Library Board

Monday, April 20, 2020

Regular Meeting

Item F1

Receipt of Mechanical Study

I have been working with The Clark Enersen Partners on a study of our 1973-vintage HVAC (heating, ventilation, and air conditioning) system. This study will be transmitted to City Administration as part of our capital improvements budget proposal for 2020-21.

Staff Contact: Steve Fosselman

EDITH ABBOTT MEMORIAL LIBRARY
MECHANICAL STUDY

1124 W 2nd Street
GRAND ISLAND, NEBRASKA 68801

February 13, 2020

The Clark Enersen Partners

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Section 1
Executive Summary

EXECUTIVE SUMMARY

The report reviews the existing mechanical systems serving the portion of the library that was the original structure (1973). The report documents the condition of the equipment and makes recommendations for replacement. A 20-year life cycle cost analysis reviews three different system types that are suitable replacements. The life cycle cost analysis was used to determine economically if one system is more beneficial than the alternates.

The Clark Enersen Partners recommends moving forward with System 1 (Multi-Zone Air Handling Unit and Air-Cooled Condenser) as described in Section 4 which has an opinion of probable cost equal to $720,000.

Section 2
Purpose and Objectives

2. PURPOSE AND OBJECTIVES

2.1 - PURPOSE AND OBJECTIVES FOR A PROJECT

The primary purpose is to review the existing air handler, water cooled chiller, and associated accessories that serve the original library. Then, The Clark Enersen Partners propose system alternates to replace this equipment. The library had an addition that was completed in the spring of 2008. At this time the staff has not had any issues with the mechanical equipment serving that area, and it will not be the focus of the review.

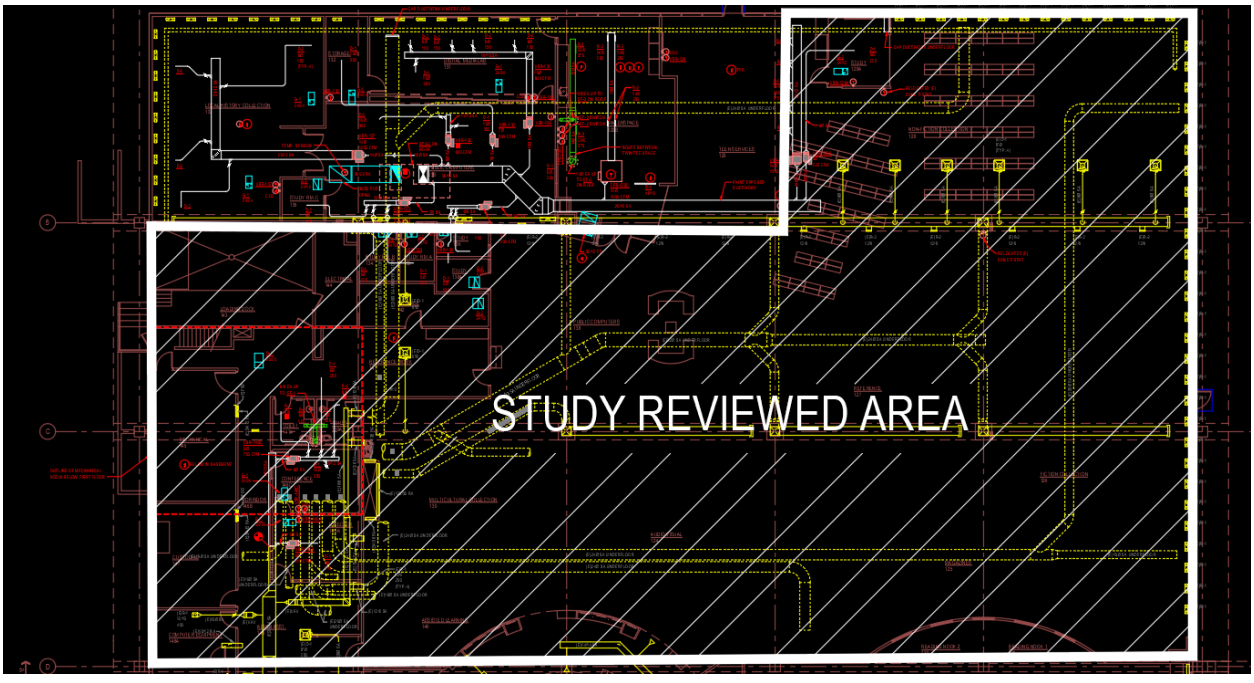
2.2 - JUSTIFICATION FOR PROJECT

The equipment under review is original to the library which was constructed in 1973. The water-cooled chiller utilizes a refrigerant that is no longer being produced(R22). The air handler had a coil that was designed to supplement cooling thru the use of the water well, the coil began to leak excessively and have been isolated. A water well located within the basement, pumps well water through the equipment to provide cooling before discharging to storm. The condition of the water well is unknown and the quality of the water has over time deteriorated the condition of the equipment it serves.

