Kliment Halsband Architects

NYC School Construction Authority Green Schools Rating System

60% CONSTRUCTION DOCUMENTS REPORT - FINAL
PS/IS 71R
Region 7, District 31, Staten Island, New York
LLW# 46429

14 July 2011

Viridian Energy & Environmental LLC

PS/IS 71R
60% CD NYC Green Schools Re-Submission
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SCA School Construction Authority

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NYC Green Schools Rating System 2009

	SD	DD	60%	100%	Const
Submission (Check one):			X		

Project: **PS/IS 71R - Targee Street School**
Address | Zip Code: **Targee Street, Staten Island**
LLW #: **46429**
Design #:
Architect: **R.M. Kliment & Frances Halsband Architects**
Submission Date: **June 3, 2011**
Reviewer :
Reviewer Sign Off:

Credit Names	BD&C Reference LEED for Schools 2009	CHPS Reference	NYC GSG 2009	Credit Description and Relevant Information and Drop-Down Menus	RPC (check project zipcode in GSG) [5]	Required For all Projects	Required if Feasible [1]	Optional Credits [2]	If Anticipated, or if Documented: [3] Enter point value, or Select NF if Not Feasible, or if Not Pursued: Design Phase	Construction Phase	Auto Filled: Blank if Pursued, Enter No. of Points if Not Pursued or if Not Feasible or Additional Credit Not Pursued
Site				**31% of Total Points**					**Points:**	**16 out of 19**	
	SS Pr 1		S 1.1R	**Construction Activity Pollution Prevention**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
	SS 1		S 1.2R	**Site Selection**		1			1		
		1.1.7	S 1.3	**Sustainable Site & Building Layout**		NP	☑ YES		Indicate Pursuit		☐ NO
Site Selection	SS 2		S 1.4	**Development Density & Community Connectivity**	RPC		4		4		
	SS 10	1.1.2	S 1.5R	**Joint Use of Facilities, Community Access**		1			1		
	SS Pr 2		S 1.6R	**Site Assessment**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
	SS 3		S 1.7	**Brownfield Redevelopment**			1			NF	1
	SS 4.1		S 2.1	**Alternative Transportation,** Public Transportation Access	RPC		4		4		
Transportation	SS 4.2		S 2.2	**Alternative Transportation,** Bicycle Storage & Changing Rooms			1		1		
	SS 4.3/4.4		S 2.3R	**Alternative Transportation,** Fuel-Efficient Vehicles/Parking Cap.		2			2		
Minimize Impact on Site	SS 5.1		S 3.1	**Site Development,** Protect or Restore Habitat	RPC		1			NF	1
	SS 5.2		S 3.2	**Site Development,** Maximize Open Space			1		1		
Stormwater Design	SS 6.2		S 4.1	**Stormwater Design,** Quality Control			1		NF		1
Heat Island Effect	SS 7.2		S 5.1	**Heat Island Effect,** Roof			1		1		
Outdoor Lighting	SS 8		S 6.1R	**Light Pollution Reduction**		1			1		
				Site Category Sub-Total:		5	14		16	0	3
Water				**12% of Total Points**					**Points:**	**6 out of 8**	
Outdoor Systems	WE 1.1		W 1.1	**Water Efficient Landscaping**, Reduce by 50%			2		2		
	WE 1.1		W 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation			2		2		
	WE Pr 1		W 2.1R	**Water Use Reduction**, 20% Reduction		NP	☑ YES		Credit Req'd - Confirm Pursuit		
Indoor Systems	WE 3		W 2.2R	**Water Use Reduction**, 30% Reduction		2			2		
	WE 3		W 2.3R	**Water Use Reduction**, 35% Reduction		1					1
	WE 3		W 2.4	**Water Use Reduction**, 40% Reduction			1		NF		1
				Water Category Sub-Total:		3	5		6		2
Energy				**10% of Total Points**					**Points:**	**5 out of 7**	
Commissioning	EA Pr 1		E 1.1R	**Fundamental Commissioning**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
	EA 3		E 1.2R	**Enhanced Commissioning**		2				2	
Refrigerant Management	EA Pr 3		E 2.1R	**Fundamental Refrigerant Management**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
	EA 4		E 2.2	**Enhanced Refrigerant Management**			2		NF		2
Verification	EA 5		E 3.1R	**Measurement & Verification**		1				1	
		3.3.5	E 3.2R	**Energy Management System Controls,** HVAC & H. W. Systems		NP	☑ YES		Indicate Pursuit		☐ NO
Energy Efficiency	EA Pr 2		E 4.1R	**Minimum Energy Performance**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
		3.1.2	E 4.2R	**HVAC System Sizing,** Avoid Oversizing		NP	☑ YES		Indicate Pursuit		☐ NO
Power	EA 6		E 5.1R	**Green Power**		2				2	
				Energy Category Sub-Total:		5	2		0	5	2
Materials				**14% of Total Points**					**Points:**	**7 out of 10**	
	MR Pr 1		M 1.1R	**Storage & Collection of Recyclables**		NP	☑ YES		Credit Req'd-Confirm Pursuit		
	MR 1.1		M 1.2	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	RPC		1			NF	1
	MR 1.1		M 1.3	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof			1			NF	1
Efficient Material Use	MR 1.2		M 1.4	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements			1			NF	1
	MR 2		M 1.5R	**Construction Waste Management**, Divert 50% from Disposal		1				1	
	MR 2		M 1.6	**Construction Waste Management**, Divert 75% from Disposal			1			1	
	MR 2		M 1.7	**Construction Waste Management**, Divert 95% from Disposal			1			1	
	MR 4		M 2.1R	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)		1				1	
	MR 4		M 2.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)			1			1	
Sustainable Materials	MR 5		M 2.3	**Regional Materials**, 10% Extracted, Processed & Manufactured			1			1	
	MR 5		M 2.4	**Regional Materials**, 20% Extracted, Processed & Manufactured			1			1	
		4.1.1	M 2.5R	**Wallboard & Roof Deck Products,** Mold Resistance		NP	☑ YES		Indicate Pursuit		☐ NO
		7.2.3	M 2.6R	**Low-Mercury Lighting,** Reduce Mercury Waste		NP	☑ YES		Indicate Pursuit		☐ NO
				Materials Category Sub-Total:		2	8			7	3

See Notes on Page 2 of 2

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SCA School Construction Authority
NYC Green Schools Rating System 2009

			SD	DD	60%	100%	Const
Project:	PS/IS 71R - Targee Street School	Submission (Check one):			X		
Address | Zip Code:	Targee Street, Staten Island	Submission Date:			June 3, 2011		
LLW #:	46429						
Design #:		Reviewer :					
Architect:	R.M. Kliment & Frances Halsband Architects	Reviewer Sign Off:					

Credit Names	BD&C Reference LEED for Schools 2009	CHPS Reference	NYC GSG 2009	Credit Description and Relevant Information and Drop-Down Menus	RPC (check project zipcode in GSG) [5]	Required For all Projects	Required if Feasible [1]	Optional Credits [2]	If Anticipated, or if Documented: [3] Enter point value, or Leave Blank if Not Feasible, or if Not Pursued: Design Phase	Construction Phase	Auto Filled: Blank if Pursued, Enter No. of Points if Not Pursued or if Not Feasible or Additional Credit Not Pursued
Indoor Environmental Quality	**27% of Total Points**							**Points:**	**14**	**out of**	**17**
	IEQ Pr 1		Q 1.1R	**Minimum IAQ Performance**		NP	☑ YES		Credit Req'd - Confirm Pursuit		
IAQ Post-occupancy	IEQ 2		Q 1.1R	**Increased Ventilation** (included in Q 1.1R credit language)		1			1		
	IEQ 1		Q 1.2R	**Air Flow Stations,** Outside Air Intakes		1			1		
IAQ Pre-occupancy	IEQ 3.1		Q 2.1R	**Construction IAQ Management Plan**, During Construction		1				1	
	IEQ 3.2		Q 2.2R	**Construction IAQ Management Plan,** Before Occupancy		1				1	
Low-Emitting Materials	IEQ 4.1		Q 3.1R	**Low-Emitting Materials**, Adhesives & Sealants [4]		1				1	
	IEQ 4.2		Q 3.2R	**Low-Emitting Materials**, Paints & Coatings [4]		1				1	
	IEQ 4.3		Q 3.3R	**Low-Emitting Materials**, Flooring Systems [4]		1				1	
	IEQ 4.4		Q 3.4R	**Low-Emitting Materials**, Comp Wood & Agrifiber Products [4]		1				1	
Pollution Source Control	IEQ 5		Q 4.1R	**Indoor Chemical & Pollutant Source Control**		1			1		
		5.3.5	Q 4.2R	**Electric Ignition Stoves**		NP	☑ YES		Indicate Pursuit		☐ NO
		6.2.4	Q 4.3R	**Provide HEPA Vacuums**		NP	☑ YES		Indicate Pursuit		☐ NO
Controllability of Systems	IEQ 6.1		Q 5.1R	**Controllability of Systems**, Lighting		1			1		
	IEQ 6.2		Q 5.2R	**Controllability of Systems**, Thermal Comfort		1			1		
Thermal Comfort	IEQ 7.1		Q 6.1R	**Thermal Comfort**, Comply with ASHRAE 55-2004		1			1		
Lighting and Views	IEQ 8.1		Q 7.1	**Daylight & Views**, Daylight 75% of Classrooms			1		1		
	IEQ 8.1		Q 7.2	**Daylight & Views**, Daylight for 90% of Classrooms			1		NF		1
	IEQ 8.1		Q 7.3	**Daylight & Views**, Daylight for 75% of Other Spaces			1		NF		1
	IEQ 8.2		Q 7.4	**Daylight & Views**, Views			1		NF		1
		5.2.1	Q 7.5	**Visual Performance,** Artificial Direct-Indirect Lighting		NP	☑ YES		Indicate Pursuit		☐ NO
Acoustics	IEQ Pr 3	5.5.1	Q 8.1R	**Minimum Acoustical Performance**		NP	☐ YES		Credit Req'd - Confirm Pursuit		
	IEQ 9		Q 8.2	**Enhanced Acoustical Performance** & Sound for Special Spaces		1			1		
		SCA	Q 8.3	**Acoustic Windows**		NP	☐ YES		Indicate Pursuit		☑ NO
				IEQ Category Sub-Total:		13	4		8	6	3
Regional	**4% of Total Points**			Use pull-down menus ↘	RPC Claimed			**Points:**	**2**	**out of**	**4**
Regionally Appropriate [5]	RP 1.1		R 1.1	**Regionally Defined Credit Achieved**	S 1.4-devel dens		1		1		
	RP 1.2		R 1.2	**Regionally Defined Credit Achieved**	S 2.1-alt trans-public		1		1		
	RP 1.3		R 1.3	**Regionally Defined Credit Achieved**	S 3.1-site dev, protect		1				1
	RP 1.4		R 1.4	**Regionally Defined Credit Achieved**	A 3.2-renew energy 1%		1				1
				Regional Category Sub-Total:		0	4	0	2		2
Additional Credits	**2% of Total Points**			For A 3.1 Use pull-down menu ↓				**Points:**	**1**	**out of**	**30**
Innovation in Design	ID 2		A 1.1R	**LEED® Accredited Professional**		1			1		
	ID 1		A 1.2	**Innovation or Exemplory Performance**				1			1
	ID 1		A 1.3	**Innovation or Exemplory Performance**				1			1
Optional - Site Impact	SS 7.1		A 2.1	**Heat Island Effect,** Non-Roof				1			1
	SS 6.1		A 2.2	**Stormwater Design**, Quantity Control	RPC			1			1
Optional - Energy	EA 1		A 3.1	**Optimize Energy Performance** [6]	If NOT Approved, 0 pts			15			15
	EA 2		A 3.2	**Renewable Energy**	If NOT Approved, 0 pts			7			7
Optional - IEQ	IEQ 4.5		A 4.1	**Low-Emitting Materials,** Furniture and Furnishings [4]				1			1
	IEQ 4.6		A 4.2	**Low-Emitting Materials,** Ceiling and Wall Systems [4]				1			1
Optional - Education	ID 3		A 5.1	**The School Building as a Teaching Tool**				1			1
				Additional Credit Category Sub-Total:		1		29	1	0	29
								Column Totals:	29	37	29	33	18	44
								LEED® Equivalent Point Total [7]:				51	out of	95

SCA Credit Name :
- Letter prefix indicates credit section (S, W, E, M, Q, R, A)
- First number indicates the category within the section
- Second number indicates the specific credit within the section category
- Suffix "R" is added for credits that are required of all projects

1 Projects required to achieve all "feasible" credits that are possible for a particular project.
2 Projects may only pursue optional "Additional" section credits with permission from SCA unless otherwise noted.
3 During GSG submission phases, enter anticipated design and construction credits, keeping the Checklist current.
4 A maximum total value of four (4) points is allowed between these six low-emitting material credits (Q3.1, 3.2, 3.3, 3.4; A5.1, 5.2)
5 RPC incentive regional credits as indicated. If the referenced credit is achieved, then the associated RPC can be claimed.
6 This credit requires project-specific energy modeling and can not be achieved by use of proto-typical modeling.
7 LL86/05 requires Certified LEED® 2009 for Schools or equivalent of a no-less stringent rating system - Minimum 40-49 Points

NP: To be consistent with LEED®, the NYC GSG assigns no point value to credits based on prerequisites or non-LEED® credits.
NYC GSG: Requires that all credits be attempted and proof through calcuation for those which are not-feasible.

School Construction Authority

NYC Green Schools Rating System

Credit Compliance Narratives

Project: PS/IS 71R Targee Street School
Address: Region 7, District 31, Staten Island, NY
LLW #: 46429
Design #:

Date: May 11, 2011
Architect: Kliment Halsband Architects
Submission: Design Development - Redesign
Reviewer:
Reviewer Sign Off:

Please note: In response to comment about redundant specifications, sections 02270, 02302, and 02303 have been removed from the specs as that information is already covered in the 02200 section.

Site Credits

Site Selection

S 1.1R **Construction Activity Pollution Prevention**

Since the site is greater than 1 acre (110,789 sf), the Design team will provide the Erosion and Sedimentation Control plan. During construction of the proposed school the contractors will be responsible for maintaining the erosion and sediment control measures. This would include installing along the entire perimeter of the site a silt fence with straw bales. Along access points to the site a stabilized driveway consisting of gravel or stone will be constructed. Any drains that remain active onsite will be protected with filter fabric.

Please see attached erosion and sedimentation control plan (Drawing C-004)

S 1.2R **Site Selection** **NARRATIVE AT SCHEMATIC SUBM.**

The project will meet the following requirements:

- Project is located on a previously developed site and therefore the flood plain requirements are not relevant.
- Richmond County which is coextensive with Staten Island is habitat for the following endangered species according to the New York Natural Heritage Program: Fence Lizard, Least Bittern, Northern Cricket, Northern Harrier, Peregrine Falcon, Pied-billed Grebe, Short-eared Owl, and Upland Sandpiper; and Shortnose sturgeon according to the Department of Fish and Wildlife (Federal). However a map from the New York Natural Heritage Program Enviromapper of the project site and surrounding area demonstrates that there are no known rare plants or animals nearby. In addition, project submitted a request to the New York Natural Heritage Program to determine if the land is identified as habitat for any species on the Federal or State endangered species list per SCA guidance. Historical records demonstrate that the following plants and animals were documented in the vicinity of the project site at one time, but have not been documented there since 1979 or earlier and their current status is unknown: Dragonflies and Damselflies.
- The Project is not located within 100 feet on any wetlands and thus will meet this requirement.
- Site was previously developed and site is not within 50 feet of a water body and will comply with the credit requirements. The project has included the reference documentation from the US Fish and Wildlife Service website on the presence of several threatened and endangered species in New York County,

New York, however since the project is not located within 50 feet of such, the credit requirements will be met.

- Project land was not parkland prior to acquisition.

S 1.3 **Sustainable Site & Building Layout** **NARRATIVE AT SCHEMATIC SUBM.**

Project is required to perform at least 3 of the following analyses.

- **Orient and compose the building to take advantage of natural daylighting**
- **Plot shadow patterns from surrounding buildings onto project site to optimize access to daylight.**
- **Plot shadow patterns from proposed building on adjacent properties and consider options to address impact as necessary.**
- **Consider prevailing winds when determining the site and building layout.**
- **Take advantage of existing building and natural land formations and vegetation to provide shelter from extreme weather or to deflect unwanted noise.**
- **Design landscaping to mitigate solar gain and winter winds.**
- **Identify locations on the roof for potential renewable energy generation.**

The project performed the following 3 analyses of sustainable design factors:

Analysis 1:
Orient and compose building to take advantage of natural daylighting:

The building's massing is arranged to create as much exposure to daylight as possible in the following ways:

1. The building is oriented around a large interior courtyard on the south side of the building. This form insures that the rooms adjacent to the courtyard receive ample sunlight, especially during the morning and midday hours when school is in session.
2. The tallest volume on the site is an L-shaped bar that creates the building's north and west perimeters. Because the assembly volumes located to the east are lower in height, this classroom bar will receive the most sunlight during school hours.
3. The majority of the classrooms are located on the top three floors of the building.
4. The "special" program places such as the library, art classroom, and music classroom are located on the top level along the north side of the building and face the large open playground. These rooms, in particular the library, will have taller windows.

Refer to updated shadow studies for building massing.

Analysis 2:
Plot shadow patterns from surrounding buildings onto project site to optimize access to daylight.

Analysis 3:
Plot shadow patterns from proposed building on adjacent properties and consider options to address impact as necessary.
Refer to the shadow studies taken at the 9:00 AM, 12:00 PM, and 3:00 PM on the spring/fall equinoxes and the summer and winter solstices.

Analysis 4:
Consider prevailing winds when determining the site and building layout.

Analysis 5: Take advantage of existing adjacent building and natural land formations and vegetation to provide shelter from extreme weather or to deflect unwanted noise:

Analysis 6:
Design landscaping to mitigate solar gain and winter winds.

Analysis 7:
Identify locations on the roof(s) for potential renewable energy generation:

Refer to the roof plan for identified locations for potential renewable energy installations.

S 1.4 **Development Density & Community Connectivity** **NARRATIVE AT SCHEMATIC SUBM.**

The project aims to comply with OPTION 1 of this credit, Community Connectivity.

The project can demonstrate compliance with pedestrian access to at least 10 basic services within ½ mile radius.

Additionally there are at least 10 dwelling units per acre as evidenced by the supporting documentation which shows an average of 10.5 dwelling units/area in the sampling of the specified lots.

S 1.5R **Joint Use of Facilities,** Community Access **NARRATIVE AT SCHEMATIC SUBM.**

The design will incorporate appropriate entrances for possible community use of school facilities such as the gymnatorium and gym. The gymnatorium and gymnasium are grouped in a common wing on the first floor and are accessible via a wide corridor stemming from the main lobby. The location of these rooms allows for community use while closing them off from the rest of the school if desired.

See attached plan indicating location and pathway to publicly accessible gymnatorium and gym.

S 1.6R **Environmental Site Assessment** **NARRATIVE AT SCHEMATIC SUBM.**

Both a Phase I and Phase II Environmental Site Assessment have been conducted. The Phase I ESAs identified several on-site recognized environmental conditions (RECs). Based on the results of the Phase II ESI, the 10,000-gallon, the 550-gallon UST and the suspect UST would be removed along with any impacted soils. As a preventative measure, a soil vapor barrier and a sub slab depressurization system would also be installed below the building to prevent any soil vapor intrusion into the proposed school building. Any suspect mold, ACM, LBP, lead-core doors, and PCB-containing materials affected by the preparation of the Site for use as a public school would be identified and properly managed during construction activities. For areas of the Site where exposed soils may exist (i.e., landscaped areas), a twenty-four (24) inch thick layer of environmentally clean fill would be placed over the soils. Documentation will be provided at that time to prove that safe levels of contamination have been achieved.

Applicable SCA Standard Specifications include:
02010, 02200, 02220, 02221, and 15880

See attached drawing demonstrating soil vapor barrier and sub-slab depressurization system (H-101).

S 1.7 **Brownfield Redevelopment** **NARRATIVE AT SCHEMATIC SUBM.**

The SCA Committee advises that as if building demolition is a separate design package this credit cannot be achieved as part of new building project. Although the final survey reports for 1050 Targee Street, prepared by New York Environmental & Material Testing Laboratories, documents the presence of asbestos and PCBs this

Transportation

S 2.1 **Alternative Transportation**, Public Transportation Access **NARRATIVE AT SCHEMATIC SUBM.**

The project is located within 1/4 mile of several stops for two or more public bus lines usable by building occupants (distance is calculated along pedestrian routes, not bird's eye distance).

- The TARGEE St. at Doctors Hospital stop is located on the northeast corner of the site on Targee Street and 3 lines (S74, S84, S86) depart from this location.

- The RICHMOND RD at SPRING ST stop is located on the west side of the site on Richmond Road and 3 lines (S74, S84, S8) depart from this location.

S 2.2 **Alternative Transportation**, Bicycle Storage & Changing Rooms **NARRATIVE AT SCHEMATIC SUBM.**

The project design incorporates secure bicycle storage and changing rooms. The bicycle storage will be provided within the building and on the site and will accommodate at least 5% of all building staff and students above third grade. The shower and changing facilities in the building will accommodate 0.5% of Full-time equivalent (FTE) staff.

Unadjusted Student Capacity above 3rd grade	=	956-356	=	600
Full-time Staff (1 staff per 25 occupants)	=	956/25	=	39
Part-time Staff (1 FTE per 200 occupants)	=	956/200	=	5
Visitors (1 FTE per 500 occupants)	=	956/500	=	2
Total Occupants	=			646

Total Bike spaces (5% of # shown above)	=	646 x .05	=	34 spaces

The size of the bicycle storage room located on the building interior is mandated by SCA Design Requirement 1.3.1.12, whereby new buildings shall have on interior bicycle parking space for every 10,000 SF of floor area.

Interior Bike Storage Spaces (Floor area/10,000)	=	110,593/10,000	=	11
Interior Bike Storage Area Req'd (15 SF/bike space)	=	11 x 15	=	min. 165 SF
Interior Bike Storage Area Provided	=	226 SF/15	=	15 spaces
Exterior Bike spaces required	=	34 - 15	=	19
Exterior Bike spaces provided	=	(2) 7' racks (9 bikes/rack) + (1) 5' rack (7 bikes/rack)		
	=	25		
Total Bike spaces provided	=	15 interior + 25 exterior		
	=	40		

Therefore, a 226 SF bicycle storage is located in the cellar level immediately adjacent to the entry stair and the elevators. The exterior bicycle racks located across from the school's main entry provide space for 25 bikes to accommodate at least 5% of building staff and students above third grade. The unisex toilet, shower and changing area is 123 SF and is also located in the basement level near the interior bicycle storage.

See the attached plan highlighting bicycle storage, changing room locations, and distances.

S 2.3R **Alternative Transportation**, Fuel-Efficient Vehicles/Parking **NARRATIVE AT SCHEMATIC SUBM.**

Per zoning regulation 25-31, the project is not required to provide any parking spaces. However, the project will provide 10 parking spaces for school use and 5% of those parking spaces (at least 1 space) will be designated for alternative and fuel efficient vehicles. The parking spaces are located in the northwest corner of the site, adjacent to the bus drop-off road that cuts across the site from west to east.

See the attached signage and striping plan indicating space reserved for low-emitting vehicles.

Minimize Impact on Site

S 3.1 **Site Development**, Protect or Restore Habitat **NARRATIVE AT SCHEMATIC SUBM.**

As currently designed, the project will not be able to comply with the requirements of this credit due to constraints of the site area. The credit guidelines require the project to restore or protect a minimum of 50% of the site area excluding building footprint or 20% of the total site area including building footprint, whichever is greater, with native or adapted vegetation. For this project, the greater requirement is to provide planting for 50% of the site area excluding building footprint which is 36,354 SF. This requirement is not possible based on the site program. Currently, the site only contains approximately 22,000 SF (below 50%) of planted area.

Site area	=	110,789 SF	
Building Footprint	=	38,081 SF	
Site area minus building footprint	=	110,789-38,081	= 72,708 SF
50% of the site area minus building footprint	=	72,708 x 0.50	= 36,354 SF
20% of total site area	=	110789 x 0.20	= 22,158 SF

The SCA committee agrees that this credit is not feasible and will not be pursued.

S 3.2 **Site Development**, Maximize Open Space **NARRATIVE AT SCHEMATIC SUBM.**

The site area is 110,789 SF. In the R3-2 zoning area, 65% of the site must be considered open space (zoning 23-141). Since the building covers 38,081 SF, 65% of the site is left as open space.

Given that the project site is 110,789 SF and the footprint is 38,081 SF, this leaves 72,708 SF of remaining site area. The credit guidelines require the project to include 20% or 14,541 SF of open space.

Site area	=	110,789 SF	
Building Footprint	=	38,081 SF	
Site area minus building footprint	=	110,789-38,081	= 72,708 SF
20% of total site area	=	72,708 x 0.20	= 14,541 SF

Currently, the project is providing approximately 22,000 SF of vegetated space. Complying with this credit using open space is attainable.

Stormwater Design

S 4.1 **Stormwater Design**, Quality Control

This credit is not applicable because the project does not have a separate storm and sewer system and is not discharging to a 303(d) listed water body. This credit will not be pursued per SCA committee direction.

S 5.1R **Heat Island Effect**, Roof

The project will pursue the credit using SRI-compliant roofing materials. The project will use roofing materials having a Solar Reflectance Index (SRI) equal or greater than 79 for low-sloped roofs and 29 for steep sloped roofs, for 100% of the non-mechanical roof surface.

Roof area:
Low-sloped roofs (<2:12)= 27,411 sf
Steep-sloped roofs (>2:12)= 6,760 sf
Total Roof Area = 34,171 sf
75% of roof surface = 34,171 x .75 = 25,628 SF

Roof pavers; SRI>79= 27,411 sf
Standing Seam Metal Roof; SRI>29= 6,760 sf
Compliant Roof Areas= 34,171 sf

34,171/34,171 = 100% compliant

Please see specification sections 07560 for Fluid-Applied Protected Membrane Roofing (minimum SRI of 79) and 07610 Sheet Metal Roofing (minimum SRI of 29). Section 07560 was updated to reflect the SRI value in the bid documents (11/29/10). See section 2.01.L. Section 07610 includes the SRI in section 2.01.B.5.

Outdoor Lighting

S 6.1R **Light Pollution Reduction**

The project will minimize light trespass from the building and site and reduce the development impact on the local nocturnal environment. The project will comply with the credit requirements of S 6.1R for Interior and Exterior Lighting. Exterior lighting will be provided at the following locations:

a. All entrances, exits and walkways including exit discharge to maintain 5.0 FC average.
b. Building perimeter to maintain 1.0 FC average to a 20 ft. depth.
c. Site playground to maintain 0.5 FC average.

The interior lighting requirements for this credit will be met by turning off, automatically, all non emergency lighting systems during non-school hours. An after-hours override will be provided by an occupant-sensing device with manual override provided that the override last no more than 30 minutes. The lighting design will include the systems required to achieve this operation automatically (Programmable Lighting Control Panels).

The exterior lighting requirement of the credit will be met by designing building mounted fixtures in addition that do not exceed a maximum initial luminance at the boundary as indicated above. Lighting power densities shall not exceed ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda) for the classified zone. Exterior lighting control requirements from ASHRAE/IESNA Standard 90.1-2007, Section 9, table 9.4.5, Exterior Lighting Section, without amendments will be met.

The Design Team assumes that the site is characterized under Lighting Zone Designation – LZ2 (Low) and will meet the prescriptive requirements for the LZ2 zone. Exterior lighting will be designed so that all site and building mounted luminaries will produce a maximum initial luminance value no greater than 0.10 horizontal and vertical foot-candles at the site boundary and no greater than 0.01 horizontal foot-candles 10 feet beyond the site. The project's exterior lighting fixtures will be selected so that no more than 2% of the total initial designed exterior lighting fixture lumens are emitted at an angle of 90 degrees or higher from nadir (straight down).

In reference to the SCA comment about metal halide fixture, the Metal Halide Lighting Fixtures used on playground and courtyard are not emergency powered. No Metal Halide Lighting Fixtures are being used for security Lighting nor Perimeter Lighting.

See attached drawings:
Light Pollution Reduction Forms A &B

Applicable SCA Design Requirements include:
7.2.1 Interior Lighting
7.2.5 Exterior/Site/Security Lighting

Applicable SCA Standard Specifications include:
16145 Lighting Control
16500 Interior Building Lighting
16501 Lamps, Ballasts, and Accessories
16520 Exit Sign Lights and Emergency Lighting Fixtures and Systems
16530 Site/Security Lighting

Water Credits

Outdoor Systems

W 1.1R **Water Efficient Landscaping**, Reduce by 50%

Native or adapted plant types that are drought tolerant will be used throughout the site. The current estimated planting area is approximately 22,000 square feet which is approximately 20% of the 110,789 sf site, meeting the requirement of providing planting for a minimum of 5% of the building site area.

The team has provided calculations indicating how potable water is reduced by 66.33% and a listing of the native and adapted plant species (See attached).

Please see attached memo indicating moisture requirements and drought tolerance for plants included in the 60% submission. Literature for each plant species has also been provided.

Applicable SCA Standard Specifications include:
02900 Landscaping (revised and reissued 2/1//11)

W 1.2 **Water Efficient Landscaping**, No Potable Use or No Irrigation

The project will use no permanent irrigation (path 2). Native or adapted plant types that are drought tolerant will be used throughout the site. The current estimated planting area is approximately 22,000 square feet which is approximately 20% of the 110,789 sf site. The current site design achieves WE1.2R without the use of permanent irrigation as a result of the native and adaptive draught tolerant plants selected for use. However, due to the large size of the project site, it is necessary to secure supplemental watering services (i.e., watering truck) during the period of establishment (first year) for the survival of the plants.

Requirements for temporary irrigation through the use of a watering truck during the first-year period of establishment are included as part of the Contractors requirements in specification 02900. Section 02900 was revised in Pre-Bid Addendum 5 and issued on 2/11/11.

Applicable SCA Standard Specifications include:
02900 Landscaping

Indoor Systems

W 2.1R **Water Use Reduction**, 20% Reduction

Compliance with this credit will be achieved with the implementation of all New York City SCA Standard Specifications and Plumbing Design Requirements for dual flushometer toilets, high water efficiency urinals, low water flow shower heads, and aerated metered faucets.

Please see attached water use reduction form indicating a combined 33% savings (school in full operation and summer operation). Please note that section 15440 has also been updated to meet compliance with the 2009 Green Schools Guide.

Applicable SCA Standards include:
SS 15440 Plumbing Fixtures

W 2.2R **Water Use Reduction**, 30% Reduction

See credit W2.1R above.

W 2.3R **Water Use Reduction**, 35% Reduction

Based on the updated water use reduction calculations, the revised savings of 33% will not qualify for this credit and therefore it will not be pursued.

W 2.4 **Water Use Reduction**, 40% Reduction

Based on the updated water use reduction calculations, the revised savings of 33% will not qualify for this credit and therefore it will not be pursued.

Energy

Commissioning

E 1.1R **Fundamental Commissioning of the Building Energy Systems**

The project will meet the credit requirements as per specification sections 01650, 01660 and other references throughout the specs. The SCA commissioning department will be performing the commissioning for the project. The updated commissioning matrix for this project has been included with the submission. Section 02400 is not included in either the SCA standard specifications or the project specifications and therefore was not included in the matrix. Please reference the commissioning matrix for details.

Applicable SCA Standards include:
SS 01650 Facility Start-up, Demonstration, and Training
SS 01660 Commissioning

E 1.2R **Enhanced Commissioning**

The project will meet the credit requirements as per specification sections 01650, 01660 and other references throughout the specs. The SCA commissioning department will be performing the commissioning for the project. The commissioning matrix for this project has been included with the submission. Please reference the commissioning matrix for details.

Applicable SCA Standards include:
SS 01650 Facility Start-up, Demonstration, and Training
SS 01660 Commissioning

Refrigerant Management

E 2.1R **Fundamental Refrigerant Management**

The project meets the requirements for this credit. All new refrigerants in this building are non-cfc based.

The central air conditioning system for the new building will consist of a chiller that utilizes 410A and rooftop units that utilize refrigerant R-410A.

E 2.2 **Enhanced Refrigerant Management**

The project will not comply with Enhanced Refrigerant credit requirements. The total weighted average atmospheric impact produced through completing the Refrigerant Impact Form is 107.

Refrigerant Impact form is included with this submission.

Verification

E 3.1R **Measurement & Verification**

The BMS System for the school will measure/monitor gas, normal electrical power, and chilled water plus the electrical power consumption by lighting panels, chilled water pumps, hot water pumps, air handling units, and fans larger than 5 HP as outlined in Specification sections 15970, 15973 and 15985.

Additionally the project has been designed to meet the SCA design requirements of section 6.2.20 Building Management Control System/ Direct Digital Control BMS/ DDC Measurement and Verification Plan. DVL provided responses to all outstanding FMSI comments and incorporated them into the Bid set.

E 3.2R **Energy Management System Controls,** HVAC and Hot Water

The building will be provided with a Building Management System (BMS) that will be connected to the NYC DOE Wide Area Intranet Network (WAN). The project will include the SCA Standard BMS System. This connection allows complete monitoring and control of the school's MEP system from both the local BMS station in the Custodian's Office as well as the DOE central monitoring and controls station located at 44-46 Vernon Blvd., Long Island City, NY.

Please see revised RTU BMS schedules attached.

Applicable SCA Standards include:
SS 15970 Temperature Control Systems
SS 15973 Facility Management Systems
SS 15985 Sequence of Operations

Energy Efficiency

E 4.1R Minimum Energy Performance

The design complies with the mandatory provisions of ASHRAE 90.1 2007 Sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 (without addenda).

The project was directed by the SCA to provide specific modeling. The model demonstrates a 10.9% improvement in the proposed building performance rating compared to the baseline building performance rating per AHSRAE/IESNA Standard 90.1-2007 (with errata but without addenda) by a whole building project simulation using the Building performance Rating Method in Appendix G of the Standard.

The proposed design includes the following energy efficient measures:

- Reduced lighting power density (1.0 w/ft^2 vs 1.2 W/ft^2)
- Occupancy Sensors in classrooms
- CO2 ventilation controls in gymnasium and gymnatorium instead of just in gymnatorium
- Heat recovery wheels on all RTU's
- High efficiency DX units (EER = 10.9 instead of 9.8)
- High efficiency air-cooled chiller (EER = 13.2 instead of 9.5)
- 87% efficient condensing boiler with modulating flame controls instead of 80% efficient boiler with on/off controls
- Dedicated outdoor air system and unit ventilators reduce required fan power

Outdoor air will be provided to the corridors and classrooms via constant volume RTU's. The CV RTU's will temper the outdoor air via 80% efficient, modulating gas furnaces and DX cooling.

Recirculating unit ventilators will provide additional heating and cooling to the classrooms. 87% efficient, condensing boilers will provide hot water to the unit ventilators, and supplemental heating system (staircases, storages, etc.). An air-cooled chiller will provide chilled water to the unit ventilators.

Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymatorium) via constant volume DX units with modulating flame natural gas furnaces.

For lighting, occupancy motion sensors will be provided for control of lights in classrooms and offices, and the power densities for lighting layouts will be designed to comply with the New York City SCA Electrical Design Requirement 7.2.1.

A report has been included that details the Proposed Design compared to the ASHRAE 90.1-2004 Energy Cost Budget Method. There is a 21.6% energy cost savings over the ASHRAE 90.1-2004 ECB baseline (23.9% for regulated loads only). The local law 86 form indicating compliance with ASHRAE 90.1-2004 is attached.

The large discrepancy in savings between the two cases is attributed to the significantly different requirements of the two baselines. ASHRAE 90.1-2007 has much more stringent requirements than the older version

ASHRAE 90.1-2004, particularly for the building envelope and HVAC equipment efficiencies. Therefore the ASHRAE 90.1-2004 ECB method is a comparatively worse baseline, and the percentage annual energy savings is much larger.

The results of Target Finder will be provided at the 100% submission per direction from the SCA.

Section 08920 – Curtain Walls has been updated to reflect a U-value of 0.51 in Addendum No. 6 (issued April 19, 2011). In addition, the rates for the model are to be provided by the SCA at the start of the model. Otherwise, the latest rates from NYPA are utilized.

With regards to the inconsistencies with DR 1.1.5.2, the updated form has been used and the fenestration area has been checked and the energy model report revised to match the reported 25%. Please also note that the report mentions total conditioned area of the project, as opposed to the total gross area reported in DR 1.1.5.2. Furthermore, the auditorium schedules have been removed from the report, as they are no longer used. Please see table from DR 1.1.5.2 for Saving and Non-Energy Saving Spaces for this project:

DR 1.1.5.2 Building Areas-Energy Saving and Non-Energy Saving Spaces - Fenestration %

Space name	Energy Saving Program Space SF	*Non-energy saving Program Space SF*	Comment
All instructional spaces including classrooms, art rooms, music rooms, science lab and demo rooms, resource rooms, special ed Cr's, D75 classrooms	34,804		
All offices including custodian office, government and club publication office, guidance offices, SBST office, Nurses office, staff work rooms, supervisory office	5,753		
Auditorium including orchestra area, stage/platform area. Exclude chair storage rooms, storage rms, coat/ticket room, projection room	0		
Auditorium related coat ticket room, projection room		*80*	
All physical education rooms including Aux Gymnasium, exercise rooms, dance classrooms, weight lifting rooms	513		
All storage rooms including, AV/Comp cart stoarge rooms, AV storage, book storage rooms, custodian storage room, chair storage room, furniture storage room, ground equipment storage room, gymnasium storage, refuse and recycling storage, roof equipment storage room, Bicycle storage, Fire pump room		*5,606*	
Cafeteria	4,448		
Custodial locker rooms, Custodian work area, custodian workshop		*654*	
Field House excluding field house storage space	0		
Field house storage space		*0*	
Gymnasiums, Gymatoriums. Exclude Gym storage, chair storage rooms	10,371		Double Height
kitchen help locker rooms, food and non-food storage		*845*	
Kitchen-excluding kitchen storage and walk-in refrigerator/freezer area	1,851		
Library excluding AV storage	2,502		
Lobby		*835*	
Multipurpose room	0		
School safety administration office	367		
Staff lunch room, staff cafeteria	489		
Student locker-rooms, auditorium dressing rooms,	1,080		
Telecom closets-MDF and IDF rooms		*458*	
Toilets and showers within locker rooms-including toilets/shower in custodial locker rooms, student locker rooms/showers.	2,468		

Total - Energy Saving Program **spaces**	64,646	
*Total - Non-energy saving program **spaces***		8,478
Actual Gross area of Building(this may be/maynot be the same as the gross area in the POR)		110,306
Total exterior wall area: Sum of wall areas for all floors. Wall area= perimeter X thickness of exterior wall. Typ wall thickness = distance between exterior face of brick and interior face of gypbd.		6,206
Total - Non-energy saving core areas	*39,454*	
Energy saving program:non-energy saving core ratio	62.10	*37.90*
Percentage of fenestration to Façade Area	*25%*	
Percentage of 'Assembly Spaces' to gross building area	9%	

The following SCA Design Requirements apply to this credit:

6.2.0 General Overview of Heating Ventilation and Air Conditioning Systems
6.2.3 Non-Assembly Spaces
6.2.4 Public Assembly Spaces
6.2.9 Convectors and Enclosures
6.2.20 Building Management Control System/DDC Control BMS
7.2.1 Interior Lighting
7.2.5 Exterior/Site/Security Lighting

The following SCA Standard Specifications apply to this credit:

15517 Water Treatment Hydronic Systems
15540 HVAC Pumps
15565 Condensing Boilers
15781 Packaged Htg & Cooling Units
15783 Packaged Heat Pump System
15853 Custom Packaged Rooftop Heating and Cooling Units (Variable Air Volume System)
15854 Custom Packaged Rooftop Heating and Cooling Units (Constant Volume System)
15855 Commercial Packaged Rooftop Heating and Cooling Units
15930 Variable Air Terminals
15970 Temperature Control System (LonWorks BMS/DDC with School Operating Console)
15973 Facility Management Systems Integration
15985 Sequence of Operations
16145 Lighting Control Devices
16500 Interior Building Lighting

HVAC Optimization

E 4.2R **HVAC System Sizing,** Avoid Oversizing

HVAC components shall be designed such that they are correctly matched to loads to preclude unnecessary oversizing and to ensure energy efficient operation. Systems should not be sized so tightly that there is no allowance for degradation of equipment.

Systems shall be sized and configured to efficiently handle peak and design load conditions, but more importantly to operate in an energy-efficient manner during a wide range of partial load conditions, which are the operating ranges that HVAC systems handle most of the time.

The RTU load and Boiler load calculations are attached. The calculations have been updated to reflect the slab to slab areas.

The following SCA Design Requirements apply to this credit:
6.2.9 Heating and Cooling Design Parameters (Load Calculations)
6.2.13 Arrangement and Sizing of Equipment

The following SCA Standard Specifications apply to this credit:
15540 HVAC Pumps
15565 Condensing Boilers
15781 Packaged Heating and Cooling Units
15783 Split Heat Pump System
15852 Air Handling Units
15853 Custom Packaged Rooftop Heating and Cooling Units (Variable Air Volume System)
15854 Custom Packaged Rooftop Heating and Cooling Units (Constant Volume System)
15855 Commercial packaged Rooftop Heating and Cooling Units

Green Power
E 5.1R **Green Power**

The project will provide at least 35% of its electricity from renewable sources by engaging in at least a two-year renewable energy contract. The allocation of green power was calculated using the annual electricity consumption from the project-specific energy model of 769,177 kWh whereas 35% of the buildings electricity is 269,212 kWh. Please see updated LL86 reflecting these values.

Materials Credits

Efficient Material Use
M 1.1R **Storage & Collection of Recyclables**

The project will comply with the requirements of this credit. The project will provide easily accessible and centralized areas for the recycling of paper, corrugated cardboard, glass, plastic and metal with sufficient space for collection bins, compactors and balers. Additionally these materials will be collected with bins placed throughout the spaces. The cafeteria will have designated bins for recycling. The refuse and recycling room (186 sf) is adjacent to the kitchen and will provide the final holding place for recyclable materials before they are removed from the building.

Based on the SCA F&E Unit standard furniture list:
- The cafeteria includes a recycling station.
- Each classroom has recycling containers

Specification 11172 for Waste Handling Equipment has been edited for this project to include a vertical trash compactor in the bid set.

Please see attached plan indicating the recycling areas for the project (226 sf).
The following SCA Design Requirements apply to this credit:

DR 1.3.1.2 Building Organization-Space Relationships
DR 1.3.1.8 Refuse and Recycling Storage
DR 1.3.5.01 Cafeterias PK-8 and HS

The following SCA Standard Specifications apply to this credit:

11172 Waste Handling Equipment

M 1.2 **Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof

The credit is not applicable to the project, as the existing structures located on the project site will be demolished.

M 1.3 **Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof

The credit is not applicable to the project, as the existing structures located on the project site will be demolished.

M 1.4 **Building Reuse**, Maintain 50% of Interior Non-Structural Elements

The credit is not applicable to the project, as the existing structures located on the project site will be demolished.

M 1.5R **Construction Waste Management**, Divert 50% from Disposal

The project intends to meet the credit requirements outlined in Section S01524. The project has targeted meeting the 50% diversion threshold. The Construction Manager will be required to implement measures to ensure the 50% threshold for recycled waste. The construction manager will create a construction waste management plan and will track percentage of material diverted from landfill and incineration throughout construction.

M 1.6 **Construction Waste Management**, Divert 75% from Disposal

The project anticipates meeting the 75% threshold. Refer to credit M 1.5R above.

M 1.7 **Construction Waste Management**, Divert 95% from Disposal

The project anticipates meeting the 95% threshold. Refer to credit M 1.5R above.

Sustainable Materials

M 2.1R **Recycled Content**, 10% (post-consumer + ½ pre-consumer)

The project specifications include language for recycled content for materials. The project will follow the SCA standards which are included in sections S01352, 02200, 02799, 02870, 03300, 04200, 05120, , 5300, 05710, 07211, 07212, 07250, 07560, 07610, 08524, 08920, 09260, 09310, 09410, 09510, 09650, 09680, 10151, and 10185. The project will track recycled content percentages and material costs throughout construction through the submittal process. The project anticipates meeting the 10% credit threshold.

M 2.2 **Recycled Content**, 20% (post-consumer + ½ pre-consumer)

The project anticipates meeting the 20% threshold. Refer to credit M 2.1R above.

M 2.3 **Regional Materials**, 10% Extracted, Processed & Manuf. Regionally

The project specifications include language for regional materials. The project will follow the SCA standards which are included in sections S01352, 02200, 02900, 03300, 04200, 04435, 05120, 05210, 05300, 07212, 07250, 07610, 09260, 09310,and 09751. The project will track regional material percentages and material costs throughout construction through the submittal process. The project anticipates meeting the 10% threshold.

M 2.4 **Regional Materials**, 20% Extracted, Processed & Manuf. Regionally

The project anticipates meeting the 20% threshold. Refer to credit M 2.3 above.

M 2.5R **Wallboard & Roof Deck Products,** Mold Resistance

The project specifications include language which specifies mold resistant wallboard products. The project will follow the SCA standards which are included in section S01352, 06100, 07212, 09260, and 09900. The project Architect, Kliment Halsband, will specify and the project will purchase compliant applicable materials at the building envelope. The project will track materials throughout construction and will comply with credit requirements.

M 2.6R **Low-Mercury Lighting,** Reduce Mercury Waste

The new lighting fixtures for the school will be specified with low mercury content in compliance with New York City SCA standard specification 16501 for low mercury lamps, which was updated in the bid documents to include the number of spare lamps required for the project. The project will comply with credit requirements.

Indoor Environmental Quality Credits

IAQ Post-occupancy

Q 1.1R **Minimum IAQ Performance / Increased Ventilation**

The ventilation system will be designed to provide 30% more outdoor air ventilation than the ASHRAE Standard 62.1-2007 requirements, with the exception of the cafeteria area. For that space, the ventilation system will comply with the minimum ASHRAE 62.1-2007 requirements, which exceed DOB ventilation rates.
The following SCA Design Requirements apply to this credit:

The Ventilation calculations are submitted as part of this 60% CD Submission.

6.2.0 General Overview of Heating Ventilation and Air Conditioning Systems
6.2.9 Heating and Cooling Design Parameters (Load Calculations)
6.2.1 HVAC Unit Centralization and Coordination
6.2.3 Non-Assembly Spaces (Classrooms, Offices, etc).
6.2.4 Public Assembly Spaces

The following SCA Standard Specifications are applicable:

S01550 Indoor Air Quality Requirements
15852 Air Handling Units
15853 Custom Packaged Rooftop Heating and Cooling Units (Variable Air Volume System)
15854 Custom Packaged Rooftop Heating and Cooling Units (Constant Volume System)
15985 Sequence of Operations
15992 Cleaning and Testing
15993 Balancing of Systems

Note: Outdoor air quality analysis is provided by SCA/IEH as noted in the Best Practices and Implementation section of this credit in the Green Schools Guide.

Q 1.2R **Air Flow Stations,** Outside Air Intakes

The new central ventilation system (rooftop HVAC units) will be provided with air flow measuring stations at the outside air intakes in order to measure/monitor the outside air supplied to the school. Data for outside air measurement will be available for verification at the school level through the BMS system schools operating console in the Custodian's Office or through the DOE centralized host control station for Automatic Temperature Control of Schools in NYC.

The following SCA Design Requirements apply to this credit:

6.2.0 General Overview of Heating Ventilation and Air Conditioning Systems
6.2.1 HVAC Unit Centralization and Coordination
6.2.3 Non-Assembly Spaces (Classrooms, Offices, etc).
6.2.4 Public Assembly Spaces
6.2.9 Heating and Cooling Design Parameters (Load Calculations)

The following SCA Standard Specifications are applicable:

15970 Temperature Control System (LonWorks BMS/DDC with School Operating Console)

15985 Sequence of Operations

IAQ Pre-occupancy

Q 2.1R **Construction IAQ Management Plan**, During Construction

The following SCA Standard Specifications are applicable:

S01550 IAQ Requirements
S01560 Installation Sequence of Finish Materials

The SCA specification Section S01550, Indoor Air Quality Requirements, requires development and implementation of and Indoor Air Quality Plan consistent with the credit intent and requirements. Section S01560 Installation Sequence of Finish Materials, requires the Contractor to avoid contamination of absorptive materials. The contractor will be responsible for certifying IAQ Management Plan has been upheld during construction.

The construction of the new school will follow the Sheet Metal and Air Conditioning Contractors National Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition 2007, ANSI/SMACNA 008-2008 (Chapter 3).

Q 2.2R **Construction IAQ Management Plan**, Before Occupancy

The contractor will be required to operate the new central ventilation system for the new school until all areas of the school receive 3500 cubic feet of outside air per square feet maintaining an internal temperature higher than 60°F DB and relative humidity no higher than 60%. The volume of outside and indoor temperature and humidity conditions will be monitored by the BMS system. Once the School is occupied, the central ventilation units will continue operating at the maximum of 0.30 cu.ft. per minute per square foot of outside air or that is required by code, until all spaces of the school receive a total 14,000 cubic feet of outside air per square feet as determined by the BMS air flow tracking system. After complying with this requirement, all ventilation systems will operate in normal mode.

Applicable SCA Standards include:
SS 01550 – Indoor Air Quality Requirements

Low-Emitting Materials

Q 3.1R **Low-Emitting Materials**, Adhesives & Sealants

All adhesives and sealants required for the project will be in compliance with VOC limits established by New York State as well as rule #1168 of the South Coast Air Quality Management District (SCAQMD) and the Green Seal Standard for Commercial Adhesives GS-36 requirements. Project will track adhesives and sealants throughout construction and confirm compliance. Project will comply with the credit requirements as per specification sections G01600, 07900, 09680, 15401, and 15440.

Q 3.2R **Low-Emitting Materials**, Paints & Coatings

All paints and coatings required for the project will be in compliance with VOC limits established by New York State as well as rule #1113 of the South Coast Air Quality Management District (SCAQMD), the Green Seal Standard for GS-11, GS- 03 requirements. Project will track adhesives and sealants throughout construction and confirm compliance. Project will comply with the credit requirements as per specification sections 01600, 09900, and others which contain relevant language

Q 3.3R **Low-Emitting Materials**, Flooring Systems

All carpet installed in the building will meet the requirements and be certified by the Carpet and Rug Institutes Green Label Plus program. All carpet cushion installed in the building interior will meet the requirements of the Green Label program. All carpet adhesive will meet the VOC requirements of Q 3.1. All hard surface flooring must be certified as compliant with FloorScore standard by independent third-party, including vinyl, linoleum, laminate flooring, ceramic flooring, rubber flooring, wall base, and associated sundries. An alternative path fro this credit is available by providing 100% FloorScore certified non-carpet finished flooring which comprises at

least 25% of the finished floor area. Project will track flooring systems throughout construction. Project will comply with the credit requirements as per specification sections G01600, 09310, 09626, 09650, and 09680.

Q 3.4R **Low-Emitting Materials**, Comp Wood & Agrifiber Products

All composite woods used on the project will not contain urea-formaldehyde. The specifications for the wood sections include the appropriate language. Project will track materials throughout construction. Project will comply with credit requirements as per specifications 06100, 06200, 06410, 08210, 09590, 10100, 10415, 10652, 12302, 12710, and 12761.

Pollution Source Control

Q 4.1R **Indoor Chemical & Pollutant Source Control**

This project will comply with the requirements of this credit by designing according to following design requirements:

1.3.4.1 Entrances and Exits
6.2.0 General Overview of Heating Ventilation and Air Conditioning Systems
6.2.28 HVAC Design Requirements for Special Spaces
6.2.8 Wardrobe Locker Ventilation

The following SCA Standard Specifications are applicable:

12485 Foot Grilles
15852 Air Handling Units
15853 Custom Packaged Rooftop Heating and Cooling Units (Variable Air Volume System)
15854 Custom Packaged Rooftop Heating and Cooling Units (Constant Volume System)

The central HVAC units for the new school will be provided with filters that have a Minimum Efficiency Reporting Value (MERV) of 13, and fan coil units and unit ventilators with MERV-7 filters. In addition, Science rooms, janitors' closets, copy rooms, and storage rooms will be provided with exhaust systems that will maintain those areas under negative air pressure and, therefore, prevent the outflow of room contaminants into other areas of the school.

The MERV 13 filtration efficiency required for the central air handling units is indicated in specification 15852, and the MERV 7 filtration efficiency required for unit ventilators and fan coil units is indicated in specifications 15857 and 15838. All the air supplied tot his building is exhausted (there is no recirculation of air) and toilet rooms, Science rooms, Janitors closets, Kitchen, Acid storage rooms and Mechanical rooms are provided with mechanical exhaust as indicated in design HVAC design drawings.

Permanent entryway systems that are at least 10 feet long will be provided at regular entry points of the building that are directly connected to the outdoors. Rooms where hazardous gases or chemicals may be present (e.g. science lab, janitor's sink closets, ground equipment storeroom, receiving and general storage, copying/printing rooms and garage areas) or are used will be negatively exhausted with respect to adjacent spaces with the doors to the room closed. For each space, a self-closing door and deck-to-deck partitions or hard-lid ceiling will be provided. The exhaust rate shall be designed for at least 0.50 cubic foot per square foot, with no recirculation. Any make-up air provided in the area must be a minimum of 10% less than the exhaust air.

Please see attached plans indicating 10 ft. long permanent entryway systems.

Q 4.2R **Electric Ignition Stoves**

Project intends to install only electronic ignitions for all gas-fired cooking appliances when available. Project will meet credit requirements as per specification sections 11400, and 16722. Additionally project will meet the SCA design requirements on 7.3.13 Gas and Carbon Monoxide Leak Detection and Alarm systems.

Q 4.3R **Provide HEPA Vacuums**

SCA/F&E will provide HEPA vacuums for use within the facility.
The project will get written confirmation from the SCA/F&E to confirm HEPA vacuums will be provided as part of the initial equipment for the school. The project team anticipates meeting the credit requirements.

Controllability of Systems

Q 5.1R **Controllability of Systems**, Lighting

Compliance with this credit is achieved by providing individual lighting controls for at least 90% of the building occupancy and lighting control switches for shared multi-occupants spaces including classrooms. All instructional spaces 2,000 S.F. or less in area, by one ceiling mounted occupancy sensor and two switches located at the entrance door. Each switch shall control one lamp in each fixture on the same side in each row. Key-operated switches shall be provided for assembly spaces (i.e. student dining area), wall mounted occupancy sensors for lighting control in individual offices, and ceiling mounted occupancy sensors in classrooms. The project will meet credit requirements.

See attached floor plans and symbols list (DWG E001) indicating lighting fixtures and control switches (assembly spaces) and occupancy sensors in individual offices (under switch description (Soc)).

SCA Design Requirement 7.2.1 Interior Lighting applies.
SCA Standard Specifications 16140 Wiring Devices, and
16145 Lighting Control Devices apply.

Q 5.2R **Controllability of Systems**, Thermal Comfort

Each classroom, office, and assembly area will be provided with an individual thermostat for temperature control to meet the credit requirements as outlined in specification section 15985.

See attached floor plans indicating locations of temperature control devices.

Project will meet the SCA design requirements of section:
6.2.0 General Overview of HVAC systems
6.2.1 HVAC unit centralization and coordination
6.2.3 Non-assembly Spaces
6.2.4 Public Assembly Spaces

Thermal Comfort

Q 6.1R **Thermal Comfort, Design**

The new HVAC systems for the school will be designed to comply with the New York City SCA HVAC Design Requirements 6.2.9, 6.2.22, and 6.2.28 in order to provide the thermal comfort requirements of ASHRAE 55-2004 and includes consideration for maximum latent OA conditions.

The project will comply with specification sections 15970 and 15985.

Please see attached HVAC calculations demonstrating compliance with ASHRAE 55-2004 Section 6.1.1.

Project will meet the SCA design requirements:
6.2.0 General Overview of HVAC systems
6.2.1 HVAC unit centralization and coordination
6.2.3 Non-assembly Spaces
6.2.4 Public Assembly Spaces
6.2.9 Heating and Cooling Design parameters
6.2.22 Kitchen Ventilation
6.2.28 HVAC Design requirement for Special Spaces

Lighting and Views

Q 7.1 **Daylight & Views**, Daylight 75% of Classrooms

The project will comply with the requirements of this credit. 80.4% of the classroom spaces are daylit based on the prescriptive calculation method. The visible transmittance was assumed to be .60, which is the minimum allowed per SCA specification 08524. Certain areas of the school will be excluded from the calculation because day lighting will hinder their use or performance. Rooms where the product of the visible light transmittance (VLT) and window to floor area ratio (WFR) of daylight zone is less than 0.15 were split into compliant and non-compliant areas.

Please reference the attached daylight & view calculations.

Q 7.2 **Daylight & Views**, Daylight 90% of Classrooms

The project will not be able to comply given that it currently does not achieve a 75% daylighting factor . Please reference the attached daylight & view calculations.

Q 7.3 **Daylight & Views**, Daylight for 75% of Other Spaces

Only 49.6% of the area of the other regularly occupied spaces receives daylight based on the prescriptive calculation method which does not meet the credit requirements and therefore this credit will not be pursued.. Please reference the attached daylight & view calculations.

The following regularly-occupied spaces will be excluded from calculations because daylight would hinder normal use:

Gymatorium: Unwanted glare in the gymatorium would hinder the use of the space as an auditorium. Although the space will include clerestory windows, the gymatorium will not be included in the calculations.

Q 7.4 **Daylight & Views**, Views

The following regularly-occupied spaces will be excluded from calculations because daylight would hinder normal use:

Gymnatorium: Unwanted glare in the gymnatorium would hinder the use of the space as an auditorium. Although the space will include clerestory windows, the gymnatorium will not be included in the calculations.

The project currently provides views for 85.5% of regularly occupied spaces which does not meet the credit requirements and therefore the credit will not be pursued. Please reference the attached views calculations.

Q 7.5 **Visual Performance,** Artificial Direct-Indirect Lighting

All classrooms will be provided with new glare-free pendant-mounted direct-indirect lighting fixtures with high efficiency T-8 fluorescent lamps. The use of this type of lighting fixtures will reduce lighting power density (LPD) and, therefore, use less energy while delivering a better quality of light to the space.

Please see attached point-by-point lighting calculations for typical and non-typical areas.

This project uses the following section numbers:

SCA Design Requirement 7.2.1 Interior Lighting
16500 Interior Building Lighting – Kitchen and Mechanical Spaces
16501 Lamps, Ballasts and Accessories – Kitchen and Mechanical Rooms

Acoustics

Q 8.1R **Minimum Acoustical Performance**

This credit is not viable. Ostergaard Acoustical Associates' 10 May 2012 report, included with this submission, indicates that the background noise criterion for classrooms is met except for the following spaces:
Classrooms 117 & 119 (44 dB(A))
Music Classroom (39 dB(A))

Q 8.2 **Enhanced Acoustical Performance & Sound for Special Spaces**

Full compliance with Q8.2 is anticipated. Ostergaard Acoustical Associates' 7 September 2010 report of acoustical recommendations covers all constructions needed for compliance and is included with this submission. OAA will monitor the contract documents to assure correct integration of sound isolating constructions. Please find memo attached with recommendations through the 60% drawings.

Please note per SCA comment, the Adagio tiles meet the acoustical requirements and the cafeteria has ducted return air which will not be compromised by the fiberglass in the tiles.

A report from Acoustical Consultant verifying that 100% documents meet the requirements has been provided. Please find memo attached with recommendations through the 100% drawings. The outstanding issues have been addressed by the design team per the attached documents:
M102 – Issued April 27, 2011
M103 – Issued April 27, 2011
M003 – Issued April 27, 2011
Section 15660 – Packaged Modular Outdoor Chillers – Issued April 27, 2011

Q 8.3 **Acoustic Windows**

According to Ostergaard Acoustical Associates this credit is not applicable and should not be pursued because standard SCA windows, in conjunction with the masonry façade and roof construction, are sufficient to control the penetration of exterior noise. The SCA committee agrees that this credit is not applicable and will not be pursued.

Additional Credits

A 1.1R **LEED® Accredited Professional**

Project has employed the services of Viridian Energy & Environmental to help advise the project to achieve the SCA's Green Schools requirements. Megan Saunders who is the Green consultant from Viridian on the project is a LEED Accredited Professional.

Optional - Green Roofs

A 2.1 **Heat Island Effect**, Non-Roof

Not pursued

A 2.2 **Stormwater Design**, Quantity Control

Not pursued

Optional - Energy

A 3.1 **Optimize Energy Performance**

Not pursued

A 3.2 **Renewable Energy**

Not pursued

A 5.1 **Low-Emitting Materials**, Furniture

Not pursued

A 5.2 **Low-Emitting Materials**, Ceiling and Wall Systems

Not pursued

Optional - Education

A 6.1 **The School Building as Educational Tool**

Not pursued

S6.1R - Light Pollution Reduction

LIGHTING FIXTURE SCHEDULE

TYPE	GENERAL LOCATION	MOUNTING	LAMPS	MANUFACTURER CATALOG NUMBER	BALLAST	VOLTS	REMARKS
A1	ADMINISTRATION AREAS, OFFICES	RECESSED	3- Super T8	LIGHTOLIER # DPS2G18LS332-120-03	ELECTRONIC	120V	18 CELL PARABOLIC, RAPID START BALLAST 2X4 GRID - LAY-IN T BAR
A2	ADMINISTRATION AREAS, OFFICES	RECESSED	2- Super T8	LIGHTOLIER# DPS2G12LS232-120-03			12 CELL PARABOLIC, RAPID START BALLAST 2X4 GRID - LAY-IN T BAR
A3	ADMINISTRATION AREAS, OFFICES	RECESSED	2- T8U	LIGHTOLIER# DPS2G9LS32U-120-SO			9 CELL PARABOLIC, RAPID START BALLAST 2X2 GRID - LAY-IN T BAR
B1	CAFETERIA, STORAGES	RECESSED	3- Super T8	LIGHTOLIER # PRS2GRFVA332-120-SO			PRISMATIC LENS WITH FLOATING ALUMINUM DOOR, RAPID START BALLAST, 2X4 GRID - LAY-IN T BAR
B2	STORAGES	RECESSED	2- Super T8	LIGHTOLIER # PRS2GRFVA232-120-SO			PRISMATIC LENS WITH FLOATING ALUMINUM DOOR, RAPID START BALLAST, 2X4 FLANGED/DRY PLASTER
B3	CAFETERIA	RECESSED	2- T8U	LIGHTOLIER # PRS2GRFVA32U-120-SO			PRISMATIC LENS WITH FLOATING ALUMINUM DOOR, RAPID START BALLAST, 2X2 FLANGED/DRY PLASTER
C1	STORAGES, CLOSETS, LOCKER ROOMS, TOILETS	RECESSED	2- Super T8	LIGHTOLIER # PRS2FRFVA232-120-SO			PRISMATIC LENS WITH FLOATING ALUMINUM DOOR, RAPID START BALLAST, 2X4 FLANGED/DRY PLASTER
C2	STORAGES, CLOSETS, LOCKER ROOMS, TOILETS	RECESSED	2- T8U	LIGHTOLIER # PRS2FRFVA32U-120-SO			PRISMATIC LENS WITH FLOATING ALUMINUM DOOR, RAPID START BALLAST, 2X2 FLANGED/DRY PLASTER
D	CORRIDOR	RECESSED	2- Super T8	LIGHTOLIER # QVS2GPFOS232-120-NYC			DIRECT/INDIRECT MICROPERFORATED MESH WHITE LAMP SHIELD, RAPID START BALLAST, 2X4 GRID - LAY-IN T BAR
F1	KITCHEN, FOOD STORAGE, SERVERY AREA	RECESSED	3- Super T8	PARAMOUNT # FF2-332-6SS-120			FOOD ZONE, CLEAR POLYCARBONATE LENS 2X4 FIXTURE - NSF CERTIFIED FOOD PROCESSING COORDINATE MOUNT WITH METAL PAN CEILING.
F2	KITCHEN, FOOD STORAGE, SERVERY AREA	RECESSED	2- T8U	PARAMOUNT # FF2-231U-6SS-120			FOOD ZONE, CLEAR POLYCARBONATE LENS 2X2 FIXTURE - NSF CERTIFIED FOOD PROCESSING COORDINATE MOUNT WITH METAL PAN CEILING.
G1	ELEVATOR PIT	WALL	1-42W TRIPLE TUBE	EXCELINE # RLW42HF-PLT-G-C-GRN-4			KALEIDOSCOPE VAPORTITE SERIES WALL MOUNT LUMINAIRE. CLEAR GLOBE
J1	CLASSROOMS	PENDANT	2- Super T8	LIGHTOILER # EG1-2AA-P(4/8)1W-D			18 GA. HOUSNG W/ PARABOLIC LOUVER 93% REFLECTIVE REFLECTOR. DUAL SWITCHING. MOUNTED 8'-6"AFF
J2	LIBRARY	PENDANT	2- Super T8	LIGHTOILER # EG1-2AA-P(4/8)1W			18 GA. HOUSNG W/ PARABOLIC LOUVER 93% REFLECTIVE REFLECTOR. MOUNTED 8'-6"AFF
L	SCIENCE ROOMS	SURFACE	T4-20W	LIGHTOLIER # 8314WH/83B20E/83EW48WH/MHT4RF			TRACK - ENCLOSED LIGHTING MODULE 40' FLOOD
N	GYMNASIUM	PENDANT	8-42W CFL	GE LIGHTING # OBCW48F1F-E6-VA11			HIGH-BAY COMPACT FLUORESCENT LUMINAIRE ENCLOSED 26 INCH REFLECTOR WITH FLAT ACRYLIC LENS.
P1	COURTYARD	POLE MOUNTED	150W-MH PULSE START	BEGA # 8208MH-916HR			INDIRECT ASYMMETRICAL WIDE FLOOD DISTRIBUTION LUMINAIRE IN STRAIGHT ROUND 16' POLE. PROTECTIONS CLASS IP65.
P2	PLAYGROUND / SITE	POLE MOUNTED	100W-MH PULSE START	KIM LIGHTING # CCS17A3-100PMH120			TYPE III FULL CUT-OFF DISTRIBUTION LUMINAIRE. SPUN ALUMINUM CIRCULAR HOUSING IN ROUND 20' POLE.
T1	MECHANICAL ROOMS, JANITOR'S CLOSETS, STORAGES	SURFACE/ WALL	2- Super T8	HOLOPHANE # HWSM4-DSH71-042-EP11			1'X 4' CEILING/WALL MOUNTED FLUORESCENT ALL PURPOSE INDUSTRIAL. RIGID COLD ROLLED STEEL HOUSING, WALL MTD. WHERE INDICATED.
T2	STAIRS	SURFACE	2- Super T8	KENALL # MILLENIUM STRETCH MLHA8-48-F-MWCP-232-EB-120			MARINE GRADE ALUMINUM EXTRUDED WITH DIE-CAST END CAPS. SHOCK AND TAMPER RESISTANT SOCKETS AND HARDWARE.
TA	CORRIDORS	SEMI-RECESSED	1-42W TRIPLE TUBE	LIGHTOLIER # D7A02-8022CL-S7142BU			DOWNLIGHT WITH INTEGRAL BALLAST. DIMENSIONS 10"X 12 3/4"X 9 7/8" DEEP WITH 9" DIAMETER DROPPED ACRYLIC LENS. OVERLAP TRIM.
TB	CORRIDOR	RECESSED	1-32W TRIPLE TUBE	LIGHTOLIER # 8021CCDWHS6132BU			DOWNLIGHT WITH INTEGRAL BALLAST. DIMENSIONS 10"X 12 3/4"X 9 7/8" DEEP WITH 6" APERTURE DIAMETER. DIFFUSE REFLECTOR AND WHITE TRIM.
TC	CORRIDOR	RECESSED	1-32W TRIPLE TUBE	LIGHTOLIER # 8046CCDWHS6132BU			LENSED WALL WASHER. DIMENSIONS ARE 10"X 12 3/4"X 6 3/4" DEEP WITH 5 3/4" APERTURE DIAMETER. DIFFUSE REFLECTOR AND WHITE TRIM.
TD	CORRIDOR	RECESSED	1- T5 28W	GAMMALUX # GB35RC-128T5ST-120V-ERS-**-REC/T1PASL-WSG			WHITE SEMIGLOSS TROFFER WITH MEDIUM DIFFUSE SATIN ACRYLIC LENS AND INTEGRAL ELECTRONIC BALLAST. DIMENSIONS ARE 3" WIDE X 5" TALL WITH ** LENGTHS AS SHOWN ON DRAWINGS. FIXTURE TO BE PERIMETER MOUNTED. LAMPS TO BE STAGGERED TO MITIGATE SOCKET SHADOWS. MANUFACTURER TO SUBMIT SHOP DRAWINGS SHOWING OVERALL LENGTHS AND STAGGERED LAMP LAYOUT FOR APPROVAL.
TE	CORRIDOR	RECESSED	1- T5 28W	GAMMALUX # GB44RC2-128T5ST-120V-ERS-**-REC/GFRASL-WSG			WHITE SEMIGLOSS TROFFER WITH MEDIUM DIFFUSE SATIN ACRYLIC LENS. DIMENSIONS ARE 4" WIDE X 5" TALL WITH ** LENGTHS AS SHOWN ON DRAWINGS. LAMPS TO BE STAGGERED TO MITIGATE SOCKET SHADOWS.
TF	GENERAL ADMINISTRATION OFFICE	RECESSED	1- T5 28W	GAMMALUX # GB44RC2-128T5-120V-ERS-**-REC-PBBWSG			WHITE SEMIGLOSS TROFFER WITH PARABOLIC BAFFLE. DIMENSIONS ARE 4" WIDE X 5" TALL. LAMPS TO BE STAGGERED TO MITIGATE SOCKET SHADOWS.
TG	GYMATORIUM	SURFACE	2- T5 54W	A&L LIGHTING LTD. # MOD5390-92 1/2"-254T5HO-TUBEGUARD-*			MODIFIED UPLIGHT WITH CONTINUOUS FLANGES ON BOTH SIDES TO MOUNT TO I-BEAM. WHITE SJ CORD 24" LONG OUT ONE END ON BOTTOM OF FIXTURE. ARCHITECT TO VERIFY I-BEAM WIDTH FOR FLANGES DURING SHOP DRAWINGS. MANUFACTURER TO PROVIDE TUBE GUARDS FOR LAMPS.
TH	GYMATORIUM	SURFACE	Q50MR16/HIR/ CG40	B-K LIGHTING INC. # CUS-1208-20-SOLITE-CUST COLOR-TRSS75-*	--		MR16 DOWNLIGHT WITH SOLITE LENS AND LOW VOLTAGE TRANSFORMER MOUNTED IN JUNCTION BOX. FIXTURE DIMENSIONS ARE 3 1/2" TALL X 2 1/4" DIAMETER WITH 5" DIAMETER CANOPY. ARCHITECT TO SPECIFY CUSTOM RAL# FOR FIXTURE FINISH.
TJ	GYMATORIUM	SURFACE	Q50MR16/HIR/ CG40	B-K LIGHTING INC. # NSII-0-CUST-12-11/BC6-CUST/TRSS75	--		JUNCTION BOX MOUNTED ADJUSTABLE DOWNLIGHT WITH JUNCTION BOX MOUNTED ELECTRONIC TRANSFORMER. FIXTURE DIMENSIONS ARE 2 1/4" DIAMETER X 4 3/8" WITH 5" DIAMETER CANOPY. FIXTURE TO HAVE SOLITE LENS. ARCHITECT TO SPECIFY CUSTOM RAL# FOR FIXTURE FINISH.
TK	GYMATORIUM	SURFACE	1- T5 28W	GAMMALUX # GB44D-128T5-120V-ERS-**-***-ASL-CCM	ELECTRONIC		LINEAR TROFFER WITH MEDIUM DIFFUSE SATIN ACRYLIC LENS. DIMENSIONS ARE 4" WIDE X 4" TALL WITH ** LENGTHS AS SHOWN ON DRAWINGS. LAMPS TO BE STAGGERED TO MITIGATE SOCKET SHADOWS. ***ARCHITECT TO SPECIFY SUSPENSION HEIGHT AND TO SPECIFY FINISH.
TL	GYMATORIUM STAIRS	RECESSED	3W AC LED	LUCIFER LIGHTING CO. # STEALTH SSL-ALED-5KSSL, PSA-60-12H	--		STAINLESS STEEL REGRESSED LED WITH SLOT APERTURE WITH SEALED LINEAR SPREAD LENS, LOCKING SET SCREWS WITH TORSION SPRING CLIPS. PROVIDE CORRESPONDING POWER SUPPLY PSA-60-12H, QUANTITY AS REQUIRED.
U	ELEVATOR LOBBIES	RECESSED	2- Super T8	LINEAR LIGHTING CORP. # WW2-D-2ET8-PBL-RRW-4	ELECTRONIC		PERIMETER WALL WASHER 20GA HOUSING, STAGGERED LAMPS, END TELESCOPING UNIT, WHITE BAFFLE LOUVER WITH ACRYLIC OVERLAY.
Z1	BUILDING PERIMETER	WALL	1-42W TRIPLE TUBE	BEGA # 2483P			ONE PIECE DIE-CAST ALUMINUM HOUSING. SEMI-SPECULAR, ANODIZED ALUMINUM INTERNAL REFLECTOR. PROTECTION CLASS: IP 55.
Z2	ROOF PENTHOUSE, WALL PACK	WALL	100W-HPS	MAGNIFLOOD # MF-2119-3-SCA			WALLPACK CUTOFF FORWARD THROW HIGH VANDAL RESISTANT LUMINAIRE. UL LISTED. PROVIDE WITH WIRE GUARD
Z3	ROOF PENTHOUSE, FLOODLIGHT	WALL / ANGLED BRACKET	100W-HPS	HOLOPHANE # PD100HPMTKW1B-06387-BZ			FLOODLIGHT IN HEAVY DUTY DIE CAST, LOW COPPER ALUMINUM HOUSING, UL WET LOCATIONS LISTED, WIDE HORIZONTAL & VERTICAL DISTRIBUTION
Z4	ACCESS RAMP AT MAIN ENTRANCE	WALL	18W XENON	NSL XSL-L			XENON STEP LIGHT 110V LOUVERED W/BULB WITH INTEGRAL 12V CLASS 2 TRANSFORMER. BRONZE
EXIT	CORRIDORS/ STAIRS	AS INDICATED	LED	McPHILBEN # ER40L	--		DIE-CAST ALUMINUM EXIT SIGNAGE WITH LEAD NICAD BATTERY

LIGHTING FIXTURE SCHEDULE NOTES:

1. ALL LTG FIXTURES SHALL BE SUPPORTED AS INDICATED IN SPECIFICATION SECTIONS 16130 AND 16503 AS REQUIRED TO COMPLY WITH SEISMIC ZONE TWO (2).
2. ALL LTG FIXTURES ARE REQUIRED TO CONFORM WITH THE REQUIREMENTS OF SPECIFICATIONS SECTION 16500.
3. THIS CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ENSURING THAT BALLAST SPECIFIED CORRESPOND TO THE LAMP FOR THE LTG FIXTURE INDICATED. REFER TO SPECIFICATIONS 16501.
4. ALL CEILING LIGHTING FIXTURES REFLECTORS LOUVERS & ACCESSORIES SHALL BE WHITE U.O.I. BY ARCHITECT.
5. ALL LIGHTING FIXTURES COLOR FINAL COLOR & FINISH SELECTION FOR FIXTURES SHALL BE AS SELECTED BY ARCHITECT.
6. ALL RECESSED LENSED FIXTURES TO HAVE SAFETY CHAIN.
7. ELECTRONIC BALLAST TO HAVE 3 YEAR WARRANTY.
8. ALL RECESSED FIXTURES TO HAVE (4) EARTH QUAKE CLIPS.
9. ALL LENSED FLUORESCENT FIXTURES TO HAVE A .130 MINIMUM THICKNESS U.O.I.
10. PROVIDE A SEPARATE NEUTRAL FOR EACH LIGHTING CIRCUIT.
11. CATALOG CUTS OR "SERIES" NUMBERS ARE INTENDED TO PROVIDE ASSISTANCE IN ESTABLISHING GENERAL TYPE OR CATEGORY OF LIGHTING FIXTURES ONLY. CONTRACTOR SHALL PROVIDE A FIXTURE THAT MEETS THE WRITTEN PERFORMANCE AND DESCRIPTION.
12. CONTRACTOR TO COORDINATE FIXTURE AND HOUSING INSTALLATION WITH CEILING TYPE, THICKNESS AND CONSTRUCTION. ANY DISCREPANCIES BETWEEN THE HOUSING TYPE AND TRIM AND CEILING TYPE SHOULD BE BROUGHT TO THE ATTENTION OF THE LIGHTING CONSULTANT PRIOR TO THE RELEASE OF A PURCHASE ORDER.
13. FOCUSING IS REQUIRED FOR ALL ADJUSTABLE FIXTURES AND REQUIRES THE CONTRACTOR TO PROVIDE ALLOWANCE FOR MANPOWER, SCAFFOLDING, AND TOOLS TO ADJUST, AIM, OR INSTALL FIXTURES AND ACCESSORIES PER THE LIGHTING CONSULTANTS DIRECTION DURING EVENING HOURS. THE CONTRACTOR IS TO LOCK BUT NOT OVER-TIGHTEN ALL FIXTURES SO THAT LAMPHOLDERS WILL NOT MOVE DURING SUBSEQUENT RELAMPING. DURING FOCUSING THE LIGHTING CONSULTANT WILL PROVIDE AIMING DIRECTION, INSTRUCTION, AND DEFINE AIMING ANGLES FOR TYPICAL FIXTURES SO THE CONTRACTOR MAY COMPLETE THE FOCUSING DURING DAY HOURS. FOCUSING CAN ONLY OCCUR AFTER INSTALLATION AND CONFIRMED OPERATION OF ALL FIXTURES, AND THE CONTRACTOR HAS VERIFIED INSTALLATION AND CONFIRMED OPERATION OF CONTROL SYSTEMS. INSTALLATION OF SPECIFIC ARCHITECTURAL ORNAMENT OR ART INTENDED TO BE ILLUMINATED MUST BE IN PLACE.

