

ALL NEW!



Exclusive Ice Rink Lighting

Finally there is high efficiency environmentally friendly lighting specifically designed for ice skating rinks. Ultra-Tech™ Lighting has created full spectrum low glare Rink-Bright™ fixtures to replace conventional metal halide lamps. For the first time, rink managers can have lighting that is precisely engineered for ice rink environments. Proprietary LumenTec® spectral tuning matches the reflective and refractive properties of ice and the undercoating to provide the very best illumination without typical hot spots or shine off the ice surface. Rink-Bright™ technology saves up to 85% in direct electricity use over metal halide and as much as 20% more on temperature and humidity control. A 300-watt Rink-Bright™ fixture can easily replace a 1,000-watt metal halide. The super high efficiency ballast has a .98 power factor (PF) and draws less than 15 watts compared with conventional metal halide ballasts that can use more than 150 watts in a 1,000-watt fixture.

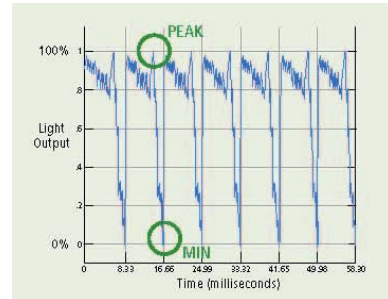
Rink-Bright™ fixtures are “cool;” operating temperatures are warm to the touch. This substantially reduces heat load. There is no radiated heat or infrared that can adversely affect the ice surface and Rink-Bright™ will not negatively impact humidity control. This represents significant savings on ice maintenance.

With a 100,000 hour rated lifecycle, Rink-Bright™ lamps last 500% longer than metal halide. More importantly, metal halide loses 30% to 50% in lumen output in the first 50% of their lifespan. Rink-Bright™ fixtures retain 90% of their lumen output over 90% of their lifecycle. Rink-Bright™ lights can be turned on and off without waiting for a lengthy warm-up or cool down. The lifecycle is unaffected by on/off cycles.

Rink-Bright™ fixtures are dead silent. There is no buzz, hum, or high-pitch harmonics. No matter how long the fixtures operate, they will not flicker or pop like metal halide. Performance is smooth and consistent over the entire 100,000-plus hours. There is no better lighting for indoor and outdoor ice skating rinks.

Rink-Bright™ versus LED –

Light emitting diode (LED) fixtures are *not appropriate* for ice rink lighting. LEDs using alternating current (AC) drivers flicker at the alternating current 60Hz cycle, causing “strobe effect.” The result is a form of stop action that can reduce visual acuity by up to half a foot for a skater at 15mph. Both ice hockey and figure skaters can sustain speed bursts in excess of 20mpg. Strobe effect also affects the ability to track and focus upon the puck that can travel between 75mph and 105mph. Even the slightest flicker can be disorienting for following



Strobe effect stops action as illustrated by the famous golf swing in motion. The flicker rate of AC driven LEDs creates the same effect that can impair visual acuity, distort depth perception, and even impact wellbeing.

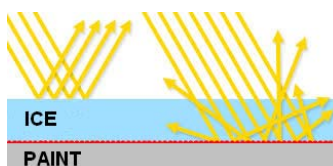
fast movement on the ice. Although metal halide lights can also flicker, the intensity tends to be less than a standard alternating current LED fixture. As the graph illustrates, an LED fixture can literally dip to near zero. LED flicker has been linked to strobe epilepsy, migraine headaches, nausea, impaired visual acuity, poor concentration, sleep disorders, mood swings, eye strain, and a lack of eye/hand coordination. The problem is serious enough for the IEEE Standards Working Group, IEEE PAR1789, to take up “Recommending practices for modulating current in High Brightness LEDs for mitigating health risks to viewers.”

The Science of Illuminating Ice Rinks –

Ice rinks present unique lighting challenges that include:

- ◆ Reflection off ice surface and refraction through the ice surface
- ◆ Penetration through to undercoating (paint)
- ◆ Glare
- ◆ Potential temperature interference
- ◆ Potential humidity interference
- ◆ Viewing gallery lighting contrast

Since ice has a high reflectivity index, metal halide and LED lighting produces sharp glare spots or “hot spots” on the surface. This can obscure contrast and cause pupils to repeatedly dilate and contract, producing eye strain. Hot spots can interfere with depth perception and distort spatial perspective. This is critical for both ice hockey and figure skating since a hot spot can obscure the position of the puck or the landing site for a jump.



On the left, metal halide and LED light bounces off the ice surface causing hot spots and glare. Rink-Bright penetrates to the painted subsurface and refracts up through the ice for more uniform illumination on the right.

