CBE Livable Buildings Award 2012:
Submission for

The Midtown Community Elementary School

Content

Project Narrative

The goal from the outset of the planning of the Neptune Midtown Community Elementary School project was to design a High Performance school that would create an environment to enhance learning. In keeping with the standards established by then–Governor McGreevy's Executive Order 24, and the emerging design practices of the New Jersey Schools Development Authority, the District sought to create the best possible environment for student learning. Obtaining LEED™ certification was considered the best means to ensure this goal.

The initial measure of success focused on energy efficiency and indoor environmental quality. However, the programming and conceptual design phases were characterized by a deep interactive design charrette process between the District, the State and the design professionals charged with development, resulting in a wider range of sustainable ideas being explored.

As a result, the school's design shifted to become a "living textbook" so it's very features would offer environmental education to its students and the community at large. Visible elements such as sunshades, a 30kW solar photovoltaic array and a rooftop garden offer ample opportunity for lessons, with more subtle sustainable features such as underfloor air delivery of heating and cooling left exposed to show the system in action. Similarly, waterless urinals and a composting toilet bring lessons of water conservation into typical building functions. Recycled and reused materials are identified with signage and information about their reduced impact on the carbon footprint.

The crowning achievement of the District in sustainability education has been the advent of environmental curriculum as a part of its science program. Integrating the lessons of the building into the students' learning process has formalized and strengthened their identification with High Performance ideals. The District employs a "live event" learning model, which incorporates out of the classroom curriculum activities conducted throughout the buildings many learning spaces, including Midtown's rooftop garden. Live event learning enables the District's educators to connect the student's experience with real-time lessons in sustainability. A visionary superintendent has joined forces with the dynamic environmental science instructor to guide students in lessons that connect them to their environment and the broader community. Lessons focus on the five areas of LEED™ design, including hands-on exploration of sustainable site use: water conversation: energy conversation and efficiency: the use of recycled and regional materials and resources: and the creation and maintenance of a healthy indoor environment.

The Midtown area has traditionally functioned as an important neighborhood center within greater Neptune Township, providing a focal point for community and economic activities. Midtown's established circulation network, infrastructure and neighborhoods represent some the Township's oldest developed areas, many of which were in need of revitalization and expanded community services.

In 2002, a Smart Growth Community School Planning Grant provided the incentive and opportunity for the Township to foster partnerships and strategies to site and develop school facilities that would serve a wide range of community need. This dovetailed with the objectives of the Master Plan for Neptune, which had a focus on the development of a new Community School that would act as a catalyst for community reinvestment, serve as a source of community pride, and provide essential community services for all Township residents.

The Township's ability to promote coordination of the goals and objectives of many local agencies was at the heart of Smart Growth principles, and fostered a collaborative effort between the Neptune Township Board of Education, the Neptune Township Council, Township Planning Board and Midtown Neighborhood Empowerment Council.

As its name implies, a goal of the Neptune Midtown Community Elementary School was to engage the surrounding community. The facility was thus planned as the anchor of the Midtown Neighborhood Master Plan. Completed in September 2008, it has adhered to the following goals for the entire neighborhood:

- It has established a centrally located community-based elementary school that has transformed a thirty year old unimproved vacant area into an attractive visual anchor for Midtown.
- It has preserved and reinforced the existing social fabric of the neighborhood with the creation of a Community Recreation Center, Youth Services area, Parent Resources area, Health and Wellness Center, Community Policing Center and Intergenerational Tutoring Center.
- It has encouraged attractive, functional and context–sensitive infill development with a focus on sustainable site use that minimizes stormwater runoff within an attractive, park like setting.
- It has fostered efficient traffic and pedestrian circulation in the heavily trafficked area bounded by four key roadways – Route 33, Memorial Drive, Atkins Avenue and Embury Avenue.
- It has embodied the goals and objectives of the Neighborhood Empowerment Plan (NEP).

Project Team Members

Neptune Township Board of Education– Owner
SSP Architectural Group– Architects
Gilbane Building Company-Construction Manager
Turner Construction Company– General Contractor
SED Design-Landscape Architects
Concord Engineering Group– HVAC Engineer/Commissioning Agent
7group– LEED/Energy Consultants

Project Images

View of main entrance looking northeast. Double exterior shading devices on the southern elevation to control any direct solar penetration.

View of the southwest corner of the building looking southeast.

View of the native plant arboretum natural area looking west. This feature spans the entire area between the building and the main roadway. The area includes a path to allow occupants and visitors access to the site.

View of the northern side of the classroom wing looking southeast.

