Step by step guidance to Light Pollution Reduction calculations

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UPLIGHT

OPTION 1. BUG RATING METHOD

There are so many options when selecting a light fixture that it is impractical for a manufacturer to provide a BUG rating for every version. The fixture's lens, wattage, optics, and house-side-shield all affect the BUG rating.

Get the IES file from the manufacturer's website that is the closest match to the selected fixture. A sales rep from the company may be able to help you if you don't know how to find the right IES file. Some IES files will have the BUG rating in the description at the beginning of the file. There are a couple places you can get free BUG ratings from your IES files, for example, here and here.

After you open the file, the second page of the report will show the BUG rating. It will be written similar to this: "B1 – U0 – G2."

Write the fixture's BUG rating on the Luminaire Schedule for each exterior fixture. Upload the schedule to GBCI for the LEED credit submittal.

Note that floodlights will not provide a BUG rating since orientation significantly impacts its values and floodlights are by their nature adjustable.

OPTION 2. CALCULATION METHOD

Look at the light fixture's cut sheet (or specification sheet or data sheet) for the amount of uplight. This may be on the last page where it shows a couple IES test numbers and isometric curves on a grid. If nothing can be found, which is likely, look for the phrase "full cutoff" somewhere in the document. This means it has zero uplight. You would still need to determine the fixture's total lumen output, which is easiest with an IES file.

If you have the IES file you can open the photometric report by following the steps in Option #1 above. On the second page of the report there is a table called "Zonal Lumen Summary." The zone 0-180 is the total fixture's light output. Enter this Lumen value in the LEED form for the "Lumens per Luminaire." The zone between 90–180 is the uplight. Enter this lumen value in the LEED form for the "Lumens Above Horizontal." The LEED form will calculate the total uplight for the site.

If you cannot find IES files documentation from the manufacture on what the uplight is then you have to assume 100% of the light is uplight. This is a worst-case scenario and is based on the initial (bare) lamp lumen output. If there are any permanent structures blocking some or all of the uplight then describe the

situation in the Special Circumstances section of the LEED form. Explain the situation and provide any calculations to prove your argument.

LIGHT TRESPASS

OPTION 1. BUG RATING METHOD

See Option #1 above for getting the fixtures' BUG ratings. Upload the Luminaire Schedule and a site plan. The Luminaire Schedule should also note the mounting height for each fixture type. The site plan must be scaled accurately and identify all of the light fixtures and the project's lighting boundary.

OPTION 2. CALCULATION METHOD

You will need lighting software to run a calculation for the site. Common software used is Visual 2012, AGi32, Microlux, Relux, DIALux, and others. Many of these programs have training videos and are available for a free 30-day trial period, while Relux is freeware.

All programs will need the site plan in an AutoCAD format like .dwg or .dxf. Draw a line in AutoCAD to indicate the project's lighting boundary. Import the file into your lighting program. Make sure the scale is accurate after import because it is not uncommon to read inches as feet and to be off by a factor of 12.

Make a Luminaire Schedule in the program by importing all of the IES files for each type of fixture on the project. Identify the fixtures to match your plan's nomenclature. Locate all exterior fixtures in the file as they are to be installed with the appropriate height and aiming.

Under the Modify tab select "Extrude." Use the default direction but adjust the extrusion distance to 33' above the tallest light fixture. If your tallest fixture is 25' above grade then set this distance to 58' (33' + 25'). Click on the Lighting Boundary line and extrude it.

This will make a wire frame box from grade to 58' above grade. Under the Calculations tab select "Surface" to insert a calculation grid on a select surface. Set grid spacing at 5'x5', decimal accuracy to 0.00, and select the new wire frame box that you made to make the vertical grid.

Now run the calculation again. If the vertical grid shows zero light then edit properties and flip the grid's normal to face the opposite direction. Run the calculation again. This is your vertical calculation grid. Repeat this around the entire Lighting Boundary. The calculation with the highest Maximum you will keep. Turn off all other calculations so only the side with the most spill light is displayed. Print a PDF for submission to GBCI.