PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

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WICHITA, KANSAS
316/262-2691

VISUAL CONDITION ASSESSMENT REPORT

Newton Public Library
Newton, KS

FOR

Gossen Livingston Architecture
420 S. Emporia
Wichita, KS 67202

Professional Engineering Consultants, P.A. discloses that our inspection consisted of mainly a visual observation, made solely to determine the mechanical (HVAC) and electrical integrity based on the observed condition of the building. This report makes no attempt to verify or quantify that the observed building conforms to the applicable building codes now enforced or the building codes enforced at the time of construction. The conclusions herein are a professional opinion based upon certain assumptions made regarding the condition of the building that could not be observed without destroying otherwise adequate or serviceable portions of the building.

PURPOSE:

Professional Engineering Consultants, P.A. (PEC) was engaged by Kirk Jurgensen of Gossen Livingston Architecture to investigate the Newton Public Library located in Newton, Kansas. Mr. Jurgensen requested a condition assessment report on the current state of the building mechanical (HVAC), electrical, and plumbing systems as they pertain to overall operating condition and energy consumption. Based upon the observations recorded below, recommendations have been included in this report to suggest possible upgrades and/or replacement of existing system components to restore proper working order and to reduce baseline energy usage of the building.

MECHANICAL HVAC OBSERVATIONS:

Chris Wapelhorst, I.E., investigated the building on November 20, 2009. The building is served by a large multi-zone air handler and several 4-pipe air handling units throughout the space. Chilled water to those units is produced by a roof mounted cooling tower coupled with a water cooled chiller located in the mechanical room. Heating hot water is produced by a gas-fired boiler also located in the mechanical room. Hydronic pumps circulate hot and chilled water throughout the building. A 10-ton air cooled split system serves the large meeting room addition and a small 2-ton air cooled split system serves the server room. The exhaust fans and gravity ventilators appear to be the original pieces of equipment. The building automation system was retrofitted approximately 5 years ago.

The HVAC equipment and a brief report of its condition is listed below.

Cooling Tower: The roof-mounted cooling tower is a Marley Aquatower, and is approximately 12-15 years old. Although efforts have been made to maintain the cooling tower, it is showing signs of deterioration and is near the end of its useful life. The associated piping and pumps show significant signs of rust. Given the condition of the tower, it is obvious that water treatment has been a problem in the past even though it has improved in the recent years.

Photo 1: Scaling on back of cooling tower.

Photo 2: Rust on pump and piping on cooling tower.

Chiller: The water cooled screw chiller is a MultiStack modular chiller system (model MS50Z6A2W) and was installed approximately five years ago. It appears to be in fairly good shape and the users reported no problems with the chiller.

Boiler: The boiler is a Weil-McLain gas fired boiler (model LGB-8) and was installed at the same time the chiller was replaced, approximately five years ago. The boiler appears to be in good shape and the users reported no problems with it. Combustion air is delivered to the space by a fan tied into the outside air duct feeding the multi-zone unit. The fan is interlocked with the boiler to run whenever the boiler is in operation.

Air Handlers: The larger air handlers throughout the building have been well maintained and appear to be functioning well. The users reported small problems with them, but nothing more than usual maintenance items such as replacing belts. The smaller fan coil units are hard to access and are at the end of their useful life. Insulation on the piping near these units is in bad condition and is routed in such a way that it makes accessing the units very difficult. Outside air is delivered to all of the air handlers through grates at grade level near the building as shown in the photos below. This makes keeping leaves and debris out of the outdoor air steam an impossible task.

Photo 3: Fan coil unit piping above ceiling. Access to the unit is poor due to the pipe routing. Insulation and piping is in poor condition.

Photo 4: Outdoor air must travel through grates to get down to the wall louvers below.

Photo 5: Leaves and other debris fall down through the grates and get into the outdoor air stream.

Pumps: The hot and chilled water pumps are close coupled end suction pumps and appear to be the original pumps. They have been well-maintained and are still in operation, but are showing signs of deterioration. Users reported substantial maintenance requirements associated with the pumps.

Photo 6: Existing pumps.

