



All Pilgrims Church

Mechanical Report (Fire Sprinkler, Plumbing, and HVAC)

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For:

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Executive Summary

The All Pilgrims Church is not equipped with a fire sprinkler system, nor Americans with Disabilities Act (ADA) compliant restrooms. It has an old heating and ventilation system that is largely worn out. No areas have cooling (air conditioning).

We recommend that the Church consider its goals and priorities in regard to mechanical systems and make educated choices.

We recommend that the building be equipped with a fire sprinkler system and that the restrooms be upgraded to comply with ADA requirements. We recommend that the heating and ventilation system be replaced in its entirety. There may be some radiators that can be reused depending on the type of system that the Church chooses.

General

We visited All Pilgrims Church on November 17, 2010 to review the existing mechanical systems. The church was built in 1906 and has approximately 26,000 square feet of finished space.

Existing Envelope

The existing building envelope is historic and original to the building. The building envelope is not considered to be energy efficient; it is essentially uninsulated.

Existing Systems

Fire Sprinklers

An important life-safety element in modern buildings is a fire sprinkler system. All Pilgrims Church does not have such a system, although if the building were built today, a fire sprinkler system would be required by Code.

Plumbing

Each level has a central toilet room. The restrooms are equipped with flush-valve toilets and wall-hung lavatories. These fixtures are in serviceable condition. The owner reports that only having one restroom on the first floor is problematic, since only one person is able to use the restroom at a time and there is often a line of people waiting for the restroom. Additionally, the owner reports that the flush-valve toilets don't always flush adequately. This may mean there is not enough building water pressure to operate the flush-valves.

The restrooms do not meet ADA requirements for faucets or clearances.

The First Floor office area has a single dedicated restroom, but it is not functioning. The Second Floor has an additional restroom for the Caretaker.

There is an abandoned shower room in the basement with four showers; the showers are reported to be not functioning. There is a domestic washing machine and dryer in this room that is functioning.

There is a commercial kitchen on the on the First Floor. It is equipped with a three-pot sink with faucet and spray hose. It also has a scullery sink with integral dishwasher and stainless steel side boards. Both fixtures are of robust quality and have additional service life left.

The building has a gas-fired water heater in the basement boiler room. It is a RUUD Model RF067, natural gas, 114 MBH input and 67 gallons storage. It is nearing the end of its service life.

HVAC (Heating, Ventilation, and Air Conditioning)

The Church is heated by steam, which is generated by a gas-fired steam boiler in the basement boiler room. This is a US Radiator unit installed in 1928 with a capacity of 1,600 MBH. The burner was replaced in the 1970's. The boiler is beyond the end of its service life. The owner reports several ongoing problems with the boiler, which is not surprising considering its age and condition. It is also inefficient compared to modern boilers.

Steam is supplied to various heating units throughout the building. Lewis Hall is served by two steam unit heaters. They are both at the end of their service life, with one missing its fan entirely. The Sanctuary is served by two fan powered steam coils with ducted supply and return. Although functioning, these units are near the end of their service life. The Sanctuary also has several historic steam convectors for supplemental heat. These convectors are of robust quality and still have some service life left. Stuart Hall is served by a steam air handler with ducted supply, return and outside air. The remainder of the building (offices, classrooms, chapel, kitchen, and hallways) are heated by a combination of various steam convector units. On the whole the convectors are of robust quality and have additional service life remaining.

In many cases the steam (supply) and condensate (return) pipe throughout the building is as old as the boiler. Some piping has been replaced over the years, so the steam pipe may have additional life left in it. Steam condensate piping is corroded by the condensate as a regular consequence of the process, so the condensate pipe is likely at the end of its life. The owner reports some leaks from the condensate pipes, which is not surprising.

The building is equipped with pneumatic controls. However, these controls have been inoperable for some time. The compressor was damaged in a fire and has not been repaired or replaced to date. As a result, the building has no functioning heating controls. The building remains mostly unheated throughout the week. On Sunday mornings, the boiler is turned on full fire and brings the entire building up to temperature. Because of the lack of control, the current building comfort is poor. This is also a very inefficient use of energy.

The kitchen range hood is operational, but is reported to be very loud. The current hood arrangement no longer meets Code. To meet Code the hood would need to be replaced, the exhaust duct go to a fan on the roof, and a makeup unit installed to make up the air that the hood exhausts. If the kitchen is not remodeled, it is considered to be "grandfathered in" and would likely not be required to be replaced. However, its function is substantially less than modern systems required for similar cooking appliances.

