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TECHNICAL REPORT 1: EXISTING CONDITIONS AND DESIGN CRITERIA

HUNTER' POINT SOUTH INTERMEDIATE SCHOOL AND HIGH SCHOOL  
QUEENS, NY

**EXECUTIVE SUMMARY**

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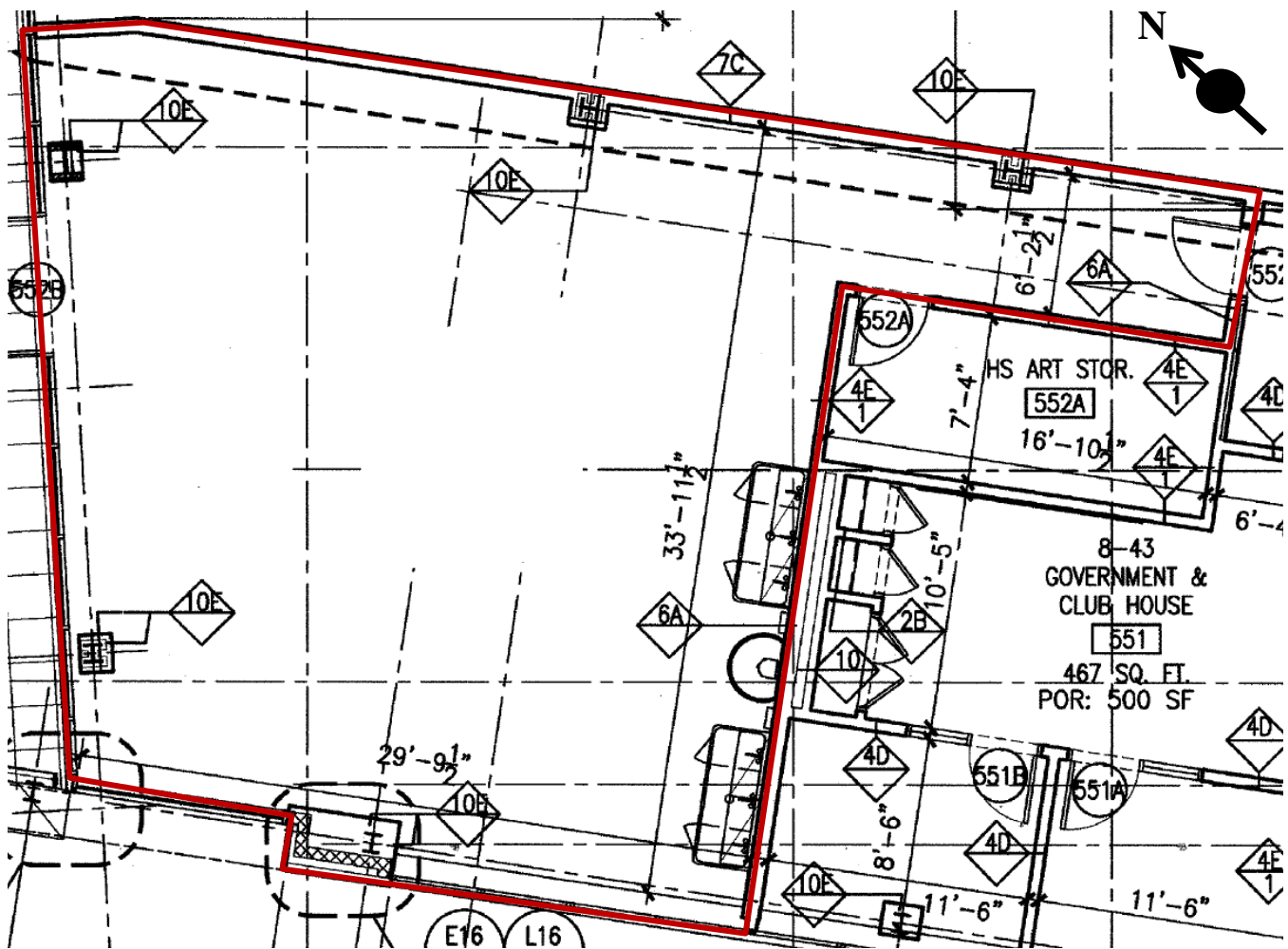
## HIGH SCHOOL ART ROOM

### A. EXISTING CONDITIONS

*Description:*

Area: 1250 ft<sup>2</sup>  
 Length: 33 ft.  
 Width: 54 ft.  
 Ceiling Height: 10 ft.

The HS Art Room (on the 5<sup>th</sup> floor) is located on the (plan) South wall of the building and has direct access to the exterior terrace via double doors on the west wall. The true orientation of this wall, which contains a large portion of glass, is approximately North-West. Although attached directly is the HS Art Storage Room, this room will not be considered in the calculations and design of the art room.

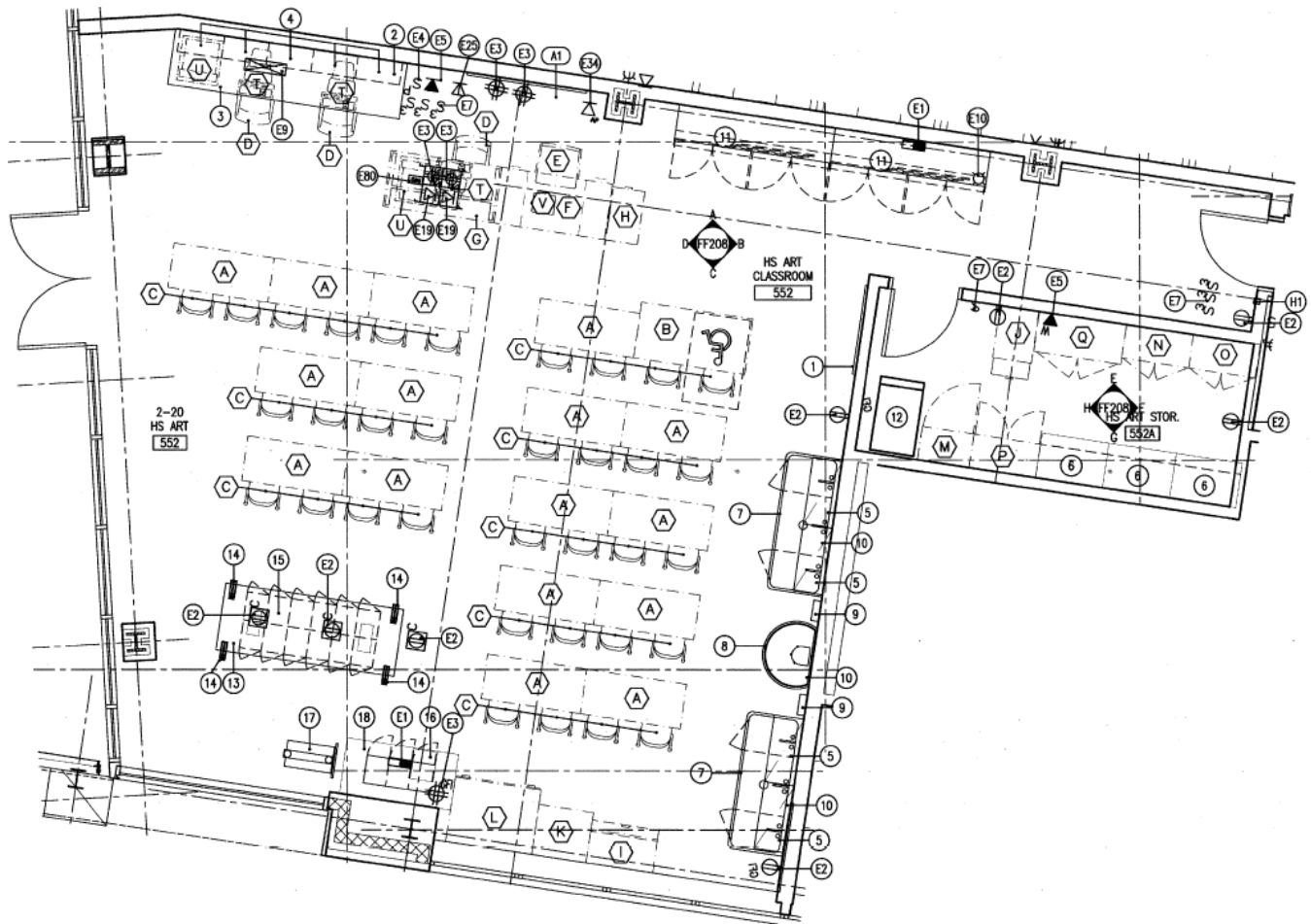


**Finishes:**

The walls (with the exception of the west glass curtain wall) will be a white, semi-gloss paint. A light paint (which has a high reflectance ideal for the distribution of light) is good for this room since visual clarity should be at a max, while visual clutter should be at a minimum. The ceiling utilizes a 2'x4' acoustical ceiling grid. This grid supports both suspended and recessed fixtures. The floor is finished with pewter tile and has a rustic feel to it.

Materials				
Surface	Material	Description	Style/Color	Reflectance
Floor	VcT	12" x 12" Vinyl Composition tile	112 Pewter	0.30
Walls	SG-P	Semi-Gloss Paint	Simply White OC-117	0.85
Ceiling	AcT	24"x48" Acoustical Ceiling Tile	White	0.75

**Furnishings:**



The HS Art Room has seating for 34 students (1 handicap). The front wall of the room has a 2-seat computer desk, a large storage cabinet, and a marker-board and tack-board. For cleaning purposes, there are 2 large trough sinks and a wash fountain located on the west wall. Located on the back wall of the room (from left to right), are the following: etching press, jewelry kiln, cabinet/plan file drawer, flat file drawer, and a 3-drawer lateral file cabinet. Also located towards the back of the room in the South-West corner is a large work bench.



**Tasks:**

The primary tasks in this space consist of the creation of (and possibly the critique and appreciation of) art. This room is equipped with a substantial amount of equipment as to facilitate the creation of art in many different forms (painting, drawing, sculpture, etc.).

Although secondary in importance to the actual art creation taking place at the students' desk, formal lectures and "pin-ups" will also be taking place in this room. The marker-board and tack-board on the front wall of the room supports these tasks.

**Existing Lighting:**



Symbol	Type	Description	Manufacturer	Lamp	Mounting	Input Watts	Voltage
	TA	Linear Fluorescent Continuous Direct/Indirect	Linear Lighting	(2) F32T8/835/ECO/Alto (Phillips)	Suspended	74	120V
	TF-2	Downlight/Double Wallwash	Lightolier Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Ceiling Recessed	32	120V

The HS Art Room utilizes suspended direct-indirect linear fluorescent pendants over the main student seating area, and multiple recessed downlight/double wallwash fixtures along the front wall. The wallwash fixtures not only wash the front wall of the room, also throw light backwards into the main student seating area. Two occupancy sensors, one located at the entrance of the room and the other in the main student seating area, are responsible for controlling these fixtures. The plan and table above indicate the location and quantity of the fixtures.

