

LIGHTING REPORT
Analysis of Existing Lighting versus
Proposed Lighting

for

Topgolf/Oxmoor Center
Louisville, KY 40222

TOPGOLF LIGHTING SUMMARY:

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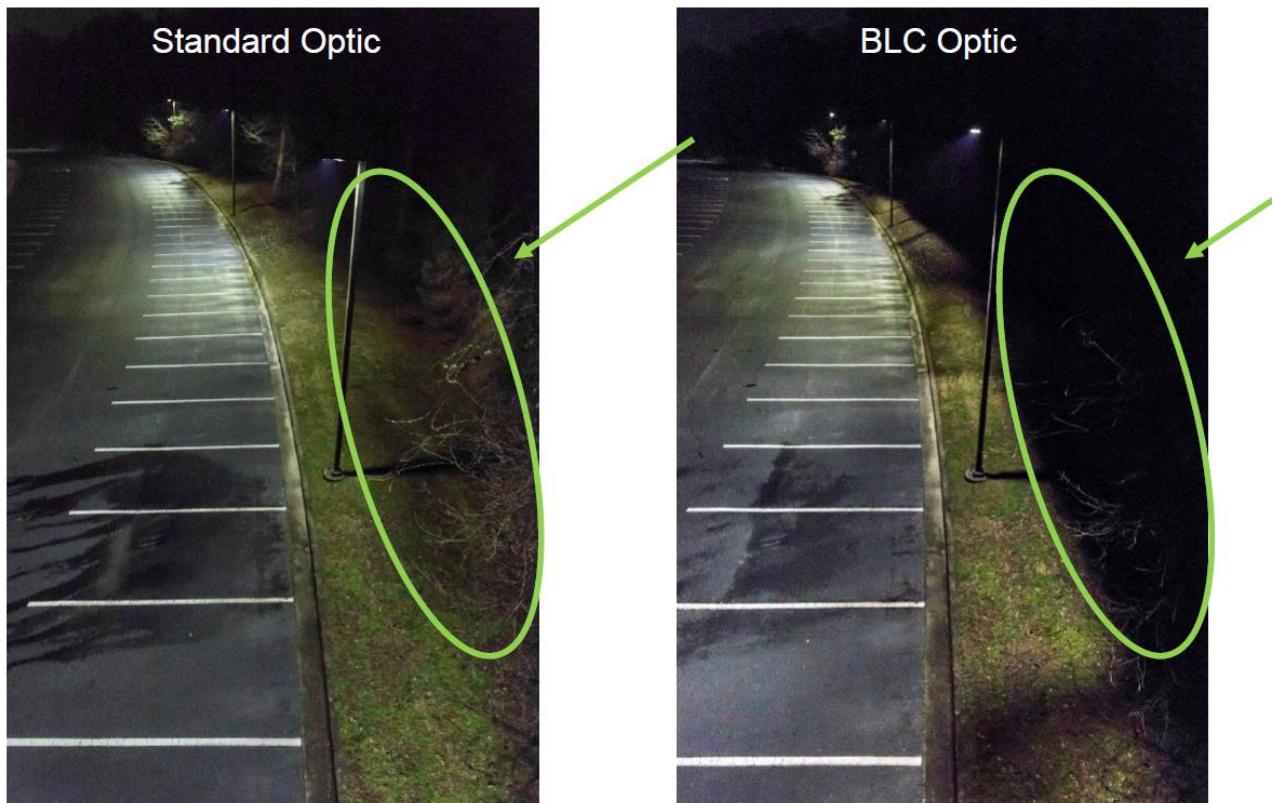
This report details an analysis of the existing Oxmoor Center parking lot lighting scheme and compares it to a light scheme planned to accompany a new Topgolf venue and new parking lot lighting fixtures. The intent of the lighting plan is to provide a design that meets the Land Development Code (LDC) with respect to lighting. Specifically, the plan is aimed to control glare and limit/decrease light pollution and light trespass to protect the residential neighbors to the south/east of the development. The proposed design meets or surpasses the LDC restrictions on these variables and improves over the current installation (which does not have glare control and fails to meet the light trespass requirements). Given the proposed Topgolf development has caused speculation and resulted in many false assumptions regarding the lighting environment, this report will address the existing conditions, compare those conditions to the proposed lighting for the actual Topgolf facility, and address the overall new and improved site lighting scheme. The new scheme will result in a much improved overall lighting environment - meeting the LDC and the intent of the regulation:

“... to provide for the health, safety and welfare of the residents of Jefferson County by regulating the placement, hours of operation, orientation, distribution patterns, intensity, and fixture types of all outdoor lighting used for the illumination outside the public right-of-way while encouraging lighting that conserves energy, reduces light pollution, and enhances nighttime enjoyment of the property within the County without decreasing safety, utility, security, and productivity”

