Implementation of Energy Conservation Measures

at

St. Joseph Parish

I.Introduction

This report on the past, present, and future implementation of energy conservation measures was requested by and prepared for the Pastoral Council of St. Joseph Parish. The information, observations, opinions and comments contained herein are for the exclusive use of the Pastor, Pastoral Council and Finance Council of St. Joseph Parish. This report was prepared from my experience as a Master Electrician, and Electrical Contractor. In addition, I have serviced the specific electrical and mechanical aspects of the buildings and grounds of St. Joseph Parish for over 20 years.

II.Facilities

A. St. Joseph School:

The building is a 50+ year old 2-story flat-roofed masonry structure utilizing a 2-zone oil-fired hydronic heating system. The majority of the interior lighting is fluorescent. These two items consume in excess of 90% of the total energy needs of this building. Other small but not insignificant loads are localized air conditioning, water heating (oil-fired), as well as copiers, computer labs, etc.

Heating System

- Although a first-rate heating system when designed (late 1950's), the current configuration of 2 boilers and associated pumps is at best an inefficient one. The lack of double-pane glass and any type of building insulation keeps the fuel demand quite high compared to similar buildings using today's construction methods. Unfortunately, any capital investment efforts to correct either the window or insulation deficiencies would be prohibitively expensive, and would carry prolonged payback periods. Past conservation measures have included the addition of a night setback thermostat system and the replacement oil burners which now burn No. 2 fuel oil[1].

- August 2007 conservation measures have added a master timer system which controls the operation of the heating system and exhaust fans. This new "occupancy-based" system not only takes advantage of the night setback features of the previous system, but also incorporates the school calendar and other recurring events to maximize the use of heating

[1] The original oil burners were designed to burn No. 4 fuel oil, which produced enormous amounts of sulfur dioxide, as well as other pollutants; in all likelihood today's emission standards would prohibit the use of such oil burners.

fuel. Future upgrades might include the installation of controls to vary the boiler temperature with respect to the outdoor temperature in an effort to further reduce the amount of fuel oil needed. Consideration might also be given to replacement oil burners for these boilers. Although a complete boiler replacement might be the best scenario, this replacement would include an asbestos[2] abatement project as well, considerably adding to the overall cost.

Lighting Systems

Although the majority of the original lighting systems in the building were fluorescent, a now outdated technology was used to operate these fluorescent lamps. Smaller rooms and closets used surface incandescent lighting fixtures most of which still exist today.

Major conservation measures were taken in the early 1990's with regard to the fluorescent lighting in the school. All magnetic-ballasted (old technology) fluorescent lighting was replaced with electronic-ballasted fluorescent lighting under conservation programs and incentives offered by Northeast Utilities. All existing incandescent hallway lighting was replaced with electronic fluorescent lighting as well.

There are a number of areas that could be addressed to reduce electrical energy consumption. Primarily, the need for incandescent lighting should be reviewed and the majority of such lighting replaced with conventional fluorescent lighting or compact fluorescent screw-in lamps. These decisions would be made based on a comparison of retrofit cost vs. potential energy savings. Additionally, occupancy sensors could be installed in areas such as closets and rest rooms where lighting use is currently not managed efficiently by occupants. Again, these decisions could be made using a quick cost/benefit analysis. Utility rebates are available for some of these retrofits/upgrades. Finally, the building's operation could benefit from the implementation of a "user-awareness" program. Informational materials could be prepared and distributed to the different levels of occupants (e.g. Administrative, Teaching Staff, Custodial, and Student) illustrating the many way this building can be made "greener".

B. St. Joseph Parish Center:

The building is a 50+ year old 3-story flat-roofed masonry structure utilizing a 3-zone oil-fired hydronic heating system. The interior lighting is a mix of fluorescent and incandescent. Other loads include localized air conditioning, water heating (oil-fired), and office equipment as well as domestic cooking and laundry requirements.

[2] This asbestos has been encapsulated and poses no immediate danger to the building's occupants.

Heating System

- Again, a first-rate heating system when designed, the current configuration of a single boiler and associated pumps is less than optimal. Similarly, any capital expenditures to improve window or insulation deficiencies would be prohibitively expensive, and would carry extended payback periods.

- Previous conservation measures have included the addition of a separate forced warm-air heating system for the basement Atrium, Counting Room, Kitchen, and Meeting Space. Previously, these areas were only minimally heated, and generally at too low a temperature during the winter months to be comfortably utilized. The addition of this heating system in reality **conserved** energy by allowing the remainder of the mostly unoccupied building to be held at a lower temperature. Once more, future upgrades might include the installation of controls to vary the boiler temperature with respect to the outdoor temperature in an effort to further reduce the amount of fuel oil needed.

Lighting Systems

- The original lighting systems in the building were almost exclusively incandescent lighting due to the nature of its design and use. During the renovations of the late 1980's, many areas of the building were converted to fluorescent, although utilizing technologically older magnetic ballasts. Today, the upper floors of the building remain with mostly incandescent lighting owing to its residential character.

