NLPIP Lighting Answers
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Alternatives to Halogen Torchieres

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Introduction

Lighting designers and consumers in the United States (U.S.) have been attracted by the appearance, **indirect lighting**, and versatility of torchieres since they were first introduced to the market in the 1980s. Today, the most popular torchieres are inexpensive 300-watt (W) **halogen** torchieres (see Figure 1), which stand approximately 6 feet (ft) [1.8 meters (m)] tall and house a double-ended tubular halogen **lamp** (see Figure 2). These **luminaires** are used most commonly in residences, but they can also be found in some workplaces.

Energy concerns and well-publicized fires have increased interest in alternatives to halogen torchieres. Manufacturers have designed torchieres that use **A-lamps**, **compact fluorescent lamps (CFLs)**, or **metal halide lamps** instead of tubular halogen lamps. *Lighting Answers: Alternatives to Halogen Torchieres* examines the strengths and weaknesses of halogen torchieres and provides information about the energy efficiency, light distribution, and price of halogen and alternative torchieres.

Figure 1

Figure 2

Why are halogen torchieres so popular?

Halogen torchieres are popular with consumers because of their appearance, light distribution, versatility, availability, and cost. Torchieres provide **indirect lighting**, which means they illuminate spaces by reflecting light off ceilings and walls. They are an inexpensive source of indirect lighting that does not require an electrician to install. Their slim, upright design helps them fit into almost any decor. Torchieres make it possible to change the ambiance within a space by moving the torchiere or dimming the **lamp**. They are lightweight and can be easily moved from room to room. Halogen torchieres are often sold with **continuous dimming**, or **bilevel** or **trilevel switching**.

Light from undimmed halogen lamps has a **correlated color temperature (CCT)** of approximately 3000 kelvin (K)--slightly higher (more white) than the incandescent A-lamps used in most residential luminaires--and a **color rendering index (CRI)** of 95+. Dimming a halogen lamp reduces the CCT of the light, making it appear warmer (more yellow) and more like that of incandescent A-lamps.

Ninety percent of the halogen torchieres sold in the United States have 300-watt halogen lamps. Halogen torchieres have been widely available for years at department stores, lighting distributors, home improvement centers, and other retail outlets at prices as low as $10 to $15.

What problems are attributed to halogen torchieres?

Three-hundred-watt **halogen** lamps reach operating temperatures high enough to ignite paper, cloth, wood, or plastic that is tossed into, blown into, or draped over the **lamp**. In some cases, fires have started when torchieres have fallen over and touched carpet, drapes, or bedding. NLPIP measured temperatures in torchieres containing halogen, fluorescent, incandescent, and **metal halide lamps**, as shown in "How hot are the torchieres?".

Ecos Consulting examined data from the United States (U.S.) Consumer Product Safety Commission (CPSC), insurance companies, law firms, and newspapers. By August 1999, Ecos attributed 350 fires to halogen torchieres, resulting in 30 deaths, 114 injuries, and $2 million in damage (LightSite 1999). As a result of potential fire hazard, halogen torchieres have been banned in dormitories by two-thirds of the colleges and universities in the U.S. (Calwell et al. 1998).

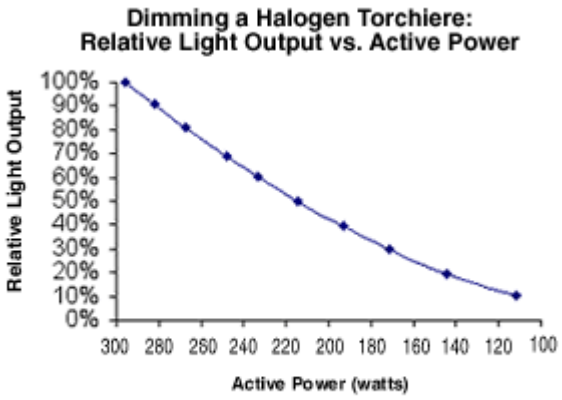
In 1996, Underwriters Laboratories (UL) withdrew its listing for halogen torchieres with 500-W lamps to reduce the risk of fire. They urged consumers to replace 500-watt (W) lamps with 300-W lamps. UL also tightened its safety requirements for halogen torchieres in 1997 and again in June 1999 (Underwriters Laboratories 1999). See "New UL Requirements" for examples of the new safety requirements.