**B. DESIGN CRITERIA/CONSIDERATIONS**

**Appearance of Space and Luminaires** – *Somewhat Important / Important / Very Important*

**Color Appearance and Color Contrast** – *Somewhat Important / Important / Very Important*

**Daylighting Integration and Controls** – *Somewhat Important / Important / Very Important*

**Direct Glare** – *Somewhat Important / Important / Very Important*

**Flicker** – *Somewhat Important / Important / Very Important*

**Light Distribution on Task Plane** – *Somewhat Important / Important / Very Important*

**Luminances of Room Surfaces** – *Somewhat Important / Important / Very Important*

**Modeling of Faces or Objects** – *Somewhat Important / Important / Very Important*

**Reflected Glare** – *Somewhat Important / Important / Very Important*

**Shadows** – *Somewhat Important / Important / Very Important*

**Surface Characteristics** – *Somewhat Important / Important / Very Important*

**Special Considerations** – *Somewhat Important / Important / Very Important*

**Horizontal Illuminance – Important**

- IES Classification: Education – Classrooms – Art Studios
  - Category R: 250 lux (25.0 fc)
  - Avg/Min: 3:1

Horizontal illuminance in the High School Art Room is important for artwork that will be created on a horizontal work surface (i.e. the students’ desks). These types of works include, but art not limited to, the following: pencil/colored pencil/marker/charcoal/pastel drawings and watercolor/acrylic/oil paintings.

**Vertical Illuminance – Important**

- IES Classification: Classrooms – Art Studios
  - Category P: 150 lux (15.0 fc)
  - Avg/Min: 3:1

The vertical levels in the art room are important, but not necessarily for the typical reason of face recognition. Although facial recognition is important, especially for a classroom, clear viewing of artwork is the primary concern here. These illuminance levels are critical to the production of artwork that is not necessarily produced on a two-dimensional surface. These types of work include, but are not limited to, the following: watercolor/acrylic/oil paintings, paper mache/plaster of paris/clay sculpture.

**C. EVALUATION**

AGI32 was used to evaluate the performance of the High School Art Room.

A work plane height of 2’-6” was used in this space. Fixtures were defined by the .IES files retrieved from the manufacturer’s website, and the light loss factors shown in the table below.

Type	Lamp Lumens		Light Loss Factors			
	Initial	Mean	LLD	LDD	BF	Total
TA	3000	2850	0.95	0.90	1.20	1.0
TF-2	2400	2330	0.97	0.90	0.98	0.9

The following results were taken from the AGI32 analysis of the existing lighting systems in this space:

Category	Illuminance (fc)	
	Recommended	Achieved
Average	25.0	46.9
Maximum	-	97.6
Minimum	-	8.6
Avg/Min	3.0	5.45
Max/Min	-	11.35



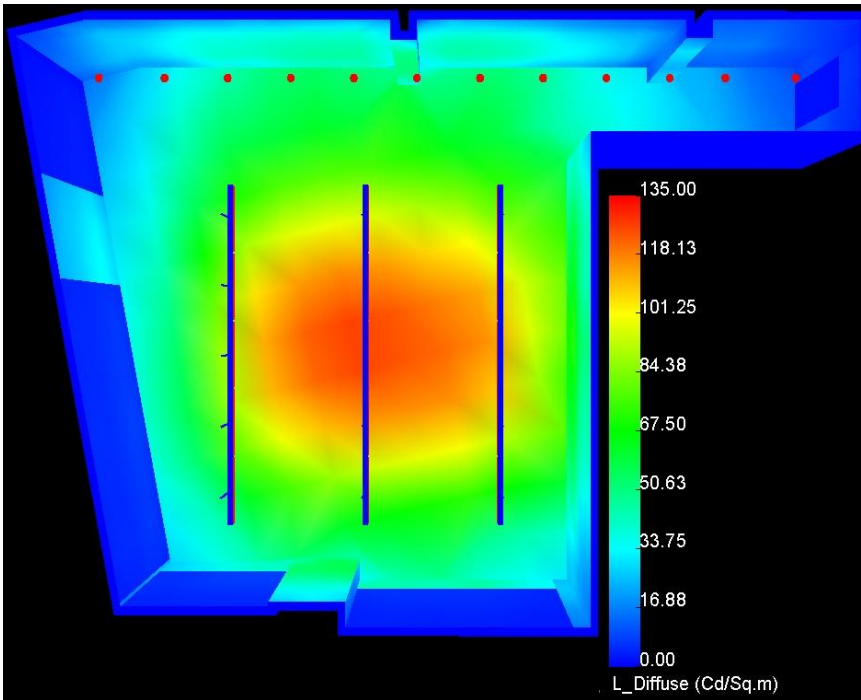
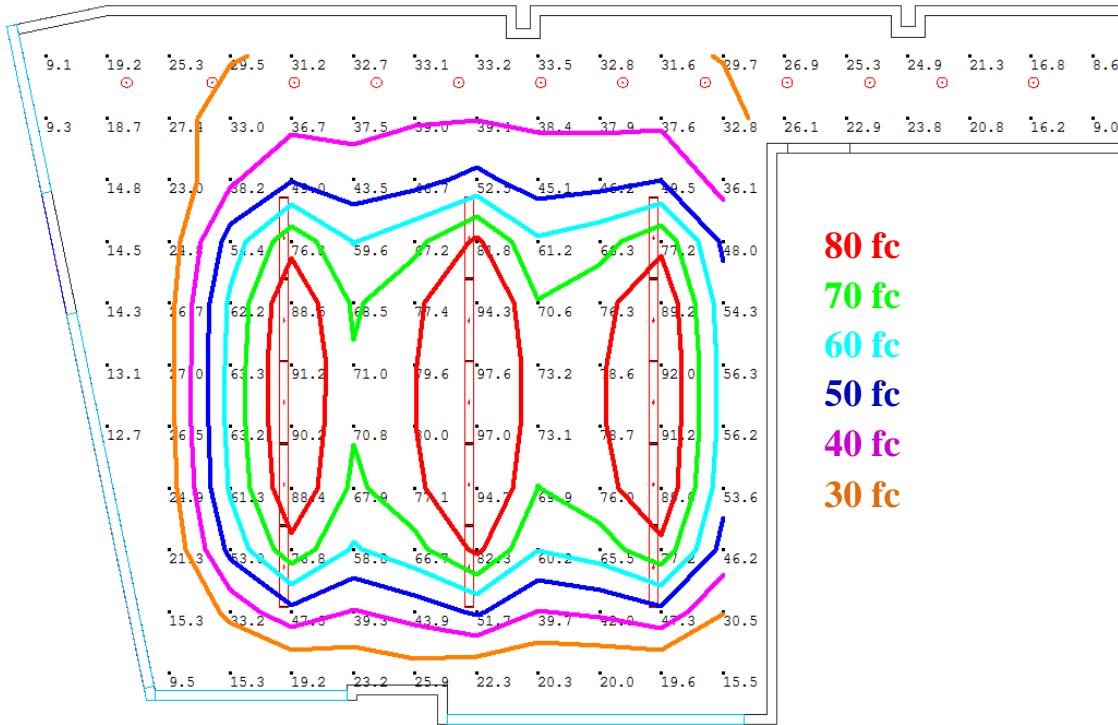
The table below shows that different fixture types used in this space, the quantity of lamps per fixture type, quantity of fixtures of each type, and the total wattage consumption of this space.

Type	Lamp	Qty	Input W	Total W
TA	(2) F32T8	15	74	1110
TF-2	(1) 32W CFL	12	36	432
			Total:	1542

Using the total wattage consumption presented above and the associated room area, the actual power density can be computed and compared to the allowable power density as given by ASHRAE/IESNA 90.1 2011. Such information is presented in the table below.

ASHRAE/IESNA 90.1 2011		
Category	Allowable	Actual
Area (sq.ft.)	-	1208
Input Watts (W)	1498	1542
Power Density (W/sqft)	1.24	<b>1.3</b>

Iso-line and pseudo-color diagrams are presented below for aid in the analysis of the uniformity performance. Besides the iso-line diagram is a legend indicating the illuminance value of each iso-line. Besides the pseudo-color diagram is a scale representing the luminance in the space.



Analyzing the data shown above, it is evident that the achieved illuminance levels in this space are well over the I.E.S recommended levels for an educational art room. Additionally, the achieved uniformity ratios do not comply with I.E.S's recommendations. These two problems could be solved by adjusting the mounting height of suspended luminaires, or reducing their wattage. Reducing the wattage is justifiable by the fact that the system is performing well above where I.E.S recommends it to be. Additionally, the wattage must be reduced to comply with the AHRAE 90.1 required power density. As viewed in the power density table above, this space does not comply with the allowable power density.

Taking a look at uniformity (illustrated by the above ISO-line and pseudo diagram), we see that this space is performing sub-par. The close proximity of the different iso-lines represents the poor uniformity of this space. As seen in the pseudo diagram, there is not only a large hot-spot in the center of the room, but a large lack of illuminance on the front wall. Although the front wall is to be used for lecture purposes, and previously stated to be a secondary task of the space, it should still be lighted to adequate levels for viewing purposes. Although perfectly uniform lighting in this space is not necessarily desirable as we want to create a visually interesting space to spark creativity, the students' desk should be (relatively) uniform.

## GYMNASIUM

### A. EXISTING CONDITIONS

#### *Description:*

Area: 8332 ft<sup>2</sup>

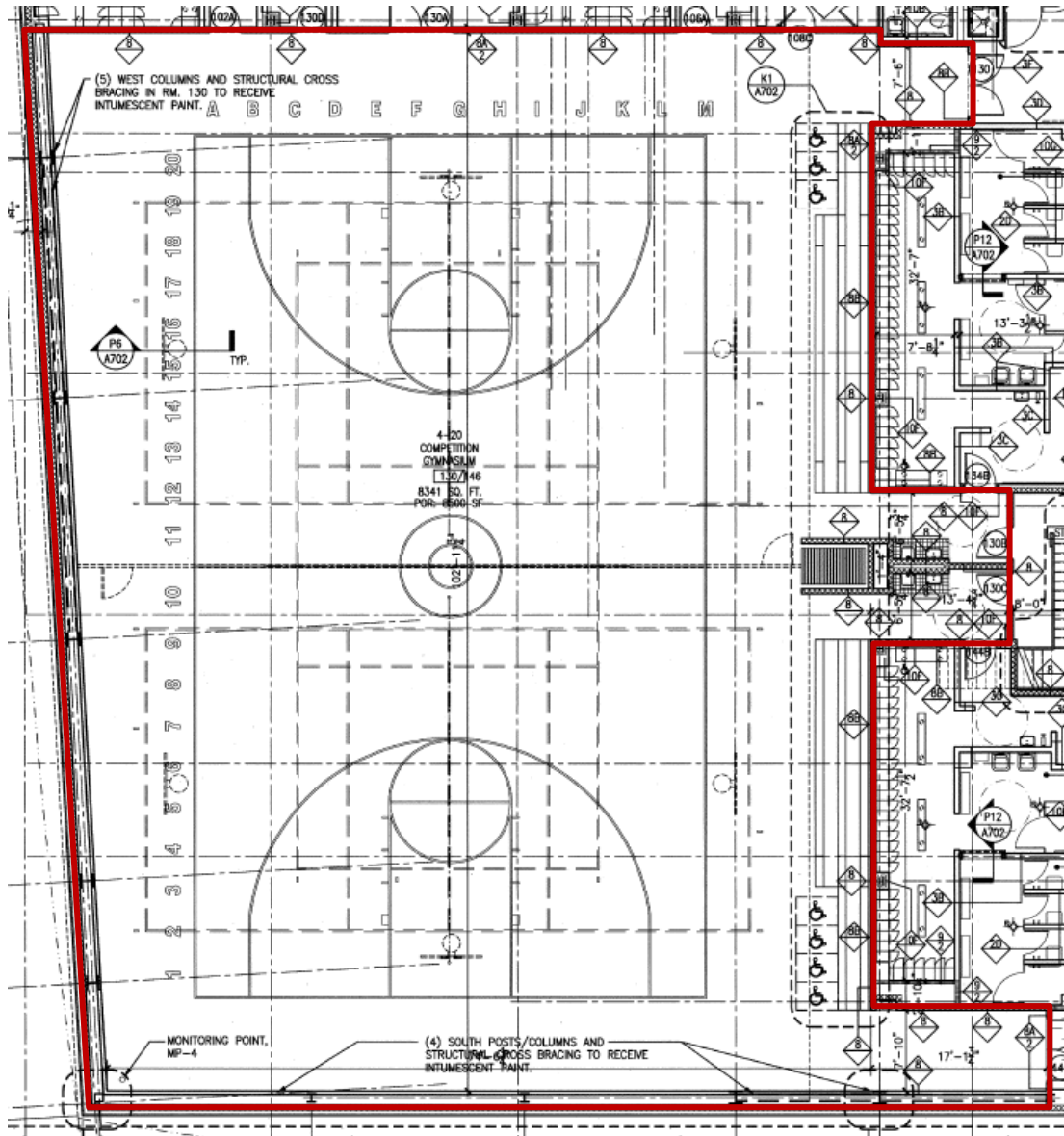
Length: 105 ft.

