

**GENERAL
BYLAWS
of the
TOWN OF TRURO**

Amended through Special Town Meeting, November 2005

Section 7 OUTDOOR LIGHTING

I applaud Truro for this effort. This is concise and well written. I have reviewed over a dozen lighting ordinances and written a few of them. My comments are based on my experiences working with communities around national parks, as well as my interest in protecting dark skies and nocturnal habitat within. I will try to present my ideas without biases in the interest in informing the Truro leaders of different options and the effectiveness of proposed actions. Feel free to contact me directly if you have further questions. Chad Moore 435-835-4904 or chad_moore@nps.gov.

4-7-1 Purpose

The regulation of outdoor lighting is intended to enhance public safety and welfare by providing for adequate and appropriate outdoor lighting, provide for lighting that will complement the character of the town, reduce glare, encourage energy savings, and minimize light trespass onto other properties. See figure 1 within this section for examples.

Other purposes not explicitly mentioned include conservation of the night for enjoyment and astronomy, conserving the heritage and scenery of the area, minimizing impact to nocturnal wildlife, and preserving the natural character of surrounding protected lands. Also, this law would certainly conserve energy, perhaps a stronger statement than “encourage energy savings.”

4-7-2 Applicability

The requirements of this Bylaw shall apply to outdoor lighting on lots and parcels in all residential and commercial districts, but shall not apply to street lighting, seasonal holiday lighting, public athletic fields, light fixtures with a lighting output of less than 1200 lumens (75 wattage incandescent lighting or equal), lights that control traffic, or for public safety on streets and ways. Municipal facilities shall comply with this Bylaw except as required for emergency services and public safety.

I assume from this section that the municipal streetlighting is managed by another authority or there is a conflict preventing towns from changing street lighting specifications. This is somewhat problematic since streetlights are often a source of light trespass and complaints, as well as creating skyglow/light pollution. As a general rule nationwide, streetlights account for 1/3 to 1/5 of all outdoor lighting energy use; but since they tend to use higher efficiency HID lamps, they are often 1/2 to 1/4 of all outdoor light output.

Another problem stemming from the Applicability Section could potential by that it is viewed as hypocritical by private citizens, and may result in less compliance. A more tangible concern is the effect on the lightscape and allowing this law to create the desired effect. Let me elaborate: The effectiveness of outdoor lighting hinges on the reduction in

glare, reducing high contrast areas (allowing gradual transitions from lit to unlit and vice versa), and matching illumination levels to the ambient environment. The darker it is, the less light you need. Conversely, a few overly bright and glary lights in one area will make the surrounding area seem too dark, and thus begets a lighting “war.” If the streetlighting are too bright, it will reduce the effectiveness of shielding that would otherwise be highly successful.

If this bylaw cannot address streetlighting, I encourage the city to pursue other means of bringing those lights into conformance (if not in specification, at least in intent).

Lighting codes often use deminimis levels ranging from 500 lumens to 2000 lumens. I am somewhat familiar with the Truro area and setting, and would recommend a slightly lower 1000 lumen level. This permits a 60 watt incandescent, especially the popular 60 watt amber “bug” lamps, or a 15 watt compact fluorescent lamp. Unshielded lamps can create substantial glare and trespass issues, even at the 60-75 watt incandescent range, and they should be limited in order to improve the contributions of those citizens and businesses that have made the effort to shield their lamps. A lower lumen allowance than 1000 would sharply diminish the number of commercially easily available lighting solutions, so I don’t recommend going lower than 1000 lumens. Dropping the limit from 1200 to 1000 is one of my key recommendations, and somewhat simplifies the law.

Finally, the phrase “except as required for emergency services and public safety” is somewhat confusing since the purpose of the law is to improve public safety. Suggest wording as “except as required for emergency services and when public safety dictates special lighting.” Public safety obligations can routinely be met with the proposed lighting, it is really only a unique or temporary situation when one must deviate from the law.

You may also want to omit seasonal holiday lighting and temporary lighting. Caution, though, I have seen this abused. Perhaps limit both to 60-day period?

Do you have any marine navigational beacons or lighthouses that need to be exempted?

