Existing Conditions and Recommendations

Mechanical, Electrical and Plumbing Conditions Assessment & Recommendations

Introduction

The purpose of this report is to present a description of the existing mechanical, electrical and plumbing systems at the Hall of Waters, assess the present condition and recommend improvements. We visited the site on December 14, 2011 to survey the mechanical, electrical and plumbing systems and met with building maintenance staff.

The Hall of Waters was constructed in 1937. Besides the Hall of Springs, where mineral waters were available at fountains, the building also housed men's and women's hydrotherapy departments, a swimming pool, locker rooms, offices and bottling facilities. Through the years the building use has changed and many of the original spaces have been repurposed or abandoned as outlined in the report below. The building was placed on the National Register of Historic Places on June 9, 1983. Care shall be taken during any mechanical, electrical and plumbing repairs, upgrades, removal or installation of new equipment to protect the historic fabric of the building.

Existing Mechanical Systems

The following sections provide a description of the existing mechanical equipment and an assessment of its condition. Recommendations for each area are also included. These sections convey a piecemeal approach to replacing the existing equipment, with the zoning and overall concept remaining the same. The section on Mechanical Master Plan describes a holistic approach to renovating the mechanical systems.

General Description

The existing heating plant consists of two 100 horsepower low pressure steam boilers located in the Boiler Room G30 on the east side of the ground floor (Figures M1 & M2). One of the two boilers is currently out of service. The boilers provide steam to radiators (approximately 86), unit heaters (approximately 6), and three ventilation units with steam heating coils. The boilers also serve a heat exchanger for a snow melt system.

For the purposes of this report, we will refer to the heating and ventilation unit located on the west side of the basement level in Open Area 004 as HVU-1. The remaining two units are located in the Fan Room P02. The unit on the west side of the penthouse mechanical room was retrofitted with a direct expansion (DX) cooling coil in 2006 and will be referred to as AHU-1. The unit in the center of the penthouse mechanical room will be referred to as HVU-2.

The Pool Room G01 is currently not mechanically ventilated. It is heated with three steam unit heaters. The steam unit heaters appear to be operational and in fair condition.

The east side of the second floor is a City Council Meeting Room 213 which is served by a cooling only DX rooftop unit (RTU-1) located directly over the space. The west side of the second floor is a Courtroom 202 and miscellaneous office space currently served by a cooling only DX rooftop unit (RTU-2) located directly over the space.

There are multiple window air conditioning units (approximately 15) that serve offices on the ground floor, mezzanine, and first floor. The restrooms, locker rooms, and hydrotherapy areas

are currently exhausted by 4 fans located on the penthouse level in Fan Room P02. The two-story Hall of Springs 101 has a smoke purge exhaust fan located in the penthouse mechanical room.

Some of the major challenges to renovating this building are:

1. The basement level floods regularly so equipment on that level of the building should not be floor mounted.
2. Access to existing ductwork is limited due to existing hard ceilings, soffits and chases. The ceilings in most spaces appear to be plaster with metal lath.
3. There are multiple spaces not currently used that are not ventilated or conditioned except for the existing steam radiators. Future use of these spaces will need to be evaluated.

Existing Steam Boilers (Boiler Room G30)

Description

The existing steam boilers are National Pacific, 100HP, natural gas fired, low pressure steam boilers. They were installed in 1954. According to building operation and maintenance personnel, the boilers are manually operated to produce 5 to 8 psi steam. They are turned on when needed, and off when not needed. One of the existing boilers is out of commission. It was tagged out by the State Boiler Inspector and is in need of re-tubing. According to estimates, it will cost approximately $50,000 to repair. One of the boilers is redundant, and has been providing adequate heat to the building so far.

The boiler flues are routed to the original boiler flue stack, which extends up through the building and discharges through the top of the tower. The boiler flues appear to be in fair condition throughout the building, while the top portion projecting from the tower is in severely deteriorated condition. The entire flue, if kept, should be carefully inspected.

The boiler drain down piping discharges freely into the basement over the new snow melt system equipment and should be re-piped so that the drain down of the boilers does not impact the snow melt system equipment.

These boilers are old and in very poor condition. They are very inefficient and are in need of replacement.

Fig. M1 Existing low pressure steam boiler circa 1954. Currently out of commission.

Fig. M2 Boiler information tag including boiler horsepower and serial number.

Boiler Recommendations

Option 1:

Replace the existing steam boilers with new, more efficient low pressure steam boilers. The boiler that is not working could be replaced first, connected to existing equipment and placed into operation. The redundant boiler could then be replaced. The new boilers would not need to be fully redundant. They could each be sized for 65% of the load, allowing for some redundancy, but at a lower cost. The existing steam heating equipment (radiators, unit heaters, etc.) could then be replaced over time. In addition to replacing the boilers, we recommend assessing the condition of the steam and condensate piping throughout the building. All un-insulated piping should be insulated and all pipe in poor condition should be replaced.

The advantage to this option is that it allows equipment to be replaced over time with no immediate requirement to replace steam heating equipment. The disadvantage is that the operating and maintenance costs will continue to be fairly high. The steam boilers are a less efficient heat source and ongoing steam trap maintenance will be required.

Option 2:

Replace the existing steam boilers with high efficiency condensing hot water boilers and provide a small steam boiler to serve the first floor Hydrotherapy equipment, if placed into service, and the snow melting system. The boiler that is not currently working could be removed and replaced with a new, high efficiency hot water boiler. The other steam boiler could remain in place to serve existing steam heating equipment. As steam heaters are replaced with hot water heaters, they could be tied into the new hot water boiler. Once all heating equipment has been upgraded, the second steam boiler could be replaced with a hot water boiler.

This approach would allow the existing piping, radiators and unit heaters to be replaced over time and would provide the benefit of new, more efficient equipment immediately. This system would be much more efficient than option 1, and would be much easier to maintain.

One significant disadvantage is that the building would have two separate heating systems and there would be no redundancy until all the heating equipment is replaced.

With either of the two options, we recommend that the temperature controls in the building be upgraded to modern direct digital controls. This would allow for automated operation of the heating system. This would include modulating control valves at all heating units to maintain the desired space temperature.

If new boilers are installed, the flue size, routing, and combustion air supply will need to be evaluated to insure it meets current code.

Snow Melt System

Description

The existing snow melt system was installed in 2010 (Figure M3). It is located in the basement and serves the terrace and ramp on the north and west sides of the building. According to building maintenance and operation personnel, the basement level floods every 3 to 4 years. Until the basement flooding problem can be remedied, we recommend that no new equipment be located in the basement. If the flooding problem is not corrected the existing snow melt system should be relocated to the ground floor mezzanine level in the enclosed space below the terrace.

