GREEN URBAN DESIGN MODEL

Laurel Heather Warner
Construction Management Option
AE Facility Advisor: David Riley

Harrisburg University Academic Center
Harrisburg, Pennsylvania

Contents

Acknowledgements

I would like to thank the following people for their assistance in my last year studies at Penn State, most notably my senior thesis. Without your support, it would have been a struggle to accomplish the things that I have.

The AE Department
Especially
Robert Holland
Kevin Parfitt
David Riley

Reynolds Construction Management
Patricia Blumenthal
Todd Buzard
James McKamey
John Miller
Ike Sholly
Walter Tack

Harrisburg University of Science and Technology
Steven Infanti

U. S. Green Building Council
John Bernard
Matthew Grenshaw

My Family and Friends
Gina Colalillo
Jay and Marcus Espenlaub
Ghazoll Motlagh
Carolyn Skiba
Tyler Smith
Charlene, Randolph, Heidi, and Darren Warner

Executive Summary

The following report reflects on one year of intensive study and analysis on the Harrisburg University of Science and Technology Academic Center. The students, faculty, and staff of the University have been eagerly awaiting this facility as they have been renting office spaces in the down town area on Market Street in Harrisburg since the University has opened its doors a few years ago. With the new academic center, Harrisburg University of Science and Technology will be able for the first time to have everyone working or attending the school in one location. Their hopes are to expand interest in science and technology within the region and one day include additional learning facilities to the University.

The first area of study performed for the construction project of the Academic Center included research of current LEED Certified buildings in the United States. Twenty-two buildings were chosen with similar aspects of the Harrisburg University Academic Center. These aspects are urban environment, size, occupancy, intended use, and LEED Rating System version.
A Green Urban Design Model was created so that those considering similar types of projects can also become LEED Certified or take into account design aspects of green and environmentally friendly building.

Breadth studies were also performed and involved a lighting analysis of daylighting a space and a structural analysis of a green roof implementation. The daylighting analysis involved research on the subject and used a typical classroom floor for a glazing factor calculation. The addition of a green roof took into account additional loading for the structural analysis and research of a specific system for the building project. With both designs considered, the Harrisburg University Academic Center has potential to qualify for LEED Rating points or simply add green features to the existing design.

Project Background

The Harrisburg University of Science and Technology is currently using spaces within local offices that are not currently in use in the down town Harrisburg area. Currently under construction is the new Academic Center on the corners of Market and North 4th Streets. This newly developed design prominently set itself apart from its surrounding buildings with extensive use of glass on two of its facades. Some of the main features that have been analyzed and researched on the Harrisburg University of Science and Technology's Academic Center are: construction schedule and budget; construction site plans; local conditions; client standpoint; project delivery methods; and project staffing relative to the construction of the project.

The contractual relationships are based on a CM at risk and joint venture delivery method. The project is also fast tracked so that construction can begin as soon as possible. Time and budget constraints in funding are the only concerns for the owner at this time. The schedule for construction indicates a start date of the beginning of January 2007 and completion date is set for November 25, 2008. Key milestone dates are also noted on the schedule as well. Early delays due to weather and improper placement of the tower crane have caused the schedule to vary, however the work is underway and on time.

Various estimates for the project have been assembled and have been thoroughly reviewed and analyzed to determine whether the Harrisburg University Academic Center is within budget. It was found that the estimates from D4 Cost 2002 estimating software and R.S. Means that the actual budget for the project is realistic and fits well to the project constraints and requirements set forth by the owner. The actual building budget and estimates are listed as followed: $73M Actual Building Cost; $68.8M D4 Estimate Building Cost; and $60.5M R.S. Means Building Cost.

A. Project Schedule Summary

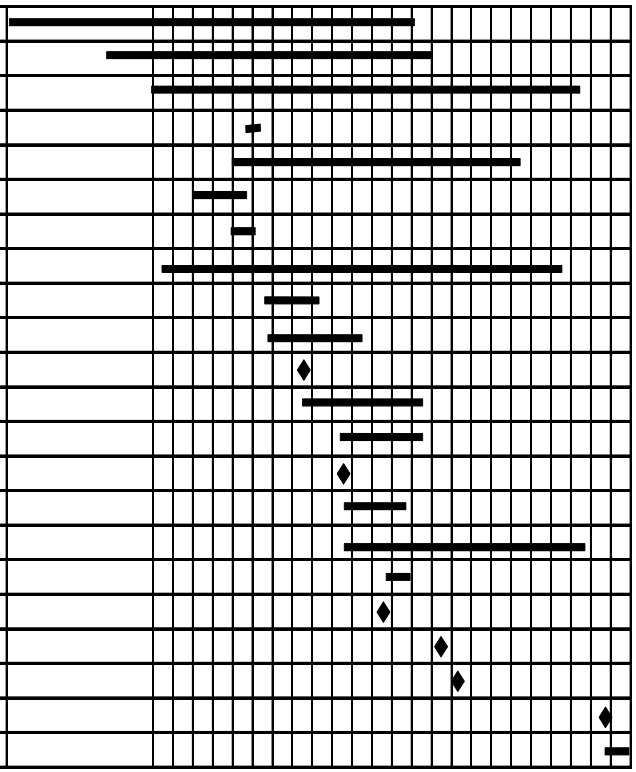
The Harrisburg University of Science and Technology had begun design work for their first building in August of 2005, not yet two years after the University opened its doors for students. It has been using office buildings within three blocks of the construction site of their Academic Center and will be occupying them until the winter semester of 2009, when the new Academic Center will open its doors for the first time. The project completion date is set for November 25, 2008. Reference schedule on following page.

The foundation of the Harrisburg University Academic Center consists of nearly 70 caissons. The caissons range in diameter from just under two feet to nearly five feet; most are on the larger side of approximately 4.5 feet in diameter. Overtop of the caissons is a grade beam of 24 inches. This slab and foundation system was chosen due to the height and load requirements of the building to resist wind lateral forces of the area.

The Academic Center has a structural system that consists of steel girders, beams, and columns; precast concrete wall panels; and composite slab on metal deck. The steel will be erected two bays at a time and the steel deck will be placed before the next set of bays will be erected. The concrete slabs for the floors will be poured after required reinforcement is placed on the decking at a rate of five every eight weeks. Two months after the beginning of slab placement on the decks, the precast slabs will be erected. The shaft for the elevator shares part of the tower crane's foundation and at the point in time when the crane is removed from the site, the elevator shaft will be installed. A material lift is to be in place and functionally at the beginning of January 2008.

Finish sequence milestones begin at the end of the first quarter in 2008-the middle of March with the first two floors clean-out scheduled. The next five floors (3-9) will be for a parking garage and therefore finishing of these levels will come near project completion. Floors 10 and 11 have a finish date of the beginning of April and finishes for the last (16^{th}) floor where the HVAC system will be housed is scheduled for late October 2008.

Activity Description	Days	Start	Finish
Design Phase	320	AUG 01 05	FEB 07 08
Procurement of Construction Services	381	SEP 19 06	FEB 27 08
Sitework	456	JAN 02 07	OCT 13 08
Remove Unsuitable Soils	10	MAY 25 07	JUN 08 07
Foundation	84	MAR 01 07	JUL 18 07
Caissons	55	MAR 01 07	MAY 18 07
Grade Beams	25	APR 30 07	JUN 04 07
Building Core and Shell	425	JAN 15 07	SEP 15 08
MEP Fitout	60	JUN 06 07	SEP 11 07
Steel	103	JUN 25 07	NOV 16 07
Begin Concrete Slabs	0	AUG 16 07	-
Concrete Slabs	127	AUG 16 07	FEB 18 08
Stairway, Elev Shaft Masonry	90	OCT 12 07	FEB 18 08
Begin Erecting Precast	0	OCT 18 07	-
Precast	67	OCT 18 07	JAN 25 08
Fitout	255	OCT 18 07	OCT 20 08
Architectural Pre-Cast Panels and Connections	20	NOV 25 07	DEC 23 08
Substantial Completion	0	-	DEC 17 07
Substantial Completion 1st & 2nd Fl Finishes	0	-	MAR 10 08
Substantial Completion 10th & 11th Fl Finishes	0	-	APR 07 08
Project Complete	0	-	NOV 25 08
Project Close Out	21	NOV 26 08	DEC 29 08



♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

PRELIMINARY OVERVIEW SCHEDULE OF PRECONSTRUCTION & CONSTRUCTION ACTIVITIES

B. Building Systems Summary

Yes	No	Work Scope
☑		Demolition Required
☑		Structural Steel Frame
☑		Cast in Place Concrete
☑		Precast Concrete
☑		Mechanical System
☑		Electrical System
☑		Masonry
☑		Curtain Wall
☑		Support of Excavation

Demolition: Soils had to be tested according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548. The existing storm sewer piping at Fourth Street, parking lot, sidewalks and curbs had to be demolished.

Structural Steel: Composite slab on metal deck for floors 2-16, hat and core frame bracing using moment connections on exterior wall for wind resistance exists in the building. Members will confirm will ASTM A992, Grade 50 steel.

Cast in Place Concrete: All floors have composite slab on metal deck, utilizing cast-in-place concrete. Stay-in-place and timber formwork is used, along with truck and buggy placement for the concrete.

Pre-cast Concrete: Casting will take place from Fourth Street site entrance. The use of pre-cast concrete exists on the façade, parking structure, and classroom partition walls. Connections will be made using pins; crane used is same for steel erection—225' tower crane with 80' horizontal jib.

Mechanical & Electrical Systems: There are rooftop HVAC units with (3) AHU on 16th floor servicing building via 96x36 ducts. Variable air volume boxes supply air to the university classroom buildings as well as the first two floors of office/retail space. Existing air conditioning units range from 1,200 CFM to 16,000 CFM; three split system heat pump units exist as well. Fire water with booster pump exists for the fire suppression system. From the main service to switch gear, a 3-phase 480/277V, 4-wire with main circuit breaker 2000A exists.

Masonry: Interior masonry will be for some of the partitioning walls inside the building along with the framing of stair and elevator shafts. Concrete masonry units will be used.

Curtain Wall: Non-load baring curtain wall exists on the exterior walls. Aluminum window glazing system and pre-cast concrete make up the south and east facades. The north and west facades are simply pre-cast concrete.

Support of Excavation: A free draining sheeting system, consisting of H beams, wood lagging and bracing, was used for support against the existing Strawberry Square building on the west façade.

C. Project Cost Evaluation

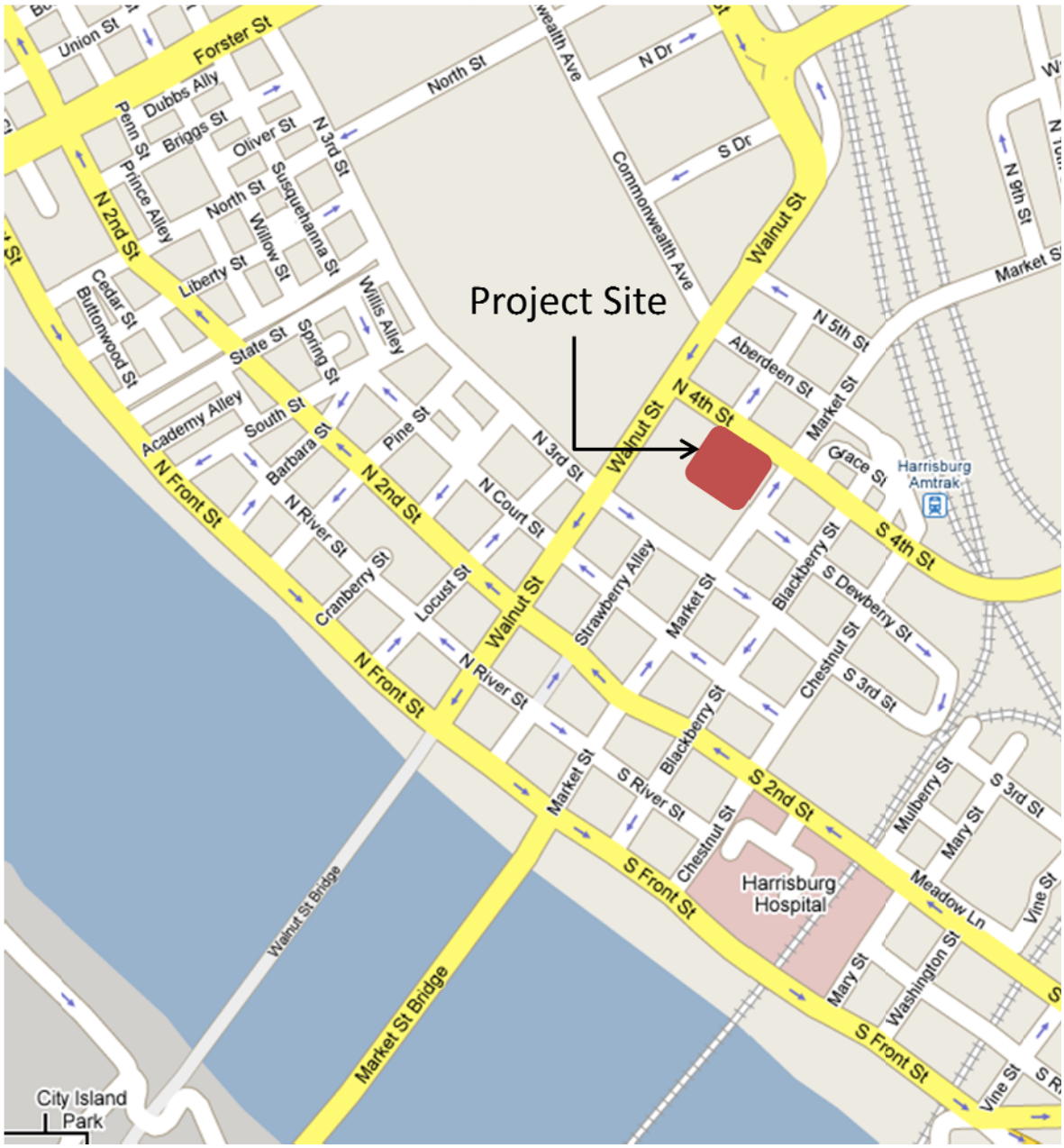
Actual Building Costs: $73,000,000
SF Costs: $197.30
Total Project Costs (to date): $100,000,000
SF Project Costs: $270.27
Parking Garage: $13,475,531
SF Parking Garage: $36.42
General Conditions: $2,499,844
SF General Conditions: $6.76
Concrete: $4,099,488
SF Concrete: $11.08
Steel: $8,770,250
SF Steel: $23.70
Aluminum Glass and Glazing: $3,240,764
SF Aluminum Glass and Glazing: $8.76
Electrical: $6,986,981
SF Electrical: $18.83
HVAC: $4,800,000
SF HVAC: $12.97
Plumbing: $2,600,000
SF Plumbing: $7.03
Technology Equipment and Furniture: $4,275,000
SF Technology Equipment and Furniture: $11.55

The actual costs for construction of the Harrisburg University Academic Center are only current values as the total package has not yet been out to bid. Costs are expected to be in excess of $100M. D4 Cost 2002 ran a comparison of building the university but comparisons were not as close as needed. The final cost of $68.8M was for a university in Pennsylvania with the same number of square feet. The parking garage and technology facilities were not able to be run in the estimate, allowing the numbers to be lower than the actual costs. The total added costs of different facilities comparable to the Academic Center totaled $60.5M, quite lower than the actual costs. This was due to the fact that the parking garage and offices in the building are state-of-the-art and have precast panels and aluminum glazing. In summary, the Harrisburg University Academic Center is a complex facility and costs are added for the buildings use as a technology center. See following sheets and numbers with a golden star.

D4 Cost 2002					
Project Name:	Harrisburg University Academic Center		**Project Height:**	I6 floors	
Project Location:	Harrisburg , Pennsylvania		**Projec Size**	370,000	SF
Year:	2007		**Facility:**	University	
	Percent		**Sq. Cost**		**Amount**
Bidding Requirements	4.08		7.59		2808300
General Requirements	6.37		II.85		4384500
Site Requirements	8.I3		I5.I2		5594400
Site Work	34.47		64.I4		2373I800
Concrete	0.52		0.96		355200
Metals	3.06		5.7		2I09000
Woods and Plastics	0.56		I.05		388500
Thermal and Moistur	I.87		3.48		I287600
Doors and Windows	II.09		20.64		7636800
Finishes	5.7I		I0.62		3929400
Specialties	0.27		0.5I		I88700
Equipment	0.II		0.2I		77700
Furnishings	0.29		0.54		I99800
Conveying Systems	4.52		8.4		3I08000
Mechanical	II.79		2I.93		8II4I00
Electrical	7.I5		I3.32		4928400
Building Costs	I00		I86.06		68842200

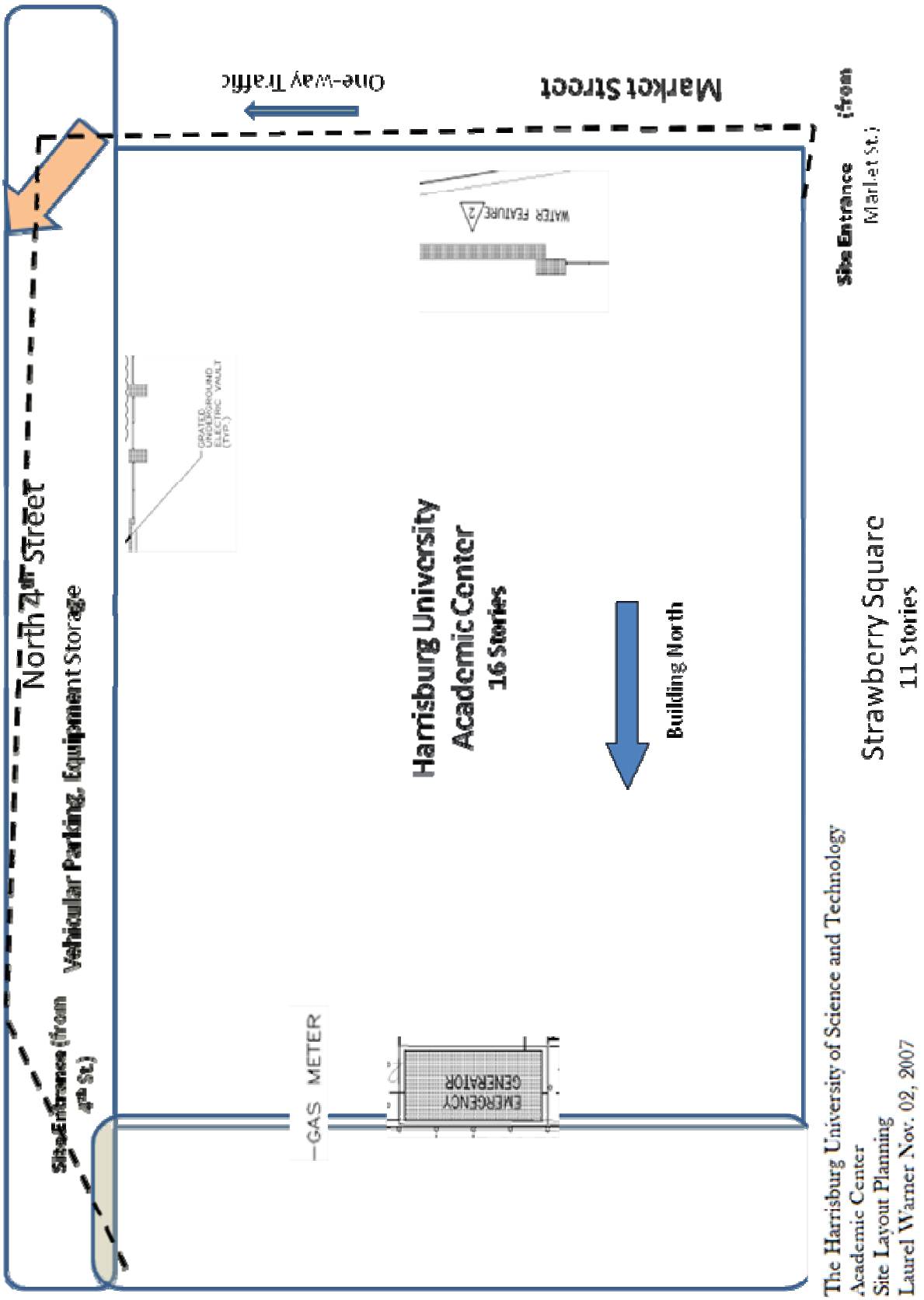
D. Site Plan of Existing Conditions

The site for the Harrisburg University Academic Center is located in the heart of down town. For a year and a half, Market Street from 3rd to 4th Street is one lane and North 4th Street from Walnut to Market will be closed. Prior to demolition, the site existed as a parking lot for Strawberry Square, and indoor shopping mall. The site, due to its location is congested and storage is limited to the south and east locations of the site. Site offices are located on the southeast corner of the site and will move to inside the first floor of the building at substantial completion of the first two floors.