I also note that illuminated signs are omitted. It may be useful to review any sign bylaws the community has to ensure that signs meet the intent of this bylaw.

4-7-3 **Definitions**

As used in this section, the following terms shall have the meanings indicated:

LIGHT FIXTURE A lighting device that may be secured to a wall, ceiling, pole, or post and is used to hold one or more lamps. Lighting fixtures are designed to distribute the light, to position and protect the lamp(s), and to connect the lamp(s) to the electrical power supply. Sometimes referred to as a **LUMINAIRE**.

HEIGHT OF THE LIGHT FIXTURE: The vertical distance from the finished grade of the ground directly below the light fixture to the lowest point of the lamp of the light fixture.

LAMP: A bulb or tube, which is a component of a light fixture that emits light.

GLARE: Light emitted from a lamp with an intensity great enough to produce a reduction in a typical viewer’s ability to see.

LIGHT TRESPASS: The shining of direct light produced by a light fixture onto an abutting lot, parcel, or street.

Do you want to add “annoying or obtrusive”, or simply “unwanted” to the definition of light trespass? Is it necessary to prove annoyance in order to be light trespass?

FULLY SHIELDED LIGHT FIXTURE: A light fixture closed at the top with shielding so that the lower edge of the shield is at or below the centerline of the light source or lamp so as to minimize the light rays emitted above the horizontal plane.

This definition needs careful attention. The pictures and definition mostly describe what the Illuminating Engineering Society describes as “Full Cut-off.” However, the phrase “minimize the light rays emitted above the horizontal plane,” is somewhat less strong, hinting that fixtures that are only partly successful at minimizing direct uplight above the horizontal are permitted. The definition of FULL CUT-OFF is 0% light above the horizontal. The definition of CUTOFF is up to 1% above the horizontal. CUTOFF lighting appears to be a nice compromise at first, but there is typically much more glare and trespass associated with a CUTOFF vs FULL CUT-OFF fixture. To add to the complexity, the IES is currently revising light fixture classifications.

My recommendation is to restrict lighting to 0% uplight fixtures only, and use this proposed definition which is written in both plain English, is precise for architects and engineers, and allows for future fixture classifications to be translated:

A light fixture closed at the top with shielding so that the lower edge of the shield is at or below the lowermost part of the lamp or diffuser so as to eliminate all light emitted above the horizontal plane. Incidental reflections off structural supports or shields to limit light trespass are permitted.

I omitted “centerline” as a frosted bulb may hang down below the shield and sharply increase glare. Cities often require lights to have “house side shields” to minimize light trespass, but this does allow a very small percentage of light to reflect upward; this should not invalidate the intent of a fully shielded fixture.

Note- here is a discussion of the semantics:

<http://www.lrc.rpi.edu/programs/nlpip/lightinganswers/lightpollution/cutoffShielded.asp>

4-7-4 Control of Glare and Light Trespass

4-7-4-1 To the greatest extent feasible, all light fixtures shall be equipped with shielding, lenses, or cutoff devices required to eliminate light trespassing onto a street or abutting lot or parcel and to minimize glare to persons on any street or abutting lot or parcel.

4-7-4-2 All light fixtures, regardless of their intended use or mounting configuration, shall be fully shielded, **properly installed**, and directed downward. Downward direction may be waived by the Building Commissioner when illuminating architectural feature such as building sections, spires, American flags, or landscaping features, provided efforts are made to minimize glare **and use only the minimum amount of light necessary.**

This is a potential large loophole. As above, a few bad lights can really reduce the effectiveness, quality, and safety of nearby lights that adhere to the code. At a minimum I would suggest adding the phrase “and use only the minimum amount of light necessary.” It may be better to add a lumen per fixture limit, a lumen per area limit, or another method to minimize; but that adds complexity. If nothing else the addition in red gives some guidance to building inspectors.

I also added the phrase “properly installed” since someone could install a fully shielded fixture sideways or upside down. The fixture isn’t certified as compliant, instead the fixture as mounted as certified as compliant. Subtle but important difference.

