



# Casino Gold

AE Senior Thesis  
Brad Robertson

### Scope of Senior Thesis

- Lighting Redesign
  - Outdoor Plaza
  - Pre-Function
  - Poker Room
  - Player's Lounge
- Electrical Depth
  - Modifications for Lighting Redesign
  - Addition of Solar Array
- Construction Breadth
- Structural Breadth

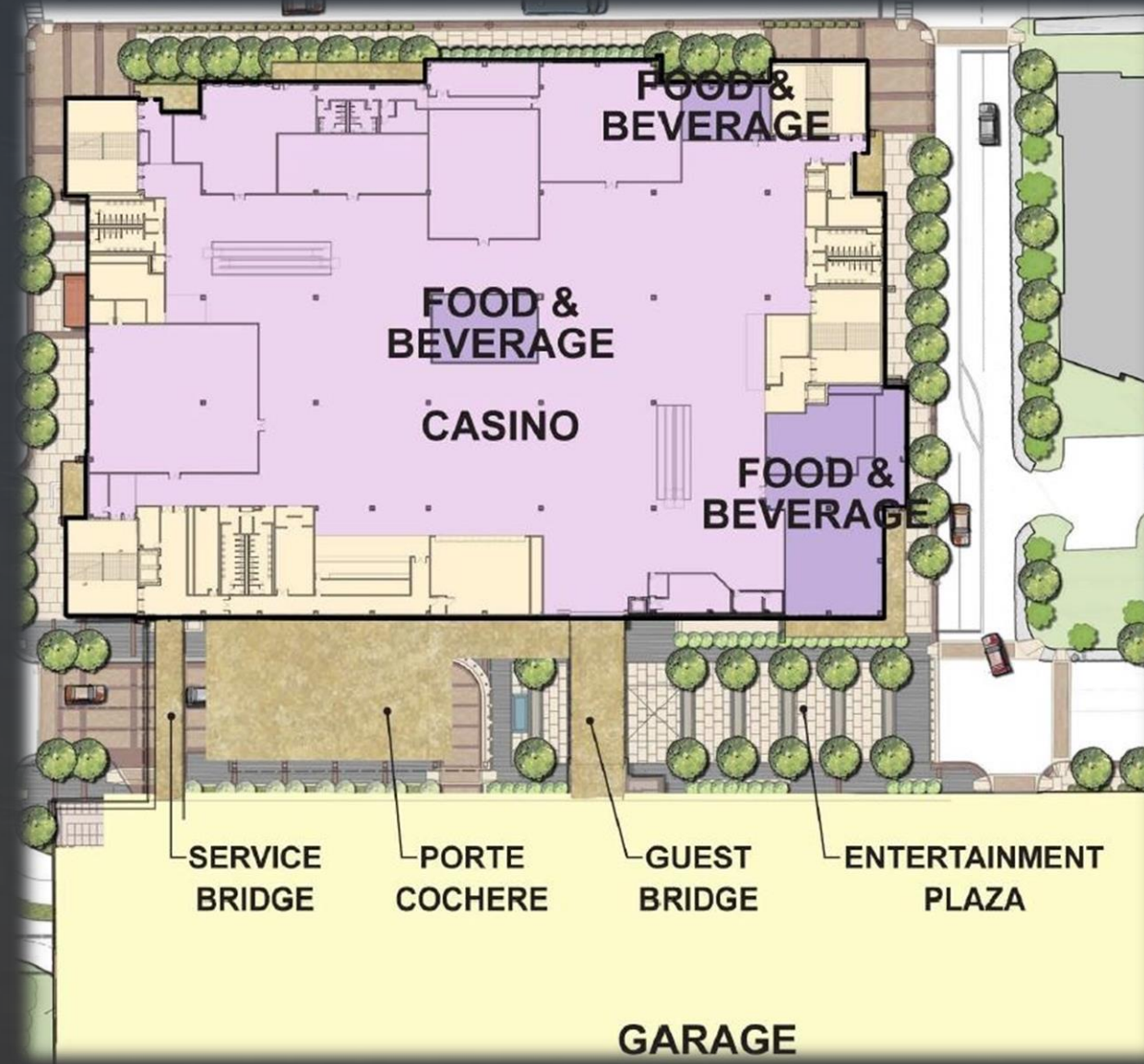
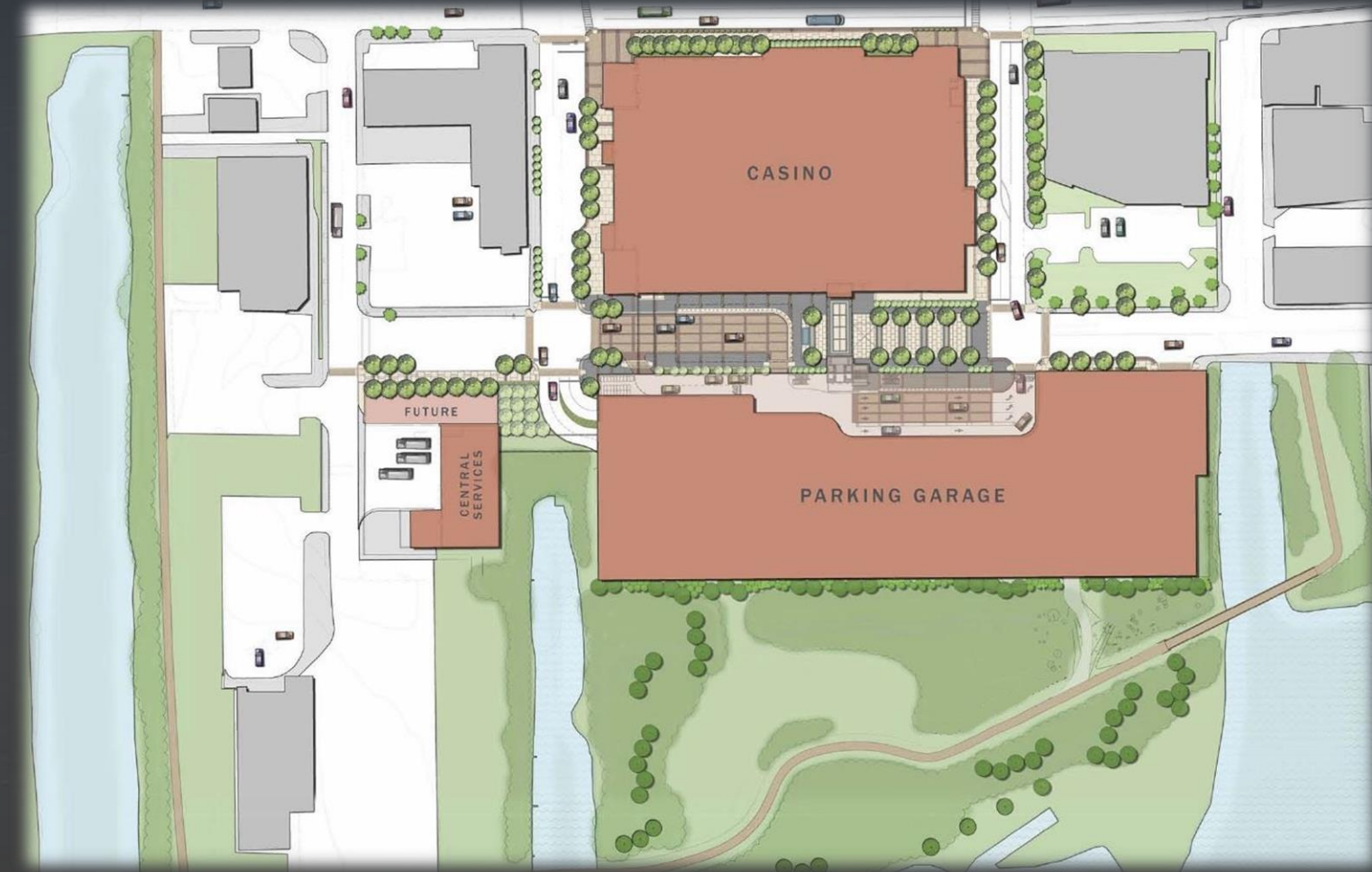
- Project Overview
- Lighting Concept
  - Poker Room
  - Design Criteria
  - Lighting Solution
  - Calculations
  - Pre-Function
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  - Solar Array
- Structural Effects
- Conclusion