City Map of Harrisburg, PA

Site Prior to Demolition


North 4th Street
Vehicular Parking, Equipment Storage
Site Entrance (from 4th St.)
One-way Traffic
Market Street
Site Entrance (from Market St.)
WATER FEATURE
GRATED UNDERGROUND ELECTRIC VAULT (TYP.)
Harrisburg University Academic Center
16 Stories
Building North
Strawberry Square
11 Stories
GAS METER
EMERGENCY GENERATOR
The Harrisburg University of Science and Technology
Academic Center
Site Layout Planning
Laurel Warner Nov. 02, 2007

E. Local Conditions

In the downtown area of Harrisburg, one sees many tower cranes amongst the rooftops of the skyline. The general area is booming with construction as the city is returning to its splendor many decades ago. In the city, construction projects have little site room as city streets are always congested and changing traffic patterns and closing roads becomes quite a hassle. Limited space for staging, working, and parking are general conditions in the area.

More recently, owners are using construction managers for their building projects and companies are expanding for in-house estimating, scheduling, and constructability reviewing as the needs are changing for owners. However, there is still a large demand for general contracting depending on the type of project. Schools are the ideal candidate owners for using construction management in their construction project.

As the construction industry moves toward a green type of design and construction approach, it becomes more desirable to have waste removal and recycling of materials for a project. There are no new fees for recycling in the area but the $2 recycling fee was reauthorized within the last decade. This has reduced construction costs by millions over the years.

The city of Harrisburg is divided into two regions by the Susquehanna River by the locals: the East Shore and the West Shore. Since most of the area is surrounded by a body of water, this impacts the soil conditions as construction buildings are concerned. Because of the moisture in the soil, the work for the construction site is affected. Foundations are designed as per the limited strength of the soil within the bounds of the perimeter of the buildings footprint.

As per the specs of the project, damage caused by the settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations is the responsibility of the general contractor during construction of the structure, utilities, sidewalks, and other facilities. Preparation of subgrade for earthwork operations is necessary and includes removal of debris, obstructions, and toxic materials from ground surface. It is also essential to prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding the project site and surrounding area. Protection of the subgrades from softening, undermining, washout, and damage by rain or water accumulation is essential also for the area. This was done by rerouting surface water runoff away from excavated areas, not allowing water to accumulate in excavations, and not using excavated trenches as temporary drainage ditches.

F. Client Information

The Harrisburg University of Science and Technology is an infant as far as Pennsylvania higher education is concern. The University became incorporated in the Commonwealth in 2001 and opened its doors for its charter class in 2005. The University is the first of its kind in the Harrisburg region and only plans on expanding by opening the doors of the Academic Center in January 2009. It will be the first building the University owns, in part to very early public and private sector investments.

In order to continue its funding, the University has a need to expand as soon as possible. Due to its location, limited space of former office buildings are now used as laboratories and classrooms. By building the Academic Center, the University hopes to bring in new talent interested in the sciences and eager to learn in a new state-of-the-art facility right downtown. For now, it focuses on bringing in local high school graduates and those wanting to further their education. Great attempts have not been made for advertising because of the size of the current temporary facilities.

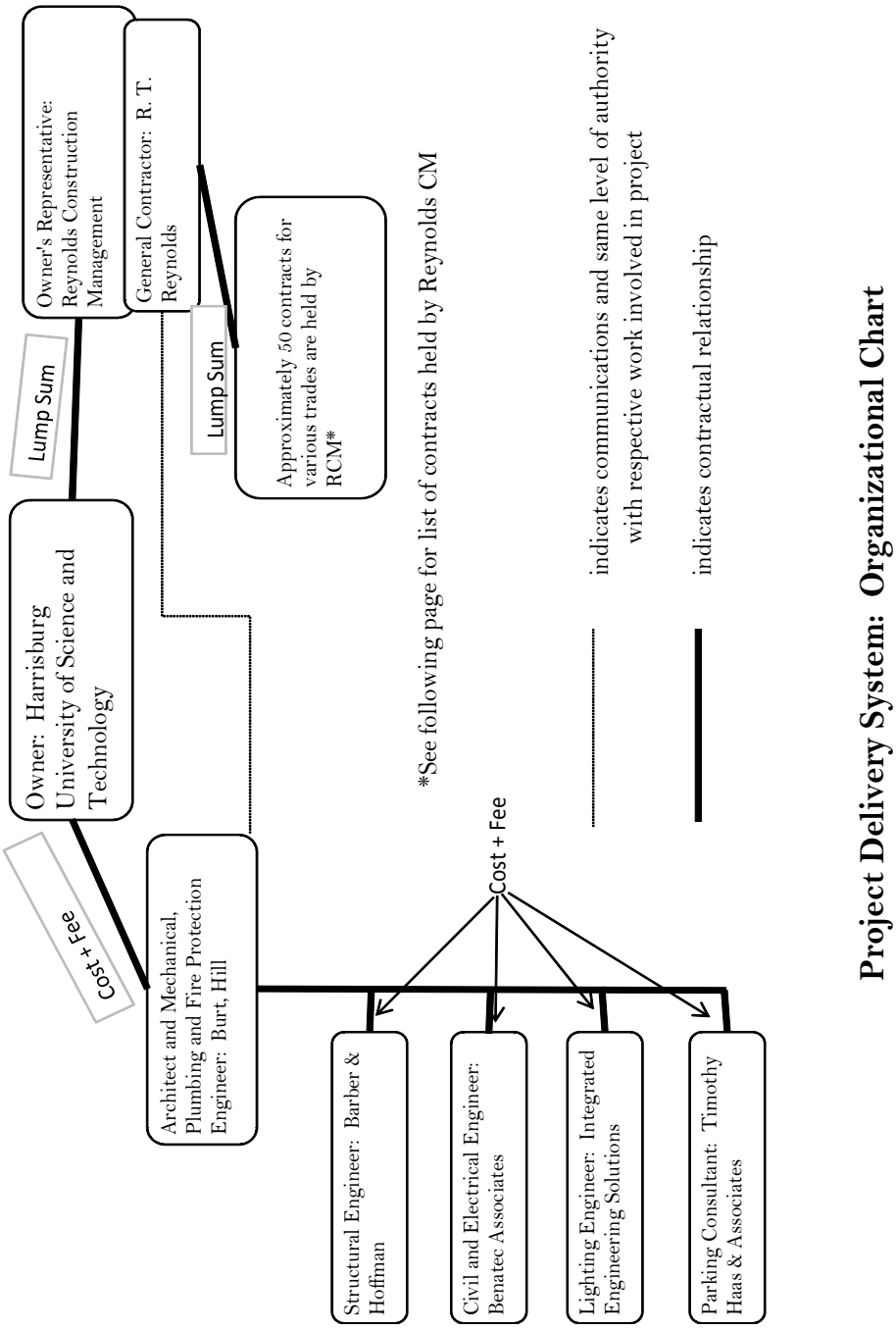
The owner representative of Reynolds Construction Management stated that the Harrisburg University Academic Center is a risky project but everything seems to be going accordingly. He hopes that the University will expand and direct new talent into the area and revive the city.

The Academic Center will be where the University's offices, classrooms, library, auditoriums, laboratories, and parking garage are located. The design stage was extensive due to the University's funding and anticipates costs just over $70 million.

The faculty, staff, and students are awaiting their new technology facility to open with hopes to spread out in the Academic Center for spring 2009 semester. Currently, they are the only occupants of the project. Their anticipation can be noted on the University's website as they are documenting the construction progress with live video feeds and milestone pictures.

G. Project Delivery System

The project delivery system for the Harrisburg University of Science and Technology's Academic Center is that of a joint venture (non-contractual) CM at Risk. Reynolds Construction Management R.T. Reynolds is acting as the general contractor on the project, holding all of the contracts from the various trades on the project.

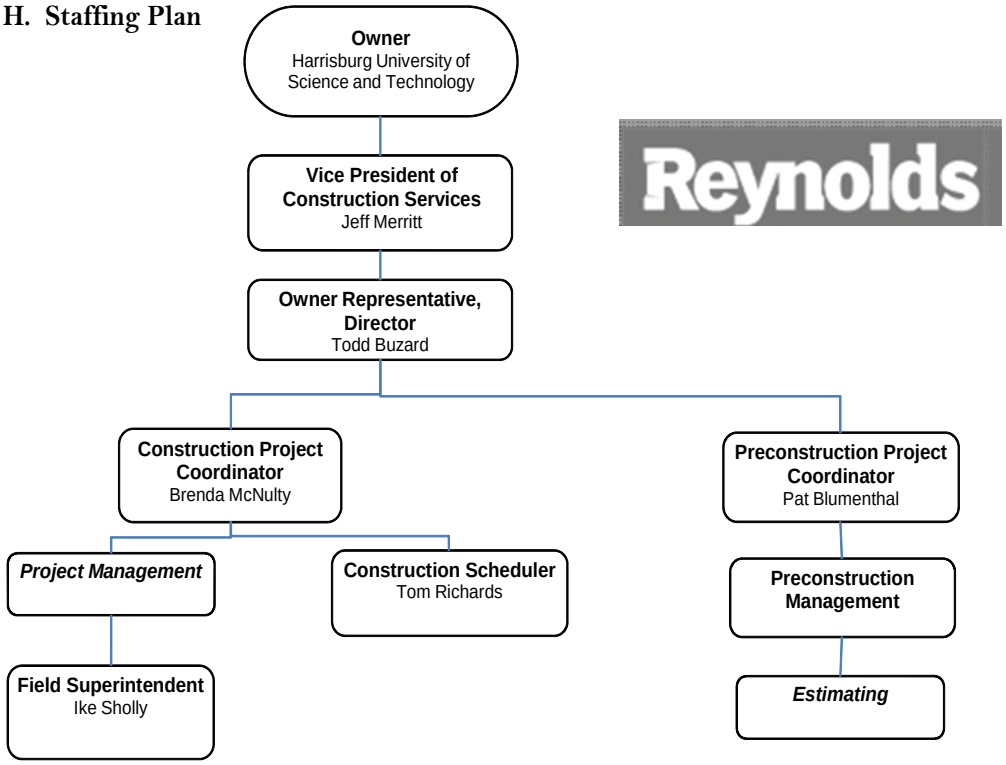


Harrisburg University of Science and Technology
Harrisburg Academic Center
Contract Values

Contract Number	Description	Subcontractor	Amount
1	General Conditions	RTR	$2,500,000.00
2	Vibration Monitoring Allowance	ALLOWANCE	$20,000.00
3	Additional Street Barricades	PSI	$43,137.00
4	Temp Winter Protection for Fireproofing	RTR	$25,000.00
5	Scaffolding for Aluminum Panels, Louvers, Soffit	RTR	$250,000.00
6	Additional Temporary Fencing	Washington & Dowling	$12,987.00
7	Sitework	Markcrete	$593,870.00
8	Excavation & Backfill for Cassions	ALLOWANCE	$6,000.00
9	Cassions	Brayman	$616,600.00
10	Cassons Bad Earth Conditions	ALLOWANCE	$48,000.00
11	60" Corrigated Casing	ALLOWANCE	$6,000.00
12	Concrete	Macri	$4,099,488.00
13	Ornamental Gate, Foundation, Pier	ALLOWANCE	$20,000.00
14	Architectural Precast	Architectural Precast	$1,992,905.00
15	Masonry	Advance	$2,012,300.00
16	Precast Connection Allowance	ALLOWANCE	$250,000.00
17	Structural Steel	Strait Steel	$8,770,250.00
18	Tower Crane/Operator	Dickinson	$750,000.00
19	Miscellaneous Metals	McGregor	$1,550,000.00
20	Metal Pan Stairs	Ebingers	$541,303.00
21	Carpentry	Acri	$1,700,000.00
22	Fixed Radiused Desk @ Lecture Hall	ALLOWANCE	$85,000.00
23	Waterproof Elevator Pits	Houck	$8,680.00
24	Courtyard Water Feature Liner		$10,000.00
25	Traffic Coating	Houck	$93,890.00
26	Spray-on Insulation	Novingers	$100,000.00
27	Temp Damp Coating at Caisson Areas	Houck	$5,000.00
28	Fireproofing	A1	$550,000.00
29	Intumescent Fireproofing	Novingers	$100,000.00
30	Roofing/Sheet Metal	Allied	$887,822.00
31	Caulking & Sealants	Thesen	$250,000.00
32	Electronic Door Hardware		$40,000.00
33	Coiling Doors & Grills	Builders Specialties	$120,000.00
34	Aluminum/Glass & Glazing	Hershocks	$3,240,764.00
35	Drywall, Metal Studs & Insulation	Novingers	$3,568,000.00
36	Upgrade Existing Facade Allowance	ALLOWANCE	$30,000.00
37	Ceramic & Glazed Tile	Interstate	$325,000.00
38	Acoustical Ceilings	Novingers	$936,600.00
39	Acoustical Wall Panel Allowance	ALLOWANCE	$100,000.00

40	Flooring	DeGol	$297,073.00
41	Painting	Art I Do	$400,000.00
42	Access Flooring	Bettinger West	$9,000.00
43	Folding Partition		$13,275.00
44	Pay-on-Foot Stations (2) Each - Allowance	ALLOWANCE	$100,000.00
45	Proximity Reader & Exit Loop for GRG Door	ALLOWANCE	$5,000.00
46	Lab Casework & Equipment	Northeast	$264,500.00
47	Roof Anchors	Pro-Bel	$39,050.00
48	Window Blinds & Shades	Kay	$55,650.00
49	Technology & Furniture Allowance	ALLOWANCE	$2,965,000.00
50	Pumping & Filtration - 2 water features	ALLOWANCE	$40,000.00
51	Elevators	Otis	$1,755,160.00
52	Elevator Call Station Kiosk Allowance	ALLOWANCE	$10,000.00
53	Elevator Color Touch Screen Terminals	ALLOWANCE	$10,000.00
54	Fire Protection	Tomko	$994,000.00
55	Plumbing	Tomko	$1,606,000.00
56	HVAC	GR Sponaugle	$4,800,000.00
57	Electrical	GR Sponaugle	$6,986,981.00
58	Telecommunications Systems Allowance	ALLOWANCE	$769,000.00
	Harrisburg Merchantile Tax	RTR	$69,700.00
	Performance Bond	RTR	$385,275.00
	Subguard	RTR	$640,000.00
	Insurances	RTR	$408,000.00
	Contingency		$1,775,000.00
	Subtotal		**$60,656,260.00**
	RTR CM Fee (3%)		$1,819,688.00
Revised GMP Construction Total			**$62,475,948.00**

H. Staffing Plan



Owner Representative: Asks as voice of owner
VP of CS: Consultant of company, reports to director
Precon Proj Coordinator: Writes contracts, in charge of bidding
Precon Management: oversees estimating, attends owner meetings
Estimating: does architectural and MEP estimating
Construction Scheduler: schedules project duration
Project Management: work in office and field (communications)
Const. Proj. Coordinator: documents submittals, RFIs
Field Superintendent: oversees construction process

Research: Green Urban Design Model

Construction Industry Issue

The environmental impact of the building design, construction and operation industry is significant. Buildings annually consume more than 30% of the total energy and more than 60% of the electricity used in the U.S. Each day five billion gallons of potable water is used solely to flush toilets. A typical North American commercial construction project generates up to 2.5 pounds of solid waste per square foot of completed floor space [29]. Development shifts land usage away from natural, biologically-diverse habitats to hardscape that is impervious and devoid of biodiversity. The far reaching influence of the built environment necessitates action to reduce its impact. Green building practices can substantially reduce or eliminate negative environmental impacts and improve existing unsustainable design, construction and operational practices [24]. As an added benefit, green design measures reduce operating costs, enhance building marketability, increase worker productivity, and reduce potential liability resulting from indoor air quality problems [17]. In other words, green design has environmental, economic and social elements that benefit all building stakeholders, including owners, occupants and the general public.

