Executive Summary

This proposal details the work to be completed in the spring of 2013. It presents a description of the redesign of several systems present in the Houston Museum of American Art. Included are explanations of two depth and two breadth topics. This document does not conclude that there are actual problems with the existing systems, it is just meant to provide an alternate approach.

The lighting depth presents new design concepts in four proposed spaces: exterior façade, lobby, theater and 8th floor gallery. The new design aims to create an aesthetically complementing, and engaging atmosphere that is tailored to specific activities going on in the spaces. The space should also be functional, with light levels that meet those specified in the IESNA handbook. All power density requirements present in ASHRAE 90.1 should also be met.

The electrical depth includes a redesign of the branch circuit distribution for the four spaces to be re-illuminated. A protective device coordination study and short circuit analysis will also be conducted. The selection of distribution equipment and protective devices for that section will be necessary.

The architectural breadth will be developing a living algae façade to extend the nearby railway park visually. For the acoustic breath, theater will be analyzed and redesigned based on STC and reverberation time.

MAE breadth will cover the daylighting analysis of 8th floor gallery. Honors breadth will be integrated with the lighting depth and architecture breadth to investigate the project neighborhood in order to produce an aesthetically and socially cohesive and responsible façade design.

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Building Overview

The 223,000sf Houston Museum of American Art is currently under construction at a cost of approximately 266 million dollars. The project is located on the far west side of Manhattan, New York. The construction started on August 14, 2012 and is expected to end on November 28, 2014. The museum is projected to open in 2015.

Building Name: Houston Museum of American Art
Location and Site: New York, NY
Building Occupant Name: Houston Museum of American Art
Occupancy or function types: A-3 (Assembly). The proposed building will contain dedicated gallery space, education and studio spaces, art-handling spaces, a restaurant, a café, a theatre, special-events spaces, museum shop, and a conservation lab.
Size: 222,952 SF
Number of Stories above Grade: 9
Dates of Construction: August 14, 2012-November 28, 2014
Actual Cost: Building is under construction; estimated cost is 266million (100% CD)
Project Delivery Method: Design-Bid-Build

Owner: Houston Museum of American Art
Design Architect: Renzo Piano Building Workshop
Executive Architect: Cooper, Robertson & Partners
MEP Engineer: Jaros, Baum & Bolles
Lighting/Daylighting Engineer: Ove Arup & Partners
Acoustics Consultant: Cerami Associates
LEED Consultant: Viridian Energy and Environmental, LLC
Structural Engineer: Robert Silman Associates
Construction Manager: Turner Construction, LLC

For an overview of the existing building systems, please visit:
http://www.engr.psu.edu/ae/thesis/portfolios/2013/cwl5153/Thesis%20Abstract/Thesis%20Abstract.pdf

Lighting Depth

Overview

The lighting depth will focus on the lighting design of four chosen spaces in the Houston Museum of American Art.

The main lighting design philosophy is to engage the neighborhood, the culture, the patrons' experiences, the art community and the energy of the diverse mix of tastes and talents, a concept derived from the owner and architect's vision for the project. The lighting redesign will involve four spaces: the exterior façade, the lobby, the theater and the 8th floor gallery.

Lutron Comments

Shawn Good:

- Very good. Clean and easy graphics. Easy to follow. Really easy to follow.
- History and site location really set the stage. That was excellent.
- Took quotes from both board of trustees and architect, then took it apart and really understood it. [small point, but maybe took too many words from these quotes]
- Then brought out these words and made them large. Absolutely great. Really liked it.
- Final slide [ENGAGE] is also really good, but explain how you went from the quotes extracted from the quotes to those that circle the word "engage".
- You got to slide 7 and hadn't talked about lighting yet, but that was really good, because you were building to it.
- Theatre --- was that the actual space showing the piano. With that background, you need to talk about daylight control. In your rendering the city scene shown in the rendering was then shown as black. Integration or exclusion of daylight in that space could be important for some performances and uses of that space. [Acoustic panels came up and need some discussion]
- Gallery on 8th floor, you talked about some of the earlier words (quotes), which was great because it was clear that you were thinking about them throughout. You never lost focus

Sandra Stashik

- Agree with a lot of what Shawn said.
- Went back to the architect and pulled your ideas from what they wrote. That's what you need to do.
- When doing the façade, wanted you to go back to the neighborhood and explain how the façade was going to work with the neighborhood. You did a great job introducing the neighborhood early in the presentation, come back to it when presenting the lighting design of the façade.
- Can you use an architect's rendering of the façade to overlay your lighting? That would make is to much stronger than a white line drawing.
- Struggled with the psychological impressions. That needs to be bolstered.
- Lobby open to the public. You didn't talk about the fact that you would be lighting the sculpture (and walls) in such a way that it would draw the public in from off the street. Your design might do it, but you didn't talk about it explicitly when talking about your presentation.
- Overall, it was really a very strong presentation.

