

THE WINSOR SCHOOL

Lubin-O'Donnell Center for Performance,
Athletics and Wellness

Maggie Golden // L + E

Lubin-O'Donnell Center



01 Introduction
Building // Scope



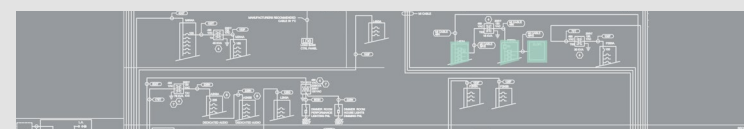
02 Wellness Plaza
Landscape Architecture



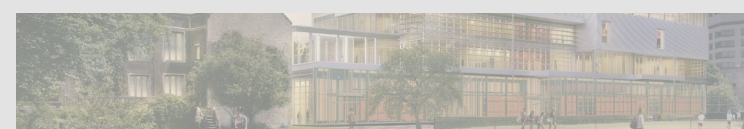
03 Wellness Corridor
Daylighting // Lighting Design



04 Dance Rehearsal Studio
Lighting Design



05 Emergency Analysis
Electrical Depth



06 Conclusion
Acknowledgments



+ Established in 1886

+ Ranked Top Ten Preparatory School in the Nation

+ Day School for Young Women Grades 5-12



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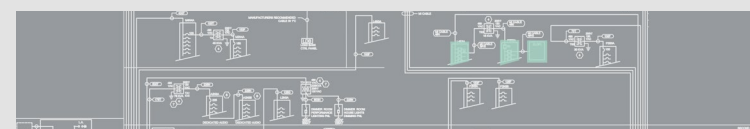
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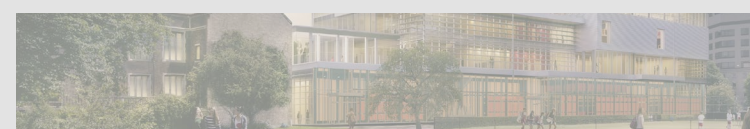
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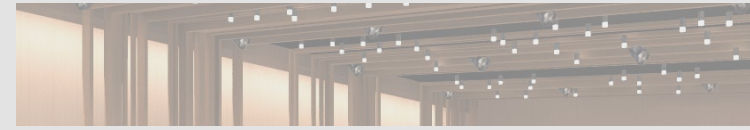
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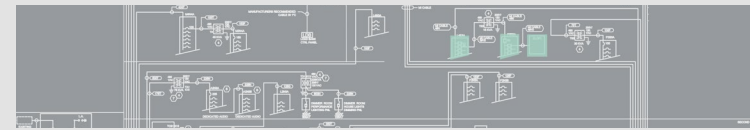
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PRESENTATION

Lighting Depth

Wellness Plaza
Wellness Lobby + Corridor
Dance Rehearsal Room
Performing Arts Theatre

Electrical Depth

Branch Circuit Redesign
Short Circuit Analysis
Electrical Cost Comparison

Daylighting Depth

Acoustical Breadth

Landscape Architecture Breadth



Lubin-O'Donnell Center



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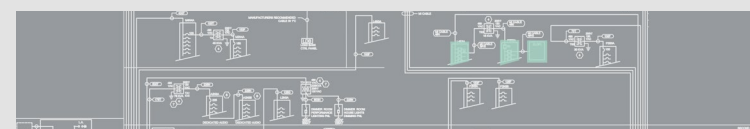
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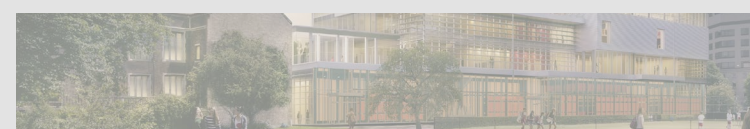
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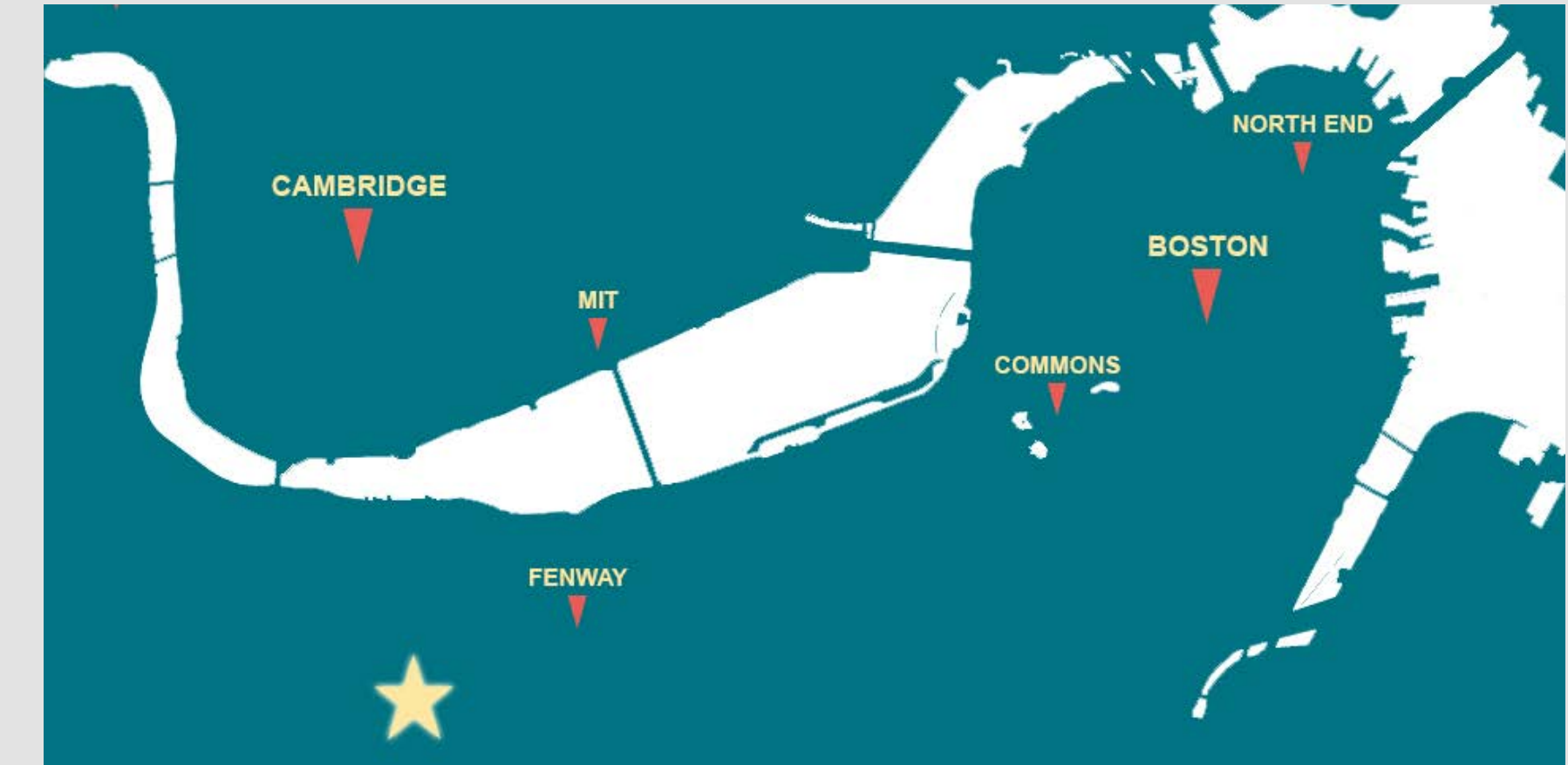
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+ Estimated Cost of \$71 Million
+ Dance and Performance Art Spaces
+ Gymnasium, Fitness Rooms and Squash Courts



THE WINSOR SCHOOL

Lubin-O'Donnell Center

LIGHTING + ELECTRICAL



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02 Wellness Plaza

Landscape Architecture



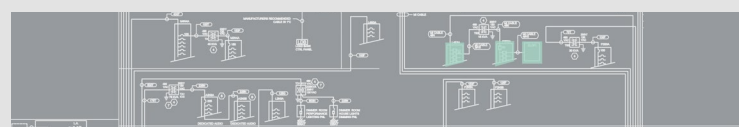
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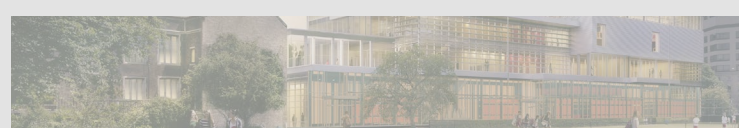
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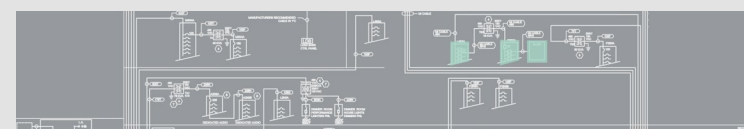
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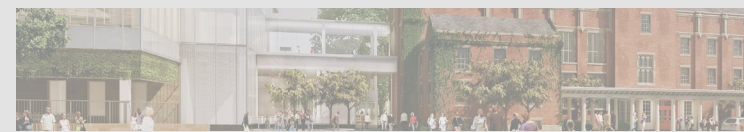
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Classic Tradition in a New Light



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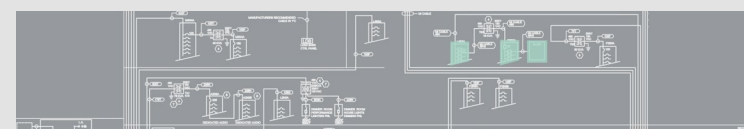
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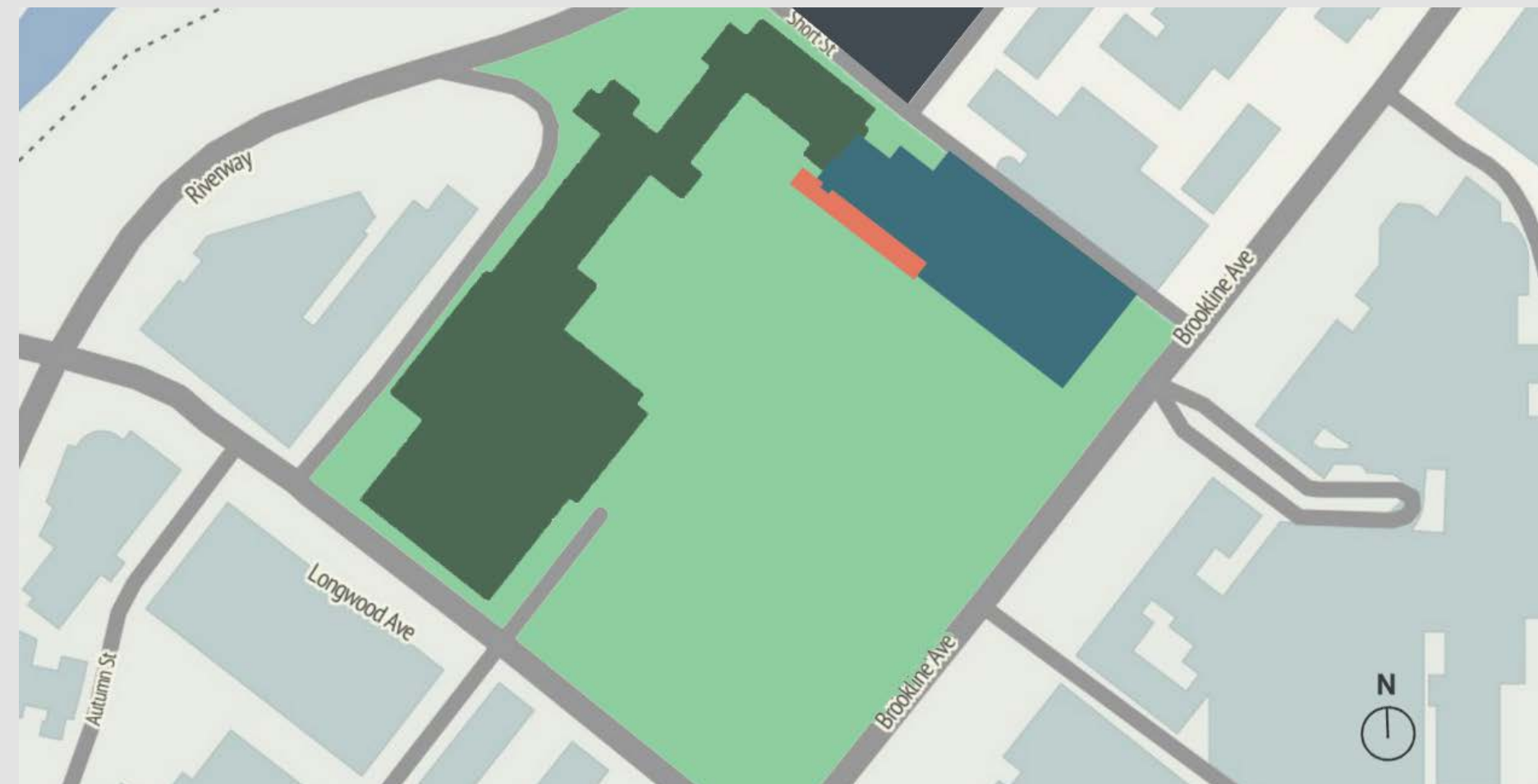
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-  Parking
-  Academic Buildings
-  Lubin-O'Donnell Center
-  Wellness Plaza
-  Lawn / Turf

WELLNESS PLAZA

Lubin-O'Donnell Center



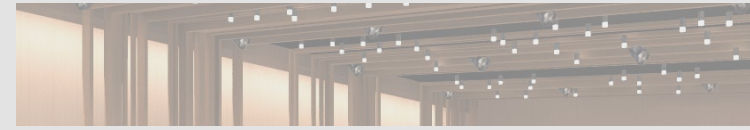
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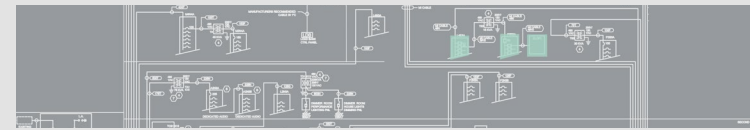
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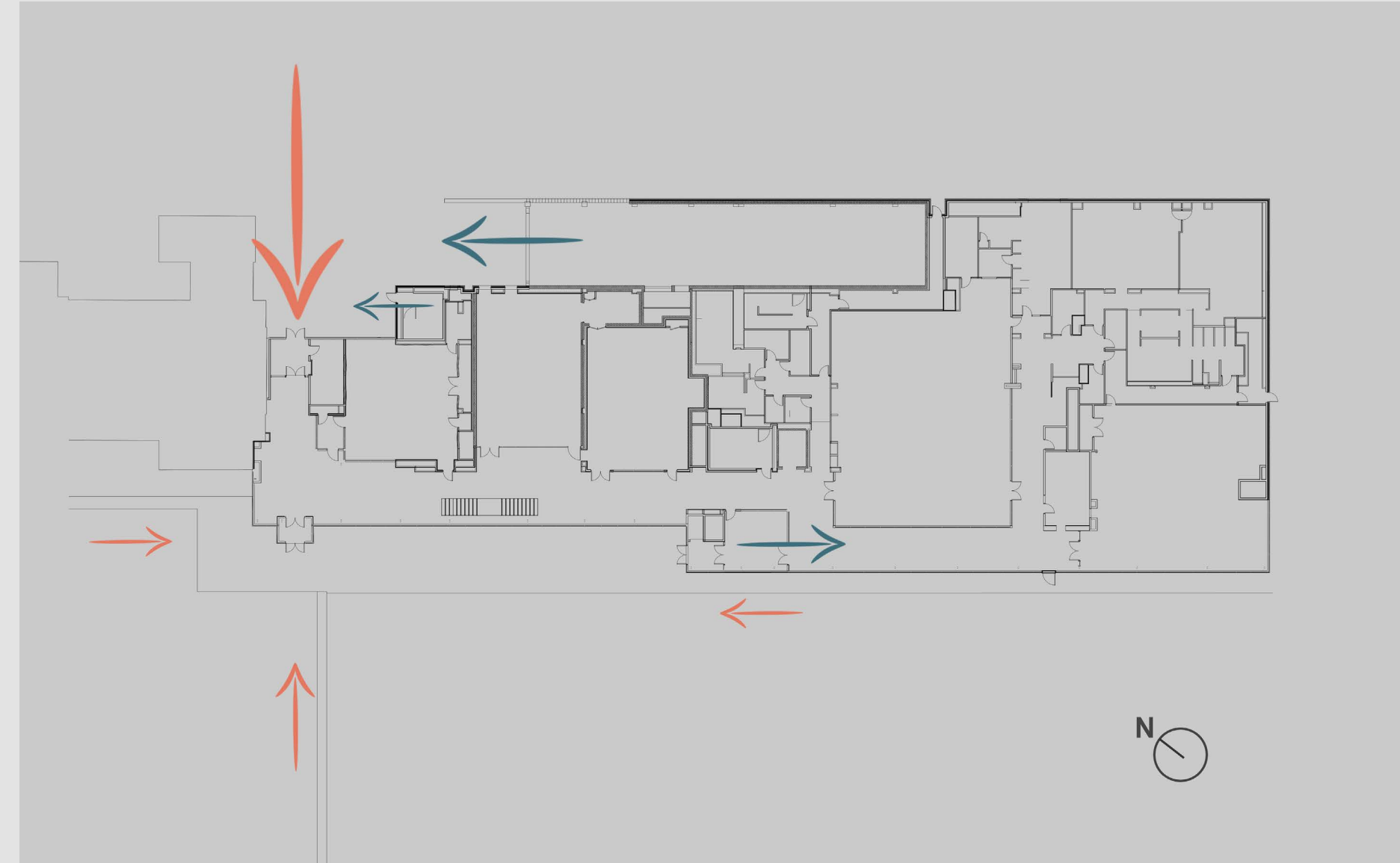
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 **Future (Parking) Circulation**
 **Current Circulation**

Lubin-O'Donnell Center



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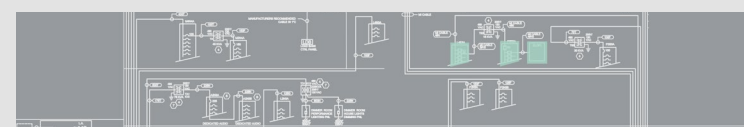
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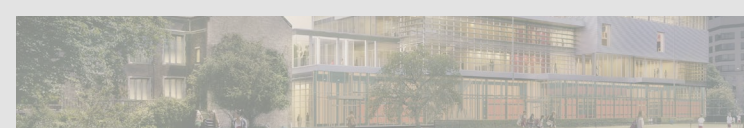
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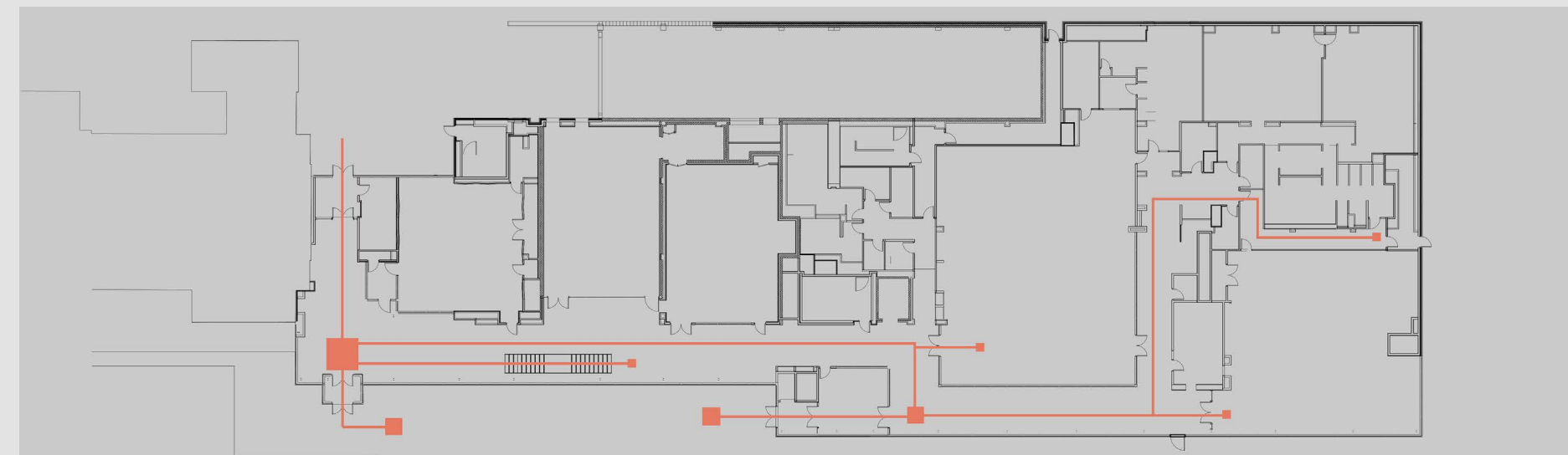
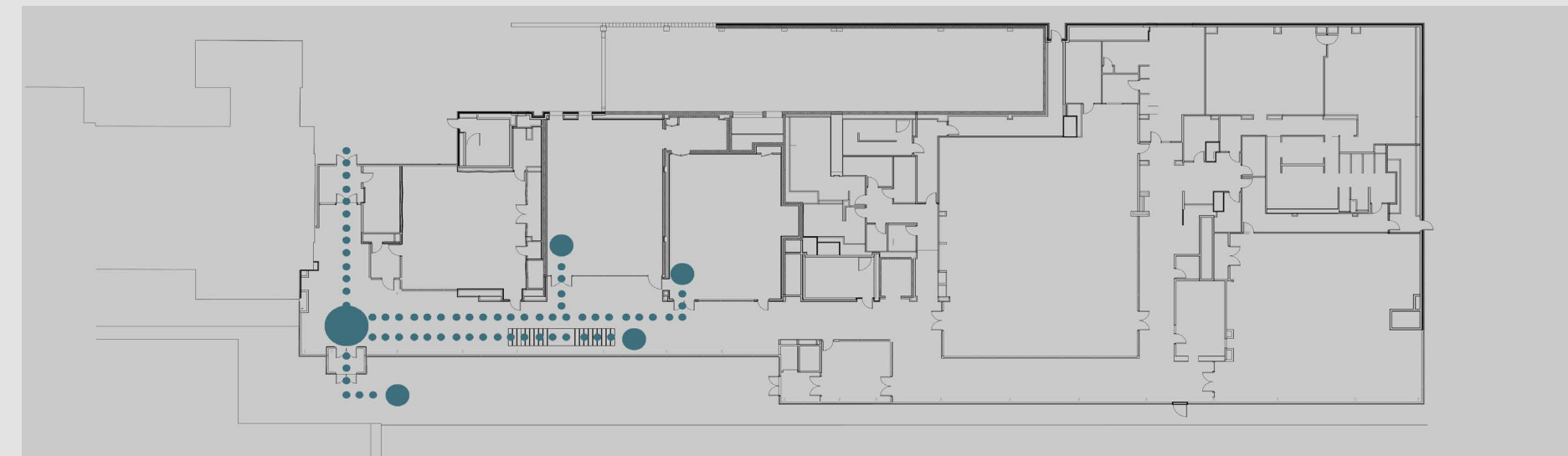
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Performing Arts Paths



Athletics Paths

Lubin-O'Donnell Center



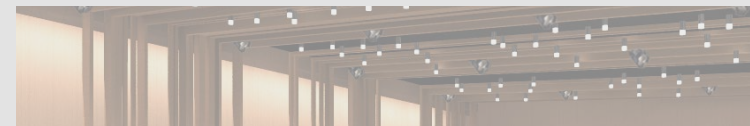
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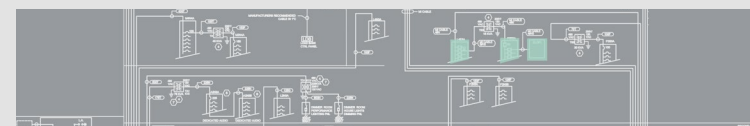
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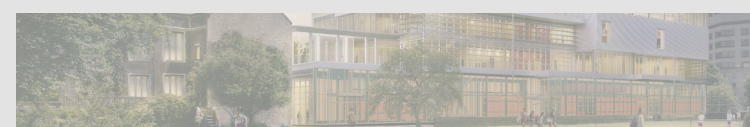
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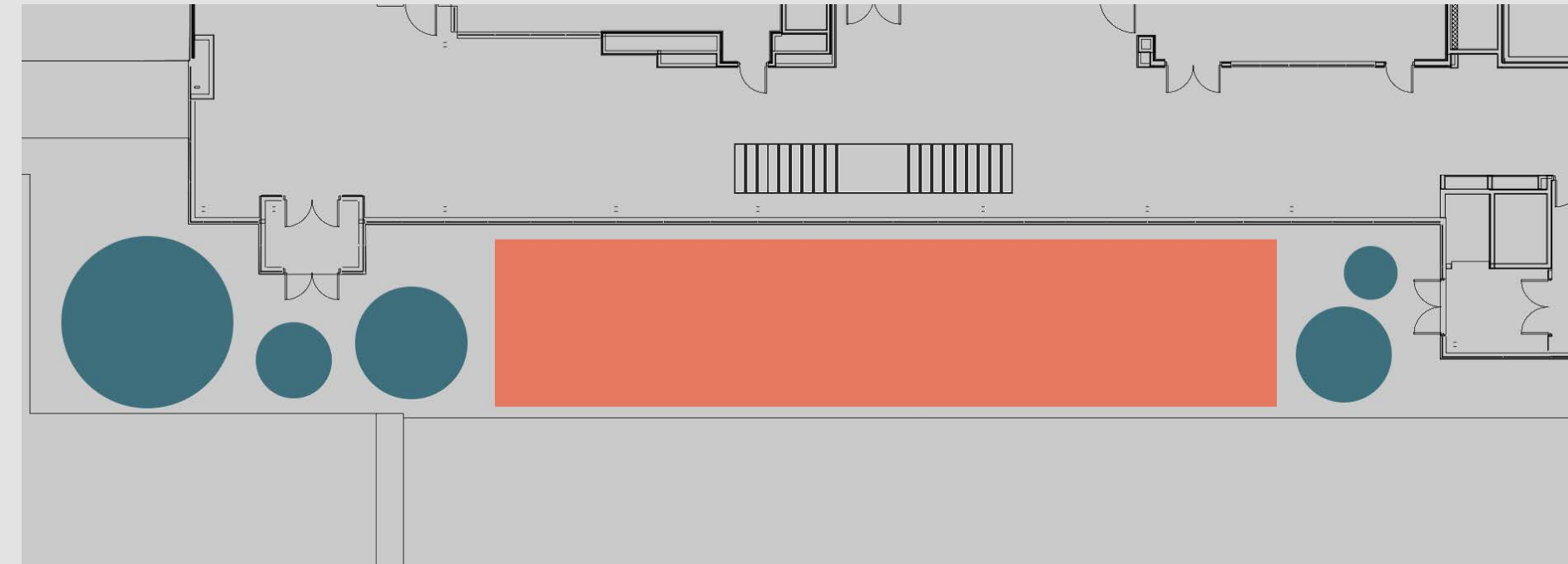
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 **Social Interaction**

 **Visual Interest**

DESIGN GOALS

Transition Main Lawn + Modern Building

Playful + Relaxing Atmosphere

High Level of Interest

Low Maintenance Design

Lubin-O'Donnell Center



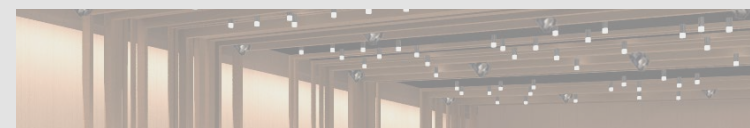
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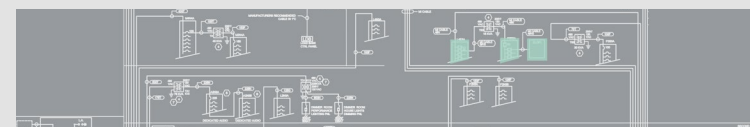
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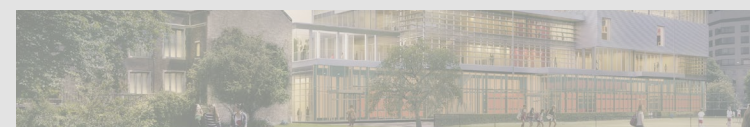
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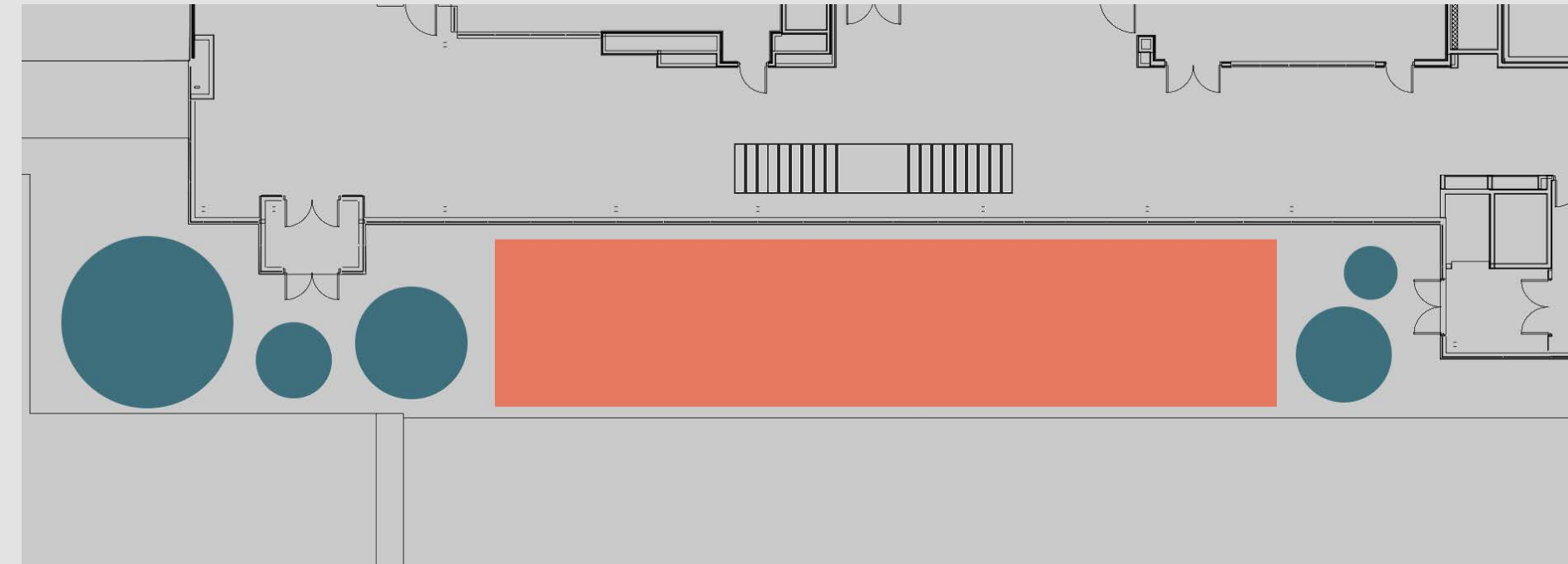
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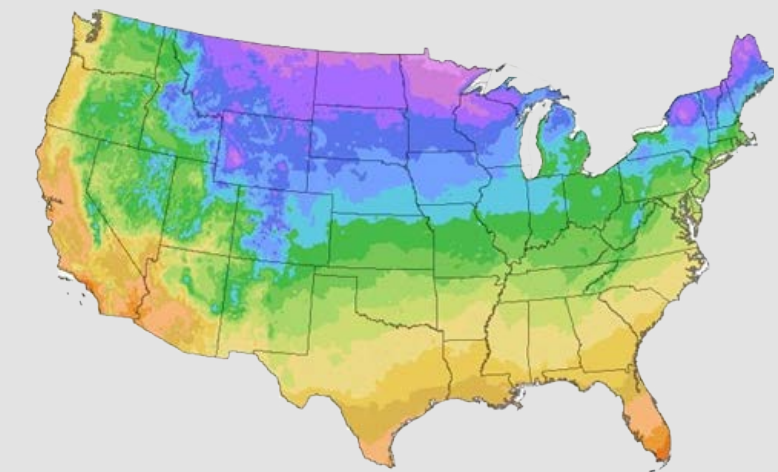


● **Social Interaction**
■ **Visual Interest**

PLANTING GOALS

Hardy in Full Sun + Boston Climate

Boston = Zone 6b via USDA



THE WINSOR SCHOOL

Lubin-O'Donnell Center

LIGHTING + ELECTRICAL



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Building // Scope



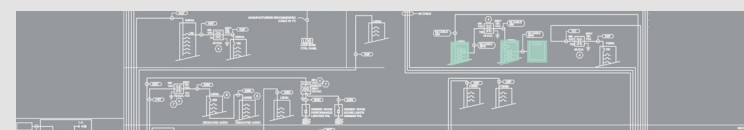
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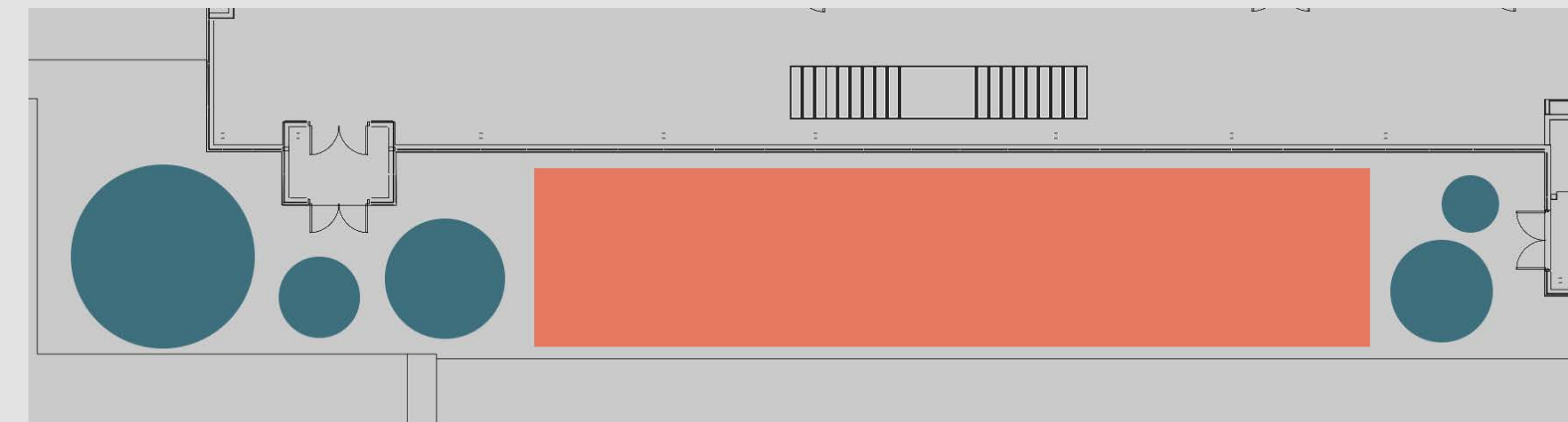
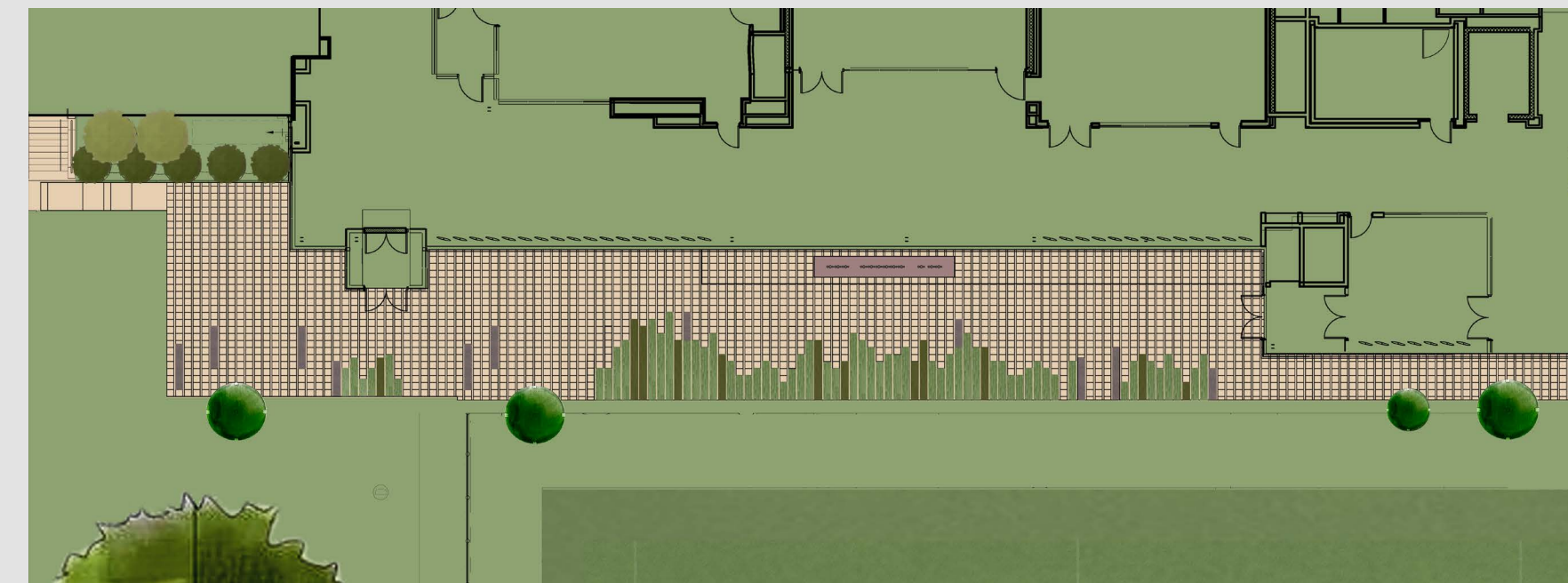
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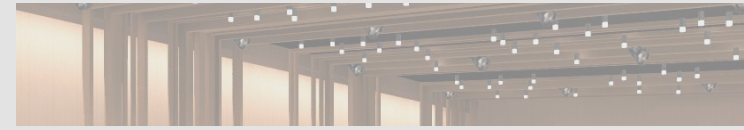
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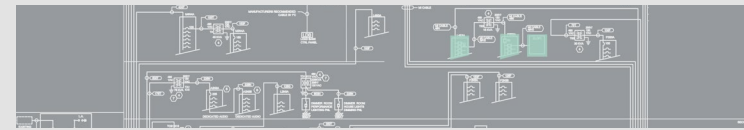
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LIGHTING + ELECTRICAL