Exhaust Fans/Gravity Ventilators: There are two exhaust fans, one inline fan and one roof mounted fan. Both appear to be the original fans and the users reported high maintenance requirements associated with them. The gravity relief ventilators on the roof appear to be in good condition. It is assumed that they are functioning well given that there were no building pressure related complaints by the users.

Condensing Units: There are two roof mounted air cooled condensing units. The first is a 10-ton unit that serves the large meeting room addition. It appears to be approximately 5-7 years old and in good shape. Insulation on refrigerant lines is in poor condition. The second is a 2-ton unit that serves the server room. It also appears to be 5-7 years old and in good shape. Insulation on refrigerant lines is in poor condition.

Controls: The building controls were retrofitted by T.A.C. at the same time the chiller and boiler were replaced. The users did not have any complaints with the new control system and it appears to be functioning well.

Miscellaneous: Overall, the piping, duct work, and insulation appeared to be in fairly good shape. There are some locations throughout the building where insulation should be replaced. Humidifiers at the air handlers throughout the building have been installed and appear to be in good condition.

MECHANICAL HVAC CONCLUSIONS:

In general, the HVAC system(s) serving this building are operating well enough to satisfy the function of the building. There are some deficiencies, which are listed below.

As mentioned and shown above, the cooling tower, along with some of the piping and accessories, should be replaced in the very near future. Developing an extensive water treatment plan would also be a vital component to ensuring efficient operation and extending the life of the new equipment. It would reduce maintenance if we could replace the cooling tower with a piece of air-cooled equipment, but that option is not seen as feasible since the chiller in the mechanical room was replaced with a water cooled unit a relatively short time ago. The water cooled chiller appears to be operating well and the users reported no problems associated with it.

The boiler is relatively new, operating well, and it should have a remaining useful life of around 15 years. A more efficient condensing boiler may be a better choice in the future, when the payback period would not be quite as long. Supplemental combustion air is currently being supplied to the room through a fan off of the outside air duct. Although this works for right now, a condensing boiler would alleviate some of the concerns with the combustion air requirements.

The larger air handlers appear to be functioning well at this time. However, the outside air intakes to them are not ideal. Dirt, leaves, and other debris have an easy path to the outside air stream through the grates mounted at grade level. It is recommended that the outside air ducts be re-routed to new roof hoods or to wall mounted louvers in the exterior wall (above grade). Chases would have to be added to make this a possibility, but the indoor air quality would be improved and maintenance requirements would be significantly reduced. The fan coil units throughout the building are at the end of their useful life. They all have maintenance access problems due to either their location or the piping blocking the access panels. At a minimum, the piping runouts to the units should be replaced as it and the insulation is in very poor condition.

The two exhaust fans in the building should also both be replaced. They are both well past their useful life expectancy.

The hydronic pumps are the original pumps. As stated above, they have been well maintained, but should be replaced in the very near future as they are at the end of their useful life.

The two air cooled split systems are both in good condition and have an estimated 5-7 years of operation before they will need to be replaced. Insulation on refrigerant lines should be replaced.

The building controls system has been updated recently and should serve the building well for years to come. If new equipment is installed, it should all be capable of being tied into the existing building automation system (which should not be a problem).

Overall, the HVAC system is functioning as well as could be expected given the date of the equipment installation. The first concern should be replacing the cooling tower, and the rest of the items listed above could all be done throughout the next several years. Occupant comfort seems to be satisfactory amongst the users. There are a few locations throughout the building where insulation or piping should be replaced, but they are minimal repairs. The majority of insulation and piping is in good condition.

PLUMBING OBSERVATIONS:

The water meter and backflow preventer are old and are showing signs of deterioration. The water meter is not currently structurally supported in an acceptable fashion. The gas-fired water heater (Reliance Sta-Kleen 40 MBH input) is outdated and showing signs of deterioration. The hot water circulation pump also needs to be replaced. Plumbing fixtures throughout the building are in good shape and no complaints were noted at the time of the inspection. The piping and insulation throughout the building is in fairly good shape.

Sewage backing up through the floor drains has been a problem in the past and has been addressed with backwater valves at the drains. The lower level sanitary waste drains to a sewage lift station located in the mechanical room. Another sump pump is also located in the mechanical room for foundation drainage. Both of these pumps have been the source of problems for the users.

