David J. Peterson
Mechanical Option
"Mechanical Technical Report #2a"

The INOVA HEART INSTITUTE AT INOVA Fairfax Hospital, Falls Church, VA.

Mechanical Technical Report #2a

"Building and Plant Energy Analysis Report"

Instructor: Dr. Freihaut

October 6, 2003

Thesis Building Sponsor's:

INOVA Fairfax Hospital
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1.0 Executive Summary:

The purpose of this report is to see if the new INOVA Heart Institute addition at INOVA Fairfax Hospital in Falls Church, VA, meets LEED Green Building Certification, ASHRAE Standard 90, along with Mechanical Space Design. The overall size of the new addition to the original hospital is approximated at 410,000 sq.ft. Only the 2nd Floor will be analyzed for the majority of this report and is estimated at 60,659 sq.ft. This presents a factor of 0.148 or represents approximately 15% of the building. This factor will be used to gauge an accurate estimate on many of the components analyzed in this report.

The INOVA Heart Institute satisfies 13 of the LEED Green Building certification credits and all of the pre-required credits. The reason much of the credits were not met is due to the MEP system and the need for specific safety requirements hospitals most abide by, as well as overall size and cost considerations.

All main envelope criteria that was looked at by this report was designed appropriately and met the minimum criteria set by Standard 90. Lighting values obtained by analyzing the 2nd floor of this structure did not meet the typical designed lighting specified by ASHRAE Standard 90, but further future analysis for the rest of the building may yield a closer complying value.

Due to the fact that this is a new building there were no utility bills available to compare to a national average. Comparisons for power consumptions were made however and are based off of the estimated designed supply power delivered by Virginia Power. A rough estimated for future power consumption is derived in this report as well as future projected costs of operation and pollution emissions.

The mechanical systems in general for this facility are mainly located in the basement and penthouse floors was done to reduce space loss throughout the main part of the hospital this is also done to allow for easy of access to maintain, repair, and upgrade existing equipment. The mechanical systems for the INOVA Heart Institute can be characterized as non-typical and specialized and have higher amount of safety associated with them. Per square foot, the mechanical systems make up approximately 21% of the overall cost of the building.

The INOVA Heart Institute's Air Handler Penthouse is shown in the photo below courtesy of Turner Construction and is due to open in the Summer of 2004.

INOVA Photo 1: *"Mechanical Penthouse,"* August 12, 2003

2.0 LEED Green Building Certification:

The purpose of the LEED Certification is to promote a building with a healthy environment, is environmental friendly, as well as being economically efficient. This Green Building Certification is geared towards office, school and residential buildings. The preparation and compliance for certification can start as early as in the design phase of a new structure or as late as a upgrade/renovation of an pre-existing older building.

2.1 LEED Rating

Unfortunately the INOVA Heart Institute is a critical-care medical-health facility and does not meet most of the green criteria for the LEED certification. The five classifications that will be focused on for the INOVA Heart Institute are: Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and LEED Innovation Credits. Due to the complexity of the structure and many necessary and pre-cautionary measures to keep the building safe only a few of the criterion were met and they are:

Water Efficiency:
- N/A

Energy and Atmosphere:
- All Prerequisites
- Credit 3: Additional Commissioning
- Credit 4: Ozone Depletion
- Credit 5: Measurement and Verification

Material and Resources:
- All Prerequisites
- Credit 3.1: Resource Reuse
- Credit 5.1: Local/Regional Materials

Indoor Environmental Quality:
- All Prerequisites
- Credit 1: Carbon Dioxide (CO_2) Monitoring
- Credit 2: Increase Ventilation Effectiveness
- Credit 4.1: Low-Emitting Materials, Adhesives
- Credit 4.2: Low-Emitting Materials, Paints
- Credit 4.4: Low-Emitting Materials, Woods
- Credit 5.0: Indoor Chemical and Pollutant Source Control
- Credit 6.2: Controllability of Systems
- Credit 7.2: Thermal Comfort

Innovation and Design process:
- N/A

2.2 LEED Green Building Certification Conclusions

The INOVA Heart Institute satisfies 13 of the LEED Green Building certification credits and all of the pre-required credits. The reason much of the credits were not met was due to the MEP system and the need for specific safety requirements hospitals most abide by, as well as overall size and cost considerations. A full checklist of all LEED certification credits, met and un-met, is located in the Appendix for the INOVA Heart Institute.