Width: 85 ft.

Ceiling Height: 10ft at entrance and seating area, 24ft in court area

The Competition Gymnasium is located on the 1<sup>st</sup> floor in the (plan) South-West corner of the building. The West and South wall of the gym are covered largely by trapezoidal-shaped windows which will eventually lend this space to a daylight analysis. There is one large basketball court stretching the length of the gymnasium in the North-South direction, and two smaller ones in the East-West direction. There is a retractable partition that splits the space down the middle, separating the two smaller basketball courts. This splitting of the space into two

smaller spaces will eventually affect the redesign of the lighting system. The entrance and spectator seating of this space has 10 foot ceilings whereas the actual court area rises two stories (approximately 24 feet).



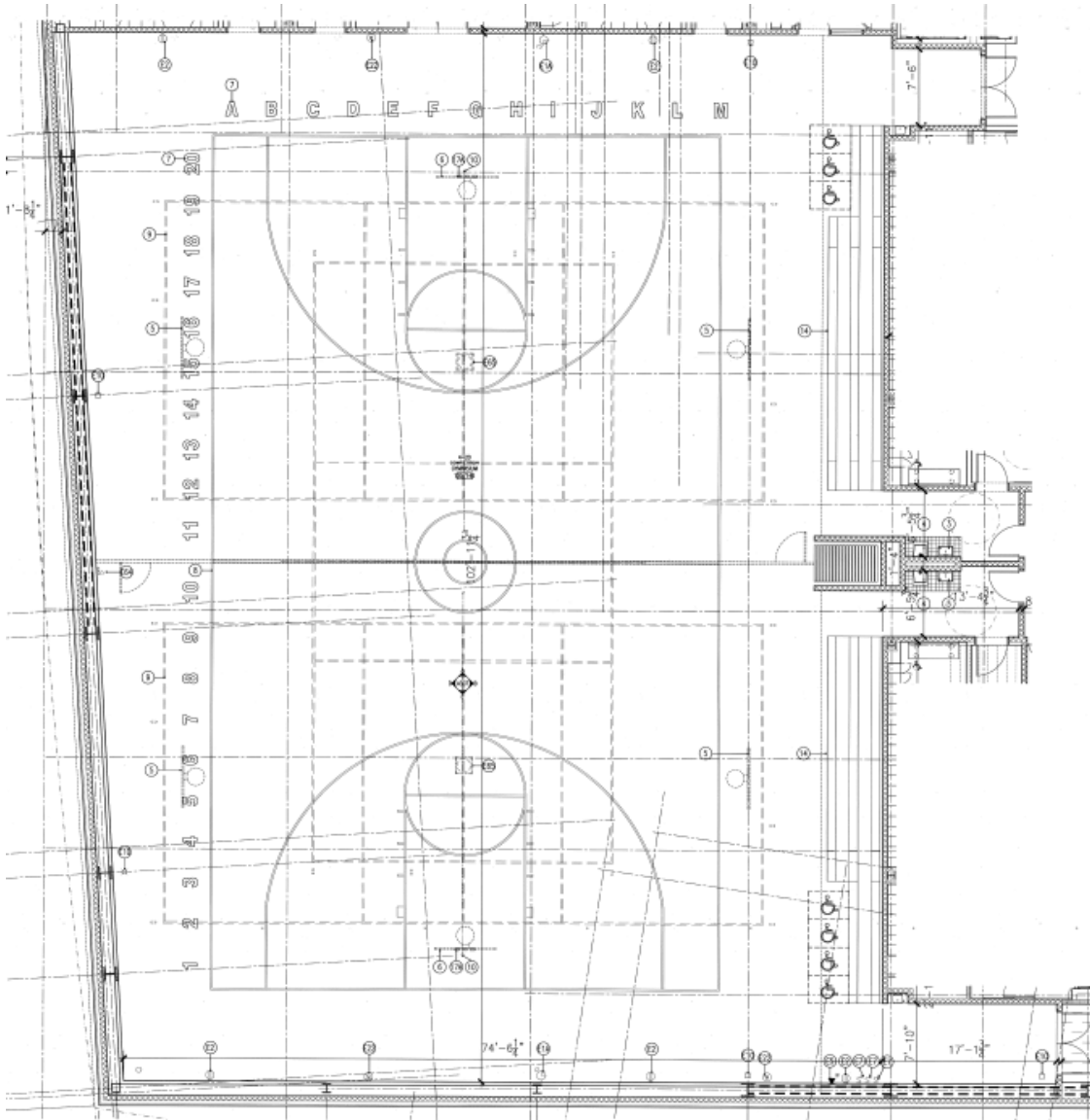
**Finishes:**

The floor of the gymnasium is comprised of resilient wood, and is very typical of an educational gymnasium. The walls, a semi-gloss white paint, have a high reflectance to aid in the distribution of light in this space. Also located on the walls, are removable protective padding used for certain physical activities and sports – no color was indicated for these panels. There are two ceiling heights in this space, as well as two ceiling materials. The 10 foot high ceiling at the entrance and spectator seating area is comprised of a 2’x4’ acoustical ceiling tile system which is white in color. This ceiling system allows for the recessed wall-washers and downlights that light these sections. The larger ceiling height, located over the court area, is and open ceiling. The lighting and mechanical equipment are exposed, and painted white.

Materials				
Surface	Material	Description	Style/Color	Reflectance
Floor	RW	Resilient Wood	-	0.30
Walls	SG-P	Semi-Gloss Paint	Simply White OC-117	0.85
Wall Panels	-	Removable Protective Padding	-	0.10
Ceiling	Open / Act	Open / 24"x48" Acoustical Ceiling Tile	Open / White	0.75

**Furnishings:**

In the spectator seating area, there are retractable bleachers. These will be used most likely for sporting events and games such as competition basketball. Not necessarily considered furnishings, is the large retractable partition used for splitting this large space into two smaller spaces.

