Illinois Smart Energy Design Assistance Center

Level III Feasibility Report

Energy Conservation Evaluation

And

Recommendations



Kane County Government Center Administrative Building

719 South Batavia Avenue
Geneva, Illinois 60134

Report Date: July 9, 2009 (sent July 30, 2009)

University of Illinois at Urbana-Champaign

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Nancy Hamill Governale, AIA, CEM
Facilities Research
135 Century Oaks Drive
North Barrington, Illinois 60010
847-712-6251 (phone)

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SEDAC Background
In order to enhance the economy the Illinois Department of Commerce and Economic Opportunity has implemented the Smart Energy Design Assistance Program for commercial buildings, municipalities, community colleges, and K-12 schools. The program is funded by the Illinois Department of Commerce and Economic Opportunity and is managed by the School of Architecture at the University of Illinois at Urbana-Champaign in partnership with the 360 Energy Group. The Smart Energy Design Assistance Center's (SEDAC) mission is to encourage communities, small business owners, design professionals, and building contractors to incorporate energy efficiency practices and renewable energy systems.

Engaging in energy and water efficiency strategies is a proven method of controlling costs. Companies that take a systematic and strategic approach to energy and water management enjoy a broad array of tangible and intangible benefits. We have entered an increasingly complex and volatile resource marketplace requiring a new emphasis on measuring and maximizing energy productivity. Resource management has become an indicator of overall management quality. Most commercial buildings use 10 to 30 percent more energy than necessary and have abundant opportunities to save. Cutting a building's energy use by 30 percent yields the same bottom-line benefits as a 5 percent increase in net operating income.

As part of this program, the SEDAC conducted a site visit to the Kane County Government Center's Building A at 719 South Batavia Avenue, Geneva, Illinois on June 5, 2009. The analysis focused on energy savings opportunities and life cycle cost estimates for various energy cost reduction measures (ECRM) with high potential for implementation. This report presents recommendations for energy saving investments resulting from the analysis, along with the methods and assumptions used.

Executive Summary

Facilities Research studied eight Energy Cost Reduction Measures (ECRMs). One measure studied, adding a vegetative barrier to the west façade of Building A was explored but not recommended at this time. Research has shown that adding vegetation on buildings or on Green Wall structures in close proximity to buildings reduces exterior building temperatures by approximately 3 degrees during sun exposure. Due to the complexity of this improvement, we felt it should be explored separately for Kane County if desired. Another ECRM, changing AC units to a higher SEER rating is recommended but only as equipment is replaced. Some existing equipment is relatively new. Replacement of older units will offer greater return on investment if they have already reached their useful life.

The remaining 6 ECRMs are recommended for immediate implementation. Overall, we identified potential energy savings of approximately $44,000 for 6 ECRMs each with varying payback periods. For Return on Investment, ROI, we established a 10 year study period. If all Energy Cost Reduction Measures were implemented, the collective savings would not reach this level. In many cases, savings from one improvement are in part savings from another improvement. To put potential energy savings in perspective, annual natural gas costs for Building A are approximately $52,000 and electricity is a portion of the Center's $140,000 annual cost. Other buildings are interconnected electrically; therefore $140,000 represents the total Kane County Government Center electricity.

The 6 Recommended ECRMs Include:

- Lighting Improvements
- Building Automation System Commissioning
- Night Set back
- Economizer Cooling
- Convert heating from Steam to Hot Water
- Add Wall Insulation

The Kane County Government Center is comprised of 6 buildings of different ages, serving various government functions. Facilities Research was commissioned by the Smart Energy Design Assistance Center, SEDAC, on behalf of Kane County to perform an energy audit for Building A. Building A serves as the administrative building for the government complex.

For background, the Facilities Research team seeks to discover the most cost effective methods to save energy in buildings. Oftentimes, total system replacement is not necessary. In the case of lighting, in addition to installing the best available technology, we question if the lamp is necessary to achieve good working conditions. In many cases, current quantity of lamps in a fixture can be reduced through new fixture choices or added features such as highly efficient reflectors. This is the case in Building A. We recommend a thorough examination of the fixture choices in interior spaces that will lead to recommendations to reduce connected wattage.

In general Building A in is good condition in terms of potential energy performance. However, certain operational and systems limitations are placing limits on the energy efficient operation of Building A. We recommend a retro-commissioning effort to set operating parameters for maintenance staff and automated systems. Items such as economizer cooling can be established through the existing building automation system with little or no additional capital costs.

The Johnson Metasys building automation system is in place but appears to be overridden in daily operation. Fan coil units are allowed to operate 24 hours, 7 days a week rather than taking advantage of night set back opportunities. Sample Metasys screen shots are provided in Appendix C.

Electricity is provided to this property by the City of Geneva. The Kane County Government Center is classified as a "Government" customer. The Electric service rate that applies to building A at the Kane County Government Center is as follows. Demand charges that apply are based on these two classifications of general service customers.

Large General Service - Demand greater than 400 kW, but less than 2,000 kW.
or
Medium General Service - Demand greater than 25 kW, but less than 400 kW

Either General Service rate is determined by total demand. Large service rates typically apply 4 months out of the year, during peak summer demand. Electricity is provided by the City of Geneva. Additional electric rate information is provided in Appendix E.

Demand charges built into the City of Geneva electric rate follow typical demand rate design. Higher demand charges apply during the summer months when the greatest demand is placed on the local electrical generating facility. In the case of the Kane County Government Center, demand charges represent almost 50% of the total electric bill. We do have an overall strategy at this time to reduce demand charges but feel that this is an area for serious further study, possibly as part of a complex wide analysis. For example, if the county chose to implement geothermal to supplement heat and supply air conditioning, summer electric demand would be greatly reduced. ECRMs recommended for implementation that will have an immediate effect on demand charges include lighting changes, building commissioning/ BAS changes, night set back and economizer cooling. As AC units are replaced with higher efficiency units. Additional demand will be reduced.

In Building A, there are two heat delivery systems in the building. Steam radiators and hot water heating through fan units create the potential for systems to compete. There is a probability of heat and air conditioning being on at the same time. In addition, because of the difficulty of operating steam radiators within a narrow range of temperature, there is a probability of opening windows to compensate for overheating.

In searching for an economical solution to the elimination of system competition, we recommend converting the existing steam boiler to hot water only. Currently the steam

boiler supplies steam to radiators and hot water through converters for air distributed heat. We have contacted the manufacturer of the steam boilers who have an approved method for converting their steam boilers to hot water.

In terms of the envelope efficiency of Building A, we assume that overall efficiency could benefit from additional insulation attached to the inside surface of exterior walls. Locations for added insulation would be determined through non-invasive testing such as thermal imaging. Accomplishing this task requires colder temperatures.

Lighting systems in Building A are varied. Because of the existing condition, quality and energy consumption of all light fixtures, we recommend a comprehensive approach to lighting upgrades including new fixtures rather than retrofit. As the lighting improvement is designed, the cost benefit of new versus retrofit can be illustrated for your review. For the purposes of this audit, a replacement cost was applied to most fixtures. This leads to a longer payback period than is absolutely necessary but leads to improved facilities and user benefit from new lighting.

Finally, there are a total of 17 small split and rooftop AC units installed throughout Building A. Existing Seasonal Energy Efficiency Ratings (SEER) range from poor to acceptable. Current recommended energy codes require SEER ratings higher than those in the Building A assortment. We recommend that when AC units are replaced, they be replaced with higher efficiency models.

The sections of this report detail the process, reasoning and insight that led to the following list of Energy Cost Reduction Measures.

ECRM Spreadsheet and Summary Information

On the electrical side of energy improvements KW demand reduction derived from six recommended ECRMs plus AC unit replacement within this audit contribute 161 KW in savings for the Kane County Government Center. KCA is the identifier for Kane County Building A.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 1	Lighting	$51,700.00	$7,995.00	26,430	n/a	26.00	6.47

Payback will be quicker if some fixtures are retrofitted rather than replaced. Grants and rebates will reduce payback period.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 2	BAS Retro - Commissioning	$10,000.00	$6,000.00	35,294	3,000.00	35.00	1.67

50% of model discrepancy attributed to poor temperature control and simultaneous heating and cooling.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 3	Replace Night Set Back	$6,000.00	$8,719.00	41,952	5,153.00	42.00	0.69

Night set back is currently overridden. Controls manipulation cost is represented in the improvement cost.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 4	Economizer Cooling	In BAS	In BAS	In BAS	In BAS	In BAS	In BAS

Included as part of the retro-commissioning. Take advantage of free cooling.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 5	Convert heating from steam to hot water	$120,000.00	$16,050.00	n/a	10,050.24	n/a	7.48

Calculated savings $10,050 + 6,000. 50% of model discrepancy attributed to poor temperature control and simultaneous heating and cooling

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 6	Add wall insulation	$39,000.00	$4,815.00	n/a	4,815.87	n/a	8.10

Wall insulation to be strategically placed based on results of thermal imaging.

ECRM #	ECRM Description	Installed Cost	Annual Savings	kWh reduced	Therms reduced	kW reduced	Payback (years)
KCA 7	Replace AC units over time	$1,200.00	$308.57	3,429	n/a	3.43	3.89
KCA 7	Replace 17 AC units over time	$20,400.00	$5,245.69	58,293	n/a	58.29	3.89

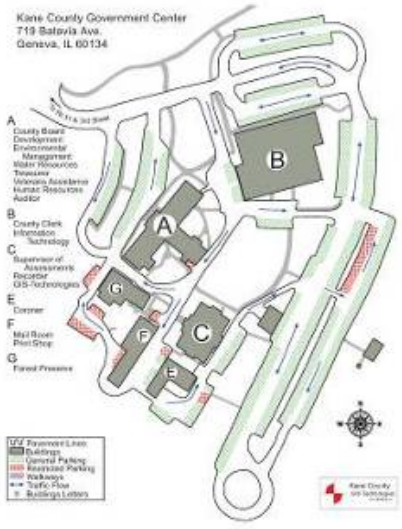
Typical 4 ton replacement with 14 SEER (only incremental increase in replacement cost over 9 SEER)

The following chart represents important economic considerations such as internal rate of return and potential monthly cash flow. We are aware that most public agencies fund their projects differently than private companies. The following information may be of use to people analyzing financial project feasibility for the County.

Economic Parameter	KCA1	KCA2	KCA3	KCA5	KCA6	KCA7
Project Cost ($)	$51,700.00	$10,000.00	$6,000.00	$120,000.00	$39,000.00	$20,400.00
Annual Savings ($/year)	$7,995.00	$6,000.00	$8,719.00	$16,050.00	$4,815.00	$5,245.69
Discount Rate (%)	10	10	10	10	10	10
Study Period (years)	10	10	10	10	10	10
Interest Rate (%)	5	5	5	5	5	5
Loan Period (years)	10	10	10	10	10	10
Simple Pay Back (years)	6.47	1.67	0.69	7.48	8.10	3.89
Internal Rate of Return (%)	9.40	59.83	145.32	6.09	4.34	23.11
Net Present Value ($)	-1,284.09	27,835.58	48,981.41	-18,789.82	-8,636.95	12678.96
Monthly Savings ($)	666.25	500.00	726.58	1,337.50	401.25	437.14
Monthly Loan Payment ($)	548.36	106.07	63.64	1,272.79	413.66	216.37
Monthly Net Cash Flow ($)	117.89	393.93	662.94	64.71	-12.41	220.77

Government Center Description

The Kane County Government Center is comprised of 6 buildings of various building types, construction and materials. The most substantial building within the complex is the original, 1940's administrative building, Building A. The envelope is in good condition. As discussed in greater detail in the Window and Doors section, windows have been updated. The attic space is well insulated. Mechanical systems and lighting systems are a blend of type, quality and efficiency.



It is assumed that the electric bills for the complex are combined. The energy simulation of Building A was

not able to be correlated to the scale of the electric bills and kilowatt hours consumed. The natural gas bills and therms used do appear to be within the range of natural gas for Building A alone. Previously combined buildings have been decentralized. As additional buildings are audited, a more comprehensive picture of energy consumption for the complex and its individual buildings can be created.

In addition, when the complex is viewed as whole, economies may arise from the inter-relatedness of buildings and systems. Energy consuming systems such as exterior lighting was not audited at this time. Taken as a whole, lighting, irrigation, water and sewer and combined heat or chilled water system, savings may be revealed. Completing an Energy Master Plan for Kane County Government buildings will allow the county to prioritize energy improvements to gain the greatest cost benefit.

Building Description and Enclosure

Originally a religious residential facility, Kane County has adapted the Building A through direct re-use and construction modifications. The cornerstone on the main façade of the building indicates a dedication date of 1941. From an energy exposure perspective, Building A has a higher percentage of roof area because the lower two floors have a larger floor plate that the upper two floors. This was taken into consideration during the energy simulation process that was used to determine ideal energy consumption parameters. Baseline analysis revealed an ideal annual natural gas consumption of 40,000 therms versus the existing consumption of 52,000 therms. At approximately $1.00 per them, this represents $12,000 in potential energy savings if operational and physical changes occur.

Walls

There are no 1941 original building drawings we could locate for Building A. Examining the building and its construction, we assume exterior walls are comprised of various types of masonry. It is assumed that little or no insulation material exists within the wall cavity. In fact, we are not certain that exterior walls possess a cavity. However, given the fact that the building was built in the 1940's it is assumed that a more common method of construction would have yielded an exterior wall construction built of withes of brick tied together metal ties. This type of construction would yield a void or dead air space which could have been filled with some type of insulation.



Since, energy efficiency was not thought to be as critical in the 1940's we assume that Building A has little or no insulation in exterior walls. In addition, since it would be difficult to fill wall cavities with insulation at this point, any added insulation to exterior

walls would be added to interior surfaces of exterior walls. Care must be taken with this type of improvement to avoid moisture getting trapped within the composite wall system.

Windows and Doors
Existing windows in Building A appear to be aluminum framed, thermally broken, with insulated glass. Installation of the windows appears to have been done such that excessive air infiltration is not an issue. Air infiltration tests were not physically completed. Blower door testing was not included in this energy audit. If problem areas such as drafts or cold spots remain after system improvements are made, further analysis can be made during winter months. Thermal imaging can help to pinpoint specific areas of air infiltration or cold spots without the expense of blower door testing.

Exterior doors in Building A vary from newer aluminum doors with panic hardware to original wood doors at major building entrances. We did not quantify weatherization cost savings in our audits. However, it is recommend that building operations routinely examine buildings for loose or missing caulk, broken window latches, worn weather-stripping, malfunctioning door closures or broken windows. The process of weatherization should be done on an annual basis at a minimum. We recommend weatherization inspections to be done every 6 months as weather permits.

Roof / Attic Spaces
The existing roof and attic spaces appear to be in good condition. There appeared to be an adequate amount of insulation in the attic. There is a large amount of mechanical equipment in the attic area requiring access periodically. The existing attic appears to have adequate ventilation and air flow keeping moisture at a minimum.



Crawl Spaces / Tunnels
There is a system of crawl spaces and tunnels in Building A. This may be helpful in the event piping changes occur to make changes to the delivery of heat or air conditioning. We looked at the tunnel spaces and crawl spaces while on a site visit. They appeared to be quite cramped with existing equipment. On the day of our visit, data wiring was being installed within the crawl space on the first floor. Use of existing crawl spaces and tunnels is questionable.



Lighting Improvements

A variety of lighting fixtures and lamp types currently exist in Building A. Central corridors have for the most part been upgraded to T8 lamps and electronic ballasts. Even though they have been updated to T8 lamps with electronic ballasts, we believe the building could benefit from fixture replacement. We believe Building A would be able to reduce the number of lamps further through the installation of new fixtures with reflectors and newer design technologies.

The 4th floor was renovated relatively recently. In this space, an open space plan for the building department was upgraded including new fixtures with T8 lamps and electronic ballasts. In this area there is opportunity to selectively turn off banks of lights or dim fixtures. Currently lights are all on or all off. Adding an automated control system, such as that available from Lighting Control and Design, would allow dimming tied to time of day, ambient light, user defined light levels or occupancy. A cost for this improvement or wiring changes to add light switches was not included in our generalized lighting improvement cost.

Some older T12 fixtures remain in Building A that could be retrofitted to T8, electronic ballast fixtures. These retrofit candidates are typically existing recessed 2'x4' fixtures in office areas. Determination of retrofit versus replacement needs to be done with further analysis. In general, it oftentimes makes sense to replace fixtures rather than retrofit. Other older T12 fixtures are surface mounted 1x4' fixtures in gathering spaces or office areas. In many of these fixtures a frosted acrylic lens was used to diffuse lamp output. Lenses have become yellowed over time and are allowing less light through than originally designed. In addition, other lenses, such as prismatic, add to fixture efficiency.



Wall sconces in the board room and in some corridor areas have a 250 Watt quartz lamp. These lamps burn incredibly hot. It is recommended that these fixtures be replaced with similar sconces wired for dimmable compact fluorescent lamps or dimmable LEDs. Wall sconces are generally for special lighting effects and not general illumination. This is the case in the board room. However, in the corridor directly outside of the boardroom, attention must be given to the overall lighting levels. In this area, wall sconces do contribute substantially to the ceiling mounted fixture.

In all areas, fixture lens selection, reflector selection and fixture design must be carefully reviewed when choosing appropriate retrofit or new fixtures for energy efficient projects.

Variety of Lighting Fixture Types

The following chart illustrates the variety of existing light fixtures within Building A. This chart expands upon information presented in the Lighting ECRM and the lighting spreadsheet in Appendix D.

Variety of Existing Fixtures

Lighting Location	Fixture Quantity	Watts Before	Watts After	Hours/ Year	Watts removed	Energy Savings
Various	493	49,386	22,956	2500 to 8760	26,430	$7,995

2' x 4' 4-Lamp T12	100 watt Incandescent	1' x 4' 3-Lamp T8 Indirect
1' x 2' 1-Lamp T8	2' x 2' 2-Ubend Lamp T12	1' x 5' 1-Lamp T12
1' x 2' 2-Lamp T12	2' x 4' 3-Lamp T12	Compact Fluorescent
1' x 2' 2-Lamp T8	2' x 4' 3-Lamp T8	Quartz 250w
1' x 4' 1-Lamp T12	2' x 4' 4-Lamp T8	1' x 4' 2-Lamp T8

Notes from Lighting Spreadsheet
The attached lighting spreadsheet provides more detailed information about lighting types and locations. This spreadsheet can be found in the Lighting Appendix D.

Many fixtures have yellowed lenses which greatly reduce light levels and fixture efficiency. New fixtures offer opportunity to reduce lamps, brighten spaces with non-yellowed lenses and install higher efficiency fixture designs.

Some areas may receive retrofit kits rather than new fixtures. This will be determined through lighting design process.

All existing fixture types, lamps, ballasts and retrofit versus replacement to be verified. Incandescent listed as 100 Watt because fixtures have the potential to use a 100 Watt lamp. Existing lamps vary.

Existing Systems and Evaluation

In order to predict energy savings for the Building A an energy simulation model was built based on the overall dimensions, materials and systems resident in the building. The following chart illustrates the base building information used.

Base Input for Energy Calculations	
Square footage	42,966
Square feet per person	200
Ventilation cfm occupied	3222.45
Ventilation cfm unoccupied	0
Gross Wall Area	26,500
Net Wall area	19,875
Net Window area	6,625
Net roof area	12,600
Cost per therm	$1.00
Cost per kWh	$0.085

Heating
Building A is heated by two Scotch Marine 60 horsepower low pressure steam boilers. The low pressure steam is supplied to two independent distribution systems.

1) Original 2 pipe steam perimeter radiation system and
2) Hot water re-heat system with steam to water converter and circulation pumps in boiler room and re-heat coils in ductwork.

The hot water reheat system was initially installed in the 1990's with additional air side systems added subsequently. The entire fourth floor is heated with hot water re-heat coils in the ductwork only. Most of the other areas of the building have hot water re-heat coils with perimeter steam radiators. The perimeter 2 pipe steam system is controlled by a thermostat near room 206.

It was reported to us that the thermostat is either turned all the way up or all the way down and operates similar to a manual switch in lieu of a thermostat. At one time building F and building G were heated from this same boiler plant. The steam connection has been disconnected through the use of a drip trap in the basement of Building G at the end of the tunnel. There is no night set back on the heating.

Cooling

There are 17 split condensing units scattered around the perimeter of the building and on two roofs of the building that provide air conditioning. There is one 8 ton rooftop unit located on the ground at the north end that is ducted into the building. The rooftop unit handles the auditor's office in Room 100 and other adjacent spaces. The air conditioning units were installed at different times. The size of the individual units varies from 3 ton to 8 ton. The efficiency of the condensing units in SEER also varies widely from 8.5 to 12.

Temperature Controls

There is a Johnson Metasys Building Automation System (BAS) with a PC located in the engineer's office. This system controls all the air handlers/fan coil units that serve the 4th floor and the Boardroom and 1st floor systems. The 2nd and 3rd floor are not on the BAS system.

Ventilation

There are operable windows throughout that provide natural ventilation. The air handlers have automated mixing dampers that are maintaining a minimum outside air position at 10%.

