

A2 Services, Inc.
Facility Survey of City of Alexandria - City Hall



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A2 Services (A2) toured the Alexandria City Hall facility on October 12, 2017. City Hall is an historic building in Old Town Alexandria and is located at 301 King Street, Alexandria VA 22314. A2 arrived on site at 0700AM and met Mr. Marvin Rodriguez, the Chief Engineer for the site. It was noted that Mr. Rodriguez is also responsible for three other nearby sites, and manages two maintenance men for these four sites.

The building is heated and cooled by an older style 2-pipe hydronic system. This system requires a complete changeover of equipment to go from cooling to heat and vice versa. This changeover takes most of a day to complete. Heating is provided by two 1940's era brick set fire tube boilers and two newer chillers. The boilers are very old and will need to be considered for replacement. The lower water wall on #1 boiler has failed twice and has had new metal welded into place to keep it operational, however the condition of the pressure vessel is extremely poor. This repair is not permanent, and as such could fail in the near future. This failure to one of these boilers could produce a water wall or tube blow out causing a rapid loss of 240 degree water (Steam explosion). This is a very hazardous condition and requires immediate attention.

The boilers are low pressure steam units which supply steam to one steam to water heat exchanger, sometimes called a hot water convertor. This convertor takes the heat from the steam and makes the hot water used to heat the facility in winter. Two old McQuay R-22 centrifugal chillers produce the chilled water for cooling in summer and reject their heat to one BAC forced draft cooling tower. A2 observed one chiller operating as intended. One significant concern with the chillers is the refrigerant utilized (R-22). R-22 has been taken off the market. The EPA Clean Air Act in 1990 identified R-22 as an HCFC refrigerant which is an ozone depleting product. R-22 is still available, however it's is becoming much more expensive and hard to obtain. The chilled or hot water produced in the central plant is pumped throughout the facility to approximately 20 ceiling hung air handlers. These units are very hard to access for maintenance. There are also several air handlers in the building attic which are also difficult to access. The building perimeter areas are heated and cooled by 180 fan coil units which office staff have in many cases blocked with furniture so the units cannot operate correctly and again are hard to access for maintenance.

Another significant item identified is the lack of fresh air ventilation for the building and staff. There is one outside air fan that filters, heats or cools the outside air and dumps it into one corridor in the center of the building. The ceiling air handlers do not seem to have any outside air being induced for the office areas. The perimeter fan coils appear not to have outside air intakes.

Finally, the historic windows are in poor condition as shown later. They are also single pane glass which allow excessive heat loss and gain through the fenestration areas of the facility depending on the season.

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The following concerns were identified during the course of the site inspection and correspond with Attachment 1 of the Report:

Mechanical Findings:

Finding # - 1. As discussed above the two low pressure steam boilers are in poor condition. These should be considered for replacement soon. Actually the entire heating and cooling system is reaching the end of its useful life. The City of Alexandria should consider a complete heating and cooling system replacement. The City Hall facility would be a good candidate for new variable refrigerant flow heating and cooling system. Roof top dedicated outside air units with heat recovery could provide ventilation. These units would allow the site to meet the ASHRAE 62.1 and 62.2 standards for indoor air quality. This type of system would be the most efficient system available and would be the least expensive and disruptive to fit into this historic building.

Finding # - 2. The hydronic system expansion tanks are flooded and are out of service. This allows the system water pressure to increase and decrease with the system temperature changes. This condition can cause the system pressure to exceed the design pressure during heating season. This will cause the system relief valves open to relieve the pressure wasting chemicals and possibly causing leaks on the heating coils in the building.

Finding # - 3. A2 noted that at least two hydronic system manual valves which were have broken handles and do not operated. These are needed to change the system from heating to cooling and should be replaced.

Finding # - 4. The cooling tower fill is damaged and has been temporarily repaired with some sheet metal to stop the tower water from blowing onto the roof. The fill should be replaced.

Finding # - 5. The McQuay R-22 chillers provide chilled water for the site in summer. These machines are operating well but are inefficient and use R-22 which has been taken off the market. As stated earlier, R-22 is an HCFC which was identified in 1990 by the clean air act to be an ozone depleting compound, thus has been taken out of production. R-22 is still available at increasing cost. There are compliant refrigerants that can replace the R-22 but these will decrease the system efficiency on already inefficient machines.

