Building Assessment Report

Wood County

Space Needs Analysis Study

Wisconsin Rapids, WI 54495

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INTRODUCTION

This report has been developed for the County for identifying the current building's Mechanical (Heating, Ventilating, and Air Conditioning HVAC), Electrical and Plumbing systems, and identifying areas in need of upgrading. An assessment was performed for the Courthouse and Jail. The Norwood Facility in Marshfield was assessed for using some of the space for future offices. Assessment of the existing building and recommendations for engineering improvements include construction budgets.

The Courthouse Center was constructed in 1954 and the Jail addition was constructed in 1989.

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NORWOOD HEALTH CENTER

Plumbing Systems

General Description

This building with regular maintenance and routine regulatory inspections has kept the plumbing systems in good condition. Additionally, the basement crawl spaces will accommodate renovations and technology upgrades without having to make any significant compromises.

Much of the resident spaces are fitted with institutional grade fixtures. If any of these spaces are to be converted to offices, the current system could remain as is or be updated to sensor flush valves and water conserving fixtures.

HVAC Systems

General Description

This building through regular maintenance has kept the HVAC systems in good condition. Additionally, the basement crawl spaces will allow for easy upgrades for office space as needed.

Electrical Systems

General Description

Although this building is about 30 years old, regular maintenance and routine regulatory inspections have kept the electrical systems in good condition. Additionally, the basement crawl spaces have accommodated renovations and technology upgrades without having to make any significant compromises.

A recent electrical service and generator upgrade project has significantly raised the reliability of electrical service available to the building.

Much of the resident spaces are fitted with institutional grade fixtures and devices. If any of these spaces are to be converted to offices, a complete electrical renovation is probably required.

Power Distribution

Recently, the utility service was changed from medium voltage to 480 volts, to accommodate the installation of a new chiller. Normal power now comes from behind the building from a loop utility feeder. This new loop service provides some redundancy from the utility side.

In addition to the utility upgrade, a new 400 kW diesel generator was installed to provide backup power to the entire building. An interlock is in place, however, to turn the chiller off when the generator is running. This interlock is a typical compromise made when sizing emergency power for the chiller could double the size and cost of the emergency power system.

The generator and utility transformer then feed transfer switches. The transfer switches then feed into the building's existing power distribution system. As mentioned, the distribution system is in good condition. Modifications can easily be made via the basement or crawl spaces. The equipment is all Square-D brand and breakers are still readily available at a reasonable cost.

Lighting

Over the last ten years, a scheduled replacement of light fixtures and lamps has taken place. Incandescent lamps have been replaced by fluorescent. Older fluorescent lamps have been replaced with newer T-8 fluorescent. Currently, the facility is considering moving to LED technology for some spaces.

Telecommunications

Much of the newer telecommunications' wiring is run underneath the main floors in the basement or crawl spaces.

Fire Alarm

The fire alarm system was upgraded in the 1980's. Any major renovation to a large section of the building would require a building wide upgrade to the fire alarm system to bring it up to current codes.

Any current spaces that are presently not used for offices but would convert to office space will require some minor upgrades. Additional strobes and alarms would be required in these new use spaces to meet ADA and current codes.

Security

Newer digital security systems are used to provide some exterior perimeter surveillance and access control into the building.

SHERIFF'S DEPARTMENT – JAIL DIVISION

Plumbing

General

The plumbing systems infrastructure is primarily in good condition. Maintenance personnel from the county indicate there are very few maintenance or operational concerns at this time.

HVAC Systems

General

The Heating, Ventilating and Air Conditioning fans, air distribution, hot water boiler, chilled water system and Direct Digital automatic temperature control system infrastructure is primarily in good condition. Maintenance personnel from the county and local mechanics from Complete Control Company indicate there are very few maintenance or operational concerns at this time.

Electrical Systems

General Description

Some of the 60 year old Jail infrastructure still exists, but most of the Jail Building's electrical systems are from the 1980's renovation/expansion. While relatively new when compared to the Courthouse, this equipment is approaching its expected life. At the least, main components should be examined and tested to reveal any defects due to age or use.

Power Distribution

Major distribution components at the penthouse level appear visually to be in good condition. The major concern is the roof mounted transformer mentioned in the Courthouse section. All normal power for the Jail comes from the Courthouse via this transformer. Although this transformer was installed in the 80's, its outdoor location has likely accelerated its deterioration. The County should consider replacing this transformer and moving it to a more protected location.

Emergency Power

The Jail Building is fully backed up by a 344 kVA generator located on the penthouse level. The generator is located safely indoors and appears to be well maintained and tested.