Energy Baseline

As stated in the Executive Summary, natural gas consumption on gas bills represents Building A. Electric bills are assumed to represent the entire Kane County Government Center. Analysis of where electricity is being used will become clearer as more of the Center is analyzed. Water consumption can be reduced through the installation of dual flush toilets or low water consuming toilets. However, since the use of Building A is office, less potential energy savings are possible through water conservation.

Natural Gas (therms)	52,896
Center Electricity Usage (kWh)	1,938,240
Square Footage	42,966
Natural Gas (kBtu)	5,289,647
Electricity Usage (kBtu)	6,615,213
Total Energy Usage (kBtu)	11,904,860
kBtu/s.f.	277.1

As shown in the above chart, the average kBTU's per square foot is 277.1. A typical moderate goal for building consumption is about 100 kBTU's per square foot. This elevated BTU average illustrates that additional buildings are being fed through common utilities. Since we were told and shown that G was disconnected from Building A, we assume this elevated BTU reading is due to common electricity.

The natural gas chart below illustrates that Building A meter readings follow typical gas consumption patterns for the Chicago area.

Type	Gas	Gas	Gas
Building	Building "B"	Services Admin	Courthouse
Account #	72480010000	96412210000	9893890000
Date	Therms	Therms	Therms
Oct-08	959.13	2701.19	
Sep-08	24.24	48.57	
Aug-08	12.12	14.14	
Jul-08	3.03	58.68	273.62
Jun-08	2.02	62.74	
May-08	104.32	1651.71	
Apr-08	991.57	4095.42	
Mar-08	2334.09	7918.21	
Feb-08		9436.39	
Jan-08	3115.98	10484.88	
Dec-07	2870.36	9559.17	
Nov-07	2250.20	6865.37	
Total	12667.06	52896.47	
		estimated read	
		predicted / modeled	
		40,000.00	

On the electrical side of energy improvements KW demand reduction derived from six recommended ECRMs within this audit contribute 161KW in savings for the Kane County Government Center.

Electric demand charges require additional scrutiny. Demand charges are imposed for most of the electricity used within the complex. There are methods to reduce the overall quantity of demand. Strategies include modifications to fan and pump starting schedules, distributing the start up of lighting and AC units and whatever else requires a large influx of electricity on an instantaneous basis. The highest level of demand reached during a rolling 30 minute period determines how you will be charged for demand. One instantaneous spike can result in a very high demand charge for the month. Delving deeper into the strategies to reduce peak demand is recommended.

Type of Charge	Electric	Demand	Demand	Demand	Total
Building	CENTER	kW	rate	Cost	Electric
Meter #	28899888				cost
Date	kWh				
11/06/07 - 12/05/07	141,300	311.76	11.43	3,563.42	$8,690.70
12/05/07 - 01/08/08	164,700	330.48	11.43	3,777.39	$9,617.41
01/08/08 - 02/08/08	162,540	341.28	11.43	3,900.83	$10,820.58
02/08/08 - 03/12/08	165,600	336.06	11.43	3,841.17	$10,583.59
03/12/08 - 04/04/08	113,400	316.80	11.43	3,621.02	$7,765.16
04/04/08 - 05/06/08	158,580	383.58	11.43	4,384.32	$9,844.59
05/06/08 - 06/06/08	156,420	460.26	16.24	7,474.62	$13,853.46
06/06/08 - 07/03/08	166,140	504.72	16.24	8,196.65	$15,001.98
07/03/08 - 08/06/08	219,600	502.56	16.24	8,161.57	$19,636.89
08/06/08 - 09/08/08	194,400	511.92	16.24	8,313.58	$15,561.75
09/08/08 - 10/08/08	160,020	432.00	11.43	4,937.76	$8,574.03
10/08/08 - 11/05/08	135,540	334.98	11.43	3,828.82	$9,601.95
Total	1,938,240	4,766.40		64,001.15	$139,552.09

Energy Cost Reduction Measures

Lighting

Replace or retrofit approximately 493, primarily fluorescent existing fixtures. Add switching, automated lighting control or occupancy sensors as needed if budgets allow. De-lamp where possible. The energy cost reduction measure for lighting described in this audit and on the lighting spreadsheet included improvements to fixture efficiency only. During the process of lighting design and implementation, it is possible to re-arrange fixtures or eliminate fixtures to increase future lighting savings.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 1	Lighting	51,700.00	7,995.00	26,430	n/a	26.00	6.47

Payback will be quicker if some fixtures are retrofitted rather than replaced. Grants and rebates will reduce payback period.

Building Automation System

Expand and re-commission the BAS system. The existing BAS system is not being effective utilized and could be expanded to save additional energy. The following Energy Cost Reduction Measures are some of the control strategies that could be implemented.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 2	BAS	10,000.00	6,000.00	35,294	3,000.00	35.00	1.67

50% of model discrepancy attributed to poor temperature control and simultaneous heating and cooling

Night Set Back

It was reported to us that the night set back provision of the BAS system is overridden for most of the spaces. Night set back is probably the easiest way to save energy. Simply shut systems down and raise or lower temperatures when no one is in the building. Providing night set back saves energy in the following three ways.

1. Fan energy. The fans are shut off during unoccupied hours.
2. Outside air dampers are closed which eliminates the need to heat or cool outside air for ventilation during unoccupied hours
3. The space temperature is either raised or lowered which reduces the heat gain or heat loss during unoccupied hours which saves energy.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 3	Replace Night Set Back	6,000.00	8,719.00	41,952	5,153.00	42.00	0.69

Night set back is currently overridden. Controls manipulation cost is represented in the improvement cost.

Economizer cooling
In lieu of running the air conditioning, during mild days the system should open the outside air dampers and shut the air conditioning off.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 4	Economizer Cooling	In BAS	In BAS	In BAS	In BAS	In BAS	In BAS

Convert heating from steam to hot water
Elimination of simultaneous heating and cooling
Our energy model predicted approximately 75% of the actual natural gas usage in building A. We suspect that this is due to poor control of the heating system and that some simultaneous heating and cooling is occurring. If the perimeter steam heating system is running and overheating spaces, the air conditioning may be running to keep the spaces comfortable. This is possible because of the independent nature of cooling systems in Building A. In fact there are some window AC units in Building A that may also be competing with the heating system. By improving temperature control and eliminating the steam heating system as discussed below the simultaneous heating and cooling can be eliminated.

As described in the mechanical systems section earlier in this report, low pressure steam is used directly in one system and indirectly in another to provide hot water reheat to heat the building. The production of low pressure steam is inherently inefficient for space heating purposes due to the high elevated temperatures required. Further, during mild days when the boilers are cycling significantly, the system becomes even more inefficient due to the inertia of heating all the water in the boiler and the thermal mass before steam is produced. Most of this inertia energy is lost up the stack and to the boiler room as the boiler cools before the next cycle. We propose that the steam heating system be eliminated. Most of the building has parallel hot water re-heat coils. Each space would require careful analysis to verify that the re-heat coils are sufficient to heat the space. Where required, the existing perimeter radiators could be modified for hot water by removing traps and adding manual air vents or replaced entirely. The boilers could either be retrofitted for hot water or replaced with high efficiency modular boilers. It may be beneficial to create a hybrid solution where only one of the boilers is replaced and the other is converted to hot water and kept for back up and cold temperatures.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 5	Convert heating from steam to hot water	120,000.00	16,050.00	n/a	10,050.24	n/a	7.48

Calculated savings $10,050 + 6,000. 50% of model discrepancy attributed to poor temperature control and simultaneous heating and cooling

Add wall insulation

Since Building A was built in the 1940's, there is minimal perceived insulation within existing walls. We believe that there are many spaces that do not have any wall insulation.

It is recommended that walls be selectively improved with added insulation. To achieve this, we recommend a wall of furring strips or 2x4's, a vapor barrier and insulation. This would allow insulation to be finished with drywall.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 6	Add wall insulation	39,000.00	4,815.00	n/a	4,815.87	n/a	8.10

Replace AC units over time

There are 17 different AC units at Building A. Each of these units has a different Seasonal Energy Efficiency Rating (SEER). It is recommended that, over time, AC units be replaced with higher efficiency units. The manufacturers of this type of equipment are making great strides to continually improve upon existing technology.

ECRM #	ECRM Description	Installed Cost	Annual Savings	KWh reduced	Therms reduced	KW reduced	Payback (years)
KCA 7	Replace AC units over time	1,200.00	308.57	3,429	n/a	3.43	3.89
KCA 7	Replace 17 AC units over time	20,400.00	5,245.69	58,293	n/a	58.29	3.89

Typical 4 ton replacement with 14 SEER (only incremental increase in replacement cost over 9 SEER)

Representative AC Efficiency	
Full load hours	1800
Load (tons)	4
Existing SEER	9
kWh (4 ton unit @ 9 SEER)	5.3
New SEER	14
kWh (4 ton unit @ 14 SEER)	3.4
Existing kWh cooling	9600
New kWh cooling	6171
kWh saved	3429
Cost per kWh	0.09
Savings	$ 308.57

In order to deliver the greatest amount of energy efficiency savings at the lowest cost of construction, it is not recommended that Kane County invest in a more efficient type of chilling, such as a building based reciprocating chiller or geothermal at this time. If Building A were to undergo a total transformation with new chilling distribution systems, a different system of chilling may be recommended. However, given the age of the building, variety of building improvements made to the base building and lack of a cohesive air distribution system, utilizing the distributed AC approach is acceptable. The chart above illustrates the potential cost savings resulting from improved SEER for air conditioners.

Conclusion and Next Steps

In conclusion we recommend implementing the following ECRMs in Building A. Savings for each of the ECRMs has been calculated independently. There may be some reduction in overall savings if all ECRMs are implemented.

Kane County Gov. Center Recommended Energy Cost Reduction Measures							
ECRM #	**ECRM Description**	**Installed Cost**	**Annual Savings**	**kWh reduced**	**Therms reduced**	**kW reduced**	**Payback (years)**
KCA 1	Lighting retrofits, upgrades and replacements	$51,700.00	$7,995.00	26,430	n/a	26.00	6.47
KCA 2	Building Automation System Retro-Commissioning	$10,000.00	$6,000.00	35,294	3,000.00	35.00	1.67
KCA 3	Replace Night Set Back	$6,000.00	$8,719.00	41,952	5,153.00	42.00	0.69
KCA 4	Economizer Cooling	In BAS	In BAS	In BAS	In BAS	In BAS	In BAS
KCA 5	Convert heating from steam to hot water	$120,000.00	$16,050.00	n/a	10,050.24	n/a	7.48
KCA 6	Add wall insulation	$39,000.00	$4,815.00	n/a	4,815.87	n/a	8.10
	Totals/ Average Payback	$226,700.00	$43,579.00	103,676.00	23,019.11	103.00	4.88

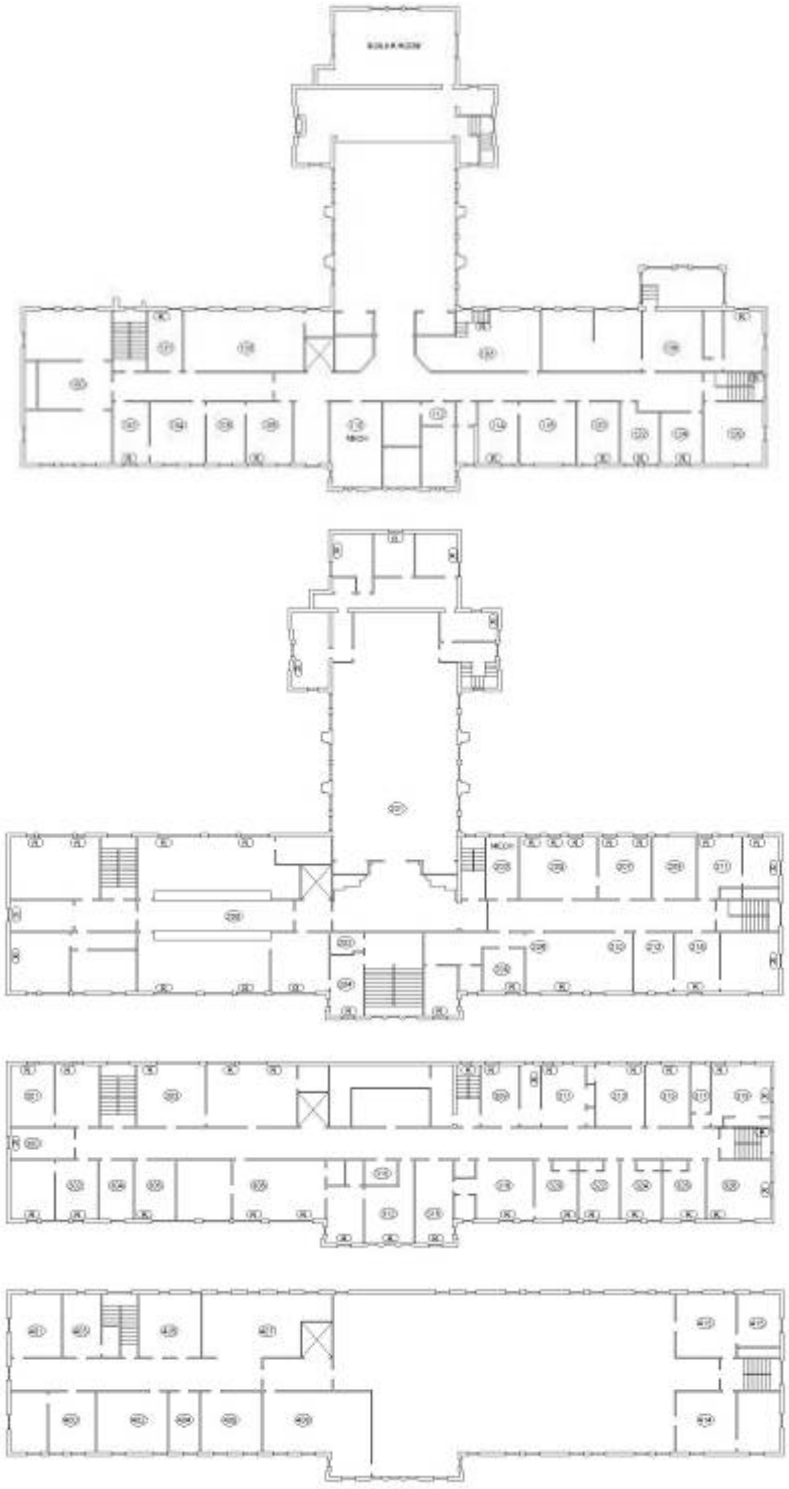
The information provided within this energy audit is a starting point. The greater knowledge an organization has about its facilities, the more energy savings it can realize. Hopefully, through intelligent design, the Kane County Government Center Building A can become more user friendly while at the same time become more energy efficient.

While on a site visit recently, we noticed a strategy at Building A to turn lights off during normal working hours. While this is a great immediate way to save energy, we believe we can devise a strategy to save even more energy while providing adequate light where necessary. In addition, areas of the building that possess built in day lighting, such as the stair hallways have lights burning during bright sunny days. It is unknown at this time if we can place these fixtures on daylight sensors to light only when necessary.

Creating an approach to energy conservation in multiple buildings requires a level of commitment and a depth of knowledge. Facilities Research offers services to put your overall energy efficiency plan on the road to success.

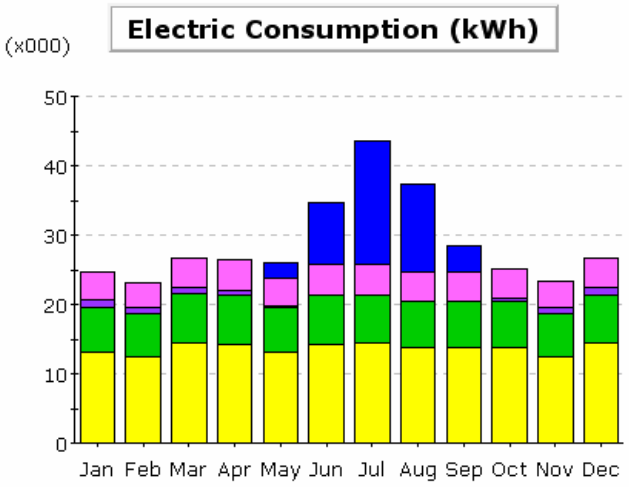
Floor Plans

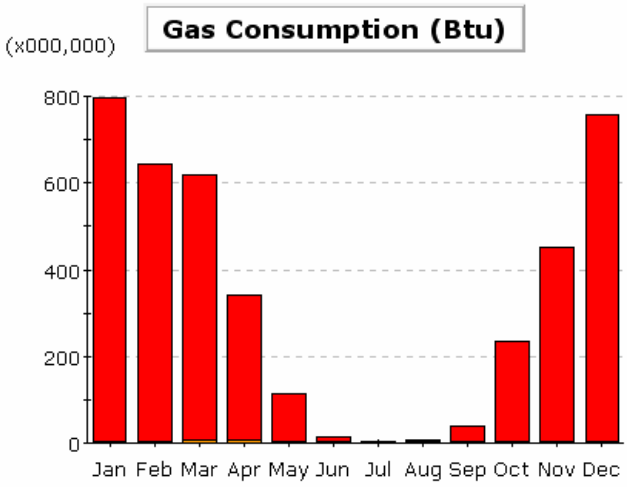
For reference, floor plans used in creating building energy models.

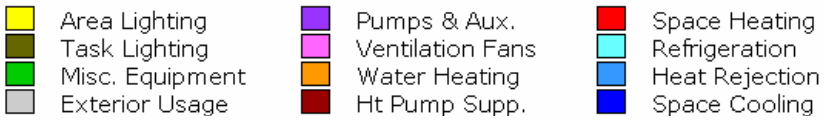


Appendix A

Energy Simulation





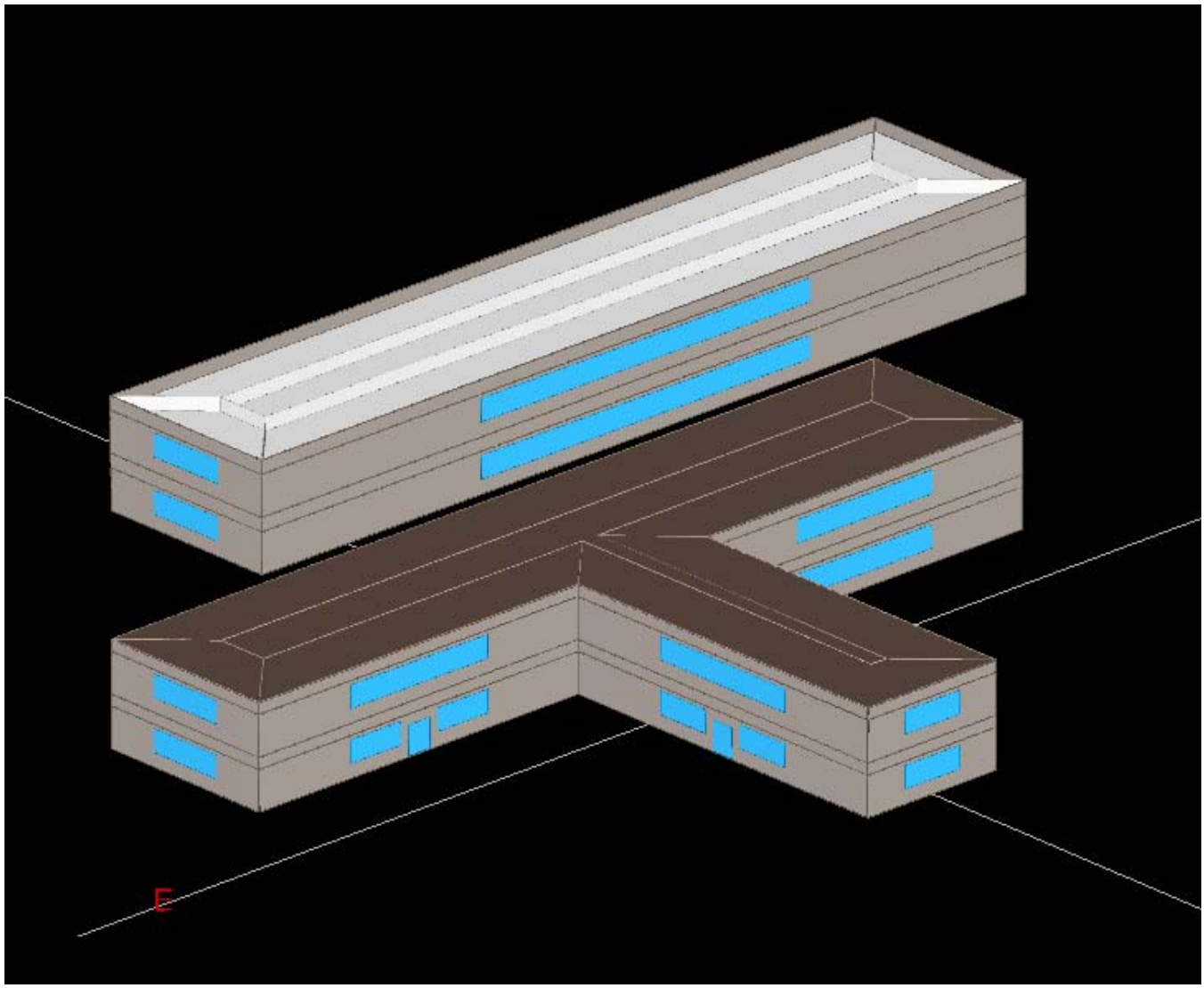


Electric Consumption (kWh x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	0.00	2.18	9.05	17.91	12.64	3.79	0.11	0.00	-	45.69
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.97	3.76	4.34	4.34	3.93	4.27	4.28	4.06	4.08	4.14	3.77	4.35	49.29
Pumps & Aux.	0.96	0.87	0.91	0.63	0.22	0.02	-	-	0.06	0.40	0.81	0.95	5.82
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	6.55	6.17	7.11	7.07	6.55	7.07	7.10	6.83	6.79	6.82	6.24	7.10	81.41
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	13.09	12.41	14.34	14.32	13.09	14.32	14.34	13.71	13.69	13.71	12.44	14.34	163.80
Total	24.56	23.21	26.71	26.35	25.96	34.73	43.63	37.24	28.41	25.19	23.26	26.74	346.01

Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	790.5	639.8	614.4	335.4	110.9	9.4	0.2	2.5	35.3	228.8	449.2	751.6	3,968.0
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	5.0	4.8	5.6	5.4	4.6	4.6	4.3	3.9	3.9	4.1	4.1	5.0	55.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	795.5	644.7	619.9	340.8	115.5	14.0	4.5	6.4	39.2	232.9	453.3	756.6	4,023.4


E

Appendix B

Boiler Specifications

Series FST

Low Pressure Scotch Marine Boilers

20 – 60 Boiler Horsepower

Manufactured by A. L. Eastmond & Sons, Inc.