When tubular halogen lamps fail, they sometimes explode or shatter. Careful handling is required because oils from the skin make the lamps susceptible to shattering while operating. For this reason, a tempered glass "shatter shield" is required in halogen torchieres to enclose any fragments of hot quartz glass that can scatter on nearby combustibles. This shield closely covers the lamp and offers very little heat protection. The shatter shield should be reinstalled every time the lamp is replaced. Unfortunately, some consumers disregard this precaution.

In addition, halogen lamps might not provide the energy savings that are sometimes advertised for them. Although some halogen lamps provide 18-20 **lumens** per watt (LPW), Siminovitch and Page (1997) found that the average imported halogen lamp produced less than 12 LPW--40% less than a 100-W **A-lamp**.

Dimming further reduces the **efficacy** of halogen lamps to as low as 2 LPW. Figure 3 illustrates that a halogen lamp dimmed to 50% of maximum light output still requires 73% of the **active power** it requires at 100% output. Another way to consider dimming efficacy is that when active power is reduced to 50%, the lamp produces only 20% of its maximum light output.

Figure 3



Although halogen torchieres are inexpensive to buy, operating cost makes them more expensive overall than most energy-efficient luminaires. The electricity costs of operating a halogen torchiere can be quite high, about $44 per year (assuming a 300-W lamp, operated for four hours every day, at 10¢ per kilowatt-hour). See "How much do the torchieres cost?" to compare the operating costs of halogen and alternative torchieres.

Consumers may also try to use the torchieres for reading, craft work, or other tasks best performed under **direct light**, and find them inadequate. Torchieres must produce relatively high light levels on the ceiling before enough light becomes available for these tasks. High or dark ceilings and walls further reduce the light available on task surfaces. Desk lamps or even table lamps with much lower-wattage lamps save energy and provide more appropriate task lighting.

What are the alternatives to halogen torchieres?

Manufacturers have introduced a number of compact-fluorescent-lamp (**CFL**) torchieres and at least one **metal halide** torchiere that offer similar light output and better energy efficiency than **halogen** torchieres and greatly reduce concerns about fire and explosion. Incandescent (**A-lamp**) torchieres are another alternative to reduce the risk of fire, although they are not necessarily more efficient than halogen torchieres. Alternative products are becoming available at retail outlets, online, and through mail-order catalogs (see "Where are they available?" for more information).

Incandescent-lamp torchieres

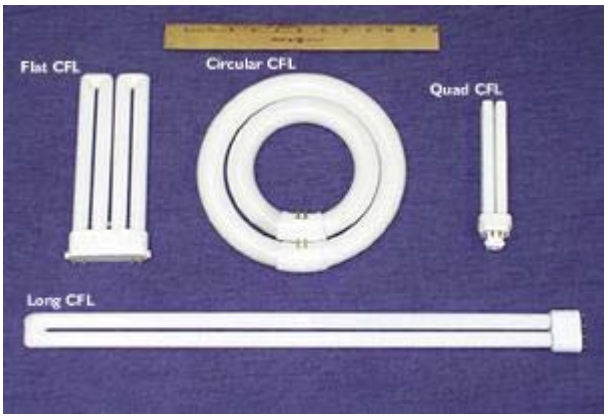
Many stores now offer torchieres with 100- or 150-watt (W) incandescent A-lamps. Like halogen **lamps**, incandescent lamps can be dimmed, and these torchieres are usually available with either **continuous** or **trilevel** dimming. Incandescent lamps are cooler than halogen torchieres, but they achieve lower temperatures primarily through reduced light output. They are about as efficacious as halogen lamps. Incandescent lamps are the least expensive of the lamps discussed in this report.

CFL torchieres

CFLs require a **ballast** to regulate starting voltage and operating current. The ballast increases the weight of the torchiere, although CFL torchieres are still lightweight and compact enough to be moved easily.

