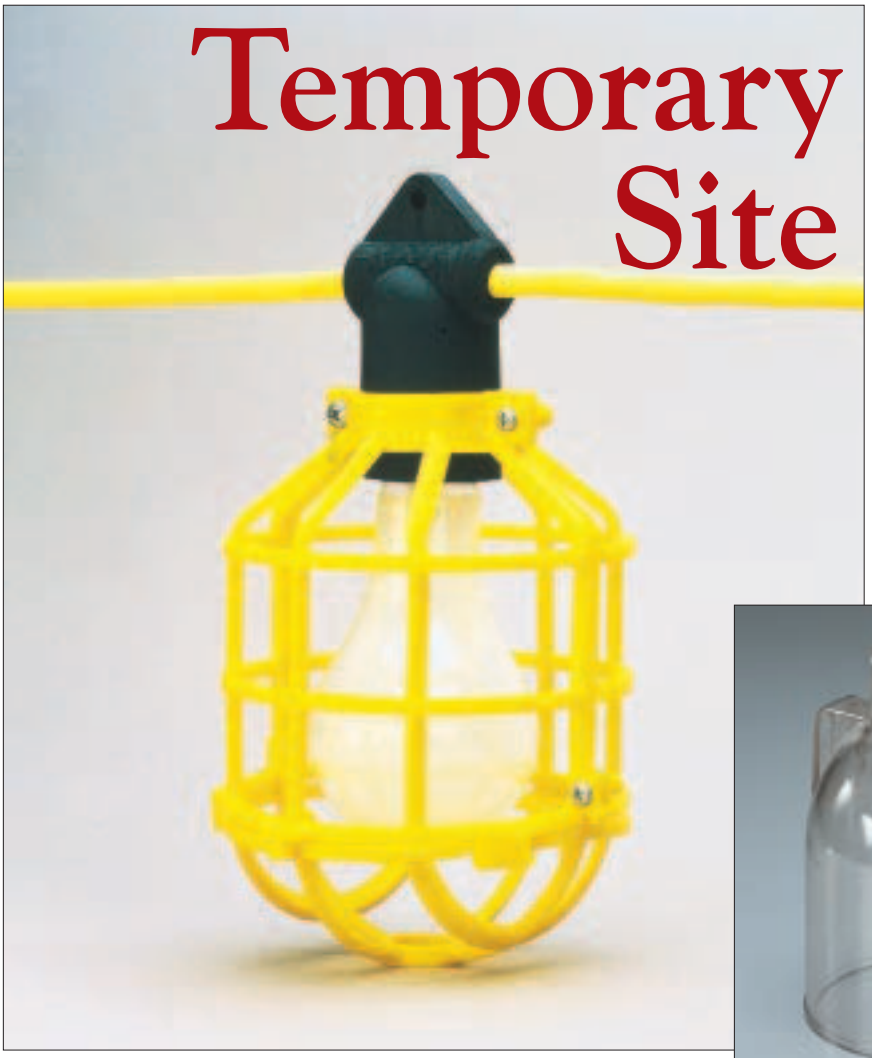
Temporary Site Lighting

by John Wagner



Ericson's Constructo-Lite is typical of incandescent string light systems. The fixtures are spaced 10 feet apart on 50- or 100-foot lengths of 12/2 or 14/2 cable, and the lamps are protected by nonconductive clamshell baskets. An open-bottom polycarbonate Rain Guard globe is also available for added protection from moisture and debris (inset).

A survey of code-approved, portable lighting for the work site

Most contractors like to work in good light. Yet a good number of them spend eight hours a day on sites or in workshops that are poorly lit by unsafe fixtures. Not only are many builders and remodelers in the dark about the OSHA regs and *National Electric Code* (*NEC*) standards that apply to temporary lighting, few know what lighting options are available beyond droplights and cheap clamp-ons.

In this article, I've surveyed manufacturers and found a variety of up-to-code general-purpose and specialty site lighting equipment, much of it at reasonable cost.

String Lights

The most common type of temporary site lighting is the string light. But older string lights that use two wire strands to connect each fixture are now in violation of the *NEC*. A 1996 change (*NEC* Article 305-4-c) now requires that the conductors be a jacketed "cable assembly" that meets *NEC* Table 400-4 specs for "hard or extra-hard usage." The new complying string light systems are essentially strung with Romexlike cables (12/2, 12/3, 14/2, or 14/3), and that's what's required on all sites.