Ratings & Capacity Data

Series FST	UNITS	20	32	40	50	60
Gross Output Boiler Horsepower	HP	20	32	40	50	60
Gross Output Steam/Hot Water	MBH	670	1072	1339	1674	2009
Gross Output Steam, from and at 212 degrees F	LBS/HR	690	1104	1380	1725	2070
Maximum Firing Rate Light Oil, 140 MBH/Gal	GPH	5.5	9.6	12	15	18
Maximum Firing Rate Heavy Oil, 150 MBH/Gal	GPH	5	9	12	14	17
Maximum Firing Rate Natural Gas	MBH	837	1339	1674	2093	2511
Heating Surface Fireside	SQ FT	100	160	200	250	300

General Service Access & Fireside Sampling

ITEM		UNIT	DIMENSIONS	NOTES
k	Manhole	IN	12 x 16	STD from FST-70
l	Handhole	IN	3 1/2 x 4 1/2	Optional
m	Furnace Access Door	IN DIA	16	STD
n	Furnace Draft Sample	IN	1 1/4 SCH 80	Optional
o	Flue Gas Outlet Cleanout Access	IN	10 x 10	Optional
p	Furnace Observation Port	IN	1 1/2	STD
q	Sequence Draft Sample	IN	1 1/4	Optional
r	Combustion Relief Mechanism	IN	10 x 10	Optional, Four Point Spring Loaded
s	Rear Smoke Box Access	1 Hinged Door		Optional
t	Front Smoke Box Access	2 Hinged Doors		STD from FST-70

Nomenclature

FST-XXX-ABBB-(FEB) PBA

WHERE FST DESIGNATES BOILER SERIES
:-XXX DESIGNATES NOMINAL BOILER HORSEPOWER
:-ABBB DESIGNATES MEDIUM (A) AND PRESSURE (BBB)

S015 = LOW PRESSURE STEAM 15 PSIG
W030 TO W160 = WATER 30 TO 160 PSIG
S = LOW PRESSURE STEAM
W = HOT WATER
FEB = FIELD ERECTED BOILER
PBA = PACKAGED BOILER ASSEMBLY

Built in accordance with the requirements of the ASME Boiler and Pressure Vessel Code

Member American Boiler Manufacturers Association

Underwriters Laboratories Inc.

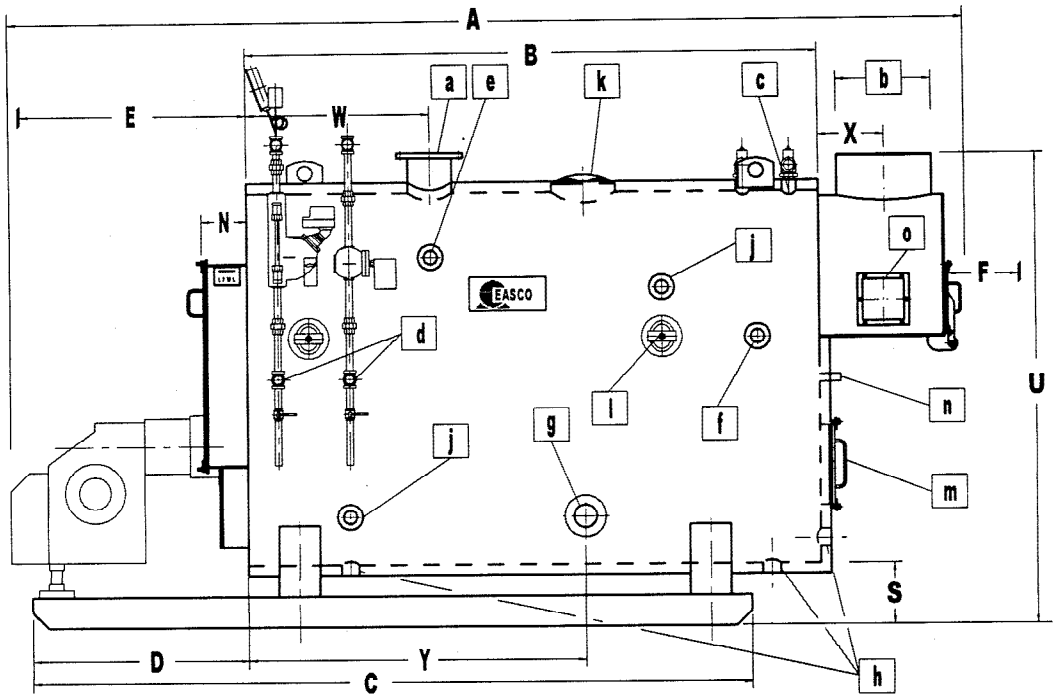
EASCO boiler corp

1175 Leggett Avenue
Bronx, New York 10474

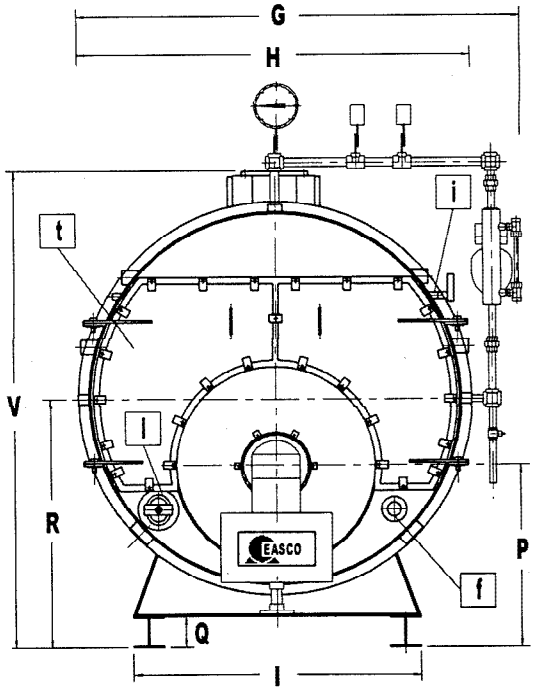
Tel 718.378.3000
Fax 718.378.4560

www.easco.com
e-mail webmaster@easco.com

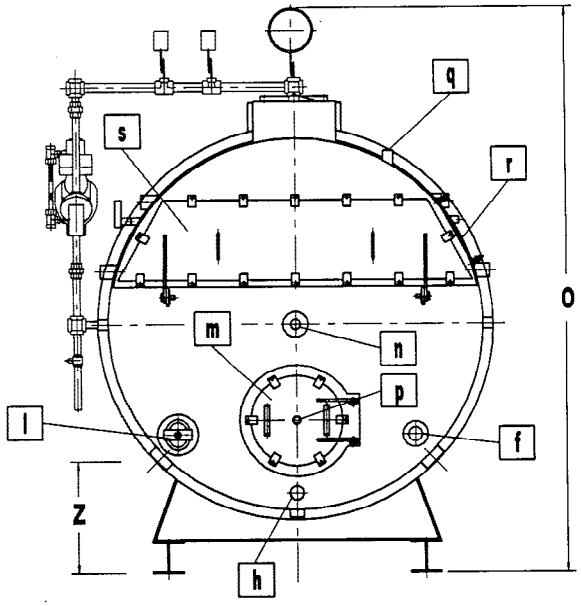
SERIES FST	20	32	40	50	60
LENGTHS:					
A-Overall	105	129	118	132	146
B-Shell	50 1/4	74 5/16	64	78	92
C-Base Frame	90	115	105	120	135
D-Service Platform	35	35	35	35	35
E-Minimum Tube Pull Clearance	56 1/4	80 5/16	70	84	98
F-Minimum Rear Smoke Box Door Clearance	28	28	28	28	28
WIDTHS:					
G-Overall	69	69	75	75	75
H-Diameter OD with 2" Insulation	49 5/8	49 5/8	55 5/8	55 5/8	55 5/8
I-Base Frame (Package)	35 11/32	35 11/32	38 27/32	38 27/32	38 27/32
J-Base Saddle (Field Erect)	38 1/2	38 1/2	42	42	42
K-Distance to C.L.Front Saddle (Field Erect)	9	9	9	9	9
L-Distance Between Saddles (Field Erect)	24 3/4	4813/16	36 1/2	50 1/2	64 1/2
M-Saddle	6	6	6	6	6
N-Front Smoke Box	8	8	8	8	8
HEIGHTS:					
O-Overall	78	78	84	84	84
P-Base to Furnace C.L.	26 13/16	26 13/16	27 11/16	27 11/16	27 11/16
Q-Base Frame	6	6	6	6	6
R-Base to Boiler C.L.	34 13/16	34 13/16	37 13/16	37 13/16	37 13/16
S-Bottom of Base Frame to Shell (Package)	12	12	12	12	12
T-Bottom of Saddle to Shell (Field Erect)	12	12	12	12	12
BOILER SERVICE CONNECTION LOCATIONS:					
U-Base to Flue Gas Outlet	61 3/4	61 3/4	68 1/4	68 1/4	68 1/4
V-Base to Supply Outlet	64 1/8	64 1/8	70 1/8	70 1/8	70 1/8
W-Length from Front Tubesheet to Center of Supply Conn.	18	18	24	30	30
X-Rear Smoke Box Outlet Center Line	7	7	7 3/4	7 3/4	7 3/4
Y-Length from Front Tubesheet to Center of Return Conn.	24 1/4	48 5/16	37	46	58
Z-Height from Base to Return Connection	17 1/2	17 1/2	18	18	18
BOILER SERVICE CONNECTION SIZES:					
a-Supply, Steam/Hot Water	6 / 3	6 / 3	6 / 3	6 / 3	8 / 3
b-Flue Gas Vent	12	12	12	12	14
c-Safety Relief Valve(s)	2	2	2	2	2
d-Control Header	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
e-Surface Blowdown	2	2	2	2	2
f-Washout	2	2	2	2	2
g-Feedwater/Return, Steam/Hot Water	3 / 3	3 / 3	3 / 3	4 / 3	4 / 3
h-Bottom Blowdown	2	2	2	2	2
i-Aquastat	3/4	3/4	3/4	3/4	3/4
j-Preheater/Blend Pump	2	2	2	2	2
SHIPPING WEIGHT DRY PACKAGED (APPROX.):	3750	4850	6275	7385	8950
WATER CONTENT STEAM BOILER:	171	261	233	294	351
WATER CONTENT HOT WATER BOILER:	213	323	291	364	434



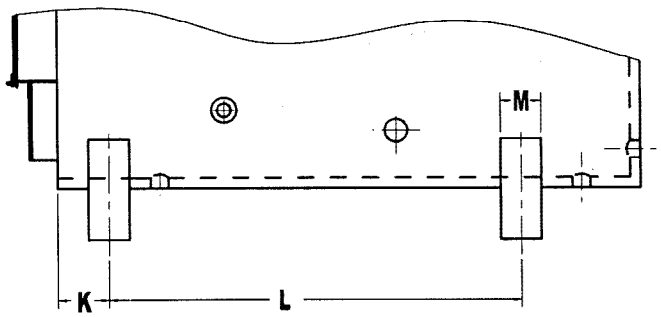
PACKAGED BOILER ASSEMBLY - RIGHT ELEVATION



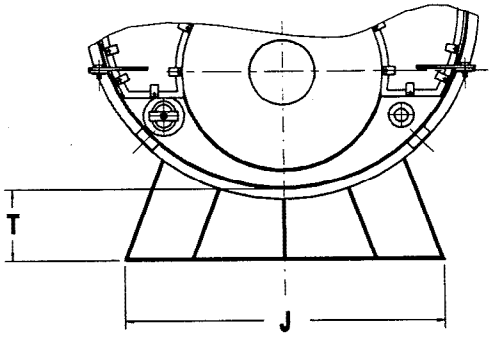
FRONT VIEW



REAR VIEW



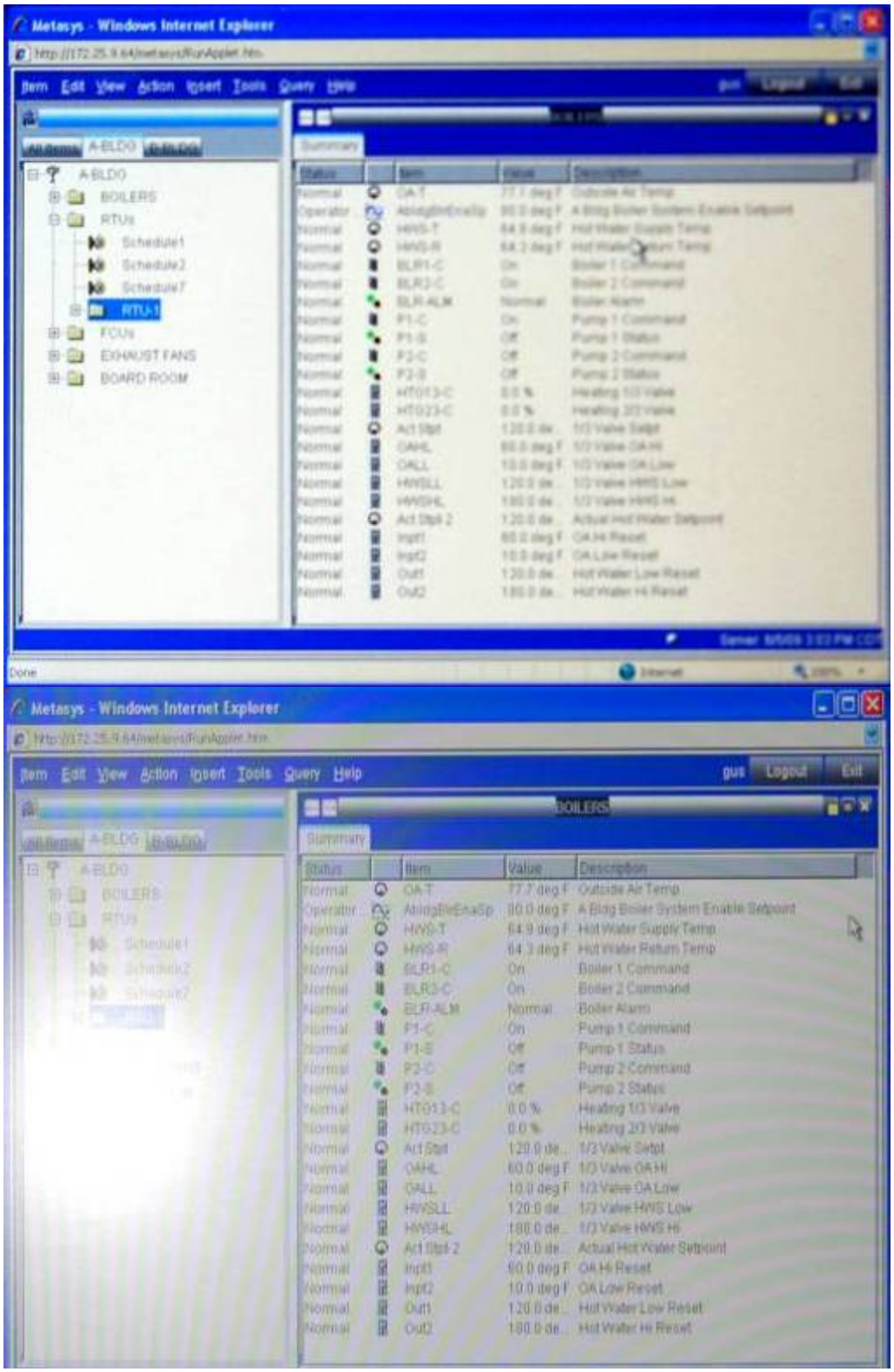
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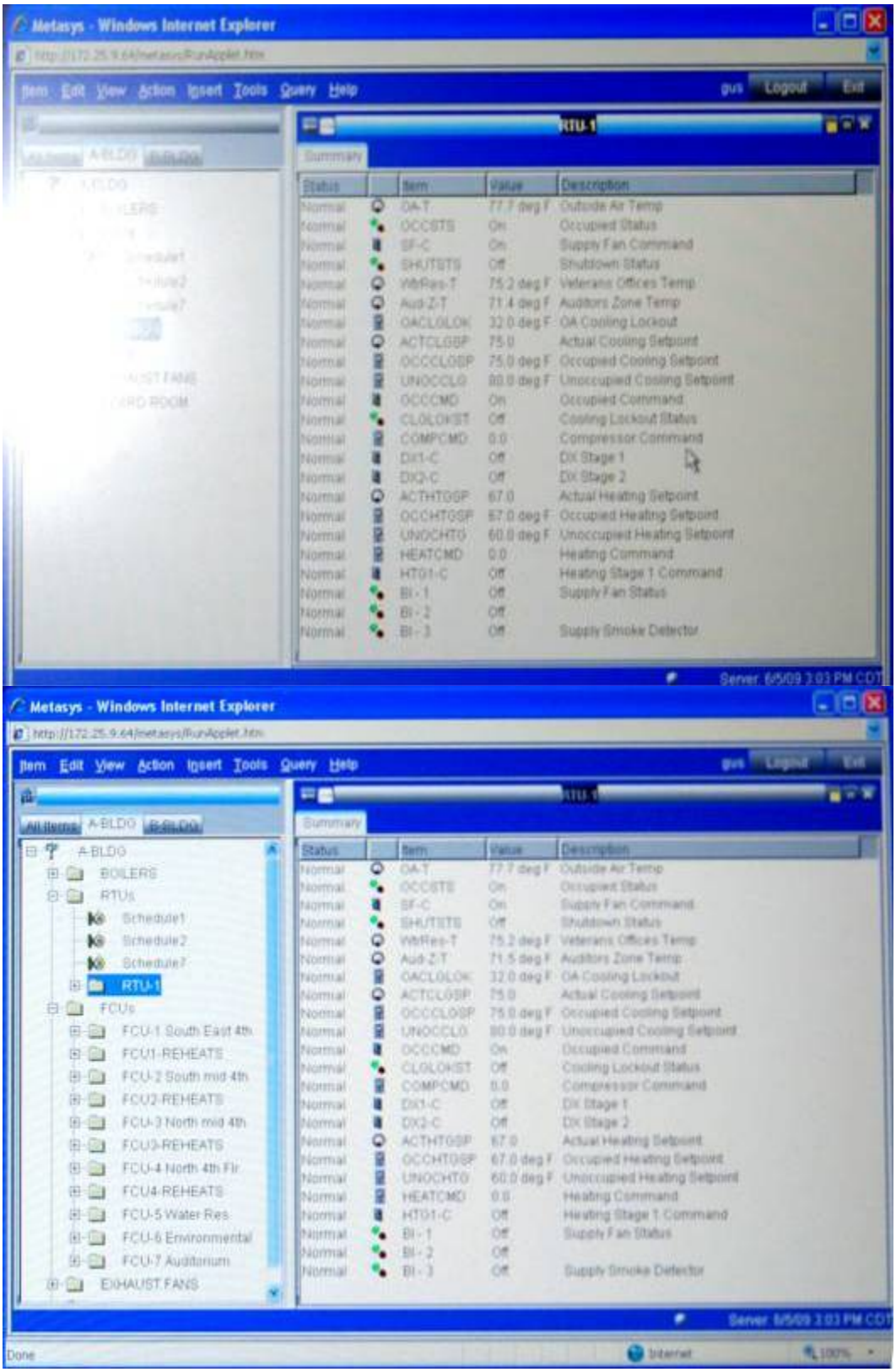