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Project Overview  
Lighting Concept  
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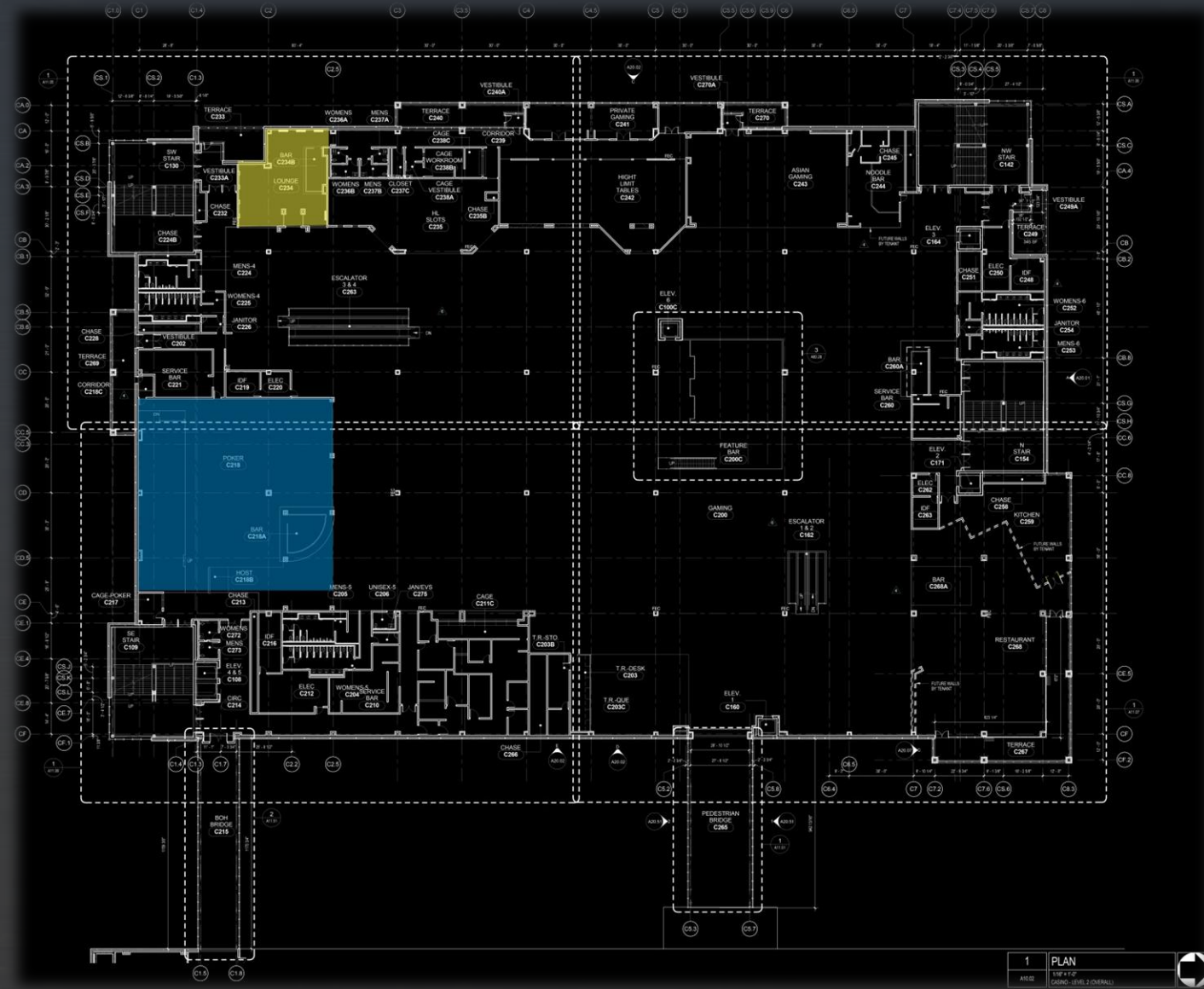
## Project Overview

- Lighting Concept
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Level 1



Level 2

- **Size: 309,450 sq. ft.**
- **Levels: 3**
- **Approximate Cost: \$400 Million**
- **Project Team**
  - Executive Architect: ka
  - Design/Interiors Architect: Friedmutter Group
  - Construction Manager: Whiting-Turner
  - Structural Engineer: Carroll Engineering, Inc.
  - MEPT Engineer: JBA Consulting Engineers
  - Lighting Design: The Lighting Practice