SERVICE SWITCHGEAR

MAIN ELECTRICAL RM.

CIRCUIT NO.	LOAD SVD	POLES	SWITCH	FUSE	LOAD	FEEDER
1	SSW # 1 - HDB	3	4000A	3000A	2596A	10 SETS OF 4#500MCM-IN 10-3"C
2	SSW # 2 - MDB	3	2000A	1600A	1497A	5 SETS OF 4#500MCM-IN 5-3"C
3	SSW # 3 - EDB	3	600A	600A	522A	2 SETS OF 4#400MCM-IN 2-3"C
4	SSW - FIRE PUMP	3	1000A	250A	200A	3#350MCM-3"C 2HR MI CABLE OR RHH/RHW

PANEL HDB   VOLT 120/208, 3ø,4W   LOC. MAIN ELECTRICAL RM.
MOUNTING FLOOR   AMP RATING 3000A   MAIN M.L.O.
SCIR: 22KA

CIRCUIT NO.	LOAD SVD	POLES	SWITCH	FUSE	LOAD	FEEDER
1	RTU-1	3	600A	600A	488A	3 SETS OF 3 # 350 MCM IN 3 - 3" C
2	RTU-2	3	200A	200A	178A	3 # 4/0 IN 2" C
3	RTU-3	3	400A	400A	300A	2 SETS OF 3 # 4/0 IN 2-2" C
4	RTU-4	3	200A	200A	148A	3 # 4/0 IN 2" C
5	RTU-5	3	200A	200A	192A	3 # 4/0 IN 2" C
6	CHI-1	3	400A	400A	390A	2 SETS OF 3 # 4/0 IN 2-2" C
7	CHI-1	3	400A	400A	390A	2 SETS OF 3 # 4/0 IN 2-2" C
8	MPC	3	100A	100A	93A	4 # 1/0 IN 2" C
9	MP1	3	100A	100A	59A	4 # 4 IN 1" C
10	MP2	3	100A	100A	48A	4 # 4 IN 1" C
11	MP3	3	100A	100A	52A	4 # 1/0 IN 2" C
12	MP4	3	100A	100A	63A	4 # 1/0 IN 2" C
13	MPR 1/2	3	400A	400A	319A	4 # 300MCM IN 3" C
14	SPARE	3	200A			
15	SPARE	3	200A			

PANEL EDB   VOLT 120/208, 3ø,4W   LOC. MAIN ELECTRICAL RM.
MOUNTING FLOOR   AMP RATING 600 AMPS   MAIN M.L.O.
SCIR: 22KA

CIRCUIT NO.	LOAD SVD	POLES	SWITCH	FUSE	LOAD	FEEDER
1	ELEVATOR 1	3	200A	150A	150A	4 # 2/0 IN 2" C
2	ELEVATOR 2	3	200A	150A	150A	4 # 2/0 IN 2" C
3	EC&S	3	60A	60A	24A	4 # 6 IN 3/4" C
4	EQC	3	60A	60A	34A	4 # 6 IN 3/4" C
5	ELP1	3	60A	60A	41A	4 # 6 IN 3/4" C
6	EQ1	3	60A	60A	29A	4 # 6 IN 3/4" C
7	ETP	3	100A	100A	76A	4 # 2 IN 1 1/2" C
8	ELP4	3	60A	60A	30A	4 # 6 IN 3/4" C
9	EQR	3	100A	100A	66A	4 # 2 IN 1 1/2" C
10	SPARE	3	100A			
11	SPARE	3	100A			

PANEL MDB   VOLT 120/208, 3ø,4W   LOC. MAIN ELECTRICAL RM.
MOUNTING FLOOR   AMP RATING 2000 A   MAIN M.L.O.
SCIR: 22KA

CIRCUIT NO.	LOAD SVD	POLES	SWITCH	FUSES	LOAD	FEEDER
1	RPC	3	60A	60A	37A	4 # 6 IN 3/4" C
2	LPC	3	30A	30A	19A	4 # 8 IN 3/4" C
3	OLP	3	60A	60A	45A	4 # 6 IN 3/4" C
4	CDB	3	600A	600A	509A	3 SETS OF 3 # 350 MCM IN 3 - 3" C
5	KP 1/2	3	400A	250A	294A	4 # 300MCM IN 3" C
6	LP1	3	60A	60A	39A	4 # 6 IN 3/4" C
7	RP1	3	100A	100A	62A	4 # 2 IN 1 1/2" C
8	LP2	3	60A	60A	44A	4 # 6 IN 3/4" C
9	RP2	3	100A	100A	71A	4 # 2 IN 1 1/2" C
10	LP3	3	60A	60A	40A	4 # 6 IN 3/4" C
11	RP3	3	100A	100A	52A	4 # 2 IN 1 1/2" C
12	LP4	3	60A	60A	41A	4 # 6 IN 3/4" C
13	RP4	3	60A	60A	60A	4 # 6 IN 3/4" C
14	AUD	3	100A	100A	39A	4 # 2 IN 1 1/2" C
15	GYM	3	100A	100A	83A	4 # 2 IN 1 1/2" C
16	DIMMERBOARD	3	200A	200A	130A	4 # 4/0 IN 2" C
17	SPARE	3	100A		--	--
18	SPARE	3	100A		--	--

PANEL CDB   VOLT 120/208, 3ø,4W   LOC. MAIN ELECTRICAL RM.
MOUNTING FLOOR   AMP RATING 600 AMPS   MAIN M.L.O.
SCIR: 22KA

CIRCUIT NO.	LOAD SVD	POLES	SWITCH	FUSE	LOAD	FEEDER
1	CP1	3	100A	100A	80A	4 # 2 IN 1 1/2" C
2	CP2A + CP2B	3	200A	200A	140A	4 # 4/0 IN 2" C
3	CP3A + CP3B	3	200A	150A	134A	4 # 2/0 IN 2" C
4	CP4	3	100A	100A	74A	4 # 2 IN 1 1/2" C
5	SCI1	3	60A	60A	29A	4 # 2 IN 1 1/2" C
6	SCI2	3	100A	100A	52A	4 # 2 IN 1 1/2" C
7	SPARE	3	100A			

Architect:
Kliment Halsband Architects
322 Eighth Avenue, New York, New York 10001

Structural Engineer
Severud Associates
469 Seventh Avenue, New York, New York 10018

MEP Engineer:
DVL Consulting Engineers, Inc.
375 Main Street, Hackensack, New Jersey 07601

Civil Engineer:
Philip Habib & Associates
226 West 26th Street - 9th Floor, New York, New York 10001

Landscape Architect:
Mathews Nielsen
120 Broadway, Suite 1040, New York, New York 10271

Geotechnical:
Langan Engineering
21 Penn Plaza 360 West 31st Street, 8th Floor New York, NY 10001-2727

Food Service Consultant:
Romano Gatland
58 Albany Avenue, Suite 201 Amityville, New York 11701

Acoustical Consultant:
Ostergaard Acoustical Associates
200 Executive Drive, West Orange, New Jersey 07052

Theater Consultant:
Harvey Marshall Berling Associates
173 West 81st Street - Suite 2 (Lower Level), New York, New York 10024

Elevator Consultant:
Van Deusen & Associates
5 Regent Street - Suite 524, Livingston, NJ 07039

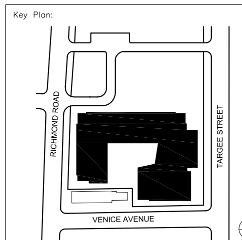
Cost Estimating:
G2 Project Planning
75 Beacon Street, Beacon, NY 12508

Bid Documents

NOTE: Drawing may be printed at reduced scale

No. Date Revision

Key Plan:



Block # 3168   Lot # 4

SCA Program Design Manager:	J. ELBERFELD
Project Architect/Engineer:	KHA
Discipline Lead:	H. MENA, P.E.
Designer:	C. PEREZ
Drawn by:	C. PEREZ
Checked by:	H. MENA, P.E.

LLW No.:	Facility Code:	Date:
46429	PS000R	11/29/10

Project:
PS/IS 71R. - STATEN ISLAND

Address: 1050 TARGEE STREET
STATEN ISLAND, NY 10304

Drawing Title:
ELECTRICAL LIGHTING FIXTURES SCHEDULE AND DISTRIBUTION BOARDS

Drawing No.: E501.00

Light Pollution Reduction - Form A
Exterior Light Tresspass - Site Lumen Calculation
Credit S5.1R

School Construction Authority
NYC Green Schools Rating System

Project: PS/IS 71R
Address: 1050 Targee Street Staten Island, NY 10304
LLW: 46429
Date: 10/12/2010

Architect:
Preparer: Carlos Perez
Telephone:

Site Lumen Calculation

Fixture Type	Quantity of Installed Luminaries	Initial Lamp Lumens per Luminaire	Total Lamp Lumens	Initial Lamp Lumens Above 90 degrees from Nadir	Total Lamp Lumens Above 90 degrees
lt-1a	4	5,000	20,000	50	200
lt-1b	2	5,000	10,000	50	100
lt-1c	1	5,000	5,000	50	50
lt-1d	14	5,000	70,000	50	700
[insert rows as necessary]					
		Total Lamp Lumens	**105,000**		
				Total Lamp Lumens above 90 degrees	**850**

Percentage of Site Lamp Lumens above 90 degrees	1%
If Percentage of Site Lamp Lumens above 90 degrees is less than or equal to the value referenced for the select site LZ then site complies.	Yes or No

LZ1: 0%, LZ2: 2%, LZ3:5%, LZ4: 10%

Light Pollution Reduction - Form B
Light Power Density Calculations
Credit S5.1R

School Construction Authority
NYC Green Schools Rating System

Project:	PS/IS 71R		
Address:	1050 Targee Street Staten Island, NY	Consulting Engineer:	
LLW:	46429	Preparer:	Carlos Perez
Date:	10/12/2010	Telephone:	

1. Exterior Site Areas in W/SF ONLY *(applies to school yards, play roofs, parking lots, building grounds and plazas)*
Note: Remove example data and insert project-specific information thourghout this form.

Site Location	Fixture Type	Fixture Wattage	Fixture Quantity	Total Fixture Power (Watts)	Area Illuminated (SF)	Actual LPD (per design)	ASHRAE Allowable LPD (Watts/SF)	SCA Allowable LPD 20% below ASHRAE	Site Lighting Fixture Complies
Area #1									
E.PLAYGROUND	P2	100	24	2,400	47,778	0.050			
	Z1	70	6	420	47,778	0.009			
				0	47,778	0.000			
[insert additional lines above as is necessary, one row for each Fixture Type]									
					Area #1 Result	**0.030**	0.2	0.16	Yes
Area #2									
I.PLAYGROUND	P1	70	9	630	8,539	0.074			
				0	8,539	0.000			
[insert additional lines above as is necessary, one row for each Fixture Type]									
					Area #2 Result	**0.074**	0.2	0.16	Yes
Area #3									
[insert additional lines above as is necessary, one row for each Fixture Type]									
Area #4									
[insert additional lines above as is necessary, one row for each Fixture Type]									
Area #5									
[insert additional lines above as is necessary, one row for each Fixture Type]									
					Overall AVERAGE Actual Designed LPD in W/SF	**0.052**			
					SCA Allowable LPD (adds 5% unrestricted allowable per ASHRAE 90.1-2004 Table 9.4.5)			**0.168**	
					Is Overall AVERAGE Actual Designed LPD less than or equal to SCA allowable LPD? Project Complies				**Yes**

Light Pollution Reduction - Form B
Light Power Density Calculations
Credit S5.1R

School Construction Authority
NYC Green Schools Rating System

Project:	PS/IS 71R		
Address:	1050 Targee Street Staten Island, NY	Consulting Engineer:	0
LLW:	46429	Preparer:	Carlos Perez
Date:	40463	Telephone:	0

2. Building Entrance, Canopy & Overhang and Other Exterior Lighting in W/LF ONLY (No Façade Lighting to be included)

Site Location	Fixture Type	Fixture Wattage	Fixture Quantity	Total Fixture Power (Watts)	Entrance Length (LF)	Actual W/LF (per design)	ASHRAE Allowable LPD (Watts/LF)	SCA Allowable LPD 20% below ASHRAE	Site Lighting Fixture Complies
Main Entrance	TA	42	6	252	15.50	16	30	24	Yes
West Entrance	TA	42	2	84	6.10	14	20	16	Yes
				0		0		0	Yes
				0		0		0	Yes
				0		0		0	Yes
				0		0		0	Yes
[insert additional lines above as necessary]									
				Overall AVERAGE Actual Designed LPD in W/LF		**15**			
				SCA Allowable LPD (adds 5% unrestricted allowable per ASHRAE 90.1-2004 Table 9.4.5)				**21**	
				Is Overall AVERAGE Actual Designed LPD less than or equal to SCA allowable LPD? Project Complies					**Yes**

Note: The Allowable ASHRAE 90.1-2004 Lighting Power Densities can be found in ASHRAE and in the LEED-NC 2.2 Reference Guide.

NYC SCA: PS/IS 71 R

WE1.1R Supporting Computations

Design Case

Area Name	Area(Sq.Ft.)	ks	kd	kmc	KL	ET0	ETL	IE	CE	TWA(gal)	Reuse Water(gal)	TPWA(gal)
Mixed Planting	22000	0.2	1.3	1.2	0.312	5.89	1.83768	0.9	0.9	25199.37		
								Total Water Applied		25199.37	3400	21799.37

Baseline Case

Area Name	Area(Sq.Ft.)	ks	kd	kmc	KL	ET0	ETL	IE	CE	TWA(gal)
Mixed Planting (Average)	11000	0.5	1.1	1.2	0.66	5.89	3.8874	0.9	0.9	29616.07
Turfgrass(Average)	11000	0.7	1	1	0.7	5.89	4.123	0.625	0.9	45231.82
								Total Water Applied		74847.89

WE 1.1	Percent Reduction of Total Water	**Point Earned?**
	66.33%	YES

KEY

ks Species Factor
kd Density Factor
kmc Microclimate Factor
KL Landscape Coefficient
ETO Evapotranspiration Rate - Regional
ETL Evapotranspiration Rate - Site
IE Irrigation Type
CE Controller Efficiency
TWA Total Potable Water Applied

User Input
Calculated Output

TPWA Total Potable Water Applied Adjusted

MEMORANDUM

To: Megan Saunders (Viridian), Billy Askey (Kliment Halsband)

From: Ryan Kovac

Re: PS/IS 71R - 60% Submittal Plant Species Supporting Documentation

Date: December 16, 2010

MATHEWS NIELSEN

LANDSCAPE ARCHITECTURE
URBAN DESIGN
ENVIRONMENTAL PLANNING

120 BROADWAY
SUITE 1040
NEW YORK, NY 10271

T: 212.431.3609
F: 212.941.1513

The following information is being provided, as per the SCA request, in support of the Green Schools W1.1R and W1.2R credits that were sought under the 60% submission.

It is important to take into consideration a multitude of factors when accurately assessing the moisture requirements of the selected plant material. These include, but are not limited to, location with regards to solar orientation, micro-topography, exposure to western winds, and density of planting (i.e. biomass). When taking these factors into account, MNLA feels that the selected plant palette will survive if provided adequate water during the period of establishment. Many of the planted areas will be shaded by the building mass for half of the day or more. Plants with higher moisture requirements have been sited to take advantage of directed stormwater runoff and low points within the landscaped areas.

The following is a summary of moisture requirements and drought tolerance for plants included in the 60% submission.

Amelanchier canadensis – Drought Tolerance: Medium; Moisture Use: Medium (USDA)
Aronia arbutifolia – Drought Tolerance: Low; Moisture Use: High (USDA)
Aster novi-belgii – Drought Tolerance: Low; Moisture Use: High (USDA)
Cercis canadensis – Drought Tolerance: High; Moisture Use: Low (USDA)
Clethra alnifolia – Drought Tolerance: Low; Moisture Use: High (USDA)
Cornus mas – Drought Tolerance: Low; Moisture Use: Medium (USDA)
Echinacea purpurea – Drought Tolerance: Low; Moisture Use: Medium (USDA)
Fothergilla gardenii – Drought Tolerance: None; Moisture Use: High (USDA)
Hydrangea quercifolia – Drought Tolerance: Medium; Moisture Use: Medium (USDA)
Ilex glabra – Drought Tolerance: Low; Moisture Use: High (USDA)
Juniperus chinensis – Drought Tolerance: Medium; Moisture Use: Medium (USDA)
Liquidambar styraciflua – Drought Tolerance: Low; Moisture Use: High (USDA)
Myrica pennsylavanica – Drought Tolerance: High; Moisture Use: Medium (USDA)
Panicum virgatum – Drought Tolerance: Medium; Moisture Use: Medium (USDA)
Pennisetum alopecuroides – Drought Tolerance: Medium; Moisture Use: Low (USDA)
Querus phellos – Drought Tolerance: None; Moisture Use: High (USDA)
Rhus aromatica – Drought Tolerance: High; Moisture Use: Low (USDA)
Viburnum lentago – Drought Tolerance: Low; Moisture Use: Medium (USDA)

Below is a list of plants not included in the USDA database.

Cotinus coggygria – described in the industry standard resource book named *Dirr's Hardy Trees and Shrubs* as a shrub that "...grows in anything but wet soils."

Tilia tomentosa – described in industry standard resource book named *Dirr's Hardy Trees and Shrubs* as a tree that "Requires ample moisture in the early years of establishment."

Viburnum plicatum var. tomentosum – described in the industry standard resource book named *Dirr's Hardy Trees and Shrubs* as a shrub that when used one should "Provide ample moisture."

MATHEWS
NIELSEN

LANDSCAPE ARCHITECTURE
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Echinacea purpurea 'Kim's Knee High' – moisture needs described by the American Horticultural Society as "moist, but well-drained soil".

Monarda 'Mahogany' – moisture needs described by the American Horticultural Society as "Requires moist soil".

Rudbeckia triloba – moisture needs described by the American Horticultural Society as "well-drained or moist soil".

Sedum 'Autumn Joy' – moisture needs described by the American Horticultural Society as "fertile, well-drained soil".

Lirope spicata – the following is an excerpt taken directly from the 2010 Sunny Border Nurseries, Inc. catalog. Sunny Border is a industry leader in the propagation of herbaceous plant material and has been in business for over 80 years.

"Lirope spicata is a perfect lawn substitute...can be plugged in and will spread, ultimately forming a deep green, glossy lawn which is extremely drought tolerant and only needs mowing a couple of times a year."

cc: SN (MNLA)

Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Viburnum lentago* L.**
nannyberry
VILE

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	FACU, FAC+

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	White

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Ecological Site Information System

Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Red
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	28
Height, Mature (feet)	28.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	128
Hedge Tolerance	None
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.0
pH, Maximum	7.0
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	1200
Precipitation, Minimum	38
Precipitation, Maximum	60
Root Depth, Minimum (inches)	14
Salinity Tolerance	None
Shade Tolerance	Tolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Late Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Low
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	7843
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Amelanchier canadensis* (L.) Medik.**
Canadian serviceberry
AMCA4

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	FACU, FAC

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	Yes
Flower Color	White

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Purple
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	20
Height, Mature (feet)	23.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	High
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	110
Hedge Tolerance	High
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	700
Planting Density per Acre, Maximum	1800
Precipitation, Minimum	30
Precipitation, Maximum	60
Root Depth, Minimum (inches)	20
Salinity Tolerance	Medium
Shade Tolerance	Intermediate
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	95708
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	Yes
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	High
Palatable Graze Animal	Medium
Palatable Human	Yes
Post Product	No
Protein Potential	High
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Photinia pyrifolia* (Lam.) K.R. Robertson & Phipps**
red chokeberry
PHPY4

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	White

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Ecological Site Information System

Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Red
Fruit/Seed Conspicuous	Yes
Growth Form	Colonizing
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	5
Height, Mature (feet)	5.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	Medium
Frost Free Days, Minimum	130
Hedge Tolerance	Low
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	700
Planting Density per Acre, Maximum	2700
Precipitation, Minimum	34
Precipitation, Maximum	60
Root Depth, Minimum (inches)	20
Salinity Tolerance	Low
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-18

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	256000
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

Symphyotrichum novi-belgii* (L.) G.L. Nesom var. *novi-belgii
New York aster
SYNON

Summary

Duration	Perennial
Growth Habit	Forb/herb
Native Status	L48 (N), CAN (N), SPM (N)
Federal T/E Status	
National Wetland Indicator	

Morphology/Physiology

Active Growth Period	Spring, Summer, Fall
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Purple

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Porous
Foliage Porosity Winter	Porous
Foliage Texture	Fine
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	6.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Short
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Low
Fertility Requirement	Low
Fire Tolerance	High
Frost Free Days, Minimum	180
Hedge Tolerance	None
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.5
pH, Maximum	7.0
Planting Density per Acre, Minimum	2700
Planting Density per Acre, Maximum	11000
Precipitation, Minimum	40
Precipitation, Maximum	60
Root Depth, Minimum (inches)	10
Salinity Tolerance	None
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Fall
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	700000
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Cercis canadensis* L.**
eastern redbud
CECA4

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACU

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Purple

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	25
Height, Mature (feet)	30.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Short
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	High
Fertility Requirement	Low
Fire Tolerance	Medium
Frost Free Days, Minimum	170
Hedge Tolerance	None
Moisture Use	Low

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.0
pH, Maximum	7.9
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	1200
Precipitation, Minimum	20
Precipitation, Maximum	80
Root Depth, Minimum (inches)	24
Salinity Tolerance	None
Shade Tolerance	Tolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Spring
Fruit/Seed Period End	Summer
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	18000
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	Low
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Medium
Palatable Graze Animal	Low
Palatable Human	Yes
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

***Clethra alnifolia* L.**
coastal sweetpepperbush
CLAL3

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	FAC+, FACW

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	White

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	16
Height, Mature (feet)	16.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	No
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	150
Hedge Tolerance	Low
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	7.0
Planting Density per Acre, Minimum	700
Planting Density per Acre, Maximum	1700
Precipitation, Minimum	35
Precipitation, Maximum	60
Root Depth, Minimum (inches)	16
Salinity Tolerance	None
Shade Tolerance	Intermediate
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Low
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

***Cornus mas* L.**
Cornelian cherry
COMA21

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (I)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	Yes
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Yellow

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Red
Fruit/Seed Conspicuous	Yes
Growth Form	Single Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	20
Height, Mature (feet)	26.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	
Frost Free Days, Minimum	130
Hedge Tolerance	Medium
Moisture Use	Medium

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- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.0
pH, Maximum	7.5
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	1200
Precipitation, Minimum	30
Precipitation, Maximum	50
Root Depth, Minimum (inches)	30
Salinity Tolerance	None
Shade Tolerance	Intermediate
Temperature, Minimum (°F)	-27

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Spring
Fruit/Seed Period End	Summer
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	2300
Seed Spread Rate	None
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Medium
Palatable Graze Animal	
Palatable Human	Yes
Post Product	No
Protein Potential	
Pulpwood Product	No
Veneer Product	No

Cornus mas L.
Cornelian cherry
COMA21
Cultivar: Redstone

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (I)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High

Coppice Potential	Yes
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	Yes
Foliage Color	Dark Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Red
Fruit/Seed Conspicuous	Yes
Growth Form	Single Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	25
Height, Mature (feet)	25.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium

Fire Tolerance	
Frost Free Days, Minimum	160
Hedge Tolerance	Medium
Moisture Use	Medium
pH, Minimum	5.0
pH, Maximum	7.5
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	1200
Precipitation, Minimum	30
Precipitation, Maximum	50
Root Depth, Minimum (inches)	30
Salinity Tolerance	None
Shade Tolerance	Intermediate
Temperature, Minimum (°F)	-27

Reproduction

Bloom Period	Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	2300
Seed Spread Rate	None

Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Medium
Palatable Graze Animal	Low
Palatable Human	Yes
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

Echinacea purpurea (L.) Moench
eastern purple coneflower
ECPU

Summary

Duration	Perennial
Growth Habit	Forb/herb
Native Status	L48 (N), CAN (I)
Federal T/E Status	
National Wetland Indicator	

Morphology/Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	Slow
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	Yes
Flower Color	Purple

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Porous
Foliage Porosity Winter	Porous
Foliage Texture	Fine
Fruit/Seed Color	Black
Fruit/Seed Conspicuous	No
Growth Form	Single Stem
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	1.2
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Low
Fire Tolerance	Medium
Frost Free Days, Minimum	90
Hedge Tolerance	None
Moisture Use	Medium

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- VegSpec

pH, Minimum	6.5
pH, Maximum	7.2
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	14
Precipitation, Maximum	40
Root Depth, Minimum (inches)	24
Salinity Tolerance	Low
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Early Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	115664
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

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Conservation Plant Characteristics

***Fothergilla gardenii* L.**
dwarf witchalder
FOGA

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N)
Federal T/E Status	
National Wetland Indicator	FACW

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	Yes
Flower Color	White

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Multiple Stem
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	4
Height, Mature (feet)	4.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	High
CaCO3 Tolerance	None
Cold Stratification Required	Yes
Drought Tolerance	None
Fertility Requirement	Low
Fire Tolerance	High
Frost Free Days, Minimum	120
Hedge Tolerance	High
Moisture Use	High

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- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.0
pH, Maximum	6.0
Planting Density per Acre, Minimum	100
Planting Density per Acre, Maximum	200
Precipitation, Minimum	35
Precipitation, Maximum	90
Root Depth, Minimum (inches)	12
Salinity Tolerance	None
Shade Tolerance	Intermediate
Temperature, Minimum (°F)	-8

Reproduction

Bloom Period	Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Low
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	13000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	No
Veneer Product	No

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Conservation Plant Characteristics

***Hydrangea quercifolia* Bartram**
oakleaf hydrangea
HYQU3

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	White

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Flower Conspicuous	Yes
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Multiple Stem
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	6
Height, Mature (feet)	6.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Semi-Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Medium
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	Medium
Frost Free Days, Minimum	165
Hedge Tolerance	Medium
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.6
pH, Maximum	7.5
Planting Density per Acre, Minimum	1200
Planting Density per Acre, Maximum	1700
Precipitation, Minimum	32
Precipitation, Maximum	60
Root Depth, Minimum (inches)	14
Salinity Tolerance	None
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-3

Reproduction

Bloom Period	Late Spring
Commercial Availability	No Known Source
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	
Palatable Graze Animal	
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

***Ilex glabra* (L.) A. Gray**
inkberry
ILGL

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N), CAN (N)
Federal T/E Status	
National Wetland Indicator	FACW-, FACW

Morphology / Physiology

Active Growth Period	Summer and Fall
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	Yes
Flower Color	White

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Black
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	5
Height, Mature (feet)	8.0
Known Allelopath	No
Leaf Retention	Yes
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	High
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	165
Hedge Tolerance	Medium
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	7.0
Planting Density per Acre, Minimum	1200
Planting Density per Acre, Maximum	2700
Precipitation, Minimum	32
Precipitation, Maximum	60
Root Depth, Minimum (inches)	16
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-13

Reproduction

Bloom Period	Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	29000
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

***Juniperus chinensis* L.**
Chinese juniper
JUCH4

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	White

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Multiple Stem
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	12
Height, Mature (feet)	60.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Decumbent
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Low
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	110
Hedge Tolerance	None
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	1200
Precipitation, Minimum	30
Precipitation, Maximum	60
Root Depth, Minimum (inches)	14
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Spring
Fruit/Seed Period End	Summer
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	No
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	24000
Seed Spread Rate	None
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

Juniperus chinensis L.
Chinese juniper
JUCH4
Cultivar: Pfitzer Compacta

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High

Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Medium
Fruit/Seed Color	Blue
Fruit/Seed Conspicuous	No
Growth Form	Multiple Stem
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	4
Height, Mature (feet)	4.0
Known Allelopath	No
Leaf Retention	Yes
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Semi-Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	Medium
Fertility Requirement	Low

Fire Tolerance	Low
Frost Free Days, Minimum	140
Hedge Tolerance	Medium
Moisture Use	Medium
pH, Minimum	4.8
pH, Maximum	8.0
Planting Density per Acre, Minimum	1100
Planting Density per Acre, Maximum	1700
Precipitation, Minimum	24
Precipitation, Maximum	60
Root Depth, Minimum (inches)	14
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-13

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Spring
Fruit/Seed Period End	Summer
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	No
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	
Seed Spread Rate	None

Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	
Palatable Graze Animal	
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	No
Veneer Product	No

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Characteristics

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Conservation Plant Characteristics

***Liquidambar styraciflua* L.**
sweetgum
LIST2

Summary

Duration	Perennial
Growth Habit	Tree
Native Status	L48 (N)
Federal T/E Status	
National Wetland Indicator	FAC, FACW

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	Yes
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Green

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Ecological Site Information System

Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	Yes
Growth Form	Single Stem
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	45
Height, Mature (feet)	100.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Low
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Low
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	180
Hedge Tolerance	Low
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	7.0
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	800
Precipitation, Minimum	40
Precipitation, Maximum	60
Root Depth, Minimum (inches)	36
Salinity Tolerance	None
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-21

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	82080
Seed Spread Rate	Moderate
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	Medium
Lumber Product	Yes
Naval Store Product	Yes
Nursery Stock Product	Yes
Palatable Browse Animal	Medium
Palatable Graze Animal	
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	Yes
Veneer Product	Yes

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Morella pensylvanica* (Mirb.) Kartesz**
northern bayberry
MOPE6

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (N), CAN (N), SPM (N)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Blue
Fruit/Seed Conspicuous	Yes
Growth Form	Colonizing
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	9
Height, Mature (feet)	12.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	Medium
Resprout Ability	Yes
Shape and Orientation	Semi-Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	No
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Low
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	High
Fertility Requirement	Low
Fire Tolerance	Low
Frost Free Days, Minimum	140
Hedge Tolerance	Low
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.5
pH, Maximum	7.8
Planting Density per Acre, Minimum	1210
Planting Density per Acre, Maximum	2722
Precipitation, Minimum	32
Precipitation, Maximum	65
Root Depth, Minimum (inches)	20
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Late Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	No
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	55000
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

Morella pensylvanica (Mirb.) Kartesz
northern bayberry
MOPE6
Cultivar: Wildwood

Summary

Duration	Perennial
Growth Habit	Tree, Shrub
Native Status	L48 (N), CAN (N), SPM (N)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High

Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Blue
Fruit/Seed Conspicuous	Yes
Growth Form	Colonizing
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	7
Height, Mature (feet)	7.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	Medium
Resprout Ability	Yes
Shape and Orientation	Semi-Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	No
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Low
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	High
Fertility Requirement	Low

Fire Tolerance	Low
Frost Free Days, Minimum	140
Hedge Tolerance	Low
Moisture Use	Medium
pH, Minimum	5.5
pH, Maximum	7.8
Planting Density per Acre, Minimum	1210
Planting Density per Acre, Maximum	2722
Precipitation, Minimum	32
Precipitation, Maximum	65
Root Depth, Minimum (inches)	20
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Late Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	Yes
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	55000
Seed Spread Rate	Slow

Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
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Conservation Plant Characteristics

***Panicum virgatum* L.**
switchgrass
PAVI2

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	5.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	120
Hedge Tolerance	None
Moisture Use	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	8.0
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	12
Precipitation, Maximum	60
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-43

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Alamo

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	High

Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	6.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High

Fire Tolerance	High
Frost Free Days, Minimum	150
Hedge Tolerance	None
Moisture Use	High
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	20
Precipitation, Maximum	40
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-10

Reproduction

Bloom Period	Late Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow

Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Blackwell

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium

CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	135
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	18
Precipitation, Maximum	50
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No

Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Cave-in-Rock

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)

Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Fine
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	5.5
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	145
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.7
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	24
Precipitation, Maximum	60
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Late Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No

Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow
Seedling Vigor	High
Small Grain	No
Vegetative Spread Rate	Moderate

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Dacotah

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Slow
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.5
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No

Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	Yes
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	High
Frost Free Days, Minimum	90
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	16
Precipitation, Maximum	24
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-43

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall

Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Forestburg

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Low
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.5
Known Allelopath	No

Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	100
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	14
Precipitation, Maximum	45
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Early Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No

Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Grenville

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous

Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	180
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	14
Precipitation, Maximum	30
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium

Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Late Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No

Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Kanlow

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate

Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	6.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	High
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Low
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	160
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	

Precipitation, Minimum	20
Precipitation, Maximum	40
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes

Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Nebraska 28

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow

Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	145
Hedge Tolerance	None
Moisture Use	Medium

pH, Minimum	4.0
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	16
Precipitation, Maximum	45
Root Depth, Minimum (inches)	16
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-28

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Pathfinder

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium

Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.5
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High

Fire Tolerance	High
Frost Free Days, Minimum	150
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	16
Precipitation, Maximum	45
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate

Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Shelter

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.5
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium

CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	145
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	30
Precipitation, Maximum	45
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No

Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Summer

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)

Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology/Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Coarse
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	4.5
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	140
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.5
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	13
Precipitation, Maximum	45
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Fall
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No

Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Moderate
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

Panicum virgatum L.
switchgrass
PAVI2
Cultivar: Trailblazer

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (N), HI (I), CAN (N)
Federal T/E Status	
National Wetland Indicator	UPL, FACW

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Moderate
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	No
Fire Resistant	No
Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Gray-Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Dense
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Rhizomatous
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	5.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No

Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Medium
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	High
Fire Tolerance	High
Frost Free Days, Minimum	150
Hedge Tolerance	None
Moisture Use	Medium
pH, Minimum	4.5
pH, Maximum	7.7
Planting Density per Acre, Minimum	
Planting Density per Acre, Maximum	
Precipitation, Minimum	13
Precipitation, Maximum	42
Root Depth, Minimum (inches)	12
Salinity Tolerance	Medium
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-33

Reproduction

Bloom Period	Late Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall

Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	No
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	259000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	Yes
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	No
Palatable Browse Animal	Medium
Palatable Graze Animal	High
Palatable Human	No
Post Product	No
Protein Potential	Medium
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Pennisetum alopecuroides* (L.) Spreng.**
Chinese fountaingrass
PEAL

Summary

Duration	Perennial
Growth Habit	Graminoid
Native Status	L48 (I)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Summer
After Harvest Regrowth Rate	Slow
Bloat	None
C:N Ratio	Medium
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Yellow

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Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Moderate
Foliage Texture	Medium
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	No
Growth Form	Bunch
Growth Rate	Moderate
Height at 20 Years, Maximum (feet)	
Height, Mature (feet)	3.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Moderate
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	No
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	No
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Low
Cold Stratification Required	No
Drought Tolerance	Medium
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	160
Hedge Tolerance	None
Moisture Use	Low

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	5.0
pH, Maximum	7.0
Planting Density per Acre, Minimum	1700
Planting Density per Acre, Maximum	2700
Precipitation, Minimum	32
Precipitation, Maximum	60
Root Depth, Minimum (inches)	10
Salinity Tolerance	None
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-18

Reproduction

Bloom Period	Mid Summer
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	No
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	Yes
Propagated by Tubers	No
Seed per Pound	1000000
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	Slow

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Quercus phellos* L.**
willow oak
QUPH

Summary

Duration	Perennial
Growth Habit	Tree
Native Status	L48 (N)
Federal T/E Status	
National Wetland Indicator	FAC+, FACW

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	No
Fall Conspicuous	Yes
Fire Resistant	No
Flower Color	Yellow

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Ecological Site Information System

Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Dense
Foliage Porosity Winter	Porous
Foliage Texture	Fine
Fruit/Seed Color	Brown
Fruit/Seed Conspicuous	Yes
Growth Form	Single Stem
Growth Rate	Rapid
Height at 20 Years, Maximum (feet)	60
Height, Mature (feet)	100.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Erect
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	No
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	Low
CaCO3 Tolerance	None
Cold Stratification Required	Yes
Drought Tolerance	None
Fertility Requirement	Medium
Fire Tolerance	Low
Frost Free Days, Minimum	180
Hedge Tolerance	None
Moisture Use	High

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

pH, Minimum	4.5
pH, Maximum	6.5
Planting Density per Acre, Minimum	300
Planting Density per Acre, Maximum	800
Precipitation, Minimum	40
Precipitation, Maximum	70
Root Depth, Minimum (inches)	12
Salinity Tolerance	None
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-23

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	High
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	No
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	462
Seed Spread Rate	Slow
Seedling Vigor	Medium
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	High
Lumber Product	Yes
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	High
Palatable Graze Animal	
Palatable Human	No
Post Product	No
Protein Potential	
Pulpwood Product	Yes
Veneer Product	No

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Characteristics

About PLANTS Characteristics
Conservation Plant Characteristics Data Definitions
PLANTS Characteristics species list

Conservation Plant Characteristics

***Rhus aromatica* Aiton var. *serotina* (Greene) Rehder**
fragrant sumac
RHARS
Cultivar: Konza

Summary

Duration	Perennial
Growth Habit	Shrub
Native Status	L48 (N)
Federal T/E Status	
National Wetland Indicator	

Morphology / Physiology

Active Growth Period	Spring and Summer
After Harvest Regrowth Rate	
Bloat	None
C:N Ratio	High
Coppice Potential	Yes
Fall Conspicuous	Yes
Fire Resistant	No

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Ecological Site Information System

Flower Color	Yellow
Flower Conspicuous	No
Foliage Color	Green
Foliage Porosity Summer	Moderate
Foliage Porosity Winter	Porous
Foliage Texture	Coarse
Fruit/Seed Color	Red
Fruit/Seed Conspicuous	Yes
Growth Form	Multiple Stem
Growth Rate	Slow
Height at 20 Years, Maximum (feet)	5
Height, Mature (feet)	5.0
Known Allelopath	No
Leaf Retention	No
Lifespan	Long
Low Growing Grass	No
Nitrogen Fixation	None
Resprout Ability	Yes
Shape and Orientation	Rounded
Toxicity	None

Growth Requirements

Adapted to Coarse Textured Soils	Yes
Adapted to Fine Textured Soils	Yes
Adapted to Medium Textured Soils	Yes
Anaerobic Tolerance	None
CaCO3 Tolerance	Medium
Cold Stratification Required	Yes
Drought Tolerance	High
Fertility Requirement	Low
Fire Tolerance	
Frost Free Days, Minimum	170
Hedge Tolerance	Medium

- PLANTS Identification Keys
- Plant Materials Web Site
- Other NRCS Tech Resources
- VegSpec

Moisture Use	Low
pH, Minimum	5.0
pH, Maximum	8.0
Planting Density per Acre, Minimum	700
Planting Density per Acre, Maximum	2700
Precipitation, Minimum	16
Precipitation, Maximum	55
Root Depth, Minimum (inches)	24
Salinity Tolerance	Low
Shade Tolerance	Intolerant
Temperature, Minimum (°F)	-13

Reproduction

Bloom Period	Mid Spring
Commercial Availability	Routinely Available
Fruit/Seed Abundance	Medium
Fruit/Seed Period Begin	Summer
Fruit/Seed Period End	Fall
Fruit/Seed Persistence	Yes
Propagated by Bare Root	Yes
Propagated by Bulb	No
Propagated by Container	Yes
Propagated by Corm	No
Propagated by Cuttings	No
Propagated by Seed	Yes
Propagated by Sod	No
Propagated by Sprigs	No
Propagated by Tubers	No
Seed per Pound	49000
Seed Spread Rate	Slow
Seedling Vigor	Low
Small Grain	No
Vegetative Spread Rate	None

Suitability / Use

Berry/Nut/Seed Product	No
Christmas Tree Product	No
Fodder Product	No
Fuelwood Product	
Lumber Product	No
Naval Store Product	No
Nursery Stock Product	Yes
Palatable Browse Animal	Low
Palatable Graze Animal	Low
Palatable Human	No
Post Product	No
Protein Potential	Low
Pulpwood Product	No
Veneer Product	No

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WATER USE REDUCTION FORM
Credits W 2.1R, W 2.2R, W2.3R & W2.4

School Construction Authority
NYC Green Schools Rating System

Project: **PS/IS 71R**
Address: **1050 Targee St., Staten Island, NY** Zip Code: 10304
LLW: **46429**
Date:

Engineer: **PS/IS 71R**
Preparer: **Megan Saunders**
Telephone: **(212) 704-9920 x 103**

School in Full Operation

BASE CASE

Fill In Only the three Un-Shaded Boxes | **Fill In Only the one Un-Shaded Box**

Base Case Flush Fixture Type		% of Student Population by Grade	Daily Uses	Flow Rate [gpf]	Duration [Flush]	Student Population	Occupant Users	Sewage Generated [Gal]
Conventional Water Closet	male 3-12	75%	1.00	1.6	1	N/A	360	576.0
Conventional Urinal	male 3-12	75%	2.00	1.0	1	N/A	360	720.0
Conventional Water Closet	female 3-12	75%	3	1.6	1	N/A	360	1728.0
Conventional Water Closet	male PK-2	25%	3.00	1.6	1	N/A	118	566.4
Conventional Water Closet	female PK-2	25%	3.00	1.6	1	N/A	118	566.4
Conventional Water Closet	Adult	N/A	3.00	1.6	1	N/A	85	409.1

Base Case Flow Fixture Type		Daily Uses	Flow Rate	Duration	Student Population	Occupant Users	Sewage Generated [Gal]
Conventional Lavatory (Student)		3	0.25 g/cycle	1 cycle	N/A	956	717.0
Conventional Lavatory (Adult)		3	0.25 g/cycle	1 cycle	N/A	85	63.9
Shower		0.1	2.5 gpm	300 sec	N/A	4	5.3
Food Service Hand Sink		4	0.25 g/cycle	1 cycle	956	10	9.6

***Base Case* "School In Full Operation" Daily Volume [Gal]**	5361.7
Annual Days School In Full Operation	**180**
***Base Case* Annual "School in Full Operation" Total Volume [Gal]**	***965,110***

DESIGN CASE

Design Case Flush Fixture Type		% of Student Population by Grade	Daily Uses	Flow Rate [gpf]	Duration [Flush]	POR Student Population	Occupant Users	Sewage Generated [Gal]
High Efficiency Water Closet	male 3-12	75%	1.00	1.28	1	N/A	360	460.8
High Efficiency Urinal	male 3-12	75%	2.00	0.125	1	N/A	360	90.0
High Efficiency Water Closet	female 3-12	75%	3	1.28	1	N/A	360	1382.4
High Efficiency Water Closet	male PK-2	25%	3.00	1.28	1	N/A	118	453.1
High Efficiency Water Closet	female PK-2	25%	3.00	1.28	1	N/A	118	453.1
High Efficiency Water Closet	Adult	N/A	3.00	1.28	1	N/A	85	327.3

Design Case Flow Fixture Type		Daily Uses	Flow Rate	Duration	Student Population	Occupant Users	Sewage Generated [Gal]
Aerated Lavatory with metering device (Student)		3	0.125 g/cycle	1 cycle	N/A	956	358.5
Aerated Lavatory with metering device (Adult)		3	0.125 g/cycle	1 cycle	N/A	85	32.0
Low Flow Shower		0.1	1.8 gpm	300 sec	N/A	4	3.8
Food Service Hand Sink		4	0.125 g/cycle	1 cycle	956	10	4.8

***Design Case* "School In Full Operation" Daily Volume [Gal]**	3,565.8
Annual Days School In Full Operation	**180**
***Design Case* "School in Full Operation" Total Volume [Gal]**	***641,845.5***

Sub-Total: Water Use Reduction for "School in Full Operation"	***33%***

Notes:

1. Figures in shaded boxes are based on EPA 1992 as amended in 2005 with revisions as per LEED 2009 (base case), SCA standards (design case) or are calculated by this spreadsheet. No design team revision required.

2. Spreadsheet will calculate occupant users for water closets and urinals for design and base cases based on figures entered by Design Team for "Occupant Users" for "Conventional Lavaratory" for students and adults, along with "% of Student Population by Grade". Distribution of male and female "Occupant USers" are based on assumption of 50-50 ratio of male and female.

3. Methodology to determine student population: Use unadjusted capacity from POR
Methodology to determine adult population: Follow DR 2.3.3.-Bicycle Racks

4. Figure entered by Design Team for occupant users for showers should include all physical education staff, potential adult bike users (GSG credit S 2.2) and for high schools with showers in the student locker rooms, all students.

5. Figure entered by Design Team to determine occupant users for "Food Service Hand Sinks" is based on 1 FTE for each 100 students. Student poplulation based on unadjusted capacity from POR is to be entered. (Minimum of 2 kitchen staff is required).

6. For "Summer Operation", occupant users is anticipated to be 30% of "Full Operation Population". If program is known to be different, actual summer population should be entered.

7. For "Annual Days of Summer Operation", revise anticipated number of days for regular summer operation, excluding weekends and days when school is closed, if program is known to be different than the default value of 30.

8. Modernization projects should include the actual fixture flow rate of fixtures to remain in the design case calculations and indicate assumptions about percentage of occupant users who will use those existing fixtures to remain.

9.Percentage of Student Population by Grade should be based on number of students in classrooms with toilets located within the classrooms. Dedicated classroom toilets would be applicable to PK and K and to first and second grade classrooms as indicated in the POR. Single user toilets are typically provided for staff use.

10. For typical IS and HS, percentage of occupant users in the PK-2 row should be equal to zero.

11. For typical PS and PS/IS, percentage of occupant users in the PK-2 row should be based on occupants users in PK-2 grade classrooms that have dedicated toilets.

WATER USE REDUCTION FORM
Credits W 2.1R, W 2.2R, W2.3R & W2.4

School Construction Authority
NYC Green Schools Rating System

Project: PS/IS 71R
Address: 1050 Targee St., Staten Island, NY Zip Code: 10,304
LLW: 46429
Date:

Engineer: PS/IS 71R
Preparer: Megan Saunders
Telephone: (212) 704-9920 x 103

Summer Operation

BASE CASE

Base Case Flush Fixture Type		% of Student Population by Grade	Daily Uses	Flow Rate [gpf]	Duration [Flush]	POR Student Population	Occupant Users	Sewage Generated [Gal]
						Fill In Only the three Un-Shaded Boxes		**Fill In Only the one Un-Shaded Box**
Conventional Water Closet	male 3-12	75%	1.00	1.6	1	N/A	108	172.8
Conventional Urinal	male 3-12	75%	2.00	1.0	1	N/A	108	216.0
Conventional Water Closet	female 3-12	75%	3	1.6	1	N/A	108	518.4
Conventional Water Closet	male PK-2	25%	3.00	1.6	1	N/A	35	169.9
Conventional Water Closet	female PK-2	25%	3.00	1.6	1	N/A	35	169.9
Conventional Water Closet	Adult	N/A	3.00	1.6	1	N/A	26	122.7

Base Case Flow Fixture Type		Daily Uses	Flow Rate	Duration	POR Student Population	Occupant Users	Sewage Generated [Gal]
Conventional Lavatory (Student)		3	0.25 g/cycle	1 cycle	N/A	287	215.1
Conventional Lavatory (Adult)		3	0.25 g/cycle	1 cycle	N/A	26	19.2
Shower		0.1	2.5/gpm	300 sec	N/A	1	1.6
Food Service Hand Sink		4	0.25 g/cycle	1 cycle	287	3	2.9

Base Case "Summer Operation" Daily Volume [Gal]	1,126.8
Annual Days Summer Operation	**30**
Base Case Annual "Summer Operation" Total Volume [Gal]	***33,803***

DESIGN CASE

Design Case Flush Fixture Type		% of Student Population by Grade	Daily Uses	Flow Rate [gpf]	Duration [Flush]	POR Student Population	Occupant Users	Sewage Generated [Gal]
High Efficiency Water Closet	male 3-12	75%	1.00	1.28	1	N/A	108	138.2
High Efficiency Urinal	male 3-12	75%	2.00	0.125	1	N/A	108	27.0
High Efficiency Water Closet	female 3-12	75%	3	1.28	1	N/A	108	414.7
High Efficiency Water Closet	male PK-2	25%	3.00	1.28	1	N/A	35	135.9
High Efficiency Water Closet	female PK-2	25%	3.00	1.28	1	N/A	35	135.9
High Efficiency Water Closet	Adult	N/A	3.00	1.28	1	N/A	26	98.2

Design Case Flow Fixture Type		Daily Uses	Flow Rate	Duration	POR Student Population	Occupant Users	Sewage Generated [Gal]
Aerated Lavatory with metering device (Student)		3	0.125 g/cycle	1 cycle	N/A	287	107.6
Aerated Lavatory with metering device (Adult)		3	0.125 g/cycle	1 cycle	N/A	26	9.6
Low Flow Shower		0.1	1.8 gpm	300 sec	N/A	1	1.2
Food Service Hand Sink		4	0.125 g/cycle	1 cycle	287	3	1.4

Design Case "Summer Operation" Daily Volume [Gal]	690.1
Annual Days Summer Operation	**30**
Design Case "Summer Operation" Total Volume [Gal]	***20,702.8***

Sub-Total: Water Use Reduction for "Summer Operation"	***39%***
Total Base Case "School In Full Operation & Summer Operation" [Gal]	***998,913.4***
Total Design Case "School In Full Operation & Summer Operation" [Gal]	***662,548.3***
Total Water Use Reduction	***33%***

SCA Total Building Commissioning Construction Document Verification Matrix

PS/IS 71R - Targee Street School

TECHNICAL SPECIFICATION SECTIONS		CONTRACT REQUIREMENTS										
		Shop Dwgs & Submittals Approved	Substitutions Approved	FID QA/QC Inspection Sign-Offs	Controlled Inspection & NCN Issues Completed	Test Verifications Completed 120 Hr. Ops; TCC/FMSI & other Funct. Perf. Tests	Warranties & Guarantees Provided	Indexed O/M Manuals Rec'd.	Custodian / Staff Training Completed	Code Inspection Sign-offs Plumbing; F/A; DOB; DOT; etc.	Cx. Package Prepared for DSF	NOTES
Division 1 - General and Supplementary Requirements												
S01352	Sustainability Requirements											
S01370	Environmental Protection Procedure											
S01524	Construction Waste Management											
S01550	Indoor Air Quality (IAQ) Requirements											
S01560	Installation Sequence of Finish Materials											
S01650	Facility Start-Up, Demonstration & Training											
S01660	Supplementary Commissioning Requirements											
S01730	Systems Operation and Maintenance Manuals											
Division 2 - Sitework												
02000	Standard Specifications and Drawings											Section Added
02010	Environmental Site Assessment Report											Section Added
02035	Maintenance and Protection of Traffic											Section Added
02060	Building Demolition											Not Applicable
02070	Selective Removals & Demolition											Not Applicable
02081	Asbestos Abatement											Not Applicable
02082	PCB-Containing Caulk Removal Work											Not Applicable
02085	Exterior Paint Removal											Not Applicable

SCA Total Building Commissioning Construction Document Verification Matrix

PS/IS 71R - Targee Street School

TECHNICAL SPECIFICATION SECTIONS		CONTRACT REQUIREMENTS											
		Shop Dwgs & Submittals Approved	Substitutions Approved	FID QA/QC Inspection Sign-Offs	Controlled Inspection & NCN Issues Completed	Test Verifications Completed 120 Hr. Ops; TCC/FMSI & other Funct. Perf. Tests	Warranties & Guarantees Provided	Indexed O/M Manuals Rec'd.	Custodian / Staff Training Completed	Code Inspection Sign-offs Plumbing; F/A; DOB; DOT; etc.	Cx. Package Prepared for DSF	NOTES
02091	Storage, Handling, Transportation and Disposal Of Petroleum Contaminated and/or Hazardous Wastes											Not Applicable
02100	Site Preparation											
02200	Earthwork											
02200A	Earthwork (Flow-through Turf AF)											Not Applicable
02200B	Earthwork (Float Drain Turf / Natural Grass AF)											Not Applicable
02215	Controlled Low Strength Material											Not Applicable
02221	Sub-Slab Depressurization System											Section Added
02250	Foundation and Other Change Adjustments											
02260	Sheeting for Utility Trenches											Section Added
02602	Excavation, Backfill, and Compaction for Pavements											Section Added
02603	Excavation, Backfill, and Compaction for Pipes and Utility Trenches											Section Added
02305	Sawcutting											Section Added
02310	Open Graded Stone Base											Section Added
02311	Roadway Foundations											Section Added
02360	Driven Pipe-Pile Foundations											
02510	Installation of Water Mains and Appurtenances											Section Added
02511	Asphaltic Concrete Paving											Not Applicable

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TECHNICAL SPECIFICATION SECTIONS		CONTRACT REQUIREMENTS										
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02512	Porous Asphalt Paving											Not Applicable
02513	Sidewalk and Street Paving											Not Applicable
02514	Porous Asphalt Pavement Test Strip											Not Applicable
02515	Unit Pavers											
02516	Exposed Porous Asphalt Paving											Not Applicable
02517	Fire Hydrants											Section Added
02520	Wet and Dry Connections to Existing Water Mains											Section Added
02521	Concrete Curbs and Pavements											Not Applicable
02531	Resilient Surfacing											Not Applicable
02532	Resilient Surface - Porous Base											Not Applicable
02533	Colored Athletic Wearing Surface											Not Applicable
02541	Synthetic Turf - TPE Infill											Not Applicable
02580	Track / Court/ Playground Markings											
02615	Gray Iron Castings											Section Added
02630	Storm and Sanitary Sewers											Section Added
02635	Sewer and Drainage Structures											Section Added
02711	Wall Subdrainage Systems											
02721	Trench Drains											
02722	Precast Conc CB/Detention Basins/MH											Not Applicable
02723	Storm Drainage Systems											Not Applicable
02724	Underdrain System - Asphalt Paving											Not Applicable

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02725	Underdrain System for Skinned Areas											Not Applicable
02741	Asphaltic Concrete Wearing Course											Section Added
02742	Tack Coat											Section Added
02743	Concrete Pavement											Section Added
02751	Concrete Base for Pavement											Section Added
02752	Concrete Sidewalks											Section Added
02753	Concrete Curbs											Section Added
02758	Pavement Markings											Section Added
02765	Traffic Signs and Posts											Section Added
02831	Chain Link Fences and Gates											
02860	Early Childhood Playground Equipment											
02862	Outdoor Game Equipment											
02870	Site and Street Furnishings											
02900	Landscaping											
Division 3 - Concrete												
03100	Concrete Formwork											
03200	Concrete Reinforcement											Not Applicable
03200A	Concrete Reinforcement - (Epoxy)											
03300	Cast-In-Place Concrete											
03542	Cement-Based Self-Leveling Underlayment											Section Added
03610	Grouting											
03733	Concrete Repair Work											Not Applicable
03740	Migrating Corrosion Inhibitor											Not Applicable
Division 4 - Masonry Systems:												
04200	Unit Masonry											

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04250	Terra Cotta											Not Applicable
04270	Glass Unit Masonry											Not Applicable
04420	Exterior Cut Stone											Not Applicable
04435	Cast Stone											
04510	Masonry Cleaning											Not Applicable
04510A	Masonry Cleaning (SHPO)											Not Applicable
04520	Masonry Restoration											Not Applicable
04520A	Masonry Restoration (SHPO)											Not Applicable
04700	Simulated Masonry											Not Applicable
Division 5 - Metals:												
05120	Structural Steel											
05170	Support System For Suspended Ceilings											
05210	Open Web Steel Joist, K-Series											Not Applicable
05220	Longspan Steel Joists, LH-Series											Not Applicable
05230	Steel Joist Girders											Not Applicable
05300	Metal Deck											
05500	Metal Fabrications											
05580	Sheet Metal Fabrications											
05700	Ornamental Metal											
05710	Steel Stairs											
05810	Prefabricated Expansion Joint Covers											
Division 6 - Wood & Plastics:												
06100	Rough Carpentry											
06200	Finish Carpentry											
06410	Custom Casework											
Division 7 - Thermal & Moisture Protection												
07110	Sheet Membrane Waterproofing											

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07115	~~Sheet Membrane Waterproofing FDNS~~ Sheet Membrane Foundation Waterproofing/Gas Vapor Barrier											
07120	Fluid-Applied Waterproofing Plazas											Not Applicable
07147	Crystalline Waterproofing											
07150	Chemical Resin Injection Grouting											Not Applicable
07160	Bituminous Damproofing											Not Applicable
07211	Perimeter Foundation Insulation											
07212	Miscellaneous Building Insulation											
07250	Sprayed Fire Resistive Materials											
07260	Intumescent Fireproofing											
07270	Firestopping/Smoke Seals											
07272	Fluid-Applied Membrane Air Barrier, Vapor Retarding											
07314	Slate Shingles											Not Applicable
07553	Hybrid Built-Up/SBS Modified Bituminous Roofing											Not Applicable
07560	Fluid-applied Protected Membrane Roofing											
07561	Fluid-applied Protected Membrane Roofing (Planted Type I)											Not Applicable
07600	Flashing and Sheet Metal											

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07610	Sheet Metal Roofing											
07720	Roof Accessories											
07820	Metal Framed Skylights											Not Applicable
07900	Joint Sealers											
Division 8 - Doors & Windows												
08110	Steel Doors and Frames											
08210	Wood Doors											
08220	Fiberglass Reinforced Polyester Doors											Not Applicable
08305	Access Doors											
08330	Coiling Doors, Grilles and Shutters											Not Applicable
08411	Aluminum-Framed Entrances and Storefronts											Section Added
08510	Stl. Windows - Projected/Casement/Pivot/ DH											Not Applicable
08521	AL. Dbl-Hung Windows - New											Not Applicable
08522	AL. Dbl-Hung Windows - Repl											Not Applicable
08524	Aluminum Projected Windows											
08610	Replacement Wood Windows											Not Applicable
08662	Security Screens/Barriers											
08710	Finish Hardware											
08730	Thresholds, Weatherstripping and Seals											
08800	Miscellaneous Glazing											
08920	Aluminum Curtain Walls											
Division 9 - Finishes												

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09205	Furring and Lathing											Not Applicable
09210	Plaster											Not Applicable
09260	Gypsum Board Assemblies											
09310	Ceramic Tile											
09410	Terrazzo - Portland Cement											
09510	Acoustical Ceilings											
09590	Wood Flooring											
09626	Resilient Athletic Flooring											Not Applicable
09650	Resilient Flooring											
09680	Carpet											
09705	Resinous Flooring											
09751	Granite Countertops											Section Added
09800	Special Coatings											Not Applicable
09860	Graffiti Resistant Coatings											Not Applicable
09900	Painting											
Division 10 - Specialties												
10100	Visual Display Boards											
10151	Toilet Compartments											
10160	Factory-Painted Steel Toilet Compartments											Not Applicable
10185	Plastic Shower and Dressing Compartments											
10214	Stationary Metal Wall Louvers											
10240	Mechanical Equipment Screens											Section Added
10270	Access Flooring											Not Applicable
10350	Flagpole											
10400	Identifying Devices											
10415	Bulletin Boards, Display Boards, Display Cabinets and Cases											

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		Shop Dwgs & Submittals Approved	Substitutions Approved	FID QA/QC Inspection Sign-Offs	Controlled Inspection & NCN Issues Completed	Test Verifications Completed 120 Hr. Ops; TCC/FMSI & other Funct. Perf. Tests	Warranties & Guarantees Provided	Indexed O/M Manuals Rec'd.	Custodian / Staff Training Completed	Code Inspection Sign-offs Plumbing; F/A; DOB; DOT; etc.	Cx. Package Prepared for DSF	NOTES
10505	Metal Lockers											
10522	Fire Extinguishers and Cabinets											
10605	Wire Mesh Work											
10652	Folding Panel Partitions											
10655	Accordion Folding Partitions											Not Applicable
10675	Metal Storage Shelving											
10720	Window Guards											Not Applicable
10810	Toilet and Bath Accessories											
10830	Mirrors											
10840	Grab Bars											
Division 11 - Equipment												
11050	Library Equipment											
11061	Platform Curtains, Auditorium Window Curtains, Projection Screen											
11172	Waste Handling Equipment											
11400	Food Service Equipment											
11450	Domestic Type Equipment											
11452	Culinary Arts Lab Equipment											Not Applicable
11460	Unit Kitchen											Not Applicable
11480	Gymnasium Equipment											
11500	Shop Equipment											
11580	Theatre Rigging and Draperies											Section Added
11600	Laboratory Equipment											
Division 12 - Furnishings												
12302	Manufactured Wood Casework											Not Applicable

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12345	Soapstone											
12485	Foot Grilles											
12500	Window Shades											
12501	Chain and Clutch Operated Window Shades											
012545	Draperies											
12710	Fixed Audience Seating											
12761	Wood Bleachers											
12762	Telescopic Gymnatorium Seating											Section Added
Division 13 - Special Construction												
13120	Steel Bleachers											Not Applicable
13031	Walk-In Trash Refrigerator											
Division 14 - Conveying Systems												
14120	Electric Dumbwaiter											Not Applicable
14211	Geared Traction Passenger Elevators											Not Applicable
14240	Direct-Acting Hydraulic Passenger Elevators											Not Applicable
14250	Dual-Jack Roped Hydraulic Passenger Elevators											
14260	Counterweighted Roped Hydraulic Passenger Elevators											Not Applicable
14315	Hydraulic Sidewalk Elevators											Not Applicable
14316	Geared Traction Sidewalk Elevators											Not Applicable
14420	Hydraulic Vertical Wheelchair Lift											Not Applicable
14510	Escalators											Not Applicable

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Division 15 - Mechanical (Fire Protection)												
15301	GENERAL PROVISONS FOR FIRE PROTECTION SYSTEMS WORK											Section Added
15303	SEISMIC CONTROLS. FIRE PROTECTION SYSTEMS											
15331	Dry Standpipe System											Not Applicable
15332	Combination Wet Standpipe/Sprinkler System											
15333	Firepumps / Sprinkler Booster Pumps											
Division 15 - Mechanical (Plumbing & Drainage)												
15401	General Provisions For Plumbing and Drainage Work											Section Added
15403	Vibration Isolation and Seismic Controls. Plumbing and Drainage System											
15410	Plumbing Piping											
15411	Hangers and Supports											
15412	Valves											
15413	Insulation (P & D)											
15414	Tests											
15415	Drainage											
15416	Gas Piping System											
15417	Cold Water Supply											
15418	Hot Water Supply											
15431	Tags, Charts and Identification											
15432	Miscellaneous											
15440	Plumbing Fixtures											
15451	Water Heaters											

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15453	Pumping Apparatus and Tanks											
Division 15 - Mechanical (HVAC)												
15501	Basic Heating, Ventilating and Air Cond. Req.											
15502	HVAC Identification											
15503	Vibration Isolation and Seismic Controls, HVAC Systems											
15510	HVAC Piping											
15511	Valves (HVAC)											
15512	Piping Insulation (HVAC)											
15513	Equipment Insulation (HVAC)											
15514	Ductwork Insulation											
15515	Hydronic Specialties											
15516	Water Treatment for Steam Boilers											Not Applicable
15517	Water Treatment for Hydronic Systems											
15525	Steam and Condensate Specialties											Not Applicable
15540	HVAC Pumps											
15555	Fire-Tube Boilers (Steam)											Not Applicable
15556	Cast-Iron Boilers											Not Applicable
15557	Fire-Tube Boilers (Hot Water)											Not Applicable
15559	Flexible-Water Tube Boilers (Steam)											Not Applicable
15560	Flexible-Water Tube Boilers (Hot Water)											Not Applicable
15565	Hot Water Condensing Boilers											
15570	Boiler Accessories											Not Applicable

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15575	Breeching, Chimney and Stacks											
15580	Feedwater Equipment											Not Applicable
15590	Emergency Generator System - Accessories											
15592	Fuel Burning/Pumping Equipment (For Steam Boilers)											Not Applicable
15593	Fuel Burning/Pumping Equipment (For Hot Water Boilers)											Not Applicable
15594	Fuel Storage Equipment											Not Applicable
15596	Natural Gas Leak Detection Equipment											
15610	Gas-Fired Duct Furnaces											Not Applicable
15650	Split Air Cooled Chillers											Not Applicable
15660	Packaged Modular Outdoor Chiller											
15670	Plate Heat Exchangers											Not Applicable
15756	Converters											Not Applicable
15781	Packaged Heating and Cooling Units											Not Applicable
15783	Split Heat Pump System											
15792	Coils											Not Applicable
15835	Convectors											
15836	Unit Heaters/Cabinet Heaters											
15838	Fan Coil Units											
15852	Air Handling Units											Not Applicable
15853	Custom Packaged Rooftop Heating and Cooling Units (Variable Air Volume System)											Not Applicable

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15854	Custom Packaged Rooftop Heating and Cooling Units (Constant Volume System)											
15855	Commercial Packaged Rooftop Heating and Cooling Units											Not Applicable
15857	Unit Ventilator											
15858	Windows Air Conditioners											Not Applicable
15860	Centrifugal Fans											
15864	Propeller Fans											Not Applicable
15865	Axial Flow Fans											Not Applicable
15872	Gravity Roof Ventilator											Not Applicable
15880	Sub-Slab Depressurization System Accessories											
15885	Air Filters											Not Applicable
15891	Metal Ductwork											
15910	Duct Accessories											
15915	Dampers											
15930	Variable Air Terminals											Not Applicable
15931	Fan-Powered Variable Air Volume (VAV) Terminal Units											Not Applicable
15940	Air Outlets and Inlets											
15970	LonWorks BMS/DDC W/School Console											
15971	TC System (LonWorks DDC Only)											Not Applicable
15972	Temperature Control System (Pneumatic)											Not Applicable
15973	Facility Management Systems Integration											
15980	Thermometers and Gauges											

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15985	Sequence of Operations											
15992	Cleaning and Testing											
15993	Balancing of Systems											
Division 16 - Electrical												
16010	General Provisions For Electrical Work											
16100	Roadway Lighting											Section Added
16120	Wiring Systems											
16130	Raceways, Fittings, Supporting Devices, Boxes and Accessories											
16140	Wiring Devices											
16145	Lighting Control Devices											
16231	Emergency Generator System											
16289	Transient Voltage Surge Suppression											
16420	Service Entrance Equipment											
16425	Switchboards											
16441	Enclosed Switches											
16450	Grounding and Bonding											
16460	Transformers											Not Applicable
16470	Panelboards											
16471	Gymatorium Dimming System											
16472	Science Laboratory Power Units											
16475	Overcurrent Protective Devices, Circuit Breakers and Fuses											
16480	Motors, Starters, and Control Equipment											
16500	Interior Building Lighting											
16501	Lamps, Ballasts and Accessories											

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16503	Vibration Isolation And Seismic Controls, Electrical Systems											
16520	Illuminated Exit Sign Fixtures											
16530	Site/Security Lighting											
16580	Theater Lighting, Dimming, and Control Systems											Section Added
16670	Lightning Protection											
16701	Auxiliary Signal Systems											
16720	Fire Detection and Alarm System											
16721	City Fire Alarm System											
16722	Stand-Alone Carbon Monoxide Alarms											
16724	Intrusion Alarm System											
16725	Telephone and Intercom Cabling System											
16726	Intercom System for Fire Rescue Areas and Emergency Telephone For Elevators											
16727	Data Cabling System											
16728	Fiber Optic Cabling System											
16770	Sound, Intercom and Teacher Activated Security System											
16771	Projection, Interactive Whiteboard and Electronic Scrolling Display Systems											
16780	TV Cabling System											

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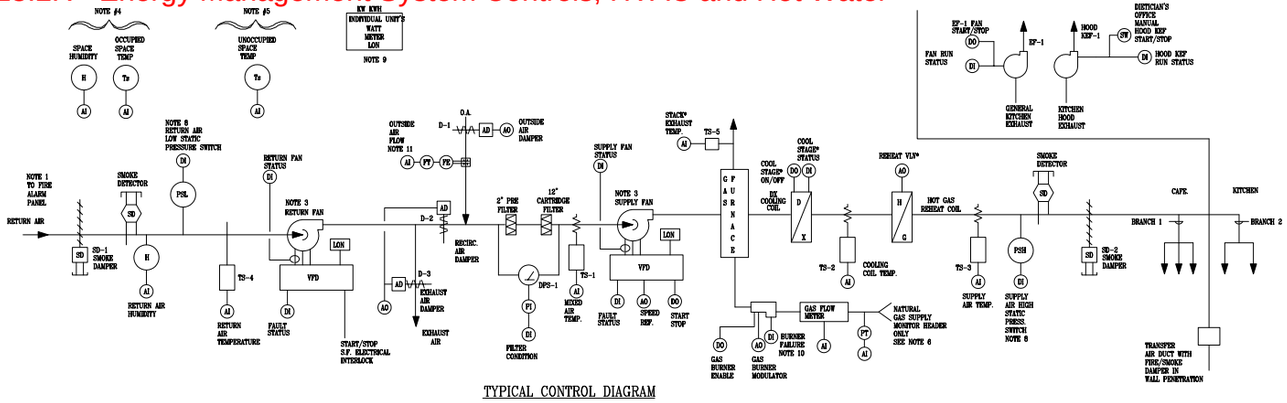
16783	Internet Protocol Digital Video Surveillance (IPDVS) Cabling System											
16784	Internet Protocol Digital Video Surveillance (IPDVS) Cabling System (Capital Improvement Projects)											Not Applicable
16791	Self-Corrective Clock System											
16792	Wireless Clock System											Not Applicable
16855	Heat Trace Cable System											Not Applicable



E3.2R - Energy Management System Controls, HVAC and Hot Water

TYPICAL CONTROL DIAGRAM
CONSTANT AIR VOLUME AIR CONDITIONER
ROOFTOP UNIT RTU-3

LEGEND:

- H HUMIDITY SENSOR
- TS TEMPERATURE SENSOR
- TS-1 MIXED AIR TEMP
- TS-2 DISCHARGE AIR TEMP (DX-COIL)
- TS-3 DISCHARGE AIR TEMP (REHEAT COIL)
- TS-4 RETURN AIR TEMP
- TS-5 STACK EXHAUST TEMP
- TS-6 OUTSIDE AIR TEMP
- FE FLOW ELEMENT
- FT FLOW TRANSMITTER
- DI DIGITAL INPUT
- DO DIGITAL OUTPUT
- AI ANALOG INPUT
- AO ANALOG OUTPUT
- * # OF HEATING OR COOLING STAGES
- DPS DIFFERENTIAL PRESSURE SWITCH
- OEM ORIGINAL EQUIPMENT MANUFACTURER
- PSL PRESSURE SWITCH LOW
- PSH PRESSURE SWITCH HIGH
- PI PRESSURE INDICATOR
- CO2 CARBON DIOXIDE

NOTES:

1. N/A
2. PROVIDE ONE SPACE HUMIDITY SENSOR PER SYSTEM AS SHOWN ON THE DRAWINGS.
3. RETURN FAN STARTER/VFD SHALL BE INTERLOCKED WITH SUPPLY FAN STARTER/VFD FOR START/STOP COMMAND.
4. DEVICES MOUNTED IN CAFETERIA AND HARDWIRED TO RTU
5. DEVICES MOUNTED IN KITCHEN AND HARDWIRED TO RTU
6. TEMPERATURE CONTROLS CONTRACTOR (TCC) SHALL FURNISH A GAS METER (INSTALLED IN THE RTU GAS HEADER BY THE P&D CONTRACTOR), TCC SHALL INTEGRATE ALL POINTS INTO THE BMS PER SPEC. ONLY THE HEADER FEEDING ALL OF THE ROOFTOP UNITS (NOT EACH INDIVIDUAL ROOFTOP UNIT) REQUIRES FLOW AND PRESSURE MONITORING.
7. VARIABLE FREQUENCY DRIVES USED TO FACILITATE BALANCING PROCEDURE AND FOR TWO-SPEED CONTROL.
8. SAFETY DEVICES SHALL BE HARDWIRED TO THE FAN STARTER CIRCUIT, IN ADDITION TO THE DDC SYSTEM. COORDINATE WITH VFD VENDOR ASSURING THAT THE SAFETIES SHUTDOWN THE FAN IN ALL MODES.
9. FAN ELECTRICAL USAGE (KW, KWH) IS AVAILABLE FOR EACH FAN FROM VFD DRIVES. PROVIDE ONE WATT METER ON THE FEEDER SERVING ALL OF THE ROOFTOP UNITS TO MONITOR THE CUMULATIVE ELECTRICAL USAGE (KW, KWH) BY ALL OF THE ROOFTOP UNITS. (COMPRESSOR ELECTRICAL USAGE CAN THEN BE CALCULATED BY SUBTRACTING OUT FAN ELECTRICAL USAGE).
10. IF THE FLAME SUPERVISION SYSTEM CAN NOT TRANSMIT A FLAME FAILURE INDICATION SIGNAL THAT CAN BE MAPPED OVER TO THE LONWORKS SYSTEM, TCC SHALL USE ALTERNATE MEANS TO INDICATE FLAME FAILURE (EX. ALARM ON LOW MAIN FURNACE OR ALARM ON LOW FLUE GAS TEMP, ETC.)
11. PROVIDE ONE OUTDOOR AIR FLOW MEASURING STATION FOR EACH OUTDOOR AIR INTAKE PORT.
12. SMOKE DETECTOR, SUPPLY AIR TEMP. SENSOR AND HIGH LIMIT DISCHARGE TEMP. SENSOR FOR GAS HEATER SHALL BE INSTALLED IN DUCTWORK 5 FEET FROM DISCHARGE OPENING INSIDE THE BUILDING. (APPLICABLE FOR AAON UNITS ONLY)

SYSTEM TYPE: RTU-3		INPUT/OUTPUT (NOTE 1)														SOFTWARE/FIRMWARE ARE FEATURES (NOTE: 2, 3)												
CUSTOM ROOFTOP UNIT CONSTANT AIR VOLUME		SENSED				CALCULATED						CONTROL				ALARM AND ADVISORIES (WITH INSTRUCTIONS)								MISC. FEATURES				NOTES
REFERENCE NO.	POINT NAME	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	RATE OF VARIABLE	TOTALIZE VARIABLE	TOTALIZE RUNTIME	DIFFERENTIAL CFM	DIFFERENTIAL CO2	OTHER CALCULATED	ANALOG CONTROL	DIGITAL CONTROL	SCHEDULED CONTROL	EVENT CONTROL	SUPERVISORY ALARM	CHANGE OF STATE	COS OFF-TO-ON	COS ON-TO-OFF	HIGH LIMIT ALARM	LOW LIMIT ALARM	RUNTIME LIMIT (HRS)	OTHER ALARM	MANUAL OVERRIDE	DIRECT LON COMMUNICATION	TRENDED VALUE	MISC. OTHER	
1	OUTSIDE AIR TEMP	B																										
2	OUTSIDE AIR HUMIDITY	B																										
3																												
4	MIXED AIR TEMP	X																			40.0F					X		
5	DX COIL DISCHARGE TEMP	X																			45.0F					X		
6	SUPPLY AIR TEMP	X																								X		
7	RETURN AIR TEMP	X										X									55.0F							
8	RETURN AIR HUMIDITY	X										X																
9	SPACE TEMP	X										X									45.0F					X		
10	SPACE HUMIDITY	X										X								75.0%RH								8
11	DIRTY FILTER ALARM			X													X			PER MFR.								
12	SF HIGH STATIC PRESSURE			X													X			4" WC								5
13	RF LOW SUCTION PRESSURE			X									X				X				3" WC							
14	OUTSIDE AIR DAMPERS		X									X																
15	RETURN/EXHAUST AIR DAMPERS		X									X																
16	GAS FURNACE COMMAND				X								X															
17	GAS FURNACE VALVE		X									X																
18	GAS FURNACE FAILURE			X													X											
19	GAS FURNACE STACK TEMP	X																		400.0F								
20	RTU GAS SUPPLY PRESSURE	X																			4.0"W.C.					X		
21	RTU GAS FLOW	X				CFH	CCF																					
22	DX COOLING COMMAND				X								X		X													
23	DX COMPRESSOR STATUS			X				X														1.000						
24	H.G. RHC VALVE COMMAND		X									X			X													
25	OUTSIDE AIR FLOW	X				CFM	CF					X								SP-10%	SP+10%					X		4
26	SUPPLY FAN STATUS			X				X								X						1.000						
27	SUPPLY FAN VFD																								X			6
28	SUPPLY FAN VFD S/S				X									X	X	X												
29	SUPPLY FAN VFD FAULT			X													X											
30	SUPPLY FAN VFD SPEED		X									X																
31	RETURN FAN STATUS			X				X								X						1.000						
32	RETURN FAN VFD																								X			6
33	RETURN FAN VFD FAULT			X													X											
34	RTU WATT METER					KW	KWH																		X	X		6
35																												
36	GEN. EXHAUST S/S & STATUS			X	X			X					X	X	X	X						1,000						
37	HOOD EXHAUST S/S			X				X							X							1,000						

LEGEND:

X = PROVIDE QUANTITY AS REQUIRED TO INCLUDE ALL INSTANCES OF THE INDICATED FEATURE. INCLUDE MULTIPLE POINTS WITHIN EACH MECHANICAL SYSTEM AS NECESSARY. COORDINATE WITH EQUIPMENT VENDOR.