Finding # - 6. The central plant and air handler controls are pneumatic. The controls are operating but will eventually need to be replaced. There is at least one actuator which should be replaced now. The steam control valve and actuator for the hot water convertor are in poor shape. If this device fails during the winter, the facility will not have heat.

Finding # - 7. The steam heat exchanger head is leaking. The unit's tube bundle should be pulled cleaned and closed with new gaskets.

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Finding # - 8. The main outside air fan for the building is small and only dumps conditioned outside air into the central corridor of the building. It appears that the fan coils do not have outside air vents and the ceiling hung air handlers do not have outside air fed to them either. This should be further investigated to make sure this finding is correct. The concern is a possibility that the office areas in the building may not be getting good fresh air ventilation.

Finding # - 9. There is a second outside air fan which dumps unconditioned outside air into the building. This fan only operates when the outside air temperature is between 30 and 50 degrees. Pumping 30 to 50 degree outside into the building must be causing cold complaints in areas where it enters the building.

Finding # - 10. There are 20 ceiling hung air handlers which heat and cool the office spaces on the floors. These units are very hard to access for maintenance. There is one unit in the print shop which failed a few years ago and hasn't been repaired because of the problem accessing it.

Finding # - 11. There are also 5 air handlers in the building attic. These units do pull outside air through the perimeter wall near the fans. One problem with these units is the condition of the duct work insulation which has failed. This condition will cause condensate leaks into the areas below in summer.

Finding # - 12. Two old dry coolers have been abandoned in place on the roof. This equipment should be removed and the roof penetrations patched and sealed over. This condition may start to cause leaks into the site.

Finding # - 13. There are 24 split system heat pumps which are placed around the building to handle extra heating and cooling requirements in the building. Many of these units are very hard to access for repairs or service.

Finding # - 14. There are 180 fan coil units which are located under windows in offices and in areas around the building perimeter. These units need to be serviced and flushed regularly to eliminate condensate leaks. In many offices the staff have furniture in front of this equipment or covered so they cannot operate properly. This condition adds a lot of preparation time to get these units open for service. This equipment also causes condensate leaks in summer. The unit's condensate pans and drains should be flushed 2 to 3 times throughout the summer to eliminate the leaks.

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Electrical Findings:

Finding # - 15. The main electrical panels and breakers panels at the site do not look as if they are being tested and serviced. All electrical systems should be thermally scanned with an infra-red camera to identify any overheating components or loose connections. This testing will identify such issues before a failure of the electrical system occurs. A2 recommends that all electrical gear be opened, thermally scanned then cleaned and all terminations checked of tightness every 2 to 3 years at a minimum. This an important risk management task that should be implemented. This maintenance is a code requirement.

Finding # - 16. The buildings emergency generator starts weekly on a timer and runs with no load for 30 minutes. About one month ago the generator was full load tested, however the building emergency transfer switches are not being tested and transferred from normal power to emergency. This testing is very important to make sure that emergency power will be transferred to the required systems in the building on loss of outside power. This work should be implemented.

Plumbing Findings:

Finding # - 17. The outside air shaft drain outside the boiler room is plugged up allowing water to enter the boiler room through a window. This drain should be snaked or repaired.

Finding # - 18. The cold water makeup line feeding the domestic hot water heater in the boiler room should be repaired before it fails. This line was installed using dissimilar metals allowing electrolysis to occur. The fittings will need to be replaced with die-electric components to eliminate this dissimilar metal corrosion.

Finding # - 19. Two new sump pumps were recently installed in the upper garage ground water sump. These two pumps are not the correct pump for the application. These two new pumps are standard well pumps with foot valves instead of the correct submersible type pump. The problem is when the foot valve sticks and these pumps loose suction these units will stop pumping.

Finding # - 20. There is another set of old shaft driven sump pumps in the lower garage pit which are still operational. It would be wise to consider replacing these pumps. They should be replaced with submersible style pumps which will provide twenty years of service with little maintenance. The ground water sump pumps in the garage are critical and are the only way to get water out of the garage.

Finding # - 21. The building Fire Pump is located in the boiler room. NFPA code requires that this pump be tested weekly with no flow. An annual flow test to the street is also required. No test tags are shown on the pump showing that this PM was being done.