Incandescent vs. fluorescent. Incandescent string lights are usually strung together into 50- or 100-foot lengths with 12/2 or 12/3 cable (see photos above). Each fixture is protected by a clamshell basket, and each has a hook or eyelet at the top that can be used to support the string from the ceiling or from a "messenger" wire. The fixtures are spaced 10 feet apart and are usually rated for a maximum of 200 watts.

Prices range from about $1.20 per linear foot for basic models to about $4.75 per linear foot for top-of-the-line units. Price variations account for quality differences in construction of sockets, size and durability of the cable, and special features, such as weathertight globes used in place of baskets.

Most fluorescent string lights have molded-rubber moisture-resistant sockets and polycarbonate bulb shields. (Figure 1). Because a 40-watt fluorescent puts out 3,150 lumens compared with 1,260 lumens for a 100-watt incandescent, fluorescent string lights can in some cases be spaced 15 feet apart rather than at the typical 10-foot intervals required by OSHA. Fluorescent lamp life also averages 20 times that of an incandescent lamp. You may pay more up front, but you get a longer-life product. Be careful, though: Fluorescent lamps may be slow to start, or not work at all, in temperatures below 40°F.

Installation. Code prohibits hanging string lights by the conductor. This means you can't just loop the cable over some nails; you must hang the fixtures from ceiling hooks or from a messenger wire, which most manufacturers sell. Either method takes strain off the wire-to-socket connection and adds life to the light string.

Also be careful when daisy-chaining light strings together. If your 100-foot light string is rated for 200 watts per socket and you daisy-chain a second one in series, you may be able to put only a 100-watt lamp in *each* fixture. Check the wattage capacity of your conductor and calculate the watts you are drawing along the *entire* length of your daisy chain.

Buying tips. Keep these four points in mind before you make a purchase:

- Buy only UL-listed products.
- Not all string lights come preassembled; you may have to put together the cages. While strings with unassembled cages may be easier to store, assembly can add half a day to setup time.
- All string lights must be GFCI-protected (see "Shedding Light on OSHA Rules"). In-line GFCIs are available, but expect to pay a premium.
- Lamps (bulbs) are sold separately. For incandescents, "rough surface" lamps may be the best buy. A Teflon coating adds life to these lamps by protecting the fragile glass globe against the damaging effects of moisture and dust.

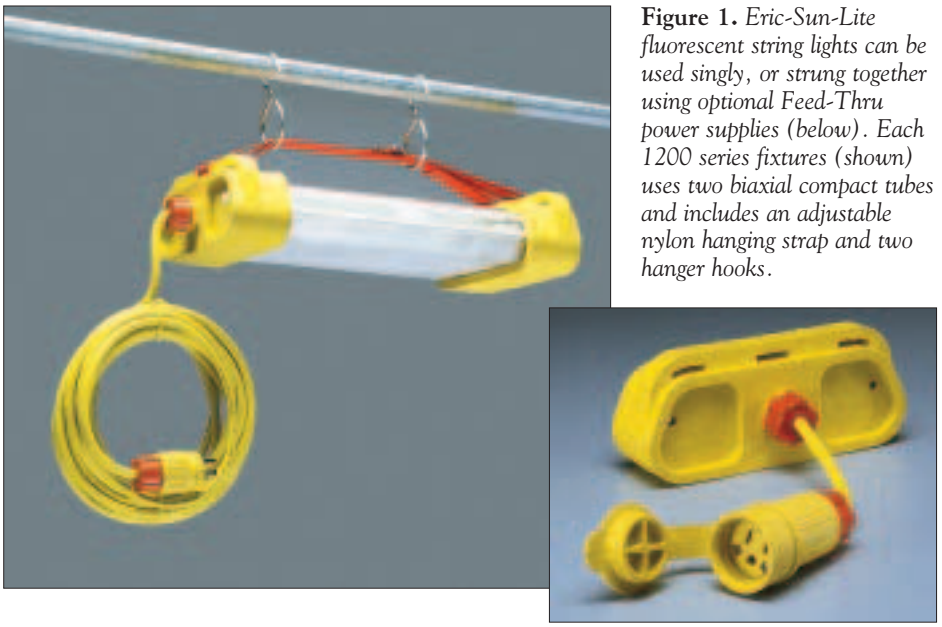


Figure 1. *Eric-Sun-Lite fluorescent string lights can be used singly, or strung together using optional Feed-Thru power supplies (below). Each 1200 series fixtures (shown) uses two biaxial compact tubes and includes an adjustable nylon hanging strap and two hanger hooks.*

Shedding Light on OSHA Rules

The Occupational Health and Safety Administration (OSHA) and *National Electrical Code* (*NEC*) have standards for temporary lighting. To request the full text, ask for OSHA 29 CFR 1926, or *NEC* Section 305-3, 305-4, and 400-4. Here's a summary of what you need to be in compliance.