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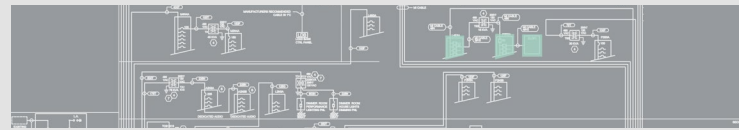
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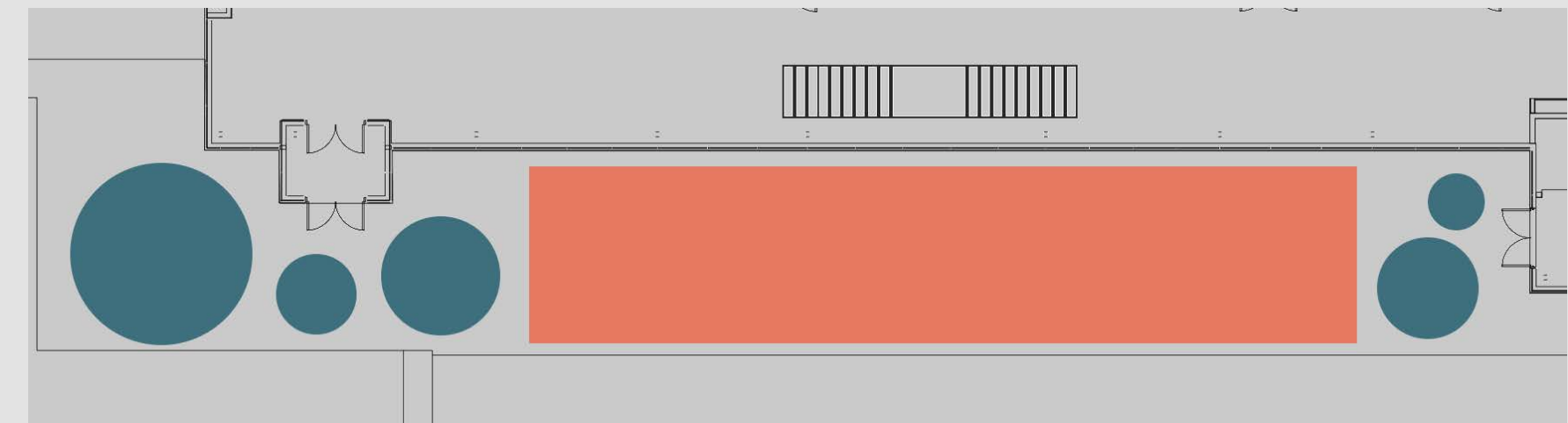
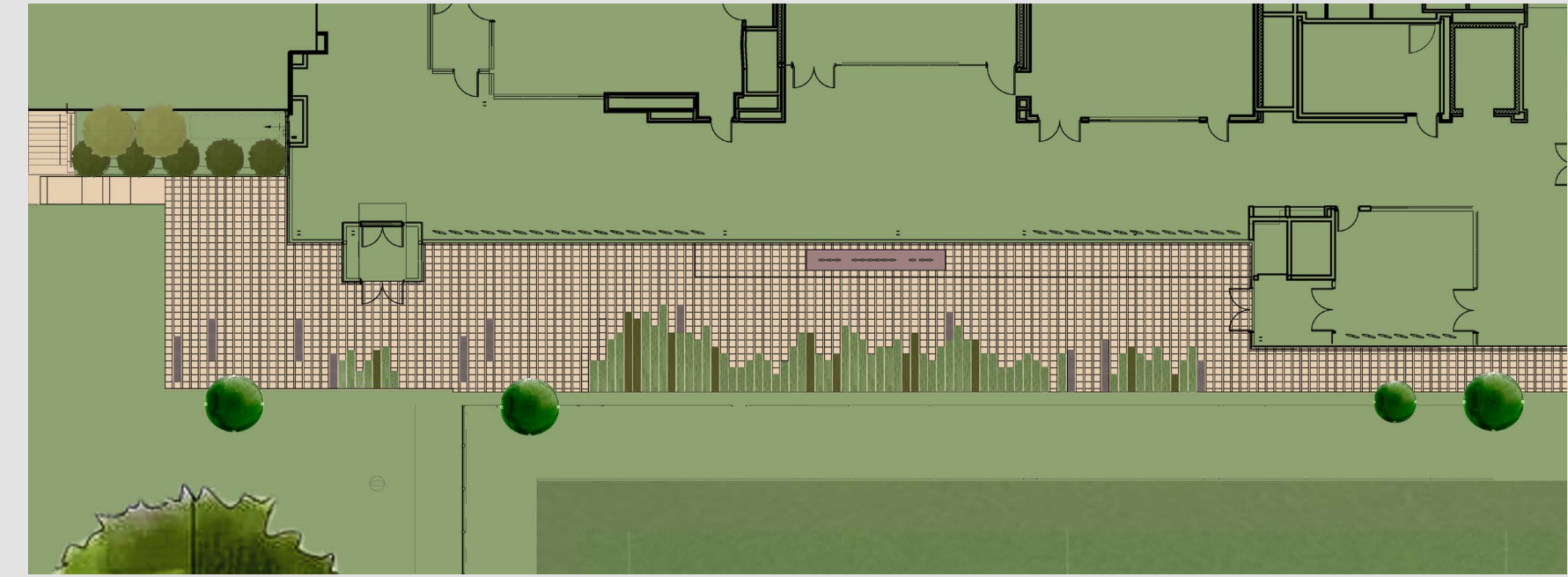
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LIGHTING + ELECTRICAL



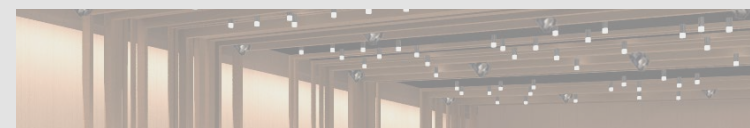
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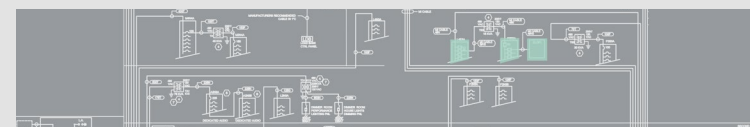
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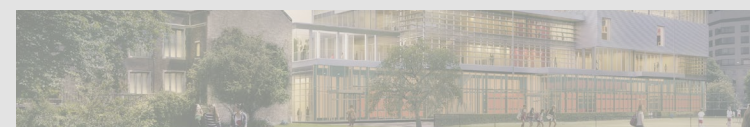
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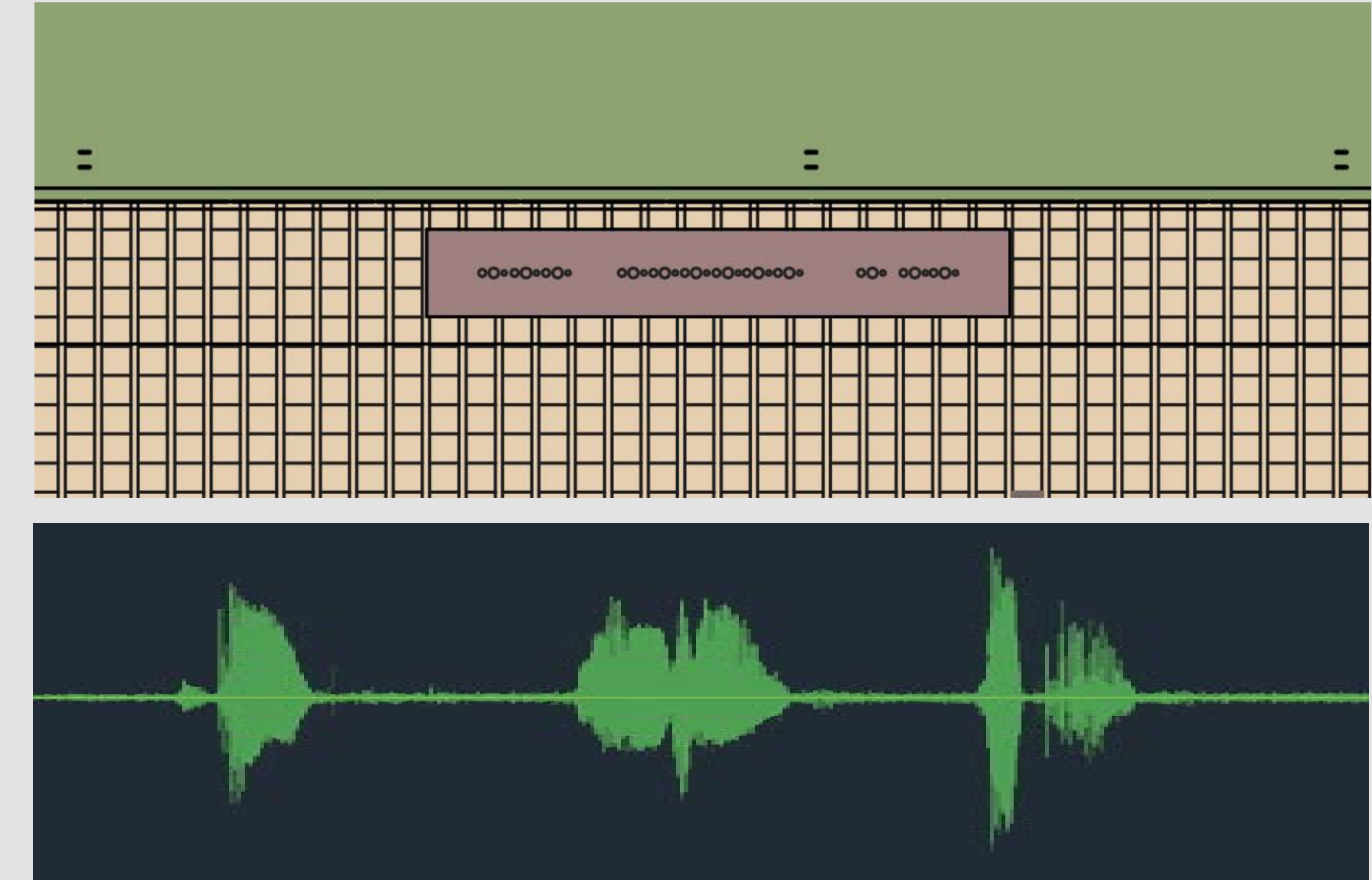
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LIGHTING + ELECTRICAL



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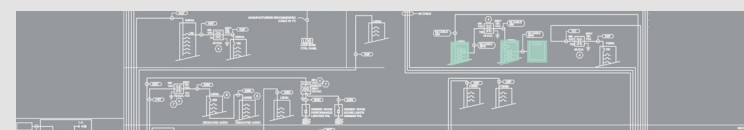
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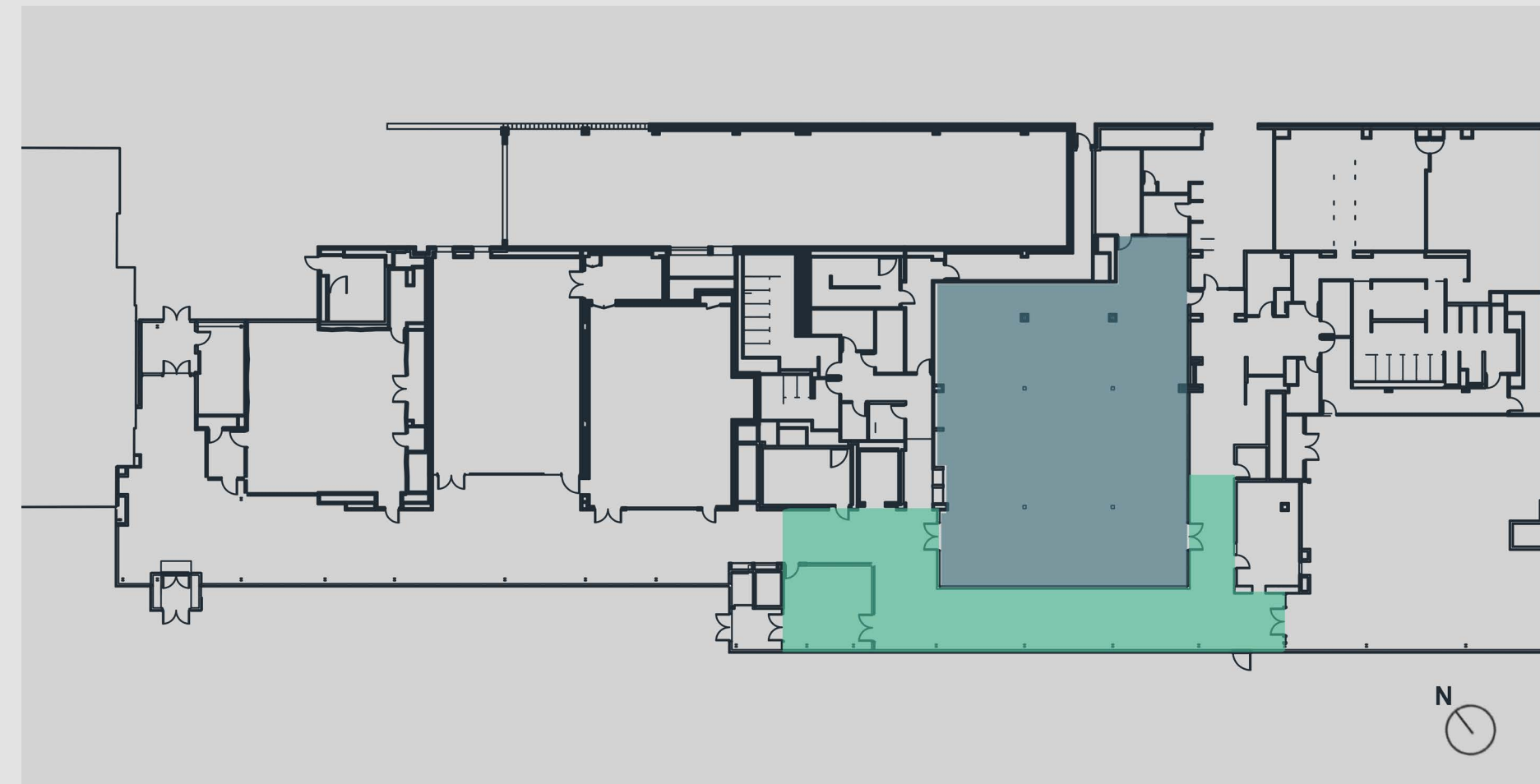
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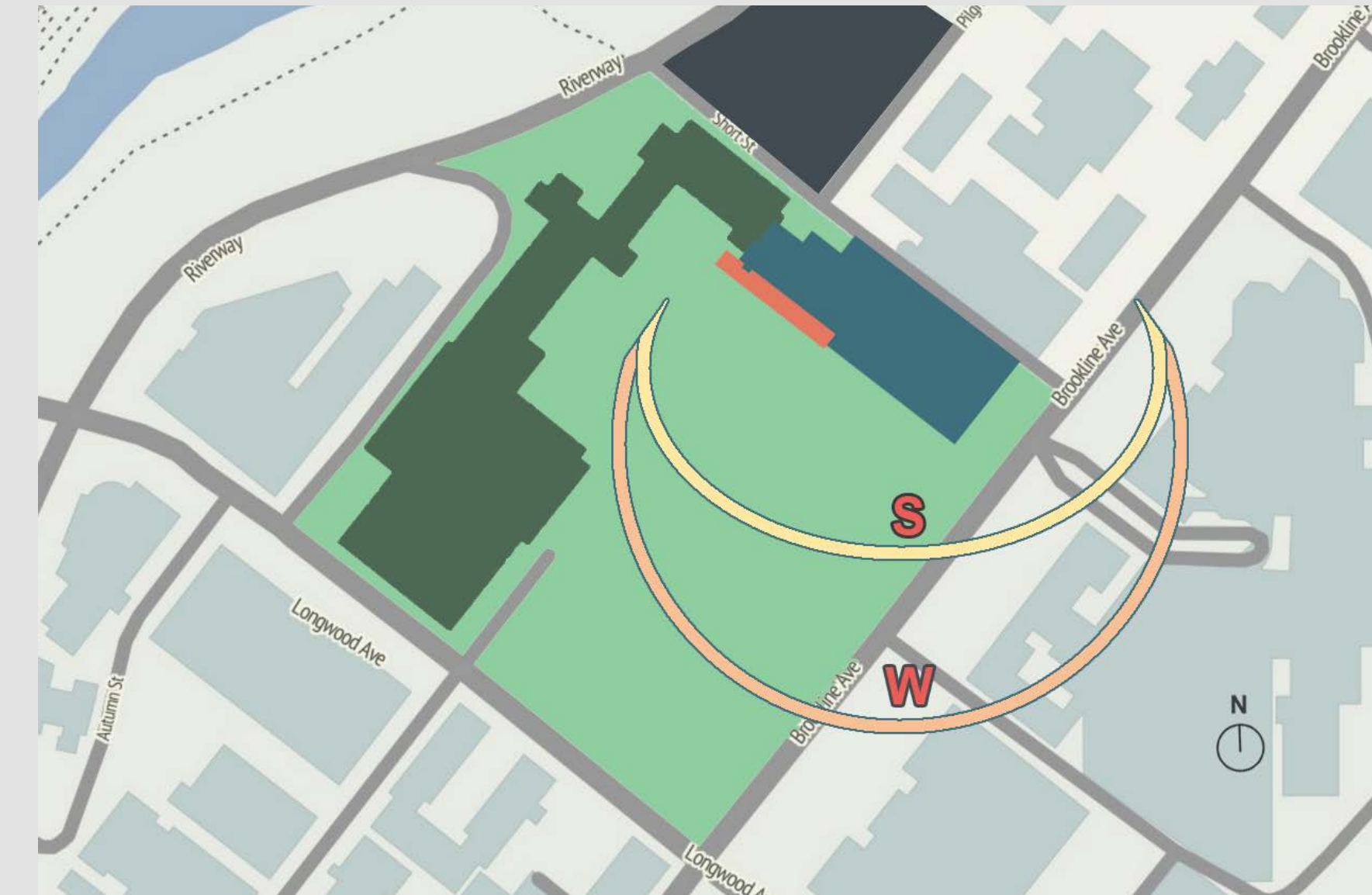
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WELLNESS CORRIDOR



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LIGHTING + ELECTRICAL



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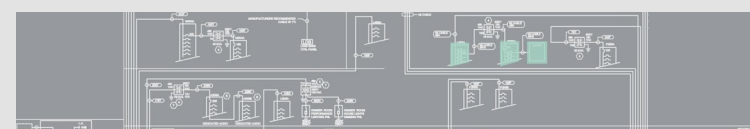
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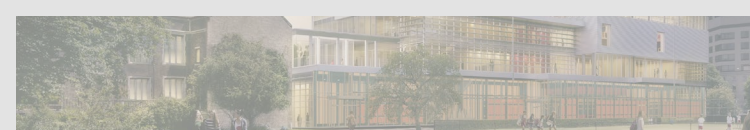
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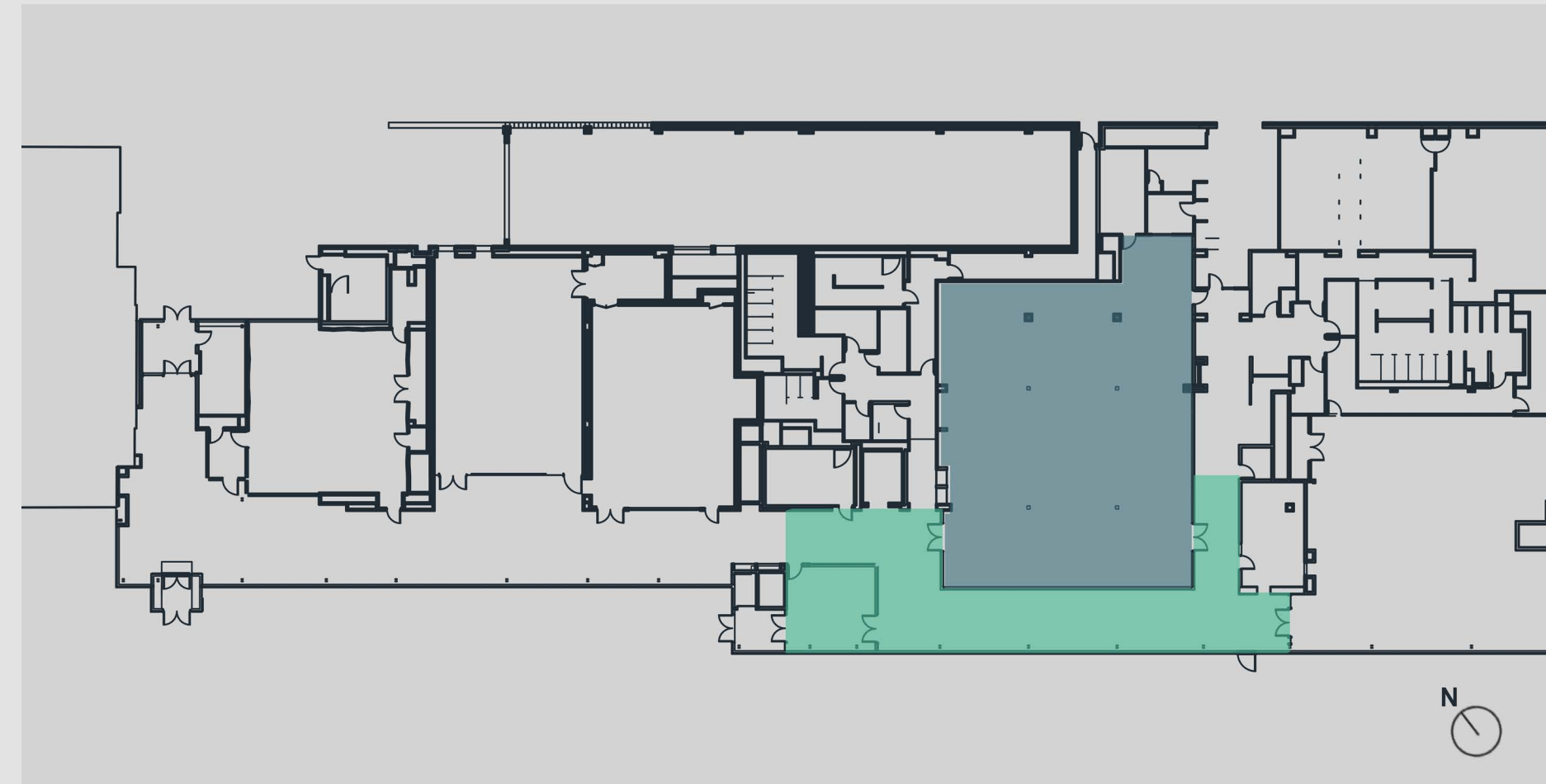
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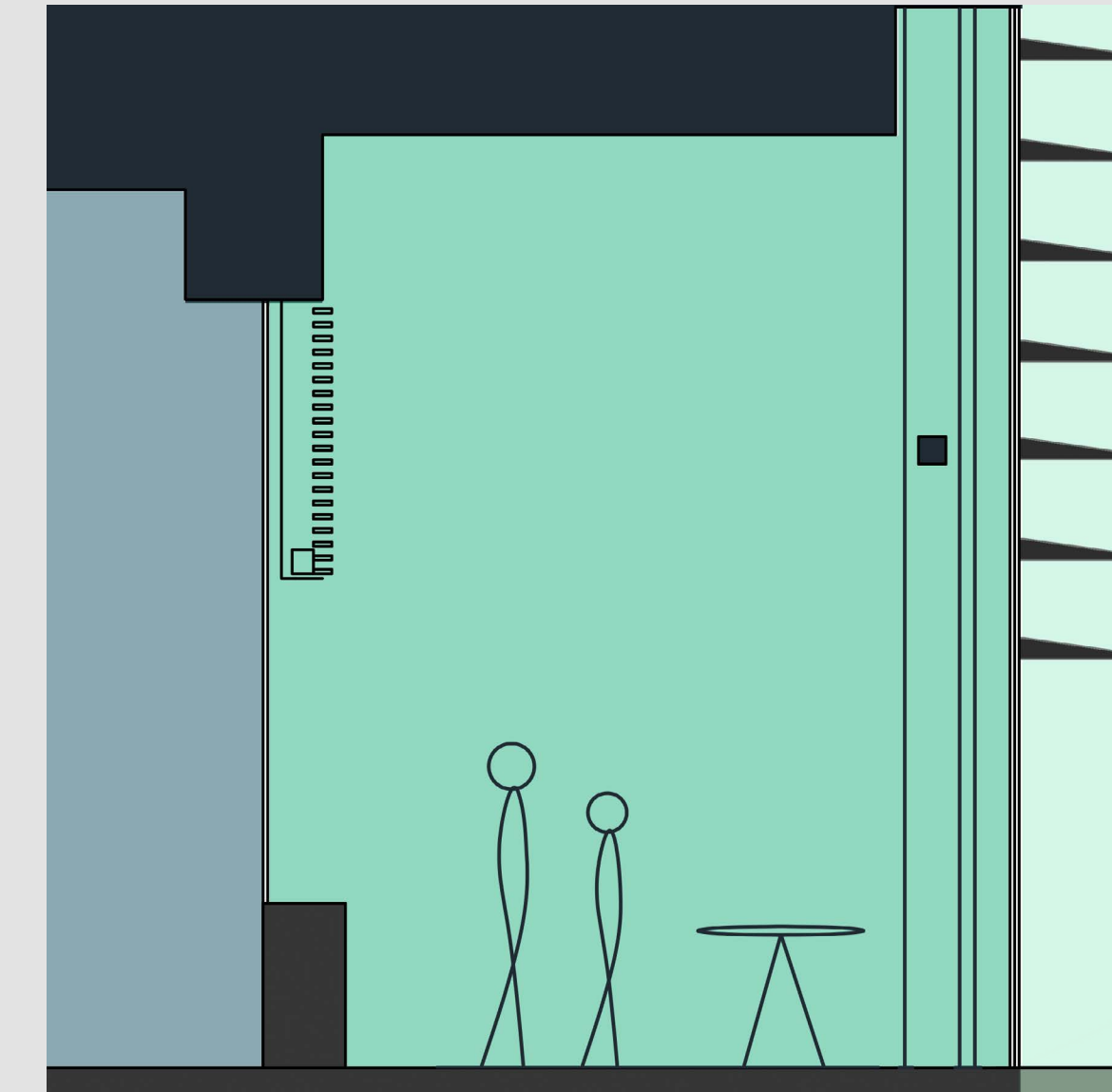
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WELLNESS CORRIDOR



Shades
+
Exterior Louvers
+
Fritted Glass



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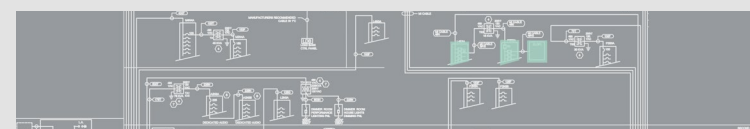
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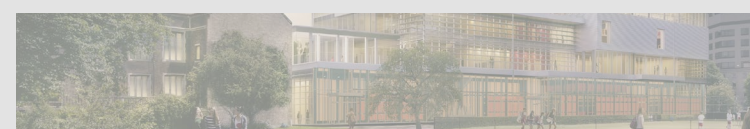
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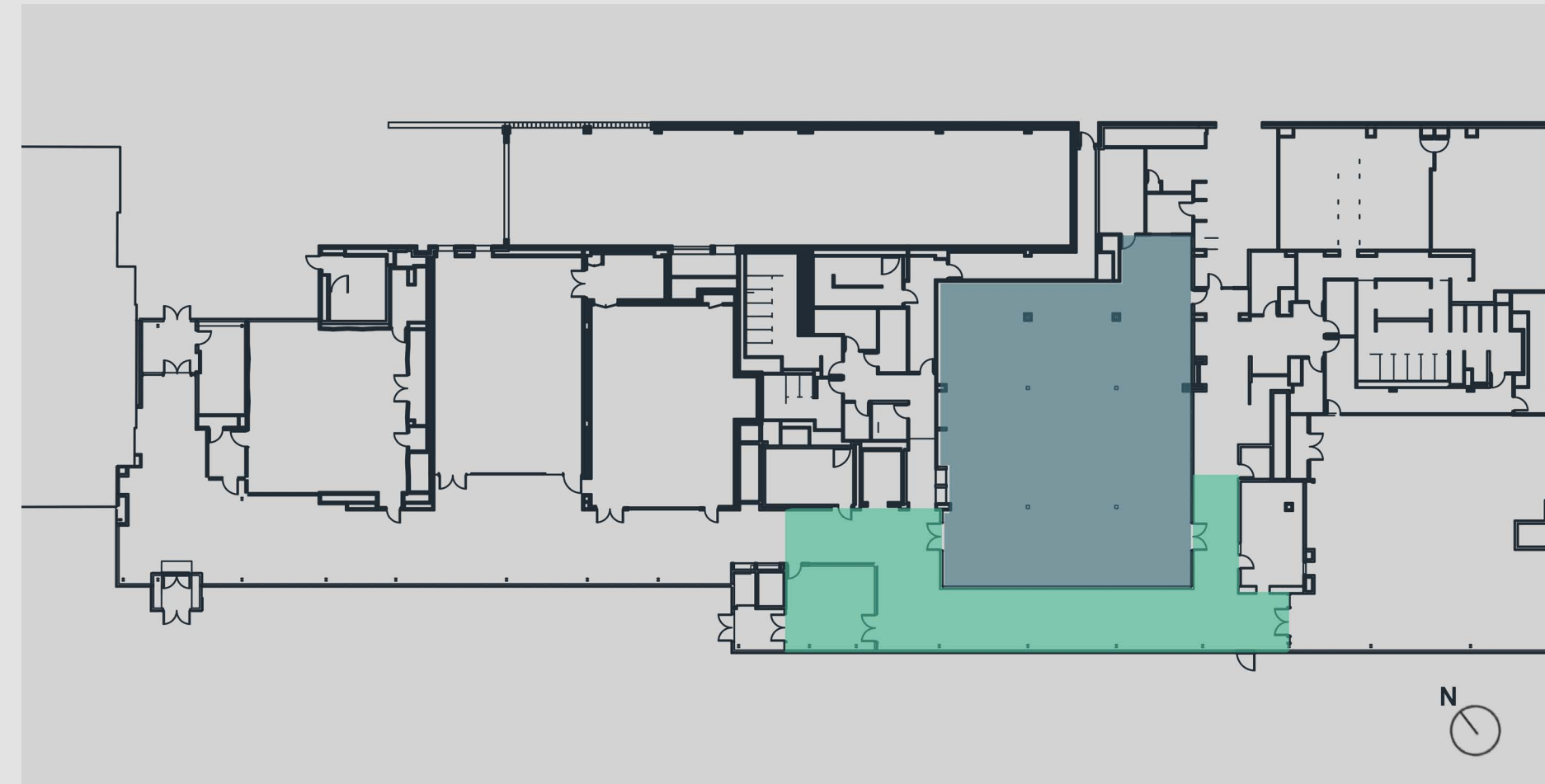
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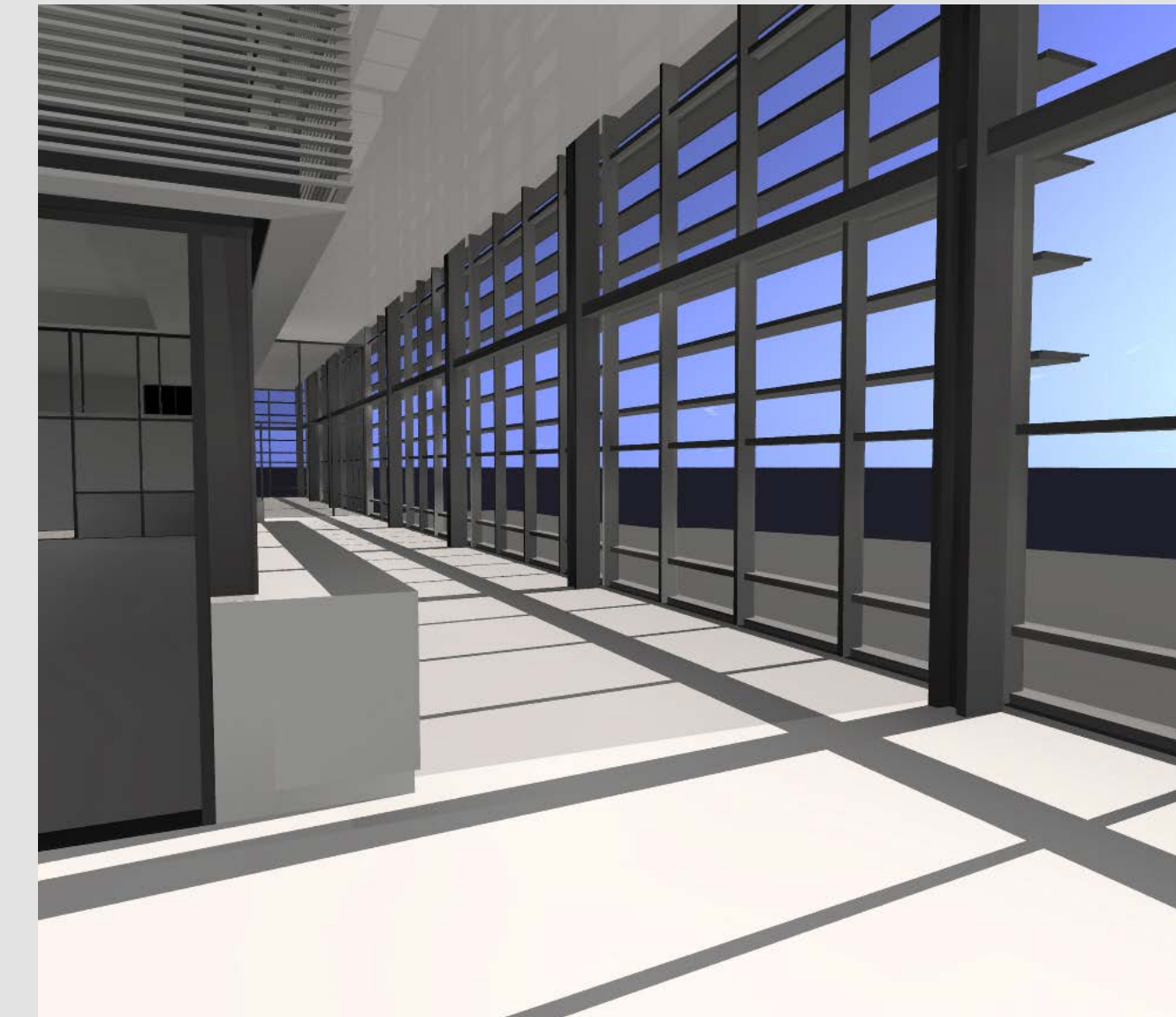
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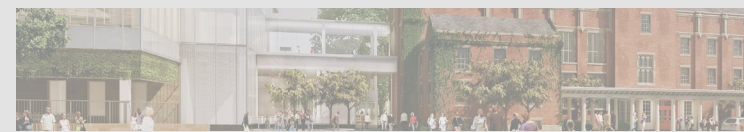


