HRSD Lighting Guidelines Rev. 092718

The purpose of these guidelines is to provide direction for sustainable lighting solutions to meet the needs of facilities and help accomplish the Mission and Vision of HRSD. Sustainable lighting meets the qualitative needs of the visual environment with the least impact on the physical environment.

- **Sustainable lighting elements**
  - Optimize use of daylight
  - Minimize use of energy
  - Reduce light pollution and light trespass
  - Minimize embodied environmental effects
  - Specify environmentally preferable materials and equipment
  - Ensure system quality, flexibility, adaptability, maintainability and durability
  - Provide staff orientation and training
- **Qualitative needs**
  - Support work
    - Productivity, safety, security
  - Regulatory
    - Minimum required light levels maintained
  - Human Centric
    - The psychological wellbeing, interest, and enthusiasm of people.
- **Optimize use of daylight**
  - Daylight can provide potential benefits in terms of health, performance, or general well being
  - Minimize electric lighting, turn off (or down) in response to daylight
    - Simple solution: Photo-sensor, controller, step-dimming ballast (bi-level op- tion) for fixture retrofit
    - Optional feature for occupancy/vacancy sensors- Built in photo-sensor- In- hibits room lights from turning on when there is sufficient daylight present
- **Minimize use of energy**
  - Integrated design
    - Optimize integration with daylighting
  - Appropriate, high quality design
    - Appropriate light levels, noticeable improvement
  - Effective controls
    - To reduce kWh by turning off lighting
      - Switching controls
    - To reduce kW by turning down lighting
      - Dimming controls
- **Reduce light pollution and light trespass**

- Light pollution is:
  - Unnecessary, unwanted or wasted light
  - Light that damages or degrades the nighttime luminous environment
  - Light that negatively impacts humans, animals or plants
- Sustainability issue because:
  - Affects use of energy & enjoyment of natural nighttime sky
- Light Trespass
  - Obtrusive light that crosses a property line
  - Difficult to quantify
    - When, where & how much light is unwanted
- Can be avoided by:
  - Aiming lights down
  - Choosing fixtures with hoods, visors, or shields
  - Installing motion sensors to turn off lights when not needed
  - Use lowest wattage lamp to do the job
  - Lighting should not be overly bright in relation to the surrounding area.
  - B.U.G. rating of fixture, Back, Up, Glare.

- **Minimize embodied environmental effects**
  - Total energy required to produce a product, service or material including all life cycle phases from raw extraction to end of life
    - Includes manufacturing, packaging, transportation, installation, recycling
  - Buy American (locally)
    - Minimize transportation
  - Retrofit vs. Re-lighting (w/new fixtures)
    - Retrofit uses less material (often w/ lamps & ballasts or LED retrofit kits only)

- **Specify environmentally preferable materials and equipment**
  - Lighting equipment manufacturers demonstrating their commitment to environmental responsibility with improvements to manufacturing.
  - RoHS COMPLIANCE
    - Reduction of Hazardous Substances Directive
    - Aims to restrict certain dangerous substances commonly used in electronic equipment
- **Ensure system quality, flexibility, adaptability, maintainability and durability**
  - Quality
    - Lighting that positively addresses human needs, architecture, economics, energy and the environment.
  - Flexibility
    - To extend useful life of facility & better serve user's changing needs
      - Ex: Flexible lighting controls, such as wireless