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Structural Findings:

Finding # - 22. Ground water is entering the boiler room through the floor slab at the boilers causing problems. This should be investigated and corrected. This type of water infiltration will damage the building matt slab.

Finding # - 23. The courtyard planter drains are leaking into the garage causing concrete damage.

Finding # - 24. There are numerous structural cracks and leaks allowing water to damage the garage walls, floors and ceiling slabs. These issues should be repaired before they create more damage.

Finding # - 25. The courtyard brick work has a few areas where it looks as if water is also getting into the garage. The water leaks into the garage are causing noticeable damage.

Finding # - 26. There is a roof leak into the building outside room 3230 and is damaging the drywall bulkhead at the glass doors.

Finding # - 27. Stairwell #1 has a water leak through the wall from outside and will need to be repaired.

Finding # - 28. The boiler chimney is structurally damaged. Metal clamps have been installed to help compensate but the damage is pretty severe.

Architectural Findings:

Finding # - 29. There is one wooden louver in the east side slate roof which is deteriorating and needs to be replaced.

Finding # - 30. The historic single pane windows are in extremely poor condition. These old windows are allowing water infiltration into the perimeter walls and are very inefficient.

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Attachment # - 1: Pictures associated with each finding.

Finding # 1 Photo. This picture is of one of the old brick set fire tube boilers. These units are in poor condition.



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Finding # 2 Photo. The 3 tanks shown in this picture are the closed system expansion tanks. These need to be repaired and the proper air cushion established to allow the systems water to expand and contact without changing the system pressure.



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Finding # 3 Photo. This picture is an example of one valve which needs to be replaced.



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Finding # 4 Photo. This picture notes the temporary sheet metal repair to the cooling tower fill.



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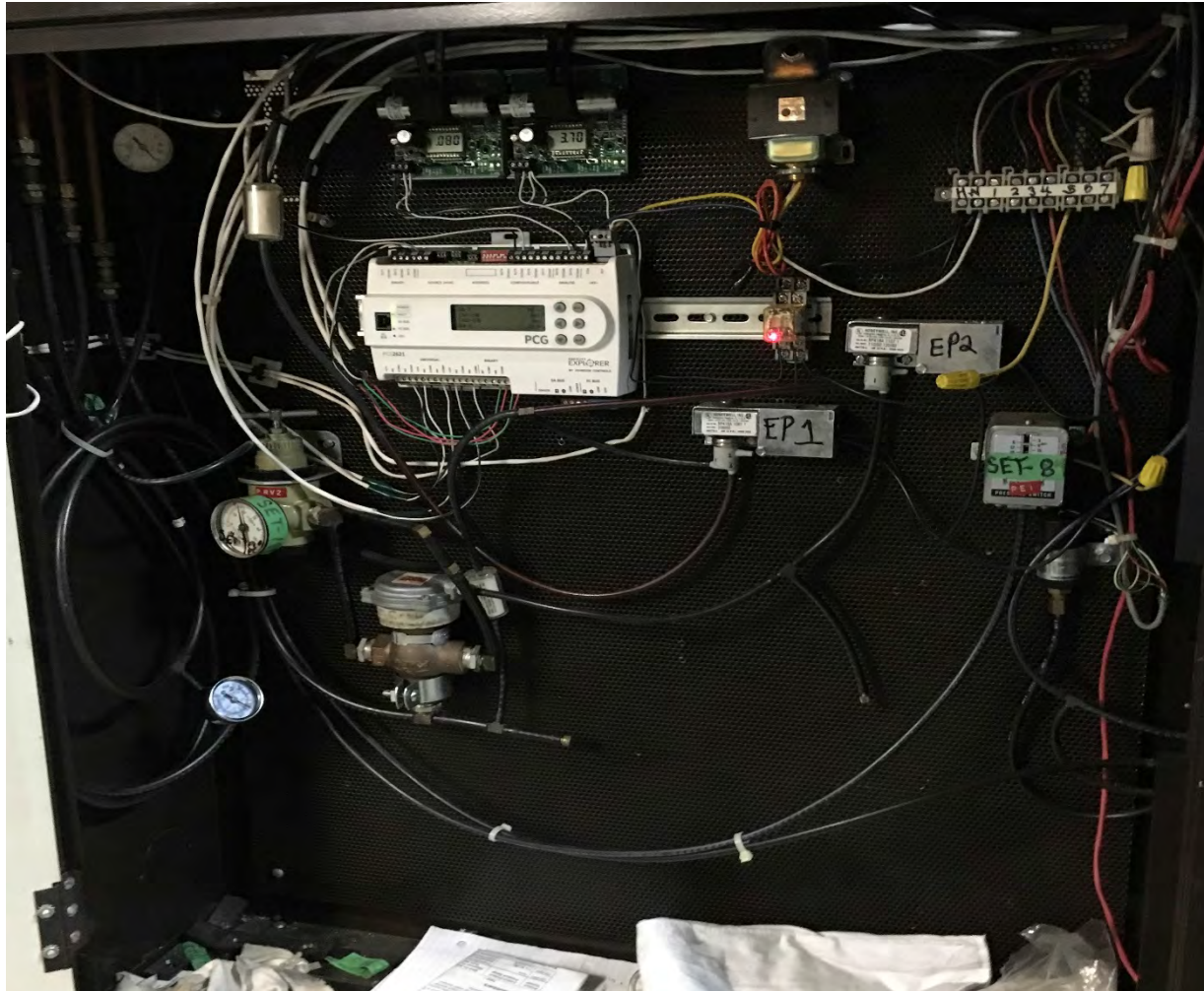
Finding # 5 Photo. This picture notes one of the R-22 centrifugal chillers.



