



Green Energy and CAST Lighting

Addressing Energy Conservation and Environmental Concerns with CAST Lighting Products.



Summary:

There is an ever-increasing demand for energy-efficient lighting and for lighting that addresses other environmental concerns. For this reason, lighting manufacturers have responded in varying degrees with products designed with these goals in mind.

- ▶ CAST Lighting LLC., from its inception, established rigorous standards for its luminaires, lamps, power supplies and other system components. Installation methods were also developed with the same intent. These standards embrace the following criteria: (These points are discussed in detail later in this document.)
- ▶ Adherence to energy efficient low voltage (12-volt) lighting.
- ▶ Selection of lamps with highest possible lumen efficacy (lumens/watts).
- ▶ Selection of lamps with longest possible life.
- ▶ Luminaire design to maximize luminaire efficiency ('emitted lumens' / 'lamp lumens').
- ▶ Luminaire design to minimize light trespass and light pollution.
- ▶ Selection of materials in the construction of luminaires for maximum useful life and resistance to corrosion.
- ▶ Selection of materials in the construction of wire to maximize resistance to corrosion and maintenance of conductivity.
- ▶ Selection of highly energy efficient toroidal transformers.
- ▶ Establishment of installation methods that maximize energy efficiency of the lighting system and preserve this efficiency for an extended time.

Lighting Mandates and Guidelines – How CAST Lighting Measures Up

Numerous agencies and organizations, both governmental and non-governmental, have established requirements and guidelines that impact the lighting industry. This is a fairly recent development coinciding with growing concern over energy usage and environmental protection.

While it is beyond the scope of this paper to document information from every group, the following summarizes what a few of these groups have developed and how CAST Lighting products fit into their goals.

- ▶ **LEED** (Leadership in Energy and Environmental Design). This is a Green Building Rating System developed by the U.S. Green Building Council. It employs a point system to reward various accomplishments in energy savings and environmental conservation.

Two parts of the LEED certifications apply to lighting - light pollution reduction and optimizing energy performance. CAST lighting luminaires and lamps can be used to meet these standards. Most of the luminaires are fully shielded to prevent light pollution; and our transformers and lamps are highly energy efficient. Used in combination with other sustainable elements in the project, an exterior lighting design using CAST Lighting luminaires can meet standards sufficient to gain LEED points.

- ▶ **Energy Efficiency and Conservation Block Grant Program** (U.S. Dept. of Energy). This is a government-backed incentive program to reward various initiatives that achieve measurable goals. Many of the initiatives involve reducing energy expenditure in commercial and municipal facilities. While goals are developed on a per project basis, the LEED standards are commonly adopted. CAST Lighting products, as stated above, contribute toward the achievement of these standards.
- ▶ **Building Energy Codes Program** (U.S. Dept. of Energy). This government program works to improve energy efficiency through various means; they collaborated with the Illumination Engineering Society of North America (IESNA) to develop guidelines for lighting. While these standards apply mainly to interior lighting, external lighting requirements exist that mandate automatic switching and controls. All CAST Lighting systems comply with this requirement since they feature timers and photocells.
- ▶ **International Dark Sky Association (IDA)**. This non-profit organization seeks to reduce light pollution and light trespass as well as energy efficiency. Their guidelines have been incorporated into numerous lighting ordinances established by state, municipal and local agencies. Their guidelines establish standards for luminaire design and use. CAST Lighting products are exceptional in their adherence to these standards. All path lighting fixtures rate as full cutoff type which is the highest possible rating. All directional fixtures that may be used in uplighting situations have extended light shrouds to allow for maximum reduction of light spill and direct glare – both requirements for the elimination of light trespass. CAST Lighting also trains designers and installers in methods to best adhere to IDA standards.

All CAST path lights (amber and red LED models) have been certified by the Florida Wildlife Conservation Commission as Turtle-Safe.

Design and Construction of CAST Lighting Luminaires

There are many features in the design and construction of CAST Lighting luminaires that meet or exceed standards employed by other manufacturers. Some of these features are critical to meeting or exceeding standards adopted by regulatory agencies.

- ▶ **Materials for construction.** The great majority of CAST Lighting luminaires are constructed of solid sand-cast bronze. This material is essentially unbreakable and resists corrosion for decades. This means that CAST Lighting luminaires never need to be replaced. Luminaires made of inferior materials require replacement every few years – requiring ongoing expense and wastage of valuable material resources.

CAST Lighting is the only manufacturer to use marine-grade tin-coated wire for all internal and field wiring. Other manufacturers use all copper wire that is subject to severe corrosion from moisture and aggressive agents in soil. Wire corrosion reduces conductivity making lighting systems less energy efficient and eventually lead to the need to entirely replace wire – another waste of valuable resources. Tin-coated wire, used in combination with tin-soldered connections, maintains good electrical conductivity throughout the life of the system.