## “Connecting People”



Project Overview

**Lighting Concept**

Poker Room

Design Criteria

Lighting Solution

Calculations

Pre-Function

Design Criteria

Lighting Solution

Calculations

Solar Array

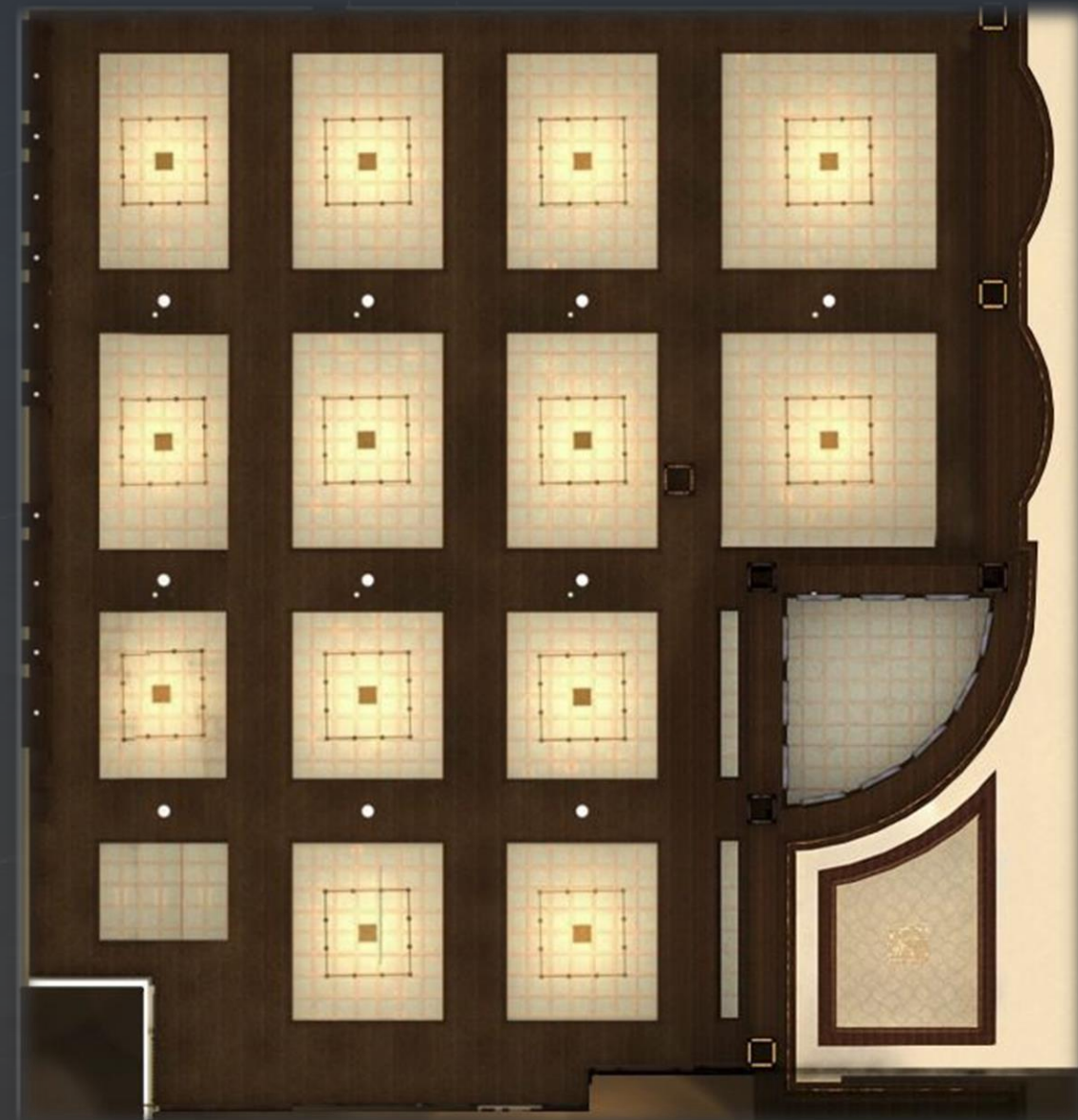
Structural Effects

Conclusion



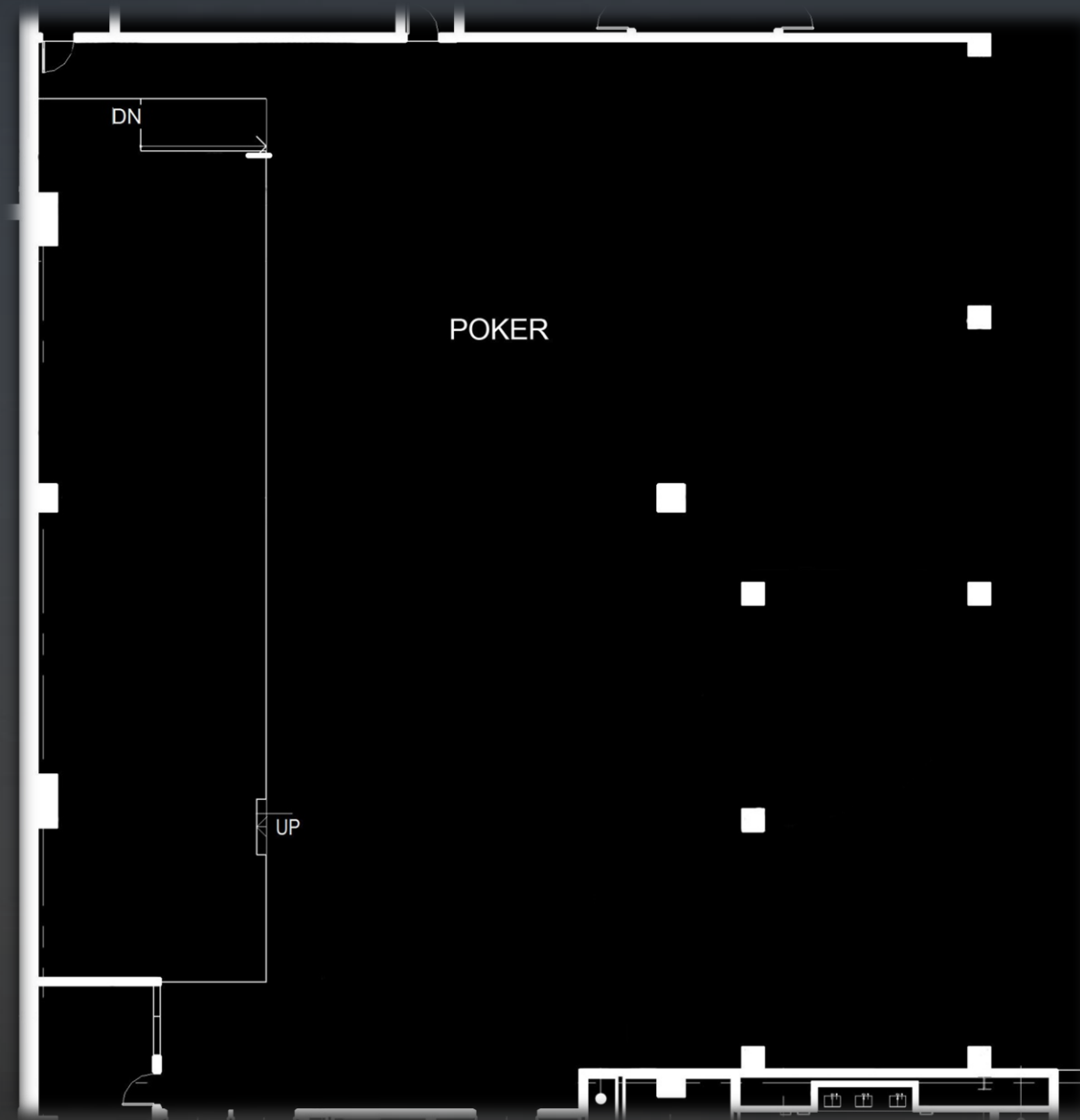
## Description

- Located on the 2<sup>nd</sup> level
- Approx. 8,100 sq. ft.
- 15ft woodwork
- 16ft ceilings



Poker Room RCP \*Friedmutter Group

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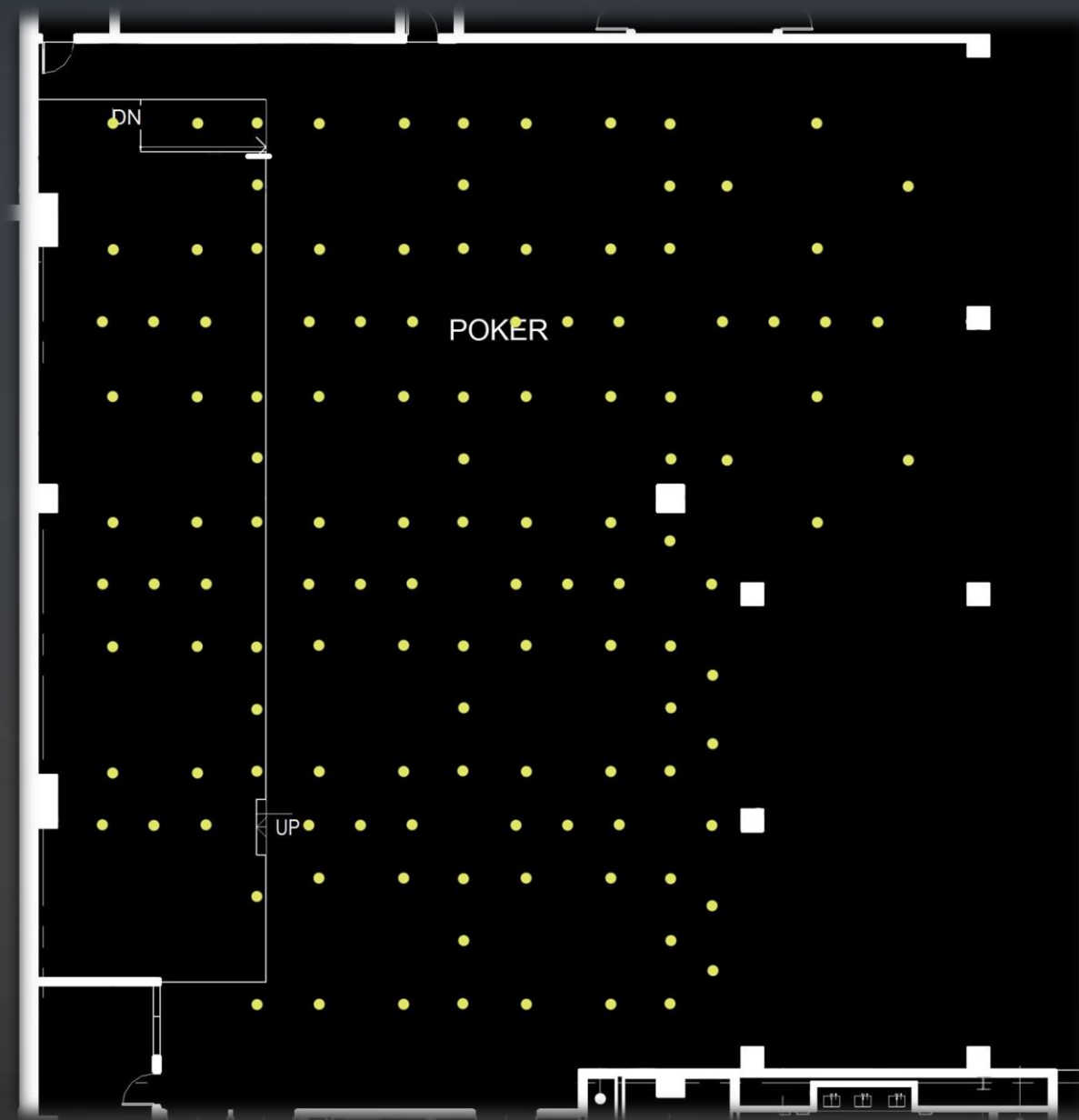


### Design Criteria and Considerations

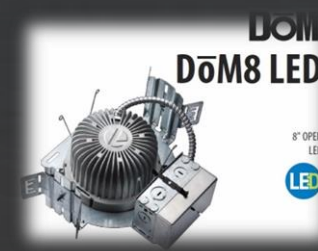
- Workspace for Players
- Uniform Light
  - Avg. / Min. of 5:1
- Horizontal Illuminance
  - $E_{h,avg} = 30fc$
- Lighting Power Density
  - Classroom/Lecture: 1.24 W/ft<sup>2</sup>

