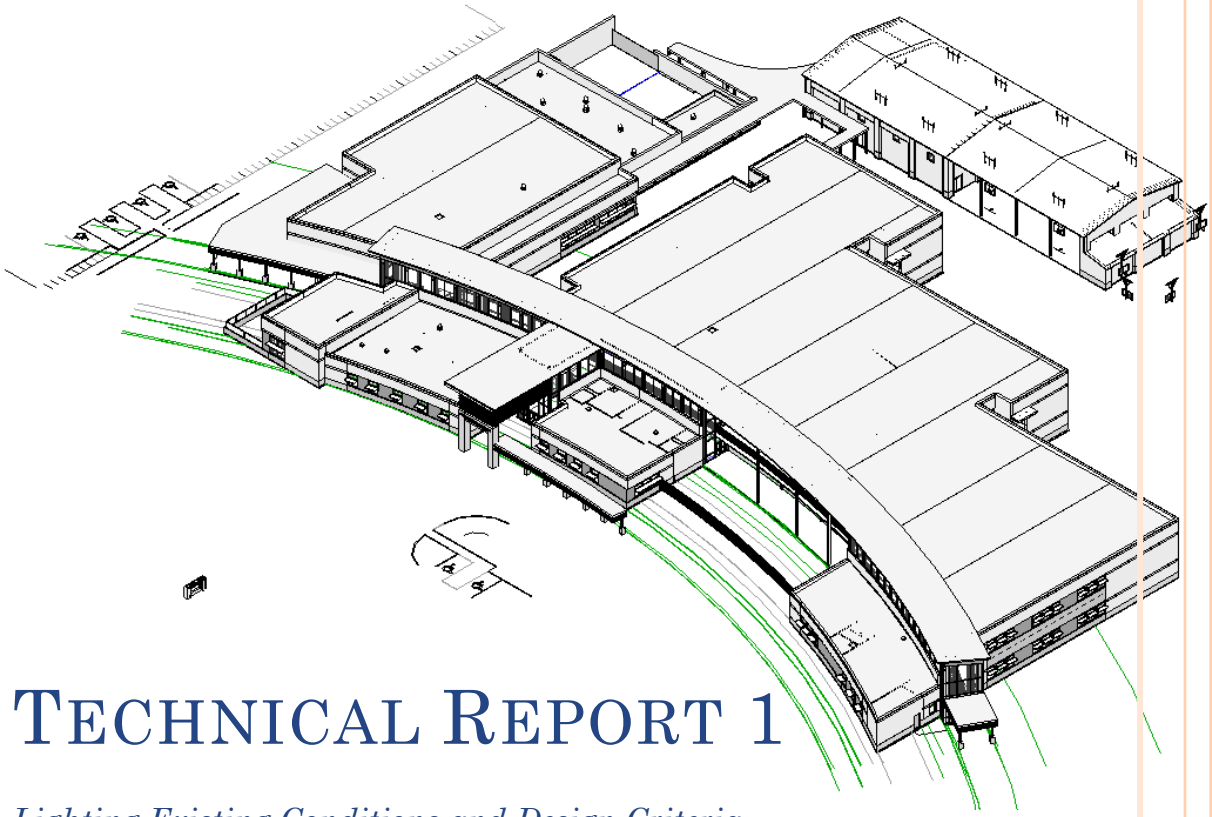

Technical Report 1

Lighting Existing Conditions and Design Criteria

Four spaces from the new construction of Cypress Hill Elementary School are examined along with their existing lighting conditions in this report. Design criteria is then determined based on these specific spaces and applicable codes and standards.

Nicholas Stuchlak | Lighting/Electrical | Shawn Good - Advisor

Cypress Hill Elementary | Texas

9/16/2013

Executive Summary

Cypress Hill School District in Texas is completely demolishing their elementary school and constructing a new school on the site. The new school will have a media center and library, cafeteria and stage, classrooms, offices, and a detached gymnasium. This report focuses on four spaces in the new elementary school. They are as follows:

Large Work Space – Media Center/Library

Circulation Space – Vestibule and Corridor A101

Special Purpose Space – Cafeteria

Outdoor Space – South Façade

Overall, the school already has some very interesting and dynamic lighting systems. Not only are the existing systems visually pleasing, they also meet the illuminance requirements easily. Sustainability may be able improve through a larger daylighting presence. There are a few design choices that could be improved through a larger integration of daylighting techniques. The spaces chosen here also go together thematically. This is interesting but ultimately may prove cumbersome because of the stiff nature of the design. There are many different directions that one could go with these spaces and they should be explored.

Contents

Building Overview

Location: Texas

Building Occupant Name: Cypress Hill Elementary School

Occupancy or Function Type: Occupancy type 'E', Educational

Levels Above Grade: Two

Construction Time Frame: 9/7/2012 – 11/26/2013

Building Cost: $82.3 Million

Project Delivery Method: Design-Build

Vestibule and Corridor A101: Circulation Space

Existing Conditions

The vestibule is the main entrance into the school for all students, faculty, and visitors. Located in the middle of the south façade of the building, two single doors and one double door open into a 30' by 20' glass enclosed area meant to usher in visitors and transition from the outside to the school. The vestibule may serve as an impromptu gathering space should the need arise. It is the main transition place between the outside and the school meant to ease visitors in. As this is mostly a transition space there are no visual activities that would need to be addressed for the vestibule. The main task is transition.

The corridor is the main artery for the entire school. The section branching right off from the vestibule in both east and west direction will be assessed for this part of the memo. The ceiling height varies throughout the space with the lighting located on the second floor ceiling. The main activity is the act of transition. People operating in these corridors will be moving throughout them so it is important to have the work plane lit sufficiently to encourage circulation. For these two spaces, the psychological impression of "spaciousness/closure" will be applied.

vestibule			
Height (ft)	Width (ft)	Length (ft)	Area (sq. ft)
14	20.4	30	612.5

corridor A101			
Height (ft)	Width (ft)	Length (ft)	Area (sq. ft)
14	15.5	149	2309.5

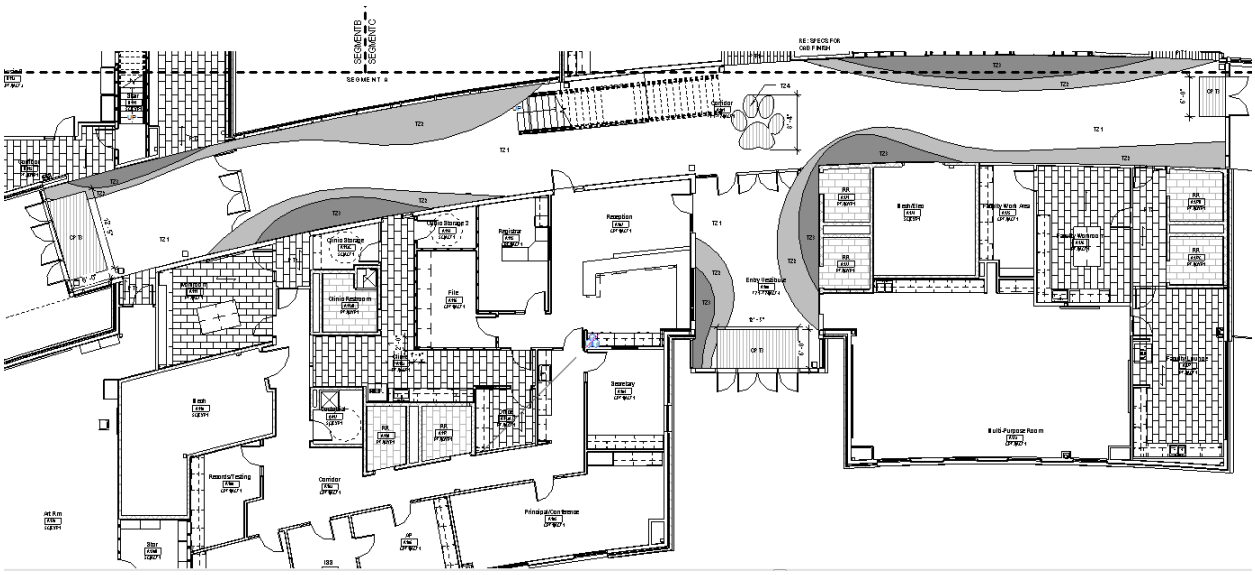

Figure 1: Plan View of Vestibule and Corridor A101

Lighting and Controls

The lighting in the vestibule and corridor are integrated and apart of the same design. This design utilizes round disc shaped pendant luminaires of varying diameters and heights to light the entrance and path for the patrons. There is no specific arrangement pattern or sequence. These luminaires are only a part of the vestibule and corridor A101, meaning this design does not extend past the double doors at both ends of the hall. All the luminaires use U-shaped fluorescents with electronic ballasts. The lights are controlled by three 4-way keyed switches. The first is on the plan west wall of the vestibule shortly after one enters and the other two are at the ends of corridor A101.

type	manufacturer	mounting	lamp	ballast	voltage	input watts	description
GG	Impact	Pendant	(1) FB032/835XP/6/ECO	Electronic	Universal	32	2' decorative pendant with (5) 6" U-T8 lamp fluorcescents.
JJ	Impact	Pendant	(5) FB032/835XP/6/ECO	Electronic	Universal	160	4' decorative pendant with (5) 6" U-T8 lamp fluorcescents.
HH	Impact	Pendant	(3) FB032/835XP/6/ECO	Electronic	Universal	96	3' decorative pendant with (3) lamp 6" U-T8 lamp fluorescents.