A final point, is there a way to encourage façade/architectural lighting from above? Even flagpole lighting can be done from above with LED technology. You have a clause for high mounted architectural lighting (4-7-5-4) and this should be encouraged. Architectural lighting from above is not only night sky friendly, but it provides illumination of the building surrounds for security purposes. It is more desirable than lighting from below provided light trespass can be mitigated.

I would recommend strengthening this section somehow.

4-7-4-3 All light fixtures shall also be positioned on the site so as to direct light into the site, lot or parcel and away from the property boundaries of the site, and or abutting properties.

Common additions to 4-7-4-3 seen in other bylaws are:

“Privately owned light fixtures located in the public right-of-way are prohibited”

“Light fixtures that are a source of glare by their design, flashing, orientation, or intensity are prohibited”

“Searchlights are prohibited except when used by government authorities.”

“Light fixtures that are in the direct line of vision of traffic control lights or impair visibility on public highways are prohibited.” This may already be a state law.

4-7-5 Pole Height

4-7-5-1 Wherever outside light fixtures are proposed for parking areas, the height of the light fixture, including the pole, base and light fixture itself shall not exceed 15 feet in height.

It appears that this section on pole height is meant to accomplish three objectives. 1) to minimize glare and trespass that often accompanies tall pole lighting, 2) to minimize the glare and scattering caused by fog between the fixture and the ground, 3) the minimize the impact to views created by tall poles.

Wal-Mart type stores typically use 20-30 foot pole heights. This would certainly impact big-box type stores as well as medium sized grocery stores and warehouse/distribution center type environments. 15’ is a very stringent pole height for a commercial environment, but not so unusual for a residential only environment. The problem with pole height restrictions is

that some architects will use many more poles in order to meet horizontal illumination criteria (whether criteria are reasonable or not). This may result in more poles, albeit at a lower height. Lower pole heights also tend to produce more “hot spots” of bright illumination under the fixture. You do get a bit more evenness of illumination when you have higher pole heights, but this is a subtle effect. Finally, if very low levels of illumination are sought, pole height restrictions work against you. For example, the lowest commonly available HPS lamp is 70 watts. If you want to limit ground illuminance to a max of 2 footcandles, you will need about a 20’ pole height to do this. A 15’ pole would produce a max illumination level 70% brighter for the same lamp.

Also note that some gas station canopies are above 15’ to accommodate trucks and RVs, which of course need lights mounted under them.

If this pole height is meant primarily to limit light trespass onto residential areas, pole height limits can be supplemented with setbacks from property lines. For example, a 12 foot pole must be at least half the fixture height distance from the proper line (ie. 6 feet). This might be a good idea regardless of what the pole height limit is.

Again, I am not as familiar with the town of Truro, but you might consider relaxing the pole height restriction to 18 or 20 feet as long as you implement something like the setback I proposed above.

4-7-5-2 Wherever outside light fixtures are proposed for walkway lighting, the height of the light fixture, [omit—including the pole, base and light fixture itself] shall not exceed 12 feet in height.

You have defined HEIGHT OF LIGHT FIXTURE elsewhere, those added words just confuse.

9-12 feet is a good height for pedestrian-scale fixtures. I concur with the 12’ limit here. Same comment for next paragraph.

4-7-5-3 Wherever outside light fixtures are proposed for walls or building surfaces, the height of the light fixture, [omit-including the light fixture itself], shall not exceed 12 feet in height.

Why not 15 feet to match 4-7-5-1? This type of installation would be commonly used in commercial areas where 15-foot poles are allowed. A building mounted light takes the place of a pole, therefore don’t you want to encourage building mounted lights provided they are fully shielded and forward-throw designs? The 12-foot limit seems more applicable to a pedestrian environment, not a vehicle environment.

4-7-5-4 Wherever outside light fixtures are proposed for accenting architectural features of building surfaces, the height of the light fixture shall be exempt from the height requirements granted, provided the light fixture is in compliance with all other provisions of this Bylaw.

4-7-6 Compliance

When an existing outdoor lighting fixture is being modified, extended, expanded, or added to, outdoor lighting shall be subject to this section. All other outdoor lighting fixtures must come into conformance with this section within 5 years of its effective date.