Project Images

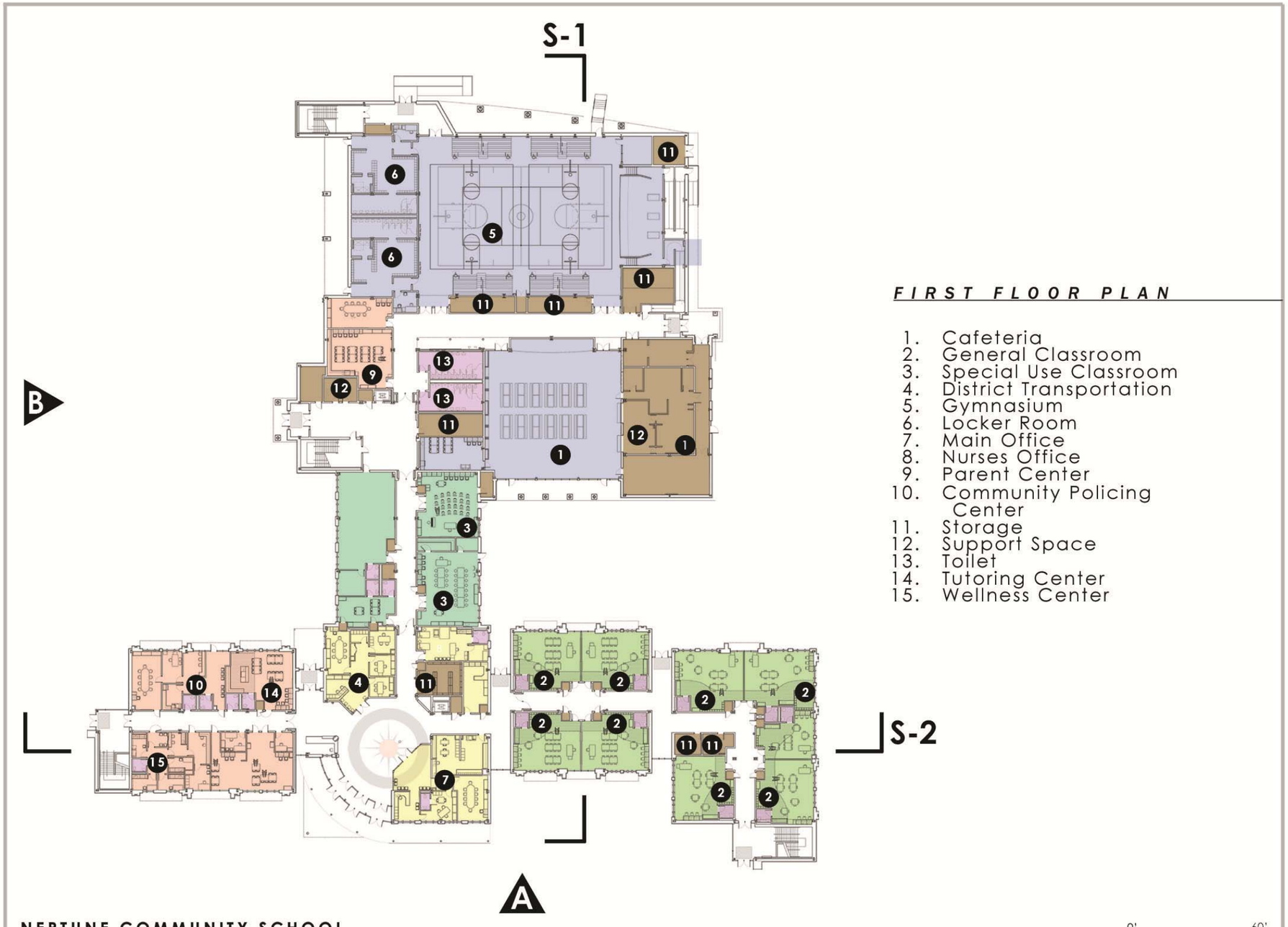
View of a typical classroom. Under floor air system, daylighting and lighting controls , installed.

View of the green roof/garden area.