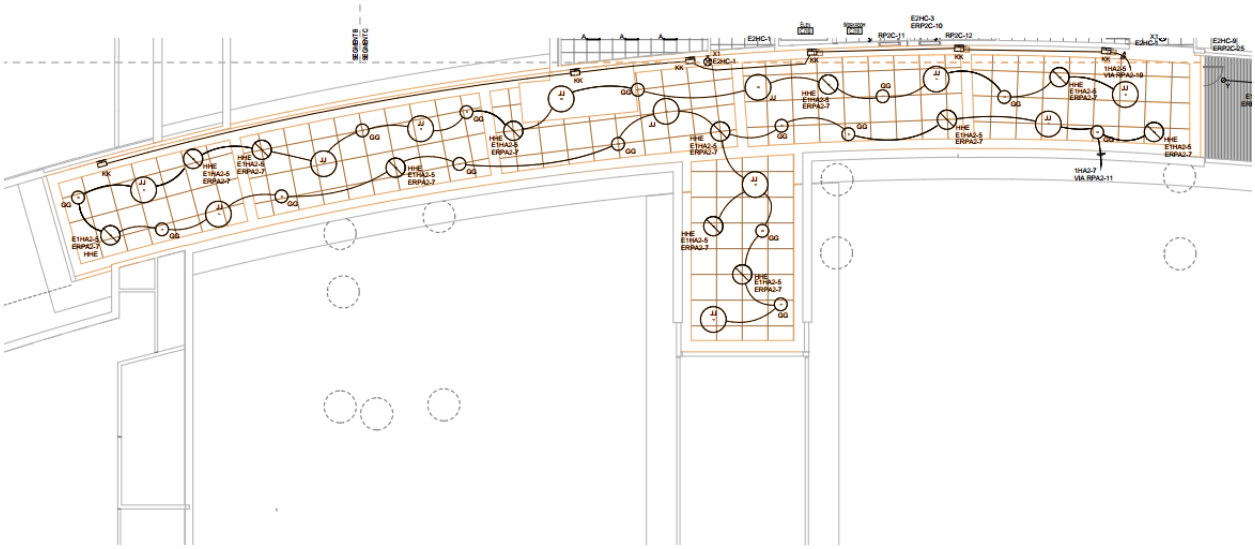

Figure 2: Reflected Ceiling Plan of Existing Lighting

Finishes and Glazing

The materials are not varied in these spaces which is good for a consistent design between the vestibule and corridor. Both floors are tiled with darker multi-colored terrazzo so a reflectance of 0.33 was assumed. The walls are gypsum with matte finish paint, color specified as “sugar almond”. Both ceilings use an acoustic tile but the vestibules are a specific style of Hunter Douglas Techstyle ceiling tiles while the corridor opts for smaller standard acoustic tiles. There is glazing on the north wall of the corridor along with the glazing for the vestibule. Both are listed in the table below.

materials							
space	floor finish	base	wall finishes				ceiling finish
			north	south	east	west	
Vestibule	Beige Field Terrazzo & Stair Treads, Green Accent Terrazzo, Brown Accent Terrazzo, Purple Accent Terrazzo	-	-	-	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	48"X48" Hunter Doulgas Techstyle Canvas-Woodrow 3203
Corridor A101	Beige Field Terrazzo & Stair Treads, Green Accent Terrazzo, Brown Accent Terrazzo, Purple Accent Terrazzo	-	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	24"x24" Acoustic Tile - Standard Tile

reflectances			
space	floor	walls	ceiling
Vestibule	0.33	0.45	0.8
Corridor	0.33	0.5	0.85

glazing					
type	T_{vis}	U_{winter}	U_{summer}	SHGC	SC
1" insulated glass, tinted low E	0.674	0.24	0.23	0.24	0.33
1" insulated tempered, tinted low E	0.55	0.25	0.22	0.35	-

Design Criteria

The design criteria for this space come from recommendations from the Illuminating Engineering Society Tenth Edition Lighting Handbook, 2009 Energy Conservation Code, and ASHRAE Standard 90.1 2010 . Specific design criteria are listed below in order of importance.

Lighting Power Density

The applicable lighting power densities are summarized in the table below. The table references both ASHRAE Standard 90.1 2007 as well as 2009 International Energy Conservation Code. Because two sources were used for the building, the chosen value on the table for design consideration is from the source with the more stringent power densities.

lighting power densities	
description	allowance (W/sq ft)
Corridor/transition	0.66
Lounge/recreation	0.73

Illuminance and Uniformity

The illuminance values below are taken from the IES Tenth Edition Lighting Handbook. The Lighting Handbook provides recommendations for illuminance based on size, space type, occupancy, and use. These are not required by code but will be used as a guideline during this design. The values suggested allow enough light for all tasks required by the space and flexibility in design.

illuminance			
function	E_h (lux)	E_v (lux)	$E_{h,avg}$:$E_{h,min}$
Break-out Study/Passageway	200	75	3:1
Independent Passageway	50	30	2:1

Psychological Aspects

As this is the first space most people will move through when entering the school, the psychological aspects are key. The vestibule should feel new but welcoming. The corridor will have children moving through it all day. The design should convey a feeling of safety and closeness while still being visually interesting for the patrons and children especially.

Controls

No controls are directly required by any code used for the project, but lighting controls are still important for this space because good controls save power. The school is almost 110,000 sq. ft with multiple corridors. Not all the corridors have a lighting design integrated with the vestibule but they can still use similar controls. The vestibule may always be on since schools generally stay lit up past hours. The corridors may utilize a time clock or occupancy sensor.

Sustainability

When a school is as big as Cypress Hill, sustainability is always a major concern, especially with the lighting. This is no exception. A sustainable design can not only potentially save the school money monthly, but also promote that effort in the students here. It's as much a practical criteria as it is a teaching tool.

Evaluation of Existing Lighting

The existing lighting is very good for the task. It lights the work plane in a reasonable and effective way. The design is very visually interesting for people walking around in the space. There truly is only one type of luminaire in this space, just with different diameters. The pendant luminaires in this space all use U-shaped T8 lamps. For all the glazing on the north wall, there is very little daylighting control but this is probably because of placement of the glazing. The north wall would not be the best for daylighting a space but overhead daylighting could be utilized. This was probably considered but abandoned in favor of the pendant heavy lighting design, which is not only completely controllable but much more varied and exciting than just standard overhead daylighting.

Library/Media Center: Large Work Space

Existing Conditions

The media center is a technology center for the students and faculty to use. It functions as both a library and technology center for research and school work. The ceiling is double high for a very open feeling while one reads or works. The large section located plan west is where most research and work will occur because it contains the library books along with computers for individual and group work. Along the wall plan south, there are tables for lounging or group activities. Because of the computers and the possibly of group work, the vertical work plane is just as important as the horizontal work plane in this space. There is also a reception desk where the librarians will work to help anyone who may need it. They will need to be able to do many different tasks such as computer work, writing, reading, cataloging, inventory, and much more.

