

Traditional Building

The History of Lighting

Shining a light on the history of lighting.

Susan D. Turner · Updated: May 13, 2020 · Original: Nov 12, 2019

Light fixtures are significant to historic spaces. Not only do they have a distinctive shape, but also the original quality of light cast provided illumination that enhanced the architecture and rendered the colors in the room uniquely. Modern illumination using historic fixtures requires tailoring to achieve such effects.



Gary Steffy Lighting Design restored the lighting in the William W. Cook Law Library Reading Room at the University of Michigan, Ann Arbor, Michigan.
Courtesy of Curt Clayton, Clayton Studio

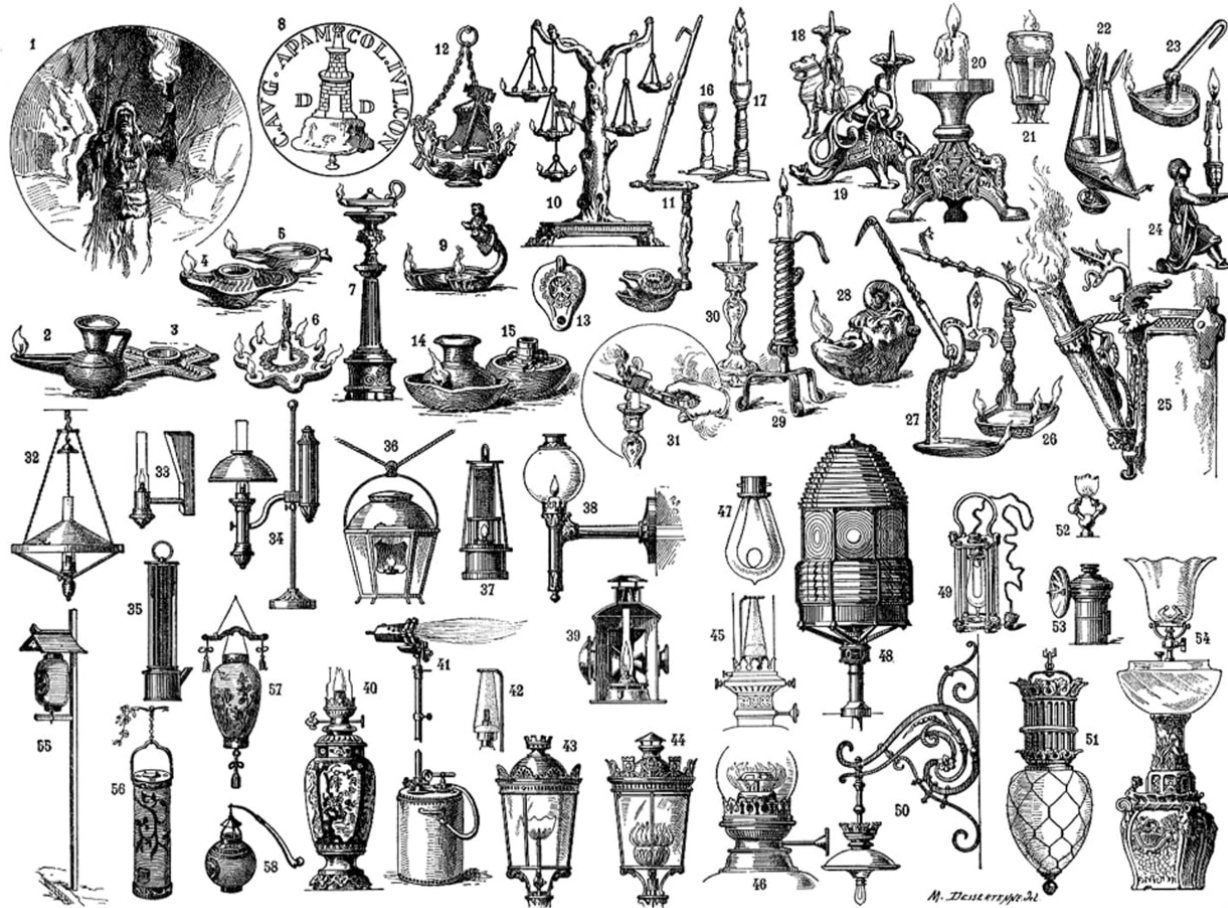
History

Typically, historic homes capitalize on natural light via large windows and building orientation. The first fabricated light was likely a torch, while the first lamps were shells or hollow rocks filled with fuel such as dried grasses or wood. In 4500 BC, lamps came into use, whose fuel source later evolved to methane, ethylene, and kerosene. In the 1790s, the gas lamp was invented in England and brought to the United States. These lamps were popular, as the same fuel source, gas, was also distributed to homes for cooking. In the early 1800s, the first electric lamps were designed, followed by light bulbs in the 1830s. In the 1840s, the arc light was introduced to Paris. Early arc lights, or “limelights,” for theatre lighting were created by directing an oxyhydrogen flame at a cylinder of calcium oxide. While this is no longer a source of theatre lighting, the expression “in the limelight” is still in common use. In the early 1860s, fluorescent lights were invented. Thomas Edison developed the carbon filament incandescent light bulb in 1879, which became the standard of lighting for decades. In the early 1880s, direct current electricity scaled to citywide levels, followed by alternating current in the late 1880s. In 1901, the mercury vapor light using standard power was invented. Following this, a variety of types of high-intensity discharge (HID) lighting were developed, high-pressure sodium, mercury vapor, and metal halide. When neon lights were introduced, they used argon or krypton gas in a closed tube, and electricity caused it to glow. Most recently, light-emitting diodes (LEDs) were invented; these did not require a glass bulb like earlier lights, but merely a semiconductor, which became much more energy-efficient and less expensive over time.