Several CFL torchieres include **bilevel** or trilevel switching, a few offer continuous dimming. Dimming generally increases the **correlated color temperature (CCT)** of CFLs, making their color appear cooler (unlike halogen and incandescent lamps). CFL torchieres are available in a number of lamp configurations containing the CFLs shown below. These CFLs are available in a range of CCTs with color-rendering indexes (**CRIs**) of at least 82, with **efficacy** ranging from 60-86 lumens per watt (LPW).

Figure 4



Metal halide torchieres

Like CFLs, metal halide lamps require a ballast to regulate starting voltage and operating current. The metal halide torchiere tested by NLPIP uses a 68-W metal halide lamp. Two 25-W (or lower wattage) incandescent A-lamps are included in the torchiere to provide light during the time needed for the metal halide lamp to reach full light output. The A-lamps can be turned off separately. The 68-W metal halide lamp has a CCT of 3200 with a CRI of about 75. The metal halide lamp is also more efficacious (at 88 LPW) than CFLs. However, it cannot be dimmed.

How much do the torchieres cost?

As of October 1999, utilities serving California, Connecticut, Idaho, Massachusetts, Montana, New Hampshire, Oregon, Rhode Island, Vermont, Washington, and Wisconsin provided incentives for ENERGY STAR torchieres (see "ENERGY STAR"). Some utilities offered $20 instant or mail-in rebates, while others offered a trade-in program: turn a **halogen** torchiere in at the store, and receive a $10-20 discount on a new ENERGY STAR torchiere.

NLPIP acquired samples of four compact-fluorescent-lamp (**CFL**) torchieres, one **metal halide** torchiere, one incandescent torchiere, and one halogen torchiere. The following table summarizes the initial and long-term costs of the torchieres tested by NLPIP.

Although the alternative torchieres cost more to purchase, their lower operating expenses (electricity and replacement lamps) make most of them more economical than halogen torchieres. For example, Table 1 shows that to buy and operate a halogen torchiere for one year costs from $59-64. To buy and operate an incandescent-lamp torchiere for one year costs $40-64 (torchiere, electricity, and one replacement lamp). A circular CFL torchiere, while costing more to buy, actually costs less in that first year ($38-58). Over a period of five years, even the $150 torchiere proves to be more economical than a halogen torchiere.

Table 1. Relative Costs of Torchieres

Lamp Type	Number & Type(s) of Lamps in Torchiere	Initial Cost of Torchiere ($U.S.)	Electricity Cost per Year ($U.S.)[a]	Rated Lamp Life (h)[b]	Replacement Cost per Lamp ($U.S.)	Approximate Operating Cost for Five Years ($U.S.)[a, c]
Halogen	one 300-W tubular double-ended halogen	15–20	44	2,000	5–8	234–243
Incandescent A-lamp	one 3-way (50-100-150-W) incandescent	16–40	22	1,200–1,500	2	118–122
Quad CFL	three 26-W quad-tube CFLs	90	12	10,000	8	58
Flat CFL	two 36-W flat CFLs	150	9	10,000	10	47
Circular CFL	one 20-W circular CFL and one 30-W circular CFL	30–50	8	10,000	18	40
Long CFL	two 40-W long twin-tube CFLs	600	14	12,000–20,000	15	69
Metal halide	one 68-W metal halide and two 25-W incandescent	375	10[d]	15,000	25	50[d]

[a] Assuming the torchiere is operated at full power (or highest switch setting) for four hours per day at 10¢ per kilowatt-hour. Based on rated active power.

[b] Information has been taken from lamp packaging or manufacturer's information.

[c] Includes cost of electricity and replacement lamps if necessary (based on rated lamp life).

[d] With the incandescent lamps switched off.

How hot are the torchieres?

According to the United States Consumer Product Safety Commission (CPSC), 300-watt (W) **halogen lamps** have operating temperatures of about 970°F (521°C) and 500-W halogen lamps have even higher operating temperatures, almost 1200°F (649°C). In comparison, the highest lamp-wall temperature reached by a 100-W incandescent **A-lamp** is 477°F (247°C). Operating temperatures of fluorescent lamps average 104°F (40°C) and rarely exceed 140°F (60°C).

To supplement these data, NLPIP measured temperatures at different points on the torchieres. The following table summarizes the findings.

