



- Existing lighting is high maintenance, shines into bedroom windows, and is too dark in some areas
- Suggested priorities in lighting retrofits or new lights are
 1. Work toward safety and light level compliance, on all walkways
 2. Repairing existing light fixtures
 3. Getting all fixtures to the same style
 4. Cost of fixtures and associated labor and installation
 5. Compliance with TRPA and other applicable code or regulations



Foot-candles

- Traditional, non-metric measure of illumination
 - Equal to the amount of illumination, 1 foot away from 1 candle

Lumens, Light fixtures and Lux

- Lumens are the amount of light, given off from a light bulb or other source
- Lux is a metric measure of illumination
 - Equal to the amount of illumination, 1 foot away from 1 candle
 - (Approximately 10.8 foot-candles per Lux)
- The light fixture used with a bulb can change the amount of light, and the direction the lumens leave the fixture
 - Fixtures that block the light, or that have dark and rough finishes inside the fixture will reduce the amount of light that actually gets out
 - The shape of the fixture, the position of the bulb and other factors create lighting patterns that are selected for purpose of the lighting

Light color

- 'Warm white' bulbs appear more yellow, and are rated at below 3000K
- 'Daylight' or 'Cool' lights are more blue (above 4200K), and help a viewer recognize object color, but can be glaring
- *A compromise is suggested, at 3500-4000K. To help with safety and vision, but without being harsh and distracting*



Light Trespass

- When light extends past the areas that actually need to lit
- Lumens and energy are wasted, and light can be bothersome to others

Owners having problem in our current lighting, painting out fixtures





Dark Sky

- Light that extends upward from fixtures creates light pollution
- Nocturnal creatures can be disrupted from their natural rhythms
- The lighting industry defined a 'Dark Sky' certification, but few available fixtures carry the official certification
- The selection of the Incline Pines fixtures should also work toward this goal, but using 'certified' fixtures has proven very difficult



The Problem

Our Goal





Regulations / Guidelines

- County of Washoe (*County has stated that it defers to TRPA in almost all planning and similar matters*)
- Tahoe Regional Planning Authority (TRPA)
 - No stated lighting values
 - Lighting should prevent sky light pollution, and avoid “trespass” lighting
- International Building Code
 - Minimum 6 lux, on any emergency pathway
- Illumination Engineering Society (IES)
 - IES Lighting Handbook (current edition)
 - States 0.5 - 2 FC (6-22 lux) for simple walkways
 - Values can be higher, depending on activity, number of persons, surrounding area

The Codes acknowledge that if the overall illumination of an area is relatively low, then the level of light needed on the walkways is lower.

→ The neighborhood at IP is dark and natural

→ A person’s eyes are already dilated for low light, so the lighting level needed for a safe walkway is lower as well

Suggested target is 8 – 30 lux, and accounting for fixtures to “fade” with age



- Fixture is actually lighting horizontally at 10x what is delivered to walkway
- Lighting actually increasing, above horizontal from light. Opposite of Dark Sky goals



- Original to IP development and style
- Plastic shielding and wood slats make fixture inefficient. Not the best for shaping light toward the walkways.
- Fixtures custom made, and in some disrepair



- Deco style
- Affordable, under \$100 / fixture

- Fixture lit the walkways, but also showed to trespass to light sides of buildings and windows