WELLNESS CORRIDOR



Average
Illuminance

11,972 lux



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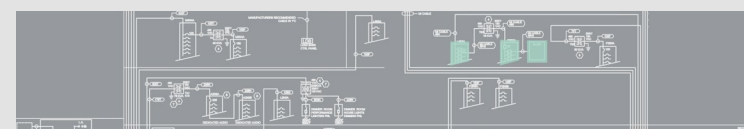
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DESIGN GOALS

Provide Occupant Control

Reduce Glare

Introduce Indirect Light

Create Spacious + Comfortable Ambiance

Create Visual Interest

Effectively Introduce and Celebrate Daylight

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LIGHTING + ELECTRICAL



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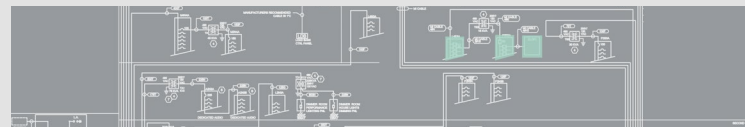
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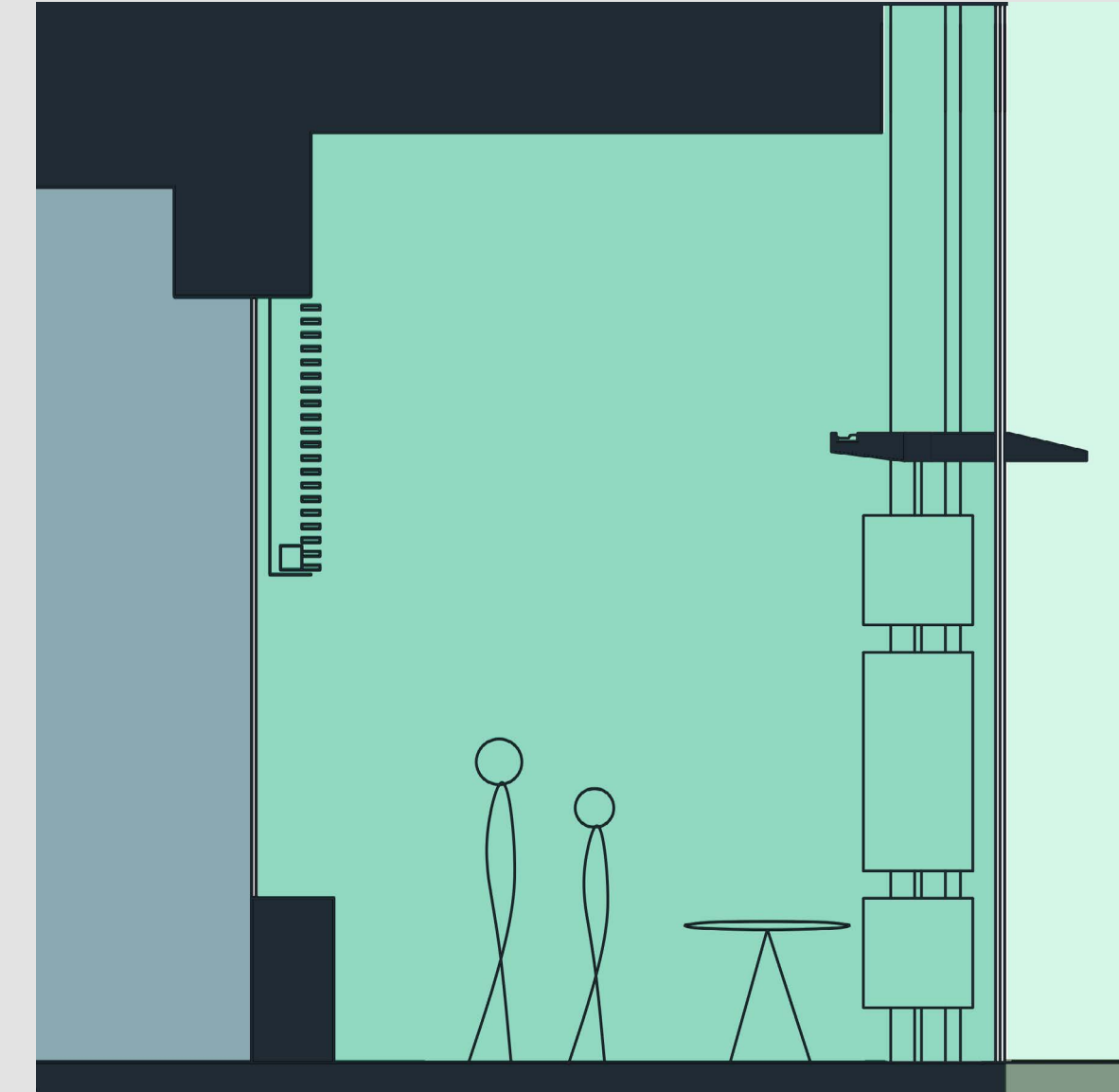
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Light Shelf
+
Operable Fins
+
Clear Glass

THE WINSOR SCHOOL

Lubin-O'Donnell Center

LIGHTING + ELECTRICAL



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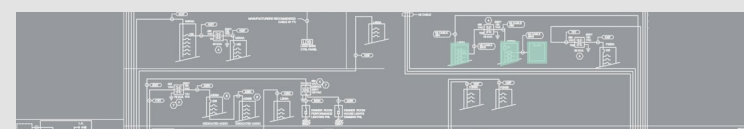
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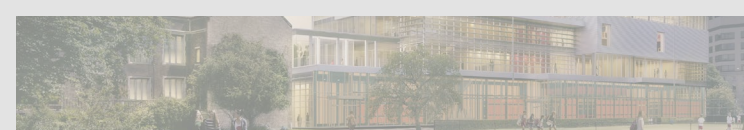
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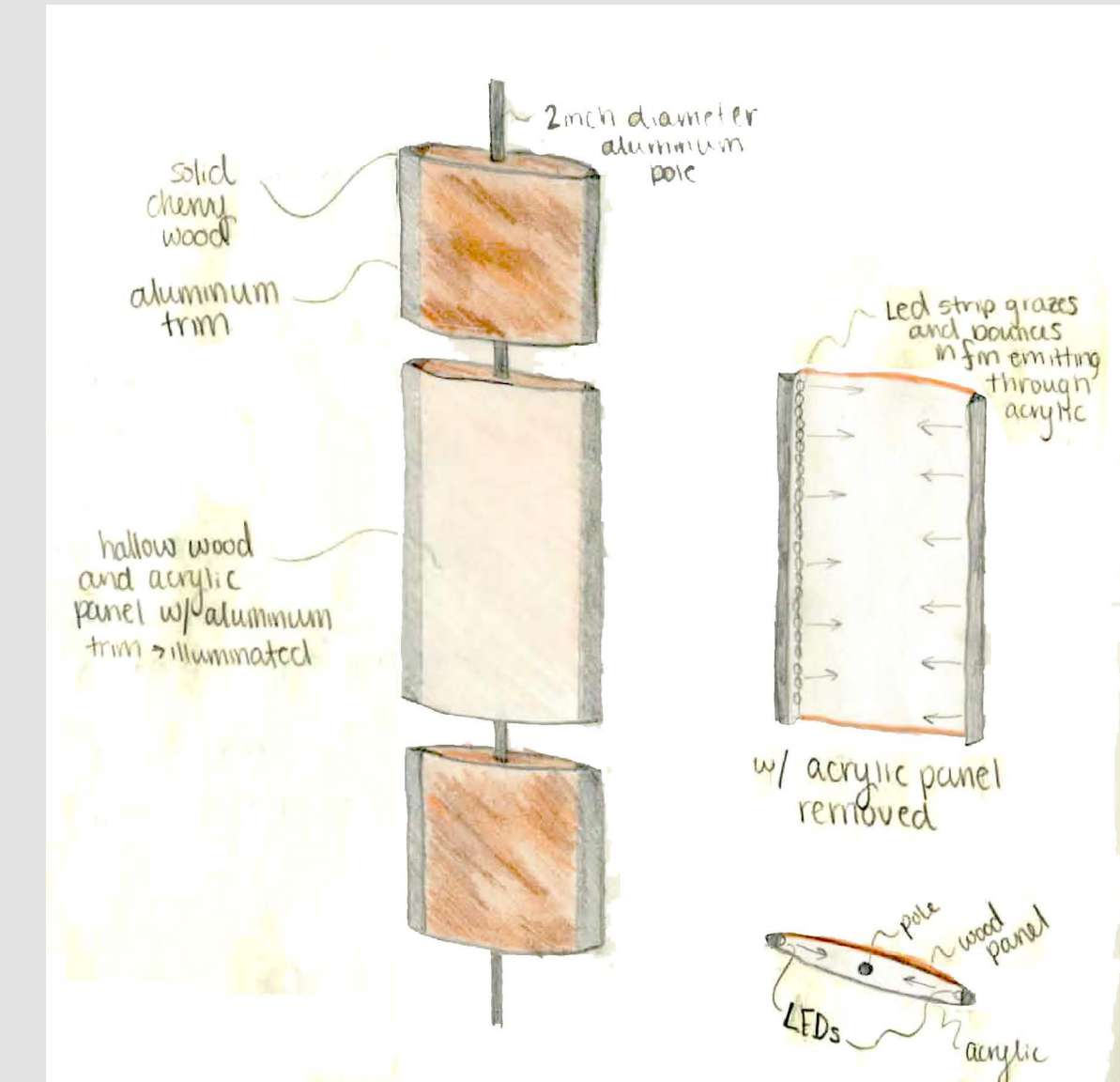
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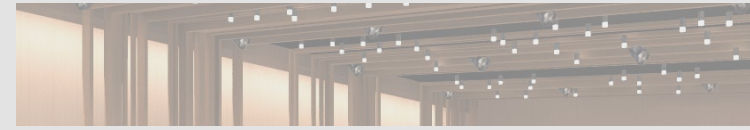
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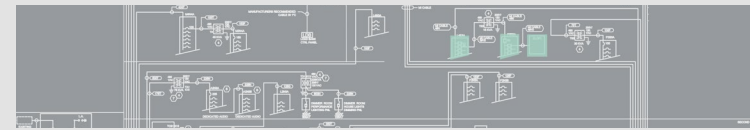
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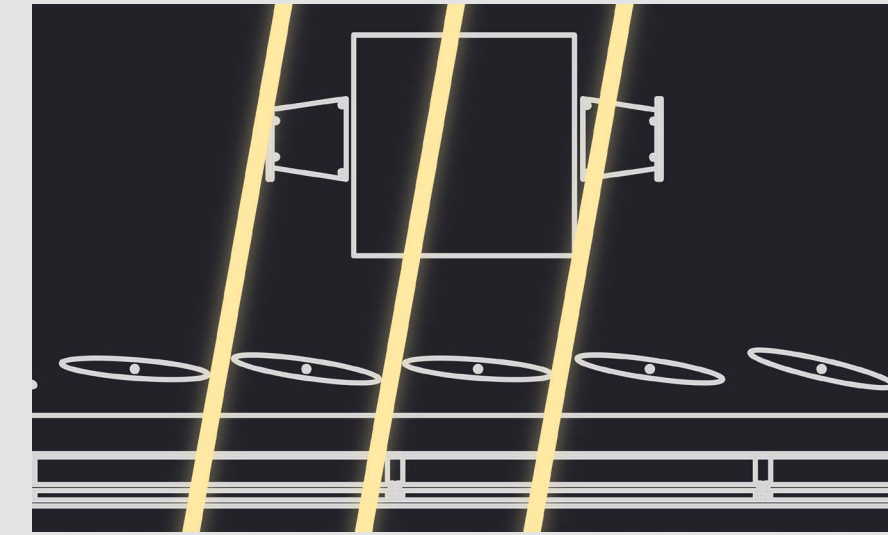
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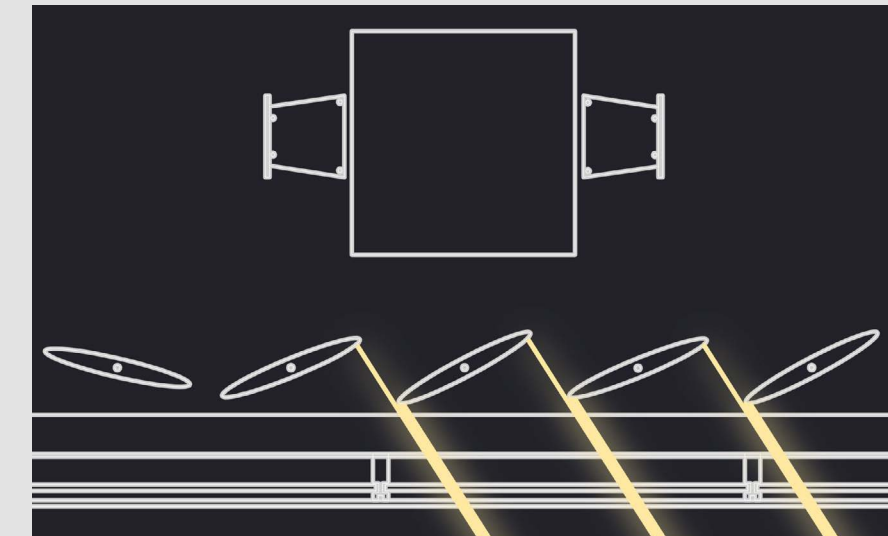
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Example of Light Leaks



Example of Light Blocked



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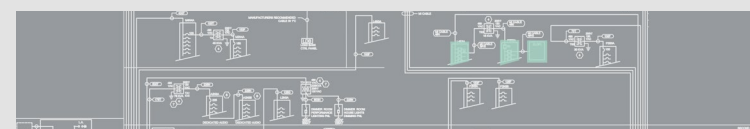
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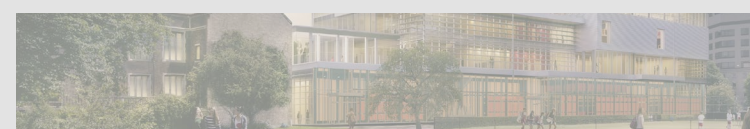
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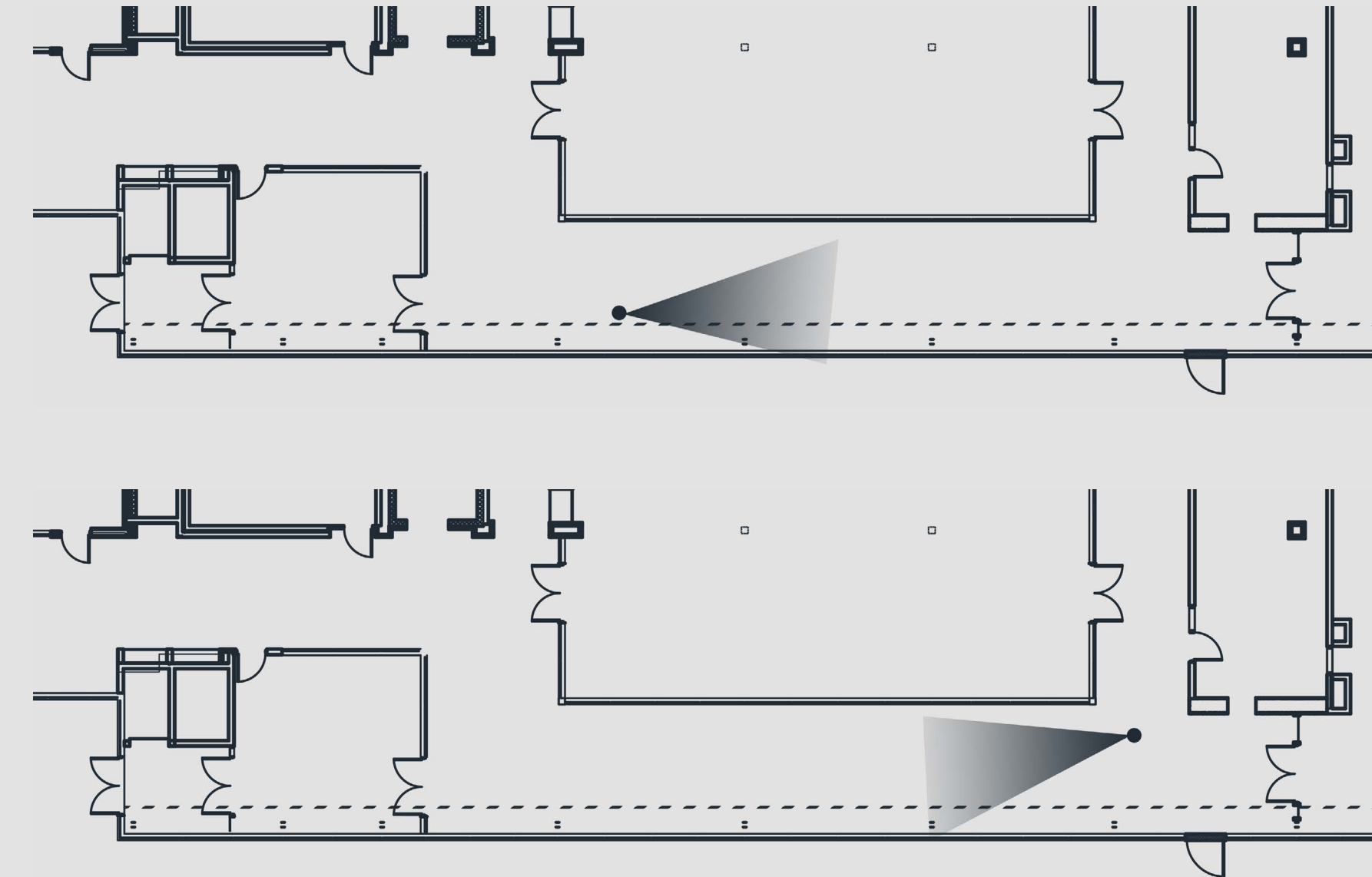
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DAYLIGHT GLARE PROBABILITY

Scale	DGP
Intolerable Glare	> 45%
Disturbing Glare	40 - 45 %
Perceptible Glare	35 - 40 %
Imperceptible Glare	< 35 %





01 Introduction
Building // Scope



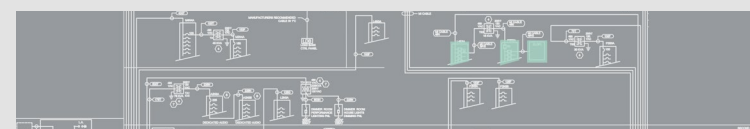
02 Wellness Plaza
Landscape Architecture



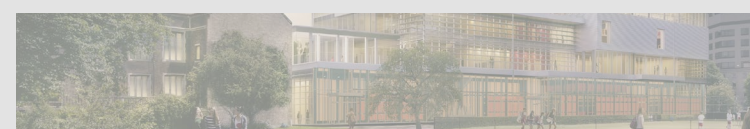
03 Wellness Corridor
Daylighting // Lighting Design



04 Dance Rehearsal Studio
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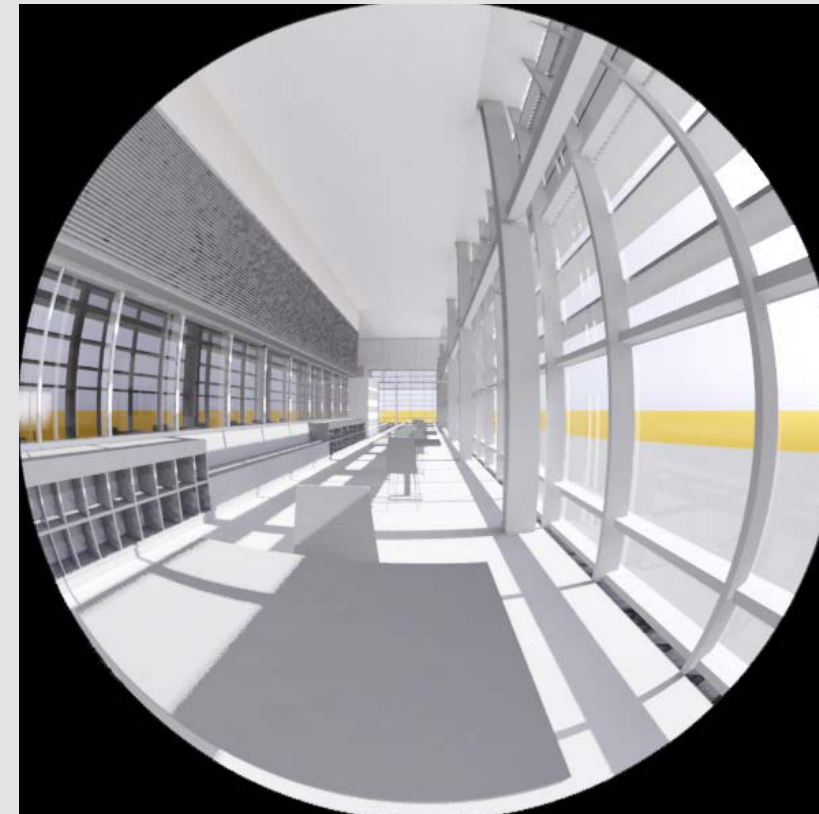
05 Emergency Analysis
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ORIGINAL VIEW 1

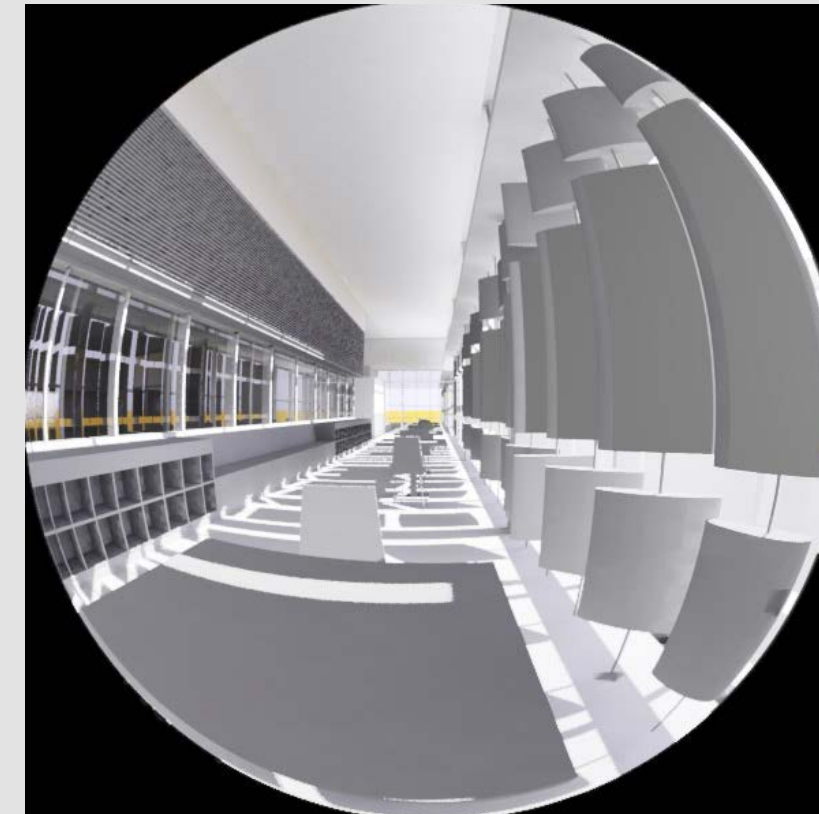
Intolerable Glare



62.25%

PROPOSED VIEW 1

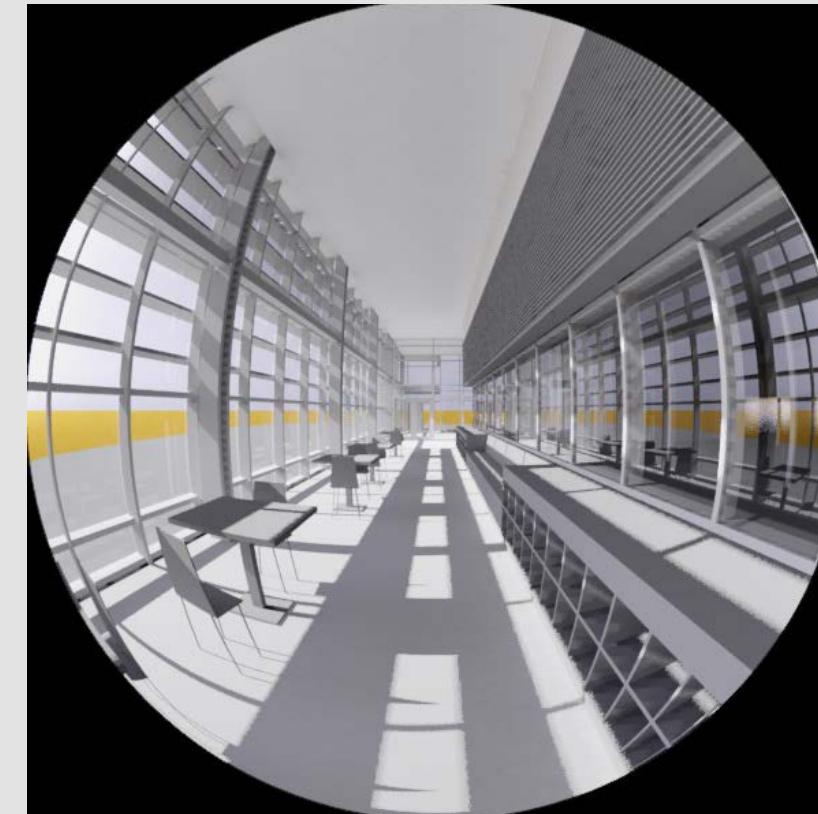
Imperceptible Glare



29.59%

ORIGINAL VIEW 2

Perceptible Glare



39.31%

PROPOSED VIEW 2

Imperceptible Glare



30.72%

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LIGHTING + ELECTRICAL



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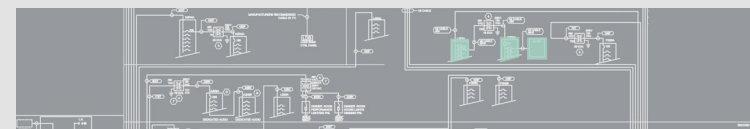
02 Wellness Plaza
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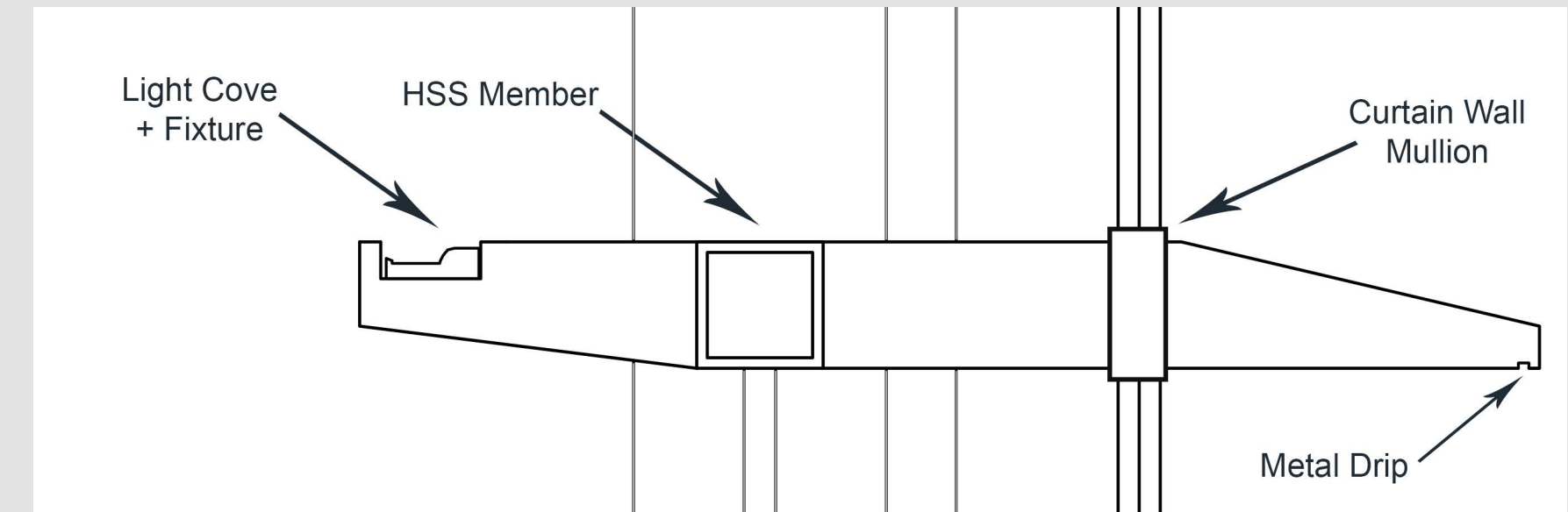
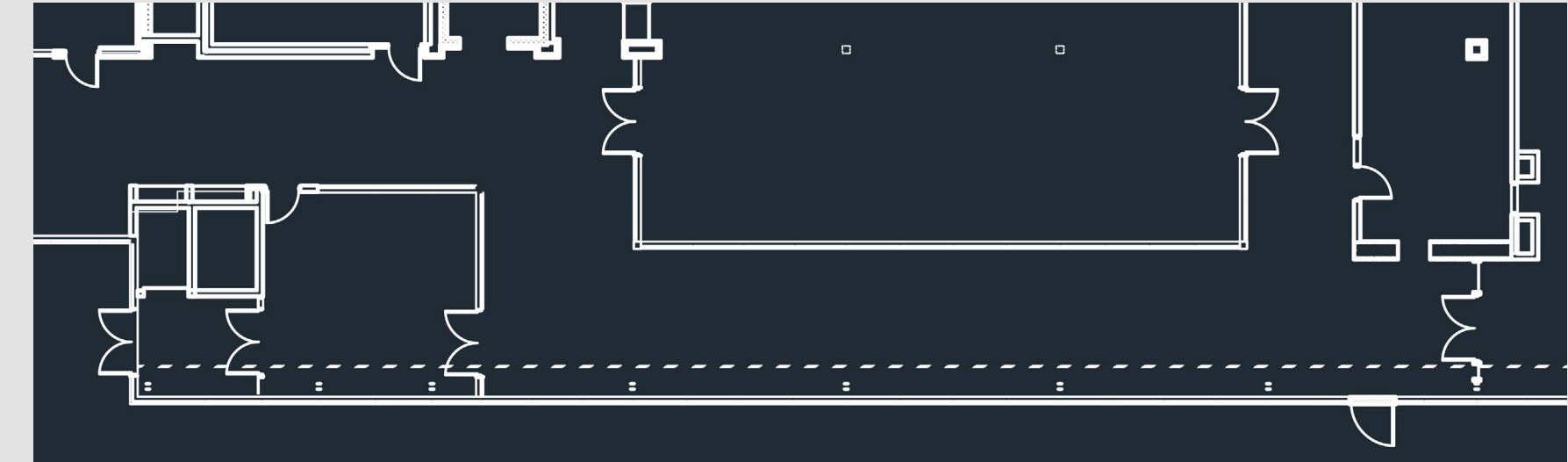
04 Dance Rehearsal Studio
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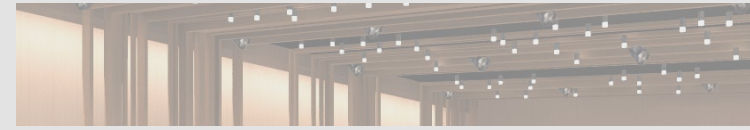
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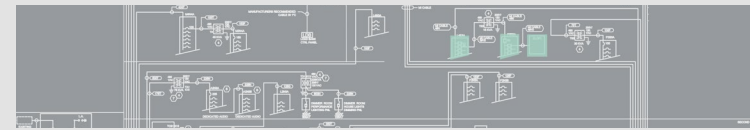
02 Wellness Plaza
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03 Wellness Corridor
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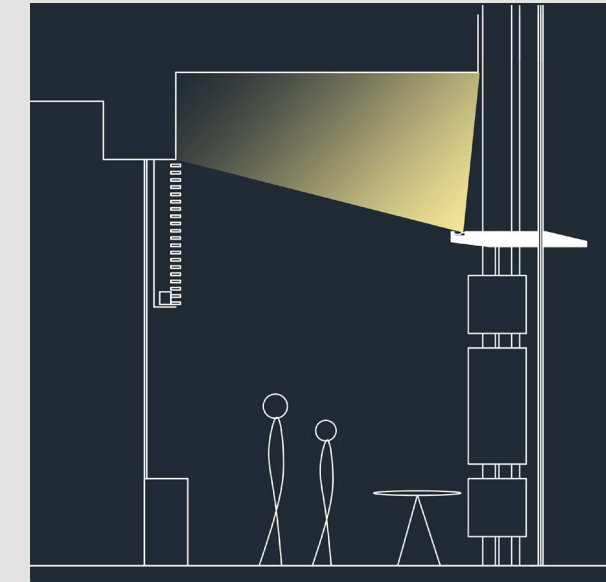
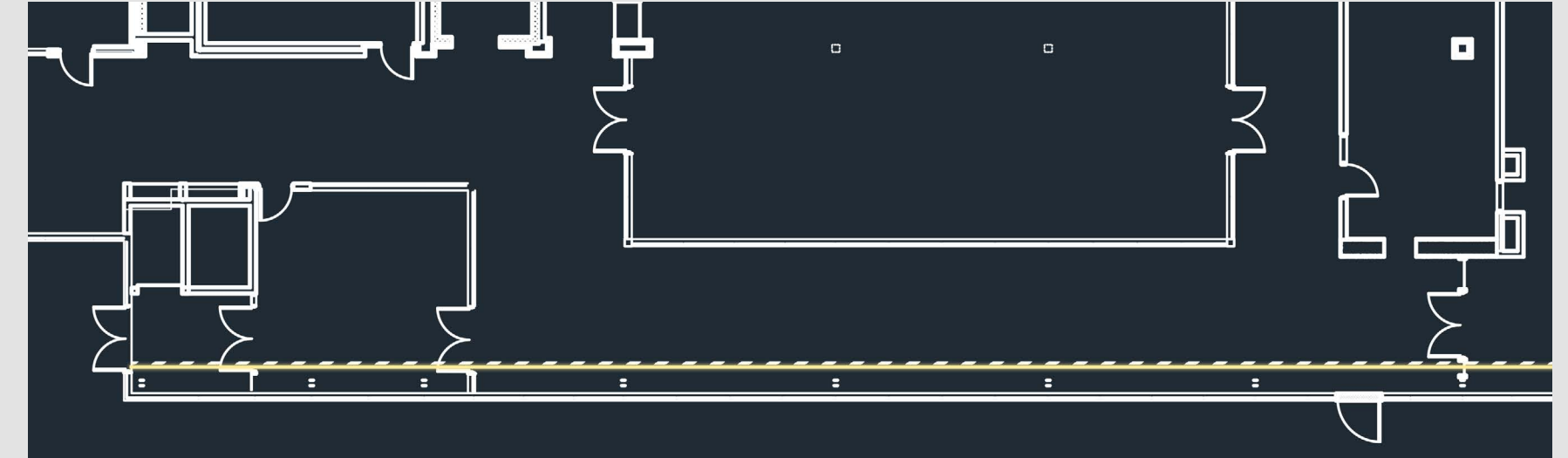
04 Dance Rehearsal Studio
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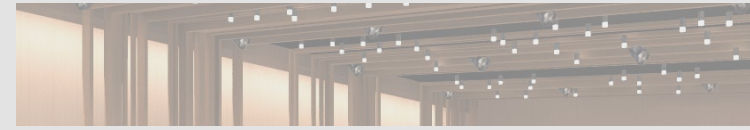
01 Introduction
Building // Scope



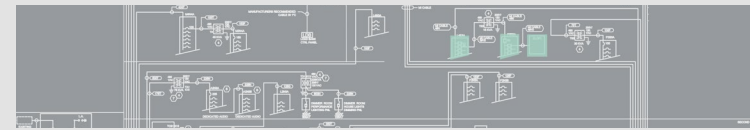
02 Wellness Plaza
Landscape Architecture