Components of a historic light

The number of elements with which a light is manufactured depends on the time period of the light, but basically, a light fixture consists of a light source (bulb or flame), an energy source (electric, gas, or solid fuel), and the fixture’s body. The body takes many forms, from ceiling mounted to wall mounted to floor standing to portable. Typically, historic lights include arms to support multiple light sources, since the wattage was not as high as is available today. A socket is mounted at the end of the arm, and frequently a shade is placed over the light source (a glass panel or globe, or a metal frame with fabric or paper over it), attached by a harp or bracket. All lights have some sort of base, whether it is weighted for a table or floor lamp, a plate for wall-hung lights, or a bell-shaped fitting for ceilings. Other parts could include a chain or rod to hang the lamp and/or individual crystals or chains to adorn it.

The materials of historic lights vary widely, from brass to bronze to cast or forged iron to even wood. Portions of the lamp may include adornments of cut, cast, or blown glass, ceramic elements, stained glass, or crystal. For the purposes of this column, only rewiring and relamping will be covered.



1: Prehistory, 2-3: Egyptian (circa 400 BC), 4-5: Assyrian, 6-13: Roman, 14-15: Carthaginian, 16-17: Merovingian, 19-20: 11th century, 21: 12th century, 22: 13th century, 23-24: 14th century, 25-27: 15th century, 28: 16th century, 29: 17th century, 30-31: 18th century, 32-54: 19th and 20th century

Illustration courtesy of www.historyoflighting.net/, by Maurice Dessertenne – “Eclairage,” in *Nouveau Larousse illustré*, tome quatrième, E-G, Public Domain, <https://commons.wikimedia.org/w/index.php?curid=6405106>

Conservation approach

As with all restoration projects, look for photographic evidence to determine the original configuration and placement of the fixtures, and at what date they were installed. When the decision is made to restore the fixture, determine the restoration goal. Is it to clean up the fixture and make it safe? Or is it to restore the original appearance? Once that direction has been decided, survey the fixture. Determine if there are any parts missing. Assess the condition of the wiring, the sockets, the finish on the fixture body, the integrity of the castings, and the condition of the adornments. Determine whether the light is for supplemental lighting or needs to provide the bulk of the lighting in the room.