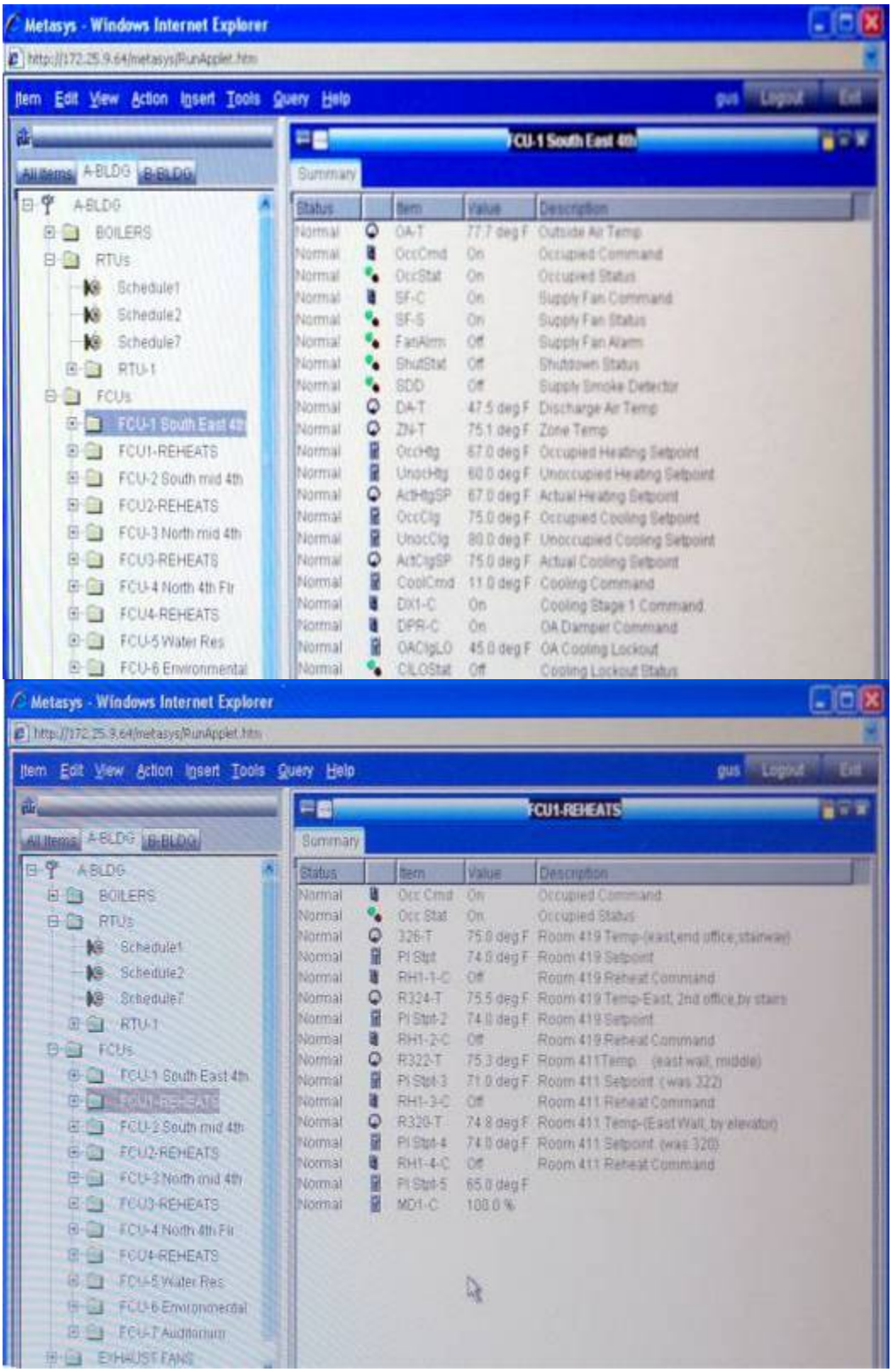
FIELD ERECT SADDLE - FRONT VIEW

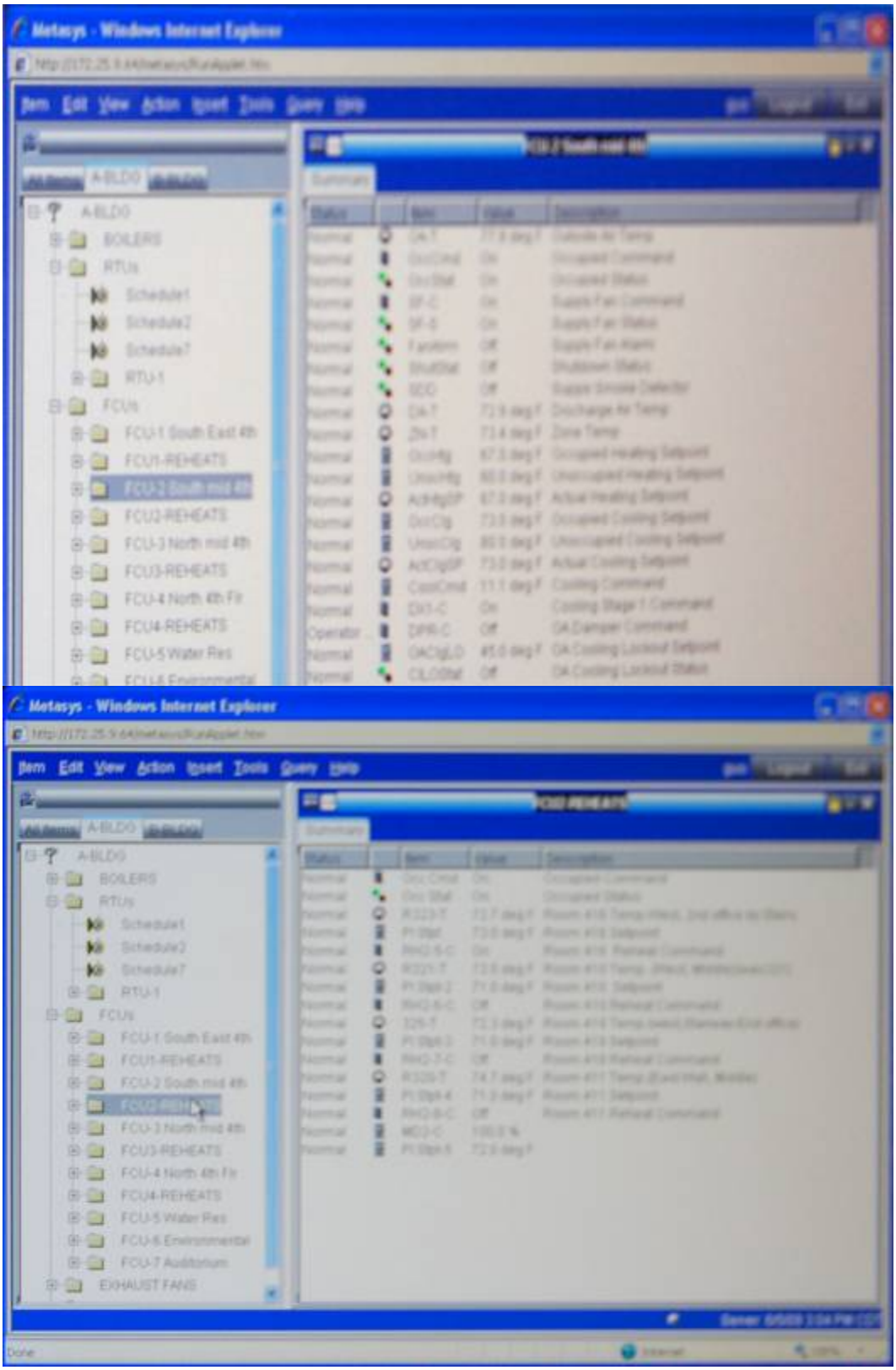
Appendix C

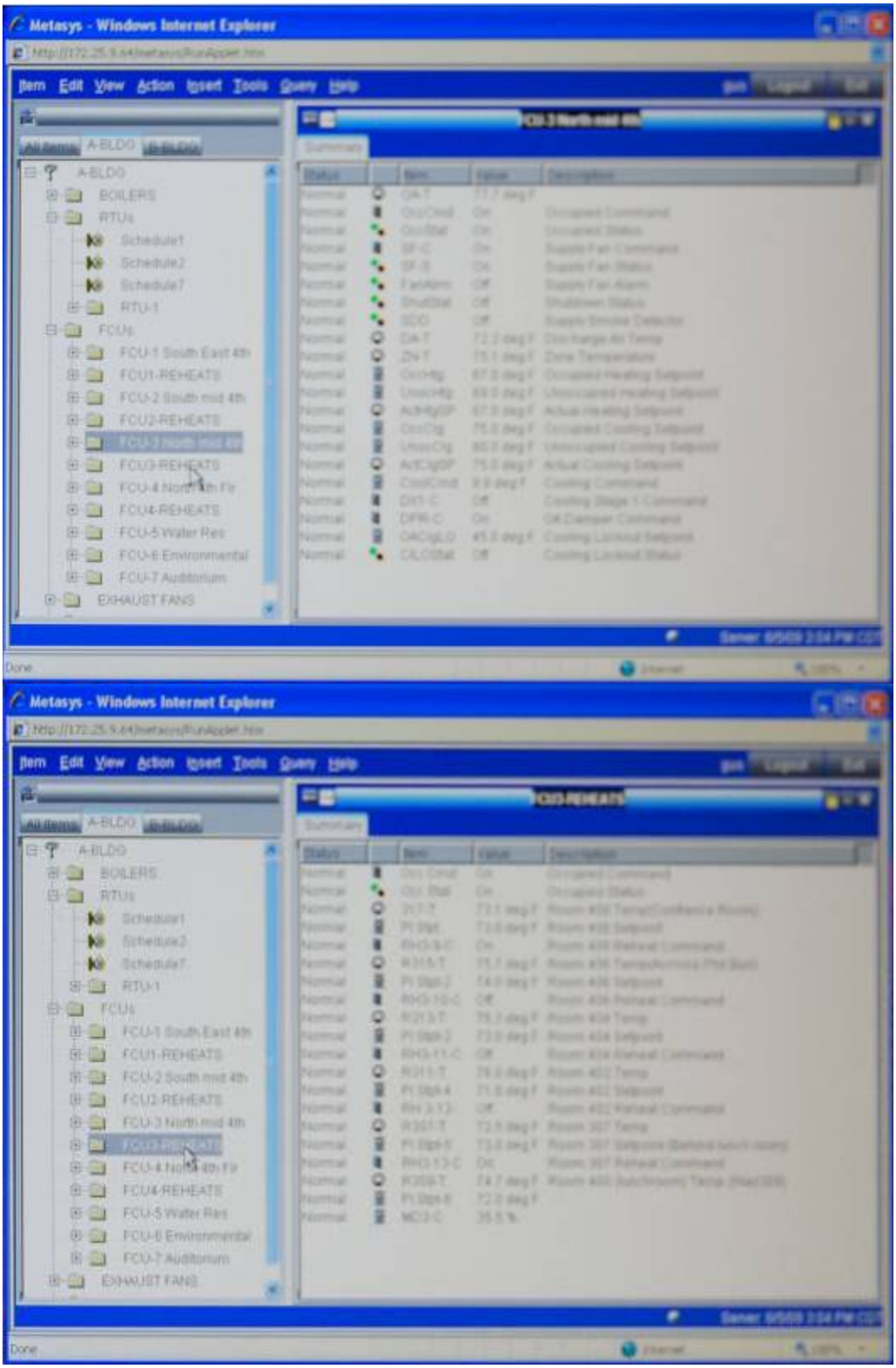
Johnson Metasys Screen Shots

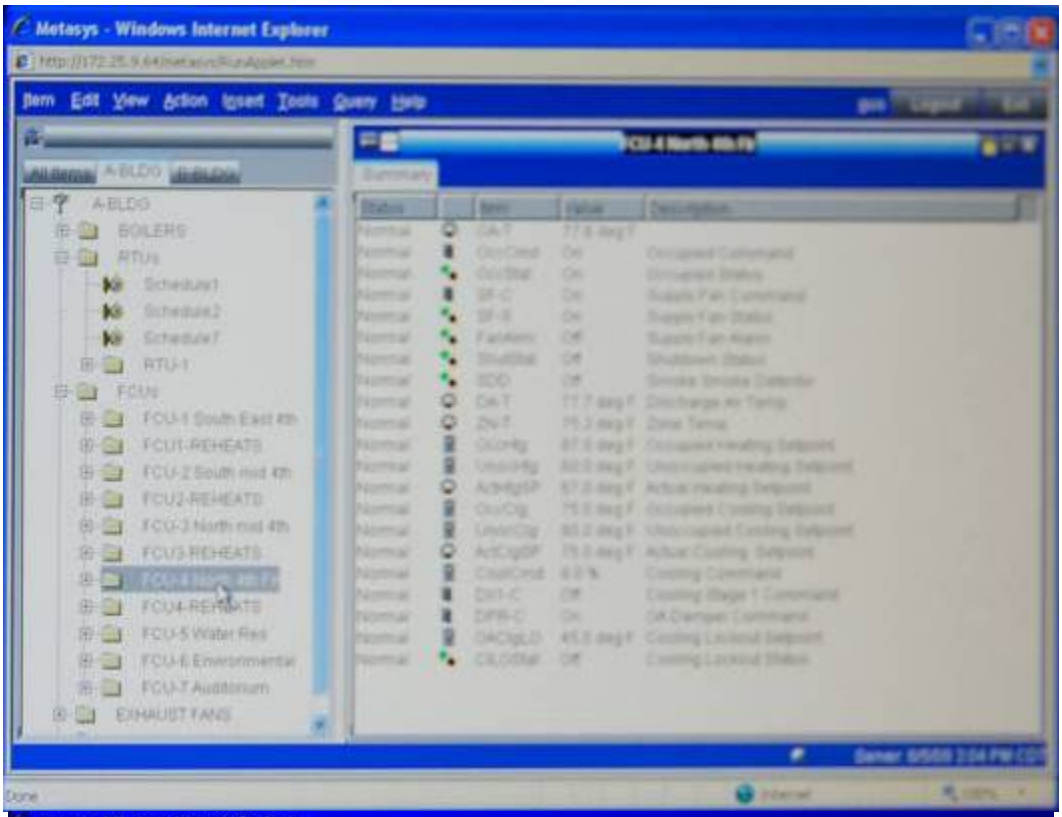

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Schedule2
Schedule7
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FCUs
EXHAUST FANS
BOARD ROOM
Summary
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Description
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Summary
Status
Item
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Hot Water Hi Reset

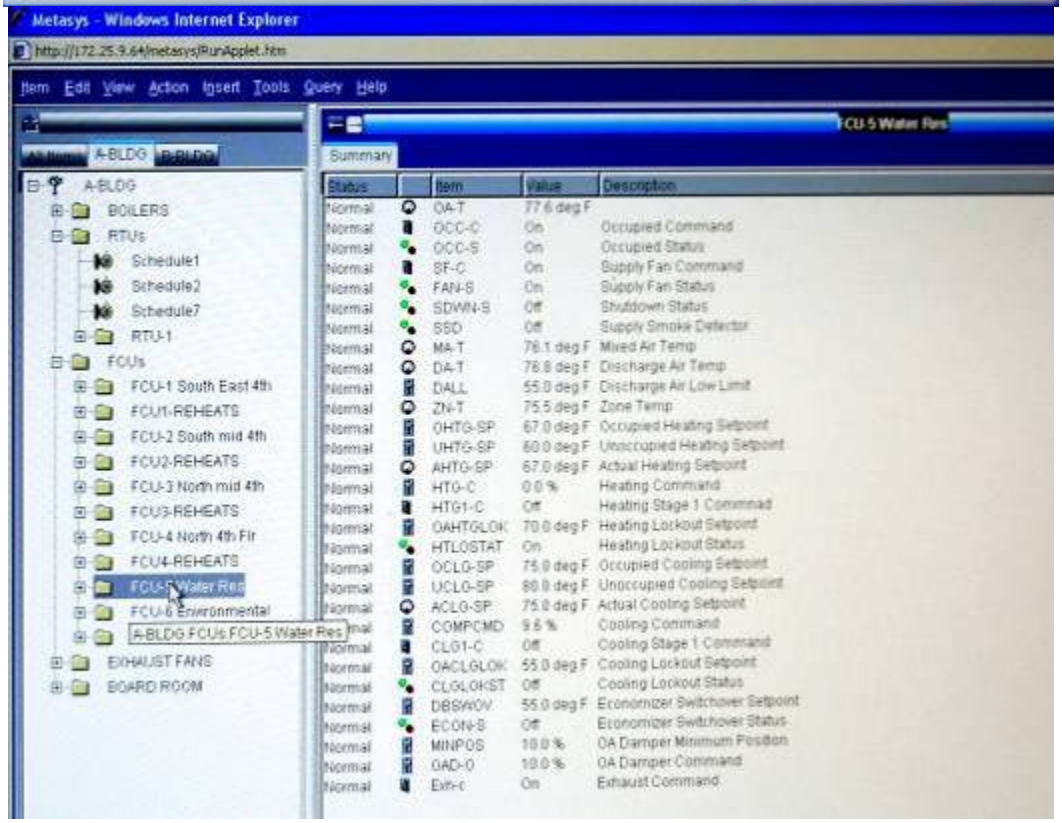

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Schedule2
Schedule7
RTU-1
FCUs
FCU-1 South East 4th
FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
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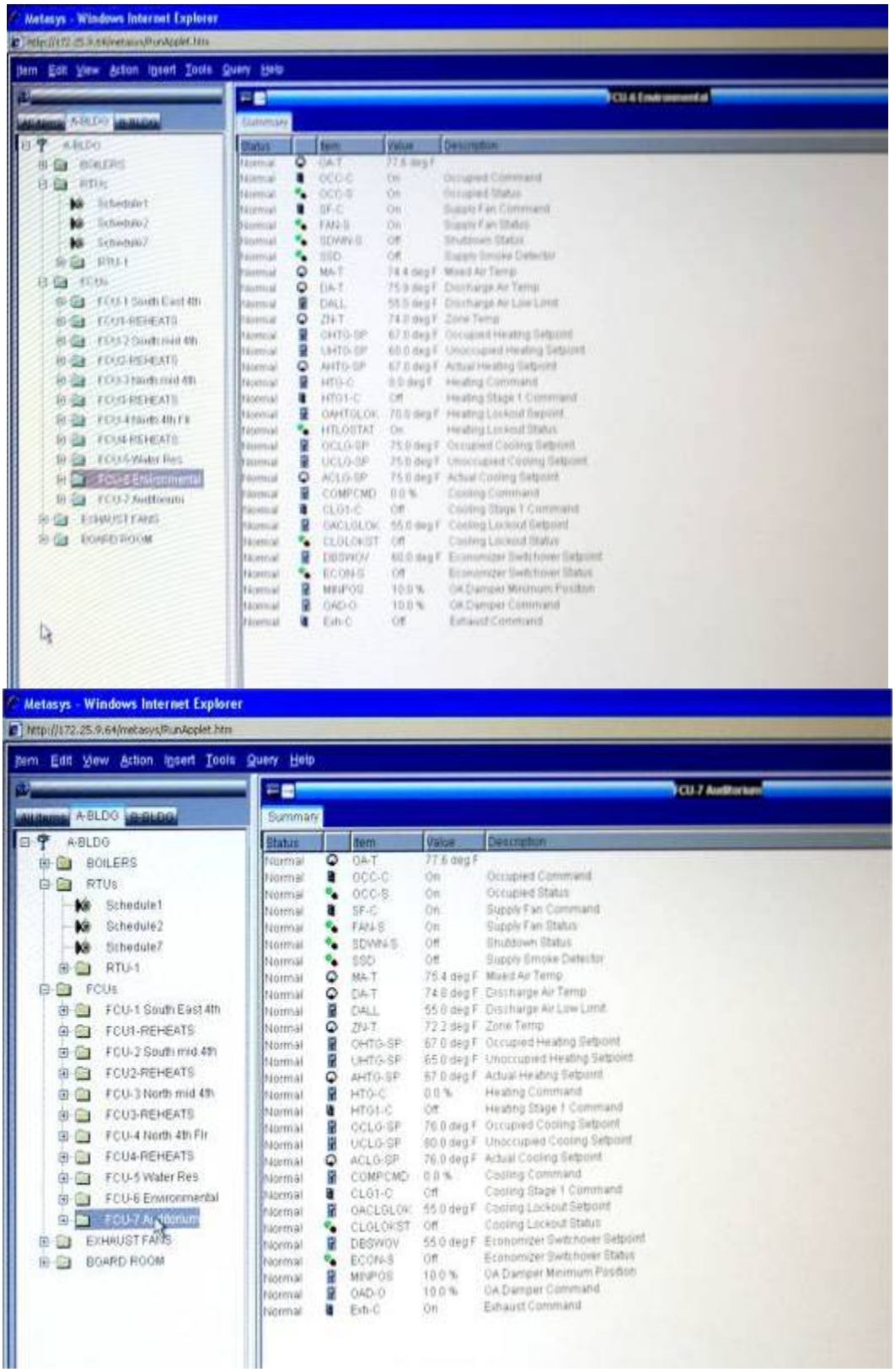