Section 3
Existing Conditions

3. EXISTING SYSTEMS

3.1 - MECHANICAL SYSTEM DESCRIPTION



Above: General Area of Review

Heating

The heating is provided through the use of three LES boilers (model VW-135), which have a vertical fire tube design that produce 1,000 MBH heating output. The heating water is distributed through a two-pipe heating water system to: cabinet unit heaters, reheat coils, and a hot / cold deck within the air handling unit. The heating water pumps installed during the remodel in 2008 distribute the water to the existing Air Handler in the basement. The boilers, heating water pumps, and heating water hydronic accessories are located in the main mechanical room on first level.

Cooling

The existing building cooling is provided through the use of a single water-cooled chiller. The chiller is a Trane unit that is original to the building (1973). The chiller is a semi-hermetic reciprocating compressor design that uses R-22 refrigerant. The chiller has an associated condenser that receives water from a water well located within the basement mechanical room. The water from the well serves as the heat sink for the chiller. The well water is rejected to the storm water system after it passes through the condenser. The water well is original to the building and initially was piped through the air handler to pre-condition the air. It has since been changed due to complications with the coil within the air handler. The well water is untreated, unfiltered, and over time has deteriorated the equipment it serves. The use of the well water was an efficient method to provide chilled water to the building.

There is a Daikin roof top unit that serves the northeast quadrant of the existing library, and was installed in 2019 during a recent remodel. The roof top unit is an air-cooled direct expansion air conditioning unit, and it is not on the existing chilled water system.

Air Handling Units

The air handling unit (AHU) is a Trane #65 medium pressure, multi-zone, blow thru unit. The AHU is original to the space, and it serves 10 zones, some of which have been modified. This unit has a centrifugal fan, chilled / heating water deck, economizer, zone dampers, and a filter roll. The return plenum and outside air is lined, and the liner is deteriorating. The outside air is provided from an area well located within the basement.

A return fan located in the basement mechanical room and return registers in a central location return air back to the AHU or outside if the unit is in economizer operation. The relief air is discharged via an adjacent area well to the outside.

Temperature Controls

The building has recently converted to a DDC electric control system in lieu of the previous pneumatic. The facility utilizes a building management system to monitor and track temperatures and other system functions throughout.

Fire Protection

The facility is protected by a wet pipe fire suppression system. The system includes a fire department connection, backflow prevention, and supervisory valves required to meet state and local code requirements.

3.2 - EXISTING MECHANICAL SYSTEM OBSERVATIONS AND EVALUATION

Cooling

The 1973 Trane chiller has had several maintenance items in recent years and is of the primary concern for catastrophic failure. The unit utilizes R22 refrigerant which was set to be 100% phased out of production January 1, 2020. It is becoming increasing difficult to attain parts to repair the chiller due to its age and the ongoing refrigerant phase out. The chiller has a single hermetic compressor, so if the compressor were to fail, there is no cooling available at the air handler until the unit is repaired or replaced. New chiller designs have multiple compressors to provide redundancy to prevent a system shut down. The condenser coil has been operating on the well water, which has corroded the air handling coil and will corrode the condenser coil. It will become increasingly more difficult to repair the unit if one of the aforementioned components fail. Replacement of the chiller could take in excess of two months if it were to fail, which could lead to additional items that would need to be replaced. The ASHRAE life expectancy of a reciprocating chiller is expected to be 20 years, and the chiller has more than exceeded its usability for the library.