String Lighting

OSHA and *NEC* require jacketed conductors for string lights. OSHA also requires that all string light lamps be protected against accidental contact or breakage. If you use metal-case sockets or metal cages, the conductors must be grounded, so use 12/3 or 14/3 cables with a three-prong plug.

Temporary lights must be supported every 10 feet, and cannot be suspended by their electric conductor (the cord) unless the conductor or fixture is designed for this purpose, as when a hook is included on top of each fixture. Also, the electrical conductor cannot touch the ground (OSHA Standard 1926.405a.2.ii).

Clip-Ons and Hand-Helds

Portable lights must be wired with grounded, flexible cord. Metal shell, paper-lined lamp holders cannot be used, and each lamp must have a lamp guard attached to the handle. Metallic guards must be grounded by a grounding conductor (you can use 12/3 or 14/3 cable with a three-prong plug). **Note:** Standard household "lamp cord" running to clip-on bell lights is noncompliant. The light must have a grounded conductor and be protected where it enters the fixture with a bushing (OSHA Standard 1926.405.j.1.iii).

Wet Areas

Portable lighting used in wet and/or conductive locations, like tanks or ducts, must be operated at 12 volts or 120 volts with a GFCI protector (OSHA Standard 1926.405.a.2.ii.G).

Hazardous Areas

OSHA Standard 1926.407.b requires hazardous-duty portable lights when working around flammable gases and vapors (Class I, Div. I, Groups C & D) and ignitable dusts (Class II, Div. I, Groups F & G). To be in compliance, you need hand lights that feature nonsparking aluminum guards, shock-resistant tempered glass globes, and nylon and ribbed antislip handles on the fixtures.

— J.W.

Lamps, Watts, and Lumens

When buying site lights, it's important to consider both the type of lamp, or bulb, and the amount and quality of the light it produces.

Lamps come in five types: fluorescent, high-pressure sodium, incandescent, metal halide, and quartz or quartz halogen. Lamp power is measured in *lumens*, which indicates the amount of visible light emitted. Lamp efficiency, however, is gauged by the number of lumens produced per watt. For instance, a 100-watt metal halide lamp produces six times the lumens (80 lumens per watt) of a 100-watt incandescent lamp (12 lumens per watt). Though the incandescent lamp may be less expensive initially, the metal halide will give you more bang for your buck.

Light quality is measured using a *color rendering index* (CRI) that ranges from 1 to 100. The index is based on sunlight, which has a CRI of 100. Sunlight renders the colors of an object as they really look; further down the CRI scale, drywall seams, paint colors, wood stains, and other surfaces appear less and less as they do in sunlight. Depending on the application, a lamp's CRI rating can affect the work you do under its light. For instance, high-pressure sodium lamps, whose CRI is 22, are no longer used for parking lots because the quality of the light they emit makes it almost impossible for drivers to distinguish the color of otherwise identical vehicles. By contrast, a fluorescent lamp's CRI is between 70 and 85, which is why they are commonly used to illuminate paint chip displays. Quartz halogen and incandescents also have a high CRI, but they have to burn more electricity to achieve it. Metal halide has a CRI of around 60.

— *J.W.*

Figure 2. *Fostoria's PUL-2000Q-TA wide-area light (left) mounts four 500-watt quartz lamps on a folding tripod; model PUL-1000QC/GEN (right) includes an integral generator on wheels for remote sites. Both stanchions feature heavy-duty telescoping poles.*

Wide-Area Lights

For more intense single-source lighting, wide-area lights are usually equipped with high-pressure sodium (HPS), metal halide, or quartz halogen lamps. Quartz halogen lamps are best for task lighting, though they create glare and burn hot; the low CRI of metal halide and HPS lamps produces a muddy, sometimes orange light (see "Lamps, Watts, and Lumens," at left). Wide-area lights usually come on tripod stands, stanchions, or weighted pedestals, and the light heads are often mounted on telescoping poles. Small wide-area and low-voltage lighting units typically use quartz lamps, with the lights mounted either on wheels or on a small stand.

Stanchions. Wide-area lights tend to be 500- or 1,000-watt units (the latter usually have two heads with one 500-watt lamp in each head). The best models have HPS lamps or quartz lamps, and the cords mount to the base of the stanchion, not the light fixture, reducing trip hazard (Figure 2). Higher-quality lights also have a sturdier chassis and a better locking system for telescoping support poles. Prices vary with quality, from about $100 to more than $500.