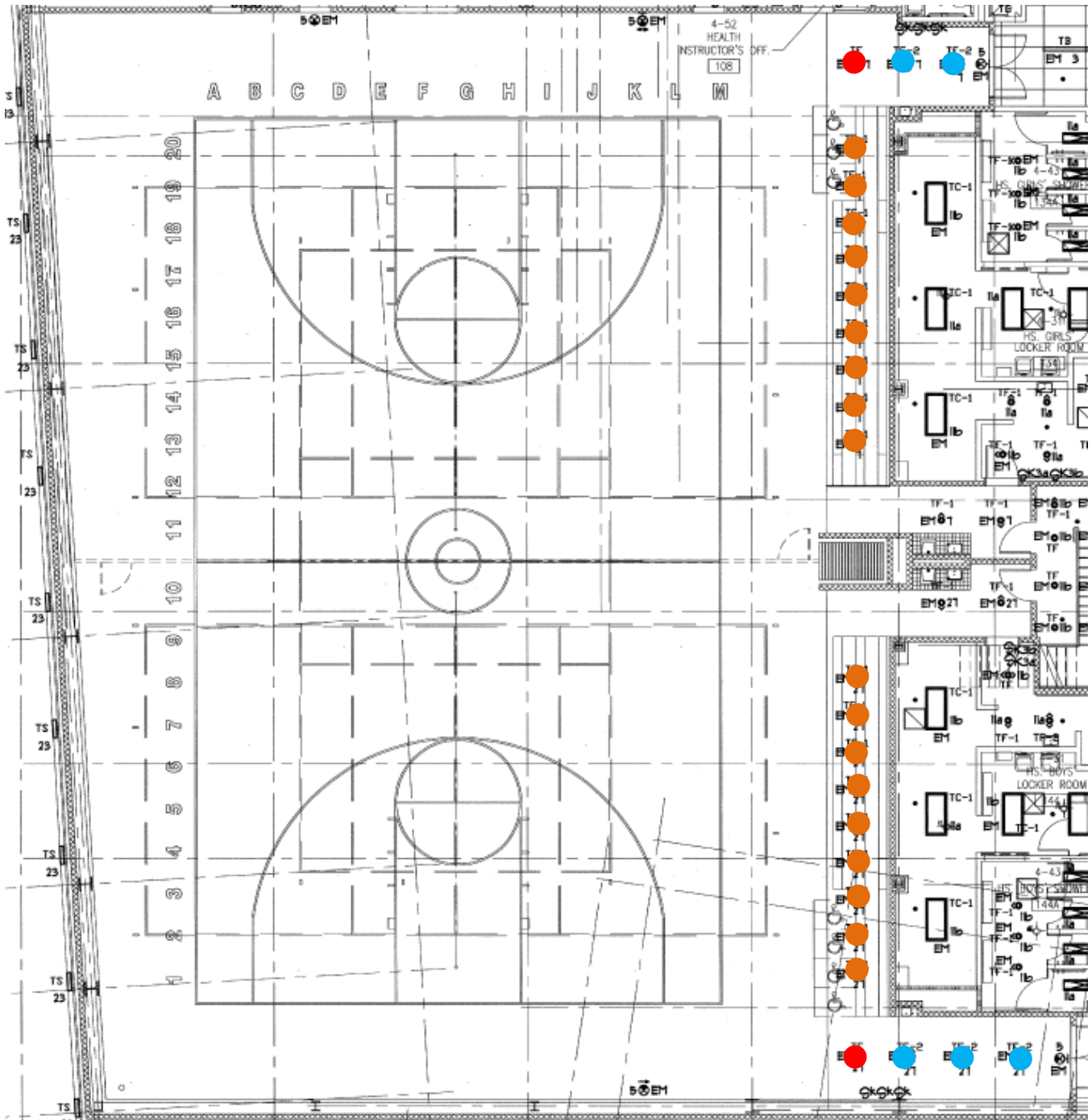


**Tasks:**

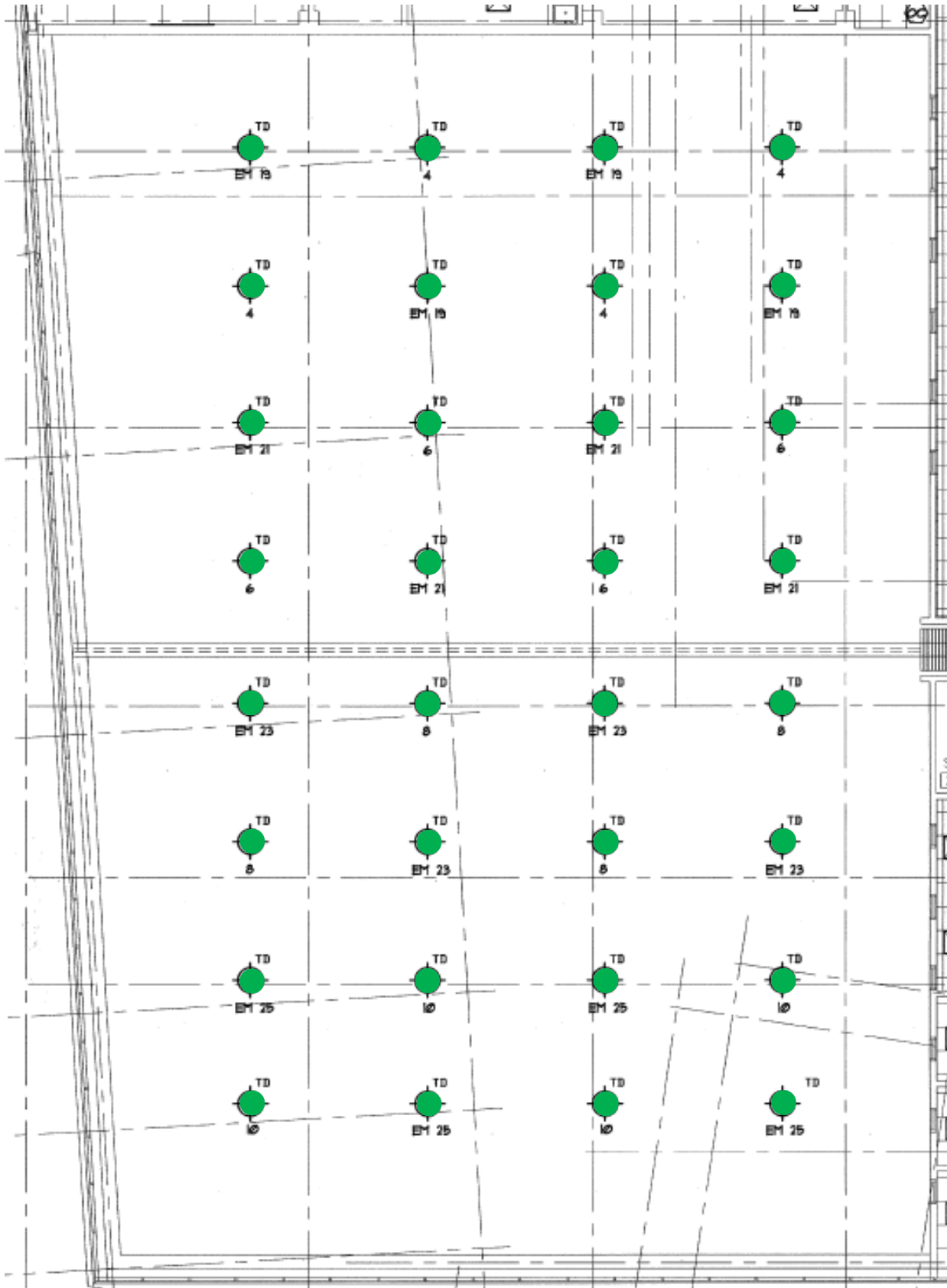
There are multiple events space could be used for, each having its own associated tasks. Some of the possible events may include: assemblies (informal informative gatherings of students or faculty), general activities, charity activities such as bake sales, school dances/proms, physical education, and sporting events. It may be fair to assume that the majority of events in this space are going to being either physical education or sporting related. This means that horizontal illuminance, vertical illuminance, and glare are going to be important design considerations.

**Existing Lighting:**

The entrance and spectator seating area, both having a 10 foot ceiling, utilize multiple circular downlights and wallwashers. These fixtures provide general illuminance and wash the side wall as to make it more inviting. The goal of the wall wash is to view the seating area as being dark and uninviting from the court area. In the area of open ceiling, 8-lamp CFL high bay fixtures are utilized to achieve adequate illuminance levels for sporting events. Locations of these fixtures are shown in the two figures to follow. The first figure represents the area with a 10 foot ceiling. The second is of the area with a 24 foot ceiling.







Symbol	Type	Description	Manufacturer	Lamp	Mounting	Input Watts	Voltage
●	TF	Compact Fluorescent Downlight	Lightolier Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Ceiling Recessed	36	120V
●	TF-1	Compact Fluorescent Downlight/Wallwash	Lightolier Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Ceiling Recessed	36	120V
●	TF-2	Downlight/Double Wallwash	Lightolier Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Ceiling Recessed	32	120V
●	TD	High Bay Compact Fluorescent Downlight	Lumark Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Suspended	144	120V

**B. DESIGN CRITERIA/CONSIDERATIONS**

**Appearance of Space and Luminaires** – *Somewhat Important / Important / Very Important*

**Color Appearance and Color Contrast** – *Somewhat Important / Important / Very Important*

**Daylighting Integration and Controls** – *Somewhat Important / Important / Very Important*

**Direct Glare** – *Somewhat Important / Important / Very Important*

**Flicker** – *Somewhat Important / Important / Very Important*

**Light Distribution on Task Plane** – *Somewhat Important / Important / Very Important*

**Luminances of Room Surfaces** – *Somewhat Important / Important / Very Important*

**Modeling of Faces or Objects** – *Somewhat Important / Important / Very Important*

**Reflected Glare** – *Somewhat Important / Important / Very Important*

**Shadows** – *Somewhat Important / Important / Very Important*

**Surface Characteristics** – *Somewhat Important / Important / Very Important*

**Special Considerations** – *Somewhat Important / Important / Very Important*

**Horizontal Illuminance** – *Very Important*

- IES Classification: Education – Gymnasia – Assembly
  - Category N: 75 luc (7.5 fc)
  - Avg/Min: 3:1

- IES Classification: Education – Gymnasia – Exhibition/General Activities
  - Category P: 150 lux (15.0 fc)
  - Avg/Min: 3:1
  
- IES Classification: Education – Gymnasia – Physical Education
  - Category R: 250 lux (25.0 fc)
  - Avg/Min: 3:1

Horizontal illuminance levels are very important in this space since it directly affects the safety of the students participating in sporting events. I.E.S. gives multiple classifications for a gymnasium based upon its use. Since this space will be a mixed-use gymnasium, it may be desirable to have a lighting system that can be controlled to achieve different light levels under different condition. At the very least, the lighting system should provide enough illumination for the task that requires the highest light levels (physical education in this case).

#### **Vertical Illuminance – Very Important**

- IES Classification: Education – Gymnasia – Assembly
  - Category K: 25 lux (7.5 fc)
  - Avg/Min: 3:1
  
- IES Classification: Education – Gymnasia – Exhibition/General Activities
  - Category M: 50 lux (5.0 fc)
  - Avg/Min: 3:1
  
- IES Classification: Education – Gymnasia – Physical Education
  - Category O: 100 lux (10.0 fc)
  - Avg/Min: 3:1

Vertical illuminance levels are very important in this space both for special recognition and “object tracking.” By object tracking I mean that there should be enough light to easily follow another person visually. For example, a basketball player should be able to easily identify and follow the person on the opposing team who he is assigned to defend.

#### **C. EVALUATION**

AGI32 was used to evaluate the performance of the Competition Gymnasium.

The work plane in this space was positioned on the floor. Fixtures were defined by the .IES files retrieved from the manufacturer’s website, and the light loss factors shown in the table below.

Type	Lamp Lumens		Light Loss Factors			
	Initial	Mean	LLD	LDD	BF	Total
TF	2400	2330	0.97	0.90	0.98	0.86
TF-1	2400	2330	0.97	0.90	0.98	0.86
TF-2	2400	2330	0.97	0.90	0.98	0.86
TD	2400	2330	0.97	0.90	0.98	0.86

The following results were taken from the AGI32 analysis of the existing lighting systems in this space:

Category	Illuminance (fc)	
	Recommended	Achieved
Average	10.0	39.0
Maximum	-	60.2
Minimum	-	5.1
Avg/Min	3.0	7.6
Max/Min	-	11.8

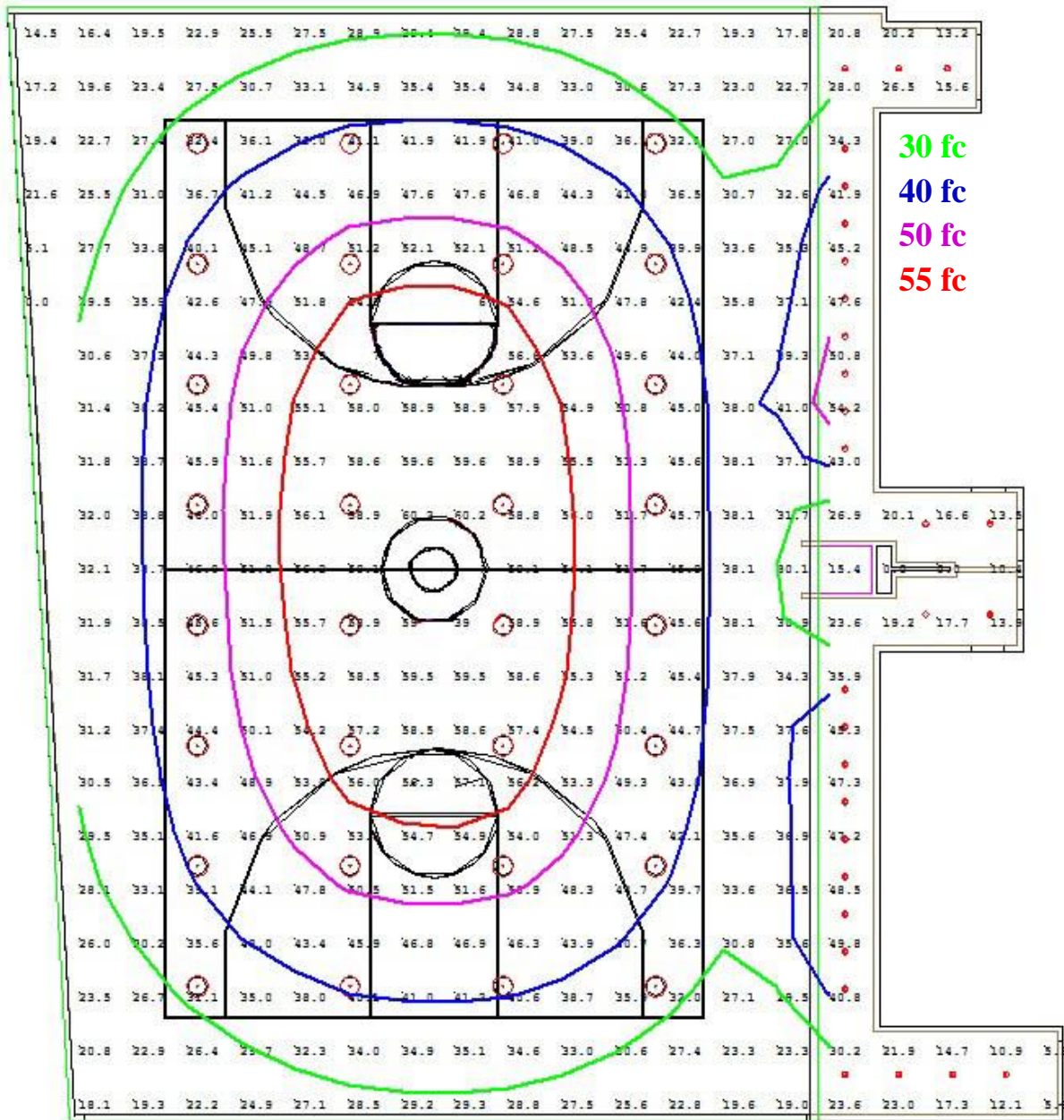
The table below shows that different fixture types used in this space, the quantity of lamps per fixture type, quantity of fixtures of each type, and the total wattage consumption of this space.

