PENNSTATE

AE 466 – Computer Aided Lighting Design
IP#3: Lighting a Vertical Surface
Assignment Date: February 6, 2017
Due Date: February 27, 2017

Objective

This project is an exploration of general techniques that can be used to light vertical surfaces. This assignment will build your technical skills in lighting design and with AGi32. The objective is to technically realize the illumination of a wall using several washing and grazing techniques. The outcome will be a professionally prepared report that documents a series of lighting design solutions for a wall.

Background

Download and read this article:

> Schielke T. 2013. Tutorial: Rationale, Concepts, and Techniques for Lighting Vertical Surfaces. Leukos. 9(4):223-243.

To access Leukos, log in to the IES website using your IES username and password. Then click through to the Leukos website. Logging in to the IES website first will give you free access to all articles published in Leukos and JIES. Or, you could log into Leukos through the Taylor & Francis portal from a Penn State computer, in which case Taylor & Francis should recognize that Penn State subscribes to Leukos.

A frequent goal of lighting design is to enhance architectural form. Shape, pattern, rhythm, texture, and other formal qualities of architecture can be amplified with the intelligent use of light, or spoiled with light's misapplication. Architecture is a composition of surfaces. Surfaces can be vertical, horizontal, sloped, or curved. Different surfaces may intersect in an infinite number of ways to create an infinite number of shapes and volumes. It follows that, in order to effectively render space, the lighting of architectural surfaces is an important tool in the craft of architecture and architectural lighting design.

Bear in mind that lighting is always context specific; a technique that may be ideal in one situation may be inappropriate in another. Here are some items that might be considered as part of programming and schematic design, especially when the rendering of the visual environment is a foremost design consideration:

- It may be desirable to wash a smooth planar wall with frontal light, whereas it may be preferable to showcase a textured wall using a grazing technique.
- Rounded scallops on a planar wall are generally undesirable because they create a lighting pattern discordant with the architectural form, though they can sometimes be used with good effect to create a (superimposed) rhythmic pattern.

- Surfaces can be short, such as the wall of a lobby, requiring short “throw” distances. Surfaces can be tall, such as the face of a skyscraper, requiring entirely different light sources and luminaires but similar techniques.
- Surfaces can be front-lighted from the top, bottom, sides, or any combination. Some surfaces can be illuminated from behind.
- A vertical surface can be illuminated with any type of light source: daylight, halogen, fluorescent, HPS, Metal Halide, LED. The source selected will depend on the size of the surface being illuminated, available mounting locations, desired color characteristics, and code considerations (e.g., connected power limits), among other considerations.
- Lighting design solutions that are truly integrated with architecture are usually more successful than solutions driven primarily by hardware or decoration. To that end, it’s often desirable to hide the lighting hardware, as with wall slots, valences, recesses, semi-recesses, niches, or any number of creative ways to shape the architecture so that the building itself conceals the gear, and selected surfaces appear luminous.

Surfaces are important elements of architecture, and therefore the various methods used to light surfaces are fundamental building blocks in the vocabulary of lighting design techniques.

This project is a study of different techniques and hardware that can be used to light a vertical surface of modest size. It is an exploration of techniques that can be applied in many different contexts. It is intended to build your conceptual development skills in lighting design and your technical skills with AGi32. The techniques you’re exploring are generic and will have application in many other contexts.

Methods

This is an individual project.

Before (or in parallel with) studying surface lighting within AGi32, you are asked to find four photographic examples of wall washing that have been well-conceived and implemented, and four photographic examples of wall grazing that have been well-conceived and implemented. These could be photographs that you take on your own or that you find via a website such as iStockPhoto, or from the websites of lighting designers and/or manufacturers. They should be high quality photographs free from pixilation. If the photographs are not your own then use appropriate credits and citations in APA, MLA, or CSE format. Briefly annotate the images by commenting on how and why each is a good execution of lighting a surface.

The room under consideration for the AGi32 component of this project is 25’ (width) × 75’ (length) × 24’ (height). Ceiling, walls, and floor reflectances are 80-50-20 percent, respectively. The vertical surface of interest is one of the longer walls that measures 75’ × 24’. Within your computer model, treat this surface as a flat plane without texture, such as painted drywall (i.e., the default AGi32 material).