Following the formation of the U.S. Green Building Council in 1993, the membership quickly realized that a priority for the sustainable building industry was to have a system to define and measure "green buildings." The USGBC began to research existing green building metrics and rating systems. Less than a year after formation, the membership followed up on the initial findings with the establishment of a committee to focus solely on this topic. The diverse initial composition of the committee included architects, realtors, a building owner, a lawyer, and environmentalist and industry representatives. This cross section of people and professions added a richness and depth both to the process and to the ultimate product. The LEED Green Building Rating System is a voluntary, consensus-based, market-driven building rating system based on existing proven technology. It evaluates environmental performance from a whole building perspective over a building's life cycle, providing a definitive standard for what constitutes a "green building." The rating system is organized into five environmental categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, and Indoor Environmental Quality. An additional category, Innovation & Design Process addresses sustainable building expertise as well as design measures not covered under the five environmental categories [30]. LEED is a measurement system designed for rating new and existing commercial, institutional and residential buildings. It is based on accepted energy and environmental principles and strikes a balance between known established practices and emerging concepts.

Research Goals

Over the last decade, green design has become more of trend in the construction industry than just a want of the architecture or perhaps building owner. Recognition for having a building that is environmentally friendly is now coveted. The goals for the critical industry research are to bring together design concepts from current LEED Certified buildings that are similar to the Harrisburg University Academic Center. With the model, research is compiled for future use in the design industry, with the intention that professionals would not have a blind eye to green building and design concepts.

*A letter and copy of this report will be sent to the Harrisburg University of Science and Technology.

Modeling Process

Research was compiled existing of various building design trends and a current list of buildings LEED certified by the U. S. Green Building Council for their outstanding design, construction, and performance systems [30]. Thousands of buildings were reviewed for their criteria to be similar in aspects to the Harrisburg University Academic Center. Among the aspects were building site selection in an urban setting, square footage between 275,000 to 500,000 square feet, use during daylit hours, information for design and construction being non-classified, and being LEED certified with versions 2.0 for New Construction or later. See Figure 1 for the list of the 22 buildings that were chosen for the analysis. Figure 2 illustrates the amount of each level of certification is represented in the analysis, with the average building being at a LEED Silver Certification.

Using the LEED Project Checklist, Figure 3.1 and 3.2, information was gathered about each building to attain design aspects that were incorporated into each project. A spreadsheet compiled the data from project profiles, LEED journal articles, and building owners, architects, and engineers. Please reference Appendix for each building's checklist. Next, the totals for each of the six categories of design were found, see Figure 4.

To create the Green Urban Design Model, the most frequently used aspects of design for each category were noted into one chart. Theses aspects represent current trends featured in the design, construction, and performance of building projects most like the Harrisburg University's Academic Center currently under construction. Please reference design model and example features of design.

Project Name	City	State	Version	Project Type	Owner Type	Occupant Type	Gross Square Feet	Registration Date
OUC Administration Building	Orlando	FL	2.2	Commercial Office	Profit Org	Mixed Occupancy	278,000	Aug 7 2006
Manulife US Headquarters	Boston	MA	2.2	Commercial Office	Federal Government	Federal Government	526,020	Jan 19 2007
Social Security Annex Building	Baltimore	MD	2.0	Commercial Office	Federal Government	Federal Government	406,069	Dec 10 2001
Liberty Mutual Office Building	Dover	NH	2.1	Commercial Office	Profit Org	Profit Org	350,000	Jun 16 2005
Molasky Corporate Center	Las Vegas	NV	2.1	Commercial Office	Profit Org	Mixed Occupancy	265,000	May 2 2005
The Plaza At PPL Center	Allentown	PA	2.0	Commercial Office	Other	Profit Org	280,000	Nov 8 2001
Bp Commercial and Trading Office	Houston	TX	2.2	Commercial Office	Profit Org	Profit Org	390,000	Sept 15 2006
Vocation Technology Center, City College	Sandiego	CA	2.1	Higher Education	State Government	State Government	336,100	Nov 20 2006
Management Building	Atlanta	GA	2.0	Higher Education	State Government	State Government	248,059	Jan 31 2001
Center for Interdisciplinary Engineering	Durham	NC	2.1	Higher Education	Profit Org	Profit Org	323,000	July 23 2002
Whitehead Biomedical Research Building	Atlanta	GA	2.0	Labrotory	Profit Org	Profit Org	325,000	July 19 2000
San Diego New Main Library	San Diego	CA	2.1	Library	Local Government	Local Government	360,858	May 4 2004
California Academy of Sciences	San Fransisco	CA	2.1	Multi-Use	Non-Profit Org	Non-Profit Org	390,000	Mar 19 2003
David Skaggs Research Center	Boulder	CO	2.2	Multi-Use	Federal Government	Federal Government	400,000	Dec 02 2006
Univ of North Florida - Osprey Fountains	Jacksonville	FL	2.2	Multi-Use	State Government	State Government	375,000	Mar 19 2007
Simmons College of Mana	Boston	MA	2.1	Multi-Use	Non-Profit Org	Non-Profit Org	309,660	Dec 9 2005
Moziac Development	Minneapolis	MN	2.2	Multi-Use	Individual	Mixed Occupancy	350,000	Oct 12 2006
Jefferson Arms	St Louis	MO	2.2	Multi-Use	Profit Org	Mixed Occupancy	509,855	Dec 22 2006
Duke Univ French Family Science Center	Durhan	NC	2.1	Multi-Use	Profit Org	Profit Org	273,872	Sep 22 2004
4275 Dean Martin Drive	Las Vegas	NV	2.1	Multi-Use	Profit Org	Profit Org	400,000	Jan 7 2006
1700 Building	Portland	OR	2.2	Multi-Use	Profit Org	Mixed Occupancy	371,000	Aug 20 2001
Two Potomac Yard	Arlington	VA	2.1	Multi-Use	Profit Org	Federal Government	309,270	Jan 31 2005

Average SF 353,489

Figure 1: Selected Projects for Analysis

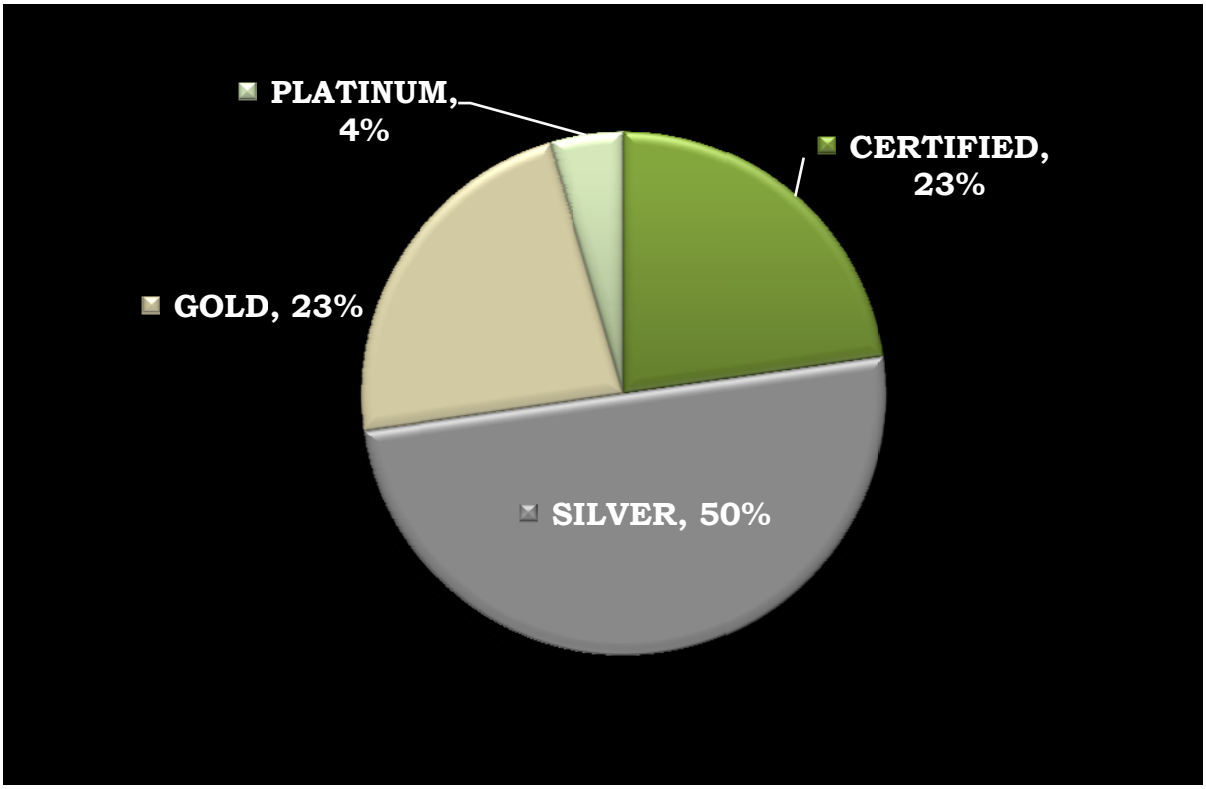


Figure 2: Percentage of Level of Certification of Buildings Used in Urban Design Model

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

<< PROJECT NAME>>
<< CITY, STATE >>

Yes	?	No			
			Sustainable Sites		**14** Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
			Credit 1	**Site Selection**	1
			Credit 2	**Development Density & Community Connectivity**	1
			Credit 3	**Brownfield Redevelopment**	1
			Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
			Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
			Credit 5.1	**Site Development,** Protect of Restore Habitat	1
			Credit 5.2	**Site Development,** Maximize Open Space	1
			Credit 6.1	**Stormwater Design,** Quantity Control	1
			Credit 6.2	**Stormwater Design,** Quality Control	1
			Credit 7.1	**Heat Island Effect,** Non-Roof	1
			Credit 7.2	**Heat Island Effect,** Roof	1
			Credit 8	**Light Pollution Reduction**	1
Yes	?	No			
			Water Efficiency		**5** Points
			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
			Credit 2	**Innovative Wastewater Technologies**	1
			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
			Credit 3.2	**Water Use Reduction**, 30% Reduction	1
Yes	?	No			
			Energy & Atmosphere		**17** Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required
			Credit 1	**Optimize Energy Performance**	1 to 10
			Credit 2	**On-Site Renewable Energy**	1 to 3
			Credit 3	**Enhanced Commissioning**	1
			Credit 4	**Enhanced Refrigerant Management**	1
			Credit 5	**Measurement & Verification**	1
			Credit 6	**Green Power**	1

Figure 3.1: Registered Project Checklist

Yes	?	No			
			Materials & Resources		**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
			Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
			Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
			Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
			Credit 3.1	**Materials Reuse**, 5%	1
			Credit 3.2	**Materials Reuse**,10%	1
			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
			Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally	1
			Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally	1
			Credit 6	**Rapidly Renewable Materials**	1
			Credit 7	**Certified Wood**	1

Yes	?	No			
			Indoor Environmental Quality		**15** Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
			Credit 1	**Outdoor Air Delivery Monitoring**	1
			Credit 2	**Increased Ventilation**	1
			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
			Credit 6.1	**Controllability of Systems**, Lighting	1
			Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
			Credit 7.1	**Thermal Comfort**, Design	1
			Credit 7.2	**Thermal Comfort**, Verification	1
			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes	?	No			
			Innovation & Design Process		**5** Points
			Credit 1.1	**Innovation in Design**: Provide Specific Title	1
			Credit 1.2	**Innovation in Design**: Provide Specific Title	1
			Credit 1.3	**Innovation in Design**: Provide Specific Title	1
			Credit 1.4	**Innovation in Design**: Provide Specific Title	1
			Credit 2	**LEED® Accredited Professional**	1

Yes	?	No		
			Project Totals (pre-certification estimates)	**69** Points

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

Figure 3.2: Registered Project Checklist

	#	Sustainable Sites	Water Efficiency	Energy and Atmosphere	Materials and Resources	Indoor Environmental Quality	Innovation and Design	Total LEED Points
OUC Administration Building	1	7	2	14	7	10	2	42
Manulife US Headquarters	2	12	3	8	6	4	1	34
Social Security Annex Building	3	10	2	8	4	8	2	34
Liberty Mutual Office Building	4	4	3	5	6	9	2	29
Molasky Corporate Center	5	6	5	9	8	9	3	40
The Plaza At PPL Center	6	10	3	11	6	10	1	41
Bp Commercial and Trading Office	7	6	2	9	6	8	2	33
Vocation Technology Center, City College	8	6	3	11	9	6	3	38
Management Building	9	6	1	7	6	11	3	34
Center for Interdisciplinary Engineering	10	6	4	4	8	6	2	30
Whitehead Biomedical Research Building	11	7	3	10	6	10	3	39
San Diego New Main Library	12	7	3	7	7	11	2	37
California Academy of Sciences	13	10	5	14	11	11	4	55
David Skaggs Research Center	14	9	3	4	5	9	3	33
Univ of North Florida - Osprey Fountains	15	8	2	8	8	12	2	40
Simmons College of Mana	16	9	4	4	6	9	2	34
Moziac Development	17	10	3	6	8	11	3	41
Jefferson Arms	18	7	2	6	8	6	2	31
Duke Univ French Family Science Center	19	11	2	2	8	6	2	31
4275 Dean Martin Drive	20	7	2	11	6	4	2	32
1700 Building	21	9	3	6	6	11	3	38
Two Potomac Yard	22	9	2	7	8	12	3	41
Category Average		8	3	8	7	9	2	37

Figure 4: Totals for Each Project in 6 Categories

Design Model

Green Urban Design Model

Sustainable Sites		**8/14 Points**
Prereq 1	**Construction Activity Pollution Prevention**	Required
Credit 1	**Site Selection**	1
Credit 2	**Development Density & Community Connectivity**	1
Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
Credit 4.4	**Alternative Transportation**, Parking Capacity	1
Credit 5.1	**Site Development,** Protect of Restore Habitat	1
Credit 6.1	**Stormwater Design,** Quantity Control	1
Credit 6.2	**Stormwater Design,** Quality Control	1
Water Efficiency		**3/5 Points**
Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
Credit 3.1	**Water Use Reduction**, 20% Reduction	1
Energy & Atmosphere		**8/17 Points**
Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Prereq 2	**Minimum Energy Performance**	Required
Prereq 3	**Fundamental Refrigerant Management**	Required
Credit 1	**Optimize Energy Performance**	5
Credit 2	**On-Site Renewable Energy**	1
Credit 5	**Measurement & Verification**	1
Credit 6	**Green Power**	1
Materials & Resources		**7/13 Points**
Prereq 1	**Storage & Collection of Recyclables**	Required
Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
Credit 3.1	**Materials Reuse**, 5%	1
Credit 3.2	**Materials Reuse**,10%	1
Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally	1
Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally	1
Credit 6	**Rapidly Renewable Materials**	1
Indoor Environmental Quality		**9/15 Points**
Prereq 1	**Minimum IAQ Performance**	Required
Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
Credit 1	**Outdoor Air Delivery Monitoring**	1
Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
Credit 6.1	**Controllability of Systems**, Lighting	1
Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
Credit 7.1	**Thermal Comfort**, Design	1
Credit 7.2	**Thermal Comfort**, Verification	1
Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Innovation & Design Process		**2/5 Points**
Credit 1.1	**Innovation in Design**: Provide Specific Title	1
Credit 2	**LEED® Accredited Professional**	1
Project Totals (pre-certification estimates)		**37/69 Points**

After compiling each building projects LEED Criteria check sheets, trends were found showing the most often used design or construction aspect of each category of sustainable sites, water efficiency, energy & atmosphere, materials & resources, indoor environmental quality and innovation and design process. The following are examples of each criteria that the design model uses [2].

SS	Credit 1	Create erosion and sediment control plan during design phase of project
	Credit 2	Give pedestrians access to a variety of services
	Credit 4.1	Project site within 1/4 mile of bus/transit stop
	Credit 4.2	Add bicycle racks, shower and locker rooms
	Credit 4.4	Provide preferred parking for carpools, share parking lot space with other facilities
	Credit 5.1	Maintain same area of greenfield as before construction by adding grasses and plants
	Credit 6.1	Use vegetative roofs or pervious paving to minimize impervious surfaces
	Credit 6.2	Employ constructed wetlands and open channels to treat stormwater runoff
WE	Credit 1.1	Use stormwater, greywater, or condensate for water irrigation
	Credit 1.2	Same as previous
	Credit 3.1	Chose fixtures to reduce water usage, i.e. toilets
EA	Credit 1	Minimum energy savingsof 24.5% of baseline building performance
	Credit 2	Use solar, wind, geothermal energy to provide 2.5% of building energy use
	Credit 5	Evaluate energy efficiency by comparing actual to baseline performance
	Credit 6	Use solar, wind, geothermal, biomass, or low-impact hydro energy sources
MR	Credit 2.1	Divert 50% of construction, demolition, and land-clearing debris from disposal
	Credit 3.1	Use 10% salvaged beams, flooring, paneling, doors, etc.
	Credit 3.2	Same as previous but 20%
	Credit 4.1	Incorporate 10% recycled material into building products
	Credit 5.1	Use 10% project materials extracted from 500 mile radius
	Credit 5.2	Same as previous but 20%
	Credit 6	Use materials such as bamboo, cotton insulation, linoleum and cork
EQ	Credit 1	Install carbon dioxide and airflow measurement equipment on HVAC system
	Credit 4.1	Reduce quantities of indoor air contaminants with these materials
	Credit 4.2	Reduce quantities of indoor air contaminants with these materials
	Credit 6.1	Provide individual lighting controls for 90% of building occupants
	Credit 6.2	Provide individual comfort controls for 50% of buillding occupants
	Credit 7.1	Evaluate air temperature, radiant temperature, air speed, humidity for comfort
	Credit 7.2	Supply assessment for previous
	Credit 8.1	Provide daylight to 75% of regularly occupied spaces
	Credit 8.2	Provide daylighted views to 90% of regularly occupied spaces
I D	Credit 1.1	Go beyond minimum requirements for a certain credit
	Credit 2	Hire a LEED Accredited Professional

Conclusions

The Green Urban Design Model shows trends in green design that are being recognized by the U. S. Green Building Council's LEED Rating System for New Construction. It also shows those trends that are significant to Harrisburg University's Academic Center's relative size, urban location, intended use, among other factors. Many design models can be created, but this one shows how environmentally friendly design can be considered into higher education and office buildings in the major cities in the United States.