Table 2. Relative Temperatures of Torchieres

Lamp Type	Number & Type(s) of Lamps in Torchiere	Bowl of Torchiere [°F(°C)]	Socket [°F(°C)]
Halogen	one 300-W tubular double-ended halogen	136 (57.8)	NM
Incandescent A-lamp	one 3-way (50-100-150-W) incandescent	86 (29.9)	106 (41.0)
Quad CFL	three 26-W quad-tube CFLs	77 (25.2)	middle lamp: 120 (48.9)
Flat CFL	two 36-W circular CFLs	89 (31.5)	middle lamp: 114 (45.7)
Circular CFL	one 20-W circular CFL and one 30-W circular CFL	near small lamp: 73 (22.8) near large lamp: 81 (27.0)	small lamp: 92 (33.5) large lamp: 91 (32.7)
Long CFL	two 40-W long twin-tube CFLs	90 (32.0)	99 (37.0)
Metal Halide*	one 68-W metal halide and two 25-W incandescents	97 (36.0)	middle lamp: 117 (47.0)

NM = not measured
* With the incandescent lamps switched off.

How efficient are the torchieres?

The following table summarizes data provided by the manufacturers or tested by NLPIP. NLPIP noticed that measured **active power** differed from rated active power for several torchieres. This difference can affect **efficacy**, operating cost, and light output.

Table 3. Torchiere Light Output and Efficacy

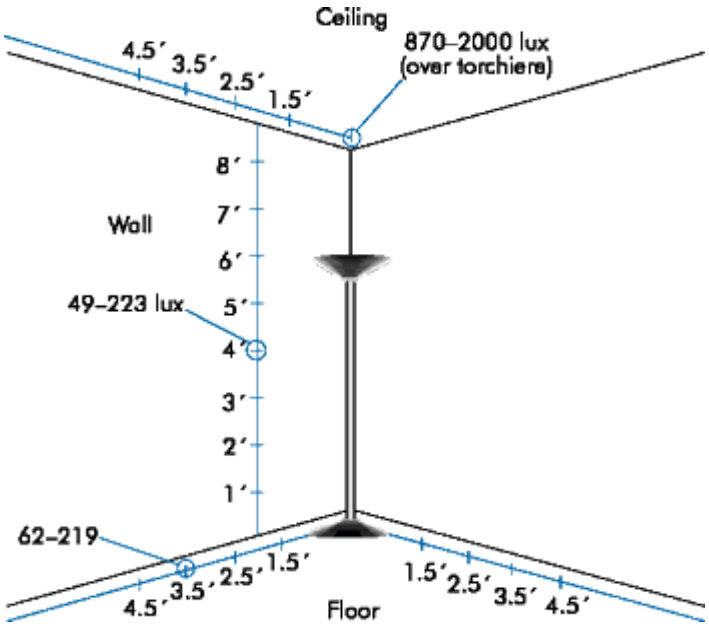
Lamp Type	Number & Type(s) of Lamps in Torchiere	CCT[a]	CRI[a]	Rated Light Output from Lamp(s) (lm)[a]	Rated Active Power (Including Ballast) (W)[a]	Measured Active Power (Including Ballast) (W)[b]	Rated Efficacy (lm/W)[c]
Halogen	one 300-W tubular double-ended halogen	3050	95+	4800–6000	300	300	16–20
Incandescent A-lamp	one 3-way (50-100-150-W) incandescent	2800	95+	2220	150	147	15
Quad CFL	three 26-W quad-tube CFLs	2700–3500	83	5400	80	74	68
Flat CFL	two 36-W flat CFLs	3000–4100	82	5600	65	65	86
Circular CFL	one 20-W circular CFL and one 30-W circular CFL	2800	84	3800	55	37	69
Long CFL	two 40-W long twin-tube CFLs	3000–4100	82	5800	95	82	61
Metal Halide	one 68-W metal halide and two 25-W incandescents	3200	75	6000	68	73[d]	88

[a] Information taken from lamp packaging or manufacturer's information.
[b] Measured by NLPIP at maximum switched setting.
[c] Calculated from rated light output and rated active power.
[d] With the incandescent lamps switched off.

Do torchieres distribute light differently?

