Sara Schonour
Lighting/Electrical
Dr. Mistrick
RIT Fieldhouse and Activities Center
Rochester, NY
10/4/06
Technical Report 1

GORDON FIELDHOUSE AND ACTIVITIES CENTER
ROCHESTER INSTITUTE OF TECHNOLOGY
ROCHESTER, NY

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10.5.06

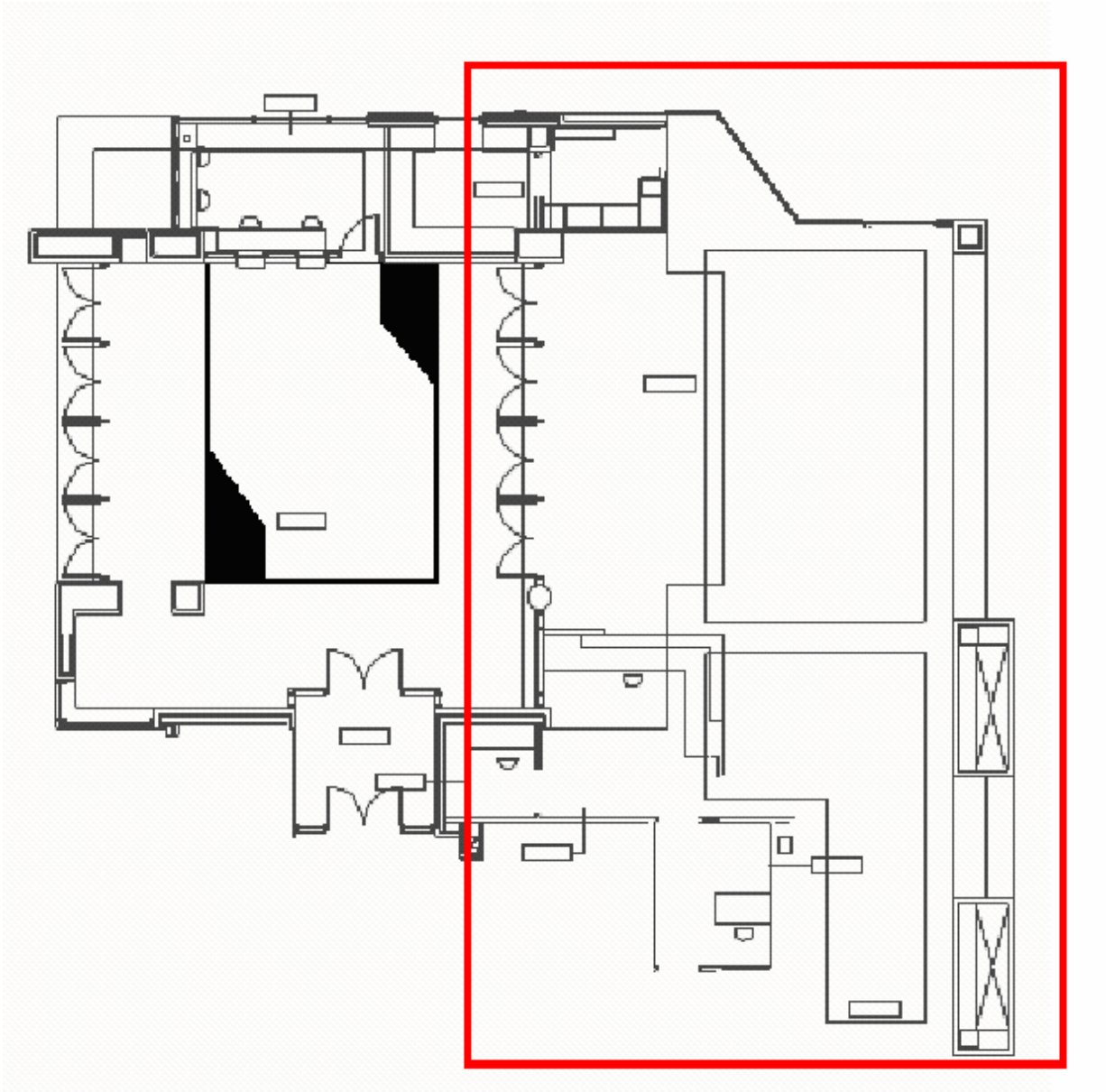
EXECUTIVE SUMMARY

The attached report summarizes the existing lighting systems employed in the design of the Gordon Fieldhouse and Activities Center, located on the RIT campus in Rochester, NY. The objective of the technical report is to assess the current lighting design and compare it with design criteria as listed in resources such as the IESNA Lighting Handbook as well as compliance to ASHRAE standards for power consumption, referenced in ASHRAE 90.1. This analysis was produced by an intense assessment of the final construction set of drawings prepared by Cannon Design, the architects and engineers of the project.

Four spaces were targeted to ascertain the illuminance levels and overall performance of the lighting design in the Fieldhouse. The entrance lobby, fitness center, concession are and decorative tower were chosen and assessed by incorporating original fixture choice and position, controlling elements, light loss factors, daylight contributions where applicable, surface and material characteristics, power density calculations, and design criteria. AGI32 was also utilized to make graphic representations of the lighting systems and evaluate their performance visually. Where appropriate, the resulting images are included below.

The resulting analysis of the 4 spaces as a test of the overall efficiency and suitability of the lighting design of the Gordon Fieldhouse yielded a general compliance with typical lighting design methods. In all cased ASHRAE 90.1 was adhered to, but conventional maximum to minimum footcandle ratios were given considerable leniency in many of the spaces. Additionally, a different interpretation of appropriate design criteria may have been administered in some of the spaces. However, the lighting levels in all areas are no doubt safe and minimally fitting for the needs of the buildings.

LOBBY:



I. Existing Conditions:

Luminaires:

LABEL	DESCRIPTION	LAMP	VOLTAGE	WATTS	QUANTITY
FP6	Direct/Indirect 6" Tube Pendant Mount	3 F32T8	277	81	6
PC2	7" Open Recessed Downlight	2 CFQ42W-GX24q-4	277	45	29
PC11	12" Open Downlight Pendant Mount	2 CFQ42W-GX24q-4	277	47	4