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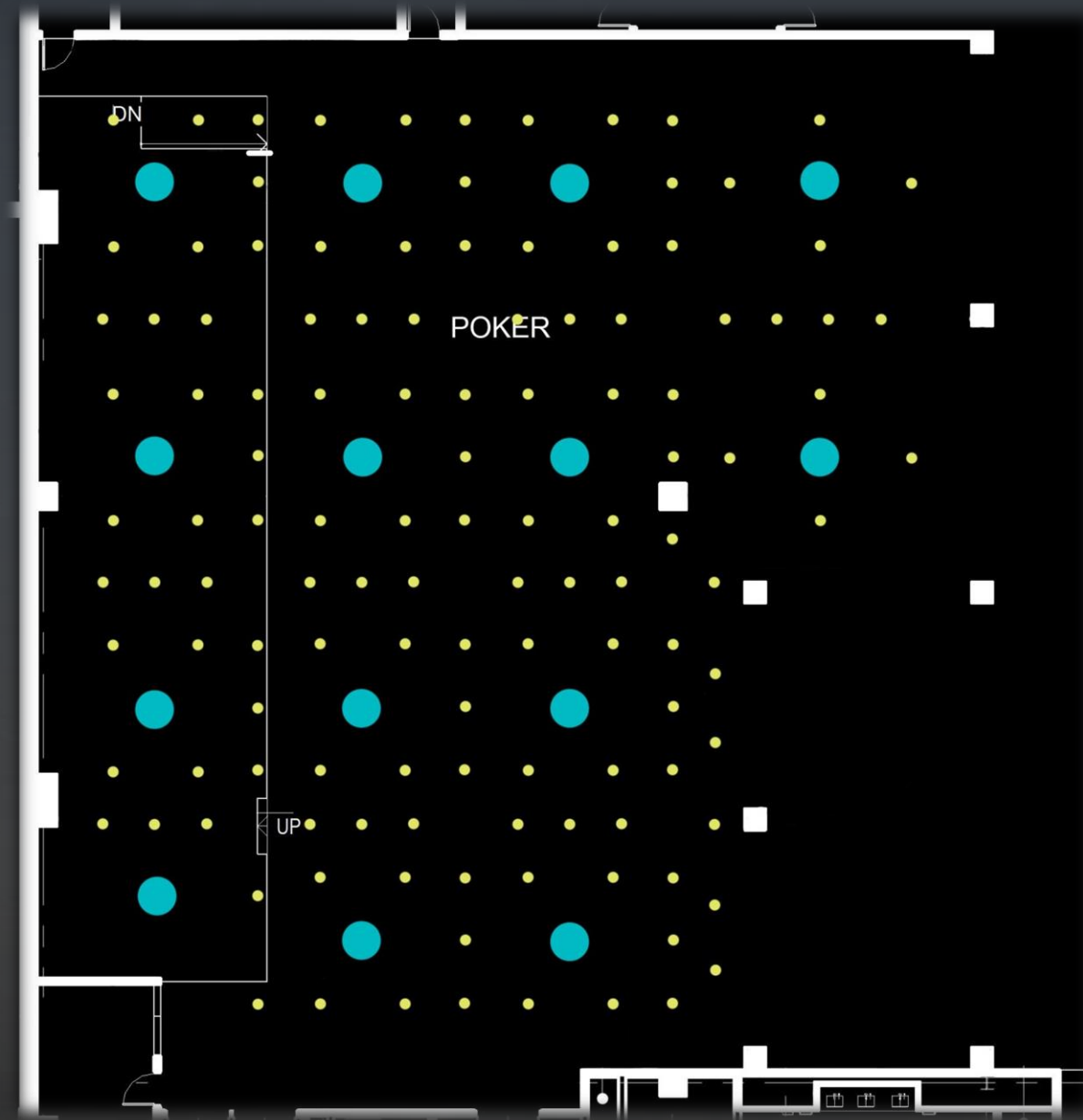
Poker Room Lighting Plan



Lithonia, 8" Downlight, 27.5W  
123 total

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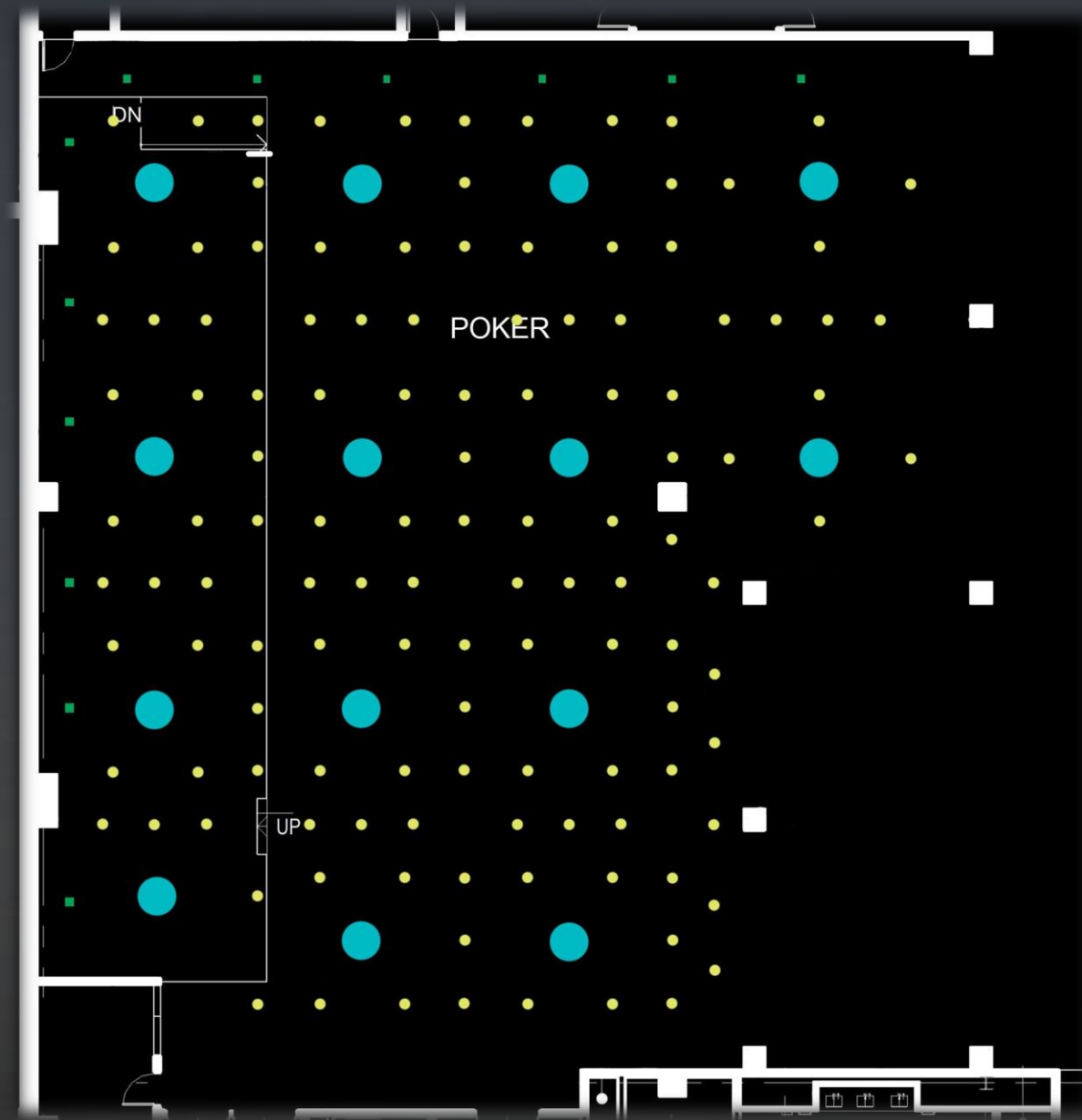
Poker Room Lighting Plan



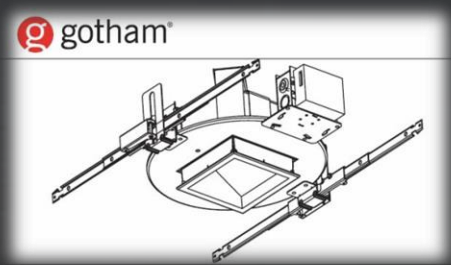
43" Dia. Winona Decorative Pendant, 186W  
14 total