B = INFORMATION PROVIDED TO EACH SYSTEM VIA NETWORK BROADCAST.

NOTES:

1. THE POINT LISTED HEREIN ARE THE MINIMUM POINTS REQUIRED FOR THE CONTROL AND MONITORING OF THIS EQUIPMENT. THIS POINT LIST IS TYPICAL FOR EACH MECHANICAL/ELECTRICAL SYSTEM OF THIS TYPE. IF THE SEQUENCE OF OPERATION REQUIRES ADDITIONAL OR DIFFERING INFORMATION IT MUST BE PROVIDED BY THE RESPECTIVE PROVIDER OF THE CONTROLS FOR THIS TYPE OF EQUIPMENT AS COORDINATED BY THE GENERAL AND MECHANICAL CONTRACTORS.
2. THE TCC SHALL PROVIDE ALL DIGITAL ALARM LOGIC. ALL DIGITAL ALARMS SHALL BE PART OF THE LNS DATABASE.
3. THE FMSI SHALL PROVIDE ALL TRENDING AND ANALOG ALARMING VIA THE WONDERWARE SOFTWARE.
4. PROVIDE ACCUMULATED AIR FLOW FOR VALIDATION OF PURGE-MODE AND FOR PERMANENT VALIDATION OF OCCUPANT VENTILATION..
5. PROVIDE MANUAL RESET DEVICE. NOTE THAT THIS DEVICE BOTH ALARMS IN THE BMS AND IS HARDWIRED TO THE VFDS FOR SHUTDOWN OF FANS IN ALL OPERATING CONDITIONS OF THE VFD.
6. PROVIDE LON COMMUNICATION CONNECTION TO THIS DEVICE MAPPING ALL REQUIRED POINTS INTO THE LNS DATABASE.
7. ANNUNCIATE ALARM ONLY AFTER AN EIGHT (8)-HOUR OF CONTINUOUS RELATIVE HUMIDITY AT THE HIGH LIMIT ALARM SETPOINT.

TABLE 1

POINT LIST REFERENCE FOR SPACE TEMP ALARM		ALARM (DEGF) HIGH	ALARM (DEGF) LOW
OCCUPIED	HEATING	85	60
	COOLING	88	65
UNOCCUPIED	HEATING	NA	45
	COOLING	NA	NA

LEGEND

- TS-1 ROOM AIR TEMP
- TS-2 DISCHARGE AIR TEMP
- FE FLOW ELEMENT
- VP VELOCITY PRESSURE
- DI DIGITAL INPUT
- DO DIGITAL OUTPUT
- AI ANALOG INPUT
- AO ANALOG OUTPUT
- OS OCCUPANCY SENSOR

FAN-COIL UNIT
CONTROL DIAGRAM

FAN-COIL UNIT		Input/Output (Note 1)														Software/Firmware are Features (Note: 2, 3)												Notes
		Sensed				Calculated						Control				Alarm and Advisories (With Instructions)								Misc. Features				
Reference No.	Point Name	Analog Input	Analog Output	Digital Input	Digital Output	Rate of Variable	Totalize Variable	Totalize Runtime	Differential CFM	Differential CO2	Other Calculated	Analog Control	Digital Control	Scheduled Control	Event Control	Supervisory Alarm	Change of state	COS OFF-to-ON	COS ON-to-OFF	High Limit Alarm	Low Limit Alarm	Runtime Limit (Hrs)	Other Alarm	Manual Override	Direct Lon Communication	Trended Value	Misc. Other	
1	Space Temp	X																		TABLE 1	TABLE 1					X		
2	FCU Controller																								X			4
3	FCU Fan Start/Stop Command				X																							
4	FCU Fan Status			X				X								X												
5	FCU Discharge Temp.	X																								X		
6	FCU Dual-Temp Control Valve		X									X																
7	Summer / Winter Changeover			B																								

Legend:

X = Provide quantity as required to include all instances of the indicated feature. Include multiple points within each mechanical system as necessary. Coordinate with equipment vendor.

B = Information provided to each system via network broadcast.

Notes:

1. The point listed herein are the minimum points required for the control and monitoring of this equipment. This point list is typical for each mechanical/electrical system of this type. If the sequence of operation requires additional or differing information it must be provided by the respective provider of the controls for this type of equipment as coordinated by the General and Mechanical Contractors.
2. The TCC shall provide all digital alarm logic. All digital alarms shall be part of the LNS database.
3. The FMSI shall provide all trending and analog alarming via the Wonderware Software.
4. Provide Lon communication connection to this device mapping all required points into the LNS database.

SEQUENCE OF OPERATION SHALL BE AS INDICATED
IN REFERENCE SPECIFICATION 15985, 3.01, E

TABLE 1

POINT LIST REFERENCE FOR SPASE TEMP ALARM		ALARM (DEGF) HIGH	ALARM (DEGF) LOW
OCCUPIED	HEATING	85	60
	COOLING	88	65
UNOCCUPIED	HEATING	NA	45
	COOLING	NA	NA

LEGEND

- TS-1 ROOM AIR TEMP
- TS-2 DISCHARGE AIR TEMP
- FE FLOW ELEMENT
- DI DIGITAL INPUT
- DO DIGITAL OUTPUT
- AI ANALOG INPUT
- AO ANALOG OUTPUT

UNIT VENTILATOR CONTROL DIAGRAM

UNIT VENTILATOR		Input/Output (Note 1)														Software/Firmware are Features (Note: 2, 3)												Notes
		Sensed				Calculated						Control				Alarm and Advisories (With Instructions)								Misc. Features				
Reference No.	Point Name	Analog Input	Analog Output	Digital Input	Digital Output	Rate of Variable	Totalize Variable	Totalize Runtime	Differential CFM	Differential CO2	Other Calculated	Analog Control	Digital Control	Scheduled Control	Event Control	Supervisory Alarm	Change of state	COS OFF-to-ON	COS ON-to-OFF	High Limit Alarm	Low Limit Alarm	Runtime Limit (Hrs)	Other Alarm	Manual Override	Direct Lon Communication	Trended Value	Misc. Other	
1	Space Temp	X																								X		
2	UV Controller																								X			4
3	UV Fan Start/Stop Command				X																							
4	UV Fan Status			X				X								X												
5	UV Discharge Temp.	X																								X		
6	UV Dual-Temp Control Valve		X									X																
7	Dirty Filter Alarm			X													X			per Mfr.								
8	Summer / Winter Changeover			B																								

Legend:

X = Provide quantity as required to include all instances of the indicated feature. Include multiple points within each mechanical system as necessary. Coordinate with equipment vendor.

B = Information provided to each system via network broadcast.

Notes:

1. The point listed herein are the minimum points required for the control and monitoring of this equipment. This point list is typical for each mechanical/electrical system of this type. If the sequence of operation requires additional or differing information it must be provided by the respective provider of the controls for this type of equipment as coordinated by the General and Mechanical Contractors.
2. The TCC shall provide all digital alarm logic. All digital alarms shall be part of the LNS database.
3. The FMSI shall provide all trending and analog alarming via the Wonderware Software.
4. Provide Lon communication connection to this device mapping all required points into the LNS database.

SEQUENCE OF OPERATION SHALL BE AS INDICATED
IN REFERENCE SPECIFICATION 15985, 3.01, F

LEGEND

- DI DIGITAL INPUT
- DO DIGITAL OUTPUT
- AI ANALOG INPUT
- AO ANALOG OUTPUT
- TS TEMPERATURE SENSOR
- FS FLOW SWITCH

TYPICAL SYSTEM CONTROL DIAGRAM
CHILLED WATER PLANT
PRIMARY PUMPING

NOTES:

1. FOR COMPLETE VALVE AND INSTRUMENTATION REQUIREMENTS SEE CONTRACT SPECIFICATION.
2. TEMPERATURE CONTROL CONTRACTOR PROVIDED POINTS ONLY USED FOR MONITORING AND NOT CONTROL.
   ORIGINAL EQUIPMENT MANUFACTURER CONTROLS SHALL ALWAYS BE PROVIDED.
3. PROVIDE DIFFERENTIAL PRESSURE TRANSMITTER TO PROVIDE VARIABLE FLOW CONTROL SIGNAL TO OPERATE WATER PUMPS. PROVIDE DIFFERENCIAL PRESSURE CONTROL VALVE TO SATISFY REQUIRED MINIMUM CRITICAL PUMP'S FLOW (25-30% VFD SPEED).
4. THE TEMPERATURE CONTROLS CONTRACTOR SHALL PROVIDE AND INTEGRATE A WATT METER FOR THE ELECTRIC FEEDER THAT SERVES ALL OF THE CHILLERS. ONLY THE FEEDER THAT SERVES ALL OF THE CHILLERS (NOT EACH INDIVIDUAL CHILLER) REQUIRES KW AND KWH MONITORING VIA WATT METERING.
   ENERGY MONITORING FOR EACH SECONDARY CHILLED WATER SUPPLY PUMP SHALL BE THROUGH THEIR RESPECTIVE VARIABLE FREQUENCY DRIVE AND SHALL BE INTEGRATED INTO THE BMS/DDC SYSTEM.
5. LOCAL CHILLER CONTROL PANELS AND MASTER CHILLER CONTROL PANEL BY OEM SHALL PROVIDE CONTROL OF FLOW SWITCH INTERFACE, LEAD/LAG CONTROL, ETC. SENSORS UTILIZED BY OEM CONTROL SYSTEM CAN ALSO BE UTILIZED FOR BMS/DDC SYSTEM (BY WIRING IN SERIES OR PARALLEL AS REQUIRED, OR MAPPING THROUGH GATEWAY). OTHER ALTERNATE IS FOR TCC TO PROVIDE THEIR OWN MONITORING SENSORS, OEM CONTROLS LEAD/LAG, CHILLERS. BMS/DDC SYSTEM MONITOR/CONTROL CHILLED WATER LOOP.

CHILLER		Input/Output (Note 1)														Software/Firmware are Features (Note: 2, 3)												Notes
		Sensed				Calculated						Control				Alarm and Advisories (with Instructions)								Misc. Features				
Reference No.	Point Name	Analog Input	Analog Output	Digital Input	Digital Output	Rate of Variable	Totalize Variable	Totalize Runtime	Differential CFM	Differential CO2	Efficiency	Analog Control	Digital Control	Scheduled Control	Event Control	Supervisory Alarm	Change of state	COS OFF-to-ON	COS ON-to-OFF	High Limit Alarm	Low Limit Alarm	Runtime Limit (Hrs)	Other Alarm	Manual Override	Direct Lon Communication	Trended Value	Misc. Other	
1	Outside Air Temp	B																										
2	Outside Air Humidity	B																										
3	Differential Water pressure	X										X								SP+10°F	SP-10°F							
4	CHWS Supply Temp - Bldg	X																								X		8
5	CHWR Return Temp - Bldg	X																								X		8
6	Glycol Supply Temp (by OEM)	X									X									SP+10°F	SP-10°F					X		
7	Glycol Return Temp (by OEM)	X									X															X		
8	Differ. Pressure Valve		X									X																
9	Ch.W. Pump VFD					kW	kWH																		X	X		4
10	Ch.W. Pump VFD S/S				X								X		X													
11	Ch.W. Pump VFD Status			X				X								X						1000						
12	Ch.W. Pump VFD Speed		X									X												X				
13	Ch.W. Pump VFD Fault			X													X											
14	Chiller Controller										X	X	X		X	X								X	X			4,5
15	All Chillers El. Consumption	X				kW	kWH				X														X	X		
16	All Prim. Pumps El. Consumption	X				kW	kWH																		X	X		
17	Glycol Pump Status			X				X								X						1000						6
18																												
19																												
20																												
21																												
22	Glycol Flow Rate	X				gpm					X															X		
23	Water Flow Rate	X				gpm					X															X		
24	Glycol Concentration Detector	X														X					25%					X		
25	Common Alarm (by OEM)		X														X											

Legend:

X = Provide quantity as required to include all instances of the indicated feature. Include multiple points within each mechanical system as necessary. Coordinate with equipment vendor.

B = Information provided to each system via network broadcast.

Notes:

1. The point listed herein are the minimum points required for the control and monitoring of this equipment. This point list is typical for each mechanical/electrical system of this type. If the sequence of operation requires additional or differing information it must be provided by the respective provider of the controls for this type of equipment as coordinated by the General and Mechanical Contractors.
2. The TCC shall provide all digital alarm logic. All digital alarms shall be part of the LNS database.
3. The FMSI shall provide all trending and analog alarming via the Wonderware Software.
4. Provide Lon communication connection to this device mapping all required points into the LNS database.
5. Provide remote chilled water setpoint adjustment.
6. Pumps are started and stopped by the Chiller controller. TCC to provide the necessary interlock each mechanical/electrical system of this type. If the sequence of operation requires additional or differing information it must be provided
7. N/A.
8. When using thermistor sensors use matched-pair elements to eliminate inter-sensor error factor.

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Bid Documents

NOTE: Drawing may be printed at reduced scale

No.	Date	Revision
1	12/22/10	REVISED AS PER GREEN COMMENTS

Key Plan:

Block # 3168
Lot # 4

SCA Program Design Manager: J. ELBERFELD
Project Architect/Engineer: KHA
Discipline Lead: H. MENA, P.E.
Designer: T. LE, P.E.
Drawn by: T. LE, P.E.
Checked by: A. KATS, P.E.

LLW No.:	Facility Code:	Date:
46429	PS000R	11/29/10

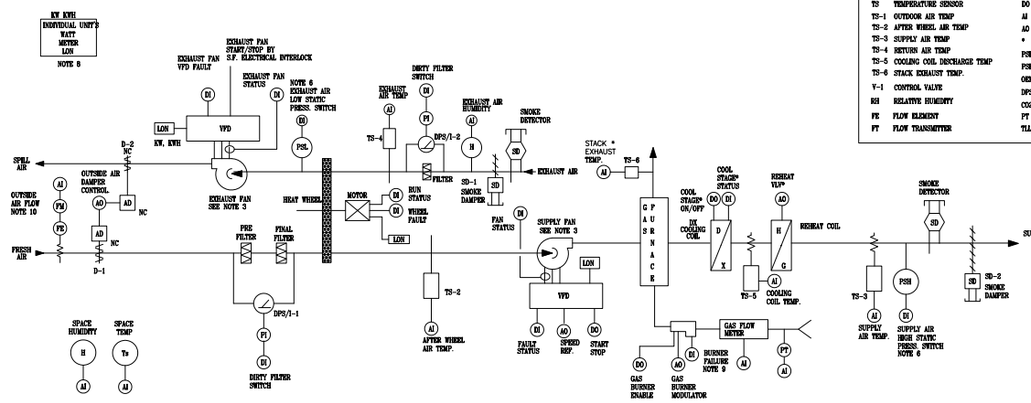
Project:
PS/IS 71R. - STATEN ISLAND

Address: 1050 TARGEE STREET
STATEN ISLAND, NY 10304

Drawing Title:
HVAC AUTOMATIC TEMPERATURE CONTROL DIAGRAM #2

Drawing No.:
M405.00

Sheets in Contract Set:
228 of 327



RTU-1, 2 – CONSTANT VOLUME UNITS
WITH ENERGY RECOVERY WHEEL
(CLASSROOMS)

LEGEND:

RH	HUMIDITY SENSOR	DI	DIGITAL INPUT
TS	TEMPERATURE SENSOR	DO	DIGITAL OUTPUT
TS-1	OUTDOOR AIR TEMP	AI	ANALOG INPUT
TS-2	AFTER WHEEL AIR TEMP	AO	ANALOG OUTPUT
TS-3	SUPPLY AIR TEMP	*	# OF HEATING OR COOLING STAGES
TS-4	RETURN AIR TEMP	PSL	PRESSURE SWITCH LOW
TS-5	COOLING COIL DISCHARGE TEMP	PSH	PRESSURE SWITCH HIGH
TS-6	STACK EXHAUST TEMP.	ORM	ORIGINAL EQUIPMENT MANUFACTURER
V-1	CONTROL VALVE	DPS/DIFF.	PRESSURE SWITCH / INDICATOR
RH	RELATIVE HUMIDITY	CO2	CARBON DIOXIDE SENSOR
FE	FLOW ELEMENT	PT	STATIC PRESSURE TRANSMITTER
FT	FLOW TRANSMITTER	TLL	TEMPERATURE LOW LIMIT

NOTES:

1. N/A
2. PROVIDE ONE SPACE HUMIDITY SENSOR PER SYSTEM AS SHOWN ON THE DRAWINGS.
3. EXHAUST FAN STARTER/VFD SHALL BE INTERLOCKED WITH SUPPLY FAN STARTER/VFD FOR START/STOP COMMAND.
4. DIV. 16 CONTRACTOR SHALL PROVIDE DIRECT ELECTRICAL CONNECTION FOR FAN SHUTDOWN TO VFD FOR ALL MODES OF VFD OPERATION. DIV. 15 CONTRACTOR COORDINATE WITH VFD VENDOR.
5. TEMPERATURE CONTROLS CONTRACTOR (TCC) SHALL INTEGRATE THE HEADER GAS METER (FURNISHED BY TCC, INSTALLED BY THE P&D CONTRACTOR) INTO THE BMS/EOC SYSTEM. ONLY THE HEADER FEEDING ALL OF THE ROOFTOP UNITS (NOT EACH INDIVIDUAL ROOF TOP UNIT) REQUIRES FLOW AND PRESSURE MONITORING.
6. SAFETY DEVICES SHALL BE HARDWIRED TO THE FAN STARTER CIRCUIT, IN ADDITION TO THE DDC SYSTEM. COORDINATE WITH VFD VENDOR ASSURING THAT THE SAFETIES SHUTDOWN THE FAN IN ALL MODES.
7. VARIABLE FREQUENCY DRIVES USED TO FACILITATE BALANCING PROCEDURE.
8. FAN ELECTRICAL USAGE (KW, KWH) IS AVAILABLE FOR EACH FAN FROM VFD DRIVES. PROVIDE ONE WATT METER ON THE FEEDER SERVING ALL OF THE ROOFTOP UNITS TO MONITOR THE CUMULATIVE ELECTRICAL USAGE (KW, KWH) BY ALL OF THE ROOFTOP UNITS. (COMPRESSOR ELECTRICAL USAGE CAN THEN BE CALCULATED BY SUBTRACTING OUT FAN ELECTRICAL USAGE).
9. IF THE FLAME SUPERVISION SYSTEM CAN NOT TRANSMIT A FLAME FAILURE INDICATION SIGNAL THAT CAN BE MAPPED OVER TO THE LONWORKS SYSTEM, TCC SHALL USE ALTERNATE MEANS TO INDICATE FLAME FAILURE (EX. ALARM ON LOW MAIN FURNACE OR ALARM ON LOW FLUE GAS TEMP, ETC.)
10. PROVIDE ONE OUTDOOR AIR FLOW MEASURING STATION FOR EACH OUTDOOR AIR INTAKE PORT.

SYSTEM TYPE: RTU-1 & 2		INPUT/OUTPUT (NOTE 1)																SOFTWARE/FIRMWARE ARE FEATURES (NOTE: 2, 3)											
CUSTOM ROOFTOP UNIT CONSTANT AIR VOLUME		SENSED			CALCULATED							CONTROL			ALARM AND ADVISORIES (WITH INSTRUCTIONS)						MISC. FEATURES						
REFERENCE NO.	POINT NAME	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	RATE OF VARIABLE	TOTALIZE VARIABLE	TOTALIZE RUNTIME	DIFFERENTIAL CFM	DIFFERENTIAL CO2	OTHER CALCULATED	ANALOG CONTROL	DIGITAL CONTROL	SCHEDULED CONTROL	EVENT CONTROL	SUPERVISORY ALARM	CHANGE OF STATE	CO2 OFF-TO-ON	CO2 ON-TO-OFF	HIGH LIMIT ALARM	LOW LIMIT ALARM	RUNTIME LIMIT (HRS)	OTHER ALARM	MANUAL OVERRIDE	REMOTE LON COMMUNICATION	TRENDED VALUE	MISC. OTHER	NOTES
1	OUTSIDE AIR TEMP	B																										
2	OUTSIDE AIR HUMIDITY	B																										
3	NUMBER / WATER CHANGEOVER		B																									
4	AFTER WHEEL AIR TEMP.	X																								X		
5	SUPPLY AIR TEMP.	X																								X		
6	RETURN AIR TEMP	X										X									55.0F							
7	RETURN AIR HUMIDITY	X										X																
8	SPACE TEMP	X										X									45.0F					X		
9	SPACE HUMIDITY	X										X									75.0%RH							8
10	COOLING COIL DISCHARGE TEMP.	X													X						39.0F							
11																												
12	DIRTY OUTDOOR AIR FILTER ALARM			X												X					PER MFR.							
13	DIRTY RETURN AIR FILTER ALARM			X												X					PER MFR.							
14	SF HIGH STATIC PRESSURE			X												X					4" WC							5
15	SF LOW SUCTION PRESSURE			X								X				X						3" WC							
16	OUTSIDE, RETURN/EXHAUST DAMPERS	X										X																
17	GAS FURNACE COMMAND				X							X																
18	GAS FURNACE VALVE		X									X																
19	GAS FURNACE FAILURE			X												X												
20	GAS FURNACE STACK TEMP	X																			400.0F							
21	UNIT GAS SUPPLY PRESSURE	X																				4.0"W.C.				X		
22	UNIT GAS FLOW	X				CFH	CCF																					
23	DX COOLING COMMAND			X								X		X														
24	DX COMPRESSOR STATUS			X				X									X					1.000						
25	H.G. HSC COMMAND		X									X																
26	OUTSIDE AIR FLOW	X				CFM	CF					X									SP+10%	SP+10%					X	4
27	SUPPLY FAN STATUS			X				X								X						1.000						
28	SUPPLY FAN VFD																									X		6
29	SUPPLY FAN VFD S/S				X									X	X	X												
30	SUPPLY FAN VFD FAULT			X												X												
31	EXHAUST FAN STATUS			X				X								X						1.000						
32	EXHAUST FAN VFD																									X		6
33	EXHAUST FAN VFD FAULT			X												X												
34	HEAT WHEEL FAULT			X												X												
35	HEAT WHEEL STATUS			X				X																				
36	UNIT WATT METER				KW	KWH																				X	X	6
37	COMMON FIRE ALARM (ONE/BLDG.)			X												X												

LEGEND:

X = PROVIDE QUANTITY AS REQUIRED TO INCLUDE ALL INSTANCES OF THE INDICATED FEATURE. INCLUDE MULTIPLE POINTS WITHIN EACH MECHANICAL SYSTEM AS NECESSARY. COORDINATE WITH EQUIPMENT VENDOR.

B = INFORMATION PROVIDED TO EACH SYSTEM VIA NETWORK BROADCAST.

NOTES:

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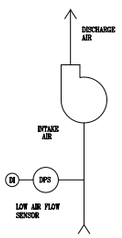
2. THE TCC SHALL PROVIDE ALL DIGITAL ALARM LOGIC. ALL DIGITAL ALARMS SHALL BE PART OF THE LNS DATABASE.
3. THE FMS SHALL PROVIDE ALL TRENDING AND ANALOG ALARMING VIA THE WONDERWARE SOFTWARE.
4. PROVIDE ACCUMULATED AIR FLOW FOR VALIDATION OF PURGE-MODE AND FOR PERMANENT VALIDATION OF OCCUPANT VENTILATION..
5. PROVIDE MANUAL RESET DEVICE. NOTE THAT THIS DEVICE BOTH ALARMS IN THE BMS AND IS HARDWIRED TO THE VFD'S FOR SHUTDOWN OF FANS IN ALL OPERATING CONDITIONS OF THE VFD.
6. PROVIDE LON COMMUNICATION CONNECTION TO THIS DEVICE MAPPING ALL REQUIRED POINTS INTO THE LNS DATABASE.
7. PROVIDE THE ALARM INDICATED AT THE CALCULATED DIFFERENTIAL BETWEEN OUTSIDE AIR AND SPACE AIR CO2 VALUES.
8. ANNUNCIATE ALARM ONLY AFTER AN EIGHT (8)-HOUR OF CONTINUOUS RELATIVE HUMIDITY AT THE HIGH LIMIT ALARM SETPOINT.



DEPRESSURIZATION FANS		Input/Output (Note 1)																		Software/Firmware are Features (Note: 2, 3)																	
		Sensed			Calculated								Control			Alarm and Advisories (With Instructions)									Misc. Features											
Reference No.	Point Name	Analog Input	Analog Output	Digital Input	Digital Output	Rate of Variable	Totalize Variable	Totalize Runtime	Totalize CFM	Differential CFM	Differential CO2	Other Calculated	Analog Control	Digital Control	Scheduled Control	Event Control	Supervisory Alarm	Change of State	CO2 Off-to-On	CO2 On-to-Off	High Limit Alarm	Low Limit Alarm	Runtime Limit (Hrs)	Other Alarm	Manual Override	Direct Lon Communication	Trended Value	Misc. Other	Notes
1																																					
2	DIFFERENTIAL PRESSURE SWITCH			X												X						50%															

Legend:

X = Provide quantity as required to include all instances of the indicated feature. Include multiple points within each mechanical system as necessary. Coordinate with equipment vendor.

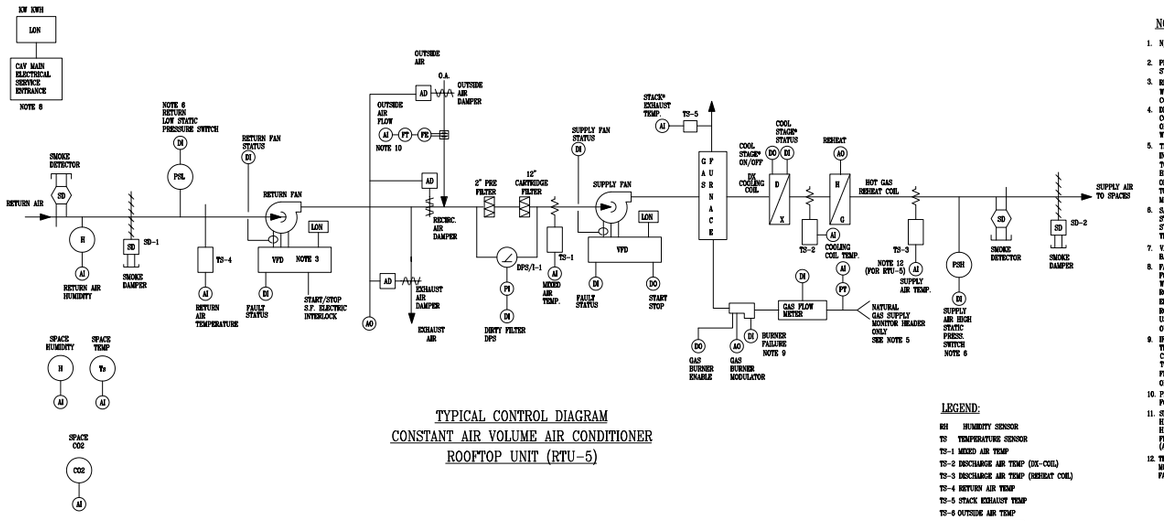
Notes:

1. The point listed herein are the minimum points required for the control and monitoring of this equipment. This point list is typical for each mechanical/electrical system of this type. If the sequence of operation requires additional or differing information it must be provided by the respective provider of the controls for this type of equipment as coordinated by the General and Mechanical Contractors.
2. The TCC shall provide all digital alarm logic. All digital alarms shall be part of the LNS database.
3. The FMS shall provide all trending and analog alarming via the Wonderware Software.
4. Provide Lon communication connection to this device mapping all required points into the LNS database.
5. REFER TO DRAWING H206 FOR DETAILS OF THIS SYSTEM.

LEGEND

DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AI	ANALOG INPUT
AO	ANALOG OUTPUT

DEPRESSURIZATION FAN
CONTROL DIAGRAM (SSDS-FAN)



TYPICAL CONTROL DIAGRAM
CONSTANT AIR VOLUME AIR CONDITIONER
ROOFTOP UNIT (RTU-5)

NOTES:

1. N/A
2. PROVIDE ONE SPACE HUMIDITY SENSOR PER SYSTEM AS SHOWN ON THE DRAWINGS.
3. RETURN FAN STARTER/VFD SHALL BE INTERLOCKED WITH SUPPLY FAN STARTER/VFD FOR START/STOP COMMAND.
4. DIV. 15 CONTRACTOR SHALL PROVIDE DIRECT ELECTRICAL CONNECTION FOR FAN SHUTDOWN TO VFD FOR ALL MODES OF VFD OPERATION. DIV. 16 CONTRACTOR COORDINATE WITH VFD VENDOR.
5. TEMPERATURE CONTROLS CONTRACTOR (TCC) SHALL INTEGRATE THE HEADER GAS METER (FURNISHED BY TCC, INSTALLED BY THE P&D CONTRACTOR) INTO THE BMS/DDC SYSTEM. ONLY THE HEADER FEEDING ALL OF THE ROOFTOP UNITS (NOT EACH INDIVIDUAL ROOF TOP UNIT) REQUIRES FLOW AND PRESSURE MONITORING.
6. SAFETY DEVICES SHALL BE HARDWIRED TO THE FAN STARTER CIRCUIT, IN ADDITION TO THE DDC SYSTEM. COORDINATE WITH VFD VENDOR ASSURING THAT THE SAFETIES SHUTDOWN THE FAN IN ALL MODES.
7. VARIABLE FREQUENCY DRIVES USED TO FACILITATE BALANCING PROCEDURE.
8. FAN ELECTRICAL USAGE (KW, KWH) IS AVAILABLE FOR EACH FAN FROM VFD DRIVES. PROVIDE ONE WATT METER ON THE FEEDER SERVING ALL OF THE ROOFTOP UNITS TO MONITOR THE CUMULATIVE ELECTRICAL USAGE (KW, KWH) BY ALL OF THE ROOFTOP UNITS. (COMPRESSOR ELECTRICAL USAGE CAN THEN BE CALCULATED BY SUBTRACTING OUT FAN ELECTRICAL USAGE).
9. IF THE FLAME SUPERVISION SYSTEM CAN NOT TRANSMIT A FLAME FAILURE INDICATION SIGNAL THAT CAN BE MAPPED OVER TO THE LONWORKS SYSTEM, TCC SHALL USE ALTERNATE MEANS TO INDICATE FLAME FAILURE (EX. ALARM ON LOW MAIN FURNACE OR ALARM ON LOW FLUE GAS TEMP, ETC.)
10. PROVIDE ONE OUTDOOR AIR FLOW MEASURING STATION FOR EACH OUTDOOR AIR INTAKE PORT.
11. SMOKE DETECTOR, SUPPLY AIR TEMP. SENSOR AND HIGH LIMIT DISCHARGE TEMP. SENSOR FOR GAS HEATER SHALL BE INSTALLED IN DUCTWORK 5 FEET FROM DISCHARGE OPENING INSIDE THE BUILDING. (APPLICABLE FOR AAON UNITS ONLY)
12. TEMPERATURE CONTROL CONTRACTOR TO FIELD MOUNT SUPPLY AIR TEMPERATURE SENSOR IF FACTORY MOUNTING IS UNAVAILABLE FOR RTU-5 ONLY.

LEGEND:

RH	HUMIDITY SENSOR
TS	TEMPERATURE SENSOR
TS-1	MIXED AIR TEMP
TS-2	DISCHARGE AIR TEMP (DX-COIL)
TS-3	DISCHARGE AIR TEMP (REHEAT COIL)
TS-4	RETURN AIR TEMP
TS-5	STACK EXHAUST TEMP
TS-6	OUTSIDE AIR TEMP
ES	END SWITCH (BY MFR)
FE	FLOW ELEMENT
FT	FLOW TRANSMITTER
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
AI	ANALOG INPUT
AO	ANALOG OUTPUT
*	# OF HEATING OR COOLING STAGES
PSL	PRESSURE SWITCH LOW
PSH	PRESSURE SWITCH HIGH
ORM	ORIGINAL EQUIPMENT MANUFACTURER
DPS/DIFF.	PRESSURE SWITCH / INDICATOR
CO2	CARBON DIOXIDE SENSOR

SYSTEM TYPE: RTU-5		INPUT/OUTPUT (NOTE 1)																SOFTWARE/FIRMWARE ARE FEATURES (NOTE: 2, 3)											
CUSTOM ROOFTOP UNIT CONSTANT AIR VOLUME		SENSED			CALCULATED							CONTROL			ALARM AND ADVISORIES (WITH INSTRUCTIONS)						MISC. FEATURES						
REFERENCE NO.	POINT NAME	ANALOG INPUT	ANALOG OUTPUT	DIGITAL INPUT	DIGITAL OUTPUT	RATE OF VARIABLE	TOTALIZE VARIABLE	TOTALIZE RUNTIME	DIFFERENTIAL CFM	DIFFERENTIAL CO2	OTHER CALCULATED	ANALOG CONTROL	DIGITAL CONTROL	SCHEDULED CONTROL	EVENT CONTROL	SUPERVISORY ALARM	CHANGE OF STATE	CO2 OFF-TO-ON	CO2 ON-TO-OFF	HIGH LIMIT ALARM	LOW LIMIT ALARM	RUNTIME LIMIT (HRS)	OTHER ALARM	MANUAL OVERRIDE	REMOTE LON COMMUNICATION	TRENDED VALUE	MISC. OTHER	NOTES
1	OUTSIDE AIR TEMP	B																										
2	OUTSIDE AIR HUMIDITY	B																										
3	OUTDOOR AIR CO2	B																										
4	MIXED AIR TEMP	X																			40.0F					X		
5	DX COIL DISCHARGE TEMP	X																			45.0F					X		
6	SUPPLY AIR TEMP	X																								X		
7																												
8	RETURN AIR TEMP	X										X									55.0F							
9	RETURN AIR HUMIDITY	X										X																
10	SPACE TEMP	X										X									45.0F					X		
11	SPACE HUMIDITY	X										X									75.0%RH							8
12	SPACE CO2	X									C2										770PPM							7
13	DIRTY FILTER ALARM			X												X					PER MFR.							
14	SF HIGH STATIC PRESSURE			X												X					4" WC							5
15	SF LOW SUCTION PRESSURE			X											X	X						3" WC							5
16	OUTSIDE AIR DAMPERS	X										X																
17	RETURN/EXHAUST AIR DAMPERS	X										X																
18	GAS FURNACE COMMAND				X																							
19	GAS FURNACE VALVE		X									X																
20	GAS FURNACE FAILURE			X												X												
21	GAS FURNACE STACK TEMP	X																			400.0F							
22	RTU GAS SUPPLY PRESSURE	X																				4.0"W.C.				X		
23	RTU GAS FLOW	X				CFH	CCF																					
24	DX COOLING COMMAND			X								X		X														
25	DX COMPRESSOR STATUS			X				X									X					1.000						
26	H.G. HSC VALVE COMMAND		X									X		X														
27	OUTSIDE AIR FLOW	X				CFM	CF					X									SP-10%	SP+10%					X	4
28	SUPPLY FAN STATUS			X				X								X						1.000						
29	SUPPLY FAN VFD																									X		6
30	SUPPLY FAN VFD S/S				X										X	X	X											
31	SUPPLY FAN VFD FAULT			X													X											
32	RETURN FAN STATUS			X				X									X					1.000						
33	RETURN FAN VFD																									X		6
34	RETURN FAN VFD FAULT			X													X											
35	RTU WATT METER				KW	KWH																				X	X	6
36																												
37																												

LEGEND:

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Stanley Dahir, R.A., Director, Quality Control & Construction Support
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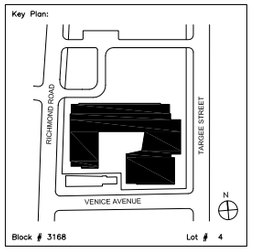
Cost Estimating:
G2 Project Planning
75 Beacon Street, Beacon, NY 12508

Bid Documents

NOTE: Drawing may be printed at reduced scale

No.	Date	Revision
1	12/22/10	REVISED AS PER GREEN COMMENTS

Key Plan:



Block # 3168 Lot # 4

SCA Program Design Manager: J. ELBERFELD		
Project Architect/Engineer: KHA		
Discipline Lead:	H. MENA, P.E.	
Designer:	T. LE, P.E.	
Drawn by:	T. LE, P.E.	
Checked by:	A. KATS, P.E.	
LLW No.: 46429	Facility Code: PS000R	Date: 11/29/10

Project:
PS/IS 71R. – STATEN ISLAND

Address: 1050 TARGEE STREET
STATEN ISLAND, NY 10304

Drawing Title:
HVAC AUTOMATIC TEMPERATURE CONTROL DIAGRAM #1

Drawing No.:
M404.00

Sheets in Contract Set: 227 of 327

ENERGY ANALYSES
for
TARGEE SCHOOL- PS71R

Preliminary LEED 3.0 Compliance Analysis

prepared by

Viridian Energy & Environmental, LLC
50 Washington Street
Norwalk, CT 06854

for

Kliment Halsband Architects
322 Eighth Avenue
New York, New York 10001

6 Dec 2010

EXECUTIVE SUMMARY

The purpose of this analysis is to show whether the proposed Targee School (PS71R) meets the requirements of EAp2 "Minimum Energy Performance" to earn a LEED rating under LEED NC 3.0. A building can show compliance with EAp2 by saving at least 10% in total energy costs compared to a building that is minimally compliant with the baseline building defined by ASHRAE 90.1-2007 Appendix G.

The proposed design, as understood by Viridian, includes the following energy efficient measures:

- Increased wall insulation- U = 0.056 Btu/hr-ft2-F instead of U = 0.064 Btu/hr-ft2-F
- Increased roof insulation- U = 0.046 Btu/hr-ft2-F instead of U = 0.048 Btu/hr-ft2-F
- More efficient windows- Ufen = 0.51 Btu/hr-ft2-F with SHGC = 0.38 instead of Ufen = 0.55 Btu/hr-ft2-F with SHGC = 0.4
- Reduced lighting power density (1.0 w/ft^2 vs 1.2 W/ft^2)
- Occupancy Sensors in classrooms
- CO2 ventilation controls in gymnasium and gymnatorium instead of just in gymnatorium
- Heat recovery on all RTU's except cafeteria
- High efficiency DX units (EER = 10.9 instead of 9.8)
- High efficiency air-cooled chiller (EER = 13.2 instead of 9.5)
- 87% efficient condensing boiler with modulating flame controls instead of 80% efficient boiler with on/off controls
- Dedicated outdoor air system and unit ventilators reduce required fan power

Results
The proposed design saves approximately $28,000, or 10.9%, compared to the LEED 3.0 baseline based on ASHRAE 90.1-2007 Appendix G. The building exceeds the minimum 10% requirement and would be eligible to pursue LEED 3.0 certification.

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs. LEED 3.0 Baseline ($)	Savings vs. LEED 3.0 Baseline (%)
LEED 3.0 Baseline	768,695	174,483	48,572	81,227	255,710		
Design Case	769,177	168,379	35,648	59,389	227,768	$27,942	10.93%

1. DESCRIPTION OF BUILDING CHARACTERISTICS

This section summarizes important parameters used in the Design Case simulation including envelope thermal properties, internal loads and schedules, and HVAC system operation schedules and specifications. The energy model is based on floor plans and HVAC descriptions dated May 2010.

1.1. Building Identification

PS-71R School in Staten Island, New York
Weather File: New York, NY
Building Addition Area: Approximately 100,500 ft^2 of conditioned space.

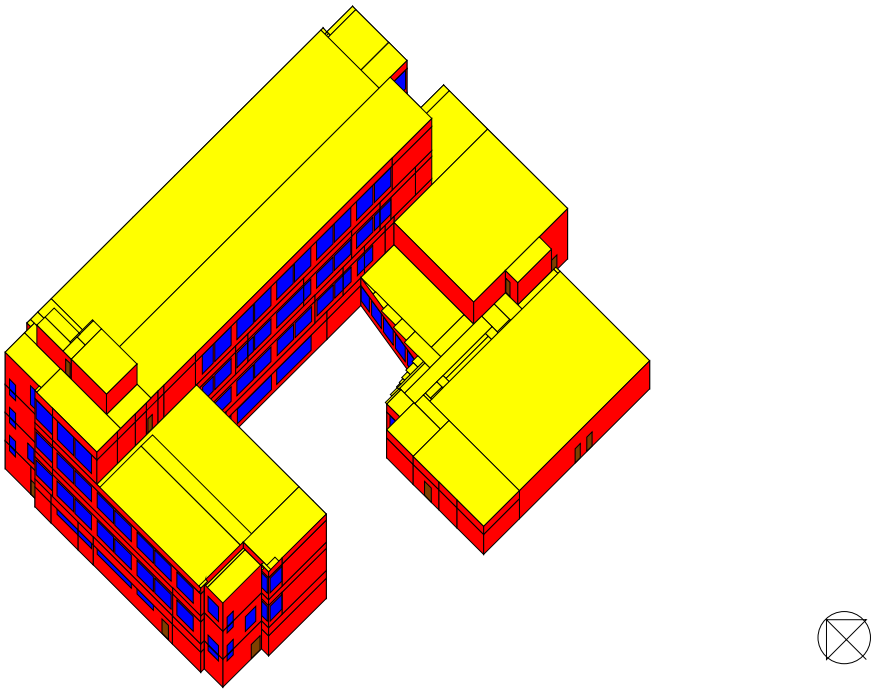


Figure 1. DOE 2.1 Rendering of proposed addition

1.2. Building Envelope Construction

Exterior wall construction

- 4” nominal utility brick
- 4” nominal air cavity w/ 3” rigid insulation (R15)
- 6” nominal CMU
- 2-1/2” nominal metal stud
- 5/8” gypsum wallboard
- U-value = 0.056 BTU/Hr-ft^{2}-$^{\circ}$F

Roof

- 2” White Pavers with SRI > 0.79
- 4” Polystyrene
- EPDM
- 3-1/4” concrete over 3” metal decking
- U factor$_{eff}$ = 0.046 BTU/Hr-ft2-°F

Windows

- Fenestration / gross wall area ratio: 25%
- Type: spectrally selective low-e
- U $_{\text{center of glass}}$ 0.30
- U $_{\text{fenestration}}$ 0.51
- Visible Transmittance 60%
- Shading Coefficient 0.44
- Solar Heat Gain Coefficient 0.38
- Thermally Broken Aluminum Frames
- Operable windows

1.3. Internal Load Patterns

The building will operate five days a week. Daily schedules of operation will vary with space type.

1.3.1. Occupancy Patterns

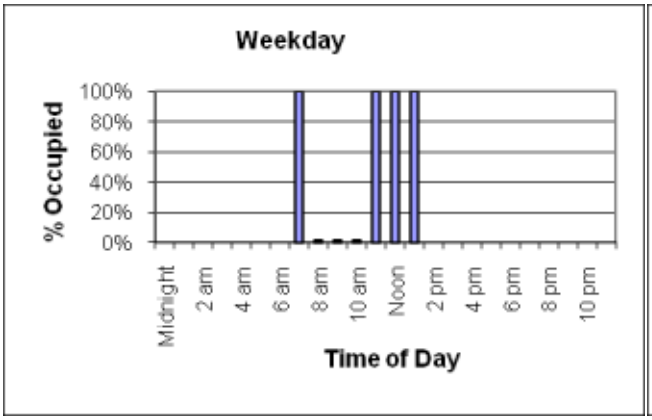
Space Type	Occupancy Density	Schedule
Cafeteria	14 ft^{2}/person	Cafeteria Occupancy Schedule
Classroom	33 ft^{2}/person	Classroom Occupancy Schedule
Gym/ Gymnatorium	50 ft^{2}/person	Gymnasium Occupancy Schedule
Kitchen	50 ft^{2}/person	Kitchen Occupancy Schedule
Office	143 ft^{2}/person	Office Occupancy Schedule
Corridors	143 ft^{2}/person	Office Occupancy Schedule
Lobby	143 ft^{2}/person	Office Occupancy Schedule
Computer Lab	33 ft^{2}/person	Computer Lab Occupancy Schedule
Library	300 ft^{2}/person	Classroom Occupancy Schedule

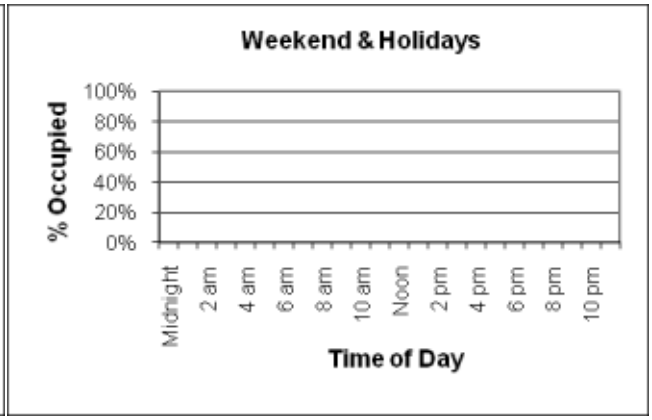
Restroom	143 ft^2/person	Office Occupancy Schedule
Vestibule	143 ft^2/person	Office Occupancy Schedule
Conference Room	143 ft^2/person	Office Occupancy Schedule

Cafeteria Occupancy Schedule

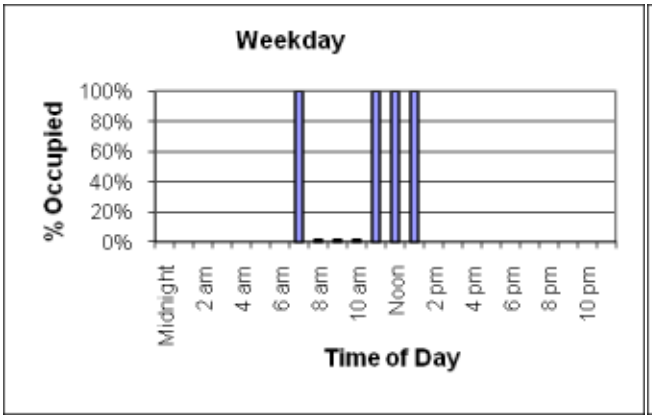
Cafeteria - 14 ft2/person

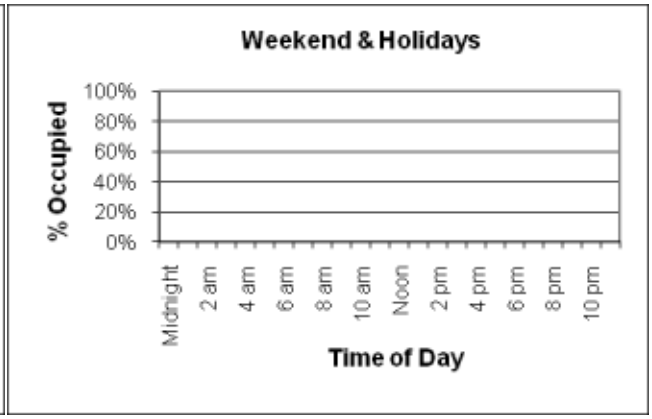
Schedule thru June 15



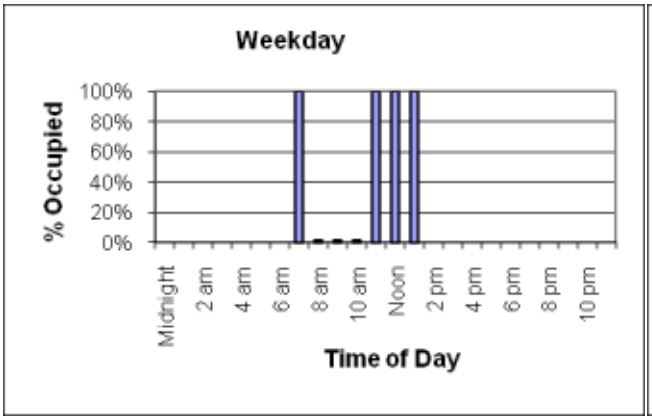


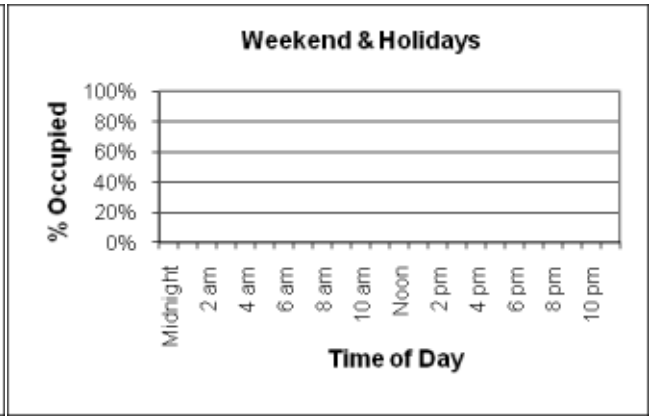
Schedule thru September 5





Schedule thru December 31



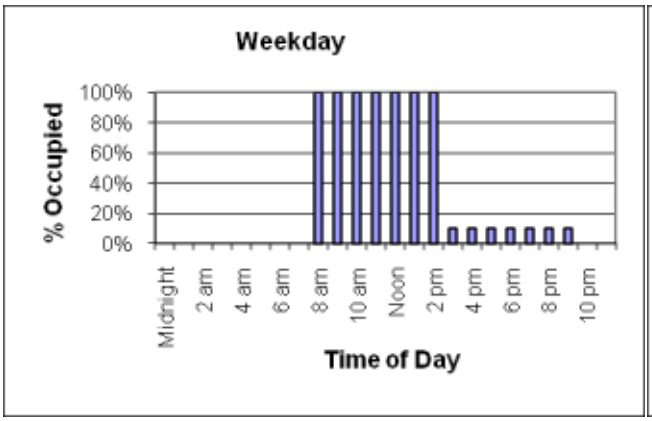


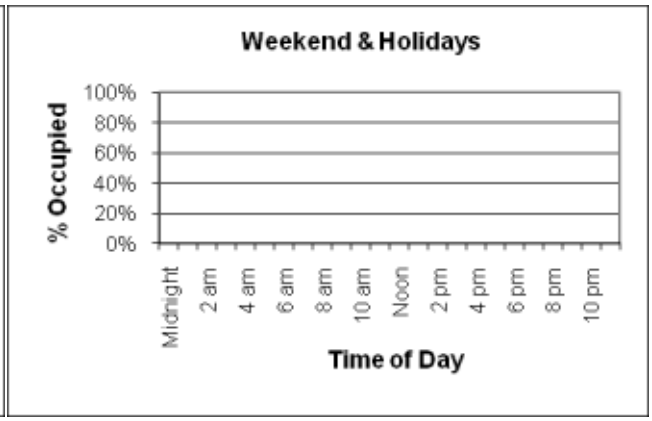
Classroom Occupancy Schedule

Classroom - 33 ft2/person

Library - 300 ft2/person

Schedule thru June 15





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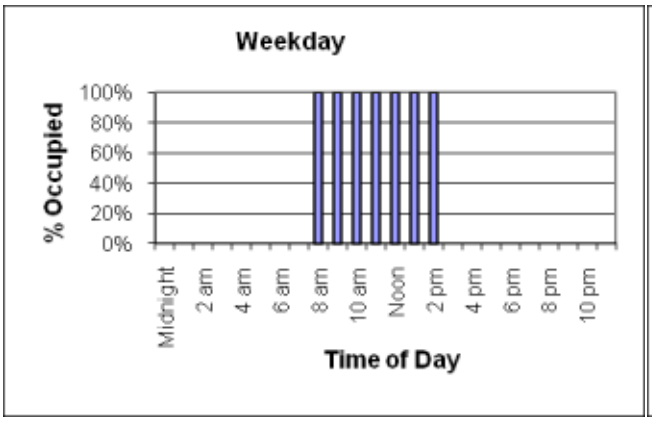
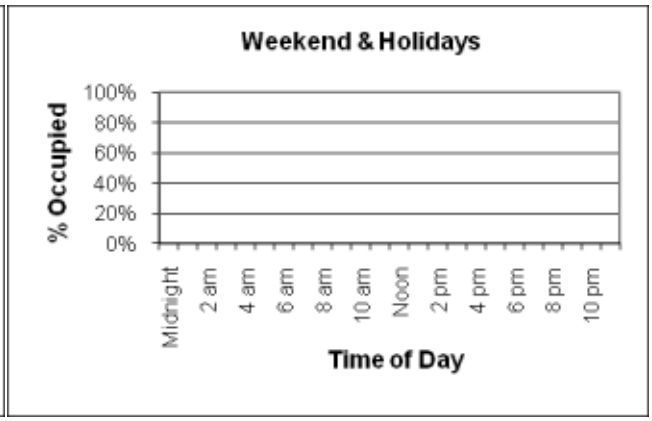
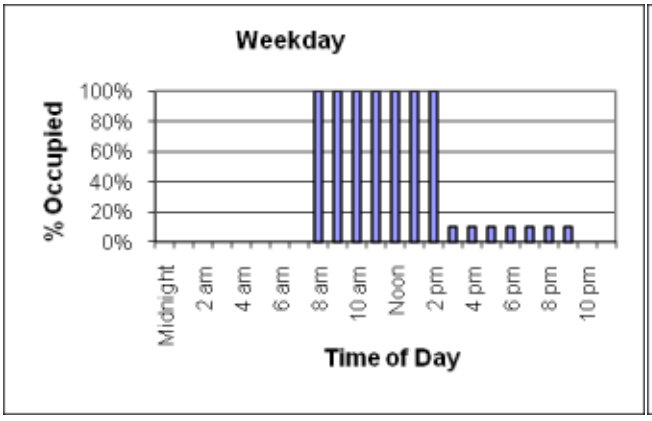
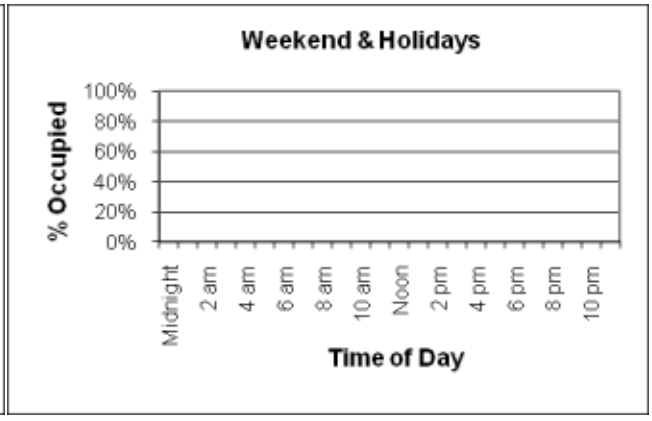




Schedule thru December 31

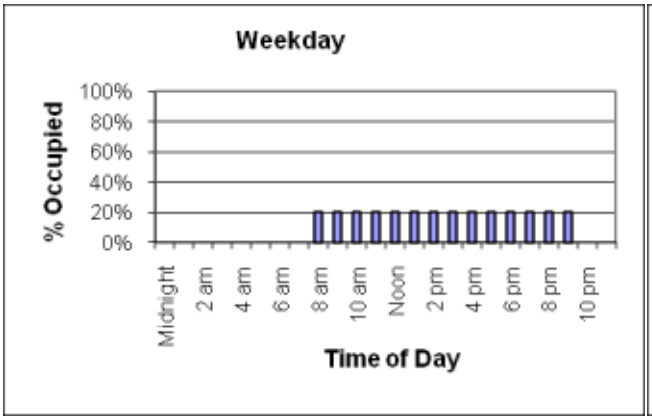


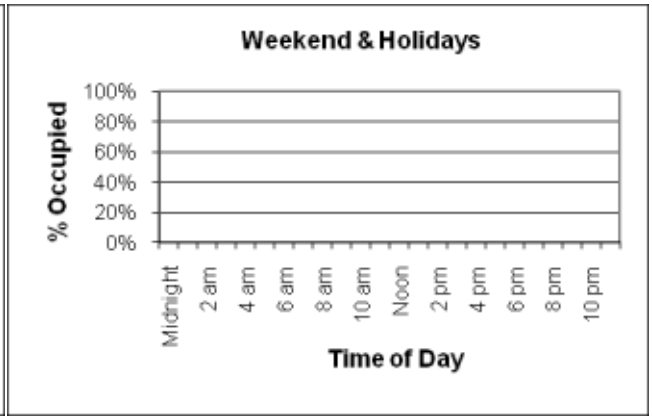


Gymnasium/Gymnatorium Occupancy Schedule

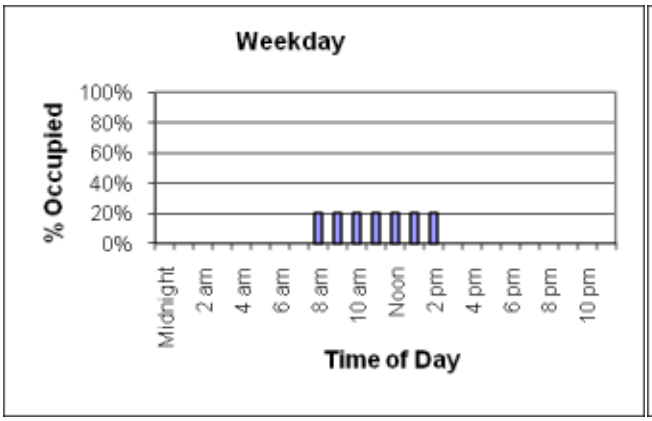
Gym/ Gymnatorium - 50 ft2/person

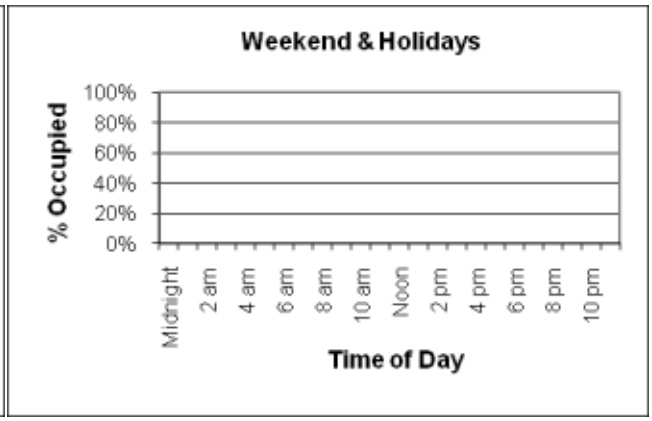
Schedule thru June 15



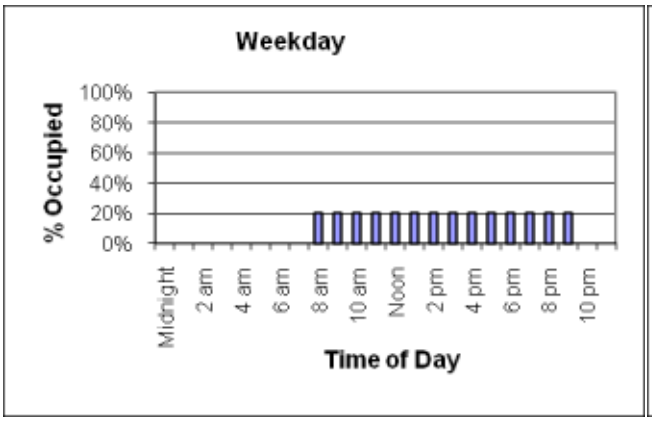


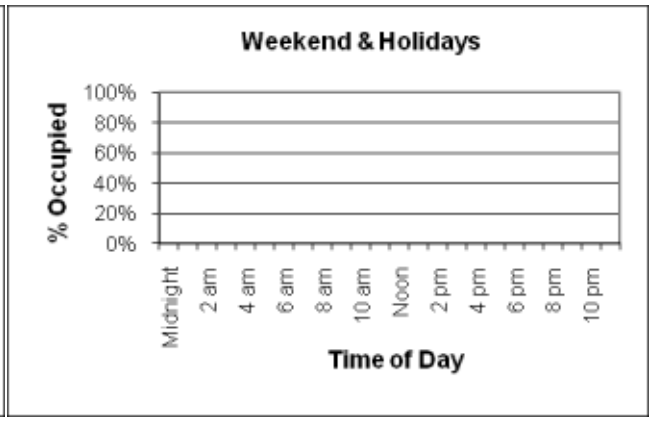
Schedule thru September 5





Schedule thru December 31

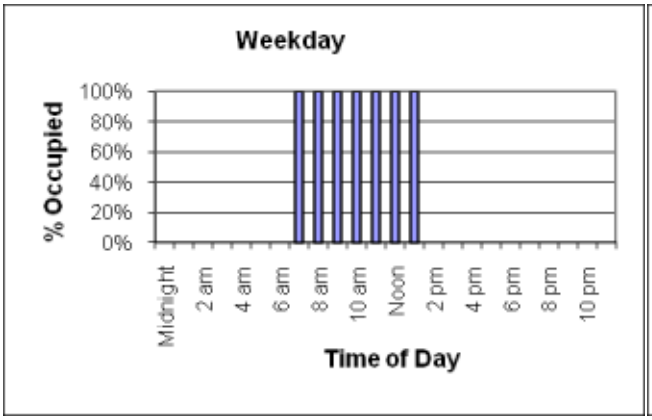


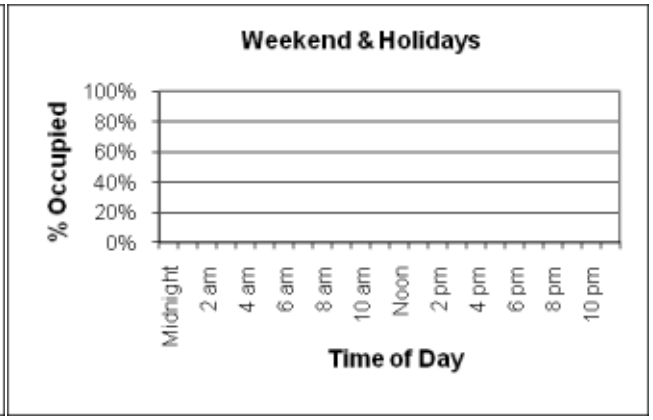


Kitchen Occupancy Schedule

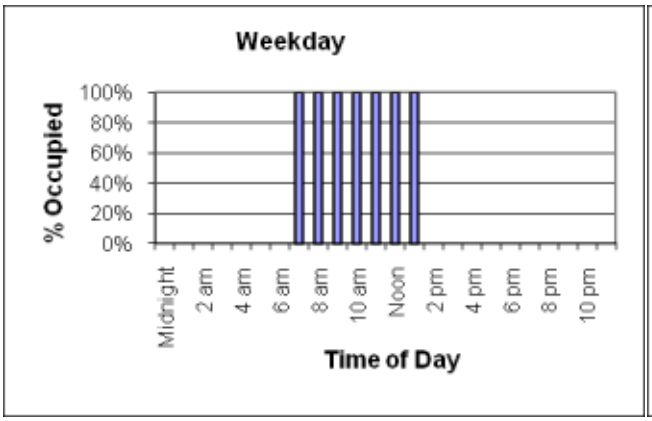
Kitchen - 50 ft2/person

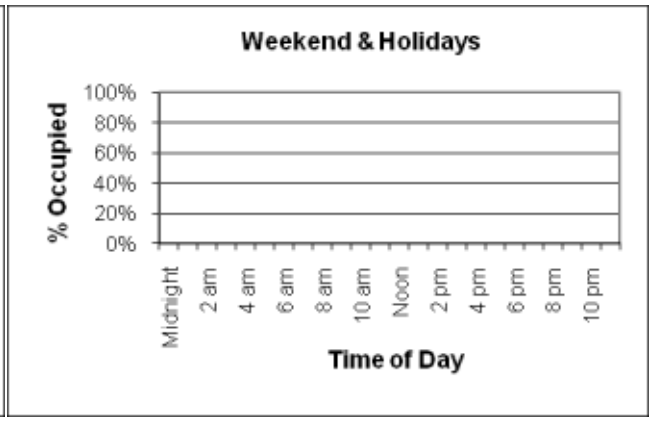
Schedule thru June 15



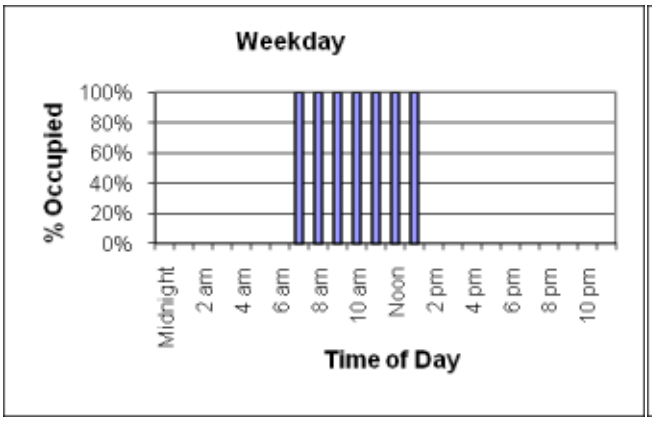


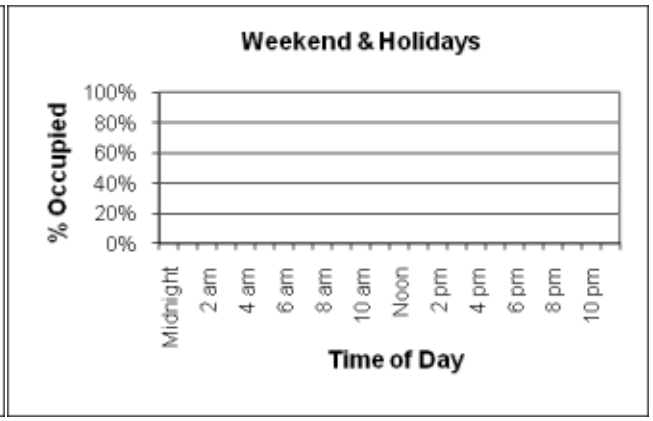
Schedule thru September 5



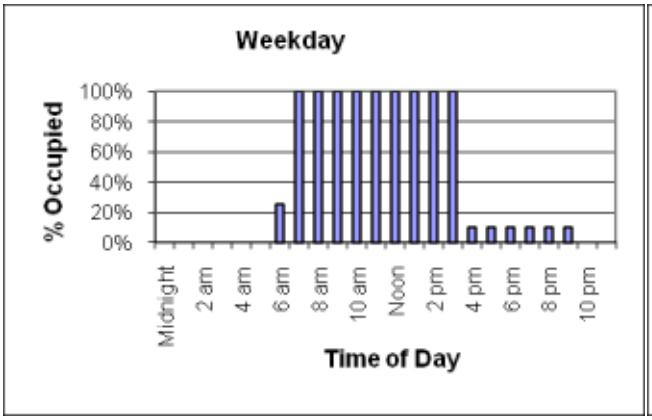


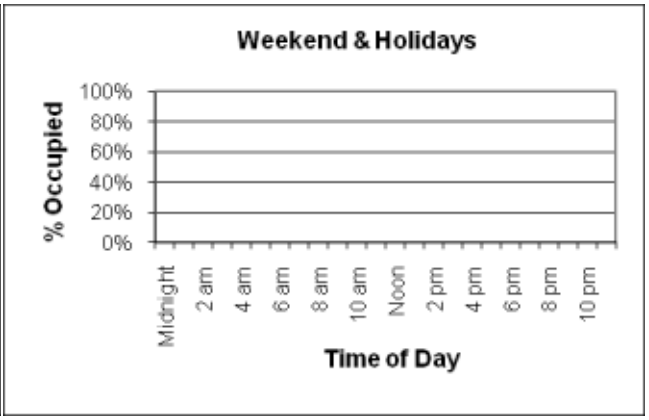
Schedule thru December 31



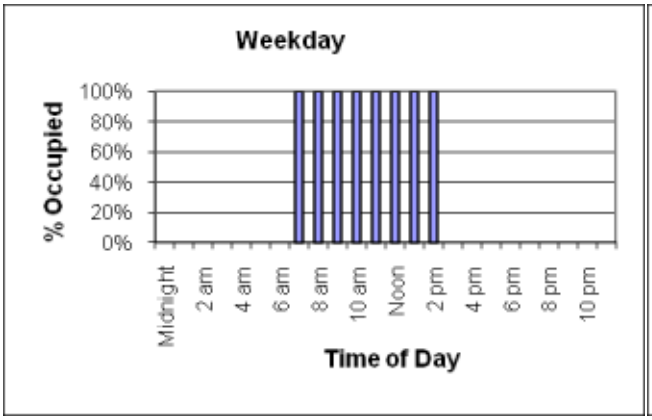


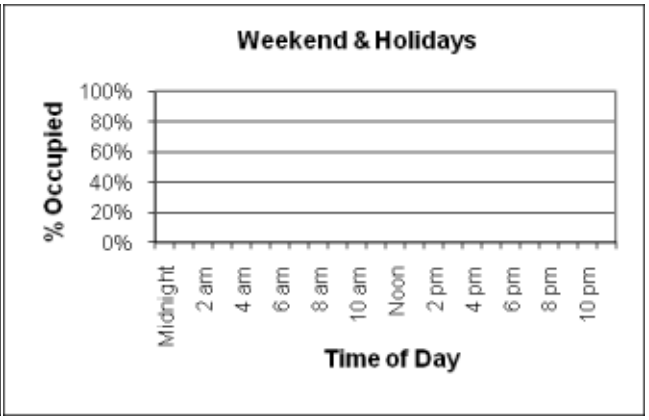
Office Occupancy Schedule
Office - 143 ft2/person
Corridors - 143 ft2/person
Lobby - 143 ft2/person
Restroom - 143 ft2/person
Vestibule - 143 ft2/person
Conference Room - 143 ft2/person
Schedule thru June 15