Lighting and Receptacles

Most of the lighting has been upgraded to more modern, mostly fluorescent, lamps. Lighting energy efficiency is now much better than what existed originally. In addition, the upgrades provide lower maintenance needs and higher reliability.

Most of the convenience receptacles have been changed over to three prong "grounded" style. However, some two pronged outlets still remain. The remaining two pronged outlets should be changed to grounded or GFI type outlets soon.

Fire Alarm

The fire alarm system is 80's vintage and generally does not comply with current ADA and Fire Alarm codes. As long as the facility is continued to be used in its current occupancy, no changes are required. When a major renovation to the entire facility is considered, this system would be replaced at that time.

Security

Closed circuit television is provided by newer digital server based equipment. Similarly, access control throughout the building is accomplished using older PLC technology. Today, access control in secured buildings is done using server based (computer) technology.

COURTHOUSE

Fire Suppression Systems

General

There is no Fire Suppression System for the Courthouse.

Recommendations

When the facility is remodeled, the installation of a complete Fire Suppression System would be required. The installation of the Fire Suppression System will require an upgrade of the water service or an additional water service dedicated to Fire Suppression be brought into the facility.

Plumbing Systems

General

The plumbing systems infrastructure is primarily circa 1954-55 with various system upgrades over the years and this portion serves the Courthouse.

Utility Infrastructure

Water Distribution

Observations

A 3" combined water service enters the building from the north.

Sanitary Sewer

Observations

Three sanitary sewer laterals leave the building to the north, one at 8" and the other two at 4".

Storm Sewer

Observations

Three storm sewer laterals leave the building to the north. One lateral at 10" and the other two are 4".

Interior Plumbing Systems

Interior Domestic Water Distribution System

Observations

The interior domestic water distribution system originates from the 3" water service. The 3" domestic water supply continues through the building serving plumbing fixtures.

Water is treated by a duplex softening system located within the basement level. Softened water serves the cold water supply to numerous water heating systems on each building level.

Water piping into the building failed and a new main constructed of copper tubing was brought into the building's boiler room overhead to reconnect into the main system.

Hot water is generated by a series of individual electric water heaters located throughout the building.

Exterior yard hydrants are supplied with a non-potable distribution system through a backflow preventer.

Assessment

Piping is beginning to fail and the condition of pipe insulation varies, with most areas observed in average condition.

Recommendations

Replace the water distribution system.

Interior Sanitary Drainage System

Observations

The interior sanitary drainage system connects to plumbing fixtures and drains and is routed to below the basement floor and drains by gravity.

Piping is generally constructed of no hub cast iron and in average to poor condition for its age.

Assessment

As the cast iron piping has aged, cracks will begin developing in the piping at limited areas and the piping should be replaced with PVC and wrapped with insulation due to the location within plenum spaces.

Recommendations

Replace cast iron drainage piping with Schedule 40 PVC with plenum wrap or an alternate product would be CPVC DWV piping which is approved for use in plenums without plenum wrap

Interior Storm Sewer

Observations

The interior storm sewer connected to drainage tile and roof drains extending the waste stacks to be low.

Assessment

Piping is generally constructed of cast iron no hub pipe and fittings in average condition for its age.

Recommendations

Nothing at this time.

Plumbing Fixtures

Observations

Plumbing fixtures are generally of older vintage. The maintenance staff has been gradually replacing flush valves with sensor operated battery powered type.

Water Closets

Water Closets are typically constructed of vitreous china, are wall hung flush valve operated, sensor.

Urinals

Urinals are typically constructed of vitreous china, flush valve operated, manual and are of the stall type configuration.

Lavatories

Lavatories are typically constructed of vitreous china, wall hung or counter mounted self-rimming with manually operated two handle faucets.

Assessment

The existing plumbing fixtures are in good condition. The majority of the plumbing fixtures in the building are not ADA compliant or water conserving.

Recommendations

Water Conservation

As existing fixtures continue to age resulting in more repairs, they should be replaced with updated water conserving fixtures.

Water Closets	**High Efficiency 1.28 gallons per flush**
Urinals	**High Efficiency 0.128 gallons per flush**
Lavatories	**Faucets with 0.5 GPM aerators**
Sinks	**1.5 GPM aerators**

ADA Compliance

The toilet room facilities throughout the building should be brought up to ADA standards.

Option 1

Construct a new men's and women's ADA compliant toilet room on each floor.

Option 2

Renovate one men's and women's toilet room on each floor for ADA compliance.