        - Ex: Flexible wiring systems
    - Adaptability
        - Should anticipate change to allow system reconfiguration and reuse in future remodeling
            - LED's improving Lumens Per Watt at 20% a year
            - Ex: Lighting controls – reprogram for new space uses
            - Ex: Lighting controls – wireless
    - Maintainability & Durability
        - Lighting systems that perform the longest with the least maintenance effort have best economic and environmental value
            - SSL equipment & LED bulbs – lowest life-cycle cost
            - Long-life lamps have great value
            - Ex: Standardizing and minimizing the number of different lamp types reduces inventory and maintenance labor
- **Provide staff orientation and training**
    - Ensures operation and maintenance
- **Lighting Metrics**
    - Provides a means to make comparisons between various lighting sources
        - Lumens-Total amount of light emitted by a source in all directions
        - Lumens Per Watt-Measure of light source energy efficiency
        - CRI- Color Rendering Index is the measurement of how colors look under a light source when compared with sunlight. The index is measured from 0- 100, with a perfect 100 indicating that colors under the light source appear the same as they would under natural sunlight.
        - CCT- Correlated Color Temperature, measured in degrees Kelvin, refers to the amount of orange vs blue hue to the white light. "Warm" Light has a more orange hue vs. "Cool" light, which has a more bluish tint to it.
        - Foot Candles- Measurement of total quantity of light falling on a square foot of a surface. This measurement is useful because working conditions are of- ten specified in foot candles.
- **Warranties**
    - Unfortunately, there are still a number of unproven products and manufacturers out there that are causing challenges for both consumers and the industry.
    - Half of new businesses last less than 5 years.
- **Reference Resources**
    - Department Of Energy (DOE)
        - Caliper Reports
    - DesignLights Consortium (DLC)
      The DesignLights Consortium® (DLC) is a non-profit organization dedicated to ac- celebrating the widespread adoption of high-performing commercial

lighting solutions. The DLC promotes high-quality, energy-efficient lighting products in collabo- ration with utilities and energy efficiency program members, manufacturers, lighting designers, and federal, state, and local entities. Through these partnerships, the DLC establishes product quality specifications, facilitates thought leadership, and provides information, education, tools and technical expertise.
    - Illuminating Engineering Society (IES)
    - Occupational Safety and Health Administration (OSHA)
    - International Dark Sky Association (IDA)
- IDA is non-profit, tax-exempt, membership-based organization to help preserve & restore dark skies while maximizing the quality and efficiency of nighttime outdoor lighting.

A Practical Guide for Choosing the Appropriate LED Lighting There's More to It Than Just Lumens Per Watt

- **General**
  - Deplete existing parts inventory
  - Plan for future network connectivity
  - Use motion activating controls with overrides
  - Color Rendering (CRI) Index of 80 or greater
  - Correlated Color Temperature (CCT) 3500-4000K, Exterior
  - Correlated Color Temperature (CCT) 4000K and above, Interior
  - Consider glare use diffuser and or indirect fixture
  - Consider vertical and up-light levels of illumination
  - Consider light trespass and pollution, Exterior
  - Ask for photo metrics of fixtures
- **Recommendations**
  - LED replacement tubes and cob lamps (plug and play) are not recommended due to safety and efficiency concerns.
  - New fixtures designed around the LED light source are recommended.
  - LED fixture retrofits are an option if more feasible than new fixture.
  - Buy a few or ask vendor to supply fixtures for a temporary trial
  - Use a light meter and record foot-candle readings horizontal and vertical before and after changes
- **Difficult Access Areas**
  - Replace with LED fixture
- **Outside / Exterior Lighting**
  - High Mast Lighting
  - No new installations, Install LED Street lighting
  - Replace with LED fixture
  - Consider light trespass and pollution
- **Street Lighting/Building Exterior**
  - LED replacement cob lamps not recommended due to safety and efficiency concerns
  - Low and High Pressure Sodium- replace with LED
  - Metal Halide- replace with LED

- Incandescent/Halogen- replace with LED
- Consider light trespass and pollution

- **<u>Fluorescent Lighting</u>**
- LED replacement tubes not recommended due to safety and efficiency concerns
- Existing T-12, Fixtures 8’0
    - Retrofit with LED kit or replace with new LED fixture preferred
    - Consider vertical levels of illumination
    - Consider glare, use indirect or diffuser
- Existing T-12, Fixtures 4’0
    - Retrofit with LED kit or replace with new LED fixture preferred
    - Consider vertical levels of illumination
    - Consider glare, use indirect or diffuser
- **<u>Hazardous (Classified) Areas, PTF, Wet Well, Digester etc.</u>**
    - Replace with LED fixture rated for specific conditions, Class and Division
        - Correlated Color Temperature (CCT) 4000K and above
        - Color Rendering (CRI) Index of 90 or greater
        - Consider vertical and uplight levels of illumination
        - Consider glare, use diffuser