NLPIP tested one sample of each of six alternative torchieres (described in "What are the alternatives to halogen torchieres?"). NLPIP also tested one halogen torchiere five times, each time with a 300-W **halogen lamp** from a different manufacturer. NLPIP duplicated a typical application of the torchieres by positioning the torchieres in the corner of a room with a white ceiling and walls. The center of each torchiere was 1.5' (0.4 meters) from the walls. The ceiling was 8' 10" (2.7 meters) high. NLPIP measured **illuminance** at the points shown in Figure 5. Figure 5 also indicates the range of illuminances that NLPIP measured at some of the points.

Figure 5



In general, the halogen torchiere and the alternatives produced similar light distribution patterns on the walls and floor. Figure 6 shows the typical pattern of illuminance produced by a torchiere in the corner of a room.

Figure 6

NLPIP compared rated light output to ceiling illuminance for the five halogen lamps and six alternatives. For the halogens and three of the alternatives (incandescent **A-lamp**, quad **CFL**, and flat CFL), the illuminance on the ceiling was directly related to the **lamp's** rated light output. In other words, the lamps with higher rated light output illuminated the ceiling more.

However, the long CFL torchiere produced higher illuminances on the ceiling than would be assumed from its rated light output.

The **metal halide** torchiere produced lower illuminances on the ceiling than might be assumed from its rated light output. It had a translucent shade instead of the usual opaque metal shade with a white interior. The translucent shade transmitted some light directly to the walls and floors rather than reflecting all light toward the ceiling.

The circular CFL torchiere also produced lower-than-expected illuminances on the ceiling. It had a translucent section at the base of the shade, which also transmitted some light instead of reflecting it toward the ceiling. Another possible explanation for this torchiere's low illuminance is that its low active power produces lower-than-rated light output from its lamp (see Table 3).

The rated light output of the five halogen lamps tested in the halogen torchiere varied by 25% (in other words, the lowest rated light output for a halogen lamp was 75% of the highest rated light output). The illuminances provided by the five lamps varied even more: the lowest illuminance at any measured point averaged only 59% of the highest illuminance at that point. These lamps were all tested in the same torchiere, which means that the variation was caused by the light produced by the lamps rather than by the design of the torchiere.

Where are they available?

Manufacturers have introduced at least 15 torchieres with the ENERGY STAR label (see "ENERGY STAR"). These torchieres are becoming more widely available at home-supply and department stores, as well as through mail-order catalogs. More information about obtaining these torchieres is available at the ENERGY STAR Web site. For regions of the country not well served by retailers listed in ENERGY STAR'S product locator, the LightSite Web site provides further information and an online catalog.

In July 1999, NLPIP staff identified the following manufacturers of **CFL** or **metal halide** torchieres by attending industry trade shows and talking to others in the industry. Most of these torchieres have the ENERGY STAR label. Contact the manufacturers directly for more information about their products.

Table 4. Manufacturer Contact Information

Company	Address	Customer Service #
Catalina Lighting Incorporated	18191 NW 68th Ave. Miami, FL 33015	305-558-4777
Emess Lighting	1 Early St. Ellwood City, PA 16117	800-688-2579
Energy Federation Incorporated	14 Tech Circle Natick, MA 0l760	800-876-0660
Good Earth Lighting	712 S. Milwaukee Ave. Wheeling, IL 60090	847-808-1133
Lights of America	611 Reyes Dr. Walnut, CA 91789	909-594-7883
Microsun	9201 Washington Ave. Racine, WI 53406	888-281-1233
Technical Consumer Products	29401 Ambina Dr. Cleveland, OH 44139	440-542-5151
Waldmann Lighting	9 West Century Dr. Wheeling, IL 60090	800-634-0007
Visa Lighting	8600 W. Bradley Rd. Milwaukee, WI 53224	414-354-6600

What can one do with an existing halogen torchiere?

Consumers who own **halogen** torchieres should use **lamps** rated at 300 watts or less and never place materials on top of or near a torchiere-style fixture.

Several halogen torchiere manufacturers, working with the United States Consumer Product Safety Commission (CPSC), have developed a wire guard that prevents the hot lamp from coming too close to flammable materials. The CPSC recommends that consumers obtain and install the guard. Free wire guards with installation instructions are available from many major retailers; for a list, call 800-985-2220. Consumers who have trouble acquiring a guard can send a postcard requesting a guard to Dana Lighting, Consumer Services, 55 Norfolk Avenue, Easton, MA 02375.