Repair versus replacement

Many companies claim to be able to replicate fixtures exactly. While this is possible, typically the quality of the brass or bronze, the existing patina, and the craftsmanship are difficult to reproduce. It is always best to restore the historic fixture, leaving some of the patina. This does not prevent the light from achieving higher, more modern lighting levels through the introduction of higher-wattage bulbs, or more bulbs within the enclosure. If there are missing fixtures, use the original to replicate the new ones, and document which are old and which are new somewhere on the fixture, for posterity.

When restoring, start with documentation. Photograph the light fixture from all sides, below and above. In order to do any work on it from rewiring to cleaning, the pieces should be taken apart. Do this systematically, labeling the parts and photographing them in order on a large work surface, to enable reassembly.

If the pieces are not taken apart, the joints tend to build up with cleaning pastes, or worse, a chemical cleaner can enter these joints and continue to corrode undetected on the interior. Review individual pieces for condition. If there are corroded areas or missing pieces, these can be repaired/replaced by historic light restorers.

Rewiring

There are many online lamp stores that can provide the parts for minor repairs. Many people think they can rewire the lamp themselves. An important point to make is that even when using all UL (Underwriters Laboratories) or CSA (Canadian Standards Association) listed parts, the completed project does not equal a UL/CSA-labeled fixture. Only qualified electrical shops can provide a refurbished light fixture with a UL/CSA sticker.

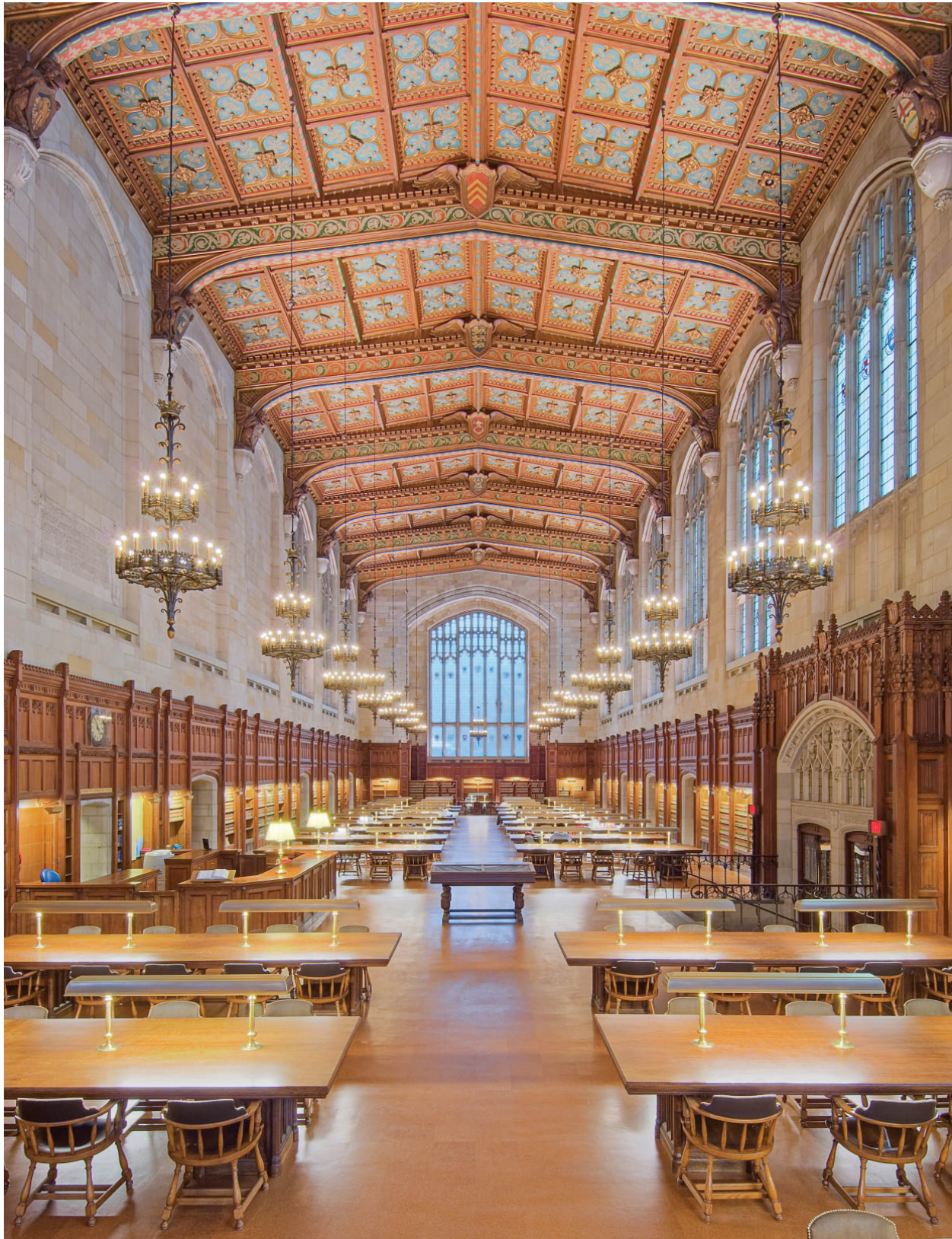
Why is this important? When you purchase a modern light fixture, it is typically “UL Listed” (ULC in Canada) or CSA Listed. Underwriters Laboratories is a group that sets standards for building elements to be insurable, while CSA sets standards and verifies quality and conformance of lighting, among many other products. If a light fixture is rewired incorrectly or the design of it results in an electrical fault, it could result in a fire. If it is not UL or CSA listed, it may void the home/business owner’s insurance.