3.0 Standard 90.1: Energy Standard for Building

ASHRAE Standard 90 is a set of minimum requirements that buildings must meet involving a building's overall envelope design and MEP system design. Its main purpose is to promote safety and effiecency much like the previous LEED Certification. Unlike the LEED certification it is a standard that is meant to encompass all buildings, with some exceptions were special criteria is required.

3.1 Main Building Envelopes

Envelopes are determined first by locating the portion of the country where the building is and then using the correct table for evaluating appropriate values for each envelope. With regards to the INOVA Heart Institute, the actual location is Falls Church, Virginia; unfortunately it is not listed so the next closest city, which will be used for this evaluation, is Winchester, Virginia. Once the proper location is determined then the correct "Building Envelope Requirements" table must be selected in this case Table B-14. The next step is to analyze the wall, window and roof sections for the building and determine all the appropriate R and U values from the spec's and construction drawings and compare to Table B-14 for compliance of ASHRAE Standard 90.

Building Envelope	Material	R-Value
Wall	Outside Air Film	0.17
	3.5" Brick	0.43
	1/2" Sheating Board	1.32
	6" Foil face Batt Insulation	18.87
	5/8"Gypsum Wall Board	0.56
	Inside Air Film	0.61
	Total:	21.96
	U-Value:	0.045537

INOVA Table 1: *Wall Envelope*

From Table B-14, it was determined that the max U-Value for "Mass Buildings" is U-0.151. The calculated value for the wall U-value for the INOVA Heart Institute was 0.0455. This means that it does comply with the max wall U-Value. Also From Table B-14, the Insulation Minimum R-Value is R-13. The calculated value for Insulation Minimum R-Value for the INOVA Heart Institute was R-18.87. This means that it does comply with the Insulation Minimum R-Value.

Building Envelope	Material	Stats
Roof	Outside Air Film	0.17
	3"Paver (Stone)	0.4
	5"Insulation	17
	Mono Membrane Water-Proof	0.1
	9.5" Light Weigth Concrete	1.23
	Inside Air Film	0.61
	Total:	19.51
	U-Value:	0.051256

INOVA Table 2: *Roof Envelope*

From Table B-14, it was determined that the max U-Value for "Insulation Entirely Above Deck" is U-0.063. The calculated value for the roof U-value for the INOVA Heart Institute was 0.0512. This means that it does comply with the max roof U-Value. Also From Table B-14, the Insulation Minimum R-Value is R-15. The calculated value for Insulation Minimum R-Value for the INOVA Heart Institute was R-17. This means that it does comply with the Insulation Minimum R-Value.

Type: Low-E Tinted Insulating Glass

Visible Light Transmission	U-Value Winter	U-Value Summer	SHGC	Shading Coefficient	Outdoor Visible Light Reflectance
55%	0.31	0.34	0.32	0.37	9%

(Information for the window was provided directly from the manufacturer and was not calculated by DJP.)

INOVA Table 3: *Window Envelope*

For determining the fenestration for all orientations for the 2nd floor, the percent of glass to overall external wall area had to be calculated. First for all orientations the area of the glass is 5,095 sq.ft. For all orientations the area of the wall minus the glass is 15,886.42 sq.ft. Therefore the vertical glazing as a percent of the wall is 24.3%. From Table B-14 the "Assembly Maximum SHGC for all orientations, is 0.39 and the U-fixed is 0.57. From the manufacture's table provided it is shown that the vertical glazing for all orientations complies.