The domestic water well installed in the mid 1970's is located in the lower level mechanical room and was designed to deliver water through the air handler pre-conditioning coil and then to the condenser on the Trane chiller. The pre-conditioning coil began to leak excessively in the air handler and had to be abandoned. The untreated well water caused the damage to the coil. Untreated well water can cause damaging affects to mechanical equipment and the water chemistry within the well can change throughout the life of the well without the owner knowing. The well has a submersible pump that has had little maintenance completed to it dating back to the 1980's. That said the condition of the well casing and pump is unknown, and if this system is going to be re-used, it will require a thorough inspection. The well is located in a difficult location to replace or maintain and it has no redundancy. If the pump were to fail, the cooling system would be down. Due to the lack of redundancy, unknown condition of the well pump and casing, and harmful side effects that the well

water can create, it is not recommended that the existing well pump be re-used for a new system. ***The domestic water well is the second highest point of concern. If the well were to fail, either the pump cannot be replaced or the casing cannot be repaired and the chilled water system will not operate. This has a compounding effect because a completely new heat rejection system would have to be developed, which would change the cooling system entirely. If this were to occur, the cooling system could be down 3-6 months or possibly more.***

Trane Chiller & Domestic Water Well

Multi-Zone Air Handling Units

The multi-zone air handling unit has exceeded its useable life. The unit does not meet energy code fan performance per ASHRAE Standard 90.1-2007. The unit has noticeable rust on the interior cooling coils, drain pan, lower unit structure, and coil connections. The unit has combustible material located within the return air section of the unit. The insulation liner is deteriorating and losing its adherance to the unit which is causing thermal and air quaility concerns.

The owner has reported issues cooling with the air handler. Without the use of the pre-conditioning coil, a percentage of capacity has been lost, and the loss of this capacity does not allow the unit to effectively dehumidify. This has also been reported by the building occupants as a noticeable change in humidity has been felt within the central section served by the air handler.

The cooling coil recently had to be repaired as it sprung a pin hole leak. The repair appeared to be an anomaly as the remaining portion of the coil was reported to be in fair condition. In order to make the repair a portion of the coil had to be removed, and an estimated 10% loss in capacity resulting from the removal. If the leak was not an anomaly and the coil develops more pin hole leaks that cannot be repaired, the coil will need to be replaced.

The air handler has a constant speed supply and return fan that run at full speed during occupied operation. The use of a variable frequency drive (VFD) would reduce energy consumption considerably, however these fan motors cannot be retrofitted with a VFD. The VFD can damage the windings and bearings in the existing motors through repetitive and rapid pulses applied to the motor from non-sinusoidal power-switching circuitry known as parasitic capacitance or harmonic content. The supply fan has never been replaced or repaired and it is located on top of the air handler. The return fan was replaced approximately 20 years ago. Due to the existing location of the supply fan, scarcity of parts, and availability of skilled personnel that could repair the fan motors, the AHU could be down for 1-2 weeks before the fans are repaired or replaced.

Multi-Zone AHU Interior Condition

Hydronic Water, Piping, and Associated Equipment

Pictured below is the single chilled water pump which shows hard insulation that may have suspected asbestos. The condition of the existing chilled water interior piping is uncertain. It is not recommended the piping be used if a future remodel is pursued. The chilled water piping is in excess of 40 years old and was reported that it has iron deposits within the piping restricting fluid flow. The chilled water pump is undersized to accommodate the required cooling capacity since the system is relying solely on the chiller and has abandoned the pre-conditioning coil. The chilled water pump has no redundancy, so if it were to fail, the system would be down. It is expected that a repair to the pump would not exceed 5 days.

Hydronic Pump and Piping

Boilers

The existing 2007 LES VW-135 vertical fire tube boilers are operational and have no significant mechanical problems at this time. The boilers have an efficiency between 75-80% when new. Due to these being 12 years old, performance derate may be occuring. The boilers have limited turn-down at reduced load and are designed to provide 180F supply water temperature. The boilers are not able to operate at temperatures below 140F as this would produce condensation. That would incurr damaging effects to the boilers.