The system is in good condition. If the boilers are replaced with hot water units, a small boiler would need to be installed to serve the snow melt system, or it could be converted to hot water.

Fig. M3 Snow Melt System Equipment.

Heating and Ventilation Unit (HVU-1) (Open Area 004)

Description

HVU-1 is a 6,000 CFM heating and ventilation unit located on the west side of the basement. The unit is currently not operational. The outside air for this unit was originally provided by louvers, but the outside air paths have been blocked off. The supply duct extends up in a shaft on the west side of the building. If it were operational, it would supply air to the Exercise Room G14 and the adjacent Closet G13 (originally the women's locker room). The supply duct continues up the shaft space to the ground floor mezzanine and serves the Server/Storage Room M14, Conference Room M12, and Kitchenette M13 (originally the men's locker room). (Figure M5).

The Exercise Room G14 on the ground floor is heated by a steam radiator but is not cooled or ventilated. The Conference Room M12 (Figure M4), Server/Storage Room M14 and Kitchenette M13 are cooled by a window a/c unit that reject heat to the enclosed mechanical space under the north terrace, room G39. The rooms are heated by a steam radiator located in the Server/Storage Room M14. There is no ventilation. All of these rooms need ventilation to meet current codes and help insure indoor air quality.

Fig. M4 Conference room on Ground Floor mezzanine with window a/c. Currently not ventilated.

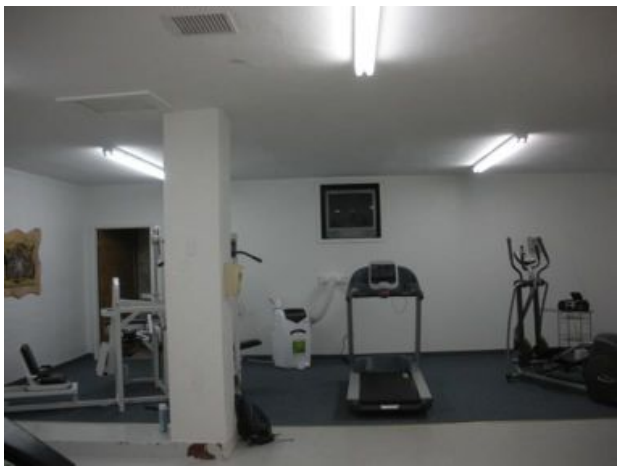


Fig. M5 Exercise Room on Ground Floor. Currently not ventilated.

HVU-1 Recommendations

Because this unit is currently not operational, we recommend removing this unit, and all associated piping, controls, power, and ductwork. The unit could be replaced with a new DX split system AHU with a steam or hot water heating coil. This unit should be located on the ground floor or ground floor mezzanine, due to the basement flooding issues previously discussed. A new mechanical room would need to be created to house the unit. Equipment size and location would need to be further evaluated. Outside air should be ducted to the unit. A condensing unit could be located on the roof with piping routed through existing chases.

Heating and Ventilation Unit (HVU-2) (Fan Room P02)

Description

HVU-2 is an 8,100 CFM heating and ventilation unit located in the center of the penthouse Fan Room P02. The unit is currently operational and is manually controlled. The outside air for this unit is provided by a 48”x48” louver on the west wall of the penthouse. The supply air duct is routed through the floor into the soffit space above the water bar in the Hall of Springs 101. It supplies air horizontally from the face of the soffit toward the windows.

There are (15) 36”x8” supply air registers in the soffit. They were originally balanced to 540 CFM each. Air is returned via (4) return grilles located in the water bar which are ducted down to the ceiling space of the Pool Room G0 (Figure M7 & M6). The return duct runs north and extends through the first and second floors back to the penthouse mechanical room. The Hall of Springs 101 is heated by steam radiators located between each set of windows.

HVU-2 is not used during heating season. It is run in intermediate seasons. During cooling season, the unit is run in recirculation mode to provide air movement in the Hall of Springs 101. HVU-2 is old, is in very poor condition, and is in need of replacement.

There is no direct cooling in the Hall of Springs 101. Air is exhausted from the Hall of Springs 101, which pulls air from the adjacent two-story Entrance Foyer 101. Consequently, the Hall of Springs 101 remains warm during cooling season.

Fig. M6 Hall of Springs. Looking up at soffit containing supply air duct.

Fig. M7 Water bar within Hall of Springs showing typical return grille in bar.

HVU-2 Recommendations

Evaluate cooling requirements and provide a new DX split system AHU with a steam or hot water heating coil. Size and location for the new unit will need to be closely evaluated to insure the unit will fit in the penthouse. The new system could be sized to replace both HVU-2 and AHU-1 and serve the Hall of Springs 101 and the two-story Entrance Foyer 103.

The new unit should have modulating outside and return air dampers with a sequence to allow an economizer mode and demand controlled ventilation. New digital controls should be provided to accommodate an automated system. The supply air ductwork should be insulated to prevent condensation. A condensate pump would need to be provided to collect the condensate from the cooling coil and pump it to the exterior of the building.

Air Handling Unit (AHU-1) (Fan Room P02)

Description

AHU-1 is a 4,000 CFM heating and cooling unit located in the west side of the penthouse Fan Room P02. AHU-1 has an original steam heating coil and was retrofitted in 2006 with a twelve-ton DX cooling coil. The condensing unit is located on the roof just west of the penthouse. The unit is operational but is old and in poor condition. The cooling is controlled by a thermostat located on the south side of the Gallery 201 walkway above the Entrance Foyer 103. (Figure M8). Condensing units located on the roof are not properly drained. They currently drain on the roof. These need to be piped directly into the roof drains.

Outside air is provided by a 48”x24” louver on the south wall of the penthouse. The supply duct penetrates the floor of the penthouse mechanical room into the soffit of the second floor of the Entrance Foyer and continues to the first floor. It supplies air to the Entrance Foyer at both the

first and second levels. At some point, the smoke purge duct serving the top of the Entrance Foyer was disconnected from the smoke exhaust fan and re-used as a supply for the Foyer.

Air is returned via four grilles located in the corners of the entrance foyer at the first floor level. One of these return grilles has been isolated within the Finance Window 104, restricting the return air path. The return ductwork extends up to the penthouse level through shafts and soffits. During heating season the unit is not used. The Entry Foyer is heated with steam radiators, but space temperature is difficult to maintain.