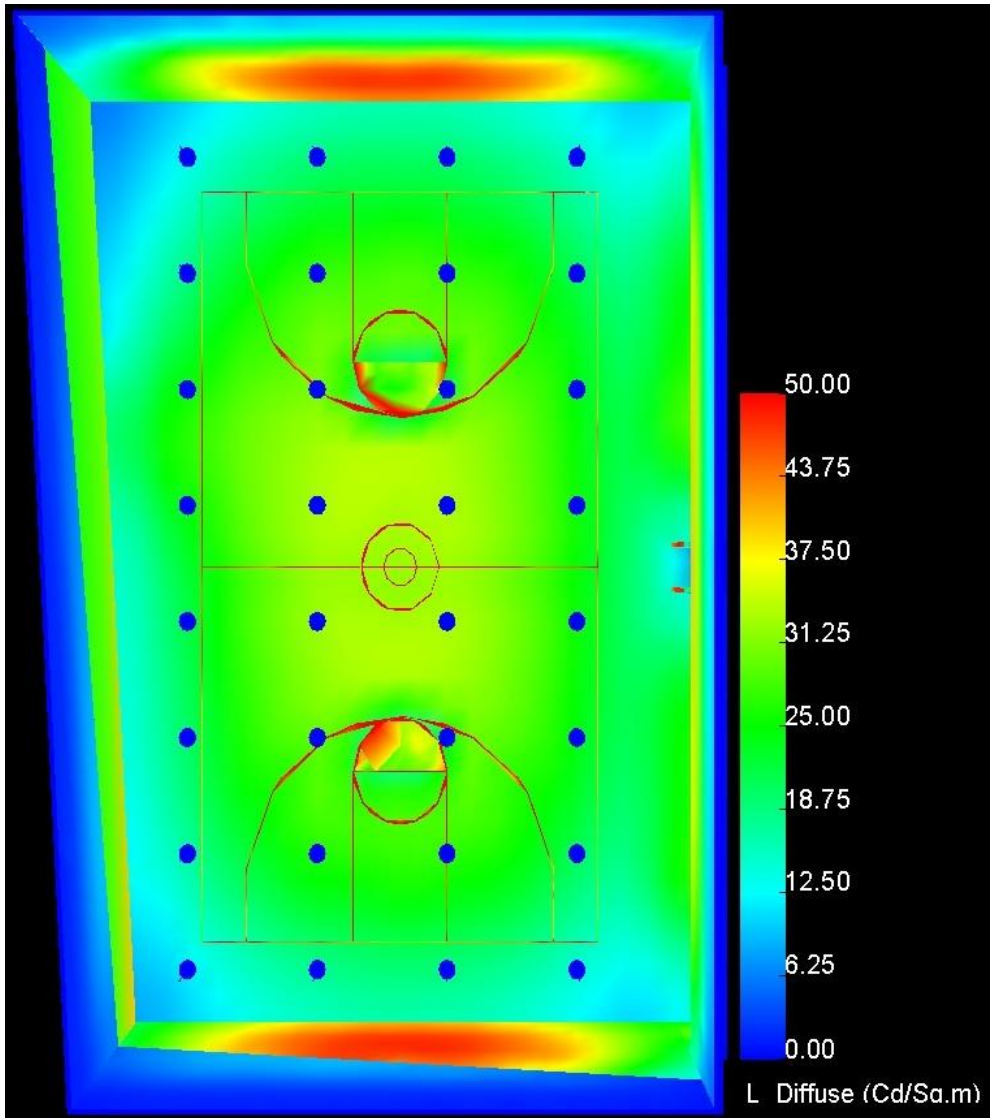
Type	Lamp	Qty	Input W	Total W
TF	(1) 32W CFL	2	36	72
TF-1	(1) 32W CFL	18	36	648
TF-2	(1) 32W CFL	5	32	160
TD	(8) 32W CFL	32	144	4608
			Total:	5488

Using the total wattage consumption presented above and the associated room area, the actual power density can be computed and compared to the allowable power density as given by ASHRAE/IESNA 90.1 2011. Such information is presented in the table below.

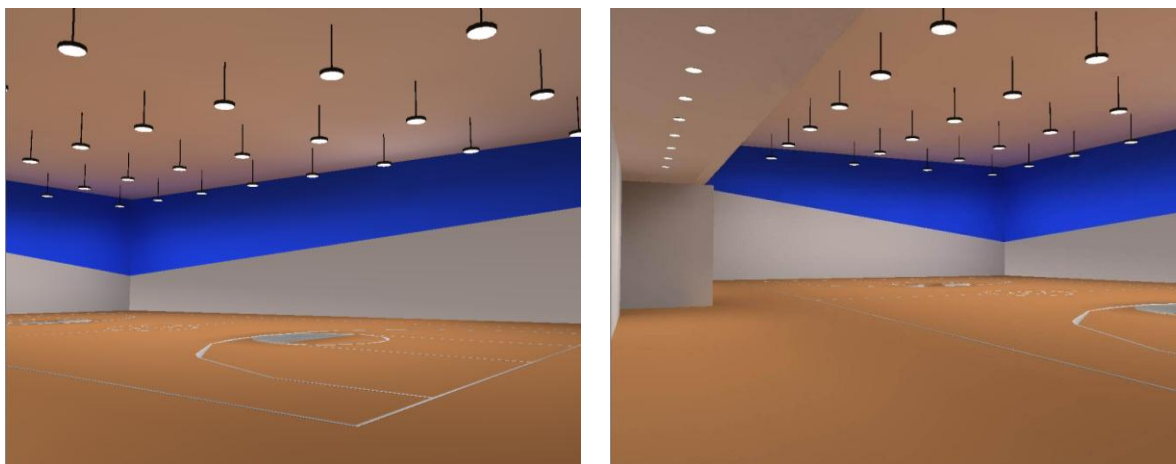
ASHRAE/IESNA 90.1 2011			
Category	Allowable	Actual	
Area (sq.ft.)	-	8332	
Input Watts (W)	5999	5488	
Power Density (W/sqft)	0.72	<b>0.7</b>	

Iso-line and pseudo-color diagrams are presented below for aid in the analysis of the uniformity performance. Besides the iso-line diagram is a legend indicating the illuminance value of each iso-line. Besides the pseudo-color diagram is a scale representing the luminance in the space.





Two (preliminary) renderings are shown below to show the special composition of this space.



Analyzing the data shown above, it is evident that the achieved illuminance levels in this space are well over the I.E.S recommended levels for an educational gymnasium. Additionally, the achieved uniformity ratios do not comply with I.E.S's recommendations. These two problems can be solved by better placement of the luminaires, or a fixture with a better distribution. As shown in the power density table shown above, this space (although barely) complies with the AHRAE 90.1 required power density.

Taking a look at uniformity (illustrated by the above ISO-line and pseudo diagram), we see that this space is also performing sub-par. It does not satisfy the recommendations for an education gymnasium. The pseudo diagram shows two large hotspots on the North and South walls. This is not only undesirable on any wall of the space, but is especially undesirable on these walls due to possible distraction of the players during a basketball game.

It should be noted that these value may not be an accurate representation of the actual conditions of the space. The mechanical equipment was not included in this model (and therefore not considered), and could significantly change the results due to trapping of the light in the ceiling. Additionally, daylight was not considered in this analysis. Because of the large window coverage of this space, the (eventual) consideration of this could very much sway the results.

## INTERMEDIATE SCHOOL CAFETERIA

### A. EXISTING CONDITIONS

#### *Description:*

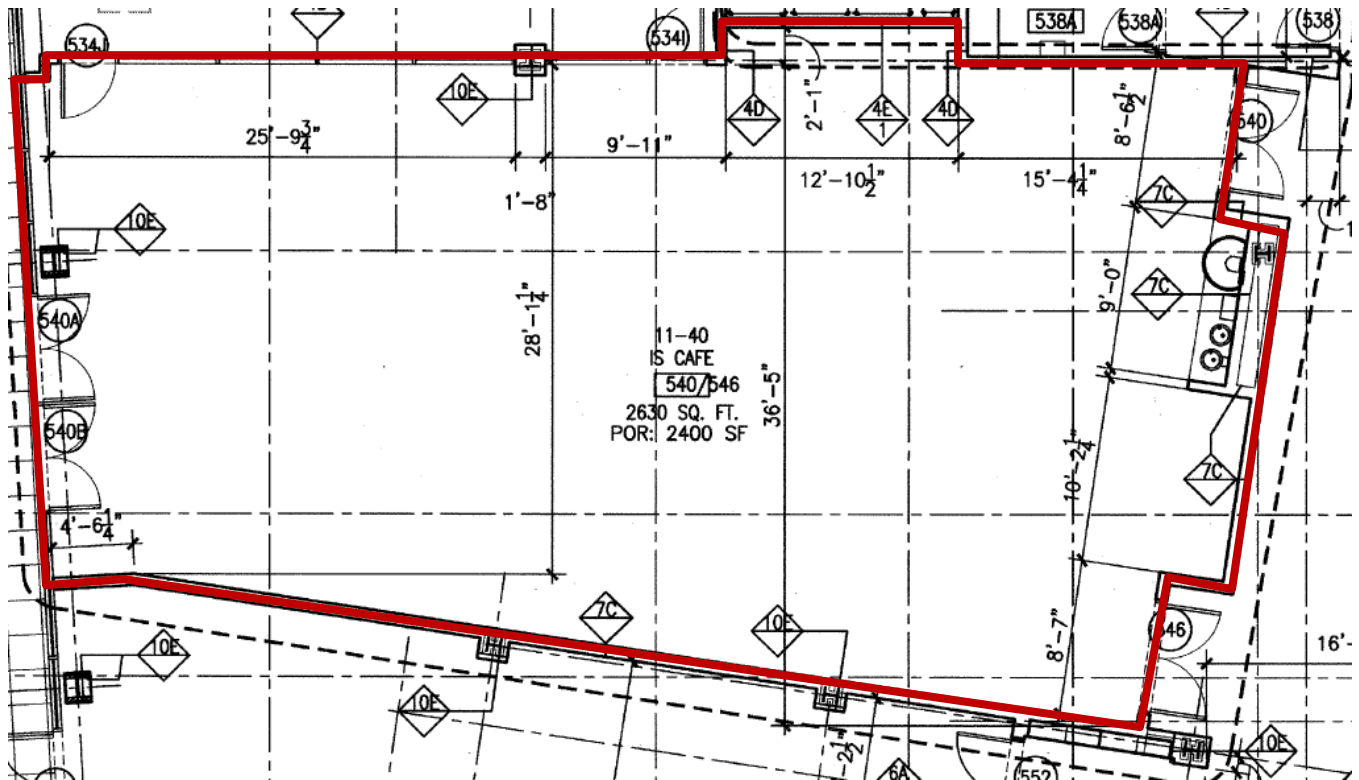
Area: 2115 ft<sup>2</sup>

Length: 73 ft.

Width: 40 ft.

Ceiling Height: 10 ft.

The Intermediate School (IS) cafeteria is located on the 5<sup>th</sup> floor directly north of the High School (HS) Art Room. There is no direct circulation between these two rooms, but like the High School Art room, the cafeteria has direct access to the exterior roof terrace. The two doors located on the western side of the North wall, lead to the lunch line, which served directly from the kitchen.