To have a building project registered as LEED Certified, many man hours go into submitting documentation about the design and construction process as well as additional calculations to provide evidence that a certain criteria has been met. If the Harrisburg University of Science and Technology incorporated the registration process at the beginning of the project conception phase in August 2005, the doors of the University would not have opened for another semester due to vigorous performance checks and document submittals. Please reference Appendix for beginning of construction schedule. Many buildings have been denied registration because of improper documentation.

Analysis I: Daylighting a Typical Interior Space

Daylighting a Space

Daylighting is the controlled admission of natural light into a space through glazing with the intent of reducing or eliminating electric lighting. By utilizing solar light, daylighting creates a stimulating and productive environment for building occupants (See Appendix). With the reduction of electric lighting is the decreased energy use. A well-designed daylit building is estimated to reduce lighting energy use by 50% to 80% [34].This conserves natural resources and reduces air pollution and impacts due to energy production and consumption. Daylighting design involves a careful balance of heat gain and loss, glare control, visual quality and variations in daylight availability. Shading devices, light shelves, courtyards, atriums and window glazing are all strategies employed in daylighting design. Important considerations include the selected building's orientation, window size and spacing, glass selection, reflectance of interior finishes and locations of interior walls. Daylit spaces also increase occupant productivity and reduce absenteeism and illness [17].

Daylighting Analysis

Through straightforward calculations by a LEED AP, designing a space for daylighting criteria based off of the LEED EQ point 8.1, daylighting for 75% of the spaces with a glazing factor of 2%. In certified projects, strategies have included building orientation, shallow floor plates, increased building perimeter, exterior and interior permanent shading devices, high performance glazing and automatic photocell-based controls [15]. See Figure 5 for glazing factor calculation.

Compliance for the EQ 8.1 Credit may be determined by either the glazing factor calculation methodology or daylighting simulation software to determine point-by-point illumination levels. Daylighting models are performed by lighting designers or electrical engineers using programs developed for use while the design of the building project is underway [30]. The remaining portion of the analysis will follow the Glazing Factor methodology.

$$\text{Glazing Factor} = \frac{\text{Window Area [SF]}}{\text{Floor Area [SF]}} \times \text{Window Geometry Factor} \times \frac{\text{Actual } T_{vis}}{\text{Minimum } T_{vis}} \times \text{Window Height Factor}$$

Figure 5: Glazing Factor Equation Used in Calculations

Areas of the building under consideration for daylighting calculations are all regularly occupied spaces such as office spaces, meeting areas, and cafeterias. For analysis for the Harrisburg University Academic Center, the twelfth floor will be studied. Rooms that will have sample calculations are located on the East side, Southeast corner, and center part of the floor. Areas that are not generally taken into consideration are support areas for copying, storage, mechanical equipment, laundry and restrooms.

The Glazing Factor calculation method is designed to identify daylighting conditions based on room and window geometry and visible transmittance based on meeting the performance criteria for overcast sky conditions. Currently this calculation method doesn't take into account light shelves, partitions, significant exterior obstructions or exterior reflective surfaces [27]. The following is a summary of the Glazing Factor method outlined in the LEED Version 2.2 Reference Guide. It will be implemented for daylighting analysis of the Harrisburg University Academic Center of rooms 1201, 1205, 1206, 1210, 1212, and 1219, all currently devoted to office spaces on the latest construction documents (Figure 6).

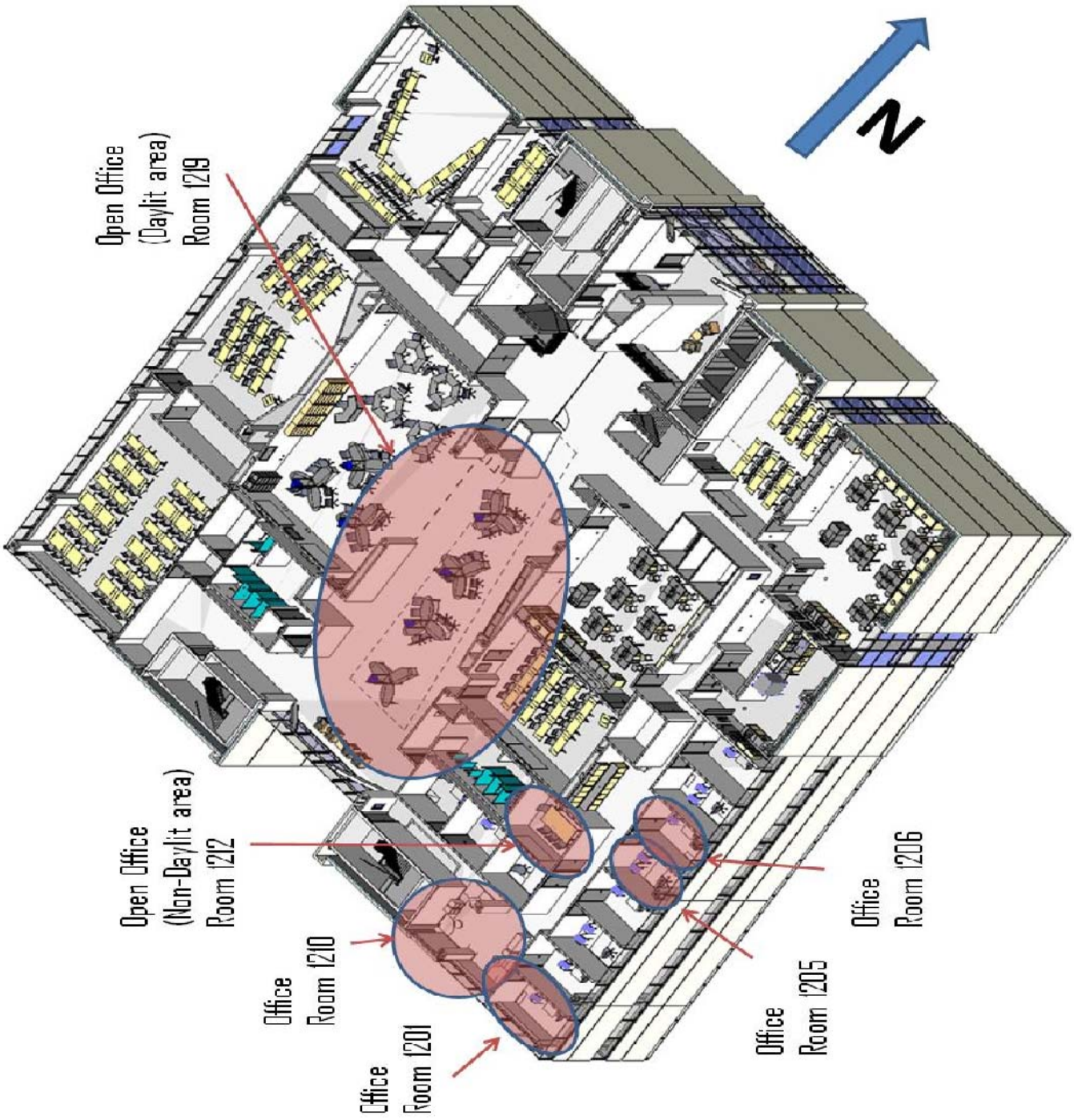


Figure 6: 12th Floor Axonometric Plan Showing Rooms in Calculation

Procedure for Glazing Factor Method

1. Create a spreadsheet and identify all regularly occupied rooms/areas. Determine the floor area of each applicable room using construction documents.

2. For each room/area indentified, calculate the window area and indicate the acceptable window types, noting that window areas above 7'-6" are considered to be daylight glazing. Glazing at this height is the most effective at distributing daylight deep into the interior space. Window areas from 2'-6" to 7'-6" are considered to be vision glazing. These window areas are primarily used for viewing and lighting interior spaces close to the building perimeter. Window areas below 2'-6" do not contribute to daylighting of interior spaces and are to be excluded from the calculations.

3. For each window type, insert the appropriate geometry and height factors (Figure 7). The geometry factor indicates the effectiveness of a particular aperture to distribute daylight relative to window location. The height factor accounts for where light in introduced to the space.

4. For each window type, indicate the visible transmittance (Tvis), a variable number that differs for each product. Minimum Tvis is the recommended level of transmittance for selected glazing.

5. Calculate the Glazing Factor for each window type using the GF equation. For rooms/areas with more than one window type, sum all window types to obtain a total Glazing Factor for the room/area.

6. If the total Glazing Factor for a room/area is 2% or greater, then the square footage of the room/area is applicable to the credit.

7. Sum the square footage of all applicable rooms/areas and divide by the total square footage of all regularly occupied spaces. If this percentage is equal to or greater than 75%, then the project qualifies for this point [30].

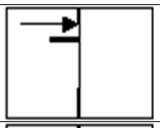
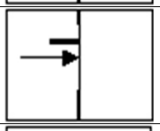
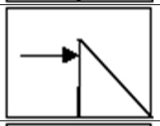
Window Type		Geometry Factor	Minimum T_{vis}	Height Factor	Best Practice Glare Control Methods
Sidelight, daylight glazing		0.1	0.7	1.4	Adjustable blinds Interior light shelves Fixed translucent exterior shading devices
Sidelight, vision glazing		0.1	0.4	0.8	Adjustable blinds Exterior shading devices
Top lighting, vertical monitor		0.2	0.4	1.0	Adjustable exterior blinds
Top lighting, saw tooth monitor		0.33	0.4	1.0	Exterior louvers
Top lighting, horizontal skylights		0.5	0.4	1.0	Interior fins Exterior fins Louvers

Figure 7: Daylighting Design Criteria [30]

Results

Using the GF procedure and actual T_{vis} of 0.5 from the design specs book, the twelfth floor of the Harrisburg University Academic Center was analyzed and the percentage of regularly occupied spaces with a 2% glazing factor meet the minimum of 75% of the spaces. Due to the excessive percentage of 95%, the daylighting of the space may meet design and performance criteria to meet another credit that will be discussed in a following section. Please reference the Appendix for the glazing factor tabulation and Figure 8 for the tabulation totals.

Total Regularly Occupied Space Area (SF)	Total Regularly Occupied Space Area with a Minimum 2% Glazing Factor	Percentage of Regularly Occupied Space with a 2% Glazing Factor
4,104	3,889	95%

Figure 8: Glazing Factor Tabulation Totals

Conclusions

As noted in the Glazing Factor method analysis, the example rooms on the twelfth floor of the Harrisburg University Academic Center meet the design criteria to obtain a rating point within the LEED EQ 8.1section. This credit may be eligible for exemplary performance under the Innovation & Design section because the project example achieves 95% daylighting based on the requirements and guidelines of this credit [2]. For this credit, it is necessary to document in writing and in calculations during the design submittal process during pre-construction phases of the project.

Specialized glazing can increase initial costs for a project and can lead to excessive heat gain if not designed properly. Glazing provides less insulating effects compared to standard walls, resulting in higher energy use and requiring additional maintenance. However, offices with sufficient natural daylight have proven to increase occupant productivity and comfort. In most cases, occupant salaries significantly outweigh first costs of incorporating daylighting measures into a building design.

Studies of schools and stores have shown that daylighting can improve student performance and retail sales. Daylighting can significantly reduce artificial lighting requirements and energy costs in many commercial and industrial buildings, as well as schools, libraries and hospitals [4]. Daylighting combined with energy-efficient lighting and electronic ballasts can reduce the lighting power density in some office buildings by up to 30% [17]. In summary, where one must pay increased prices in proper heating and cooling of a space, they make up for in reduced costs for lighting and worker productivity.

Analysis II: Green Roof Implementation

Vegetation on a Roof

Specialized roofs with regional plants and grasses are known as green, garden, or planted roofs. They are comprised of layers that support the vegetation: root resistance, drainage, filter membrane, growing medium, and vegetation (Figure 9). This type of roof is becoming more popular with local and state governments promoting them for tax purposes. Another advantage of adding green roofs are for their ability to substantially reduce heat flux from the top of a building, preventing what is known as the heat island effect in urban environments [22]. This phenomenon is when the temperature of a city is compared to a surrounding suburban environment, the former having warmer temperatures. Higher temperatures have negative impacts on the society because of the increase in energy consumption, air pollution levels and heat-related illnesses [24]. In this way, the green roof technology has a potential to add value to a building due to its positive health and productivity impacts of the tenants and surrounding citizens of the area. Currently, the real estate market is in favor of green buildings with similar features.

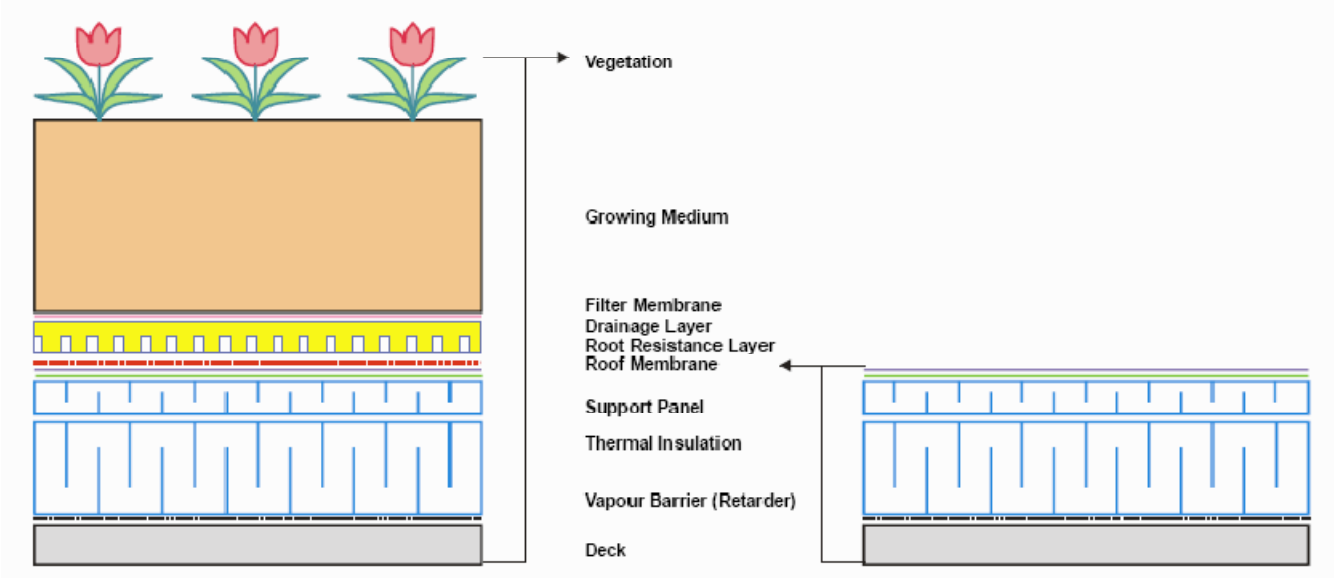


Figure 9: Principle components of a green roof system installed on a conventional roofing system [33].

Structural Analysis

The current roof design where the green roof implementation will be analyzed uses steel beams sized for the current loading conditions with a W24x76. See Figure 15 for specific beam placement, sizing and chosen beam for calculations and Figure 16 for placement of green areas. Assumptions for the analysis include uniform loading, simply supported beams with shear connections, the depths of the beams are not critical to the 16th floor which houses the mechanical equipment for the building. Conservative figures were used in the calculations which are located in the Appendix. Also used in the analysis was information from the AISC Steel Construction Manual and Vulcraft Steel Decking Catalog.