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Poker Room Lighting Plan



6" Square Wallwash, 32.5W  
12 total

Project Overview  
Lighting Concept

**Poker Room**

Design Criteria

**Lighting Solution**

Calculations

Pre-Function

Design Criteria

Lighting Solution

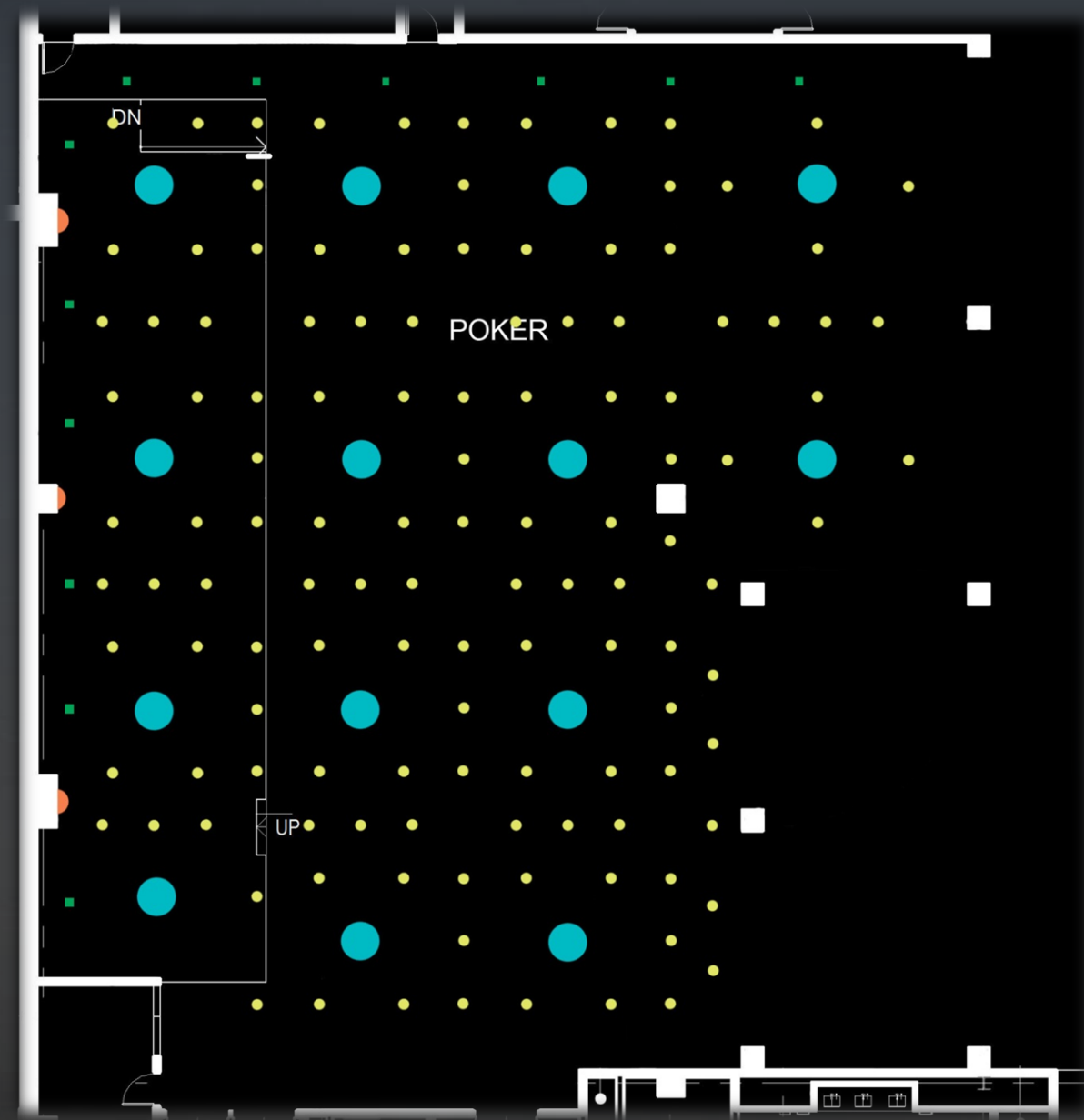
Calculations

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Poker Room Lighting Plan



Winona Wall Drum, 32.2W  
3 total

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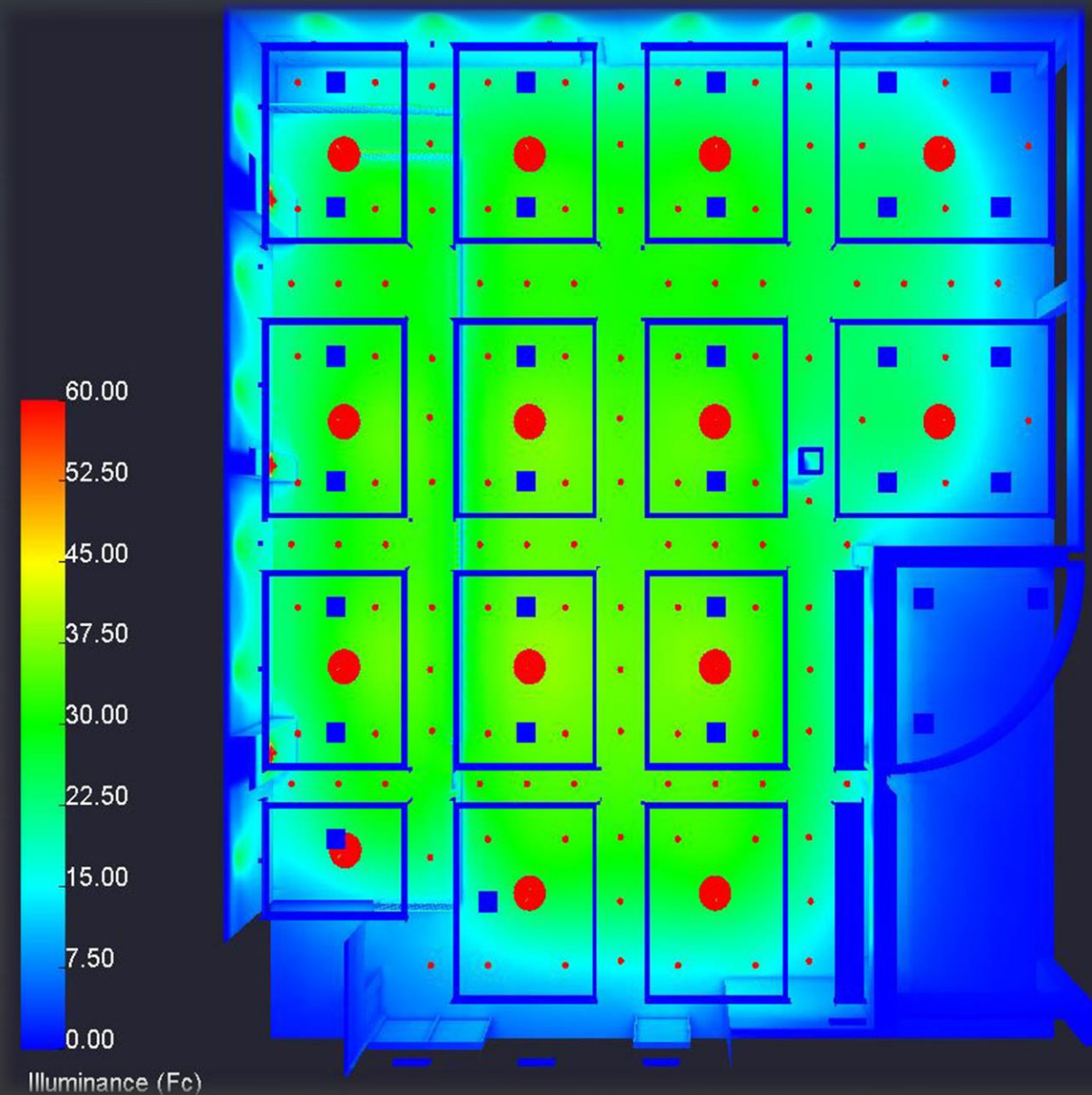


### Design Criteria and Considerations

- Uniform Light
  - Avg. / Min. of 5:1
- Horizontal Illuminance
  - $E_{h,avg} = 30fc$
- Lighting Power Density
  - Classroom/Lecture: 1.24 W/ft<sup>2</sup>

### Final Design

- Avg. / Min. ratio of 1.85
- Horizontal Illuminance of 32fc
- Lighting Power Density of 0.80 W/ft<sup>2</sup>