**Finishes:**

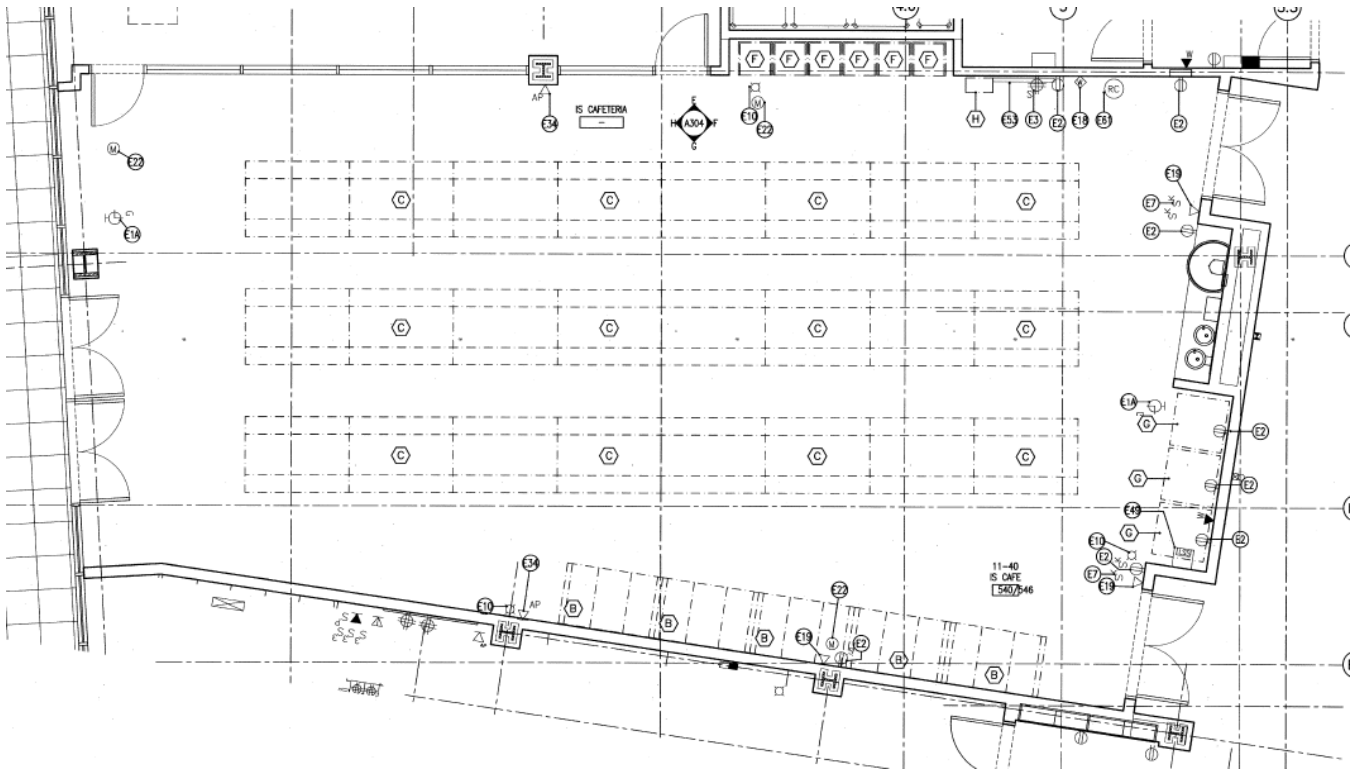
Similar to the HS Art Room, the floor of the cafeteria is a vinyl composite tile which is pewter in color. The walls, which are a semi-gloss white paint, aid in the distribution of light throughout the space. Also on the walls, are matte white tiles, semi-gloss white tiles, and a tri-color blend of mosaic tiles. These mosaic tiles may be arranged in any configuration desirable, as to produce a certain effect. There is no specific information on these colors, or if an artistic effect is desired, but the configuration of these mosaic tile may play an important role in my design approach of this space.

Materials				
Surface	Material	Description	Style/Color	Reflectance
Floor	VcT	12" x 12" Vinyl Composition tile	112 Pewter	0.30
Walls	SG-P	Semi-Gloss Paint	Simply White OC-117	0.85
Wall Panels	GCT - 1	Glazed Ceramic Trim Tile	Artic White - Matte	0.85
	GCT - 2	Glazed Ceramic Trim Tile	Artic White - Semi-Gloss	0.85
	GCT - 5	2"x2" Glazed Ceramic Mosaic Tile	1:1:1 Three color Blend	0.70
Ceiling	AcT	24"x48" Acoustical Ceiling Tile	White	0.75



**Furnishings:**

In the main eating area of the room, there are 24 cafeteria tables with benches. The East wall, contains 3 vending machines for the students. The trash cans are located in the recessed portion of the North wall.

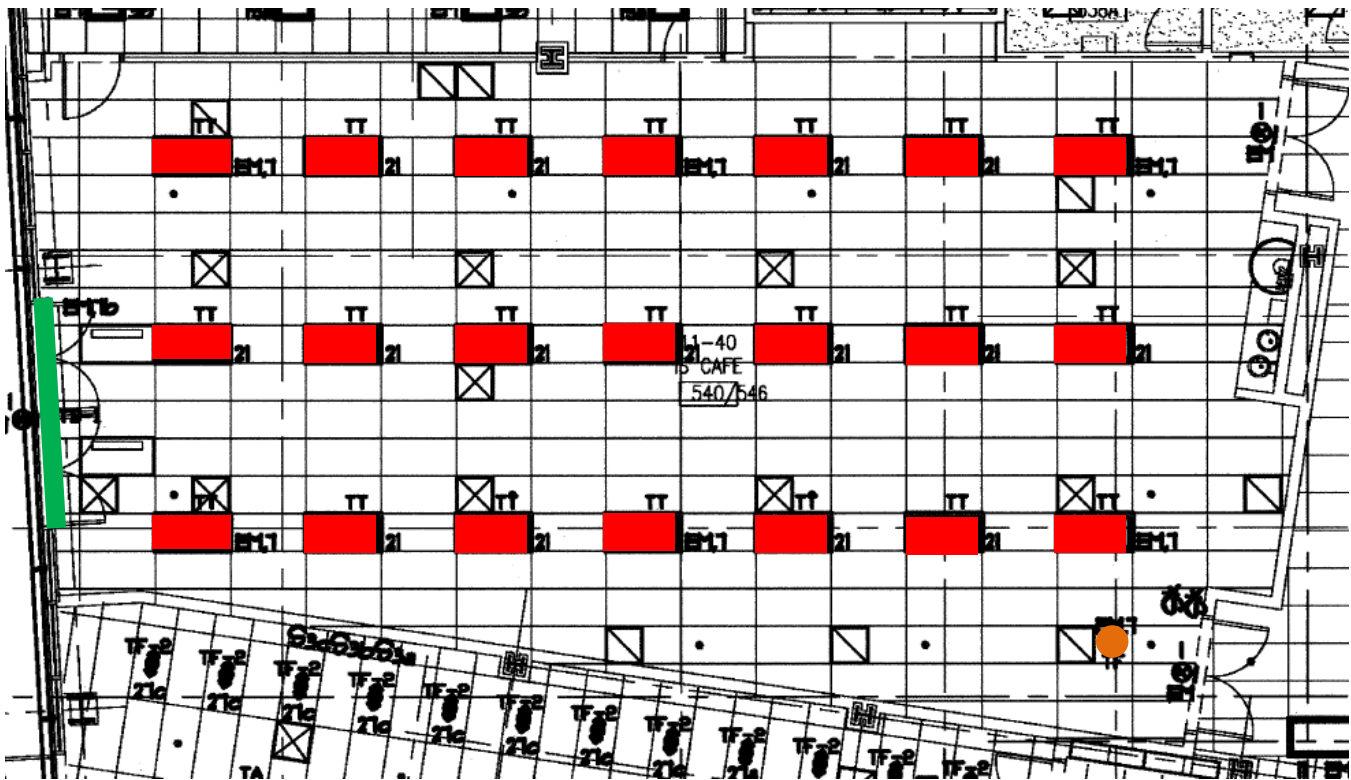





**Tasks:**

The primary task in this space is eating. Light levels should be adequate so that eating is not difficult. One additional consideration for this space is security. Lunch rooms in schools may lend themselves to behavioral problems especially in a large city like New York.

**Existing Lighting:**

A 7x3 array of recessed, linear fluorescent 2’x4’ fixtures is centered in this space. These fixtures provide task light on the eating surfaces, as well as general ambient light to the space. A single downlight, whose purpose I am still not aware of, is placed in front of the entrance door to the south – the entrance door to the north has no downlight. A single linear fluorescent placed above the doors that exit to the exterior roof terrace, is meant to establish these doors as a focal point of the space. Their success in this is debatable, as these doors, and the entire west wall, are glass.



Symbol	Type	Description	Manufacturer	Lamp	Mounting	Input Watts	Voltage
	TT	2 Lamp 2'x4' , T8 Linear Fluorescent With 18-Cell	Metalux	(2) F32T8/835/ECO/Alto (Phillips)	Ceiling Recessed	74	120V
	TF	Compact Fluorescent Downlight	Lightolier Lighting	(1) PL-T 32W/835/4P/Alto (Phillips)	Ceiling Recessed	36	120V
	TB-1	T8 Linear Fluorescent, 4" Wide, with White flush	Linear Lighting	(1) F32T8/835/ECO/Alto (Phillips)	Ceiling Recessed	38	120V

**B. DESIGN CRITERIA/CONSIDERATIONS**

**Appearance of Space and Luminaires** – *Somewhat Important / Important / Very Important*

**Color Appearance and Color Contrast** – *Somewhat Important / Important / Very Important*

**Daylighting Integration and Controls** – *Somewhat Important / Important / Very Important*

**Direct Glare** – *Somewhat Important / Important / Very Important*

**Flicker** – *Somewhat Important / Important / Very Important*

**Light Distribution on Task Plane** – *Somewhat Important / Important / Very Important*

**Luminances of Room Surfaces** – *Somewhat Important / Important / Very Important*

**Modeling of Faces or Objects** – *Somewhat Important / Important / Very Important*

**Reflected Glare** – *Somewhat Important / Important / Very Important*

**Shadows** – *Somewhat Important / Important / Very Important*

**Surface Characteristics** – *Somewhat Important / Important / Very Important*

**Special Considerations** – *Somewhat Important / Important / Very Important*

**Horizontal Illuminance – Somewhat Important**

- IES Classification: Common Applications – Food Service – Cafeterias
  - Category N: 75 lux (7.5 fc)
  - Avg/Min: 3:1

Horizontal illuminance in this space is somewhat important because there needs to be adequate light for the students to eat, and is not a critical task. As long as the illuminance levels in the room are maintained, there should be no problems with the students having enough light to eat.

**Vertical Illuminance – Very Important**

- IES Classification: Common Applications – Food Service – Cafeterias
  - Category K: 25 lux (7.5 fc)
  - Avg/Min: 3:1

As the cafeteria could be a source of mischievous behavior, vertical illuminance is essential for face recognition. The adequate illumination for facial recognition of the students is essential for both the school faculty and the security system (cameras).

**C. EVALUATION**

AGI32 was used to evaluate the performance of the Competition Gymnasium.

The work plane height of this space is 2’6”. Fixtures were defined by the .IES files retrieved from the manufacturer’s website, and the light loss factors shown in the table below.

Type	Lamp Lumens		Light Loss Factors			
	Initial	Mean	LLD	LDD	BF	Total
TT	3000	2850	0.95	0.90	1.20	1.0
TF	2400	2330	0.97	0.90	0.98	0.9
TB-1	3000	2850	0.95	0.90	1.20	1.0

AGI32 was used to evaluate the performance of the Competition Gymnasium.