media center			
Height (ft)	Width (ft)	Length (ft)	Area (sq. ft)
23	61	68	5633

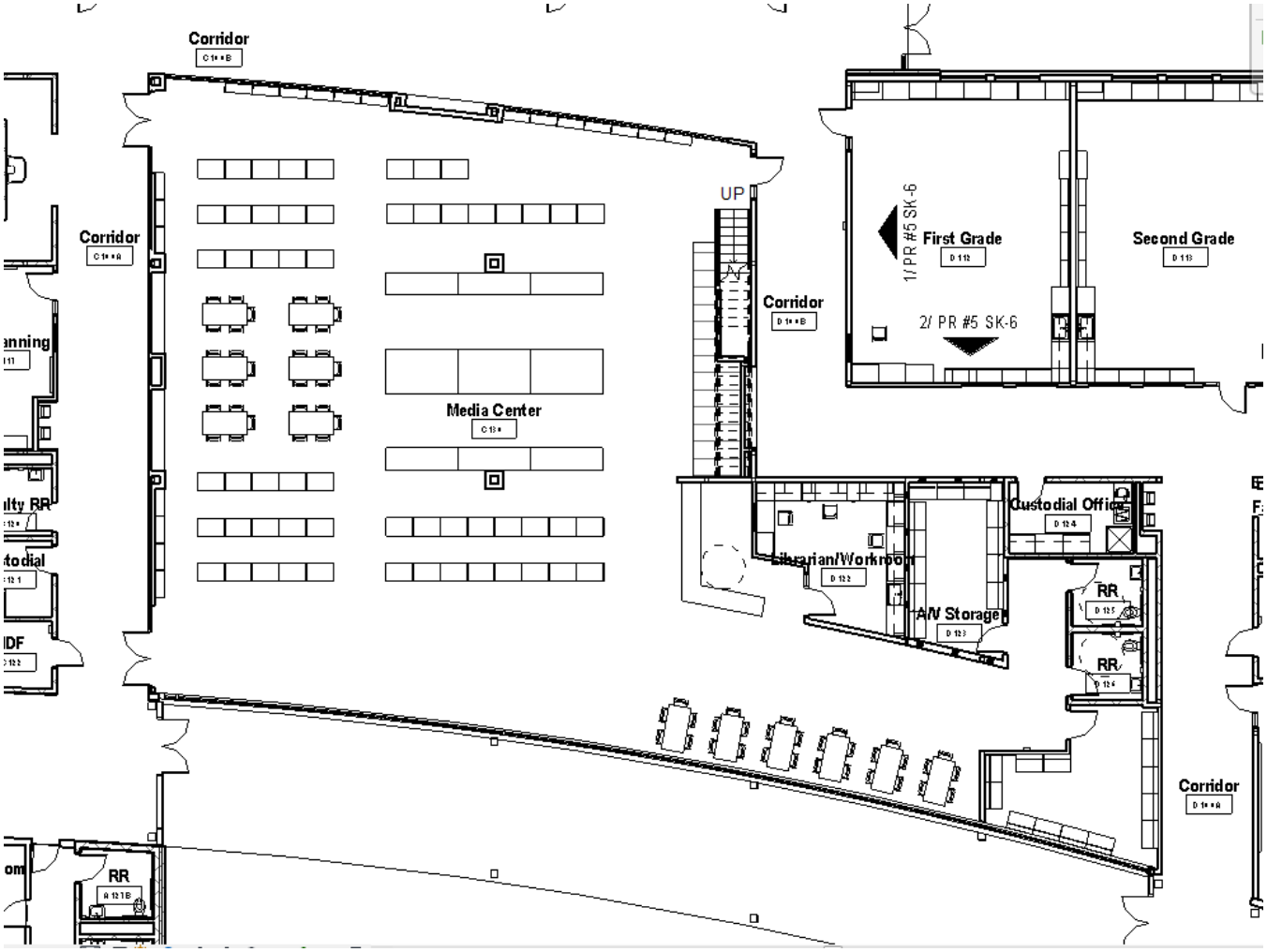

Figure 3: Plan View of Library and Media Center

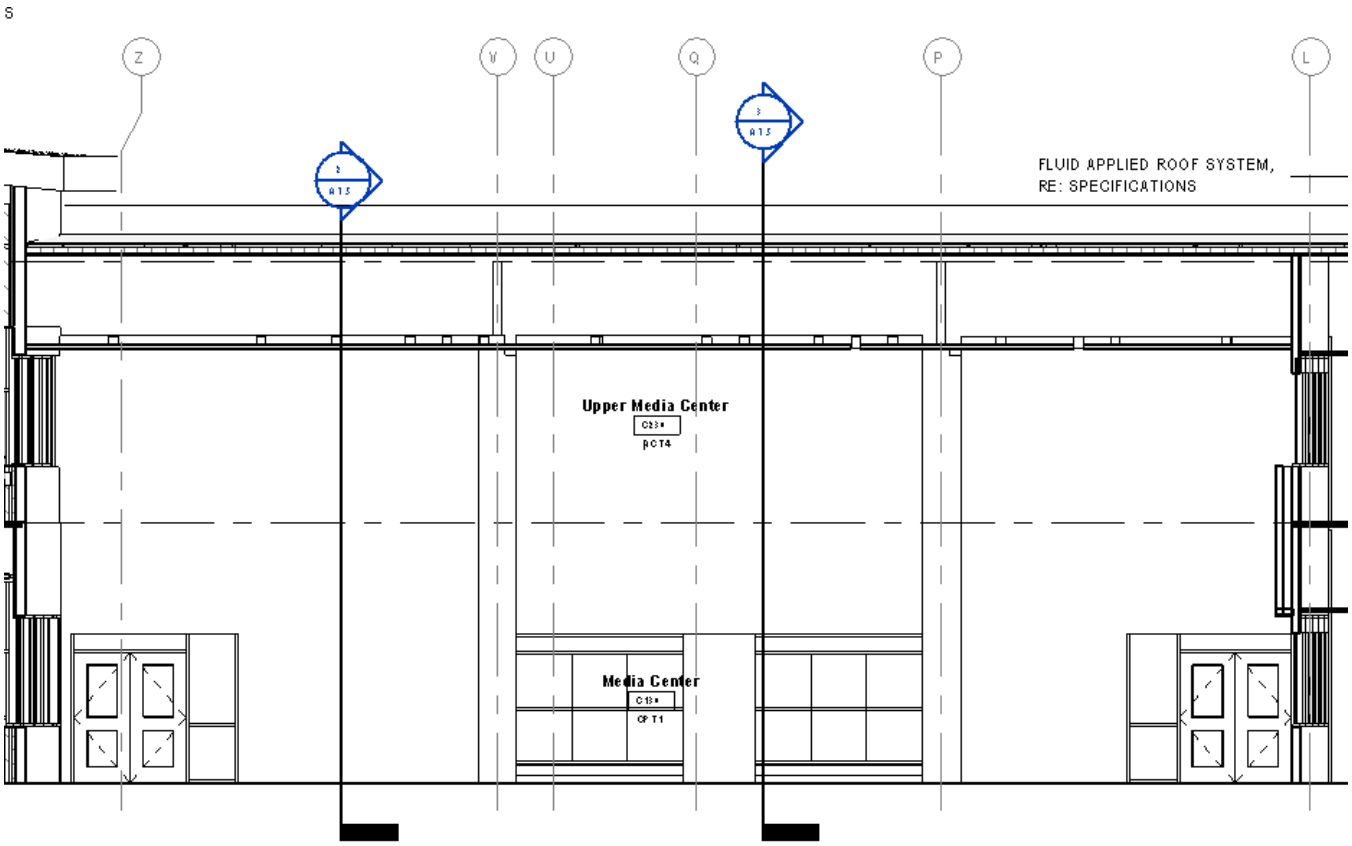

Figure 4: Section View of Library and Media Center

Lighting and Controls

The design for the library and media center is thematically connected to the corridor and vestibule's design. It utilizes the same different sized pendants but adds downlights for functionality in spaces. The pendant luminaires now weave and intersect with each other while downlights are sprinkled throughout to make sure the work plane is at the recommended values. There are downlights over the checkout desk for a more uniform distribution where the librarians and technicians work. The immediate entrance into the space uses an occupancy sensor to switch the lights at the entrance. Behind the front desk is the switching for all other light systems in the space.

type	manufacturer	mounting	lamp	ballast	voltage	input watts	description
B	Lightolier	Recessed	(1) CF32DT/E/IN/835/ECO	Electronic	Universal	32	6" aperture horizontal lamp 32W CFL luminaire with white flange and clear reflector.
GG	Impact	Pendant	(1) FB032/835XP/6/ECO	Electronic	Universal	32	2' decorative pendant with (5) 6" U-T8 lamp fluorescents.
HH	Impact	Pendant	(3) FB032/835XP/6/ECO	Electronic	Universal	96	3' decorative pendant with (3) lamp 6" U-T8 lamp fluorescents.
JJ	Impact	Pendant	(5) FB032/835XP/6/ECO	Electronic	Universal	160	4' decorative pendant with (5) 6" U-T8 lamp fluorescents.
LL	Lightolier	Recessed	(1) 70W PAR38 CMH	-	Universal	70	7" recessed metal halide downlight serving upper media center.

Figure 5: Reflected Ceiling Plan of Existing Lighting in Media Center

Finishes and Glazing

There are very few materials in this space even though it has many functions. The same sugared almond color is present in this space which ties the interior design to the pendant lighting design that keeps popping up in these spaces. The purple finish on the floor provides a low reflectance to facilitate work as it is not distracting. The ceiling uses Hunter Douglas Techstyle acoustic tiles with a relatively high reflectance. Most of the ceilings looked at this report have similar Hunter Douglas acoustic tiles because of the uplight of the pendant. The reflectance for the ceiling is crucial for the design because of the direct-indirect classification of the pendant luminaries used. In the second story of the media center there are clerestory windows which are good for the natural daylight in the space. The glazing is listed below.

materials							
space	floor finish	base	wall finishes				ceiling finish
			north	south	east	west	
Media Center	Tandus Powerbond - Median, Royal Purple 02813-30515	Flexo - Bark 02	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	48' X 48' Hunter Douglas Techstyle Canvas - Woodrow 3203

reflectances			
space	floor	walls	ceiling
Media Center	0.25	0.5	0.8

glazing					
type	T_{vis}	U_{winter}	U_{summer}	SHGC	SC
1" insulated glass, tinted low E	0.674	0.24	0.23	0.24	0.33

Design Criteria

The design criteria for this space come from recommendations from the Illuminating Engineering Society Tenth Edition Lighting Handbook, 2009 Energy Conservation Code, and ASHRAE Standard 90.1 2010 . Specific design criteria are listed below in order of importance.