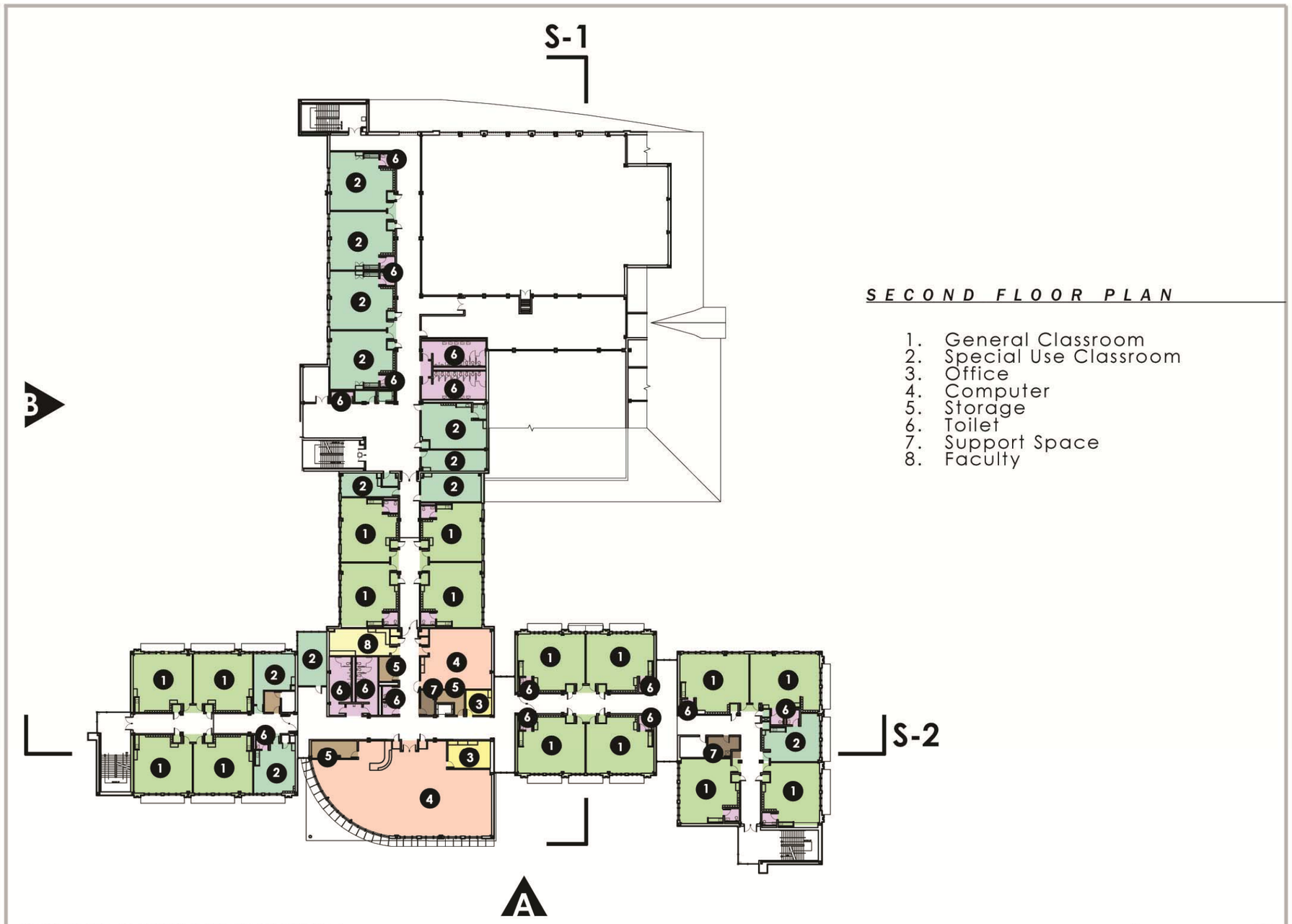
The gymnasium used Kalwall panels to provide daylight.

Photovoltaic panels installed over the cafeteria.