HVAC Systems

General

The Heating, Ventilating and Air Conditioning fans, air distribution, steam boiler and parts of the automatic temperature control system infrastructure is primarily circa 1954 with a new water chiller for air conditioning installed in 1992. The automatic temperature control is being converted from a pneumatic system to a Direct Digital Control (DDC) system. The entire building should be mostly converted over by the end of 2015.

Air Handling Systems

Air Distribution

Observations

The air is distributed into the building through multiple air handling units. Each unit is a constant volume system running continuously when the building is occupied. Each unit has a steam coil and a chilled water coil.

The same unit will provide air to rooms on each exposure of the building. Many of the units supply air only to the interior zones and not to the perimeter office spaces. The units are controlled by return air sensors.

Return air transfers into corridor and back to the air handling systems..

Assessment

A constant volume system uses too much fan energy as it is supplying the same amount of air all the time and cannot reduce it energy when spaces may not be occupied

It appears the original system was designed for large open spaces and cubicle type work spaces. Over the years multiple individual offices have been created. There is a shortage of supply air and ventilation air to many spaces as the ductwork does not extend into all the spaces and are not providing a continuous source of ventilation air which can lead to “stuffy” feelings of personnel working in the space.

Also, there is a lack of individual zone / space control with the same unit providing air to the east and west sides of the building at the same time. So with the sun shining on one side of the building the opposite side may not be a good working environment.

The air transferring into a corridor and then into return air duct was allowed when this building was constructed. However current codes do not allow air to transfer into a corridor used for egress as a fire in the room would allow smoke to enter the exit corridor.

Recommendations

Provide air terminal zones and extend ductwork into all the different types of occupancy zones and different exposures that that have been created.

Make these zones served by variable air volume (VAV) boxes that would be fitted with hot water reheat coils. The box would vary the amount of air needed based on the space needs to use only the amount of energy required based on occupancy. The VAV boxes would also have a set minimum air flow when the spaces are occupied to provide improved working environment. Occupancy sensors in the space will shut down boxes to reduce air flow for the entire system and save fan energy when spaces are unoccupied.

Extend the return ductwork into the space to meet current code conditions.

Air Handing Units

Observations

The building's heating and cooling air is moved by a multiple constant volume air handlers installed in several locations throughout the building. The units have a steam heating coil and chilled water coil along with filters.

Automatic controls have some direct digital control updates for damper and valve control as well as on/off requirements. There are parts of the building still utilizing a pneumatic system to operate. As previously mentioned the entire building should be controlled with DDC by the end of 2015.

Assessment

The main units are in fair condition but have exceeded their useful recommended life.

Recommendations

The units should be replaced with new units having high efficient motors and variable frequency drives to control the air flow to match the space needs. The steam coils should be replaced with hot water coils as controlling a hot water coil can be done more efficiently than steam. Hot water temperatures can be modified based on the need of the system saving energy at the boiler level.

Complete the installation of the DDC controls as soon as budgets will allow for energy savings.

Coils (Heating and Cooling)

Observations

The hot water and chilled water coils appear to be in acceptable condition.

Assessment

The current coils should be replaced with the new units.

The heating coil should be changed from steam to hot water and provided with valves and redesigned for variable flow.

Recommendations

The coil control valves should be changed to modulating two way operation and the pumping systems modified to variable volume flow based on demand of the system by installing pressure differential controls on the piping that could be used for pump control.

This will reduce electrical power consumption and increase diversification of reserve flow for other areas in need of capacity.

Miscellaneous Air Handling Units

Observations

The IT equipment is served by separate systems with back up that appear in good condition.

The Dispatch Center has its own HVAC system with a backup system as well. The current system is undersized for the amount of equipment and personnel in the spaces. Also some of the office areas adjacent to the center have large temperature swings.

Assessment

The Dispatch Center needs to be reevaluated for better temperature control of the entire space.

Recommendations

A study should be completed to determine the actual needs and best methods to provide the correct environment for the Dispatch Center.

Humidification

Observations

There is Humidity available to be added to Dispatch Center through a humidifier section in the Liebert unit.

Assessment

A Dispatch Center requires humidification in the winter.

Recommendations

The dispatch center humidity needs should also be part of the study for the overall environment for this area.

Exhaust Fan Systems

Exhaust Fans

Observations

There are at many different exhaust fans on the roof and throughout the building.

Assessment

The fans appear to be past their useful life.

Recommendations

Update the entire exhaust system.

Chilled Water Systems

Chiller - Tower

Observations

An air cooled water chiller was installed in 1992. Two of the four compressors have failed and have been replaced. Unit capacity appears to be suitable for the building's needs.

Assessment

The system appears to be in failing condition. The current controls do not allow for conversion to Direct Digital Controls.