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Schedule7
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FCUs
FCU-1 South East 4th
FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-1 South East 4th
Summary
Status Item Value Description
Normal OA-T 77.7 deg F Outside Air Temp
Normal OccCmd On Occupied Command
Normal OccStat On Occupied Status
Normal SF-C On Supply Fan Command
Normal SF-S On Supply Fan Status
Normal FanAlrm Off Supply Fan Alarm
Normal ShutStat Off Shutdown Status
Normal SDD Off Supply Smoke Detector
Normal DA-T 47.5 deg F Discharge Air Temp
Normal ZN-T 75.1 deg F Zone Temp
Normal OccHtg 67.0 deg F Occupied Heating Setpoint
Normal UnocHtg 60.0 deg F Unoccupied Heating Setpoint
Normal ActHtgSP 67.0 deg F Actual Heating Setpoint
Normal OccClg 75.0 deg F Occupied Cooling Setpoint
Normal UnocClg 80.0 deg F Unoccupied Cooling Setpoint
Normal ActClgSP 75.0 deg F Actual Cooling Setpoint
Normal CoolCmd 11.0 deg F Cooling Command
Normal DX1-C On Cooling Stage 1 Command
Normal DPR-C On OA Damper Command
Normal OAClgLO 45.0 deg F OA Cooling Lockout
Normal CILOStat Off Cooling Lockout Status
Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
gus Logout Exit
All Items A-BLDG B-BLDG
A-BLDG
BOILERS
RTUs
Schedule1
Schedule2
Schedule7
RTU-1
FCUs
FCU-1 South East 4th
FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
FCU1-REHEATS
Summary
Status Item Value Description
Normal Occ Cmd On Occupied Command
Normal Occ Stat On Occupied Status
Normal 326-T 75.0 deg F Room 419 Temp-(east,end office,stairway)
Normal PI Stpt 74.0 deg F Room 419 Setpoint
Normal RH1-1-C Off Room 419 Reheat Command
Normal R324-T 75.5 deg F Room 419 Temp-East, 2nd office by stairs
Normal PI Stpt-2 74.0 deg F Room 419 Setpoint
Normal RH1-2-C Off Room 419 Reheat Command
Normal R322-T 75.3 deg F Room 411Temp (east wall, middle)
Normal PI Stpt-3 71.0 deg F Room 411 Setpoint (was 322)
Normal RH1-3-C Off Room 411 Reheat Command
Normal R320-T 74.8 deg F Room 411 Temp-(East Wall, by elevator)
Normal PI Stpt-4 74.0 deg F Room 411 Setpoint (was 320)
Normal RH1-4-C Off Room 411 Reheat Command
Normal PI Stpt-5 65.0 deg F
Normal MD1-C 100.0 %

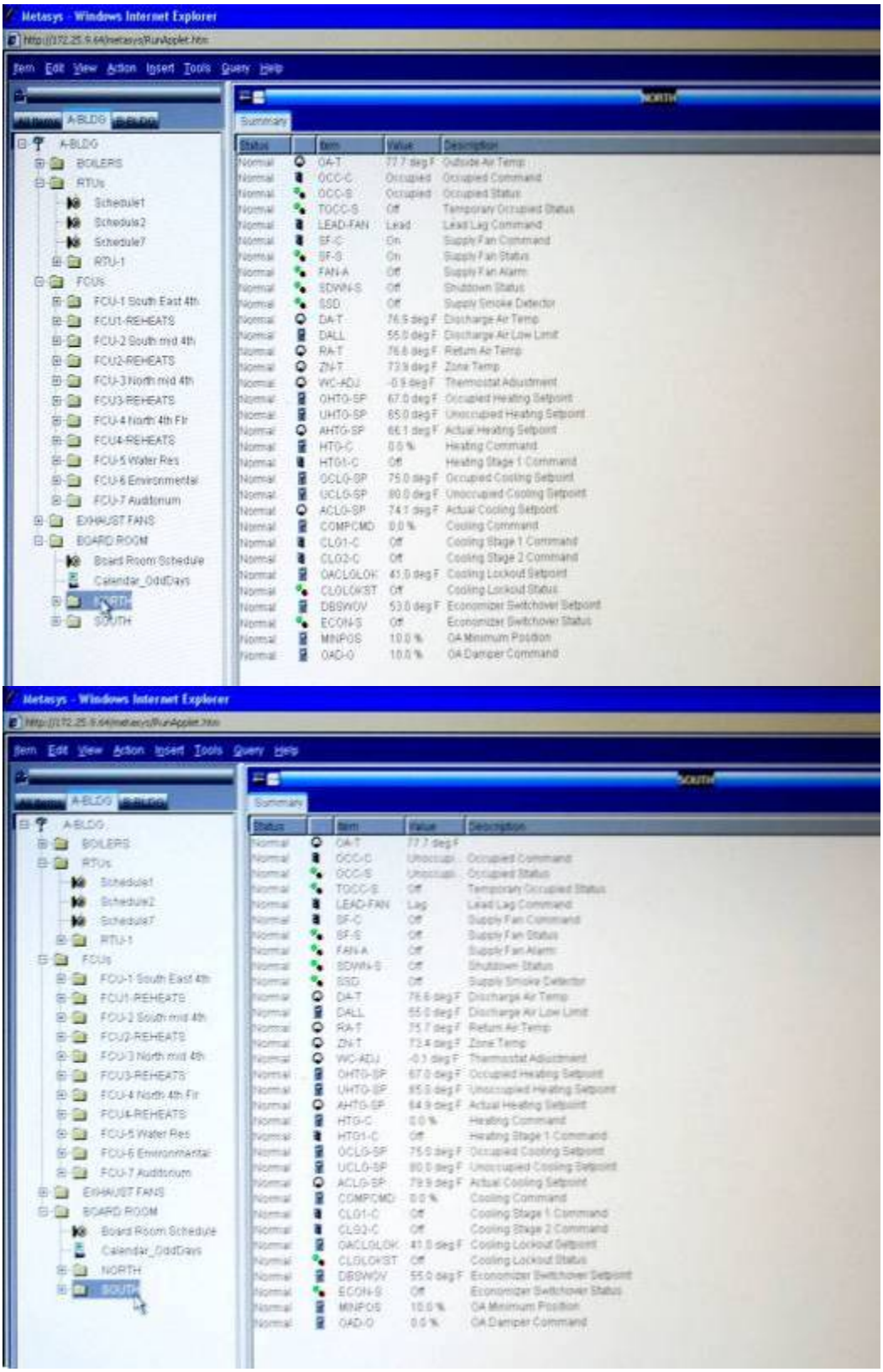

Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
A-BLDG
BOILERS
RTUs
Schedule1
Schedule2
Schedule7
RTU-1
FCUs
FCU-1 South East 4th
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
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EXHAUST FANS
Metasys - Windows Internet Explorer
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FCU-1 South East 4th
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FCU-2 South mid 4th
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS

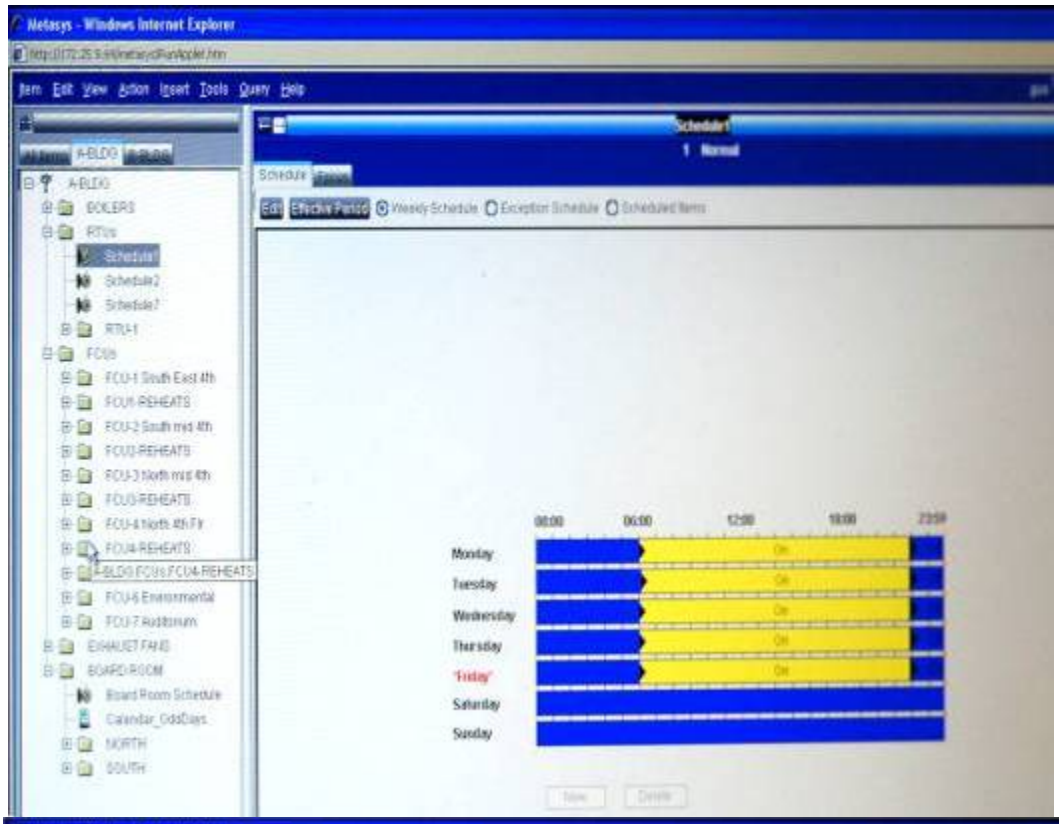

Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
A-BLDG
BOILERS
RTUs
Schedule1
Schedule2
Schedule7
RTU-1
FCUs
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
Done
Metasys - Windows Internet Explorer
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FCU-1 South East 4th
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
Done

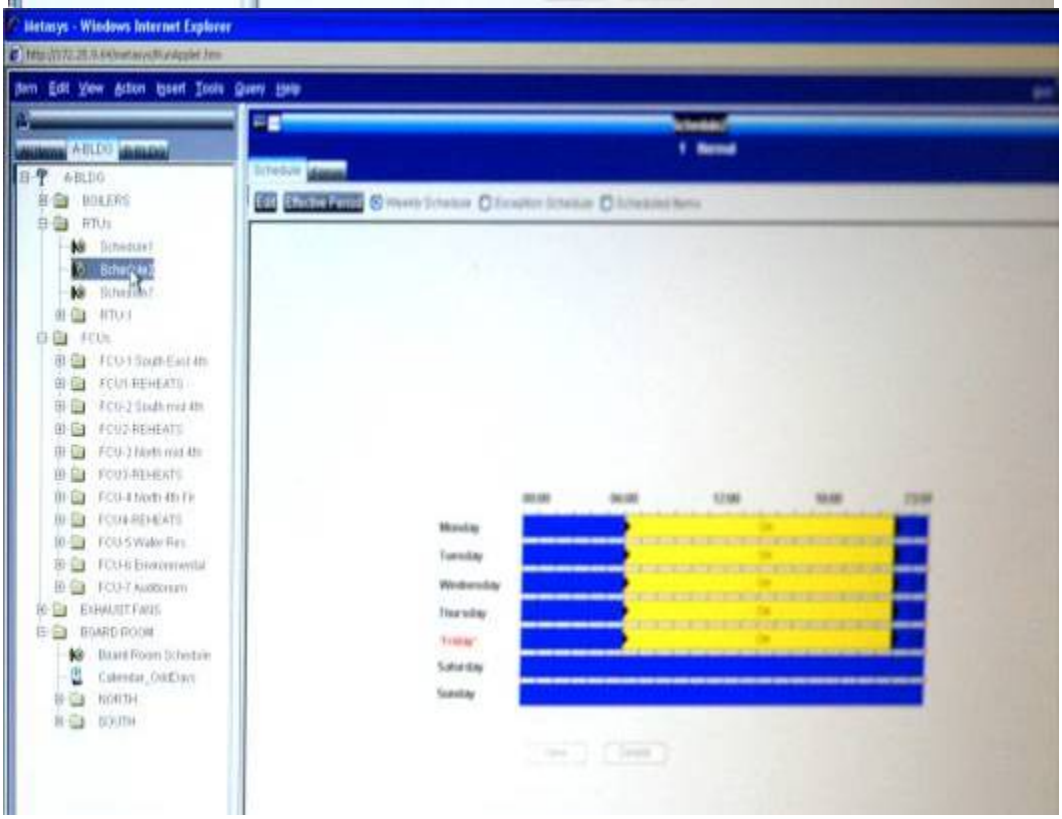

Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
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BOILERS
RTUs
Schedule1
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RTU-1
FCUs
FCU-1 South East 4th
FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS

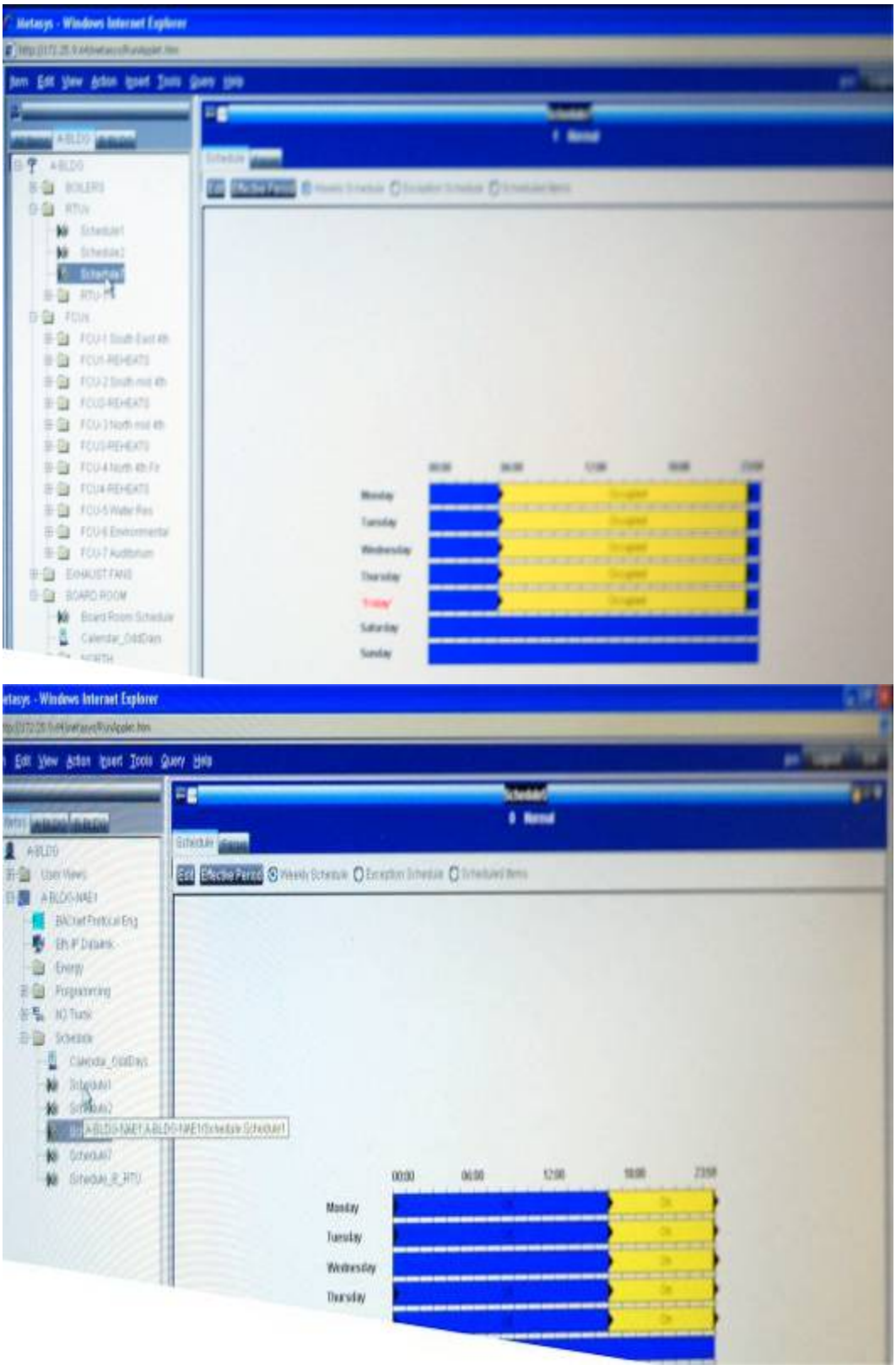

Metasys - Windows Internet Explorer
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Item Edit View Action Insert Tools Query Help
A-BLDG
B-BLDG
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FCU-1 South East 4th
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
A-BLDG FCUs FCU-5 Water Res
EXHAUST FANS
BOARD ROOM
FCU-5 Water Res
Summary
Status Item Value Description
Normal OA-T 77.6 deg F
Normal OCC-C On Occupied Command
Normal OCC-S On Occupied Status
Normal SF-C On Supply Fan Command
Normal FAN-S On Supply Fan Status
Normal SDWN-S Off Shutdown Status
Normal SSD Off Supply Smoke Detector
Normal MA-T 76.1 deg F Mixed Air Temp
Normal DA-T 76.8 deg F Discharge Air Temp
Normal DALL 55.0 deg F Discharge Air Low Limit
Normal ZN-T 75.5 deg F Zone Temp
Normal OHTG-SP 67.0 deg F Occupied Heating Setpoint
Normal UHTG-SP 60.0 deg F Unoccupied Heating Setpoint
Normal AHTG-SP 67.0 deg F Actual Heating Setpoint
Normal HTG-C 0.0 % Heating Command
Normal HTG1-C Off Heating Stage 1 Command
Normal OAHTGLOK 70.0 deg F Heating Lockout Setpoint
Normal HTLOSTAT On Heating Lockout Status
Normal OCLG-SP 75.0 deg F Occupied Cooling Setpoint
Normal UCLG-SP 80.0 deg F Unoccupied Cooling Setpoint
Normal ACLG-SP 75.0 deg F Actual Cooling Setpoint
Normal COMPCMD 9.6 % Cooling Command
Normal CLG1-C Off Cooling Stage 1 Command
Normal OACLGLOK 55.0 deg F Cooling Lockout Setpoint
Normal CLGLOKST Off Cooling Lockout Status
Normal DBSWOV 55.0 deg F Economizer Switchover Setpoint
Normal ECON-S Off Economizer Switchover Status
Normal MINPOS 10.0 % OA Damper Minimum Position
Normal OAD-O 10.0 % OA Damper Command
Normal Exh-c On Exhaust Command