When rewiring, ensure that new wiring is the high-heat type. If there is cloth wiring, be aware that it likely contains asbestos. If you like the look of cloth wiring, it can be replaced with rayon “cloth”-wrapped plastic-coated high-heat wiring. The wiring can be run within the arm of a gas light invisibly and permit the conversion of the gas light to electric.



Restored Gothic chandelier hangs in the library. The project won an AIA Michigan Honor Award.

Courtesy of Curt Clayton, Clayton Studio



The library after restoration work was complete.
Courtesy of Curt Clayton, Clayton Studio

Relamping

Typically, early historic lights used lower-wattage bulbs, until higher-wattage bulbs were later invented. To keep the look of the fixture, a higher-wattage bulb can be used, but only if you have accommodated the change by upgrading the wiring and the socket. You can increase output by increasing the number or type of light sources within the fixture, but this could change the look of the fixture and should be done sensitively and reversibly. Lastly, the light source can be changed, such as by using LED sources. The advantages to LED lighting are many: lower power consumption, higher efficiency, less heat, and greater light output while using smaller-gauge wires. The color of the light can be programmed to resemble gaslight or candlelight, or display non-historic colors like red or green for temporary modern effects.

Refinishing

Refinishing varies greatly, depending on the base material, and will not be covered here. However, a common problem with old light fixtures is that they can be painted over. The paint finish can be removed using a variety of paint stripping products. It is important to consider whether there was an original polychromatic painted finish; if this is suspected, a paint conservator should be consulted to remove the paint in layers to enable exposure of the original finish. That finish can then be either restored or replicated.

Cautions

When hiring a company to perform restoration, communicate your expectations with respect to patina appearance at the completion of cleaning. Discuss with them what the purpose of the light will be once it is returned. If it is a small chandelier providing one of many light sources, it is not an issue if the lighting level of the original fixture remains. If, however, this is a lighting upgrade and you are trying to get the historic fixture to provide the brunt of the lighting, then you should understand the ways to increase the output without compromising the appearance of the fixture.