Project Drawings



Project Drawings



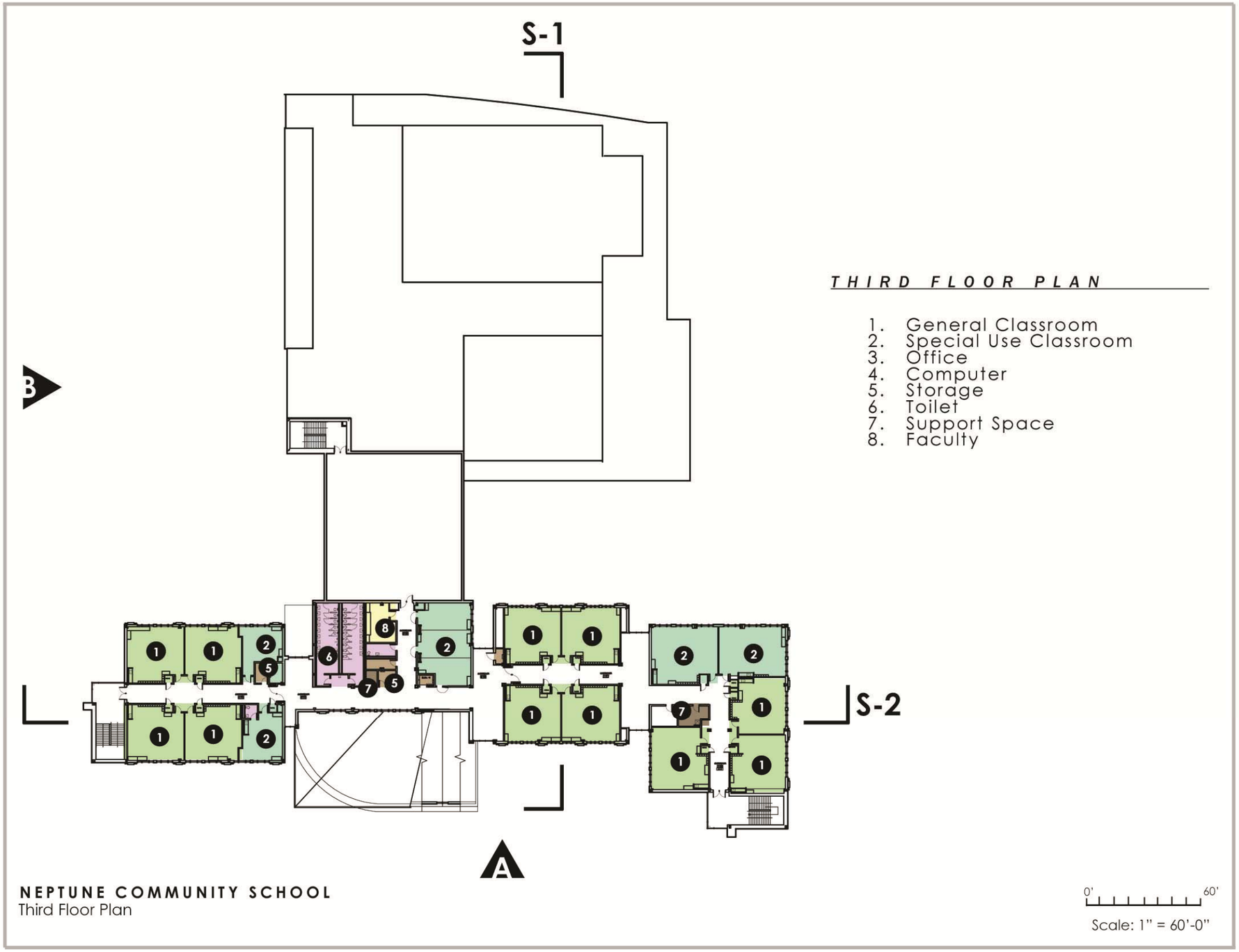
SECOND FLOOR PLAN

1. General Classroom
2. Special Use Classroom
3. Office
4. Computer
5. Storage
6. Toilet
7. Support Space
8. Faculty

NEPTUNE COMMUNITY SCHOOL
Second Floor Plan

0' 60'
Scale: 1" = 60'-0"

Project Drawings



THIRD FLOOR PLAN

1. General Classroom
2. Special Use Classroom
3. Office
4. Computer
5. Storage
6. Toilet
7. Support Space
8. Faculty

NEPTUNE COMMUNITY SCHOOL
Third Floor Plan

0' 60'
Scale: 1" = 60'-0"

Project Drawings

FRONT ELEVATION - A

SIDE ELEVATION - B

Energy Performance Data

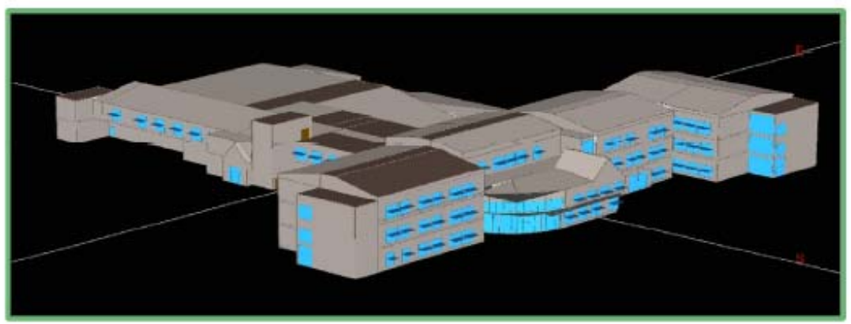
Building Performance Summary

7group

The Midtown Community Elementary School

Introduction

The following report compares the actual energy performance of The Midtown Community Elementary School to the predicted performance of the energy model developed for the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) rating system. The energy performance is also evaluated using a national database of similar buildings' energy consumption, and a reference elementary school. The purposes of these comparisons are to gauge whether the building is performing as well as predicted, and to identify any obvious problems or potential areas of improvement early on. It is important to exercise caution when making comparisons between a modeled prediction and actual performance due to the significant number of assumptions made during the modeling process which may not be consistent with the constructed and operating building. A direct comparison is most appropriate when the energy models have been calibrated to the actual building's installed equipment and operating parameters. Since the energy models for this project have not been calibrated, direct comparisons have only been made to evaluate the general trends of energy use and reveal potential opportunities for improvements.



