

5/17/2011



First Presbyterian Church of Florence, SC  
700 Park Ave  
Florence, SC

### **Building Assessment Report**

Upon visiting First Presbyterian Church of Florence, the following has been assessed for the HVAC equipment:

#### **Sanctuary Building**

- There are four air handling units that use chill water for cooling and hot water for heat. The units range in size, but for the most part, they are large units. There are no date codes on the units; however, they are original to the building which would make them around 60 years old. They are definitely in the last stages of their useful life.
- There is one 60 ton air cooled McQuay Chiller that is outside the building, and it serves the four air handling units. The pumps for the Chiller are in the mechanical room.
- There is one 672,000 BTU output Peerless Boiler that is in the mechanical room, along with the pumps for it. The Boiler is original to the building which makes it around 60 years old. It supplies hot water for the four air handling units, which in turn supplies heat for the building.

#### **Education and Office Building**

- There are five Carrier split systems that vary in size. The largest is a 7.5 ton split system. The majority of these are models from the 1990's, with exception of a few that are newer. The newer units are in good shape, and the older units are in decent shape.
- There is a 5 ton Carrier package unit that serves the Pastor's office and a few other offices in that area. It has been replaced recently.
- There is a 504,000 BTU output Peerless boiler for this building as well. It is older and still working to provide heat. This boiler is in decent shape given its age.
- There are also multiple window units and wall units that are still being used. They are located in most of the rooms and offices. These are older, with the exception of a few that been replaced.

### **Youth/Gym Building**

- There are nine roof top package units that serve this building. Most are units that are from the 1990's era. The unit's are decent shape given their age. They vary in size with the largest being a 14 ton and the smallest being a 4 ton.
- There are a few Bard units on the side of the building that serve a few of the upstairs rooms on this building. These units are in pretty decent shape.

### **Life Cycles of Equipment**

- Peerless Boilers for Both Buildings – Life cycle has past standard
- McQuay Air Cooled Chiller – Less than 10 years remaining
- Sanctuary Building Air Handlers – Life Cycle has past
- Wall Units – Life cycle has past standard
- Window Units – Life Cycle has past standard
- Pastor's Office 5 ton Package Unit – 12 years remaining
- Meeting Hall in Education Building – 12 years remaining
- Youth Building Rooftop Package units – 5 to 7 years remaining
- Kitchen Unit – 2 to 4 years remaining
- Carrier Gemini unit for Education building – 12 years remaining
- Carrier Split Systems for Education building – 2 to 4 years remaining
- Bard units – approximately 7 years remaining

### **Cost of Replacing Equipment**

- 7.5 ton split units (3) - \$10,000
- 5 ton split units (3) - \$8,000
- 5 ton package unit (3) - \$7,000
- 4 ton package unit (1) – \$6,000

- 10 ton package unit (4) - \$14,000
- 14 ton package unit (1) - \$18,000
- 672k BTU Boiler (1) - \$30,000
- 504k BTU Boiler (1) - \$27,000
- 60 ton air cooled chiller (1) - \$70,000
- Sanctuary air handler unit (1) - \$18,500
- Sanctuary air handler units that serve the ends (2) - \$10,000
- Choir Loft air handler unit (1) - \$13,500
- \*\*\*All prices are budget figures. When time for replacement comes, please revisit figures\*\*\*
- \*\*\*Prices are per unit replacement. Number in parenthesis is the quantity of units in the facility\*\*\*

### **Findings**

- The sanctuary air handlers need to be addressed relatively soon. These units are original to the building, and have outlived their life expectancy. These units are very inefficient, and now cost more to operate and repair, than replacing.
- The church is already aware of the condition of the boiler that serves the sanctuary building. This is a main concern that needs to be addressed as soon as possible. The boiler has experienced a failure, and is not worth repairing. In order to be prepared for the cool weather, this boiler needs to be replaced during this summer.
- The sanctuary mechanical system is very old, but it has been slightly updated. It was originally a two pipe system that has been converted to a four pipe system for better control of the system. According to the church, the boiler and the chiller both run at the same time to control humidity in the building. This is a very inefficient and extremely expensive way to do this.
- The chiller is in good shape and not that old. Since the equipment in this building are either nearing their life expectancy or have past their life expectancy, this would be a good time to either explore other options or look at replacement (this will be addressed later in the report).
- There is a Carrier CCN building automation system that controls part of the building's HVAC equipment. This is relatively new to the building, and has helped greatly with the control of the system.