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Finding # 6 Photo. The picture is an example of the old pneumatic controls used to operate the boiler room systems and the air handlers systems in the building.



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Finding # 7 Photo. This picture is of the heat exchanger which heats the whole building. The head is leaking while in operation and should be repaired.



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Finding # 8 Photo. This picture is of the main outside air fan which filters, heats or cools the incoming air for building ventilation.



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Finding # 9 Photo. This picture is of the second OA fan which most likely causes more issues. It simply dumps unfiltered cold air into the building.



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Finding # 10 Photo. This picture is of the air handler in the print shop which the fan bearings have failed. It is very hard to access.



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Finding # 11 Photo. This picture is of one of the attic air handlers with damaged duct work insulation. This will cause condensate leaks in summer.



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Finding # 12 Photo. This picture notes the old dry cooler equipment abandoned in place.



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Finding # 13 Photo. This picture notes the difficult access to the HVAC units.



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Finding # 14 Photo. This picture is an example of one perimeter fan coil unit. This one is in an entrance way off the courtyard.



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Finding # 15 Photo. This picture is an example of one main switch gear which does not look like it has been shut down for cleaning and tighten-up work. Infra-Red testing should also be implemented.



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Finding # 16 Photo. A2 recommends that the emergency generator transfer switches be transferred and tested under load at least every 2 months. This picture is of the emergency generator.



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Finding # 16 Photos Continued. This picture is of one of the emergency transfer switches which should be tested.



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Finding # 17 Photo. This picture notes the window where water is entering the boiler room from the outside air shaft.



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Finding # 18 Photo. This picture notes the corroded inlet water fittings to the domestic water heater in the boiler room.



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Finding # 19 Photo. This picture notes the two new pumps being used at the upper garage sump pit. These should have been submersibles.



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Finding # 20 Photo. This picture notes the old shaft driven sump pumps which are noisy. If they fail the garage could flood.



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Finding # 21 Photo. This picture notes the fire pump in the boiler room. The pump needs to be tested weekly with no flow and once a year with full flow to the street. This is required to make sure the pump will operate correctly in an actual fire event.



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Finding # 22 Photo. This picture notes the water on the boiler room floor which is coming in through the floor slab.



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Finding # 23 Photo. This picture is of one planter drain which is leaking into the garage.



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Finding # 24 Photo. This picture is one example of structural damage in the garage from water infiltration.



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Finding # 24 Photos Continued. This picture is another example of structural damage in the garage.



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Finding # 25 Photo. This picture notes a section of the brick work on the courtyard deck which looks to be adding to the water issues in the garage.



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Finding # 26 Photo. This picture notes the water damaged dry wall bulk head outside room 3230. This is from a roof leak.



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Finding # 27 Photo. This picture notes the crack between the block and the brick walls where water is entering stairway #1.



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Finding # 28 Photo. This picture notes the structural damage to the brick chimney.