The following results were taken from the AGI32 analysis of the existing lighting systems in this space:

Category	Illuminance (fc)	
	Recommended	Achieved
Average	7.5	81.9
Maximum	-	105
Minimum	-	23.9
Avg/Min	3.0	3.43
Max/Min	-	4.41

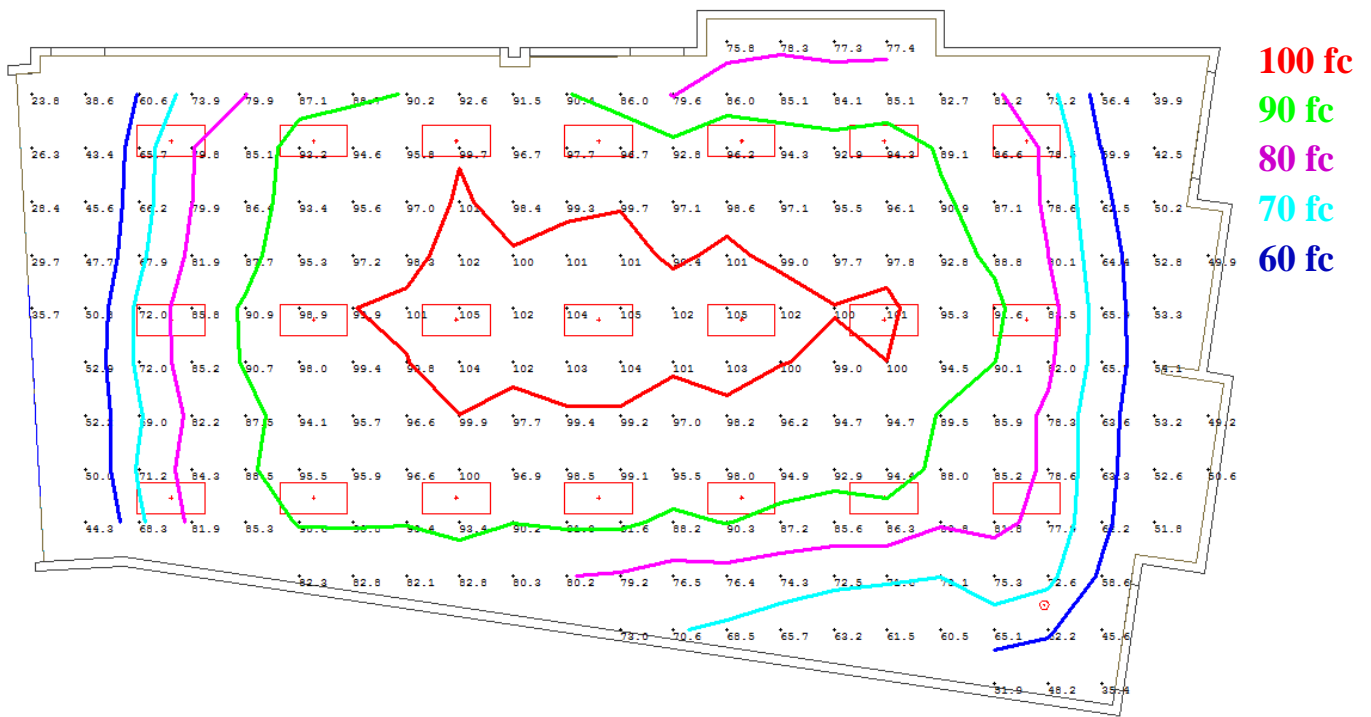
The table below shows that different fixture types used in this space, the quantity of lamps per fixture type, quantity of fixtures of each type, and the total wattage consumption of this space.

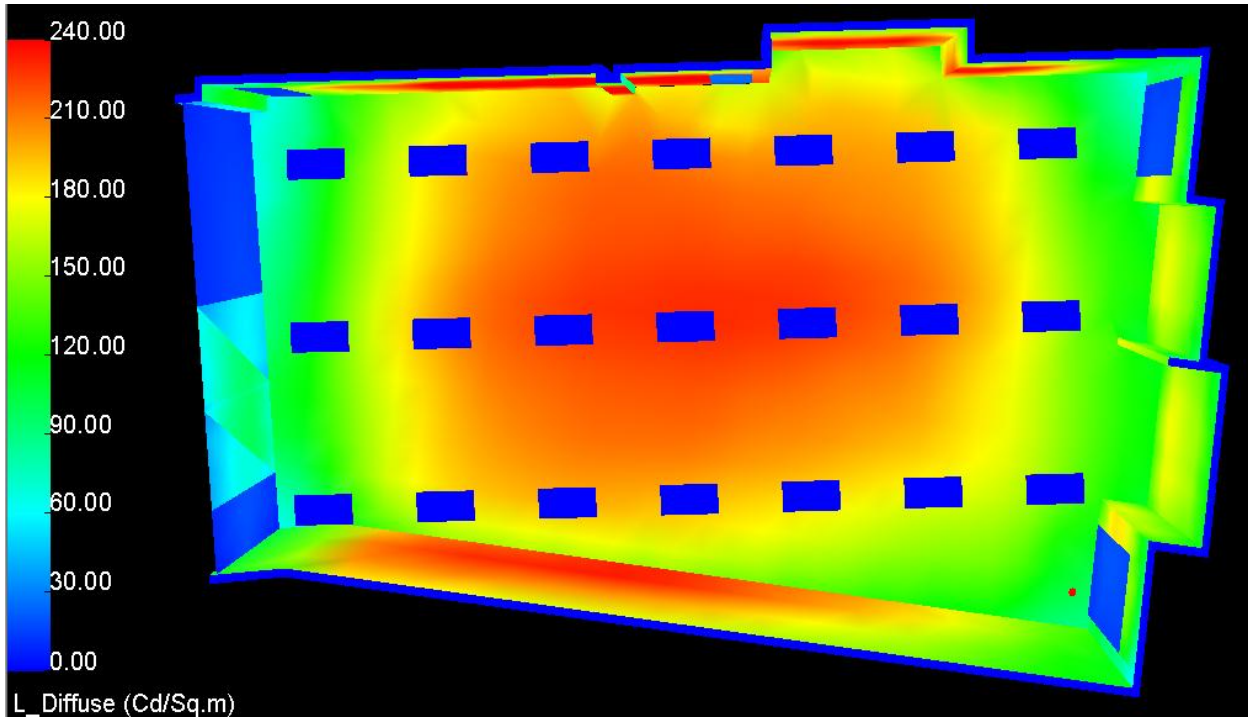
Type	Lamp	Qty	Input W	Total W
TT	(2) F32T8	21	74	1554
TF	(1) 32W CFL	1	36	36
TB-1	(1) F32T8	1	38	38
Total:				1628

Using the total wattage consumption presented above and the associated room area, the actual power density can be computed and compared to the allowable power density as given by ASHRAE/IESNA 90.1 2011. Such information is presented in the table below.

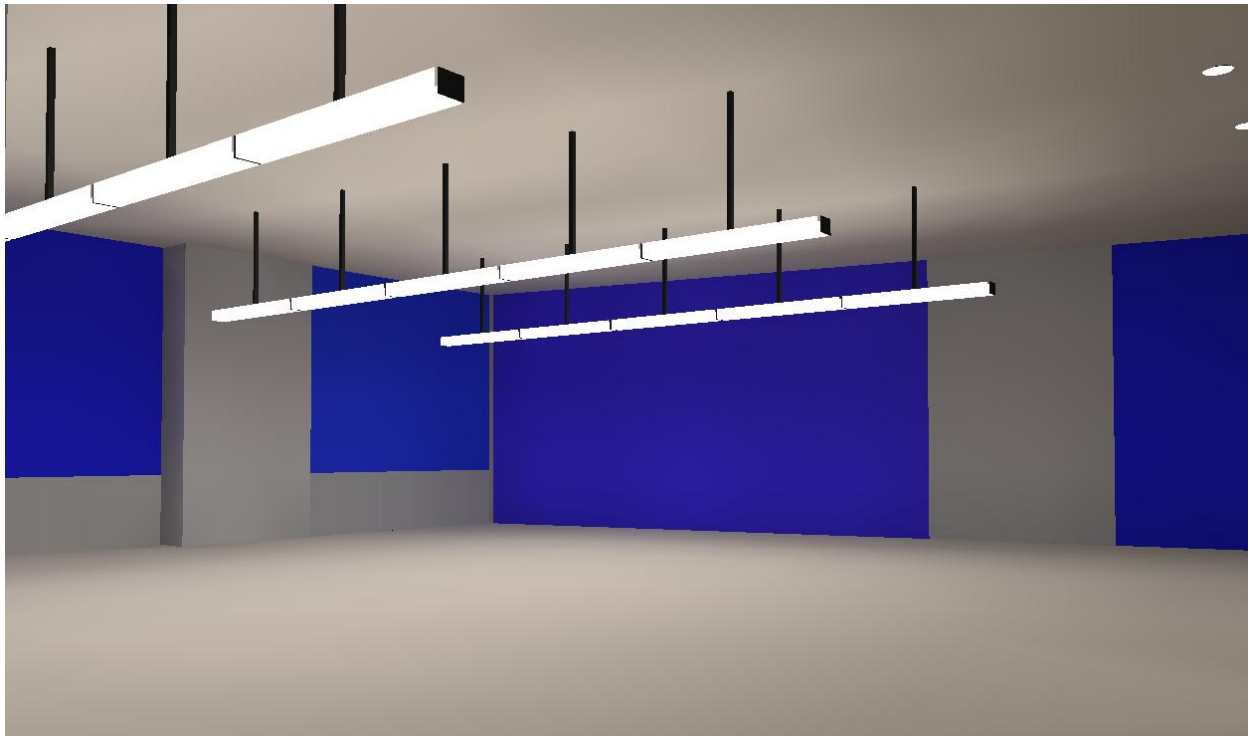
ASHRAE/IESNA 90.1 2011			
Category	Allowable	Actual	
Area (sq.ft.)	-	2115	
Input Watts (W)	1375	1628	
Power Density (W/sqft)	0.65	<b>0.77</b>	

Iso-line and pseudo-color diagrams are presented below for aid in the analysis of the uniformity performance. Besides the iso-line diagram is a legend indicating the illuminance value of each iso-line. Besides the pseudo-color diagram is a scale representing the luminance in the space.





A (preliminary) rendering is shown below to show the special composition of this space.



Analyzing the data shown above, it is evident that the achieved illuminance levels in this space are well over the I.E.S recommended levels for a cafeteria. Additionally, the achieved uniformity ratios do not comply with I.E.S's recommendations, although they are much closer than the previous two spaces analyzed. As shown in the power density table shown above, this space does not comply with the AHRAE 90.1 required power density.

Taking a look at uniformity (illustrated by the above ISO-line and pseudo diagram), we see that this space is performing much better than the previous two spaces analyzed. It was not considered in this model, but daylight entering the large west curtain wall has the capacity to drastically change the uniformity in the room.