Fig. M8 Entrance Foyer 103. Standing on second floor walkway looking across the two-story space.

Fig. M9 New 12-ton condensing unit just outside penthouse mechanical room. Added in approximately 2006.

AHU-1 Recommendations

Option 1:

Provide a new DX split system AHU with a steam or hot water heating coil. Size and location for the new unit will need to be closely evaluated to insure the unit will fit in the penthouse. The existing condensing unit installed in 2006 could possibly be reused. (Figure M9).

Option 2:

Use the new system described for HVU-2 to serve the Entry Foyer 103 and the Hall of Springs 101. The new system would be sized to replace both HVU-2 and AHU-1.

The new unit should have modulating outside and return air dampers with a sequence to allow an economizer mode and demand controlled ventilation. New digital controls should be provided to accommodate an automated system. The supply air ductwork should be insulated to prevent condensation. A condensate pump would need to be provided to collect the condensate from the cooling coil and pump it to the exterior of the building.

Rooftop Unit (RTU-1)

Description

RTU-1 is a five ton, 2,000 CFM, cooling only, DX rooftop unit (Figure M10). It was installed in 1993. The unit is located on the east side of the roof and serves the second floor City Council Meeting Room 213 (Figure M11). The unit is operational and cooling is controlled by a thermostat located in the space. The supply duct penetrates the roof and distributes air via ceiling diffusers located in a lay-in ceiling.

The space is heated by steam radiators. During heating season the rooftop unit is not operated, therefore, there is no mechanical ventilation.

Fig. M10 Existing rooftop unit serving city council meeting room. This unit is improperly drained and needs to be re-piped to drain directly into a roof drain.

Fig. M11 City council meeting room 213, with lay-in ceiling.

RTU-1 Recommendations

Option 1:

This cooling system could be left as-is and the radiators could continue to provide heat. If the boilers are replaced with hot water models, the radiators would need to be replaced with hot water radiators or fin tube. The cooling system could be replaced like for like when the system reaches the end of its useful life. The radiators are old and in reasonable condition. The rooftop unit is in fair condition.

The operable windows technically meet code for ventilation purposes; however, we do not recommend using windows for winter ventilation. This option is less desirable than option 2 due to the lack of mechanical ventilation.

Option 2:

Replace the existing rooftop unit with a new DX rooftop unit or split system with a steam or hot water heating coil. The system should be selected to allow for economizer mode and designed to allow continuous ventilation. The digital controls for the system should be upgraded to allow for automated operation of the system, economizer cycle, and demand controlled ventilation.

Rooftop Unit (RTU-2)

Description

RTU-2 is a five-ton, 2,000 CFM, cooling only, DX rooftop unit (Figure 12). It was installed in 1993. The unit is located on the west side of the roof and serves the second floor Courtroom 202 (Figure M13). The unit is operational and is in fair condition. Cooling is controlled by a thermostat located in the space. The supply duct penetrates the roof and distributes air via ceiling diffusers located in a lay-in ceiling. The space is heated by steam radiators. During heating season the rooftop unit is not operated, therefore, there is no mechanical ventilation.

Fig. M12 Existing rooftop unit serving courtroom.

Fig. M13 Second Floor Courtroom.

RTU-2 Recommendations

Option 1:

This cooling system could be left as-is and the radiators could continue to provide heat. If the boilers are replaced with hot water models, the radiators would need to be replaced with hot water radiators or fin tube. The cooling system could be replaced like for like when the system reaches the end of its useful life. The radiators are old and in reasonable condition. The rooftop unit is in fair condition.

The operable windows technically meet code for ventilation purposes; however, we do not recommend using windows for winter ventilation. This option is less desirable than option 2 due to the lack of mechanical ventilation.

Option 2:

Replace the existing rooftop unit with a new DX rooftop unit or split system with a steam or hot water heating coil. The system should be selected to allow for economizer mode and designed to allow continuous ventilation. The digital controls for the system should be upgraded to allow for automated operation of the system, economizer cycle, and demand controlled ventilation.

Office Spaces

There are multiple spaces throughout the building which have no mechanical ventilation, but do have operable windows. They are cooled with window a/c units and heated with steam radiators or supplemental electric heat. While these spaces could continue to be cooled with window a/c units, ideally, they may be better served with a central system such as a variable air volume (VAV) air handling unit with terminal boxes and hot water reheat. This would provide significantly improved space temperature control and ventilation.

This approach would be costly and would require a significant amount of hard ceiling demolition to install new ductwork. Air handler location would take careful consideration due to the building's historic designation. This air handling unit could also provide conditioning for spaces that are currently heated only, such as the Pool G01 and Exercise Rooms G14 on the ground floor, the Hydrotherapy Department M35, Offices (M06, 23, 27, 29, 30, 31, and 33) Conference Room M12 and Kitchenette M13 on the ground floor mezzanine and the Hydrotherapy Department 130 and Offices (125, 120, 104-107, 110-112) on the first floor. See pictures below for various window a/c units (Figures M14 - M19).

Fig. M14 Northeast corner.

Fig. M15 South side of East Wing.

Fig. M16 South side of East Wing.

Fig. M17 South side of West wing.

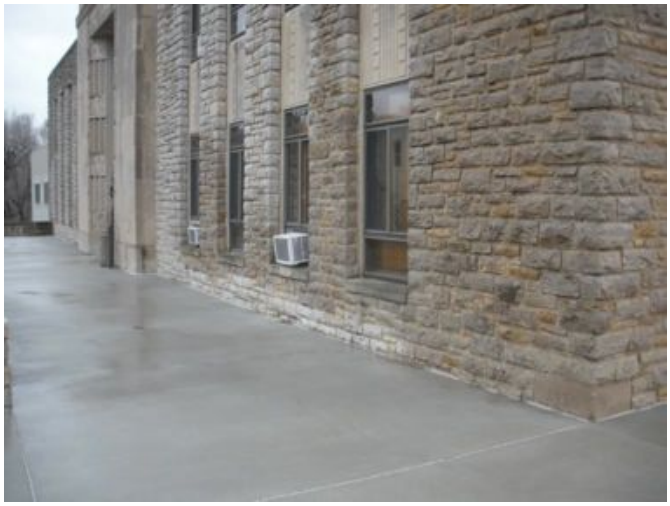


Fig. M18 North side of West Wing.

Fig. M19 North side of East Wing.

Well Pump Room

The well pump room located beneath the terrace on the north side of the building is currently not conditioned or ventilated (Figure M20). We would recommend that this space be ventilated and dehumidified to help preserve the structural integrity of the space.