Potential Future System Upgrades

The church will need to make decisions on mechanical system upgrades. This can be a challenging exercise. We recommend as a first step that the church prioritize the following list of possible goals and priorities. Balancing these items will be an ongoing process throughout the mechanical system upgrade decision process.

Goals and Priorities

Life safety priority in this case refers to adding fire sprinklers, and the major plumbing issues are ADA accessibility and the number of fixtures available for use on the First Floor. HVAC goals and priorities might include the following.

- Good indoor comfort.
- Reasonable first cost.
- Good energy efficiency.
- Reasonable operating cost.
- Minimal maintenance.
- Sustainable (“green”) features. (Some examples below)

Plumbing

Low flow fixtures

High efficiency domestic water heat (98% rather than 80%)

Collect and retain rainwater for building use

HVAC

High efficiency boilers for space heat (88-95% rather than 80%)

Variable speed drives for fans

Turning off equipment when it is not needed

Natural ventilation in lieu of mechanical cooling for spaces

High efficiency mechanical units (efficiencies that exceed Code minimums)

As a starting point, we offer the following suggestions for future mechanical system upgrades. These suggestions are based on our understanding of the church’s programming needs, their issues/problems with current systems, and our experience with similar buildings.

Fire Sprinklers

This is an historic wood-framed structure with relatively large assembly spaces and as such, a fire sprinkler system seems especially important. Adding an automatic fire sprinkler system would be required by today’s Codes and would be a life-safety improvement to the building.

Cost Estimate: \$100,000 plus the cost of a new water service from the street (Note that this may be more expensive if special steps are taken to hide sprinkler pipe in spaces such as the Sanctuary).

Plumbing

The addition of a second restroom on the first floor level would greatly reduce the wait times that are currently experienced. **Plumbing Cost Estimate: \$15,000.** Note that plumbing is not the major cost here; there would be architectural and electrical costs as well.

If additional plumbing fixtures are added to the building, the incoming water line and meter sizes will need to be reviewed. If a new cold water service is required, we would suggest **Cost Estimate: \$10,000.** The City charges for new meters and these fees can be large. We would anticipate an **additional fee of \$10,000** for a new water meter.

The inadequate flush of flush-valve toilets may be due to lack of building water pressure. This could be due to several possibilities. Two likely candidates are inadequate pipe size or lack of pressure to the building from the street. **Re-pipe Cost Estimate: \$10,000.** If there is inadequate site pressure, a booster pump could be added. **Booster Pump Cost Estimate: \$10,000.** Because of the large number of unknowns with this symptom, we recommend further investigation before proceeding.

Replacing the existing water heater will be necessary in the near future, as it is nearing the end of its service life. **Cost Estimate: \$15,000.**

We understand that the abandoned shower facilities in the basement are not intended to be upgraded.

We anticipate no plumbing upgrades to the existing kitchen area.

HVAC

The existing HVAC system is in rough shape. No part of the system is fully operational as it was designed to be. We recommend removing the entire HVAC system and replacing with a new system.

We recommend a different heating source than the current steam system. Although steam systems have some positive aspects to them, they are more costly, less efficient, and require more maintenance than other heating options.

Below are three possible HVAC system options. They are in order from least first cost (but less efficient, less comfort, more long-term cost) to most desirable (most efficient, increased comfort, best system longevity, but highest first cost).

Option One: Least First Cost

One direction to go is to install very simple systems, such as gas furnaces and electric wall heaters. With this system type, we anticipate the following HVAC scope of work:

- Gas-fired furnaces for the Sanctuary, Chapel, Lewis Hall, and Stuart Hall.
- Electric baseboard heat for the First and Second Floor offices, as well as the Caretaker's apartment (if the windows are operable).
- Exhaust fans for restrooms
- Stand-alone, electric/electronic controls (thermostats)
- Leave the Kitchen systems as "grandfathered."

Option One Cost Estimate: \$240,000

Pros: These systems require very little maintenance. They can be run to failure and then replaced fairly straightforwardly. This is also the least first cost option.

Cons: These systems are the least efficient of the three options. Gas furnaces efficiencies are typically in the 80-90% efficiency range. Gas furnaces and electric wall heaters only have an expected life of around 15 years. Funds for replacement therefore become required on a semi-regular basis. (Replacement Cost Estimates: Furnace: \$15,000 each, Electric Baseboard: \$1,000 each) The spaces with electric wall heaters would depend on occupants opening windows for ventilation. If there are extended periods of time where the windows are closed, the space will be unventilated and potentially stuffy.

