on all surfaces required to be lit. (Lewis 3).

Another important aspect of light is color. Red is long wavelength (700 nm) and blue is short wavelength (400 nm). If a light source glows because it is hot, then the higher the temperature, the brighter and bluer it is. Light sources can be assigned "color temperatures" based on the surface temperature of a "black body radiator" whose light is of a similar hue. Thus candle flames are 1850K, standard incandescents, 2400K, moonlight ~4100K, daylight 5000-6000K. (Wikipedia).

Note that we see certain wavelengths of light better than others, and the peak sensitivity wavelength depends on the light level. The photopic (bright) curve peaks at 555 nm and the scotopic (dim and fully dark-adapted) at 507, with the scotopic eye being less than half as effective. Since full dark adaptation is unusual, even if the sole source of light is starlight or moonlight, the practical visual effect of the light is likely to be a blend of photopic and scotopic.