CAST Lighting uses the highest quality lamp sockets that withstand heat and corrosion for an extended time. These sockets are connected to field wires with a corrosion-proof method of soldering, crimping and the use of waterproof heat-shrink tubing. Other manufacturers are much less aggressive in their protection of these vulnerable connections.

- ▶ **Luminaire Design.** CAST Lighting produces two main types of luminaires – directional lights and path lights.
 - ◆ CAST Lighting Directional lights are designed with extra-long adjustable shrouds to enable precise aiming and concealment – both important factors in the control of light trespass and light pollution. Other manufacturers fail with many of their models to properly shroud the light source leading to greater incidence of direct glare and light spill into the sky and adjacent properties.
 - ◆ CAST Lighting Path Lights are designed to completely hide the lamp – the only light emitted is light that reflects off the underside of the hats. This creates a luminaire with full cutoff rating and eliminates any possibility of direct glare.

Design and Construction of CAST Lighting Power Supplies (Transformers)

A low voltage lighting system requires a transformer to convert 120-volt current to 12-volt current. The energy required to make this conversion determines the electrical efficiency of the transformer. CAST Lighting transformers all use highly efficient toroidal-type magnetic cores. Many other manufacturers use the less efficient EI (laminated) type and are up to 10% less efficient.

Design and Construction of CAST Lamps

CAST Lighting manufacturers highly efficient tungsten halogen and miniature incandescent lamps with extended lamp life. The most commonly used CAST Lighting lamp, the MR-16 Service Saver, is constructed with an aluminum reflector specifically designed to increase luminous efficacy throughout its life. Other manufactures use dichroic reflectors that have a lower efficacy and exhibit greatly reduced lumen output as they age.

Lumen Output of CAST MR-16 Service-Saver Lamps

Various municipalities may impose a limitation on lamp lumen output.

- ▶ 10 watt: 120 lumens
- ▶ 20 watt: 300 lumens
- ▶ 35 watt: 510 lumens
- ▶ 50 watt: 900 lumens

The CAST Lighting (Energy-Conscious) System of Installation

David Beausoleil, President and Founder of CAST Lighting, pioneered a comprehensive method of low voltage lighting installation that succeeds in conserving energy, extending longevity and maintaining optimal system performance. Other methods, currently promoted by other manufacturers waste energy and result in a sub-optimal system.

The CAST Lighting System of Installation includes the following:

- ▶ Selection of CAST Lighting luminaires, lamps, wire and transformers.
- ▶ Selection of wire gauge to reduce voltage loss.
- ▶ Configuration of lighting system to reduce lighting loads on individual wires.
- ▶ Selection of lowest possible lamp wattages to accomplish lighting design.
- ▶ Selection and settings of timer and photocell to minimize run times.

A comparison of the CAST Lighting System of Installation vs. another manufacturer's recommendations was conducted based on a typical 25-luminaire installation. The CAST Lighting System consumed 42% less energy than the other system.

A Note about LED's

Many architects and lighting designers are seeking information about the use of LED's for outdoor lighting projects.

- ▶ Bright light LED's are very new to the market and long-life claims are highly suspect. These claims are based on testing under ideal laboratory conditions with controlled temperature and humidity for a truncated period of time. In addition, most LED's are not tested inside the fixtures they are meant to populate, nor under variations typical in a field installation. The accuracy of these claims has already received very poor grades in the Caliper testing program conducted by the U.S. Dept. of Energy.
- ▶ Bright light LED's are highly susceptible to heat damage. Exposure of the LED to temperatures a few degrees above specifications results in a dramatic degradation of life. For this reason, luminaires require aggressive heat management that will function under conditions of high ambient temperatures.
- ▶ LED's are highly susceptible to voltage spikes and electromagnetic radiation. Existing LED power supply supplies and regulators offer insufficient protection from this type of challenge.
- ▶ Since LED's do not burn out (they become dimmer), it is very difficult to assess the actual life of LED luminaires once they've been installed.

CAST Lighting now offers a number of LED fixtures. These were only released after several years of engineering with the following quality criteria:

- ▶ Effective heat management to maintain junction temperatures within functional limits - tested in the fixtures under extreme environmental conditions.
- ▶ Effective protection from moisture intrusion including conditions of condensing humidity.
- ▶ All boards and modules can be replaced by the user.
- ▶ Effective controls for color and RFI filtering.
- ▶ Electronic designs to maximize energy efficiency.