- Suggestions with regard to lighting for this facility mimic those of the school. The need for incandescent lighting should be reviewed and the majority of such lighting replaced with conventional fluorescent lighting or compact fluorescent screw-in lamps. Lighting in the Parish Center basement Meeting Room should be reviewed for possible energy savings through the use of electronic-ballasted fluorescent lighting. This may be a simple retrofit, or a complete change out of the existing lighting fixture. Similarly, these decisions should be made based on the cost of the retrofit vs. potential energy savings; many of these areas are not fully utilized, so spending $10.00 to install a fluorescent lamp that is rarely turned on would be counter productive. Again, there are areas where occupancy sensors could be installed in areas to manage lighting more efficiently. Utility rebates are also available for some of these retrofits/upgrades. Finally, informational materials might be prepared and distributed to occupants and users of this facility to illustrate areas where energy could be conserved.

C. St. Joseph Church:

The building is an 80+ year old 1-story slate-roofed masonry structure utilizing a 2-zone oil-fired[3] steam heating system. The interior lighting is an approximate 50-50mix of fluorescent and incandescent. Other loads include domestic water heating, cooking (both gas-fired), as well as refrigeration and small appliance equipment associated with a small scale commercial kitchen operation.

Heating System

- The current heating system is typical of a building this size and age. The single 2-zone asbestos-insulated[4] boiler generates 12-15 lbs of steam pressure on demand and distributes it through the use of motorized steam valves to the appropriate zones as required. Not unlike the Parish Center and St Joseph School, the lack of sidewall insulation and heat loss through single pane glass is a major factor. Architectural considerations and implementation costs have severely limited any economical efforts to reduce heat loss in these areas. Unlike the previous heating systems described, there is no practical way to adjust fuel consumption based on outdoor temperature. The original heating system was designed to keep the heated space at 72° on a 24/7 basis. Clearly there is no need to maintain this temperature throughout the week. Consequently, substantial fuel is used to bring the temperature from 56° to 68° during periods of occupancy. Minimizing the number of times the facility is raised to the higher temperature would certainly result in fuel savings at some level.

- Past conservation measures have included the installation of paddle fans (’88 renovation) as well as the addition of batt-type fiberglass insulation in the attic of the Church (late 90’s). There are few suggestions which could result in any significant energy savings with regard to heating. Continued use of the existing paddle fans is recommended to redistribute heated air back down to floor-level. Future consideration may be given to a dual-fuel burner which could take advantage of both the oil and natural gas services available. While total energy consumption may not be reduced, economic decisions could be made regarding which fuel to use and result in an overall dollar savings. There are currently 2 gas-fired water heater; one supplies water to original restroom facilities as well as the sacristy. The second supplies hot water exclusively to the kitchen. Thinking at the time was that the kitchen was used infrequently, and did not need a constant supply of hot water. Over the years, the kitchen has received a dramatic increase in its utilization. In light of these changes, it is recommended that these water heaters be consolidated and modifications made to existing recirculation systems.

Lighting Systems

- Again, the original lighting systems in the building were almost exclusively incandescent lighting owing to the nature of the available technology. Renovations of the Guild Hall (probably in the early 1950’s) converted most the lighting in this area to fluorescent, again

[3] Original fuel for this steam boiler was probably No. 6 bunker oil which had to be heated prior to ignition as a fuel source. Burners were changed to utilize the more familiar No. 2 fuel oil, and then changed again in the late 1980’s to use natural gas as a fuel source. As the price of natural gas rose, the boiler was changed back to No. 2 fuel oil were it remains today.
[4] This asbestos has also been encapsulated and again poses no immediate danger to the building’s occupants.

- using older-technology ballasts. Another renovation in the mid-90's added the suspended ceiling and recessed fluorescent and incandescent lighting we see today. As a cost-saving measure, the existing fluorescent lighting (along with PCB-type[5] ballasts) was left above the ceiling. While these PCB ballasts pose no danger to the building or its occupants, it is important to recognize their existence, and plan for proper future disposal. Chandeliers in the Church have been fitted with compact fluorescent lamps, reducing energy consumption. As in other buildings, LED (light emitting diode) type exit lighting has been installed to reduce energy and maintenance costs.

- Suggestions with regard to lighting for this facility again mimic those of the school and Parish Center. The need for incandescent lighting should be reviewed and the majority of such lighting replaced with conventional fluorescent lighting or compact fluorescent screw-in lamps. Again, there are areas where occupancy sensors could be installed in areas to manage lighting more efficiently. Existing fluorescent lighting in the Guild Hall could be retrofitted with electronic ballasts (utility rebates are available); this would standardize lamps types throughout the plant, and reduce maintenance cost. Finally, informational materials might be prepared and distributed to illustrate areas where energy could be conserved.

[5] Polychlorinated Biphenyls, an electrical insulating oil.

D. Grounds

Lighting Systems:

- As expected, much of the original exterior lighting was incandescent. Over the years, this has been replaced with varying forms of high intensity discharge (HID) lighting having a much higher light output per watt consumed. The overall energy consumption for exterior lighting has increased; this is attributable in part to an expansion of parking as well as the objective to provide a “safer feel” to Parish facilities.

III.Conclusions

In closing, the facilities at St. Joseph Parish are in relatively good shape considering the age of the buildings. Many large steps have already been undertaken with regard to their structural and ‘carbon footprint’ integrity. Continued monitoring and adjustment to procedures and guidelines currently in place is a crucial factor in maintaining our economically viable and eco-friendly facilities.

Respectfully Submitted,

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