Ballasts:

Advance Centium Series (Electronic)

Control Devices:

2 Mytech Light Owl-DT Wide View Range Occupancy Sensors:
-Integral passive infrared (PIV) and ultrasonic sensing
-Self Adjusting sensing sensitivity and timeout functions
-Adjustable Ambient Light override
-Minimum 110 degree field of view, minimum 1600 sf coverage
-Control of load via control unit

Materials:

Floor: Sealed Concrete
Reflectance: 38%

Ceiling: Acoustical Tile (white); Exposed Painted Elements (Decorator's White)
Reflectances: 80%; 85%

Walls: Painted Gypsum Wallboard (Sail Cloth); Brick Accents
Reflectances: 75%; 35%

Glazing: (To Entry)
Monolith Floating Glass
Transmittance: 90%
Reflectance: 9%

(To Exterior)
Insulating Glass (Argon)
Transmittance: 89%
Reflectance: 8%

II. Design Criteria:

The lobby of the fieldhouse and activities center is in essence a multi-purpose space and the different tasks that occur regularly in this area should be taken into account in its lighting design. First and foremost, the lobby needs to be a welcoming area as visitors transition from the exterior campus to the interior of one of its signature buildings. One of the main advantages to the construction of the building at RIT was to showcase the university's understanding and support of student and community needs. A major priority of the lobby that must be sustained by the lighting design is direction and wayfinding to the exceptional facilities housed within the structure. In conjunction with this, the building needs to prove itself worthy of the considerable capital it necessitated, so the entire lobby space and its luminaires need to make a positive impact, especially as this area is most likely the first impression of many guests. The appearance of colors, materials, and surface characteristics are all important factors that the lighting design should address. The sizeable presence of glazing should be taken into account not only as a possible energy saving opportunity but also because daytime lighting will be quite different from that of nighttime. The main tasks of the space include walking, talking, reading and possibly writing, vending of tickets, and should provide for the viewing of different types of displays. For these reasons, direct and reflected glare as well as facial modeling and points of interest all play reasonably important roles in the realm of lighting design criteria.

