Mechanical / Electrical System Evaluation

for

Mastics Moriches Shirley Community Library

407 William Lloyd Parkway
Shirley, New York

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Prepared by:

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INTRODUCTION

Renovations are being proposed to the Mastics Moriches Shirley Community Library. The Board of Directors requested Strunk-Albert Engineering to provide an evaluation of the mechanical / electrical systems and make recommendations for improvements as a part of the renovations.

DEFINITIONS

AHU	Air Handling Unit
CFM	Cubic Feet per Minute is measure of air flow rate.
DX	Direct eXpansion is a term for a refrigeration system coil
EER	Energy Efficiency Rating
HVAC	Heating, Ventilating, and Air Conditioning
RTU	Rooftop HVAC Unit
VAV	Variable Air Volume

BUILDING DESCRIPTION

There are two major sections of the building, the original building and the 1993 Addition. The following is a breakdown of the building.

Original Building

Basement	4,050 sq.ft.
First Floor	15,250 sq.ft.

1993 Addition:

Cellar	9,300 sq.ft.
Basement	9,300 sq.ft.
First Floor	9,900 sq.ft.

EXISTING HVAC SYSTEM DESCRIPTION

RTU-1 Serves ½ of the Main Level (Original Building)

1. The RTU was originally a multi-zone unit and now a constant volume unit is installed.
2. The RTU has 30 ton (nominal) of cooling capacity.
3. The RTU has two stages of gas heat.
4. The RTU has two stages of cooling.

5. The RTU utilizes R-22 refrigerant.
6. The RTU has no capability of dehumidification.
7. The RTU was manufactured in 2005
8. The RTU does not meet the current International Energy Conservation Code. The unit is a standard efficiency with a 9.5 EER. The current code requires a minimum of 10.0 EER.
9. The RTU has an Economizer cycle with a power exhaust fan.
10. There is no VFD (variable frequency drive) on the supply air fan.
11. The RTU does not have energy recovery. (This is not required based on current code.)

- The ductwork distribution system is galvanized sheetmetal with external insulation. Insulation is missing in many areas.
- There is a electric duct coil serving the main entrance Vestibule.
- The ceiling space is a return air plenum (non ducted).
- The RTU is above the Vestibule/Bathrooms. The bathroom ceiling is acoustical ceiling tiles (ACT), which can be transferring bathroom odors back to unit.

RTU-2 Serves Mezzanine and Lower Level (Original Building)

1. The RTU was originally a multi-zone unit and now a constant volume unit is installed.
2. The RTU has 30 ton (nominal) of cooling capacity.
3. The RTU has two stages of gas heat.
4. The RTU has two stages of cooling.
5. The RTU utilizes R-22 refrigerant
6. The RTU has no capability of dehumidification.
7. The RTU was manufactured in 2007.
8. The RTU has an economizer cycle with a power exhaust fan.
9. There is a VFD provided on the supply air fan.
10. The RTU is a 10.0 EER.
11. The RTU does not have energy recovery. (This is not required based on current code)

- The ductwork distribution system is galvanized sheetmetal with external insulation. Insulation is missing in many areas.
- We did identify zone dampers within existing ductwork which are used to vary the amount of air to the space.
- There are multiple electric duct coils that are installed within the ductwork.

RTU-3 Serves ½ of the Main Level (Original Building)

1. The RTU was originally a multi-zone unit and now a constant volume unit is installed.

2. The RTU has 30 ton (nominal) of cooling capacity.
3. The RTU has two stages of gas heat
4. The RTU has two stages of cooling.
5. The RTU utilizes R-22 Refrigerant
6. The RTU has no capability of dehumidification.
7. The RTU was manufactured in 2007
8. The RTU has an economizer cycle with a power exhaust fan.
9. There is no VFD on the supply air fan.
10. The RTU has a 10.0 EER.
11. The RTU does not have energy recovery. (This is not required based on current code)

- The ceiling space is a return air plenum (non ducted).
- The ductwork distribution is galvanized sheetmetal with external insulation. Insulation is missing in many areas.
- There is an electric duct coil that serves the Vestibule.

RTU-4 Serves the Main Level (1993 Addition)

1. 20 ton unit Hot Water/DX unit, 8000 S/A CFM.