One final caution: increase all lighting within a space relative to the other lighting elements. For example, if the overall light level is 2 foot-candles and the stained glass is backlit with 8 foot-candles, if the main fixtures increase to 15 foot-candles, the stained glass will lose all its glow, as the backlighting can't compete with the incident light.



Gary Steffy, a master lighting designer, did not attempt to push light levels through the original historic fixtures. Rather, his goal was to raise ambient light levels in the room as a whole to create balance, reduce eyestrain from bright, focalized light sources, and highlight the room's architectural beauty.

Courtesy of Curt Clayton, Clayton Studio

Understanding Light Quality

With the rapid development of all forms of lighting within a period of 100 years, it can be difficult to ascertain with which lighting source a space would originally have been lit. Each of the light sources described above provided a different light quality. Light is composed of intensity (brightness), direction, and color (wavelength spectrum). When retrofitting a light fixture, it is important to emulate these qualities to provide the best historic match.

The intensity of light can be measured in the more archaic unit of foot-candles, which is based on the amount of light from one candle falling on a surface at a distance of 1 foot. Its modern equivalent is 1 lumen per square foot, or 10.76 lux. There are design guidelines for lighting levels, related to the function of the space. Typically, historic lights provide less light than modern functions demand.

Direction of light can assist or hinder sight in a space. If the bulbs are exposed and very bright, they will cause glare, and the light fixture itself will not be appreciated. If the light is very directional, it can produce "hot" and "cold" spots in the lighting design, leading to inefficient use of the available light.

Color of light influences perception of colors in the space. The color temperature of light is measured in degrees Kelvin (K), with the sun registering between 5000 K and 6500 K. Examples of typical historic light colors include the following: candlelight is 1650 K (favoring the red spectrum), gaslight is 1980 K (favoring the blue spectrum), and original Edison bulbs were 2200 K to 2400 K. The color rendering index (CRI) is a relative measurement of a light source from 1 to 100, where 100 is the closest to the color rendition of the sun. It is important to realize that when trying to achieve the light quality of the original fixture, a high CRI may not be what you are aiming for.

Practical Approach

In the process of writing the column on Restoration of Lighting, many excellent restoration companies were consulted. Jason Selnick, vice president of National Sales for of Crenshaw Lighting provided technical support to the article, based on Crenshaw's experience with many large and small historic light restoration projects.

Crenshaw's General approach is to be a partner from the start. "We love to visit the site, and make observations of the lights, in collaboration with the client, the lighting designer, the architect, or a combination of stakeholders." The first step is to understand the lighting goals, and the overall intent of the restoration. This determines the scope and leads to itemizing the minutia of work involved in each fixture, balancing the criteria of architect, the lighting designer, the client, and the technical constraints of the existing fixture with CSA listing.

Initial inspection documents the alloy and thickness of metals, the connection methods, the state of any painted finishes, determines any missing lenses or nonhistoric parts, identifies broken parts (finials, arms, sockets etc.) enabling detailed work scope for bidding. "After bidding and award, a large project can take from 16 weeks to over a year to execute."

Preparation work in the field is as important as actual work in the workshop. "It starts with site assistance to remove the fixture, labeling each for its unique mounting and location tied back to a ceiling plan. We crate the fixtures and truck them back to the shop." With large numbers of fixtures, a mock up is recommended, following the same process as will be implemented on each subsequent fixture. The parts are numbered, the fixture is dismantled, the wiring removed, and missing or broken parts are identified for order or fabrication. Based on the design intent, the patina can be either 'touched up' or completely reapplied. The patina is addressed before reassembly, rewiring, and relamping. The mock-up is then reviewed by the stakeholders to ensure that the desired visual effect is achieved relative to lighting levels and final appearance.

After the mock-up is approved, the rest of the fixtures are completed, labeled for their return to their original locations, crated in the shop, and shipped by Crenshaw to the site. "We prefer to be involved from start to finish." Selznick is proud that they are a "one stop shop. We do it all, from glass blowing to CSA testing."



Close up of the Gothic chandelier.
Courtesy of Crenshaw Lighting

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