PLUMBING CONCLUSIONS:

The water meter, backflow preventer, water heater, and recirculation pump all should be replaced soon. The water meter and backflow preventer appear to be the equipment from the original installation, while the water heater and recirculation pump are approximately 15-20 years old. All have reached the end of their useful life.

The sump pump and sewage ejector are the source of problems and unnecessary maintenance. Discharge piping from both systems needs to be re-routed. We would also recommend adding back-up pumps and controls to make both systems duplex systems.

The existing plumbing is in good condition other than the problems listed above.

ELECTRICAL OBSERVATIONS:

Steve Vo, I.E. investigated the building on November 20, 2009. The electrical service consisted of a single electrical service entrance located in the basement level at the northwest portion of the mechanical room. A Westar Energy pad mounted utility company transformer serves a Cutler-Hammer Type QVB 600-Amp, 120/208-Volt, three phase service that provides power to the entire building. This main service entrance does not have a main breaker and utilizes the "six handle" rule as allowed by the National Electrical Code. The main distribution panel has six fused switches that serve multiple power panels and loads throughout the building (there is one 400-Amp, two 200-Amp, and three 100-amp switches). This limits the capacity for future addition of new panels or large loads as by Code, we can not add any more "handles" to this service entrance. Additionally, from a cursory inspection of what is currently connected to this service, it seems that the existing 600-Amp is nearly (if not already) loaded to its maximum rated capacity. The branch circuit panels connected to this distribution panel are of various manufacturer, age, and load capacity. Panel 'A' is an 125-Amp, main lug Cutler-Hammer panel, panels 'B' and 'C' are 225-Amp, main lug Square D panels, the newest panel 'D' is a 125-Amp, main lug Siemens panel. Branch circuit panels 'A' and 'C' are located on the main floor, panels 'B' and 'D' are located in the basement. The multiple panels serve loads such as lighting, mechanical, computer (panel 'C' is an isolated ground panel) and miscellaneous plug loads. From visual inspection, the main distribution panel and panel 'A' seem to be original to the building (circa 1971) while the other pieces of gear seem newer. This could cause future issues as replacement circuit breakers and switches might be difficult to find and purchase to resolve maintenance issues. During the investigation, there were no comments by the head librarian or the building maintenance personnel that would indicate existing or possible problems with the electrical distribution system.

The fire alarm and data/telephone systems seem to be in adequate operating condition for current operating conditions. Although the existing zoned fire alarm system (Simplex #4002) is in working order according to the maintenance personnel, it does not meet current Code requirements (insufficient notification devices). In regards to the data/telephone system, there were no comments by the head librarian or the building maintenance personnel that would indicate any existing or possible problems in reference to this system.

As with the electrical distribution system, visual observation and discussion with the librarian and maintenance personnel indicated that there were no existing or possible problems with the lighting system in the building. It was stated by the librarian that an "energy upgrade" had been performed in the building in recent years that replaced all light fixtures in the library with more efficient T8 lamp fixtures. In regards to lighting controls, it seems that the original controls are still in operation (wall mounted toggle switches). The majority of the interior light fixtures are 3 or 4 lamp T8 fixtures with acrylic lenses. Emergency lighting within the building is provided by self contained emergency battery operated lights. Exterior lighting is accomplished via building mounted wall packs and post top light fixtures. All exterior lights have a metal halide source and are controlled via a timeclock/photocell combination. There is no provision for emergency egress lighting at exterior doors and walkways.

ELECTRICAL CONCLUSIONS:

From visual inspection the current configuration of loads on the existing electrical service does not warrant immediate concern, but seems to be close to the maximum 600-Amp capacity that the electrical system is rated. However, addition and/or replacement of significant heating, cooling, lighting, or equipment loads will adversely affect this status and could cause an overload situation. Although the existing connected loads did not seem to pose an immediate problem, the availability of spare breakers or spaces for additional breakers was lacking and will inhibit the Owner from adding additional branch circuits or loads.

The existing fire alarm and data/telephone systems seem, from a visual inspection, to be operating as needed. However, as stated above, the system as it exists today does not meet current Code.

