



## SCOTT'S "HOW TO CHANGE A LIGHTBULB" CHECKLIST

LEDs are likely the best energy-efficient source for most museum applications. Below is a list of lighting qualities to help museums maintain the quality they enjoyed using their incandescent track systems.

### **Intensity**

- Are the new energy-efficient lights bright enough for each application in your museum?
- Are the lights still bright enough after you add lenses?
- Will the electronics from the new lights overheat inside a sealed can?
- Is dimming large quantities of fixtures as a group necessary? Are the new lights dimmable with your existing system or do you need to match a new dimming system to your new lights?

### **Distribution**

- Spotlights: Do the new lights provide the same beam angles as your existing system? I typically use every beam spread available when I light exhibits - including 4, 8, 15 and 25 lamps.
- Wall wash: Can the lighting fixtures produce an asymmetric (rectangular or cigar-shaped) light so the illumination on the wall is flat (without scallops)?

### **Color**

- Do the lights produce the desired color? For most installations, the choice of a specific color temperature is less important than matching the color of the adjacent lighting sources.
- How important is color rendering to your application? Assessing color rendition is complicated and mockups on colored surfaces are useful, in addition to checking metrics like color rendering index (CRI) or IES's TM-30. Some LED's with CRI's in the low 80's produce light with excellent color rendering characteristics, although they may not render reds quite brightly as LEDs with a high CRI (<90). CRI values less than 10 points may not be noticeable and don't forget that the intensity light will have a significant impact on color rendition.
- Ultraviolet light needs to be eliminated or reduced to minimal levels (75 microwatts per lumen). Most LEDs don't create UV, but for the most light-sensitive materials (equivalent to ISO blue wool 1-4) it is best to avoid high CCT lamps (above 4000K).
- Are there, appropriate, opportunities to use colored light?

### **Movement**

- Do the new energy-efficient lights flicker? Flicker is common when LEDs are improperly dimmed or when the electronics were poorly constructed. Check DOE and IEEE websites for more information. Flicker impacts people susceptible to migraines, photo-sensitive epilepsy and people on the autism spectrum.