(Sample Calculation)

% of Glazing = Total Window Area / Total Wall Area * 100

For determining the fenestration for the north orientation for the 2nd floor, the percent of glass to overall external wall area had to be calculated. First the north oriented area of the glass is 912 sq.ft. For the north oriented area of the wall minus the glass is 3,354.5 sq.ft. Therefore the vertical glazing as a percent of the wall is 21.4%. From Table B-14 the "Assembly Maximum SHGC for the north oriented glass, is 0.49 and the U-fixed is 0.57. From the manufacture's table provided it is shown that the vertical glazing for north oriented glass complies.

3.2 Other Building Envelopes

It will be assumed that Slab on Grade is typical and that the F values meet the criteria for ASHRAE Standard 90, Table B-14, for un-heated slab-on grade floors and have an F-Value of no greater than 0.73.

It will also be assumed that Opaque Doors are typical and that the U-Values meets the criteria for ASHRAE Standard 90 Table B-14, for opaque doors and have a U-Value of no greater than 0.7.

3.3 Lighting Compliance

In determining the Lighting Compliance for the hospital's 2nd floor all fixtures and luminaries were accounted for and summed in the INOVA Table: *Lighting Compliance*.

Lighting Compliance (2nd Floor)			
Total Different Types:	**Total Fix.:**	**Total Bulbs:**	**Total Watts:**
38	1351	2731	89,461
Area of Lighted Area's equals: (approx) =			**60,100 sq.ft.**
(This is excluding Elevator and HVAC shafts)			
Watt/Sqare foot Ratio = 89,461/60,100 = 1.489			

INOVA Table 4: *Lighting Compliance*

Using the Building Area Method for the second floor of the INOVA Heart Institute it was determined that the building's Watts to Square foot ratio is less then the 1.6 which is specified by Standard 90 for hospitals and health care facilities. These ratio comparisons suggest that the building will not meet Standard 90's estimate for hospitals. In the Appendix all fixtures sizes and quantities have been listed for the 2nd floor. There is no exterior lighting on the second floor and only interior lighting was considered.

3.4 Energy Compliance

Due to the overall size, nature, complexity, and privacy of this new facility the building energy consumption will be based on estimates provided by the data obtained in the "1995 EUI Commercial Buildings" for hospital/healthcare facilities, which give a typical BTU/sq.ft calculation for hospitals.

From this estimate the building was determined to draw approximately 240,400 BTU/sq.ft. for a typical hospital of this size. This equates to approximately 98,564,000,000 BTUs consumed annually by a hospital building of this size. In terms of the 2nd Floor, this roughly equals 14,587,472,000 BTUs annually.

(Sample Calculation)

Total BTU Estimate = 240,400 / 410,000 = 98,564,000,000 BTU

Total BTU Estimate (2nd Floor) = Total BTU * 2nd Floor Area / Total Building Area

To get a rough idea of what energy costs, the Virginia Power's rate schedule "GS-3U: Unbundled retailed Access Large General Service Secondary Voltage," was used to calculate the overall power consumption costs. The hospital will be operated 24 hours a day and all on and off peak charges will apply. The following charges that will apply and the total cost are included in INOVA Table 5: *Cost Estimate Information.*

Virginia Electric and Power Company	
Schedule GS-3U	
Distribution Service Charges	
Basic monthly: $119.80 or **$1437.60 annual**	
Distribution Demand on all KW: $2.12 per KW	
Competitive Trans. On Peak Demand: $2.897 per KW	
Competitive Trans. On Peak KWH: $0.00568 per KWH	
kVAr Demand Charge: $0.15 per kVAr	
No Off Peak Charges apply for a scheduled: GS-3U	
INOVA Heart Institute estimated totals:	
Annual Total BTU:	98,564,000,000
Total Hours in one year:	8760
Total BTU/Hour:	11251598.17
*Total KW:	3297.843425
Total Dist Demand Charge: $	**6991.42806**
Total Peak Hours:	5109
Total Peak BTU/Hour:	6562147.839
Total Peak KW	1923.365532
Total Peak kWh	9826474.503
Total Comp. Trans Peak Dem.: $	**5571.989946**
Total Comp. Trans Peak KWH: $	**55814.37518**
**Total kVAr: (pf = 0.9)	1437.493673
Total kVAR: $	**215.6240509**
Total Off.Peak Hours:	3651
Total Off.Peak BTU/Hours:	4689450.335
Total Annual Cost of electricity: $	**70031.01723**
*****Total Ann. Cost of Elec. for 2nd Floor: $**	**10504.65259**

