RISE ENGINEERING
Division of Thielsch Engineering, Inc.
1341 Elmwood Avenue
Cranston, Rhode Island 02910

December 20, 2007

Beth and Russell Milham
Channing Memorial Church
135 Pelham Street
Newport, RI 02840

RE: Energy efficiency evaluation of buildings for Channing Memorial Church

Dear Beth:

We have presented our comments and observations of energy efficiency opportunities that may exist at the three buildings of the Channing Memorial Church. Our findings are based on site visits performed by John Fidrych and Wayne Ferri of our staff, as well as from a review of available energy consumption data provided by the Church, its tenants, and its energy suppliers.

OVERVIEW

Like most faith-based facilities, energy use per square foot is relatively low in the Channing buildings. A significant amount of the space is currently either unoccupied, or occupied for only a limited time each week. Although some efficiency opportunities exist, applying typical decision criteria such as simple payback or return on investment to these opportunities will likely result in little or no action, since the economics of potential improvements are not as attractive as would be found in other buildings of similar characteristics/construction but much longer occupied hours.

As a result, the single most important consideration for the facility to minimize its energy costs is to insure that spaces are only conditioned when the space is being used, and that temperatures are maintained at the lowest setting necessary to protect the building, its contents, and its systems. Based on our review of the usage data, it appears that the facility personnel and tenants are already very diligent in their temperature control practices.

ELECTRICITY USAGE

The facility appears to be served by six (6) separate electricity meters from National Grid. Five (5) of the accounts are listed in the name of the Church, and one is listed in the name of a tenant. Three (3) of the accounts used an average of well under 200 kWh per month during 2007, while a fourth used about 350 kWh and the fifth used about 500 kWh a month. Usage on these accounts was relatively constant throughout the year, with no unusual variation from season to season, and

no significant summer load due to air conditioning. These levels are at or well below the conventional average usage estimates for such accounts of about 500 kWh per month, and we did not observe any significant opportunity to reduce these further beyond some suggested practices listed below.

The sixth account showed average usage of about 1,273 kWh per month, with 75% of the use occurring during winter months of November through April. It is unclear whether the higher electrical usage was attributable entirely to usual conditions (more use of the facilities, shorter daylight hours, holiday lighting or electricity use for heating fan motors and circulators). It appears that there may be some supplemental use of electric resistance space heaters that could possibly be adding to the winter electrical loads. Their use should be minimized or eliminated if possible.

Suggested practices (these are already known to you):

- Wherever possible, use compact fluorescent lamps in place of incandescent lamps throughout the facility. National Grid participate sin a web site sponsored by utilities and service providers in the region (**www.myenergystar.com**) that includes the latest offers and discounts for this technology;

- In a similar vein, any appliances used within the facility's buildings should be Energy Star™ qualified. The aforementioned Web site also includes information concerning product offerings, discounts, and incentives for many appliances, including refrigerators, dishwashers, clothes washers and dehumidifiers.

Findings and recommendations for Sanctuary building

Building envelope:

- Attic: the flat and sloped ceilings are either tin or a very decorative plaster. The attic area is not accessible and it is not clear if anyone has ever been above the ceiling. The flat ceiling is approximately 60 feet off the floor and the roof is slate. In view of these conditions, no opportunity exists;

- Exterior walls: This is a large masonry building with a stone exterior. There is evidence that there is no insulation in the wall cavities. Through an opening in the wall, brick is visible. Thus, even if the interior plaster surface were drilled and plugged to allow blown-in insulation, the likelihood of a resulting moisture problem precludes this recommendation;

- Basement ceiling: The basement ceiling is framed with 3" x 12" joists - 12" o/c, with about 10 feet of head room above the dirt basement floor. There is asbestos in poor condition on abandoned steam pipes, as well as on the dirt floor. Work should not be done in this location until this area has been made safe by an asbestos abatement contractor. There is also a fair amount of storage debris that would need to be removed prior to trying to install this insulation. If the aforementioned conditions were addressed and abandoned pipes removed, there is air sealing and basement ceiling insulation work that could be completed. However, in view of these conditions and the chance that the space may one day be converted into office space, there is no cost-effective opportunity to address this area at present.