Both

- Needed to understand building façade and building façade concepts. Not really able to understand the exterior façade of the building.
- Highline ends right next to the museum.
- The views of the building will influence the best way to light it. Who are we trying to light it for? (person walking by, person on rooftop garden, pedestrian on the street, vehicular traffic, person seeing it from the Highline?) This needs to be addressed and decisions made, and that should inform the design solution.
- Make sure the building tastefully integrates into the neighborhood/community, rather than sticking out too much. The exterior lighting design concept should consider this, too

Lobby

The entrance lobby consists of a 1,000 SF indoor gallery space that is open to public, free of charge. Sculptures and outdoor installations will be displayed in the space. Because the installations in the lobby are temporary, one of the most important design considerations is for the lighting solution to be flexible. The lighting in the lobby also aim to create an engaging and welcoming environment and provide intuitive way finding.

Theater

The theater located on the south east corner of the third floor, houses 170 seats. The theater space is used for multiple configurations and activities, including performances, films and installations. Because of the multipurpose nature of the room, the lighting solution needs to be flexible and pleasant for occupants.

Gallery

The 8th floor gallery is used to display parts of the permanent collection. Because the gallery is on the top floor, it is the only indoor gallery that has daylight design potential. It is a perfect space to create spatially diverse experiences for the museum patrons. The lighting solution will embrace the temporality of natural light and offers occupants different sensations and perceptions of the collections when viewed at different time throughout the day, throughout the year.

Exterior façade

The exterior façade of the future Houston plays a prominent role in composing its identity at night. With an architectural design that really responds to the site and its neighborhood, the lighting solution established need to enhance the building's dynamic presence and echoes the neighborhood's vibrant energy.

Tasks and Tools

1. Schematic Design
    - Conceptual design will be illustrated with hand sketches and photoshoped renderings. The design will be altered according to the suggestions from professionals

2. Design Development
    - Equipment selection will be completed, with custom fixtures designed if necessary
    - 3D models will be constructed and AGI32 renderings and calculations will be used to determine the exact location of luminaires. Appropriate adjustment to the design will be made according to the measurement
    - Daysim will be used for daylight modeling and analysis
3. Construction Document
    - Final adjustment will be made
    - Final renderings will be completed for the report and presentation
4. Final Submittal

Electrical Depth

With the CHP system upgrade discussed in section seven, the system voltage can be upgraded to 480Y/277V from the existing 208Y/120V without relying on the central grid for the main power supply. Because the CHP system is selected based on a preliminary estimation, the exact electrical load that can be provided with the on-site generator is undefined. Thus assumptions were made that the electric loads will be met by the CHP system.

Mechanical Breadth

An analysis of the CHP system will be conducted. The overall goal of this study is to determine if combined heat and power system is appropriate for this specific project, as well as the energy and cost savings resulted. The final deliverable for this study will be a compilation of prime movers, and their corresponding cost and performance characteristics. Analyzing these results, the prime mover with the maximum benefits will be selected for the CHP system.

Acoustic Breadth

A reverberation time and STC analysis for the 3rd floor theater will be completed for the acoustic breadth. The space is critical acoustically because of it is used for musical performances. The reverberation time in the space will be important to how the music will be heard and enjoyed. STC value is also critical to keep the sound isolated. After analyzing the values, it will be determined whether changes are necessary. New products will be select to design an optimized acoustical environment.