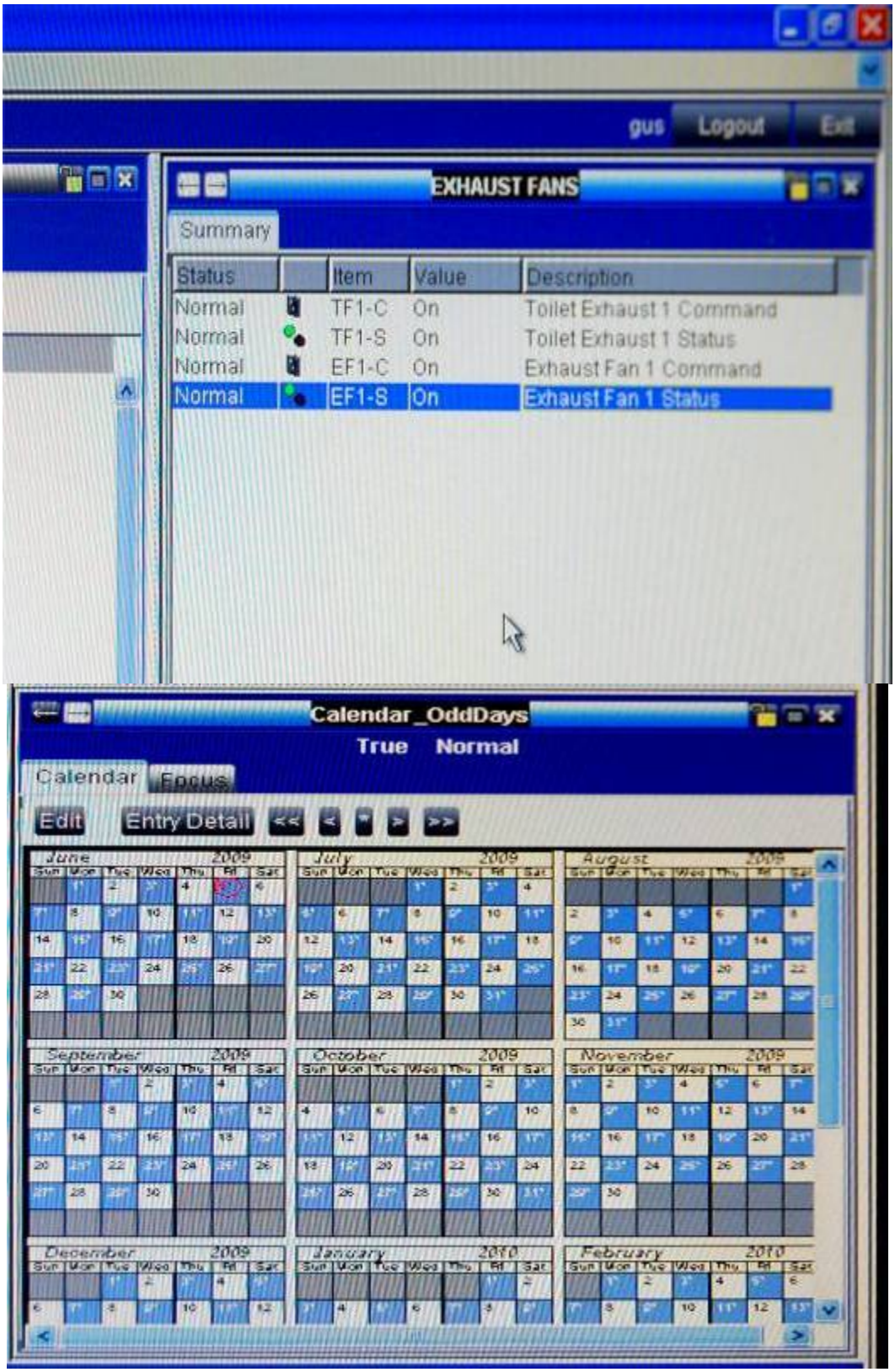

Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
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FCU-1 South East 4th
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
BOARD ROOM
Summary
Status Item Value Description
Normal OA-T 77.6 deg F
Normal OCC-C On Occupied Command
Normal OCC-S On Occupied Status
Normal SF-C On Supply Fan Command
Normal FAN-S On Supply Fan Status
Normal SDWN-S Off Shutdown Status
Normal SSD Off Supply Smoke Detector
Normal MA-T 75.4 deg F Mixed Air Temp
Normal DA-T 74.8 deg F Discharge Air Temp
Normal DALL 55.0 deg F Discharge Air Low Limit
Normal ZN-T 72.2 deg F Zone Temp
Normal OHTG-SP 67.0 deg F Occupied Heating Setpoint
Normal UHTG-SP 65.0 deg F Unoccupied Heating Setpoint
Normal AHTG-SP 67.0 deg F Actual Heating Setpoint
Normal HTG-C 0.0 % Heating Command
Normal HTG1-C Off Heating Stage 1 Command
Normal OCLG-SP 76.0 deg F Occupied Cooling Setpoint
Normal UCLG-SP 80.0 deg F Unoccupied Cooling Setpoint
Normal ACLG-SP 76.0 deg F Actual Cooling Setpoint
Normal COMPCMD 0.0 % Cooling Command
Normal CLG1-C Off Cooling Stage 1 Command
Normal OACLGLOK 55.0 deg F Cooling Lockout Setpoint
Normal CLGLOKST Off Cooling Lockout Status
Normal DBSWOV 55.0 deg F Economizer Switchover Setpoint
Normal ECON-S Off Economizer Switchover Status
Normal MINPOS 10.0 % OA Damper Minimum Position
Normal OAD-O 10.0 % OA Damper Command
Normal Exh-C On Exhaust Command

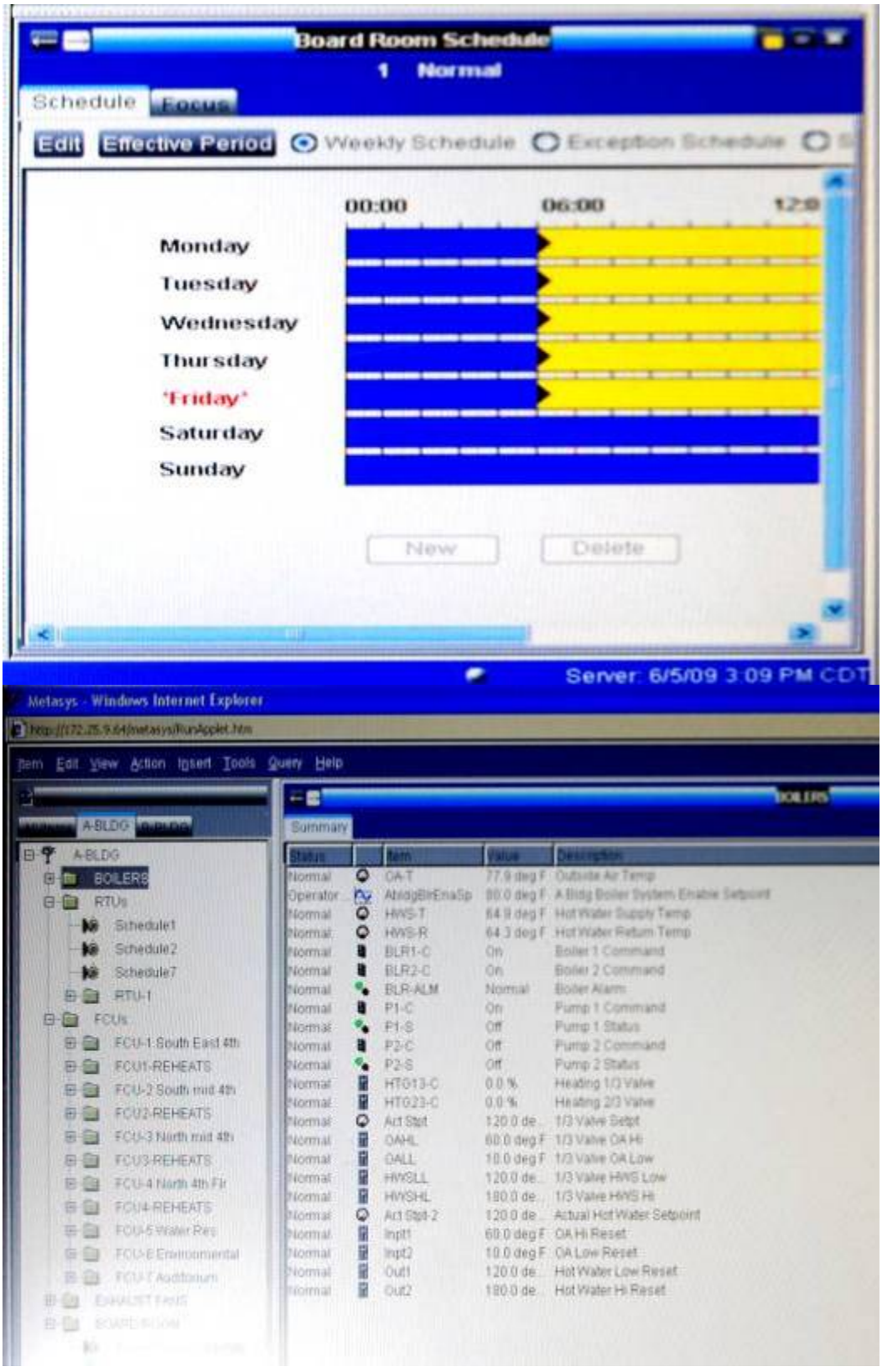

Metasys - Windows Internet Explorer
Item Edit View Action Insert Tools Query Help
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BOILERS
RTUs
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Schedule7
RTU-1
FCUs
FCU-1 South East 4th
FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
BOARD ROOM
Board Room Schedule
Calendar_OddDays
NORTH
SOUTH
Summary
Status
Item
Value
Description
Metasys - Windows Internet Explorer
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Res
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
BOARD ROOM
Board Room Schedule
Calendar_OddDays
NORTH
SOUTH
Summary
Status
Item
Value
Description

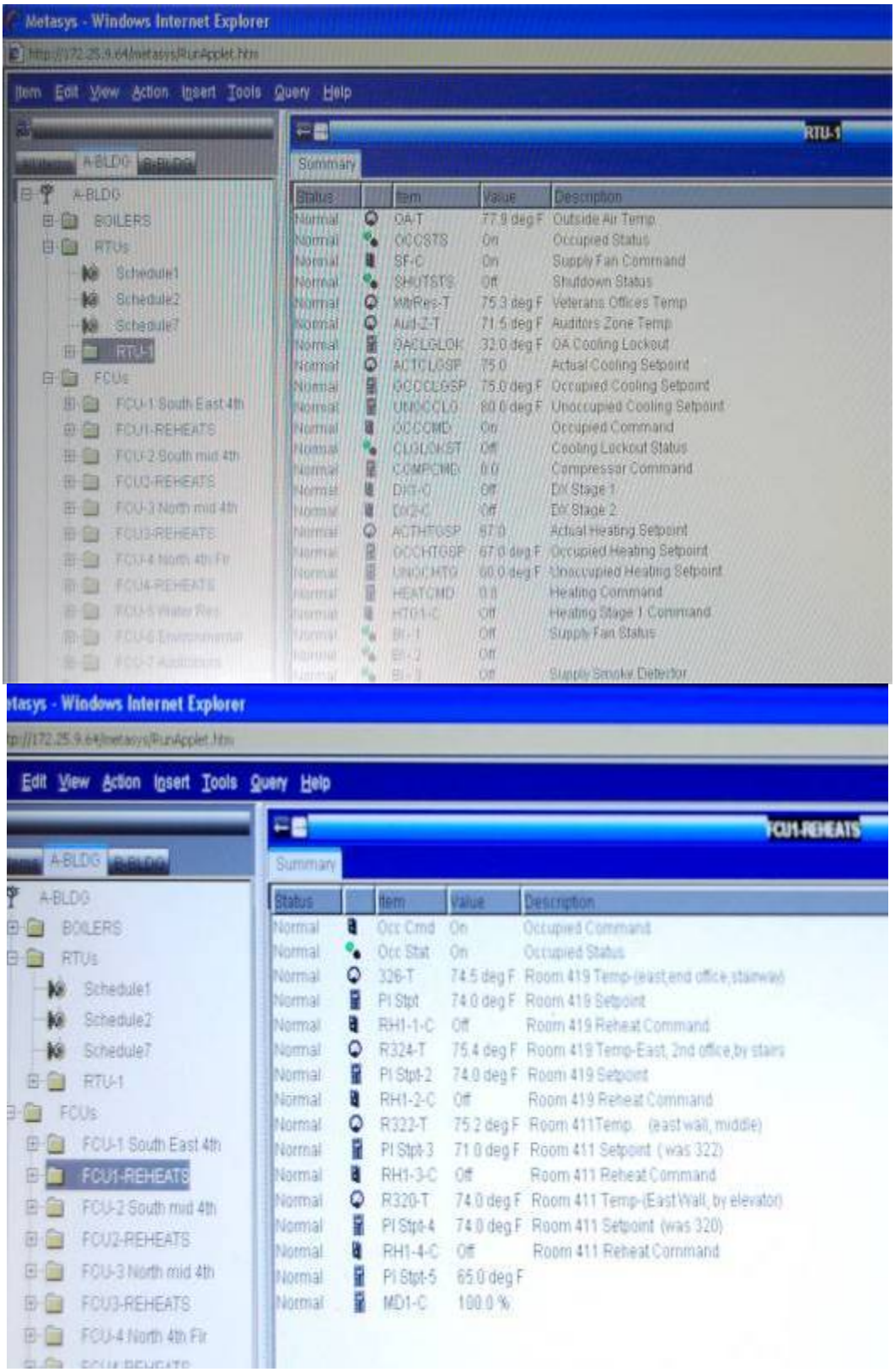

Metasys - Windows Internet Explorer
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

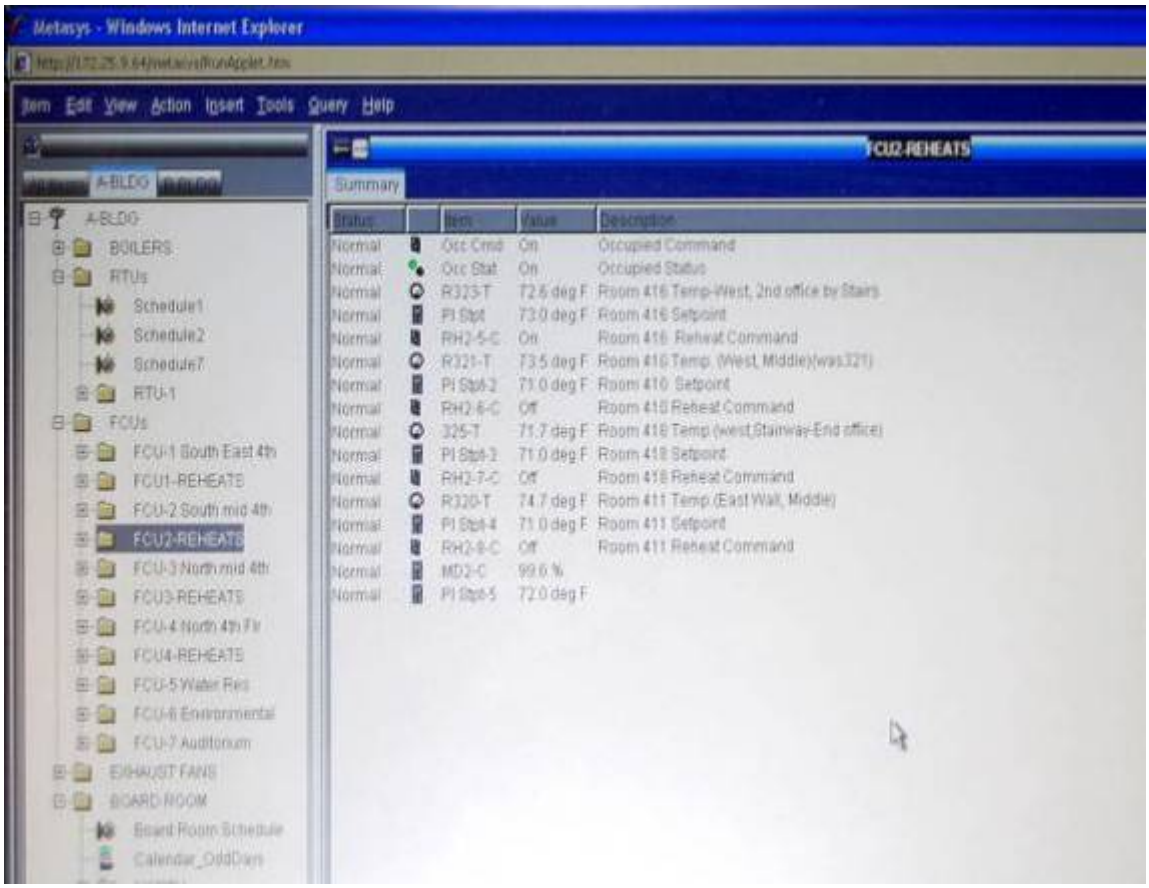

Metasys - Windows Internet Explorer


Metasys - Windows Internet Explorer
Edit View Action Insert Tools Query Help
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
Metasys - Windows Internet Explorer
Edit View Action Insert Tools Query Help
Edit
Effective Period
Weekly Schedule
Exception Schedule
Scheduled Items
00:00
06:00
12:00
18:00
23:59
Monday
Tuesday
Wednesday
Thursday


gus
Logout
Exit
EXHAUST FANS
Summary
Status
Item
Value
Description
Normal
TF1-C
On
Toilet Exhaust 1 Command
Normal
TF1-S
On
Toilet Exhaust 1 Status
Normal
EF1-C
On
Exhaust Fan 1 Command
Normal
EF1-S
On
Exhaust Fan 1 Status
Calendar_OddDays
True
Normal
Calendar
Focus
Edit
Entry Detail
June
July
August
September
October
November
December
January
February
2009
2010


Board Room Schedule
1 Normal
Schedule
Focus
Edit
Effective Period
Weekly Schedule
Exception Schedule
00:00
06:00
Monday
Tuesday
Wednesday
Thursday
'Friday'
Saturday
Sunday
New
Delete
Server: 6/5/09 3:09 PM CDT
Metasys - Windows Internet Explorer
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FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
Summary
Status
Item
Value
Description
OA-T
77.9 deg F
Outside Air Temp
HWS-T
64.9 deg F
Hot Water Supply Temp
HWS-R
64.3 deg F
Hot Water Return Temp
BLR1-C
On
Boiler 1 Command
BLR2-C
On
Boiler 2 Command
BLR-ALM
Normal
Boiler Alarm
P1-C
On
Pump 1 Command
P1-S
Off
Pump 1 Status
P2-C
Off
Pump 2 Command
P2-S
Off
Pump 2 Status
HT013-C
0.0 %
Heating 1/3 Valve
HT023-C
0.0 %
Heating 2/3 Valve
OAHL
60.0 deg F
1/3 Valve OA Hi
OALL
10.0 deg F
1/3 Valve OA Low
HWSLL
120.0 de...
1/3 Valve HWS Low
HWSHL
180.0 de...
1/3 Valve HWS Hi
Act Stpt-2
120.0 de...
Actual Hot Water Setpoint
Inpt1
60.0 deg F
OA Hi Reset
Inpt2
10.0 deg F
OA Low Reset
Out1
120.0 de...
Hot Water Low Reset
Out2
180.0 de...
Hot Water Hi Reset


Metasys - Windows Internet Explorer
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FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
RTU-1
Summary
Status Item Value Description
Normal OAT 77.9 deg F Outside Air Temp
Normal OCCSTS On Occupied Status
Normal SF-C On Supply Fan Command
Normal SHUTSTS Off Shutdown Status
Normal MltRes-T 75.3 deg F Veterans Offices Temp
Normal Aud-Z-T 71.5 deg F Auditors Zone Temp
Normal OACLGLOK 32.0 deg F OA Cooling Lockout
Normal ACTCLGSP 75.0 Actual Cooling Setpoint
Normal OCCCLGSP 75.0 deg F Occupied Cooling Setpoint
Normal UNOCCLG 80.0 deg F Unoccupied Cooling Setpoint
Normal OCCCMD On Occupied Command
Normal CLGLOKST Off Cooling Lockout Status
Normal COMPCMD 0.0 Compressor Command
Normal DX1-C Off DX Stage 1
Normal DX2-C Off DX Stage 2
Normal ACTHTGSP 67.0 Actual Heating Setpoint
Normal OCCHTGSP 67.0 deg F Occupied Heating Setpoint
Normal UNOCHTG 60.0 deg F Unoccupied Heating Setpoint
Normal HEATCMD 0.0 Heating Command
Normal HTG1-C Off Heating Stage 1 Command
Normal SF-1 Off Supply Fan Status
Normal SF-2 Off
Normal SF-3 Off Supply Smoke Detector
Edit View Action Insert Tools Query Help
A-BLDG
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FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU1-REHEATS
Summary
Status Item Value Description
Normal Occ Cmd On Occupied Command
Normal Occ Stat On Occupied Status
Normal 326-T 74.5 deg F Room 419 Temp-(east,end office,stairwell)
Normal PI Stpt 74.0 deg F Room 419 Setpoint
Normal RH1-1-C Off Room 419 Reheat Command
Normal R324-T 75.4 deg F Room 419 Temp-East, 2nd office,by stairs
Normal PI Stpt-2 74.0 deg F Room 419 Setpoint
Normal RH1-2-C Off Room 419 Reheat Command
Normal R322-T 75.2 deg F Room 411Temp (east wall, middle)
Normal PI Stpt-3 71.0 deg F Room 411 Setpoint (was 322)
Normal RH1-3-C Off Room 411 Reheat Command
Normal R320-T 74.0 deg F Room 411 Temp-(East Wall, by elevator)
Normal PI Stpt-4 74.0 deg F Room 411 Setpoint (was 320)
Normal RH1-4-C Off Room 411 Reheat Command
Normal PI Stpt-5 65.0 deg F
Normal MD1-C 100.0 %


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FCU1-REHEATS
FCU-2 South mid 4th
FCU2-REHEATS
FCU-3 North mid 4th
FCU3-REHEATS
FCU-4 North 4th Flr
FCU4-REHEATS
FCU-5 Water Rm
FCU-6 Environmental
FCU-7 Auditorium
EXHAUST FANS
BOARD ROOM
Board Room Schedule
Calendar_OddDays
FCU2-REHEATS
Summary
Status Item Value Description
Normal Occ Cmd On Occupied Command
Normal Occ Stat On Occupied Status
Normal R323-T 72.6 deg F Room 416 Temp-West, 2nd office by Stairs
Normal PI Stpt 73.0 deg F Room 416 Setpoint
Normal RH2-5-C On Room 416 Reheat Command
Normal R321-T 73.5 deg F Room 410 Temp. (West, Middle)(was321)
Normal PI Stpt-2 71.0 deg F Room 410 Setpoint
Normal RH2-6-C Off Room 410 Reheat Command
Normal 325-T 71.7 deg F Room 418 Temp (west,Stairway-End office)
Normal PI Stpt-3 71.0 deg F Room 418 Setpoint
Normal RH2-7-C Off Room 418 Reheat Command
Normal R320-T 74.7 deg F Room 411 Temp (East Wall, Middle)
Normal PI Stpt-4 71.0 deg F Room 411 Setpoint
Normal RH2-8-C Off Room 411 Reheat Command
Normal MD2-C 99.6 %
Normal PI Stpt-5 72.0 deg F