As a community center, team meeting place and general public facility, the social atmosphere of the building should be personified in the atmosphere of the lobby. Therefore, the lighting in this space should ideally convey a feeling of openness and welcome.

The IESNA Lighting Handbook suggests that lobbies such as this maintain a horizontal illuminance range of 10 to 30 footcandles for the various tasks occurring in the area, and the ASHRAE 90.1 guidelines recommend a power density of 1.3 watts per square foot under the space by space method.

Power Density Calculation:

$$\frac{\sum(\text{Watts/fixture}) * (\text{\# fixtures})}{\text{total square feet}}$$

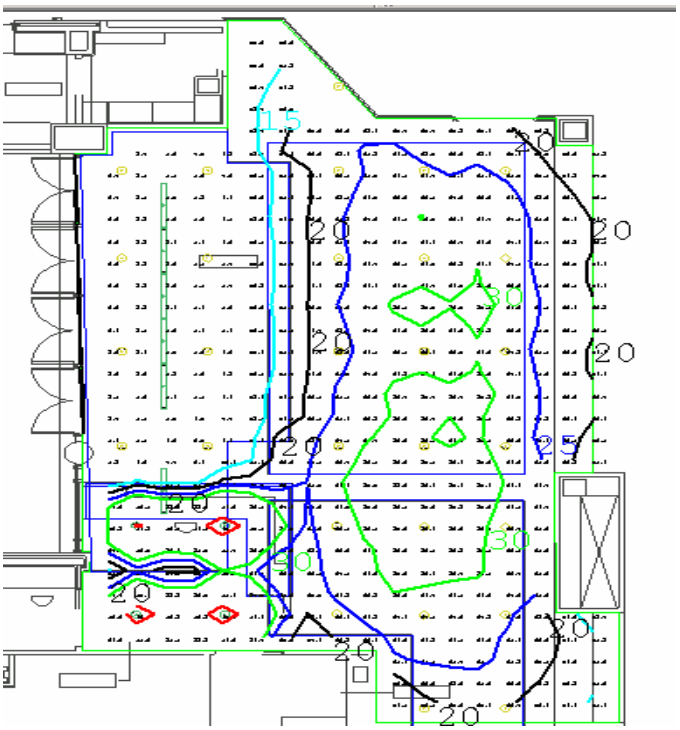
$$\frac{(81w*6)+(45*29)+(47*4)}{2016\ sf} = 0.98\ w/sf$$

UNDER

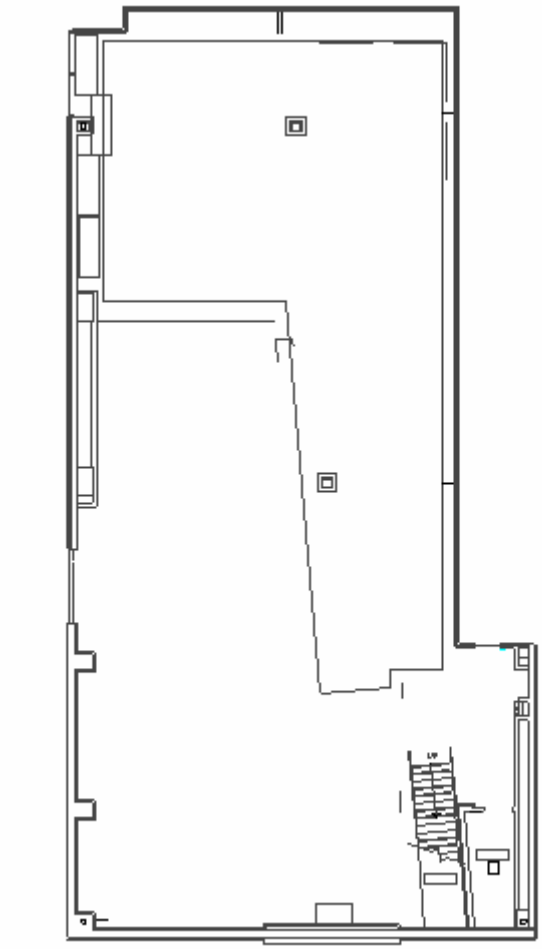
III. Analysis:

The lighting layout in the lobby is basically transparent when you are physically in the space, and the fact that it reaches its design goals from this state bolsters the idea that this is an instance of solid lighting design. The analysis performed does not include the major daylight component, so the 22 fc where the target is 30 is hardly a concern, and may be a factor that enables the achievement of a relatively low power density. The maximum to minimum footcandle ratio, however, is troublesome. This is one specific area that could use significant improvement, as it stands now at about 23:1.