Lighting Power Density

The applicable lighting power densities are summarized in the table below. The table references both ASHRAE Standard 90.1 2007 as well as 2009 International Energy Conservation Code. Because two sources were used for the building, the chosen value on the table for design consideration is from the source with the more stringent power densities.

lighting power densities	
description	allowance (W/sq ft)
Card file and cataloging	0.72
Reading area	0.93
Stacks	1.71

Illuminance and Uniformity

The illuminance values below are taken from the IES Tenth Edition Lighting Handbook. The Lighting Handbook provides recommendations for illuminance based on size, space type, occupancy, and use. These are not required by code but will be used as a guideline during this design. The values suggested allow enough light for all tasks required by the space and flexibility in design.

illuminance			
type	E_h (lux)	E_v (lux)	$E_{h,avg}$:$E_{h,min}$
Lending Desk	300	100	2:1
Computer Center	300	100	2:1
Reading and Writing	300	75	-
Book Stacks	200	200	2:1

Controls

No controls are directly required by any code used for the project, but lighting controls are still important for this space because good controls save power. The school is almost 110,000 sq. ft with multiple corridors. Not all the corridors have a lighting design integrated with the vestibule but they can still use similar controls. The vestibule may always be on since schools generally stay lit up past hours. The corridors may utilize a time clock or occupancy sensor.

Glare

Because of the space's nature, glare angles should be considered and avoided. A lot of room in the space is dedicated to writing, reading and working. These are things that could be easily disrupted by glare.

Psychological Aspects

This space is, most of all, for work. In addition to the front desk, there are also work desks throughout as well as tables for individual thought. The media center hub in the middle also has a number of computers for work that requires them. The design should encourage a calm and productive working environment.

Sustainability

A sustainable design would include the clerestory windows in a larger capacity. A sustainable design is important for the school because of its size. When dealing with a building with an ecological footprint as large as Cypress Hill Elementary, the more sustainable the design, the better. Even if it proves to be not feasible, sustainability should be considered. Since schools are usually built to last at least 50 years, a sustainable design is a good move.

Evaluation of Existing Lighting

The existing lighting does a good job of lighting all the spaces evenly and effectively. The downlights utilized do not distract from the main design with the pendants and move from ancillary to primary in the administrative spaces like the desk. This distinction creates a visual order for the spaces. The structure of the downlights above the front desk implies a different attitude than the rest of the library and media center. Meanwhile, in the main pendant design in the media center, the downlights from the desk are peppered throughout to unite the entire space. The clerestory windows could be utilized to a greater degree for natural daylighting. The number of metal halide is pretty significant compared to the other luminaires but metal halide sources are generally very efficacious. The average illuminance is 463 lux or about 43 footcandles which is a little high for this type of space. The patterning of the pendant luminaires creates a large hot spot and the metal halides almost seem like an afterthought. They are not as integrated as the pendants. They function differently from the downlight luminaires over the desk. Those create a partition through the light source. The metal halide luminaires are just placed around to pick up the slack of the pendant luminaires.