Building Performance Summary

7group

The Midtown Community Elementary School

Predicted Energy Performance

The following figures summarize the predicted performance of the energy models developed for the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) rating system. Results for both the proposed (as-designed building) and baseline (code compliant building) energy models are included. These are also compared to a similar building classification using the US EPA's Energy Star Target Finder program. Target Finder is a program that scores commercial building energy consumption relative to the range of similar buildings' energy use nationwide, adjusting for weather variations and basic operating conditions of each building. Target Finder scores, which range from 1 (worst) to 100 (best), represent the percentage of existing buildings that perform less efficiently than the rated building. The database used by Target Finder is the U.S. Department of Energy's Commercial Building Energy Consumption Survey (CBECS). By entering a few of the project's facility characteristics (i.e. location of project, building type, area, occupancy levels, and hours of operation), the CBECS data can be accessed and normalized. The normalized data is then ranked on a scale of 1-100.

The energy models predicted that the proposed building would use 47.0% less energy (46.1% less energy cost) than a code compliant baseline building. The proposed model's Target Finder rating using the K-12 School category is 65, which means that the building is predicted to perform in the top 35% of buildings within this category. This equates to a 14% energy savings compared to an average (Target Finder 50) building in this category. The energy performance data of this average building has been included, along with data for an Energy Star qualified building (Target Finder 75) and the best performing buildings in this category (Target Finder 100).

Final Modeling Results

Building	Electricity (kWh)	Electricity Cost	Natural Gas (therms)	Natural Gas Cost	Total Energy (Btu/ft^2)	Total Cost	Cost/ft^2	% Cost Savings
Proposed	1,576,333	$135,249	3,654	$4,433	39,432	$139,682	$0.96	46.1%
Baseline	2,648,868	$238,944	18,018	$19,978	74,417	$258,922	$1.78	

Energy Star Target Finder Inputs for the Energy Models

Zip Code: 07114 City: Neptune State: New Jersey

Space Type*	Floor Area (ft^2)	Computers	Walk-in Refrig./Freezers	Cooking?
K-12 School	145,663	322	2	Yes

*The US DOE's CBECS database used in Target Finder has a limited number of building types.

Energy Star Target Finder Results for the Energy Models

Energy Data	Proposed	Baseline	100 Target Finder	75 Target Finder	50 Target Finder
Energy Performance Rating	65	11	100	75	50
Energy Reduction (%)	14%	-51%	62%	22%	0%
Energy Use Intensity (kBtu/ft^2)	39.0	74.0	17.0	36.0	46.0
Annual Energy Cost ($)	$139,682	$258,922	$61,770	$126,554	$161,834
Cost/ft^2	$0.96	$1.78	$0.42	$0.87	$1.11
CO2 Emissions (tons/year)	781.0	1376.0	345.0	708.0	905.0

Building Performance Summary — 7group

The Midtown Community Elementary School

Actual Energy Performance - National Comparisons

The following figures summarize the actual energy performance of the building using the utility data from January 2011 - December 2011. The actual building has also been scored using the Energy Star Target Finder program as a means of benchmarking performance against a national database. A more detailed national comparison is made against a reference school building which shows how energy use varies by outdoor temperature. The Target Finder results show that the building's energy performance is in the top 19% of similar buildings in the database.

2011 Utility Data

Building	Electricity (kWh)	Electricity Cost	Natural Gas (therms)	Natural Gas Cost	Total Energy (Btu/ft²)	Total Cost	Cost/ft²
Actual Building	1,325,400	$189,205	2,210	$2,925	32,563	$192,130	$1.32

Energy Star Target Finder Inputs for the Actual Building

Zip Code: 07114 City: Neptune State: New Jersey

Space Type*	Floor Area (ft²)	Computers	Walk-in Refrig./Freezers	Cooking?
K-12 School	145,663	322	2	Yes

*The US DOE's CBECS database used in Target Finder has a limited number of building types.