The current lighting system is, from visual inspection, operating as it should and is adequate for the current needs of the Occupants. However, the current lighting system does not utilize any type of automatic lighting control to sweep the lights off. The ASHRAE 90.1/2003 IECC energy codes requires an automatic method of light shutoff for buildings with greater than 5000SF.

ELECTRICAL RECOMMENDATION:

It is recommended that an overall facilities plan to be developed that will allow the Owner to understand upcoming electrical needs and desires. For example, if remodels, renovations, or additions are projected in the near future, it would be feasible to investigate an upgrade of the current electrical distribution system. As stated above, the current system is a 600-Amp system which at this point adequately serves the building in its current configuration. However, if additional loads require that panels need to be added to serve them, Code dictates that we can not add it to the main distribution panel. Additionally, there are no panels currently existing that would be able to serve another panel without a good possibility of overload. Therefore, the electrical distribution system would have to be reworked to allow for additional load and to allow for the future flexibility of adding additional breakers/switches to the main distribution board all while meeting Code and avoiding possible overload conditions.

A new electrical service (1200-Amp, 3-phase, 120/208-volt) with a main breaker is recommended in the place of the existing 600-Amp board. If an upgrade of the existing electrical system is expected and/or desired, it is also suggested that since this is a City owned building, that the maintenance personnel develop a standardization plan that would include limiting the manufacturer to be used in the building (i.e. Cutler-Hammer, GE, Square D, Siemens, etc.) to be consistent with existing systems in other buildings maintained by the City. This will aid current and future maintenance personnel to more efficiently catalog and stock spare parts and pieces (possibly requiring less storage space) and also to more efficiently troubleshoot as the buildings all now would have the same type of gear and devices installed. A drawback to this method is that on future new or remodel bids, a standardization of gear might cause an increase in price due to sole sourcing.

If any work is to be done in terms of remodel or addition to the building, it would be recommended that the existing fire alarm system be upgraded to meet current Code requirements.

Currently, there are no recommendations for the existing data/telephone system as there were no issues expressed by the Owner that would warrant any type of work with this system.

In regards to the existing lighting system, installation of occupancy sensors in all spaces will allow the building to conform to energy code by providing an automatic control for lighting shutoff. The occupancy sensors will also aid in reducing energy consumption as lights will be de-energized in rooms that are not in use. In lieu of occupancy sensors, a lighting relay panel can also be used to shut lights off.

ENERGY EFFICIENCY/GREEN CONCEPTS:

The building mechanical, electrical and plumbing systems are all reasonably efficient given the life of some of the equipment and date of installation, but there are still several opportunities to reduce energy usage and make the building more sustainable.

The type of HVAC system that is currently installed is inherently an efficient system. Replacing the aged cooling tower and accessories as stated above will go a long way in increasing the operating efficiency of the HVAC system. Introducing a water treatment plan as recommended will also ensure that the system is operating at optimum level. The hydronic pumps should be replaced and variable frequency drives should be considered to reduce energy consumption. Replacing the boiler with a highly efficient modulating condensing boiler may also be justifiable in the near future. The condensing boilers can achieve part-load efficiencies as high as 98%, while the existing boiler has closer to an 80% thermal efficiency rating.

Electrically, the installation of occupancy sensors in themselves will start helping with energy efficiency. To garner the most savings, the Owner should look to replace standard acrylic troffers with high efficiency troffers which would reduce energy consumption by approximately 33%. With proper lighting design/layout along with the proper utilization and programming of occupancy sensors/controls, the Owner can see a return on investment of such systems in a short span of time.

The plumbing fixtures in the building are in good shape, but could be replaced by low flow fixtures fairly easily to reduce the amount of building water usage. The existing water heater needs to be replaced as stated above and a water heater with up to 96% thermal efficiency could be installed for little extra cost.

With several pieces of equipment at the end of their useful life, it makes sense to replace them with energy efficient equipment. Life cycle cost analysis should be calculated to make the most sensible decision for the Owner for each piece of equipment. Reducing the amount of water usage is not required and will likely never pay for itself, but it is the right thing to do and could make a valuable learning tool.