Due to the location of the unit it requires a large crane to do the compressor replacements and the last one cost in excess of $30,000 to replace.

Recommendations

Replace the chiller with a new unit. Investigate a new location that would allow for easier compressor replacement 25 years later when that may be required.

Pumps

Observations

The water chiller pumps have been maintained well and appear to be in good condition.

Assessment

The system appears to be in good condition but should have new high efficiency motors and be converted over to variable volume flow to reduce energy costs

Recommendations

Convert the constant flow control valve at the main air handling systems to variable flow to allow for optimal energy reduction and improved comfort and performance.

Hot Water Systems

Boilers

Observations

The boilers are steam and were installed with the original building in 1954. There are steam to hot water heat exchangers to provide hot water to heat the perimeter of the building and the vestibule areas. There are two boilers with one being a backup for both the Courthouse and the Jail. In an emergency steam is piped to the Jail and a heat exchanger converts it to hot water.

Assessment

One of the boilers recently had tubes fail so the overall condition is suspect; however these boilers are operating in the range of 60 to 65% efficiency versus new boilers that could be operating in the 85%efficiency range.

Recommendations

Convert the building completely over to hot water and install high efficiency boilers.

Pumps

Observations

The existing hot water pumps have been maintained well and appear to be in good condition.

Assessment

The system appears to be in good condition but should have new high efficiency motors and be converted over to variable volume flow to reduce energy costs.

Recommendations

Convert the constant flow control valve at the main air handling systems to variable flow to allow for optimal energy reduction and improved comfort and performance. Also there would be a requirement for additional pumps to be installed to serve the new hot water coils in the new system.

Piping

Observations

The existing hot water, steam and condensate piping appears to be in good condition due to an excellent program of chemical treatment for the systems.

Assessment

While the system appears to be in good condition by converting over from steam to hot water and by adding new VAV air terminal boxes with hot water reheat coils it appears new piping would be required for the new system.

Recommendations

Provide new hot water supply and return piping for the entire building.

Control System

Temperature Controls

Observations

The building is a combination of pneumatic controlled systems and new Siemens Direct Digital components. The remaining pneumatic system has a considerable amount of air leaks and the compressor runs too long.

It was reported that the entire facility will be completely DDC by end of 2015, however there appears to be some systems currently in the building (i.e. Chiller) that may not be capable to connect into new system.

Assessment

It is becoming increasingly more difficult to find pneumatic control technicians and parts for the systems. Compressed air is expensive to operate and as the systems become older there are additional air leaks causing additional energy use. Direct Digital systems provide better working environment and energy savings throughout the entire system.

Digital controls also increase building comfort and area a useful maintenance and diagnostics. Numerous operational parameters are continuously monitored by the digital system and can be viewed and alarmed by the facility's maintenance staff.

Recommendations

Remove as much pneumatics and provide a complete direct digital control system for the entire HVAC System. Where items must remain on pneumatics, provide new tubing to that equipment to allow the shutting off of the leaking piping

Electrical Systems

General

This is a 60 year old building with most of the electrical power infrastructure still intact. Some low voltage systems have been more recently replaced and some new systems have been installed. While the building has been well maintained, it faces several issues typically seen in a structure of this size and type:

- Hard surfaces and embedded conduit paths which make electrical modifications difficult and expensive.
- Branch circuit panel boards with little or not available circuits.
- A communications pathway system designed for 1960's telephones, compromising the performance of a modern telecommunications system.
- Older power distribution equipment where available spare parts are scarce and expensive.
- Due to the critical nature of this building, regular exercising and testing of larger overcurrent protection equipment has not been done on a regular basis. This brings to question the ability of certain components to safely open or close when required.
- The large dry-type medium volt transformers are well beyond their useful life and should be replaced to avoid a large, sustained loss of power.

Power Distribution

The building is served from a utility pole off the south side of the site. Medium volt power is then divided and delivered to two large dry-type distribution transformers. One in the lower level and another on the roof.

These transformers feed standard 120/208 Volt, 3 Phase distribution equipment in the basement and penthouse. This distribution equipment breaks power down into smaller circuits to serve branch circuit panels located throughout the building.

Much of the original 1960's infrastructure is still in place. Some newer panelboards have been added to provide additional circuiting as electrical loads increased over the life of the building. As mentioned earlier, much of the original equipment is being used beyond its normal lifetime and should be replaced to provide a higher level of capacity and reliability. Of most concern are the large dry-type transformers, especially the one located on the roof.