03 Wellness Corridor
Daylighting // Lighting Design



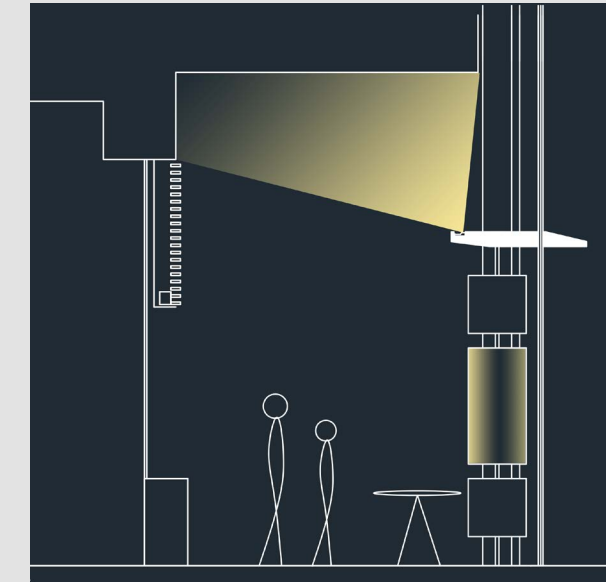
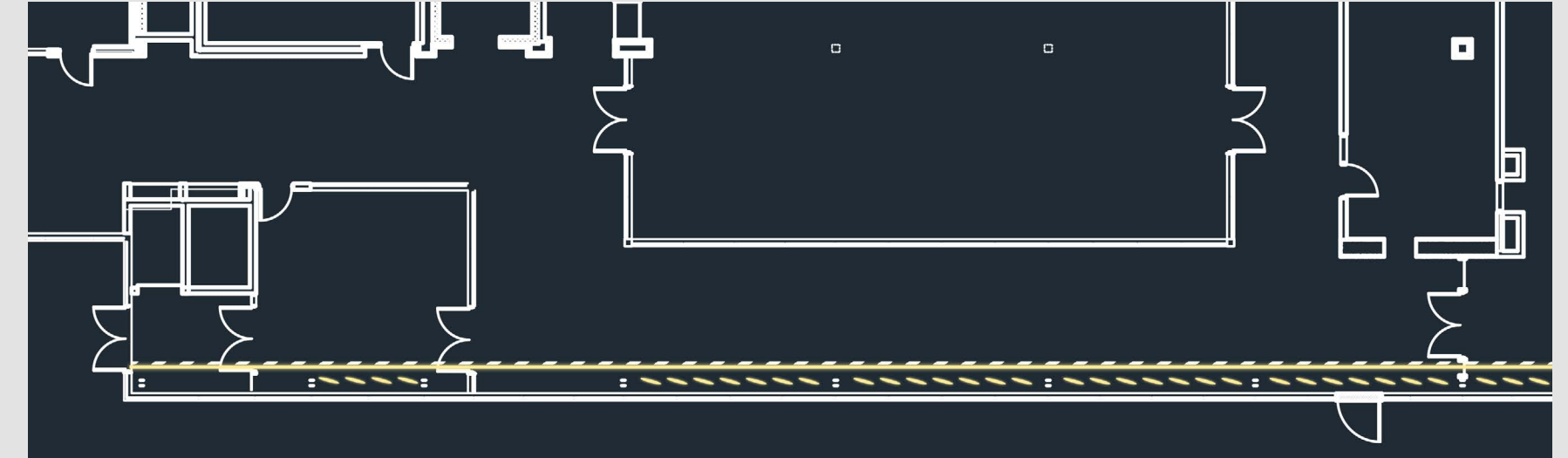
04 Dance Rehearsal Studio
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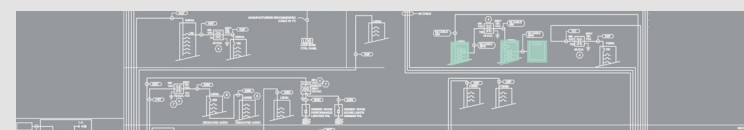
02 Wellness Plaza
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03 Wellness Corridor
Daylighting // Lighting Design



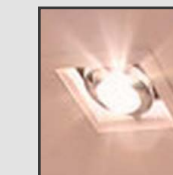
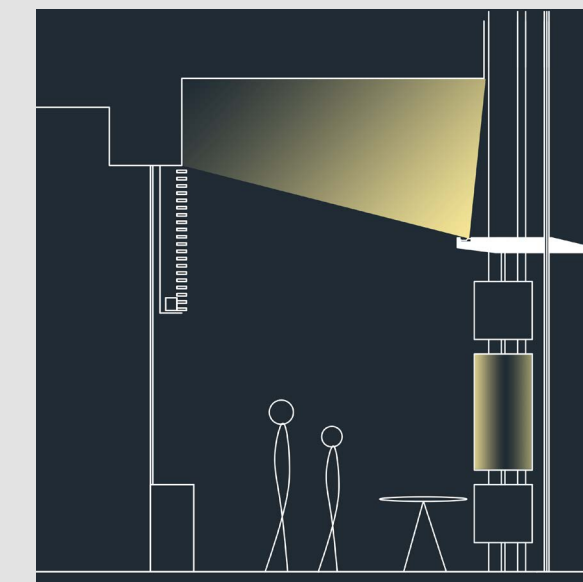
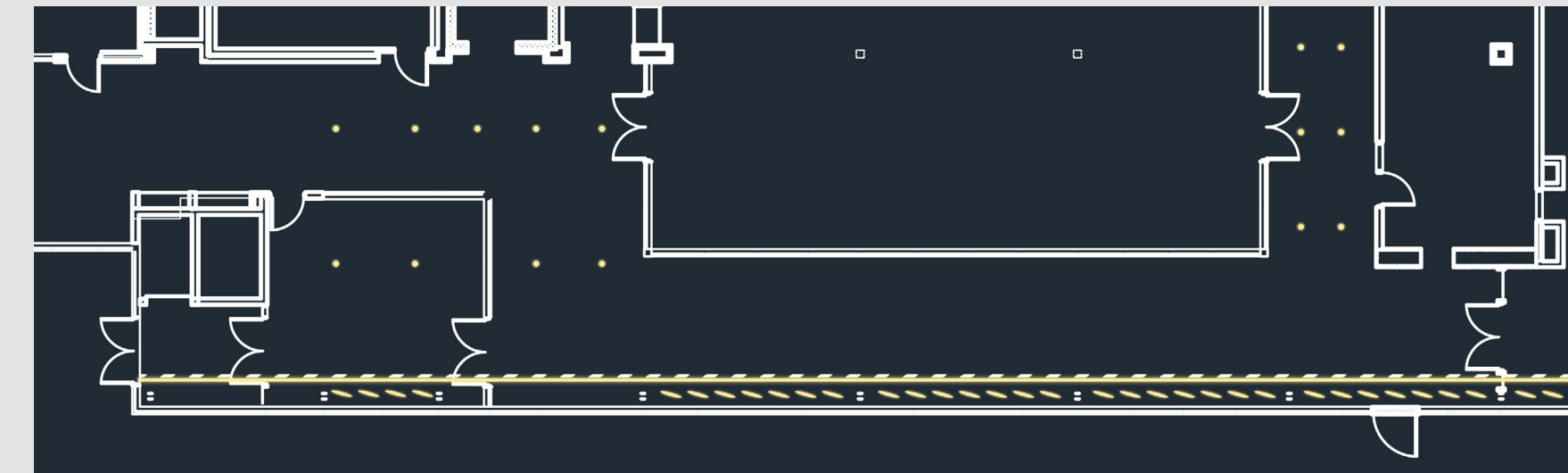
04 Dance Rehearsal Studio
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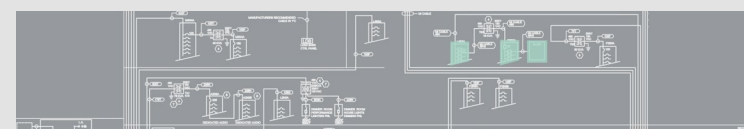
02 Wellness Plaza
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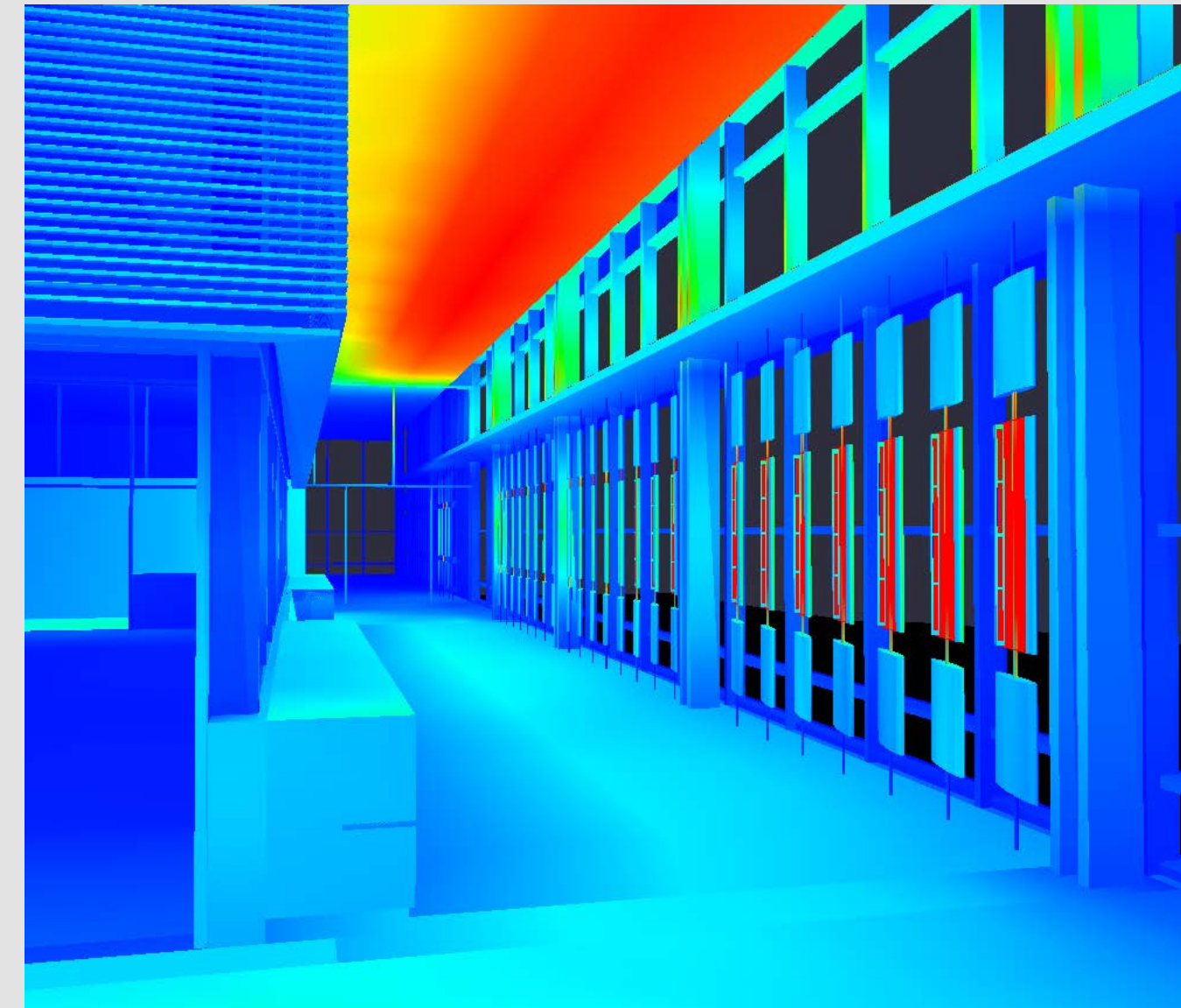
04 Dance Rehearsal Studio
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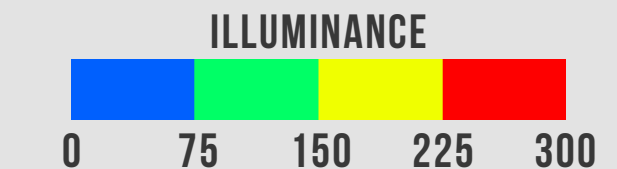
ILLUMINANCE

IES Recommendations

Wellness Corridor - 50 lux
Wellness Lobby - 50 lux
Avg:Min - 3:1

Calculated Illuminance

Wellness Corridor - **95.2 lux**
Wellness Lobby - **100 lux**
Avg:Min - **2.73**





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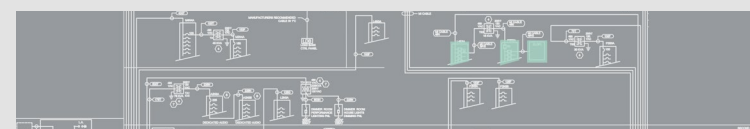
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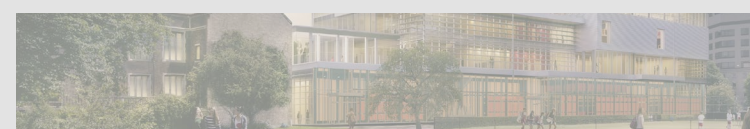
03 Wellness Corridor
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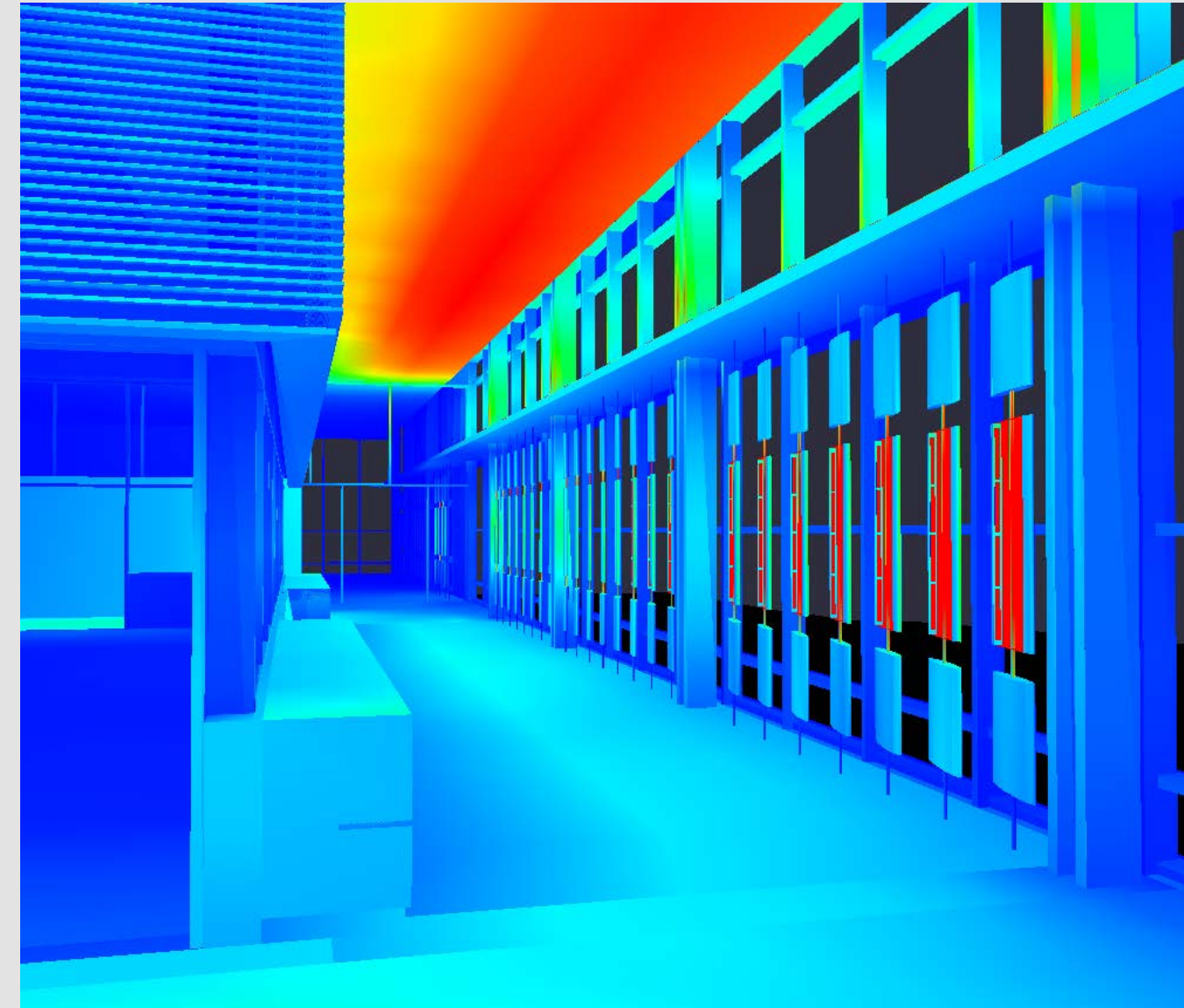
04 Dance Rehearsal Studio
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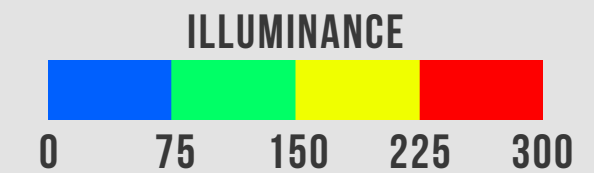
LIGHTING POWER DENSITY

ASHRAE 90.1 Compliance

Wellness Corridor - 0.66 W/sf
Wellness Lobby - 0.90 W/sf

Calculated LPD

Wellness Corridor - 0.638 W/sf < 0.66 W/sf
Wellness Lobby - 0.354 W/sf < 0.90 W/sf





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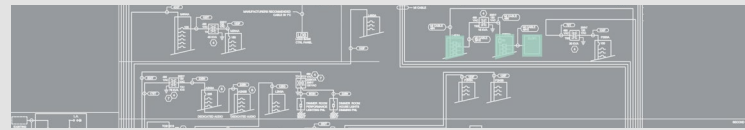
02 Wellness Plaza
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03 Wellness Corridor
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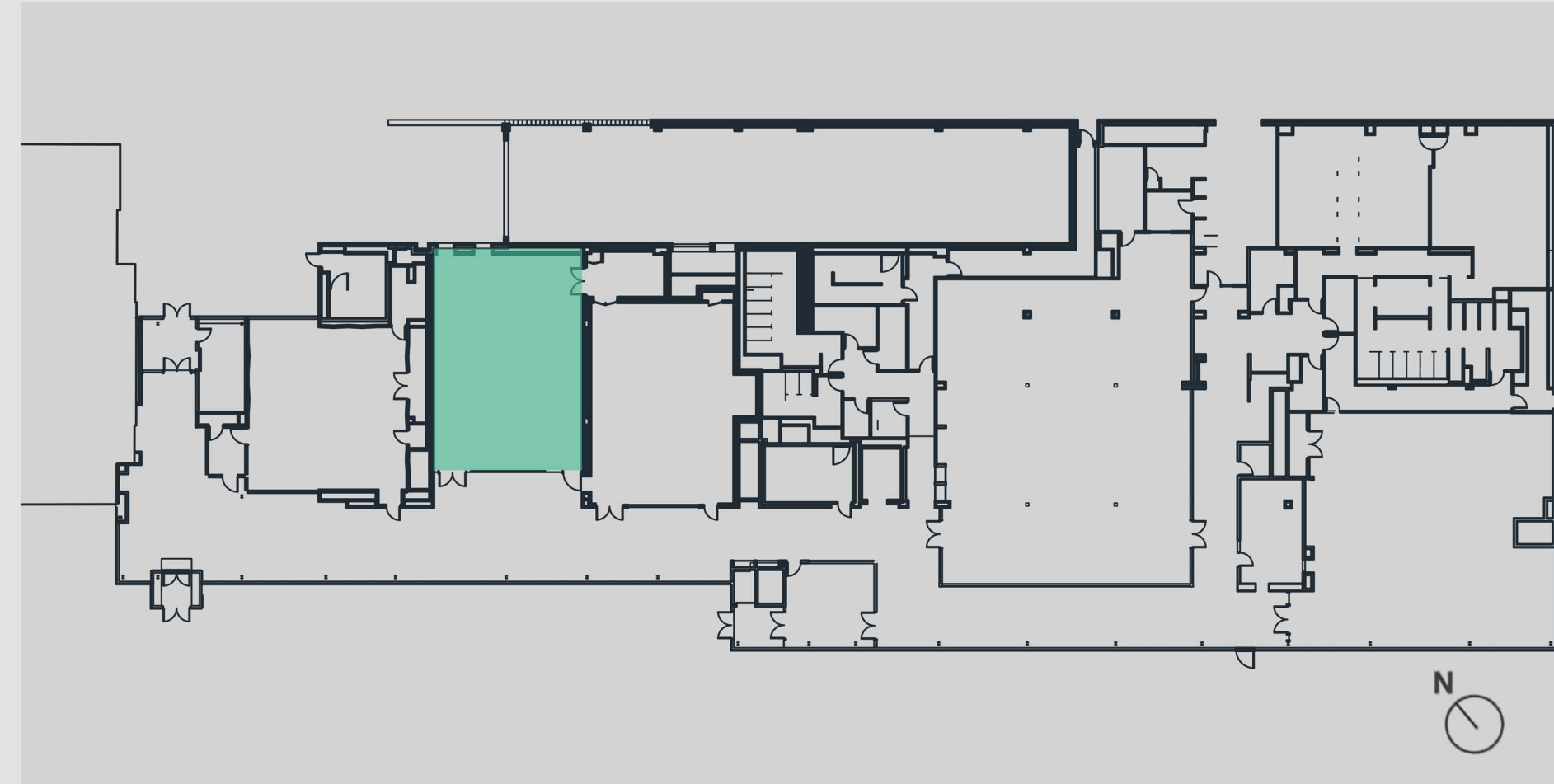
04 Dance Rehearsal Studio
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DANCE REHEARSAL STUDIO



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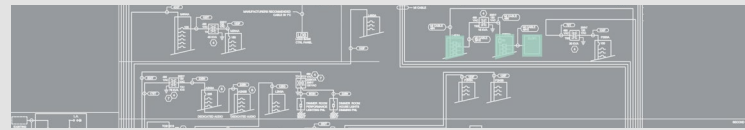
02 Wellness Plaza
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03 Wellness Corridor
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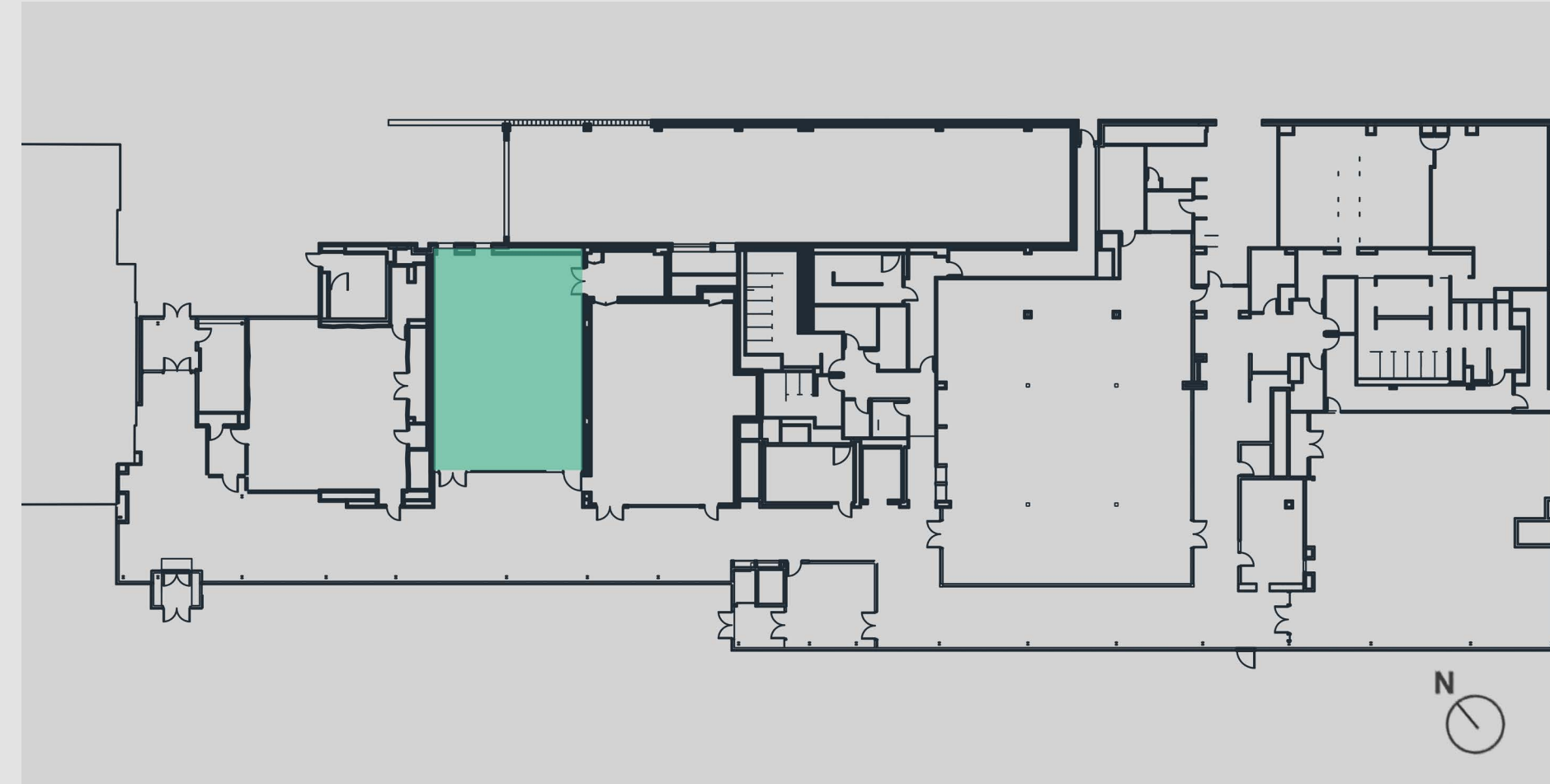
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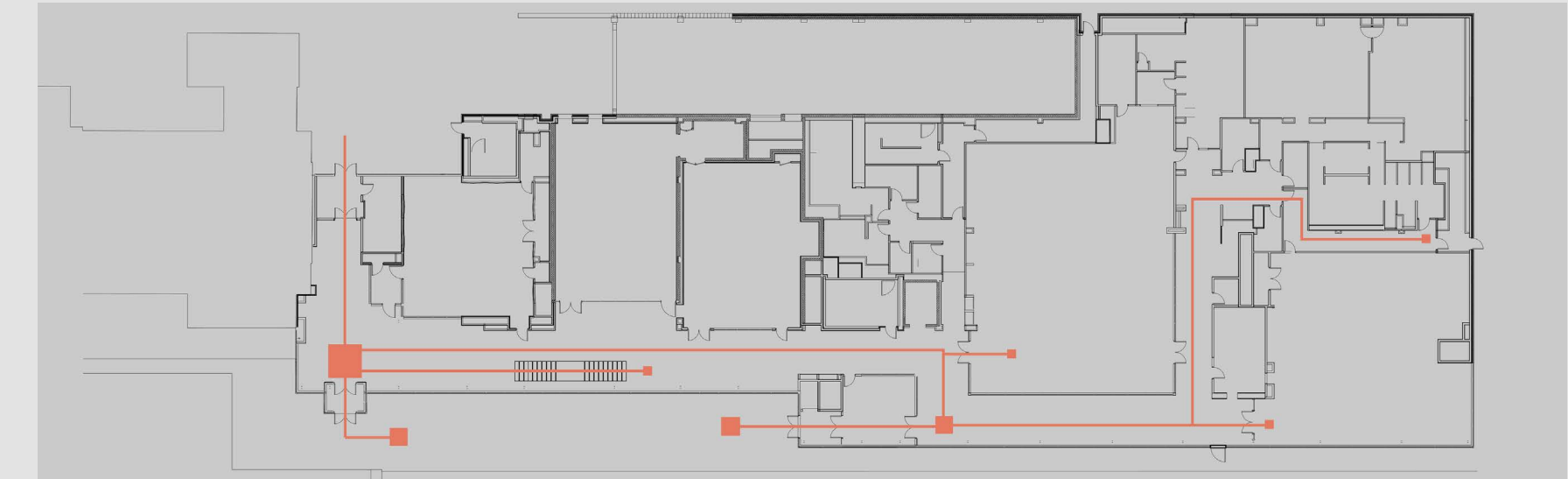
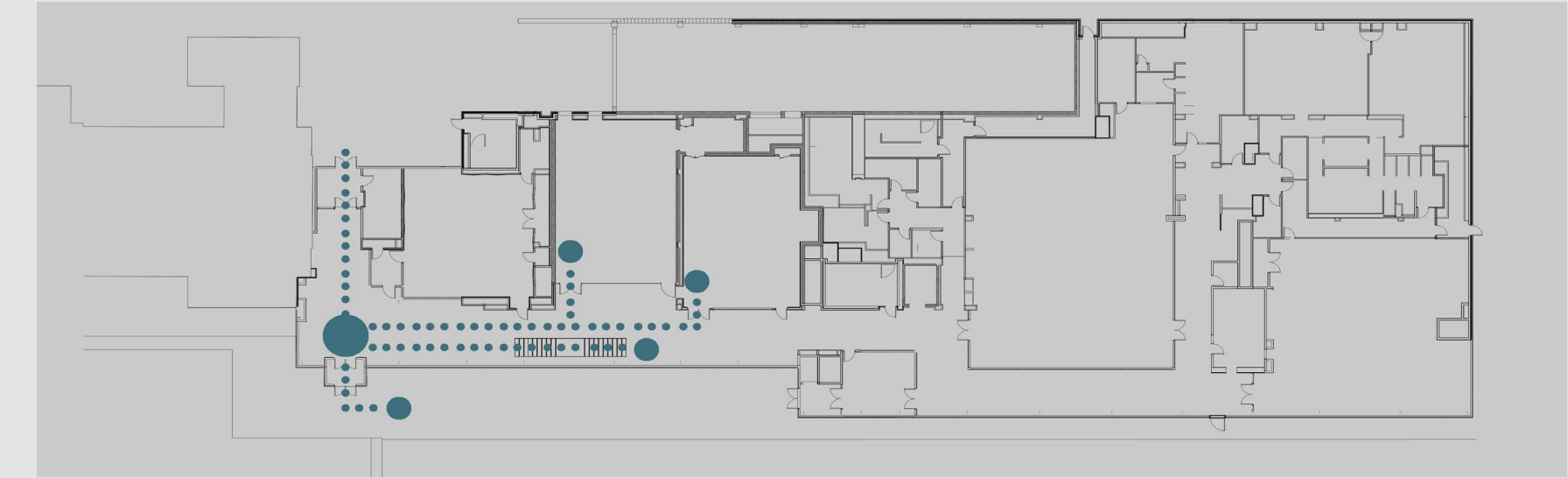
05 Emergency Analysis
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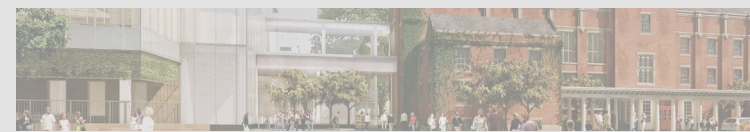


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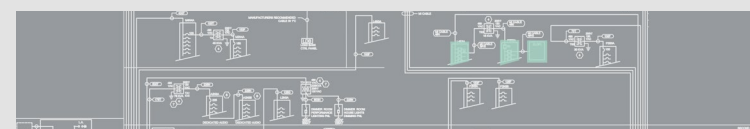
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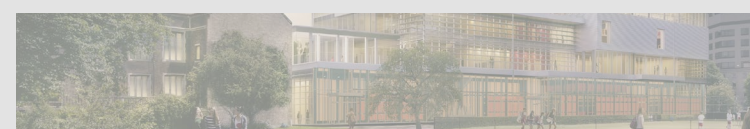
03 Wellness Corridor
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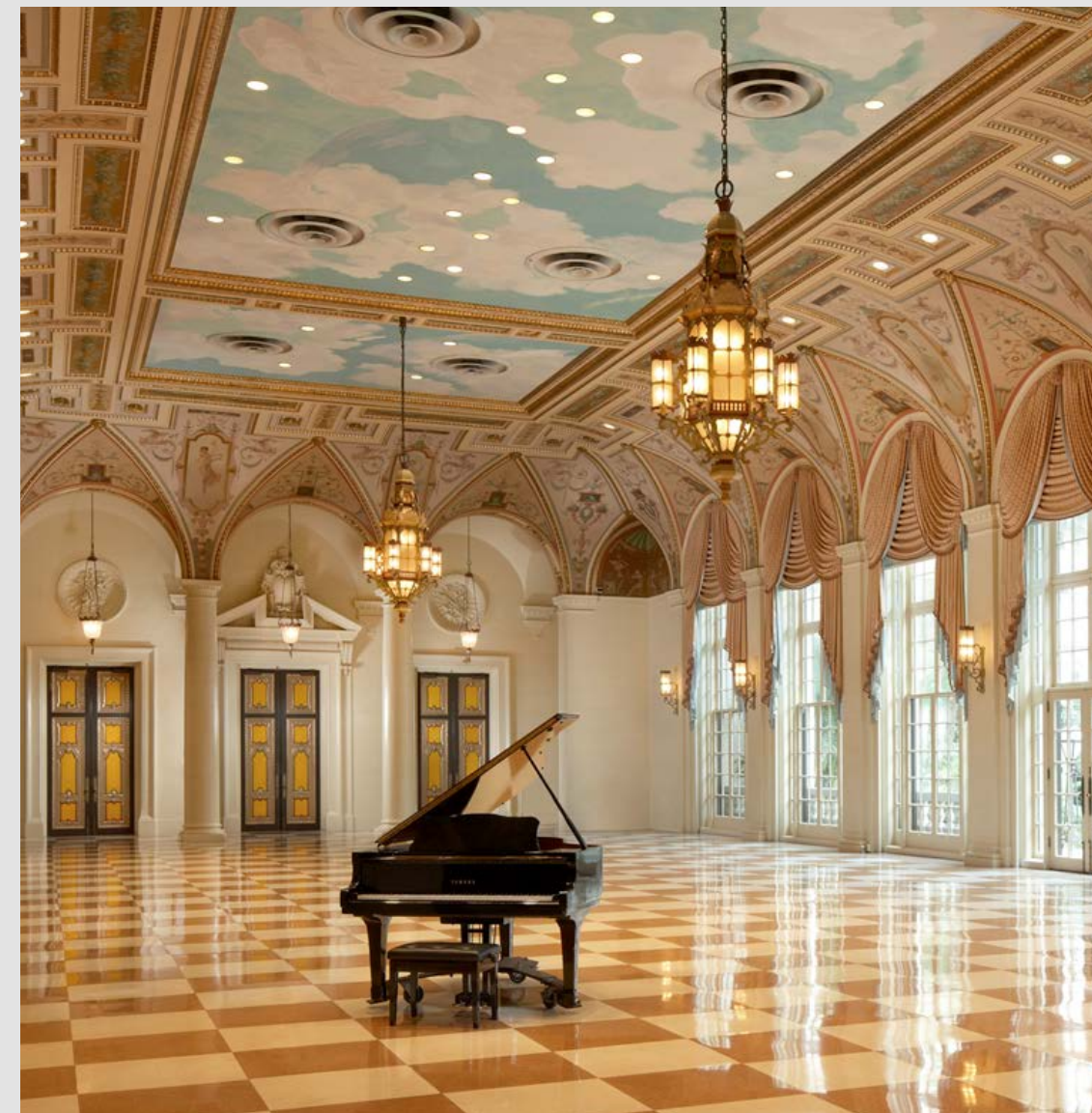
04 Dance Rehearsal Studio
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DESIGN GOALS