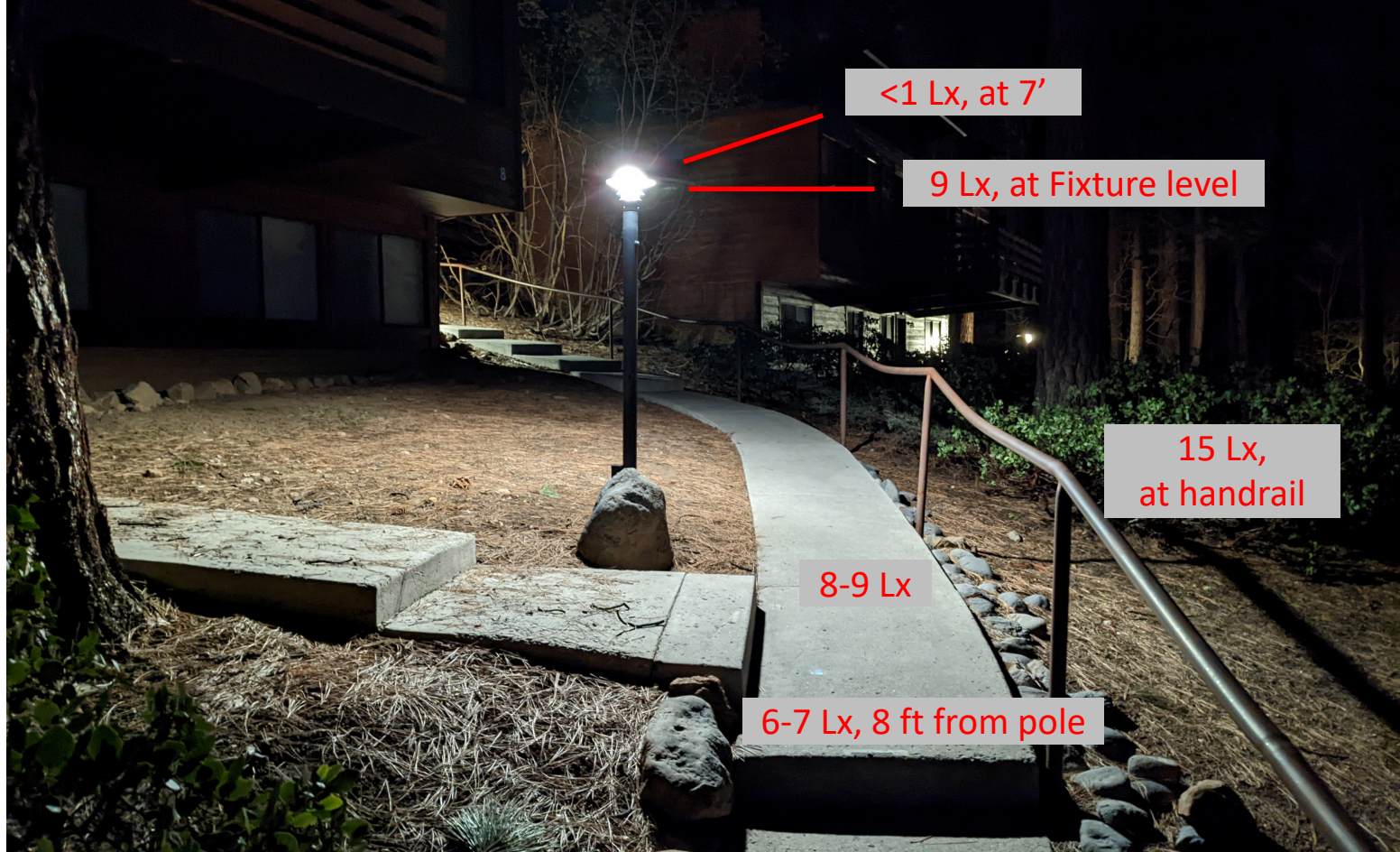
- Deco style
- Affordable , under \$100 / fixture
- Strong top, for snow loads
- Fixture has better “cutoff”, for dark sky
- Not as good as other models for forcing light down to walkways



- Style departs somewhat from art deco, but better than existing
- Affordable , \$45/ fixture
- Very strong, for snow and high moisture applications



- Socket extension lifts bulb higher into dome
- Silver paint increases downward reflectivity



- Light levels very close to target, at walkways and up to 10' from poles
- Great performance, for Dark Sky, after bulb position is elevated and interior of fixture cap is painted with silver paint