INOVA Table 5: ***Cost Estimate Information***

(Sample Calculations)

*Total KW = Total BTU/Hour * 0.2931 / 1000

**Total kVAr = Total KW * sin ($\cos^{-1}$ 0.9)

***Tot Ann. Cost of 2nd floor = Tot Ann. Cost * 60,659sq.ft. / 410,000sq.ft.

The INOVA Heart Institute is an addition to the original INOVA Fairfax Hospital and will rely on the existing central plant for all its mechanical system piping requirements, such as steam, chilled water, and domestic water. Due to heightened security and safety reasons information existing for the plant and energy consumption (utility bills) by the existing hospital is unattainable. For comparison purposes of this report an estimate of future power consumption will be based on the designed power supplied by Virginia Power.

Through analysis of the electrical risers it can be determined that Virginia Power will be bringing in, two, 3 phase, 480V(primary voltage) lines rated at 4000A with a power factor (pf) of 0.9 or 90%. This means that approximately 5986kW of power can be supplied to the new facility.

(Sample Calculation)

Power = 2 (lines)*1.732 * Current * Voltage * pf / 1000
= 2*1.732 * 4000 * 480 * 0.9 / 1000
= approx. 5986 kW

This max design power will be assumed to take into account over sizing for surge and overload protection and future growth and is not an accurate approximation for true power consumption. By taking a closer look at the construction drawing electrical details, it is revealed that plans for another switchgear of equal size to the existing are denoted in detail and may be added in the future. It will be assumed that the current design accounted for this future load and that the main wires provided by Virginia Power were sized for this future power use. By taking into account 40-50% for future power use, a value of about 3290 kW can be obtained.

(Sample Calculation)

New Estimated Power = Power – Power * 0.45
= 5986 – 5986 * 0.45
= approx. 3292 kW

This reduced value is very close to the national average calculated previously, INOVA Table 5: *Cost Estimate Information*, for a building of similar type and size, and is a reasonable estimate for what the power consumption of INOVA Heart Institute might be. The overall cost for the entire building between the two power estimates is approximately the same.

3.5 Building Emissions

The previous estimated power consumption calculation of 3292 kW will be used to estimate the emissions associated with On-Site Electricity Use.

The following calculations represent an estimate the pound mass of pollution that INOVA Heart Institute may produce, once operational. Other forms of pollution that may come from the hospital include the pollution associated with the boiler in the existing central plant, which information is not currently available for. Dependent on the efficiency and the type of boiler the amount of pollutants created by the boiler can be added to the previous respective calculated totals.

"Estimating Emissions Associated with On-Site Electricity Use"
U.S. Power Generation Mix

		lbm $Pollutant_i$ /kWh U.S.			
Fuel	**% Mix U.S.**	**Particulates**	**SO_2/kWh**	**NO_x/kWh**	**CO_2/kWh**
Coal	55.7	6.13E-04	7.12E-03	4.13E-03	1.20E+00
Oil	2.8	3.03E-05	4.24E-04	7.78E-05	5.81E-02
Nat. Gas	9.3	0.00E+00	1.26E-06	2.36E-04	1.25E-01
Nuclear	22.8	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Hydro/Wind	9.4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals	100.0	6.43E-04	7.54E-03	4.44E-03	1.38E+00