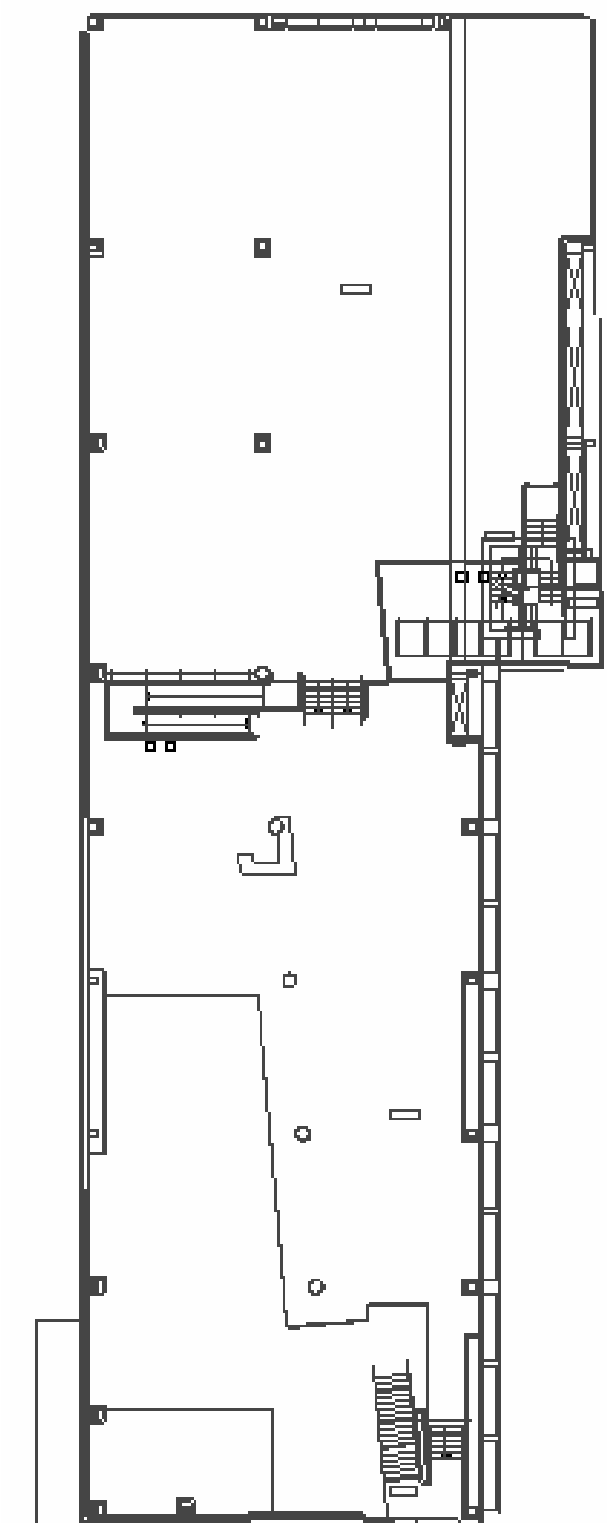
The use of a floating ceiling in this space reduces the area without compromising the openness of the double heighted atrium, and the incorporation of the lighting into those panels brings a feeling of warmth and closeness. Perhaps a different lamp choice would further this sensation even more, as the compact fluorescent that is in use now doesn't lend itself entirely to this cause.