Appendix D

Lighting Spreadsheet and Images

Room Number	Room name	Existing Fixture	T8 or T12	Existing Number Fixtures Existing	Number of Lamps	Watts per Fixture Watts	Total Watts Connected Total	Proposed Fixture Type	Existing Number Fixtures	Number of Lamps	Proposed Watts per Fixture	Proposed Watts Connected	Proposed Watts Saved	Lamp Burn Hours	Energy Cost Savings	Cost of New Fixture	Labor to Install	Cost for Number of Fixtures
100	Office	2' x 4' 4-Lamp T12	12	8	4	192	1,536	2' x 4' 2-Lamp T8 with reflector	8	2	58	464	1,072	3,120	284	75	30	840
101	Office	2' x 4' 4-Lamp T12	12	2	4	192	384	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	268	3,120	71	75	30	210
102	Office	TBD	12	2	4	192	384	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	268	3,120	71	75	30	210
103	Office	2' x 4' 3-Lamp T12	12	6	3	150	900	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	552	3,120	146	75	30	630
104	Office	2' x 4' 3-Lamp T12	12	4	3	150	600	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	368	3,120	98	75	30	420
106	Office	2' x 4' 4-Lamp T12	12	2	4	192	384	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	268	3,120	71	75	30	210
107	Office	2' x 4' 3-Lamp T12	12	3	3	150	450	2' x 4' 2-Lamp T8 with reflector	3	2	58	174	276	3,120	73	75	30	315
108	Office	2' x 4' 4-Lamp T12	12	4	4	192	768	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	536	3,120	142	75	30	420
109	Office	1' x 4' 1-Lamp T12	12	8	1	56	448	2' x 4' 1-Lamp T8 with reflector	8	2	58	464	-16	3,120	-4	75	30	840
109	Office	2' x 4' 4-Lamp 12	12	11	4	192	2,112	2' x 4' 2-Lamp T8 with reflector	11	2	58	638	1,474	3,120	391	75	30	1,155
110	Mech	TBD																
112	Office	2' x 2' 2- U bend Lamp T12	12	2	2	96	192	2' x 2' 2 Lamp T8 with reflector	2	2	30	60	132	3,120	35	75	30	210
112	Office	2' x 4' 4-Lamp T12	12	2	4	192	384	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	268	3,120	71	75	30	210
114	Storage	TBD																
116	Office	2' x 4' 4-Lamp T12	12	3	4	192	576	2' x 4' 2-Lamp T8 with reflector	3	2	58	174	402	3,120	107	75	30	315
118	Office	2' x 4' 4-Lamp T12	12	4	4	192	768	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	536	3,120	142	75	30	420
122	Office	2' x 4' 4-Lamp T12	12	2	4	192	384	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	268	3,120	71	75	30	210
124	Office	TBD																
126	Office	2' x 4' 4-Lamp T12	12	4	4	192	768	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	536	3,120	142	75	30	420
200	Office	2' x 2' 2-Lamp U bend T12	12	17	2	96	1,632	2' x 2' 2 Lamp T8 with reflector	17	2	30	510	1,122	3,120	298	75	30	1,785
200	Office	2' x 4' 3-Lamp T12	12	22	3	150	3,300	2' x 4' 2-Lamp T8 with reflector	22	2	58	1,276	2,024	3,120	537	75	30	2,310
200	Office	Incandescent		1	1	100	100	26 watt CFL	1	1	100	100	0	3,120	0	0	0	0
201	Board Room	1' x 2' 1-Lamp T8	8	2	1	30	60	no change	2	1	30	60	0	2,500	0	0	0	0
201	cove lighting	1' x 4' 1-Lamp T12	12	33	1	56	1,848	1' x 4' 1-Lamp T8 with reflector	33	1	30	990	858	2,500	182	75	30	3,465
201	cove lighting	1' x 4' 2-Lamp T8	8	8	2	58	464	1' x 4' 1-Lamp T8 with reflector	8	1	30	240	224	2,500	48	75	30	840
201	Board Room	2' x 4' 4-Lamp T8	8	14	4	116	1,624	2' x 4' 2-Lamp T8 with reflector	14	2	58	812	812	2,500	173	75	30	1,470
201	Board Room	Quartz 250w	quartz	6	1	250	1,500	26 watt CFL	6	1	26	156	1,344	2,500	286	100	30	780
202	Storage	2' x 4' 4-Lamp T8	8	1	4	116	116	2' x 4' 2-Lamp T8 with reflector	1	2	58	58	58	3,120	15	75	30	105
203	Mech	TBD																
204	Office	2' x 4' 4-Lamp T8	8	4	4	116	464	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	232	3,120	62	75	30	420
205	Office	2' x 4' 4-Lamp T8	8	4	4	116	464	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	232	3,120	62	75	30	420
206	Office	1' x 4' 1-Lamp T12	12	19	1	56	1,064	1' x 4' 1-Lamp T8 with reflector	19	1	30	570	494	3,120	131	75	30	1,995
206	Office	2' x 4' 4-Lamp T8	8	3	4	116	348	2' x 4' 2-Lamp T8 with reflector	3	2	58	174	174	3,120	46	75	30	315
206	Office	100 watt Incandescent	incandescent	1	1	100	100	26 watt CFL	1	1	26	26	74	3,120	20			0
207	Office	2' x 4' 4-Lamp T8	8	4	4	116	464	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	232	3,120	62	75	30	420
208	Office	2' x 4' 4-Lamp T8	8	6	4	116	696	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	348	3,120	92	75	30	630
209	Office	TBD																
211	Office	2' x 4' 4-Lamp T8	8	6	4	116	696	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	348	3,120	92	75	30	630
212	Office	2' x 4' 4-Lamp T8	8	6	4	116	696	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	348	3,120	92	75	30	630
214	Office	TBD																
300	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
301	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
302	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
303	Office	2' x 4' 3-Lamp T8	8	11	3	86	946	2' x 4' 2-Lamp T8 with reflector	11	2	58	638	308	3,120	82	75	30	1,155
304	Office	TBD																
306	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
307	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
308	Office	2' x 4' 3-Lamp T8	8	10	3	86	860	2' x 4' 2-Lamp T8 with reflector	10	2	58	580	280	3,120	74	75	30	1,050
309	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
310	Office	TBD																
311	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
312	Office	2' x 4' 3-Lamp T8	8	6	3	86	516	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	168	3,120	45	75	30	630
313	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
315	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
316	Office	2' x 4' 3-Lamp T8	8	3	3	86	258	2' x 4' 2-Lamp T8 with reflector	3	2	58	174	84	3,120	22	75	30	315
317	Office	TBD																
318	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420

Room Number	Room name	Existing Fixture	T8 or T12	Existing Number Fixtures Existing	Number of Lamps	Watts per Fixture Watts	Total Watts Connected Total	Proposed Fixture Type	Existing Number Fixtures	Number of Lamps	Proposed Watts per Fixture	Proposed Watts Connected	Proposed Watts Saved	Lamp Burn Hours	Energy Cost Savings	Cost of New Fixture	Labor to Install	Cost for Number of Fixtures
319	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
320	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
322	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
324	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
326	Office	2' x 4' 3-Lamp T8	8	2	3	86	172	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	56	3,120	15	75	30	210
328	Office	2' x 4' 3-Lamp T8	8	4	3	86	344	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	112	3,120	30	75	30	420
400	Office	2' x 4' 3-Lamp T12	12	2	3	150	300	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	184	3,120	49	75	30	210
400	Office	100 watt Incandescent	incandescent	2	1	100	200	26 watt CFL	2	1	26	52	148	3,120	39	0	0	0
401	Office	100 watt Incandescent	incandescent	2	1	100	200	26 watt CFL	2	1	26	52	148	3,120	39	0	0	0
402	Office	2' x 4' 3-Lamp T12	12	6	3	150	900	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	552	3,120	146	75	30	630
403	Office	100 watt Incandescent	incandescent	2	1	100	200	26 watt CFL	2	1	26	52	148	3,120	39	0	0	0
404	Office	2' x 4' 3-Lamp T12	12	2	3	150	300	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	184	3,120	49	75	30	210
405	Office	1' x 5' 1-Lamp T12	12	4	1	100	400	1' x 4' 1-Lamp T8 with reflector	4	1	30	120	280	3,120	74	75	30	420
406	Office	1' x 5' 1-Lamp T12	12	4	1	100	400	1' x 4' 1-Lamp T8 with reflector	4	1	30	120	280	3,120	74	75	30	420
407	Office	2' x 4' 3-Lamp T12	12	6	3	150	900	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	552	3,120	146	75	30	630
408	Office	1' x 5' 1-Lamp T12	12	12	1	100	1,200	1' x 4' 1-Lamp T8 with reflector	12	1	30	360	840	3,120	223	75	30	1,260
413	Office	2' x 4' 3-Lamp T12	12	4	3	150	600	2' x 4' 2-Lamp T8 with reflector	4	2	58	232	368	3,120	98	75	30	420
414	Office	2' x 4' 3-Lamp T12	12	6	3	150	900	2' x 4' 2-Lamp T8 with reflector	6	2	58	348	552	3,120	146	75	30	630
415	Office	1' x 5' 1-Lamp T12	12	2	1	100	200	1' x 4' 1-Lamp T8 with reflector	2	1	30	60	140	3,120	37	75	30	210
1xx Corridor	Corridor	2' x 2' 2-Ubend Lamp T12	12	1	2	96	96	2' x 2' 2 Lamp T8 with reflector	1	2	30	30	66	3,120	18	75	30	105
1xx Corridor	Corridor	2' x 4' 3-Lamp T8	8	11	3	86	946	2' x 4' 2-Lamp T8 with reflector	11	2	58	638	308	3,120	82	75	30	1,155
1xx Meeting	Meeting Room	1' x 4' 3-Lamp T8 Indirect	8	16	3	86	1,376	no change	16	3	86	1,376	0	2,500	0	0	0	0
1xx Stairwells	Stairwell	1' x 2' 2-Lamp T8	8	5	2	58	290	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	5	2	30	150	140	8,760	104	75	30	525
2xx Corridor	Admin Area	2' x 2' 4-Lamp T8	8	2	4	116	232	2' x 4' 2-Lamp T8 with reflector	2	2	58	116	116	6,552	65	75	30	210
2xx Corridor	Corridor	2' x 4' 3-Lamp T8	8	5	3	86	430	2' x 4' 2-Lamp T8 with reflector	5	2	58	290	140	6,552	78	75	30	525
2xx Corridor	Corridor	2' x 4' 4-Lamp T8	8	1	4	116	116	2' x 4' 2-Lamp T8 with reflector	1	2	58	58	58	6,552	32	75	30	105
2xx Corridor	Corridor	Compact Fluorescent	CFL	1	1	26	26	no change	1	1	26	26	0	6,552	0	0	0	0
2xx Corridor	Corridor	Quartz 250w	quartz	4	1	26	104	26 watt CFL	4	1	26	104	0	6,552	0	100	30	520
2xx Stairwells	Stairwell	1' x 2' 2-Lamp T12	12	6	2	96	576	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	6	2	30	180	396	8,760	295	75	30	630
2xx Stairwells	Stairwell	Compact Fluorescent	CFL	2	1	26	52	no change	2	1	26	52	0	8,760	0	0	0	0
3xx Corridor	Corridor	2' x 4' 2-Lamp T8	8	14	2	58	812	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	14	2	30	420	392	6,552	218	75	30	1,470
3xx Stairwells	Stairwell	1' x 2' 2-Lamp T12	12	3	2	96	288	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	3	2	30	90	198	8,760	147	75	30	315
4xx Corridor	Corridor	2' x 4' 2-Lamp T8	8	62	2	58	3,596	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	62	2	30	1,860	1,736	6,552	967	75	30	6,510
4xx Stairwells	Stairwell	1' x 2' 2-Lamp T12	12	2	2	96	192	1' x 2' 2-Lamp, reflector, daylight sensor, if possible	2	2	30	60	132	8,760	98	75	30	210
				493	224		49,386		493			22,956	26,430		$7,966			$48,970

Notes:

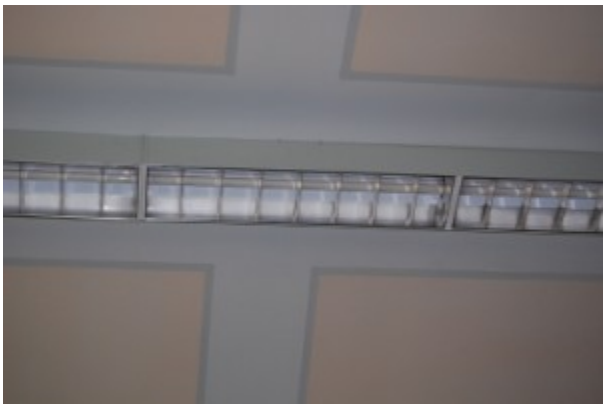
Many fixtures have yellowed lenses which greatly reduces light levels and fixture efficiency.

New fixtures offer opportunity to reduce lamps, brighten spaces with non-yellowed lenses and install higher efficiency fixture designs.

Payback in years 6.15

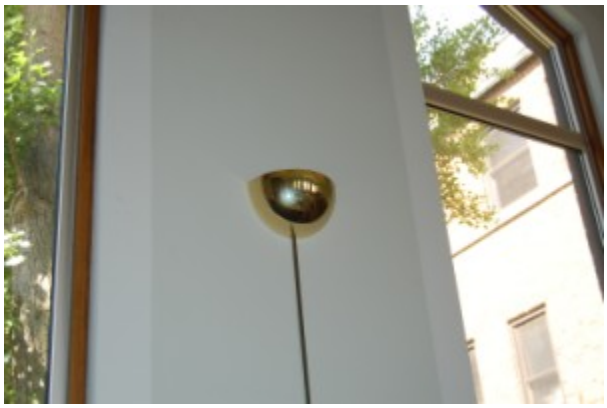
Less possible grant

Refined through design




Boardroom – Ceiling lights





Boardroom – Exit Sign and Wall Sconce




Boardroom – Closet Lighting



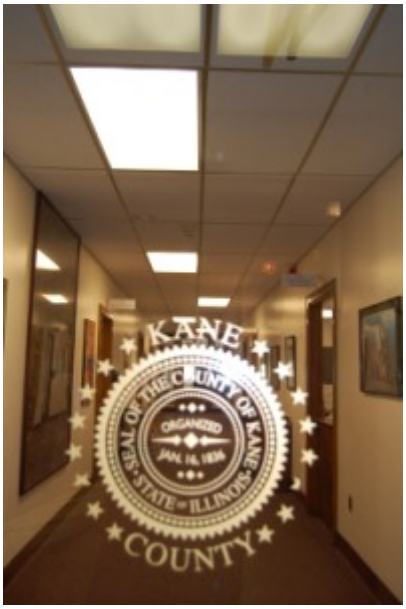
Boardroom – Cove Lighting



Boardroom – Pendant Light

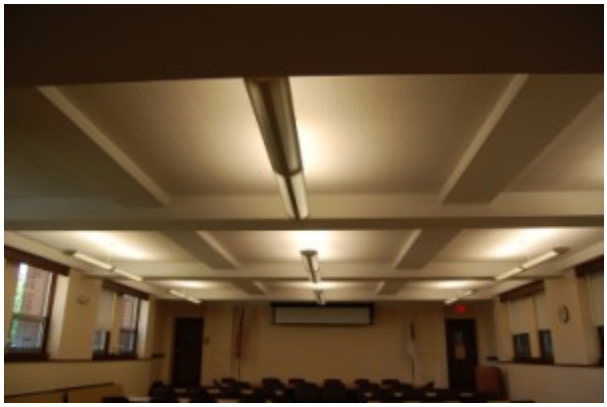


Hallway – Wall Sconce



Hallway – Ceiling Lights

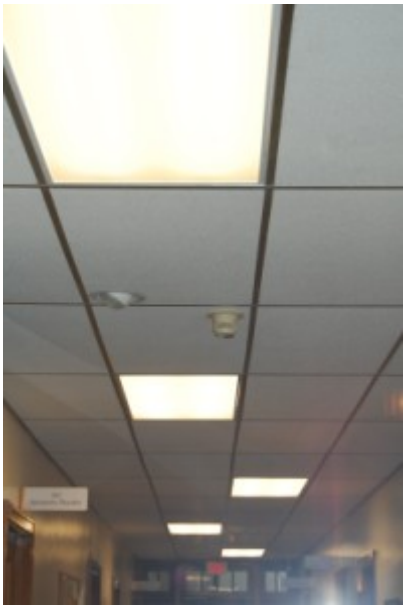




Meeting Room – Ceiling Lights



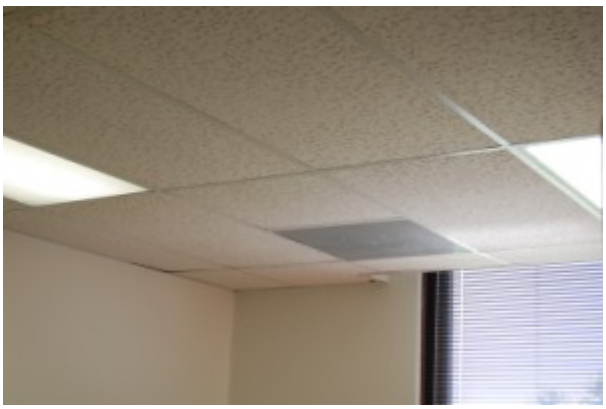
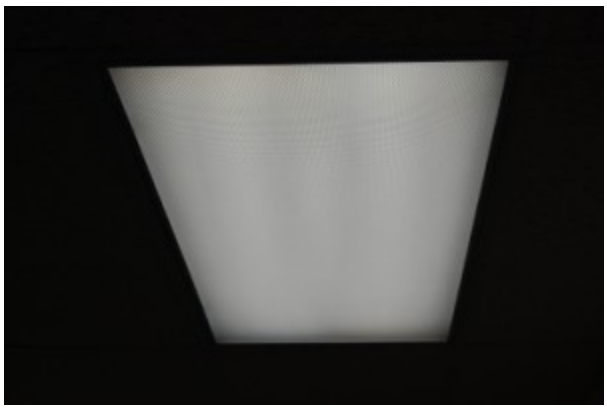
Hall – Wall Sconce