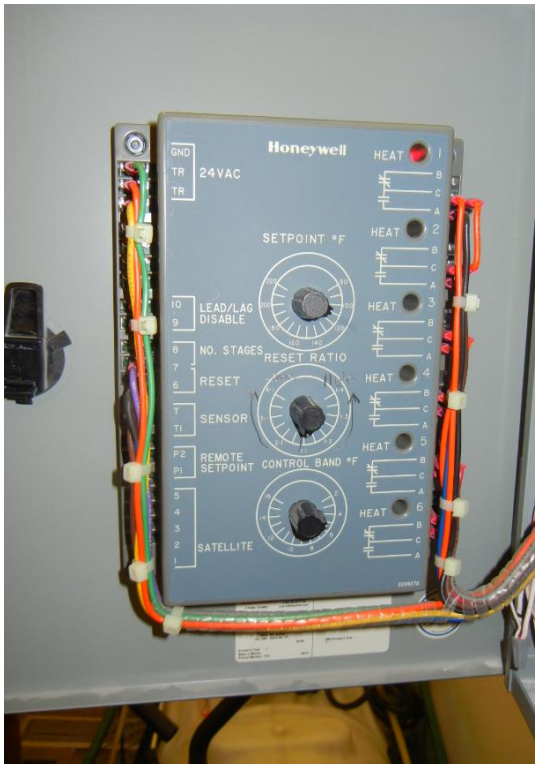
LES Fire Tube Boiler

The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) recommend steel fire tube boilers have a median life expectancy equal to 25 years.

Boilers of similar configuration are able to operate at lower temperatures and improve the boiler efficiency to as high as 95%. The replacement of these boilers with a more energy efficient boiler is not warranted at this time as these boilers have no operational problems and are at half the ASHRAE life expectancy.

Control System

The digital control system will need to be reviewed to determine if a software update is necessary. At this time the system is operational and does not concern the staff. The existing boiler control panel is dated, and if a new boiling implementation were to occur, it is recommended that this control panel be upgraded with the new boiler systems.



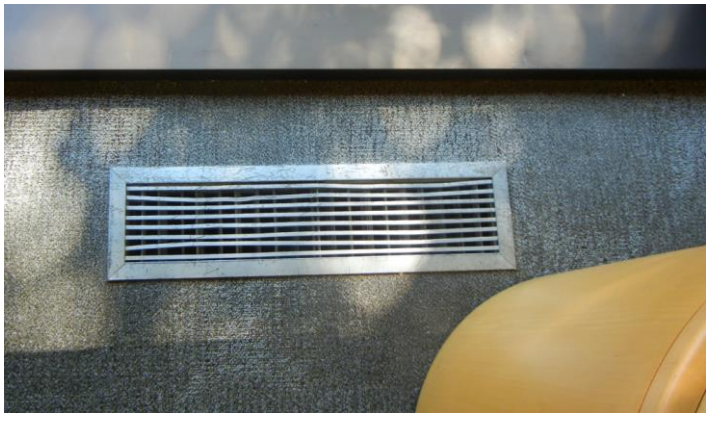
Boiler Control Panel

Envelope

There are no envelope improvements expected or proposed as part of this study.

Miscellaneous Items

The floor diffusers are worn and are in need of replacement if the below floor duct system is to be re-used.



Floor Diffuser Example

3.3 - ELECTRICAL SYSTEM DESCRIPTION

Electrical Service

Electrical Service is provided by the Grand Island Public Power Utility. The existing service voltage is 208/120 Volts, 3 Phase, 4 wire. The service is provided with a 2000 Amp main service with disconnect switch.

The electrical service was upgraded during the 2008 remodel, and the associated equipment in the lower level mechanical room were back fed from the new service main. The library is billed on consumption only and not on demand. The rate structure is attached in Appendix 1. The existing electrical service was reviewed to determine if it has sufficient capacity to power the proposed mechanical systems.

Lighting Systems

Lighting throughout the existing building is comprised primarily of parabolic fluorescent lighting fixtures. Lighting fixtures use T8 lamps and electronic ballasts.

Fluorescent fixtures with T8 lamps and magnetic ballasts are not very energy efficient and are becoming obsolete. LED lighting often provides an attractive payback and reduced maintenance costs.

3.4 - SUMMARY

The items that will have a significant impact to library operations if they were to fail are as follows:

1. Trane Chiller Failure
2. Domestic Water Well Failure
3. AHU Chilled Water Coil Leak
4. Air Handler Supply and Return Fan Failure
5. Hydronic Chilled Water Pump Failure

As mentioned above, each of these items have exceeded their ASHRAE recommended life and are becoming increasingly more difficult to attain parts to repair. The loss of the Trane chiller or the domestic water well could leave the area served by AHU-1 (approximately 19,000 SF) without cooling for an extended period of time.