Fig. M20 Spring water piping in well pump room.

Basement

The basement is currently not conditioned or ventilated. With the issue of the flooding basement and the potential for standing water we would recommend this space be evaluated, ventilated and dehumidified as required to maintain conditions in the basement to help in preventing the growth of mold and bacteria. In addition to conditioning the basement the cause of the flooding needs to be reviewed and addressed to help maintain an acceptable indoor air quality within this space and the rest of the building.

Due to the standing water in the basement, the base of the original flue for the boilers is rusting and the structural integrity of this flue piping at the basement level should be evaluated by a qualified engineer. The bottom portion of this piping sits on the floor and appears to help support the weight of the flue as it extends up through the building.

To help in removal of the water floor drains should be located in the basement to allow water to drain to the sump pit. Any unused sump pits should be filled.

Existing Exhaust Systems

The original locker room exhaust fan is located on the west side of the roof in a small penthouse. It is old and is in poor condition (Figure M21).

It has two exhaust duct branches. The north branch extends down in a shaft to the Exercise Room G14 and abandoned shower and restroom facilities (Rooms M07-M11)on the ground floor (old women's locker room), which is no longer used.

The south branch extends down in a shaft to the Conference Room, Closet, Kitchenette, and abandoned restroom facilities located on the ground floor mezzanine (old men's locker room), which is no longer used. This exhaust fan is inactive. The spaces that were served by this fan are either abandoned or the use has changed and exhaust is not required.

We recommend that this exhaust fan, ductwork, and grilles be removed and the ceilings repaired. There are portions of this exhaust duct that could remain to serve the Exercise Room, the small restroom adjacent to the Exercise Room G14 and the Kitchenette M13. A new exhaust fan should be installed to serve these areas.

Fig. M21 Locker room exhaust fan, currently not used.

The original hydrotherapy exhaust fan is located in Fan Room 216. It is old and is in poor condition.

It has two duct branches. The north branch extends down in a shaft to the Women's Hydrotherapy Department 130 and miscellaneous restrooms on the first floor.

The south branch extends down in a shaft to the Men's Hydrotherapy Department M35 and miscellaneous restrooms on the first floor. The men's hydrotherapy department is currently being used as a storage space. The exhaust fan is active.

We recommend that this exhaust fan, ductwork, and grilles be removed and the ceilings repaired. The portions of exhaust duct that serve the first floor Hydrotherapy Department 130 and active restrooms and janitors closets could remain (Figure M22). A new exhaust fan should be installed to serve these areas.

Fig. M22 Hydrotherapy room exhaust fan.

The existing vapor room in historical hydrotherapy department exhaust fan is located in Fan Room 216 (Figure M23). It is a small exhaust fan that serves only the vapor room on the first floor. The exhaust fan that had served the vapor room on the ground floor mezzanine has been removed as that space is inactive. This exhaust fan appears to be near the end of its service life and should be replaced.

Fig. M23 Vapor room exhaust fan.

Fig. M24 Core restroom and janitor closet exhaust fan.

The core restroom and janitor closet exhaust fan is located in the penthouse Elevator Machine Room P04 (Figure M24). The main exhaust duct extends down a shaft near the boiler flue and serves restrooms and janitor closets on each level in the core area. This fan is active but appears to be near the end of its service life and should be replaced.

To save energy, all exhaust fans serving the restrooms and hydrotherapy departments should be operated based on occupancy. We recommend installing digital controls or a time clock to turn the fans on when the building is occupied and off when the building is unoccupied.

Mechanical Systems Master Plan

Many of the heating, ventilation, and air conditioning (HVAC) systems that serve this building are very old and in poor condition. The building was not air conditioned when it was built. Isolated cooling equipment has been installed over the years but is mostly piecemeal and inefficient. Maintenance requirements are substantial due to the multitude of equipment, the age of much of the equipment, and the steam system.

We recommend that the City consider a phased upgrade of all equipment in the building. Installing new central systems would be very challenging due to limited ceiling space and the building's historic designation. Decentralized equipment appears to be a much better option, allowing for more flexibility. Small closets could be created in some locations to house the units. All mechanical installation shall be coordinated with the Architect to ensure the installations do not harm historic finishes, materials, and spaces. Some installations may be able to be above existing ceilings, within voids between the hard ceilings and the concrete structure above. Large mechanical rooms and extensive duct distribution would not be needed.

Systems that may be considered include the following:

Option 1(Figure M25): Distributed variable refrigerant flow (VRF) units with central condensing units located on the roof. The individual units could be heat pumps, which would provide both heating and cooling. This system is very efficient, requires minimal maintenance, and would provide excellent space conditioning. This system likely has the lowest first cost.