Wide-area fluorescents. Because of their true color rendering, wide-area fluorescents offer better task lighting for jobs like wood finishing, painting, plastering, wallpapering, drywalling, and trim work (Figure 3).

Buying tips. Here are some premium features to consider:

Figure 3. *Wide-area fluorescents stay cool and render colors accurately, making them a good choice for finish work. Fostoria's PUL-72F-C Light Cart ($170) casts 5,800 lumens at 72 watts.*

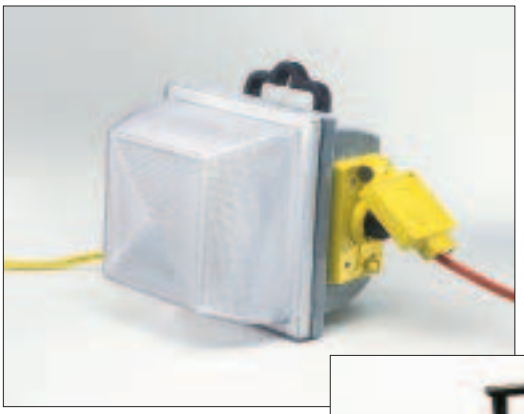


Figure 4. *Woodhead's handheld 8560U wide-area light (above) includes a GFCI-protected outlet mounted on the case. Fostoria's Hand-Carry handheld (right) uses a 500-watt Hubbell lighthead and comes with a 15-foot grounded cord.*

Figure 5. *Two new hand lights from Carol have no permanently attached cord of their own, but can be plugged into the female end of an ordinary extension cord. The Plug-It Fluorescent Light (left) uses a cool-to-the-touch 13-watt bulb; the Plug-It Utility Light (below) improves on standard droplights with the addition of a polished reflector to boost output, and a six-sided cage design that helps to hold the light in position against flat surfaces.*

- Always buy UL-listed products.
- Look for a weathertight chassis. Fixtures last longer when sealed against moisture, rain, and dust.
- Consider shockproof sockets. Wide-area lights are rugged, but if one tips over a few times or gets jostled around in the truck, the filament will break.
- Buy extra lamps at the time of initial purchase. To prolong lamp life, use a tissue when installing a lamp with your bare hands. Otherwise, the sweat and salt residue will cause the bulb to heat unevenly and burn out prematurely.
- Ask about optional reflectors that can be used to direct light on your task.

Hand Lights

Like string lights, hand lights use either incandescent or fluorescent lamps, and are fitted with a stand, a clamp, or a hook at one end of the fixture for easy hanging.

Fluorescent hand lights are popular because they have high lumen output per watt, they don't heat up tight spaces, and they have a "cool" glareless light (Figure 4). Also, fluorescent hand lights tend to be more durable, because the lamp can be protected by a shatter-resistant plastic shield.

Incandescent hand lights are the general-purpose droplights you see in every plumber's toolbox (Figure 5). At the low end is Dayton's $12 model; Woodhead's high-end model costs $105 and can run on 12, 110, or 220 volts. It has a rubberized molded handle, a rubber diaphragm over the switch, and an integral outlet.

Clip-ons are cheap, lightweight, and can be clamped nearly anywhere. Their watt ratings range from 75 to 300, and they cost between $10 and $20. But the typical product available at the local hardware store may be a household rather than an industrial fixture. OSHA requires a three-prong grounded cord that is protected from fraying by a bushing where it enters the fixture. Look for a UL listing on the label showing that the product complies with OSHA standards 410-42(a), 410-42(b), and 410-44.

Wet-area and hazardous-duty lights are also available in fluorescent and incandescent models. Made specially for wet or hazardous locations (such as metallic tanks, or with confined flammable gases, vapors, or volatile dusts), they typically include sealed tempered-glass globes and nonsparking cast-aluminum cages. Most can run on line voltage or low voltage (lamp wattage may be limited in hazardous-duty models). ■

Contributing editor John Wagner writes frequently on construction topics from his home in Montpelier, Vt.

Sources of Supply

Carol Consumer Products
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Highland Heights, KY 41076-9753
606/572-8000
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Daniel Woodhead Company
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Northbrook, IL 60062
847/272-7990
Circle # 19

Ericson Manufacturing Company
P.O. Box 890
Willoughby, OH 44094
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Fostoria, OH 44830-0986
419/435-9205
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