Underwriters Laboratory (UL) maintains a safety information line at 800-787-8540 and offers tips on its Web site; free literature is also available. The CPSC Web site also offers tips and other news.

Halogen torchieres manufactured after February 5, 1997, come with a guard in place or loose in the box (torchieres manufactured after June 1, 1999, must have the guard attached). Other new halogen torchieres feature an automatic switch that turns off the torchiere if it detects higher-than-normal heat or if the torchiere tips over.

Glossary Terms

Sources of term definitions: National Lighting Product Information Program (NLPIP), Lighting Research Center's Lighting Education Online, the IEEE Standard Dictionary of Electrical and Electronics Terms (IEEE Std 100-1996).

A-lamp	**The incandescent lamp most commonly used in North American households. The "A" designation refers to the lamp's bulbous shape.**
Active Power	**the system input power (in watts) for a lamp-ballast combination.**
Ballast	**A device required by electric-discharge light sources such as fluorescent or HID lamps to regulate voltage and current supplied to the lamp during start and throughout operation.**
Bi-level switching	**Control of light source intensity at two discrete levels in addition to off.**
Color rendering index (CRI)	**A measure of the degree of color shift that objects undergo when illuminated by the light source as compared with those same objects when illuminated by a reference source of comparable correlated color temperature. The maximum CRI is 100.**
Compact fluorescent lamp (CFL)	**A family of single-ended fluorescent-discharge light sources with small-diameter [16-millimeter (5/8-inch) or less] tubes.**
Continuous dimming	**Control of a light source's intensity without abrupt transitions.**
Correlated color temperature (CCT)	**A specification of the apparent color of a light source relative to the color appearance of an ideal incandescent source held at a particular temperature and measured on the Kelvin (K) scale. The CCT rating for a lamp is a general indication of the warmth or coolness of its appearance. As CCT increases, the appearance of the source shifts from reddish white toward bluish white; therefore, the higher the color temperature, the cooler the color appearance. Lamps with a CCT rating below 3200 K are usually considered warm sources, whereas those with a CCT above 4000 K usually considered cool in appearance.**
Direct light	**Light emitted by a luminaire in the general direction of the task to be illuminated. The term usually refers to light emitted in a downward direction.**
Efficacy	**The ratio of light output (in lumens) to input power (in watts), expressed as lumens per watt (LPW).**

Halogen lamp	**An incandescent lamp that uses a halogen fill gas. Halogen lamps have higher rated efficacies and longer lives than standard incandescent A-lamps.**
Illuminance	**The density of luminous flux incident upon a surface. Illuminance is measured in footcandles (lumens/square foot) or lux (lumens/square meter). One footcandle equals 10.76 lux.**
Indirect lighting	**Light arriving at a surface after reflecting from one or more surfaces (usually walls and/or ceilings) that are not part of the luminaire.**
Lamp	**A radiant light source.**
Lamp life	**The number of hours at which half of a large group of lamps have failed when operated under standard testing conditions.**
Lumen (lm)	**A unit measurement of the rate at which a lamp produces light. A lamp's lumen output rating expresses the total amount of light the lamp emits in all directions per unit time.**
Luminaire	**A complete lighting unit consisting of a lamp or lamps and the parts designed to distribute the light, to position and protect the lamp(s), and to connect the lamp(s) to the power supply. (Also referred to as fixture.)**
Metal halide lamp	**A high-intensity discharge (HID) lamp that uses mercury and several halide additives as light-producing elements.**
Tri-level switching	**Control of light source intensity at three discrete levels in addition to off.**

Resources

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Lighting Answers

Lighting Answers is a serial that complements the National Lighting Product Information Program's (NLPIP's) other serial, *Specifier Reports*. Each issue of *Lighting Answers* presents information in one of three formats: educational information about a specific topic of concern to lighting professionals; a summary of available information about a particular technology in an educational format with no testing; and information about a new or special technology on which NLPIP has performed some limited testing. For this issue of Lighting Answers, NLPIP presented information about halogen torchieres and alternative products and performed some limited testing.