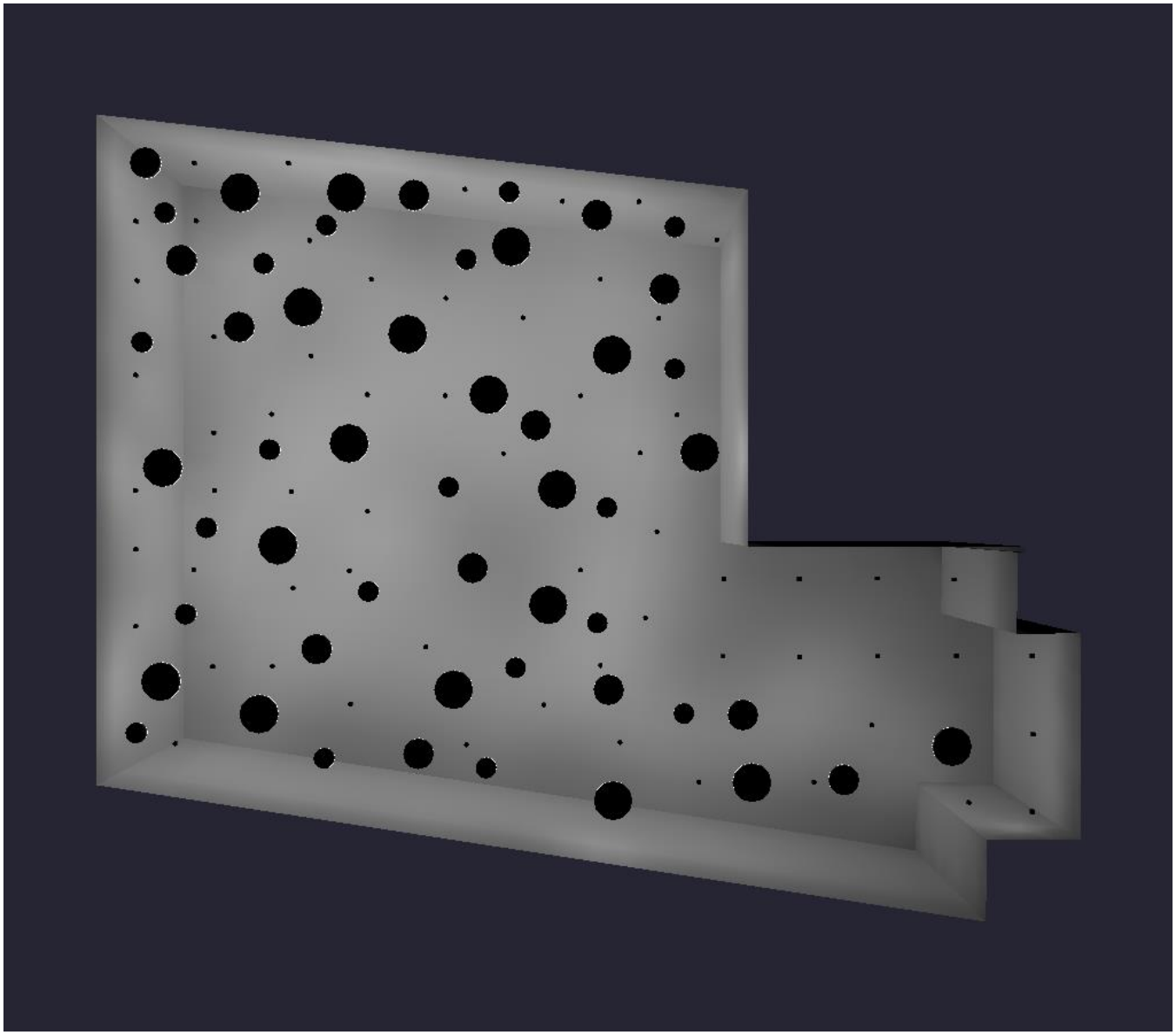

Figure 6: Ceiling Plan of Existing Lighting in AGi32

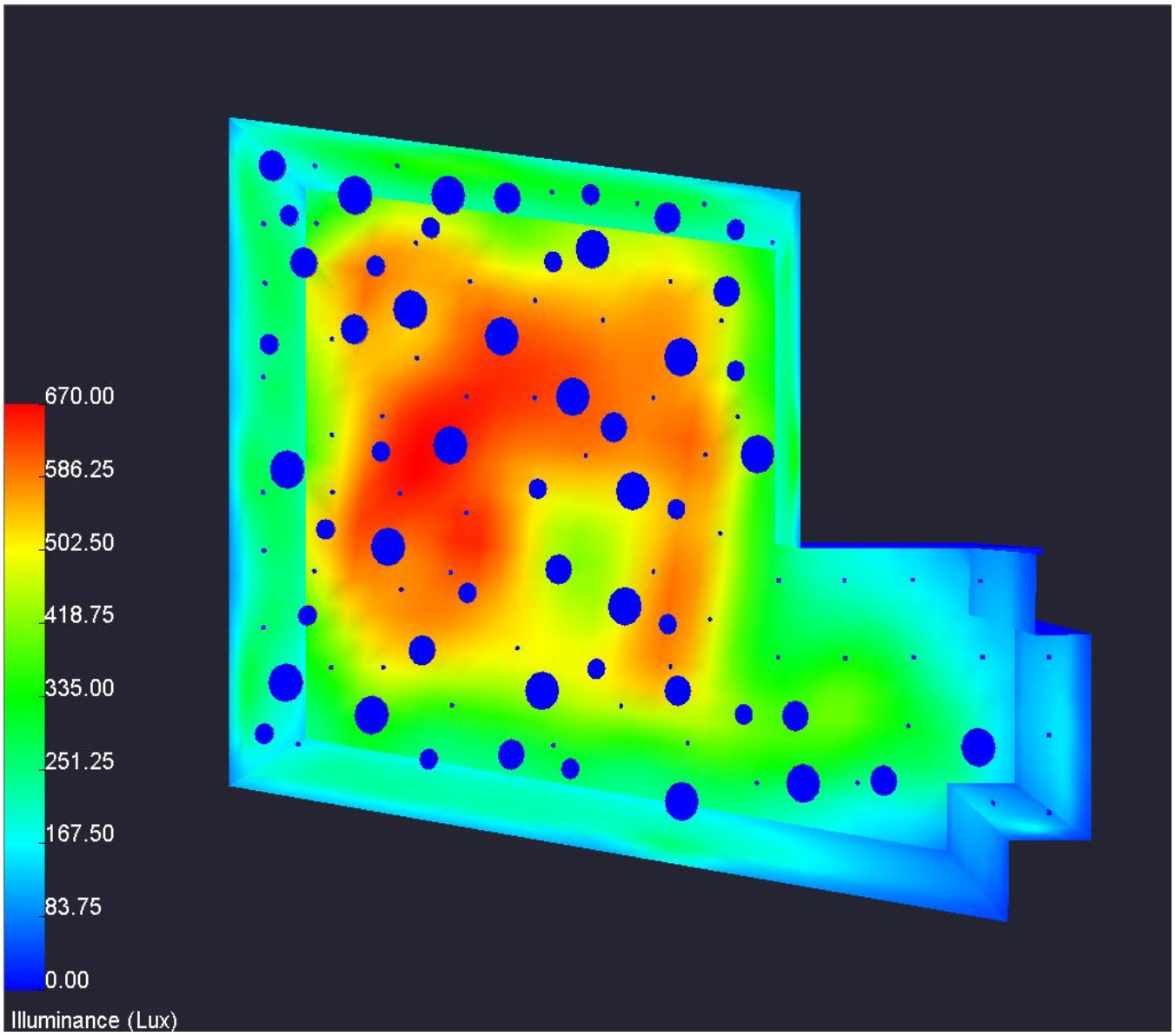

Figure 7: Ceiling Plan of Existing Lighting in AGi32 with pseudo color

CAFETERIA: SPECIAL PURPOSE SPACE

Existing Conditions

The cafeteria is a large space with a double height ceiling for a 28' wall height. It is 55.5' long and 65' wide. The cafeteria is where the students are served and eat their lunches, either brought from home or prepared and sold to them by the district. This space also doubles as a stage space for a number of different possibilities, such as music, dances, plays, and other large scale gatherings. The stage also comes equipped with a digital projector for the audio/visual hook up to a computer. The most common function, however, is for consumption of food. With so many different possibilities for this space, a scene control could be very beneficial.

cafeteria			
Height (ft)	Width (ft)	Length (ft)	Area (sq. ft)
Varies	66	80	5326.5

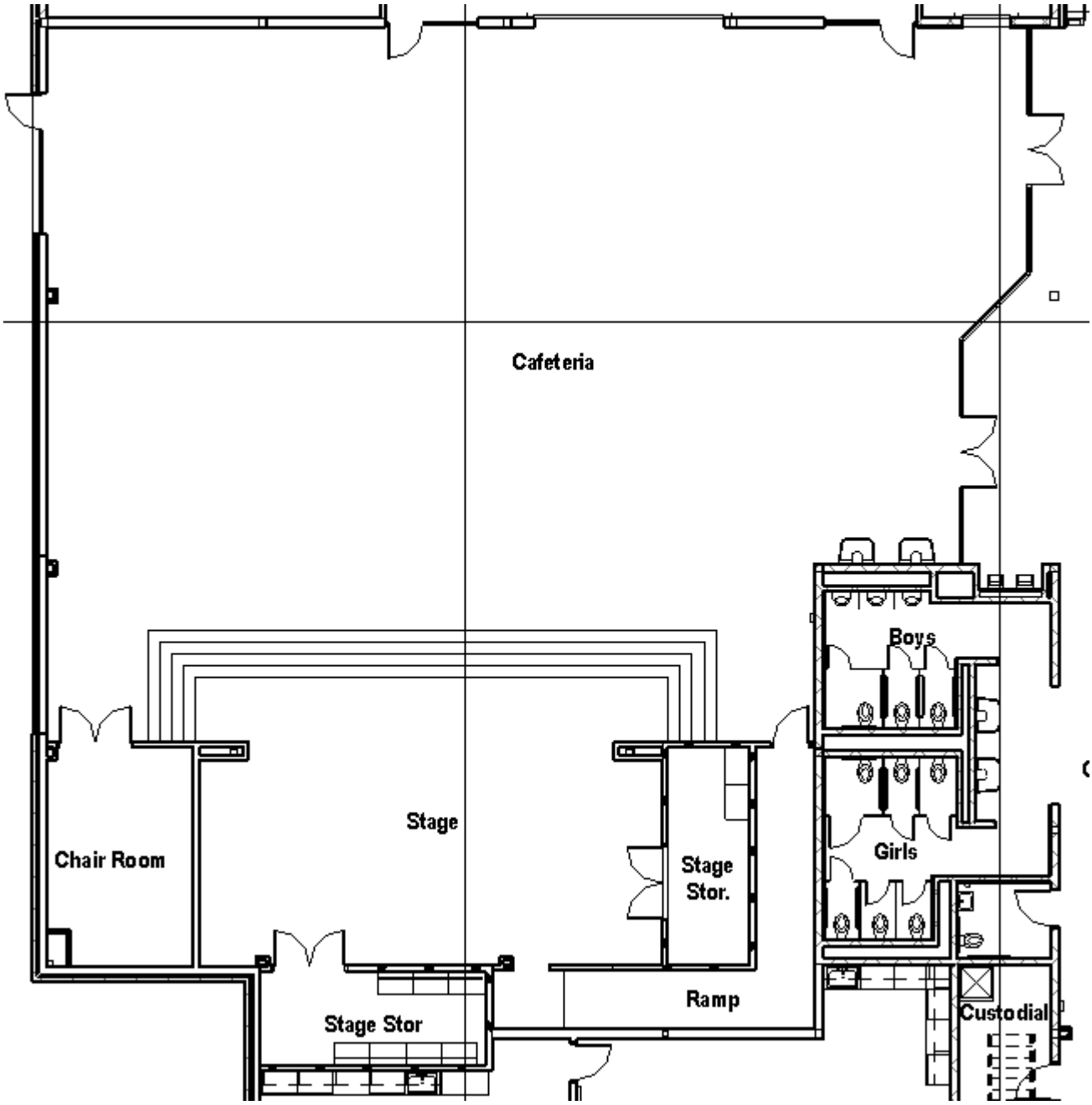

Figure 8: Plan View of Cafeteria and Stage

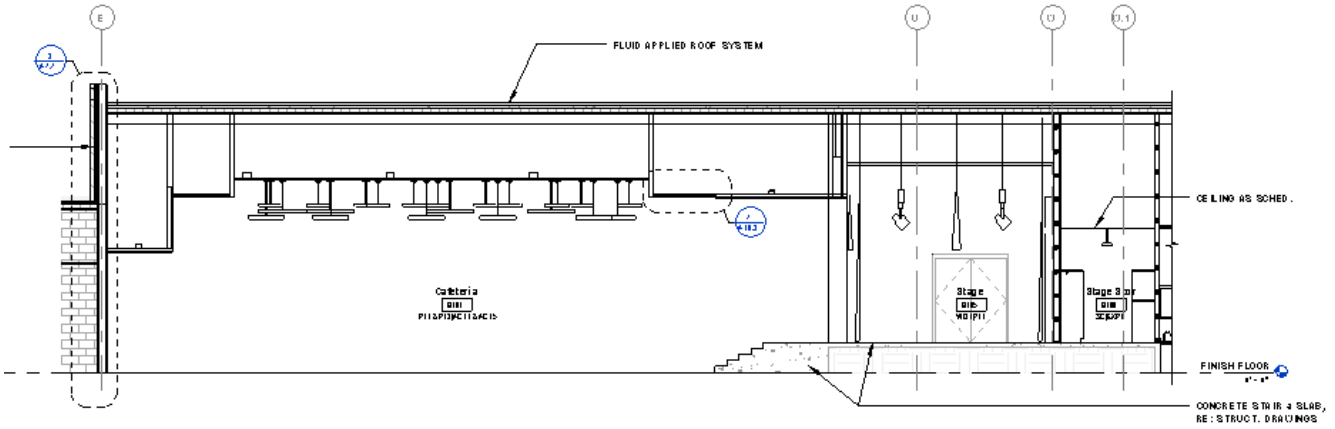

Figure 9: Section View of Cafeteria and Stage

Lighting and Controls

The lighting design in this space connects thematically to the vestibule/corridor and the media center. This design uses the same round pendants as the other two. They are hung at different heights throughout the space and the ceiling has a couple different heights. The lighting design completely changes design once it crosses the threshold of the stage. This part of the design abandons the pendant motif and goes for a very functional set of lights for stage productions and to work with use of the stage. Around the edges of the room, outside the pendants there are downlights for coverage. These downlights bleed into the pendants design and become an ancillary part. Back behind the stage the design simplifies significantly is essentially just linear fluorescent luminaires. Dimmable incandescent luminaries are immediately above the stage for stage lighting. 4-way switching at the plan north west corner of the room controls pendants and downlights in the main part of the cafeteria. Plan north east corner has the other switching for the design. Backstage there is also switching for these lights along with switching for the backstage linear fluorescents. The stage lighting above goes to a tertiary control room.

type	manufacturer	mounting	lamp	ballast	voltage	input watts	description
B	Lightolier	Recessed	(1) CF32DT/E/IN/835/ECO	Electronic	Universal	32	6" aperature horizontal lamp 32W CFL luminaire with flange and clear reflector.
C	Lightolier	Recessed	(1) 100W PAR38 HIR NFL 27	Electronic	120	100	6" aperature incandescent recessed downlight - to be dimmed.
H	Lightolier	Suspended	(2) F032/835/XPS/ECO	Electronic	Universal	64	2-lamp T8 fluorescent strip fixture.
Y	Lightolier	Wall	(1) CF32DT/E/IN/835/ECO	Electronic	Universal	64	2-lamp 32W CFL 8" open fluorescent downlight.
GG	Impact	Pendant	(1) FB032/835XP/6/ECO	Electronic	Universal	32	2' decorative pendant with (5) 6" U-T8 lamp fluorescents.
HH	Impact	Pendant	(3) FB032/835XP/6/ECO	Electronic	Universal	96	3' decorative pendant with (3) lamp 6" U-T8 lamp fluorescents.
JJ	Impact	Pendant	(5) FB032/835XP/6/ECO	Electronic	Universal	160	4' decorative pendant with (5) 6" U-T8 lamp fluorescents.