FITNESS CENTER:



Lower Level



Upper Level

Luminaires:

LABEL	DESCRIPTION	LAMP	VOLTAGE	WATTS	QUANTITY
FK5	Direct/Indirect 2x2 Recessed	2 CFL 40W	277	69	109
PD4	8" Lensed Recessed Downlight	2 CFQ18W	277	44	8
FF8	Linear Wall Wash, Pendant Mount	1 70W MH	277	69	3
PC11	Open Downlight, Pendant Mount	2 CF42W/GX24q-4	277	47	42
PC4	8" Lensed Downlight Recessed	2 CF42W/GX24q-4	277	36	3
FT9	Linear Direct, Pendant Mount	3 F32WT8	277	83	49

Ballasts:

Advance Centium Series (Electronic)
Advance Super CWA Series (Ignitor Pulse Start)

Control Devices:

7 Mytech Light Owl-DT Wide View Range Occupancy Sensors:
-Integral passive infrared (PIV) and ultrasonic sensing
-Self Adjusting sensing sensitivity and timeout functions
-Adjustable Ambient Light override
-Minimum 110 degree field of view, minimum 1600 sf coverage
-Control of load via control unit

2 Mytech Light Owl-OMNI-DT500 Local View Range Occupany Sensors:
-Integral passive infrared (PIV) and ultrasonic sensing
-Self Adjusting sensing sensitivity and timeout functions
-Adjustable Ambient Light override
-Minimum 500 degree field of view
-Control of load via control unit

1 Lutron SF-10P series Fluorescent Dimmer Switch
- Solid State, 120 V, Linear Slide Control

Materials:

Floor:	Carpet (Generation Why Pattern) Reflectance: 53%
Ceiling:	Acoustical Tile (white); Exposed/Painted Elements (Brilliant Blue) Reflectances: 80%; 20%
Walls:	Existing: Painted Gypsum Wallboard (Decorator's White) Reflectance: 80% New: Painted Gypsum Wallboard (Citrus Blast) Reflectance: 88%
Glazing: (To Exterior)	Insulating Glass (Argon) Transmittance: 89% Reflectance: 8%

II. Design Criteria

Perhaps the noblest goal of lighting design in a fitness center regards the safety of the participants in the space. Because of the close proximity of equipment and people in this type of area, it's very important that the space and all of the objects within it are properly identifiable. The light distribution on the task plane as well as the surfaces of the room is of key importance. Shadows should be avoided as well as direct glare, especially since the frequency of weightlifters and exercisers in positions causing them to look directly at the ceiling is high. The equipment layout and decorative color combinations in the fitness center in the Gordon Fieldhouse have clearly been intentionally and deliberately planned, so the lighting design should reflect that consideration and present these elements in their most attractive light. The luminaries themselves should also be attractive as well as efficient, as the space is large and power density could be an issue.

The lighting solutions suggested by the IESNA Lighting Handbook incorporate a general uniform and diffuse lighting of 30 footcandles in a facility of this type. ASHRAE's 90.1 standards allow 1.1 watts per square foot in an exercise center when utilizing the space by space method.

Power Density Calculation:

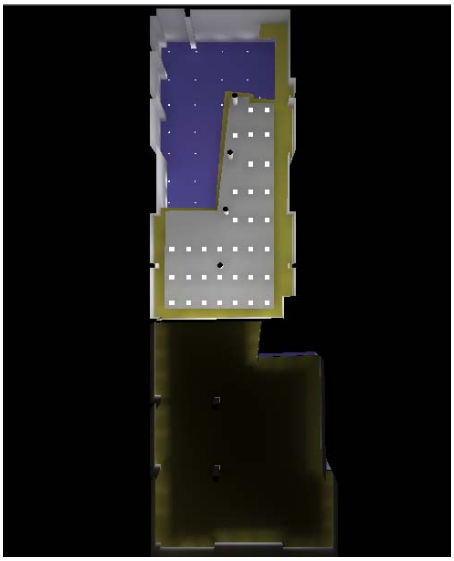
$$\frac{\sum(\text{Watts/fixture}) * (\text{\# fixtures})}{\text{total square feet}}$$

$$\frac{(69w*109)+(44*8)+(69*3)+(47w*42)+(36w*3)+(83*49)}{6000sf\ (lower) + 12000sf\ (upper)} = 0.79\ w/sf$$