5 years is an aggressive sunset time, though I support this. This gets the city out of the complex and time consuming task of figuring out what is grandfathered, and will more quickly achieve the desired results. If Truro has a limited number of commercial properties with extensive lighting, then I believe this 5-year sunset is reasonable. 10 years is more commonly seen in lighting laws in larger cities.

4-7-7 Enforcement and Appeals

This Bylaw shall be enforced by the Building Commissioner, or his designee.

4-7-7-1 This bylaw shall be enforced by the Building Commissioner, or his designee. Whoever violates the provisions of this Bylaw shall be subject to a penalty as described in Appendix A of this document.

4-7-7-2 If the Building Commissioner or his designee shall find any provision of this section is being violated, he/she shall notify such person deemed responsible for the violation in writing, indicating the nature of the violation and the action necessary to correct it.

4-7-7-3 Any order or decision of the Building Commissioner made in accordance with 4-7-7-2 and the administration of this bylaw may be appealed by any person aggrieved, to the Board of Selectmen. Any such appeal shall be taken within thirty (30) days from the date of the decision or order which is being appealed by filing a notice of appeal, specifying the grounds thereof with copy to the Town Clerk's Office.

4-7-7-4 An order of the Board of Selectmen may be appealed to Court.

More Points—

The beach and wetland environment common along Cape Cod is ecologically sensitive to artificial light. Florida has gone to great lengths to protect sea turtle nesting and is a model for the nation. The city should consider a clause to the effect of "Illumination of the public beach and estuarine waters shall be prohibited unless it is essential for marine transportation safety." The bylaw as written would not be considered "turtle friendly lighting;" to do so would require much more stringent illumination level control and use of yellow-orange or red lights, but it does mitigate what is know to cause widespread habitat displacement in nocturnal animals.

The figures of light fixtures are good. I would encourage adding fixtures more relevant to the residential environment, like a "Jelly Jar" porch light vs. a Glarebuster GB-2000 fixture.

Clearly, this is a plain-English ordinance without the complexity of footcandles, light meters, and illumination levels. However, I wonder if it isn't appropriate to add lumen or wattage limits for lighting. This should be carefully considered in light of the workload and capability of the building inspector. One suggestion would be to have a 250 watt per fixture limit for all lighting, unless a variance was granted. This will avoid the occasional commercial establishment (ie. gas stations) from going overboard with 400 Metal Halide lamps. It would be somewhat embarrassing and counter to the goals of the bylaw to have a glaringly bright establishment that was OK'd under this code. Putting a cap on watts per fixture would give some sort of upper limit on illumination levels. This can also be done with greater accuracy and complexity of course by using watt/square foot or lumen/square foot limits. This latter approach was used by the California Energy Commission and in ASHRAE 90.1 Energy Efficiency Standards.

see Figure 1 on following page.

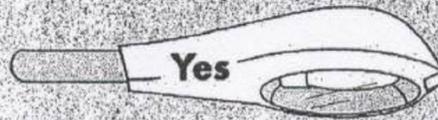
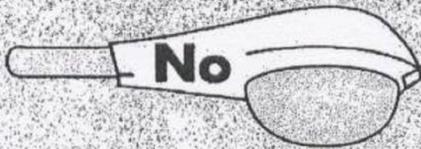
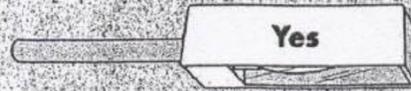
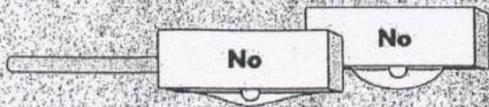
Figure 1: Lighting examples as defined by the bylaw

Outdoor Lighting Bylaw



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...to this



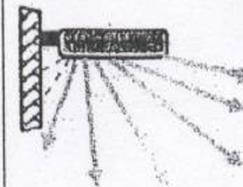
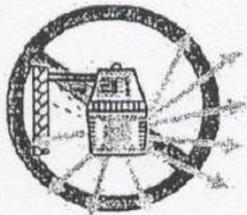
Outdoor Lighting Bylaw



Change this...

...to this...

... or this



Un-shielded

Shielded

Shielded