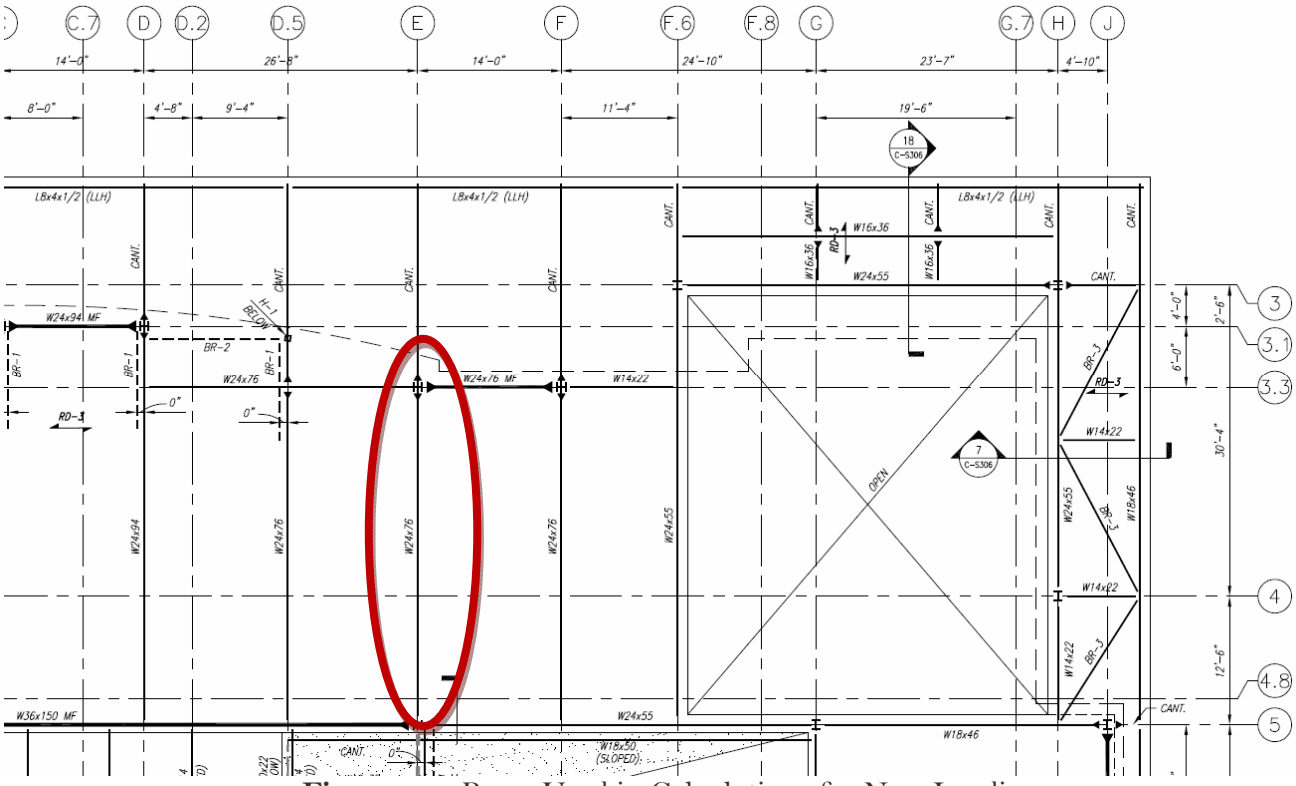


Figure 10: Beam Used in Calculations for New Loading

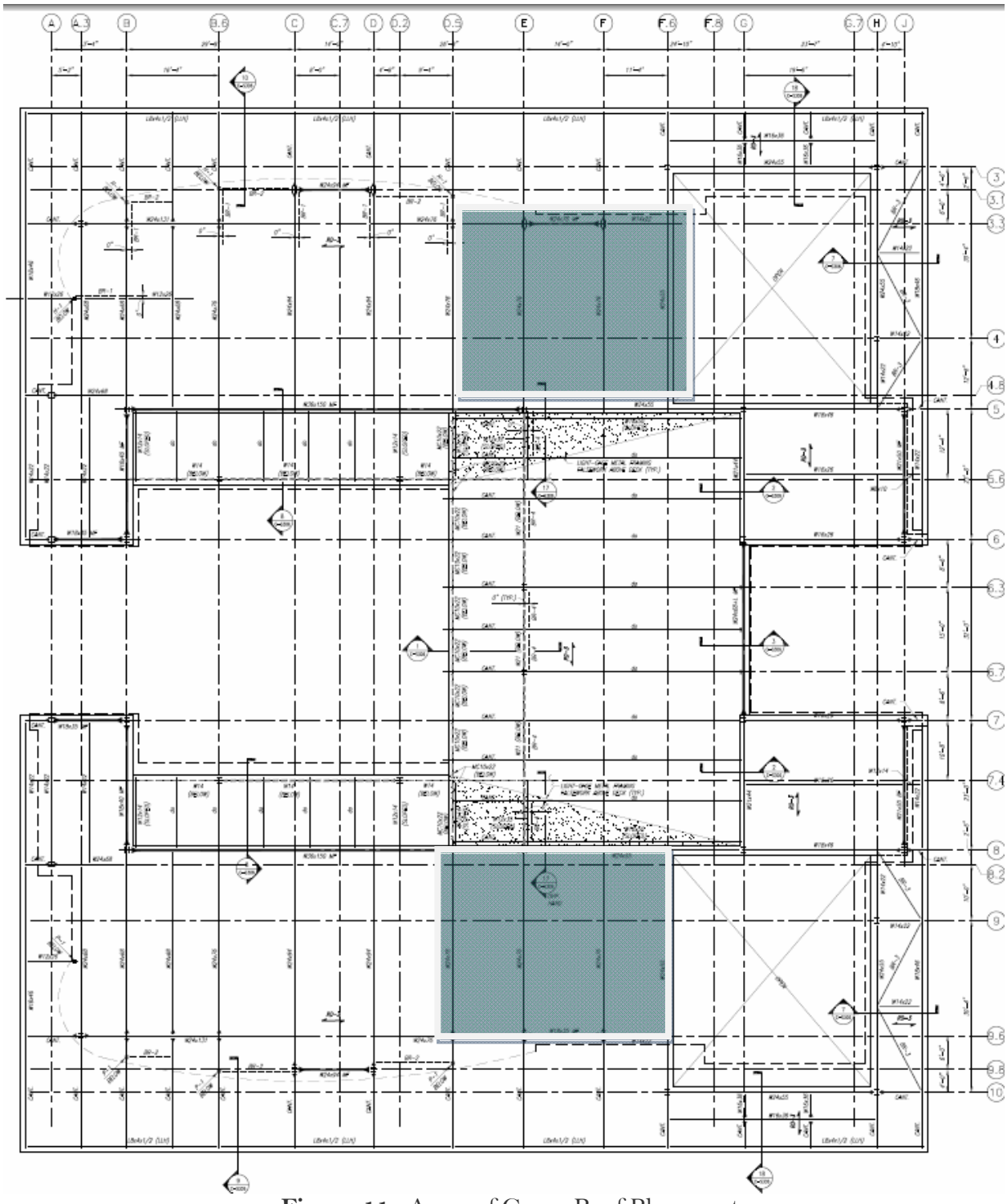


Figure 11: Areas of Green Roof Placement

The Extensive Assembly from American Hydrotech was the green garden of choice for its design features that include relatively no maintenance, lighter weight added to structure, and ability to reduce storm water runoff. In the weight of the added plants to the roof, water from rainfall was included. An added 18psf dead load was used for the Extensive Assembly green roof, an average figure for this type of system. Please see Appendix for more about the Hydrotech system.

Figure 12: Extensive Green Roof System [5].

Outcome

Through structural analysis of an added Hydrotech Extensive Assembly, it is economically possible to add a green roof to the structure. The changes to the structure would be fairly small, including using a lower gauge metal deck for the roof structure.

Loads used: (Dead) 58psf + (Live) 55psf

NUCOR VULCRAFT GROUP

ROOF DECK

3N20 --> 3N16

ADDED

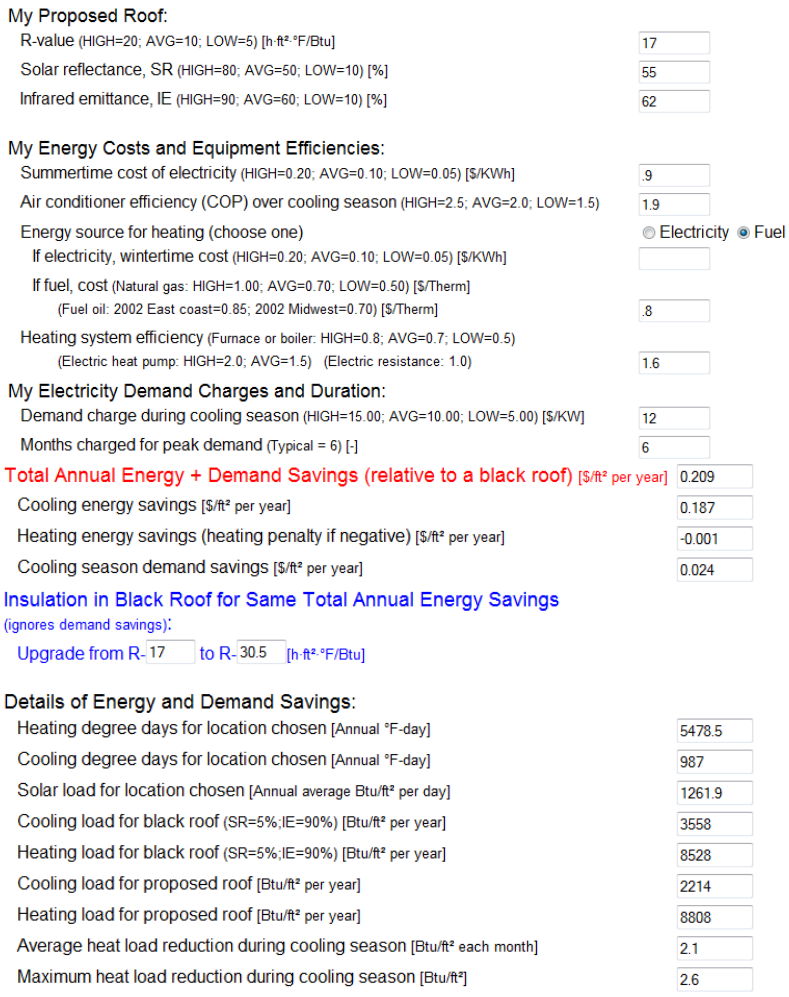
31.2 tons

to structure

$69,700

to project costs

Conclusions



My Proposed Roof:

R-value (HIGH=20; AVG=10; LOW=5) [h·ft²·°F/Btu]	17
Solar reflectance, SR (HIGH=80; AVG=50; LOW=10) [%]	55
Infrared emittance, IE (HIGH=90; AVG=60; LOW=10) [%]	62

My Energy Costs and Equipment Efficiencies:

Summertime cost of electricity (HIGH=0.20; AVG=0.10; LOW=0.05) [$/KWh]	.9
Air conditioner efficiency (COP) over cooling season (HIGH=2.5; AVG=2.0; LOW=1.5)	1.9
Energy source for heating (choose one)	○ Electricity ◉ Fuel
If electricity, wintertime cost (HIGH=0.20; AVG=0.10; LOW=0.05) [$/KWh]	
If fuel, cost (Natural gas: HIGH=1.00; AVG=0.70; LOW=0.50) [$/Therm] (Fuel oil: 2002 East coast=0.85; 2002 Midwest=0.70) [$/Therm]	.8
Heating system efficiency (Furnace or boiler: HIGH=0.8; AVG=0.7; LOW=0.5) (Electric heat pump: HIGH=2.0; AVG=1.5) (Electric resistance: 1.0)	1.6

My Electricity Demand Charges and Duration:

Demand charge during cooling season (HIGH=15.00; AVG=10.00; LOW=5.00) [$/KW]	12
Months charged for peak demand (Typical = 6) [-]	6

Total Annual Energy + Demand Savings (relative to a black roof) [$/ft² per year]	0.209
Cooling energy savings [$/ft² per year]	0.187
Heating energy savings (heating penalty if negative) [$/ft² per year]	-0.001
Cooling season demand savings [$/ft² per year]	0.024

Insulation in Black Roof for Same Total Annual Energy Savings (ignores demand savings):

Upgrade from R-17 to R-30.5 [h·ft²·°F/Btu]

Details of Energy and Demand Savings:

Heating degree days for location chosen [Annual °F-day]	5478.5
Cooling degree days for location chosen [Annual °F-day]	987
Solar load for location chosen [Annual average Btu/ft² per day]	1261.9
Cooling load for black roof (SR=5%;IE=90%) [Btu/ft² per year]	3558
Heating load for black roof (SR=5%;IE=90%) [Btu/ft² per year]	8528
Cooling load for proposed roof [Btu/ft² per year]	2214
Heating load for proposed roof [Btu/ft² per year]	8808
Average heat load reduction during cooling season [Btu/ft² each month]	2.1
Maximum heat load reduction during cooling season [Btu/ft²]	2.6

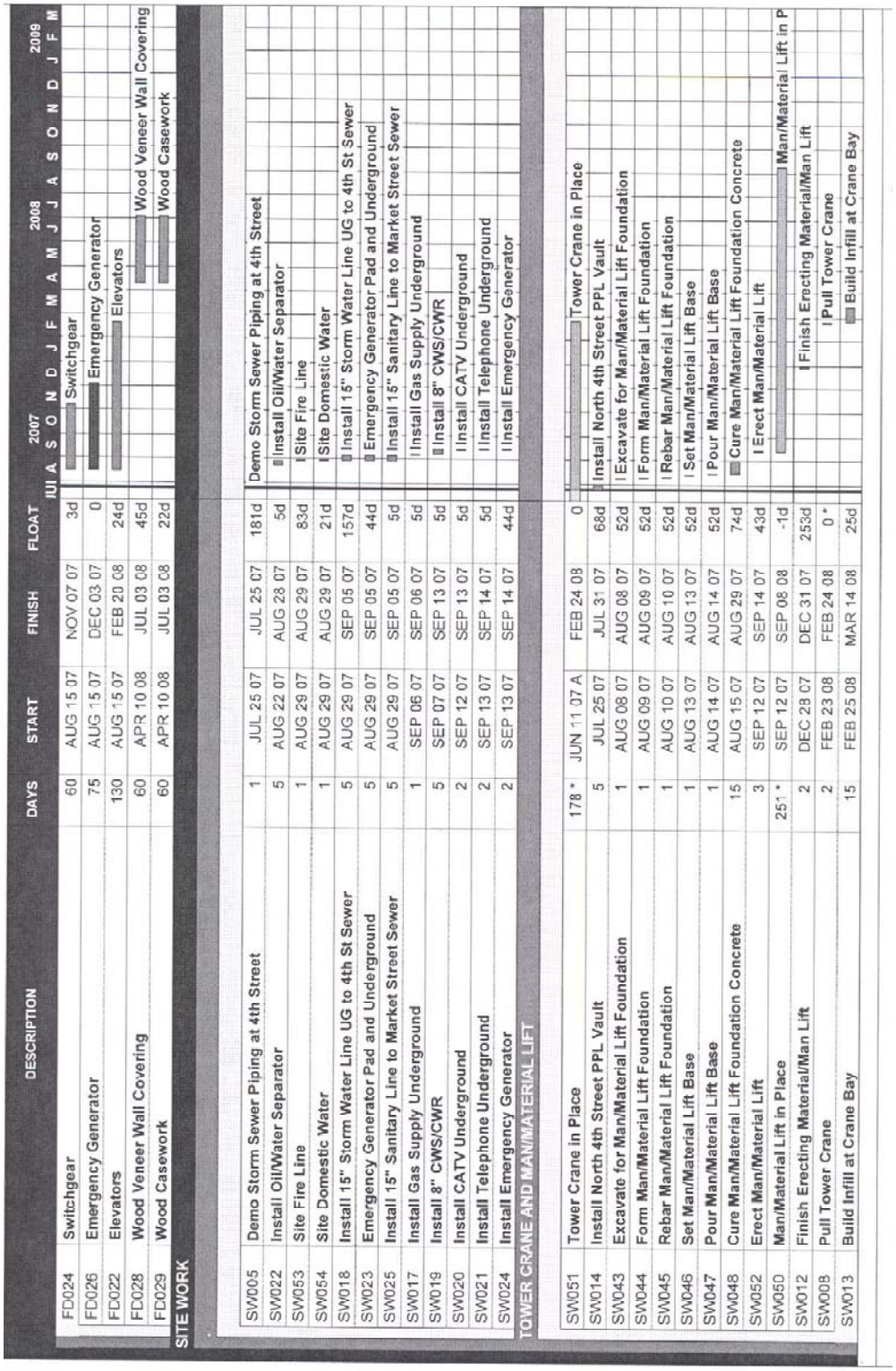
Figure 13: DOE Cool Roof Calculator

With the new loads of added weight to the structure, the current beam system in place could with stand the green roof structure. However, with a closer look at other factors affecting implementation of the green roof, it would not be advisable at this time. Figure 13 shows energy calculations for the current roof. Data was taken from the drawing specs. With the 3,500 square feet of added of green space, the average R-value of the roof increased from 17 to 18.7. The Hydrotech Extensive Assembly would save $0.02/SF per year to both heat and cool the structure. At this rate, it would take 9.42 years to payback the initial cost of the green roof. Changing the rigid insulation to have a larger R-value would also be another option instead of implementing a green roof because of schedule impacts.

As per the project schedule and the time it takes to install a green roof structure as proposed, it would not affect the current completion date. When the building is fully enclosed and roof structure complete, a crew can place the green space while other activities are

occurring for the project fit-out. The roof completion date is set for June of 2008, and is currently on schedule. This would allow for the crew to work simultaneously while other activities take place. Please reference project schedule in Appendix. During warm weather months is the best time to install such an assembly for a building. In the month of September of 2008, a material man-lift will be installed, as could be used for the green roof installation. However, due to the man-lift's limited use and time needed to place all materials needed to install the roof, it would not be recommended to use the man-lift. At this time in the project's schedule, the tower crane will not be in place (refer to Figure 14). Re-erection of the tower crane or having it idle on site would be too costly for the project. Due to limited storage space of the site and the capacity for the beams located on the roof to their maximum, having the soils, plants, etc. for the roof on site prior to their installation would also not be recommended. Therefore, adding a green roof structure as proposed would not be the best choice for the Harrisburg University Academic Center.

> *"Even less-effective green roofs make a difference, though. Compared to regular roofing material, green roofs do a better job of insulating buildings and lowering interior temperatures and energy costs. Green roofs also reduce rain runoff onto streets and in storm drains."*
>
> ~Charlie Carter, *Engineering Value into Your Project (2007)*



	DESCRIPTION	DAYS	START	FINISH	FLOAT
FD024	Switchgear	60	AUG 15 07	NOV 07 07	3d
FD026	Emergency Generator	75	AUG 15 07	DEC 03 07	0
FD022	Elevators	130	AUG 15 07	FEB 20 08	24d
FD028	Wood Veneer Wall Covering	60	APR 10 08	JUL 03 08	45d
FD029	Wood Casework	60	APR 10 08	JUL 03 08	22d
SITE WORK					
SW005	Demo Storm Sewer Piping at 4th Street	1	JUL 25 07	JUL 25 07	181d
SW022	Install Oil/Water Separator	5	AUG 22 07	AUG 28 07	5d
SW053	Site Fire Line	1	AUG 29 07	AUG 29 07	83d
SW054	Site Domestic Water	1	AUG 29 07	AUG 29 07	21d
SW018	Install 15" Storm Water Line UG to 4th St Sewer	5	AUG 29 07	SEP 05 07	157d
SW023	Emergency Generator Pad and Underground	5	AUG 29 07	SEP 05 07	44d
SW025	Install 15" Sanitary Line to Market Street Sewer	5	AUG 29 07	SEP 05 07	5d
SW017	Install Gas Supply Underground	1	SEP 06 07	SEP 06 07	5d
SW019	Install 8" CWS/CWR	5	SEP 07 07	SEP 13 07	5d
SW020	Install CATV Underground	2	SEP 12 07	SEP 13 07	5d
SW021	Install Telephone Underground	2	SEP 13 07	SEP 14 07	5d
SW024	Install Emergency Generator	2	SEP 13 07	SEP 14 07	44d
TOWER CRANE AND MAN/MATERIAL LIFT					
SW051	Tower Crane in Place	178 *	JUN 11 07 A	FEB 24 08	0
SW014	Install North 4th Street PPL Vault	5	JUL 25 07	JUL 31 07	68d
SW043	Excavate for Man/Material Lift Foundation	1	AUG 08 07	AUG 08 07	52d
SW044	Form Man/Material Lift Foundation	1	AUG 09 07	AUG 09 07	52d
SW045	Rebar Man/Material Lift Foundation	1	AUG 10 07	AUG 10 07	52d
SW046	Set Man/Material Lift Base	1	AUG 13 07	AUG 13 07	52d
SW047	Pour Man/Material Lift Base	1	AUG 14 07	AUG 14 07	52d
SW048	Cure Man/Material Lift Foundation Concrete	15	AUG 15 07	AUG 29 07	74d
SW052	Erect Man/Material Lift	3	SEP 12 07	SEP 14 07	43d
SW050	Man/Material Lift in Place	251 *	SEP 12 07	SEP 08 08	-1d
SW012	Finish Erecting Material/Man Lift	2	DEC 28 07	DEC 31 07	253d
SW008	Pull Tower Crane	2	FEB 23 08	FEB 24 08	0 *
SW013	Build Infill at Crane Bay	15	FEB 25 08	MAR 14 08	25d

Figure 14: Detailed Schedule for Site Work and Tower Crane and Man/Material Lift

Closing Remarks

For future building projects that the Harrisburg University of Science and Technology may wish to endeavor upon, green design is a step in the right direction. With the setting of the University in an urban environment, it is easy to meet most requirements of each of the LEED Criteria points. For instance, a project is awarded points for being in close proximity to many services for its occupants, such as restaurants, grocery stores, pharmacies, banks, and post offices [2]. Having public transportation systems already within the city adds to the benefits of the urban setting. Specifically for the University, it gives faculty and students different modes of transportation options; taking the city bus reduces CO_2 pollutance [5]. This criteria falls under Sustainable Site Credit 2 for development density and community connectivity.