### Project Overview

#### Lighting Concept

#### **Poker Room**

#### Design Criteria

#### Lighting Solution

#### **Calculations**

#### Pre-Function

#### Design Criteria

#### Lighting Solution

#### Calculations

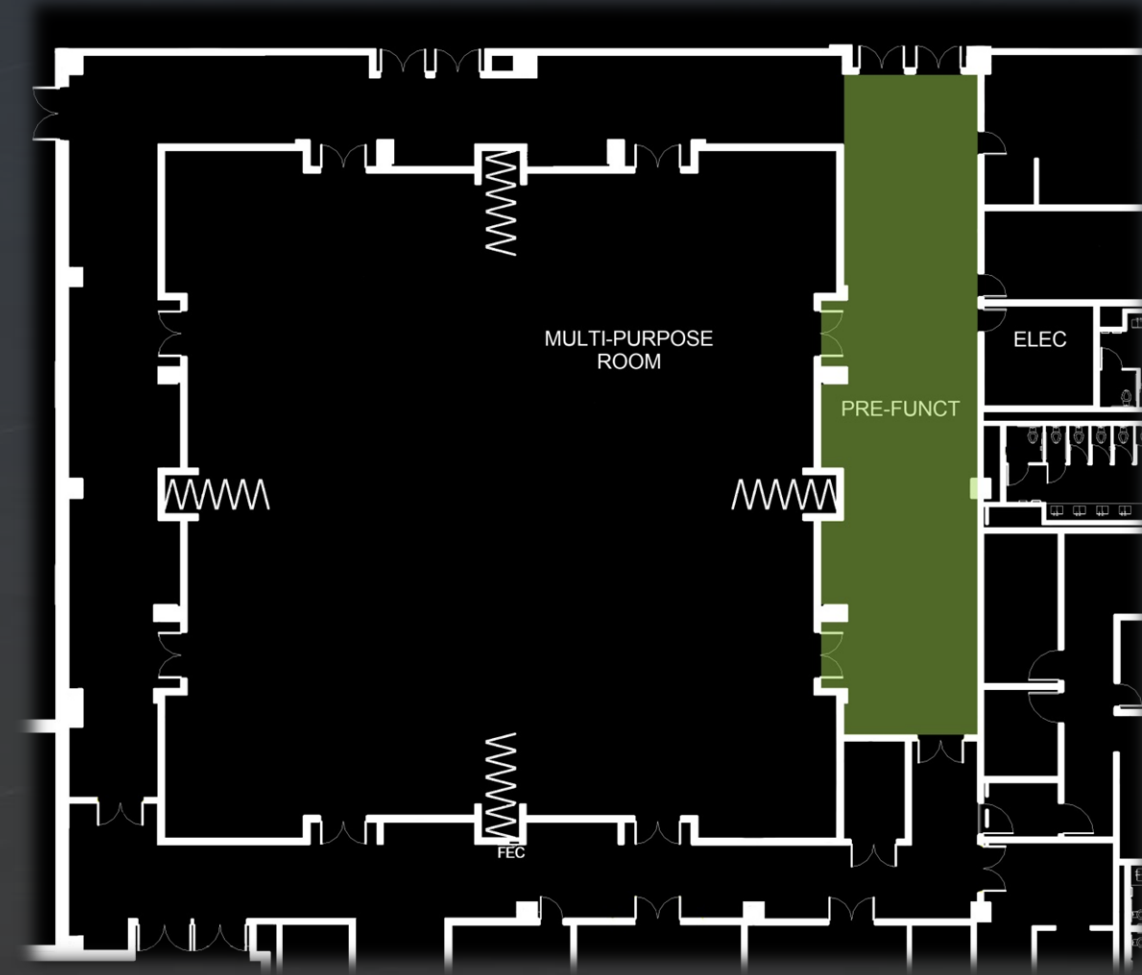
#### Solar Array

#### Structural Effects

#### Conclusion

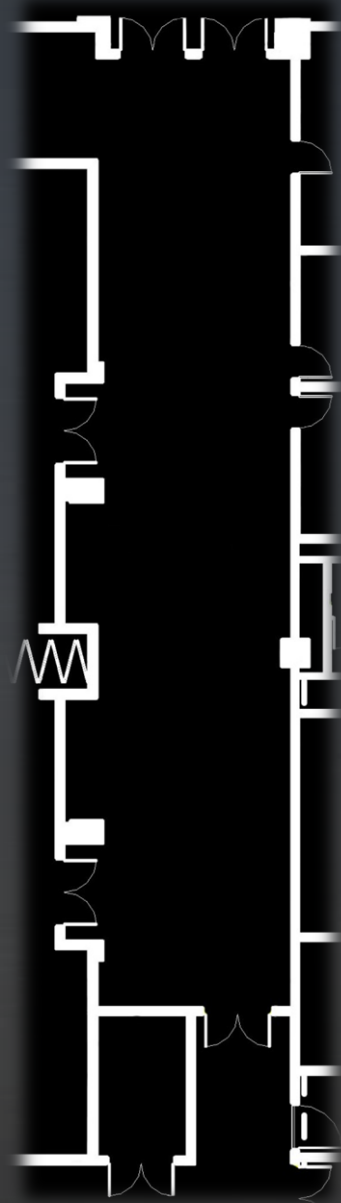
## Description

- Located on the 1<sup>st</sup> level
- Approx. 1,980 sq. ft.
- 15ft ceiling
- 17ft recessed ceilings



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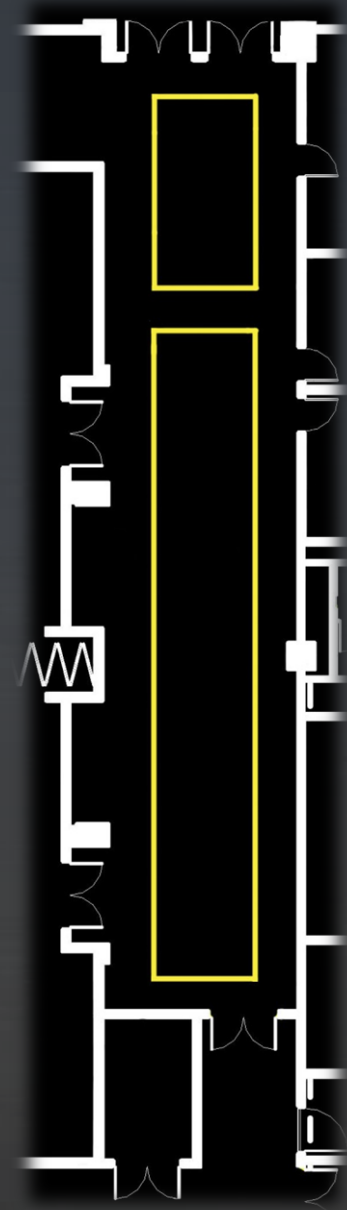




### Design Criteria and Considerations

- Promote Impression of Spaciousness
- Guide Guests
- Horizontal Illuminance
  - $E_{h,avg} = 30fc$
- Avg. / Min. ratio of 4:1
- Lighting Power Density
  - Corridor/Transition: 0.66 W/ft<sup>2</sup>

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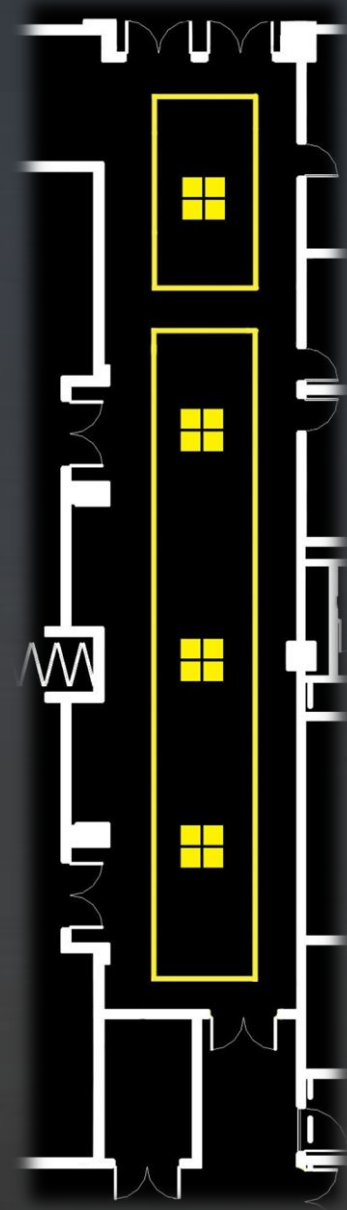
Pre-Function Lighting Design



Philips 4ft Linear Cove w/ Intelligent White, 20.7W  
22 total

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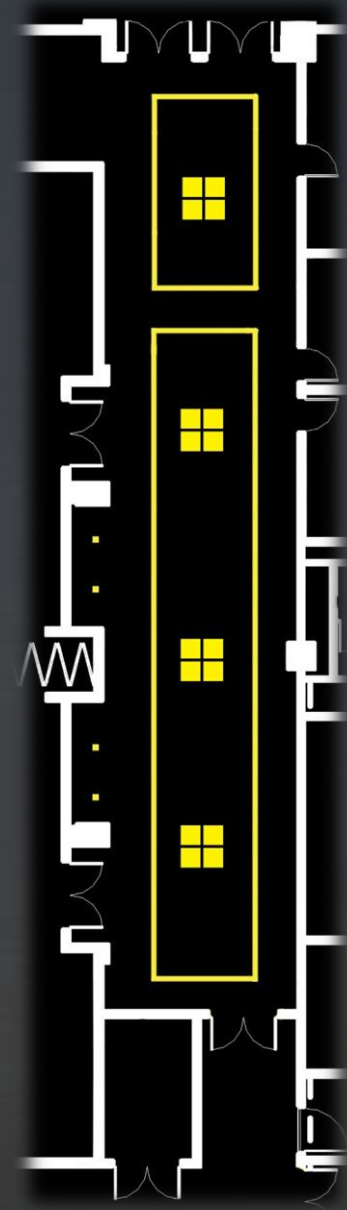