- The wall units and window units that are in the Education/Office building are very inefficient. They have various infiltration points surrounding them, causing the units to run in an inefficient manner. They have also outlasted their life expectancy. A few have been already been replaced, but there are still many more left (this will be addressed late in the report).
- The split systems that serve parts of the Education/Office Building are in pretty good shape. With that said, these split systems are also “obsolete” from an EPA stand point. The EPA has demanded a cease on all manufacturing of R-22 air conditioning systems. They have also demanded all new systems be 13 SEER or higher. SEER stands for “Seasonal Energy Efficiency Ratio”. This is how the EPA rates the efficiency of an air conditioner. The existing split systems are still legal and parts are still available for them, but they are technically “obsolete” according to the EPA’s efficiency rating. This does not mean that these units need to be replaced right away.
- The roof top units on the Youth Building are in good shape as well. Parts are still available for them; however, they do fall into the same category of being “obsolete” according to the EPA’s efficiency rating. This does not mean that these units need to be replaced right away. This just means that according to today’s standards of efficiency, they are much more inefficient.
- The Church does have a maintenance program in place for the HVAC system. This is a necessity for the facility. Properly maintained systems are much more efficient, and have less breakdowns and repairs than those that are not properly maintained.
- There is an estimated 5% to 50% energy savings with a properly maintained system versus a system that has not been maintained. This varies for all the maintainable components in the system, and depends on the condition of the equipment.

### **Replacement Options and Budget Figures**

- Sanctuary Building Options
  - **Split Systems** - The air handlers could be replaced with split systems, which would eliminate the need for a chiller and a boiler as well as loop pumps. Condensing units would be placed outside and new air handlers would be installed instead of ones with hot and chill water coils in them. Several units could be installed to provide redundancy throughout the sanctuary itself. This would allow for redundancy incase one unit went down, there would still be some air from the other units. In the case of a boiler and chiller, if they happen to fail, then the whole building suffers from one failure. Price - \$120,000 for the two small splits for each end of the building, the choir loft unit, and two splits to serve the sanctuary.
  - **Same Equipment** - The air handlers could be replaced with like equipment. This would keep the system intact and not stray from the original design. This would also mean that the boiler will have to be replaced as well, since it is needed for heating with this design.

The current boiler has suffered a major failure and has to be replaced if this option is elected. A more efficient boiler with proper controls would greatly increase the efficiency of the system. The chiller is in good shape, and does not need replacing at this time. Further down the road the chiller will need to be replaced. \*\*\*Please see "Cost of Replacing Equipment" for budget figures\*\*\*

- **DX with hot water coils** - There is the option of replacing the air handlers with ones that contain a hot water coil and a DX coil for cooling. This would allow the church to keep the boiler (that needs replacing) and use it for heating, but allow condensing units to cool the space and eliminate the need for the chiller. This would also eliminate the need for chill water loop pumps. Price - \$130,000 for two splits to serve the ends of the building, the choir loft, and two for the sanctuary. All with hot water coils for heating and DX coils for cooling.
- **Package Units** - Package units could be another option for the sanctuary. This would entail replacing the air handler units with package units outside, and re-routing the duct work to connect to the outside units. This would allow one single point of placement for the equipment to be maintained and serviced. Would also allow for easier replacement in the future. Price - \$160,000 for two package units for the sanctuary, package units for each side of the building, and a split for the choir loft (too difficult to convert to a package unit)
- **Education/Office Building**
  - **Same Equipment** - The split systems that are currently in place for this building are sufficient for the building's needs. When it comes time for replacement, they will need to be replaced with a minimum of a 13 SEER unit equivalent to the existing unit (See Life Cycle section for life expectancy of the units). \*\*\*Please see "Cost of Replacing Equipment" for budget figures\*\*\*
  - **Ductless Splits for Wall Units** - The wall units that serve certain areas of this building will definitely need replacing. They can be replaced with a ductless heat pump split system. This would eliminate the need for the boiler that serves these units (which will need replacing unless this option is elected for all the wall units). Price - \$5,000 per unit
  - **Boiler** - Boiler will need replacing, unless wall units will be done away with, then it would no longer be needed. The current boiler is very inefficient, and the building would greatly benefit from a new efficient boiler with the latest operating controls. \*\*\*Please see "Cost of Replacing Equipment" for budget figures\*\*\*
  - **New Building** - The church has informed us that there might be talks of a new building for this area of ministry. This would be ideal for this space. Then a whole new system could be put in place that would run more efficiently. Price depends on what an engineer would spec for the building.