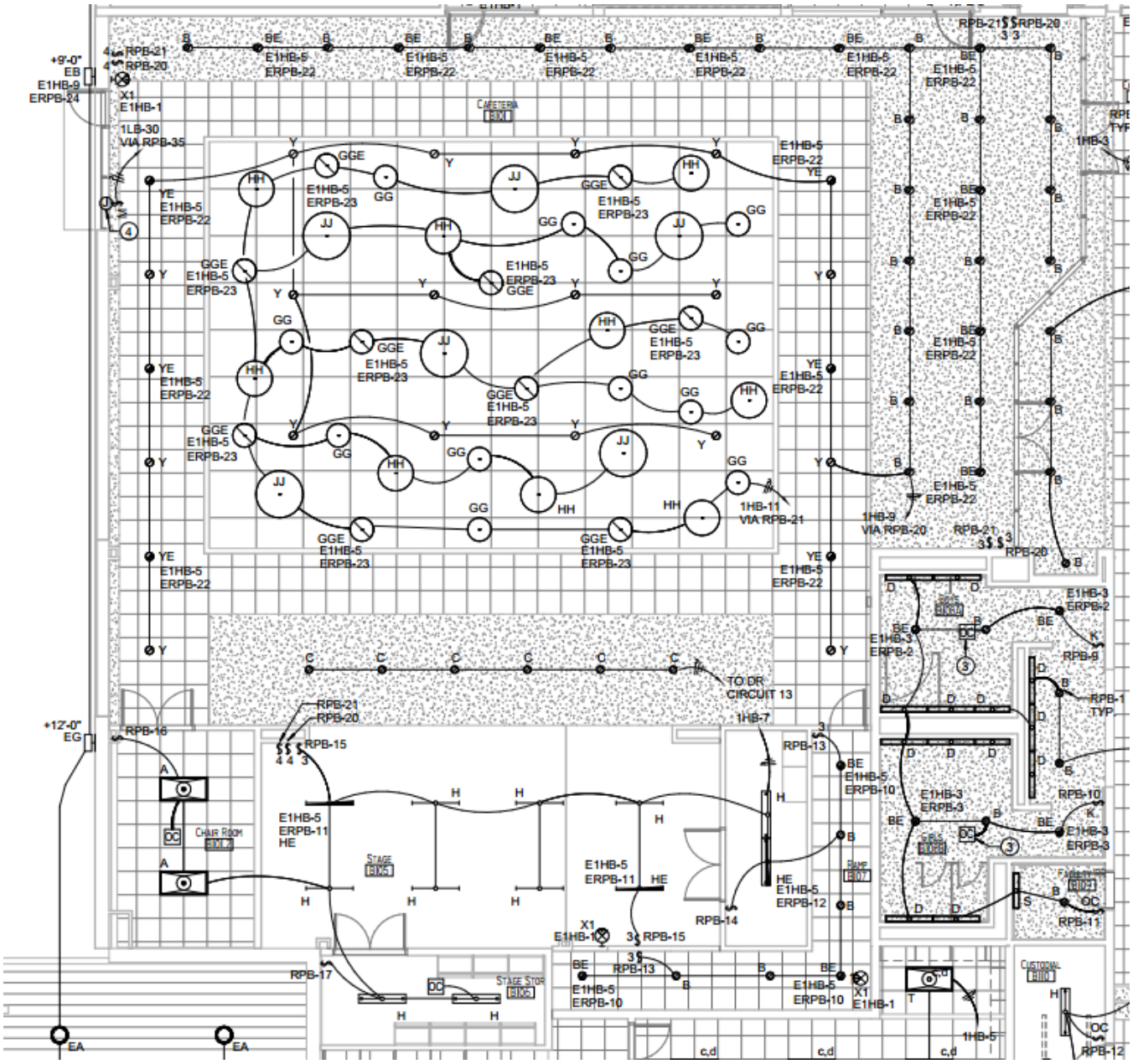

Figure 10: Reflected Ceiling Plan of Existing Lighting in Cafeteria

Finishes and Glazing

materials							
space	floor finish	base	wall finishes				ceiling finish
			north	south	east	west	
Cafeteria	Daltile Yacht Club - Cockpit (6X36)	Daltile Semi-Gloss, Biscuit	ICI Paint - Sugared Almond Color	Limestone Tile	ICI Paint - Sugared Almond Color	ICI Paint - Sugared Almond Color	24" X 24" Acountic Tile - Standard
	Daltile Stone Age - Antimonio (12X24)						48" X 48" Hunter Douglas Techstyle Canvas - Blue Chiffon

There are two different types of flooring and ceiling tiles used for this space along with two ceiling types. The sugared almond paint is present again except for the south wall which has a limestone tile. This changes the overall reflectance of the wall slightly. The double ceilings and floor is because of how the space is partitioned, at least as far as functionality goes. The ceiling breaks the space into its different components and segregates the stage from the cafeteria from the circulation space around the cafeteria. There is no glazing in this space.

reflectances			
space	floor	walls	ceiling
Cafeteria	0.4	0.52	0.75

Design Criteria

The design criteria for this space come from recommendations from the Illuminating Engineering Society Tenth Edition Lighting Handbook, 2009 Energy Conservation Code, and ASHRAE Standard 90.1 2010 . Specific design criteria are listed below in order of importance.

Lighting Power Density

The applicable lighting power densities are summarized in the table below. The table references both ASHRAE Standard 90.1 2007 as well as 2009 International Energy Conservation Code. Because two sources were used for the building, the chosen value on the table for design consideration is from the source with the more stringent power densities.

lighting power densities	
description	allowance (W/sq ft)
Casual dining	1.31

Illuminance and Uniformity

The illuminance values below are taken from the IES Tenth Edition Lighting Handbook. The Lighting Handbook provides recommendations for illuminance based on size, space type, occupancy, and use. These are not required by code but will be used as a guideline during this design. The values suggested allow enough light for all tasks required by the space and flexibility in design.

illuminance			
function	**E_h (lux)**	**E_v (lux)**	**$E_{h,avg}$:$E_{h,min}$**
Demonstration	1000	500	3:1
Assembly	50	30	2:1
Cafeteria	Avg = 3 times adjacent area E_h, but < 100	Avg = 3 times adjacent area E_v, but < 30	3:1

Psychological Aspects

As this is the first space most people will move through when entering the school, the psychological aspects are key. The vestibule should feel new but welcoming. The corridor will have children moving through it all day. The design should convey a feeling of safety and closeness while still be visually interesting for the patrons and children especially.

Controls

No controls are directly required by any code used for the project, but lighting controls are still important for this space because good controls save power. The school is almost 110,000 sq. ft with multiple corridors. Not all the corridors have a lighting design integrated with the vestibule but they can still use similar controls. The vestibule may always be on since schools generally stay lit up past hours. The corridors may utilize a time clock or occupancy sensor.

Sustainability

When a school is as big as Cypress Hill, sustainability is always a major concern, especially with the lighting. This is no exception. A sustainable design can not only potentially save the school money monthly, but also promote that effort in the students here. It's as much a practical criteria as it is a teaching tool.

Evaluation of Existing Lighting

The existing lighting for this space is well designed. It is a very multi-faceted design for the many different functions of the cafeteria. The downlights are a welcome addition to the pendant luminaires because they are there for support and to provide coverage for circulation. The design is flexible enough to work within the four different ceiling heights and the different use areas (dining, stage, etc.). The average luminance in the space is 425 lux or about 40 footcandles which seems high. The average for a cafeteria space is based on the adjacent spaces so an average of 425 might be reasonable. The stage has an average of about 600 lux or about 55 footcandles. These numbers look more reasonable since the stage will be used for demonstrations or

during assemblies. One aspect of the design that is impressive is the uniformity. Even with different uses, ceiling heights, and light sources, the lighting is still very uniform across the work plane.