- Weatherstripping: The main doors of do not fit snugly within their frame. These doors could be weatherstripped to prevent excessive air leakage.

Heating equipment: The building is currently heated by an oil-fired furnace with an input rating of 450,000 Btu/hr that is in relatively poor condition It is presently fired with a 3 GPH nozzle for a maximum output of 336,000 Btu/hr if operated at its original design efficiency of 80%, but it is more likely operating at efficiencies of 20% less than its original design. Temperatures in the space are maintained at 50˚F except during occupied periods Fuel use records indicate consumption of approximately 2170 gallons of oil during the period between 11/06 to 4/07.

The existing mechanical room has gaps and openings throughout the room. Per code, fire dampers with access doors should be installed where the ducting penetrates what should be fire rated sheetrock. All seams should also be caulked with fire rated sealant. Fire rated doors should also be installed.

Replacement of the existing system with a new Thermopride oil fired furnace of similar capacity can be considered, rated at 80%+ efficiency. Although some higher efficiency oil-fired furnaces are on the market, care must be exercised to insure that they will provide the reliability and durability that the Church would expect. Estimated costs for a new furnace would be $18,000 and at least another $3,000 to upgrade the duct penetrations with new fire dampers. Assuming oil costs at $3.00 per gallon, savings of 20% on the 06-07 usage would yield a simple payback of about 15 years.

Subject to consultation with National Grid Gas to determine whether the existing gas service on the site is adequate, another alternative that can be considered is a switch from the current oil-fired system to a set of two or three smaller capacity gas-fired 92% condensing furnaces totaling the required heating load of the building. Each gas furnace could be a zone using an existing branch of the ducting. This would be a good application for much more efficient

equipment. National Grid Gas provides a $400 incentive for each 92% efficient furnace installed that incorporates a high efficiency motor. The cost of the smaller units and gas piping would be the same or less than replacement of the oil fired unit with of the same kind. Based on current gas rates, the National Grid incentive, and the improved level of efficiency, it is expected that a simple payback in the range of 10 years would be expected if this measure can be implemented.

Findings and recommendations for the "Parish Hall"(rear building)

Building envelope:

- Attic: The 3rd floor is not presently occupied and therefore, it should not be heated. The pieces of baseboard heating element should be drained in the boiler room until such time as it becomes necessary to heat the space because it becomes occupied. If the 3rd floor is not going to be occupied in the near term, it may be possible to drill and plug the ceiling and the stairway walls to isolate the 2nd floor conditioned space from the unheated floor above. The floor and ceiling surfaces would have to be evaluated to see if there are structural limitations that might not support the weight of the insulation;

- Exterior walls: Evidence of blown-in cellulose insulation in the exterior walls was found through a thermographic scan of the areas. Further, there is evidence of drill and plug marks in the board and batten siding where it is assumed insulation was blow in. During a prior renovation, it appears that the 1st floor had kraft faced fiberglass insulation installed at that time. No further opportunity exists;

- Basement ceiling: R-19 faced fiberglass insulation exists in the basement ceiling. It is installed properly with the paper face up. and held in place with wire supports. Some wire supports are out of place and needs to be re-secured. The basement has a dirt floor and there is evidence of much moisture in this area. This excessive moisture can negatively affect the performance of the insulation. There is also evidence of the gas pipes rusting due to this moisture, and the condition was pointed out to site personnel.

- Windows: The removal and disposal of the existing storm windows, and the installation of "Harvey Tru-Channel" aluminum triple track storm windows (or equivalent low infiltration unit) is recommended. In addition to providing additional protection from conductive heat loss, they will reduce air infiltration through the window openings without modifying the original wood windows. They are available in white, almond or bronze, and the average installed cost is between $185 to $205 each based on the size of the windows. Energy savings of approximately 10% of current heating costs can be expected.

Heating and water heating equipment: The building is currently heated by two (2) gas-fired Burnham boilers Model PB-W-22AN, each rated at 146,000 Btu/hr output. The boilers are in fair condition, and are located in the basement. There are two gas-fired 40 gallon hot water heaters in good condition located in basement, one for each floor. Annual heating gas usage is estimated at 1,850 therms, and annual water heating is estimated to use 240 therms of natural gas.