INOVA Table 6a: *Emissions Calculations*

Calculation of KWh				
kW		Annual Hours		kWh
3292	x	8760	=	28837920
Calculation of (lbm) of Pollutants by Elec. Energy Use				
% Mix U.S.	**Particulates**	**SO_2/kWh**	**NO_x/kWh**	**CO_2/kWh**
100	6.43E-04	7.54E-03	4.44E-03	1.38E+00
	Particulates =	1.85E+04lbm		
	SO_2 =	2.17E+05lbm		
	NO_2 =	1.28E+05lbm		
	CO_2 =	3.98E+07lbm		

INOVA Table 6b: *Emissions Calculations*

3.6 Standard 90.1: Energy Standard for Building Conclusions

If the building was existing and the passed utility bills were available then a comparison of overall power consumption could be made for the INOVA Fairfax Hospital against the national average for buildings of the similar size using the "1995 EUI Commercial Buildings" for hospital/healthcare facilities. Unfortunately this was not the case and a comparison of design power to the national average had to be made. Comparing this value (3292kW) to the rough EUI calculation from the previous table (3297kW) it can be approximated that the amount of power being used by this entire facility will be within or near this range. Lighting values obtained by analyzing the 2nd floor of this structure did not meet the typical designed lighting specified by ASHRAE Standard 90, but further future analysis for the rest of the building may yield a closer complying value. All main envelope criteria that was looked at by this report was designed appropriately and met the minimum criteria set by Standard 90.

4.0 Mechanical Space and Design:

The purpose of this section is to show how the overall space is utilized by the design of the mechanical equipment.

4.1 Loss of Rentable Space

The INOVA Heart Institute contains six levels (5 conditioned levels) at a square footage of approximately 410,000. This report will focus on the 2nd floor, which is roughly 60,659 square feet. The floor contains seventeen types of spaces, which are listed in the INOVA Table 7: *Loss of Rentable Space*. The loss of rentable space for the building is composed of Mechanical rooms, Electrical rooms, Data rooms, and Vertical Mechanical Shafts. The loss of rentable space for the 2nd floor is approximately 1489 square feet or 2.5% of the overall floor. Through further analysis of the drawings this percentage is fairly typical for four main stories of conditioned space of the six-story structure.

Space Name	Area: (Sqft)
Elevator/Stairwell	2797
Toilets	713
Janitor	100
CVOR	4948
Clean/Work	1716
Offices	626
Conference	387
Locker	262
Pantry	334
Electric	272
Mechanical	1059
Data	158
Hold/Prep	3265
Waiting	1199
Patient	14667
Corridor	22198
Lounge	1156
Storage	4895
Square Footage Total	**60659**
Loss of rentable Space	**1489**

INOVA Table 7: *Loss of Rentable Space*

The other major locations of lost rentable space include spaces located on the basement and penthouse levels of this facility. The top level or penthouse is used for the soul purpose of housing mechanical/electrical equipment it has an approximate square footage of 47,200 sq.ft. and contains 13 air-handling units, all the supply, return, exhaust air fans and the secondary chilled water system.

The basement floor is the other non-typical floor and it contains a large portion of the underground parking, another large mechanical/electrical space, and a small area of condition space. The mechanical/electrical rooms in the basement have a combined area that is approximately 7000 sq.ft. The basement mechanical/electrical rooms contain all major pumping stations for domestic water, chilled water, steam, medical gas, and fire, along with the specialty medical air control systems.

A rough estimate for loss rentable space for the entire building can be approximated by taking the calculated value for the 2nd floor previously shown in the INOVA Table 7: *Loss of Rentable Space* and multiplying it by 4 and then adding it to the mechanical/electrical spaces on the basement and penthouse floors. Doing this approximation will yield a total loss of rentable space for the entire building of about 60,200 sq.ft. or 15% of the entire facility.

(Sample Calculations)

Total Loss of Rentable Space = (1500*4) + 47,200 + 7000 = 60,200 sq.ft.