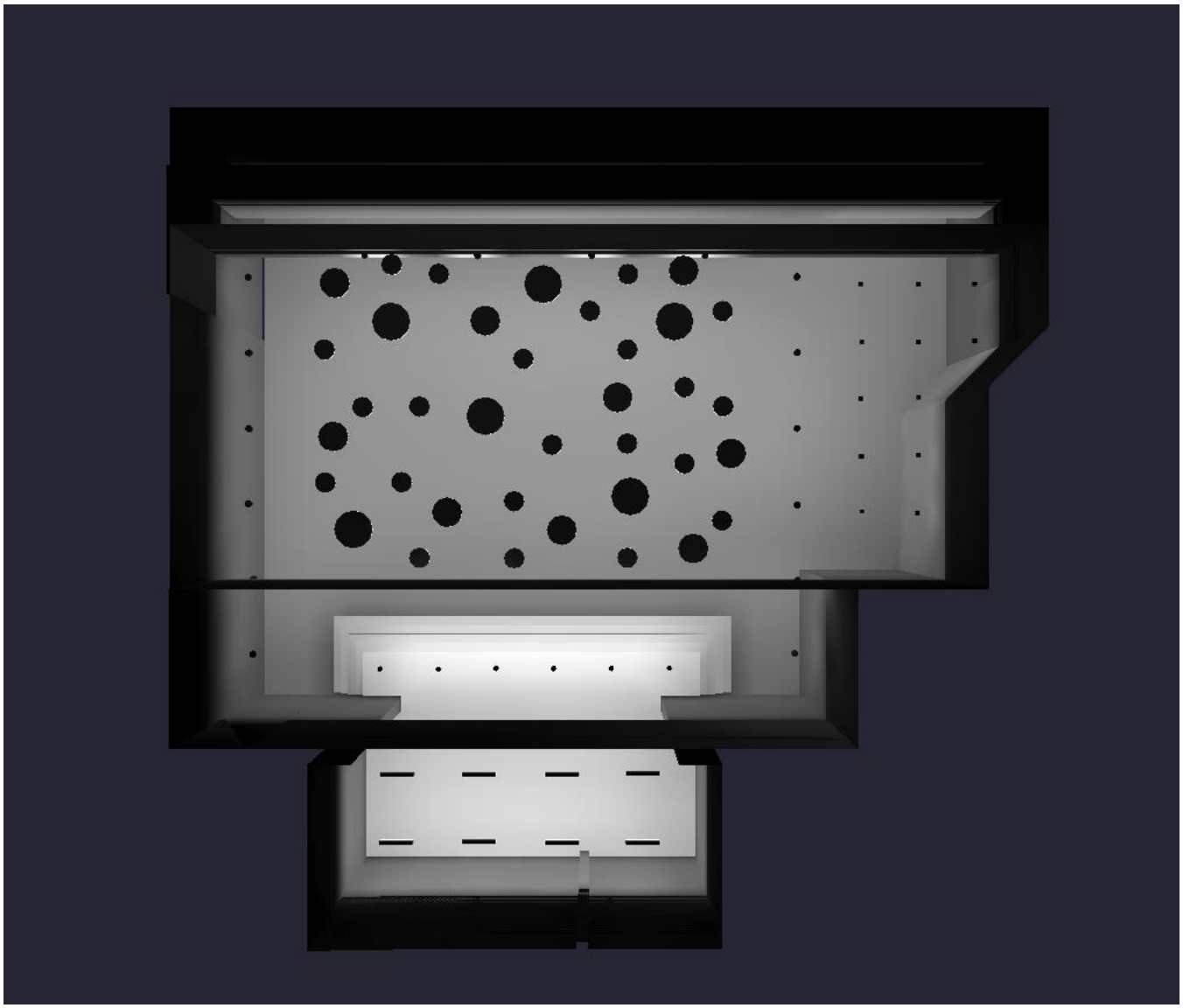

Figure 11: Ceiling Plan of Existing Lighting in AGi32

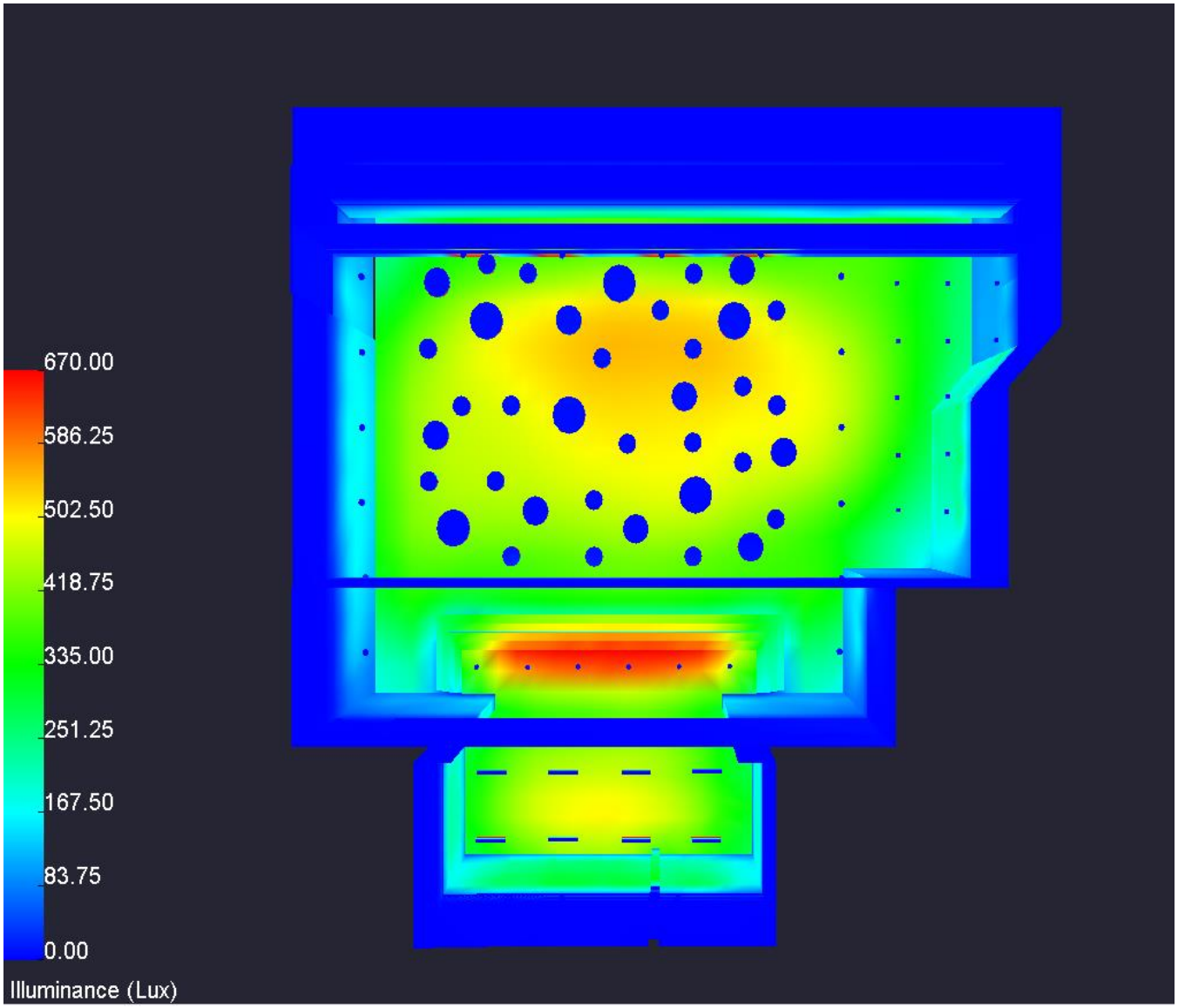

Figure 12: Ceiling Plan of Existing Lighting in AGi32 with pseudo color and scale

Façade: Outdoor Space

Existing Conditions

The façade is a limestone veneer with glass curtain walls. The south façade is interesting because of its varying heights in spots. The building maintains a solid profile by filling in the height gaps with curtain walls. It creates a nice effect for a potential patron entering the school. Because of the curtain walls, there is a lot of potential for daylighting inside. The south façade also serves as the main entrance to the school. To the incoming students and parents, it serves as a sort of representative for the school itself. This is enhanced by the school's name above the vestibule. For this façade, there will be three different concepts for the lighting.