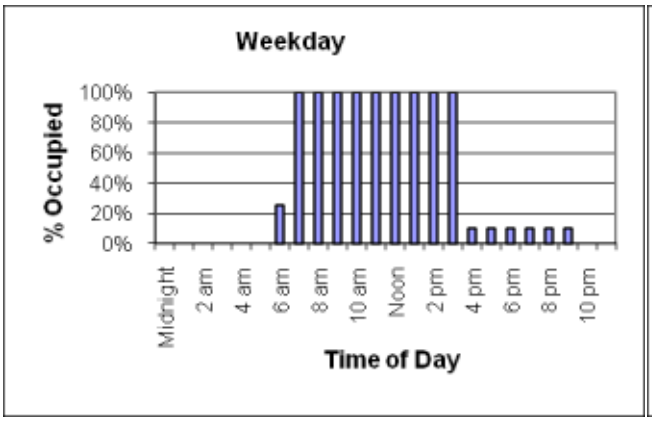


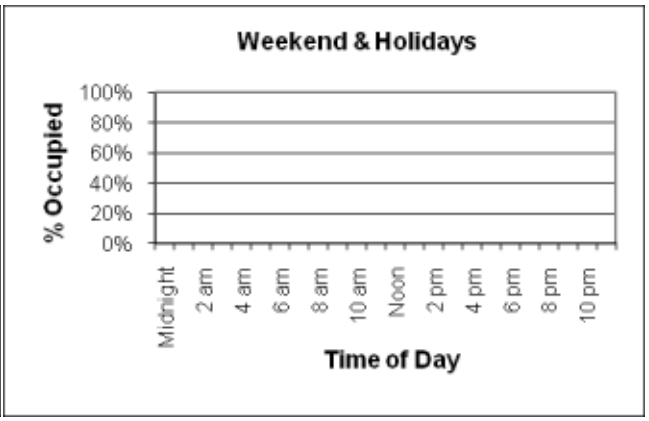
Schedule thru September 5





Schedule thru December 31

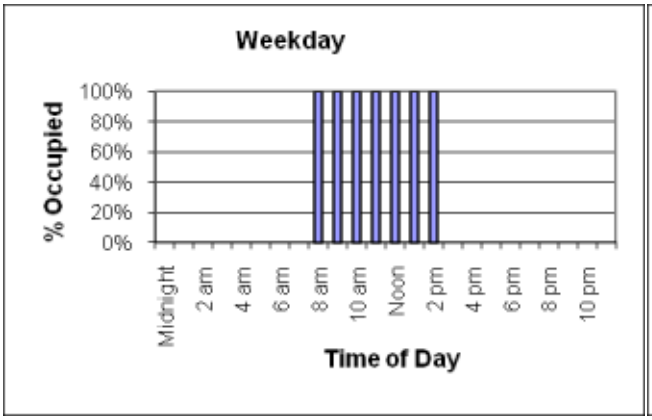


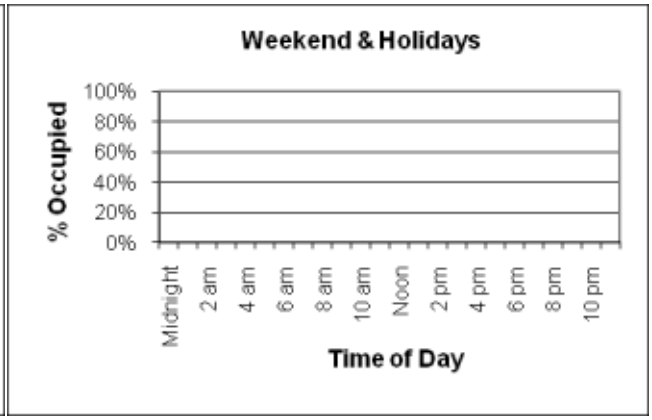


Computer Lab Occupancy Schedule

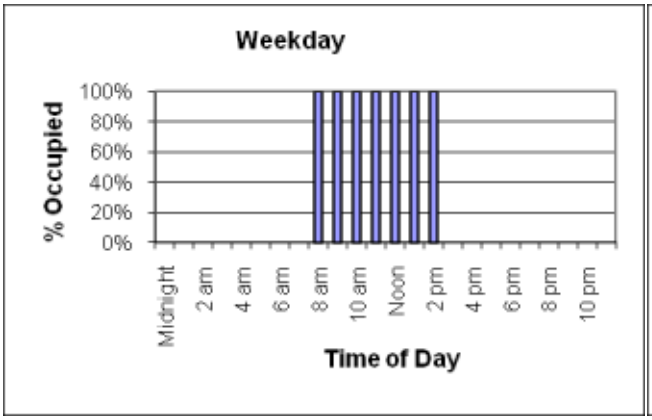
Computer Lab - 33 ft2/person

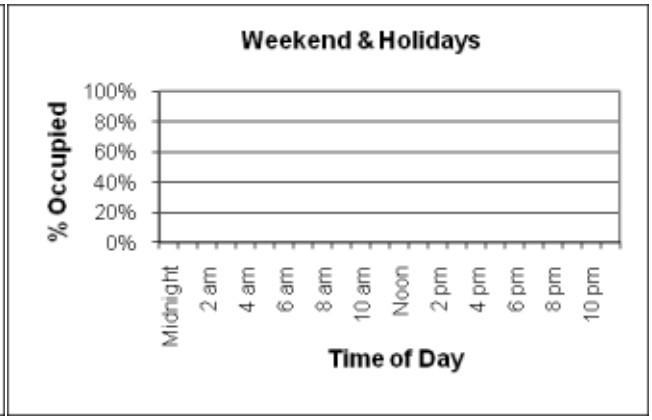
Schedule thru June 15



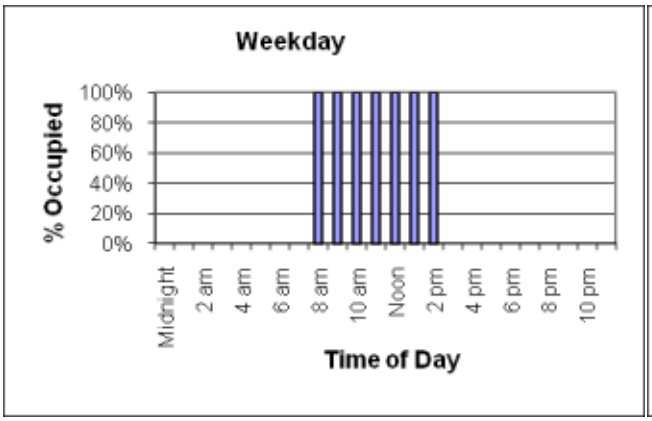


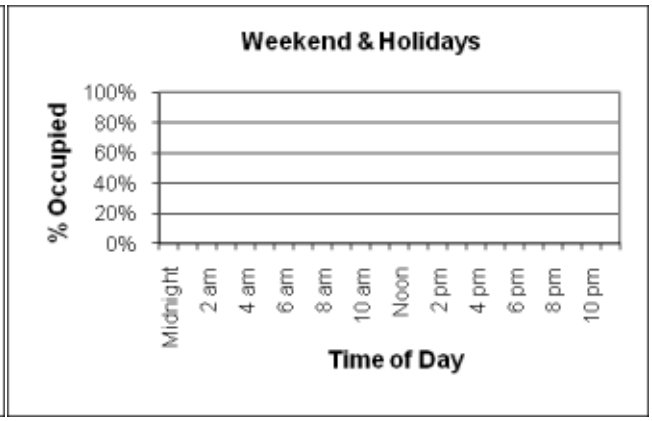
Schedule thru September 5





Schedule thru December 31

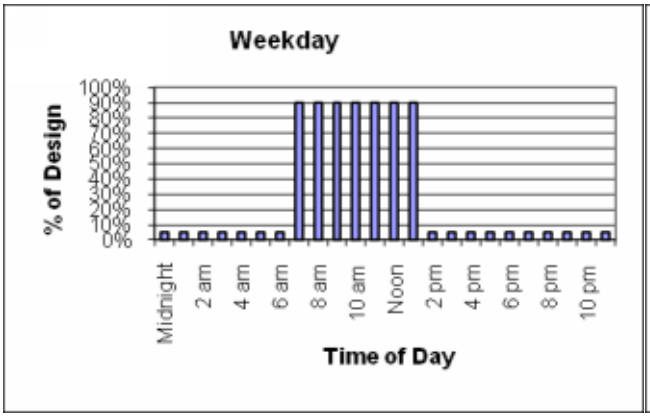


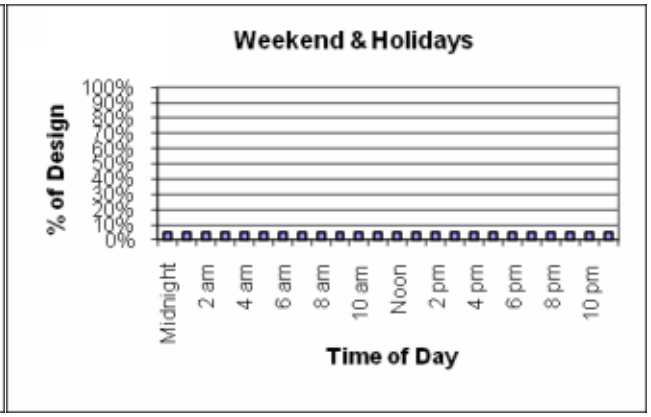


1.3.2. Lighting Use Patterns

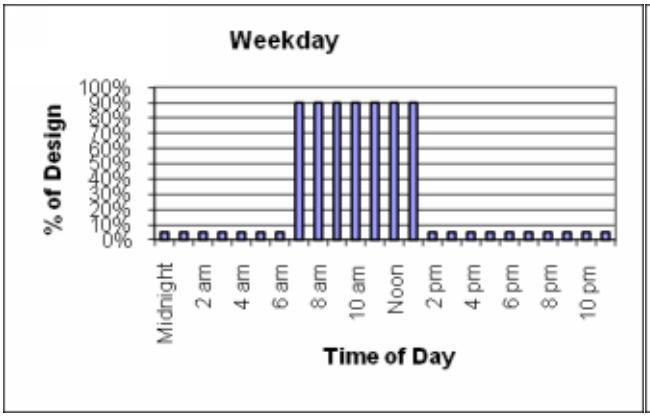
Space Type	Lighting Power Density	Schedule
Cafeteria	0.9 W/ft^2	Cafeteria Lighting Schedule
Classroom	1.01 W/ft^2	Classroom Lighting Schedule
Gym/ Gymnatorium	1.36 W/ft^2	Gymnasium Lighting Schedule
Kitchen	1.01 W/ft^2	Kitchen Lighting Schedule
MER	0.8 W/ft^2	MER Lighting Schedule
Office	0.98 W/ft^2	Office Lighting Schedule
Corridors	0.5 W/ft^2	Corridor Lighting Schedule
Lobby	1 W/ft^2	Corridor Lighting Schedule
Locker	0.6 W/ft^2	Locker Lighting Schedule
Stair	0.6 W/ft^2	Corridor Lighting Schedule
Storage	0.8 W/ft^2	Storage Lighting Schedule
Library	1.13 W/ft^2	Classroom Lighting Schedule
Restroom	0.9 W/ft^2	Corridor Lighting Schedule
Vestibule	0.5 W/ft^2	Corridor Lighting Schedule
Conference Room	1.1 W/ft^2	Office Lighting Schedule

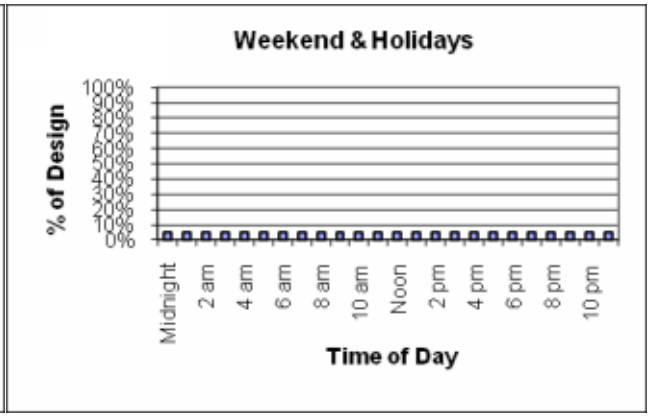
<u>Cafeteria Lighting Schedule</u>
Cafeteria - 0.9 W/ft2
Schedule thru June 15



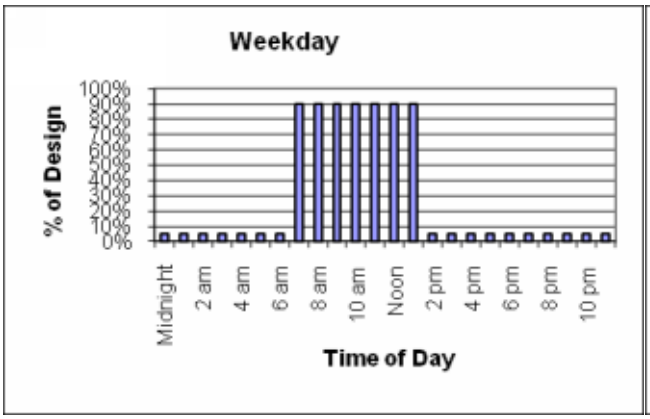


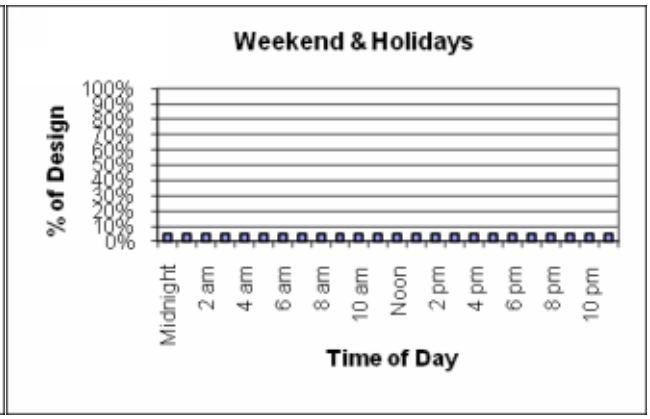
Schedule thru September 5



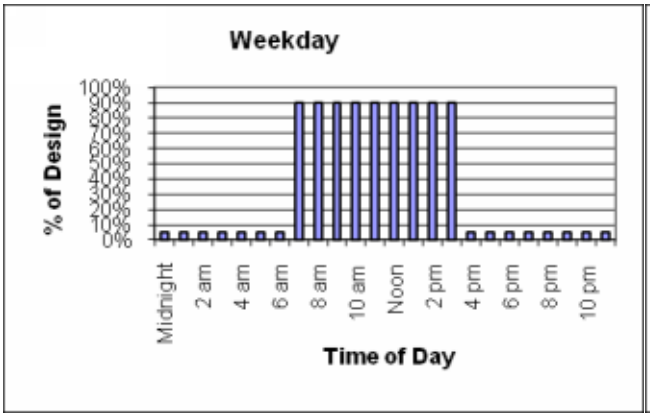


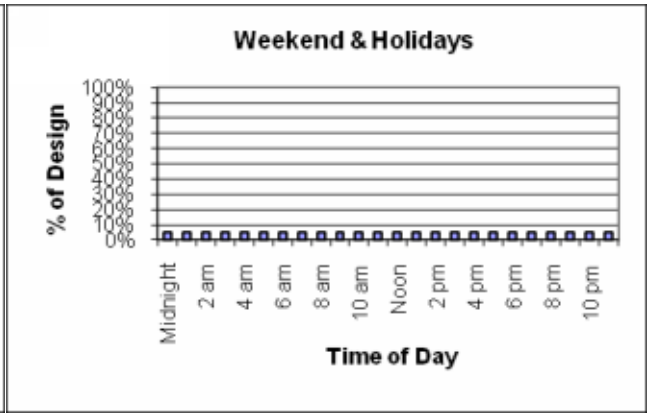
Schedule thru December 31



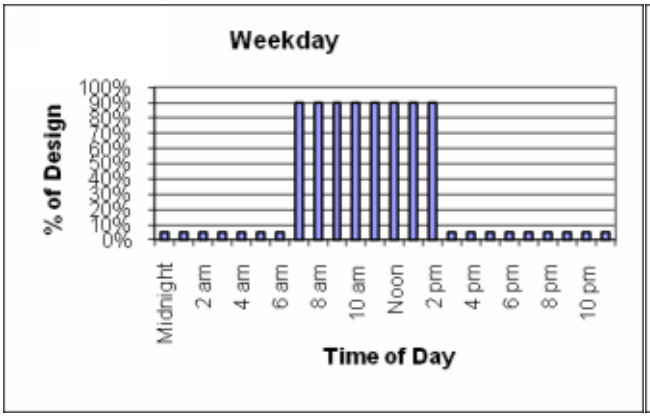


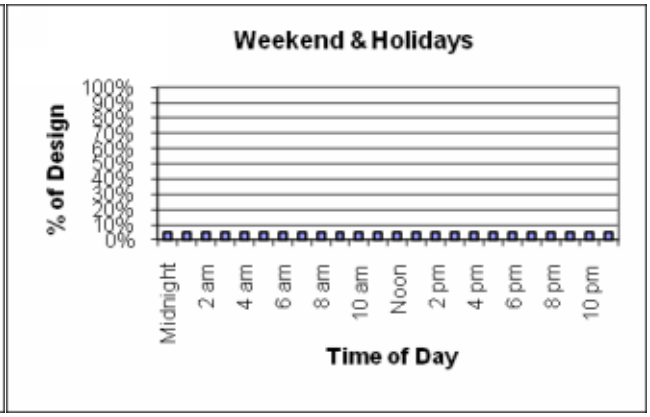
<u>Classroom Lighting Schedule</u>
Classroom - 1.01 W/ft2
Library - 1.13 W/ft2
Schedule thru June 15



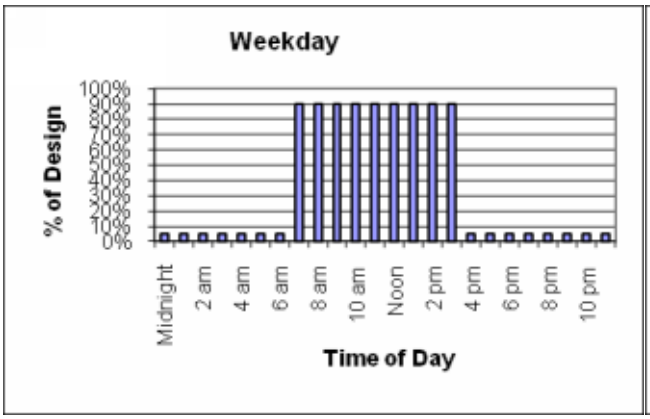


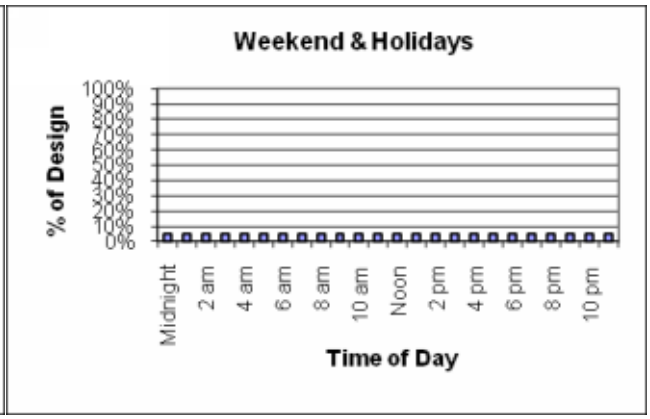
Schedule thru September 5





Schedule thru December 31

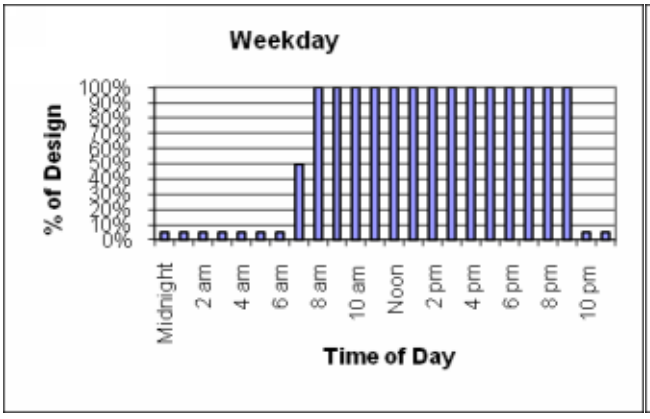


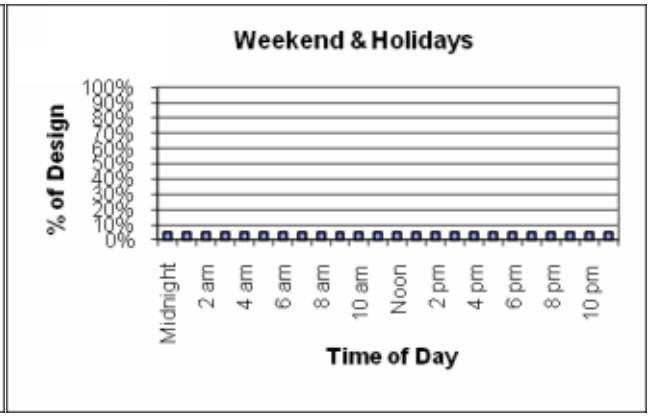


<u>Gymnasium/ Gymnatorium Lighting Schedule</u>

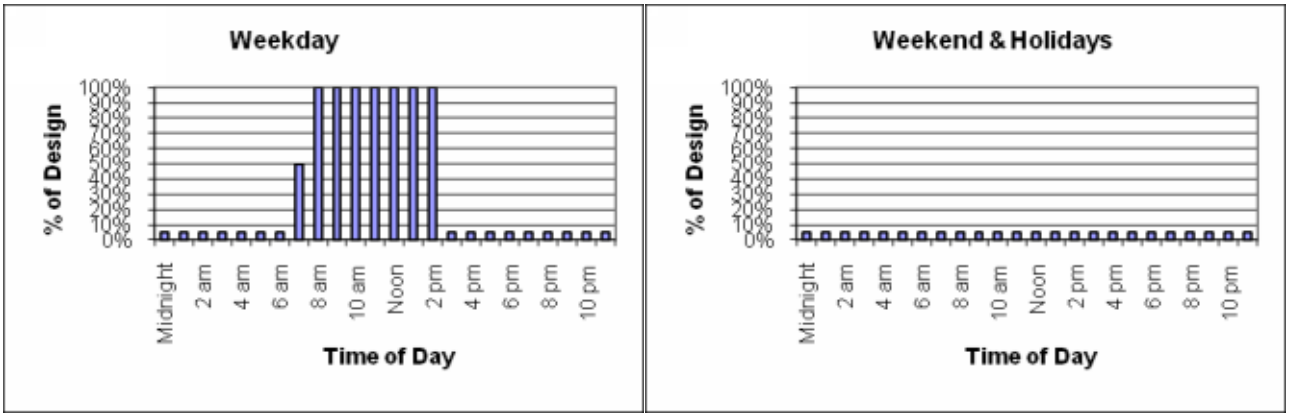
Gym/ Gymnatorium - 1.36 W/ft2

Schedule thru June 15

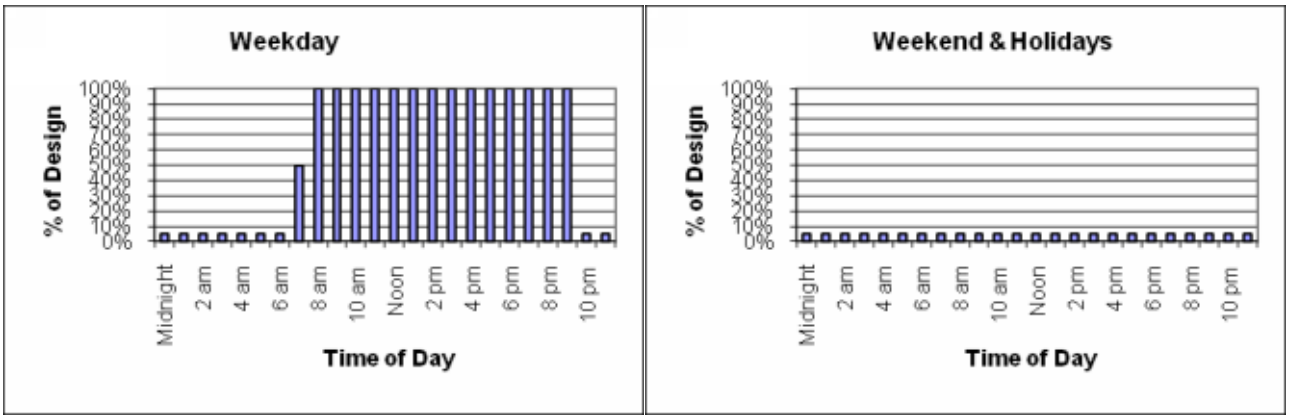




Schedule thru September 5



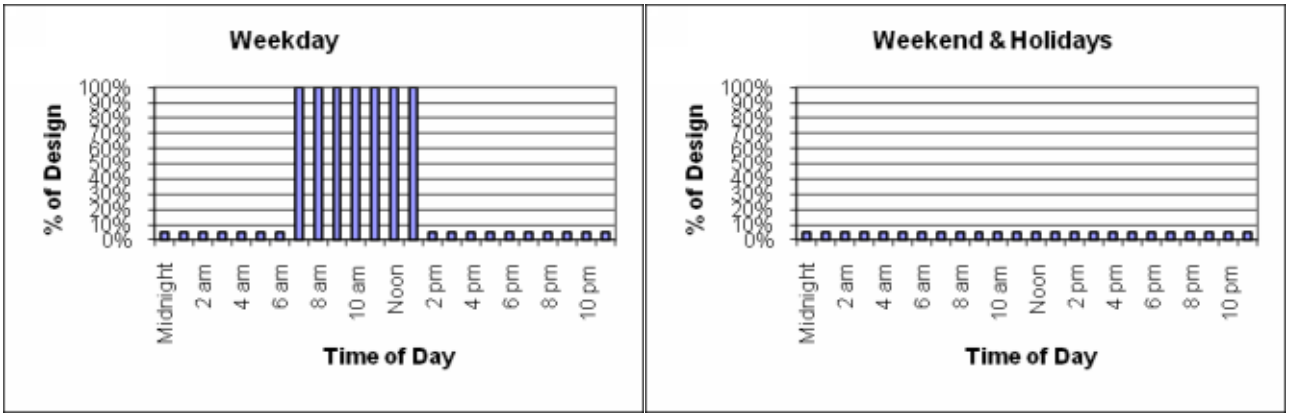
Schedule thru December 31



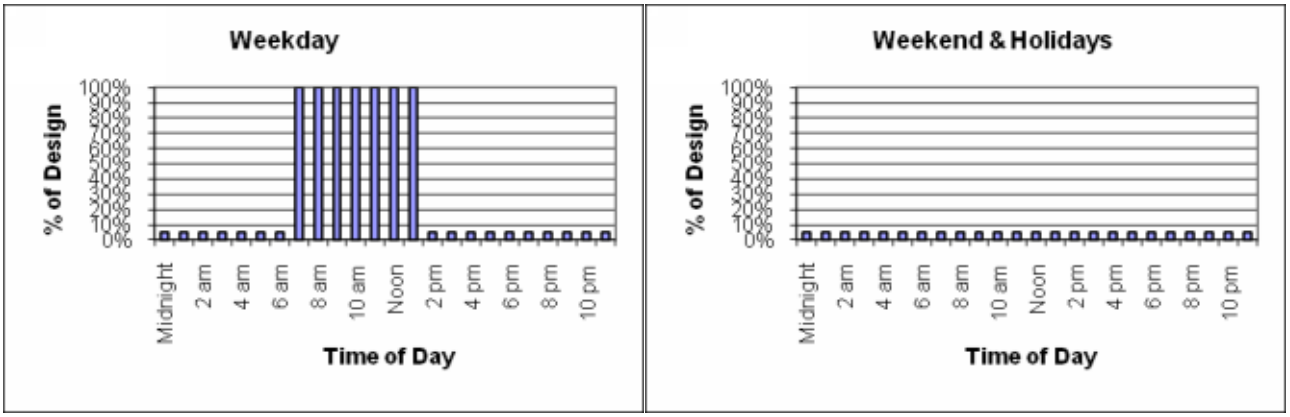
<u>Kitchen Lighting Schedule</u>

Kitchen - 1.01 W/ft2

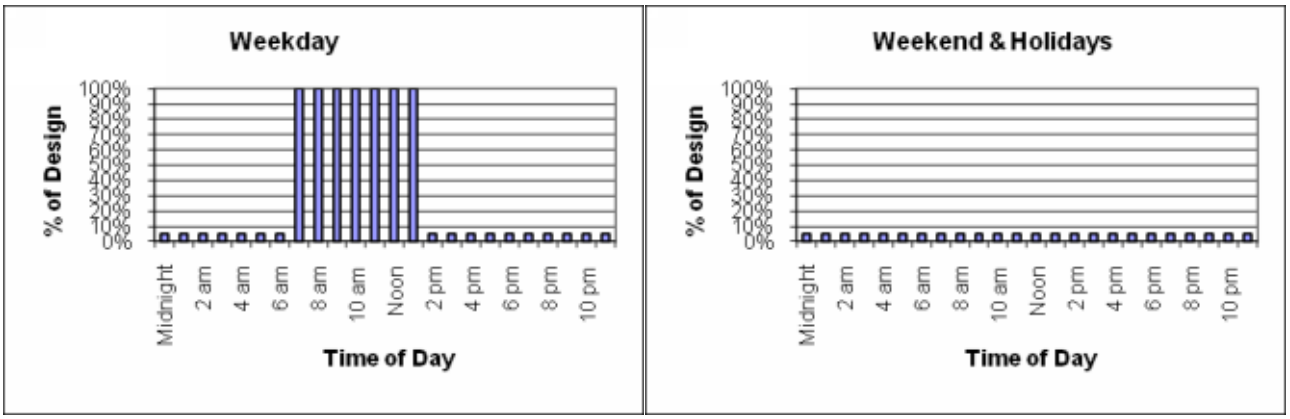
Schedule thru June 15



Schedule thru September 5



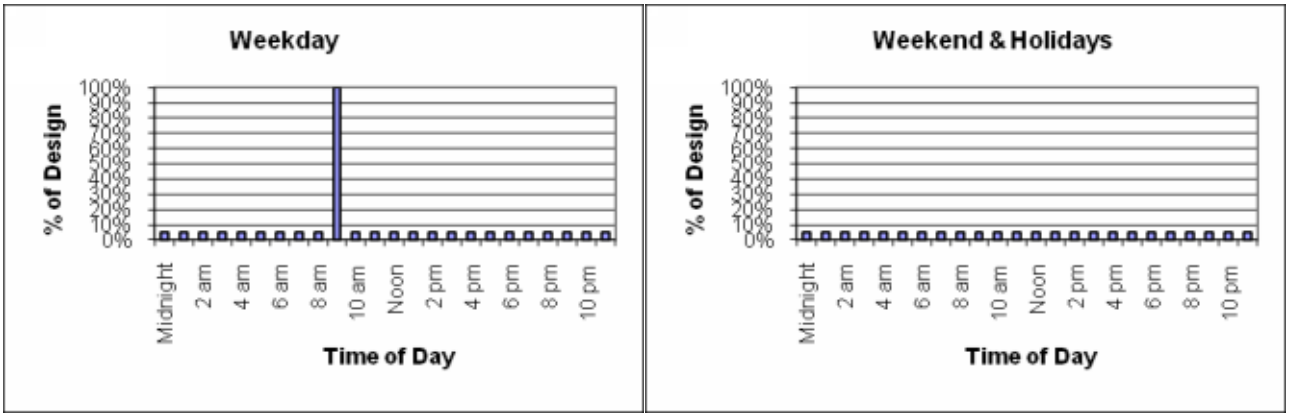
Schedule thru December 31



<u>MER Lighting Schedule</u>

MER - 0.8 W/ft2

Schedule thru December 31

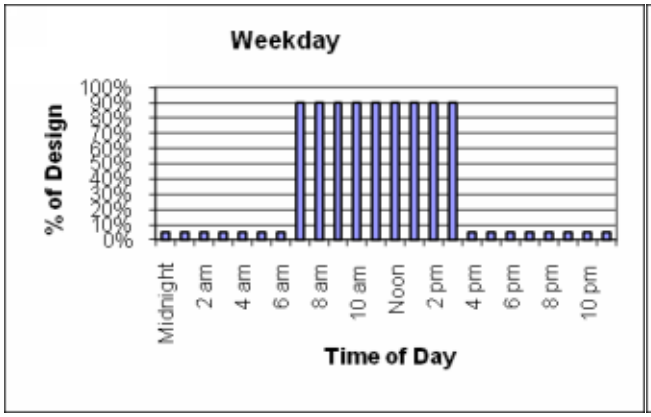


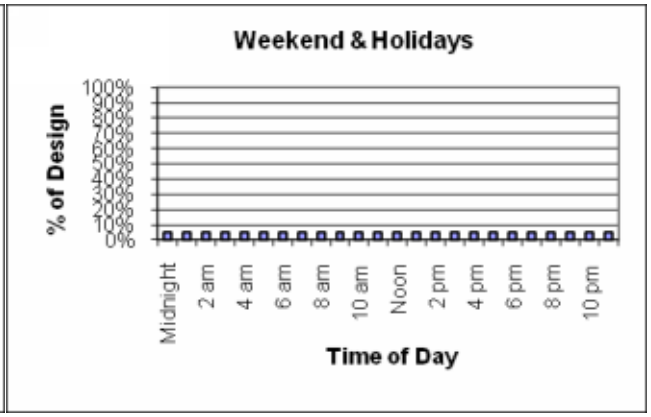
Office Lighting Schedule

Office - 0.98 W/ft2

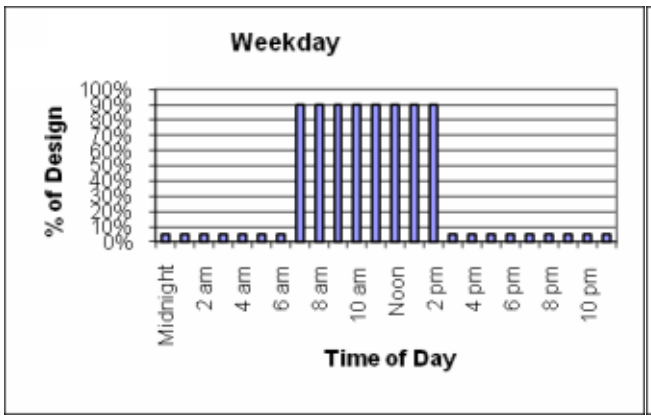
Conference Room - 1.1 W/ft2

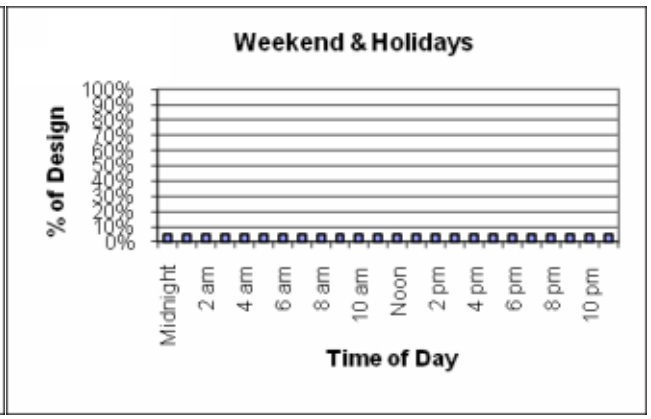
Schedule thru June 15



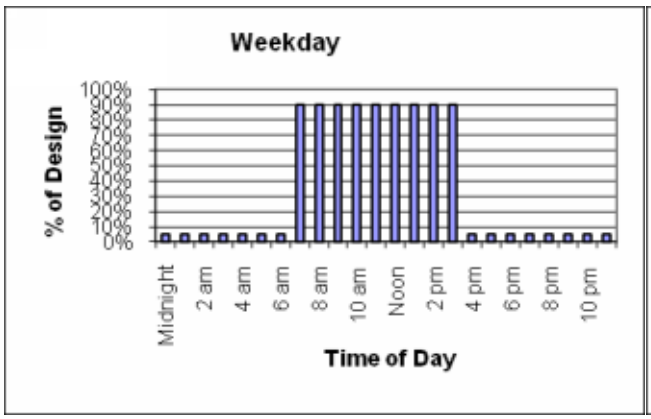


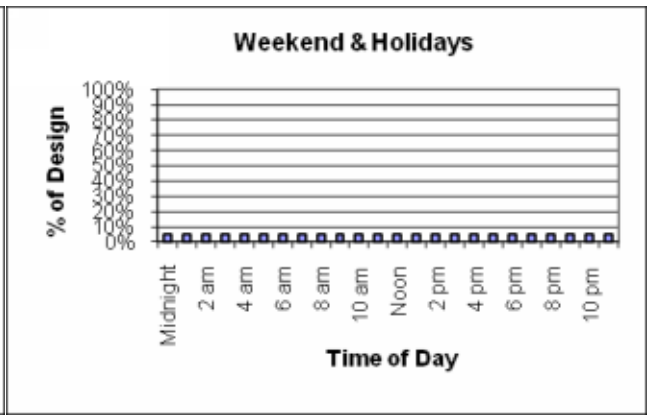
Schedule thru September 5



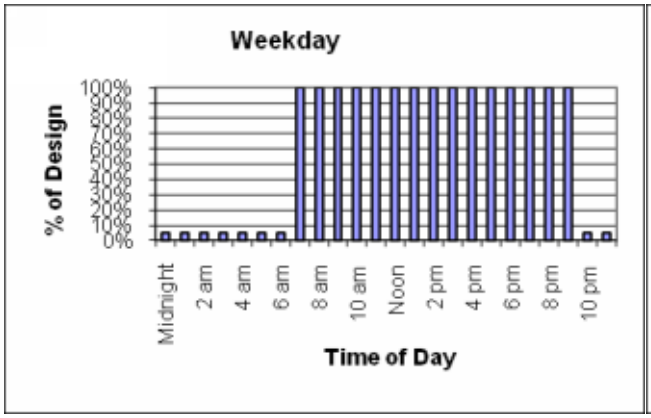


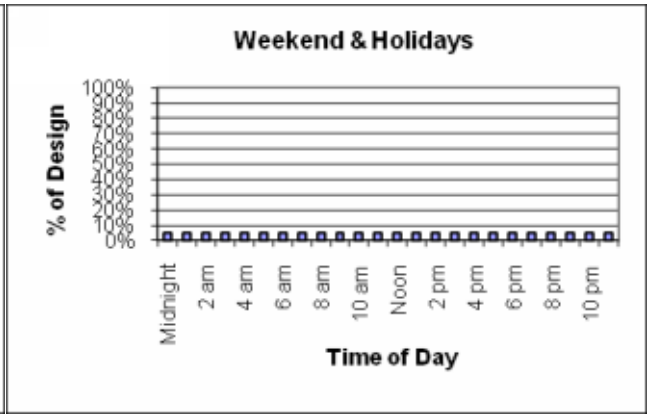
Schedule thru December 31



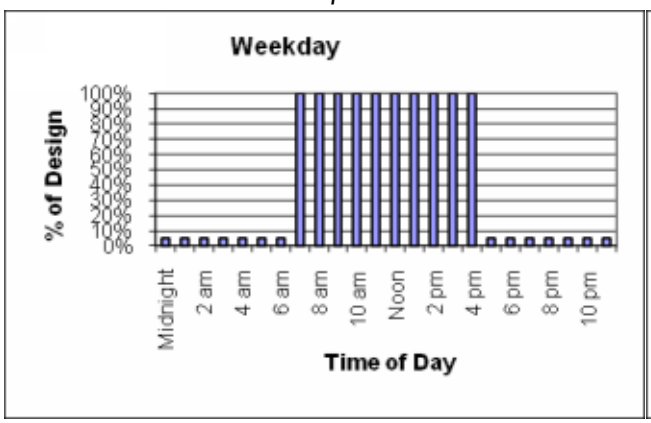


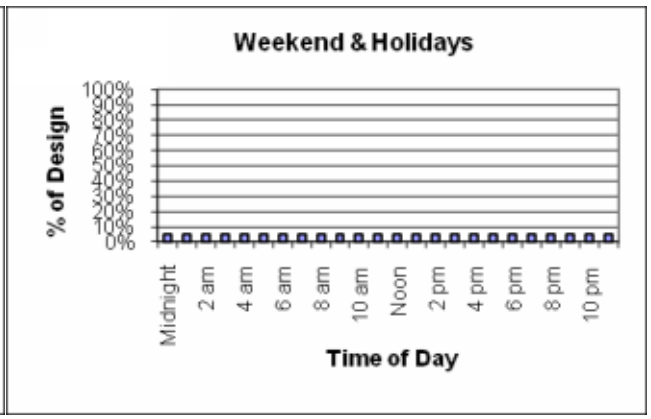
Corridor Lighting Schedule
Corridors - 0.5 W/ft2
Lobby - 1 W/ft2
Stair - 0.6 W/ft2
Restroom - 0.9 W/ft2
Vestibule - 0.5 W/ft2
Schedule thru June 15



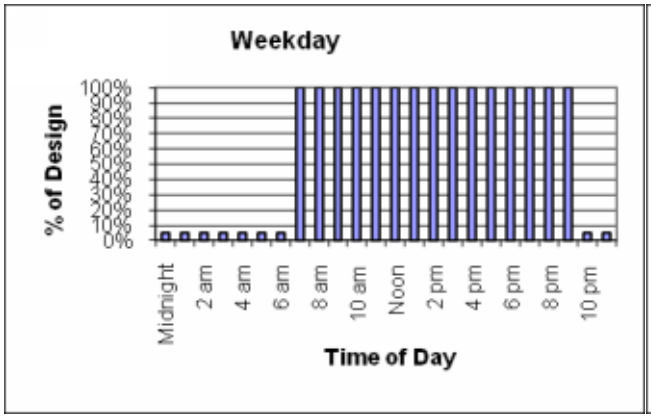


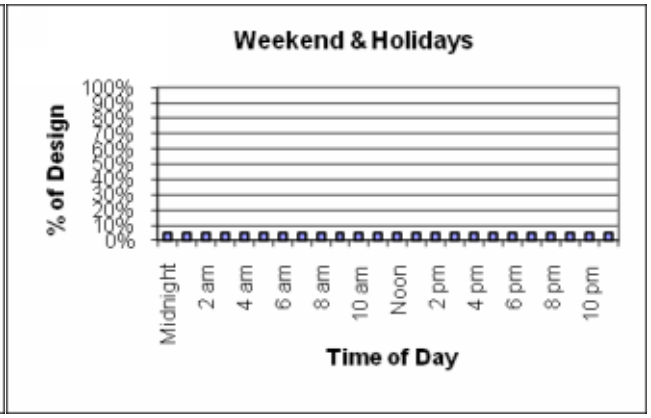
Schedule thru September 5





Schedule thru December 31

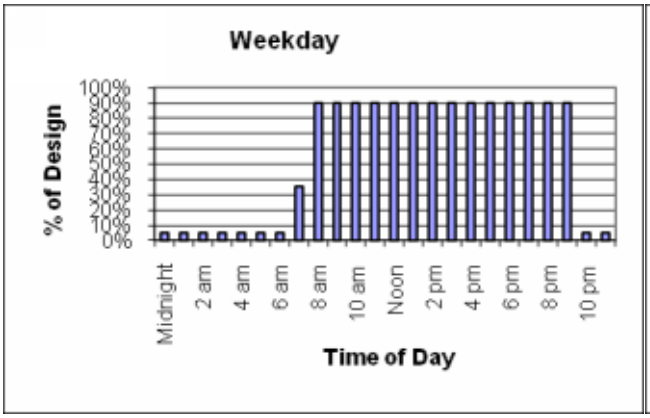


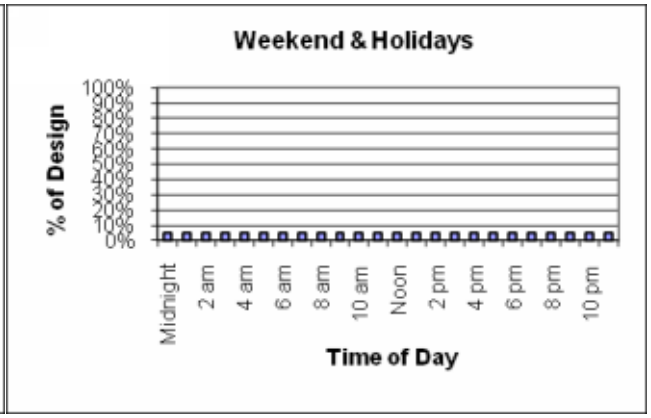


Locker Lighting Schedule

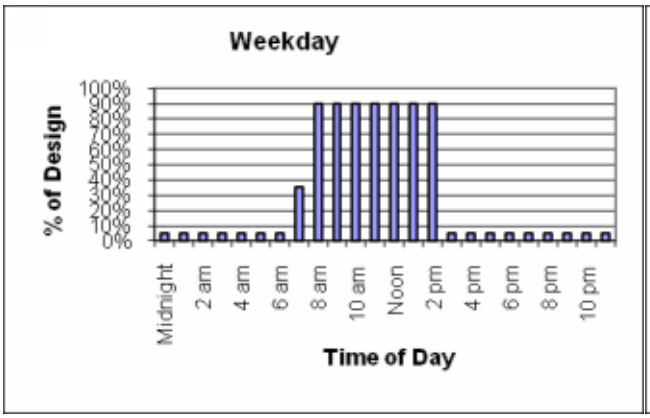
Locker - 0.6 W/ft2

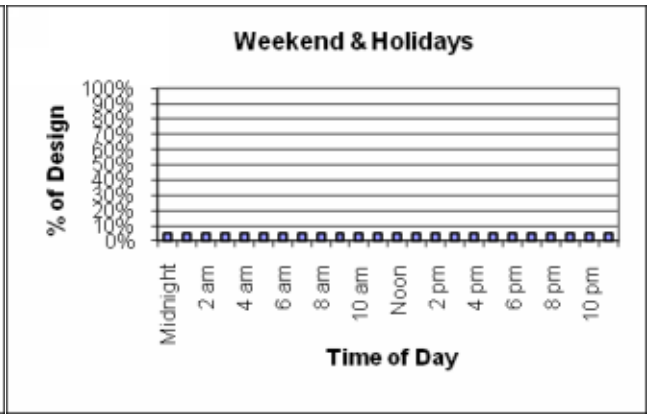
Schedule thru June 15



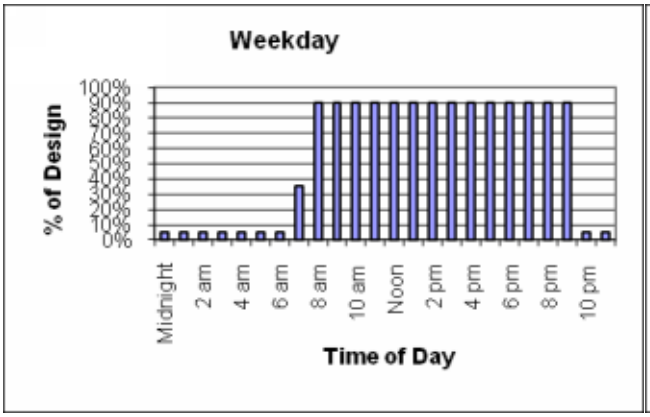


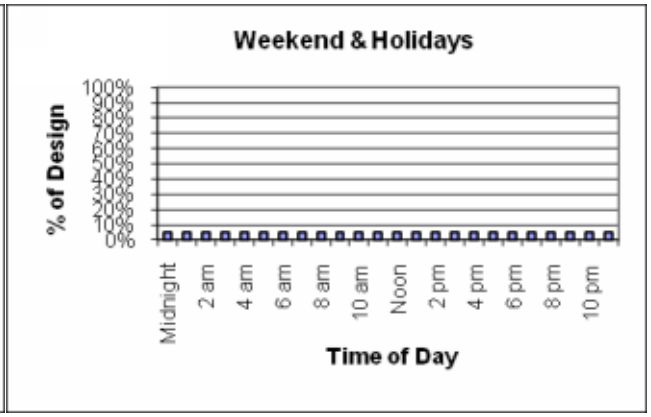
Schedule thru September 5





Schedule thru December 31

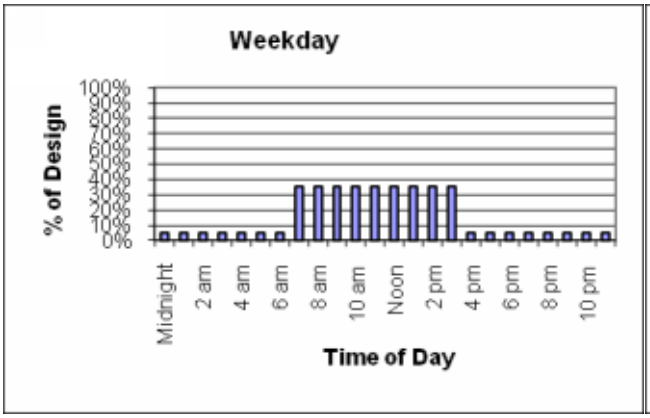


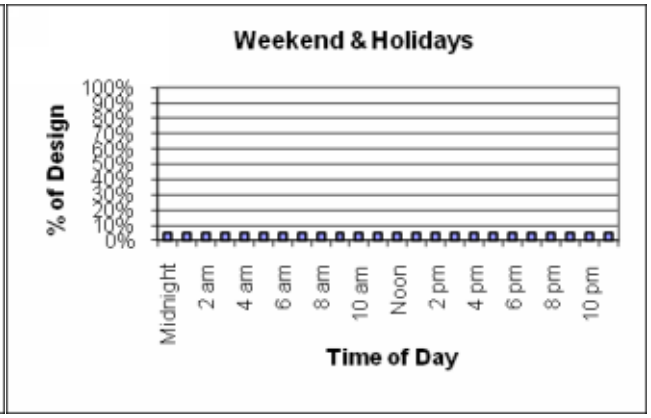


Storage Lighting Schedule

Storage - 0.8 W/ft2

Schedule thru December 31

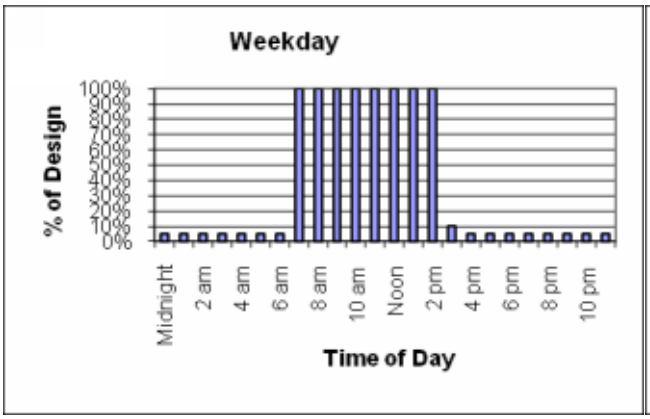


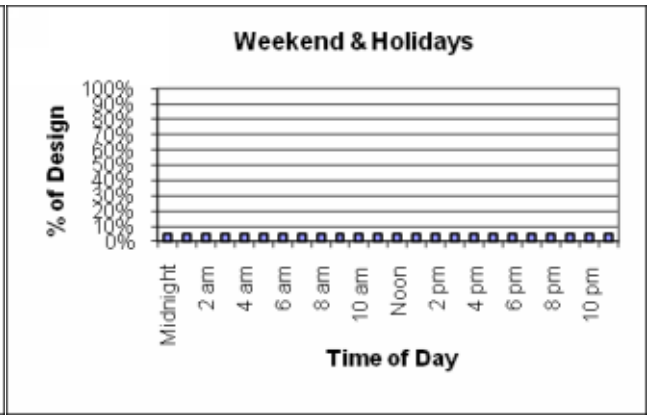


Computer Lab Lighting Schedule

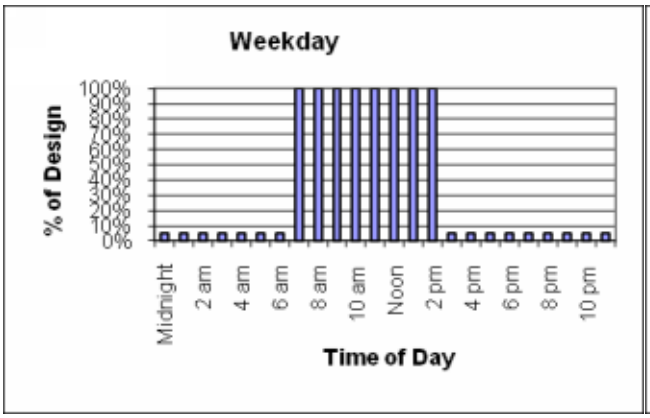
Computer Lab - 1.13 W/ft2

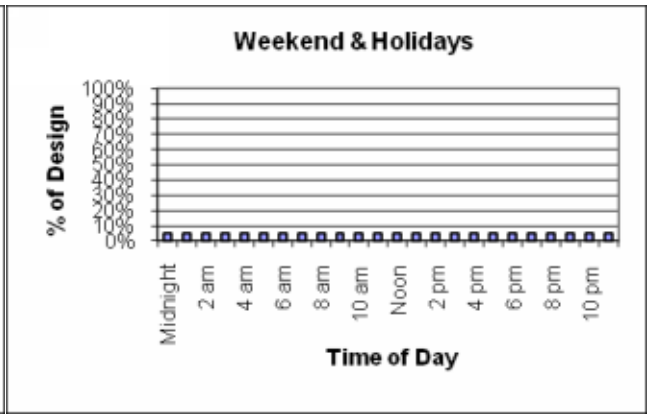
Schedule thru June 15



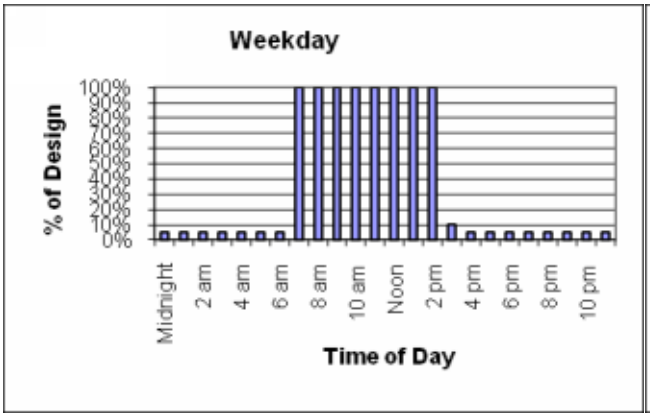


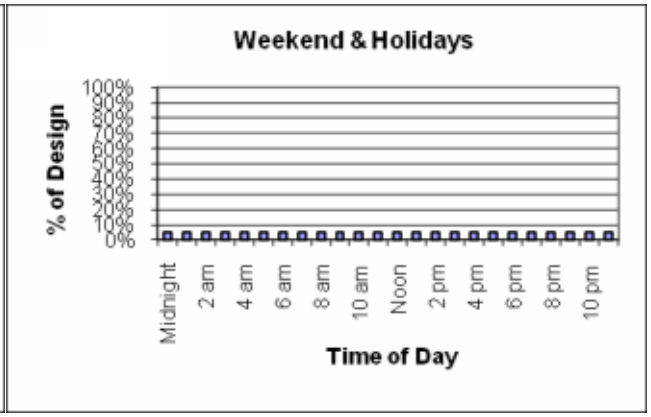
Schedule thru September 5





Schedule thru December 31

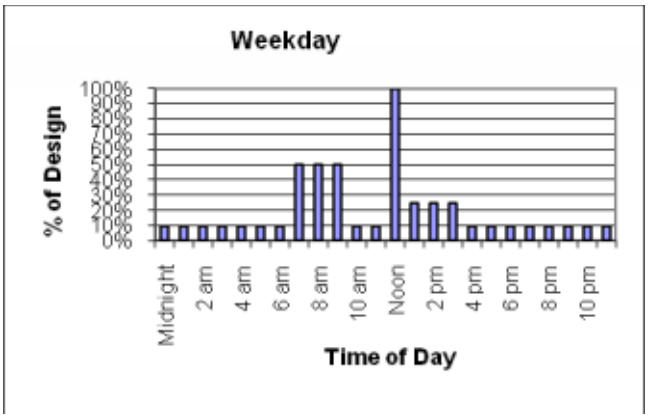


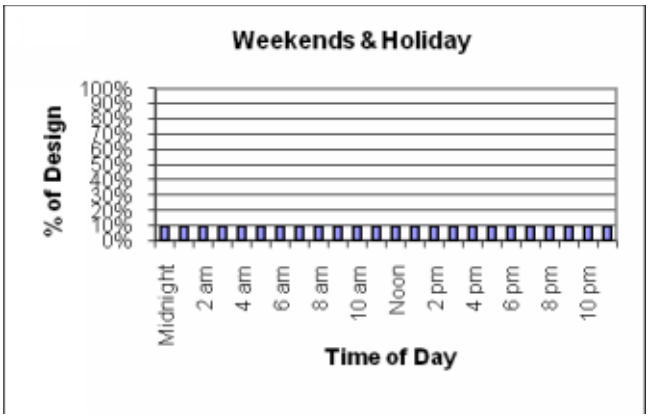


1.3.3. Equipment Use Patterns

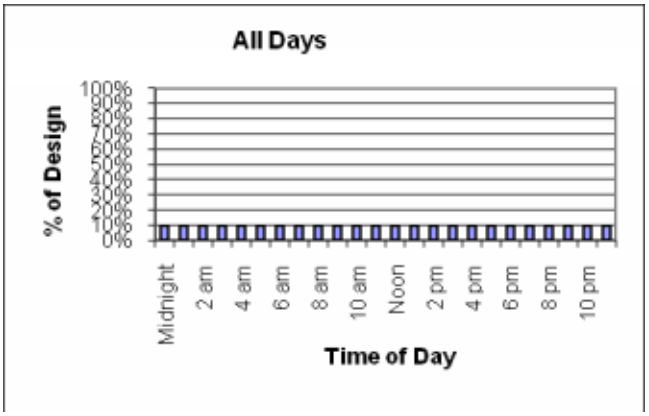
Space Type	Equipment Power Density	Schedule
Cafeteria	0.62 W/ft^2	Cafeteria Equipment Schedule
Classroom	0.5 W/ft^2	Classroom Equipment Schedule
Kitchen	3 W/ft^2	Kitchen Equipment Schedule
Office	1.25 W/ft^2	Office Equipment Schedule
Computer Lab	2.5 W/ft^2	Classroom Equipment Schedule
Library	0.5 W/ft^2	Classroom Equipment Schedule
Conference Room	1.25 W/ft^2	Office Equipment Schedule

Cafeteria Equipment Schedule
Cafeteria - 0.62 W/ft2
Schedule thru April 15

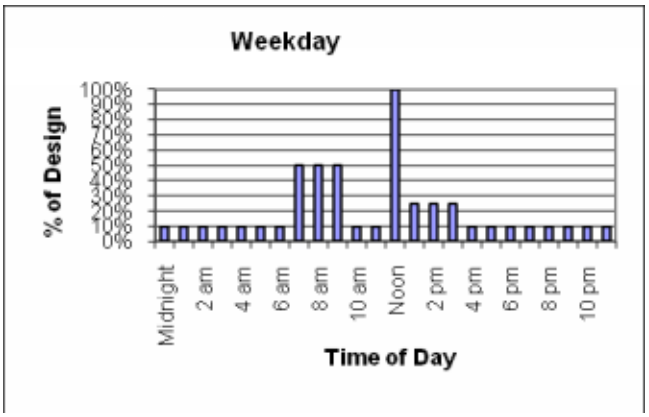


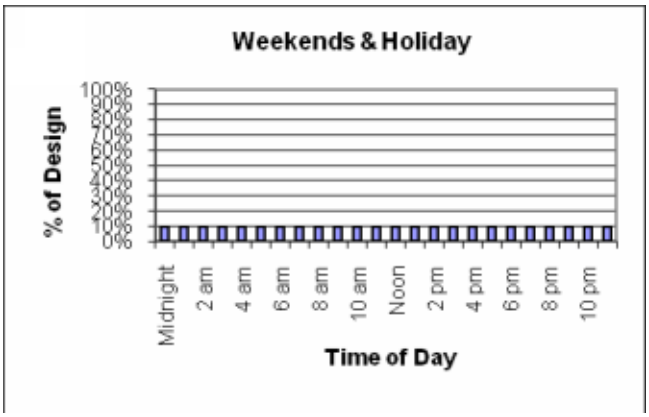


Schedule thru April 21

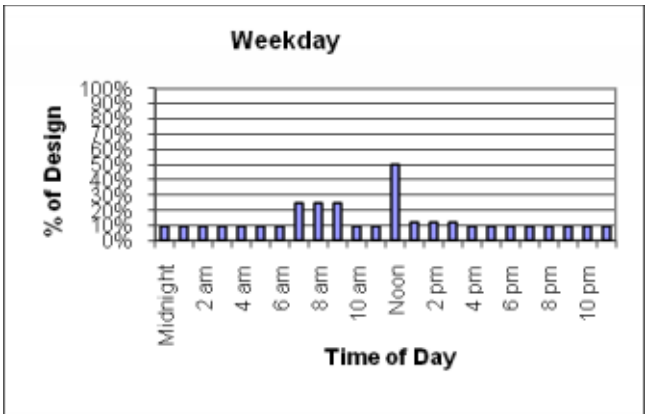


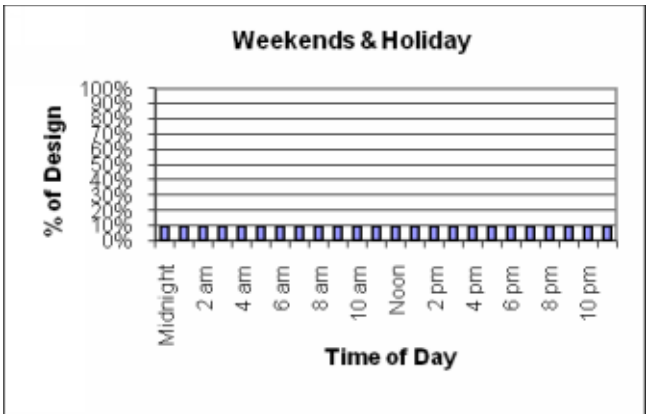
Schedule thru June 30



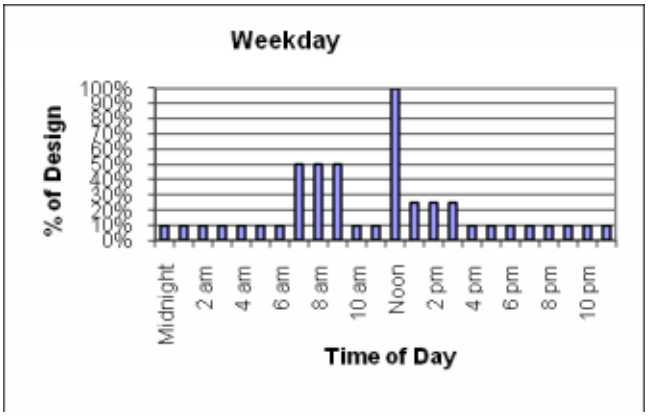


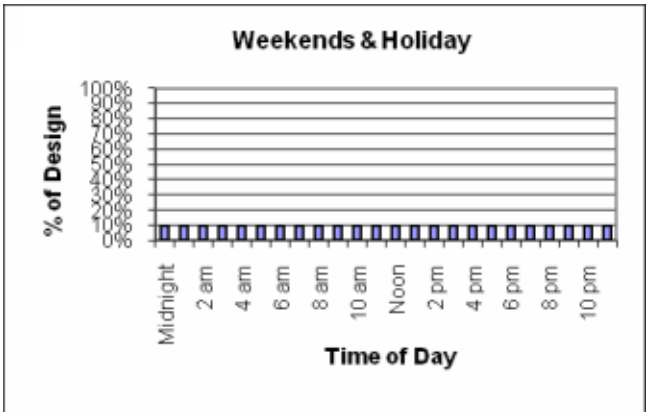
Schedule thru August 31



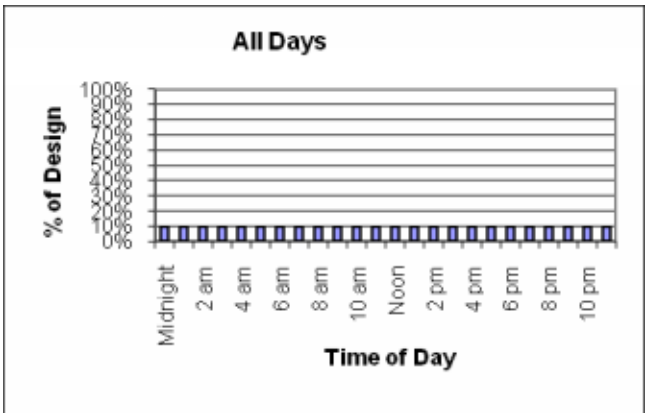


Schedule thru December 23



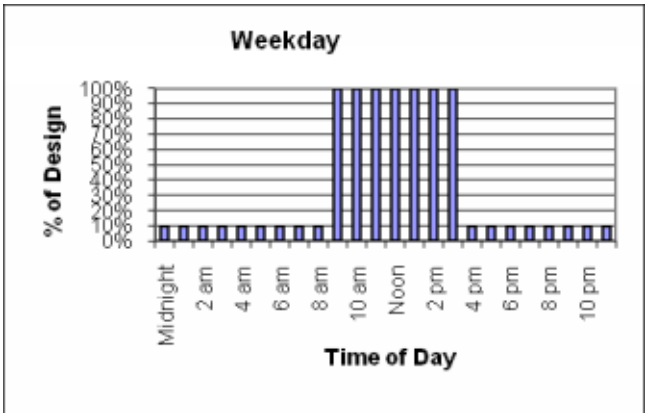


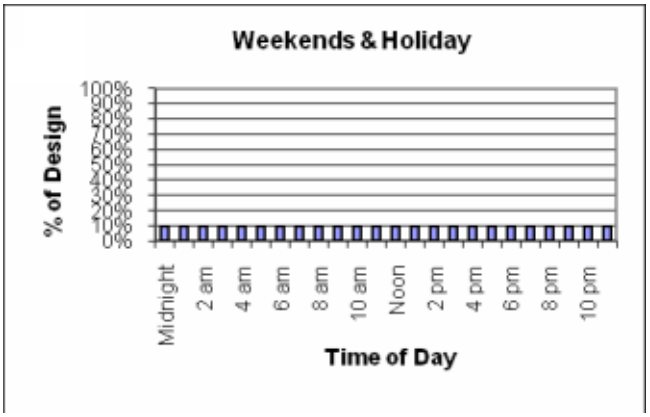
Schedule thru December 31



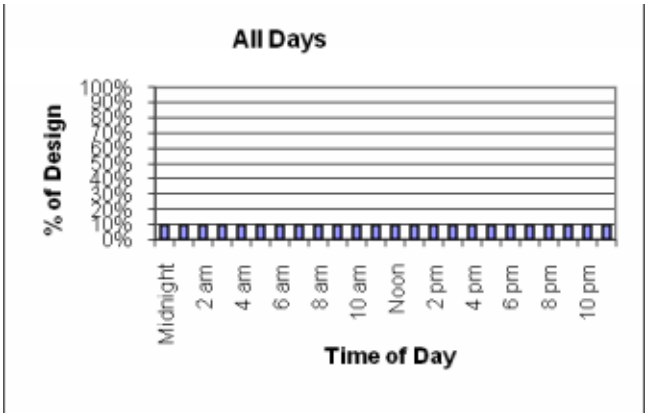
<u>Classroom Equipment Schedule</u>
Classroom - 0.5 W/ft2
Library - 0.5 W/ft2
Computer Lab - 2.5 W/ft2

Schedule thru April 15

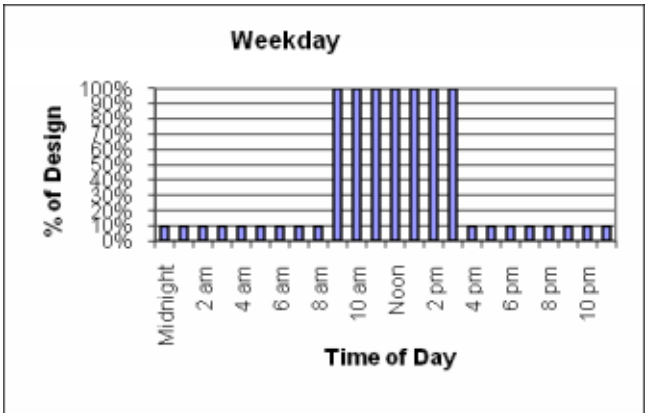


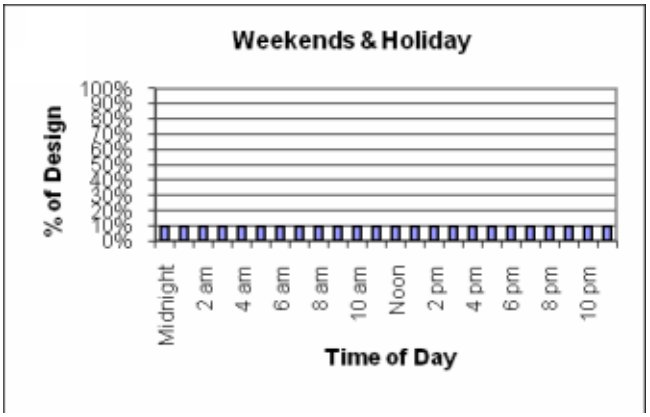


Schedule thru April 21

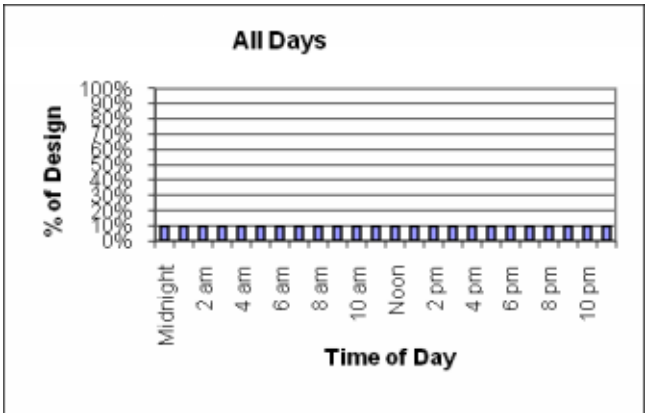


Schedule thru December 23





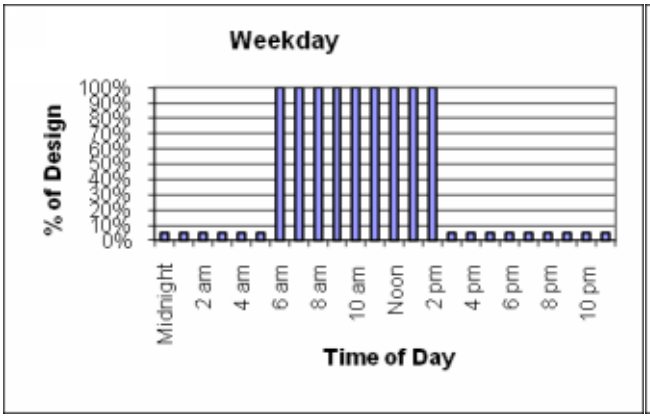
Schedule thru December 31

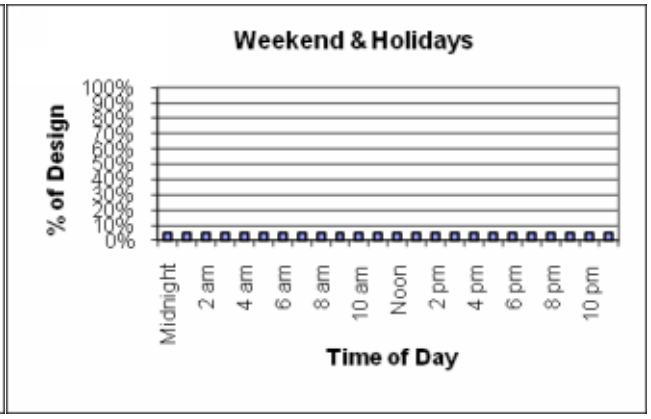


Kitchen Equipment Schedule

Kitchen - 3 W/ft2

Schedule thru December 31



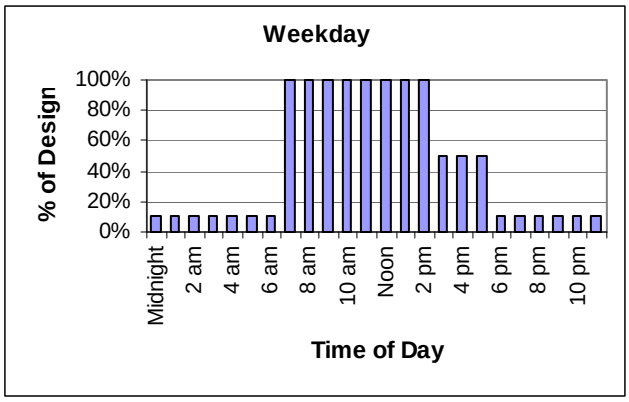


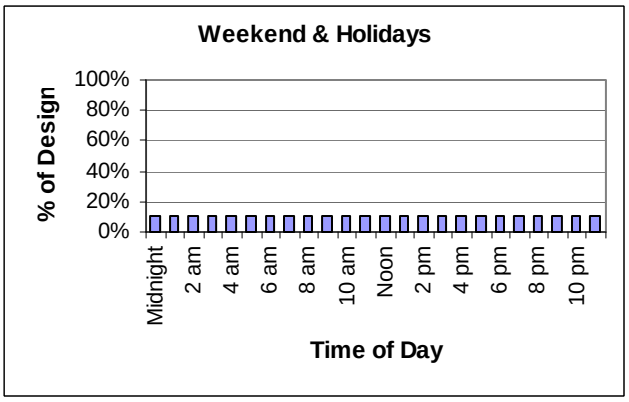
Office Equipment Schedule

Office - 1.25 W/ft2

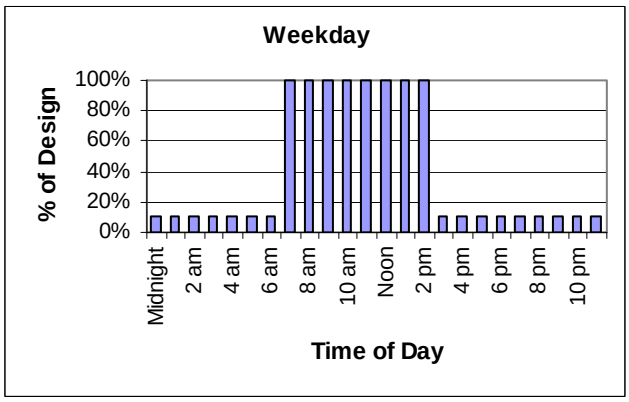
Conference Room - 1.25 W/ft2

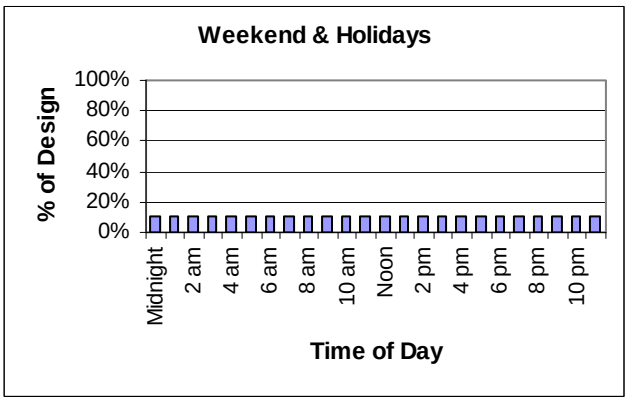
Winter/Fall Schedule





Summer Schedule





1.4. Building Environmental Conditions

Heating and cooling follow the occupancy schedules.

1.4.1. Heating Schedule

Heating temperature is set for 72°F during the hours of operation with a 65°F setback during unoccupied hours between January 1 thru May 15 and October 1 thru December 31.

1.4.2. Cooling Schedule

Cooling temperature is set for 76°F during the hours of operations with an 85°F setback during unoccupied hours from May 15 thru October 1.

2. MECHANICAL SYSTEM

2.1. General

Outdoor air will be provided to the corridors and classrooms via constant volume RTU's. The CV RTU's will temper the outdoor air via 80% efficient, modulating gas furnaces and DX cooling.

Recirculating unit ventilators will provide additional heating and cooling to the classrooms. 87% efficient, condensing boilers will provide hot water to the unit ventilators. An air-cooled chiller will provide chilled water to the unit ventilators.

Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with modulating flame natural gas furnaces.

2.2. Boilers

Two Veissman 87% efficient, modulating flame boilers will be installed. The boilers provide hot water to the unit ventilators.

2.3. Rooftop Units

The rooftop units all have variable speed drives and modulating furnace control. The classroom RTU's provide 100% outside air to the classrooms and corridors. The RTU's are constant volume, DX units with EER = 10.9. The fan power is estimated based on 5 inH2O supply pressure drop and 1-1.75 inH2O return pressure drop. The total fan efficiencies are 60%. The properties of the RTU's are given below.

Tag	Service	Total Air Flow (cfm)	Total Brake Horsepower (Supply + Return, assumed)	Heating Efficiency	Cooling EER
RTU-1	Classrooms	14,000	29.3	80%	10.9
RTU-2	Classrooms	14,000	17.4	80%	10.9
RTU-3	Classrooms	8,000	30.6	80%	10.9
RTU-4	Kitchen/ Cafeteria	7,500	11.8	80%	10.9
RTU-5	Gymnatorium	7,500	7.7	80%	10.9
RTU-6	Gymnasium	4,000	12.8	80%	10.9

2.4. Unit Ventilators

The unit ventilators in the classrooms are assumed to have supply pressure drop of 0.75 inH2O and supply efficiency = 50%.

2.5. Air Cooled Chiller

A 200-ton air cooled chiller with EER = 13.2 supplies chilled water to the unit ventilators.

2.6. Pumps

The pumps are assumed to be minimally compliant with ASHRAE 90.1-2007, Appendix G. The chilled water pumps require 22 W/gpm and the hot water pumps use 19 W/gpm.

3. UTILITY RATES

Electricity- NYPA rate, Conventional account as of February 2009
Energy : $0.06739/ kWh
Demand : $11.63/kW
Delivery : $17.07/kW

Natural Gas- ConEdison Firm rate as of February 2009
Energy, On-Peak Firm : $1.72/ therm (November-April)
Energy, On-Peak Firm : $1.08/ therm (May-October)

4. Side-By-Side Comparison of Preferred Design and LEED 3.0 Baseline Cases for PS-71R

Building as Designed	ASHRAE 90.1-2007 Appendix G LEED Baseline Model
Exterior wall construction • 4" nominal utility brick • 4" nominal air cavity w/ 3" rigid insulation (R15) • 6" nominal CMU • 2-1/2" nominal metal stud • 5/8" gypsum wallboard • U-value = 0.056 BTU/Hr-ft^{2}-$^{\circ}$F •	*Exterior wall construction* • Stucco • 5/8" Gypboard • Insulation • 5/8" Gypboard • U factor$_{eff}$ = 0.064 BTU/Hr-ft^{2}-$^{\circ}$F
Roof • 2" White Pavers with SRI > 0.79 • 4" Polystyrene • EPDM • 3-1/4" concrete over 3" metal decking • U factor$_{eff}$ = 0.046 BTU/Hr-ft^{2}-$^{\circ}$F	*Roof* • 2" Gravel • 2.8" Polystyrene • EPDM • 8" Concrete • U factor$_{eff}$ = 0.048 BTU/Hr-ft^{2}-°F
Windows • Type: spectrally selective low-e • U $_{\text{center of glass}}$ 0.30 • U $_{\text{fenestration}}$ 0.51 • Visible Transmittance 60% • Shading Coefficient 0.44 • Solar Heat Gain Coefficient 0.38 • Thermally Broken Aluminum Frames • Operable windows	*Windows* • Type: double pane clear insulating • U $_{\text{fenestration}}$ =0.55 • Shading coefficient = 0.465 • Solar Heat Gain Coefficient= 0.4
Lighting Average Lighting power density = 1.0 W/ft^{2}	*Lighting* Average Lighting power density = 1.2 W/ft^{2}

General HVAC Outdoor air will be provided to the corridors and classrooms via constant volume RTU's. The CV RTU's will temper the outdoor air via 80% efficient, modulating gas furnaces and DX cooling. Recirculating unit ventilators will provide additional heating and cooling to the classrooms. 87% efficient, condensing boilers will provide hot water to the unit ventilators. An air-cooled chiller will provide chilled water to the unit ventilators. Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with modulating flame natural gas furnaces.	*General HVAC* All cooling to the corridors and classrooms will be provided via variable volume packaged DX units. Heating will be provided by 80% efficient, on/off boilers. Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with on/off natural gas furnaces.
Cooling Equipment RTU 1-6 EER = 10.9 • Air-cooled, packaged DX units, EER = 10.9 Air Cooled Chiller EER = 13.2	*Cooling Equipment* • RTU-1 – EER = 9.5 • RTU-2 – EER = 9.5 • RTU-3 – EER = 9.5 • RTU-4 – EER = 9.8 • RTU-5 – EER = 9.8 • RTU-6 – EER = 9.8
Heating Equipment Furnaces • Gas fired furnaces with modulating flame • Rated Efficiency 80% • Furnaces provide 100% of heating to cafeteria, gymnasium, and gymnatorium, and temper outside air to classrooms Boilers • (2) gas fired boilers supply heating to classroom unit ventilators • Modulating flame controls • Rated Efficiency 87% • Hot water delta-T 20 °F	*Heating Equipment* Furnaces • Gas fired furnaces with on/off controls • Rated Efficiency 80% • Furnaces provide 100% of heating to cafeteria, gymnasium, and gymnatorium Boilers • (2) Gas fired boilers supply all heat to classrooms • On/off controls • Rated Combustion Efficiency 80% • Hot water delta-T 50 °F

Fans RTU's 1-3 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.75" • Return efficiency = 60% RTU 4 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.0" • Return efficiency = 60% RTU 5-6 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.5" • Return efficiency = 60% Unit ventilator fans • Supply DP = 0.75" • Supply efficiency = 50% **Note: The fan power is based on assumptions made by the energy modeler. Deviations from these assumptions may have a significant impact on the level of savings.**	*Fans* Fan power compliant with ASHRAE 90.1-2007
Heat Recovery 50% effective heat recovery on RTU's 1,2,3,5 & 6	*Heat Recovery* 50% effective heat recovery on RTU's 5 & 6
Pumping Equipment Minimally compliant with ASHRAE 90.1-2007	*Pumping Equiment* Minimally compliant with ASHRAE 90.1-2007

5. RESULTS

The proposed design, as understood by Viridian, includes the following energy efficient measures:

- Increased wall insulation- U = 0.056 Btu/hr-ft2-F instead of U = 0.064 Btu/hr-ft2-F
- Increased roof insulation- U = 0.046 Btu/hr-ft2-F instead of U = 0.048 Btu/hr-ft2-F
- More efficient windows- Ufen = 0.51 Btu/hr-ft2-F with SHGC = 0.38 instead of Ufen = 0.55 Btu/hr-ft2-F with SHGC = 0.4
- Reduced lighting power density (1.0 w/ft^2 vs 1.2 W/ft^2)
- Occupancy Sensors in classrooms
- CO2 ventilation controls in gymnasium and gymnatorium instead of just in gymnatorium
- Heat recovery on all RTU's except cafeteria
- High efficiency DX units (EER = 10.9 instead of 9.8)
- High efficiency air-cooled chiller (EER = 13.2 instead of 9.5)
- 87% efficient condensing boiler with modulating flame controls instead of 80% efficient boiler with on/off controls
- Dedicated outdoor air system and unit ventilators reduce required fan power

The proposed design saves approximately $28,000, or 10.9%, compared to the LEED 3.0 baseline based on ASHRAE 90.1-2007 Appendix G. The building exceeds the minimum 10% requirement and would be eligible to pursue LEED 3.0 certification.