- The ceiling space is a return air plenum (non ducted).
- The ductwork distribution system is galvanized sheetmetal with external insulation. The insulation is missing in many areas.
- There are electric duct coils that are installed within the ductwork.
- There is flexible ductwork that is not insulated.
- Directly below the RTU is an ACT ceiling installed with fiberglass insulation directly above. This fiberglass insulation serves no purpose other than some minor acoustical value. Having exposed fiberglass in a return air plenum can allow fibers to migrate back to the HVAC unit and into the occupied space.

RTU-5 Serves the Basement Level (1993 Addition)

1. 20 ton unit Hot Water/DX unit, 7000 S/A CFM.

- The ceiling space is a return air plenum (non ducted). The return opening in the basement has a screen that is blocked by dust. We suggest a complete cleaning of the entire space above the grid. A samples should be taken.
- Ductwork distribution system is galvanized sheet metal with external insulation. Insulation is missing in many areas and should be replaced.
- Electric duct coils are installed within the ductwork.
- Some ductwork is insulated and some is not.
- Directly below unit, ACT ceiling is installed with fiberglass insulation directly above. The fiberglass insulation serves no purpose other than some minor acoustical value. Having

exposed fiberglass in a return air plenum can allow fibers to migrate back to the HVAC unit and into the occupied space.

Air Handling Unit -1 Serves the Cellar Level (1993 Addition)

1. The air handling unit has a hot water heating coil and refrigerant coil for cooling.
2. This unit also has an electric duct coil installed within the supply air duct.

Boiler

1. The boiler is an oil fired Weil-McClain, Series 86 with an input capacity of 1,800,000 BTUH.
2. The boiler provides hot water for RT-4, RT-5, and AHU-1.
3. The boiler is located in the basement of the original building. The fuel tank is located in the cellar of the 1993 Addition. The fuel oil piping runs outside the building underground between the fuel tank room and the Boiler Room.

HVAC SYSTEM EVALUATION

RTU-1, 2, & 3: These units are approximately seven years old and are suitable for re-use. They should have approximately 15 year of usable life left. However, it is suggested that ductwork modifications and additional control sequences be applied to provide better temperature control of the spaces. The original units were multi-zone unit. This means that there were multiple temperature control points capable of providing independent heating or cooling for each of the spaces. RTU-1 had four zones, RTU-2 had five zones, and RTU-3 had four zones. Currently as constant volume units they are single zone units.

RTU-1 serves an office, conference room, and half of the main library space but there is only one thermostat controlling the unit. Therefore, the HVAC unit will work to maintain temperature at the thermostat location and the other rooms, such as the office and conference room will not have any temperature control. Based on the original ductwork layout, there were four temperature control zones. It is recommended that this HVAC unit and ductwork distribution system be converted to a VAV system with supplemental hot water heat. This will provide better temperature control for each of the different spaces. Because the cooling is only two stages the supply air cannot be greatly reduced.

RTU-2 serves multiple spaces in the basement and on the first floor of the original building. Zone dampers were installed to provide some level of individual temperature control but it is not effective. It is recommended that this HVAC unit and ductwork distribution system be converted to a VAV system with supplemental hot water heat. This will provide better temperature control for each of the different spaces. Because the cooling is only two stages the supply air cannot be greatly reduced.

RTU-3 serves some offices on the first floor and one-half of the main library space but there is only one thermostat controlling the unit. It is recommended that this HVAC unit and ductwork distribution system be converted to a VAV system with supplemental hot water heat. This will provide better temperature control for each of the different spaces. Because the cooling is only two stages the supply air cannot be greatly reduced.

RTU-4: This unit is approximately 18 years old and is approaching the end of its useful life. It is recommended that this unit be replaced as a part of the renovations. It is recommended that the ductwork distribution system be modified to eliminate the electric resistance duct coils and be replaced with hot water coils or VAV boxes with hot water coils. The new unit should have new controls capable of providing individual temperature control for the large library area and the enclosed offices and storage rooms on the perimeter. Presently it is a constant volume single thermostat unit so temperature control issues exist.

RTU-5: This unit is approximately 18 years old and is approaching the end of its useful life. It is recommended that this unit be replaced as a part of the renovations. It is recommended that the ductwork distribution system be modified to include hot water coils or VAV boxes with hot water coils. The new unit should have new controls capable of providing individual temperature control for the large library area, meeting rooms, and the offices and storage rooms on the perimeter. Presently it is a constant volume single thermostat unit so temperature control issues exist.

