

Color-Changing LED Lights Have Not Been Approved to Meet Pool Lighting Requirements

The [Iowa Swimming Pool and Spa rules](#) require artificial lighting to light the swimming pool and deck at all indoor swimming pools and at outdoor swimming pools which are to be used after sunset. During the construction permitting process, design professionals must provide calculations to demonstrate that the lighting as designed meet the minimum lighting requirements as follows:

- Underwater lighting of at least 8 lamp lumens/ft² or 0.5 watts/ft² of water surface area, located to provide illumination of the entire swimming pool bottom, and area lighting of at least 10 lumens/ft² (footcandles) or 0.6 watts/ft² of deck area.
- If underwater lights are not provided, overhead lighting of at least 30 lumens/ft² (footcandles) or 2.0 watts/ft² of swimming pool water surface area shall be provided

To date, no design professionals have submitted calculations demonstrating that color changing LED lighting will meet the lighting requirements of the Iowa Swimming Pool and Spa rules for a pool or spa project within Iowa.

Color-changing LED pool lighting is intended for decorative purposes, not to meet specific lighting requirements. It would be difficult to demonstrate that color-changing LEDs meet the lighting requirements as the manufacturers of color changing LED lighting do not provide catalogued data on the lumen output across the range of available colors.

The little data that is available demonstrates that for color changing LED lighting, the light output in lumens for the various colors is significantly less than that of a white LED of similar input wattage.

An additional issue associated with the use of colored underwater lighting is that the rate at which the light is absorbed by the water varies based on the wavelength of the light. Red lighting, for example, is much more quickly absorbed than white light. This can lead to significant variability in the lighting levels throughout a swimming pool.

The variations in the lumen output and absorption of the light of different wavelengths is observable in the following videos: [YouTube Video example 1](#) ; [YouTube Video example 2](#)

The underwater lighting requirement provides a minimum allowable light output from the underwater lighting based on the area of the swimming pool that is intended to assist in the recognition of objects (i.e. a bather) in or on the bottom of the pool. A traditional incandescent or other types of white light are generally comprised of a broad spectrum of wavelengths across the visible light spectrum and provides good color rendering. In colored LEDs, the red, green, or blue LED have a very limited spectrum of wavelength and very poor color rendering. This [YouTube video](#) demonstrates for example how a Rubik cube appears under white light versus red or blue lights. The narrower the spectrum of the lighting source, the poorer the color rendition and the less light that is reflected from various objects which can reduce the visibility and recognition of the objects.

If a facility has installed color-changing LED lighting, the facility shall replace it with the original white lights as designed and specified. Changes to the lighting require submission of a construction permit application and plans and specifications sealed and certified by an engineer or architect licensed in Iowa that demonstrate compliance with the requirements of the Iowa Swimming Pool Spa Rules.

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