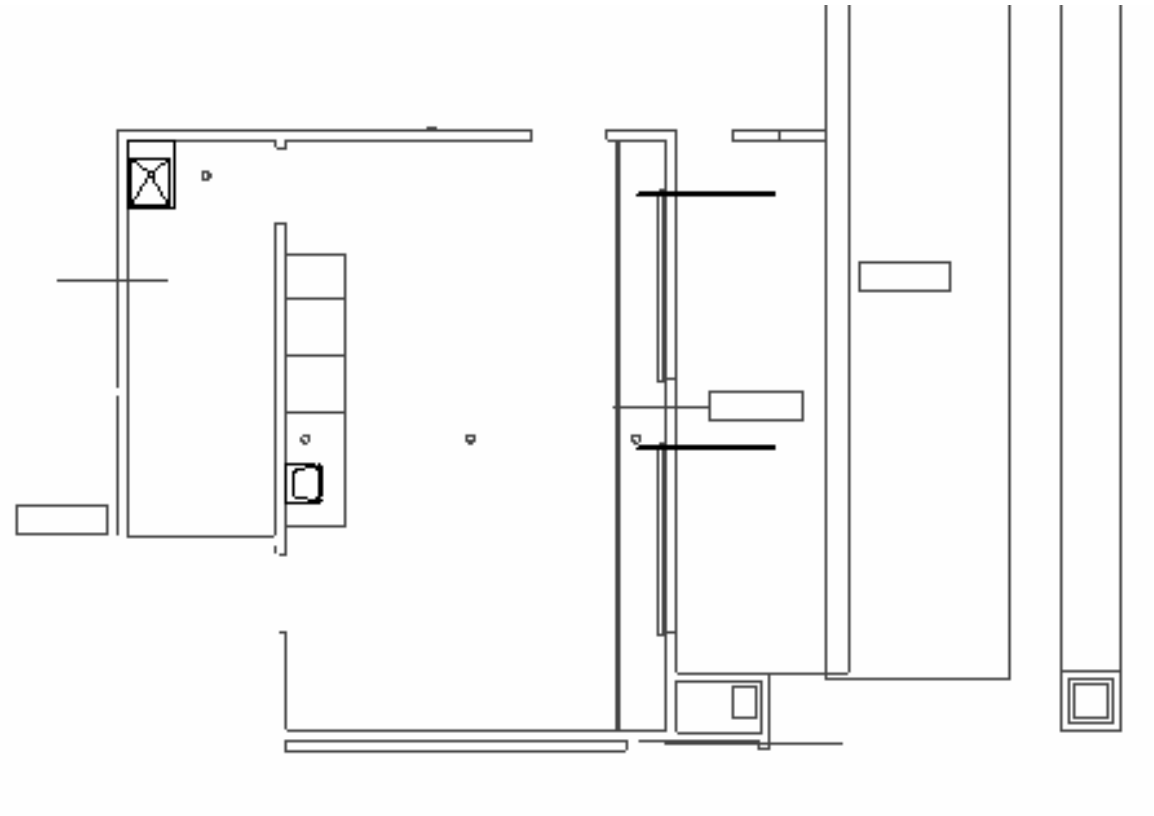
UNDER

III. Analysis:

The lighting design of this space doesn't quite meet the recommended criteria and a major player in that may be the fixture choice. Although the power density is under the allowed level by a significant amount, the tradeoff received for the lowed watts per square foot was a less efficient (visually) fixture for the space's means. The employment of the floating ceiling as a vehicle for the masking of the lighting design is again utilized in this space, but in some instances the light may be inefficiently bounced around in the ceiling cavity of the room as a result of the close proximity to the outer walls of the space. The central axis of fluorescent lights visually directs the attention of the viewer and acts as a tool in displaying the grand scale of the facility, but is not the most beautiful of fixtures and a different choice could possible produce the same effect with aesthetic benefits.