If the best interest of the students is in mind, having a productive place to grow, learn, and work would only benefit the University. Providing for the building's occupants a connection between indoor spaces and the outdoors through the introduction of daylight and views into the regularly occupied areas will add to the sense of well-being and let minds develop and flourish. Occupant well-being can be improved by providing views to the exterior and by providing daylighting, in this case, students and faculty of the University. The joint efforts of the owner, building design team, contractors, subcontractors and suppliers are integral to providing a quality indoor environment [34].

The cost savings for the vegetative roof when the price of natural gas and electricity are on a steady increase adds value to the building. If the idea for the new roof design came in the design phase of the project, the implementation would have been easy. Scheduling the installation of the extensive assembly system would have taken roughly 10 days and not have made either schedule delays or significantly added to the project costs. Due to the current construction conditions and limited energy savings, implementation of the green roof would not be recommended unless the owner or developer would have other reasons for its addition.

The green design field is growing and changing daily. New technologies and products are coming into the marketplace and innovative designs are proving their effectiveness. This summary report is preceded by a year of analysis and research into the pre-construction and construction phases of the Harrisburg University Academic Center. The calculations provided generate an example of LEED criteria points that could be obtained due to the nature of the existing design.

Appendix

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
OUC Administration Building
Orlando, FL

Yes			
7	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
14	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
8	Credit 1	**Optimize Energy Performance**	1 to 10
3	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
7	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
10	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
42	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Manulife
Boston, MA

Yes			
12	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

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

Yes			
8	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
4	Credit 1	**Optimize Energy Performance**	1 to 10
1	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
4	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
1	**Innovation & Design Process**		**5** Points
	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
34	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Social Security Annex Building
Baltimore, MD

Yes			
10	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

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

Yes			
8	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
6	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
4	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes			
8	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
34	**Project Totals (pre-certification estimates)**		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Liberty Mutual
Dover, NH

Yes			
4	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
	Credit 1	**Site Selection**	1
	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1
Yes			
3	**Water Efficiency**		**5** Points
1	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
1	Credit 2	**Innovative Wastewater Technologies**	1
1	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	Credit 3.2	**Water Use Reduction**, 30% Reduction	1
Yes			
5	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
3	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1
Yes			
6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1
Yes			
9	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1
Yes			
29	**Project Totals (pre-certification estimates)**		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Molasky
Las Vegas, NV

Yes

6	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

9	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
7	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes

8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes

9	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

40	**Project Totals**	**(pre-certification estimates)**	**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
The Plaza
Allentown, PA

Yes

10	**Sustainable Sites**		14 Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

11	**Energy & Atmosphere**		17 Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
8	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes

6	**Materials & Resources**		13 Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes

10	**Indoor Environmental Quality**		15 Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

2	**Innovation & Design Process**		5 Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

42	**Project Totals** (pre-certification estimates)		69 Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
BP
Houston, TX

Yes

6	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

9	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
5	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes

6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes

8	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

33	**Project Totals (pre-certification estimates)**	**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Vocation Tech Center
San Diego, CA

Yes			
6	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
11	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
6	Credit 1	**Optimize Energy Performance**	1 to 10
3	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
9	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
6	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
38	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Management Building
Atlanta, GA

Yes			
6	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

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

Yes			
7	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
4	Credit 1	**Optimize Energy Performance**	1 to 10
2	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
11	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
34	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Center for Interdisiplinary Engineering
Durham, GA

Yes				
6	**Sustainable Sites**			**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**		Required
	Credit 1	**Site Selection**		1
	Credit 2	**Development Density & Community Connectivity**		1
	Credit 3	**Brownfield Redevelopment**		1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access		1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms		1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles		1
	Credit 4.4	**Alternative Transportation**, Parking Capacity		1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat		1
	Credit 5.2	**Site Development,** Maximize Open Space		1
1	Credit 6.1	**Stormwater Design,** Quantity Control		1
	Credit 6.2	**Stormwater Design,** Quality Control		1
1	Credit 7.1	**Heat Island Effect,** Non-Roof		1
1	Credit 7.2	**Heat Island Effect,** Roof		1
	Credit 8	**Light Pollution Reduction**		1

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

Yes				
4	**Energy & Atmosphere**			**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**		Required
Y	Prereq 2	**Minimum Energy Performance**		Required
Y	Prereq 3	**Fundamental Refrigerant Management**		Required
2	Credit 1	**Optimize Energy Performance**		1 to 10
	Credit 2	**On-Site Renewable Energy**		1 to 3
1	Credit 3	**Enhanced Commissioning**		1
	Credit 4	**Enhanced Refrigerant Management**		1
1	Credit 5	**Measurement & Verification**		1
	Credit 6	**Green Power**		1

Yes				
8	**Materials & Resources**			**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**		Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof		1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof		1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements		1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal		1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal		1
1	Credit 3.1	**Materials Reuse**, 5%		1
1	Credit 3.2	**Materials Reuse**,10%		1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)		1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)		1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior		1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior		1
	Credit 6	**Rapidly Renewable Materials**		1
1	Credit 7	**Certified Wood**		1

Yes				
6	**Indoor Environmental Quality**			**15** Points
Y	Prereq 1	**Minimum IAQ Performance**		Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**		Required
	Credit 1	**Outdoor Air Delivery Monitoring**		1
	Credit 2	**Increased Ventilation**		1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction		1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy		1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants		1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings		1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems		1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products		1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**		1
	Credit 6.1	**Controllability of Systems**, Lighting		1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort		1
1	Credit 7.1	**Thermal Comfort**, Design		1
1	Credit 7.2	**Thermal Comfort**, Verification		1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces		1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces		1

Yes				
2	**Innovation & Design Process**			**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title		1
	Credit 1.2	**Innovation in Design**: Provide Specific Title		1
	Credit 1.3	**Innovation in Design**: Provide Specific Title		1
	Credit 1.4	**Innovation in Design**: Provide Specific Title		1
1	Credit 2	**LEED® Accredited Professional**		1

Yes				
30	**Project Totals** (pre-certification estimates)			**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

Whitehead Building
Atlanta, GA

Yes

7	**Sustainable Sites**		14 Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

10	**Energy & Atmosphere**		17 Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
6	Credit 1	**Optimize Energy Performance**	1 to 10
2	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes

6	**Materials & Resources**		13 Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes

10	**Indoor Environmental Quality**		15 Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

3	**Innovation & Design Process**		5 Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

39	**Project Totals (pre-certification estimates)**	69 Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

San Diego New Main Library
San Diego, CA

Yes				
7	**Sustainable Sites**			14 Points
Y	Prereq 1	**Construction Activity Pollution Prevention**		Required
1	Credit 1	**Site Selection**		1
1	Credit 2	**Development Density & Community Connectivity**		1
	Credit 3	**Brownfield Redevelopment**		1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access		1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms		1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles		1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity		1
	Credit 5.1	**Site Development,** Protect of Restore Habitat		1
1	Credit 5.2	**Site Development,** Maximize Open Space		1
1	Credit 6.1	**Stormwater Design,** Quantity Control		1
	Credit 6.2	**Stormwater Design,** Quality Control		1
	Credit 7.1	**Heat Island Effect,** Non-Roof		1
	Credit 7.2	**Heat Island Effect,** Roof		1
1	Credit 8	**Light Pollution Reduction**		1

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

Yes				
7	**Energy & Atmosphere**			17 Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**		Required
Y	Prereq 2	**Minimum Energy Performance**		Required
Y	Prereq 3	**Fundamental Refrigerant Management**		Required
4	Credit 1	**Optimize Energy Performance**		1 to 10
1	Credit 2	**On-Site Renewable Energy**		1 to 3
1	Credit 3	**Enhanced Commissioning**		1
	Credit 4	**Enhanced Refrigerant Management**		1
1	Credit 5	**Measurement & Verification**		1
	Credit 6	**Green Power**		1

Yes				
7	**Materials & Resources**			13 Points
Y	Prereq 1	**Storage & Collection of Recyclables**		Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof		1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof		1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements		1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal		1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal		1
1	Credit 3.1	**Materials Reuse**, 5%		1
1	Credit 3.2	**Materials Reuse**,10%		1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)		1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)		1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior		1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior		1
1	Credit 6	**Rapidly Renewable Materials**		1
	Credit 7	**Certified Wood**		1

Yes				
11	**Indoor Environmental Quality**			15 Points
Y	Prereq 1	**Minimum IAQ Performance**		Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**		Required
1	Credit 1	**Outdoor Air Delivery Monitoring**		1
1	Credit 2	**Increased Ventilation**		1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction		1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy		1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants		1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings		1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems		1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products		1
	Credit 5	**Indoor Chemical & Pollutant Source Control**		1
1	Credit 6.1	**Controllability of Systems**, Lighting		1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort		1
	Credit 7.1	**Thermal Comfort**, Design		1
	Credit 7.2	**Thermal Comfort**, Verification		1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces		1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces		1

Yes				
2	**Innovation & Design Process**			5 Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title		1
	Credit 1.2	**Innovation in Design**: Provide Specific Title		1
	Credit 1.3	**Innovation in Design**: Provide Specific Title		1
	Credit 1.4	**Innovation in Design**: Provide Specific Title		1
1	Credit 2	**LEED® Accredited Professional**		1

Yes				
37	**Project Totals (pre-certification estimates)**			69 Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
California Academy of Arts and Sciences
San Fransisco, CA

Yes			
10	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
14	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
8	Credit 1	**Optimize Energy Performance**	1 to 10
2	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
11	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
11	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
4	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
55	**Project Totals (pre-certification estimates)**		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
David Skaggs
Boulder, CO

Yes			
9	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
4	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
2	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
1	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes			
5	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
9	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
33	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

University of N. Florida - Osprey
Jacksonville, FL

Yes			
8	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
8	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
6	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
12	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
40	**Project Totals**	**(pre-certification estimates)**	**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

Simmons
Boston, MA

Yes

9	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

4	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
2	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes

6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes

9	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

34	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Mosiac
Minnaepolis, MN

Yes			
10	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
6	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
3	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1

Yes			
8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes			
11	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
41	**Project Totals** (pre-certification estimates)		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Jefferson Arms
St Louis, MO

Yes			
7	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
6	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
4	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes			
8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
6	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes		
31	**Project Totals (pre-certification estimates)**	**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist
Duke French Family Sciences
Durham, NC

Yes			
11	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

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

Yes			
2	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
1	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes			
8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regior	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regior	1
1	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes			
6	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
1	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
2	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes			
31	**Project Totals (pre-certification estimates)**		**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

4275 Dean Martin
Las Vegas, NV

Yes			
7	**Sustainable Sites**		14 Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1
Yes			
2	**Water Efficiency**		5 Points
	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	Credit 2	**Innovative Wastewater Technologies**	1
1	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	Credit 3.2	**Water Use Reduction**, 30% Reduction	1
Yes			
11	**Energy & Atmosphere**		17 Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
6	Credit 1	**Optimize Energy Performance**	1 to 10
2	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
1	Credit 6	**Green Power**	1
Yes			
6	**Materials & Resources**		13 Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regiona	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regiona	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1
Yes			
4	**Indoor Environmental Quality**		15 Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
	Credit 7.1	**Thermal Comfort**, Design	1
	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Yes			
2	**Innovation & Design Process**		5 Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1
Yes			
32	**Project Totals (pre-certification estimates)**		69 Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

1700 Building
Portland, Or

Yes

9	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
	Credit 5.2	**Site Development,** Maximize Open Space	1
1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
1	Credit 8	**Light Pollution Reduction**	1

Yes

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

Yes

6	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
4	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes

6	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Region	1
	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Region	1
1	Credit 6	**Rapidly Renewable Materials**	1
1	Credit 7	**Certified Wood**	1

Yes

31	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
11	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
11	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes

3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes

58	**Project Totals**	**(pre-certification estimates)**	**69** Points

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

LEED-NC

LEED-NC Version 2.2 Registered Project Checklist

Two Potomac Yard
Arlington, VA

Yes			
9	**Sustainable Sites**		**14** Points
Y	Prereq 1	**Construction Activity Pollution Prevention**	Required
1	Credit 1	**Site Selection**	1
1	Credit 2	**Development Density & Community Connectivity**	1
1	Credit 3	**Brownfield Redevelopment**	1
1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	1
1	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
1	Credit 5.1	**Site Development,** Protect of Restore Habitat	1
1	Credit 5.2	**Site Development,** Maximize Open Space	1
	Credit 6.1	**Stormwater Design,** Quantity Control	1
1	Credit 6.2	**Stormwater Design,** Quality Control	1
	Credit 7.1	**Heat Island Effect,** Non-Roof	1
	Credit 7.2	**Heat Island Effect,** Roof	1
	Credit 8	**Light Pollution Reduction**	1

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

Yes			
7	**Energy & Atmosphere**		**17** Points
Y	Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**Fundamental Refrigerant Management**	Required
5	Credit 1	**Optimize Energy Performance**	1 to 10
	Credit 2	**On-Site Renewable Energy**	1 to 3
1	Credit 3	**Enhanced Commissioning**	1
	Credit 4	**Enhanced Refrigerant Management**	1
1	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

Yes			
8	**Materials & Resources**		**13** Points
Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1	Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
	Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
1	Credit 3.1	**Materials Reuse**, 5%	1
1	Credit 3.2	**Materials Reuse**,10%	1
1	Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1	Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Region	1
1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Region	1
1	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Yes			
12	**Indoor Environmental Quality**		**15** Points
Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1	Credit 1	**Outdoor Air Delivery Monitoring**	1
	Credit 2	**Increased Ventilation**	1
1	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1	Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1	Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
1	Credit 6.1	**Controllability of Systems**, Lighting	1
1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1	Credit 7.1	**Thermal Comfort**, Design	1
1	Credit 7.2	**Thermal Comfort**, Verification	1
1	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Yes			
3	**Innovation & Design Process**		**5** Points
1	Credit 1.1	**Innovation in Design**: Provide Specific Title	1
1	Credit 1.2	**Innovation in Design**: Provide Specific Title	1
	Credit 1.3	**Innovation in Design**: Provide Specific Title	1
	Credit 1.4	**Innovation in Design**: Provide Specific Title	1
1	Credit 2	**LEED® Accredited Professional**	1

Yes		
41	**Project Totals (pre-certification estimates)**	**69** Points

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

Detailed Project Schedule Summary

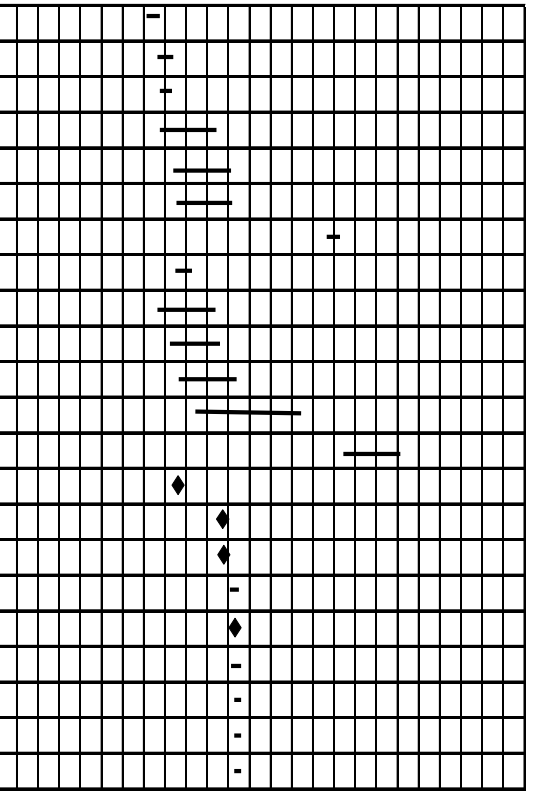
The Harrisburg University of Science and Technology had begun design work for their first building in August of 2005, not yet two years after the University opened its doors for students. It has been using office buildings within three blocks of the construction site of their Academic Center and will be occupying them until the winter semester of 2009. The project completion date is set for November 25, 2008.

Finish sequence milestones begin at the end of the first quarter in 2008-the middle of March with the first two floors clean-out scheduled. The next five floors (3-9) will be for a parking garage and therefore finishing of these levels will come near project completion. Floors 10 and 11 have a finish date of the beginning of April and finishes for the last (16^{th}) floor where the HVAC system will be housed is scheduled for late October 2008.

For the core-shell package, interior work is completed in a sequence that allows for phased finishing by floor. Each crew works each floor start to finish and then moves on to the floor above to repeat the process. This sequencing method allows for the substantial completion of the building, the project to be fast-tracked, and have separate core-shell and fit-out packages with more than 60 contracts. The phased completion of each floor is in approximate two week increments, with some slight differences in the parking garage levels.

The following pages consist of the construction schedule, first of which is the preliminary overview schedule, continued by a detailed schedule with highlights of each floor. Due to the events of construction and the complexity of the project, many items were left out but the milestone dates and general durations are noted.