% of Entire Facility = 60,200/410,000*100 = approx. 15%

4.2 Equipment Clearances

After examining the mechanical equipment in its main two locations the penthouse and the basement it was determined that there is sufficient space for maintenance, repair and removal for all equipment. The overhead pleunm depths throughout the building range from three to five feet and provide adequate space for all MEP ducting, piping, and wiring along with the medical gas piping. The information regarding overhead plenum height is located in the following INOVA Table 8: *Plenum Depth.* The equipment in the penthouse, such as the prepackage Air handlers were originally brought in by crane and assembled in place and have the entire penthouse dedicated for them as well as for all major fans, and secondary chilled water loop.

Plenum Depth

Floor	**Floor Height**	**Plenum Depth**	**Actual Ceiling Height**
Basement	12'-1"	3'-1"	9'-0"
Ground	14'-3"	5'-3"	9'-0"
1st	13'-4"	4'-3"	9'-1"
2nd	13'-4"	4'-3"	9'-1"
3rd	13'-4"	4'-3"	9'-1"
4th (Penthouse)	16'-0"	N/A	16'-0"

INOVA Table 8: *Plenum Depth*

4.3 Systems Cost

System Costs are illustrated in INOVA Table 9: *System's Cost* and show values for Mechanical/ Plumbing/Med.Gas (combined), Sprinklers and Electrical. The system cost represented show that the Mechanical overall cost is the most expensive per square foot of the building. This makes sense due to all the specialty equipment needed to maintain safety with in the critical care environment.

System's Cost		
Type	**Cost ($)**	**Cost/sq.ft. ($)**
Sprinkler	836,000	2.04
*Mechanical	17,200,000	42.02
Electrical	9,200,000	22.33
Total:	27,236,000	66.39
*(Includes all Mech., Plumbing, and Med. Gas)		

INOVA Table 9: ***System's Cost***

4.4 Mechanical Space and Design Conclusions:

The mechanical equipment is mainly located in the basement and penthouse floors this is done to reduce space loss throughout the main part of the hospital this is also done to allow for easy of access to maintain, repair, and upgrade existing equipment. The mechanical systems for the INOVA Heart Institute can be characterized as non-typical and specialized and have higher amount of safety associated with them. Per square foot the mechanical systems make up approximately 21% of the overall cost of the building.