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs. LEED 3.0 Baseline ($)	Savings vs. LEED 3.0 Baseline (%)
LEED 3.0 Baseline	768,695	174,483	48,572	81,227	255,710		
Design Case	769,177	168,379	35,648	59,389	227,768	$27,942	10.93%

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : Base Case: Building As Designed

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	4557	122378	0	242510	23031	0	270181	103241	24812	790711
NATURAL GAS (CCF)	32023	0	0	0	0	2015	0	1442	0	35480

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	59929	232	10711	8083	13903	0	0	0	0	0	24614
FEB	55210	232	10388	6209	10680	0	0	0	0	0	21068
MAR	66226	256	11823	5567	9577	0	0	0	0	0	21400
APR	61768	257	11549	2855	4911	0	0	0	0	0	16460
MAY	61143	346	14057	583	630	0	0	0	0	0	14687
JUN	81288	534	20807	385	417	0	0	0	0	0	21224
JUL	81916	539	20992	368	397	0	0	0	0	0	21389
AUG	75554	532	20379	370	400	0	0	0	0	0	20779
SEP	78109	497	19545	355	384	0	0	0	0	0	19929
OCT	55987	257	11176	937	1012	0	0	0	0	0	12188
NOV	54987	231	10338	3425	5892	0	0	0	0	0	16230
DEC	58578	231	10601	6338	10902	0	0	0	0	0	21503
TOTAL	790711	539	172365	35480	59105	0	0	0	0	0	231470

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : AZ00L:ASHRAE 90.1-2007G LEED 3.0 BASELINE, 0 DEGREES

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	5762	142878	0	170911	6625	0	342732	103241	24812	796961
NATURAL GAS (CCF)	44378	0	0	0	0	2015	0	1442	0	47836

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	62457	224	10664	11014	18946	0	0	0	0	0	29610
FEB	57280	223	10275	8738	15030	0	0	0	0	0	25305
MAR	66510	275	12383	7628	13121	0	0	0	0	0	25504
APR	60154	269	11790	3878	6671	0	0	0	0	0	18461
MAY	60419	341	13858	749	810	0	0	0	0	0	14668
JUN	81468	578	22106	385	417	0	0	0	0	0	22523
JUL	84433	608	23164	368	397	0	0	0	0	0	23561
AUG	77496	589	22126	370	400	0	0	0	0	0	22526
SEP	77543	533	20532	355	384	0	0	0	0	0	20916
OCT	54187	270	11400	1436	1551	0	0	0	0	0	12951
NOV	55355	220	10063	4919	8461	0	0	0	0	0	18524
DEC	59644	222	10414	7991	13745	0	0	0	0	0	24159
TOTAL	796961	608	178773	47836	79931	0	0	0	0	0	258704

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : AZ09L:ASHRAE 90.1-2007G LEED 3.0 BASELINE, 90 DEGREES

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	5923	148657	0	172583	7184	0	342732	103241	24812	805131
NATURAL GAS (CCF)	44299	0	0	0	0	2015	0	1442	0	47756

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	62920	227	10774	11497	19776	0	0	0	0	0	30550
FEB	57011	224	10297	8300	14276	0	0	0	0	0	24573
MAR	66583	274	12366	7397	12724	0	0	0	0	0	25090
APR	59992	269	11771	3749	6449	0	0	0	0	0	18220
MAY	61330	340	13916	720	778	0	0	0	0	0	14694
JUN	83087	585	22398	385	417	0	0	0	0	0	22815
JUL	86769	612	23418	368	397	0	0	0	0	0	23815
AUG	79268	594	22406	370	400	0	0	0	0	0	22806
SEP	78474	538	20739	355	384	0	0	0	0	0	21123
OCT	54151	269	11387	1379	1490	0	0	0	0	0	12877
NOV	55275	221	10072	4773	8211	0	0	0	0	0	18283
DEC	60255	223	10478	8458	14548	0	0	0	0	0	25026
TOTAL	805131	612	180021	47756	79849	0	0	0	0	0	259870

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : AZ18L:ASHRAE 90.1-2007G LEED 3.0 BASELINE, 180 DEGREES

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	5656	143007	0	169056	6953	0	342732	103241	24812	795457
NATURAL GAS (CCF)	42870	0	0	0	0	2015	0	1442	0	46327

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	63055	225	10708	11671	20075	0	0	0	0	0	30783
FEB	56765	223	10235	8047	13841	0	0	0	0	0	24076
MAR	66192	274	12349	7343	12632	0	0	0	0	0	24981
APR	59924	268	11743	3751	6452	0	0	0	0	0	18195
MAY	60658	340	13861	728	787	0	0	0	0	0	14648
JUN	81395	576	22031	385	417	0	0	0	0	0	22448
JUL	84097	606	23072	368	397	0	0	0	0	0	23469
AUG	77282	590	22140	370	400	0	0	0	0	0	22540
SEP	77950	537	20691	355	384	0	0	0	0	0	21075
OCT	54007	268	11357	1305	1410	0	0	0	0	0	12767
NOV	54764	219	10002	4438	7634	0	0	0	0	0	17636
DEC	59354	219	10309	7560	13004	0	0	0	0	0	23313
TOTAL	795457	606	178497	46327	77433	0	0	0	0	0	255930

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : AZ27L:ASHRAE 90.1-2007G LEED 3.0 BASELINE, 270 DEGREES

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	5695	149033	0	171968	6581	0	342732	103241	24812	804062
NATURAL GAS (CCF)	44139	0	0	0	0	2015	0	1442	0	47596

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	62078	225	10650	10639	18300	0	0	0	0	0	28950
FEB	57410	223	10288	9014	15504	0	0	0	0	0	25792
MAR	66932	274	12387	7905	13597	0	0	0	0	0	25984
APR	59930	269	11760	3712	6386	0	0	0	0	0	18146
MAY	61284	339	13873	721	779	0	0	0	0	0	14652
JUN	83176	580	22276	385	417	0	0	0	0	0	22693
JUL	87436	609	23374	368	397	0	0	0	0	0	23771
AUG	78840	590	22265	370	400	0	0	0	0	0	22665
SEP	78251	535	20643	355	384	0	0	0	0	0	21027
OCT	54043	269	11372	1394	1506	0	0	0	0	0	12878
NOV	55226	223	10135	4855	8352	0	0	0	0	0	18487
DEC	59438	223	10412	7873	13542	0	0	0	0	0	23954
TOTAL	804062	609	179435	47596	79564	0	0	0	0	0	258999

ENERGY ANALYSES
for
TARGEE SCHOOL- PS71R

Preliminary Local Law 86Compliance Analysis

prepared by

Viridian Energy & Environmental, LLC
50 Washington Street
Norwalk, CT 06854

for

Kliment Halsband Architects
322 Eighth Avenue
New York, New York 10001

6 December 2010

EXECUTIVE SUMMARY

The purpose of this analysis is to show whether the proposed Targee School (PS71R) meets the requirements of Local Law 86. A building can show compliance with Local Law 86 by saving at least 20% compared to a building that is minimally compliant with the baseline building defined by ASHRAE 90.1-2004 Section 11 ECB Method. Unregulated loads, such as plug and process loads, are excluded from the cost comparison.

The proposed design, as understood by Viridian, includes the following energy efficient measures:

- Increased wall insulation- U = 0.056 Btu/hr-ft2-F instead of U = 0.151 Btu/hr-ft2-F
- Increased roof insulation- U = 0.046 Btu/hr-ft2-F instead of U = 0.063 Btu/hr-ft2-F
- More efficient windows- Ufen = 0.51 Btu/hr-ft2-F with SHGC = 0.38 instead of Ufen = 0.57 Btu/hr-ft2-F with SHGC = 0.39
- Reduced lighting power density (1.0 w/ft^2 vs 1.2 W/ft^2)
- Occupancy Sensors in classrooms
- CO2 ventilation controls in gymnasium and gymnatorium instead of just in gymnatorium
- Heat recovery on all RTU's except cafeteria
- High efficiency DX units (EER = 10.9 instead of 9.8)
- High efficiency air-cooled chiller ($EER_{average}$ = 13.2 instead of 9.1)
- 87% efficient condensing boiler with modulating flame controls instead of 80% efficient boiler with on/off controls
- Dedicated outdoor air system and unit ventilators reduce required fan power

Results
The proposed design saves approximately $63,258, or 21.6% in total, when compared to the ECB Baseline based on ASHRAE 90.1-2004 Section 11.

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TOTAL ENERGY SAVINGS

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs ECB Baseline ($)	Savings vs. ECB Baseline (%)
ECB Baseline	957,721	215,674	46001	76,874	292,548		
Design Case	769,177	169,901	35,648	59,389	229,290	$63,258	21.6%

When unregulated loads are separated out of the model results, the proposed design saves approximately 23.9%, compared to the ECB Baseline based on ASHRAE 90.1-2004 Section 11. The building exceeds the minimum 20% requirement for Local Law 86.

REGULATED LOAD ENERGY SAVINGS

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs ECB Baseline ($)	Savings vs. ECB Baseline (%)
ECB Baseline	829,671	189,557	44,559	74,858	264,415		
Design Case	641,120	143,784	34206	57,373	201,157	$63,258	23.9%

DESCRIPTION OF BUILDING CHARACTERISTICS

This section summarizes important parameters used in the Design Case simulation including envelope thermal properties, internal loads and schedules, and HVAC system operation schedules and specifications. The energy model is based on floor plans and HVAC descriptions dated May 2010.

1.1. Building Identification

PS-71R School in Staten Island, New York
Weather File: New York, NY
Building Addition Area: Approximately 100,500 ft^2 of conditioned space.

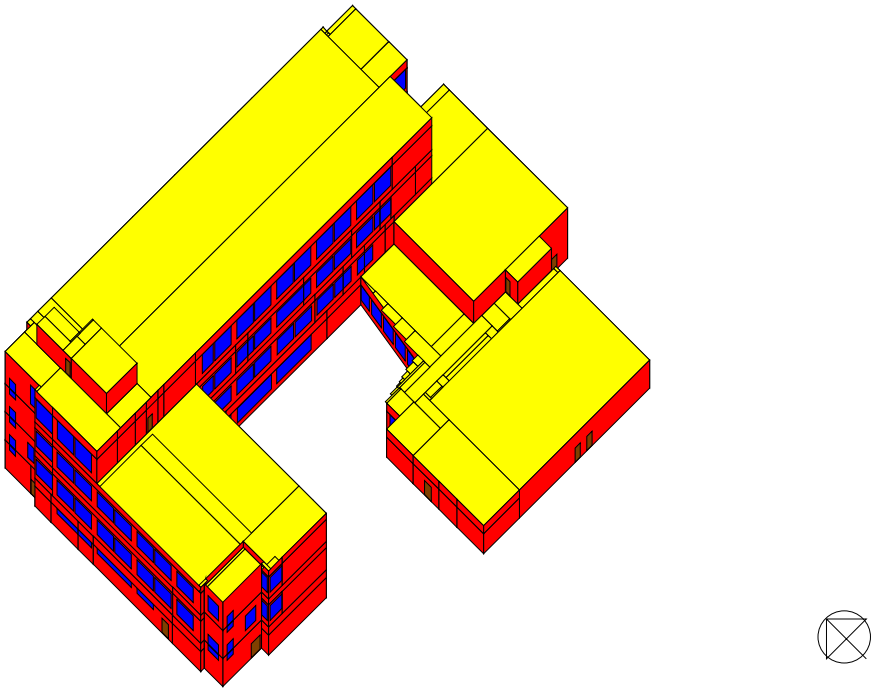


Figure 1. DOE 2.1 Rendering of proposed addition

1.2. Building Envelope Construction

Exterior wall construction

- 4" nominal utility brick
- 4" nominal air cavity w/ 3" rigid insulation (R15)
- 6" nominal CMU
- 2-1/2" nominal metal stud
- 5/8" gypsum wallboard
- U-value = 0.056 BTU/Hr-ft^{2}-$^{\circ}$F

Roof

- 2" White Pavers with SRI > 0.79
- 4" Polystyrene
- EPDM
- 3-1/4" concrete over 3" metal decking
- U factor$_{eff}$ = 0.046 BTU/Hr-ft2-°F

Windows

- Fenestration / gross wall area ratio: 25%
- Type: spectrally selective low-e
- U $_{\text{center of glass}}$ 0.30
- U $_{\text{fenestration}}$ 0.51
- Visible Transmittance 60%
- Shading Coefficient 0.44
- Solar Heat Gain Coefficient 0.38
- Thermally Broken Aluminum Frames
- Operable windows

1.3. Internal Load Patterns

The building will operate five days a week. Daily schedules of operation will vary with space type.

1.3.1. Occupancy Patterns

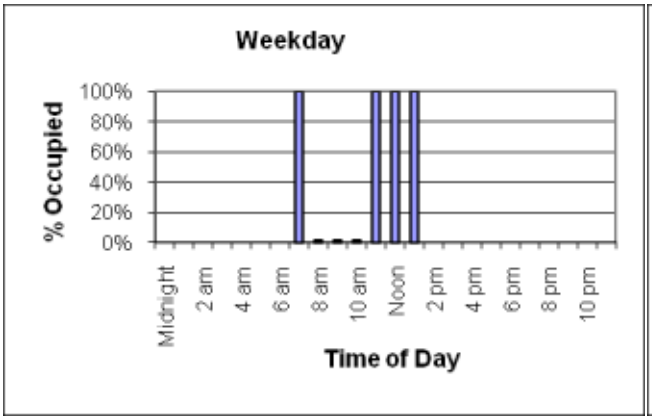
Space Type	Occupancy Density	Schedule
Cafeteria	14 ft^{2}/person	Cafeteria Occupancy Schedule
Classroom	33 ft^{2}/person	Classroom Occupancy Schedule
Gym/ Gymnatorium	50 ft^{2}/person	Gymnasium Occupancy Schedule
Kitchen	50 ft^{2}/person	Kitchen Occupancy Schedule
Office	143 ft^{2}/person	Office Occupancy Schedule
Corridors	143 ft^{2}/person	Office Occupancy Schedule
Lobby	143 ft^{2}/person	Office Occupancy Schedule
Computer Lab	33 ft^{2}/person	Computer Lab Occupancy Schedule
Library	300 ft^{2}/person	Classroom Occupancy Schedule

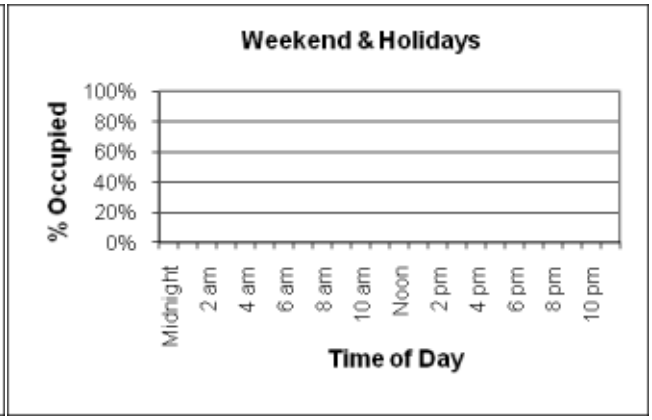
Restroom	143 ft^2/person	Office Occupancy Schedule
Vestibule	143 ft^2/person	Office Occupancy Schedule
Conference Room	143 ft^2/person	Office Occupancy Schedule

Cafeteria Occupancy Schedule

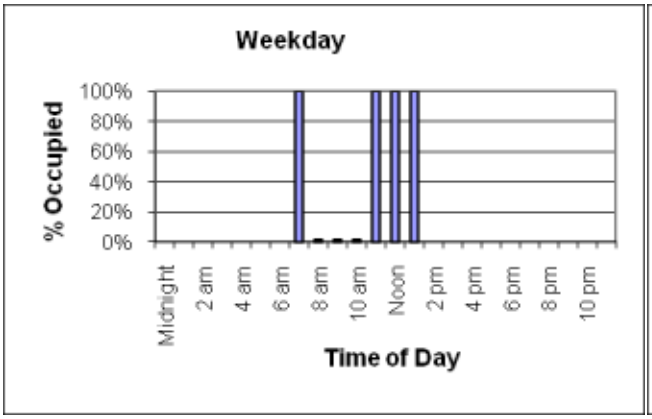
Cafeteria - 14 ft2/person

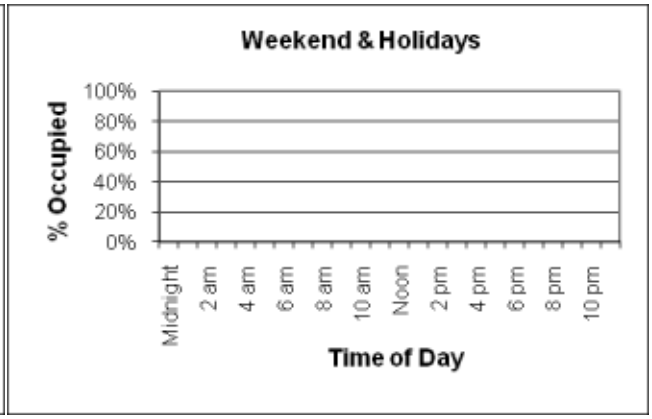
Schedule thru June 15



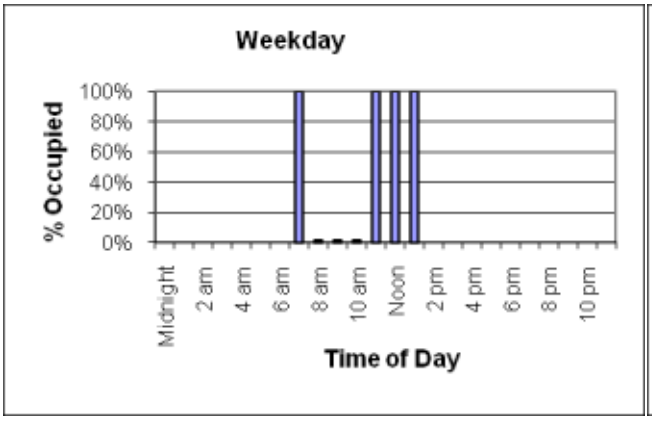


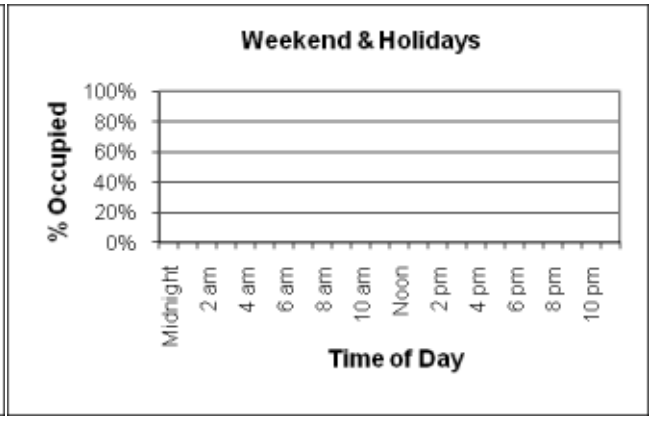
Schedule thru September 5





Schedule thru December 31



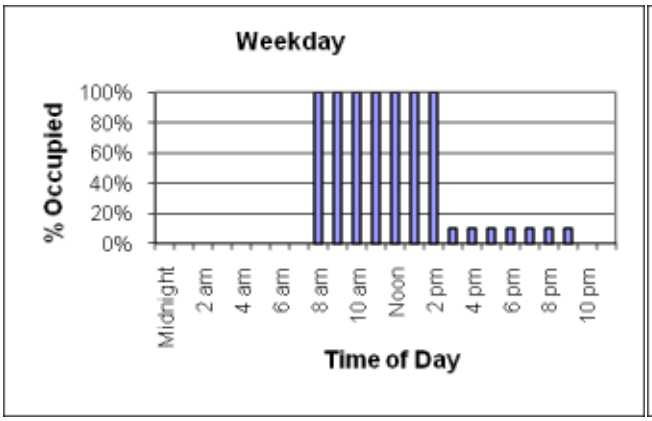


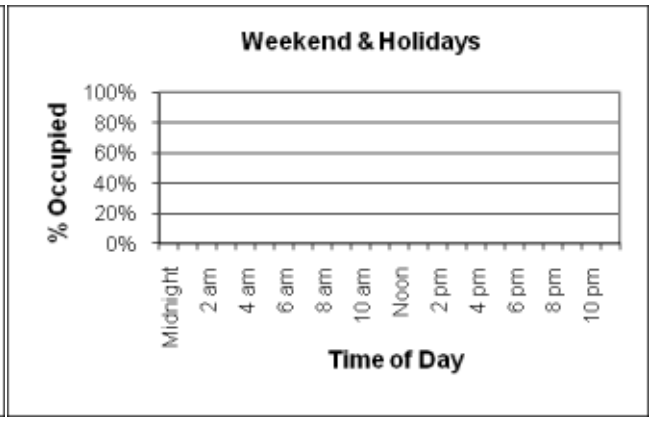
Classroom Occupancy Schedule

Classroom - 33 ft2/person

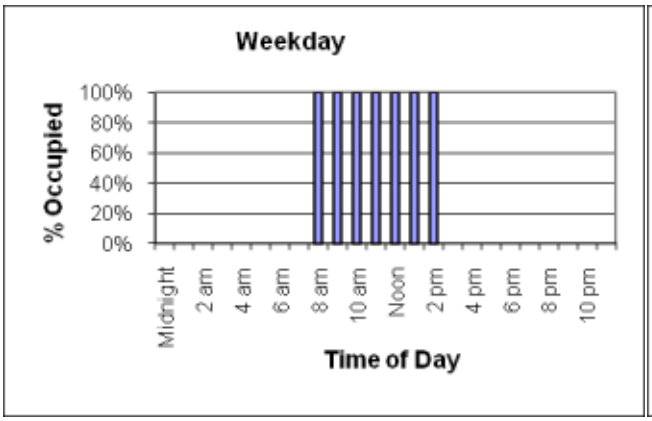
Library - 300 ft2/person

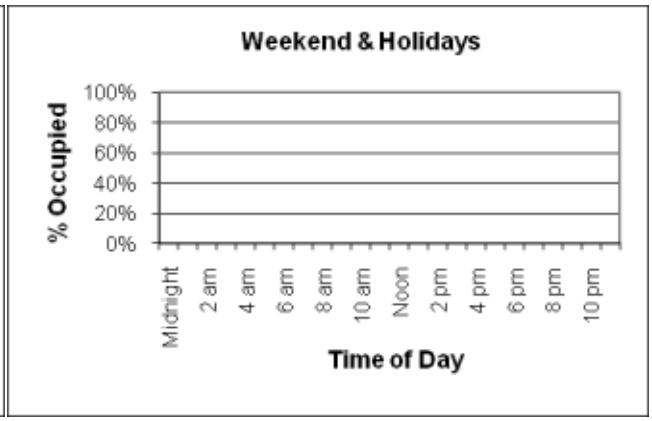
Schedule thru June 15



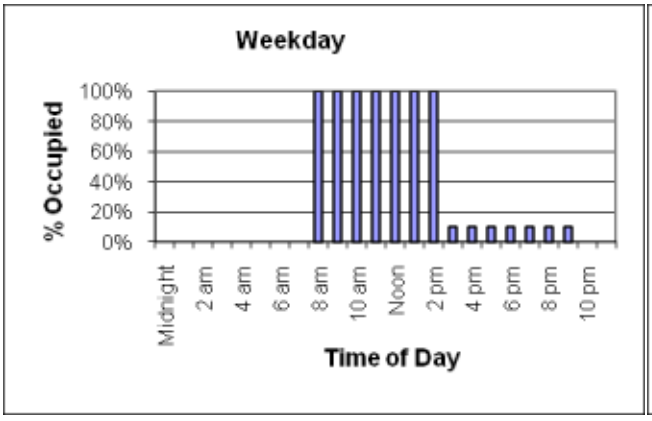


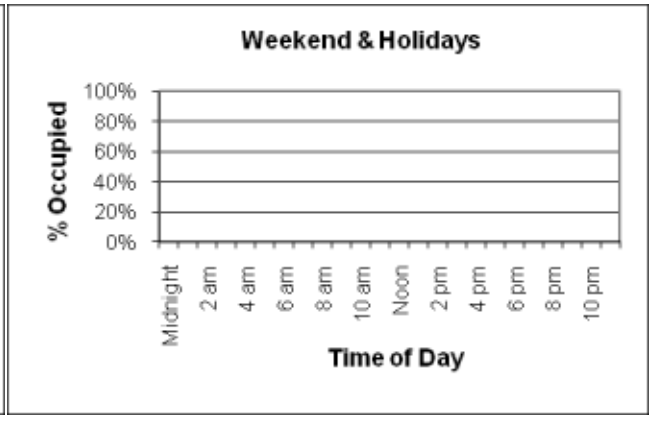
Schedule thru September 5





Schedule thru December 31

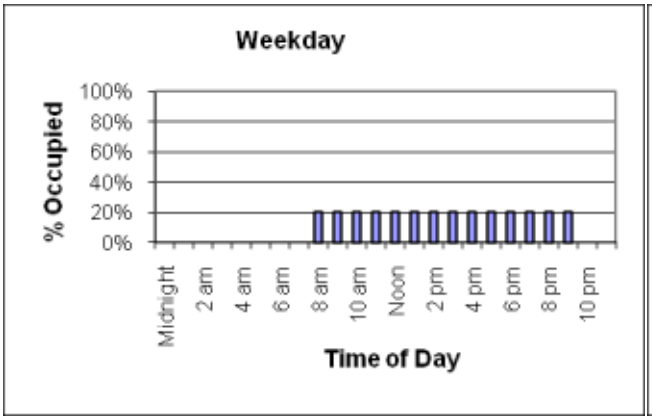


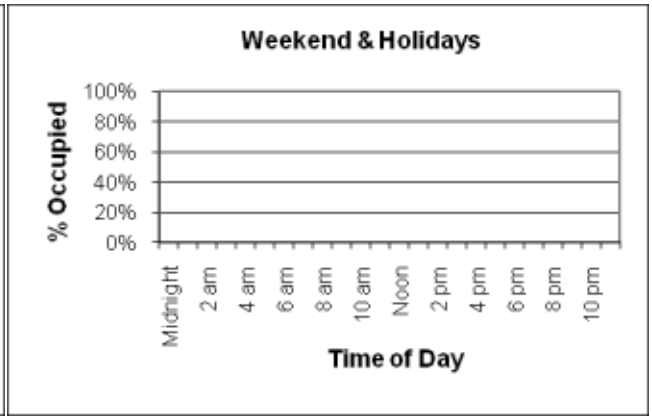


Gymnasium/Gymnatorium Occupancy Schedule

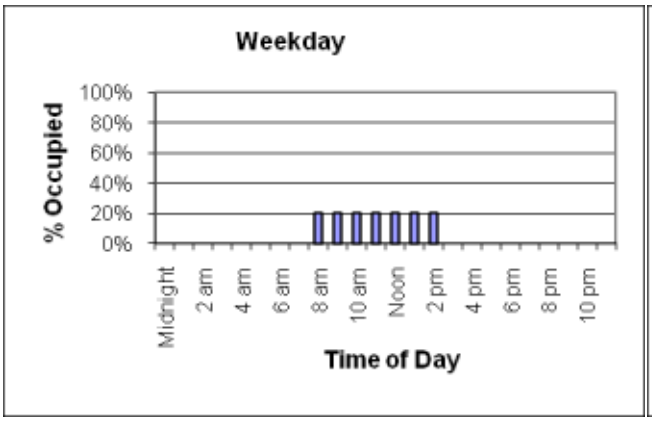
Gym/ Gymnatorium - 50 ft2/person

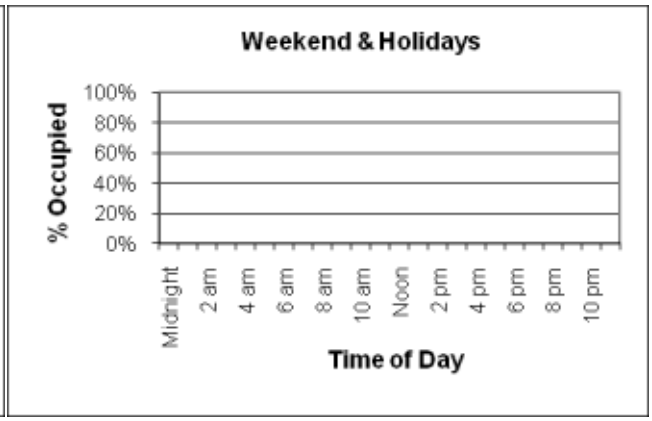
Schedule thru June 15



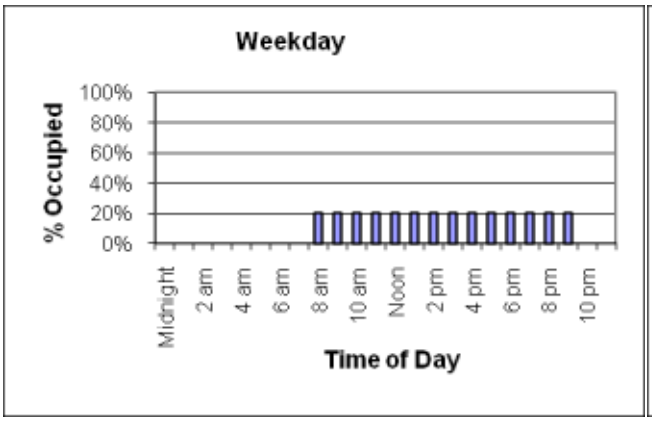


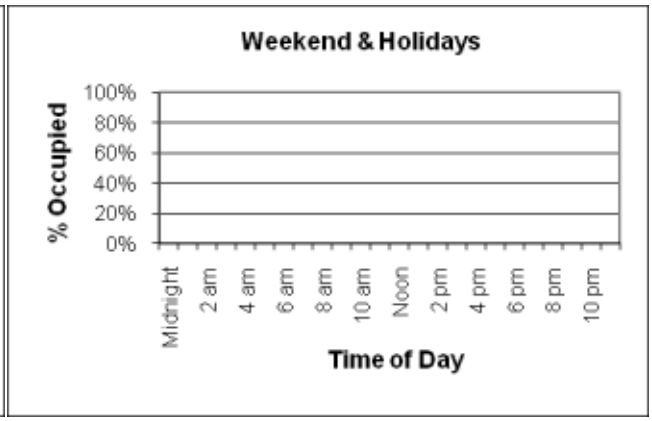
Schedule thru September 5





Schedule thru December 31

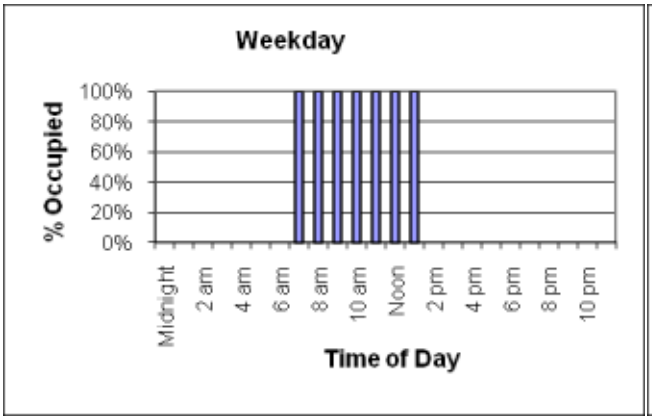


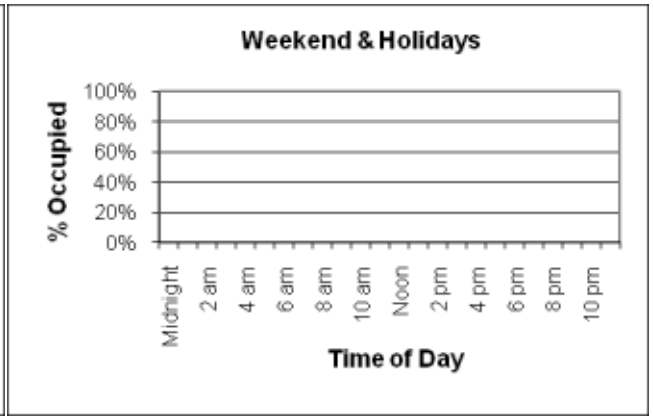


Kitchen Occupancy Schedule

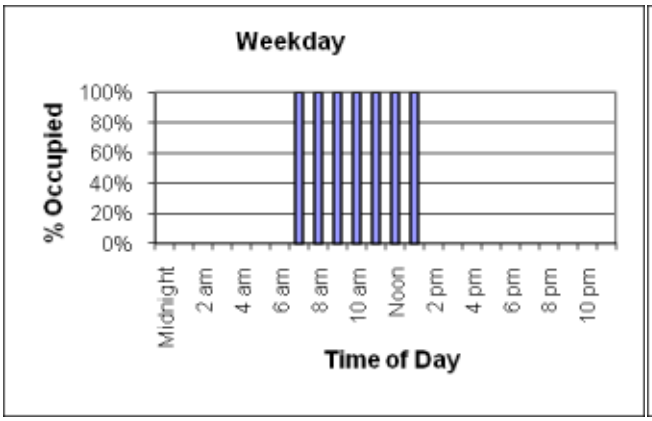
Kitchen - 50 ft2/person

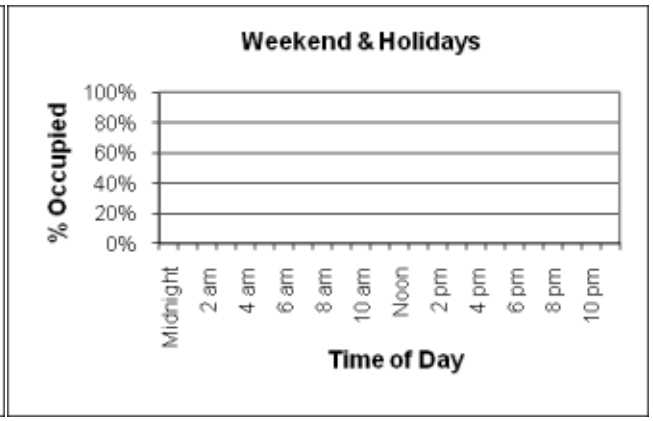
Schedule thru June 15



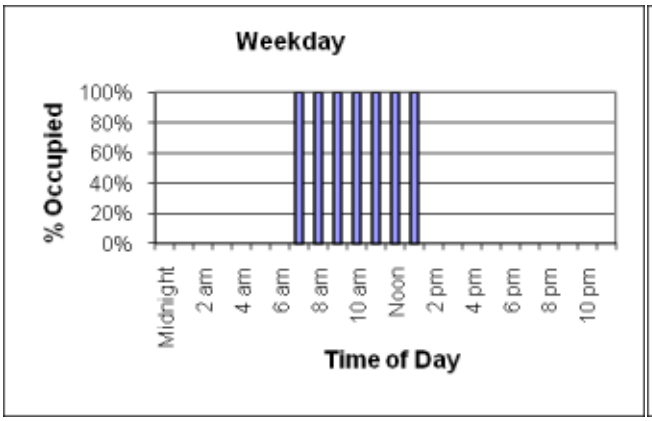


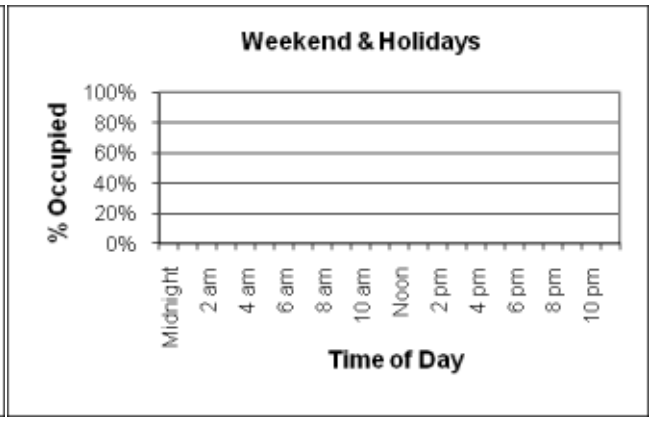
Schedule thru September 5



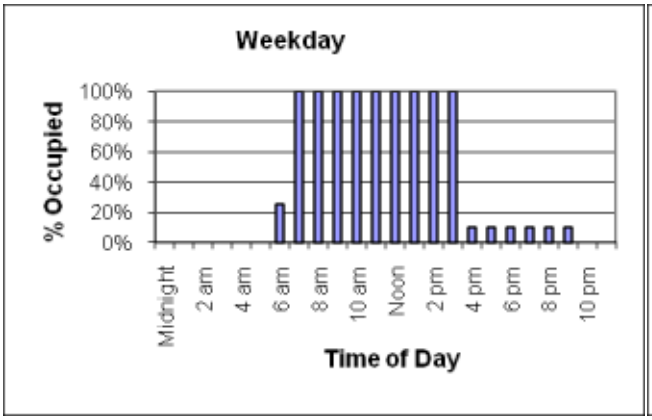


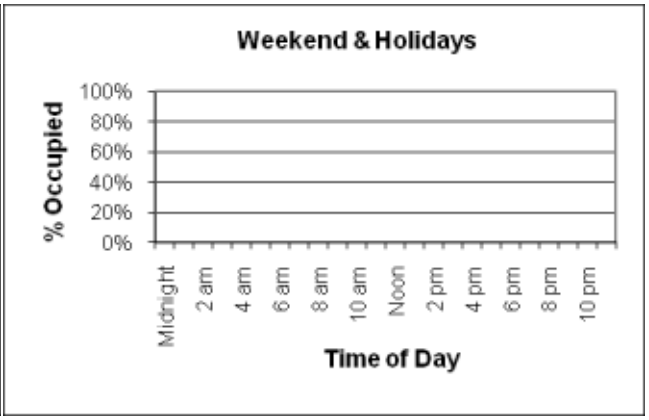
Schedule thru December 31



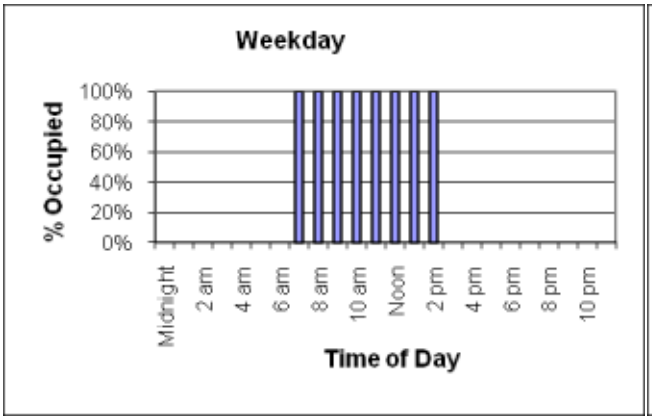


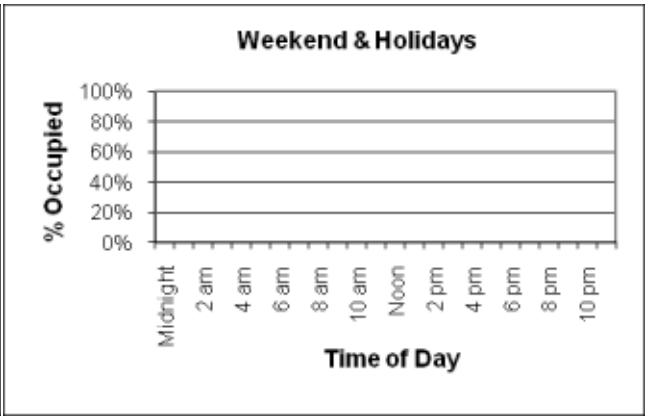
Office Occupancy Schedule
Office - 143 ft2/person
Corridors - 143 ft2/person
Lobby - 143 ft2/person
Restroom - 143 ft2/person
Vestibule - 143 ft2/person
Conference Room - 143 ft2/person
Schedule thru June 15



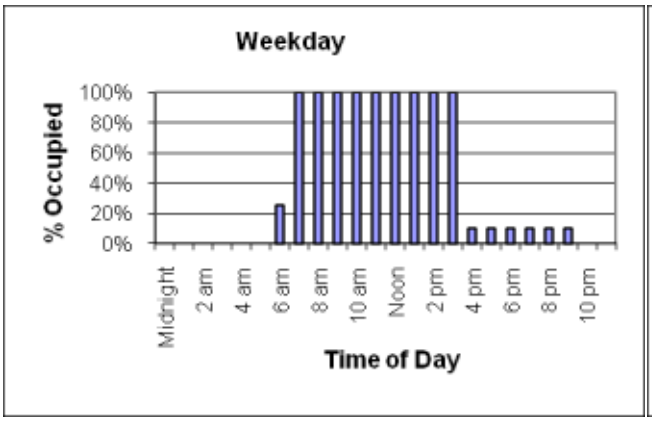


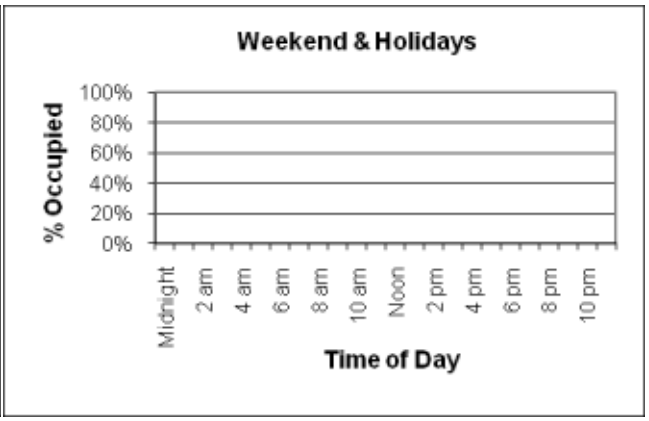
Schedule thru September 5





Schedule thru December 31

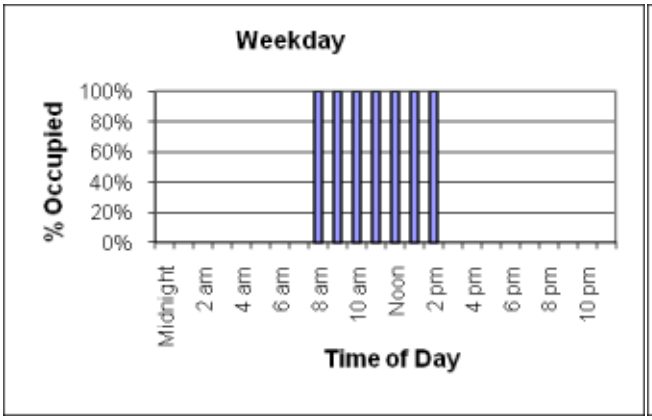


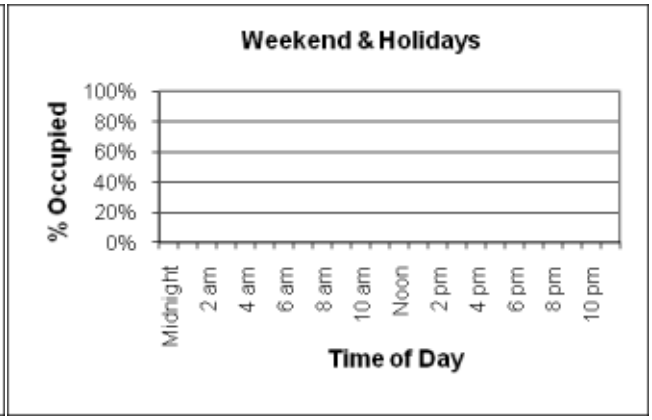


Computer Lab Occupancy Schedule

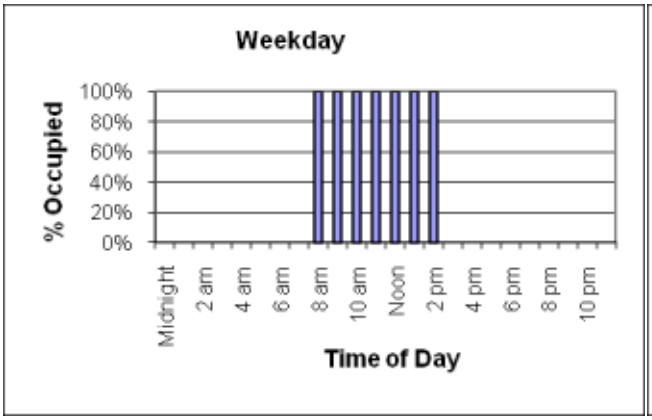
Computer Lab - 33 ft2/person

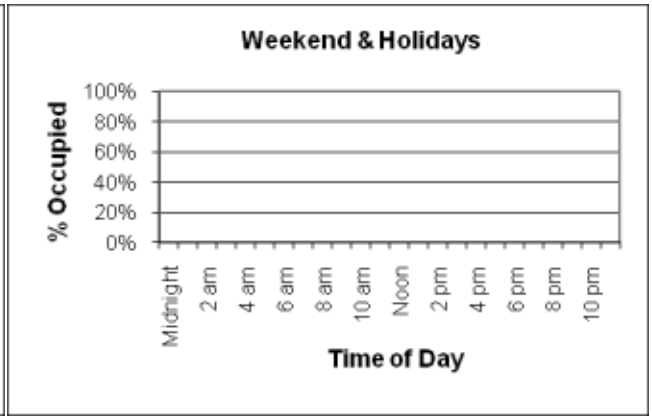
Schedule thru June 15



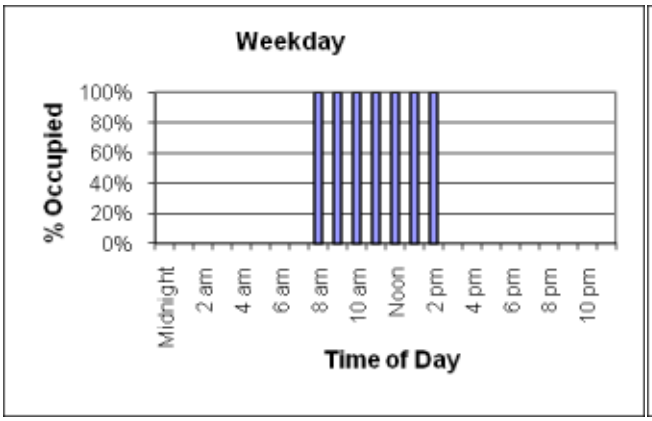


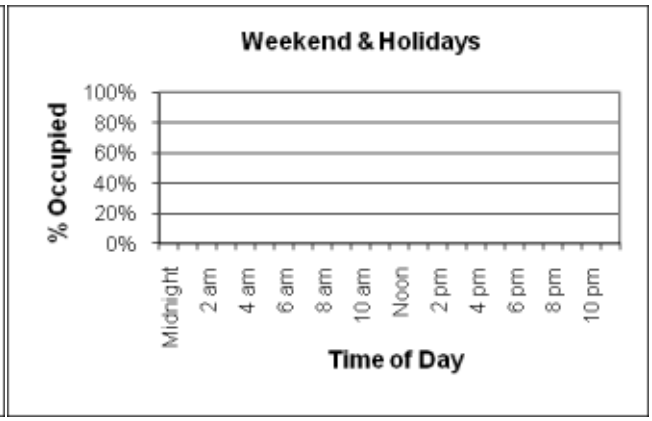
Schedule thru September 5





Schedule thru December 31

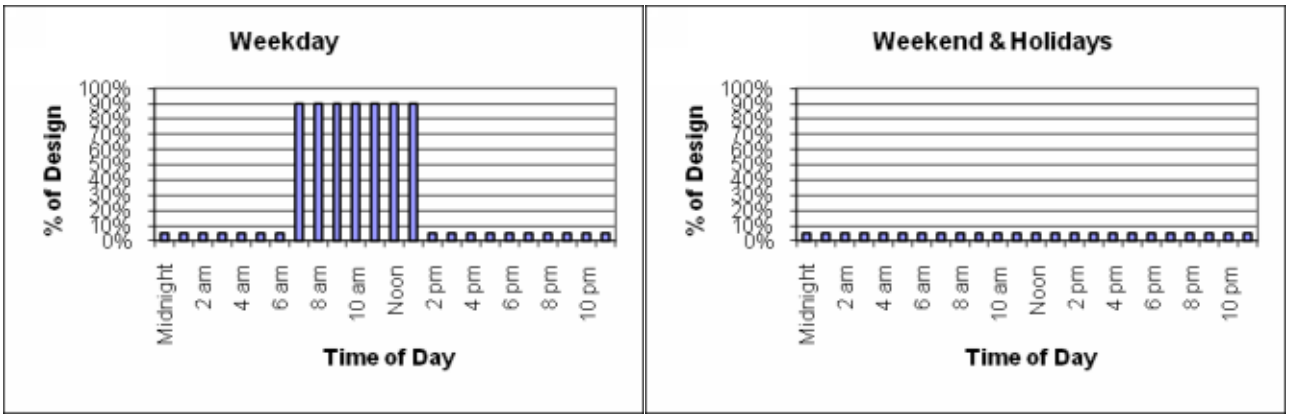




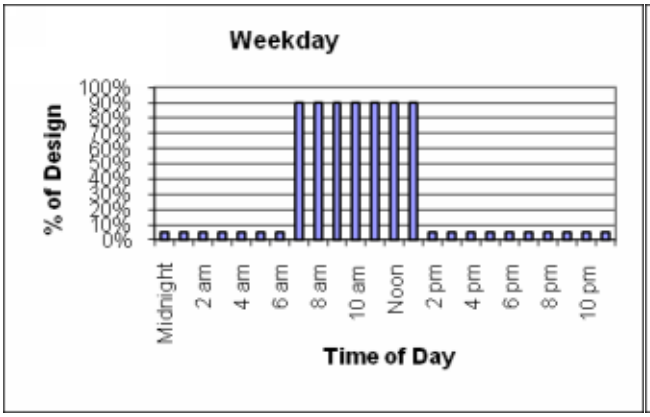
1.3.2. Lighting Use Patterns

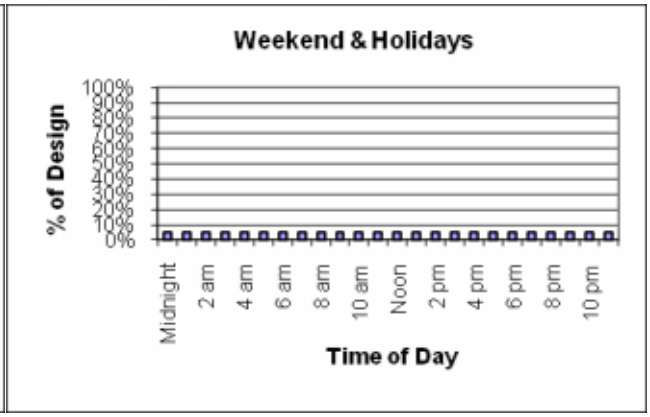
Space Type	Lighting Power Density	Schedule
Cafeteria	0.9 W/ft^2	Cafeteria Lighting Schedule
Classroom	1.01 W/ft^2	Classroom Lighting Schedule
Gym/ Gymnatorium	1.36 W/ft^2	Gymnasium Lighting Schedule
Kitchen	1.01 W/ft^2	Kitchen Lighting Schedule
MER	0.8 W/ft^2	MER Lighting Schedule
Office	0.98 W/ft^2	Office Lighting Schedule
Corridors	0.5 W/ft^2	Corridor Lighting Schedule
Lobby	1 W/ft^2	Corridor Lighting Schedule
Locker	0.6 W/ft^2	Locker Lighting Schedule
Stair	0.6 W/ft^2	Corridor Lighting Schedule
Storage	0.8 W/ft^2	Storage Lighting Schedule
Library	1.13 W/ft^2	Classroom Lighting Schedule
Restroom	0.9 W/ft^2	Corridor Lighting Schedule
Vestibule	0.5 W/ft^2	Corridor Lighting Schedule
Conference Room	1.1 W/ft^2	Office Lighting Schedule

<u>Cafeteria Lighting Schedule</u>
Cafeteria - 0.9 W/ft2
Schedule thru June 15

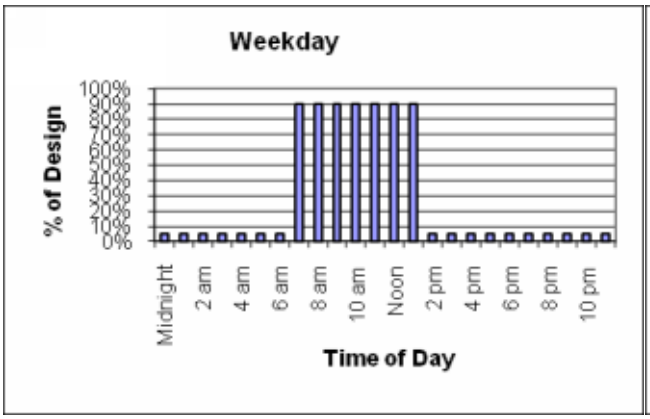


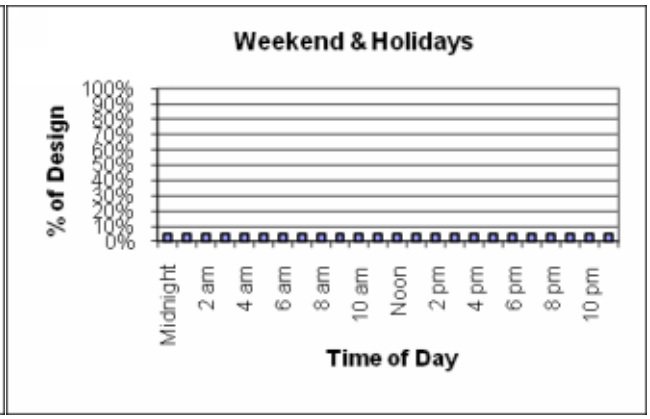
Schedule thru September 5



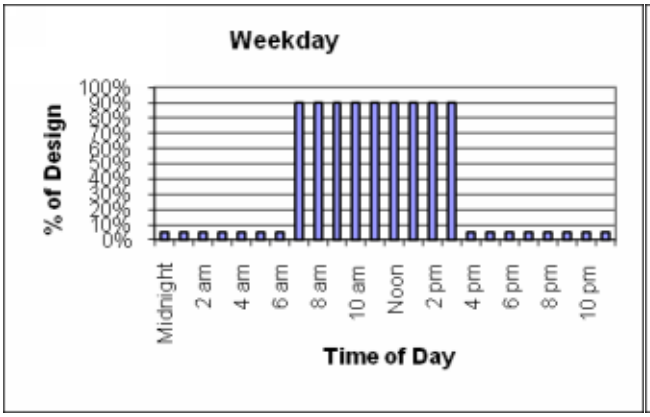


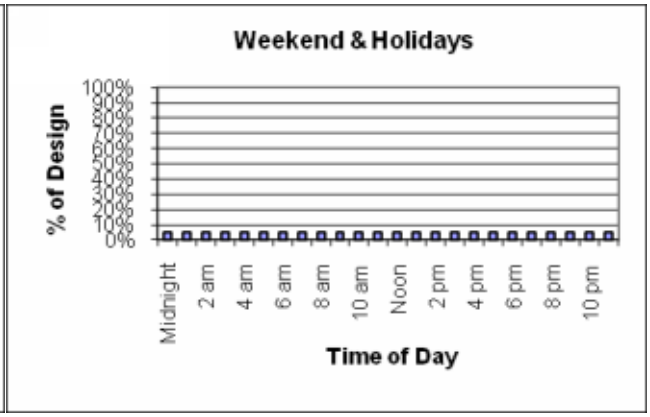
Schedule thru December 31



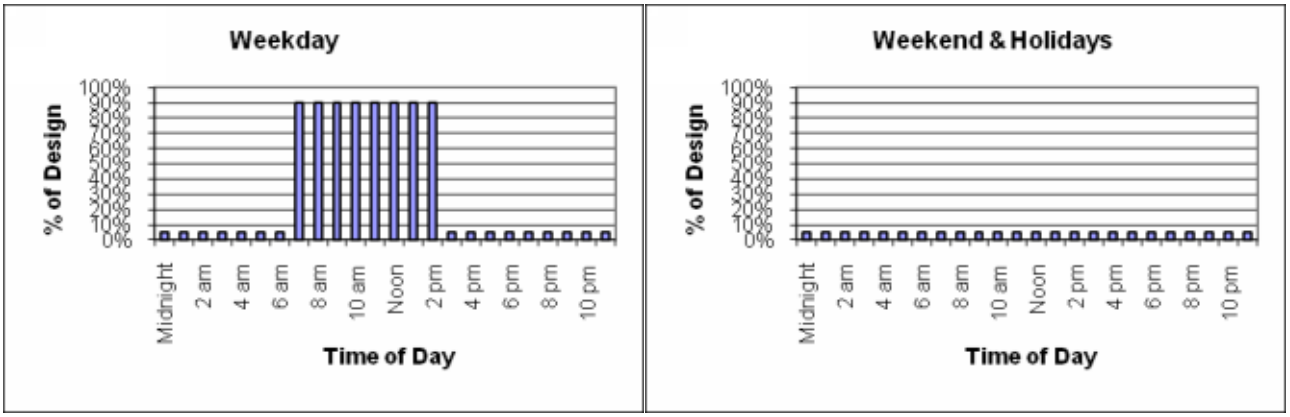


<u>Classroom Lighting Schedule</u>
Classroom - 1.01 W/ft2
Library - 1.13 W/ft2
Schedule thru June 15

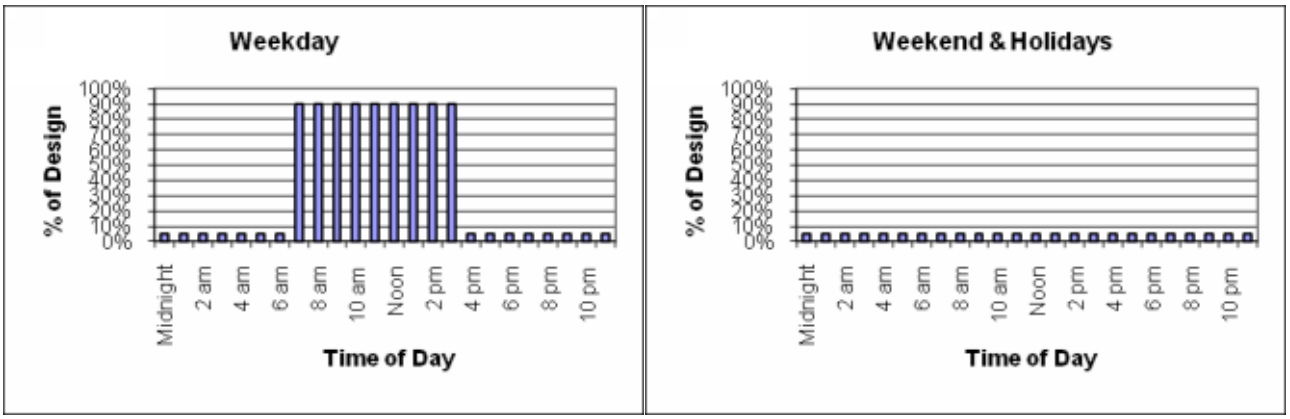




Schedule thru September 5



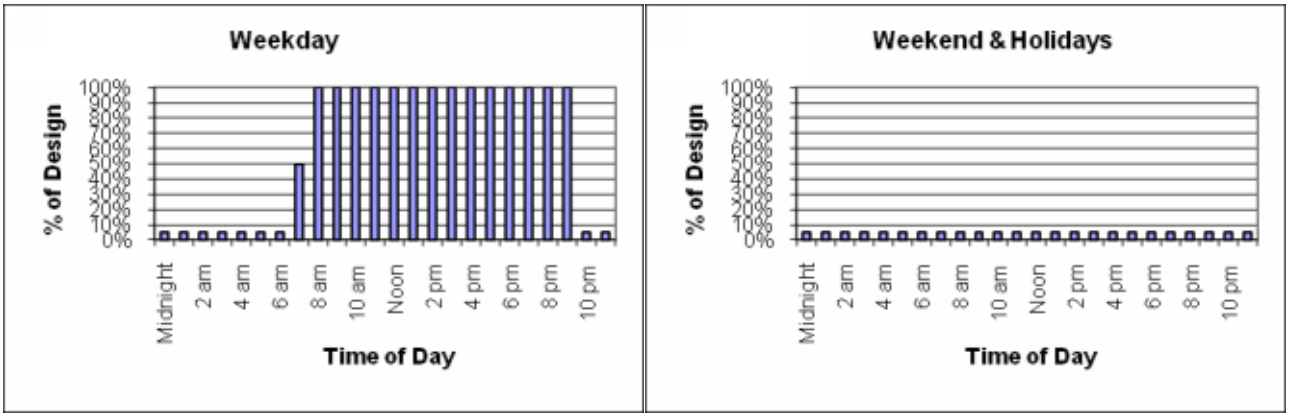
Schedule thru December 31



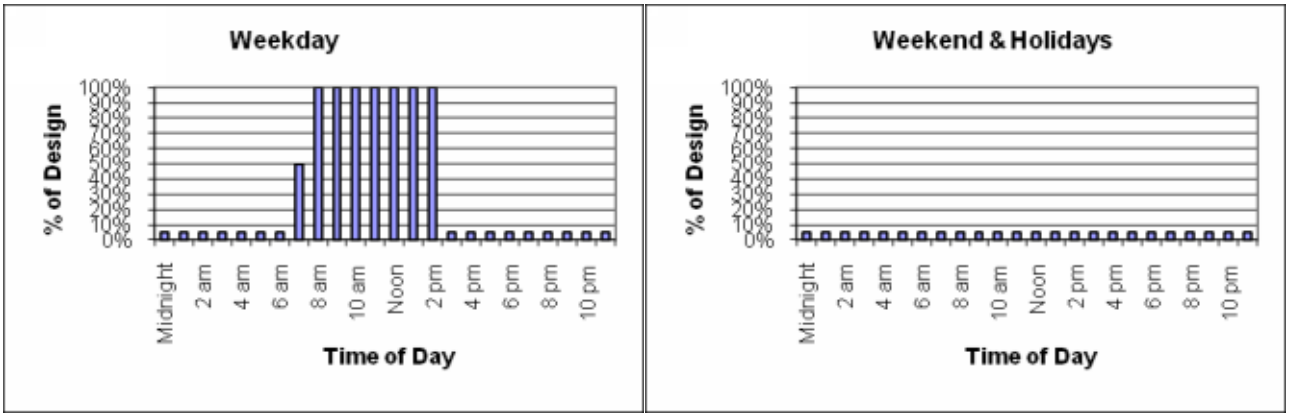
<u>Gymnasium/Gymnatorium Lighting Schedule</u>

Gym/ Gymnatorium - 1.36 W/ft2

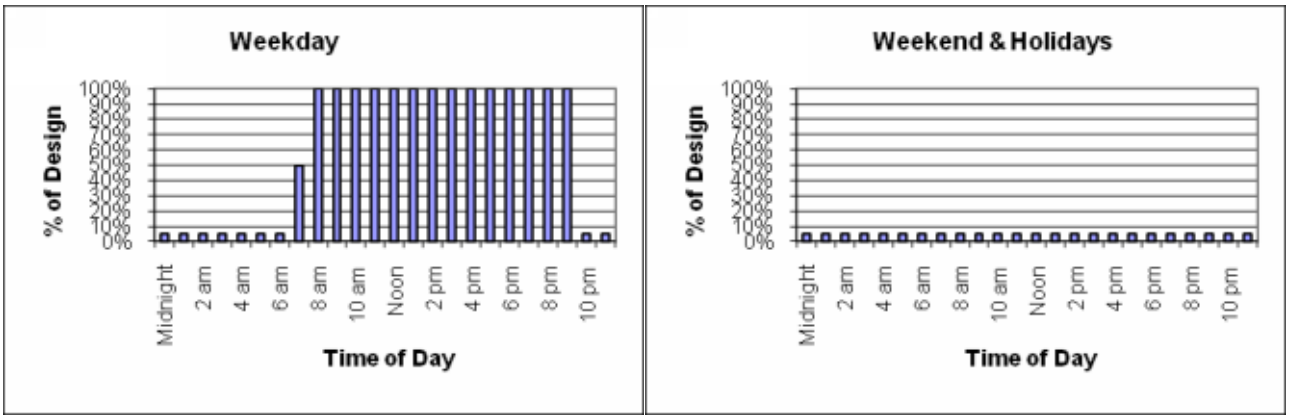
Schedule thru June 15



Schedule thru September 5



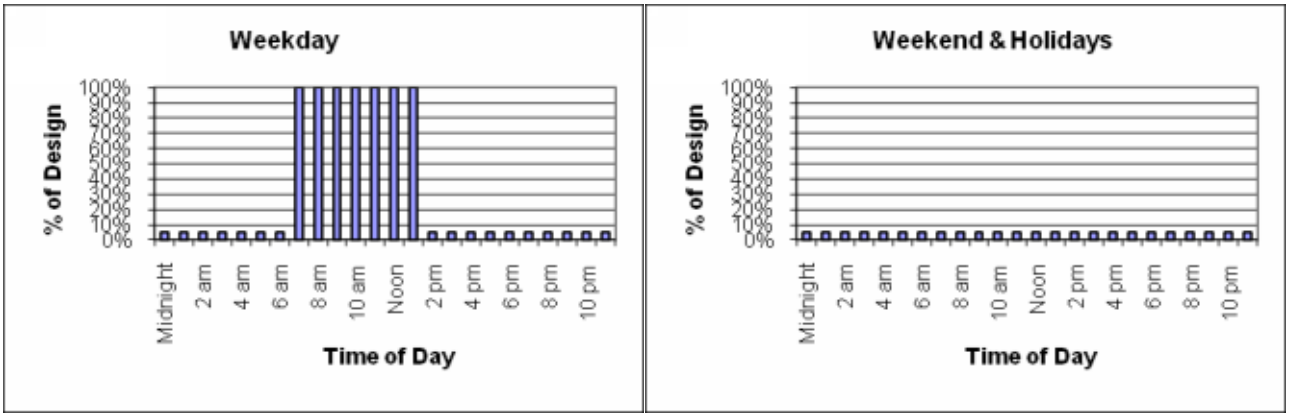
Schedule thru December 31



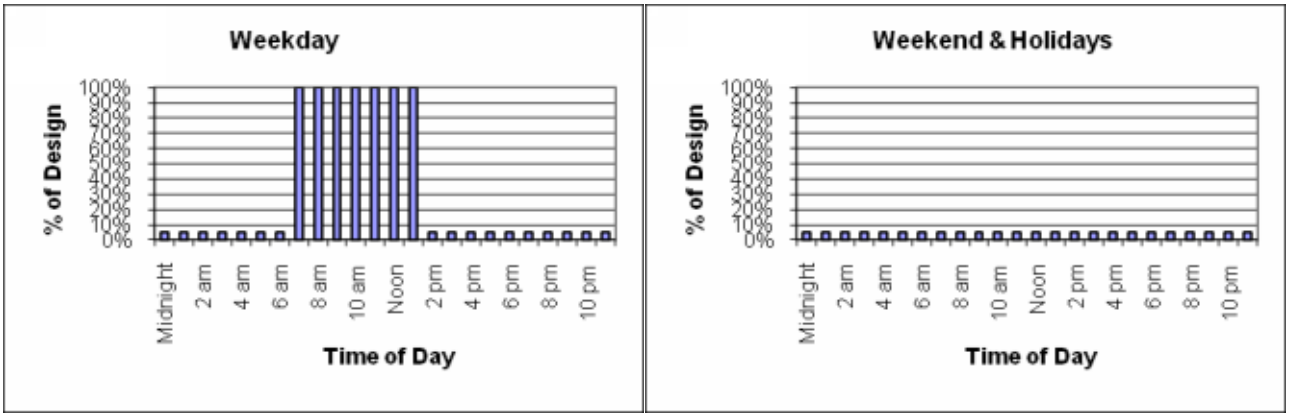
<u>Kitchen Lighting Schedule</u>

Kitchen - 1.01 W/ft2

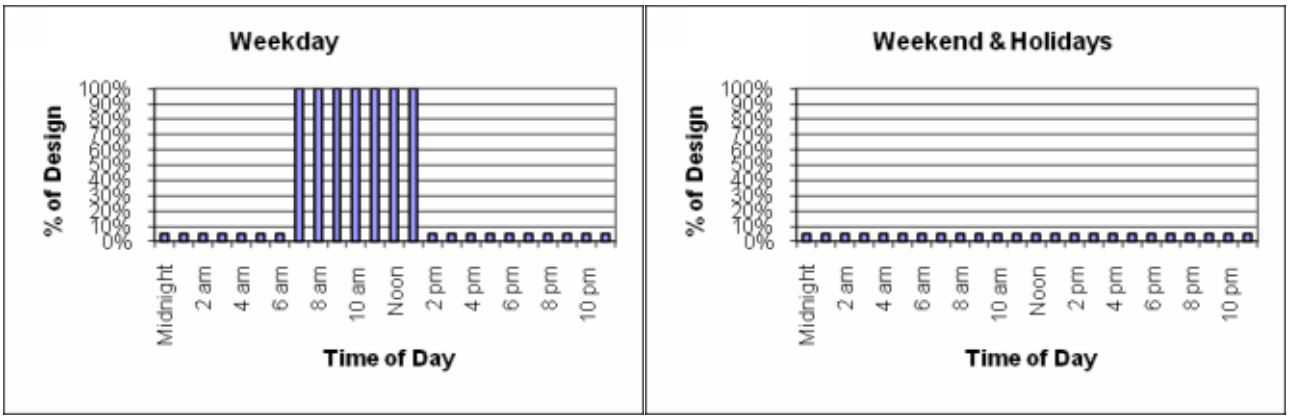
Schedule thru June 15



Schedule thru September 5



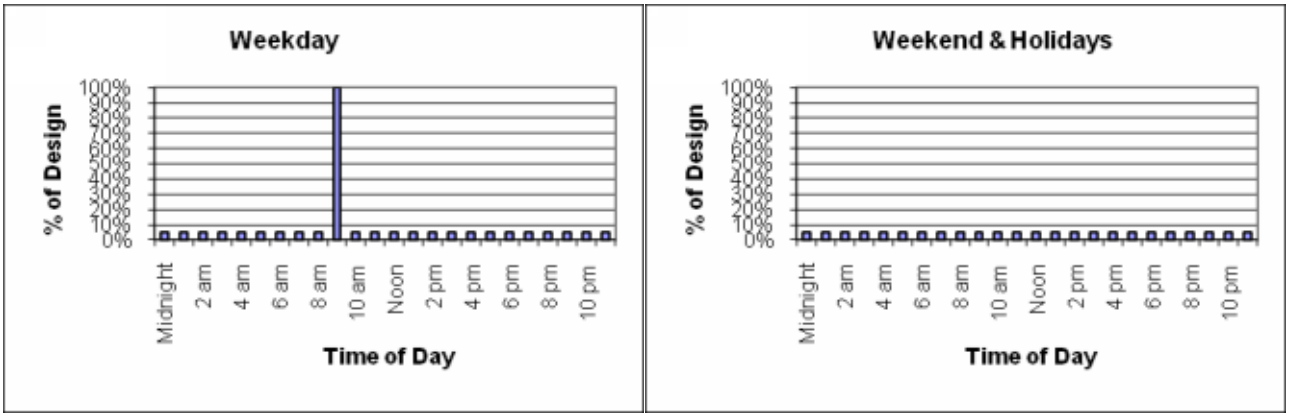
Schedule thru December 31



<u>MER Lighting Schedule</u>

MER - 0.8 W/ft2

Schedule thru December 31

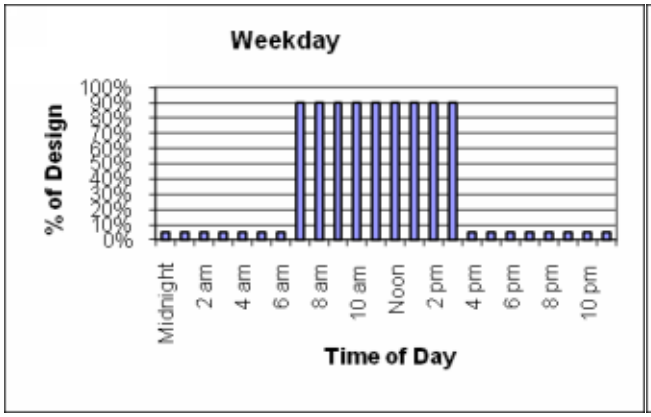


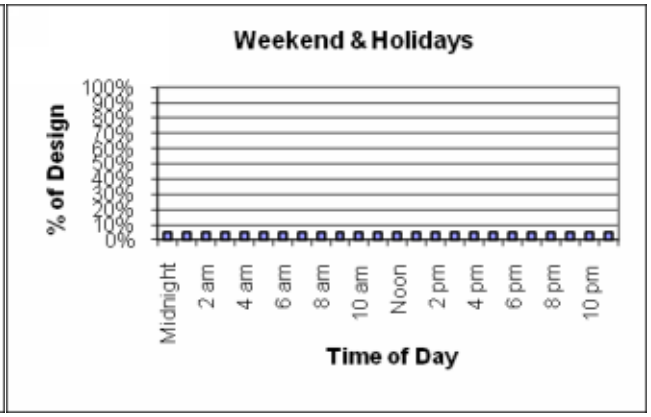
Office Lighting Schedule

Office - 0.98 W/ft2

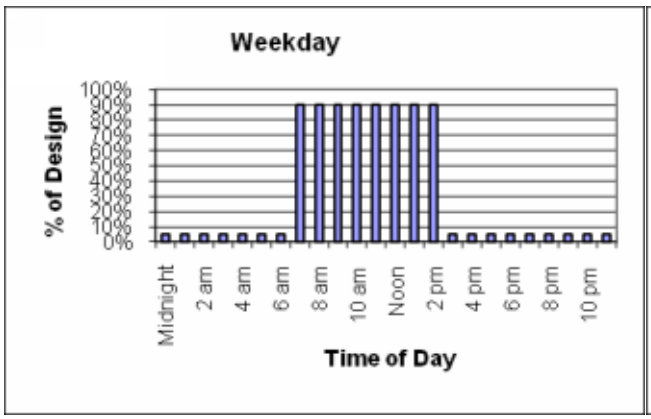
Conference Room - 1.1 W/ft2

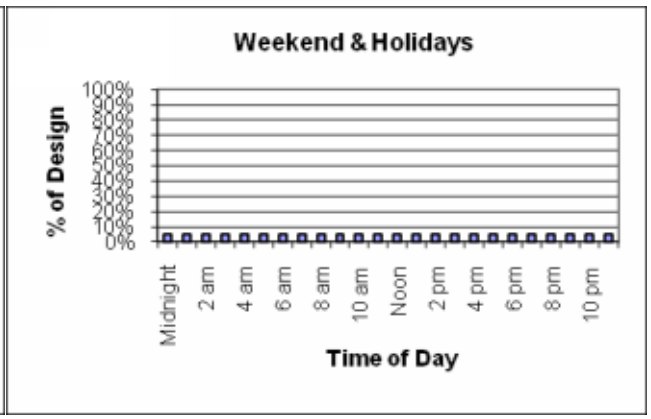
Schedule thru June 15



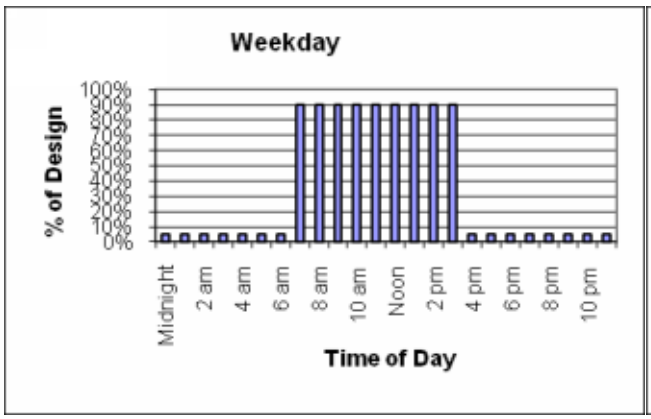


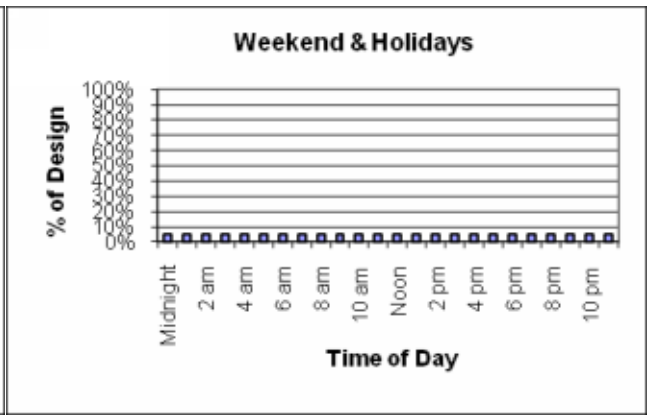
Schedule thru September 5



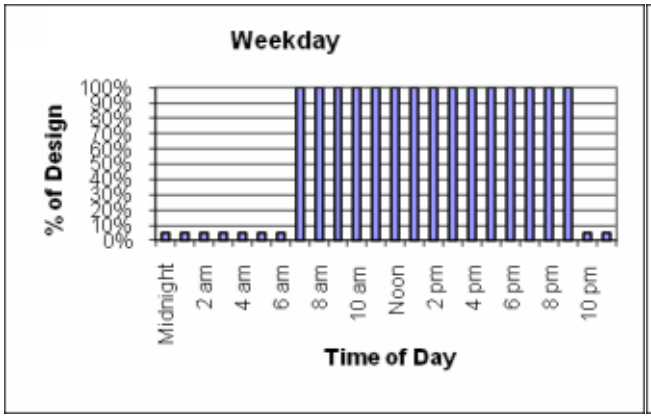


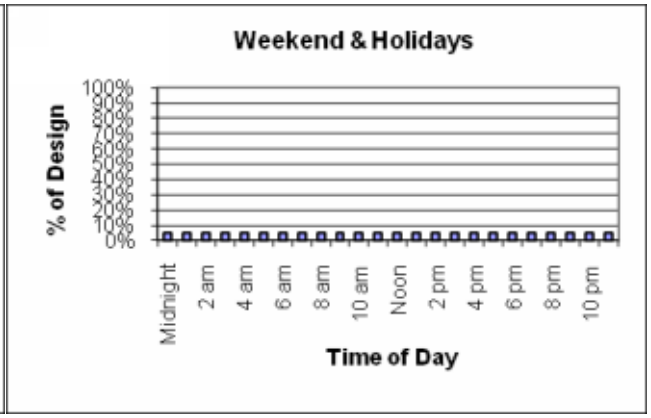
Schedule thru December 31



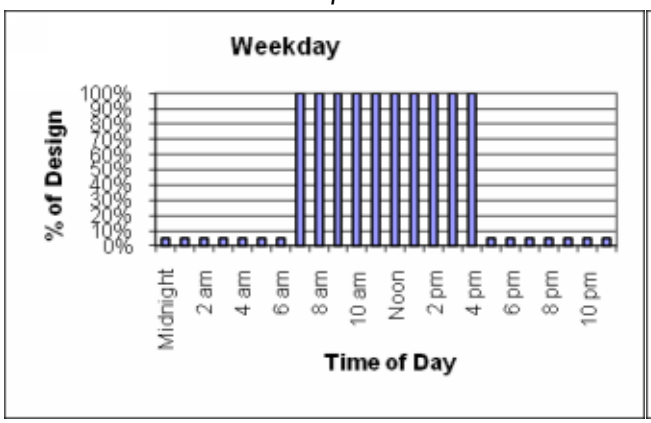


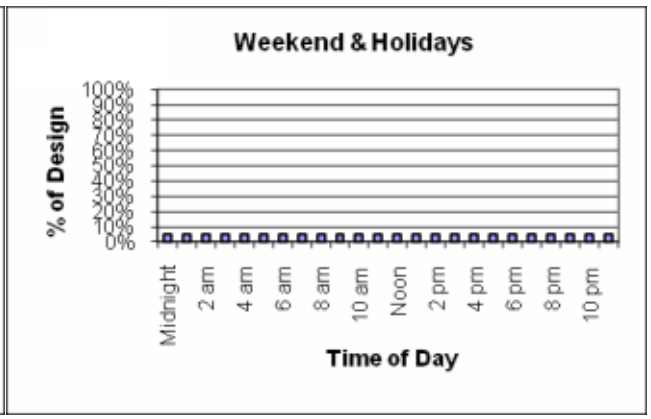
Corridor Lighting Schedule
Corridors - 0.5 W/ft2
Lobby - 1 W/ft2
Stair - 0.6 W/ft2
Restroom - 0.9 W/ft2
Vestibule - 0.5 W/ft2
Schedule thru June 15