façade		
Length (ft)	Height (ft)	Area (sq. ft)
15,386	23	353,878

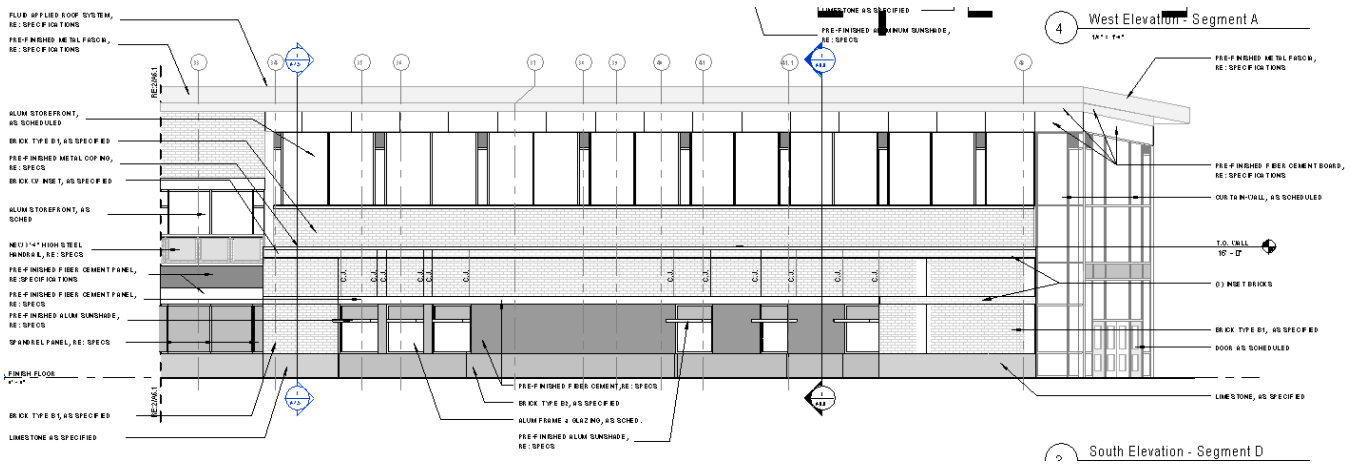

Figure 13: South façade segment 1

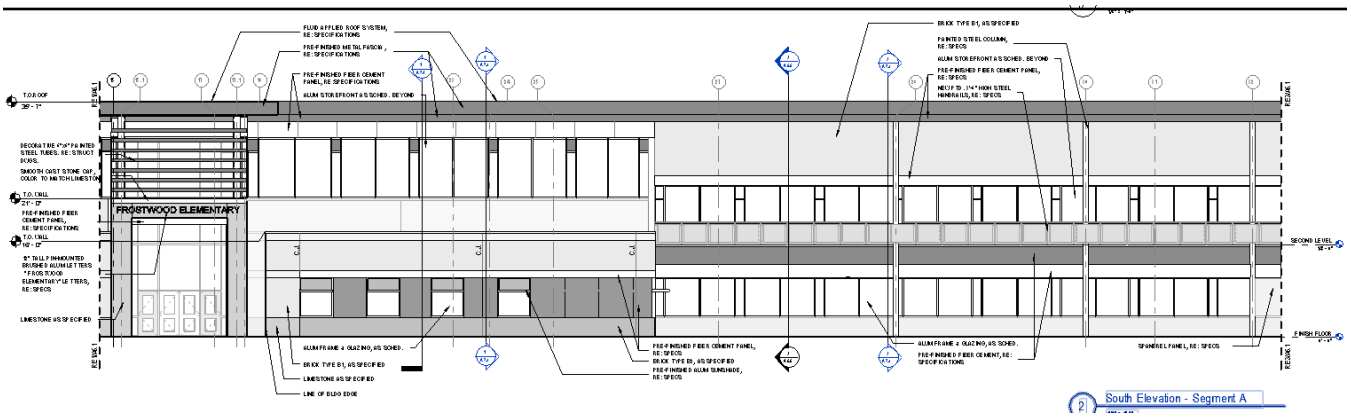

Figure 14: South façade segment 2

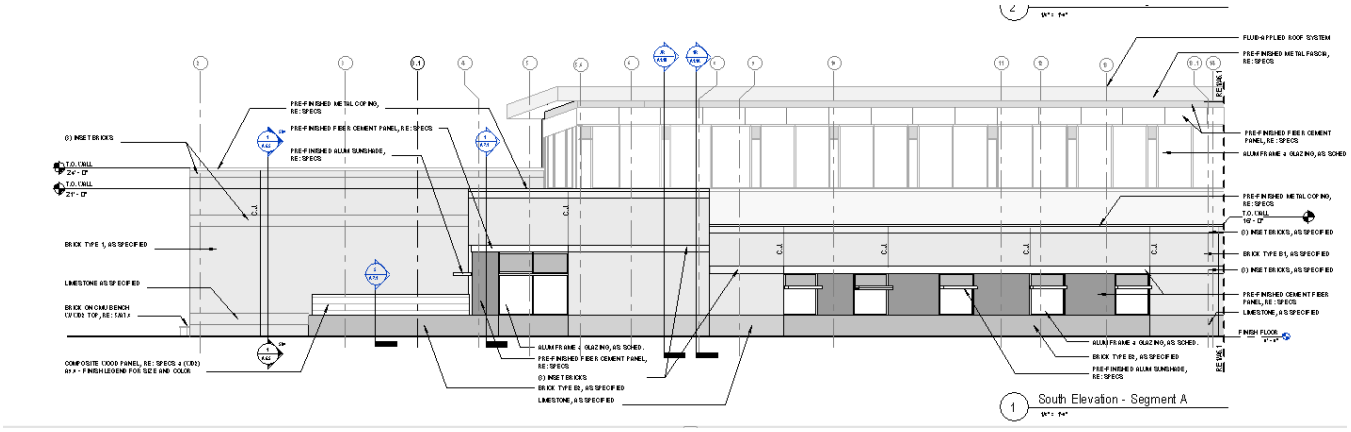

Figure 15: South façade segment 3

Lighting and Controls

Site lighting for parking exists but currently, there is no decorative façade lighting. The lights are on an automatic time clock switching which can be controlled from the box outside should it need to be serviced.

type	manufacturer	mounting	lamp	ballast	voltage	input watts	description
SL1-ALT	Visionaire	Pole	192 LEDs, 21,576 lumen	-	480	304	Sinlge LED shoebox mounted on 20' pole
SL2-ALT	Visionaire	Pole	(2) 193 LEDs, 21,576 lumen	-	480	608	Double LED shoebox mounted on 20' pole.

Finishes and Glazing

There are many different stone veneers on the south façade along with the sign above the vestibule. The walls are a beige brick and limestone around the lower part of the perimeter. Additionally, there are also a large amount of curtain wall systems throughout the façade. Some are just windows while others are for natural daylighting into the corridors of the school. Glazing is listed below.

glazing					
type	T_{vis}	U_{winter}	U_{summer}	SHGC	SC
1" insulated glass, tinted low E	0.674	0.24	0.23	0.24	0.33
1" insulated tempered, tinted low E	0.55	0.25	0.22	0.35	-

Design Criteria

The design criteria for this space come from recommendations from the Illuminating Engineering Society Tenth Edition Lighting Handbook, 2009 Energy Conservation Code, and ASHRAE Standard 90.1 2010 . Specific design criteria are listed below in order of importance.

Lighting Power Density

The applicable lighting power densities are summarized in the table below. The table references both ASHRAE Standard 90.1 2007 as well as 2009 International Energy Conservation Code. Because two sources were used for the building, the chosen value on the table for design consideration is from the source with the more stringent power densities.

lighting power densities	
description	allowance (W/sq ft)
Façade	0.2 W/sq ft. for each illuminated wall or surface or 5.0 watts per linear foot for each illuminated wall or surface length.

Illuminance and Uniformity

The illuminance values below are taken from the IES Tenth Edition Lighting Handbook. The Lighting Handbook provides recommendations for illuminance based on size, space type, occupancy, and use. These are not required by code but will be used as a guideline during this design. The values suggested allow enough light for all tasks required by the space and flexibility in design. Because this is façade lighting, model lighting ordinance will also be followed. The zoning is defined below in accordance with IES.

zone	recommened uses or area	zoning considerations
LZ-2	Lighting Zone 2 pertains to areas with moderate ambient lighting levels. These typically include muiltfamily residential uses, institutional residentials uses, schools, churches, hospitals, hotels/motels, commercial and/or businessess areas with evening activites embedded in predominately residential area, neighborhood serving recreational and playing fields and/or mized use developments with a predominance of residental uses. Can be used to accommodate a district of outdoor sales or industry in an area otherwise zoned LZ-1.	Recommened default zone for light commerical business districts and high density or mixed use residential. Includes neighborhood business districts; churches, schools and neighborhood recreation facilities; and light industrial zoning with modest nighttime uses or lighting requirements.

illuminance			
type	E_h (lux)	E_v (lux)	$E_{h,avg}$:$E_{h,min}$
LZ2 Medium Activity; reflectances greater than 0.5	Apply strategically to ≤ 15% of area of building façade.		-

Psychological Aspects

The façade needs to be well lit and feel open to the public. A school should not feel suffocating. It needs to be welcoming while still being decorative and bringing out details of the architecture. A child should see the school at night, lit up, and be excited to come in the next morning.

Controls

No controls are directly required by any code used for the project, but lighting controls are still important for this space because good controls save power. The school is almost 110,000 sq. ft with multiple corridors. Not all the corridors have a lighting design integrated with the vestibule but they can still use similar controls. The vestibule may always be on since schools generally stay lit up past hours. The corridors may utilize a time clock or occupancy sensor.

Sustainability

As the façade lighting is completely decorational, it will probably be less sustainable than the other spaces discussed in this report. However, large strides will be taken to make sure the design is as sustainable as possible without compromising the integrity of the design.

Evaluation of Existing Lighting

Because this is an educational facility and focused on the betterment of its occupants and not necessarily on its aesthetics, there is no existing façade lighting. They probably felt that it was not necessary to the design and it was either never considered or simply value engineered out. There are a number of pole lights for parking and driving around the school. They do not sufficiently light façade in a compelling way however.