Energy Star Target Finder Results for the Actual Building

Energy Data	Actual Building	100 Target Finder	75 Target Finder	50 Target Finder
Energy Performance Rating	81	100	75	50
Energy Reduction (%)	28%	62%	22%	0%
Energy Use Intensity (kBtu/ft²)	33.0	17.0	35.0	45.0
Annual Energy Cost ($)	$192,130	$101,642	$208,242	$266,295
Cost/ft²	1.319003453	0.697788732	1.429614933	1.828158146
CO2 Emissions (tons/year)	652.0	345.0	707.0	904.0

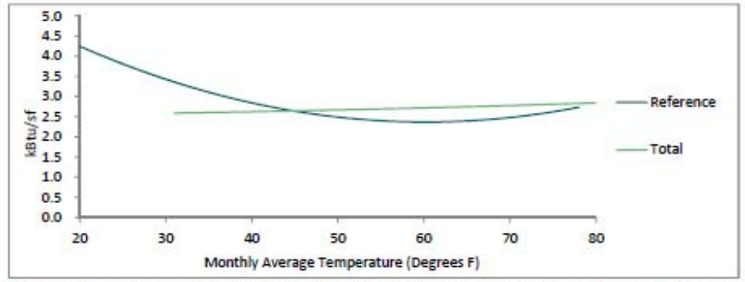
Building Performance Summary — 7group

The Midtown Community Elementary School

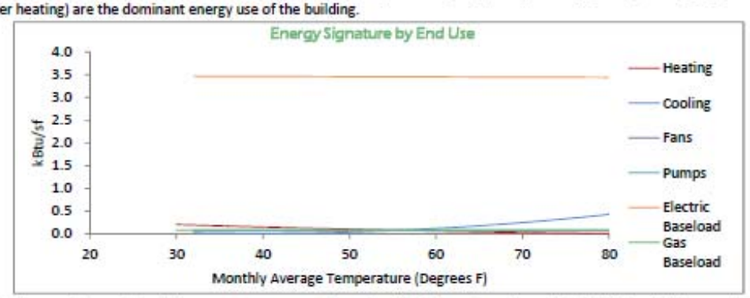
Actual Energy Performance - National Comparisons

Energy Signature Comparison

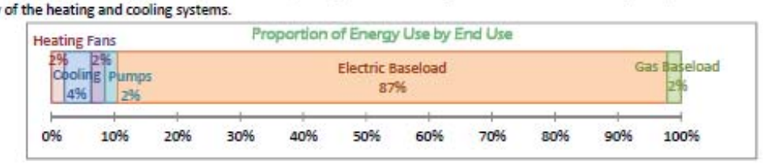
The following figure shows the building's total Energy Signature: the relationship between total energy use and outside temperature. The light green line represents your building's total energy consumption as a function of monthly average temperature. This line can be compared to the dark green line, which represents a reference elementary school in Pennsylvania, with data taken from Energy Signatures developed by the New Buildings Institute. The trend shows that energy use is lowest during the coldest months, and increases steadily as temperatures increase, which is somewhat unexpected for a school in a predominantly heating climate. Energy use would be expected to be lowest during the warmest months, since the building is mostly unoccupied during the summer. The comparison indicates that energy use is much less temperature-dependent than the reference school, since the curve is relatively flat across the entire temperature range.



The following figure shows an estimation of the building's Energy Signature by end use. The red line estimates the natural gas consumption for heating, which would be expected to be highest at the coldest temperatures. The blue line estimates the electricity consumption for cooling, which would typically be highest at the warmest temperatures. The purple, aqua, orange, and green lines estimate the electricity consumptions for fans, pumps, electric baseloads, and gas baseloads, respectively, which would be expected to remain relatively constant throughout the year. These estimates show that the electric baseloads (such as lighting, receptacle equipment, cooking equipment, and service water heating) are the dominant energy use of the building.



The following figure estimates the relative energy use proportions of each of the major end uses in the building. This shows that over 3/4 of the energy use is associated with electric baseloads. This shows that any improvements made to the efficiency or operation of these baseloads will likely have the greatest impact. However, it may not be caused by inefficiencies with these systems, but rather the high efficiency of the heating and cooling systems.