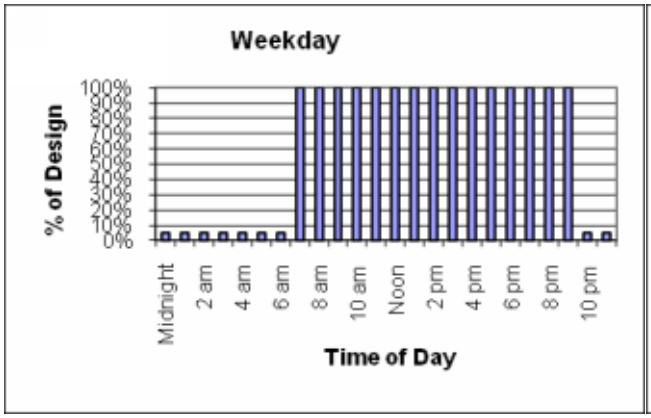


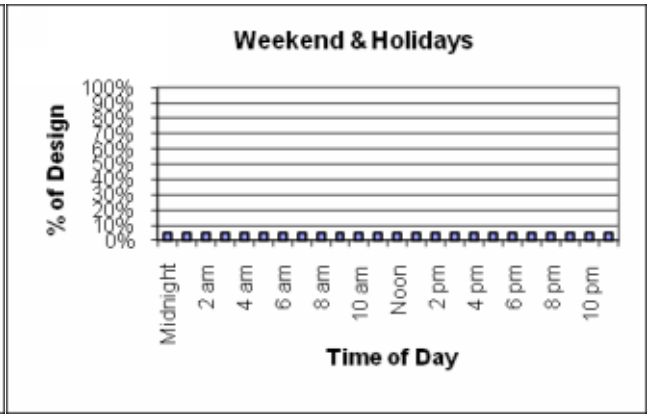
Schedule thru September 5





Schedule thru December 31

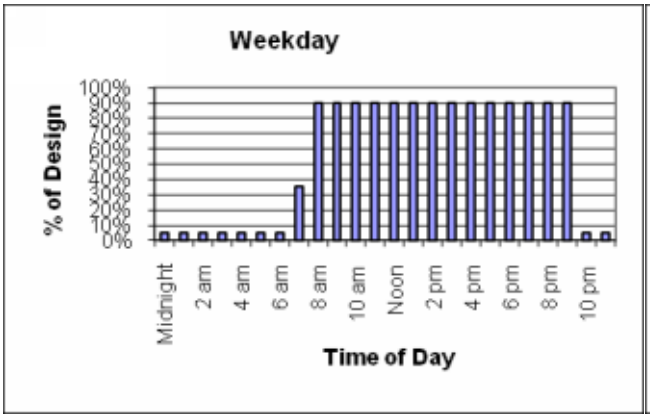


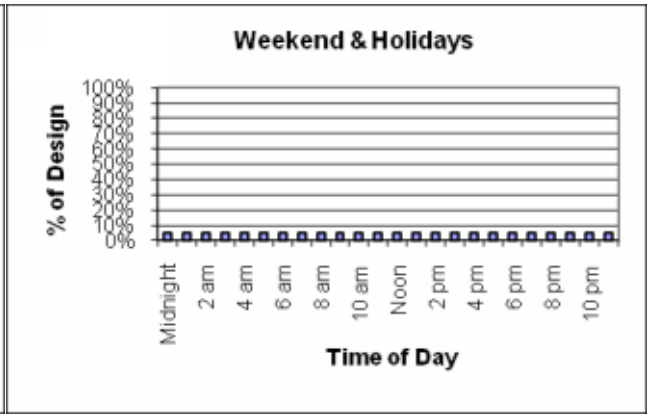


Locker Lighting Schedule

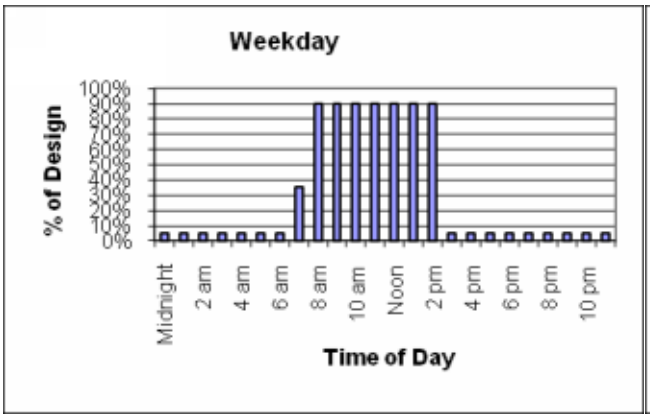
Locker - 0.6 W/ft2

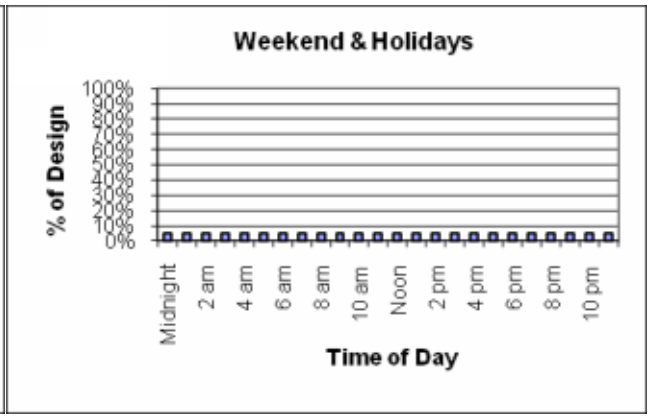
Schedule thru June 15



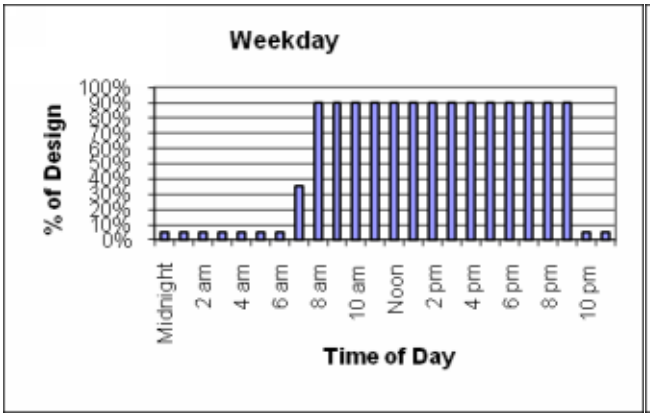


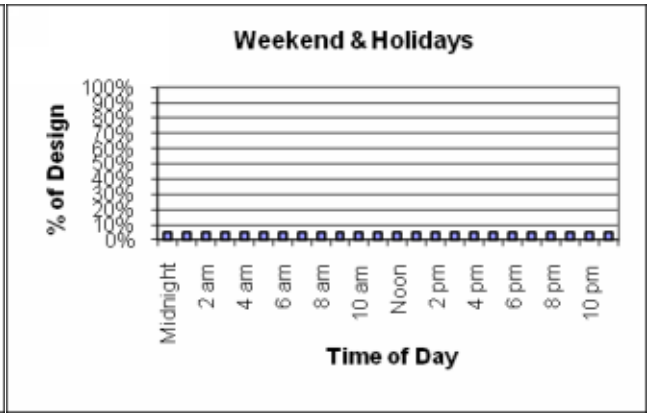
Schedule thru September 5





Schedule thru December 31

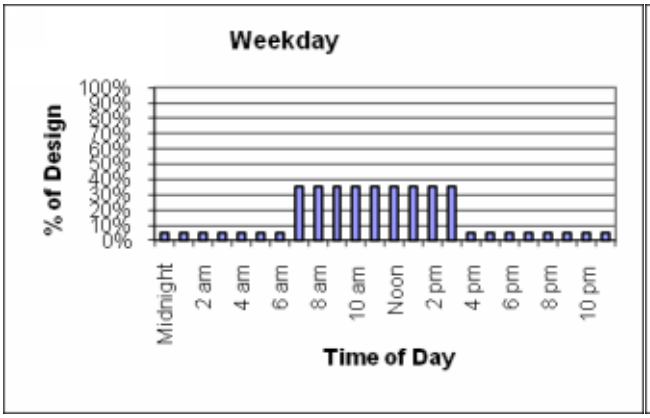


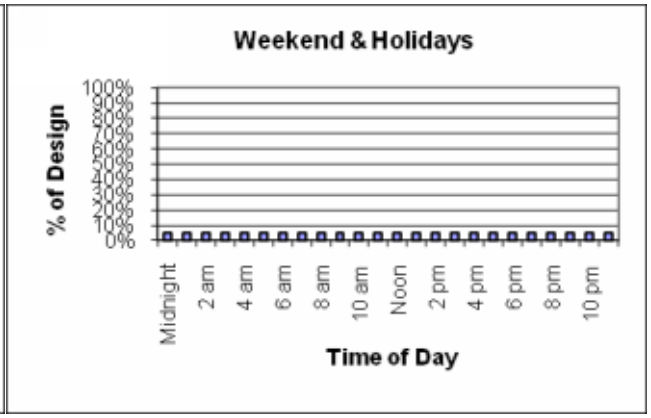


Storage Lighting Schedule

Storage - 0.8 W/ft2

Schedule thru December 31

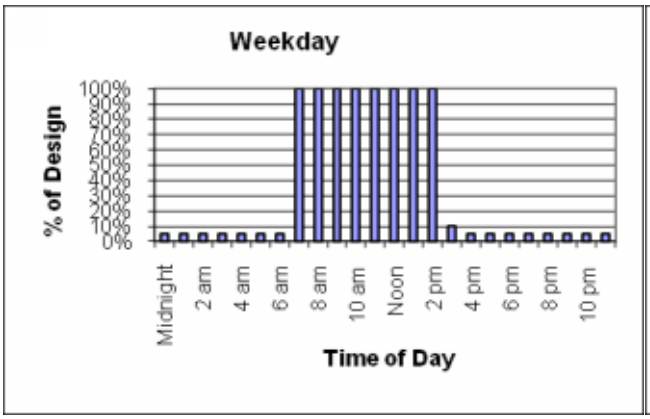


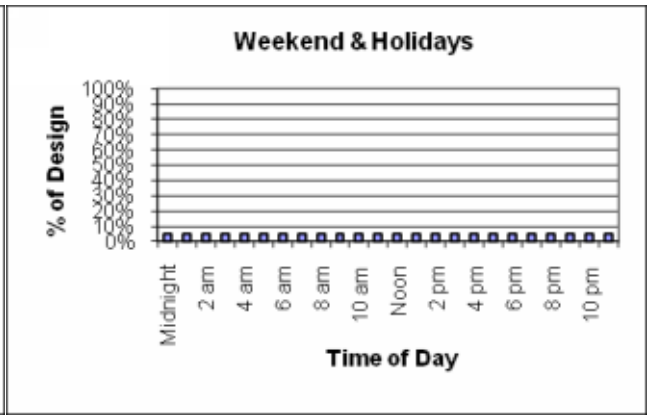


Computer Lab Lighting Schedule

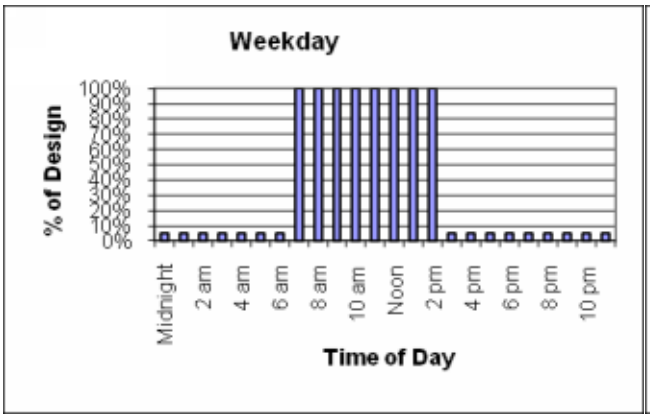
Computer Lab - 1.13 W/ft2

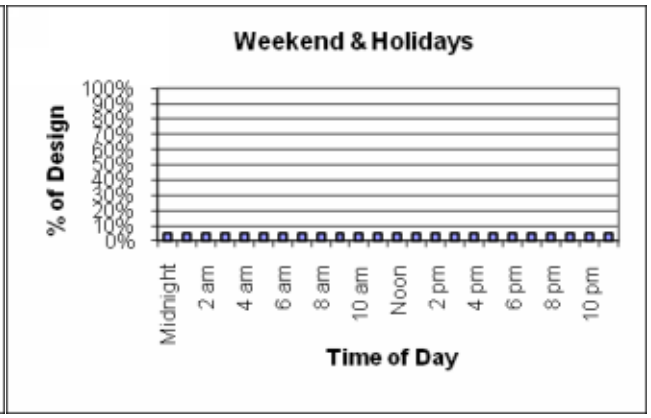
Schedule thru June 15



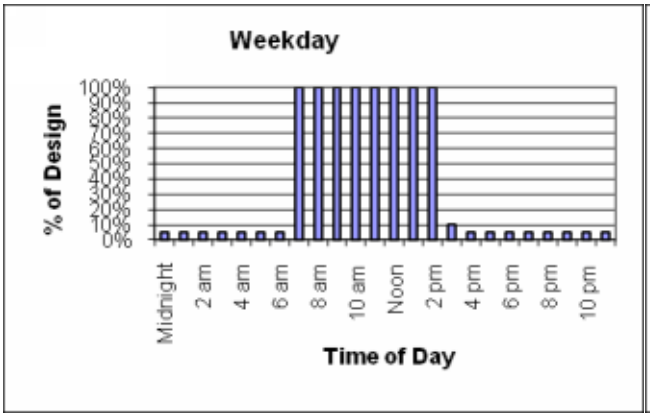


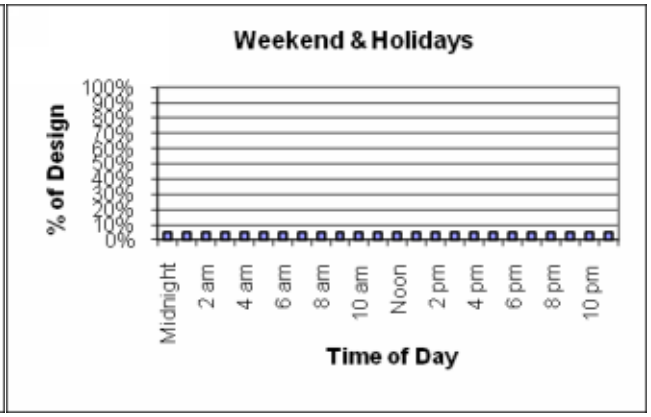
Schedule thru September 5





Schedule thru December 31

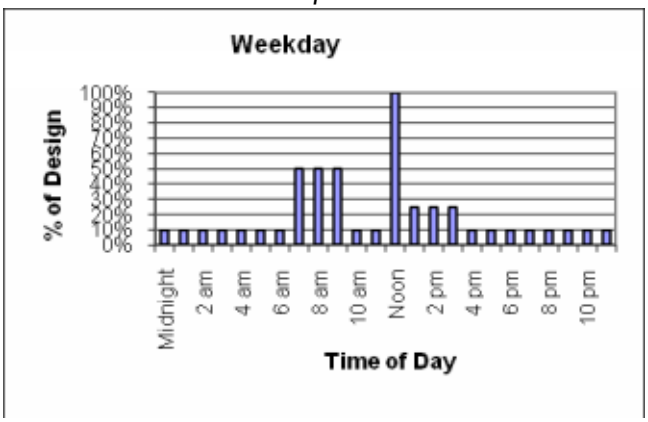


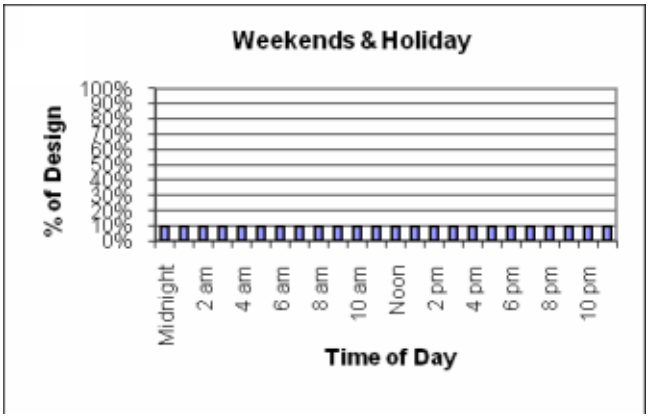


1.3.3. Equipment Use Patterns

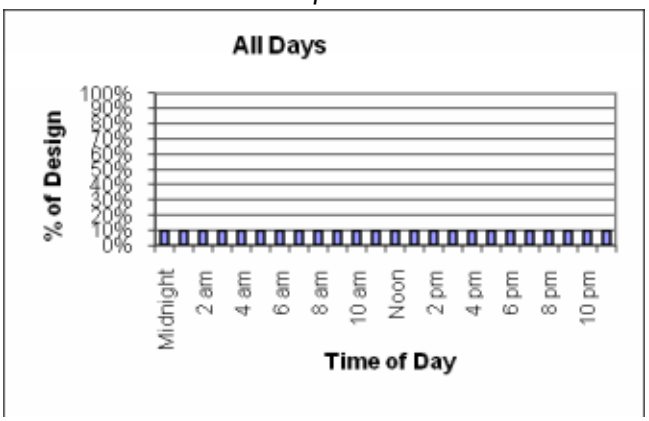
Space Type	Equipment Power Density	Schedule
Cafeteria	0.62 W/ft^2	Cafeteria Equipment Schedule
Classroom	0.5 W/ft^2	Classroom Equipment Schedule
Kitchen	3 W/ft^2	Kitchen Equipment Schedule
Office	1.25 W/ft^2	Office Equipment Schedule
Computer Lab	2.5 W/ft^2	Classroom Equipment Schedule
Library	0.5 W/ft^2	Classroom Equipment Schedule
Conference Room	1.25 W/ft^2	Office Equipment Schedule

<u>Cafeteria Equipment Schedule</u>
Cafeteria - 0.62 W/ft2
Schedule thru April 15

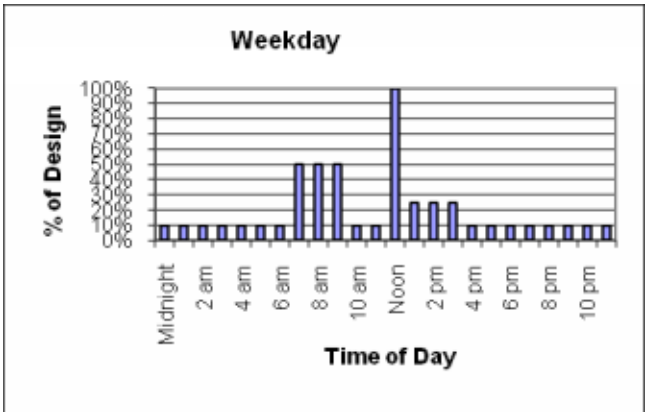


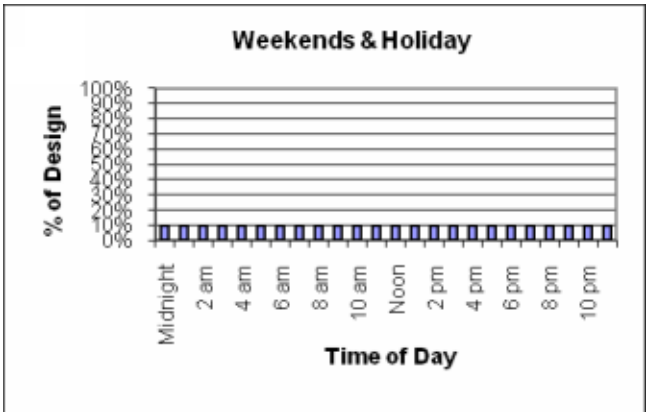


Schedule thru April 21

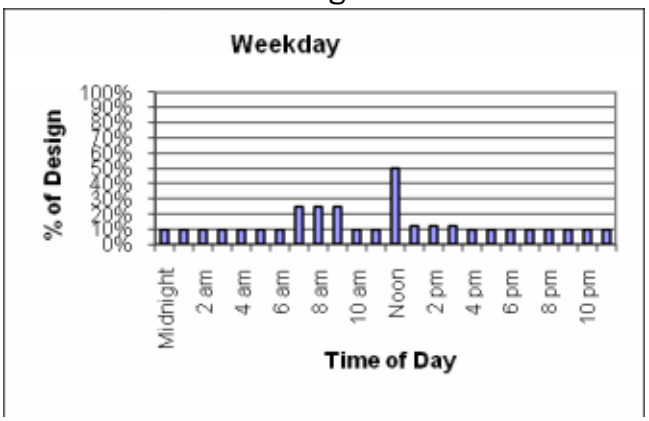


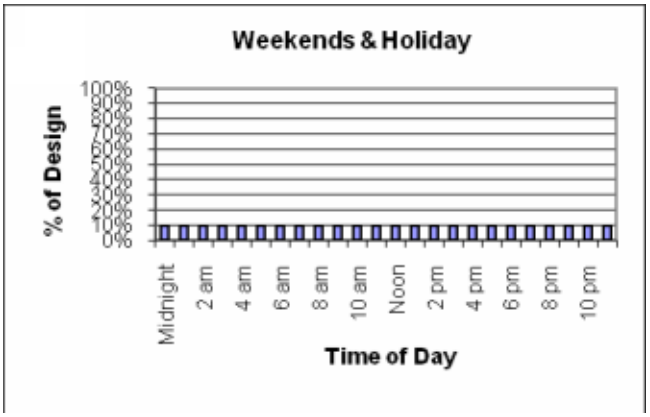
Schedule thru June 30



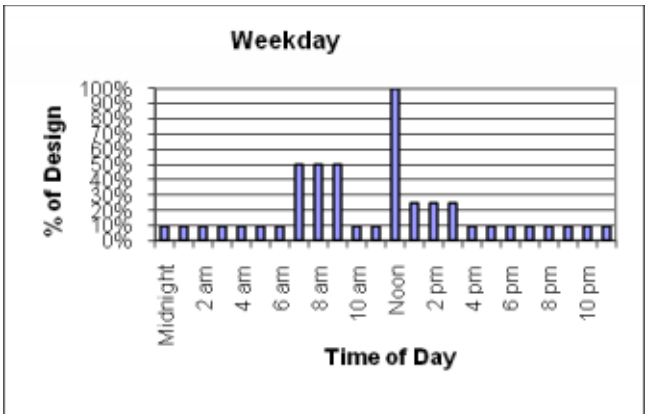


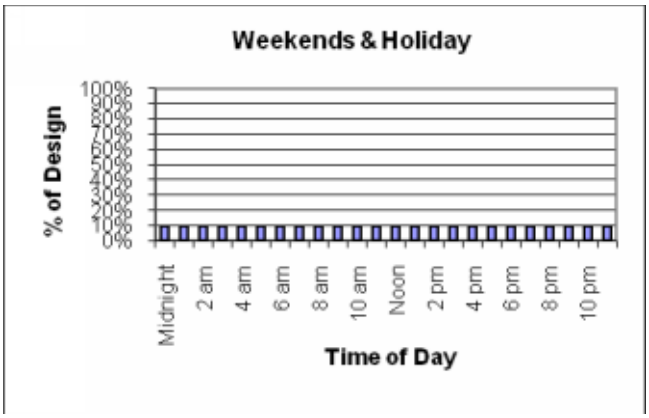
Schedule thru August 31



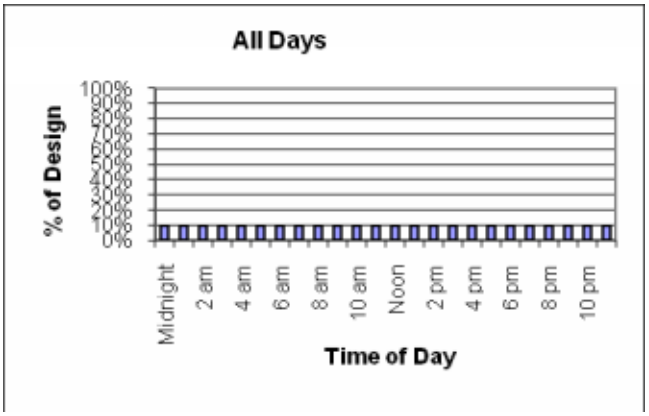


Schedule thru December 23

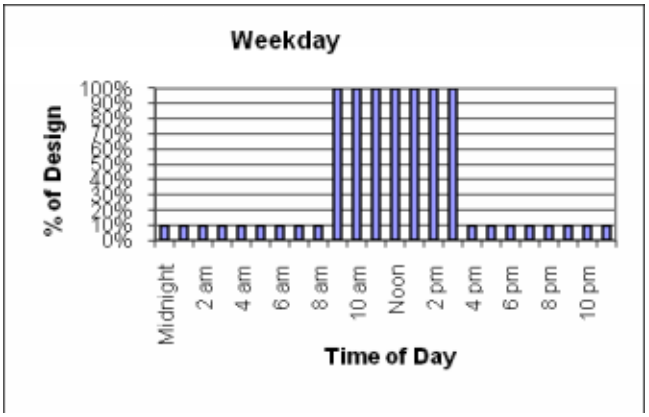


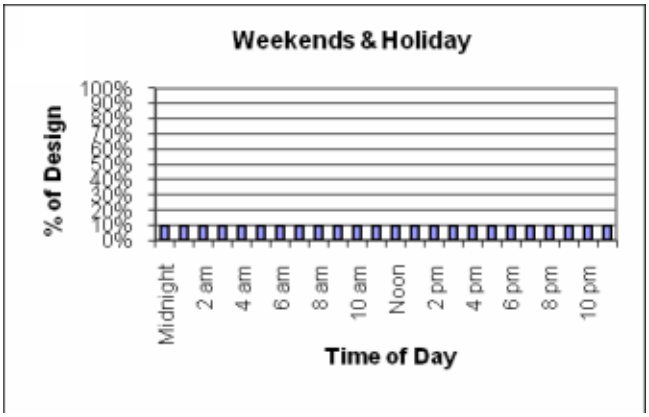


Schedule thru December 31

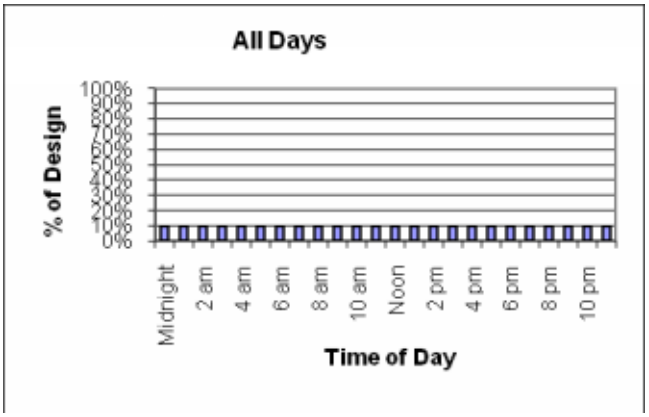


Classroom Equipment Schedule
Classroom - 0.5 W/ft2
Library - 0.5 W/ft2
Computer Lab - 2.5 W/ft2
Schedule thru April 15

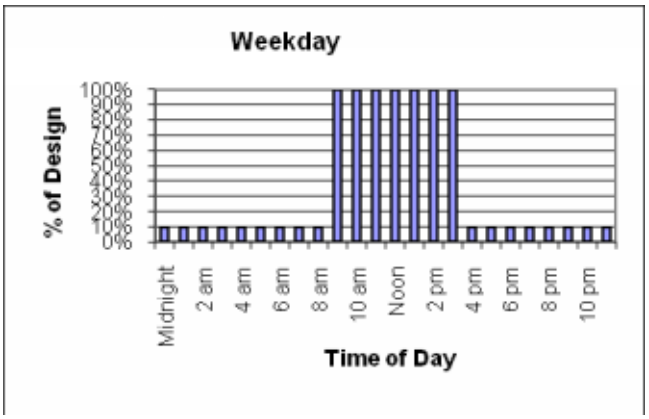


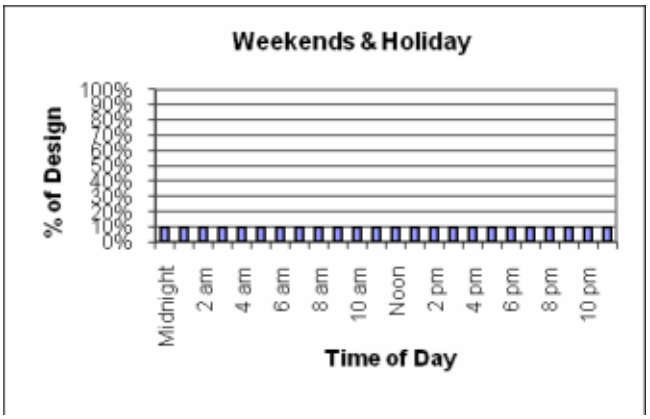


Schedule thru April 21

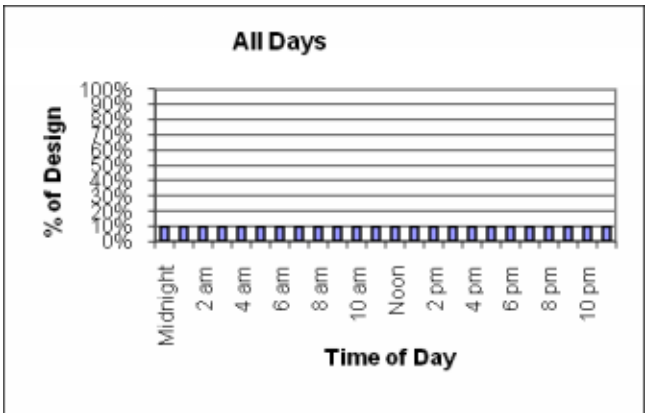


Schedule thru December 23

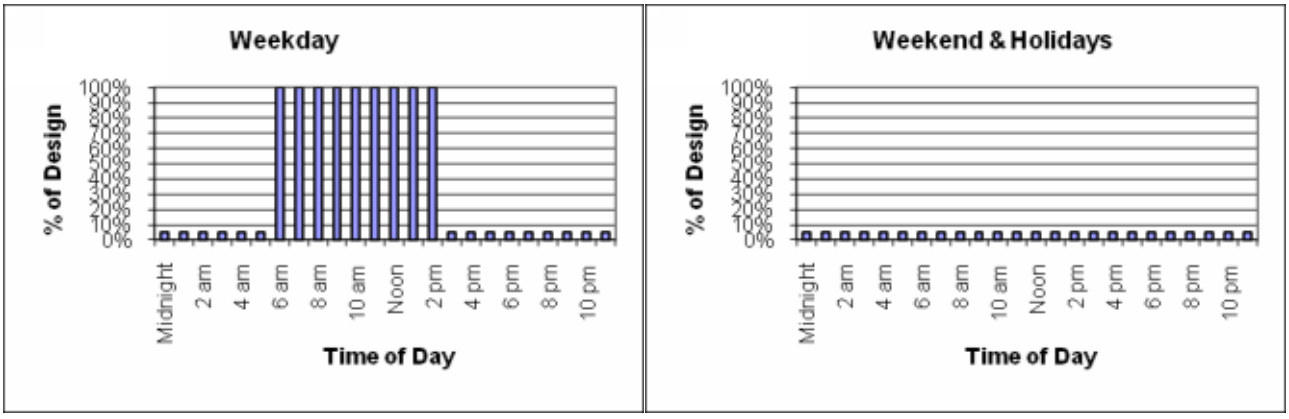




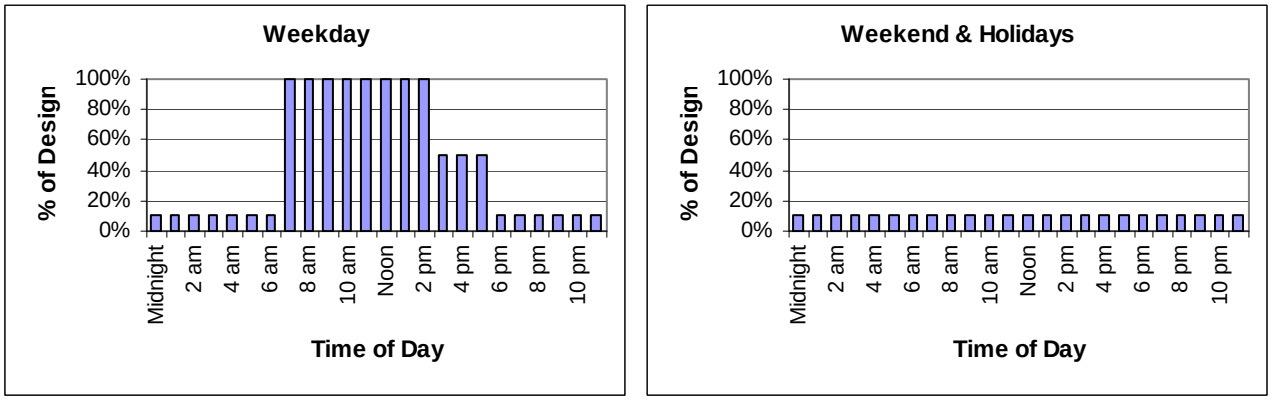
Schedule thru December 31



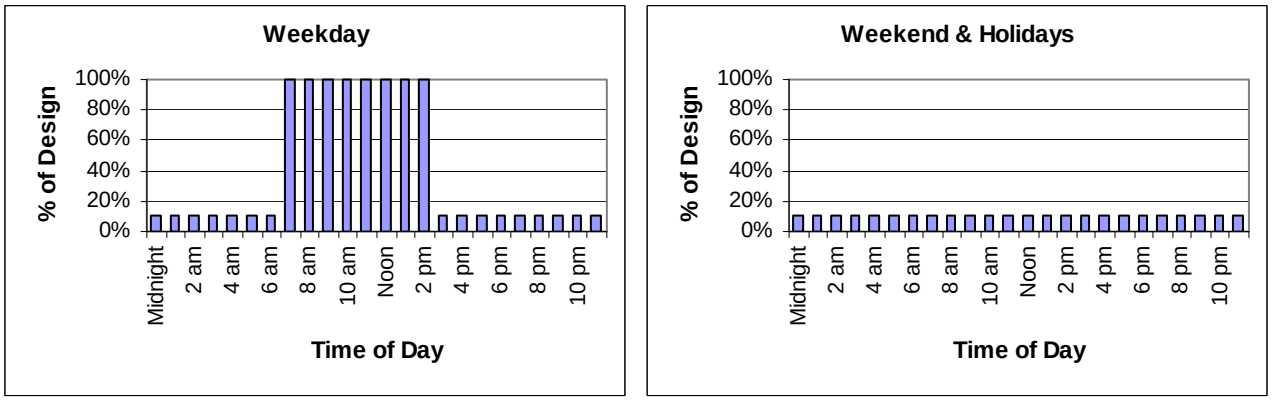
Kitchen Equipment Schedule
Kitchen - 3 W/ft2
Schedule thru December 31



Office Equipment Schedule
Office - 1.25 W/ft2
Conference Room - 1.25 W/ft2
Winter/Fall Schedule



Summer Schedule



1.4. Building Environmental Conditions

Heating and cooling follow the occupancy schedules.

1.4.1. Heating Schedule

Heating temperature is set for 72°F during the hours of operation with a 65°F setback during unoccupied hours between January 1 thru May 15 and October 1 thru December 31.

1.4.2. Cooling Schedule

Cooling temperature is set for 76°F during the hours of operations with an 85°F setback during unoccupied hours from May 15 thru October 1.

2. MECHANICAL SYSTEM

2.1. General

Outdoor air will be provided to the corridors and classrooms via constant volume RTU's. The CV RTU's will temper the outdoor air via 80% efficient, modulating gas furnaces and DX cooling.

Recirculating unit ventilators will provide additional heating and cooling to the classrooms. 87% efficient, condensing boilers will provide hot water to the unit ventilators. An air-cooled chiller will provide chilled water to the unit ventilators.

Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with modulating flame natural gas furnaces.

2.2. Boilers

Two Veissman 87% efficient, modulating flame boilers will be installed. The boilers provide hot water to the unit ventilators.

2.3. Rooftop Units

The rooftop units all have variable speed drives and modulating furnace control. The classroom RTU's provide 100% outside air to the classrooms and corridors. The RTU's are constant volume, DX units with EER = 10.9. The fan power is estimated based on 5 inH2O supply pressure drop and 1-1.75 inH2O return pressure drop. The total fan efficiencies are 60%. The properties of the RTU's are given below.

Tag	Service	Total Air Flow (cfm)	Total Brake Horsepower (Supply + Return, assumed)	Heating Efficiency	Cooling EER
RTU-1	Classrooms	14,000	29.3	80%	10.9
RTU-2	Classrooms	14,000	17.4	80%	10.9
RTU-3	Classrooms	8,000	30.6	80%	10.9
RTU-4	Kitchen/ Cafeteria	7,500	11.8	80%	10.9
RTU-5	Gymnatorium	7,500	7.7	80%	10.9
RTU-6	Gymnasium	4,000	12.8	80%	10.9

2.4. Unit Ventilators

The unit ventilators in the classrooms are assumed to have supply pressure drop of 0.75 inH2O and supply efficiency = 50%.

2.5. Air Cooled Chiller

A 200-ton air cooled chiller with EER = 13.2 supplies chilled water to the unit ventilators.

2.6. Pumps

The pumps are assumed to be minimally compliant with ASHRAE 90.1-2007, Appendix G.

The chilled water pumps require 22 W/gpm and the hot water pumps use 19 W/gpm.

3. UTILITY RATES

Electricity- NYPA rate, Conventional account as of February 2009
Energy : $0.06739/ kWh
Demand : $11.63/kW
Delivery : $17.07/kW

Natural Gas- ConEdison Firm rate as of February 2009
Energy, On-Peak Firm : $1.72/ therm (November-April)
Energy, On-Peak Firm : $1.08/ therm (May-October)

4. Side-By-Side Comparison of Proposed Design and ECB Baseline Cases for PS-71R

Building as Designed	ASHRAE 90.1-2004 Section 11 ECB Baseline Model
Exterior wall construction • 4" nominal utility brick • 4" nominal air cavity w/ 3" rigid insulation (R15) • 6" nominal CMU • 2-1/2" nominal metal stud • 5/8" gypsum wallboard • U-value = 0.056 BTU/Hr-ft^{2}-$^{\circ}$F •	*Exterior wall construction* • Same heat capacity as the proposed design • Insulation R-5.7 ci • U factor$_{eff}$ = 0.151 BTU/Hr-ft^{2}-$^{\circ}$F
Roof • 2" White Pavers with SRI > 0.79 • 4" Polystyrene • EPDM • 3-1/4" concrete over 3" metal decking • U factor$_{eff}$ = 0.046 BTU/Hr-ft^{2}-$^{\circ}$F	*Roof* • Same heat capacity as the proposed design • Insulation R-15 ci • U factor$_{eff}$ = 0.063 BTU/Hr-ft^{2}-°F
Windows • 25% window to wall area ratio • Type: spectrally selective low-e • U $_{\text{center of glass}}$ 0.30 • U $_{\text{fenestration}}$ 0.51 • Visible Transmittance 60% • Shading Coefficient 0.44 • Solar Heat Gain Coefficient 0.38 • Thermally Broken Aluminum Frames • Operable windows	*Windows* • 25% window to wall area ratio • Type: double pane clear insulating • U $_{\text{fixedfenestration}}$ =0.57 • U $_{\text{operablefenestration}}$ =0.67 • 50% operable windows • Shading coefficient = 0.44 • Solar Heat Gain Coefficient= 0.39
Lighting Average Lighting power density = 1.0 W/ft^{2}	*Lighting* Average Lighting power density = 1.2 W/ft^{2}

General HVAC Outdoor air will be provided to the corridors and classrooms via constant volume RTU's. The CV RTU's will temper the outdoor air via 80% efficient, modulating gas furnaces and DX cooling. Recirculating unit ventilators will provide additional heating and cooling to the classrooms. 87% efficient, condensing boilers will provide hot water to the unit ventilators. An air-cooled chiller will provide chilled water to the unit ventilators. Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with modulating flame natural gas furnaces.	*General HVAC* Classrooms and corridors are served by packaged variable air volume units with reheat. Heating is provided by hot water gas boilers. (System #4 in Table 11.3.2A) Heating and cooling will be provided to the assembly spaces (cafeteria, gymnasium, and gymnatorium) via constant volume DX units with on/off natural gas furnaces. (System #11 in Table 11.3.2A)
Cooling Equipment RTU 1-6 EER = 10.9 • Air-cooled, packaged DX units, EER = 10.9 Air Cooled Chiller EER = 13.2	*Cooling Equipment* • RTU-1 – EER = 9.0 • RTU-2 – EER = 9.0 • RTU-3 – EER = 9.0 • RTU-4 – EER = 9.3 • RTU-5 – EER = 9.3 • RTU-6 – EER = 9.3
Heating Equipment Furnaces • Gas fired furnaces with modulating flame • Rated Efficiency 80% • Furnaces provide 100% of heating to cafeteria, gymnasium, and gymnatorium, and temper outside air to classrooms Boilers • (2) gas fired boilers supply heating to classroom unit ventilators • Modulating flame controls • Rated Efficiency 87% • Hot water delta-T 20 °F	*Heating Equipment* Furnaces • Gas fired furnaces with on/off controls • Rated Efficiency 80% • Furnaces provide 100% of heating to cafeteria, gymnasium, and gymnatorium Boilers • (2) Gas fired boilers supply all heat to classrooms • On/off controls • Rated Combustion Efficiency 75% • Hot water delta-T 50 °F

Fans RTU's 1-3 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.75" • Return efficiency = 60% RTU 4 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.0" • Return efficiency = 60% RTU 5-6 • Supply DP = 5.0" • Supply efficiency = 60% • Return DP = 1.5" • Return efficiency = 60% Unit ventilator fans • Supply DP = 0.75" • Supply efficiency = 50% **Note: The fan power is based on assumptions made by the energy modeler. Deviations from these assumptions may have a significant impact on the level of savings.**	*Fans* Fan power compliant with ASHRAE 90.1-2004. Fan system efficiency (kW/cfm) is the same as the proposed design. Fan motor efficiency meets minimums specified in Table 10.8.
Heat Recovery 50% effective heat recovery on RTU's 1,2,3,5 & 6	*Heat Recovery* 50% effective heat recovery on RTU's 5 & 6
Pumping Equipment Minimally compliant with ASHRAE 90.1-2007	*Pumping Equiment* Pump power compliant with ASHRAE 90.1-2004. Pump system efficiency (kW/cfm) is the same as the proposed design. Motor efficiency meets minimums specified in Table 10.8. Hot water pumps have VFDs for continuous variable flow.

5. RESULTS

The proposed design, as understood by Viridian, includes the following energy efficient measures:

- Increased wall insulation- U = 0.056 Btu/hr-ft2-F instead of U = 0.151 Btu/hr-ft2-F
- Increased roof insulation- U = 0.046 Btu/hr-ft2-F instead of U = 0.063 Btu/hr-ft2-F
- More efficient windows- Ufen = 0.51 Btu/hr-ft2-F with SHGC = 0.38 instead of Ufen = 0.57 Btu/hr-ft2-F with SHGC = 0.39
- Reduced lighting power density (1.0 w/ft^2 vs 1.2 W/ft^2)
- Occupancy Sensors in classrooms
- CO2 ventilation controls in gymnasium and gymnatorium instead of just in gymnatorium
- Heat recovery on all RTU's except cafeteria
- High efficiency DX units (EER = 10.9 instead of 9.8)
- High efficiency air-cooled chiller ($EER_{average}$ = 13.2 instead of 9.1)
- 87% efficient condensing boiler with modulating flame controls instead of 80% efficient boiler with on/off controls
- Dedicated outdoor air system and unit ventilators reduce required fan power

The proposed design saves approximately $63,258, or 21.6% in total, when compared to the ECB Baseline based on ASHRAE 90.1-2004 Section 11.

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TOTAL ENERGY SAVINGS

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs ECB Baseline ($)	Savings vs. ECB Baseline (%)
ECB Baseline	957,721	215,674	46001	76,874	292,548		
Design Case	769,177	169,901	35,648	59,389	229,290	$63,258	21.6%

When unregulated loads are separated out of the model results, the proposed design saves approximately 23.9%, compared to the ECB Baseline based on ASHRAE 90.1-2004 Section 11. The building exceeds the minimum 20% requirement for Local Law 86.

REGULATED LOAD ENERGY SAVINGS

Case	Total Electricity Use (kWh)	Total Electricity Cost ($)	Total Gas Use (CCF)	Total Gas Cost ($)	Total Utility Cost ($)	Savings vs ECB Baseline ($)	Savings vs. ECB Baseline (%)
ECB Baseline	829,671	189,557	44,559	74,858	264,415		
Design Case	641,120	143,784	34206	57,373	201,157	$63,258	23.9%

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : Proposed Design

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	4635	122274	0	241620	23307	0	249287	103241	24812	769177
NATURAL GAS (CCF)	32191	0	0	0	0	2015	0	1442	0	35648

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	58087	228	10457	8098	13930	0	0	0	0	0	24387
FEB	53452	227	10138	6231	10717	0	0	0	0	0	20855
MAR	64160	255	11667	5593	9620	0	0	0	0	0	21287
APR	59790	256	11392	2890	4972	0	0	0	0	0	16364
MAY	58974	344	13848	585	631	0	0	0	0	0	14479
JUN	79032	531	20578	385	417	0	0	0	0	0	20995
JUL	79623	536	20748	368	398	0	0	0	0	0	21146
AUG	76110	528	20307	370	401	0	0	0	0	0	20708
SEP	75888	494	19291	355	384	0	0	0	0	0	19675
OCT	54263	257	11037	944	1020	0	0	0	0	0	12057
NOV	53154	227	10096	3457	5947	0	0	0	0	0	16043
DEC	56636	227	10342	6367	10953	0	0	0	0	0	21295
TOTAL	769177	536	169901	35648	59389	0	0	0	0	0	229290

SUMMARY REPORTS OF ENERGY USE AND FUEL BILL

NAME OF BUILDING : PS-71R
MODEL DESCRIPTION : ASHRAE 90.1-2004 Case: ECB

REPORT-1: ANNUAL ENERGY USE STATISTICS **********

FUEL TYPE	HEATING EQUIP.	COOLING EQUIP.	COOLING TOWER	FANS	PUMPS	DOMESTIC WATER	LIGHTING	MISC. EQUIP.	VERTICAL TRANS.	TOTAL FUEL USE
ELECTRICITY (KWH)	82140	186313	0	239887	7035	0	314293	103241	24812	957721
NATURAL GAS (CCF)	42544	0	0	0	0	2015	0	1442	0	46001

REPORT-2: MONTHLY AND ANNUAL FUEL BILLS **********

MONTH	ELECTRIC KWH	ELECTRIC KW	ELECTRIC BILL ($)	NAT. GAS CCF	NAT. GAS BILL ($)	FUEL OIL GALLONS	FUEL OIL BILL ($)	STEAM MBTU	STEAM MBTU/HR	STEAM BILL ($)	TOTAL FUEL BILL ($)
JAN	83651	299	14219	10316	17745	0	0	0	0	0	31964
FEB	74549	298	13594	7906	13599	0	0	0	0	0	27193
MAR	87365	346	15830	7160	12315	0	0	0	0	0	28145
APR	73780	352	15080	3630	6244	0	0	0	0	0	21324
MAY	64444	371	15012	693	749	0	0	0	0	0	15761
JUN	89990	663	25111	385	417	0	0	0	0	0	25528
JUL	94051	696	26319	368	398	0	0	0	0	0	26717
AUG	87749	672	25224	370	401	0	0	0	0	0	25625
SEP	89097	623	23888	355	384	0	0	0	0	0	24272
OCT	59532	346	13942	1338	1445	0	0	0	0	0	15387
NOV	73235	298	13488	5192	8932	0	0	0	0	0	22420
DEC	80279	298	13967	8282	14246	0	0	0	0	0	28213
TOTAL	957721	696	215674	46001	76874	0	0	0	0	0	2925480

2009 REPORTING FORM for Project Subject to the LEED® Rating and/or Water Use Reduction Provisions of Local Law 86 of 2005

1.15.09

DESIGN PHASE

General	**1**	Client Agency[1]……	NYCSCA
	2	Reporting Agency[2]……	NYCSCA
	3	Project Type (New Building, Addition, and/or Substantial Reconstruction), Name, and Address:	New Building PS/IS71R 1050 Targee Street Staten Island, NY,
	4	Building Identification Number (BIN)[3]……	
	5	Block(s) and Lot(s)……	
	6	FMS Number……	
	7	Occupancy Group[4]……	G Education
	8	Floor Area Subject to LEED® Requirements[5]……	110770
	9	Is All Energy Use in Project Area Metered Independently (Y/N)?	
Schedule[6]	**10**	Date of CP for Design or CP for Design and Construction……	
	11	Date of DOB Application……	
	12	Date of CP for Construction……	
	13	Date of Completion……	
Costs	**14**	Construction Cost (CC) of Work Subject to LEED® Requirements[7]	
	15	Project Cost[8]……	
	16	Capital Allocation for FY09[9]……	
	17	Domestic Plumbing Construction Cost ……	
Requirements		**LEED® Rating**	
	18	LEED® Silver (All occupancies except G, H-2) (Y/N)……	n/a
	19	LEED® Certified (Only G, H-2 Occupancies) (Y/N)……	Y (LEED certified equivalent required)
	20	Application to the USGBC for LEED Rating (Y/N)……	N
		Energy Cost Reduction	
	21	20-25% (Occupancies other than G; $12M≤CC<$30M) (Y/N)……	n/a
	22	25-30% (Occupancies other than G; CC≥$30M) (Y/N)……	n/a
	23	20-30% (Only G Occupancies; CC≥$12M) (Y/N)……	Y
		Domestic Water Use Reduction	
	24	Minimum 20% (Domestic Plumbing CC≥$.5M)	Y
	25	Minimum 30% (Domestic Plumbing CC≥$.5M)	N

CONSTRUCTION PHASE

Energy	**26**	Energy Sources Used in Project (electric, gas, purchased steam, #2 oil, #4 (mixed) oil, and/or #6 oil)……	electric, gas
	27	Electric Provider (Con- Ed, NYPA or LIPA)……	NYPA
	28	Gas Provider (Con-Ed or Keyspan)……	Con-Ed
	29	Reduction in Annual Electric Use (kwh)[10]……	188,551
	30	Annual Reduction in Sum of Monthly Peak Demands (kw/yr)[10]…	1151
	31	Annual Reduction in Peak Demand (kw/yr)[10]……	160
	32	Reduction in Annual Gas Use (therms/yr)[10]……	10,353
	33	Reduction in Annual #2, #4 (mixed), and/or #6 Oil Use (gals/yr)[10]	NA
	34	Reduction in Annual Purchased Steam Use (mlbs summer/ mlbs winter)[10]……	NA
Water	**35**	Potable Water Use Reduction[11] (gals/yr)……	367607
	36	Storm Water Runoff Reduction[11] (gals/yr)……	
Added Costs	**37**	Cost Attributable to LEED Compliance (include fees for energy analysis, commissioning agent, USGBC filing, and LEED expert)	
	38	Additional Construction Cost to Reduce Energy Cost (report only if subject to one of Energy Cost Reduction requirements above)….	
Green Power[12]	**39**	Annual Green Power Allocation Requested (kwh)……	269212
	40	Number of Years Annual Green Power Allocation is Required (yrs)	2
	41	Start Date of Power Allocation (mo/yr)……	

POST CONSTRUCTION PHASE

LEED	**42**	LEED® Rating Achieved (Certified, Silver, Gold, or Platinum)	
	43	Certification by the USGBC (Y/N)	

Notes:

1. The client agency is the agency that either will occupy the project or will sponsor another occupant.

2. The reporting agency is the agency responsible for identifying projects within their portfolio that are subject to LL86, for the expenditure of city funding on such projects, and for reporting to the Mayor's office. Note that, in some cases, the client agency may also be the reporting agency.

3. If the capital project involves an addition to and/or substantial reconstruction in an existing building, enter the BIN of the existing building. If available and if the capital project involves a new building, the BIN assigned by the Department of City Planning (DCP) should be entered. If a BIN is not available, enter N/A in the space provided.

4. The primary occupancy group classification is that under which the project would have been filed with the Department of Buildings (DOB) in accordance with the NYC Building Code that was in effect in 2005.

5. Floor areas indicated refer to the portion of the project that is subject to the LEED® or alternative rating system provisions in the law. For example, for a project that involves the substantial reconstruction of only a portion of a building, the floor area indicated refers only to that area, not to the area of the entire building.

6. Where actual dates are not yet available, they must be projected.

7. Construction costs requested here are only for the portion of the project that is subject to the relevant LL86 provisions. For example, where a project that has a large landscaping component as well as a smaller enclosed building component over $2,000,000, the construction cost reflects only the enclosed building portion of the project that is subject to the LEED® related provisions of the law. Note that all construction costs reported should be derived from or anticipate costs in the final CP for Construction or for Design and Construction and should include all mark-ups and contingencies as well as construction management fees.

8. Project cost is the sum of capitally eligible costs (per NYC Comptroller Directive 10) associated with an entire capital project, regardless of funding source. It could include such costs related to site acquisition, site preparation, furniture, fittings, and equipment, as well as to design and construction, and covers work on all portions of the project, including portions that may not be subject to the provisions of LL86.

9. Since projects typically take several years to complete and the city budget process runs on an annual cycle, each project is allocated a portion of the total project funds over several of the City's annual fiscal years until a project is complete and total project funds are expended. The allocations requested here represent the amount spent during fiscal year 2009 that ends June 30, 2009.

10. Consistent with the Rules for LL86, the calculation for energy use reduction must be performed in comparison to the NYS Energy Conservation Code in effect at the time the project is filed with the Department of Buildings.

11. Consistent with the Rules for LL86, the baseline for stormwater runoff and potable water use reduction must be calculated in accordance with the applicable credits in LEED NC 2.2 or LEED NC 2.1.

12. The information regarding green power must be provided here as part of the application for green power equivalents that may be submitted to the USGBC in order to achieve LEED® green power credits. See *Green Power Credit Application for Project Subject to LEED® Provisions of Local Law 86 of 2005* for more information.

P.S/I.S 71R Staten Island
Heating Calculation for the Size of Boilers

DVL#: 605 **Date: 3/23/2011**

New Building:

1. Instantaneous Block Heating Load and Conductive Heat Load

A. Conductive Heat Load:

(Total Glass Area)	X	(Glass "U")	X	59 °F			
15,070	X	0.51	X	59	=	453,456	BTU/HR
(*Total Wall Area)	X	(Wall "U")	X	59 °F			
59,924	X	0.06	X	59	=	212,131	BTU/HR
(Total Roof Area)	X	(Roof "U")	X	59 °F			
24,520	X	0.045	X	59	=	65,101	BTU/HR
				Total:		730,688	BTU/HR

B. Total Block Heating Load 730,688 BTU/HR

2. Heating Safety Factor 25%

3. Total Heating Load: 730,688 BTU/HR X 1.25 = 913,360 BTU/HR

4. As per SCA HVAC Design Standard No. 6.2.13 - Two (2) Boilers, each sized for 75% of the building total heating load shall be provided for the school.

One (1) Boiler Minimum Net Capacity:	913,360	X	0.75	=	**685,020** BTU/HR

Two (2) Boilers to be considered at the capacity = 685 MBH Each (minimum)
Actual Size from Catalog (VIESSMANN Boiler) = 763 MBH Each
LWT = 140 °F
EWT = 120 °F or less

Notes:
1. The "U" values considered in this calculations are in compliance with SCA standards Section: 4.0 Building Envelope
2. The boiler sizing is in compliance with SCA standards Section: 6.2.13 Sizing of Equipment.
3. *Total wall area equals the entire wall area minus the glass area.

System Checksums

By DVL CONSULTING ENGINEERS INC.

RTU-1 (CLASSROOMS)

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 16
Outside Air: OADB/WB/HR: 89 / 73 / 97

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	0	0	0	0
Glass Cond	0	0	0	0
Wall Cond	0	0	0	0
Partition	0		0	0
Exposed Floor	0		0	0
Infiltration	0		0	0
Sub Total ==>	0	0	0	0
Internal Loads				
Lights	0	0	0	0
People	0		0	0
Misc	0	0	0	0
Sub Total ==>	0	0	0	0
Ceiling Load	0	0	0	0
Ventilation Load	0	0	417,335	36
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	679,170		679,170	59
Exhaust Heat		-32,670	-32,670	-3
Sup. Fan Heat			57,172	5
Ret. Fan Heat		32,670	32,670	3
Duct Heat Pkup		0	0	0
Reheat at Design			0	0
Grand Total ==>	679,170	0	1,153,677	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	0	0
Glass Cond	0	0
Wall Cond	0	0
Partition	0	0
Exposed Floor	0	0
Infiltration	0	0
Sub Total ==>	0	0
Internal Loads		
Lights	0	0
People	0	0
Misc	0	0
Sub Total ==>	0	0
Ceiling Load	0	0
Ventilation Load	0	0
Dehumid. Ov Sizing		
Ov/Undr Sizing	679,170	100
Exhaust Heat		
Sup. Fan Heat		
Ret. Fan Heat		
Duct Heat Pkup		
Reheat at Design		
Grand Total ==>	679,170	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 13

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	0	0	0.00
Wall Cond	0	0	0.00
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	0	0	0.00
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	0	0	0.00
Ventilation Load	0	-535,642	100.00
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		0	0.00
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Grand Total ==>	0	-535,642	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.9	72.0
Plenum	78.0	72.0
Return	79.1	72.0
Ret/OA	80.8	54.6
Fn MtrTD	0.1	0.0
Fn BldTD	0.3	0.0
Fn Frict	0.9	0.0

AIRFLOWS

	Cooling	Heating
Vent	27,565	27,565
Infil	0	0
Supply	27,565	27,565
MinStop/Rh	0	0
Return	27,565	27,565
Exhaust	27,565	27,565
Rm Exh	0	0
Auxiliary	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	100.0	100.0
cfm/ft²	0.61	0.61
cfm/ton	286.72	
ft²/ton	473.46	
Btu/hr·ft²	25.35	-11.77
No. People	0	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR ℉	℉	gr/lb	Leave DB/WB/HR ℉	℉	gr/lb
Main Clg	96.1	1,153.7	821.0	27,565.0	81.2	69.5	89.6	55.0	55.0	64.5
Aux Clg	0.0	0.0	0.0	0	0	0	0	0	0	0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	96.1	1,153.7								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	45,518		
Part	0		
ExFlr	0		
Roof	45,518	0	0
Wall	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent ℉	Lvg ℉
Main Htg	-535.6	27,565.0	54.6	72.0
Aux Htg	0.0	0	0	0
Preheat	0.0	0	0	0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-535.6			

System Checksums

By DVL CONSULTING ENGINEERS INC.

RTU-2 (CLASSROOMS)

COOLING COIL PEAK

Peaked at Time: Mo/Hr: 7 / 16
Outside Air: OADB/WB/HR: 89 / 73 / 97

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	0	0	0	0
Glass Cond	0	0	0	0
Wall Cond	0	0	0	0
Partition	0		0	0
Exposed Floor	0		0	0
Infiltration	0		0	0
Sub Total ==>	0	0	0	0
Internal Loads				
Lights	0	0	0	0
People	0		0	0
Misc	0	0	0	0
Sub Total ==>	0	0	0	0
Ceiling Load	0	0	0	0
Ventilation Load	0	0	124,148	36
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	202,039		202,039	59
Exhaust Heat		-9,719	-9,719	-3
Sup. Fan Heat			17,007	5
Ret. Fan Heat		9,719	9,719	3
Duct Heat Pkup		0	0	0
Reheat at Design			0	0
Grand Total ==>	202,039	0	343,194	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	0	0
Glass Cond	0	0
Wall Cond	0	0
Partition	0	0
Exposed Floor	0	0
Infiltration	0	0
Sub Total ==>	0	0
Internal Loads		
Lights	0	0
People	0	0
Misc	0	0
Sub Total ==>	0	0
Ceiling Load	0	0
Ventilation Load	0	0
Dehumid. Ov Sizing		
Ov/Undr Sizing	202,039	100
Exhaust Heat		
Sup. Fan Heat		
Ret. Fan Heat		
Duct Heat Pkup		
Reheat at Design		
Grand Total ==>	202,039	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 13

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	0	0	0.00
Wall Cond	0	0	0.00
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	0	0	0.00
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	0	0	0.00
Ventilation Load	0	-159,342	100.00
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		0	0.00
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Grand Total ==>	0	-159,342	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.9	72.0
Plenum	78.0	72.0
Return	79.1	72.0
Ret/OA	80.8	54.6
Fn MtrTD	0.1	0.0
Fn BldTD	0.3	0.0
Fn Frict	0.9	0.0

AIRFLOWS

	Cooling	Heating
Vent	8,200	8,200
Infil	0	0
Supply	8,200	8,200
MinStop/Rh	0	0
Return	8,200	8,200
Exhaust	8,200	8,200
Rm Exh	0	0
Auxiliary	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	100.0	100.0
cfm/ft²	0.72	0.72
cfm/ton	286.72	
ft²/ton	400.32	
Btu/hr·ft²	29.98	-13.92
No. People	0	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB ℉	Enter WB ℉	Enter HR gr/lb	Leave DB ℉	Leave WB ℉	Leave HR gr/lb
Main Clg	28.6	343.2	244.2	8,200.0	81.2	69.5	89.6	55.0	55.0	64.5
Aux Clg	0.0	0.0	0.0	0	0	0	0	0	0	0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	28.6	343.2								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	11,449		
Part	0		
ExFlr	0		
Roof	11,449	0	0
Wall	0	0	0

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent ℉	Lvg ℉
Main Htg	-159.3	8,200.0	54.6	72.0
Aux Htg	0.0	0	0	0
Preheat	0.0	0	0	0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-159.3			

System Checksums

By DVL CONSULTING ENGINEERS INC.

RTU-3 (CAFETERIA/KITCHEN)

COOLING COIL PEAK

Peaked at Time: Mo/Hr:
Outside Air: OADB/WB/HR: Sum of Peaks

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	0	0	0
Glass Solar	18,996	0	18,996	3
Glass Cond	2,181	0	2,181	0
Wall Cond	3,280	1,192	4,472	1
Partition	0		0	0
Exposed Floor	0		0	0
Infiltration	0		0	0
Sub Total ==>	24,456	1,192	25,648	4
Internal Loads				
Lights	22,807	5,702	28,509	5
People	132,300		132,300	22
Misc	125,050	0	125,050	21
Sub Total ==>	280,157	5,702	285,859	47
Ceiling Load	1,057	-1,057	0	0
Ventilation Load	0	0	249,003	41
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	51,852		51,852	9
Exhaust Heat		-3,367	-3,367	-1
Sup. Fan Heat			0	0
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Reheat at Design			0	0
Grand Total ==>	357,522	2,470	608,996	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	49,395	15
Glass Cond	87	0
Wall Cond	3,703	1
Partition	0	0
Exposed Floor	0	0
Infiltration	0	0
Sub Total ==>	53,186	16
Internal Loads		
Lights	22,807	7
People	79,380	24
Misc	125,050	38
Sub Total ==>	227,237	68
Ceiling Load	1,009	0
Ventilation Load	0	0
Ov/Undr Sizing	51,852	16
Grand Total ==>	333,284	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 13

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	0	0.00
Glass Solar	0	0	0.00
Glass Cond	-12,058	-12,058	2.34
Wall Cond	-4,467	-6,141	1.19
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	-1	-1	0.00
Sub Total ==>	-16,525	-18,199	3.54
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-259	0	0.00
Ventilation Load	0	-497,216	96.62
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		823	-0.16
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Grand Total ==>	-16,784	-514,592	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	73.2
Plenum	78.4	71.9
Return	78.4	71.9
Ret/OA	84.6	37.7
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Vent	7,560	7,560
Infil	0	0
Supply	12,999	12,999
MinStop/Rh	0	0
Return	12,999	12,999
Exhaust	7,560	7,560
Rm Exh	0	0
Auxiliary	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	58.2	58.2
cfm/ft²	1.56	1.56
cfm/ton	256.14	
ft²/ton	164.59	
Btu/hr·ft²	72.91	-61.61
No. People	378	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR ℉	℉	gr/lb	Leave DB/WB/HR ℉	℉	gr/lb
Main Clg	50.8	609.0	399.7	12,999.2	84.6	68.9	81.2	55.0	54.3	61.7
Aux Clg	0.0	0.0	0.0	0	0	0	0	0	0	0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	50.8	609.0								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	8,353		
Part	0		
ExFlr	0		
Roof	0	0	0
Wall	2,538	678	27

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent ℉	Lvg ℉
Main Htg	-514.6	12,999.2	37.7	73.2
Aux Htg	0.0	0	0	0
Preheat	-251.5	12,999	38	55
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-514.6			

System Checksums

By DVL CONSULTING ENGINEERS INC.

RTU-4 (GYMATORIUM)

COOLING COIL PEAK

Peaked at Time: Mo/Hr:
Outside Air: OADB/WB/HR: Sum of Peaks

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	16,909	16,909	7
Glass Solar	5,923	0	5,923	2
Glass Cond	1,262	0	1,262	1
Wall Cond	3,692	355	4,047	2
Partition	0		0	0
Exposed Floor	0		0	0
Infiltration	0		0	0
Sub Total ==>	10,878	17,264	28,141	11
Internal Loads				
Lights	13,652	3,413	17,065	7
People	118,300		118,300	47
Misc	2,800	0	2,800	1
Sub Total ==>	134,752	3,413	138,165	55
Ceiling Load	4,527	-4,527	0	0
Ventilation Load	0	0	89,056	36
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	7,244		7,244	3
Exhaust Heat		-16,150	-16,150	-6
Sup. Fan Heat			3,004	1
Ret. Fan Heat		0	0	0
Duct Heat Pkup		0	0	0
Reheat at Design			0	0
Grand Total ==>	157,400	0	249,461	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	28,475	22
Glass Cond	253	0
Wall Cond	5,211	4
Partition	0	0
Exposed Floor	0	0
Infiltration	0	0
Sub Total ==>	33,939	26
Internal Loads		
Lights	13,652	11
People	70,980	55
Misc	2,800	2
Sub Total ==>	87,432	67
Ceiling Load	1,374	1
Ventilation Load	0	0
Ov/Undr Sizing	7,244	6
Grand Total ==>	129,989	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 13

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-14,231	12.47
Glass Solar	0	0	0.00
Glass Cond	-7,154	-7,154	6.27
Wall Cond	-7,630	-8,416	7.37
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	0	0	0.00
Sub Total ==>	-14,784	-29,801	26.11
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-3,288	0	0.00
Ventilation Load	0	-96,079	84.17
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		11,729	-10.28
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Grand Total ==>	-18,072	-114,151	100.00

TEMPERATURES

	Cooling	Heating
SADB	55.0	75.2
Plenum	80.9	69.9
Return	80.9	69.9
Ret/OA	82.9	55.0
Fn MtrTD	0.0	0.0
Fn BldTD	0.0	0.0
Fn Frict	0.0	0.0

AIRFLOWS

	Cooling	Heating
Vent	5,070	5,070
Infil	0	0
Supply	5,070	5,070
MinStop/Rh	0	0
Return	5,070	5,070
Exhaust	5,070	5,070
Rm Exh	0	0
Auxiliary	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	100.0	100.0
cfm/ft²	1.01	1.01
cfm/ton	243.89	
ft²/ton	240.52	
Btu/hr·ft²	49.89	-22.83
No. People	338	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR ℉	℉	gr/lb	Leave DB/WB/HR ℉	℉	gr/lb
Main Clg	20.8	249.5	140.6	5,070.0	82.9	70.0	89.6	55.0	54.9	64.1
Aux Clg	0.0	0.0	0.0	0	0	0	0	0	0	0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	20.8	249.5								

AREAS

	Gross Total	Glass ft²	Glass (%)
Floor	5,000		
Part	0		
ExFlr	0		
Roof	5,000	0	0
Wall	2,958	402	14

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent ℉	Lvg ℉
Main Htg	-114.2	5,070.0	55.0	75.2
Aux Htg	0.0	0	0	0
Preheat	0.0	0	0	0
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-114.2			

System Checksums

By DVL CONSULTING ENGINEERS INC.