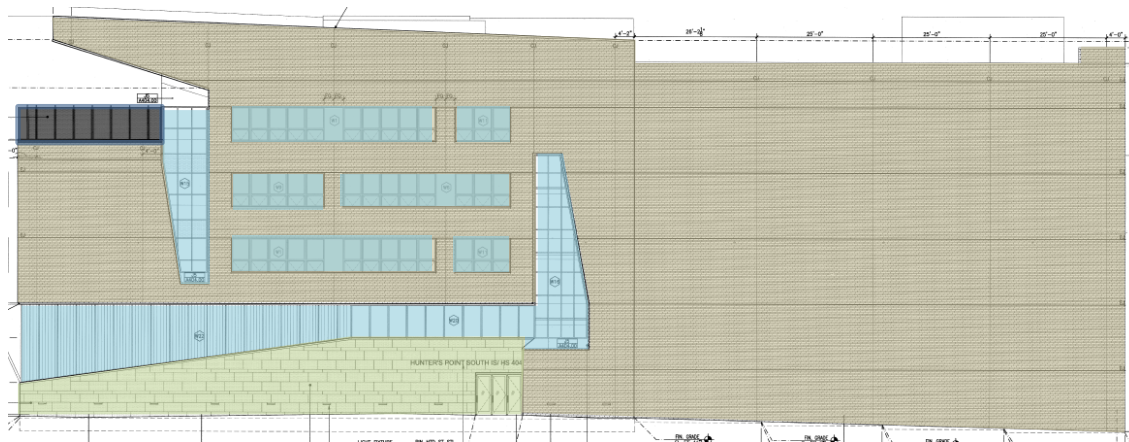
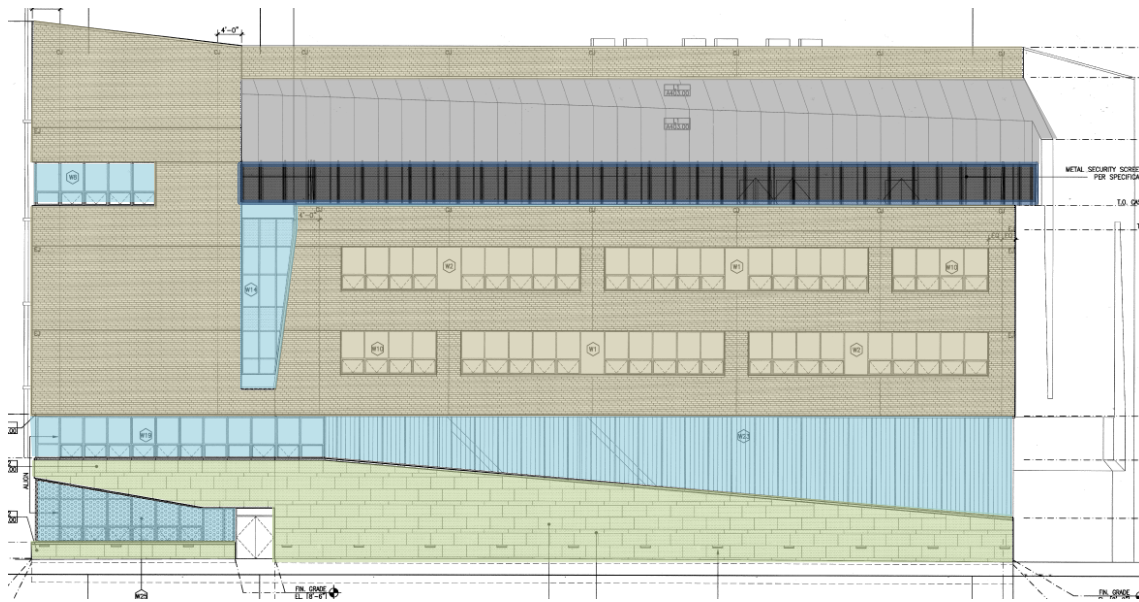
## FAÇADE

### A. EXISTING CONDITIONS

*Description:*

**Finishes / Materials:**

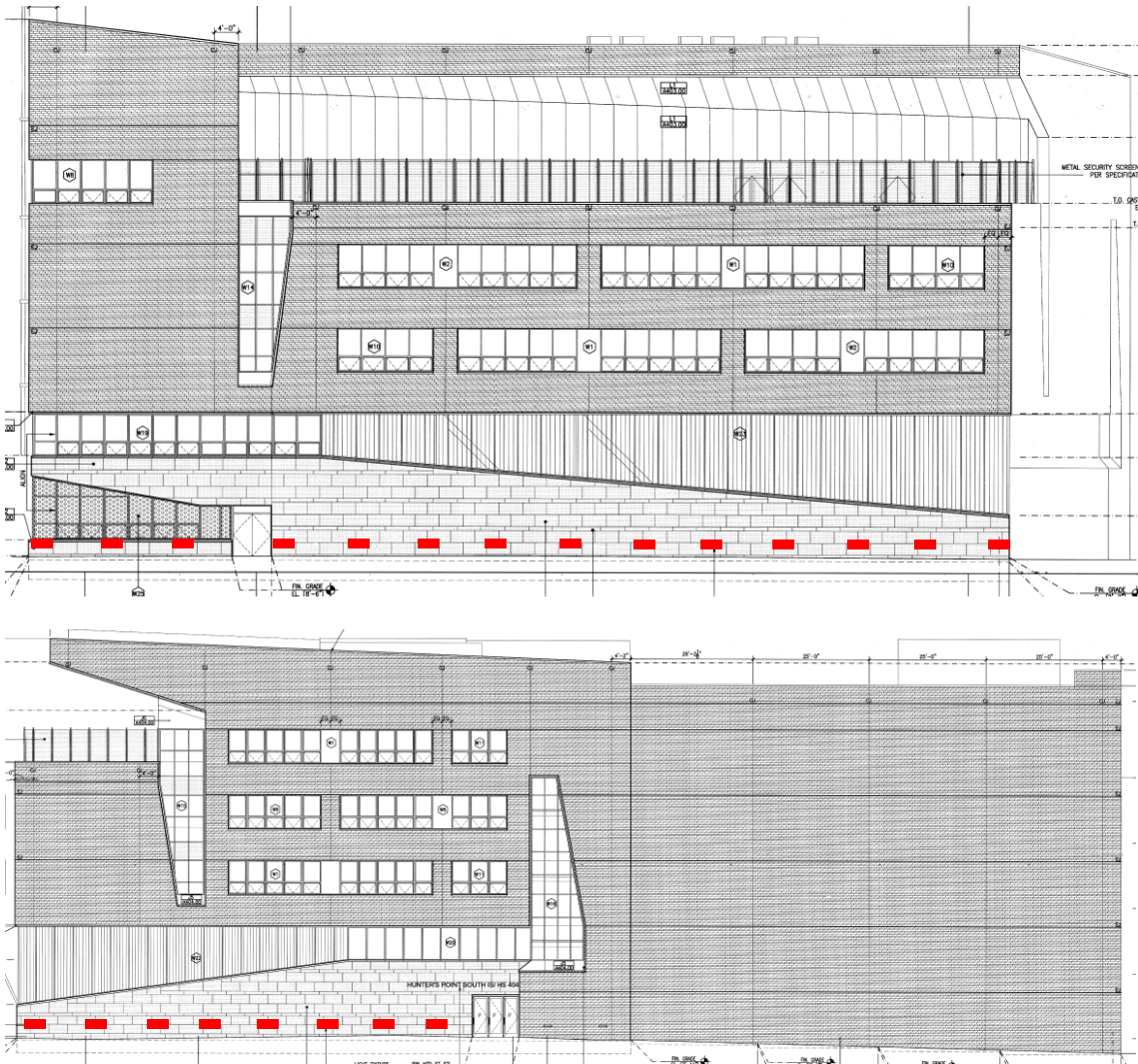
The façade of this building utilizes multiple material types. Grey stone and glazing are used to establish the first and second floors as the “base” of the building. A combination of dark grey utility brick and glazing are used in most of the upper portion of the building. The exterior roof terrace on the 5<sup>th</sup> floors has an aluminum composite panel cantilever. The actual roof terrace itself is outlined in a dark grey/black security screen for safety purposes. The table below gives information about each material, and a color swatch indicating its locations on the building elevations.






Material			
Symbol/ Swatch	Description	Style/Color	Reflectance
	3-5/8" x 3-5/8" x 11-5/8" Utility Brick	Dark Grey	0.10
	2" Thick Exterior Cut Stone	Grey	0.15
	Aluminum Composite Panel	Aluminum	0.50
	Metal Security Screen	Grey	-
	Glazing	Glass/Transparent	-

**Existing Lighting:**



Symbol	Type	Description	Manufacturer	Lamp	Mounting	Input Watts	Voltage
	TS	Compact Fluorescent Step Light	Bega lighting	(1) FT36DL/830/ECO	Wall Recessed	40	120V

There is very minimal lighting on the exterior of this building. The only lighting present in this building are the step lights positioned around the base of the building. The site plans show no actual pathways around the perimeter of the building, in which case these lights serve little to no purpose. The architectural features are not accented in anyway, and are completely lost to passers-by at night. Additionally, the façade containing the outdoor roof terrace faces the river, and also remains unlit.

**B. DESIGN CRITERIA/CONSIDERATIONS**

**Appearance of Space and Luminaires** – *Somewhat Important / Important / Very Important*

**Color Appearance and Color Contrast** – *Somewhat Important / Important / Very Important*

**Daylighting Integration and Controls** – *Somewhat Important / Important / Very Important*

**Direct Glare** – *Somewhat Important / Important / Very Important*

**Flicker** – *Somewhat Important / Important / Very Important*

**Light Distribution on Task Plane** – *Somewhat Important / Important / Very Important*

**Luminances of Room Surfaces** – *Somewhat Important / Important / Very Important*

**Modeling of Faces or Objects** – *Somewhat Important / Important / Very Important*

**Reflected Glare** – *Somewhat Important / Important / Very Important*

**Shadows** – *Somewhat Important / Important / Very Important*

**Surface Characteristics** – *Somewhat Important / Important / Very Important*

**Special Considerations** – *Somewhat Important / Important / Very Important*

**Horizontal Illuminance – Important****Entrance**

- IES Classification: Common Applications – Building Entries – Paths to curb – Low Activity – LZ4
  - Category C: 2 lux (0.2 fc)
  - Avg/Min: 3:1

Horizontal illuminance is important for walking the site and entering the building at night. Although there will not be heavy traffic into this building at night, it may be possible to have a few sporting events take place at this school at night. Also, where there are dances or proms, there will be a large number of students back at the building at night.

**Vertical Illuminance – Very Important****Entrance**

- IES Classification: Common Applications – Building Entries – Paths to curb – Low Activity – LZ4
  - Category C: 2 lux (0.2 fc),
  - Avg/Min: 3:1

The vertical illuminance at night is listed here as more important than horizontal illuminance due to the importance of facial recognition. With this building being located (possibly) in an area of mid to high crime rate, facial recognition is going to be very important.

**Facade**

- IES Classification: Exteriors – Facades – High Activity – LZ4
  - Category O: 100 lux (10 fc)
  - Gauge: Max

The illuminance values stated here are allotted values for key elements or details of the building. These apply to less than 25% of the building façade.

**C. EVALUATION**

The table below shows that different fixture types used in this space, the quantity of lamps per fixture type, quantity of fixtures of each type, and the total wattage consumption of this space.

Type	Lamp	Qty	Input W	Total W
TS	(1) FT36DL	26	40	1040
			Total:	1040

Using the total wattage consumption presented above and the associated room area, the actual power density can be computed and compared to the allowable power density as given by ASHRAE/IESNA 90.1 2011. Such information is presented in the table below.

ASHRAE/IESNA 90.1 2011			
Category	Allowable	Actual	
Perimeter (Linear Ft.)	-	302	
Input Watts (W)	1510	1040	
Power Density (W/ft)	5.0	<b>3.4</b>	

According to the table above, the façade meets the ASHRAE required power densities. This is largely due to the fact that there is almost no façade lighting on this building. I believe that a design that accents the interesting architecture of this building is can be achieved while still meeting the ASHRAE requirements.

AGI32 files found at the following location:

Y:\txe136\Technical Report 1\AGI Files