Concentrate Light

Create Visual Interest + Glamour

Respond to Architecture

Coordinate Ceiling between all Systems

Craft a Modern Grand Ballroom

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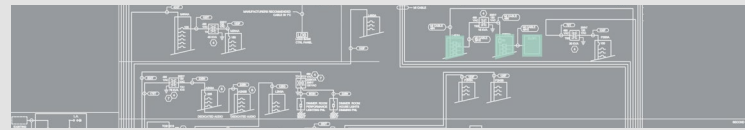
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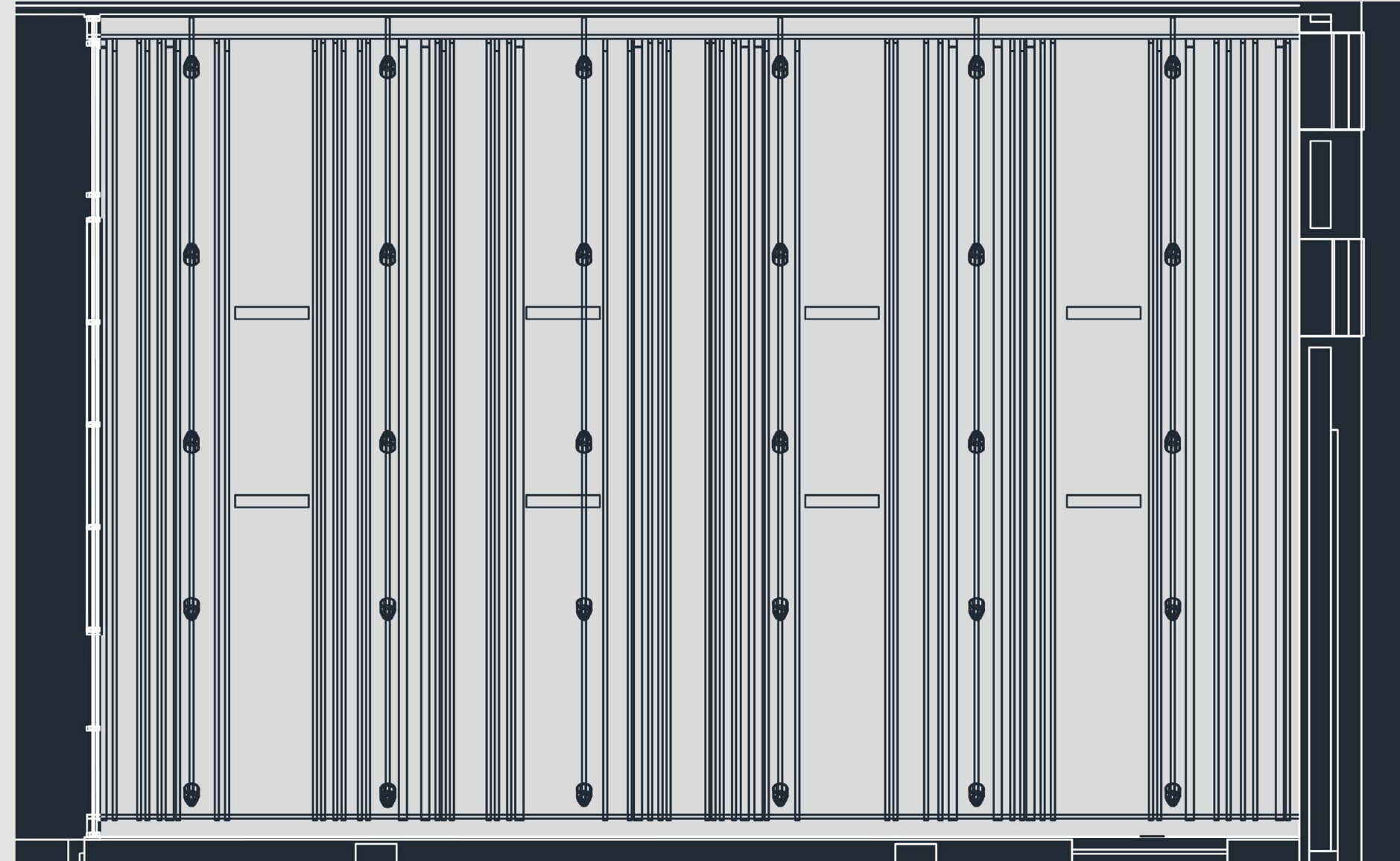
04 Dance Rehearsal Studio
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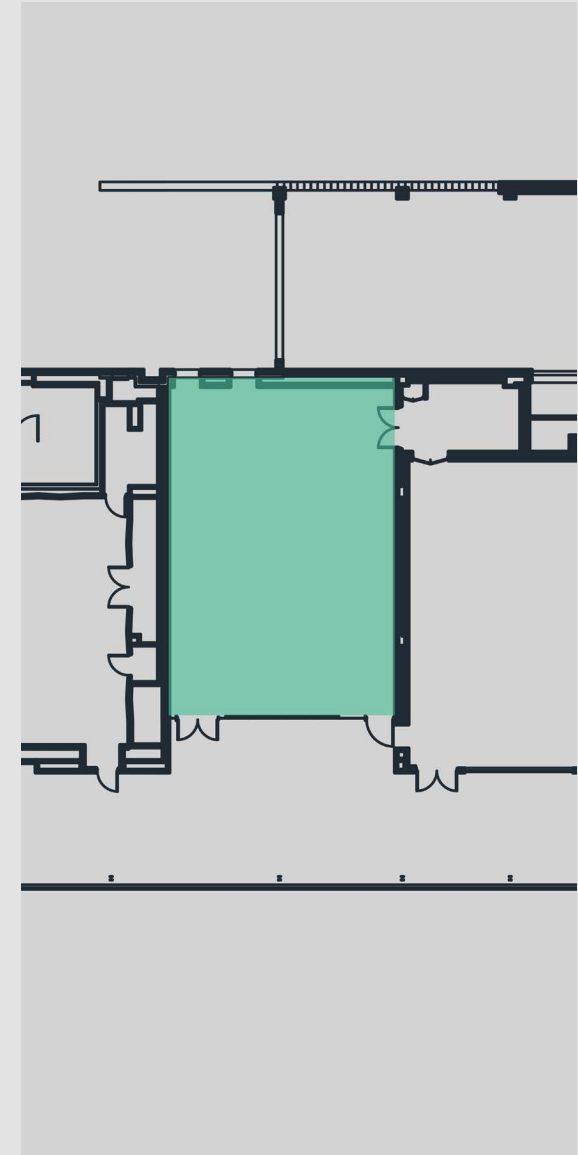
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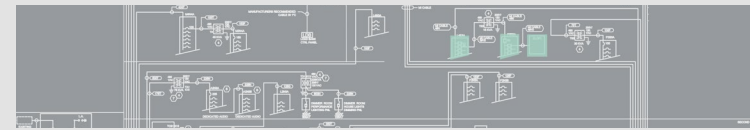
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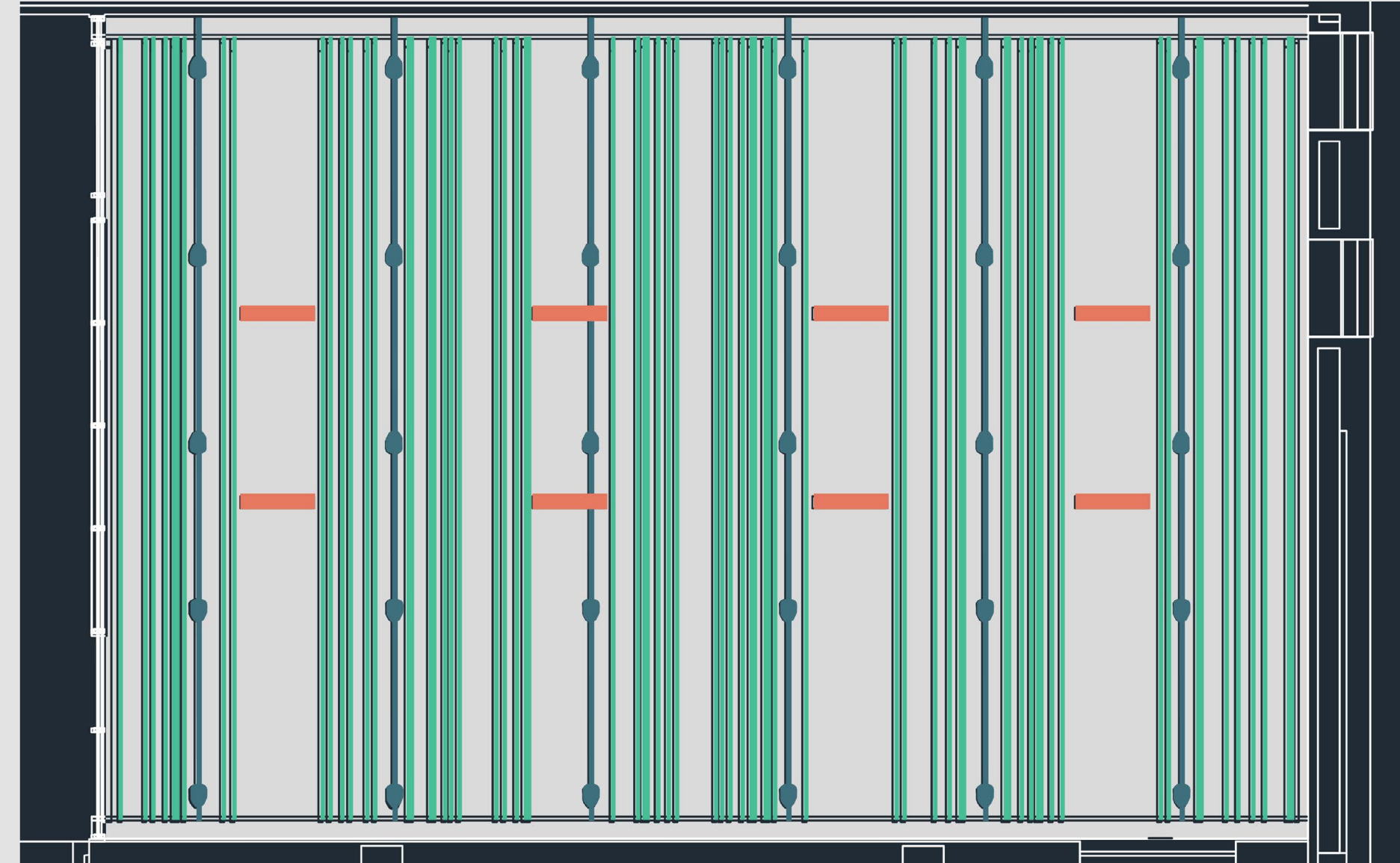
04 Dance Rehearsal Studio
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 Theatre Lights

 Mechanical Diffusers

 Wood Slats



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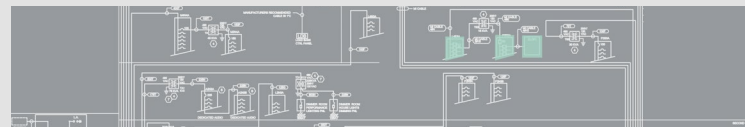
02 Wellness Plaza
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03 Wellness Corridor
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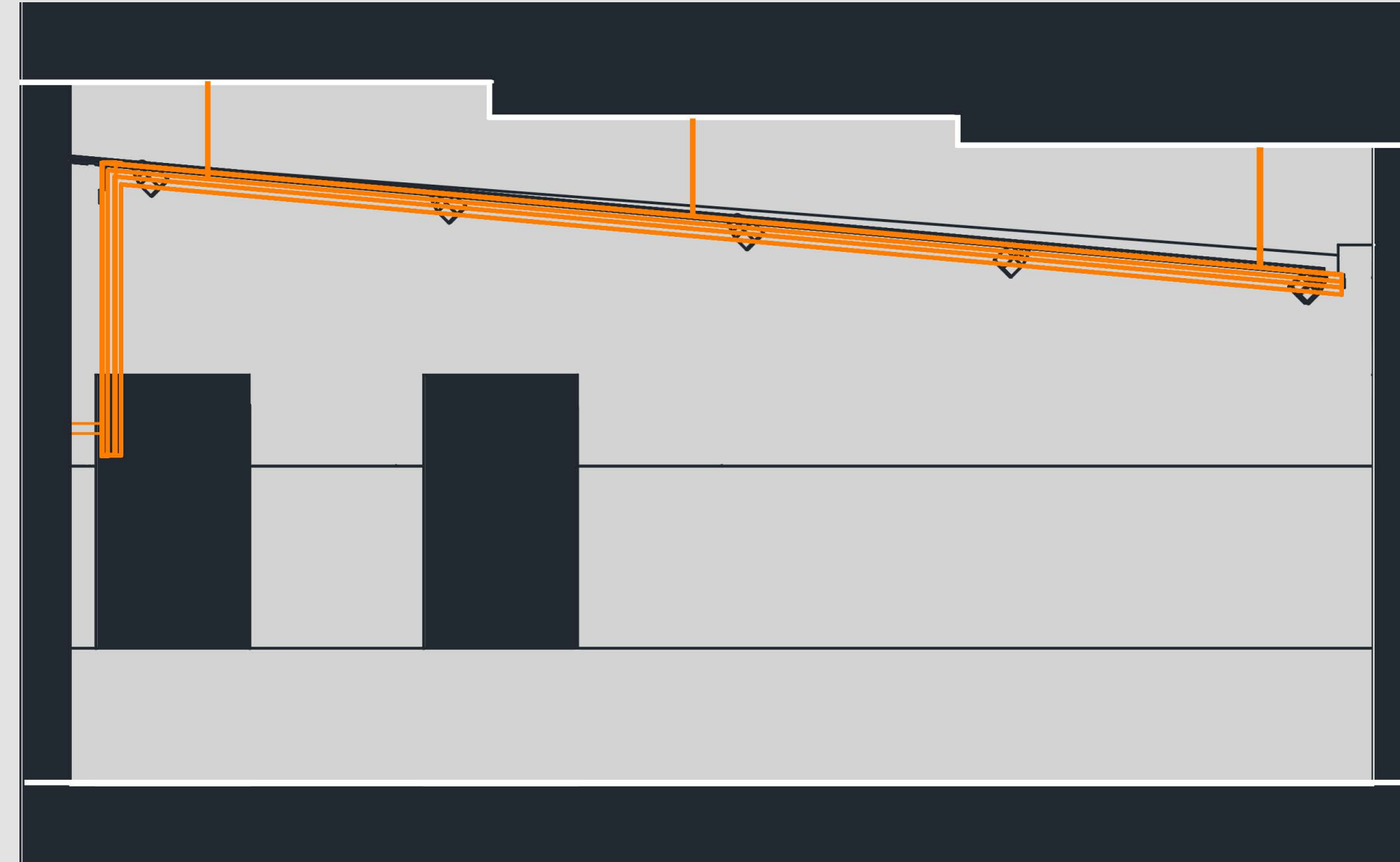
04 Dance Rehearsal Studio
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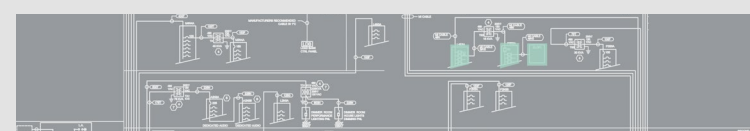
03 Wellness Corridor

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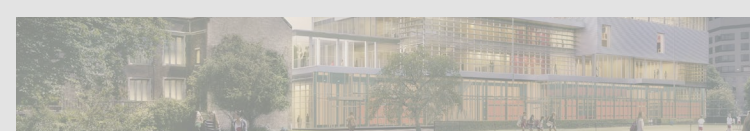
04 Dance Rehearsal Studio

Lighting Design



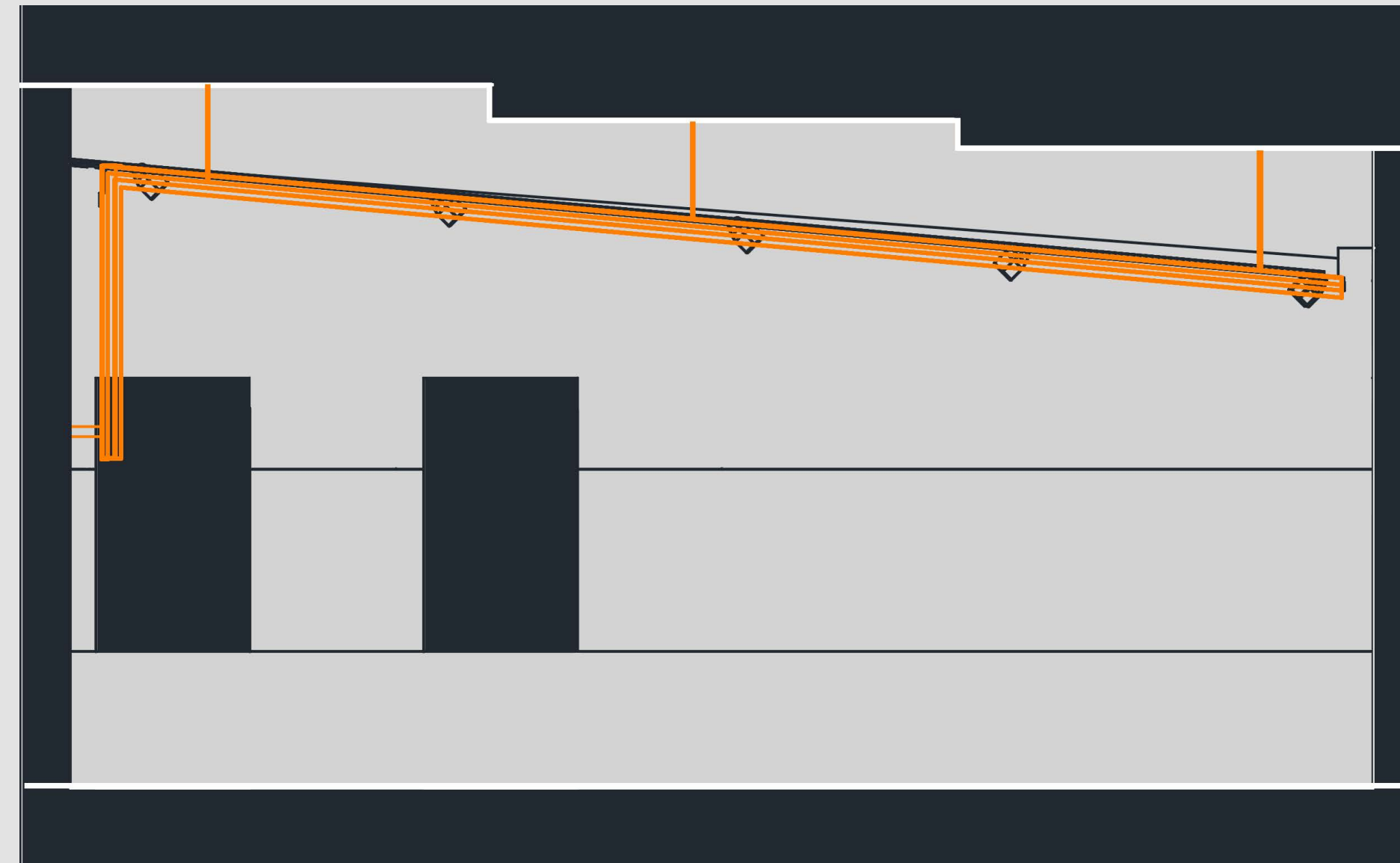
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REVERBERATION TIME

Original Metal Perforated Ceiling
0.57 Seconds at 500 Hz

Surface Description	Surface Area, S (ft ²)	Material Description	Sound Absorption Coefficient, α						S α (sabins)					
			Frequency (Hz)						Frequency (Hz)					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
South Wall - Mirrors	278.14	Mirror	0.01	0.01	0.01	0.01	0.01	0.01	2.78	2.78	2.78	2.78	2.78	2.78
South Wall - Wood Wall	356.31	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	99.77	78.39	60.57	32.07	35.63	39.19
South Wall - Drywall	135.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	13.58	9.51	6.79	6.79	5.43	5.43
East Wall - Windows	433.54	Glass Window	0.03	0.02	0.04	0.03	0.12	0.07	12.99	8.67	17.34	1.66	6.62	3.86
East Wall - Acous Panels	233.64	FabTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	37.78	95.14	190.28	232.24	222.26	106.75
East Wall - Wood Panels	233.64	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	65.83	79.74	61.61	32.62	36.24	39.67
North Wall - Acous Panels	230.64	FabTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	36.90	92.41	184.83	229.84	224.24	106.75
North Wall - Wood Panels	362.44	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	101.48	79.74	61.61	32.62	36.24	39.67
West Wall - Dry Wall	167.70	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	16.77	11.74	8.39	8.39	6.71	6.71
West Wall - Glass	433.54	Glass Curtain Wall	0.15	0.05	0.04	0.03	0.12	0.07	65.03	21.68	17.34	13.01	52.02	30.35
Plenum - Acoustical Panels	822.80	FabTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	131.65	329.12	674.70	789.89	756.98	756.98
Plenum - Drywall	822.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	82.28	57.60	41.14	41.14	32.91	32.91
Floor - Dance Floor	1645.60	Marley Vinyl Dance Floor	0.01	0.03	0.03	0.03	0.03	0.02	16.46	49.37	49.37	49.37	49.37	32.91
Ceiling - Metal Perforated	1316.48	CeilingsPlus Illusions	0.81	0.90	0.75	0.90	0.95	0.81	1066.35	1184.83	987.36	1184.83	1250.66	1066.35
			$\Sigma S\alpha =$						1748.79 2000.25 2162.24 2428.81 2489.32 2273.33					

Proposed Wood Slat Ceiling
0.60 Seconds at 500 Hz

Surface Description	Surface Area, S (ft ²)	Material Description	Sound Absorption Coefficient, α						S α (sabins)					
			Frequency (Hz)						Frequency (Hz)					
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000
South Wall - Mirrors	278.14	Mirror	0.01	0.01	0.01	0.01	0.01	0.01	2.78	2.78	2.78	2.78	2.78	2.78
South Wall - Wood Wall	356.31	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	99.77	78.39	60.57	32.07	35.63	39.19
South Wall - Drywall	135.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	13.58	9.51	6.79	6.79	5.43	5.43
East Wall - Windows	433.54	Glass Window	0.03	0.02	0.04	0.03	0.12	0.07	12.99	8.67	17.34	1.66	6.62	3.86
East Wall - Acous Panels	233.64	FabTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	37.78	95.14	190.28	232.24	222.26	106.75
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Floor - Dance Floor	1645.60	Marley Vinyl Dance Floor	0.01	0.03	0.03	0.03	0.03	0.02	16.46	49.37	49.37	49.37	49.37	32.91
Ceiling - Wood Slats	665.78	CeilingsPlus Barz	0.12	0.38	0.95	1.08	1.10	0.99	79.89	253.00	632.49	719.04	732.36	659.12
			$\Sigma S\alpha =$						790.85 1188.73 2033.15 2219.70 2232.46 2101.39					

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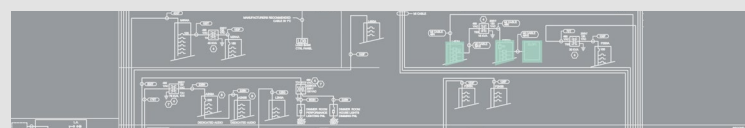
02 Wellness Plaza
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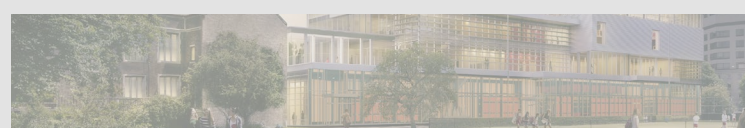
03 Wellness Corridor
Daylighting // Lighting Design



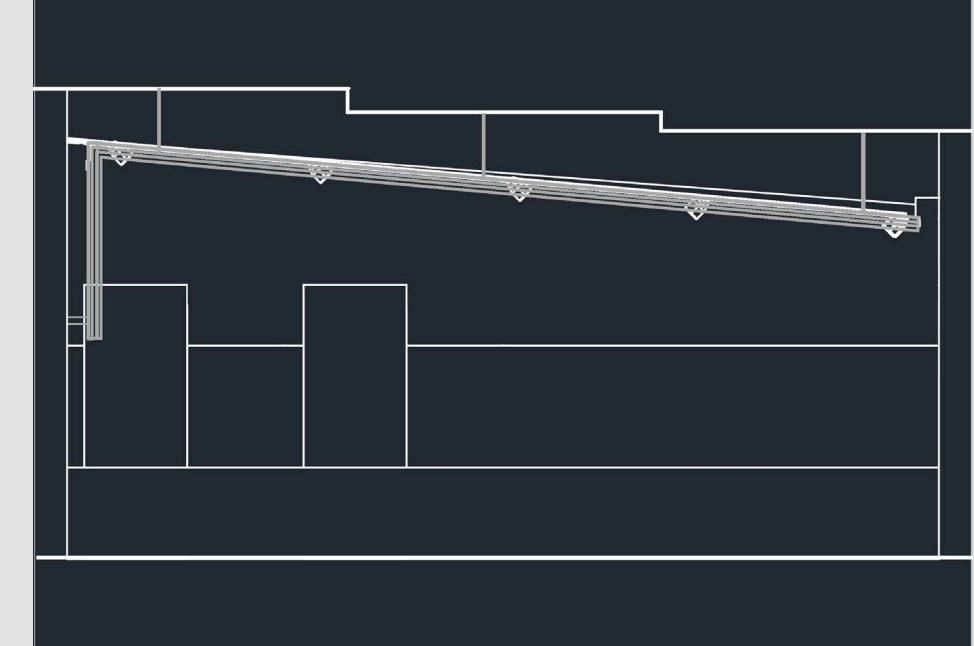
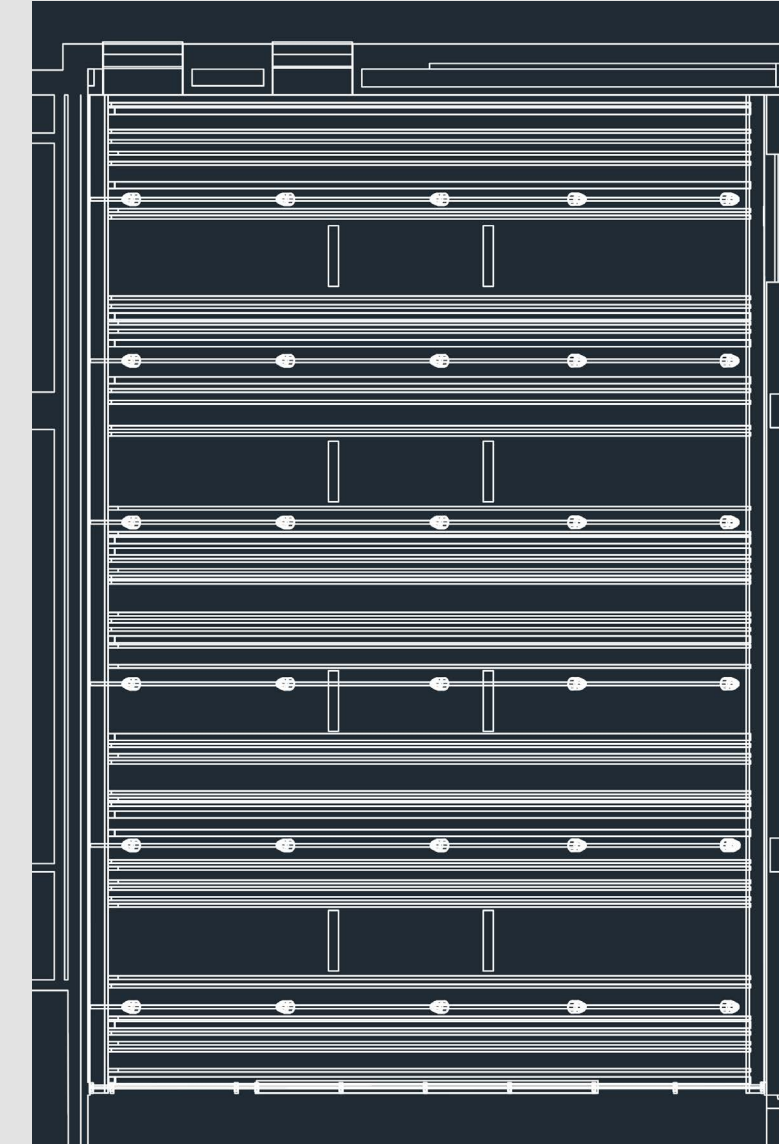
04 Dance Rehearsal Studio
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Building // Scope



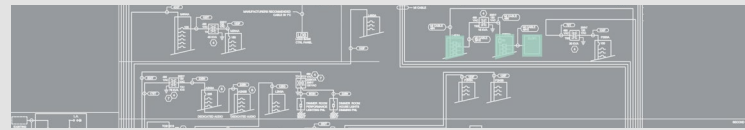
02 Wellness Plaza
Landscape Architecture



03 Wellness Corridor
Daylighting // Lighting Design



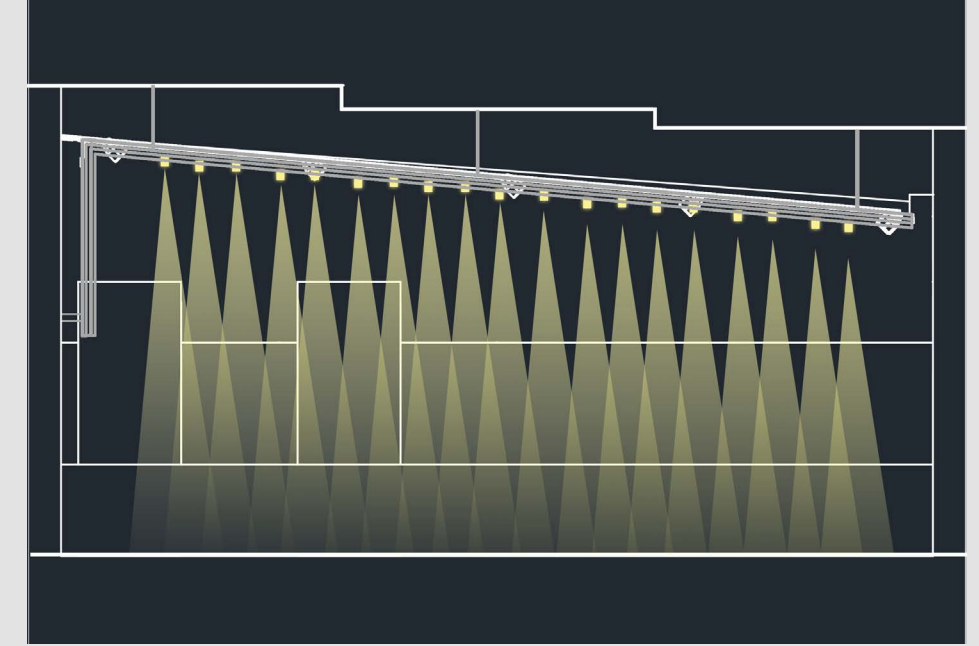
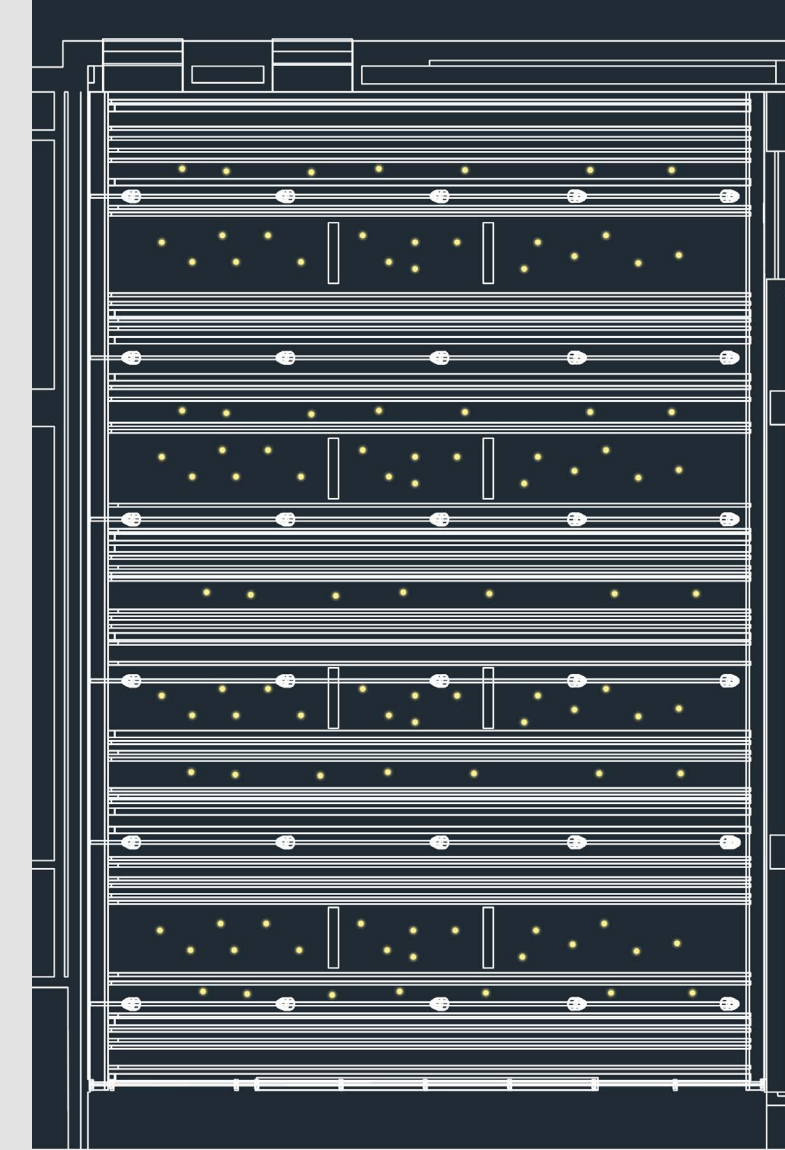
04 Dance Rehearsal Studio
Lighting Design



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Acknowledgments



THE WINSOR SCHOOL

Lubin-O'Donnell Center

LIGHTING + ELECTRICAL



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Landscape Architecture



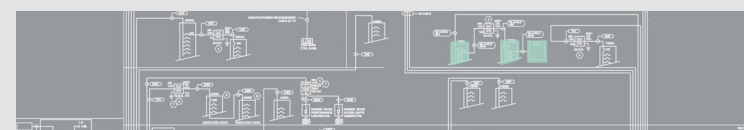
03 Wellness Corridor

Daylighting // Lighting Design



04 Dance Rehearsal Studio

Lighting Design



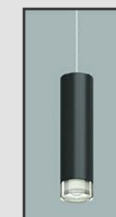
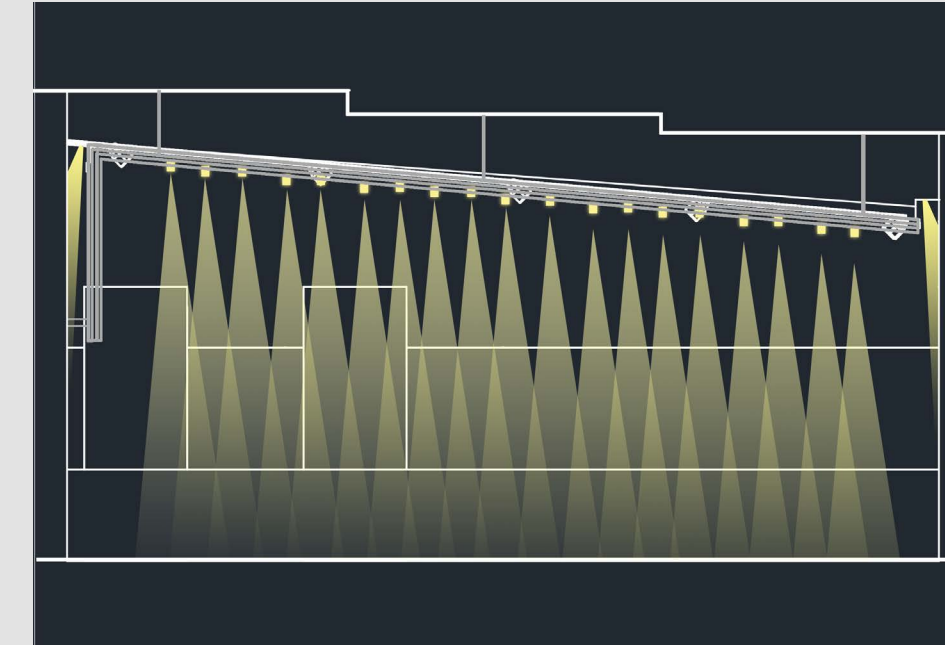
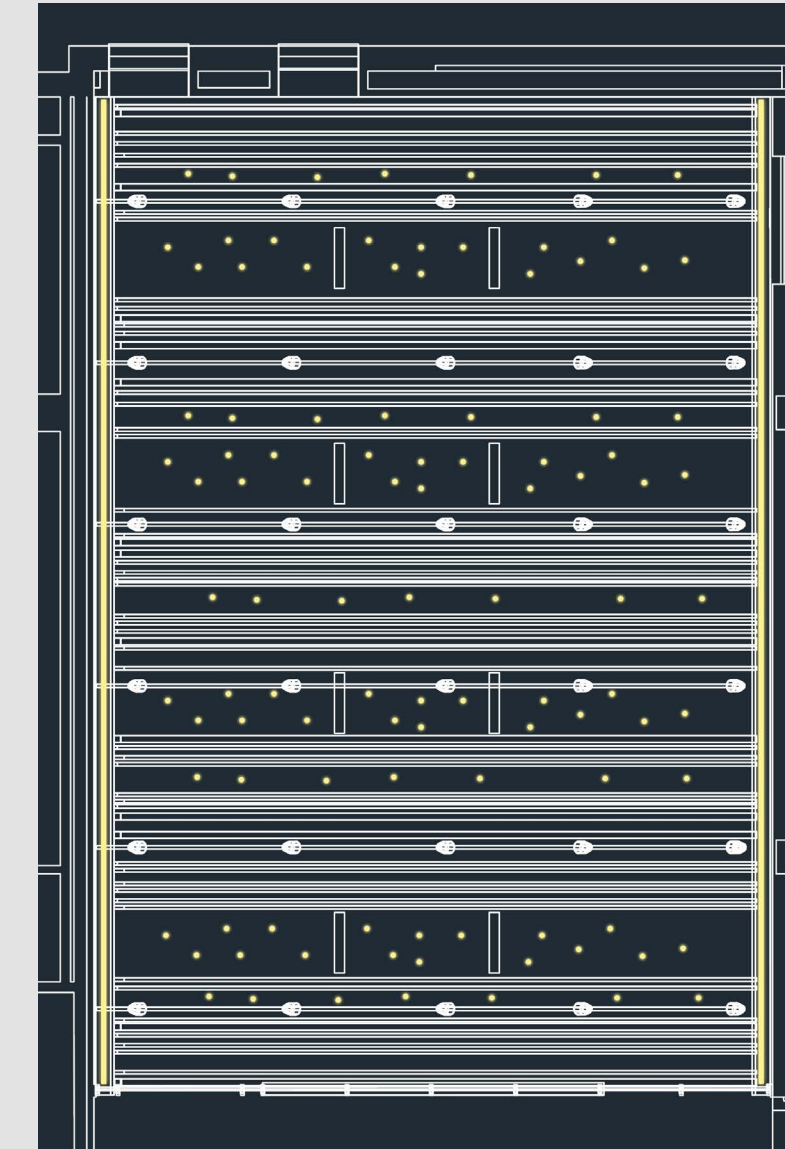
05 Emergency Analysis