RTU-5 (GYMNASIUM)

COOLING COIL PEAK

Peaked at Time: Mo/Hr:
Outside Air: OADB/WB/HR: Sum of Peaks

	Space Sens. + Lat. Btu/h	Plenum Sens. + Lat Btu/h	Net Total Btu/h	Percent Of Total (%)
Envelope Loads				
Skylite Solar	0	0	0	0
Skylite Cond	0	0	0	0
Roof Cond	0	22,032	22,032	6
Glass Solar	61,918	0	61,918	17
Glass Cond	4,028	0	4,028	1
Wall Cond	9,497	2,065	11,561	3
Partition	0		0	0
Exposed Floor	0		0	0
Infiltration	0		0	0
Sub Total ==>	75,442	24,097	99,539	27
Internal Loads				
Lights	17,464	4,366	21,830	6
People	85,050		85,050	23
Misc	14,000	0	14,000	4
Sub Total ==>	116,514	4,366	120,880	33
Ceiling Load	5,691	-5,691	0	0
Ventilation Load	0	0	136,239	37
Dehumid. Ov Sizing			0	0
Ov/Undr Sizing	11,680		11,680	3
Exhaust Heat		-18,536	-18,536	-5
Sup. Fan Heat			10,776	3
Ret. Fan Heat		8,621	8,621	2
Duct Heat Pkup		0	0	0
Reheat at Design			0	0
Grand Total ==>	209,327	12,857	369,199	100.00

CLG SPACE PEAK

Mo/Hr: Sum of
OADB: Peaks

	Space Sensible Btu/h	Percent Of Total (%)
Envelope Loads		
Skylite Solar	0	0
Skylite Cond	0	0
Roof Cond	0	0
Glass Solar	61,918	35
Glass Cond	4,028	2
Wall Cond	9,971	6
Partition	0	0
Exposed Floor	0	0
Infiltration	0	0
Sub Total ==>	75,917	43
Internal Loads		
Lights	17,464	10
People	51,030	29
Misc	14,000	8
Sub Total ==>	82,494	47
Ceiling Load	5,633	3
Ventilation Load	0	0
Ov/Undr Sizing	11,680	7
Grand Total ==>	175,724	100.00

HEATING COIL PEAK

Mo/Hr: Heating Design
OADB: 13

	Space Peak Space Sens Btu/h	Coil Peak Tot Sens Btu/h	Percent Of Total (%)
Envelope Loads			
Skylite Solar	0	0	0.00
Skylite Cond	0	0	0.00
Roof Cond	0	-18,200	5.52
Glass Solar	0	0	0.00
Glass Cond	-23,001	-23,001	6.97
Wall Cond	-13,237	-16,217	4.92
Partition	0	0	0.00
Exposed Floor	0	0	0.00
Infiltration	-1	-1	0.00
Sub Total ==>	-36,239	-57,419	17.41
Internal Loads			
Lights	0	0	0.00
People	0	0	0.00
Misc	0	0	0.00
Sub Total ==>	0	0	0.00
Ceiling Load	-4,235	0	0.00
Ventilation Load	0	-282,479	85.63
Ov/Undr Sizing	0	0	0.00
Exhaust Heat		10,005	-3.03
OA Preheat Diff.		0	0.00
RA Preheat Diff.		0	0.00
Additional Reheat		0	0.00
Grand Total ==>	-40,474	-329,893	100.00

TEMPERATURES

	Cooling	Heating
SADB	56.3	77.0
Plenum	80.8	69.9
Return	81.9	69.9
Ret/OA	85.8	36.3
Fn MtrTD	0.1	0.0
Fn BldTD	0.3	0.0
Fn Frict	0.9	0.0

AIRFLOWS

	Cooling	Heating
Vent	4,295	4,295
Infil	0	0
Supply	7,274	7,274
MinStop/Rh	0	0
Return	7,274	7,274
Exhaust	4,295	4,295
Rm Exh	0	0
Auxiliary	0	0

ENGINEERING CKS

	Cooling	Heating
% OA	59.0	59.0
cfm/ft²	1.14	1.14
cfm/ton	236.43	
ft²/ton	207.89	
Btu/hr·ft²	57.72	-51.58
No. People	243	

COOLING COIL SELECTION

	Total Capacity ton	Total Capacity MBh	Sens Cap. MBh	Coil Airflow cfm	Enter DB/WB/HR ℉	℉	gr/lb	Leave DB/WB/HR ℉	℉	gr/lb
Main Clg	30.8	369.2	249.6	7,274.1	85.8	70.0	84.7	55.0	54.3	61.7
Aux Clg	0.0	0.0	0.0	0	0	0	0	0	0	0
Opt Vent	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0
Total	30.8	369.2								

AREAS

	Gross Total ft²	Glass ft²	Glass (%)
Floor	6,396		
Part	0		
ExFlr	0		
Roof	6,396	0	0
Wall	6,235	1,293	21

HEATING COIL SELECTION

	Capacity MBh	Coil Airflow cfm	Ent ℉	Lvg ℉
Main Htg	-329.9	7,274.1	36.3	77.0
Aux Htg	0.0	0	0	0
Preheat	-151.6	7,274	36	55
Humidif	0.0	0	0.0	0.0
Opt Vent	0.0	0	0.0	0.0
Total	-329.9			

Q1.1R - Minimum IAQ/Increased Ventilation

Building:							**PS-71R Gymnasium**				
System Tag/Name:							**AHU-5**				
Operating Condition Description:							**Peak Cooling and Heating Condition**				
Units (select from pull-down list)							**IP**				
Inputs for System		**Name**	**Units**				**System**				
	Floor area served by system	As	sf				6396				
	Population of area served by system (including diversity)	Ps	P	0%	diversity		243				
	Design primary supply fan airflow rate	Vpsd	cfm				7,300				
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf				0.06				
	OA req'd per person for system area (Weighted average)	Rps	cfm/p				10.0				
Inputs for Potentially Critical zones								**Potentially Critical Zones**			
	Zone Name		*Zone title turns purple italic for critical zone(s)*					***Gymnasium***	**Instructor off**		
	Zone Tag							**103**	**106**		
	Space type		Select from pull-down list					**Music/theater/ dance**	**Music/theater/ dance**		
	Floor Area of zone	Az	sf					6,000	132		
	Design population of zone	Pz	P	(default value listed; may be overridden)				242	1		
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm					6,600	175		
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					DFDD	DFDD		
	Local recirc. air % representative of ave system return air	Er									
Inputs for Operating Condition Analyzed											
	Percent of total design airflow rate at conditioned analyzed	Ds	%				100%	100%	100%		
	Air distribution type at conditioned analyzed		Select from pull-down list					CS	CS		
	Zone air distribution effectiveness at conditioned analyzed	Ez						1.00	1.00		
	Primary air fraction of supply air at conditioned analyzed	Ep						60%	100%		
Results											
	Ventilation System Efficiency	Ev					**0.81**				
	Outdoor air intake required for system	Vot	cfm				**3474**				
	Outdoor air per unit floor area	Vot/As	cfm/sf				**0.54**				
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p				**14.3**				
	Outdoor air as a % of design primary supply air	Ypd	cfm				**48%**				
Detailed Calculations											
Initial Calculations for the System as a whole											
	Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	7300				
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	2814				
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.39				
Initial Calculations for individual zones											
	OA rate per unit area for zone	Raz	cfm/sf					0.06	0.06		
	OA rate per person	Rpz	cfm/p					10.00	10.00		
	Total supply air to zone (at condition being analyzed)	Vdz	cfm					6600	175		
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=		2780.0	17.9		
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=		2780	18		
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=		1.00	1.00		
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=		0.60	1.00		
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=		1.00	1.00		
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=		0.42	0.10		
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=		0.42	0.10		
System Ventilation Efficiency											
	Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=		0.81	1.28		
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**0.81**				
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.73				
Minimum outdoor air intake airflow											
	Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**3474**				
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**0.48**				
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	3861				
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.53				
OA Temp at which Min OA provides all cooling											
	OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf	=	36				

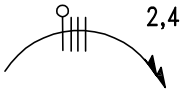
Building:							**PS - 71R Classrooms**								
System Tag/Name:							**AHU-1**								
Operating Condition Description:							**Peak Cooling and Heating Condition**								
Units (select from pull-down list)							**IP**								
Inputs for System		**Name**	**Units**					**System**							
	Floor area served by system	As	sf					45518							
	Population of area served by system (including diversity)	Ps	P		5%	diversity		1,200							
	Design primary supply fan airflow rate	Vpsd	cfm					28,310							
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf					0.12							
	OA req'd per person for system area (Weighted average)	Rps	cfm/p					10.0							
Inputs for Potentially Critical zones									**Potentially Critical Zones**						
	Zone Name			*Zone title turns purple italic for critical zone(s)*					***6 to 8 Grade Classroom***	**2nd Grade Classroom**	**Kindergarten Classroom**				
	Zone Tag								**402**	**215**	**402**				
	Space type			Select from pull-down list					**Classrooms (ages 5–8)**	**Classrooms (ages 5–8)**	**Classrooms (ages 5–8)**				
	Floor Area of zone	Az	sf						756	685	950				
	Design population of zone	Pz	P	(default value listed; may be overridden)					36	32	45				
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm						1,500	1500	2190				
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?			Select from pull-down list or leave blank if N/A					DFDD	DFDD	DFDD				
	Local recirc. air % representative of ave system return air	Er													
Inputs for Operating Condition Analyzed															
	Percent of total design airflow rate at conditioned analyzed	Ds	%					100%	100%	100%	100%				
	Air distribution type at conditioned analyzed			Select from pull-down list					CS	CS	CS				
	Zone air distribution effectiveness at conditioned analyzed	Ez							1.00	1.00	1.00				
	Primary air fraction of supply air at conditioned analyzed	Ep							60%	100%	100%				
Results															
	Ventilation System Efficiency	Ev						**1.00**							
	Outdoor air intake required for system	Vot	cfm					**16326**							
	Outdoor air per unit floor area	Vot/As	cfm/sf					**0.36**							
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p					**13.6**							
	Outdoor air as a % of design primary supply air	Ypd	cfm					**58%**							
Detailed Calculations															
Initial Calculations for the System as a whole															
	Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	28310								
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	17462								
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.62								
Initial Calculations for individual zones															
	OA rate per unit area for zone	Raz	cfm/sf						0.12	0.12	0.12				
	OA rate per person	Rpz	cfm/p						10.00	10.00	10.00				
	Total supply air to zone (at condition being analyzed)	Vdz	cfm						1500	1500	2190				
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=			450.7	402.2	564.0				
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=			451	402	564				
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=			1.00	1.00	1.00				
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=			0.60	1.00	1.00				
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=			1.00	1.00	1.00				
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=			0.30	0.27	0.26				
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=			0.30	0.27	0.26				
System Ventilation Efficiency															
	Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=			1.07	1.35	1.36				
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**1.07**								
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.85								
Minimum outdoor air intake airflow															
	Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**16326**								
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**0.58**								
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	20555								
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.73								
OA Temp at which Min OA provides all cooling															
	OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf	=	43								

Building:							**PS - 71R Classrooms**				
System Tag/Name:							**AHU-2**				
Operating Condition Description:							**Peak Cooling and Heating Condition**				
Units (select from pull-down list)							**IP**				
Inputs for System		**Name**	**Units**				**System**				
	Floor area served by system	As	sf				11449				
	Population of area served by system (including diversity)	Ps	P	5%	diversity		414				
	Design primary supply fan airflow rate	Vpsd	cfm				8,200				
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf				0.12				
	OA req'd per person for system area (Weighted average)	Rps	cfm/p				10.0				
Inputs for Potentially Critical zones								**Potentially Critical Zones**			
	Zone Name		*Zone title turns purple italic for critical zone(s)*					***6 to 8 Grade Classroom***	**4th Grade Classroom**	**3rd Grade Classroom**	
	Zone Tag							**332**	**234**	**229**	
	Space type		Select from pull-down list					**Classrooms (ages 5–8)**	**Classrooms (ages 5–8)**	**Classrooms (ages 5–8)**	
	Floor Area of zone	Az	sf					756	730	720	
	Design population of zone	Pz	P	(default value listed; may be overridden)				36	36	45	
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm					1,500	1500	1490	
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					DFDD	DFDD	DFDD	
	Local recirc. air % representative of ave system return air	Er									
Inputs for Operating Condition Analyzed											
	Percent of total design airflow rate at conditioned analyzed	Ds	%				100%	100%	100%	100%	
	Air distribution type at conditioned analyzed		Select from pull-down list					CS	CS	CS	
	Zone air distribution effectiveness at conditioned analyzed	Ez						1.00	1.00	1.00	
	Primary air fraction of supply air at conditioned analyzed	Ep						60%	100%	100%	
Results											
	Ventilation System Efficiency	Ev					**1.00**				
	Outdoor air intake required for system	Vot	cfm				**4999**				
	Outdoor air per unit floor area	Vot/As	cfm/sf				**0.44**				
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p				**12.1**				
	Outdoor air as a % of design primary supply air	Ypd	cfm				**61%**				
Detailed Calculations											
Initial Calculations for the System as a whole											
	Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	8200				
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	5514				
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.67				
Initial Calculations for individual zones											
	OA rate per unit area for zone	Raz	cfm/sf					0.12	0.12	0.12	
	OA rate per person	Rpz	cfm/p					10.00	10.00	10.00	
	Total supply air to zone (at condition being analyzed)	Vdz	cfm					1500	1500	1490	
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=		450.7	447.6	536.4	
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=		451	448	536	
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=		1.00	1.00	1.00	
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=		0.60	1.00	1.00	
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=		1.00	1.00	1.00	
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=		0.30	0.30	0.36	
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=		0.30	0.30	0.36	
System Ventilation Efficiency											
	Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=		1.10	1.37	1.31	
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**1.10**				
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.79				
Minimum outdoor air intake airflow											
	Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**4999**				
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**0.61**				
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	6980				
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.85				
OA Temp at which Min OA provides all cooling											
	OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf	=	44				

Building:							**PS-71R Cafeteria**				
System Tag/Name:							**AHU-3**				
Operating Condition Description:							**Peak Cooling and Heating Condition**				
Units (select from pull-down list)							**IP**				
Inputs for System		**Name**	**Units**				**System**				
	Floor area served by system	As	sf				8353				
	Population of area served by system (including diversity)	Ps	P	0%	diversity		378				
	Design primary supply fan airflow rate	Vpsd	cfm				13,000				
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf				0.18				
	OA req'd per person for system area (Weighted average)	Rps	cfm/p				7.5				
Inputs for Potentially Critical zones								**Potentially Critical Zones**			
	Zone Name	*Zone title turns purple italic for critical zone(s)*						***Cafeteria***	**Kitchen**		
	Zone Tag							**130**	**B03**		
	Space type		Select from pull-down list					**Cafeteria/fast-food dining**	**Cafeteria/fast-food dining**		
	Floor Area of zone	Az	sf					6,053	2300		
	Design population of zone	Pz	P	(default value listed; may be overridden)				367	11		
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm					10,050	2950		
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					DFDD	DFDD		
	Local recirc. air % representative of ave system return air	Er									
Inputs for Operating Condition Analyzed											
	Percent of total design airflow rate at conditioned analyzed	Ds	%				100%	100%	100%		
	Air distribution type at conditioned analyzed		Select from pull-down list					CS	CS		
	Zone air distribution effectiveness at conditioned analyzed	Ez						1.00	1.00		
	Primary air fraction of supply air at conditioned analyzed	Ep						60%	100%		
Results											
	Ventilation System Efficiency	Ev					**0.82**				
	Outdoor air intake required for system	Vot	cfm				**5304**				
	Outdoor air per unit floor area	Vot/As	cfm/sf				**0.64**				
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p				**14.0**				
	Outdoor air as a % of design primary supply air	Ypd	cfm				**41%**				
Detailed Calculations											
Initial Calculations for the System as a whole											
	Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	13000				
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	4339				
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.33				
Initial Calculations for individual zones											
	OA rate per unit area for zone	Raz	cfm/sf					0.18	0.18		
	OA rate per person	Rpz	cfm/p					7.50	7.50		
	Total supply air to zone (at condition being analyzed)	Vdz	cfm					10050	2950		
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=		3842.0	496.5		
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=		3842	497		
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=		1.00	1.00		
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=		0.60	1.00		
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=		1.00	1.00		
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=		0.38	0.17		
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=		0.38	0.17		
System Ventilation Efficiency											
	Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=		0.82	1.17		
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**0.82**				
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	0.77				
Minimum outdoor air intake airflow											
	Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**5304**				
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**0.41**				
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	5651				
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	0.43				
OA Temp at which Min OA provides all cooling											
	OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf	=	30				

Building:							**PS-71R Gymatorium**				
System Tag/Name:							**AHU-4**				
Operating Condition Description:							**Peak Cooling and Heating Condition**				
Units (select from pull-down list)							**IP**				
Inputs for System		**Name**	**Units**				**System**				
	Floor area served by system	As	sf				5000				
	Population of area served by system (including diversity)	Ps	P		0%	diversity	338				
	Design primary supply fan airflow rate	Vpsd	cfm				5,100				
	OA req'd per unit area for system (Weighted average)	Ras	cfm/sf				0.06				
	OA req'd per person for system area (Weighted average)	Rps	cfm/p				10.0				
Inputs for Potentially Critical zones								**Potentially Critical Zones**			
	Zone Name		*Zone title turns purple italic for critical zone(s)*					**Gymatorium**	***Upper Level***		
	Zone Tag							**102**	**102**		
	Space type		Select from pull-down list					**Music/theater/ dance**	**Music/theater/ dance**		
	Floor Area of zone	Az	sf					3,614	1386		
	Design population of zone	Pz	P	(default value listed; may be overridden)				214	124		
	Design total supply to zone (primary plus local recirculated)	Vdzd	cfm					3,775	1325		
	Induction Terminal Unit, Dual Fan Dual Duct or Transfer Fan?		Select from pull-down list or leave blank if N/A					DFDD	DFDD		
	Local recirc. air % representative of ave system return air	Er									
Inputs for Operating Condition Analyzed											
	Percent of total design airflow rate at conditioned analyzed	Ds	%				100%	100%	100%		
	Air distribution type at conditioned analyzed		Select from pull-down list					CS	CS		
	Zone air distribution effectiveness at conditioned analyzed	Ez						1.00	1.00		
	Primary air fraction of supply air at conditioned analyzed	Ep						60%	100%		
Results											
	Ventilation System Efficiency	Ev					**0.72**				
	Outdoor air intake required for system	Vot	cfm				**5090**				
	Outdoor air per unit floor area	Vot/As	cfm/sf				**1.02**				
	Outdoor air per person served by system (including diversity)	Vot/Ps	cfm/p				**15.1**				
	Outdoor air as a % of design primary supply air	Ypd	cfm				**100%**				
Detailed Calculations											
Initial Calculations for the System as a whole											
	Primary supply air flow to system at conditioned analyzed	Vps	cfm	=	VpdDs	=	5100				
	UncorrectedOA requirement for system	Vou	cfm	=	Rps Ps + Ras As	=	3680				
	Uncorrected OA req'd as a fraction of primary SA	Xs		=	Vou / Vps	=	0.72				
Initial Calculations for individual zones											
	OA rate per unit area for zone	Raz	cfm/sf					0.06	0.06		
	OA rate per person	Rpz	cfm/p					10.00	10.00		
	Total supply air to zone (at condition being analyzed)	Vdz	cfm					3775	1325		
	Unused OA req'd to breathing zone	Vbz	cfm	=	Rpz Pz + Raz Az	=		2356.8	1323.2		
	Unused OA requirement for zone	Voz	cfm	=	Vbz/Ez	=		2357	1323		
	Fraction of zone supply not directly recirc. from zone	Fa		=	Ep + (1-Ep)Er	=		1.00	1.00		
	Fraction of zone supply from fully mixed primary air	Fb		=	Ep	=		0.60	1.00		
	Fraction of zone OA not directly recirc. from zone	Fc		=	1-(1-Ez)(1-Ep)(1-Er)	=		1.00	1.00		
	Unused OA fraction required in supply air to zone	Zd		=	Voz / Vdz	=		0.62	1.00		
	Unused OA fraction required in primary air to zone	Zp		=	Voz / Vpz	=		0.62	1.00		
System Ventilation Efficiency											
	Zone Ventilation Efficiency (App A Method)	Evz		=	(Fa + FbXs - FcZ) / Fa	=		0.81	0.72		
	System Ventilation Efficiency (App A Method)	Ev		=	min (Evz)	=	**0.72**				
	Ventilation System Efficiency (Table 6.3 Method)	Ev		=	Value from Table 6.3	=	n/a				
Minimum outdoor air intake airflow											
	Outdoor Air Intake Flow required to System	Vot	cfm	=	Vou / Ev	=	**5090**				
	OA intake req'd as a fraction of primary SA	Y		=	Vot / Vps	=	**1.00**				
	Outdoor Air Intake Flow required to System (Table 6.3 Method)	Vot	cfm	=	Vou / Ev	=	n/a				
	OA intake req'd as a fraction of primary SA (Table 6.3 Method)	Y		=	Vot / Vps	=	n/a				
OA Temp at which Min OA provides all cooling											
	OAT below which OA Intake flow is @ minimum		Deg F	=	{(Tp-dTsf)-(1-Y)*(Tr+dTrf	=	55				

POWER & SYSTEMS SYMBOL LIST

SYMBOL	DESCRIPTION
	CONDUIT AND WIRE RUN CONCEALED IN FLOOR, CEILING OR WALL. HASH MARKS DENOTE NUMBER OF WIRES IF MORE THAN TWO ARE REQUIRED. ARROWS DENOTE HOMERUNS OF PARTICULAR CIRCUITS, MINIMUM 2#12 THHN/THWN IN 3/4" CONDUIT. ALL BRANCH CIRCUITS FOR 120V IF GREATER THAN 100 FEET SHALL BE ONE SIZE LARGER MINIMUM, AND FOR 277V IF MORE THAN 200 FEET ONE SIZE LARGER MINIMUM (BOTH TO MEET VOLTAGE DROP REQUIREMENTS) " " DENOTES GROUND CONDUCTOR TO MATCH CIRCUIT WIRES
PNL-1	"PNL" INDICATES PANEL DESIGNATION AND "1" INDICATES CIRCUIT NUMBER. CIRCUIT WIRE SHALL BE MINIMUM 2#12 THHN/THWN IN 3/4" CONDUIT, U.O.I. ALL COMPUTER CIRCUIT SHALL ALSO BE PROVIDED WITH A SEPARATE NEUTRAL
	LIGHTING AND POWER PANEL BOARD, FLUSH MOUNTED IN WALL WITH COVER.
	LIGHTING AND POWER PANEL BOARD, SURFACE MOUNTED ON WALL.
	SAME AS ABOVE BUT WITH GUTTER TAP.
	WIRING TROUGH/SPLICE BOX, SIZE AS REQUIRED.
S_a	SINGLE POLE TOGGLE SWITCH. SUBSCRIPT DENOTES LIGHTING FIXTURES CONTROLLED. 'K' INDCATES KEY OPERATED SWITCH. '3' INDICATES THREE-WAY SWITCH. 'PL' INDICATES WITH PILOT LIGHT SWITCH. 'OC' INDICATES INTEGRATED WITH OCCUPANCY SENSOR. 'a' INDICATES LIGHTING FIXTURES CONTROL. 'e' INDCATES CONTROL OF EMERGNECY LIGHTING FIXTURE WITHIN THE ROOM OR SPACE INDICATED. REFER TO LIGHTING DWGS FOR LOCATION OF SWITCHES.
$S_{R/L}$	THREE POSITION KEY ACTIVATED, RAISE & LOWER, CONTROL SWITCH.
$S_{MS\ WP}$	MOTOR STARTER SNAP ACTION TOGGLE SWITCH WITH THERMO OVERLOAD. "WP" INDICATES WEATHER PROOF
	DUPLEX THREE WIRE GROUNDED RECEPTACLE 20A 125V (NEMA 5-20R)

Q7.5R - Visual Performance, Artificial Direct-Indirect Lighting

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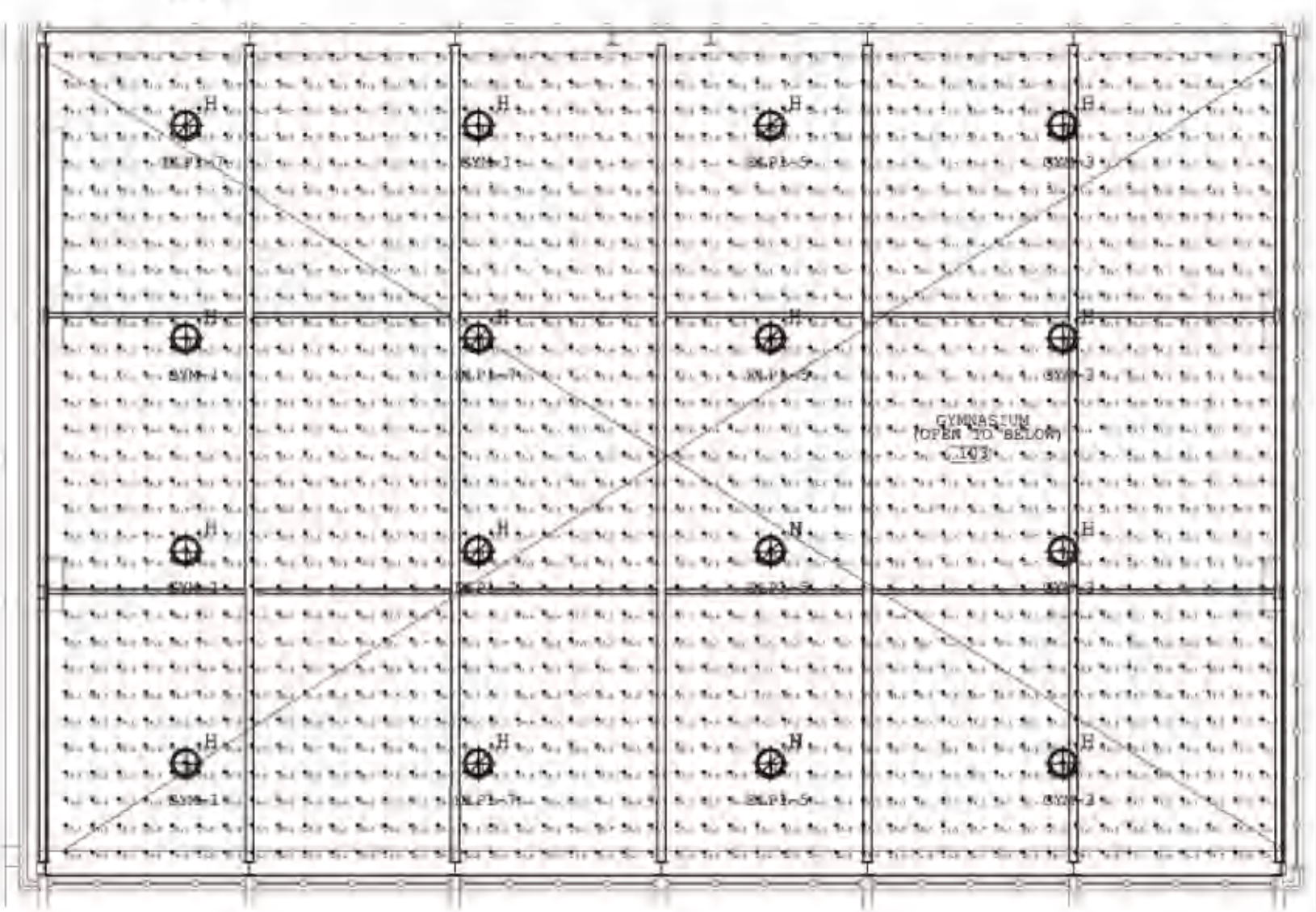
IS 71 R - LIGHTING CALCULATIONS



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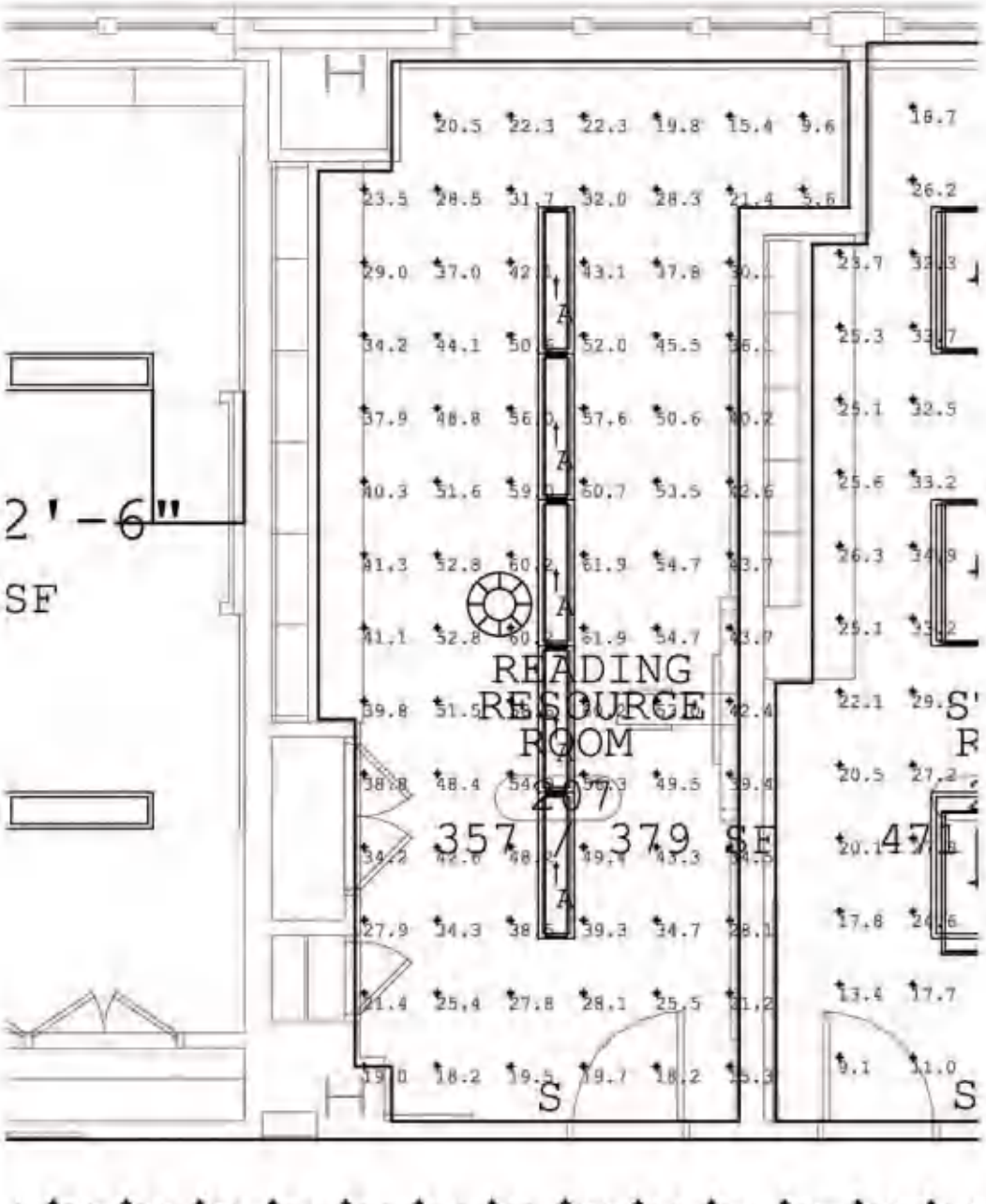
IS 71 R - LIGHTING CALCULATIONS

LPDArea_6
Room 207
Area =327.00 Sq.Ft.
Total Watts = 280
Lighting Power Density =0.856 Watts/Sq.Ft.

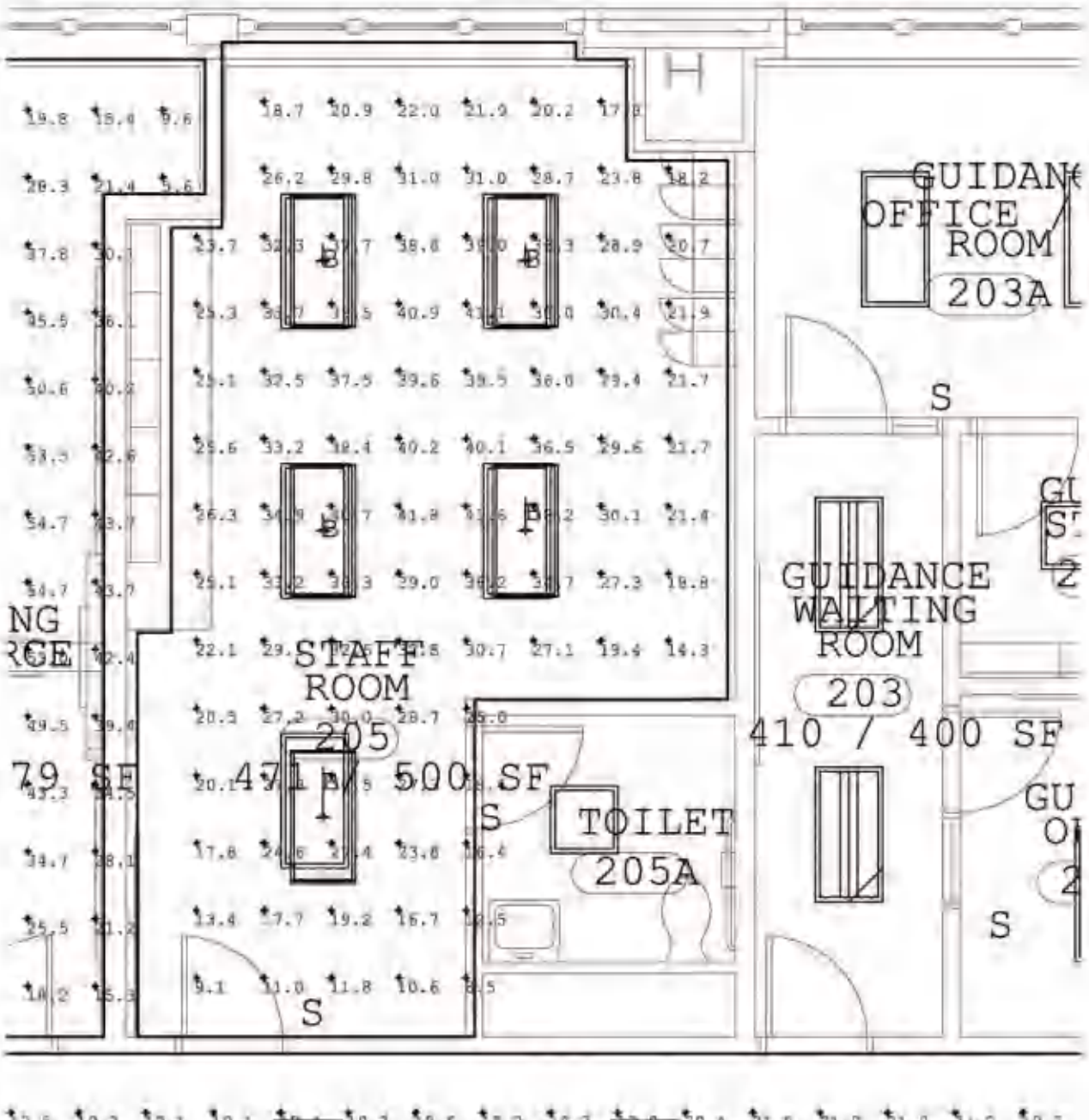
L R A T L



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

LPDArea_5
Room 205
Area =404.25 Sq.Ft.
Total Watts = 280
6 Watts/Sq.Ft. Lighting Power Density =0.693 Watts/Sq.Ft.



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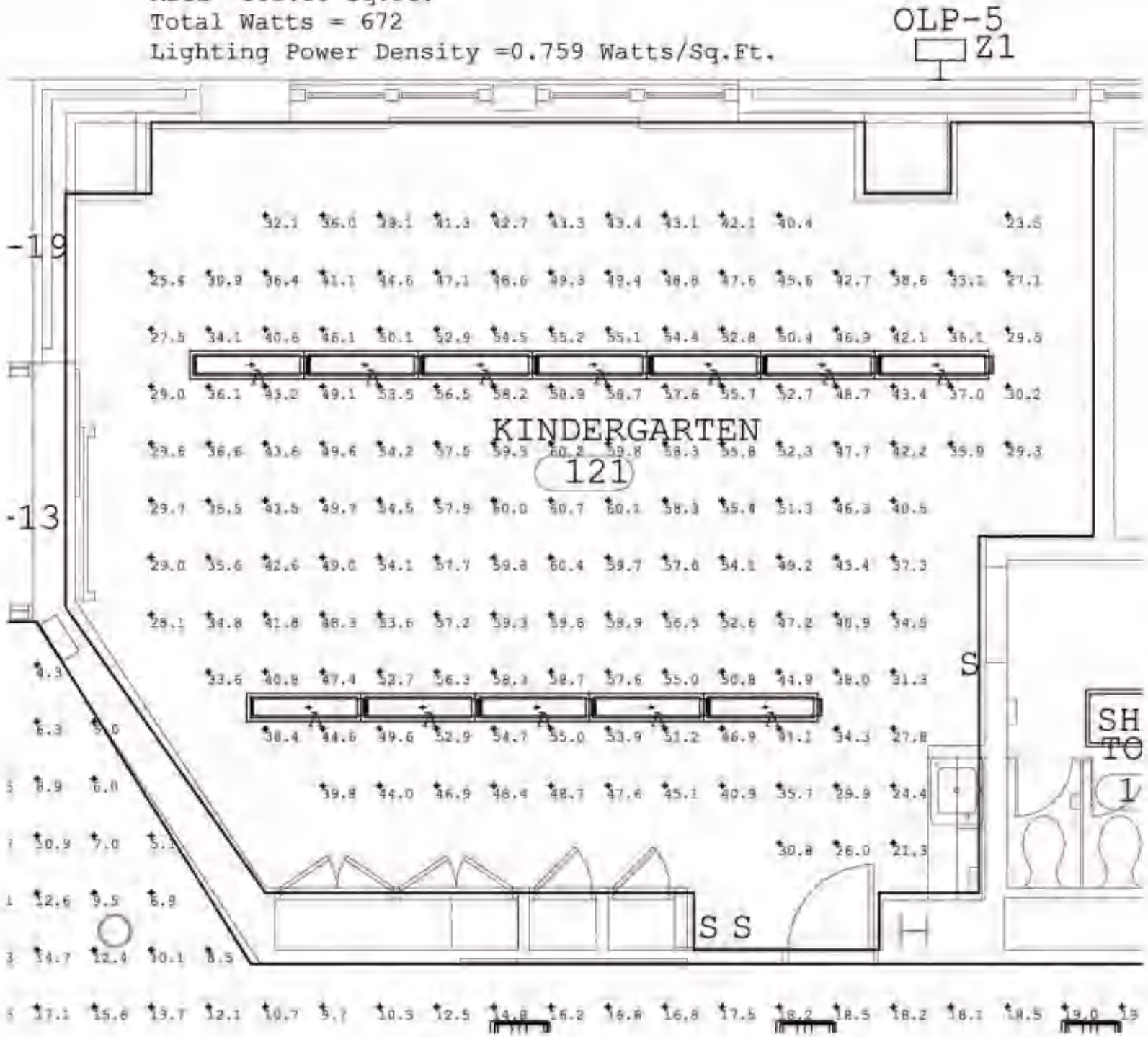
IS 71 R - LIGHTING CALCULATIONS

LPDArea

Area =885.00 Sq.Ft.
Total Watts = 672
Lighting Power Density =0.759 Watts/Sq.Ft.

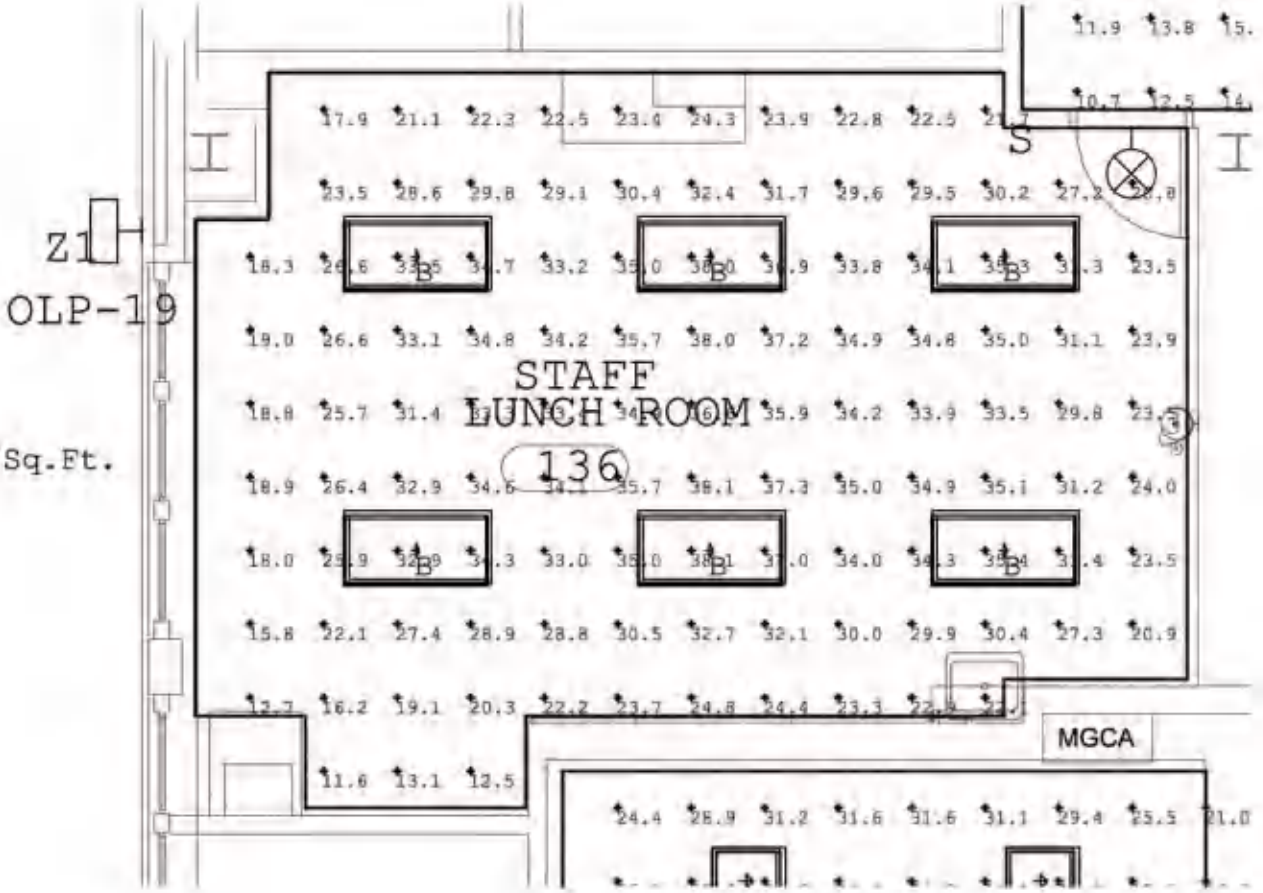


CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

LPDArea_1

Area =467.00 Sq.Ft.
Total Watts = 336
Lighting Power Density =0.719 Watts/Sq.Ft.



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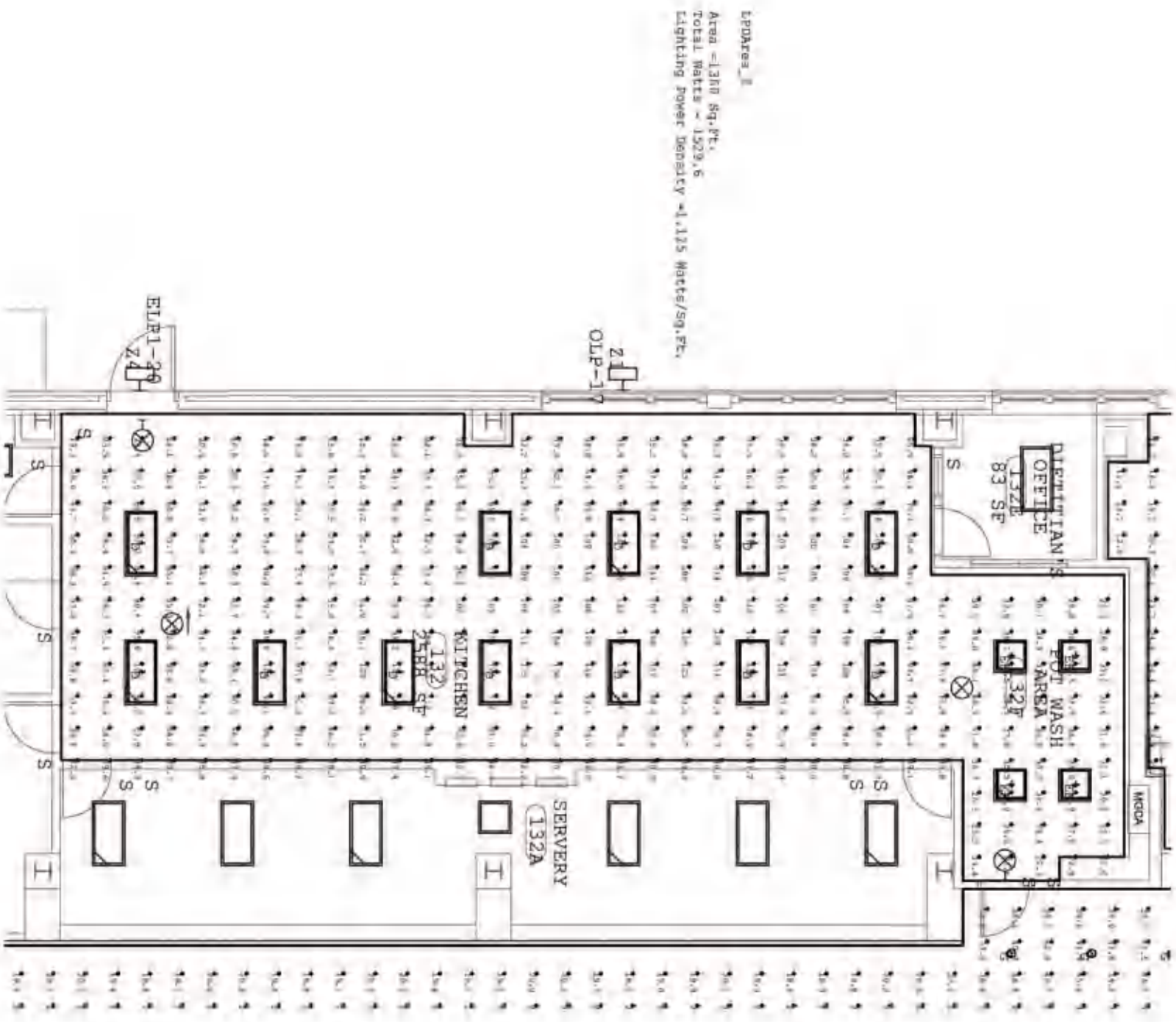
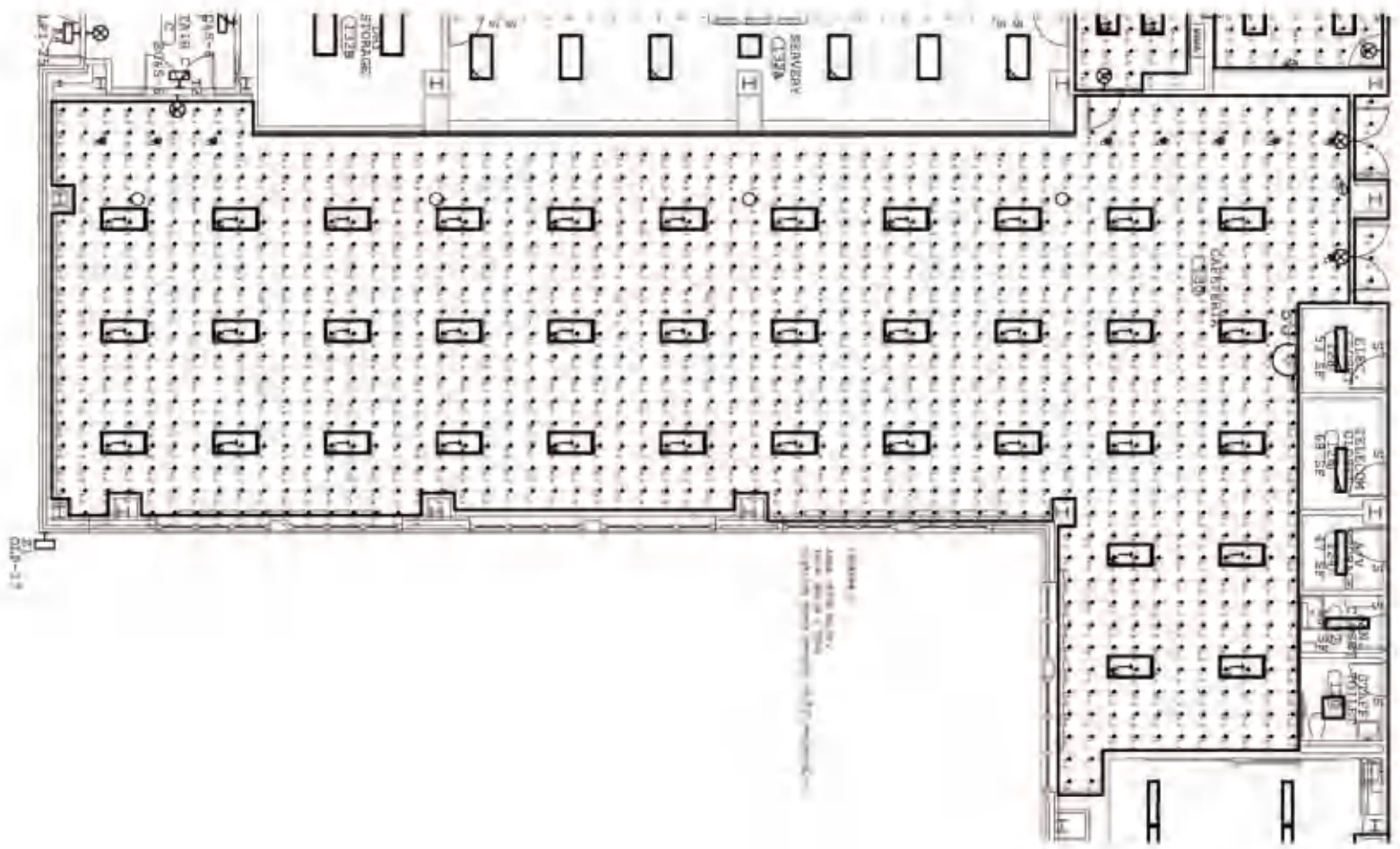
IS 71 R - LIGHTING CALCULATIONS



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



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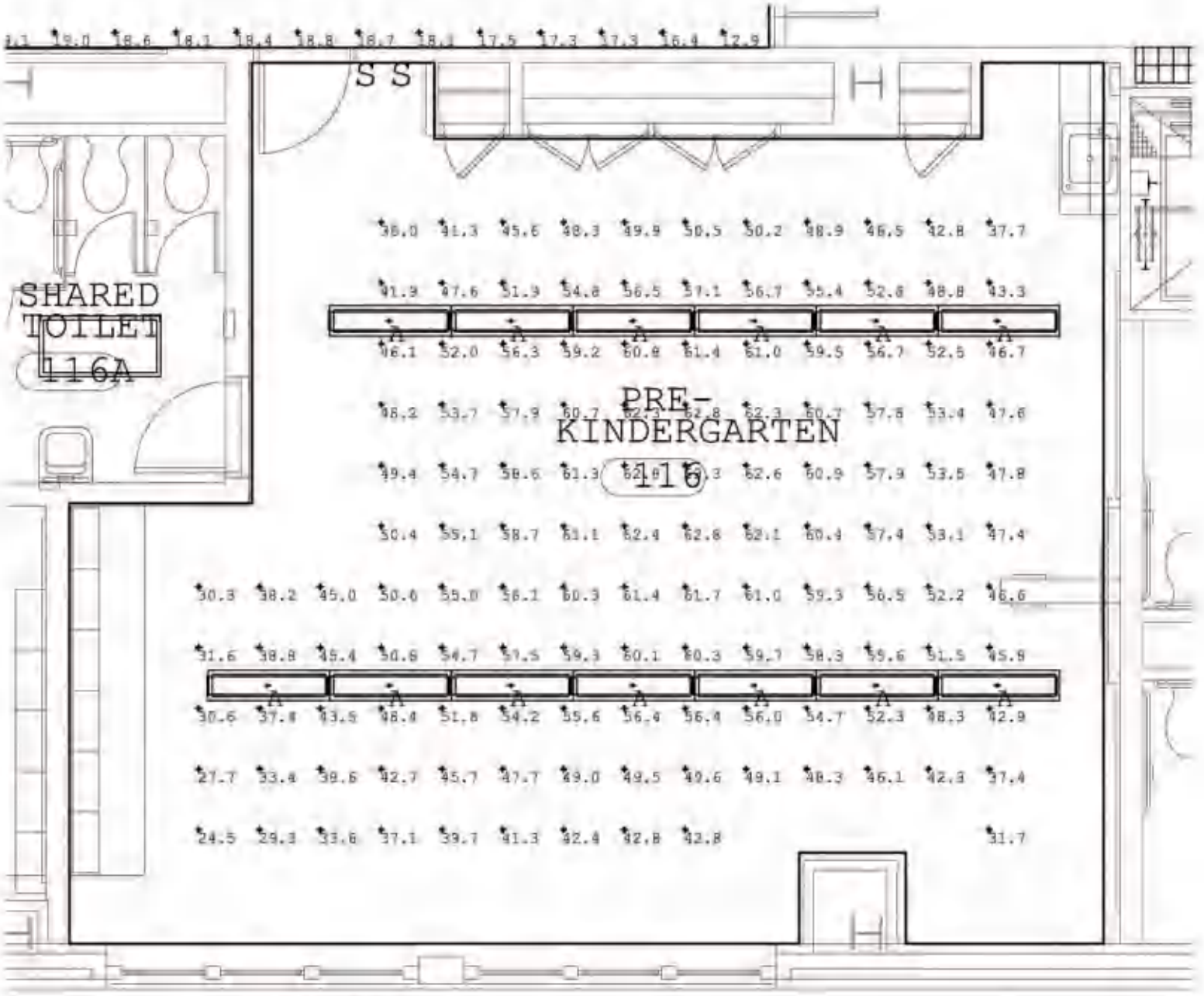
IS 71 R - LIGHTING CALCULATIONS



LPDArea_4

Area =843.50 Sq.Ft.
Total Watts = 728
Lighting Power Density =0.863 Watts/Sq.Ft.

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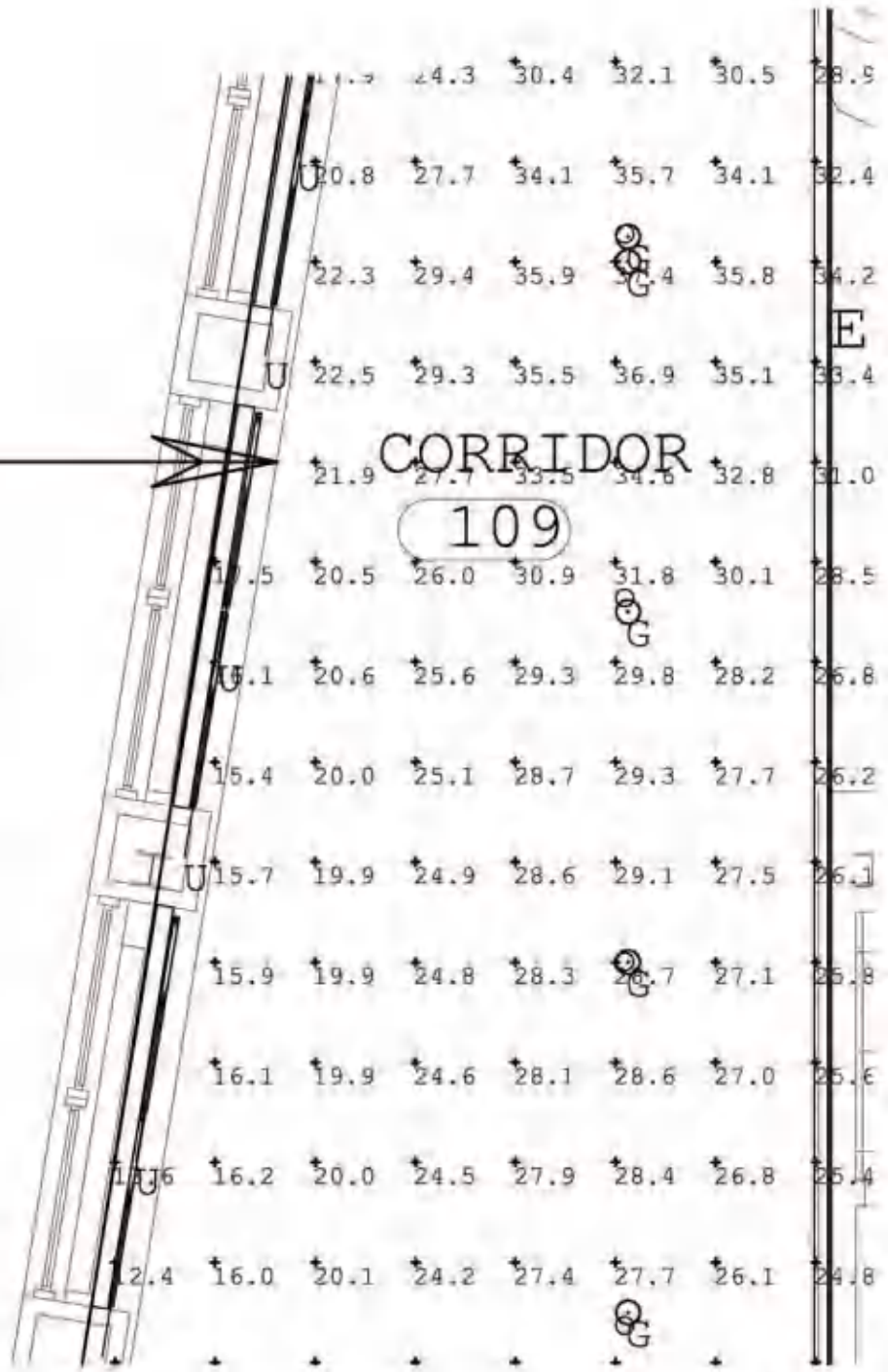
IS 71 R - LIGHTING CALCULATIONS

LPDArea_7

Area =2843 Sq.Ft.
Total Watts = 1568
Lighting Power Density =0.552 Watts/Sq.Ft.



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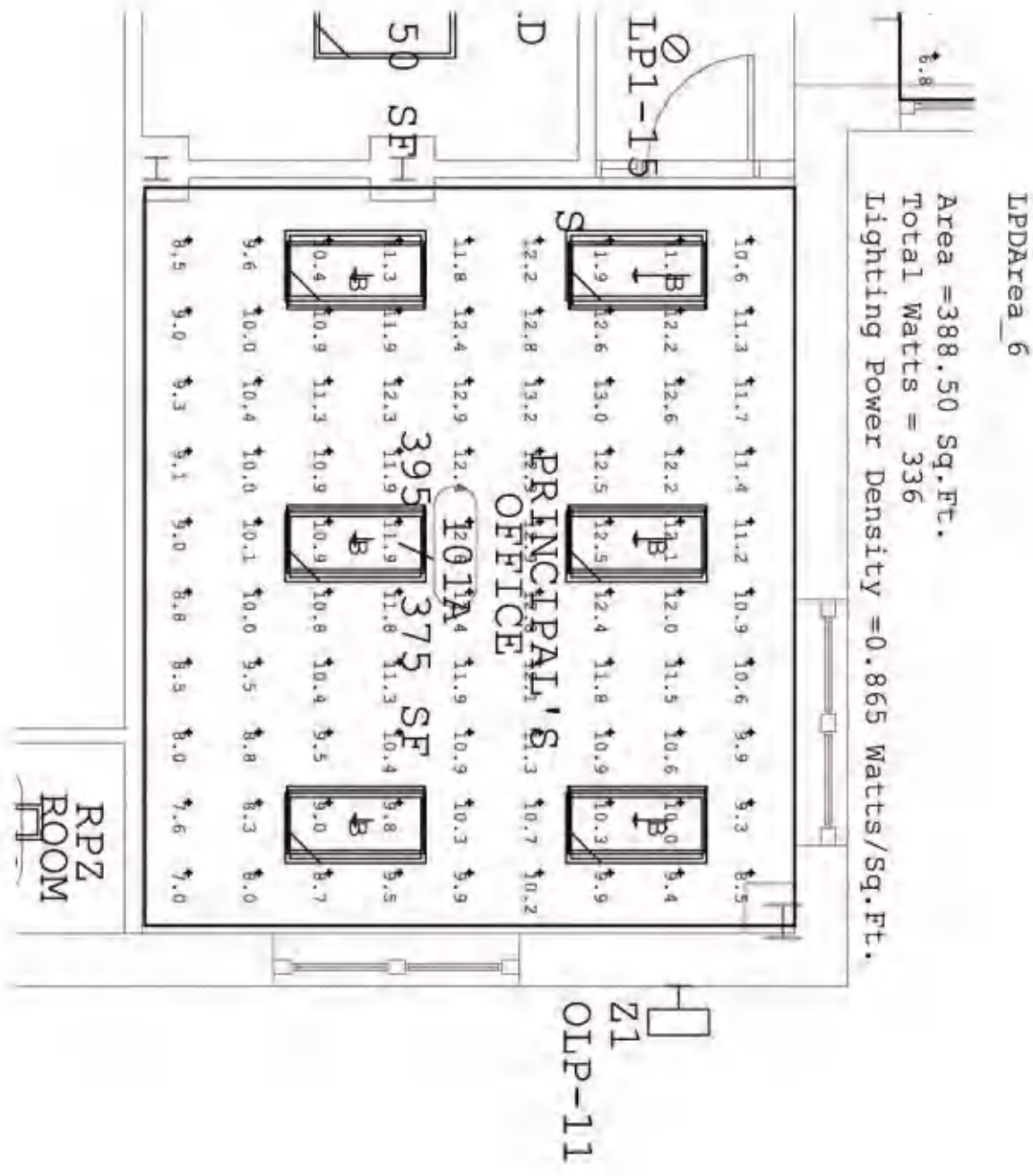
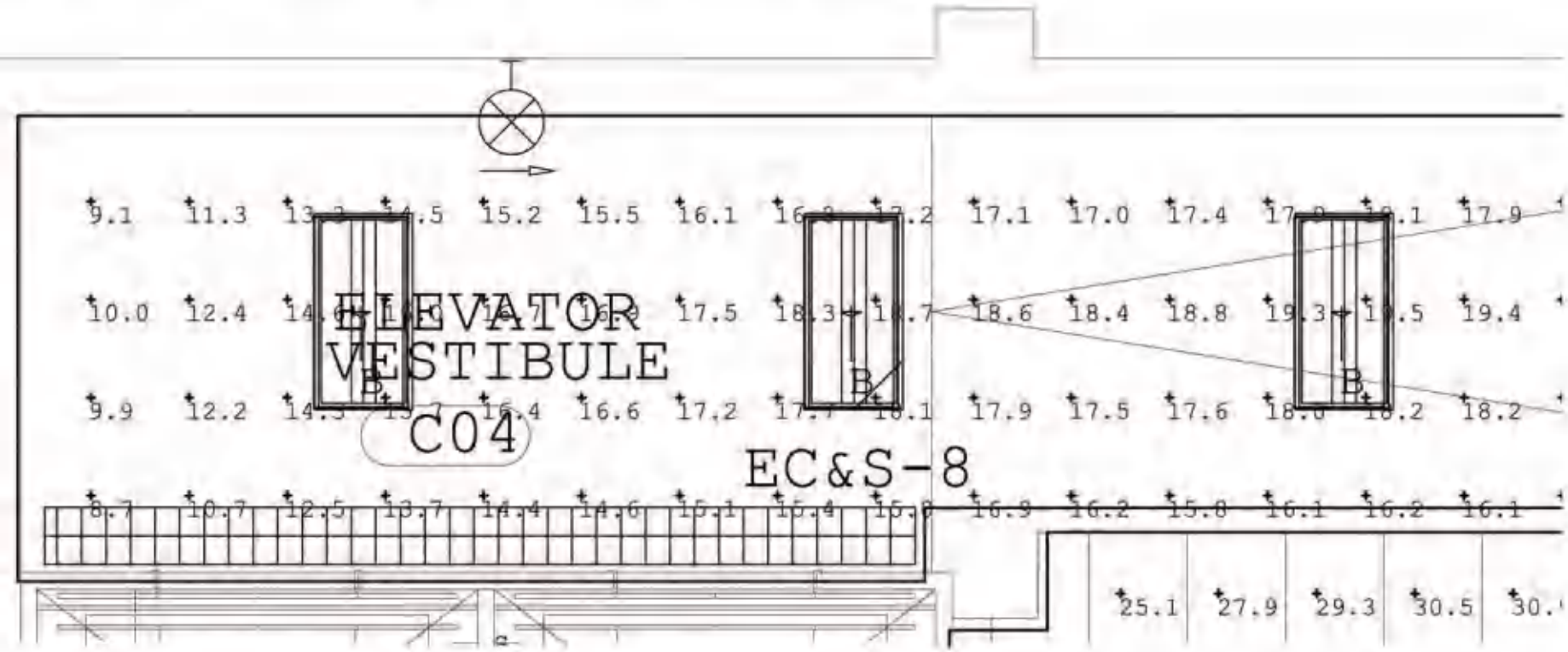
IS 71 R - LIGHTING CALCULATIONS



LPDArea

Area =435.75 Sq.Ft.
Total Watts = 280
Lighting Power Density =0.643 Watts/Sq.Ft.



CONSULTING ENGINEERS INC.

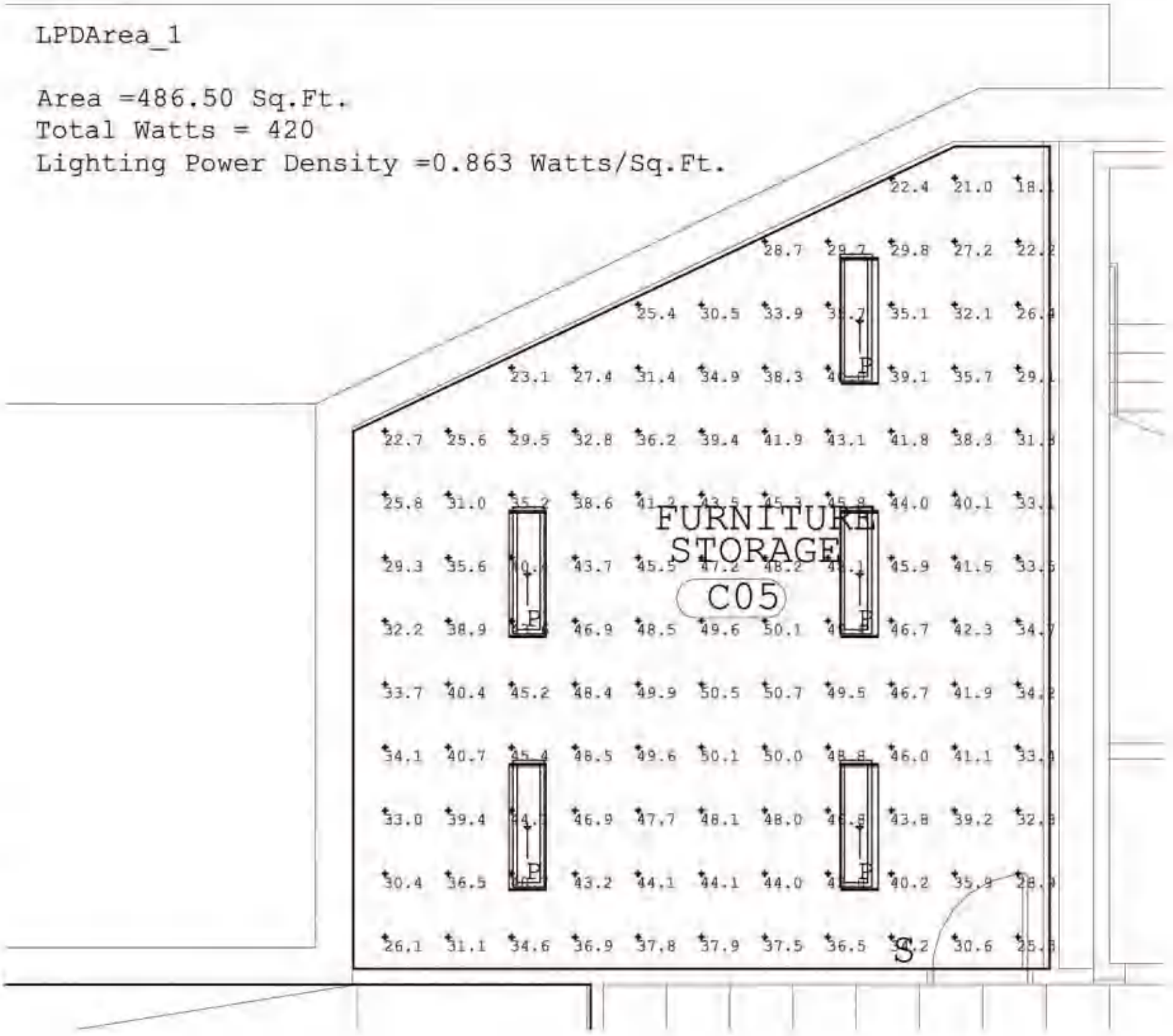
IS 71 R - LIGHTING CALCULATIONS

CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

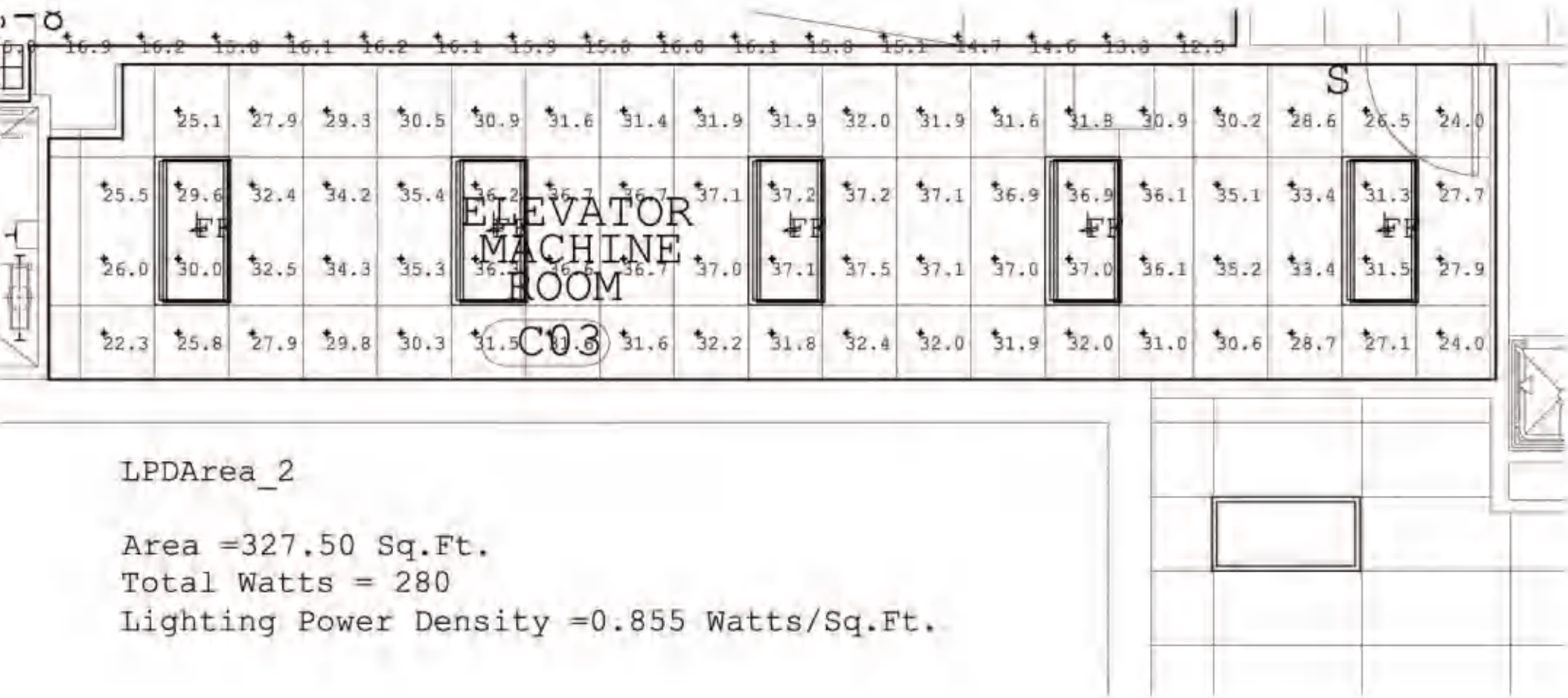
LPDArea_1

Area =486.50 Sq.Ft.
Total Watts = 420
Lighting Power Density =0.863 Watts/Sq.Ft.



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



LPDArea_2

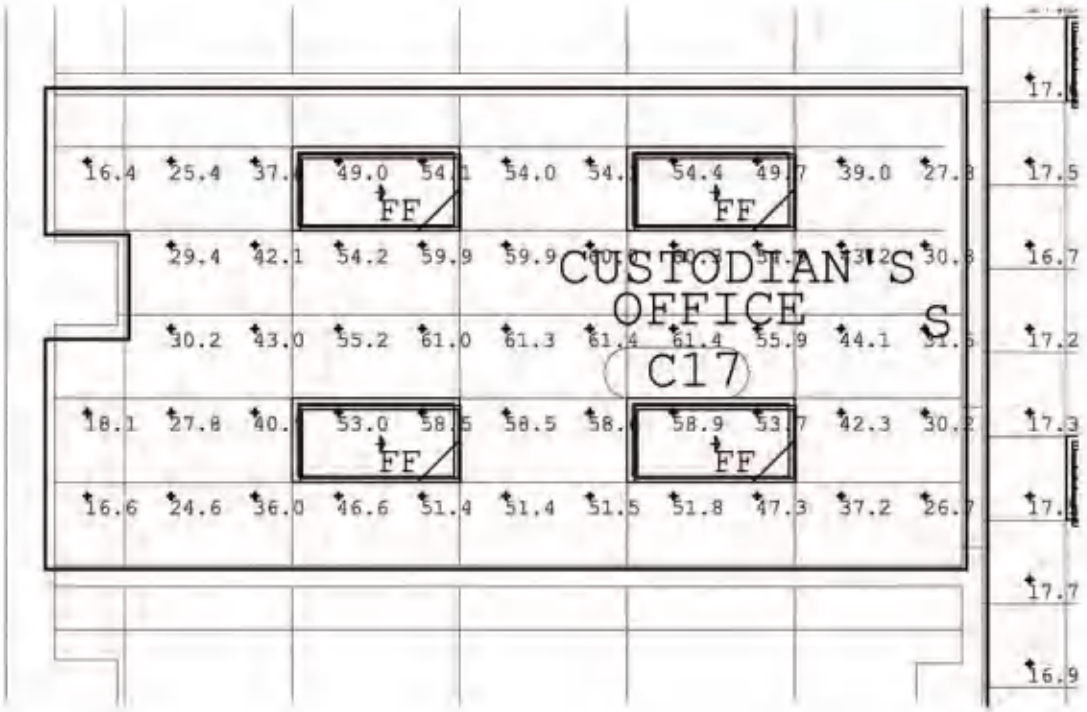
Area =327.50 Sq.Ft.
Total Watts = 280
Lighting Power Density =0.855 Watts/Sq.Ft.

CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

LPDArea_3

Area =248.00 Sq.Ft.
Total Watts = 224
Lighting Power Density =0.903 Watts/Sq.Ft.