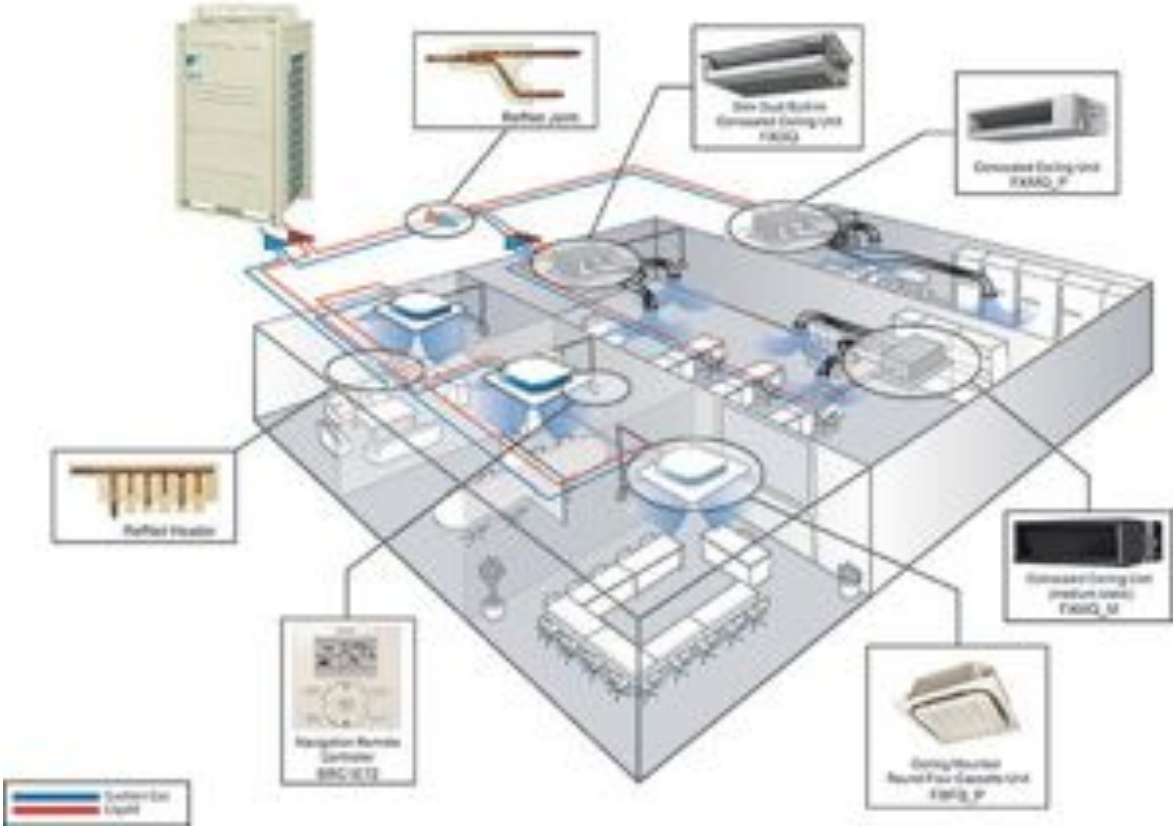


Fig. M25 General Variable Refrigerant Flow System Layout.
For additional information visit the following website:
http://www.daikinac.com/content/commercial/vrv/vrv-heat-recovery-reyq/

Option 2: Distributed four-pipe fan coil units (Figure M26 & Figure M27) with chilled and heating hot water. High efficiency hot water boilers would be installed. Air-cooled chillers would need to be installed to provide cooling. New pumps and accessories would also be required. This equipment is more conventional but would require more maintenance than the VRF system. Finding a location for the chiller may be challenging.

Fig. M26 Floor mounted FCU.

Fig. M27 Concealed FCU.

For additional information visit the following website:
http://www.daikinmcquay.com/McQuay/ProductInformation/Fancoils

Option 3: Water source or geothermal heat pumps would be another option (Figure 28 & Figure 29). A standard water source heat pump system would require the installation of a cooling tower, or fluid cooler in addition to new boilers. The location of outdoor equipment would need to be carefully coordinated. A geothermal heat pump system would be more costly up front, but more efficient. This system has the highest first cost but would have the lowest operating cost. This option would require more research, due to the high water table in the area, to verify its viability and maintainability.

Fig. M28 Floor mounted Water Source Heat Pump.

Fig. M29 Concealed Water Source Heat Pump.

For additional information visit the following website:
http://www.daikinmcquay.com/McQuay/ProductInformation/WSHP/WSHPpage

Summary

The variable refrigerant flow system (Option 1) is our top recommendation.

All 3 options would require installing a dedicated outdoor air system for ventilation. This unit could be located on the roof or in the penthouse and could incorporate energy recovery. It would need to be ducted to all occupied spaces. The ductwork would be small, and routings would need to be carefully coordinated. This system could be a heat pump, or have conventional hot water and chilled water coils, depending on the main system option selected.

New system installation would need to be phased and a detailed phasing plan for installation should be developed if this option is selected. When new systems have been installed throughout the building, the existing steam boilers could be removed.

Mechanical Systems Master Plan Based on Proposed Floor Plan and Space Use Modifications

Basement

If the basement flooding issue can be resolved and the basement is to be repurposed as storage space we recommend the space be ventilated and conditioned as required to maintain acceptable indoor air quality. We recommend the basement be conditioned by a variable refrigerant flow system with the indoor units located at various locations in the basement and heat recovery variable refrigerant flow condensing units located on the roof. Outdoor air should be provided by the dedicated outdoor air unit located on the roof. There is existing ductwork serving these areas and these routes could be used for new outside air ductwork and refrigerant lines. A commercial dehumidifier should also be installed for the basement, piped to drain.

Ground Floor

The proposed ground floor renovation includes an event space, catering kitchen, storage areas, restrooms, mechanical spaces, etc. We recommend the majority of the spaces be conditioned by a variable refrigerant flow system with the indoor units located in the various spaces and heat recovery variable refrigerant flow condensing units located on the roof. Outdoor air should be provided by the central dedicated outdoor air unit located on the roof. There is existing ductwork serving these areas and these routes could be used for new outside air ductwork and refrigerant lines.

The Therapy Pool Room (if intended to remain) would require special HVAC equipment to meet indoor pool space conditioning requirements. New exhaust duct should be routed from restrooms and janitor's closets to an exhaust fan located on the roof. The exhaust fan could be controlled by a time clock or direct digital control system to be energized during occupied hours. If kitchen hoods are required in the catering kitchen, grease exhaust and/or dish exhaust ducts will need to be routed to new exhaust fans located on the roof.

Ground Floor Mezzanine

The proposed ground floor mezzanine renovations include men's and women's locker rooms, restrooms, office spaces, reception space, and the restored historic spa space. We recommend the majority of the spaces be conditioned by a variable refrigerant flow system with the indoor units located in the various spaces and heat recovery variable refrigerant flow condensing units located on the roof. Outdoor air should be provided by the dedicated outdoor air unit located on the roof. There is existing ductwork serving these areas and these routes could be used for new outside air ductwork and

refrigerant lines. The restored historic spa space would require a small, dedicated steam boiler to serve the steam rooms and the snow melt system. New exhaust duct should be routed from locker rooms, restrooms and janitors closets to an exhaust fan located on the roof. The exhaust fan could be controlled by a time clock or direct digital control system to be energized during occupied hours.