In May 2018, a lighting survey of Oxmoor Center's parking areas' existing system was conducted. This survey utilized a Mastech Digital Illuminance Meter model LX1330B and measured lighting was taken in the unit of Footcandle (FC) – an industry recognized measure of illuminance (defined as the illuminance on a one-square foot surface from a uniform source of light of one lumen). From this survey, a model of the lighting was produced utilizing an industry standard lighting design program (AGI 32 from Lighting Analyst). The model and program accounted for the site layout, height of luminaire (50' poles), and lighting fixture heads and generated the “EXISTING PHOTOMETRIC CONTOUR ILLUMINATION PLAN” shown on associated drawing L0.1. The values indicated on the plan are a computer generated model of the actual typical values observed. The current fixtures are a combination of older metal-halide and newer LED array heads installed mostly in a (3) head arrangement mounted at the top of a 50' pole. The existing metal-halide fixtures have no cutoff and are not shielded for illumination above horizontal. The existing LED retrofit heads are of a type that “throw the light” out in order to maintain an illumination level across the broad area required when there is a large distance between poles (here, approximately 200' on average). The taller poles allow for this greater spacing. These 50' poles are more than 1-1/2 times the LDC allowed current height restriction (30'). The current fixtures are also “high glare” luminaires with no shielding or cutoff optics and are highly visible from adjoining properties.

The new lighting plan indicated on L0.2 “NEW PHOTOMETRIC CONTOUR ILLUMINATION PLAN” is a newly designed site lighting package utilizing full cutoff optics on all site lighting fixtures. IESNA (Illuminating Engineering Society of North America) standards were followed. These fixtures are all LED and are specifically engineered to provide dark sky, full cutoff illumination. They have options for Dark Sky approved by IDA, are certified DLC QPL premium, Nighttime Friendly, zero

uplight, consistent with LEED and Green Globes for eliminating wasteful and nuisance uplight. The new lighting scheme will eliminate the existing high glare, light trespass environment and replace it with a comprehensive LDC compliant system and also meets even the most stringent recommendations in the industry. Oxmoor Center requires/recommends the lighting levels on its site maintain a 2 FC minimum with an 8:1 max to min ratio and also calls for zero light trespass at the property lines, all of which comply with the LDC. The new design meets all these requirements. Importantly, the fixtures selected for the boundary/perimeter are facing "inward" toward the site and away from the neighboring properties and these fixtures are specified to have Back Light Control (BLC) - i.e. virtually zero light trespass along the site perimeter. The photo samples below show the distinct optical cutoff of the specified fixtures with this BLC control.



The fixtures specified for the interior are a combination of Type 3 Medium and Type 5 Wide depending on the required distribution to produce the overall FC required and meeting the max to min ratios. Also, the new fixtures are only 30' tall to meet the LDC requirements, are LED and have advanced options for control (including dimming via simple control system components). Thus the fixtures can be controlled to a variety of levels and can be adjusted as desired for after-hours situations in a multitude of configurable ways.

The Topgolf lighting internal to the specific venue was supplied with the fixture locations and IES files (Illuminating Engineering Society, files for insertion into the lighting program). These fixtures were also modeled and are indicated on the drawings L0.2 and L1.2. The fixtures used in the

Topgolf area are specialty LED fixtures designed for the purpose used – to light the field. The fixtures have tightly controlled optical patterns that are designed specially to light the field with a high degree of accuracy and virtually no light trespass beyond the field perimeter. After analysis of the model and calculations, it is evident that these fixtures are capable of producing the lighting necessary on the field, while maintaining a high degree of cutoff. They have built in glare control utilizing TIR (Total Internal Reflection) lens technology which allows precise lighting projection.

In summary, the provided drawings compare the existing conditions to the proposed comprehensive lighting solution. L0.1 and L0.2 are described above and as an aide, drawings L1.1 "EXISTING PHOTOMETRIC CONTOUR SHADING PLAN" and L1.2 "NEW PHOTOMETRIC CONTOUR SHADING PLAN" visually simulate the FC levels of illuminance across the subject property. The observer can "see" the brightness/hot spots associated with the existing 50' high non-shielded fixtures on L1.1 and then in turn notice the much more "muted" more uniform lower illuminance lighting of the area with the new fixtures on L1.2. Note, the one row of fixtures to the west of the plan are "brighter" on the new plan – these have been modeled to remain as existing since that part of the site is mostly undisturbed and is the greatest distance from the property boundary near the residential area.

The new system results in virtually zero FC past the property boundaries and the FC at any residential area is absolutely zero for illuminance generated by the newly designed subject property.

In Summary:

- Existing 50' poles replaced with 30' poles – cutting height by 60%, minimizing stray light and glare
- Existing non-shielded fixtures replaced with Dark Sky friendly, fully shielded LED fixtures
- Perimeter lighting has "inward facing" fixtures away from neighboring area with zero light trespass
- Topgolf fixtures are precision controlled LEDs, designed to eliminate glare and light trespass
- New design utilizes more fixtures, closer together - which decreases the "brightest" spots on the site by more than 60%
- New LED design allows for greater control flexibility and dimming across the site for after-hours conditions