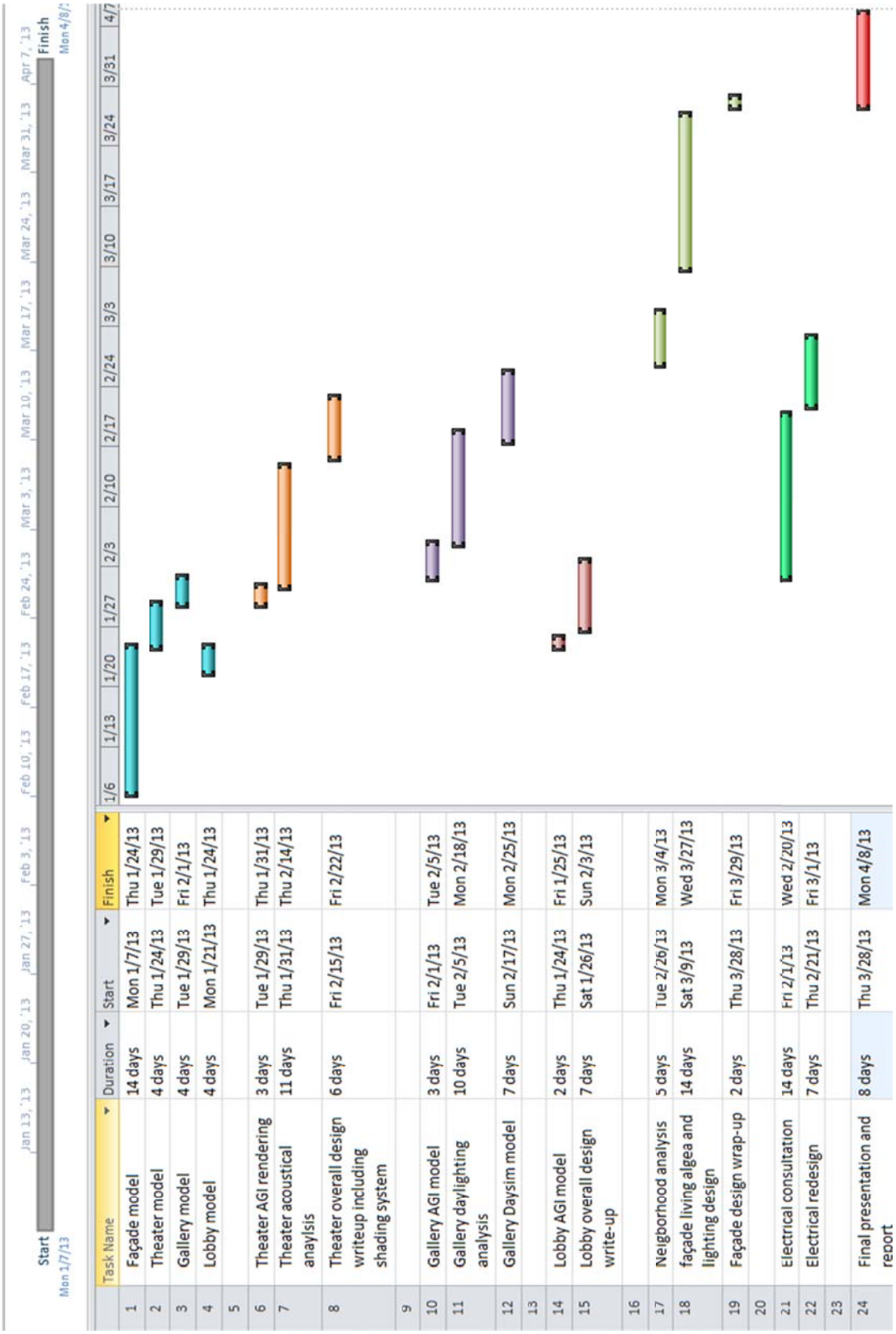
MAE Breadth

The MAE breadth will cover the daylighting analysis for 8th floor gallery. The breadth will largely depend on the knowledge and skills learned from AE 565- Daylighting taught by Dr. Mistrick. Different fenestration variations will be investigated for the existing skylight. Potential changes will be developed and implemented to provide a different approach to the existing system.

Honors Breadth

The honors breadth aims to investigate the social concepts that can affect lighting design and in turn influence the human perception and interpretation of the space. Three concepts researched including the motivation of why people visit museums, how people self-congregate, and different scale of perception, focusing on the idea “life, space, buildings – in that order”.

Proposed spring semester schedule



	Task Name	Duration	Start	Finish
1	Façade model	14 days	Mon 1/7/13	Thu 1/24/13
2	Theater model	4 days	Thu 1/24/13	Tue 1/29/13
3	Gallery model	4 days	Tue 1/29/13	Fri 2/1/13
4	Lobby model	4 days	Mon 1/21/13	Thu 1/24/13
5				
6	Theater AGI rendering	3 days	Tue 1/29/13	Thu 1/31/13
7	Theater acoustical anaylsis	11 days	Thu 1/31/13	Thu 2/14/13
8	Theater overall design writeup including shading system	6 days	Fri 2/15/13	Fri 2/22/13
9				
10	Gallery AGI model	3 days	Fri 2/1/13	Tue 2/5/13
11	Gallery daylighting analysis	10 days	Tue 2/5/13	Mon 2/18/13
12	Gallery Daysim model	7 days	Sun 2/17/13	Mon 2/25/13
13				
14	Lobby AGI model	2 days	Thu 1/24/13	Fri 1/25/13
15	Lobby overall design write-up	7 days	Sat 1/26/13	Sun 2/3/13
16				
17	Neigborhood analysis	5 days	Tue 2/26/13	Mon 3/4/13
18	façade living algea and lighting design	14 days	Sat 3/9/13	Wed 3/27/13
19	Façade design wrap-up	2 days	Thu 3/28/13	Fri 3/29/13
20				
21	Electrical consultation	14 days	Fri 2/1/13	Wed 2/20/13
22	Electrical redesign	7 days	Thu 2/21/13	Fri 3/1/13
23				
24	Final presentation and report	8 days	Thu 3/28/13	Mon 4/8/13