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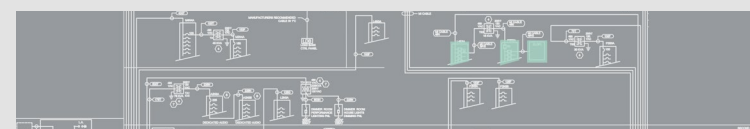
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Landscape Architecture



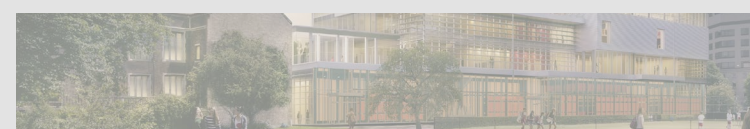
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Daylighting // Lighting Design



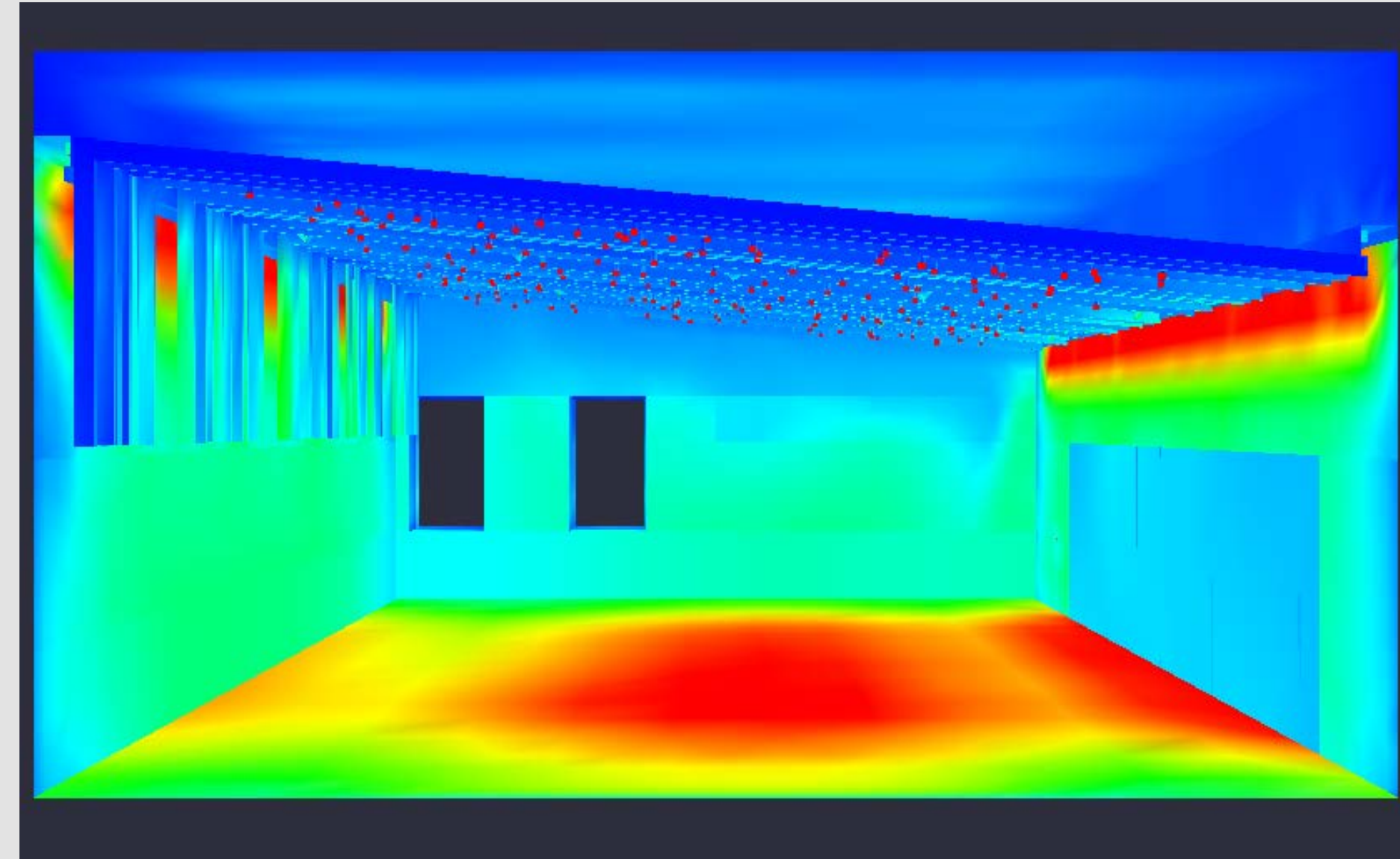
04 Dance Rehearsal Studio
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05 Emergency Analysis
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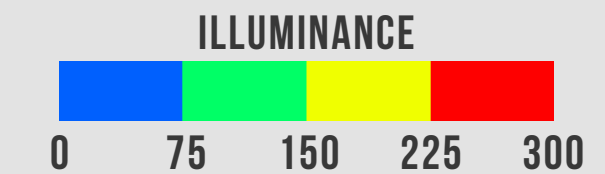
ILLUMINANCE

IES Recommendations

Dance Rehearsal Room - 300 lux
Avg:Min - 1.5:1

Calculated Illuminance

Dance Rehearsal Room - **315 lux**
Avg:Min - 1.95





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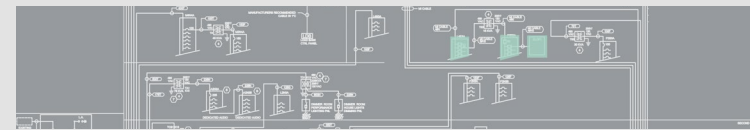
02 Wellness Plaza
Landscape Architecture



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Daylighting // Lighting Design



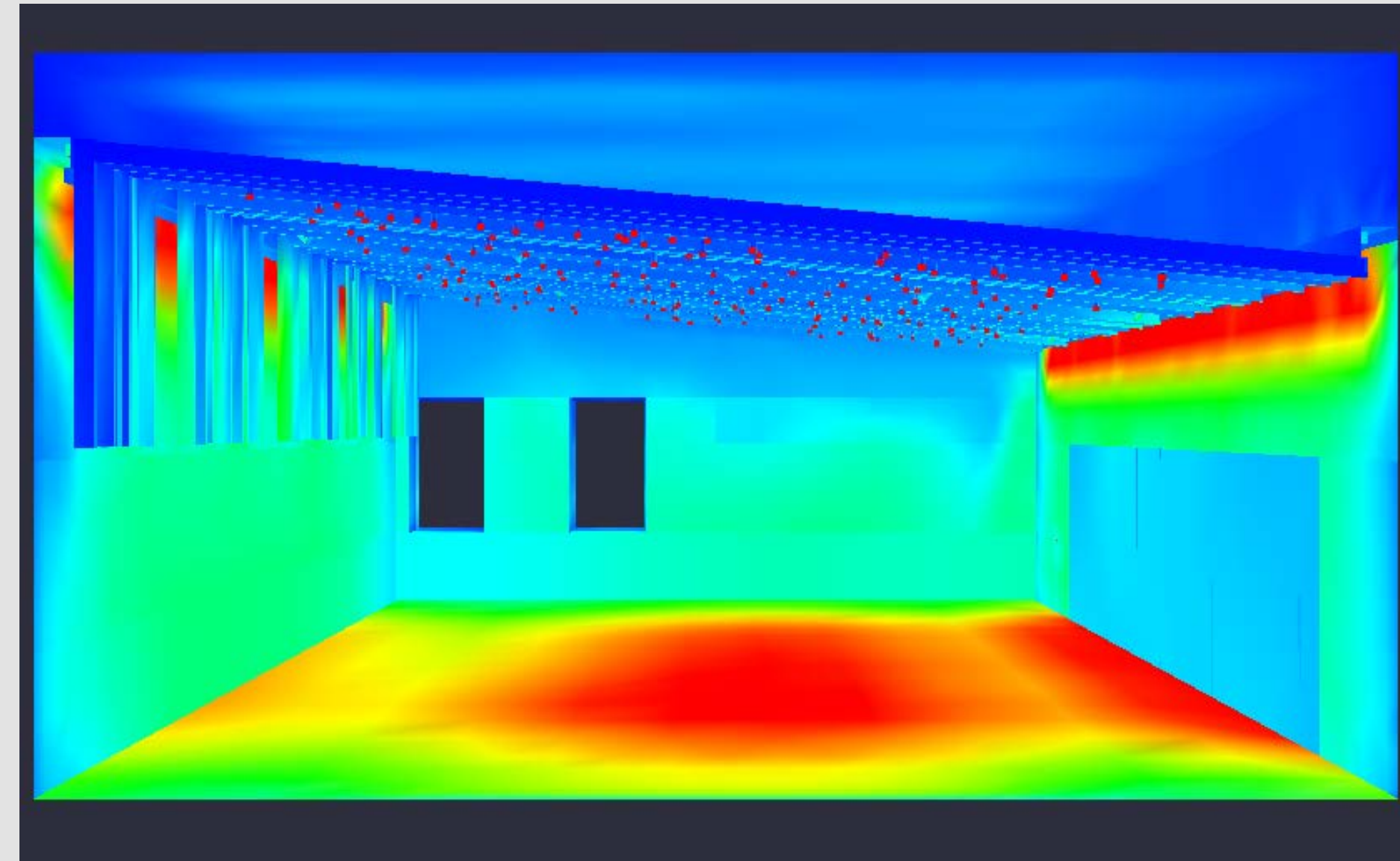
04 Dance Rehearsal Studio
Lighting Design



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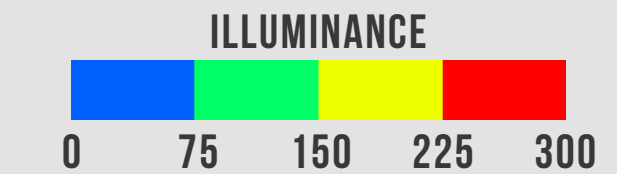
LIGHTING POWER DENSITY

ASHRAE 90.1 Compliance

Dance Rehearsal Room - 1.24 W/sf

Calculated LPD

Dance Rehearsal Room - **0.83** W/sf < 1.24 W/sf





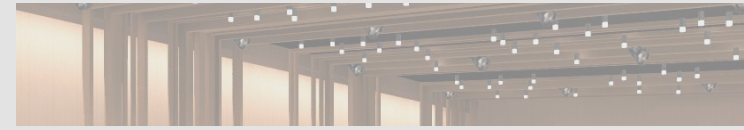
01 Introduction
Building // Scope



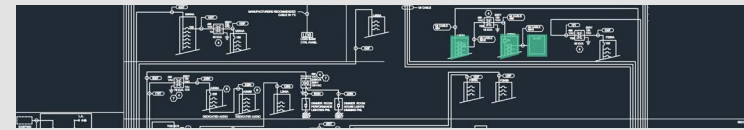
02 Wellness Plaza
Landscape Architecture



03 Wellness Corridor
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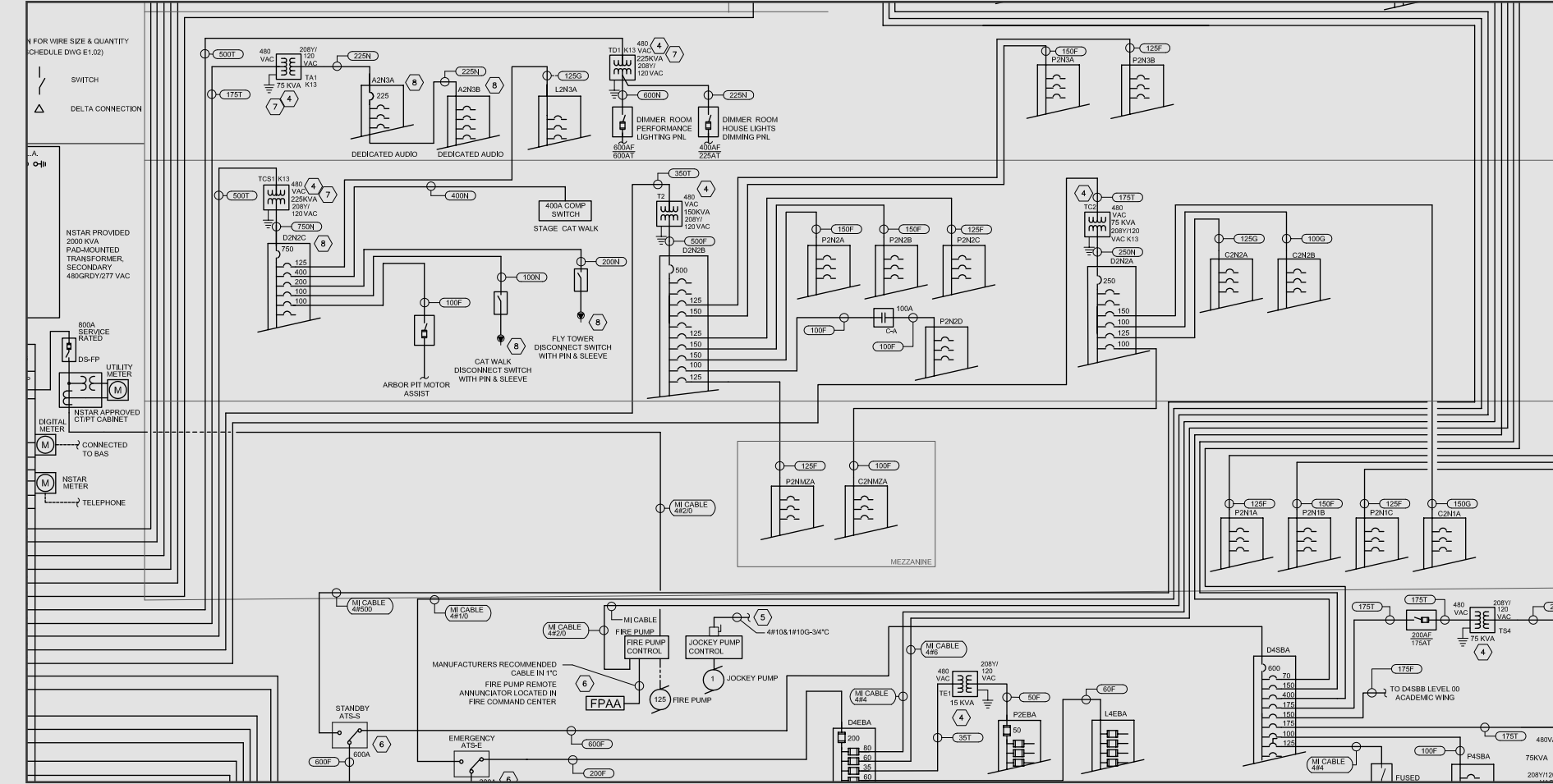
04 Dance Rehearsal Studio
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EMERGENCY FEEDER COST ANALYSIS



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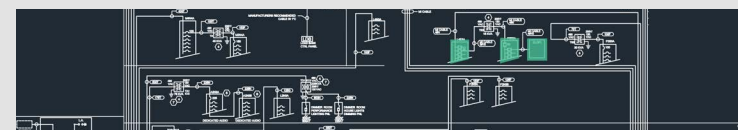
02 Wellness Plaza
Landscape Architecture



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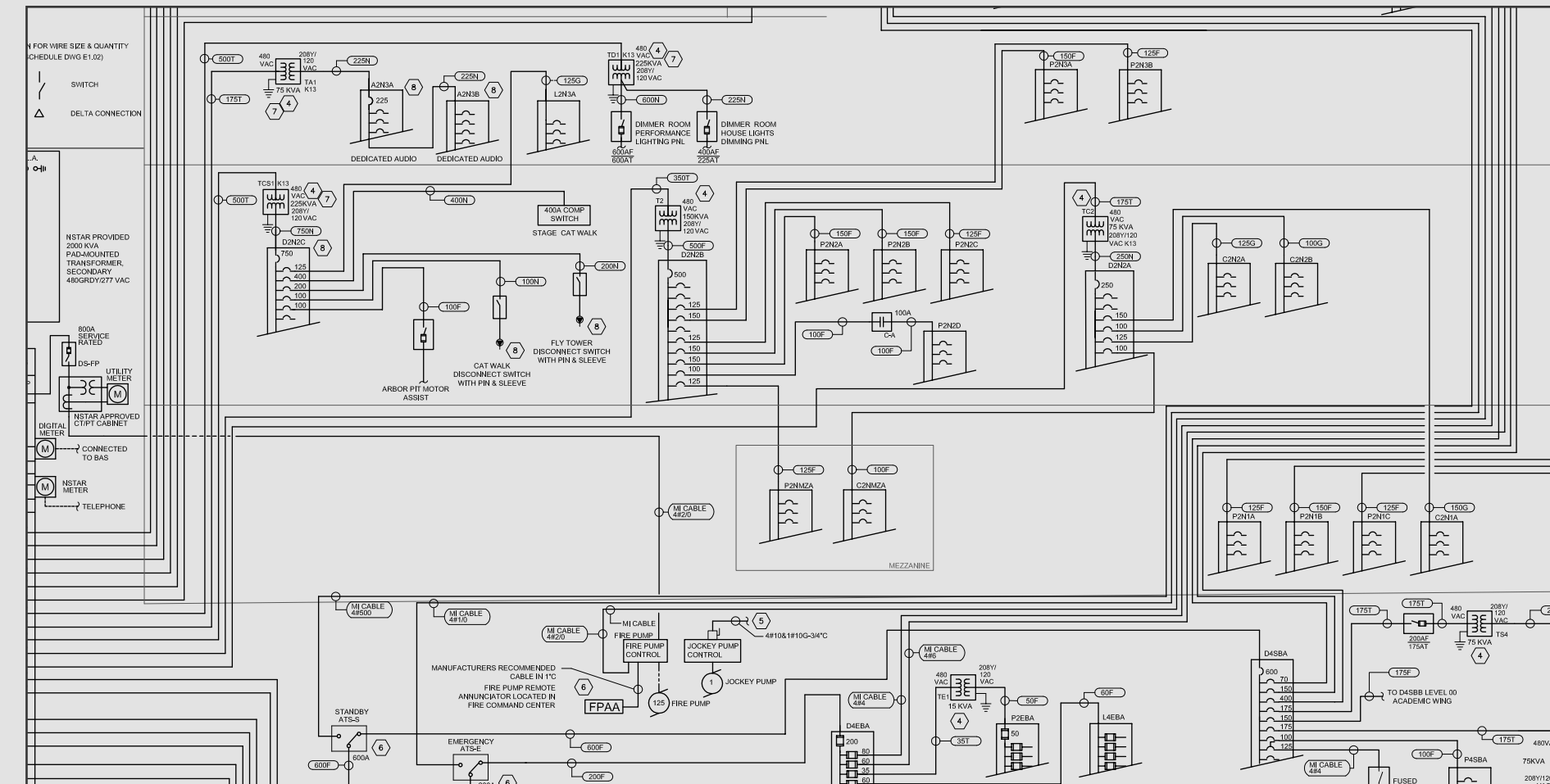
04 Dance Rehearsal Studio
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Mineral Insulated Cable (MI)

Metal Clad Cable (MC)

EMERGENCY FEEDER COST ANALYSIS



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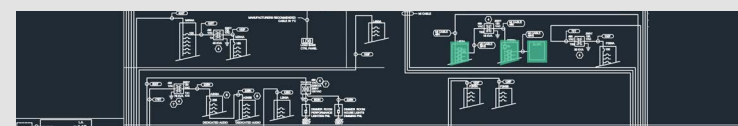
03 Wellness Corridor

Daylighting // Lighting Design



04 Dance Rehearsal Studio

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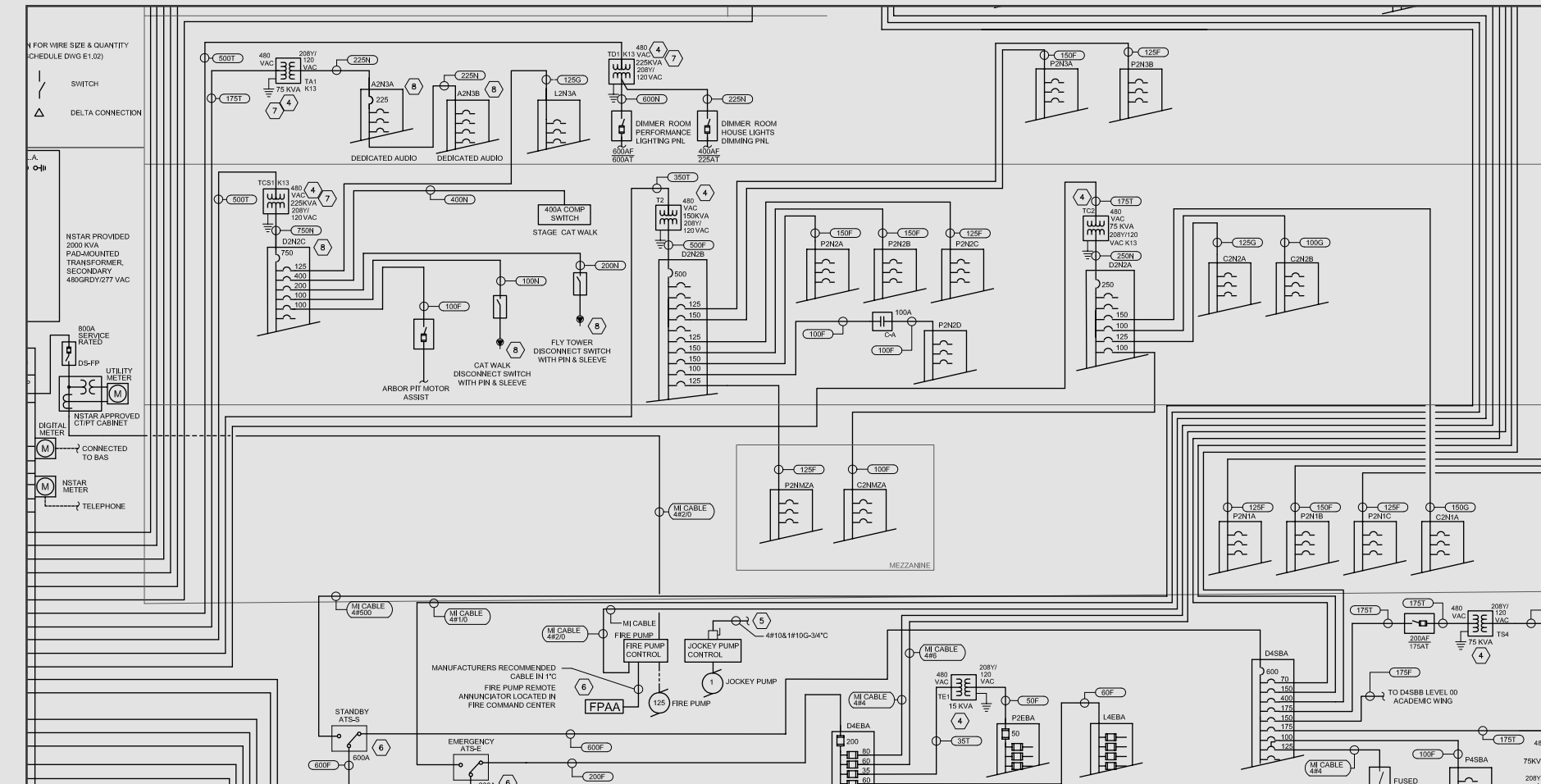
05 Emergency Analysis

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Standby = Optional Loading

Emergency = Life Safety Loading

EMERGENCY FEEDER COST ANALYSIS



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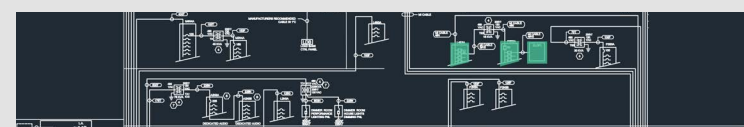
03 Wellness Corridor

Daylighting // Lighting Design



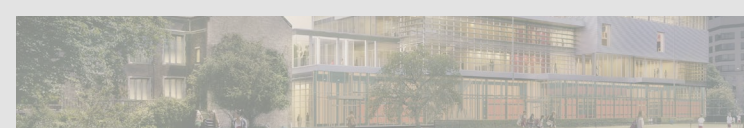
04 Dance Rehearsal Studio

Lighting Design



05 Emergency Analysis

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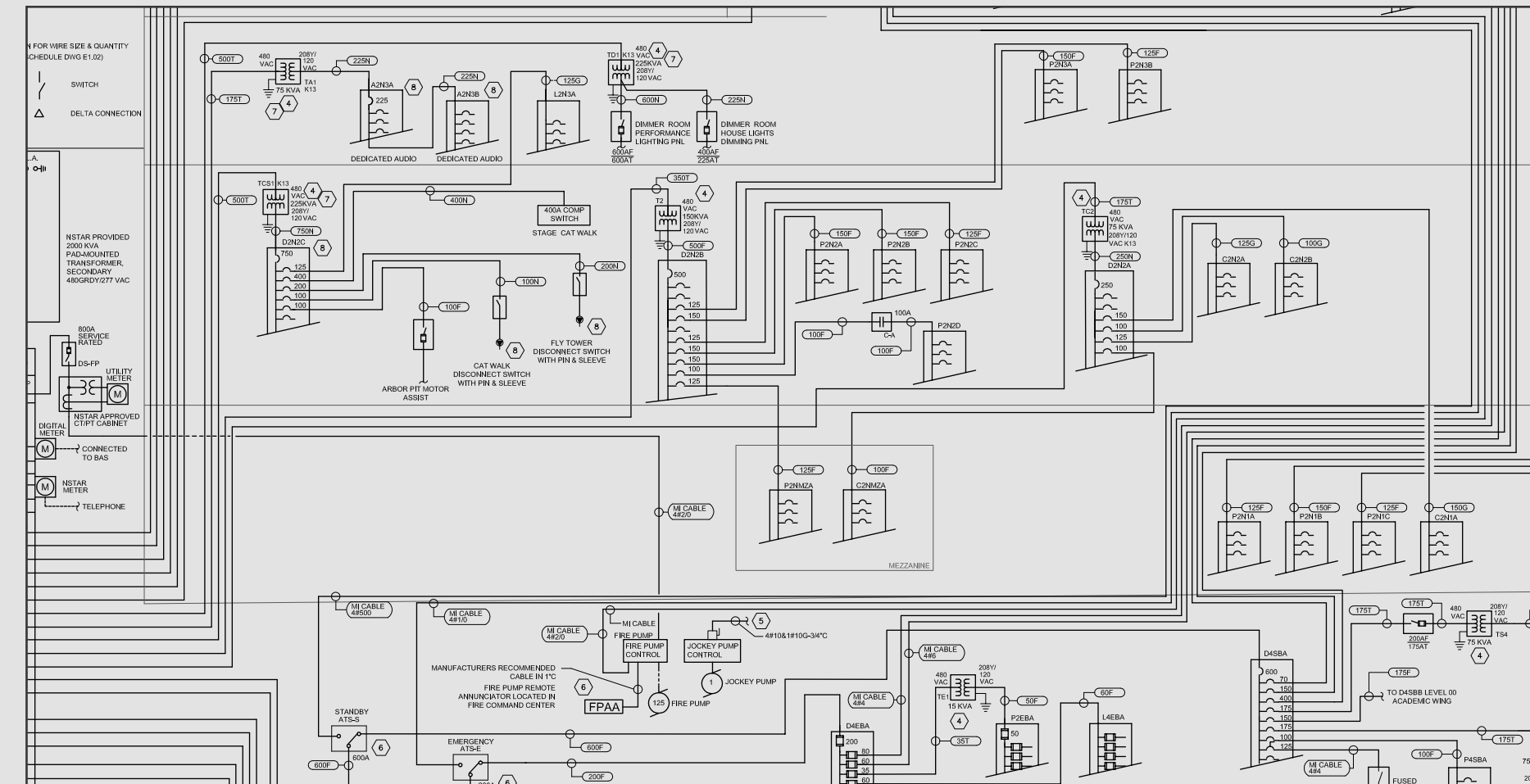


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ANALYSIS QUESTION

The Emergency Branch Circuits all used MI Cable...
But was that necessary?



EMERGENCY FEEDER COST ANALYSIS



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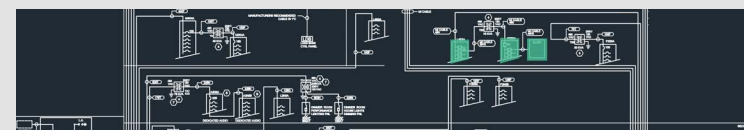
03 Wellness Corridor

Daylighting // Lighting Design



04 Dance Rehearsal Studio

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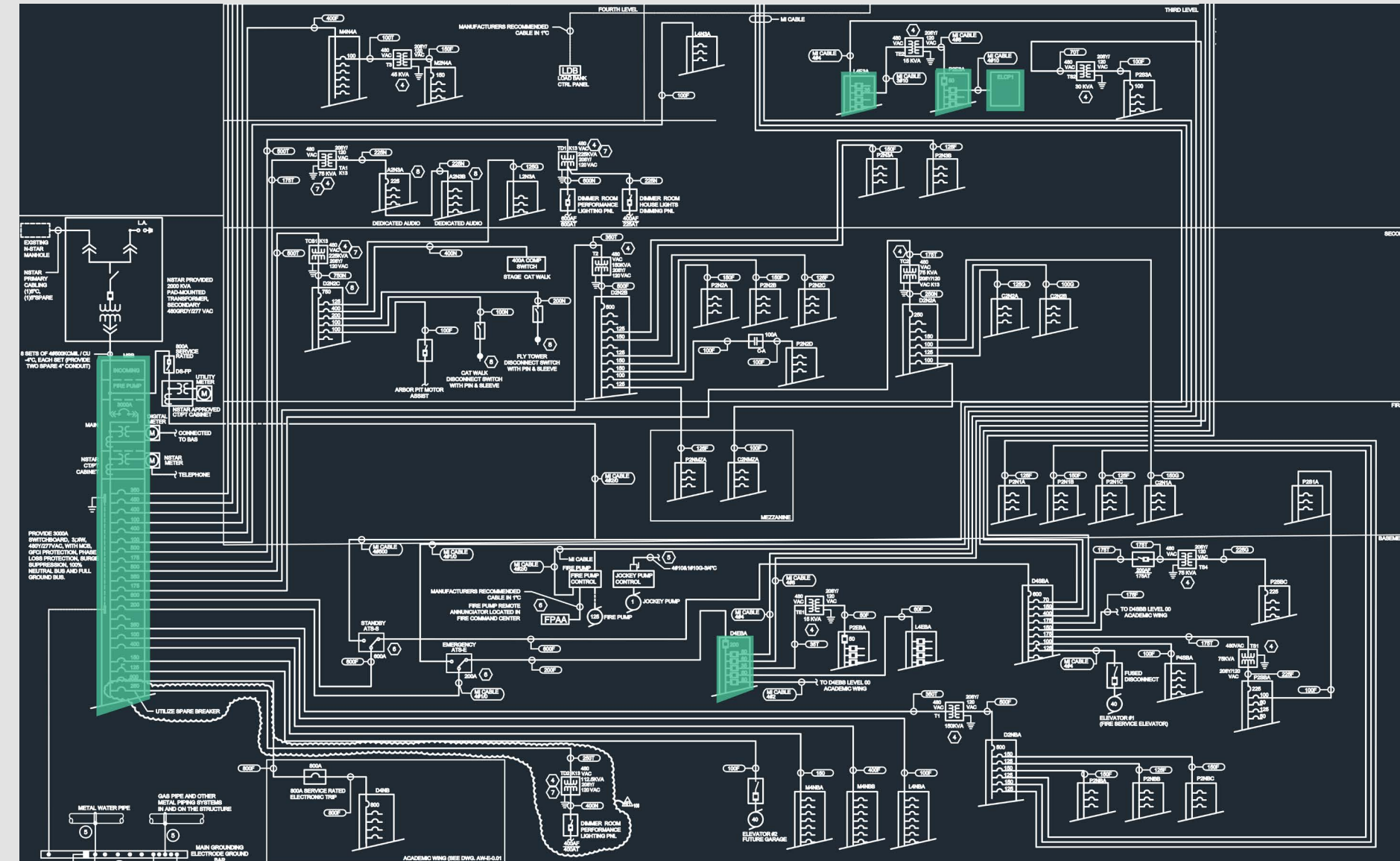
05 Emergency Analysis

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Panelboard L4E5A

Panelboards P2E3A - L4E3A - ELCP1

Distribution Board D4EBA



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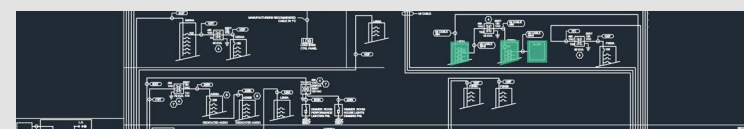
03 Wellness Corridor

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04 Dance Rehearsal Studio

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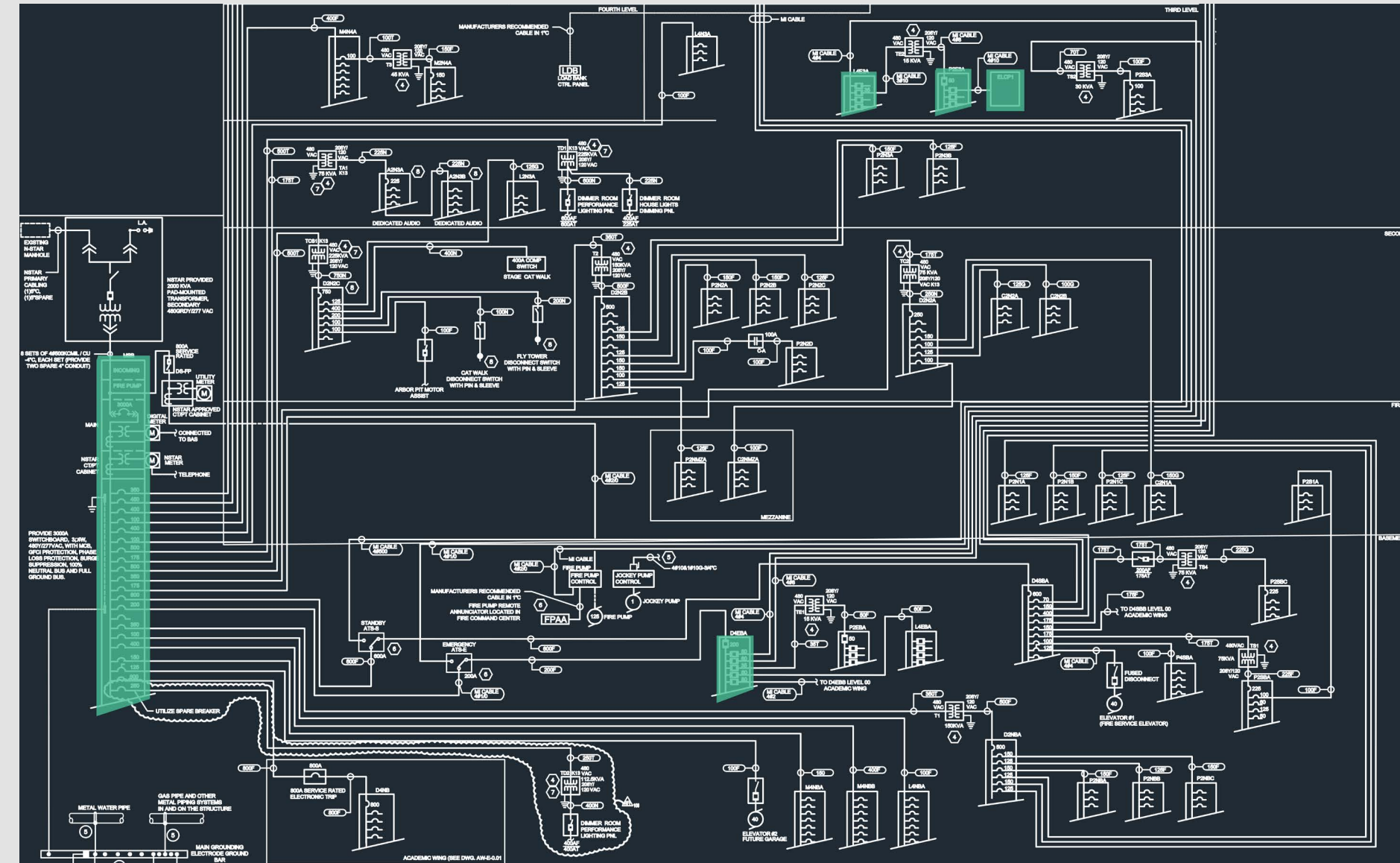
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RESULTS