Activity Description	Days	Start	Finish
Curatin Wall Shop Drawings	15	JUL 11 07	JUL 31 07
Fit Out General Trades	15	JUL 25 07	AUG 14 07
Ground Floor Duct Drawings	15	JUL 25 07	AUG 14 07
Fit Out MEP	60	JUL 25 07	OCT 17 07
Core and Shell Technology	60	AUG 11 07	NOV 07 07
Fit Out Technology	60	AUG 11 07	NOV 07 07
Wood Veneer Wall Covering/Casework Mockup	15	MAR 20 08	APR 09 08
Cast-in-Place Plumbing Equipment Fab	10	JUL 25 07	AUG 07 07
Architectural Precast Panel Connections	55	JUL 25 07	OCT 10 07
HVAC Pumps and Heat Exchangers Delivery	30	AUG 08 07	SEP 19 07
Switchgear	60	AUG 15 07	NOV 07 07
Elevators	130	AUG 15 07	FEB 20 08
Wood Casework	60	APR 10 08	JUL 03 08
Demo Storm Swear Piping at 4th street	1	JUL 25 07	JUL 25 07
Site Fire Line	1	AUG 29 07	AUG 29 07
Site Domestic Water	1	AUG 29 07	AUG 29 07
Install 15inch Sinitary to Market Street Sewer	5	SEP 06 07	SEP 13 07
Install Gas Supply Underground	1	SEP 07 07	SEP 07 07
Install 8 inch CWS/CWR	5	SEP 07 07	SEP 14 07
Install CAT 5 Underground	2	SEP 13 07	SEP 14 07
Install Telephone Underground	2	SEP 13 07	SEP 14 07
Install Emergency Generator	2	SEP 13 07	SEP 14 07

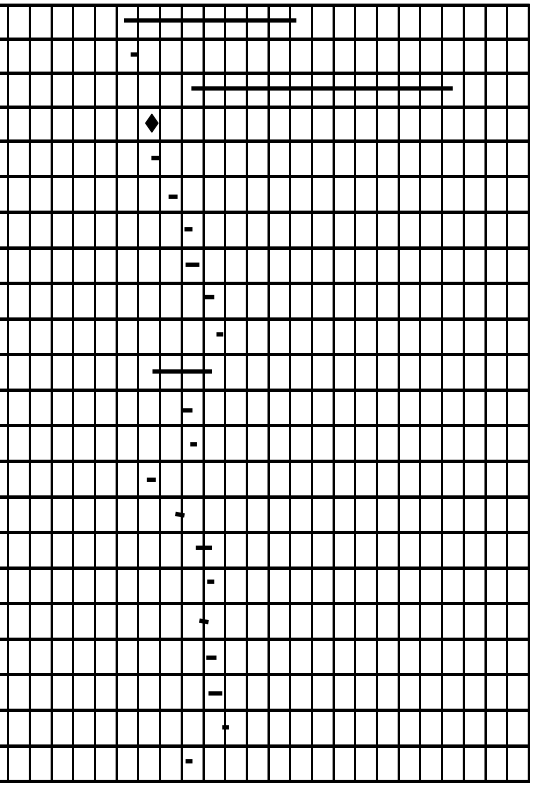


♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

	Activity Description	Days	Start	Finish
	Tower Crane in Place	178	JUN 11 07	FEB 24 08
	Install North 4th Street PPL Vault	5	JUL 25 07	JUL 31 07
	Man/Material Lift in Place	251	SEP 12 07	SEP 08 08
	Pour Slab on Grade Where Req'd For Equip.	1	JUL 25 07	JUL 25 07
1st Floor	Set Steel Stairways	6	JUL 23 07	JUL 31 07
	Prep and Pour 1st Floor Slab	5	AUG 16 07	AUG 22 07
	Exterior Wall CMU	5	SEP 07 07	SEP 13 07
	Above Ground Sanitary Piping	16	SEP 07 07	SEP 28 07
	Interior Metal Stud Wall Framing	10	OCT 02 07	OCT 15 07
	Drywall	5	OCT 23 07	OCT 29 07
2nd Floor	Set Steel Stairways	6	JUL 24 07	SEP 05 07
	Weld Nelson Studs	2	AUG 07 07	AUG 08 07
	Spray on Insulation to Roof Deck Above	5	SEP 14 07	SEP 19 07
3rd Floor	Erect 3rd Floor Columns and 4th Fl Structural	7	JUL 19 07	JUL 27 07
	Erect 3rd Floor Detail and Deck	10	JUL 24 07	AUG 06 07
	Prep and Pour 3rd Floor Slab	5	AUG 29 07	SEP 05 07
	Temporary Handrails at Floor Openings	2	SEP 10 07	SEP 11 07
4th Floor	Erect Floor Columns and 5th Fl Structural	7	JUL 30 07	AUG 07 07
	Prep and Pour Floor Slab	5	SEP 06 07	SEP 11 07
	Concrete Column Encasement	10	SEP 13 07	SEP 26 07
	Cable Rails	5	SEP 27 07	OCT 03 07
5th Floor	Erect Floor Columns and 6th Fl Structural	7	AUG 08 07	AUG 16 07

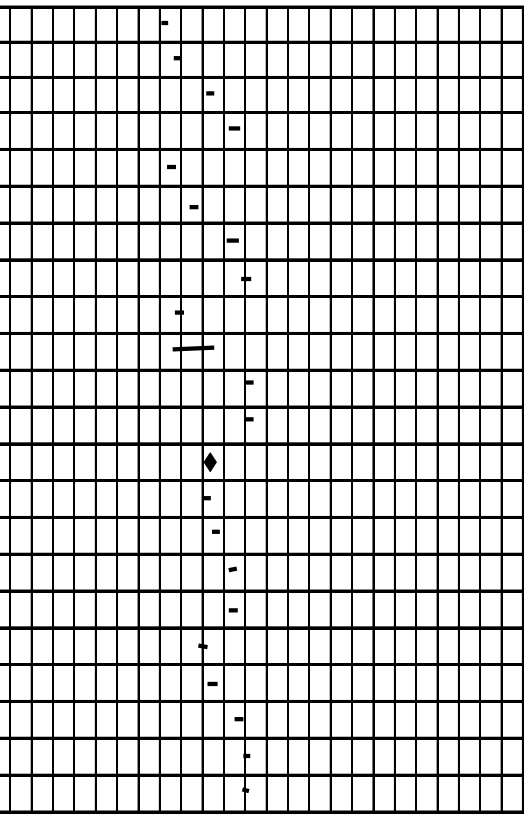


♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

	Activity Description	Days	Start	Finish
	Erect Floor Detail and Deck	7	AUG 08 07	AUG 16 07
	Install Pipe and Duct Hangers	10	AUG 08 07	AUG 21 07
	Set Duct in Chases	5	OCT 03 07	OCT 09 07
8th Floor	Erect Floor Columns and 7th Fl Structural	2	NOV 14 07	NOV 15 07
	Erect Floor Detail and Deck	7	AUG 17 07	AUG 27 07
	Erect Precast Panels	10	SEP 12 07	SEP 25 07
	Stairway, Elev Shaft, Vert Chase Masonry	3	NOV 15 07	NOV 19 07
7th Floor	Erect Floor Columns and 8th Fl Structural	6	NOV 27 07	DEC 04 07
	Erect Floor Detail and Deck	7	AUG 08 07	SEP 11 07
	Install Pipe and Duct Hangers	10	AUG 08 07	OCT 29 07
	HVAC Piping	5	DEC 06 07	DEC 12 07
	Gas Piping	5	DEC 07 07	DEC 12 07
6th Floor	Erect Floor Columns and 9th Fl Structural	1	SEP 07 07	SEP 07 07
	Erect Floor Detail and Deck	7	OCT 02 07	OCT 15 07
	Set Steel Stairways	10	OCT 23 07	OCT 30 07
	Cable Rails	6	NOV 06 07	NOV 12 07
	Spray on Fireproofing	5	NOV 15 07	NOV 21 07
5th Floor	Erect Floor Detail and Deck	5	SEP 18 07	OCT 01 07
	Erect Floor Columns and 10th Fl Structural	10	SEP 19 07	SEP 26 07
	Prep and Pour Floor Slab	6	OCT 23 07	OCT 29 07
	Concrete Column Encasement	10	OCT 30 07	NOV 12 07
	Temporary Handrails at Floor Openings	2	NOV 01 07	NOV 02 07

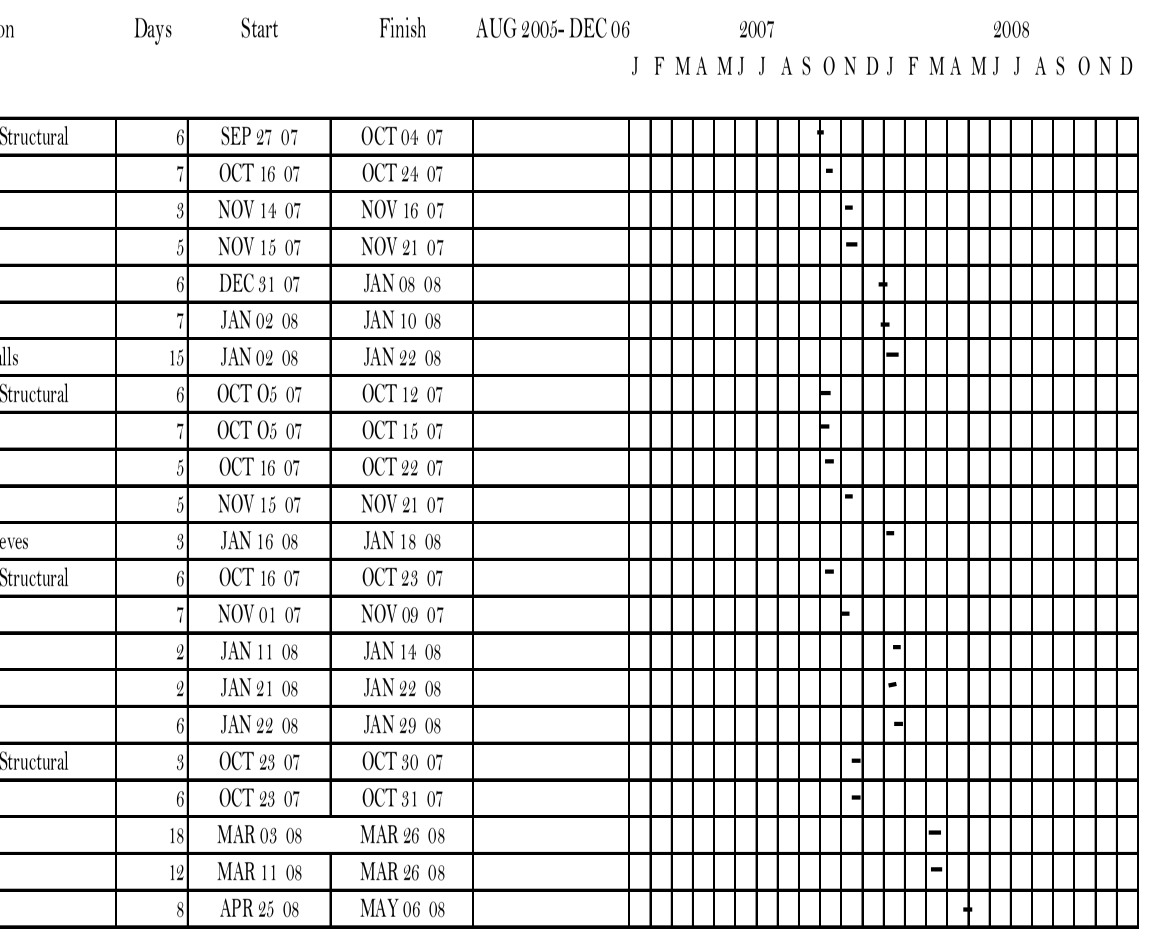


♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

	Activity Description	Days	Start	Finish
10th Floor	Erect Floor Columns and 11th Fl Structural	6	SEP 27 07	OCT 04 07
	Erect Floor Detail and Deck	7	OCT 16 07	OCT 24 07
	Set Hollow Metal Frames	3	NOV 14 07	NOV 16 07
	Install Pipe and Duct Hangers	5	NOV 15 07	NOV 21 07
	Gas Piping	6	DEC 31 07	JAN 08 08
	Acid Waste Piping	7	JAN 02 08	JAN 10 08
	Drywall and Insulate Exterior Walls	15	JAN 02 08	JAN 22 08
11th Floor	Erect Floor Columns and 12th Fl Structural	6	OCT 05 07	OCT 12 07
	Erect Floor Detail and Deck	7	OCT 05 07	OCT 15 07
	Electrical Rough Ins	5	OCT 16 07	OCT 22 07
	Lab Vacuum	5	NOV 15 07	NOV 21 07
	Electrical Wall Rough Ins and Sleeves	3	JAN 16 08	JAN 18 08
12th Floor	Erect Floor Columns and 13th Fl Structural	6	OCT 16 07	OCT 23 07
	Erect Floor Detail and Deck	7	NOV 01 07	NOV 09 07
	Sprinkler Rough Ins	2	JAN 11 08	JAN 14 08
	Stormwater Piping	2	JAN 21 08	JAN 22 08
	Drywall Mechanical Chases	6	JAN 22 08	JAN 29 08
13th Floor	Erect Floor Columns and 14th Fl Structural	3	OCT 23 07	OCT 30 07
	Erect Floor Detail and Deck	6	OCT 23 07	OCT 31 07
	Domestic Water Piping	18	MAR 03 08	MAR 26 08
	Plumbing Pipe Insulation	12	MAR 11 08	MAR 26 08
	Plumbing Fixtures	8	APR 25 08	MAY 06 08

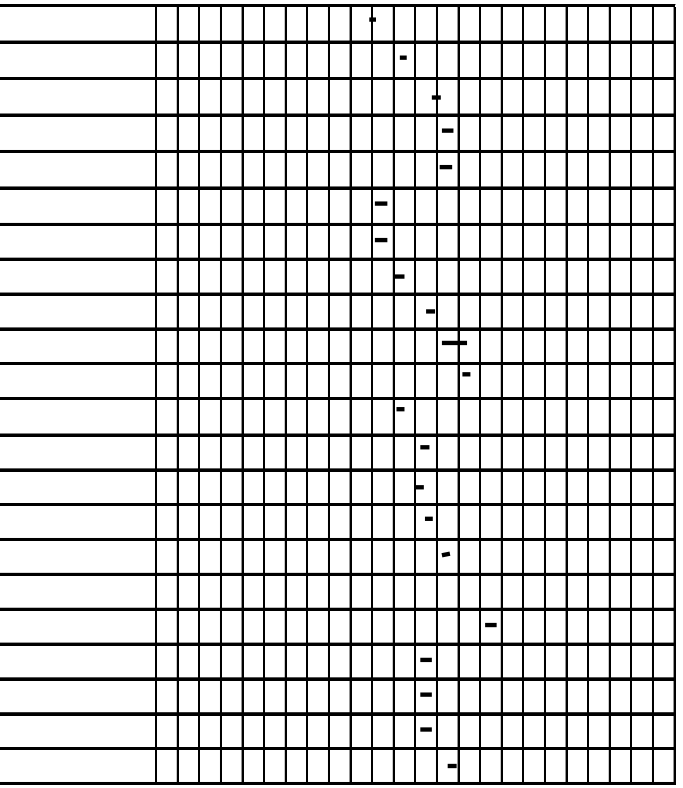


♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

	Activity Description	Days	Start	Finish
14th Floor	Erect Floor Columns and 15th Fl Structural	5	OCT 31 07	NOV 06 07
	Erect Floor Detail and Deck	7	DEC 03 07	DEC 11 07
	Water Feature	5	JAN 29 08	FEB 04 08
	Waterproofing	2	FEB 05 08	FEB 06 08
	Stairway, Elev Shaft, Vert Chase Masonry	6	FEB 06 08	FEB 13 08
15th Floor	Erect Floor Columns and 16th Fl Structural	5	NOV 07 07	NOV 13 07
	Erect Floor Detail and Deck	7	NOV 19 07	NOV 30 07
	Weld Nelson Studs	2	DEC 03 07	DEC 04 07
	Prep and pour Floor Slabs	4	DEC 21 07	DEC 27 07
	Ductwork	15	FEB 18 08	MAR 07 08
	HVAC Piping	15	MAR 10 08	MAR 28 08
16th Floor	Erect Floor Columns and Roof Structural	3	NOV 14 07	NOV 16 07
	Erect Floor Detail and Deck	7	DEC 03 07	DEC 11 07
	Infill Steel and Slab Above Chiller	3	JAN 07 08	JAN 09 08
	Prep and pour Floor Slabs	4	JAN 10 08	JAN 15 08
	Erect Floor Perimeter Roof Structure	2	FEB 11 08	FEB 12 08
	Install Pipe and Duct Hangers	5	FEB 19 08	FEB 25 08
	Acid Vent Piping	5	APR 16 08	APR 22 08
	Erect Roof Deck	7	DEC 12 07	DEC 20 07
	Erect and Glaze North Curtain Wall	5	DEC 21 07	DEC 28 07
	Install Window Washer Tie-Off Anchors	5	DEC 21 07	DEC 28 07
	Roof Insulation	5	FEB 19 08	FEB 25 08



♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

Activity Description	Days	Start	Finish
Elev Mech Room Framing and Sheathing	5	FEB 19 08	FEB 25 08
EPDM Roofing	5	MAR 06 08	MAR 12 08
Install Elevators	90	APR 24 08	AUG 29 08
Erect and Glaze South Curtain Wall	5	SEP 09 08	SEP 15 08
Final Cleaning of Roof	5	JUN 12 08	JUN 18 08
On Site Design Session	1	NOV 01 07	NOV 01 07
On Site Design Session	1	DEC 07 07	DEC 07 07
100% CDs Issued by Reynolds	1	JAN 31 08	JAN 31 08
Bidding Phase of Fit Out	20	FEB 01 08	FEB 28 08
Negotiation and Award	42	MAR 03 08	APR 29 08
Offsite Network Systems Burn In	58	MAY 01 08	JUL 23 08
Building Network Construction Phase	78	MAY 01 08	AUG 20 08
Onsite Network Installation	27	JUL 24 08	AUG 29 08
Network Commissioning and Univ Move In	77	SEP 02 08	DEC 19 08
Fit Out Substantial Completion	0	OCT 22 08	OCT 22 08
Punch Lists	18	OCT 23 08	DEC 19 08
Fit Out Completion	0	NOV 17 08	NOV 17 08

♦ *Represents key milestone dates as per discussion of project schedule with owner requirements for occupancy, especially completion.*

HARRISBURG UNIVERSITY ACADEMIC CENTER

DETAILED PROJECT SCHEDULE

(a) (b)

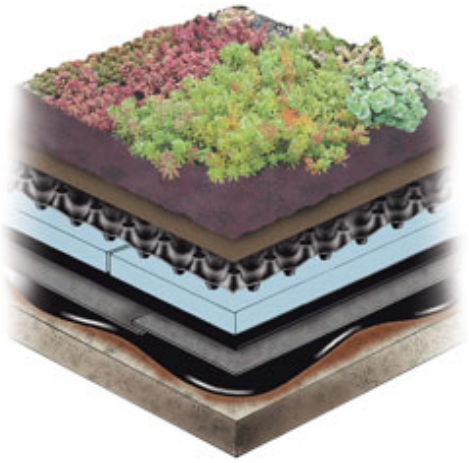
Comparison of Office Space with traditional Fluorescent lighting (a) and daylighting (b).