First Floor Plan

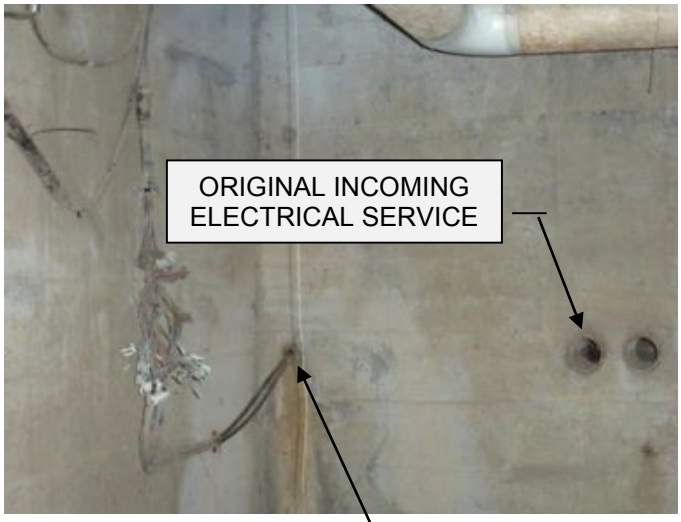
The proposed first floor renovations include office space, restrooms, historic main entry foyer, and the historic Hall of Springs bar area. We recommend the majority of the spaces be conditioned by a variable refrigerant flow system with the indoor units located in the various spaces and heat recovery variable refrigerant flow condensing units located on the roof. Outdoor air should be provided by the dedicated outdoor air unit located on the roof. There is existing ductwork serving these areas and these routes could be used for new outside air ductwork and refrigerant lines. Care should be taken to maintain the existing historic integrity by selecting or reusing existing diffusers and decorative grilles for the HVAC system. New exhaust duct should be routed from restrooms and janitors closets to an exhaust fan located on the roof. The exhaust fan could be controlled by a time clock or direct digital control system to be energized during occupied hours.

Second Floor Plan

The proposed second floor renovations include office space, the county courtroom, the council chambers, and the historic gallery space overlooking the entry foyer and water bar below. We recommend the majority of the spaces be conditioned by a variable refrigerant flow system with the indoor units located in the various spaces and heat recovery variable refrigerant flow condensing units located on the roof. Outdoor air should be provided by the dedicated outdoor air unit located on the roof. There is existing ductwork serving these areas and these routes could be used for new outside air ductwork and refrigerant lines. Care should be taken to maintain the existing historic integrity by selecting or reusing existing diffusers and decorative grilles for the HVAC system. New exhaust duct should be routed from restrooms and janitors closets to a centralized exhaust fan located on the roof. The exhaust fan could be controlled by a time clock or direct digital control system to be energized during occupied hours.

Electrical & Telephone Systems

The existing telephone service entrance is located in the basement. The original electrical service was located in the basement but in 1993, the electrical room was severely flooded so the main electrical service was relocated to the ground floor mezzanine above the dock. The main telephone service conductor enters the building at the original location room G15 (Figures E1 & E2); however, the telephone demarc was relocated to the floor above. We recommend bringing a new telephone service and demarc point into the ground floor mezzanine electrical room to reduce the possibility of future flooding.



ORIGINAL INCOMING TELEPHONE SERVICE CABLE WITH TELEPHONE DEMARC LOCATED ON GROUND FLOOR

Fig. E1 Basement Electrical Room G15. (Left)

Fig. E2 Basement Electrical Room G15, Telephone Entrance. (Right)

Fig. E3 Existing Main Electrical Room with additional panels for each floor on right side and proposed telephone DEMARC on left side

The existing electrical service was installed in 1993 and is fed overhead from a pole top transformer in the alley. The service consists of three (3) parallel runs of conductors providing 1200 amps at 208Y/120 volt, 60 Hz. According to utility records, the maximum electrical demand for last year was 65.6 kW or 82 kVA assuming an 80% power factor. The peak load which occurred during the billing cycle of 6/14/11 through 7/14/11, was 228 amps. The service is adequate, and leaves approximately 675 amps available for electrical upgrades.

Fig. E4 View of northeast exterior corner of the building. Fig. E5 Overhead electrical service installed following the 1993 flood

The building does not have an emergency generator. We recommend installing a generator sized to handle the flood and sump pumps to reduce the likelihood of future flooding. It appeared to us that the interiors of the lower level electrical panels were removed when the electrical service was upgraded in 1993. The branch circuits were re-fed from new panels located in the 1993 electrical room. The original enclosures were used for junction boxes, and the original conductors from the old panel locations to the end devices were retained. These conductors were submerged in the floodwaters and are installed in severely rusted open boxes (Figures E6-E9).

We recommend removing all abandoned conduit, rusted enclosures such as junction boxes or conduit, and original conductors located in the Basement. They should be replaced with new conductors from panels to end source.

Fig. E6 & E7 Original panel enclosures and branch circuit conduits used as junction boxes. Boxes and conductors were flooded in 1993 and show extensive rust.

Fig. E8 & E9 Original panel enclosures and branch circuit conduits used as junction boxes. Boxes and conductors show extensive rust.

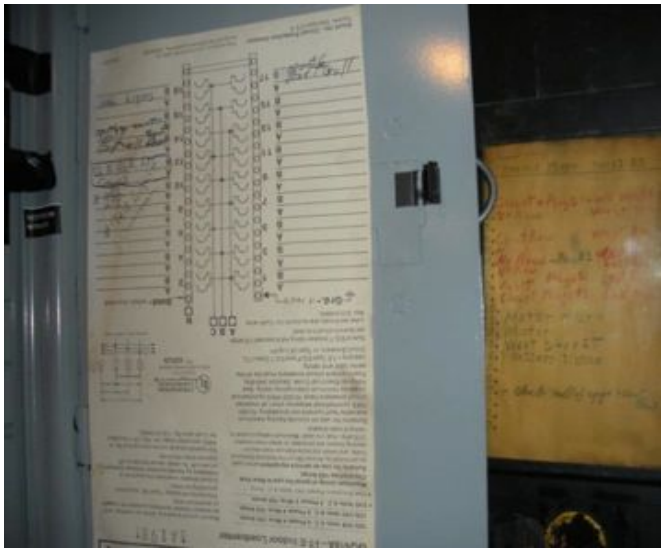
Power distribution conductors from the electrical room to each panel were replaced in 1993 and appear to be adequate. The original panel enclosures were reused and replacement load centers were installed inside them (Figure E10 & E11). There are exposed and energized conductors inside the panels, which is a code violation and safety hazard. We observed that original branch circuit conductors are still energized and many have brittle insulation that is falling off. We recommend replacing the panels and branch circuit conductors to all the panels on the ground floor, ground floor mezzanine, first floor and second floor; eight panels total.

Fig. E10 & E11 Panels installed inside the original panel enclosures. Detail of wiring (Right).

E12

E13

E14



E15

E16

E17

Fig. E12-E17 Photographs of panels installed inside the original panel enclosures. Typical in many locations.

Lighting Systems

Basement and Ground Floor

The basement is lit with incandescent fixtures, which do not sufficiently illuminate the space (Figure E18 & E19). We recommend installing fluorescent fixtures with fiberglass housings and energy efficient T8. The fixtures should be rated for a damp location. Occupancy sensors should be installed so that lights turn off automatically when areas are unoccupied. This will comply with current energy codes.