Tag	From	To	Material	MI Cable	Cost(\$)/LF	Length** (LF)	Total Cost
1	D4EBA	L4E5A	Copper	4 #6	20.50	4.85	25.35
2	D4EBA	L4E3A	Copper	4 #6	20.50	4.85	25.35
3	D4EBA	P2E3A	Copper	4 #8	10.75	2.00	21.50
4	P2E3A	ELCP1	Copper	4 #10	12.00	4.00	16.00
Total							\$5,309.10

Mineral Insulated Cable
 Estimated \$5,309.10 in Branch Circuit

Tag	From	To	Material	MC Cable	Cost(\$)/LF	Length** (LF)	Total Cost
1	D4EBA	L4E5A	Alum/Alum Clad	4 #6	2.90	2.67	5.57
2	D4EBA	L4E3A	Alum/Alum Clad	4 #6	2.90	2.67	5.57
3	D4EBA	P2E3A	Copper/Alum Clad	4 #8	2.53	2.75	3.27
4	P2E3A	ELCP1	Copper/Alum Clad	4 #10	2.15	2.82	4.97
Total							\$1,181.01

Metal Clad Cable
 Estimated \$1,181.01 in Branch Circuit



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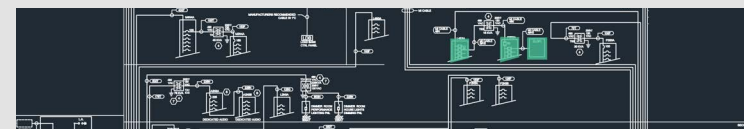
03 Wellness Corridor

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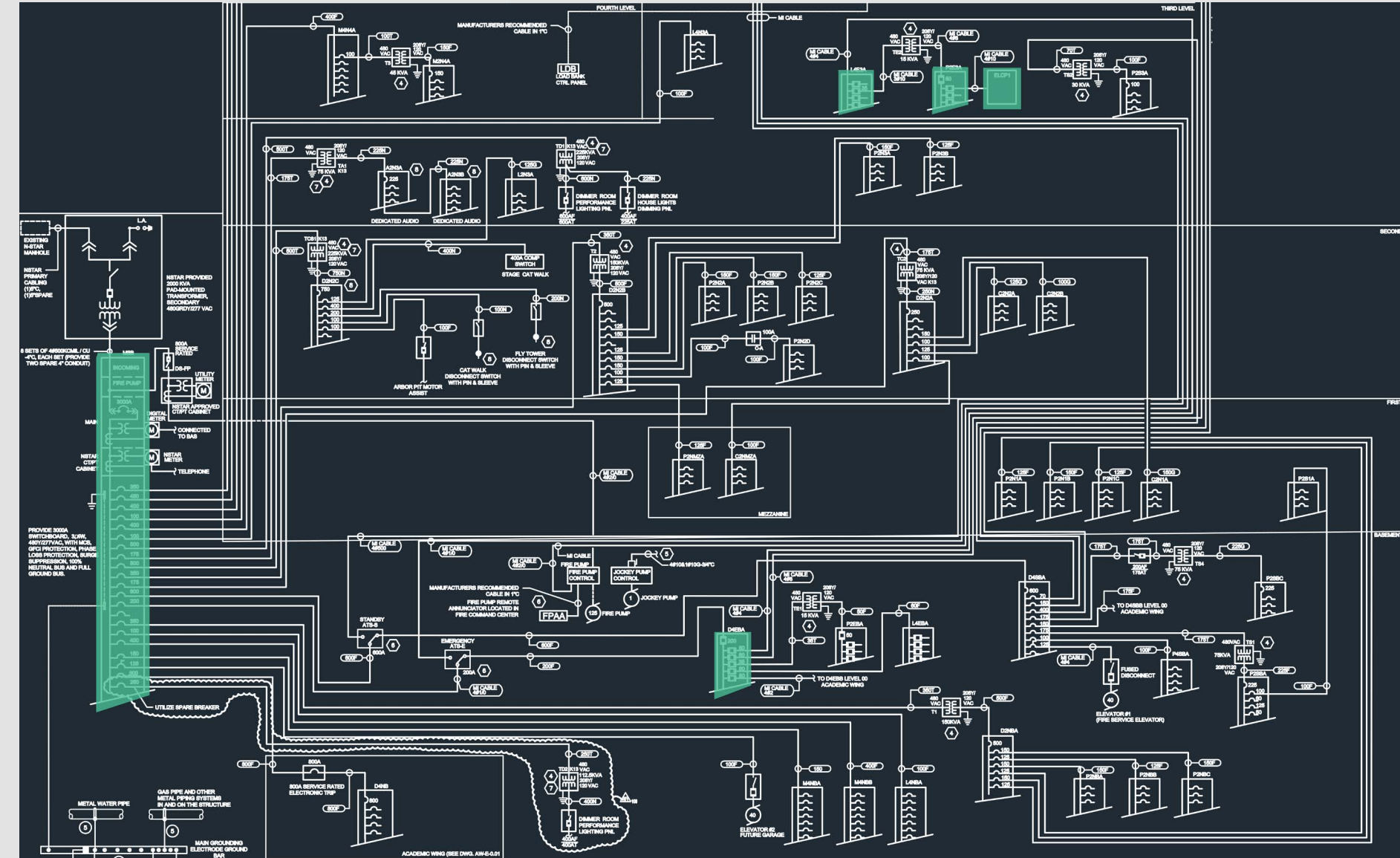
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SAVINGS IN BRANCH CIRCUIT

78%



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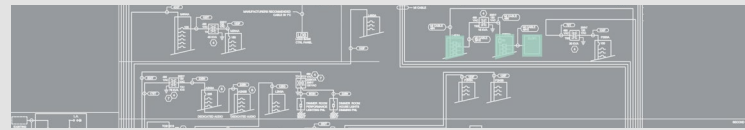
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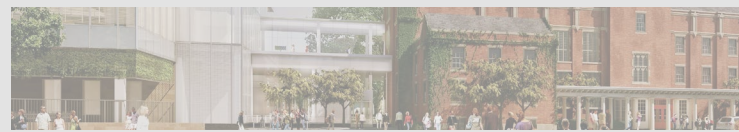


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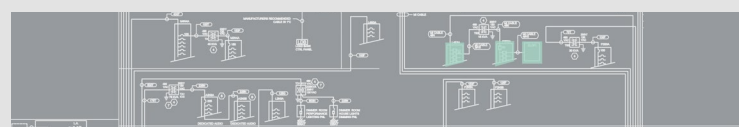
03 Wellness Corridor

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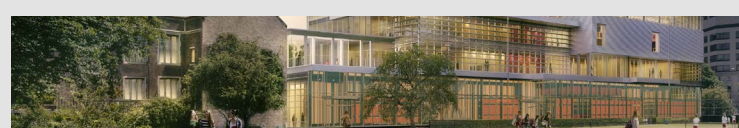
04 Dance Rehearsal Studio

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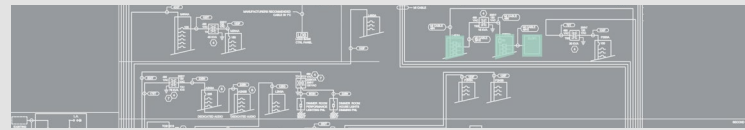
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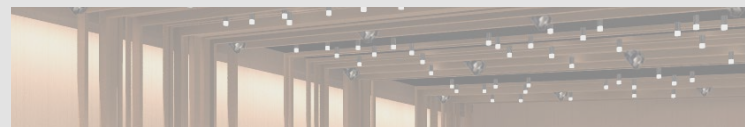
01 Introduction
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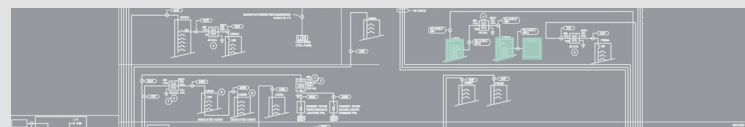
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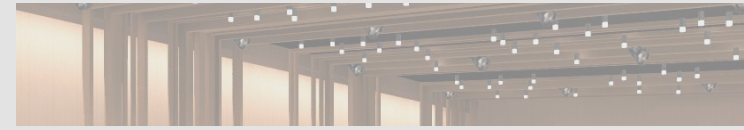
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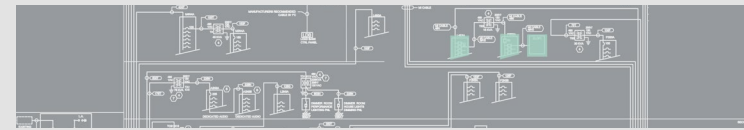
02 Wellness Plaza
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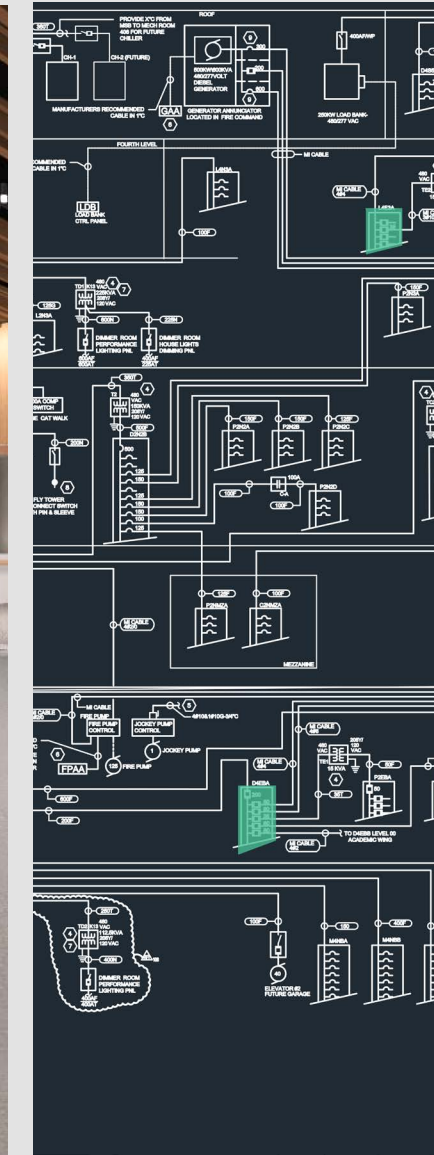
04 Dance Rehearsal Studio
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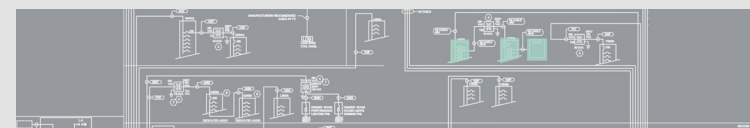
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03 Wellness Corridor
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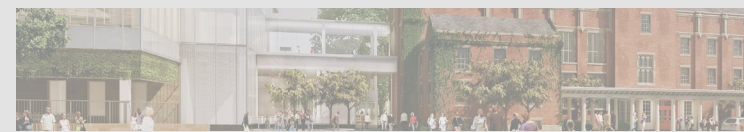


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Classic Tradition in a New Light





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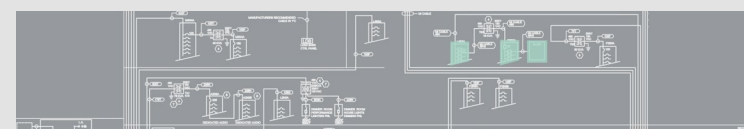
02 Wellness Plaza
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Acknowledgments

THANK YOU!!

AE Department + Penn State Faculty

Dr Mistrick
Shawn Good
Dr Houser
Gary Golaszewski
David Goldberg
Craig Casey

Professionals

Lam Partners
Horten Lees Brogden Lighting Design

Most of all, my friends and family





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Building // Scope



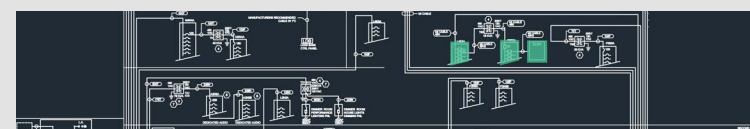
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THE WINSOR SCHOOL

Lubin-O'Donnell Center for Performance, Athletics and Wellness

Maggie Golden // L + E





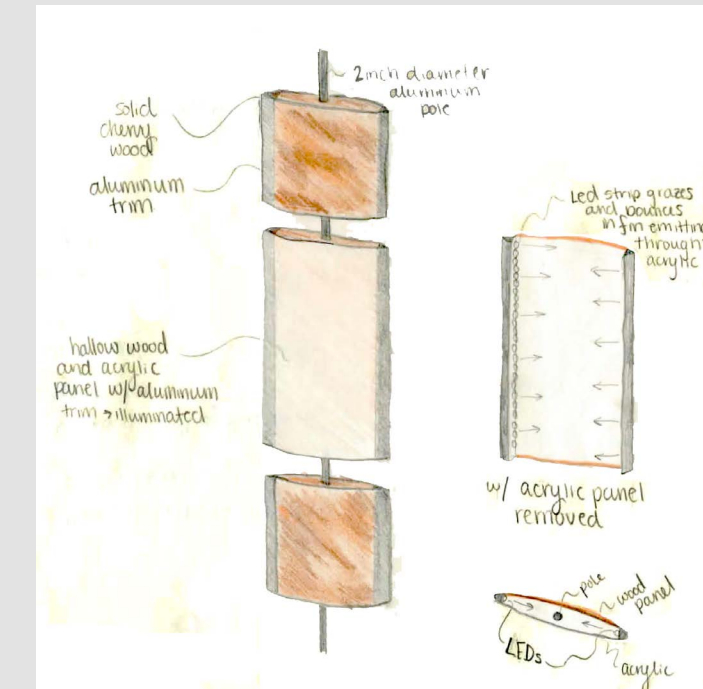
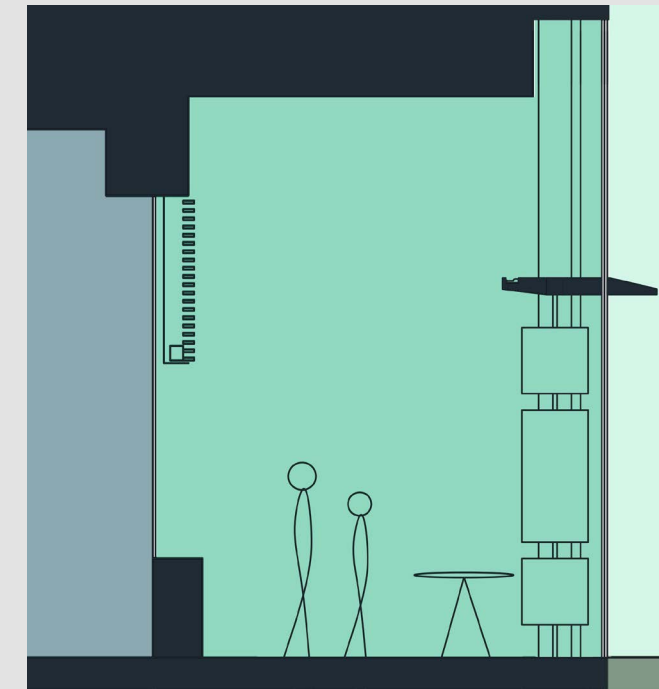
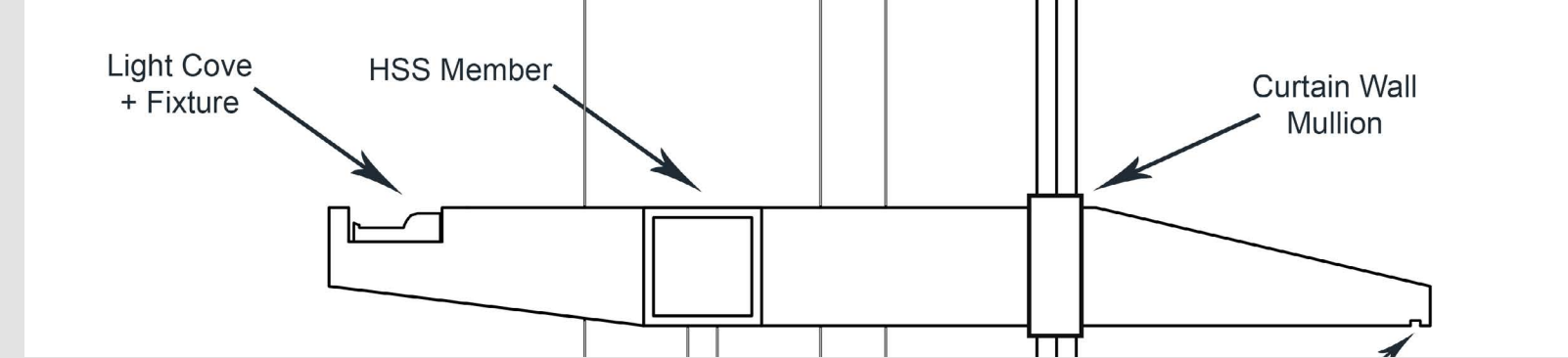
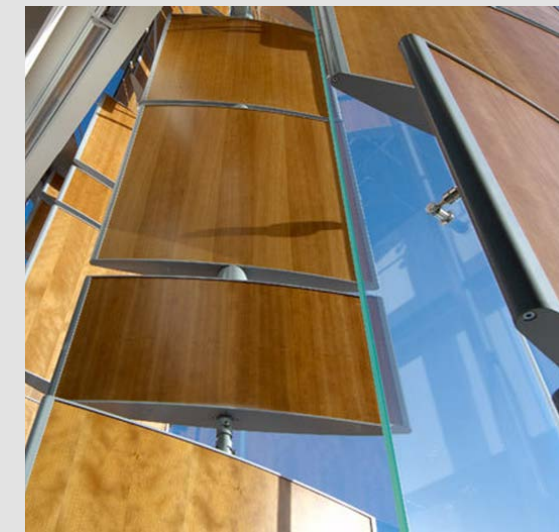
LANDSCAPE DAYLIGHTING



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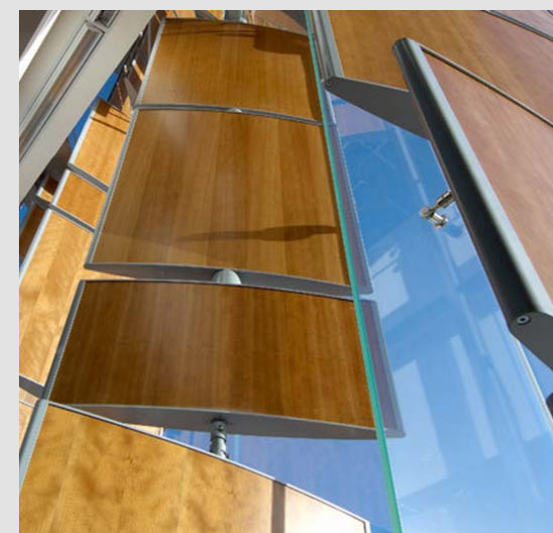
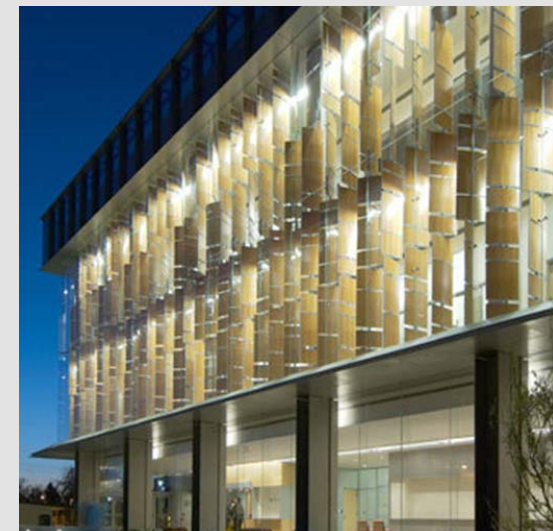
SUPPORT // APPENDICES



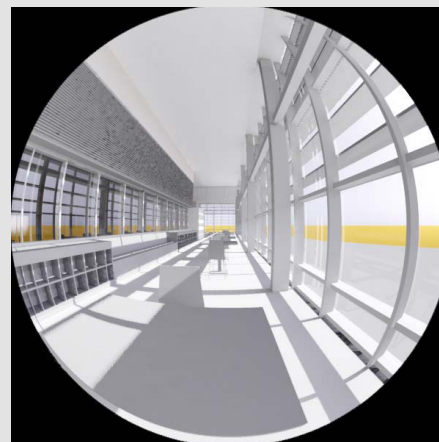
DAYLIGHTING

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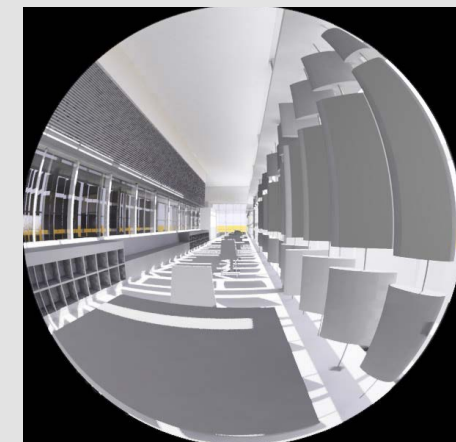
Lubin-O'Donnell Center



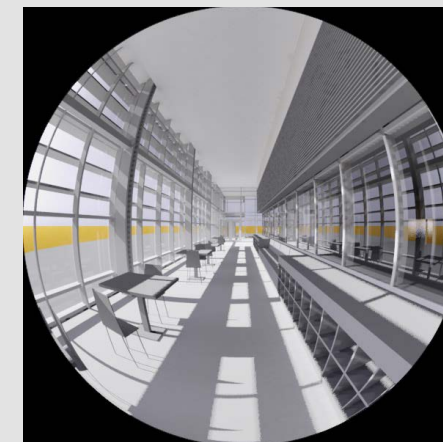
ORIGINAL VIEW 1
Intolerable Glare



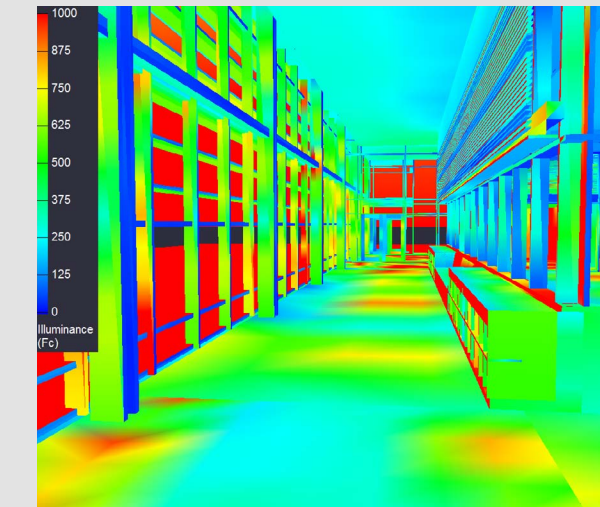
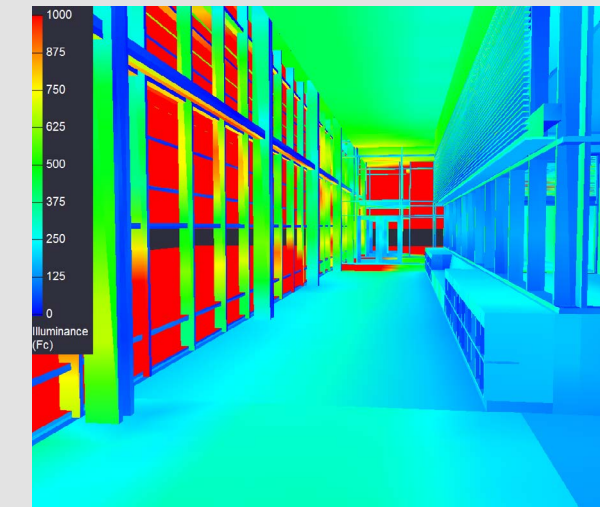
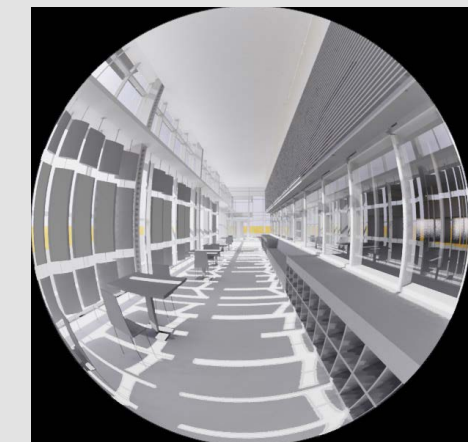
PROPOSED VIEW 1
Imperceptible Glare



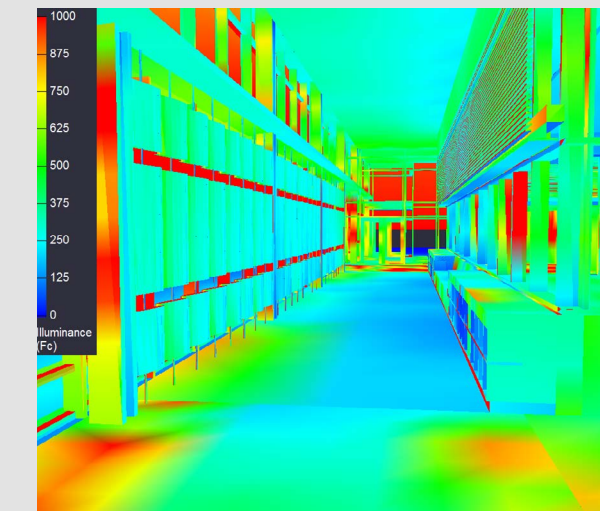
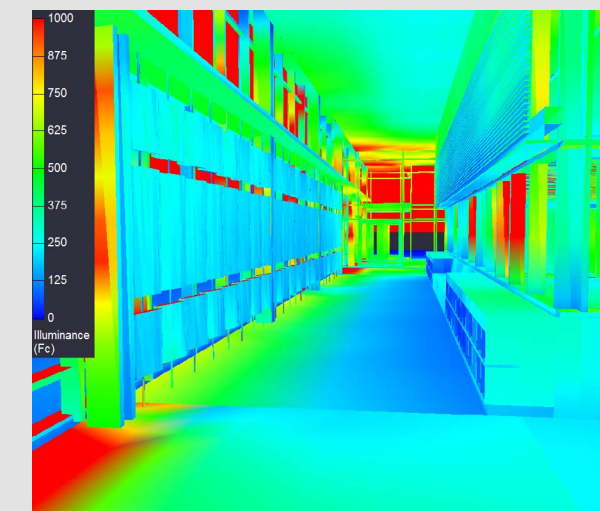
ORIGINAL VIEW 2
Perceptible Glare



PROPOSED VIEW 2
Imperceptible Glare

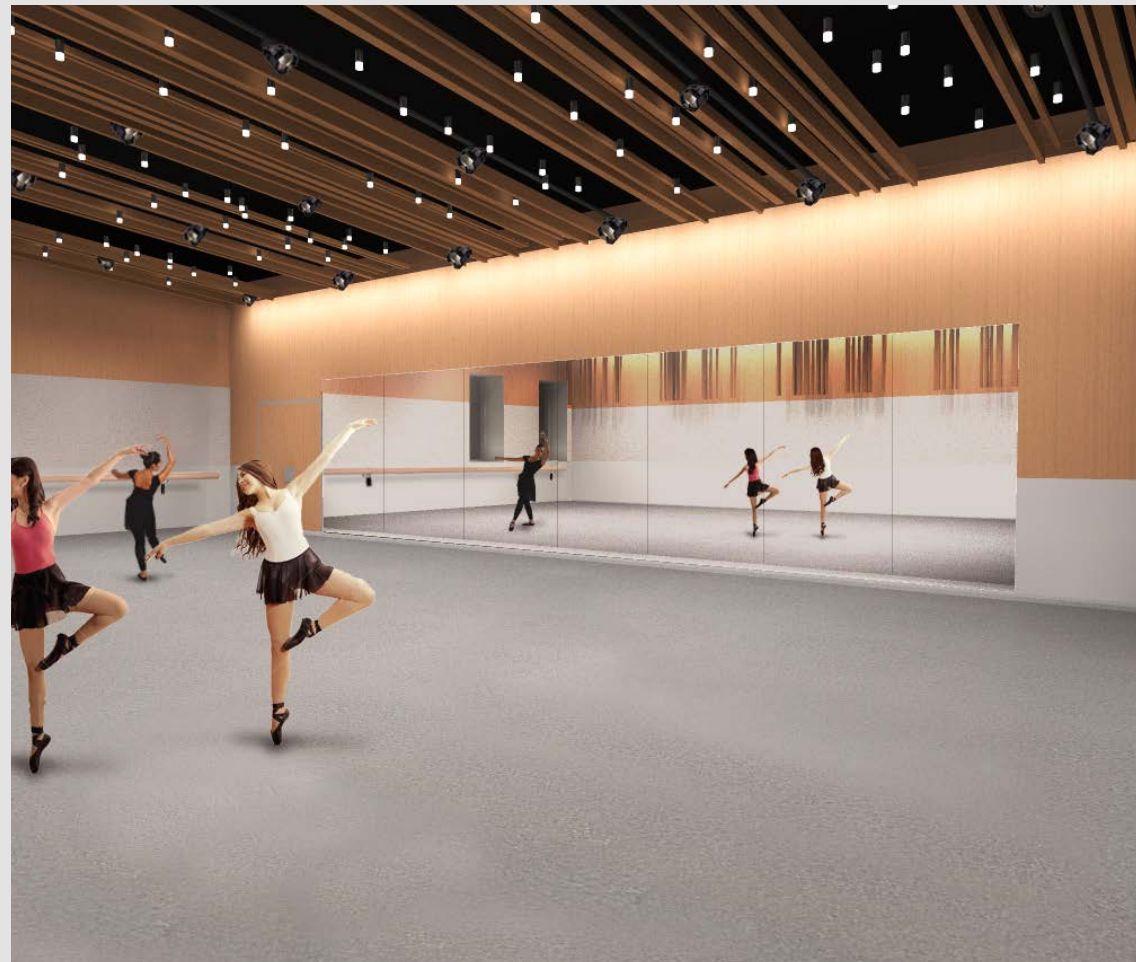


ORIGINAL
SUMMER, WINTER

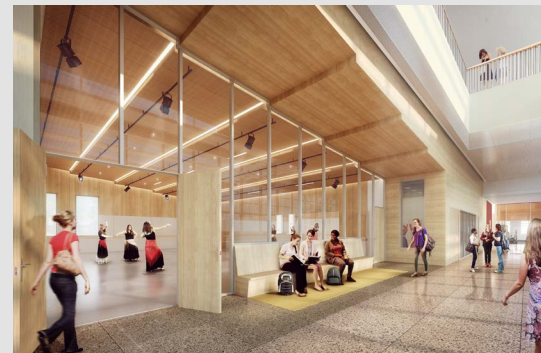


PROPOSED
SUMMER, WINTER

DAYLIGHTING



ACOUSTICS BREADTH



ORIGINAL // 0.57 SECS

AE Thesis 2015 - Reverberation Time Calculations for the Dance Rehearsal Space in The Winsor School

(English Units)

Volume [ft³] = 30150.00
Total Surface Area [ft²] = 7451.49

Surface Description	Surface Area, S (ft ²)	Material Description	Sound Absorption Coefficient, α						S*α (sabins)																																			
			Frequency (Hz)						Frequency (Hz)																																			
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000																														
South Wall - Mirrors	278.14	Mirror	0.01	0.01	0.01	0.01	0.01	0.01	2.78	2.78	2.78	2.78	2.78	2.78																														
South Wall - Wood Wall	356.31	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	99.77	78.39	60.57	32.07	35.63	39.19																														
South Wall - Drywall	135.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	13.58	9.51	6.79	6.79	5.43	5.43																														
East Wall - Windows	55.20	Glass Window	0.15	0.05	0.04	0.03	0.12	0.07	8.28	2.76	2.21	1.66	6.62	3.86																														
East Wall - Acous Panels	116.03	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	18.56	46.41	95.14	111.39	106.75	106.75																														
East Wall - Wood Panels	202.40	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	56.67	44.53	34.41	18.22	20.24	22.26																														
East Wall - Drywall	233.41	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	23.34	16.34	11.67	11.67	9.34	9.34																														
North Wall - Acous Panels	230.64	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	18.56	46.41	95.14	111.39	106.75	106.75																														
North Wall - Wood Panels	362.44	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	101.48	79.74	61.61	32.62	36.24	39.87																														
North Wall - Drywall	272.20	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	27.22	19.05	13.61	13.61	10.89	10.89																														
West Wall - Dry Wall	167.70	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	16.77	11.74	8.39	8.39	6.71	6.71																														
West Wall - Glass	433.54	Glass Curtain Wall	0.15	0.05	0.04	0.03	0.12	0.07	65.03	21.68	17.34	13.01	52.02	30.35																														
Plenum - Acoustical Panels	822.80	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	131.65	329.12	674.70	789.89	756.98	756.98																														
Plenum - Drywall	822.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	82.28	57.60	41.14	41.14	32.91	32.91																														
Floor - Dance Floor	1645.60	Marley Vinyl Dance Floor	0.01	0.03	0.03	0.03	0.03	0.02	16.46	49.37	49.37	49.37	49.37	32.91																														
Ceiling - Metal Perforated	1316.48	CeilingsPlus Illusions	0.81	0.90	0.75	0.90	0.95	0.81	1066.35	1184.83	987.36	1184.83	1250.66	1066.35																														
			ΣSa =						1748.79						2000.25						2162.24						2428.81						2489.32						2273.33					

Avg. α =	0.23	0.27	0.29	0.33	0.33	0.31
----------	------	------	------	------	------	------

Air absorption constant for 20°C and 40% RH, m	0	0	1.83E-04	3.26E-04	7.86E-04	2.56E-03
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Sabine Reverb Time: (s) RT =	0.84	0.74	0.68	0.60	0.57	0.57
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Norris-Eyring Reverb Time: (s) RT =	0.74	0.63	0.57	0.50	0.47	0.49
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Calculated RT (s)	0.74	0.63	0.57	0.50	0.47	0.49
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PROPOSED // 0.60 SECS

AE Thesis 2015 - Reverberation Time Calculations for the Dance Rehearsal Space in The Winsor School

(English Units)

Volume [ft³] = 30150.00
Total Surface Area [ft²] = 6372.68

Surface Description	Surface Area, S (ft ²)	Material Description	Sound Absorption Coefficient, α						S*α (sabins)																																			
			Frequency (Hz)						Frequency (Hz)																																			
			125	250	500	1000	2000	4000	125	250	500	1000	2000	4000																														
South Wall - Mirrors	278.14	Mirror	0.01	0.01	0.01	0.01	0.01	0.01	2.78	2.78	2.78	2.78	2.78	2.78																														
South Wall - Wood Wall	356.31	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	99.77	78.39	60.57	32.07	35.63	39.19																														
South Wall - Drywall	135.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	13.58	9.51	6.79	6.79	5.43	5.43																														
East Wall - Windows	55.20	Glass Window	0.15	0.05	0.04	0.03	0.12	0.07	8.28	2.76	2.21	1.66	6.62	3.86																														
East Wall - Acous Panels	116.03	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	18.56	46.41	95.14	111.39	106.75	106.75																														
East Wall - Wood Panels	202.40	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	56.67	44.53	34.41	18.22	20.24	22.26																														
East Wall - Drywall	233.41	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	23.34	16.34	11.67	11.67	9.34	9.34																														
North Wall - Acous Panels	230.64	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	18.56	46.41	95.14	111.39	106.75	106.75																														
North Wall - Wood Panels	362.44	Wood Veneer - 1/2" Air Space	0.28	0.22	0.17	0.09	0.10	0.11	101.48	79.74	61.61	32.62	36.24	39.87																														
North Wall - Drywall	272.20	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	27.22	19.05	13.61	13.61	10.89	10.89																														
North Wall - Wood Slats	237.67	CeilingsPlus Barz	0.12	0.38	0.95	1.08	1.10	0.99	28.52	90.31	225.79	256.68	261.44	235.29																														
West Wall - Dry Wall	167.70	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	16.77	11.74	8.39	8.39	6.71	6.71																														
West Wall - Glass	433.54	Glass Curtain Wall	0.15	0.05	0.04	0.03	0.12	0.07	65.03	21.68	17.34	13.01	52.02	30.35																														
Plenum - Acoustical Panels	822.80	FabriTrak Stretch Fabric Panel NRC .80	0.16	0.40	0.82	0.96	0.92	0.92	131.65	329.12	674.70	789.89	756.98	756.98																														
Plenum - Drywall	822.80	Two 5/8" Gyp with 3-5/8" studs + fiberglass	0.10	0.07	0.05	0.05	0.04	0.04	82.28	57.60	41.14	41.14	32.91	32.91																														
Floor - Dance Floor	1645.60	Marley Vinyl Dance Floor	0.01	0.03	0.03	0.03	0.03	0.02	16.46	49.37	49.37	49.37	49.37	32.91																														
Ceiling - Wood Slats	665.78	CeilingsPlus Barz	0.12	0.38	0.95	1.08	1.10	0.99	79.89	253.00	632.49	719.04	732.36	659.12																														
			ΣSa =						790.85						1158.73						2033.15						2219.70						2232.46						2101.39					