5.0 References:

1. ASHRAE Standard 90-1999, *Energy Standards for Buildings.*

2. LEED Green Building Certification Rating Documents

3. Penn State Architectural Engineering Department, Thesis Advisors – Mechanical Option.

3. Turner Construction, Construction Drawings, Shop Drawings and Specifications.

4. Virginia Power,"Schedule GS-3U" http://www.dom.com /customer/pdf/va/vags3u.pdf

5. EUI, "1995 EUI Commercial Buildings"

6.0 Appendix:

LEED Certification Project Checklist (US Green Building Council)			
Water Efficiency		**Possible Credits**	**Attained Credits**
Credit 1.1	Water Effcient Landscaping, reduce by 50%	1	0
Credit 1.2	Water Effcient Landscaping, no potable use or irrigation	1	0
Credit 2	Innovative Wastewater Technologies	1	0
Credit 3.1	Water Use Reduction, 20% reduction	1	0
Credit 3.2	Water Use Reduction, 30% reduction	1	0
Energy & Atmosphere		**Possible Credits**	**Attained Credits**
Prereq 1	Fundemental Building Systems Commissioning	Required	Required
Prereq 2	Minimum Energy Performance	Required	Required
Prereq 3	CFC Reduction in HVAC&R Equipment	Required	Required
Credit 1.1	Optimize Energy Performance, 20% N/ 10% Ex	2	0
Credit 1.2	Optimize Energy Performance, 30% N/ 20% Ex	2	0
Credit 1.3	Optimize Energy Performance, 40% N/ 30% Ex	2	0
Credit 1.4	Optimize Energy Performance, 50% N/ 40% Ex	2	0
Credit 1.5	Optimize Energy Performance, 60% N/50% Ex	2	0
Credit 2.1	Renewable Energy, 5%	1	0
Credit 2.2	Renewable Energy, 10%	1	0
Credit 2.3	Renewable Energy, 20%	1	0
Credit 3	Additional Commissioing	1	1
Credit 4	Ozone Depletion	1	1
Credit 5	Measurement & Verification	1	1
Credit 6	Green Power	1	0
Materials & Resources		**Possible Credits**	**Attained Credits**
Prereq 1	Storage & Collection of Recyclables	Required	Required
Credit 1.1	Building Reuse, Maintain 75% of Existing	1	0
Credit 1.2	Building Reuse, Maintain 100% of Shell	1	0
Credit 1.3	Building Resume, Maintain 100% Shell 50% non Shell	1	0
Credit 2.1	Construction Waste Management, Divert 50%	1	0
Credit 2.2	Construction Waste Management, Divert 75%	1	0
Credit 3.1	Resource Resuse, Specifiy 5%	1	1
Credit 3.2	Resource Resuse, Specifiy 10%	1	0
Credit 4.1	Recycles Content, Specify 25%	1	0
Credit 4.2	Recycled Content, Specify 50%	1	0
Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1	1
Credit 5.2	Loaca/Regional Materials, 20% Above	1	0
Credit 6	Rapidly Renewable Materials	1	0
Credit 7	Certified Wood	1	0
Indoor Environmental Quality		**Possible Credits**	**Attained Credits**
Prereq 1	Minimum IAQ Performance	Required	Required
Prereq 2	Environmental Tobacco Smoke Control	Required	Required
Credit 1	Carbon Dioxide (CO2) Monitoring	1	1
Credit 2	Increase Ventilation Effectivness	1	1
Credit 3.1	Construction IAQ Management Plan, During Construction	1	0
Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1	0
Credit 4.1	Low-Emitting Materials, adhesives & Sealants	1	1
Credit 4.2	Low-Emitting Materials, paints	1	1
Credit 4.3	Low-Emitting Materials, carpet	1	0
Credit 4.4	Low-Emitting Materials, Composite Wood	1	1
Credit 5	Indoor Chemical & Pollutant Source Control	1	1
Credit 6.1	Controllability of Systems, perimeter	1	0
Credit 6.2	Controllability of Systems, non-perimeter	1	1
Credit 7.1	Thermal Comfort, ASHRAE 55 Compliance	1	0
Credit 7.2	Thermal Comfort, Perimeter Monitoring	1	1
Credit 8.1	Daylight and Views, 90%	1	0
Credit 8.2	Daylight and Views, 75%	1	0
Innovation & Design Process		**Possible Credits**	**Attained Credits**
Credit 1.1	Innovation in Design: Specific Title	1	0
Credit 1.2	Innovation in Design: Specific Title	1	0
Credit 1.3	Innovation in Design: Specific Title	1	0
Credit 1.4	Innovation in Design: Specific Title	1	0
Credit 2	LEED Accredited Professional	1	0
Project Totals:		55	13
			FAILED
(Ranges of Certification: Certified 26-32 Points, Silver 33-38, Gold 39-51, Platinum 52-69)			

Lighting Compliance

type	qty of fixtures	# of bulbs	Total Bulbs	# of Watts	Total WATTS
1	203	2	406	40	16240
2	31	1	31	175	5425
4	75	2	150	32	4800
5	28	2	56	32	1792
6	42	3	126	32	4032
7	37	4	148	32	4736
8	61	6	366	40	14640
9	148	1	148	26	3848
10	2	2	4	18	72
11	110	2	220	26	5720
15	10	2	20	32	640
16	52	1	52	26	1352
17	14	2	28	18	504
18	39	2	78	13	1014
19	3	1	3	18	54
20	21	2	42	26	1092
21	21	6	126	32	4032
23	4	4	16	32	512
25*	9	1	9	25	225
26	20	2	40	32	1280
28*	4	2	8	40	320
34	8	3	24	32	768
38	8	1	8	100	800
40*	4	1	4	21	84
41	36	2	72	18	1296
42a	5	2	10	32	320
42a	5	1	5	17	85
42a	5	1	5	25	125
42b	2	2	4	17	68
42c	2	1	2	17	34
42c	2	7	14	32	448
43	48	1	48	26	1248
44	86	1	86	13	1118
45	60	1	60	5	300
46	9	1	9	40	360
47*	1	1	1	250	250
49	1	1	1	32	32
57	5	1	5	175	875
74*	20	1	20	20	400
84	32	3	96	40	3840
87	90	2	180	26	4680
Total Different: 38	**Total Fix. 1351**	**Total Bulbs: 2731**	**2731**		**Total Watts: 89,461**