Pre-Function Lighting Design

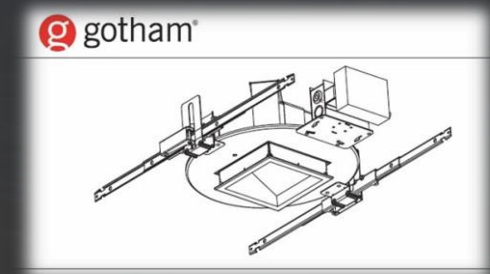


Shaper Fabric Covered Pendant, 93W  
4 total

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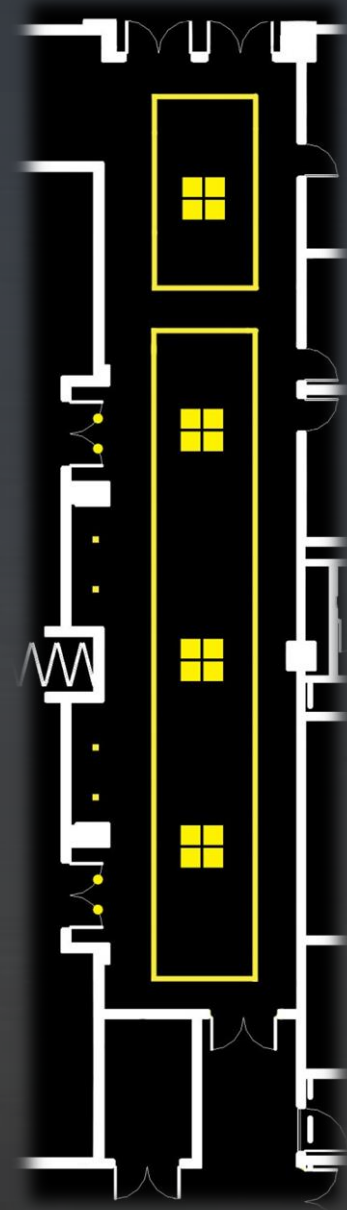
Pre-Function Lighting Design



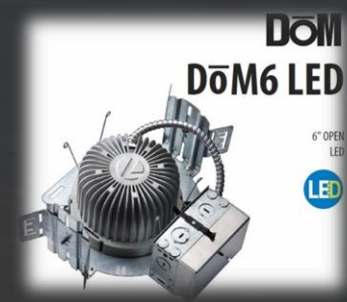
6" Square Wallwash, 86.6  
4 total

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Pre-Function Lighting Design



6" Recessed Downlight, Lithonia, 15.6W  
4 total

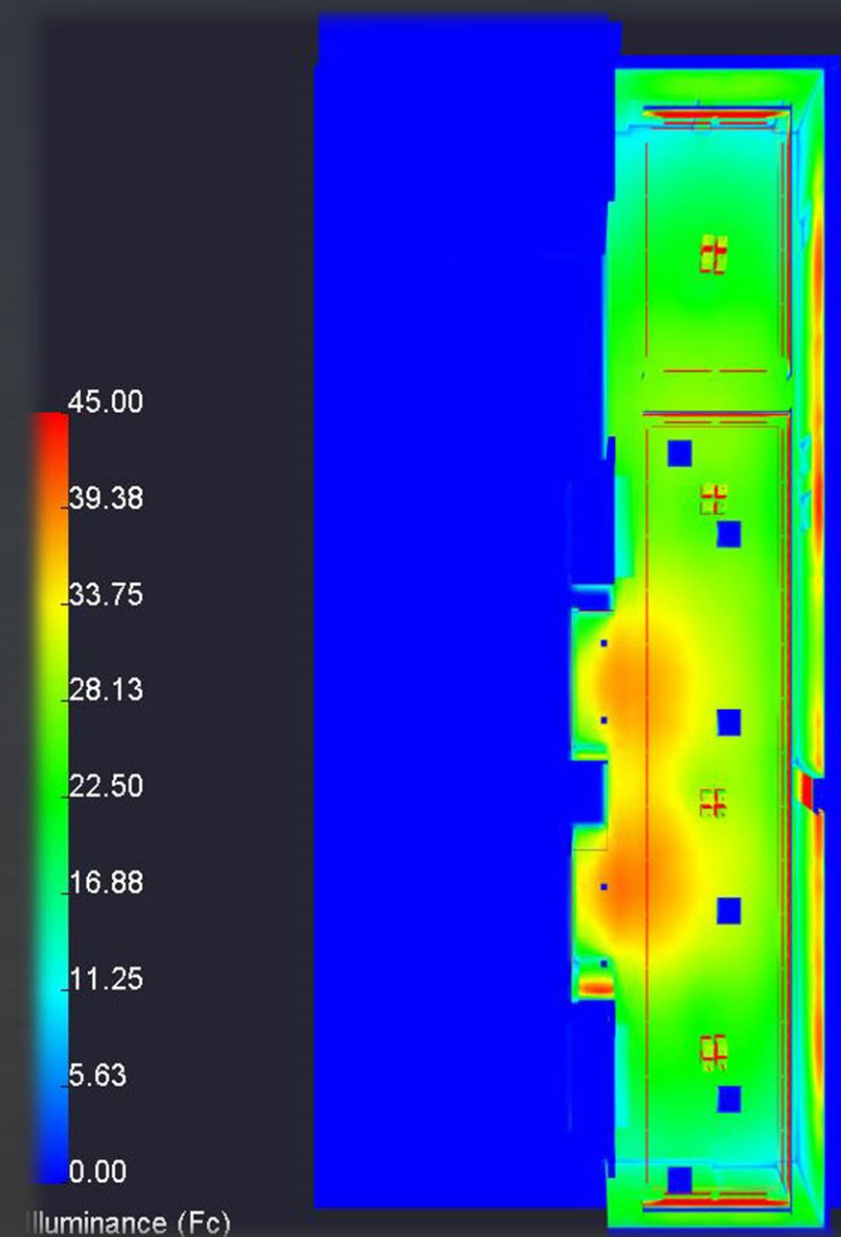
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- Poker Room
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## Design Criteria and Considerations

- Avg. / Min. of 4:1
- Horizontal Illuminance
  - $E_{h,avg} = 30fc$
- Lighting Power Density
  - Corridor/Transition:  $0.66 \text{ W/ft}^2$

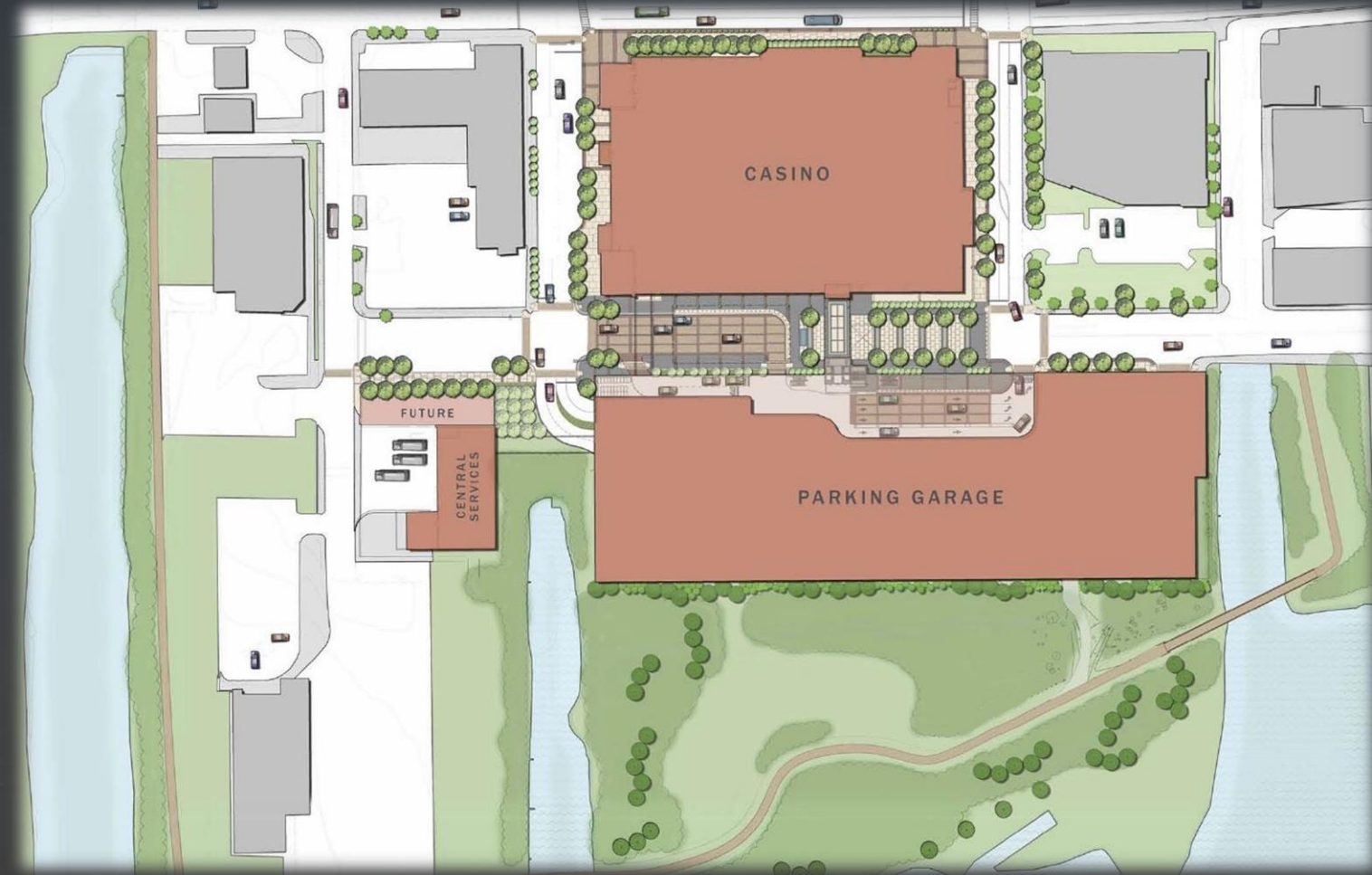
## Final Design

- Avg. / Min. ratio of 1.95
- Horizontal Illuminance of  $30fc$
- Lighting Power Density of  $0.62 \text{ W/ft}^2$