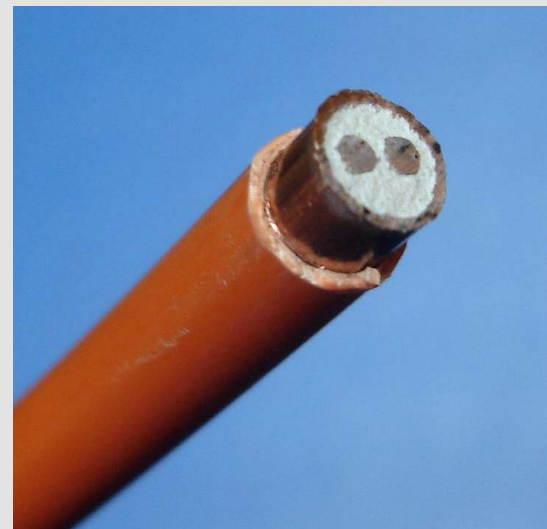
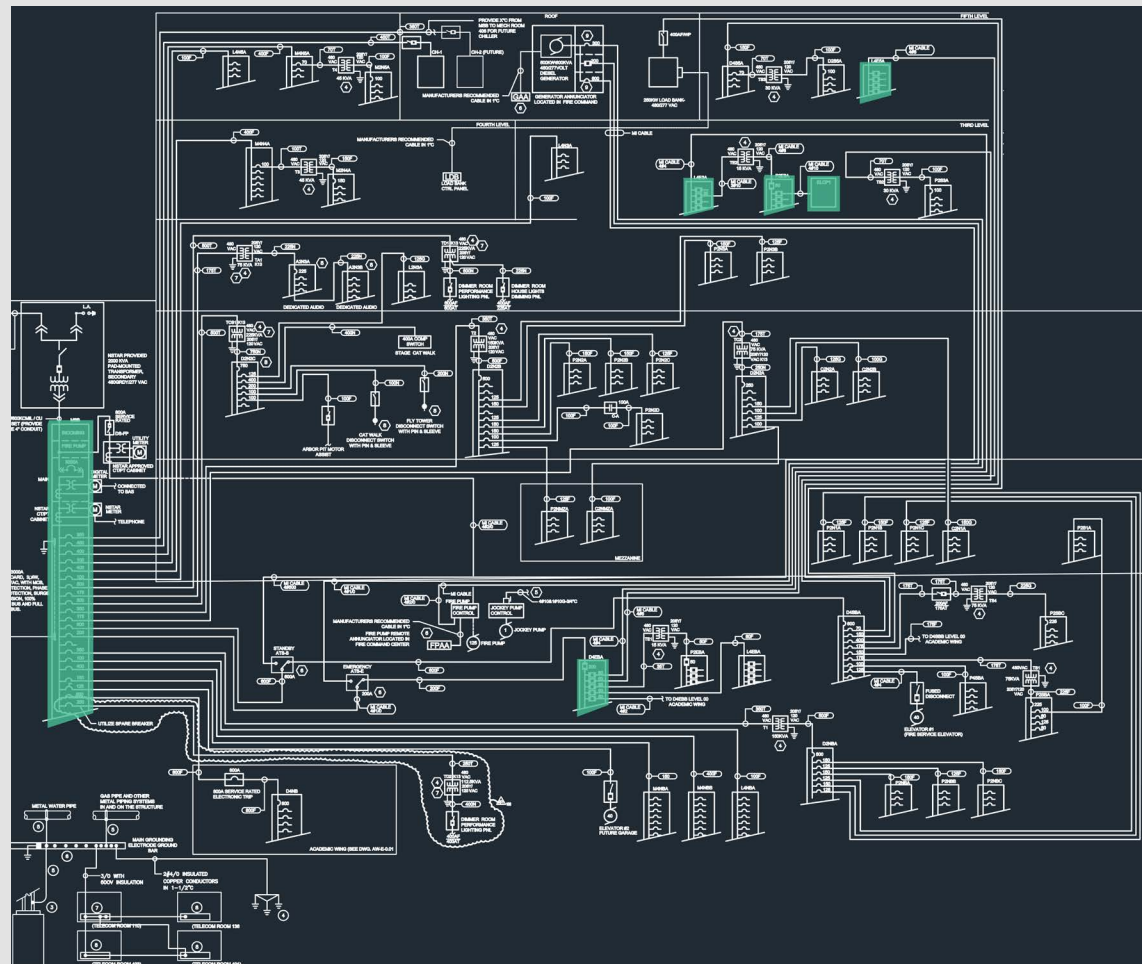
Avg. α =	0.12	0.18	0.32	0.35	0.35	0.33
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Air absorption constant for 20°C and 40% RH, m	0	0	1.83E-04	3.26E-04	7.86E-04	2.56E-03
------------------------------------------------	---	---	----------	----------	----------	----------

Sabine Reverb Time: (s) RT =	1.87	1.27	0.72	0.65	0.63	0.61
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Norris-Eyring Reverb Time: (s) RT =	1.75	1.16	0.60	0.53	0.52	0.52
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Calculated RT (s)	1.75	1.16	0.60	0.53	0.52	0.52
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Tag	From	To	Material	MI Cable		Cost(\$)/LF			Length** (LF)	Total Cost
				NO.	Size	Material	Labor	Total		
1	D4EBA	L4E5A	Copper	4	#6	20.50	4.85	25.35	94	\$2,382.90
2	D4EBA	L4E3A	Copper	4	#6	20.50	4.85	25.35	104	\$2,636.40
3	D4EBA	P2E3A	Copper	4	#8	15.75	4.40	20.15	12	\$241.80
4	P2E3A	ELCP1	Copper	4	#10	12.00	4.00	16.00	3	\$48.00
									Total	\$5,309.10

CALCULATION

Tag	From	To	Material	MC Cable		Cost(\$)/LF			Length** (LF)	Total Cost
				NO.	Size	Material	Labor	Total		
1	D4EBA	L4E5A	Alum/Alum Clad	4	#6	2.90	2.67	5.57	94	\$523.58
2	D4EBA	L4E3A	Alum/Alum Clad	4	#6	2.90	2.67	5.57	104	\$579.28
3	D4EBA	P2E3A	Copper/Alum Clad	4	#8	2.53	2.75	5.27	12	\$63.24
4	P2E3A	ELCP1	Copper/Alum Clad	4	#10	2.15	2.82	4.97	3	\$14.91
									Total	\$1,181.01

PANELBOARD: L4E5A
 BUS SIZE: 100 AMPS MAIN: () MF (X) MLO SERVICE RATED: () YES (X) NO
 VOLTAGE: 208Y/120V 3PH, 4W MCB AMPS: LOCATION: EMERGENCY ELEC RM 53
 NEUTRAL: (X) 100% () 200% () NONE MOUNTING SURFACE
 ISOLATED GND BUS: () YES (X) NO TVSS: () YES (X) NO
 SHORT CIR CURRENT RATING: 25 K

DIRECTORY	WATTS OF LOAD			FUSE AMPS	POLES	FUSE AMPS	WATTS OF LOAD			DIRECTORY
	L1	L2	L3				L1	L2	L3	
LTG ELECTRICAL 304	310			20	1	20	300			LTG ELECTRICAL 298
LTG EXTERIOR PLAN WEST		180		20	3	4	20	880		LTG ELECTRICAL 288A
SPARE				20	5	6	20		1275	LTG FOM STORAGE 200B
SPARE				20	7	8	20	1194		LTG ALCOVE
SPARE				20	9	10	20	728		LTG IT 528
SPARE				20	11	12	20			SPARE
SPARE				20	13	14	20			SPARE
SPARE				20	15	16	20			SPARE
SPARE				20	17	18	20			SPARE
SUBTOTAL	310	180	0				1564	1088	1275	SUBTOTAL

NOTES:
 TOTAL WATTS L1: 1864
 TOTAL WATTS L2: 1168
 TOTAL WATTS L3: 1275
 TOTAL WATTS: 4807
 TOTAL AMPS @ 100%: 14
 TOTAL AMPS @ 125%: 17

TOTAL PANEL RECP LOAD = 0 WATTS

PANELBOARD: L4E3A
 BUS SIZE: 125 AMPS MAIN: () MF (X) MLO SERVICE RATED: () YES (X) NO
 VOLTAGE: 480Y/277V 3PH, 4W MCB AMPS: LOCATION: ELEC ROOM 304A
 NEUTRAL: (X) 100% () 200% () NONE MOUNTING SURFACE
 ISOLATED GND BUS: () YES (X) NO TVSS: () YES (X) NO
 SHORT CIR CURRENT RATING: 25 K

DIRECTORY	WATTS OF LOAD			FUSE AMPS	POLES	FUSE AMPS	WATTS OF LOAD			DIRECTORY
	L1	L2	L3				L1	L2	L3	
PANEL P2E3A				35	1	2	20	1733		LTG 2 COURT GYM
VIA IEZ 15 KVA		2474		20	3	4	20		1733	LTG 2 COURT GYM
LTG MECHANICAL 406	456		2146	20	5	6	20			LTG 2 COURT GYM
SPARE				20	9	10	20			SPARE
SPARE				20	11	12	20			SPARE
SPARE				20	13	14	20			SPARE
SPARE				20	15	16	20			SPARE
SPARE				20	17	18	20			SPARE
SUBTOTAL	2726	2474	2146				3466	1733	1733	SUBTOTAL

NOTES:
 TOTAL WATTS L1: 6192
 TOTAL WATTS L2: 4207
 TOTAL WATTS L3: 2879
 TOTAL WATTS: 14278
 TOTAL AMPS @ 100%: 40
 TOTAL AMPS @ 125%: 50

TOTAL PANEL RECP LOAD = 0 WATTS

PANELBOARDS

PANELBOARD: P2E3A (REVISED)
 BUS SIZE: 100 AMPS MAIN: (X) MF () MLO SERVICE RATED: () YES (X) NO
 VOLTAGE: 208Y/120V 3PH, 4W MCB AMPS: 50A FUSE LOCATION: ELEC ROOM 304A
 NEUTRAL: (X) 100% () 200% () NONE MOUNTING SURFACE
 ISOLATED GND BUS: () YES (X) NO TVSS: () YES (X) NO
 SHORT CIR CURRENT RATING: 10 K

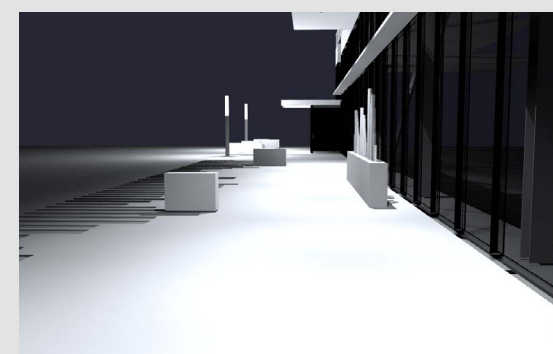
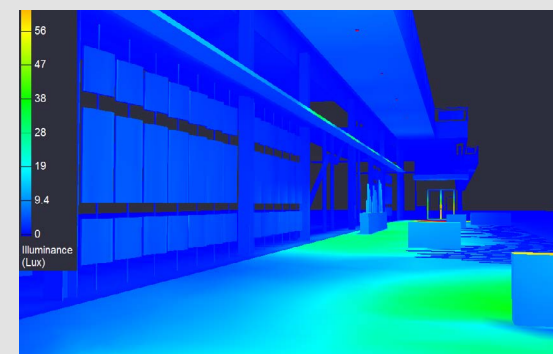
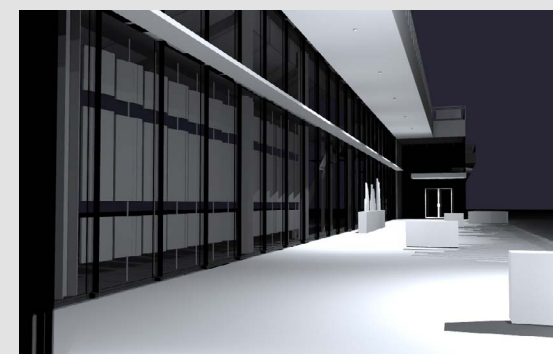
DIRECTORY	WATTS OF LOAD			CKT BRK AMPS	POLES	CKT BRK AMPS	WATTS OF LOAD			DIRECTORY
	L1	L2	L3				L1	L2	L3	
FAS EMERGENCY ELEC RM 304A	500						384			LTG STAGE SIL 278
LTG CATWALK		512					576		256	LTG FLY TOWER
LTG CATWALK			504							SPARE
SPARE										SPARE
SPARE										SPARE
ELCP1 DIMMER ROOM	624	624								SPARE
			624							SPARE
SUBTOTAL	1124	1136	1128				384	576	256	SUBTOTAL

NOTES:
 TOTAL WATTS L1: 1508
 TOTAL WATTS L2: 1712
 TOTAL WATTS L3: 1384
 TOTAL WATTS: 4604
 TOTAL AMPS @ 100%: 13
 TOTAL AMPS @ 125%: 16

TOTAL PANEL RECP LOAD = 0 WATTS

LIGHTING CONTROL PANEL : ELCP1 (MAIN C.B PANEL) - REVISED

CIRCUIT #	DESCRIPTION / FIXTURE TYPE(S)	PANEL	LOAD TYPE	ON/OFF OR DIMMING	SWITCHING ZONE	DAY LIGHTING CONTROL	VOLTAGE/A	LOAD (WATTS)
1	T13/T14 HOUSE CIRCULATION - F14A	P2E3A	INC	DIMMING	1	NO	120/20	350
2	T8 MAIN FLOOR WEST - L14	P2E3A	LED	DIMMING	2	NO	120/20	40
3	T9 MAIN FLOOR NORTH - L14	P2E3A	LED	DIMMING	3	NO	120/20	80
4	T4 MAIN FLOOR EAST - L14	P2E3A	LED	DIMMING	4	NO	120/20	104
5	STAIR 7 - L12	P2E3A	LED	DIMMING	5	NO	120/20	108
6	BALCONY STEP LIGHTS - L12	-	LED	DIMMING	6	NO	120/20	156
7	HOUSE AMBIENT - L16	P2E3A	LED	DIMMING	7	NO	120/20	396
8	BALCONY - L16	P2E3A	LED	DIMMING	8	NO	120/20	396
9	BALCONY AISLE - L16	P2E3A	LED	DIMMING	9	NO	120/20	120
10	ASSEMBLY/ORCHESTRA STEP LIGHTS - L12	-	LED	DIMMING	10	NO	120/20	120
11	RISER ORCHESTRA STEP LIGHTS - L12	-	LED	DIMMING	11	NO	120/20	120
12	(SPARE)							
13	(SPARE)							
14	(SPARE)							
15	(SPARE)							
16	(SPARE)							



LANDSCAPE LIGHTING

Type	Fixture Image	Manufacturer	Description	Lamp	Wattage
L1		Moda Light AquaFlex	Wet location LED linear flex light	LED 3000K 127 lm/ft	1.48 W/ft
L2A		Gotham 4" Evo	Wet Location 4" LED Downlight with a Specular finish and clear aperture and trim	LED 3000K 600 lms	16 W
L2B		Gotham 4" Evo	Wet Location 4" LED Downlight with a Specular finish and clear aperture and trim	LED 3000K 1000 lms	21 W
L3		DesignPlan Rio 1.1/2/4	Wet Location low level 1" thick linear in-ground uplight with aluminum casting and diffuse optics, line voltage	LED 2800K 168 lms	8 W
L4		Selux MTR Column	LED Light Column extending 10 ft above grade - 3 ft of Light, 8" diameter and MTR sheilding rings to bend light and a Type 5 Distribution	LED 3000K 6344 lms	90 W

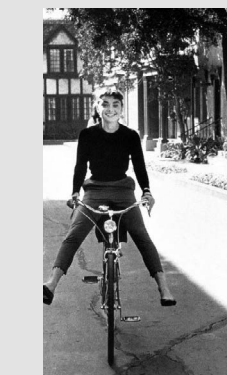
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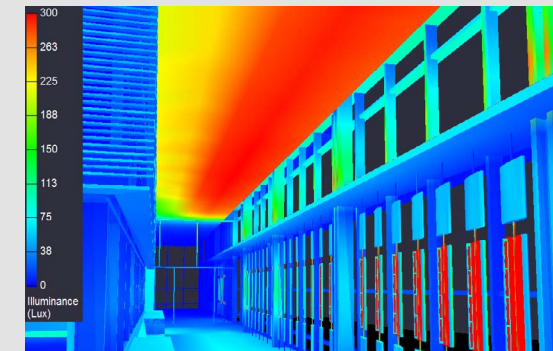
Illuminance

Exterior Plaza - 19.38 > 15 lux
 Exterior Vestibules - 132 > 100 lux


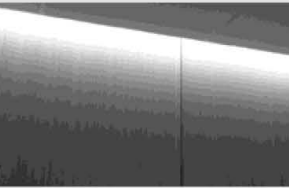


Lighting Power Density

Exterior Plaza - 0.1283 < 0.1600 W/sf
 Exterior Vestibules - 0.3261 < 0.400 W/sf





CORRIDOR LIGHTING

Type	Fixture Image	Manufacturer	Description	Lamp	Wattage
L5		3G Lighting Madison RC1	Recessed small aperture downlight, gimble adjustment trim and 40° distribution	LED 3000K 1000 lms	8W
L6		Focal Point Trace	Low wattage LED Slot light creates a 3" architectural slot using the fixture (For a detail, please see the specification sheet)	LED 3000K 1207 lms	23W
L7		LiteControl Cove-15	Asymmetric indirect small scale fixture concealed in a cove detail and a high performance specular reflector	LED 3000K 1800 lms	32W
L8		Moda Light Flex 3000K	Dimmable LED linear flexible system, cuttable every 2"	LED 3000K 132 lms/ft	1.40W/ft

DATA

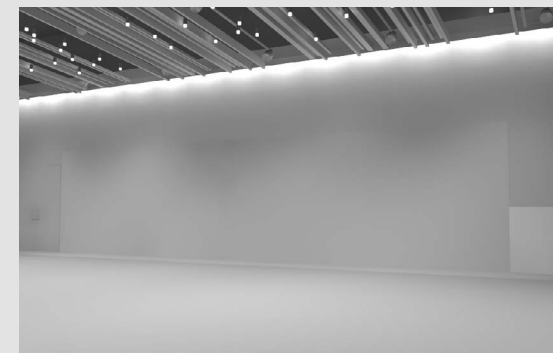
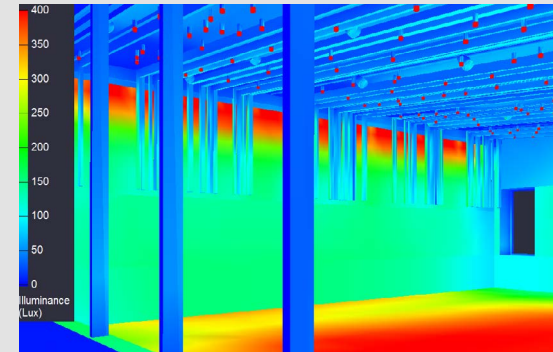
Illuminance

Wellness Corridor - 95 > 50 lux
 Wellness Lobby - 106 > 50 lux
 Wellness Vestibule - 79 > 50 lux

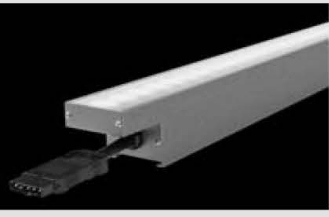

Lighting Power Density

Wellness Corridor - 0.64 > 0.66 W/sf
 Wellness Lobby - 0.35 > 0.90 W/sf
 Wellness Vestibule - 0.546 > 0.66 W/sf





DANCE STUDIO LIGHTING

Type	Fixture Image	Manufacturer	Description	Lamp	Wattage
L9		Lumenpulse Interior Façade	Linear LED interior wall grazing fixture with a 30° x 60° Regular Output beam distribution and essential white technology	LED 2700K 2450 lms	8.5 W/ft
L10		Erco Starpoint	Cylinder small aperture pendant downlight with glowing translucent ring around the bottom of the fixture, extra wide flood distribution	LED 3000K 550 lms	8 W

DATA

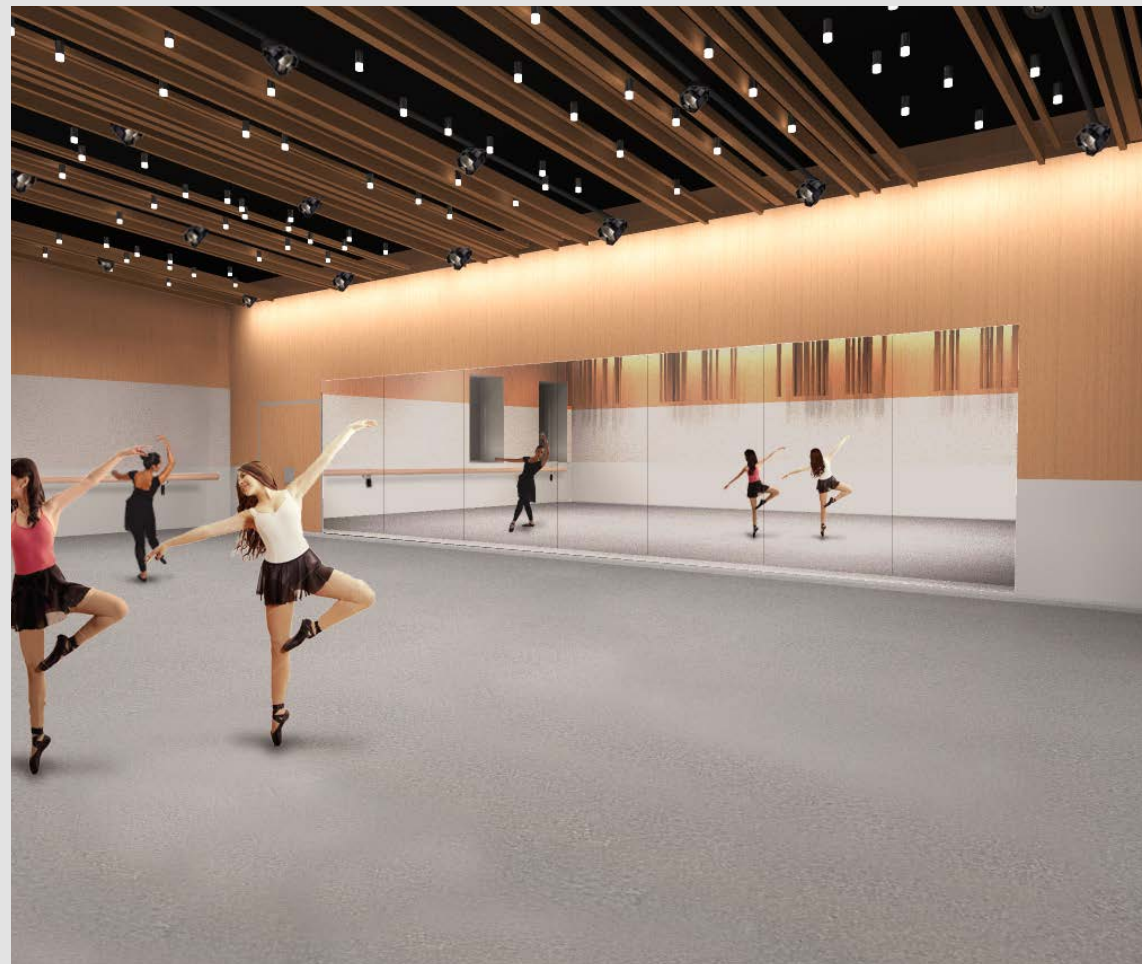
Illuminance

Dance Rehearsal - 315 > 300 lux

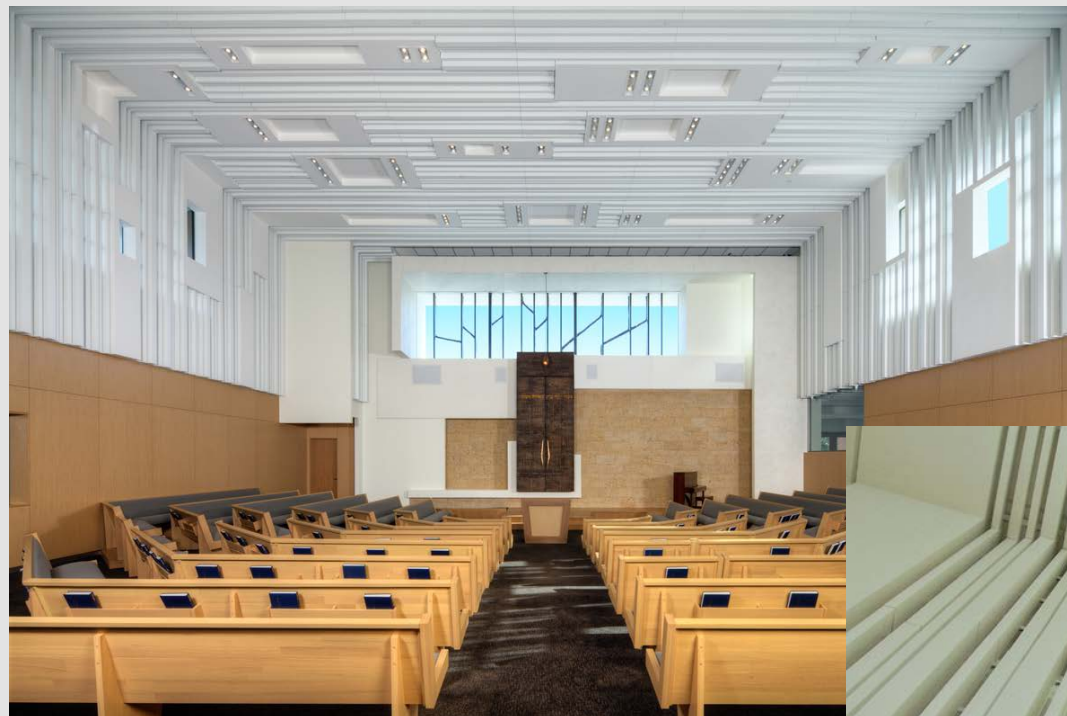
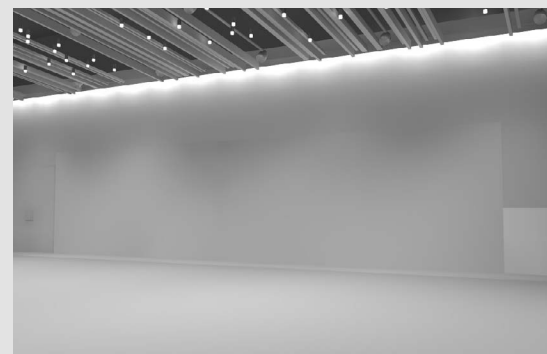
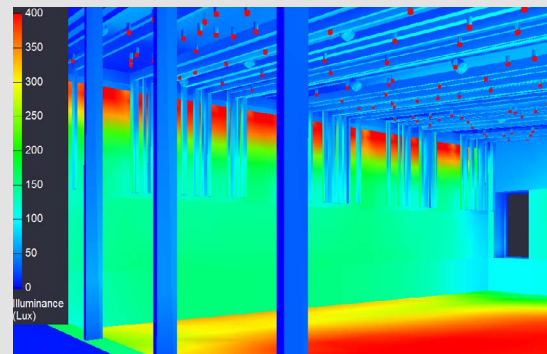
Lighting Power Density

Dance Rehearsal - 0.80 > 1.24 W/sf





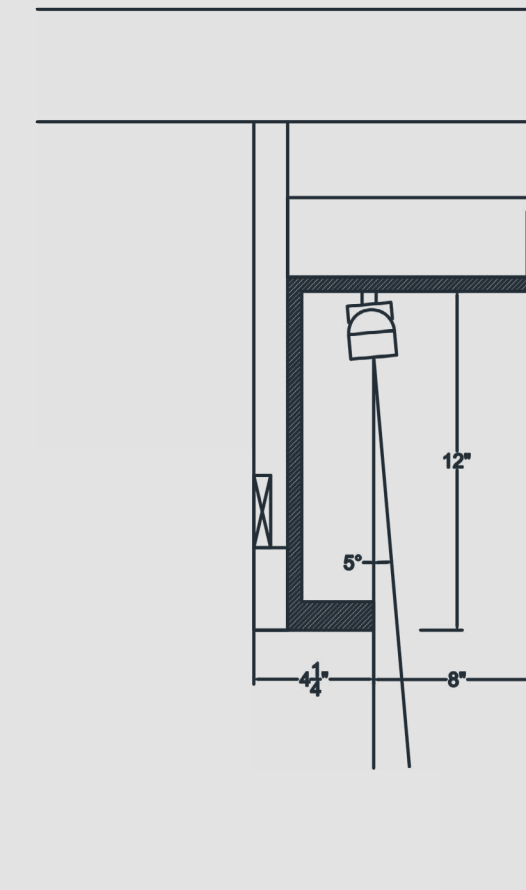
DANCE STUDIO CEILING

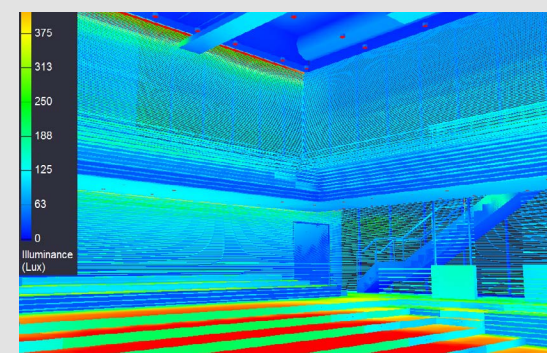
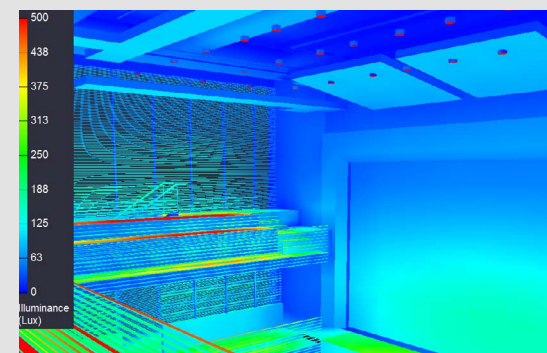
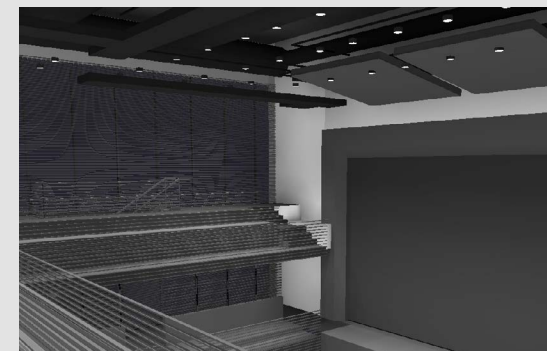
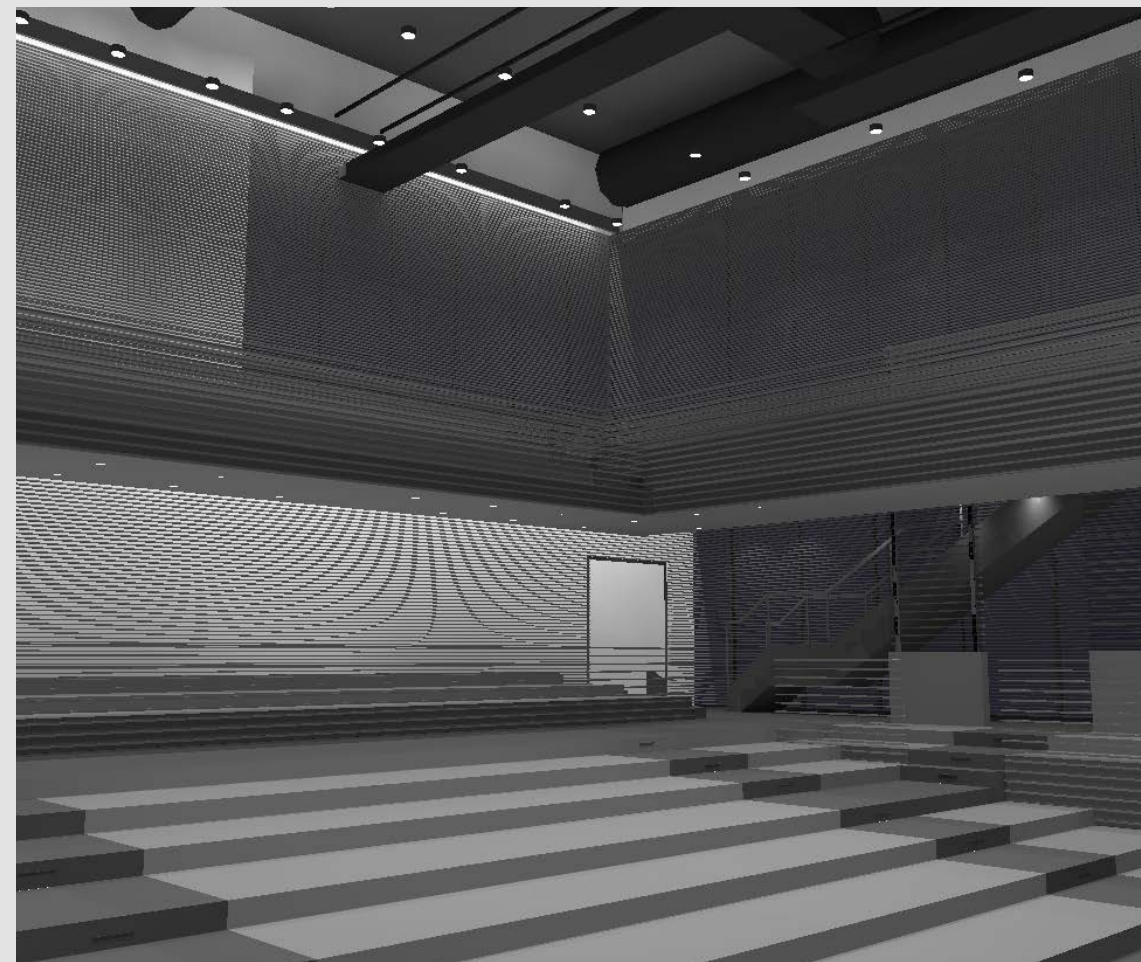


Ceilings Plus BARZ









DETAIL





THEATRE LIGHTING

Type	Fixture Image	Manufacturer	Description	Lamp	Wattage
L11		Lumenpulse Interior Façade	Linear LED interior wall grazing fixture with a 30° x 60° High Output beam distribution and essential white technology	LED 2700K 2883 lms	10 W/ft
L12		Winona Step13	Rectangular LED 6" step light, surface mount with concealed optics, solid aluminum brass plate	LED 3000K 202 lms	5.53 W
L13		Lumenpulse LumenDome Small	2" small color changing pixel luminaire with a 240° domed optic	LED 42 lms	6 W
L14		Gotham 4" Incito	4" LED Downlight with self-flanged, semi-specular reflector with a 40° distribution	LED 3000K 500 lms	8 W
L15		Gotham 4" Evo WW	4" LED Wallwash with self-flanged, semi-specular reflector with a 45° cutoff to source	LED 3000K 600 lms	18 W
L16		Juno Indy LC8	8" LED cable mounted cylinder downlight with a medium hyperbolic distribution	LED 3000K 4000 lms	43.6 W

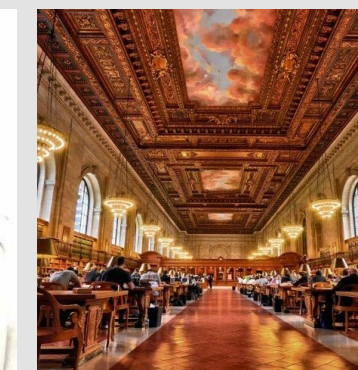
DATA

Illuminance

Dance Rehearsal - 407.5 > 400 lux

Lighting Power Density

Dance Rehearsal - 1.01 > 2.43 W/sf



REFERENCES

Photos from: www.designspiration.com or www.thewinsorschool.org

All Architectural Renderings courtesy of William Rawn Associates.

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