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Finding # 29 Photo. The picture notes the rotten wooden louver which will need to be replaced.



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Finding # 30 Photo. This picture is an example of the damaged windows wood work.



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Finding # 31 Photo. This picture is one of the leaking skylights on the 5th floor.



Issues/Deficiencies List

Name of Facility:		Alexandria City Hall	
Photo	#	Description of Deficiency/Issues	Location - Floor/Room
MECHANICAL	1	The two steam boilers are in very poor condition. They are also very inefficient, it would be cost effective to modernize the central plant.	Boiler room
	2	The heating and cooling systems expansion tanks are flooded and will not let the system water expand and contract as required.	Boiler room
	3	The heating and cooling system is a two - pipe design. Numerous manual valves have frozen up and can't be operated properly to change from heat to cooling. These valve need to be replaced.	Throughout the facility
	4	The cooling tower fill is damaged. The tower itsself is also showing its age.	Roof
	5	The centrifugal chillers which provide chilled water to the site for cooling are old and inefficient. They also use refrigerant R-22 which is no longer produced as part of the Clean Air Act.	Boiler room
	6	The central plant and building controls are still pneumatic and some actuators are failing. Recommend converting to DDC controls.	Boiler room
	7	The steam system heat exchanger head is leaking and should be rebuilt.	Boiler room
	8	The main building outside air fan is inadequate to provide proper fresh air ventilation to the site. From what I see the OA is only fed to one corridor in the building. None is being fed to the office spaces.	Boiler room
	9	A second outside air fan dumps unconditioned, unfiltered air into the building and only runs between 30 to 50 degrees outside. This quite strange?	Outdoor mechanical courtyard
	10	There are 20 building air handlers which are basically inaccessible for maintenance due to their locations. One in the print shop has failed and cannot be accessed for repair without completely removing the ceiling and support beams.	Throughout the facility
	11	The air handlers in the attic are in poor condition but operational. Duct work insulation should be replaced to prevent condensate leaks into the spaces below.	Attic
	12	Two dry coolers have been abandoned in place on the roof.	Roof
	13	There are 24 split system heat pumps that have been added to handle new heating and cooling needs. Many of these units are hard to access for service.	Throughout the facility
	14	There are 180 perimeter fan coil units which have problems with condensate leaks in summer.	

Issues/Deficiencies List

Photo	#	Description of Deficiency/Issues	Location - Floor/Room
ELECTRICAL	15	It does not look as if the high voltage switch gear maintenance is being done	Boiler room
	16	Verify the building emergency generator is being properly tested and maintained.	Garage
Photo	#	Description of Deficiency/Issues	Location - Floor/Room
PLUMBING	17	Outside air pit to the boiler room. Drain is plugged and water in the pit overflows into the	Boiler room
	18	The cold water makeup line to the domestic hot water heater in the central plant needs to be repiped.	Boiler room
	19	Two new garage sump pumps have been installed. The pumps that were installed are not correct for the application.	Upper level of garage
	20	Another set of shaft driven sump pumps in the garage are in poor condition.	Lower level of the garage
	21	Verify all code required testing is being done with the fire pump	Boiler room
Photo	#	Description of Deficiency/Issues	Location - Floor/Room
STRUCTURAL	22	Boiler room floor ground water infiltration	Boiler room
	23	There are leaks from the courtyard planters into the garage causing damage.	Garage upper level
	24	There are numerous structural leaks through the concrete slabs into the garage which is causing concrete failure	Garage, both levels
	25	The courtyard brick work has several bad areas which look to be part of the water issues in the garage.	Courtyard
	26	There is a roof leak outside room 3230 which is damaging a drywall bulkhead at the glass doors.	3rd floor
	27	Stairwell # 1 has a wall leak from outside.	Stair # 1, 4th floor
	28	The boiler brick chimney is badly cracked. Metal clamps have been added to stabilize the structure.	Outside at the roof

Issues/Deficiencies List

Photo	#	Description of Deficiency/Issues	Location - Floor/Room
ARCHITECTURAL	29	A wooden louver on the east slate roof is in poor condition and needs to be replaced.	
	30	The historic wooden multi-pane windows are in very poor condition and need to be repaired. These windows are single pane.	
	31	Skylights in the fifth floor lunch area leak and need to be repaired.	