You are to consider six different scenarios:

Scenario Number	Lighting Technique	Luminaire Type	Lamp	Considerations
1	Wall-washing	Semi-recessed	Linear fluorescent	Use appropriate set-back and aiming to achieve a visually uniform wash
2	Wall-washing	Semi-recessed	LED	Use appropriate set-back and aiming to achieve a visually uniform wash
3	Wall-washing	Semi-recessed	Metal Halide	Use appropriate set-back and aiming to achieve a visually uniform wash
4	Wall-grazing	Recessed wall slot	Linear fluorescent	Select and position luminaires to provide approximately uniform grazing on the wall surface
5	Wall-grazing	Recessed wall slot	LED	Select and position luminaires to provide approximately uniform grazing on the wall surface
6	Wall-grazing	Recessed wall slot	Halogen	Select and position luminaires to provide approximately uniform grazing on the wall surface

Insofar as it is possible and reasonable, endeavor to make your six scenarios as apples-to-apples as possible. You will need to determine what criterion or criteria to hold (approximately) constant. Should each solution be designed for (approximately) equal: average illuminance, E_{max}:E_{min}, number of luminaires, mounting locations, something else, none of these, some combination of these? What is “approximately constant” or “approximately equal”: ±1%, ±10%, ±100%, something else? You are asked to think through these questions and make informed judgments. The discussion section of your report should summarize and comment on these decisions.

Deliverables

The report that you submit should at least contain the following:

1. Cover Page
2. Executive summary
3. Table of contents
4. The body of the report should include:

4.1. Introduction: Summarizes the project requirement and give a preview of what's to follow. Note that and Introduction is not the same as an Executive Summary. (1 – 2 paragraphs)

4.2. Methods: Summarize how you arrived at your solutions. What tools and procedures did you use to complete this project? (1 – 3 paragraphs)

4.3. Results: The appendix that comes later will summarize each individual scenario, and so you need be redundant. Instead, focus on providing comparative data through graphics and/or tables. The results should summarize how the different scenarios perform on salient performance criteria. (Not more than 1 page)

4.4. Discussion: Discuss the similarities and differences between the various scenarios. The discussion should bring meaning to the data. Use your data to make inferences: How does the data suggest that grazing different than washing? How have the different light sources led to different results (in terms of average illuminance delivered, uniformity, wattage consumed, etc.)? What are the limitations of using AGi32 to communicate washing and grazing techniques? These questions are not intended to be exhaustive, but rather representative of the things that you should be considering and addressing in your report. (not more than 1.5 pages)

4.5. Conclusions: This is essentially a summary of your discussion, with a restatement and emphasis on the most salient points. (1 – 2 paragraphs)

5. Appendices (8 pages):

5.1. Appendix A: This appendix will have up to 8 pages that include your photographic examples of wall-washing and wall-grazing, with annotations. You can use fewer sheets by placing more than one image on a page, as long as clarity is retained. The annotations are an important part of the grading criteria—there are many examples of annotated images in the 10th edition IES Handbook. The selection of images and the graphical communication of your results are also important parts of the grading criteria.

5.2. Appendix B: Each of the six scenarios should be summarized on one sheet of paper. You can choose to use either 8-½" by 11" or 11" by 17" as the form factor for this report (see **OPTION 2** comment, below). Preparation of these summary sheets will be somewhat repetitive in the sense that each page should contain the same type of information, presented in the same format. Think carefully about the format for which you will present your information. Again, and as noted above, the graphical communication of your results is an important part of the grading criteria.

The specific information that you include is at your discretion. They key is to provide adequate information to fully describe how the wall is illuminated and the visual effect that will be achieved. Consider including the following: technique used to illuminate the surface (including layout details such as setback, aiming, spacing); a photographic image of the luminaire (as can generally be found on the manufacturer's web site); description of the luminaire and lamp, including the product number and lamp code; quantitative performance summary (e.g. numerical illuminance and/or luminance summary, uniformity statistics); any other technical considerations needed to communicate your design; total connected watts; a

rendered view; a brief (i.e. one paragraph) written evaluation of the lighting solution.

Note: You should include something in your rendered image to provide a sense of scale, such as people, or perhaps a few familiar objects. These could be included in your AGi32 model, or added via Photoshop at the end.

It should be intuitively easy for someone unfamiliar with your project to make apples-to-apples comparisons between the different lighting solutions by making comparisons between the different summary sheets.

6. Work-log
7. Copy of this assignment

OPTION 1: At your discretion, you may produce your deliverables as a webpage rather than a printed document. The above listed content is still required, but producing the work as a webpage may offer more creative freedom.

OPTION 2: At your discretion, you may produce your deliverable in 11 x 17 format rather than 8½ x 11. Or, you may make some pages 11 x 17 and fold them to 8½ x 11. The larger page size may afford some flexibility in how you visually present your work. As one example, Appendix A may lend itself to the larger page size.

This is an option to showcase *your* work. Please don't use a stock Microsoft template; I have every confidence that your work can be more visually appealing.

For this assignment, luminaire specification sheets are not required, a luminaire schedule is not required, and reflected ceiling plans are not required. However, salient information should be included in Appendix B. Your report should be submitted in 8½ x 11 or 11 x 17 format either stapled or with a spiral binding, or provide a link to the website you've created. No three-ring binders. See the attached IP#3 Grading Sheet for the point breakdown.

Attachment:
1. IP#3 grading sheet (1 page)