Hall – Ceiling Lighting



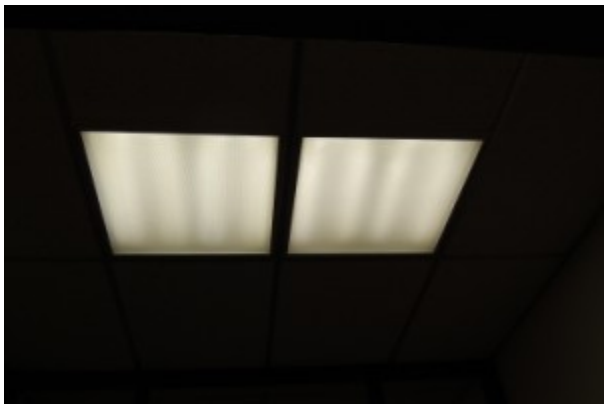

Offices – Ceiling Lighting

Offices – Ceiling Lighting

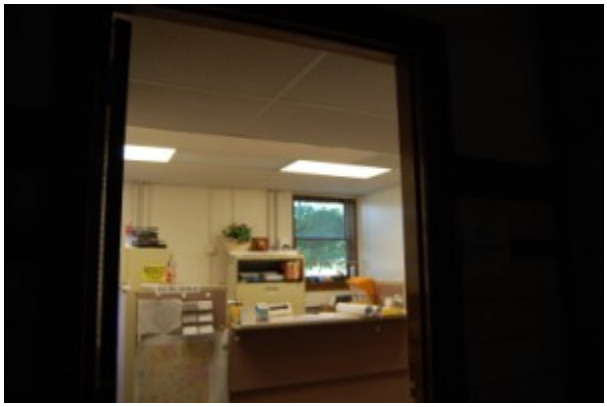



Offices – Ceiling Lighting



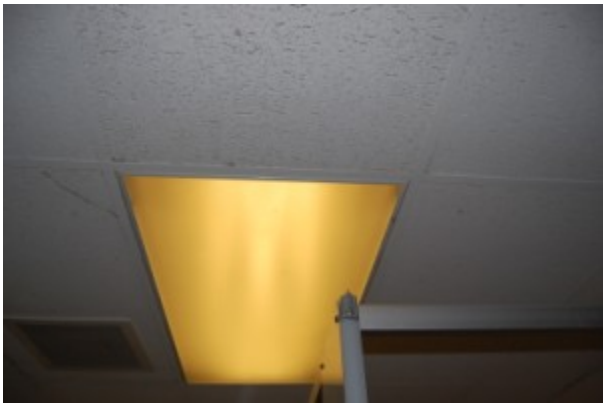
Admin – Ceiling Lighting



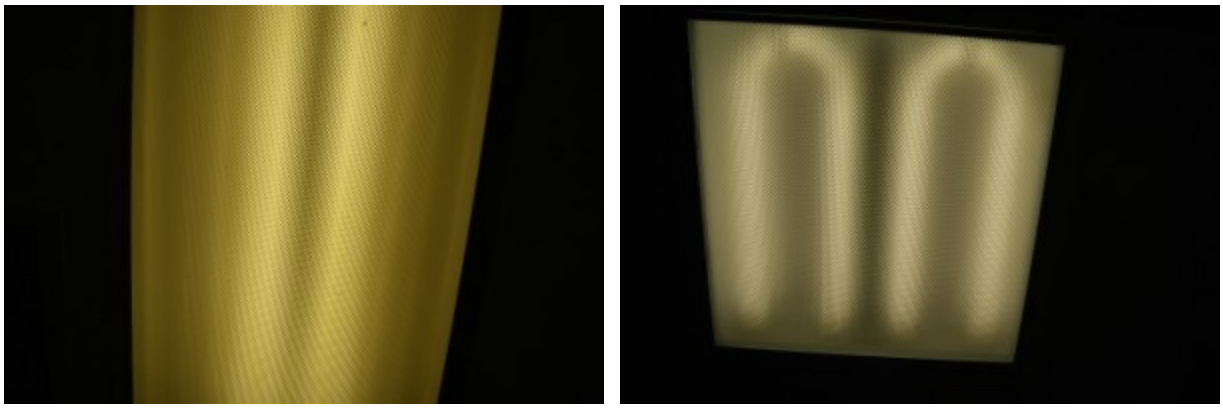


Third Floor Offices – Ceiling Lighting

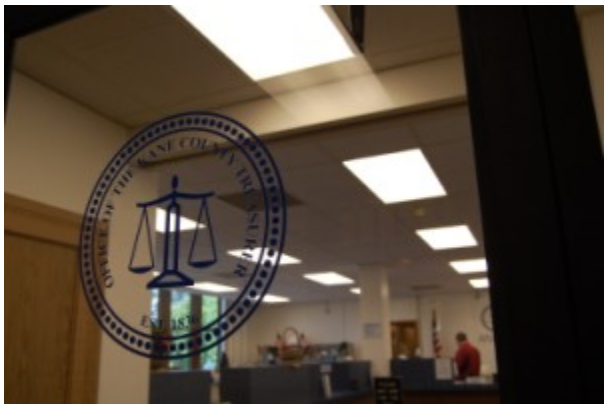




Third Floor Offices – Ceiling Lighting



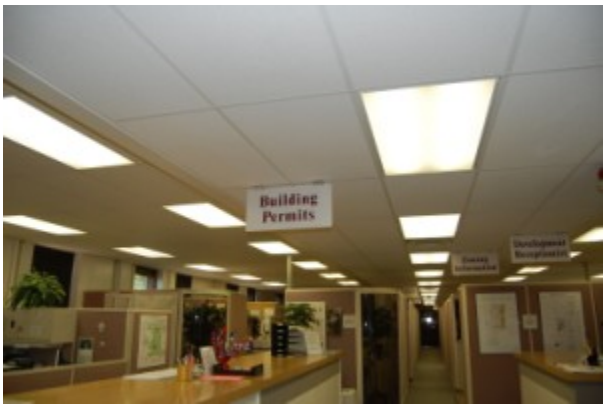
Third Floor Offices – Ceiling Lighting



Third Floor – Ceiling Lighting



Third Floor Halls – Ceiling Lighting





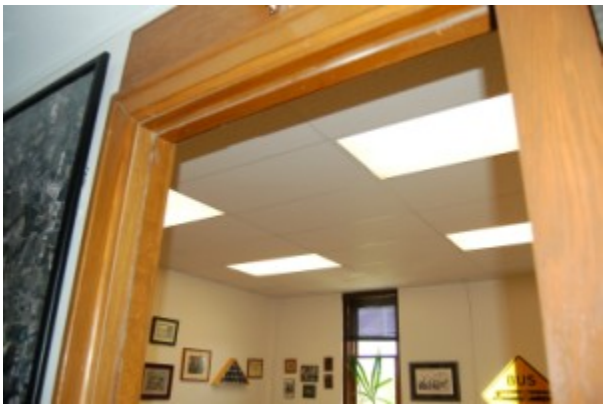
Fourth Floor Buildings Dept – Ceiling Lighting




Fourth Floor – Ceiling Lighting



Fourth Floor End of Hall - Ceiling Lighting




Fourth Floor Offices – Ceiling Lighting



Fourth Floor Offices – Ceiling Lighting




Fourth Floor Offices – Ceiling Lighting



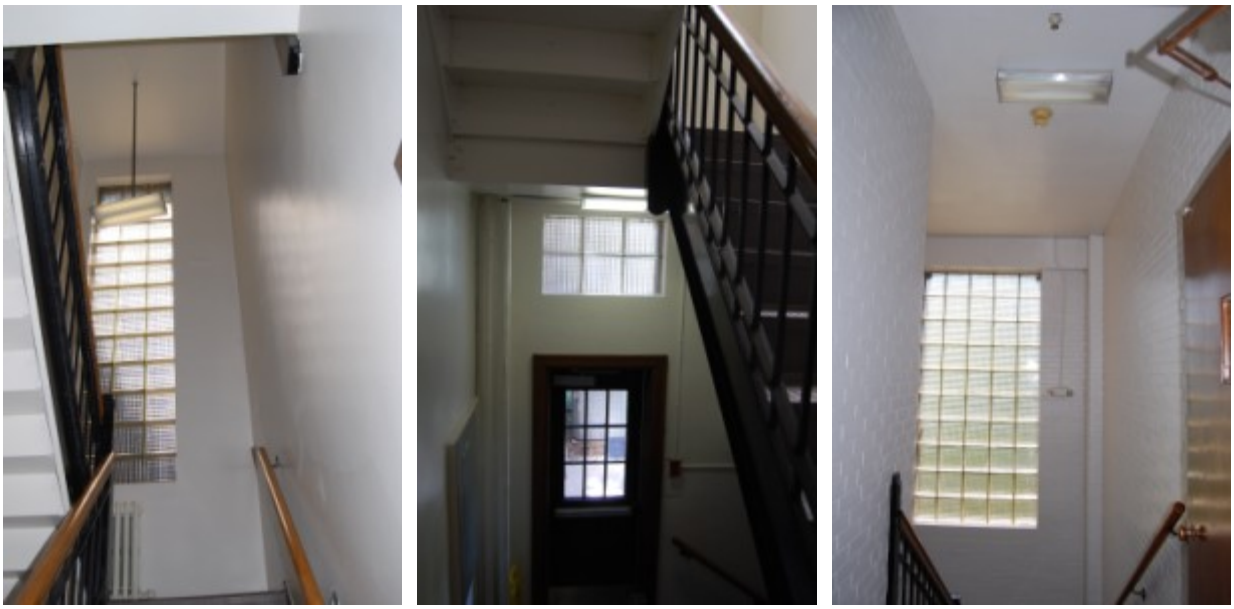

Fourth Floor – Ceiling Lighting



Elevator – Ceiling Lighting



Near Boiler Room – Ceiling Lighting



Stairwell – Ceiling Lighting



Stairwell – Ceiling Lighting



Stairwell – Ceiling Lighting

Appendix E

City of Geneva Electric Riders

Public Works Department - Electric Rates

City of Geneva Public Works Department
Electric Division
1800 South Street
Geneva, IL 60134
(630) 232-1503

City of Geneva Residential, General Service and Industrial Electrical Rates

All units $/kWh unless otherwise noted	**May 07**	**April 08**
	Summer	Winter
Residential Service Rate		
Energy Charge	0.03637	0.03637
Demand Charge	0.03580	0.01837
Transmission Demand Charge	0.01041	0.01041
Distribution Charge		
First 500 kWh, per kWh	0.02034	0.01646
Over 500 kWh, per kWh	0.00547	0.00456
Total Energy Charges		
First 500 kWh, per kWh	0.10292	0.08161
Over 500 kWh, per kWh	0.08805	0.06972
Customer Charge, $/Bill/Mo.	$6.55	$6.55
Space Heat Rate		
Energy Charge	0.03637	0.03637
Demand Charge	0.03580	0.01837
Transmission Demand Charge	0.01041	0.01041
Distribution Charge		
First 500 kWh, per kWh	0.02034	0.01646
Over 500 kWh, per kWh	0.00547	0.00456
Total Energy Charges		
First 500 kWh, per kWh	0.10292	0.08161
Over 500 kWh, per kWh	0.08805	0.06972
Customer Charge, $/Bill/Mo.	$6.55	$6.55
General Service Rate - Demand Less than 25 kW		
Energy Charge	0.03636	0.03636
Demand Charge	0.03330	0.01610
Transmission Demand Charge	0.00925	0.00925
Distribution Charge		
First 500 kWh, per kWh	0.02476	0.02005
Over 500 Kwh, per kWh	0.00665	0.00555
Total Energy Charges		
First 500 kWh, per kWh	$0.10368	$0.08176
Over 500 Kwh, per kWh	$0.08556	$0.06727
Customer Charge, $/Bill/Mo.	**$13.10**	**$13.10**
Medium General Service - Demand greater than 25 kW, but less than 400 kW		
Energy Charge	N/A	N/A
Supply Charge	0.03462	0.03462

Losses @ 5%	0.00173	0.00173
Total Energy Charge	**$0.03635**	**$0.03635**
Demand Charge		
Supply Charge - Non Transmission	$9.50	$4.69
4.69 Transmisssion	$2.67	$2.67
Distribution	$4.07	$4.07
Total Demand Charge, per kW	**$16.24**	**$11.43**
Customer Charge, $/Bill/Mo.	**$47.63**	**$47.63**
Minimum Bill = Customer Charge + Demand Charge		
Large General Service - Demand greater than 400 kW, but less than 2,000 kW		
Energy Charge	N/A	N/A
Supply Charge	0.034910	0.034910
Losses @ 4%	0.001400	0.001400
Total Energy Charge	**0.036310**	**0.036310**
Demand Charge		
Supply Charge - Non Transmission	$9.31	$4.42
Transmission	$2.55	$2.55
Distribution	$4.23	$4.23
Total Demand Charge, per kW	**$16.09**	**$11.20**
Customer Charge, $/Bill/Mo.	**$77.39**	**$77.39**
Minimum Bill = Customer Charge + Demand Charge		
Large Industrial Rate - Demand greater than 2,000 kW		
Energy Charge	N/A	N/A
Supply Charge	0.03523	0.03523
Losses @ 3%	0.00106	0.00106
Total Energy Charge	**0.03629**	**0.03629**
Optional Time of Day Energy Charge		
Supply Charge		
On-Peak	0.4446	0.4446
Off-Peak	0.02844	0.02844
Losses @ 3%		
On-Peak	0.00133	0.00133
Off-Peak	0.00085	0.00085
Total Time of Day Energy Charge		
On-Peak	$0.04579	$0.04579
Off-Peak	$0.02929	$0.02929
Demand Charge		
Supply Charge - Non Transmission	$8.69	$3.70
Transmission	$2.22	$2.22
Distribution	$3.57	$3.57
Total Demand Charge, per kW	**$14.48**	**$9.49**
Customer Charge, $/Bill/Mo.	$136.93	136.93
Minimum Bill = Customer Charge + Demand Charge		

Power Cost Adjustment Clause: Energy charges for the current month shall be adjusted by the amount of a power cost adjustment factor to reflect the preceding calendar month's cost of power as compared to a base cost as described below.

Power Cost Adjustment Factor = PCAF= Fm/Sm - $0.05491/kWh

Where Fm = the cost of power in the preceding calendar month includes:

A. The cost of power from Exelon Generation Company, LLC ("Exelon") and WM Illinois Renewable Energy, LLC ("BEP").

B. The charges and credits as billed or credited by PJM.

C. Charges for fuel actually used at GGF.

D. Charges for transportation of fuel used at GGF.

E. Other Variable GGF Expenses charged to accounts 20-68-001 -120,20-68-001 -230 and 20-68-001-355.

Where Sm = All kWh retail sales for the preceding billing month.

SECTION TWO: That the following Power Cost Adjustment Clause be and the same is hereby added to the Section 9-1A-6 (Residential Rates), Section 9-1A-7 (Residential Space Heating Rate [8 Months Heating Season Rate for Existing Customers], Section 9-1A-8 (General Service Rate), Section 9-1 A-10 Medium General Service Rate) and Section 9-1 A-11 (Large General Service Rate) of Chapter 1 of Title 9 of the Geneva City Code:

"Power Cost Adjustment Clause: Energy charges for the current month shall be adjusted by the amount of a power cost adjustment factor to reflect the preceding calendar month's cost of power as compared to a base cost as described below.

Power Cost Adjustment Factor = PCAF= Fm/Sm - $0.05491 AWh

Where Fm = the cost of power in the preceding calendar month includes:

A. The cost of power from Exelon Generation Company, LLC ("Exelon") and WM Illinois Renewable Energy, LLC ("BEP").

B. The charges and credits as billed or credited by PJM.

C. Charges for fuel actually used at GGF.

D. Charges for transportation of fuel used at GGF.

F. Other Variable GGF Expenses charged to accounts 20-68-001 -120, 20-68-001 -230 and 20-68-001-355.

Where Sm = All kWh retail sales for the preceding billing month."

SECTION THREE: That Paragraph D of Section 9-1 A-13, Chapter 1 of Title 9 of the Geneva City Code be and the same is hereby amended by substituting the following therefor:

Section 9-1A-13: METER READING AND BILLING:

D. Delinquent Bills: Where billings in the amount of less than Fifty ($50.00) Dollars remain delinquent and unpaid for a period of two (2) consecutive months, or where billings in excess of Fifty ($50.00) Dollars remain delinquent and unpaid for a period of Thirty (30) days, the Finance Director shall order service discontinued to the delinquent customer's premises. In the event service is discontinued due to such delinquency, an Administrative Fee of Seventy-Five ($75.00) Dollars shall be paid before service is reinstated to such delinquent customer, provided, however, if service is reinstated during times other than regular working hours, the Administrative Fee shall be One hundred and Twenty -Five ($125.00) Dollars, and shall be in addition to payment in full for all outstanding monies owned by the delinquent customer, including any late charges or penalties.

SECTION FOUR: That Section 9-1 A-12, Chapter 1 of Title 9 of the Geneva City Code be and the same is hereby amended by substituting the following therefor:

9-1A-12: ELECTRICAL CUSTOMER CONNECTION CHARGE:

As a condition of approval of annexation of land to the city by an annexation agreement; and as a part of such annexation agreement for the development of residential, commercial or industrial land; each owner of such land, his successors and assigns (hereinafter referred to as customer(s)), who requires connection of any residence, building or structure to the city's electrical distribution system, shall pay to the city an electrical connection charge as follows:

Single-family residential buildings or structures, and multi-family residential buildings, per individual dwelling unit

$610.00

Single-family residential buildings and multi-family residential buildings, per individual dwelling unit with 201 amp or greater service

$910.00

General service customers, as defined by this article, per connection
Large general service customers, as defined by this article, per connection:

$1,100.00

For demand usage up to 500 kW

$33.64/kW

For demand usage for each connection in excess of 500 kW, but less than 2,000 kW

$33.64/kW

Large industrial service customers, as defined by this article, for each connection

$33.64/kW

The connection charges, in addition to all other costs imposed by ordinance, shall be paid by the customers as follows:

All residential connection charges shall be paid to the city at the time of the approval of the final plat of subdivision or approval of a planned development. All nonresidential connection charges shall be paid to the city at the time of the issuance of a building permit for the building or structure sought to be connected to the electrical distribution system.

SECTION FIVE: That Chapter 1 of Title 9 of said Geneva City Code as heretofore and hereinabove amended shall otherwise remain in full force and effect.

SECTION SIX: This ordinance shall become effective from and after its passage as in accordance with law and the amended rates shall be applied to all meters read after May 1,2006. Publication of this ordinance is approved to be published in pamphlet form.

Appendix F

City of Geneva
Water Rates

TRANSPORTATION

Motor Carrier

Interstates Serving Community: I-90, I-88, I-39, I-355
Highways Serving Community: 2 Federal, 3 State, 5 County
Motor Freight Terminals*: 3 Local Carriers*: 31
Intrastate Carriers*: 9

** within 5 miles*

Air

Nearest Commercial Airport: O'Hare Intl Airport, 50 min
Commercial Airlines: 43
Flights per year: 304,657
Passengers per Year: 19,378,855

Source: www.ohare.com

Nearest Public Airport: DuPage Airport, 10 min
Longest Runway: 7,570 ft
Runway Lighted: Yes Fuel Available: Yes
Take-offs/Landings per Year: 150,000
Personal Aircraft & Corp. jets based on site: 460
Charter Service Available: Yes
Private Storage Available: Yes
Private Maintenance Available: Yes
US Customs office on site: Yes

Source: www.dupageairport.com

Rail

Nearest Intermodal for Union Pacific Railroad:
Northlake (Global II) 24 miles
Rochelle (Global III) 42 miles

Public

Bus: [1]PACE bus service includes 3 Routes (529, 801, 802)
Van: O'Hare and Midway Airport Shuttle Service
Rail: [2]Metra Commuter – Metra Union Pacific West Line
Limousine: 11 companies Taxi: 5 companies

For more information, [1] www.pacebus.com [2] www.metrarail.com

Travel Time

Distance and travel time to major cities

City	Hwy Miles	Hwy KM	Days By Rail	Day By Truck
Atlanta	730	1168	5	3
Chicago	30	48	1	1
Cleveland	343	549	3	2
Dallas	936	1498	5	3
Denver	1016	1626	3	3
Detroit	271	434	2	2
Kansas City	499	798	2	2
Los Angeles	2095	3352	3	4
Memphis	544	870	2	2
Minneapolis	412	659	1	2
New Orleans	944	1510	5	3
New York	840	1344	4	3
St. Louis	288	461	1	1
Seattle	063	3301	4	5

FIRE AND BUILDING CODES ADOPTED

2003 IBC, IFC and Life Safety Codes with Geneva amendments found at www.geneva.il.us/fd/fireprevention/preplans.htm

MUNICIPAL SERVICES

Village Bond Rating: Aa3
Annual Village Budget: $71,041,000 (2008-09)
Type of Government: Mayor/Council Home Rule: No
Municipal Zoning, Subdivision: Yes Last Comp Plan Update: 2003
Emergency 911 System: Yes Rescue Squad: Yes
Police Department: 49 Full-Time
Fire Department: 31 Full-Time 42 Paid On Call 6 Contract
Fire Insurance Class: ISO 3

UTILITIES

Water and Sanitary Service Provided by the City of Geneva

In 2008 the City constructed a $30 MIL Reverse Osmosis Membrane Filtration Plant which provides excellent water quality, reduced water hardness levels to 6 grains, and is sized for future expansion. For information, contact the Water Division (630) 232-1551.

In 2004 the City completed a $16.5 MIL Wastewater Treament Plant improvement. The plant treats 4 to 5 MIL gallons of wastewater per day (1.5 BIL gallons treated in 2007). The City maintains compliance of the NPDES permit at an average of 98% efficiency.

Water Source	3 deep wells, 4 shallow wells
Storage Capacity	2,750,000
Average Daily Demand	3,100,000
# of Metered Accounts	6,700

City of Geneva Water Rates

Cubic Feet	Usage Charge	Meter Size	Monthly Fixed Charge
0-1500	$3.37/ 100 cu ft	5/8"	$1.06
1,501-20,000	$3.15/ 100 cu ft	¾"	$1.11
20,001+	$3.07/ 100 cu ft	1"	$1.28
		1 ½"	$1.49
		2"	$2.09
		3"	$6.46
		4"	$8.08
		6"	$11.86

City of Geneva Sewer Rates

Class	Rate	Fixed Charge
Non-Industrial	$2.09/ per 100 cu	$0.77
Industrial	$3.18/per 100 cu	$0.77

Electric Power Provided by the City of Geneva

For information, contact the Electric Division (630) 232-1503.

Description	First 500 kWh	Over 500 KWh	Monthly Charge
Residential	0.10292 S 0.08161 W	0.08805 S 0.06972 W	$6.55
General Service	0.10368 S 0.08176 W	0.08556 S 0.06727 W	$13.10
Medium General	0.03635 S $16.24/kW[1]	0.0635 W $11.43/kW [1]	$47.63
Large General	0.03631 S $16.09/kW[1]	0.03631 W $11.20/kW[1]	$77.39
Large Industrial	0.03629 S $14.48/kW[1]	0.03629 W $9.49/kW[1]	$136.93

S - summer rates W - winter rates [1]demand changes

Source: Municipal Rates adopted by Ordinances
http://www.geneva.il.us/Departments/PublicWorks/rates.htm

Natural Gas Provided by NICOR

For information, contact the Regional Community Relations Director, (630) 629-2500.