CONCESSION AREA:



I. Existing Conditions:

Luminaires:

LABEL	DESCRIPTION	LAMP	VOLTAGE	WATTS	QUANTITY
FB2	2x4 Recessed Troffer	2 F32T8	277	60	10
PD1	7" Fluorescent Lensed Shower	2 CFQ18W	277	40.5	6
FF7	8"x24" Recessed Wall Wash	1 FL-L40W	277	41	3

Ballasts:

Advance Centium Series (Electronic)
Advance Super CWA Series (Ignitor Pulse Start)

Control Devices:

1 Mytech Light Owl-OMNI-DT500 Local View Range Occupany Sensors:
-Integral passive infrared (PIV) and ultrasonic sensing
-Self Adjusting sensing sensitivity and timeout functions
-Adjustable Ambient Light override
-Minimum 500 degree field of view
-Control of load via control unit

Materials:

Floor: Sealed Concrete
Reflectance: 38%

Ceiling: Acoustical Tile (white); Painted Gypsum Wallboard (Decorator's White)
Reflectances: 80%; 85%

Walls: Painted Gypsum Wallboard (Sail Cloth)
Reflectances: 75%

II. Design Criteria:

As this space's main function pertains to the vending of food products, naturally the most important design criteria for the lighting to focus upon is the favorable appearance and general attractiveness of the merchandise. The look of the space in which these wares are sold is also an influencing factor in the design of the space, so the lighting should compliment that as much as possible. Distribution of light on both the task plane as well as the various surfaces that are incorporated within the space should also be given substantial consideration as the 'look' of the products and the cleanliness of their surroundings is of high importance. All forms of glare, both direct and reflected, should be avoided to enhance the visual comfort of the customers as well as the employees. The interaction between these two social groups also warrants a need for proper facial modeling, and it goes without saying that object modeling also should be a priority. Finally, source/task/eye geometry carries some weight especially when considering the construction of the room. The counter opening in the wall presents a lighting challenge to not only avoid discomfort in the patron's visual field but in the vendor's as well.

The retail facet of this space lends itself to some creative accent and attention getting lighting applications. Color can be used as an advertising tool, but natural looking light is also important to reinforce the quality of the food and beverages being marketed. All in all the lighting design for the exterior of the space should promote the sale of the concessions. The interior of the space should be well lit to facilitate productivity as well as comfort for the employed staff.

A horizontal illuminance of 50 footcandles is recommended by the IESNA Lighting Handbook for food displays and food service work areas. Additionally, a vertical illuminance range of 5-10 footcandles is suggested in this type of area. ASHRAE suggests 1.2 watts per square foot and 1.7 watts per square foot for food preparation and retail areas, respectively.

Power Density Calculation:

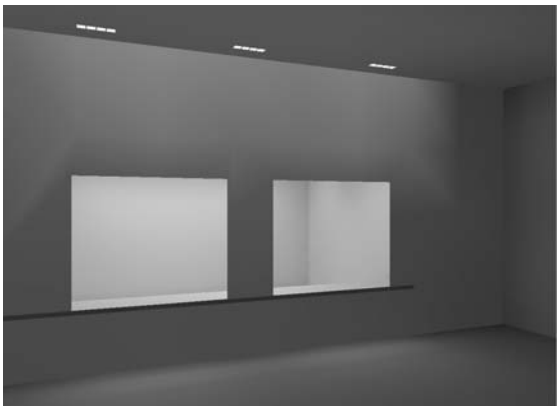
$$\frac{\Sigma(\text{Watts/fixture}) * (\text{\# fixtures})}{\text{total square feet}}$$

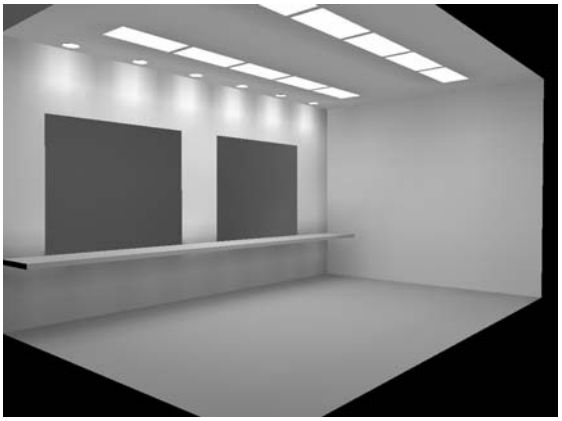
$$\frac{(60w*10)+(40.5*6)+(41*3)}{572\ sf} = 1.69\ w/sf$$