Modeled vs. Predicted Performance

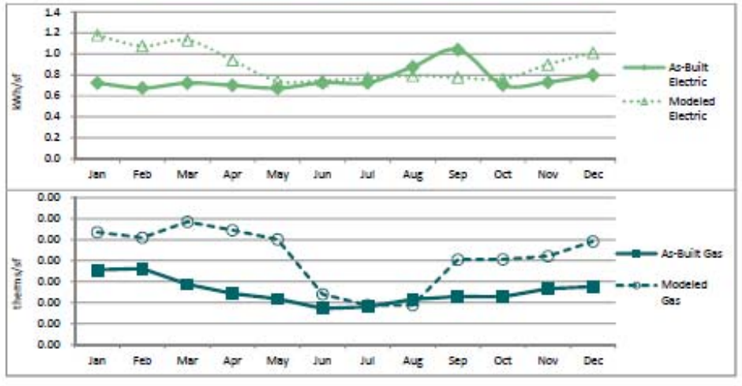
Up to this point the energy performance of the actual building has been analyzed independently of the predicted performance of the energy model, due to the limitations of modeling as a predictor of actual performance discussed in the introduction. The only similar metric used for both was their respective Energy Star Target Finder ratings. The following section compares the actual and modeled performance of the building more directly. Still, this comparison should not be used to determine whether or not the building is performing better or worse than predicted. It is intended to reveal those areas where the assumptions made when creating the energy model were not representative of the actual building, as well as trends in actual energy use that may indicate problems or improvement opportunities.

Monthly Energy Comparison

One method of comparing the as-built building to the as-designed building at a more detailed level is a monthly energy use comparison. The following charts visualize the trends of electricity and natural gas consumptions throughout the year as measured by the utility companies and as predicted by the energy model. The actual building is consistently using less electricity and gas throughout the school year than predicted, but nearly the same energy as predicted during the summer. Energy use remains relatively steady throughout the year and does not drop in the summer as predicted. This is likely due to an assumption made in the modeling process that the building would be largely unoccupied during the summer, with lighting and receptacle equipment turned off, thermostats set higher, and ventilation air shut off to most of the building. Based on the actual energy use it appears some or all of these conditions have not been implemented to the degree they were originally assumed. On average the building is using 16% less electricity than predicted, and 38% less gas.

Modeled vs. Actual Monthly Energy Use

Month	Electric (kWh)		Gas (therms)	
	Modeled	Actual	Modeled	Actual
Jan	171,647	105,300	390	259
Feb	156,652	98,400	371	264
Mar	164,634	105,300	426	209
Apr	136,901	102,000	397	177
May	107,942	98,100	365	159
Jun	108,650	105,750	175	125
Jul	112,278	105,750	137	131
Aug	115,478	127,800	137	157
Sep	113,035	151,500	295	167
Oct	110,840	102,600	296	166
Nov	131,017	106,500	307	194
Dec	147,259	116,400	358	201
Total	***1,576,333***	***1,325,400***	***3,654***	***2,274***



Building Performance Summary 7group
The Midtown Community Elementary School

Conclusions

The Midtown Community Elementary School building was predicted to use 47% less energy than a building designed for minimal code compliance. Comparisons of the actual building's energy use to similar K-12 school buildings at the national level shows a better than average energy performance. Comparisons with a reference school indicate that energy use is lower overall, and much more consistent throughout the ranges of temperature. A monthly comparison with the modeled energy use also reveals lower electric and gas use during the school year, which remains relatively steady during the summer rather than decreasing as predicted. While there may be opportunities to reduce energy use during the months when school is in session through refinements to the building automation system and operational policies like turning off equipment overnight, the greatest potential for savings appears to be in reducing energy use over the summer. In 2011 there was virtually no difference between the electricity use during the summer and the rest of the year, which is unexpected if the school is partially or fully closed during the summer. We recommend checking the thermostat and fan schedules to confirm that temperature settings are high and fans are set to only cycle as needed, and verifying that all lights and receptacle equipment are turned off in the areas of the building that are unoccupied in the summer. Despite these potential opportunities for improvements, the building is performing very well overall.

Appendix: January 2011 - December 2011 Utility Data

The following tables provide the actual utility data which was used in the previous analyses.

Electric Utility Data

Mo.	Billing Period From:	Billing Period To:	Meter Read Type	kW Metered	kW Billed	kWh Billed	Total $
Jan	12/21/2010	1/20/2011	Estimated			105,300	$17,117.16
Feb	1/21/2011	2/18/2011	Estimated			98,400	$16,175.82
Mar	2/19/2011	3/21/2011	Estimated			105,300	$16,504.41
Apr	3/22/2011	4/20/2011	Estimated			102,000	$15,792.32
May	4/21/2011	5/19/2011	Estimated			98,100	$13,448.36
Jun	5/20/2011	6/20/2011	Adjusted			105,750	$13,932.38
Jul	6/21/2011	7/21/2011	Adjusted			105,750	$15,502.33
Aug	7/21/2011	8/19/2011	Actual			127,800	$17,620.61
Sep	8/20/2011	9/20/2011	Actual			151,500	$16,844.11
Oct	9/21/2011	10/19/2011	Actual			102,600	$14,476.22
Nov	10/20/2011	11/18/2011	Actual			106,500	$15,111.78
Dec	11/19/2011	12/19/2011	Actual			116,400	$16,679.71
Total						***1,325,400***	***$189,205.21***