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Lighting Concept  
Poker Room  
Design Criteria  
Lighting Solution  
Calculations  
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Lighting Solution  
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Solar Array  
Structural Effects  
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## Photovoltaic Array

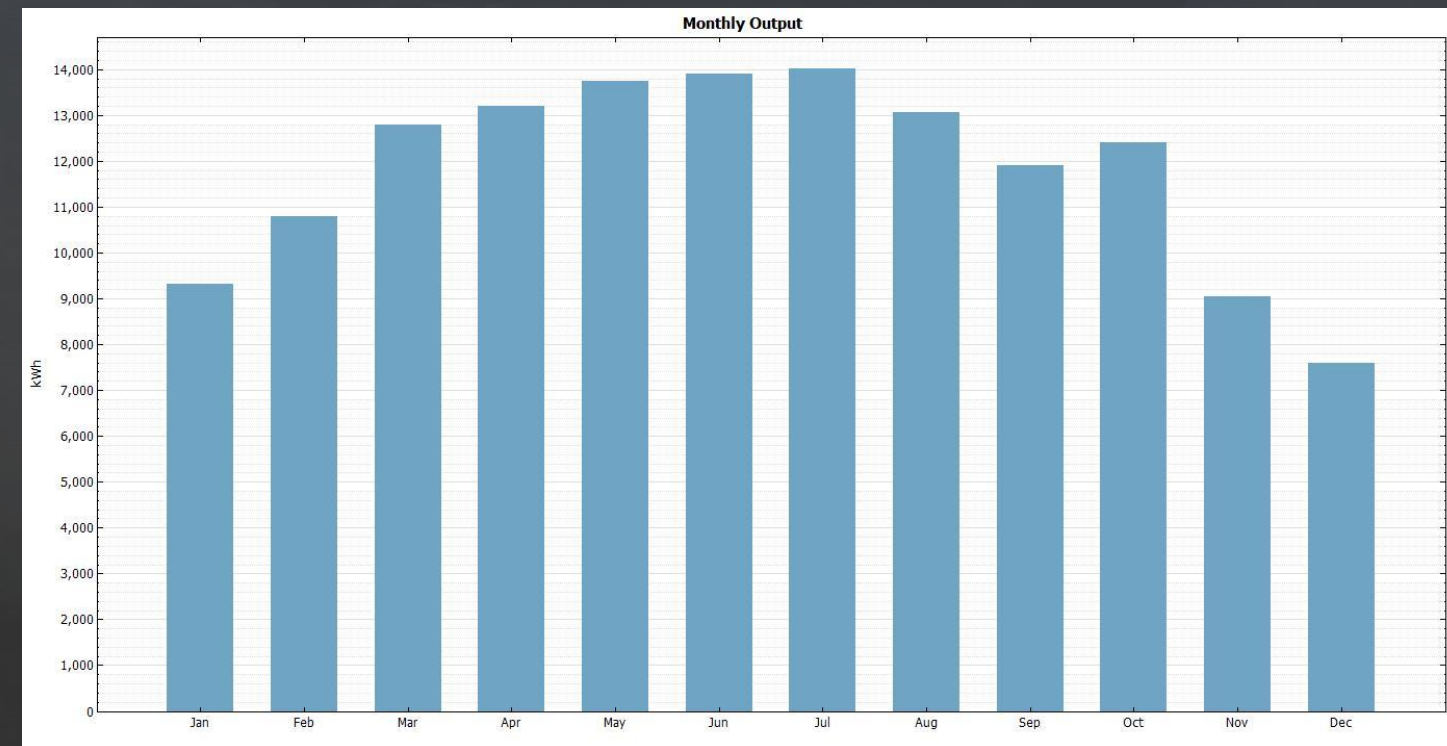
- System Advisor Model, SAM
- Suntech Power STP250 – 20Wd Module
  - 250W, 37.4A, efficiency of 15.4%
- Growatt 20000TL3-US Inverter
- 400 Panels, 20x20
- 5 inverters needed

Project Overview  
Lighting Concept  
Poker Room  
Design Criteria  
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Calculations  
Pre-Function  
Design Criteria  
Lighting Solution  
Calculations  
**Solar Array**  
Structural Effects  
Conclusion

	Monthly Energy (kWh)	Net ac output (kWh)	Net dc output (kWh)
<b>1</b>	9324.69	9324.69	9681.71
<b>2</b>	10785.1	10785.1	11175.7
<b>3</b>	12786	12786	13274.6
<b>4</b>	13206.1	13206.1	13724.6
<b>5</b>	13743.2	13743.2	14303.9
<b>6</b>	13895.6	13895.6	14481.4
<b>7</b>	14008.3	14008.3	14601.6
<b>8</b>	13070	13070	13626.9
<b>9</b>	11916.1	11916.1	12411.9
<b>10</b>	12397.3	12397.3	12885.2
<b>11</b>	9056.27	9056.27	9416.5
<b>12</b>	7594.67	7594.67	7912.91

## Photovoltaic Array

- Peak production of 14,000kWh in July
- Monthly Average of 11,820kWh
- Total Cost of Array
  - \$239,680
- Assuming \$0.09/kWh
  - Payback Period of 18 years and 9 months



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## Dead Load

- 3psf – Suntech panel
- 5.5psf – Roof Assembly (AISC Table 17-13, 14<sup>th</sup> Edition)
- 10psf – Superimposed
- 1.78psf – Vulcraft 1.5B x 22 gauge roof deck
  - **Total = 21psf**

## Live Load

- 30psf - Snow

## Roof Deck

- Vulcraft 1.5B x 22 gauge
- Meets requirements for a 3-span, unshored condition

## Current Roof Joist

- 32LH09
  - Span of 60ft, 5' 8" spacing
- Does not meet deflection requirements

## New Roof joist

- Increase size to 32LH11
  - Depth does not change

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## Live Load

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## Joist Girder

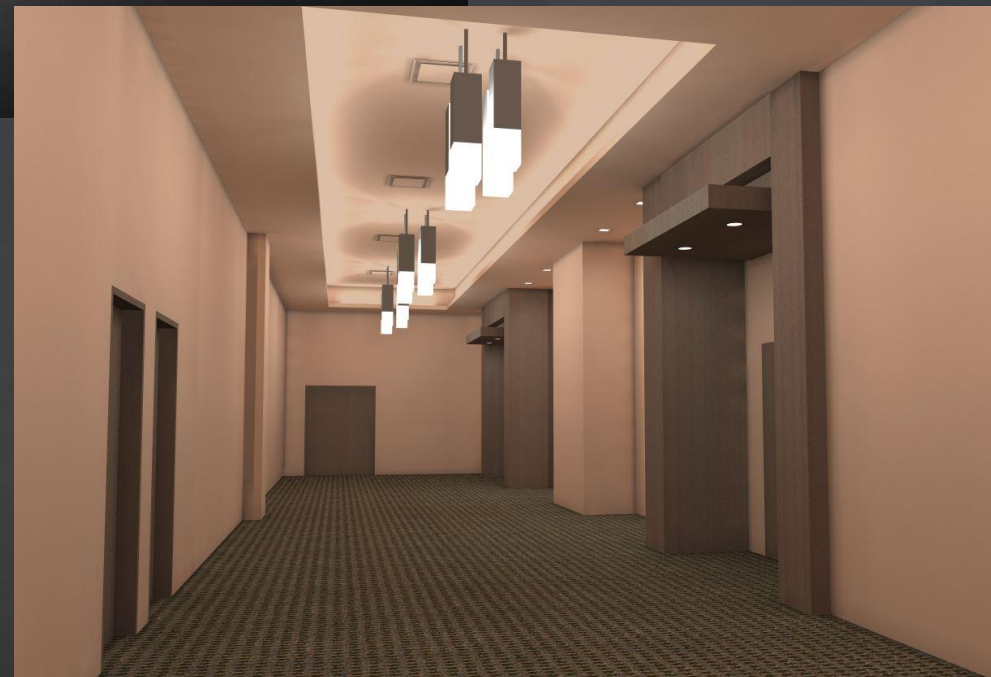
- 60G10N20K
  - 60” deep, has 10 panels, unfactored point load of 20kips
  - Calculations find actual point load of 17.5kips

## Third Level Column

- W8X48
  - Table 4-1, AISC 14<sup>th</sup> Edition used to evaluate column
  - Calculations find column to be adequate

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Conclusion





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