Rink-Bright™ technology employs proprietary nano-reflector coatings that diffuse light over the intended illumination field. In addition, the spectrum is tuned to penetrate through the ice to the undercoating and refract back

through the surface to provide uniformity. The result is a more visible surface with no glare and no distortion. Bulbs are not hot like metal halide so none of the lamp's energy is wasted by generating heat and invisible infrared light. This provides maximum efficiency using the least amount of electricity. Since there is no excess heat, Rink-Bright™ fixtures will not add to air conditioning or refrigeration loads. Consider that metal halide bulbs may be as hot as 900°F and can project radiant heat down to the ice surface. This can accelerate melting and sublimation, requiring additional refrigeration and ice surface maintenance. The added evaporation can adversely impact humidity, further degrading the rink environment and raise energy costs.



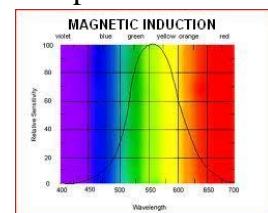
Spectrum Balance –

Rink-Bright™ uses a fully balanced spectrum with emphasis upon “visually effective lumens” (VEL). Although the color temperature is rated above 6,500K, the light is UV truncated with wavelength concentrations within the most appropriate range for the reflective and refractive properties of ice surfaces. It is important to understand that frozen water is one of the most complex and variable compositions in nature. There is no such thing as simply “ice.” The reflective and refractive properties of ice depend upon many factors that include the freezing time, freezing temperature, maintenance temperature, humidity, surface finish, moisture, and more. This is why the *right spectral balance* is so important. For the best illumination, the spectrum must have a range and intensity that covers all likely ice conditions.



For ice and snow, a more uniform color distribution is critical. Excessive peaks or dips in spectral balance can cause visual voids. Unfortunately, very little attention has been given to perfecting lighting specifically for the conditions of ice skating venues... both indoor and outdoor. Virtually every ice rink has used *generic* high-bay or low-bay conventional lighting that is used for wide varieties of applications... none specific to ice rink illumination.

Rink-Bright™ is part of the Ultra-Tech™ Lighting family of winter sports luminaries that include Snow-Bright™ and Field-Bright™. Already, Snow-Bright™ lamps have become the absolute standard for night skiing and riding with a spectrum matched to the reflective and refractive properties of snow. This same technology is now available for ice rinks. Not only does the Rink-Bright™ spectrum match the properties of ice skating surfaces, it also takes advantage of particular properties of the human eye which has maximum sensitivity within the green/orange range. This means that less intensity can still provide greater visual acuity. When combined with the full diffusion nano-particle reflector and high dispersion fixture geometry, maximum effective illumination is achieved with more than 85% energy savings.



Superior Economics –

Savings associated with Rink-Bright™ go well beyond reductions in net electrical consumption of the lamps. Since Rink-Bright™ fixtures do not add to the environmental heat load and do not radiate infrared heat down to the ice surface, there are up to 20% savings in ice maintenance and similar savings on environmental control. A typical regulation rink can have as many as fifty 1,000-watt metal halide high-bay fixtures, each generating 900°F at the bulb surface. Effectively, it is like having fifty 1,000-watt radiators that must be compensated for with additional air conditioning load. When retrofitting metal halide with Rink-Bright™, environmental and ice maintenance savings alone can pay back the investment in less than a year.

Additional savings come from reductions in “in-rush” current which is the amount of electricity required when turning lights on. For metal halide and even LEDs, in-rush current can be up to twenty times (20X) the operating current. This is a very significant factor that is almost always overlooked in payback analysis. Lighting fifty 1,000-watt metal halide fixtures can draw 50,000 watts which will spin the electric meter and can raise demand charges for the entire electric bill. Rink-Bright™ lamps have negligible in-rush current and do not require extensive warm-up to come to full brightness. In many cases, the in-rush reduction using Rink-Bright™ instead of metal halide or LED can further reduce *overall* electricity costs.

Typically, metal halide bulbs can last 2,000 to 5,000 hours. However, metal halide and even LEDs can lose 30% to more than 50% of their original rated light output within the first third of their operating life. That means *less light* for the same amount of electricity over more than two thirds of the lamp life. Rink-Bright™ fixtures have a 100,000 hour rated lifecycle which translates into 11 years running 24 hours a day by 365 days per year with only 10% lumen degradation over 90% of the lifespan. This represents a 500% reduction in bulb maintenance over metal halide without considering ballast replacements. Simply put, Rink-Bright™ is the most maintenance-free lighting in the industry. For most facilities Rink-Bright™ will last more than half a century.

Rink-Bright™ bulbs do not use dispersed mercury, making them more environmentally friendly and easily disposable. The bulb has an encapsulated amalgam similar to the type of composite used by dentists to fill teeth. Because the mercury is in solid form, it can be removed within the encapsulated glass and simply recycled. All remaining pieces of the bulb are disposable as glass and inert metal. Today, more and more municipalities are charging fees for disposing metal halide, LED, and fluorescent bulbs. Rink-Bright™ bulbs are not subject to the same fees.



Superior light, energy savings, environmentally friendly... That is what Rink-Bright™ delivers. See how Rink-Bright™ can improve your bottom line.

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