Emergency Power

The original generator has been removed. The building's emergency power needs are now served from the Jail Building's diesel generator. Emergency power is delivered to exit and egress lighting and to main IT room cooling and equipment loads. Because this system originates in the Jail Building, most of the major components of the emergency power distribution system are 1980's vintage.

Lighting and Receptacles

Most of the lighting has been upgraded to more modern, mostly fluorescent, lamps. Lighting energy efficiency is now much better than what existed originally. In addition, the upgrades provide lower maintenance needs and higher reliability.

Most of the convenience receptacles have been changed over to three prong "grounded" style. However, some two pronged outlets still remain. The remaining two pronged outlets should be changed to grounded or GFI type outlets soon.

Telecommunications

In general, Telecommunications equipment and cabling has been "shoehorned" into a building that was constructed before the needs of a modern IT infrastructure could be anticipated. The main IT room is a converted office area that isn't able to provide the ventilation, separation and clearance needed for reliable operation. Multiple rack-mounted UPS's are used to provide uninterruptible power to IT equipment. It was said that batteries in these units only last about a year. A larger, central, UPS could be used along with a regular maintenance service to provide a more reliable back-up power system.

Fire Alarm

The fire alarm system is relatively new and mostly meets current codes. Some upgrades are needed to meet current ADA visual and audible requirements.

Security

New digital security systems are used to provide some interior surveillance and access control into the building.

SUMMARY – RECOMMENDATIONS & BUDGETS

The following tables summarizes the recommendations. All projects are budgeted in today's dollars (2014), and are to be inflated to the time when they are intended to be implemented.

Priority One is work that needs to be done within the next five years.

Priority Two is work that needs to be done within the next five to ten years.

Budget numbers are for construction only and do not include additional project related costs.

NORWOOD

	Project	Description	Budget	Priority
Electrical	Fire Alarm	Upgrade to Office Spaces	$2,000 TOTAL	1

COURTHOUSE

	Project	Description	Budget	Priority
Fire Protection	Bring the entire facility up to current standards	New mains, distribution, and heads.	$400,000 TOTAL	2

	Project	Description	Budget	Priority
Plumbing	Bringing the entire facility up to current standards	Water Distribution, Sanitary Sewer, fixtures and new facilities	$1,000,000 TOTAL	2

	Project	Description	Budget	Priority
HVAC	Additional HVAC Ductwork for more zones	Provide additional ductwork for additional air to individual rooms.	$250,000	2
HVAC	Additional HVAC Air Terminals	Provide air terminal devices with reheat & thermostatic controls in individual offices	$500,000	2
HVAC	Occupancy Sensors	Provide an occupancy sensor on every air terminal box to go full closed when personnel out.	$150,000	2
HVAC	New Air Handling Units with VAV controls	Replace existing AHU with new units with hot water coils and chilled water coils	$400,000	2
HVAC	New Dispatch HVAC Equipment	Provide new systems per the study's recommendations	$370,000	1
HVAC	New Chiller and Pumps	Provide new chiller, pumps and additional piping for new location	$300,000	1
HVAC	New Boiler and pumps	Provide new boilers, pumps and additional piping for new location	$400,000	1
HVAC	New Temperature Controls	Remove the remaining pneumatic systems and provide all Direct Digital Controls.	$175,000	1
HVAC	**Opinion of Probable Cost**	**TOTAL HVAC**	**$2,545,000 TOTAL**	

	Project	Description	Budget	Priority
Electrical	Remodel Spaces	New Circuits	$500,000	2
Electrical	Add Branch Circuit Panel	Add a panel to provide more circuits	$150,000	2
Electrical	Dry Type Transformers	Replace / Relocate Transformers	$50,000	1
Electrical	Equipment Assessment	Survey / Scan of main distribution system components	$25,000	1
Electrical	Fire Alarm Devices	Add devices for code compliance	$100,000	2
Electrical	IT	Main UPS	$30,000	2
Electrical	**Opinion of Probable Cost**	**TOTAL ELECTRICAL**	**$855,000 TOTAL**	

	Project	Description	Budget	Priority
Fire Protection Plumbing, HVAC, Electrical, and IT	Remodel Courthouse	Grand Total Of All Work	$4,800,000 GRAND TOTAL	-

Summarization Of Priorities

NORWOOD

Priority One – NOW $2,000

- Fire Alarm System

COURTHOUSE

Priority One – In Next 5 Years..... $1,320,000

- New Dispatch HVAC Equipment
- New Chiller and Pumps
- New Boiler and Pumps
- New Temperature Controls
- Dry Type Transformers
- Equipment Assessment

Priority Two In Next 5-10 Years $3,480,000

- Meet Current Standards for Fire Protection & Plumbing
- HVAC Improvements