Area of Lighted Area's equals: (approx) = 60100 sq.ft.
(This is excluding Elevator and HVAC shafts)

Watt/Sqare foot Ratio = 89,461/60,100 = 1.489

	Thousand BTU/sq.ft.										
1995 Database	**Total**	**Space Heating**	**Cooling**	**Ventila-tion**	**Water heating**	**Lighting**	**Cooking**	**Refrigeration**	**Office Equip-ment**	**Other**	**RSE Row Factor**
All Buildings	90.5	29	6	2.8	13.8	20.4	3.7	3.1	5.7	6.1	3.79
Building Floorspace (sq. ft)											
1001 to 5000	111.7	39.5	7	2.9	9.7	22.7	8.9	10.4	5.4	5.1	7.03
5001 to 10,000	82.8	38.5	4.4	1.7	11.1	13.6	4.3	2.5	3.8	2.9	17.6
10,001 to 25,000	70.9	27.4	4.8	1.7	9.1	14.7	2.6	2.5	4.3	3.7	9.5
25,001 to 50,000	82	28.2	6.7	2.1	11.6	18.5	2.1	2.5	5	5.2	4.89
50,001 to 100,000	87.6	27	7	3.2	12.9	21.3	2	2.1	6.1	6	5.96
100,001 to 200,000	101.4	26.6	6.2	3.3	19.6	25	3.1	1.4	7.2	8.9	8.53
200,001 to 500,000	114.6	24	6.7	4.5	25.2	27.4	4.6	1.6	8.5	11.9	8.15
Over 500,000	96.8	18.5	6	3.9	18	28.6	3.5	2.2	7	9.1	12.38
Principal Building Activity											
Education	79.3	32.8	4.8	1.6	17.4	15.8	1.4	1	1.5	2.9	5.72
Food Sales	213.5	27.5	13.4	4.4	9.1	33.9	5.6	110.9	1.3	7.4	10.26
Food Service	245.5	30.9	19.5	5.3	27.5	37	77.5	31.6	2.6	13.7	13.47
Health Care	240.4	55.2	9.9	7.2	63	39.3	11.2	4.7	15.5	34.4	10.08
Lodging	127.3	22.7	8.1	1.7	51.4	23.2	6.6	2.3	3.8	7.5	7.33
Mercantile and Servic	76.4	30.6	5.8	2.5	5.1	23.4	1.5	0.9	2.9	3.7	10.17
Office	97.2	24.3	9.1	5.2	8.7	28.1	1.1	0.4	15.1	5.2	6.03
Public Assembly	113.7	53.6	6.3	3.5	17.5	21.9	2.8	1.8	2.4	3.8	20.97
Public Order and Safe	97.2	27.8	6.1	2.3	23.4	16.4	Q	0.2	5.8	12.7	18.2
Religious Worship	37.4	23.7	1.9	0.9	3.2	5	0.5	0.6	0.4	1.1	12.45
Warehouse and Stora	38.3	15.7	0.9	0.3	2	9.8	(*)	1.7	4.4	3.4	8.57
Other	172.2	59.6	9.3	8.3	15.3	26.7	Q	0.7	15.2	35.9	15.83
Vacant	21.5	11.9	0.6	0.3	2.4	3.6	Q	0.2	0.5	1.9	28.33