- Youth Building
  - **Same Equipment** - The current roof top package unit system in place is the best set up for this building. When the time arrives to replace these units, it would be best to replace them with the same style, but a newer more efficient model. \*\*\*Please see “Cost of Replacing Equipment” for budget figures\*\*\*
  - **Bard Units** - The Bard units on the building that serve several areas are in good shape. Replacement will not be needed for a few years. Replacing them with the same equipment would be the best scenario for the building. If another option is preferred, there will be extra cost for construction/renovation to make another system work and still look professional. Price for Bard Unit Replacement - \$7,000 to \$9,000 depending on tonnage.

**\*\*\*All pricing are budget figures, and will need revisiting at time of replacement\*\*\***

### **Recommendations**

- The best system replacement for the sanctuary building would be going with the split systems. There will be redundancy for the sanctuary, which is important, in our opinion. This would also reduce the cost of energy of having to run a big chiller when the demand is not needed. Repairs would be more frequent than with the original system (fan motors, compressors, etc...), and also slightly more expensive on initial installation compared to replacing the air handlers with like equipment. However, the pay back with energy consumption and redundancy would out-weigh the cons.
- If constructing a new facility for the education/office building is the plan, then this would be ideal for this building. Given all the wall units, window units, and the old boiler, it would be much better to start from scratch with an efficient and economic system. If this is not the plan, then it would be best to replace the split systems when they fail, and replace the wall units with ductless heat pumps when they fail.
- Replace the roof top units on the youth building when they fail.
- A building automation (control) system would help the facility run more efficiently. Some benefits include: easily accessible and monitored by the web, schedule changes very easily, system runs more efficiently, system alerts sent via email or text messaging, early detection of problems with the system, and energy savings. Every building would greatly benefit from this. While performing the assessment, there were multiple systems running and cooling even though the spaces were vacant. This is a contributor to a higher energy bill. The sanctuary building does have a control system. Recommend either upgrading to a newer version of that system or exploring other system manufacturers. Money spent on a building automation system is money well spent. Usually the pay back for a system is only a few years. If a building

automation system is not added to every building, at the very least the church should replace every thermostat with programmable thermostats. This would also help eliminate waste in energy.

- A good, quality, comprehensive maintenance program needs to be put into effect. This will ensure the belts stay tight, the coils are clean, the drain pans and drain lines are clean, the indoor and outdoor coils stay clean, filters are changed regularly, the heat exchangers are inspected, the economizer filters are clean, someone would be notified if any pulleys are becoming worn, and boilers stay in good shape. All of these things affect system performance and efficiency. When everything is maintained properly, it helps prolong the life of the equipment, increases efficiency of the units, reduces down time, reduces service calls, and saves energy. According to the church, there is already one in effect. Recommend keeping a very comprehensive maintenance program in place at all times.

### **Control System**

- Based on current system for all buildings - \$135,000 ( 20% - 30% in energy savings)
- \*\*\*Prices are budget prices and will need revisiting when time for proposal comes\*\*\*

### **Maintenance**

- Minimal - \$8,000 (minor maintenance with no filters or coil cleanings – would be done on a time & material basis)
- Standard - \$12,940 (overall standard maintenance with filter changes and coil cleanings)
- More Comprehensive - \$22,180 (same as standard but with more hours dedicated to saving energy and increasing the efficiency of the units)
- Full Maintenance - \$42,620 (covers all maintainable parts, service calls, etc...)
- \*\*\*These are the prices for each type of maintenance agreement. Prices do not need revisiting\*\*\*

These are the findings at First Presbyterian Church of Florence. I hope this report and the recommendations herein are useful.

Please contact us if you have any questions, or would like further explanations.

Thank you for giving us the opportunity to provide your facility with an assessment.

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