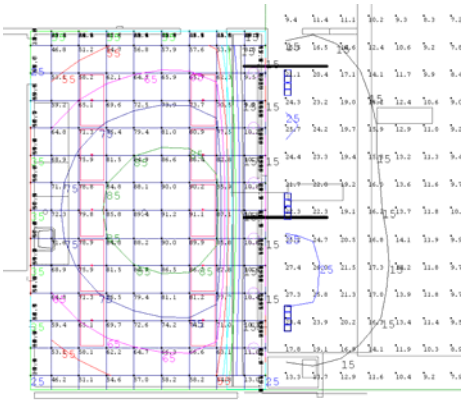
UNDER

III. Analysis:

The Illuminance level for the existing interior of the concession area clearly meets the 50 footcandle recommendation of the IESNA Lighting Handbook, but it is too much light for the requirements of the space. Additionally, the excess illuminance from the 2x4 troffers causes a maximum to minimum ratio that is too high (exceeds 10:1). The power density barely comes in under the maximum allowable, but the majority of the allotted wattage is utilized by the 2x4 fixture which is in the interior of the space. It might make sense to use a fixture with a lower illuminance output on the vendor side of the space and apportion the wattage instead to the outer segment of the concession area. This way the light can be used for decorative purposes while still maintaining appropriate light levels in the interior.







TOWER:

I. Existing Conditions:

Luminaires:

LABEL	DESCRIPTION	LAMP	VOLTAGE	WATTS	QUANTITY
FR7	4’ Tube Light	1 F32T8	277	30	10

Ballasts:

Advance Centium Series (Electronic)

Materials:

Glazing: 2” Tempered Glass, Opaque (painted white) on one side
Transmittance: 79%
Reflectance: N/A

Structure: Face Brick
Reflectance: 35%

Aluminum Tubing
Reflectance: 60%

II. Design Criteria:

The decorative tower atop the Fieldhouse serves as a signature landmark indicating the location of RIT's most impressive building to date. The design of the tower should be showcased by it's lighting, particularly at night. The luminaries employed should ideally be hidden so as to not detract from the splendor of the sculpture they light. Object modeling, color and material rendering, the light distribution on the tower's various surfaces, and the accurate representation of their characteristics are of the utmost importance as the lighting for this structure should be similar to the design that would be selected to illuminate a piece of art. Reflected glare and shadows are equally as important to avoid as the former could cause severe visual discomfort and the latter could take away from the artistic intent of the tower's design. A final concern that might be worth considering is the effect of light pollution from the chosen lighting design. Although distinction is certainly a goal in the illumination of the tower, it would be prudent to avoid too much light spread in the almost suburban environment of the RIT campus.

The IESNA Lighting Handbook suggests levels of 3-10 footcandles for illuminating exterior building elements or monuments with dark surroundings. Because the tower of the Fieldhouse falls under the exceptions to 9.3.2 in the ASHRAE 90.1 standards, there are no specific limitations to the power consumption of the lighting design.

Power Density Calculation:

$$\frac{\sum(\text{Watts/fixture}) * (\text{\# fixtures})}{\text{total square feet}}$$

$$\frac{(30w*10)}{150\ sf} = 2\ w/sf$$

MEETS CRITERIA

III. Analysis:

The main concern with the lighting system employed in the tower of the Gordon Fieldhouse is the fact that from the main terrace outside the entrance, both the fixtures and the lamping are visible. The actual quality and quantity of light produced from said system are completely satisfactory and because of the decorative nature of the tower strict adhesion to ASHRAE standards is not necessary. One improvement to the illumination of the tower could be to enhance the color of the light emitted from the structure, be it adding actual color (for example blue) or simply achieving a "whiter" light from a change in lamping.