The installation of a Buderus 93% efficient modulating condensing gas fired wall hung boiler (ore equal) for each floor is recommended. These units are highly efficient, and are eligible for an incentive from National Grid Gas of $1,000 each to help partially offset the installed cost of approximately $7,200 each. Savings of about 25% of current use will be achieved.

The installation of an on-demand gas-fired water heater (Rinnai or equal) for each floor is also recommended. These small efficiency units operate at 87% efficiency, in large part due to the elimination of the need to store large amounts of hot water on a standby basis. These units cost about $1,500 - $1,800 installed, and they are eligible for a National Grid Gas rebate of $300 each. Savings of about 40% over current gas usage rates would be expected.

If separate metering and equipment for each floor is not required, installing one heating system and one hot water system to take care of the whole building would require a substantially smaller investment – perhaps as much as one-third less than the cost of two independent systems.

Findings and recommendations for Channing House

Building envelope:

- Knob and tube wiring: There is evidence of some live "Knob and Tube" electrical wiring throughout the building. Because this wiring release heat, it should not be in contact with any form of insulation. There is evidence of substantial recently installed wiring as well – it is assumed that a licensed electrician is cognizant of the insulated areas and has taken steps to insure that any remaining knob and tube wiring is not in contact with any insulation.

- Attic: There is visual evidence of insulation in the accessible floored-over attic areas. There are two (2) areas of the building with flat roofs. We are unable to determine the level of insulation in these areas. with flat roofs. No cost-effective opportunity in these areas is apparent;

- Exterior walls: Evidence of blown-in cellulose insulation in the exterior walls was observed through a thermographic inspection of the exterior walls. Cellulose wall insulation was also visible from the basement from an opening that an electrician had made to run new wires.

- Basement ceiling: There is a small crawl space area on the left side of the building faced fiberglass insulation, but it was installed incorrectly with the paper face down. The rest of the crawl space does not have enough head room to permit someone to access the area to install insulation.

  The basement is warmed during the heating season from the standby losses from the 2 heating systems. If the waste heat is cut down by updating the heating equipment, R19 faced fiberglass insulation could be installed to the basement ceiling, but the remainder of the plaster and lath ceiling would need to be removed by the client, and the large amounts of storage materials would have to be removed. The services of an asbestos removal contractor are required to clean up the asbestos that is loose on the pipes and on the floor.

- Windows: The removal and disposal of the existing storm windows, and the installation of "Harvey Tru-Channel" aluminum triple track storm windows (or equivalent low infiltration unit) is recommended. In addition to providing additional protection from conductive heat loss, they will reduce air infiltration through the window openings without modifying the original wood windows. They are available in white, almond or bronze, and the average installed cost is between $185 to $205 each based on the size of the windows. Energy savings of approximately 10% of current heating costs can be expected.

Heating equipment: The building is currently heated by two (2) oil-fired Burnham boilers Model VP 190,000 Btu/hr output The boilers are in fair condition, and are located in the basement.

The installation of a Buderus G115/28 oil-fired 86% efficiency boiler (or equal) is recommended for the first floor system. The boiler can be equipped with a reset control, which allows the boiler to operate at lower temperatures during times when moderate outdoor temperatures means that the full output capacity of the boiler is not required to keep the building comfortable. The combination of a more efficient boiler and the reset control should enable a reduction of about 25% of the estimated current heating requirement for this space of about 500 gallons of fuel oil.

The installation of a Buderus G115/34 oil-fired 86% efficiency boiler (or equal) is recommended for the second floor system. As with the first floor system, the boiler can be equipped with a reset control. The combination of a more efficient boiler and the reset control should enable a

reduction of about 25% of the estimated current ~900 gallon annual heating requirement for this space.

I hope that this information is useful to you, and I apologize for the lengthy delay in assembling these comments. Please feel free to contact me at (401) 784-3700 extension 115 or via e-mail at **vgraziano@riseenginering.com** if you have any questions or comments.

Best wishes for success in your efforts.

Sincerely,

Vincent R. Graziano
President