Fig. E18 & E19 Basement incandescent lighting (Left and Right). View of typical fixtures.

The non-public, 'back of house' lighting consists mainly of fluorescent strip fixtures with T12 lamps (Figure E20 & E21). These lamps have not been produced since 2009, and are currently illegal (as of 2012). We recommend installing energy efficient strip fixtures withT8 Phillips extra-extended life lamps that will provide approx 60,000 hrs of operation. Occupancy sensors should also be installed so that lights turn off automatically when areas are unoccupied. This will comply with current energy codes.

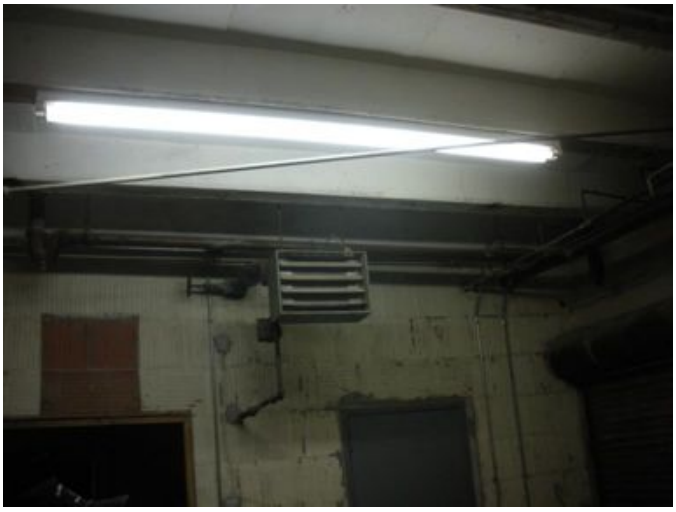


Fig. E20 & E21 Basement and Ground Floor fluorescent lighting. View of typical fixtures.

First Floor

The same T12 fluorescent strip light fixtures are installed in the Entrance Foyer 103 cove light (Figure E22). These fixtures are not only inefficient, but very difficult to relamp and do not adequately light the space. Fixtures are wired with Romex and open splices which are code violations (Figure E23). We recommend installing new energy efficient T8 strip fixtures with Phillips extra extended life lamp giving 60,000 hours of operation time. We also recommend re-wiring all fixtures using proper wiring methods. In addition to the cove light we recommend installing directional metal halide recessed down lights in the flat ceiling between the cove light and the skylight to adequately illuminate the space.

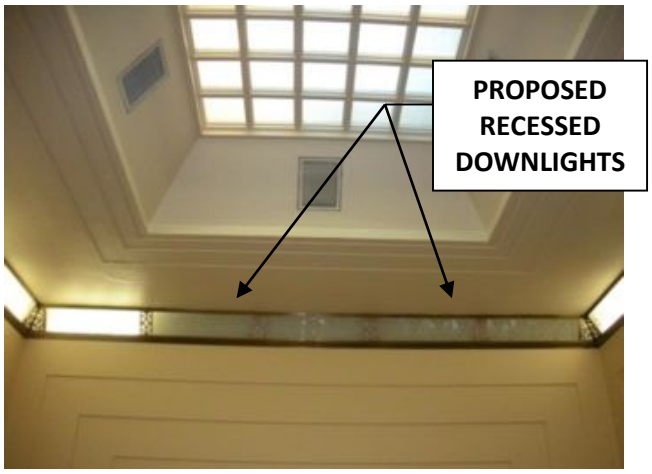


Fig. E22 & E23 View of cove lighting from Second Floor (Left). View of improper wiring methods supplying power to cove lights (Right).

Skylight

The skylight is illuminated during the day with natural daylight and at night with nine (9) incandescent lamp holders retrofitted with self-ballasted compact fluorescent lamps (Figure E24). The existing fixture locations makes re-lamping difficult. The lamps must be replaced frequently due to relatively short lamp life and lack of daylight/ photocell controls to keep lights off during the day. We recommend replacing the existing fixtures with a linear LED color changing system mounted around the perimeter of the cavity with daylight/photocell controls. This LED system has a 100,000 hour lamp life and would add interesting color changing technology for night time visual interest. The existing fixtures and supports along with wood planking should be removed, skylight glass replaced and the entire cavity cleaned and painted white for maximum reflectivity.

Fig. E24 & E25 View of lighting inside the skylight from roof deck (Left). Exterior view of skylight from roof deck (Right).

Second Floor Council Chambers and Courtroom
Council chambers and courtroom lighting consists of 2' x 4' lay-in troffer fixtures with T12 lamps (Figure E26 & E 27). We recommend installing energy efficient T8 fixtures. Occupancy sensors should also be installed throughout so that lights turn off automatically when rooms are unoccupied. This will comply with current energy codes.

Fig. E26 Council Chamber Room 213 lighting (Left). Fig. E27 Second Floor Courtroom 202 lighting (Right).

Hall of Springs (Room 101)
The Hall of Springs 101 is illuminated with original decorative incandescent fixtures that have been re-lamped with self-ballasted compact fluorescent lamps. These fixtures are very difficult and expensive to re-lamp and appear to have several lamps in need of replacement. The fixtures do not provide adequate illumination at night, and provide a cooler color than the original incandescent lamps. These original fixtures have a very ornate design in the glass that is not currently being noticed due to the "burn-through" effect and color of the replacement fluorescent lamp.

Hall of Springs Lighting Recommendations

1. Re-lamp the existing fixtures with a 130 volt incandescent 69 watt "traffic signal lamp" with rated 8,000 hour life.

2. Provide a separate, dedicated uplight system with a significant luminous component to fill the volume with the recommended light level.

With the re-lamped incandescent lamps, install commercial grade "soft start" dimmers that provide full-range dimming. Commercial-grade dimmers have a "soft start" feature that ramps up power to the lamp over a period of a few milliseconds, instead of closing the circuit to the filament instantly. Some of the more sophisticated systems have fade on and off times that can last from a few seconds to a few minutes.

For incandescent loads, this prevents a shock to the filament and prolongs lamp life. Critical to the incandescent re-lamping process, dimmers that can reduce output to 50% will increase lamp life by over 10 times. Essentially, the lamps within the fixture can be extended to over 100,000 hours, nearly 10 times the rated life of the compact fluorescent lamps currently being used.