Natural Gas Utility Data

Mo.	Billing Period From:	Billing Period To:	Meter Read Type	Therms billed	Total $
Jan	1/14/2011	2/14/2011	Actual	259	$327.42
Feb	2/14/2011	3/17/2011	Actual	264	$324.31
Mar	3/17/2011	4/14/2011	Actual	209	$268.75
Apr	4/14/2011	5/16/2011	Actual	177	$241.64
May	5/16/2011	6/15/2011	Actual	159	$223.04
Jun	6/15/2011	7/15/2011	Actual	125	$187.44
Jul	7/15/2011	8/12/2011	Actual	131	$193.98
Aug	8/12/2011	9/13/2011	Actual	157	$217.94
Sep	9/13/2011	10/13/2011	Actual	167	$223.42
Oct	10/13/2011	11/11/2011	Actual	166	$222.10
Nov	11/11/2011	12/14/2011	Actual	194	$246.19
Dec	12/14/2011	1/16/2012	Actual	201	$248.45
Total				***2,210***	***$2,924.68***

Additional Information

Neptune Township Community School

LEED V2.0/2.1/2.2 Checklist

Yes	?	No			
13		1	**Sustainable Sites**		14 Points
Y			Prereq 1	**Erosion & Sedimentation Control**	Required
Y			Credit 1	**Site Selection**	1
Y			Credit 2	**Urban Redevelopment**	1
Y			Credit 3	**Brownfield Redevelopment**	1
Y			Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
Y			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Y			Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
Y			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		N	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
Y			Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
Y			Credit 6.1	**Stormwater Management**, Rate or Quantity	1
Y			Credit 6.2	**Stormwater Management**, Treatment	1
Y			Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
Y			Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
Y			Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
4		1	**Water Efficiency**		5 Points
Y			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Y			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
		N	Credit 2	**Innovative Wastewater Technologies**	1
Y			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
Y			Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Yes	?	No			
12		5	**Energy & Atmosphere**		17 Points
Y			Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
Y			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
Y			Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
Y			Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
Y			Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
Y			Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
Y			Credit 2.1	**Renewable Energy**, 2.5%	1
		N	Credit 2.2	**Renewable Energy**, 7.5%	1
		N	Credit 2.3	**Renewable Energy**, 12.5%	1
		N	Credit 3	**Additional Commissioning**	1
		N	Credit 4	**Ozone Depletion**	1
		N	Credit 5	**Measurement & Verification**	1
Y			Credit 6	**Green Power**	1

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Yes	?	No			
6		7	**Materials & Resources**		13 Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		N	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
		N	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
		N	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
Y			Credit 2.1	**Construction Waste Management**, Divert 50%	1
Y			Credit 2.2	**Construction Waste Management**, Divert 75%	1
		N	Credit 3.1	**Resource Reuse**, Specify 5%	1
		N	Credit 3.2	**Resource Reuse**, Specify 10%	1
Y			Credit 4.1	**Recycled Content**, Specify 5%	1
Y			Credit 4.2	**Recycled Content**, Specify 10%	1
Y			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
Y			Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
		N	Credit 6	**Rapidly Renewable Materials**, 2.5%	1
		N	Credit 7	**Certified Wood**	1

Yes	?	No			
12		4	**Indoor Environmental Quality**		15 Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
Y			Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
Y			Credit 2	**Increase Ventilation Effectiveness**	1
		N	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
		N	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
Y			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
Y			Credit 4.2	**Low-Emitting Materials**, Paints	1
Y			Credit 4.3	**Low-Emitting Materials**, Carpet	1
		N	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
Y			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
Y			Credit 6.1	**Controllability of Systems**, Perimeter	1
Y			Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
Y			Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
Y			Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
Y			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
Y		N	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
5			**Innovation & Design Process**		5 Points
Y			Credit 1.1	**Innovation in Design**: Green Building Demonstration	1
Y			Credit 1.2	**Innovation in Design**: Exemplary Performance MRo4	1
Y			Credit 1.3	**Innovation in Design**: Blended Cement	1
Y			Credit 1.4	**Innovation in Design**: Exemplary Performance MRc5	1
Y			Credit 2	**LEED™ Accredited Professional**	1

Yes	?	No		
52		18	**Project Totals**	69 Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

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