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IS 71 R - LIGHTING CALCULATIONS

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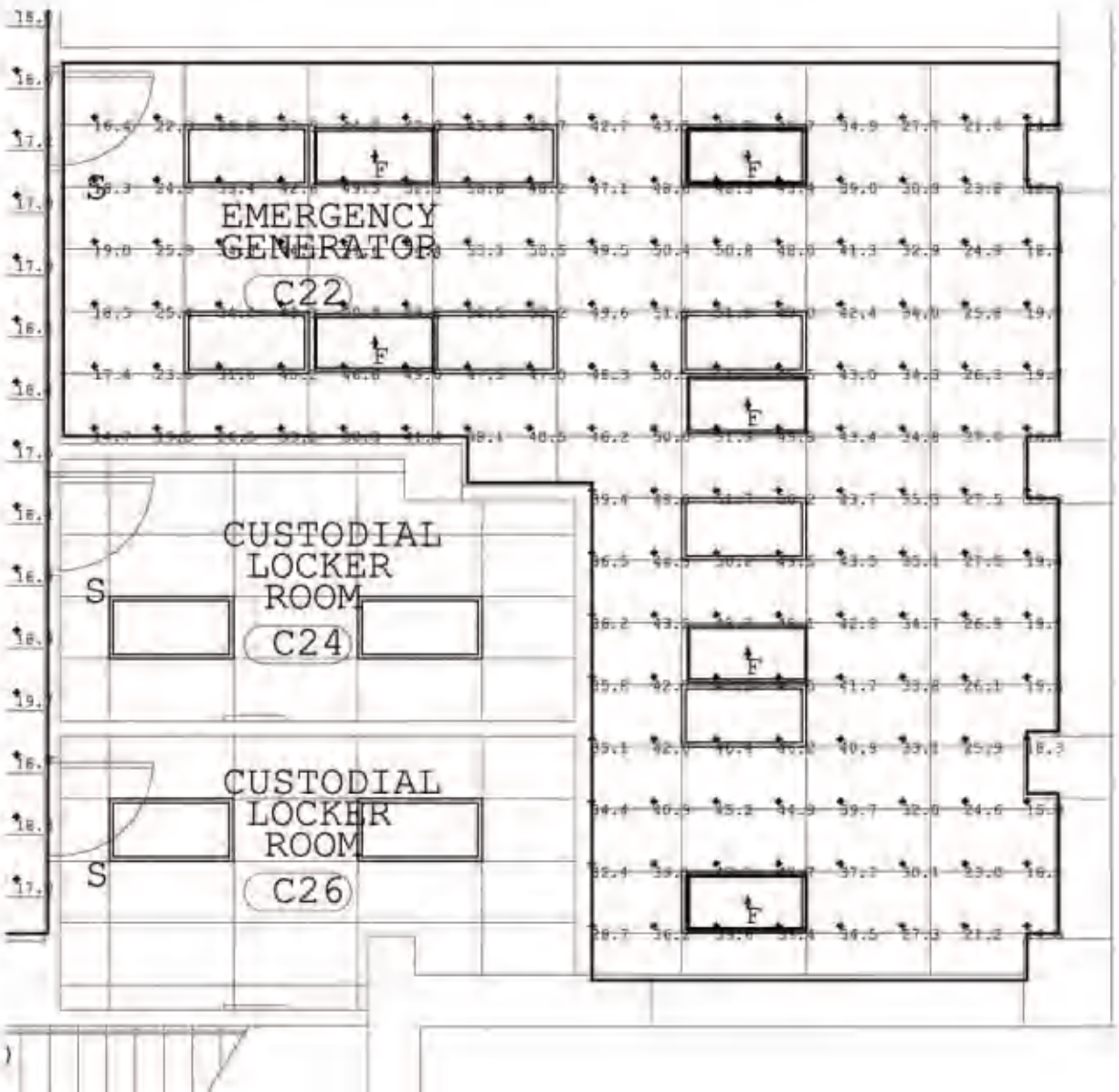
IS 71 R - LIGHTING CALCULATIONS



LPDArea_5

Area =645.00 Sq.Ft.
Total Watts = 506.4
Lighting Power Density =0.785 Watts/Sq.Ft.

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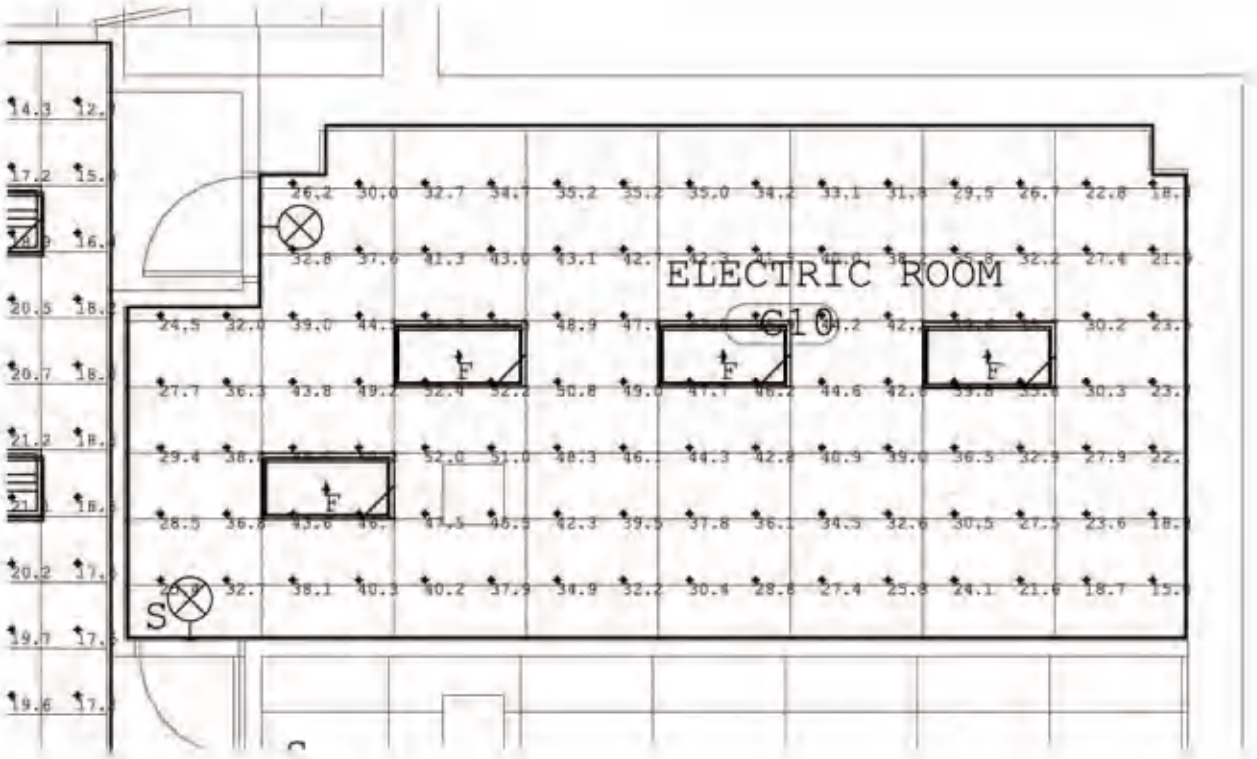
IS 71 R - LIGHTING CALCULATIONS



LPDArea_4

Area =469.50 Sq.Ft.
Total Watts = 337.6
Lighting Power Density =0.719 Watts/Sq.Ft.

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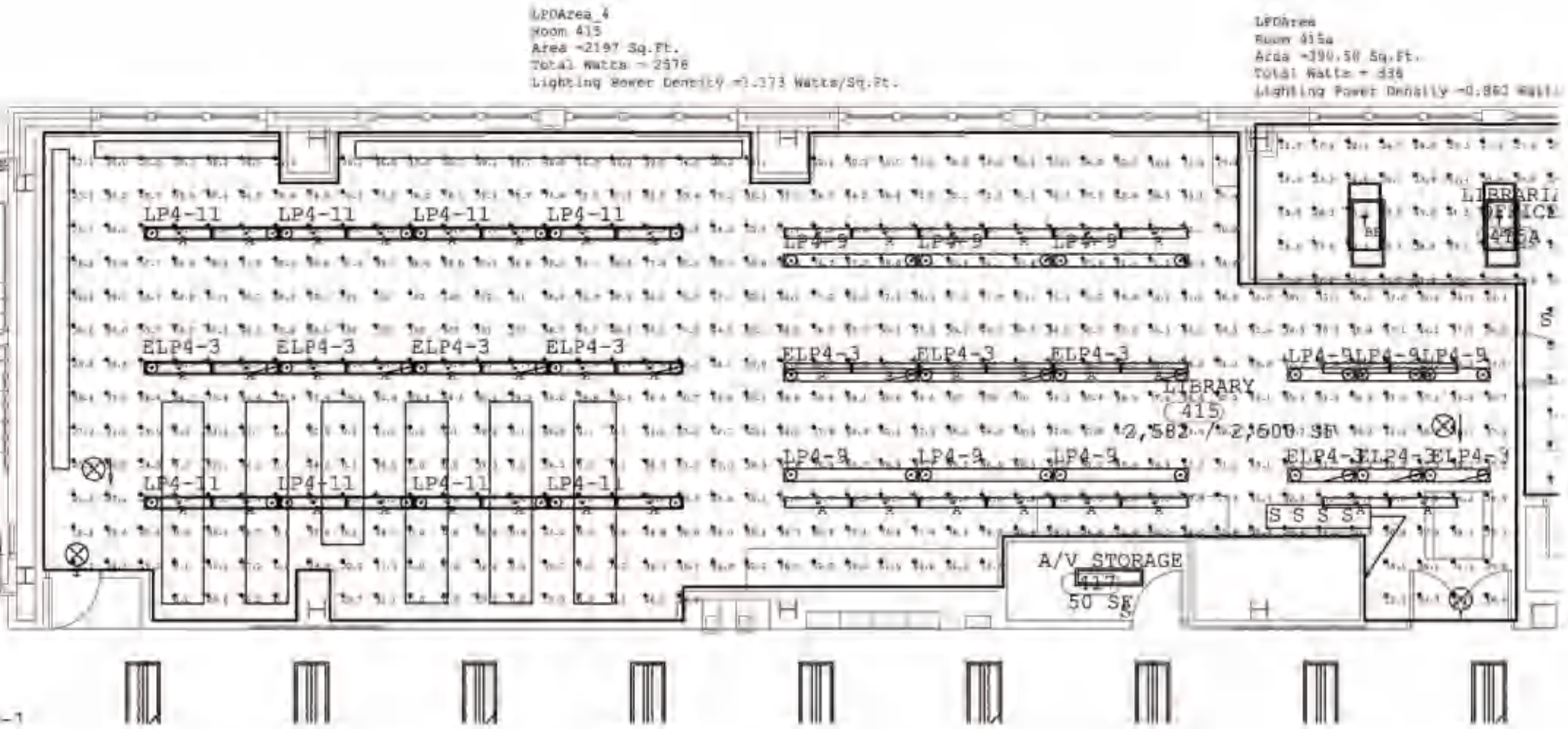
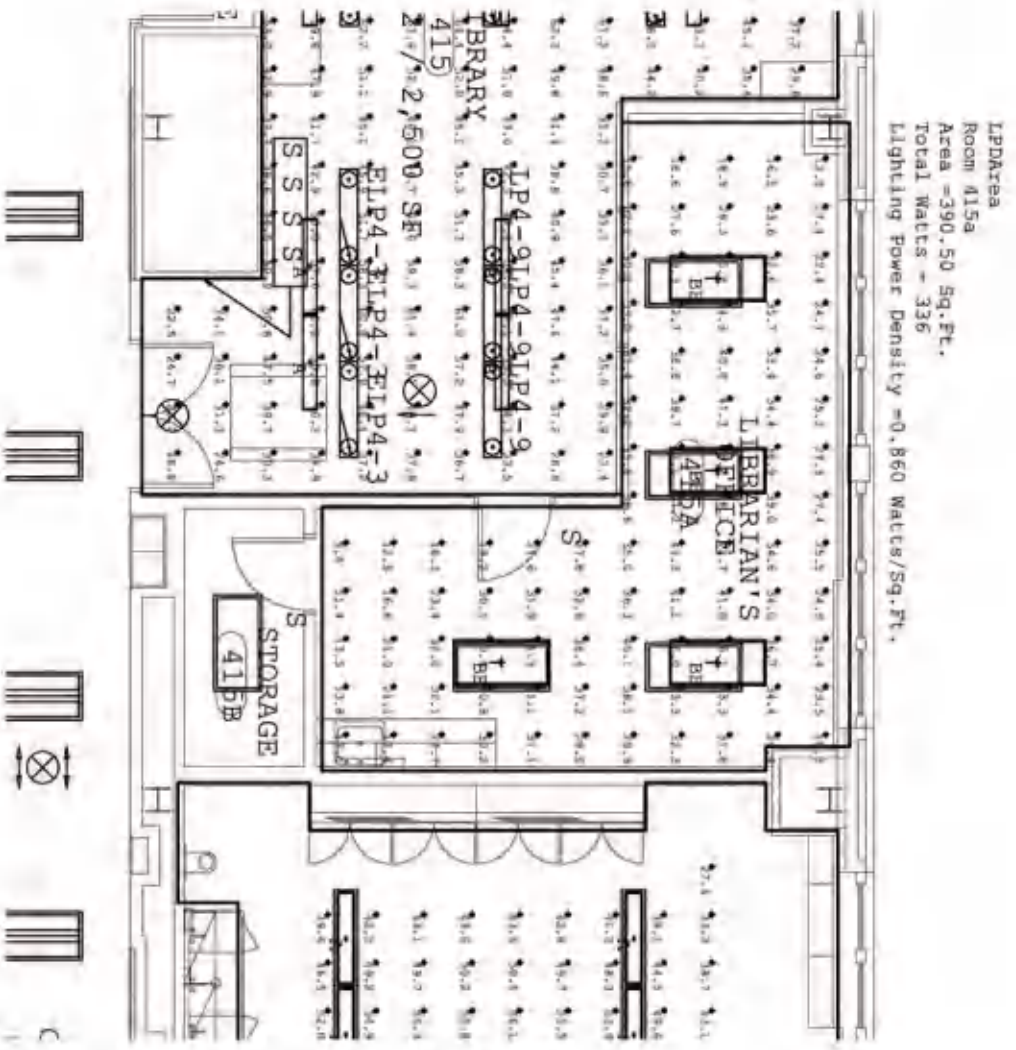
IS 71 R - LIGHTING CALCULATIONS



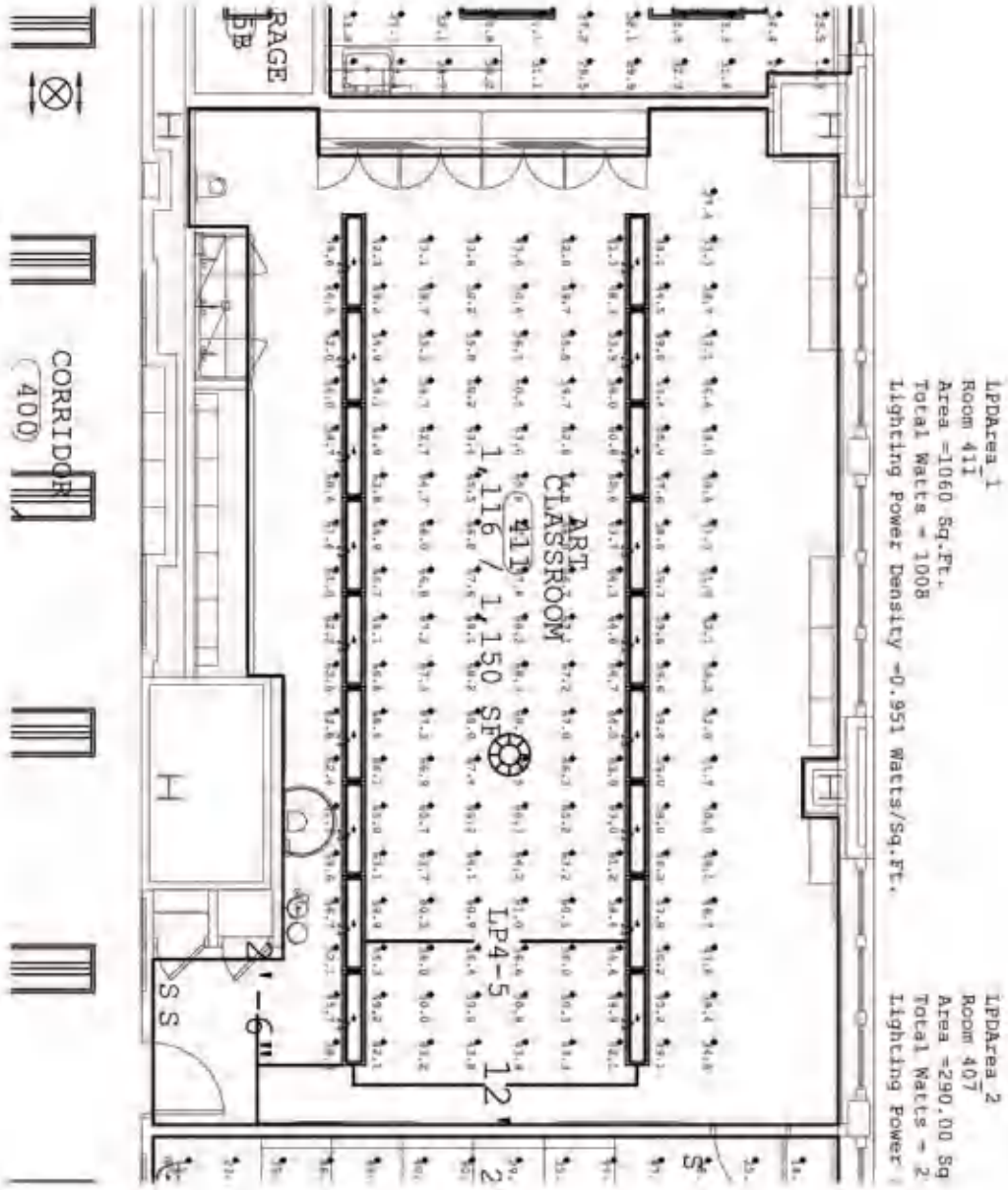
CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



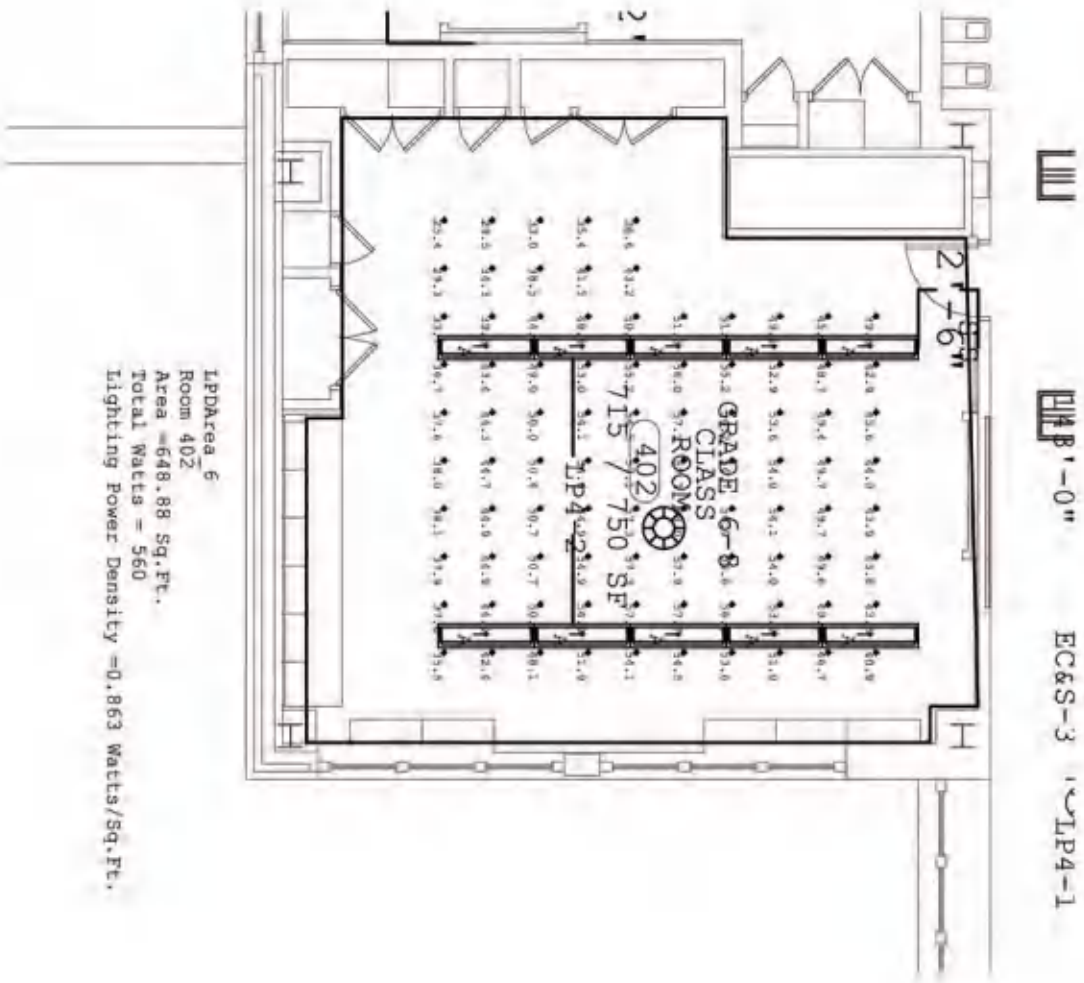
CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



LPDArea_6
Room 402
Area =648.88 Sq.Ft.
Total Watts = 560
Lighting Power Density =0.863 Watts/Sq.Ft.

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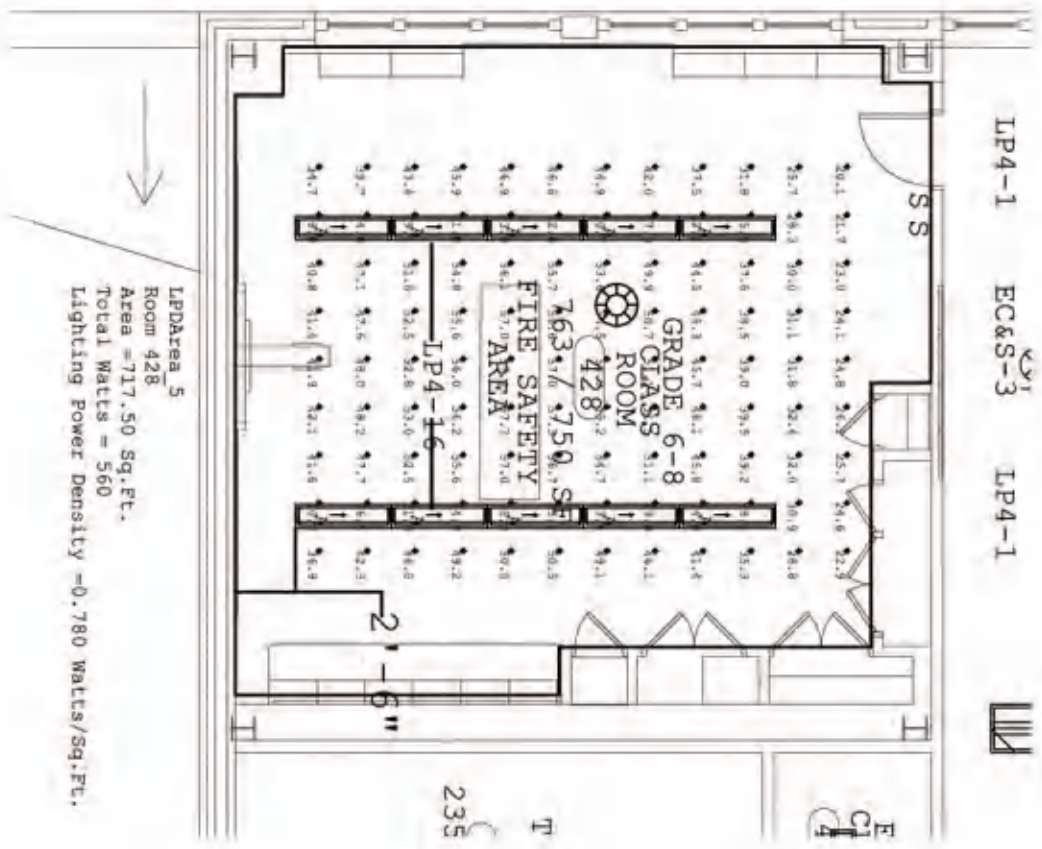
IS 71 R - LIGHTING CALCULATIONS



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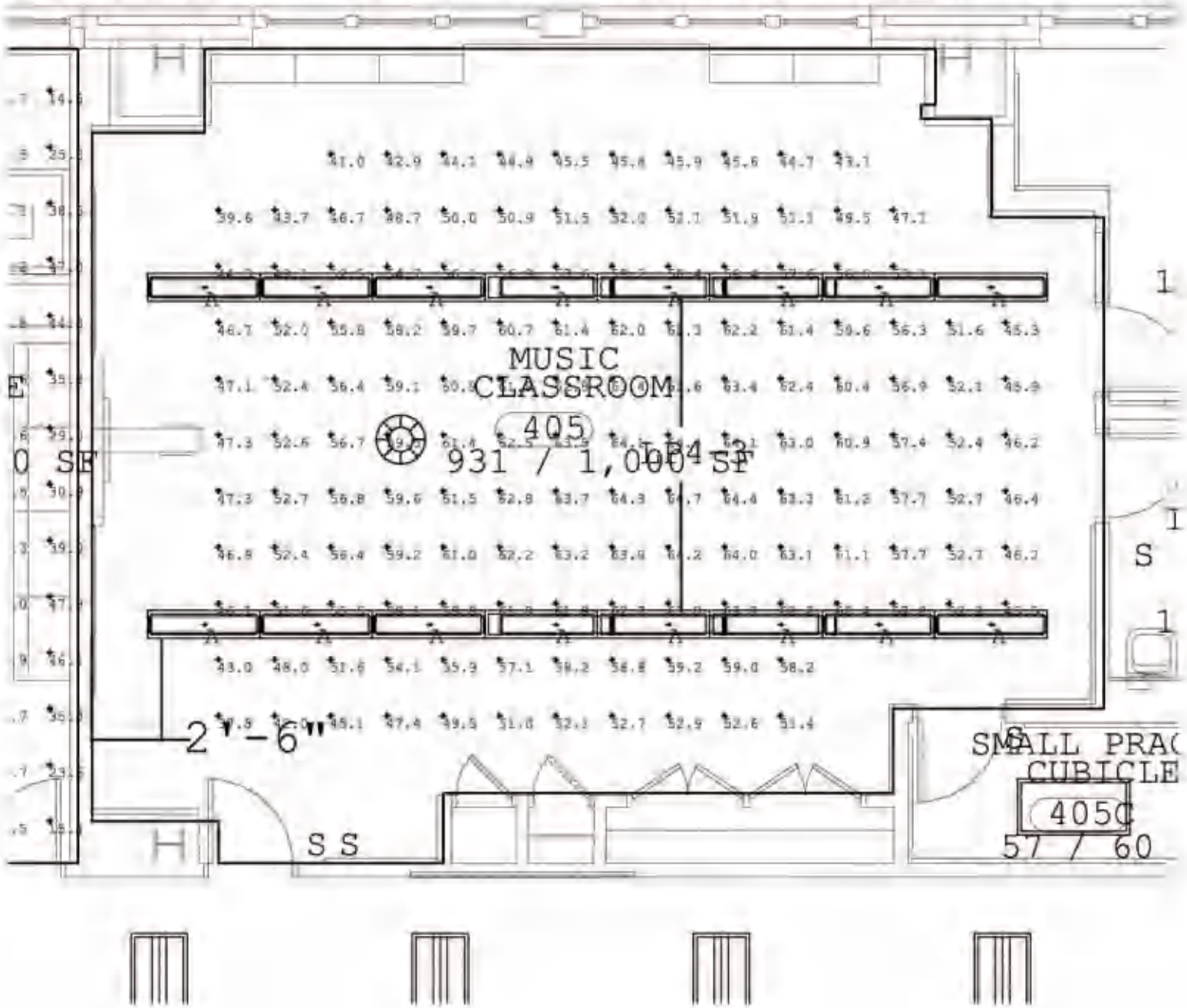
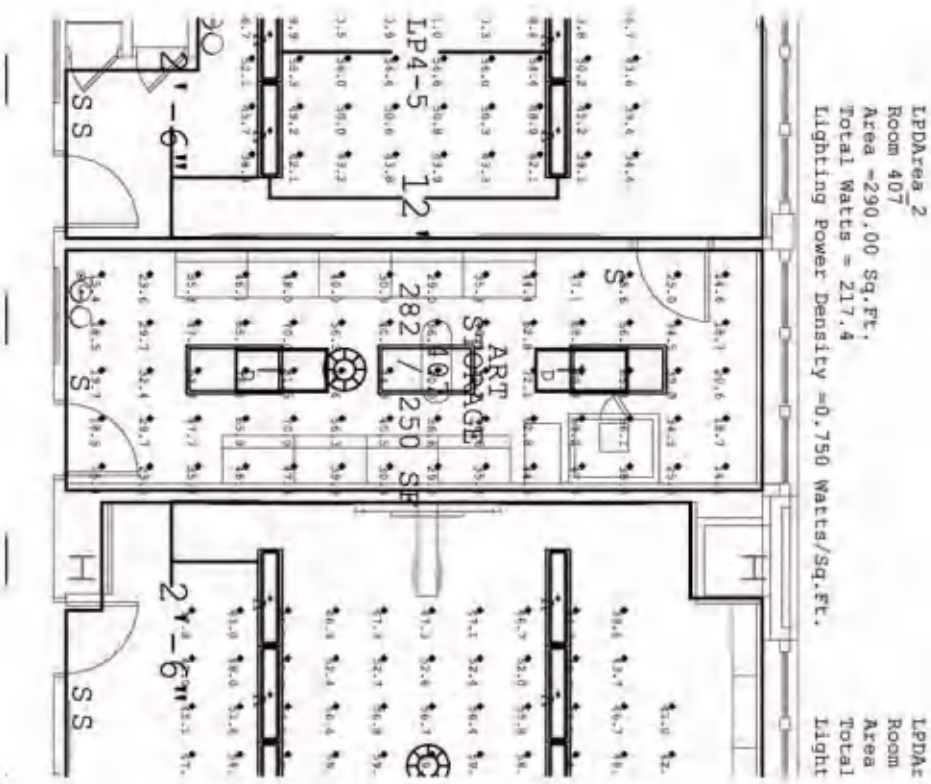
IS 71 R - LIGHTING CALCULATIONS

LPDArea_3
Room 405
Area =914.75 Sq.Ft.
Total Watts = 896
750 Watts/Sq.Ft. Lighting Power Density =0.980 Watts/Sq.Ft.



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



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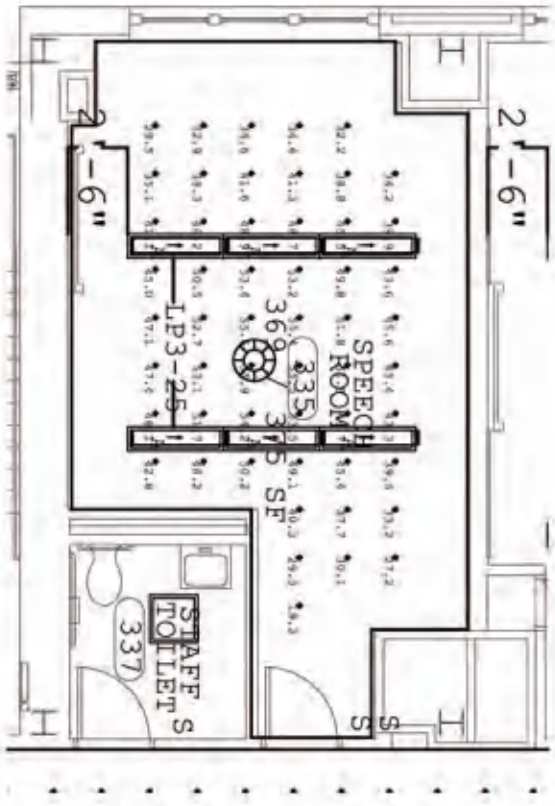
IS 71 R - LIGHTING CALCULATIONS

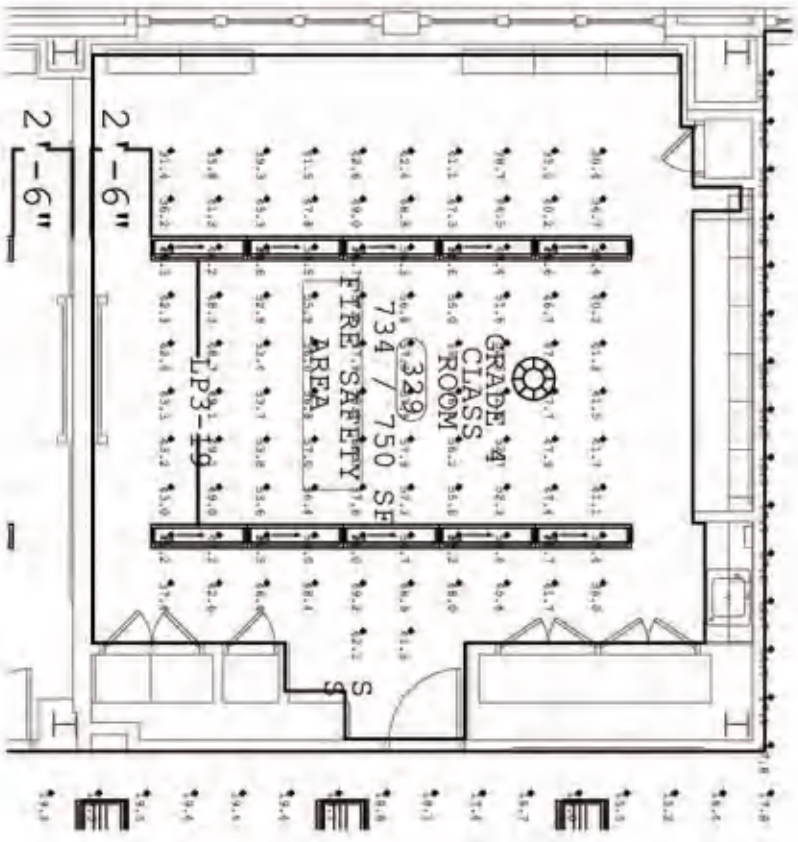
LPDArea_6
Room 335
Area =376.75 Sq.Ft.
Total Watts = 336
Lighting Power Density =0.892 Watts/Sq.Ft.



CONSULTING ENGINEERS INC.

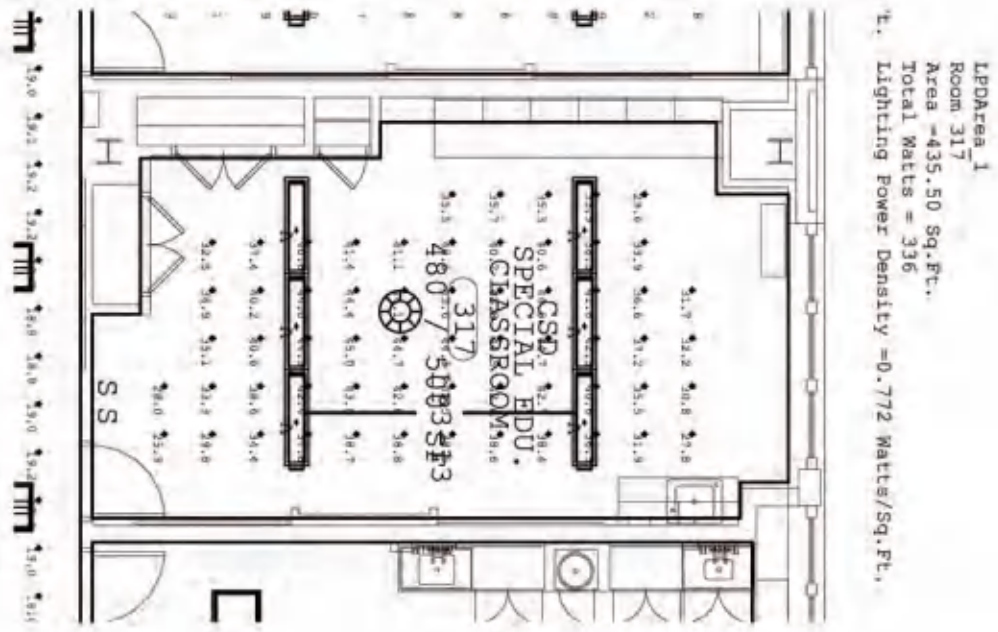
IS 71 R - LIGHTING CALCULATIONS

LPDArea_5
Room 329
Area =640.50 Sq.Ft.
Total Watts = 560
Lighting Power Density =0.874 Watts/Sq.Ft.



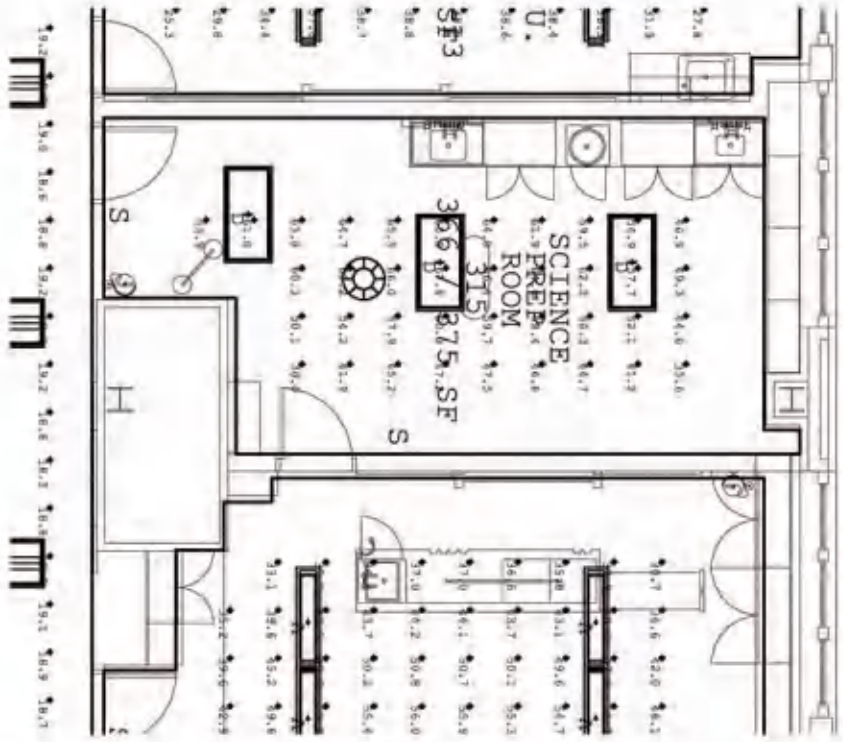
CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



CONSULTING ENGINEERS INC.

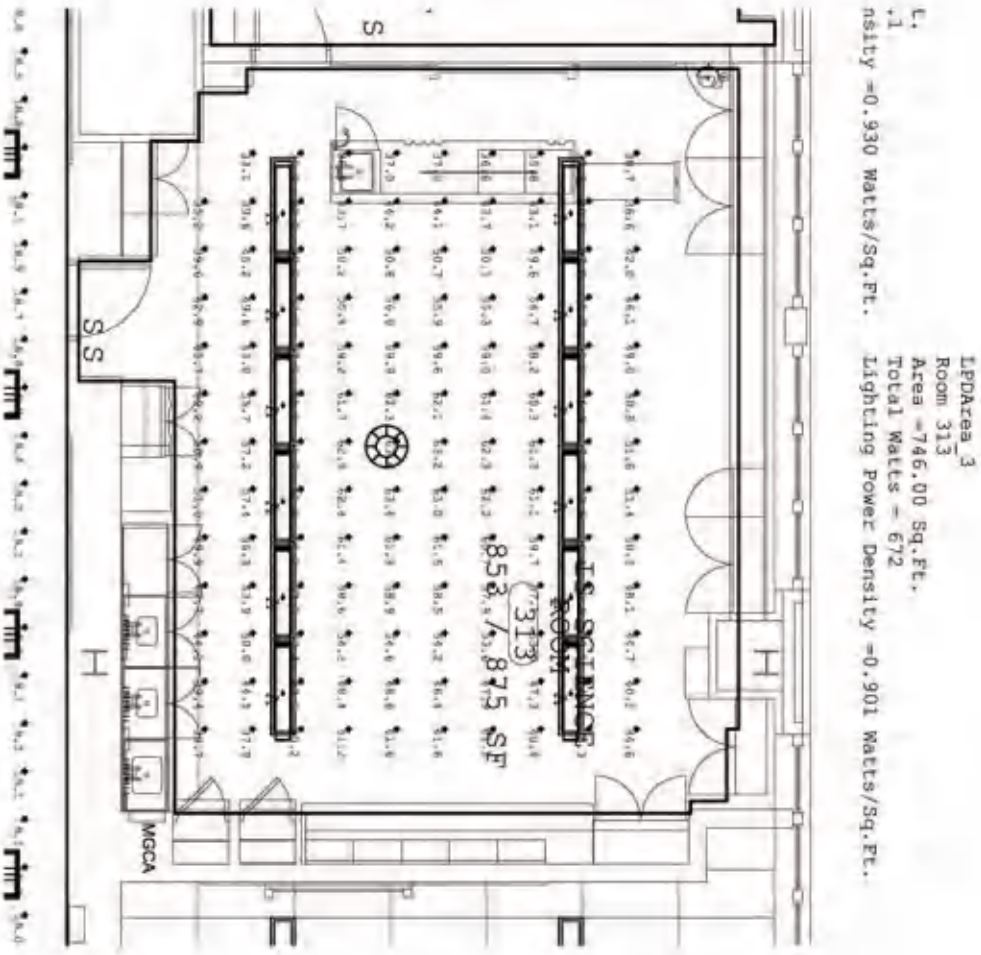
IS 71 R - LIGHTING CALCULATIONS



LPDArea_2
Room 315
Area =350.75 Sq.Ft.
Total Watts = 326.1
Watts/Sq.Ft. Lighting Power Density =0.930 Watts/Sq.Ft.

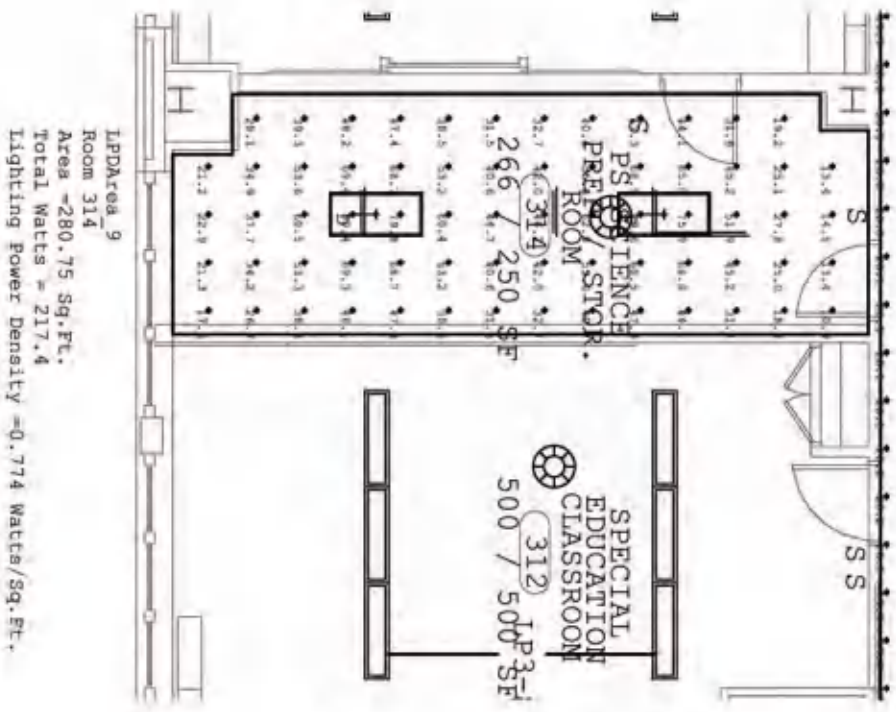
CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

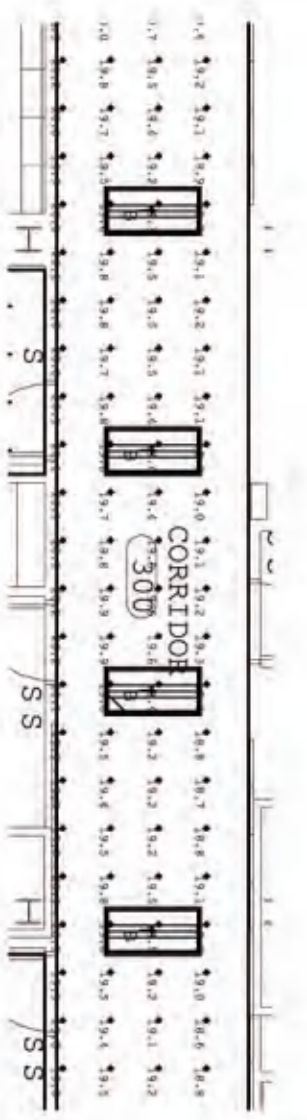


CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

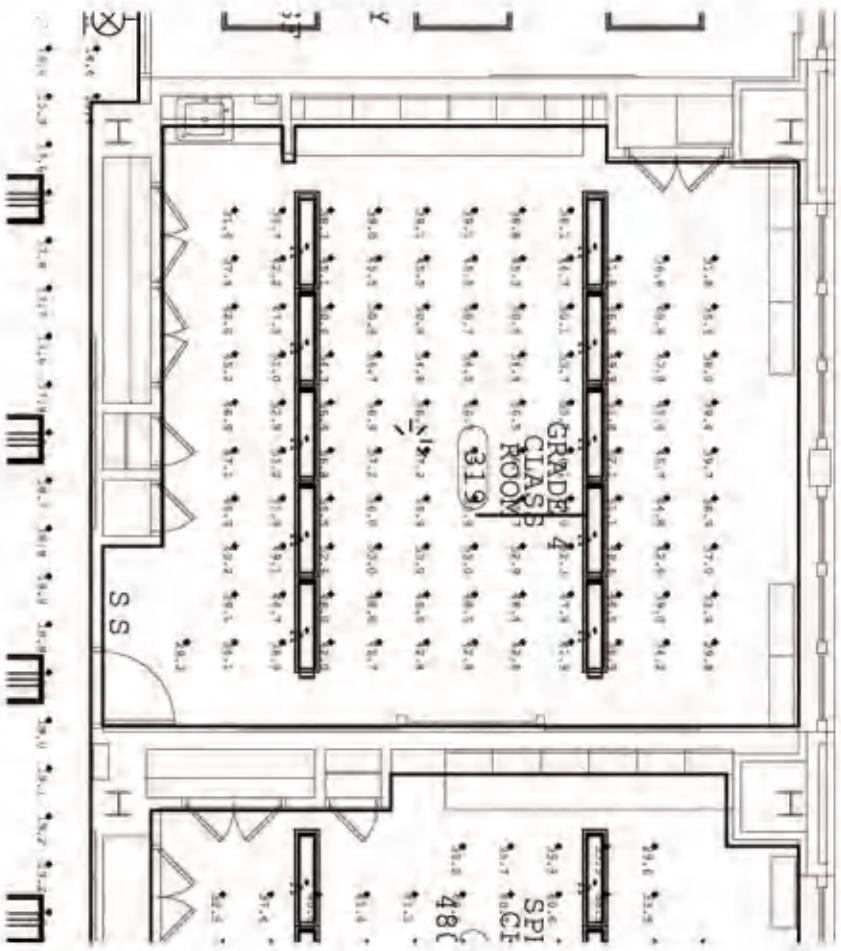


IS 71 R - LIGHTING CALCULATIONS



CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

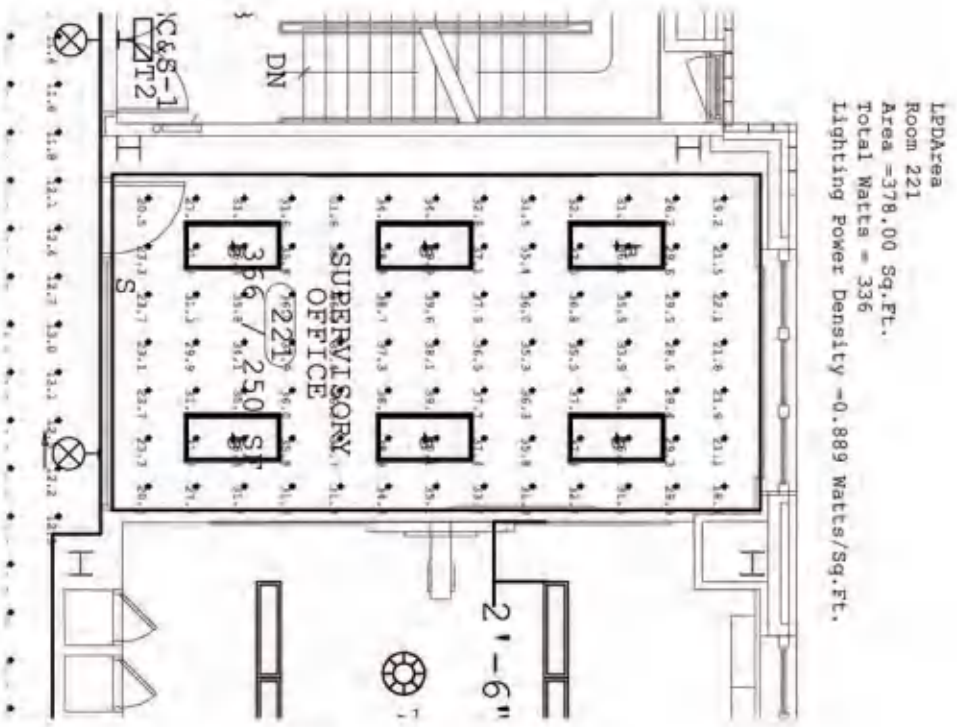


LPDArea
Room 319
Area =668.50 Sq.Ft.
Total Watts = 560
Lighting Power Density =0.838 Watts/Sq.Ft.

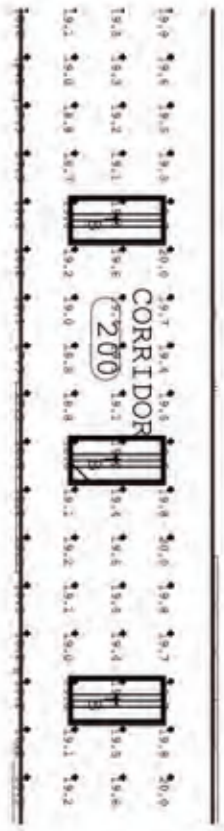
LPDArea_1
Room 317
Area =435.50 Sq.Ft
Total Watts = 336
Lighting Power Den

CONSULTING ENGINEERS INC.

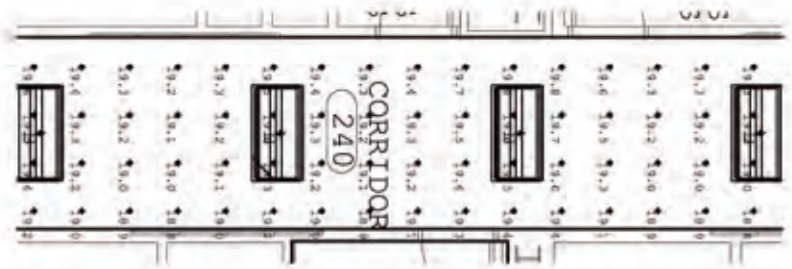
IS 71 R - LIGHTING CALCULATIONS



IS 71 R - LIGHTING CALCULATIONS

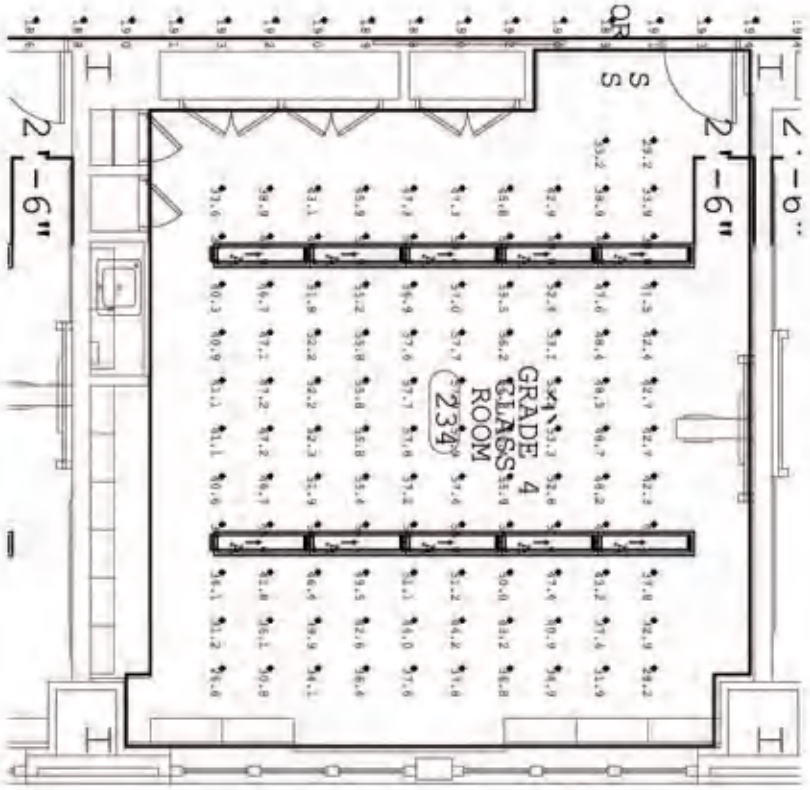


IS 71 R - LIGHTING CALCULATIONS



CONSULTING ENGINEERS INC.

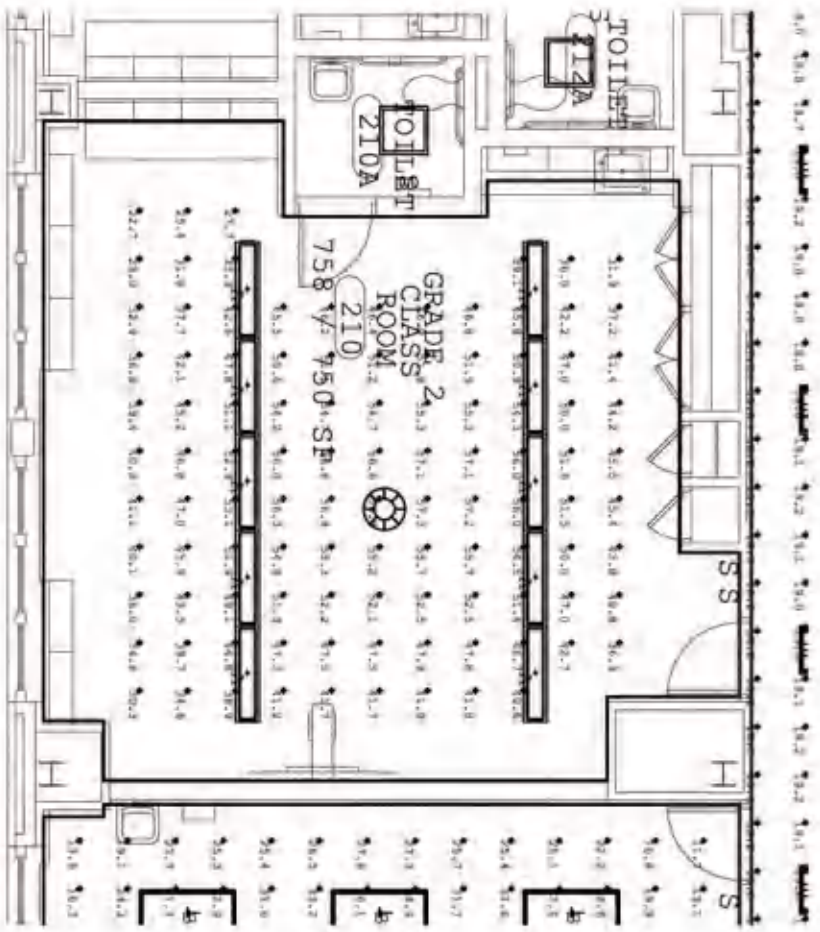
IS 71 R - LIGHTING CALCULATIONS



LPDArea 2
Room 234
Area =683.50 Sq.Ft.
Total Watts = 560
Lighting Power Density =0.819 Watts/Sq.Ft.

CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS

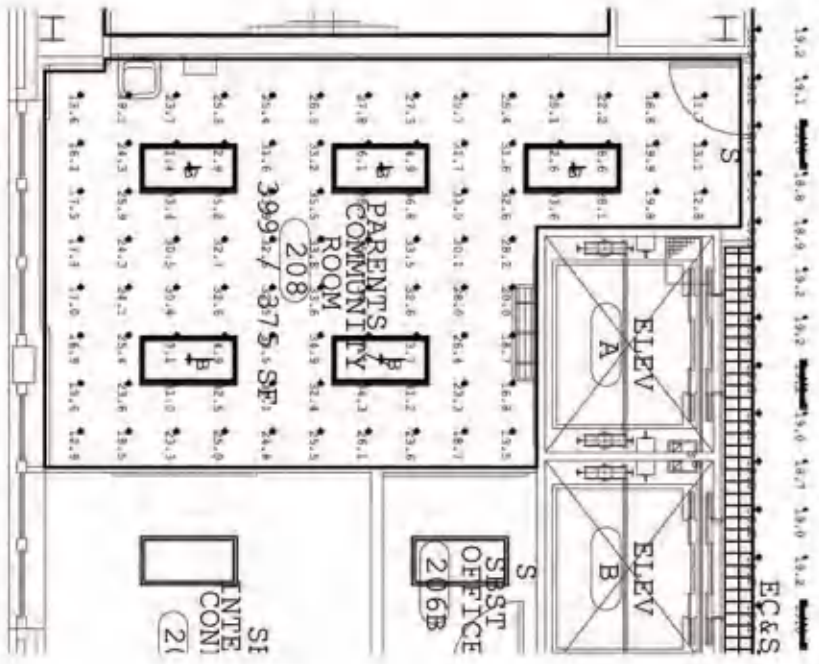


LPDArea_3
Room 210
Area =673.00 Sq.Ft.
Total Watts = 560
Lighting Power Density =0.832 Watts/Sq.Ft.

LPDArea_4
Room 208
Area =406.
Total Watt
Lighting P

CONSULTING ENGINEERS INC.

IS 71 R - LIGHTING CALCULATIONS



LPDArea_4
Room 208
Area =406.75 Sq.Ft.
Total Watts = 280
Lighting Power Density =0.688 Watts/Sq.Ft.

OSTERGAARD ACOUSTICAL ASSOCIATES
200 Executive Drive
W Orange NJ 07052
Voice 973-731-7002
Fax 973-731-6680
acousticalconsultant.com

7 September 2010

Mr. Alex Diez, AIA
Kliment Halsband Architects
322 Eighth Avenue
New York, NY 10001

cc: Mr. George George, Kliment Halsband Architects
Mr. Billy Askey, Kliment Halsband Architects
Mr. Hector R. Mena, P.E., DVL Consulting Engineers Inc.
Mr. Jose Valencia, DVL Consulting Engineers Inc.

Re: Architectural Acoustics Review
60% Contract Documents
PS/IS-71R
OAA File 3593A

Dear Mr. Diez:

We have reviewed the 60% drawings for PS/IS-71R concerning architectural acoustics recommendations contained in our 15 June 2010 30% review letter. The following items are either not shown in the current drawings or represent recommended changes to acoustical features. Findings concerning HVAC noise control and New York City Noise Code Compliance will be confirmed in a separate letter.

ELEVATOR MACHINE ROOM

A ceiling is recommended in the elevator machine room to reduce the level of machine noise in the overhead office area. The ceiling should have one layer of $^5/_8$-inch gypsum board overlaid with a 6-inch insulation blanket. There should be no openings in the ceiling and all piping should be supported from below.

GYMATORIUM

1. We have carried out a reverberation analysis of the current gymatorium design which indicates that acoustical block will not be needed in the walls. Acoustical panels (see specification at the end of this letter) are needed on the upper wall areas behind the fixed seating.

2. Ostergaard Acoustical Associates should review the specification for the acoustical deck for the gymatorium.

STUDENT DINING

3. It is recommended that a composite ceiling board capable of contributing to vertical sound isolation for overhead classrooms as well as good absorption be specified for the student dining ceiling. Such a product is CertainTeed "Adagio" which achieves CAC-40 and an NRC of 0.95. Unfortunately we know of no comparable products from other manufacturers. An Adagio cut is attached. The product is 2-inches thick and available with a reveal edge.

4. The Student Dining ceiling should be overlaid with 3½-inch insulation blanket.

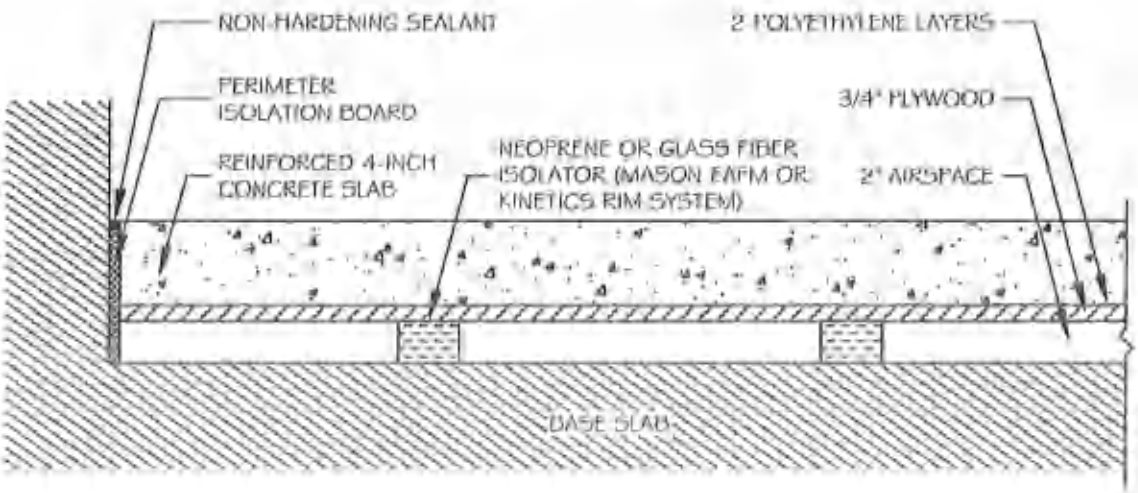
5. The ceiling air return openings should be ducted or fitted with acoustically treated transfer ducts and not fitted with open grilles.

GYMNASIUM

6. Ostergaard Acoustical Associates should review the specification for the acoustical deck for the gymnasium.

MUSIC SUITE

7. A floated concrete slab is needed throughout the music suite. The floated floor should comprise 4-inch thick normal weight concrete on plywood lost forms, supported on neoprene or glass fiber isolators as depicted below. Recommended isolators include the Kinetics Noise Control RIM System and Mason Industries EAFM neoprene isolators. Partitions within the suite should bear on the floated floor.



Doors

8. The entry doors and practice room doors should comprise STC-50 sound rated door assemblies. By "door assembly" is meant that the door panel, frame, seals, and hardware are all procured as a system from a single manufacturer with sole source responsibility. These are long lead items. Recommended manufacturers include Overly, Krieger, and Security Acoustics. Likewise, the side lights adjacent to practice room doors should be STC-50 sound rated window assemblies.

❑ ❑ ❑ ❑

We trust that the above recommendations are helpful and look forward to the team's questions and comments.

Sincerely yours,

OSTERGAARD ACOUSTICAL ASSOCIATES

R. Kring Herbert, FASA
Principal

RKH:amc

Enclosures Specification
Adagio Cut

SOUND ABSORBENT WALL PANELS FOR MUSIC SUITE
PS/IS-71R, 1050 TARGEE STREET, STATEN ISLAND, NEW YORK

ACOUSTICAL SPECIFICATION:
The sound absorbent wall panels shall meet the following requirements. All test data shall have been obtained within the last five years by an independent acoustical laboratory. Test reports shall be submitted to the architect for approval. If the fabric specified for the panels differs from the test report specimen, a sample of the fabric shall be submitted for testing by the acoustical consultant prior to fabrication.

The wall panels shall, at a minimum, have the following sound absorption coefficients when tested in accordance with ASTM Test Method C 423 and mounted according to ASTM Standard Practice E 795, mounting Type A.

1/3 Octave Frequency Band (Hz)	***125***	***250***	***500***	***1000***	***2000***	***4000***
Nominal 2" Thick Panels	*.20*	*.74*	*1.10*	*1.06*	*1.01*	*1.00*

[The above specification can generally be met by panels having a Sound Absorption Average (SAA) or Noise Reduction Coefficient (NRC) of 1.00.]

Acceptable Suppliers:
CorporateAcoustics.Com, Inc., Millerton, NY, (518)-789-6504, www.corporateacoustics.com

Decoustics Limited, Getzville, NY, (800) 387-3809, www.decoustics.com

Kinetics Noise Control, Dublin, OH, (800) 959-1229, www.kineticsnoise.com

MBI Products Co., Cleveland, OH, (216) 431-6400, www.mbiproducts.com

Novawall Systems, Inc., Alexandria, VA, (800) 695-6682, www.novawall.com

Panel Solutions, Hazelton, PA, (570) 459-3490, www.panelsolutions.com

CertainTeed

Adagio™

Designer Series Fiberglass/Mineral Fiber Composite Ceilings

Features:

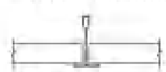
- Unique composite panel that offers optimum acoustical performance
- Encapsulated fiberglass layer provides exceptional sound absorption and acoustic comfort (0.95 NRC—Class A absorber)
- Mineral backboard offers highly effective sound containment (CAC 40)
- Can enhance space privacy compliance (HIPAA, GLBA)
- High performance Overtone® finish combines beauty and durability
- Enhanced light reflectance and diffusion complements exceptional aesthetics
- Contributes toward LEED® certification

ITEM NUMBER	NOMINAL SIZE*	EDGE DETAIL	NRC	R-Value	AC	CAC	LR	RECYCLED CONTENT %	[illegible] ABSORPTION CLASS
			SAFETONE® CLASS A						
White Overtone									
1582-OVT-1	24 x 24 x 2	Trim	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1582B-OVT-1	24 x 24 x 2	Reveal	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1582F-OVT-1	24 x 24 x 2	Narrow Reveal	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1583-OVT-1	24 x 48 x 2	Trim	0.95	7.5	[illegible]	40	[illegible]	48-57	A
1583B-OVT-1	24 x 48 x 2	Reveal	0.95	7.5	[illegible]	40	[illegible]	48-57	A
1583F-OVT-1	24 x 48 x 2	Narrow Reveal	0.95	7.5	[illegible]	40	[illegible]	48-57	A
White Nubby									
1582-NBY-1	24 x 24 x 2	Trim	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1582B-NBY-1	24 x 24 x 2	Reveal	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1582F-NBY-1	24 x 24 x 2	Narrow Reveal	0.95	7.5	[illegible]	38	[illegible]	48-57	A
1583-NBY-1	24 x 48 x 2	Trim	0.95	7.5	[illegible]	40	[illegible]	48-57	A
1583B-NBY-1	24 x 48 x 2	Reveal	0.95	7.5	[illegible]	40	[illegible]	48-57	A
1583F-NBY-1	24 x 48 x 2	Narrow Reveal	0.95	7.5	[illegible]	40	[illegible]	48-57	A

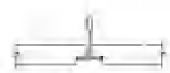
[illegible]

*[illegible]

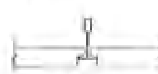
Edge Details:



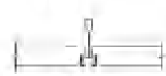
TRIM EDGE
(Square) [illegible] Grid



REVEAL EDGE
[illegible] Grid



NARROW REVEAL EDGE
[illegible] Grid

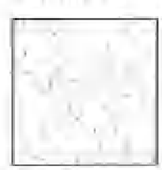


NARROW REVEAL EDGE
[illegible] Grid (Bolt Slot)

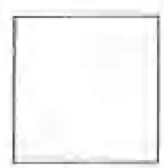
Popular Applications:
- Professional Private Office • Medical Treatment Room • Conference Room • Music Room

BioShield™
BioShield™ treatment included for added mold and mildew resistance.

Finishes:



White Overtone
OVT-1



White Nubby
NBY-1

CertainTeed
Quality made certain. Satisfaction guaranteed.™

PRODUCT SPECIFICATION DETAILS
ACOUSTICAL CEILINGS
09 51 00

PART 2: PRODUCTS

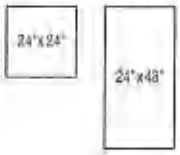
2.1 GENERAL

Provide Acoustical Ceiling Material manufactured to meet requirements of this specification in accordance with ASTM E 1264.

2.2 MATERIALS

Acoustical Ceiling Units:

Standard Sizes:



1. Type XX (composite fiberglass/wet-felted base)
2. Form NA
3. Pattern [E]
4. Composite fiberglass/mineral fiber lay-in panel with fine textured fabric and painted edges [White Nubby] [White Overtone]
5. Size 2" x [24"x 24"] [24"x 48"] [Custom]
6. Edge Detail [Trim (Square)] [Reveal] [Narrow Reveal]
7. Noise Reduction Coefficient (NRC) [.95]
8. Articulation Class (AC) 210
9. Sound Absorption Class [Class A]
10. Ceiling Attenuation Class (CAC) [40] [38]
11. Light Reflectance Coefficient (LR) [.89] [.84] Light Reflectance Designation LR-1
12. Color [White]
13. Flame Spread Classification (ASTM E 84, CAN/ULC-S102M) Class A
14. Manufacturer, subject to compliance with requirements of this specification, CertainTeed Ceilings
15. Product Name Adagio™

Distributed by:

CertainTeed Corporation
P.O. Box 860
Valley Forge, PA 19482

Professional: 800-233-8990
Consumer: 800-782-8777
www.certainteed.com

CertainTeed

OSTERGAARD ACOUSTICAL ASSOCIATES
200 Executive Drive
W Orange NJ 07052
Voice 973-731-7002
Fax 973-731-6680
acousticalconsultant.com

30 March 2011

Mr. Alex Diez, AIA
Kliment Halsband Architects
322 Eighth Avenue
New York, NY 10001

cc: Mr. George George, Kliment Halsband Architects
Mr. Billy Askey, Kliment Halsband Architects
Ms.Megan Saunders, Viridian

Re: Acoustical Compliance — PS/IS-71R
OAA File 3593A

Dear Mr. Diez:

As you know, Ostergaard Acoustical Associates, as acoustical consultants for PS/IS-71R, has been involved with the aspects of the school's design that relate to correct acoustical planning. These include meeting the acoustical requirements of the NYC Green Schools Guide, SCA Design Requirements, and the New York City Noise Code. With the incorporation of the five items below the school will comply with these requirements, with the exception listed for GSG Q8.1. This includes compliance with all items previously identified in our 60% and 100% Reviews.

1. The duct silencer schedule on M003.00 does not match our recommended silencer schedule given in our 5 October 2010 letter. For reference this recommended schedule is reprinted below.

2. On Drawing M102.00 a framed gypsum board duct enclosure is needed around ST-7S and the RTU-5 supply ductwork upstream of ST-7S.

3. Air velocities in Gymnasium branch ducts shown on M102.00 are excessive; the maximum velocity in these ducts should be 720 fpm.

4. Air velocities in the Gymatorium duct currently shown on M103.00 as 30-inch-diameter and 30x24 are excessive; the maximum velocity should be 550 fpm.

5. The chiller specification section 15660, ¶2.01 L, should be revised to read "The maximum acceptable sound pressure levels for the outdoor air cooled modular chiller shall be as follows **when measured at a distance of 30 feet.**"

With the exception of the above 5 items, all items identified at our 60% and 100% review are now addressed. Specifically our findings are as follows:

GSG Q8.1 Establishes minimum acoustical performance requirements for classrooms including:

- Background noise levels associated with HVAC systems;
- Unoccupied reverberation times;
- Sound isolation performance of constructions; and,
- Sound isolation from exterior noise sources.

Finding: When the original background noise analysis for PS/IS-71R was carried out, the background noise criterion for classrooms was 35 dB(A). Because of the planned use of unit ventilators, none of the classroom met the criterion. Subsequently the SCA relaxed the classroom criterion to 40 dB(A), which is met by all but two classrooms and the music classroom. The two classrooms are 117 and 119, where we predict that the background level will be 44 dB(A). The music classroom, with a criterion of 30 dB(A), will have a level of 39 dB(A). With the exception of the background level in the two classrooms and music, the school is in compliance with Q8.1.

GSG Q.8.2 Establishes the sound isolation requirements for special spaces.

Finding: Complies.

GSG Q8.3 Establishes the need for façade elements, including fenestration, to adequately control the penetration of exterior noises into the school's interior.

Finding: This credit is not applicable because the standard SCA windows, in conjunction with the masonry façade and roof construction, are sufficient to control the penetration of exterior noise.

DR 1.3.1.9 Architectural Acoustics

Finding: Complies.

DR 6.2.25 HVAC Acoustical Standards

Finding: See findings for GSG Q8.1 otherwise fully complies.

New York City Noise Code 2006

Finding: Full compliance anticipated for noise emissions from HVAC equipment with incorporation of item five above.

Sincerely yours,

OSTERGAARD ACOUSTICAL ASSOCIATES

R. Kring Herbert, FASA
Principal

Enclosure

Duct Silencer Schedule

Unit No.	Service	Location	Dynamic Insertion Loss at Listed Face Velocity, dB								Unit Dimensions W x H, inches	Based On Face Velocity Of, fpm	Design Based On:		Notes
			Octave Band										Manufacturer	Model No. Based On	
			1	2	3	4	5	6	7	8					
			Center Frequency – Hz												
			63	125	250	500	1000	2000	4000	8000					
ST-1S	RTU-1 Supply	4th Floor	8	12	20	23	22	16	13	10	60 x 28	+1000	IAC	5HLFM	
ST-2S	RTU-1 Supply	4th Floor	8	12	20	23	22	16	13	10	60 x 28	+1000	IAC	5HLFM	
ST-3S	RTU-2 Supply	3rd Floor	8	12	20	23	22	16	13	10	28 x 20	+1000	IAC	5HLFM	
ST-4S	RTU-2 Supply	3rd Floor	8	12	20	23	22	16	13	10	36 x 16	+1000	IAC	5HLFM	
ST-5S	RTU-3 Supply	3rd Floor	8	12	20	23	22	16	13	10	38 x 36	+1000	IAC	5HLFM	1
ST-6S	RTU-4 Supply	4th Floor	4	6	7	15	20	33	22	9	40 x 24	+2000	IAC	5HL	
ST-7S	RTU-5 Supply	1st Floor	8	12	20	23	22	16	13	10	32 x 30	+1000	IAC	5HLFM	1
ST-1R	RTU-1 Return	4th Floor	7	9	15	20	23	17	13	10	40 x 30	-1000	IAC	5HLFL	
ST-2R	RTU-1 Return	4th Floor	7	9	15	20	23	17	13	10	40 x 22	-1000	IAC	5HLFL	
ST-3R	RTU-2 Return	3rd Floor	5	8	10	17	24	37	23	10	48 x 20	-2000	IAC	5HL	
ST-4R	RTU-3 Return	3rd Floor	9	13	23	31	40	47	34	16	36 x 32	-1000	IAC	5HS	1
ST-5R	RTU-4 Return	4th Floor	8	13	21	23	23	16	13	10	40 x 24	-1000	IAC	5HLFM	
ST-6R	RTU-5 Return	1st Floor	8	13	21	23	23	16	13	10	46 x 24	-1000	IAC	5HLFM	

Notes:

1. Silencer shall be provided with 18-gauge walls.

OSTERGAARD ACOUSTICAL ASSOCIATES
200 Executive Drive
W Orange NJ 07052
Voice 973-731-7002
Fax 973-731-6680
acousticalconsultant.com

10 May 2011

Mr. Alex Diez, AIA
Kliment Halsband Architects
322 Eighth Avenue
New York, NY 10001

cc: Mr. George George, Kliment Halsband Architects
Mr. Billy Askey, Kliment Halsband Architects
Ms. Megan Saunders, Viridian

Re: Acoustical Compliance — PS/IS-71R
OAA File 3593A

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- Unoccupied reverberation times;
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Finding: When the original background noise analysis for PS/IS-71R was carried out, the background noise criterion for classrooms was 35 dB(A). Because of the planned use of unit ventilators, none of the classroom met the criterion. Subsequently the SCA relaxed the classroom criterion to 40 dB(A), which is met by all but two classrooms and the music classroom. The two classrooms are 117 and 119, where we predict that the background level will be 44 dB(A). The music classroom, with a criterion of 30 dB(A), will have a level of 39 dB(A). With the exception of the background level in the two classrooms and music, the school is in compliance with Q8.1.

GSG Q.8.2 Establishes the sound isolation requirements for special spaces.

Finding: Complies.

GSG Q8.3 Establishes the need for façade elements, including fenestration, to adequately control the penetration of exterior noises into the school's interior.

Finding: This credit is not applicable because the standard SCA windows, in conjunction with the masonry façade and roof construction, are sufficient to control the penetration of exterior noise.

DR 1.3.1.9 Architectural Acoustics

Finding: Complies.

DR 6.2.25 HVAC Acoustical Standards

Finding: See findings for GSG Q8.1 otherwise fully complies.

New York City Noise Code 2006

Finding: Complies.

❑ ❑ ❑ ❑

All items identified during our previous 60%, 100%, and Bid Document reviews are now addressed. With the exception of the classrooms identified in GSG Q8.1, the school design is in full compliance.

Sincerely yours,

OSTERGAARD ACOUSTICAL ASSOCIATES

R. Kring Herbert, FASA
Principal