The new incandescent, dimmed lamps will have far less light output than the current lamping, however, that can be an advantage since the incandescent lamps will bring back the color and effect of the original fixtures. Instead of trying to use an inefficient method of projecting light through glass to illuminate a space, the existing fixture has a unique feature to the design that allows a separate, indirect component to be hidden on the top by the return glass element that can be the real generator of light. More efficient light sources on top can create the required light levels, heighten the visual perception of the space, and allow the inherent beauty of the glass and fixture to be seen with relatively little effort. In addition to the re-lamping, we recommend that the uplight fixtures be separately circuited for additional controls. All fixtures in this area should have daylight and occupancy controls so they meet current energy codes.

Fig. E28 Hall of Springs looking South from Second Floor.

Fig. E29 Detail of Hall of Springs ornate light fixture.

The above bar lighting in the Hall of Springs 101 and the Hallway lobby 108 fixtures are currently lamped with the same screw-in type compact fluorescent lamps. Due to proximity of the glass to the lamp source in the Hallway Lobby 103 (Figure E31) fixtures, we do not recommend replacing the fluorescent lamps with clear traffic signal lamps. The photograph below illustrates how the soft diffusion of the existing lamps effectively covers the glass in light without burn-through.

In contrast, the Water Bar 102 (Figure E30) fixtures are recommended to be replaced with a series of continuous, linear LED light bars to mimic backlit stained glass for a smooth, even illumination of the glass. Due to the proximity of the glass to the top of the structure, an LED solution with typical fixtures less than ½" deep would be preferable to a 3 ½" deep linear fluorescent option.

Fig. E30 Water Bar 102 Illumination (Left).

Fig. E31 Typical Lobby 108 Light Fixture (Right).

The tower lighting consists of quartz-based PAR lamp fixtures that illuminate the glass from the interior. A more effective approach would be to paint the interior volume white, and illuminate the entire interior space with longer-life, higher wattage fixtures for a more even illumination of the glass. This can be accomplished by installing a single fixture in the center of the room.

The exterior of the tower offers unique opportunities, textures, and details that, when illuminated properly, would enhance the tower significantly, increase the visibility of this landmark, and bring this structure back to its deserved iconic status within the community. As with the rest of the project, these fixtures should have daylighting/ photocell control to prolong lamp life.

Fig. E32 Exterior view of Tower (Left).

Fig. E33 Interior view of Tower lighting (Right).

Domestic Water System

The existing domestic water system appears to be mostly original to the building. The galvanized 3" water service enters a large underground room (well pump room) located below the grass terrace north of the building. The pipe extends to the south entering the basement level where the backflow preventer is located. From this location, piping is distributed throughout the building to restrooms, locker rooms, hydrotherapy rooms, pool rooms, etc. All domestic water heating is achieved by small storage or instantaneous point of use electric water heaters. With remodel and repair over the years, water piping of multiple materials has been installed including PVC, PEX, copper and galvanized.

Water Bar (Room 102)

An area of particular concern is the water bar area located in the Hall of Springs 101. It was noted that the floor below this area has notable water damage. Through our investigation it appears there are a couple of potential contributors to the water damage. One of those contributors appears to be the fountain located at the south end of the water bar 102. This fountain structure and piping should be evaluated and replaced as necessary to verify the water from the fountain is not leaking. The other contributor is the water piping serving the water bar itself. This piping should be replaced for fixtures that are intended to remain in used and removed for fixtures that are being abandoned or removed.

Fig. P1 Historic Water Bar fountain.

Domestic Water Recommendations

Given the age and current state of the domestic water distribution system we recommend that the entire system be analyzed and resized or replaced as required to meet current standards. Piping to areas that no longer have active plumbing fixtures should be removed. New piping should be installed for active fixtures and to areas that will have future fixtures. Insulation on most of the domestic water pipe needs to be repaired or replaced.

The water pressure appears to be low and should be evaluated. This is most likely due to old, corroded pipe. The pressure may improve if old piping is replaced.

As a water saving measure the plumbing fixtures, flush valves and faucets throughout the building should also be evaluated and replaced with low flow fixtures.

Fig. P2 Existing 3" water service entrance and backflow preventer.

In addition to housing the incoming domestic water service, the well pump room also houses the spring water services. The spring water services were not evaluated as a part of this report.

Sanitary Waste and Vent Systems

Description

The existing sanitary waste and vent systems appear to be mostly original to the building. The main sanitary lines are located in the basement level which floods regularly. The existing sanitary piping appears to be in poor condition and should be evaluated and replaced as necessary (Figure P3). In the basement area there were sanitary traps noted as leaking near the abandoned original boilers for the building. As fixtures and domestic water piping is replaced to areas that remain in use, the sanitary lines from those fixtures and area floor drains should also be evaluated and replaced back to a point where the sanitary line is in a satisfactory condition. Sanitary lines serving areas of the building which have been abandoned should be removed and or capped to prevent p-traps from drying out and allowing noxious sewer gas into the building.

Fig. P3 Existing sanitary main exiting the south wall of the basement.

Storm Drainage Systems

Description

The existing storm drainage system includes roof drains, piping, and sump pits located in the basement. The pumps and piping for the main sump system in the basement should be evaluated and replaced as necessary. According to building personnel storm water floods the basement when the creek level, where the sump discharges, rises above that discharge point. This issue should be addressed by a Civil Engineer in conjunction with the MEP Engineer and Architect as part of a rehabilitation project.

When the basement floods the standing water in the sub-basement area can be pumped out by additional pumps that building operation personnel have added to the boiler room above the basement and piped to the original boiler room in the basement. Even with this additional system there is constantly standing water in the basement around the abandoned original boilers where there is a depression in the floor slab (Figure P4). These boilers should be removed and the depression should be filled to aid in drying out the basement. Adjacent to the main sump system is an abandoned sump pit which is currently standing full of water and has no means to pump that water out (Figure P5). The need for this additional sump pit should be evaluated and either filled or pumped as necessary. Near the abandoned original boilers in the sub-basement is a pipe which comes up through the floor and has been cut off. The abandoned pipe and sump appear to have been part of the condensate return system for the original boilers and could be removed if that can be confirmed.

Fig. P4 Original boiler in sub-basement with standing water around boiler.

Fig. P5 Main sump and associated pumps.

Existing Gas Service

Description

The existing gas service enters the ground floor on the northeast corner of the building (Figure P6). The gas line serves the boilers and will need to be evaluated when the boiler system is replaced.

Fig. P6 Existing gas meter and entrance on the northeast corner of the building.

Fire Protection and Fire Alarm Systems

Description

The fire protection and fire alarm systems for the building should be evaluated and modified as required to bring the building up to current codes and standards. The building is currently not sprinkled. The need to sprinkle the building will need to be evaluated based on its current use and occupancy.