Examples of church with this system type are: LDS church standard prototype (although not with electric baseboard), Bellevue Christian Church, Sacred Heart (Seattle Center).

Option Two: Hydronic (Hot Water) Heat with Central Boiler, Cooling Rental Offices

Another option is to install a longer-lasting, more robust heating system, such as a central boiler plant with hot water air handling units and convectors. This is a very common heating system for urban church facilities. With this system type, we anticipate the following HVAC scope of work:

- Central boiler plant with high-efficiency gas-fired boiler
- Heating water piped throughout the building
- Hot water air handling units for the Sanctuary, Chapel, Lewis Hall, and Stuart Hall.
- Convert the existing radiators in the Sanctuary to hot water (rather than steam).
- Hot water baseboard heat for the First and Second Floor offices, as well as the Caretaker's apartment (if the windows are operable).
- Small hot water heating/refrigerant cooling unit for the Second Floor offices to be rented out.
- Exhaust fans for restrooms
- Stand-alone, electric/electronic controls (thermostats)
- Leave the Kitchen systems as "grandfathered."

Option Two Cost Estimate: \$400,000

Pros: Modern gas-fired boilers are very efficient. Boiler efficiencies are typically in the 90-98% efficiency range. Boilers and associated hydronic piping are robust and can have life expectancies from 50-100 years (depending on exact type and maintenance). Therefore replacement cost will be minimal for the foreseeable future.

Cons: First cost is higher than the gas furnace option. The spaces with hot water baseboards would depend on occupants opening windows for ventilation. If there are extended periods of time where the windows are closed, the space will be unventilated and potentially stuffy.

Examples of church with this system type are: Saint James Church, Saint Anne Church (Queen Anne), Our Lady of the Lake (Lake City), Saint James Rectory, Blessed Sacrament Church, Christ our Hope Church, Holy Rosary Parish Center and Chapel.

Option Three: Sanctuary Radiant Floor & New Kitchen Hood

This option is identical to Option Two, but has radiant floor heat in the Sanctuary and adds modern range hood exhaust hood to the kitchen. With this system type, we anticipate the following HVAC scope of work:

- Central boiler plant with high-efficiency gas-fired boiler
- Heating water piped throughout the building
- Hot water air handling units for the Sanctuary, Chapel, Lewis Hall, and Stuart Hall.
- Eliminate the radiators in the Sanctuary and provide a radiant floor with hot water heat.
- Hot water baseboard heat for the First and Second Floor offices, as well as the Caretaker's apartment (if the windows are operable).
- Small hot water heating/refrigerant cooling unit for the Second Floor offices to be rented out.
- Exhaust fans for restrooms
- Stand-alone, electric/electronic controls (thermostats)
- New Type 1 Kitchen Range Hood exhaust system. Replace the kitchen hood and install a modern Type I hood with fire suppression, ductwork to the roof and a rooftop exhaust fan. Provide a hot water air handling unit for makeup air for the hood.

Option Three Cost Estimate: \$460,000

Pros: Same as Option Two, with the following additional benefits. A radiant floor in the Sanctuary would add a great deal of comfort. The warm floor radiates heat directly to occupants, resulting in a very comfortable environment. Radiant floors are also inherently efficient in very tall spaces like the Sanctuary. With a forced air system, the heated air stratifies, which means basically heating all of the air in the space from the top down before heat reaches occupants. A heated floor radiates heat directly to occupants. The benefit of the modern Type 1 kitchen exhaust system are improved life-safety and reduced noise in the kitchen.

Cons: Same as Option Two. First cost is higher than Option Two because of the additional equipment.

Examples: Blessed Sacrament (University District) is a tall space with radiant floors.

Please note that with all three options, we recommend the church employ an outside service contract for HVAC system maintenance. Proper maintenance is critical for maintain system efficiency and equipment longevity.

Also, it would be wise for someone at the church to be the maintenance point person to make sure that the maintenance provider is performing as necessary and as promised. No outside service will care as much as someone who is a member of the congregation.

We trust that with this information, the owner can begin the process of choosing the mechanical and plumbing scope of work that best suits their current and future needs.

If you have any questions, please give us a call.