Regularly Occupied Space ID	Regularly Occupied Space Name	Regularly Occupied Space Area (SF)	Sidelighting Vision Glazing		Sidelighting Daylight Glazing		Toplighting Sawtooth Monitor		Toplighting Vertical Monitor		Toplighting Horizontal Skylight		Glazing Factor
			Area (SF)	Tvis	Area (SF)	Tvis	Area (SF)	Tvis	Area (SF)	Tvis	Area (SF)	Tvis	
1201	Office	215	148	0.9	74	0.7	0	N/A	0	N/A	0	N/A	2.7
1205	Office	215	68	0.9	32	0.7	0	N/A	0	N/A	0	N/A	3.9
1206	Office	215	68	0.9	32	0.7	0	N/A	0	N/A	0	N/A	3.9
1210	Open Office (Daylit Area)	566	80	0.9	13	0.7	0	N/A	0	N/A	0	N/A	2.8
1212	Office (Non Daylit Area)	215	0	0.9	0	0.7	0	N/A	0	N/A	0	N/A	0
1219	Open Office	2,678	224	0.9	56	0.7	0	N/A	0	N/A	0	N/A	2.0

Total Regularly Occupied Space Area (SF)	Total Regularly Occupied Space Area with a Minimum 2% Glazing Factor	Percentage of Regularly Occupied Space with a 2% Glazing Factor
4,104	3,889	95%

Glazing Factor Tabulation Spreadsheet

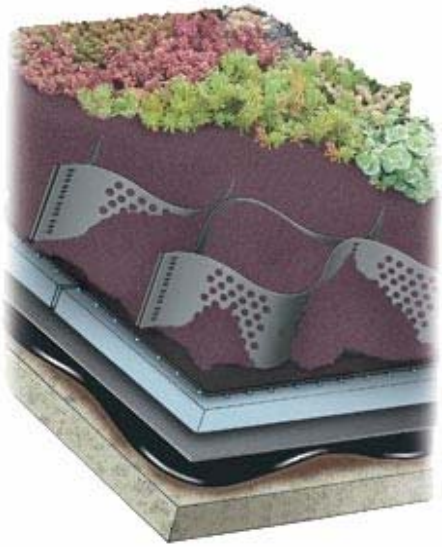
Extensive Assembly



An extensive Garden Roof® uses a select range of hardy plants, making it attractive to look at while requiring little maintenance. Extensive green roofs are not intended for recreational use, but are usually chosen for their appearance or to help reduce the "urban heat island" effect and minimize stormwater run-off. Extensive roofs only require a shallow growing media depth, generally as little as 3" - 4", and therefore add little weight (typically 18-34 lb/sf wet weight) to the roof structure below.

Features:

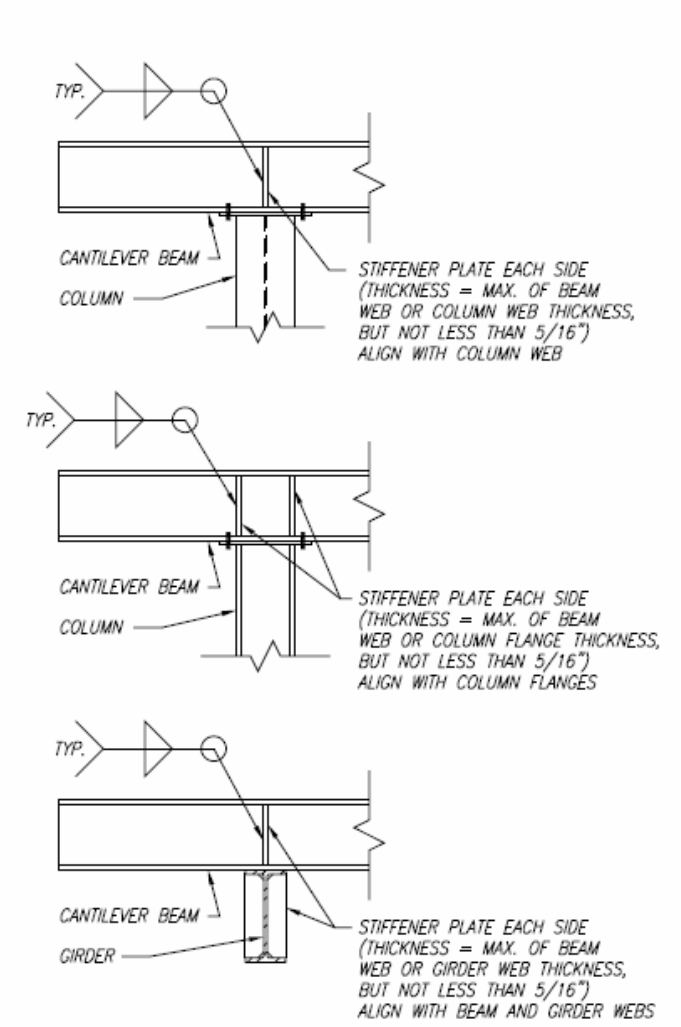
- Are lightweight with only 3" - 4" of growing media
- Ideal for inaccessible roofs
- Can be used on flat or sloping roofs
- Reduce stormwater runoff
- Help to mitigate the urban heat island
- Require minimum maintenance



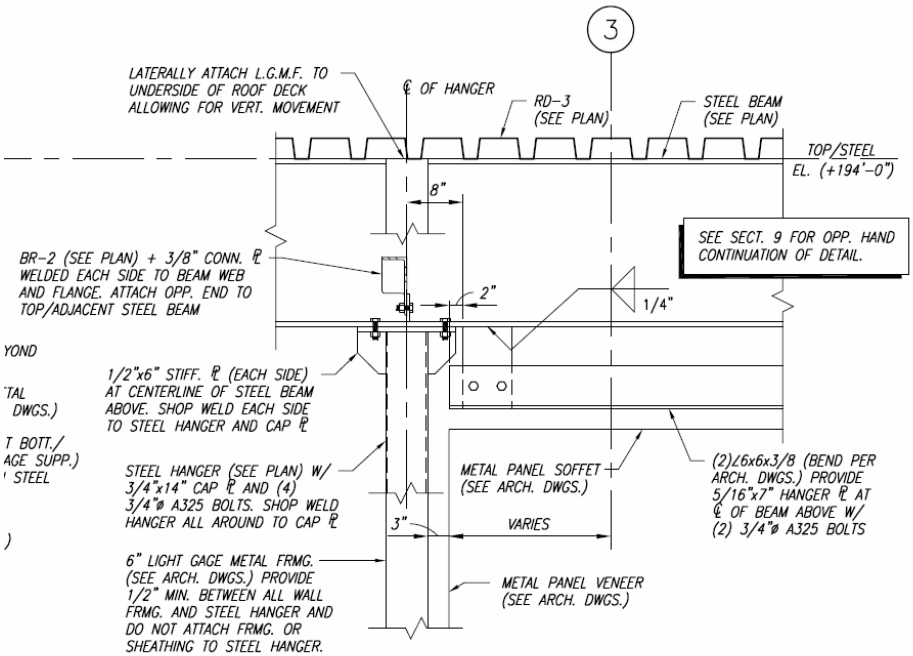
The water stored in the growing media and drainage/retention layer is sufficient to sustain the drought resistant plants between periods of rainfall. Irrigation systems are not normally required except in extreme climates.

Extensive green roofs can be applied to flat roofs and sloping roofs with a pitch of up to 12:12 or 45º, provided the appropriate measures are taken to cope with the shear forces and soil retention. Please contact Hydrotech for additional information regarding sloped applications.

http://www.hydrotechusa.com/extensive.html
American Hydrotech, Inc.,
303 E. Ohio Street, Chicago, IL 60611



DETAILS AT CANTILEVER BEAMS



SECTION 10
3/4" = 1'-0"

(1) Green Roof Load Calculations

Current
Vulcraft 3N20 deck galvanized
and W24x76 beams

conditions – 2 span, various spacing

Loads: DEAD → 40 psf
+18 psf
= 58 psf

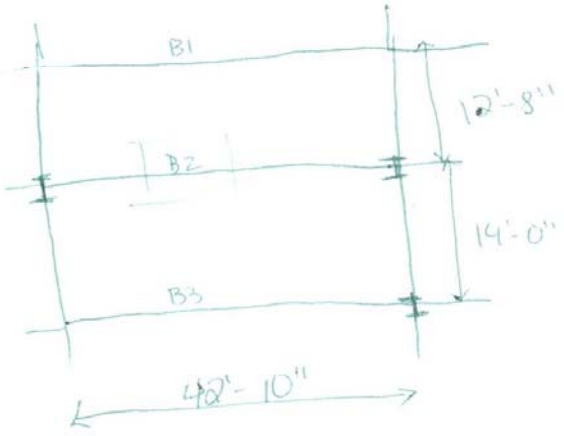
- Deck
- Rigid Insulation
- Built-up Roof
- Misc. Loading
- + GREEN Roofing +

LIVE → 55 psf

- Snow
- Misc. Loading

Total Load = 1.2D + 1.6L
= 1.2(58) + (55)1.6 = 157.6 psf

or 158 psf with Green Roofing



Analyzing for
* B2 *

* New loading uses Vulcraft 3N16 decking *

(3)

$M_u \leq \phi_b M_{px}$

W24x76 $\rightarrow \phi_b M_{px} = 750$ k-ft

$M_u \leq \phi M_n$ ∴ economical OK ✓

$\phi V_n \geq V_u$ [$T_w = 0.440$ in, $d = 23.9$ in]

$\phi V_n = \frac{1.0}{\phi_n}(0.6) F_y A_w \rightarrow \phi V_n = 1.0(0.6)(50)(0.440)(23.9)$

$= 315.5$ k

$V_u \leq \phi V_n$ ∴ economical OK ✓

* with added Hydrotech Extensive Assembly, it would be necessary to change Vulcraft deck guage

→ from 3N20 + 3N16

to remain economical, beam size should remain the same

→ W24x76

Added weight to structure w/proposed green areas:

~~at~~ 18 psf

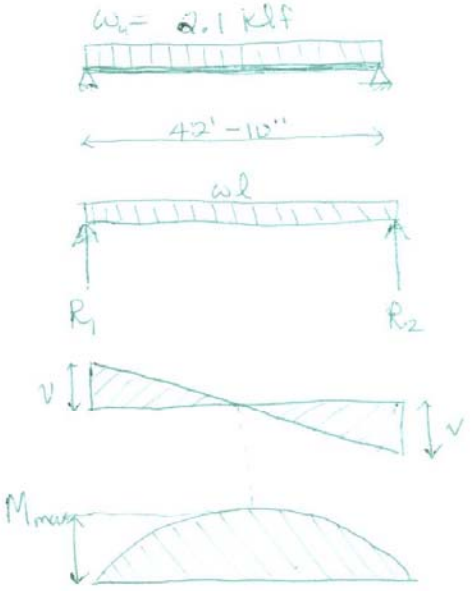
2 proposed areas of (42'-10" x 40'-8") → 3,485 SF

(18 psf x 3,485 SF) = 62,700 lbs

(2)

$A_w = \left(\frac{14'-0" + 12'-8"}{2}\right) = 13.4$ feet

158 psf $\times$ 13.4 feet $= 2.1$ klf



* uniformly distributed load, simply supported

$w = 2.1$ klf

$l = 42.8$ feet

$R_1 = R_2 = \frac{wl}{2} = V_u$

$= \frac{(2.1)(42.8)}{2} = \boxed{44.9 \text{ K}}$

M_{max} (at center of B2) $= M_u$

$= \frac{wl^2}{8} = \frac{(2.1)(42.8)^2}{8}$

$= 480.9$ or $\boxed{481 \text{ K-ft}}$

* economical design (compact)

Criteria $\longrightarrow$ $M_u \leq \phi M_n$

$V_u \leq \phi V_n$

Flexural Strength $\rightarrow \phi M_n$

$\phi = 0.9$ $\quad F_y = 50$ ksi for A992 steel

$M_n = M_p = F_y Z_x$ (for W24x76) $\rightarrow Z_x = 200 \text{ in}^3$

$= \frac{(50)(200)}{12} \Rightarrow$ W24x76 $\quad \phi M_n = 750$ K-ft

* Beam is laterally braced $\therefore L_b = 0$

(4)

62,700 lbs ≅ 31.4 tons

Cost to project (maximum $20/SF for chosen assembly)

3,485 SF * $20/SF = $69,700

or $8/SF → least expensive ⇒ $27,880

* $27,880 - 69,700 to add suggested green roof

→ Which is less than $\frac{1}{10}$ of 1% of building costs

or

less than $\frac{1}{100}$ of project costs

∴ great investment to add green roof

Weight Matrix

Analysis	Research	Value Engineering	Constr. Review	Schedule Reduction	Total
LEED	20	10	5	5	40%
Daylighing	10	15	10	0	35%
Green Roof	5	5	10	5	25%
Total	35%	30%	25%	10%	100%

Bibliography

[1] Daylighting Simulation Software (2008): radsite.lbl.gov. Lawrence Berkeley National Laboratory.

[2] LEED Rating System. (2008): usgbc.org. U.S. Green Building Council.

[3] Public Technology Institute. (1996). *Sustainable Building Technical Manual*. www.pti.org.

[4] Ander, G. (1997). *Daylighting Performance and Design*. New York: John Wiley and Sons.

[5] Andereck, Kelly J. (2002). www.edcmag.com. *Breaking the Green Ceiling.* Boston, MA.

[6] Bennett, Doug. (2008). *Molasky Corporate Center: 'Greening Las Vegas with LEED Gold Certification'*. Las Vegas, NV: Southern Nevada Water Authority.

[7] Brightworks. (2008). *Intelligent Strategies for Sustainability: 1700 Building*. Portland, OR: Brightworks Northwest, LLC.

[8] Carter, Charlie. (2007). *Engineering Value into Your Project*. Chicago, IL: Modern Steel Construction.

[9] City of Houston. (2007). *LEED, Green Building.* City of Houston, Texas.

[10] California Academy of Sciences. (2008). www.calacademy.com. *Green Architecture in the New California Academy of Sciences.* San Francisco, CA: Department of the Environment.

[11] Duke University. (2008). www.duke.edu. *Environmental Sustainability at Duke.* Durham, NC: Office of the Executive Vice President.

[12] Dittbenner, Richard. (2007). *Recycling and Environmental Sustainability.* San Diego, CA: Community College District.

[13] Edison Electric Institute. (2008). www.eei.org. *Plaza at PPL Center Wins Coveted Environmental Award from U.S. Green Building Council.* Allentown, PA: Edison Electric Institute.

[14] Energy Efficiency and Renewable Energy. (2004). *Management Building at Georgia Tech*. Washington, DC: Energy Efficiency and Renewable Energy

[15] Ginsburg, M. (2006). *Green Building Research Funding: An Assessment of Current Activity in the United States*. Washington, D.C: U.S. Green Building Council.

[16] Great Lakes Water Institute. (2006). www.glwi.uwm.edu. *Installing Green Roofs.* University of Wisconsin—Milwaukee.

[17] Guzowski, M. (1999). *Daylighting for Sustainable Design* . New York: McGraw-Hill, Inc.

[18] Jackson, M. (2002). *City Takes LEED in Green Buildings.* San Diego Business Journal. Vol. 23, No. 46

[19] Kats, G. (2006). *Greening America's Schools: Costs and Benefits*. Washington, D.C: U.S. Green Building Council.

[20] Langdon, Davis. (2007). *Cost of Green Revisited.* Washington, D.C: U.S. Green Building Council.

[21] Liberty Mutual. (2006). www.libertymutualgroup.com. *Green Practices.* Boston, MA: Liberty Mutual Insurance Company.

[22] Liu, K.K.Y. (2004). *Sustainable Building Envelope -Garden Roof System Performance.* New Orleans, LA: RCI Building Envelope Symposium.

[23] Pratt School of Engineering. (2006). www.pratt.duke.edu. *The Fitzpatrick Center's LEED Certification.* Durham, NC: Duke University.

[24] Rousseau, D. (2002). *Resource Guide for Sustainable Development in an Urban Environment.* Seattle, Washington: UEI, Inc.

[25] Saxena, Rohit et al. (2004). *Smart Sustainability: A Case Study of the Emory University Whitehead Biomedical Research Facility.* Atlanta, GA: Environmental Protection Agency.

[26] Simmons College. (2008). www.simmons.edu. *School of Management's New Green Home.* Boston, MA: Simmons College.

[27] Sera, A. (2000). *Green City Buildings: Applying the LEED Rating System.* Portland, Oregon: Xenergy, Inc.

[28] Sustainable Design. (2007). www.scribd.com. *David Skaggs Research Center.* Boulder, CO: Environmental Protection Agency.

[29] U. S. Green Building Council. (2002). *Building Momentum: National Trends and Prospects for High-Performance Green Buildings.* Washington, D.C: U.S. Green Building Council.

[30] U. S. Green Building Council. (2005). *LEED-NC Version 2.2 Reference Guide.* Washington, D.C: U.S. Green Building Council.

[31] U. S. Green Building Council. (2006). *Project Profile: Banner Bank Building.* Washington, D.C: U.S. Green Building Council.

[32] University of Florida. (2007). www.facilities.ufl.edu. Facilities Planning and Construction. Gainsville, FL: University of Florida

[33] Velasco, Paulo C. T. (2006). *A New Model to Calculate Energy Savings of Green Roofs to be Used in Building Energy Simulation Programs.* University Park, Pa. Architectural Engineering Department, The Pennsylvania State University.

[34] Warner, L. (2008). *LEED and Urban Daylighting.* University Park, Pennsylvania: English Department, The Pennsylvania State University.

[35] Whole Building Design Guide. (2008). www.wbdg.org. *One and Two Potomac Yard.* Washington, D.C: National Institute of Building Designs.