Air Handling Unit 1: This air-handling unit is located in a mechanical room adjacent to the storage area on the cellar level. It serves the entire cellar level, which are mainly storage and some IT offices. The air-handling unit has a hot water coil for heating, and a refrigerant coil connected to a roof mounted condensing unit for air-conditioning. There is also an electric resistance coil mounted in the supply duct for supplemental heating. We are not sure why the electric coil is installed, as the hot water coil should have adequate capacity to heat the space.

This air-handling unit, like the rooftop units, was installed as a part of the building addition and is approximately 18 years old. It could be reused, however; the condensing unit is in need of replacement, as it is approaching the end of its useful life. New condensing units utilize a different refrigerant, which will require replacement of the refrigerant coil inside the air handling unit and the refrigerant piping. (R-22 refrigerant is being phased out and new equipment does not use this refrigerant.) It may be more cost effective to replace the entire air handler unit than to just replace the refrigerant coil and clean the unit. As a part of the upgrades to this system, it is recommended that the electric resistance coil be eliminated. Where supplemental zone control is desired, hot water coils are to be installed in the duct or VAV boxes with hot water coils would be provided.

Boiler: The boiler utilizes fuel oil. It is recommended that the boiler be replaced with a smaller gas fired boiler and that the fuel oil tank and underground fuel piping be eliminated. Natural gas is cleaner burning and has a lower operating cost. We recommend that hot

water be utilized as supplemental heat for the various sub-zones. It is recommended that the new rooftop units utilize gas as a heat source not hot water to prevent coil freeze ups.

Water Heater: The electric water heater should be replaced with an on demand gas fired water heater.

Building Controls: It is recommended that an overall building energy management system be installed that allows the users to make changes and monitor the equipment more easily than the standalone controls.

ELECTRICAL SYSTEMS

Electric Service:

The 1600A 120/208V 3 phase electric service was installed as part of 1993 addition. It backfeeds the original service and panels in original building.

The service is fed from a 500 kva transformer outside building. The peak electric demand appears to be around 225 KW(600 amp at 208 volt 3 phase). The existing 500 KVA transformer is more than adequate to handle additional load. The existing transformer is presently less than 50% loaded.

There is a window within 25 feet of the pad mount transformer. On all new installations, LIPA requires a fire barrier to protect the building from exposure to any fire in the transformer. The library may want to consider installing a fire barrier as per LIPA construction standards.

The electrical panels in original building are what were initially installed and can be reused but if there is money available consideration should given to replacing them due to their age, and to provide additional breakers.

Devices and Branch Wiring

Most wiring devices (receptacles, switches, etc) appear to be original; some have been replaced; many are visibly worn or damaged. All existing devices should be replaced with new; comply with ADA heights where possible and provide GFI where required. Provide additional convenience receptacles for computers where needed.

Remove all surface mounted wireway and devices that have been installed over the years and recess mount in walls; remove obsolete or abandoned conduit and wiring, on walls and above ceilings.

Replace floor boxes that protrude above floors with flush mounted versions (tripping hazard); replace all floor box devices.

Replace existing branch circuit wiring where wall removal makes it accessible.

Lighting:

The interior lighting is mostly older fluorescent, some having been replaced or retrofitted. The Emergency and Exit lighting is a mixture of various types and vintages. The building mounted exterior lighting is mostly older wallpacks.

New more energy efficient fluorescent & LED luminaires should be installed to reduce energy consumption and provide better lighting levels and uniformity.

The emergency lighting should be integrated with 'normal' luminaires, eliminating wall mounted battery packs and heads; providing better illumination over the egress paths.

Provide lighting control system complying with energy codes and reduce energy consumption.

Fire Alarm & Security:

The fire alarm system is a mixture of various vintages and types of equipment. All new devices should be provided; old fire bells should be replaced with audio/visual devices, and devices installed should comply with latest ADA requirements. Ideally the fire alarm control panel should be replaced with an addressable system. Upgrade the Area of Rescue communication system.

The security alarm system is a mixture of various vintages and types of equipment. Obsolete devices should be removed; a new, integrated system provided. CCTV cameras are a mix of old and new. We recommend that the cameras be replaced with new high resolution, motion activated type connected to a DVR recorder.

Other:

Consider updating auditorium/meeting room for today's needs.