The existing McQuay and Daikin rooftop units may be able to temper the area served by AHU-1 if a system failure were to occur. Conditions may not be ideal, but the units could run extended operation at adjusted set points during non-occupied hours to mitigate temperature swings. The faculty could experiment with the existing systems to see how the building reacts. There are many factors that are uncertain at this time to provide an affirmative answer to whether this is a feasible approach. Mechanical systems are designed to have redundancy, it is likely during most days throughout the year the equipment will have additional capacity.

The side effects using existing equipment to temper the space are:

- Temperature / Humidity Complaints
    - Over cooling & heating areas to compensate
    - Building Automation System Alarms
- Excessive use and wear on the existing equipment
- Lower occupant census
- Lower productivity
- Employee and Occupant Health affects

Section 4
Recommendations

4. RECOMMENDATIONS

4.1 – MECHANICAL RECOMMENDATIONS

Heating and Cooling Systems Life Cycle Cost Analysis

Three systems were reviewed with a 20-year life cycle cost payback. The systems were: System 1: Multi-Zone Air Handler with remote Air-Cooled Condenser, System 2: Variable Air Volume Roof Top Unit with Reheat, and System 3: Single Zone Variable Air Volume Roof Top Unit(s). The energy rates used for the life cycle cost analysis were:

2019 Grand Island Utilities Consumption Fee

- $70 Customer charge assumed based on connected horsepower
- Summer consumption charge (KWH). See attached rate schedule in Appendix 1.
- Winter consumption charge (KWH). See attached rate schedule in Appendix 1.

2019 Blackhills Energy

- $18.50 Facilities Charge
- $0.61865 per therm

See Appendix 2 for a historic energy consumption listing provided by Grand Island Public Utilities.

TCEP also reviewed replacement of individual system components. This may produce a short-term solution and extend equipment life, but it is not recommended due to the compounding issues surrounding the entirety of the existing heating and cooling systems.

System 1 Description:

System 1 would utilize a replacement multi-zone air handler with a fan array or similar technology. The replacement air handler would utilize direct expansion or (DX) cooling. A remote air-cooled condenser would be located either on the roof or at grade on the exterior of the building. A pre-heat and reheat heating water coil would be installed in the unit to pre-condition ventilation air and heat the supply air. The multi-zone air handler would tie into the existing ductwork that serves the underfloor and above floor supply air networks in the library. Due to the location, the unit would need to be provided in sections that can fit through the intake plenums or constructed in place.

The floor diffusers would be updated throughout, and the ceiling diffusers would remain the same. A duct cleaning to include bacteriological fogging would be specified to remove any contaminants from existing infrastructure. System balancing would be required to ensure equal air distribution through the supply and return air network.

The existing domestic water well would need to be abandoned in an appropriate manner. This mechanical system would have minimal construction impact to the space and all the existing infrastructure on first level can remain as is. Regardless, the mechanical system serving this area would be down for a period of time while the replacement is being completed. Temporary heating and cooling could be provided to temper these areas during the replacement.

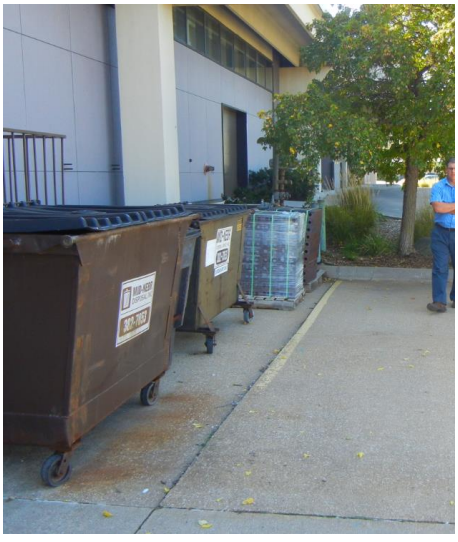
See Appendix 3 for an image of the proposed Multi-Zone Air Handling Units and associated Air-Cooled Condenser.

Advantages:

- Minimal impact to the existing first floor plan, all existing infrastructure to remain in place
- Improved system performance
- Familiar System to facility maintenance

Disadvantage

- Limited Conditioning Zones due to the existing underfloor ductwork
- Does not dehumidify as effectively as other systems
- Temporary heating and cooling may be necessary



Above: Potential Locations for the Air-Cooled Condenser

System 2 Description:

System 2 would utilize a variable air volume roof top unit (RTU) system with reheat boxes. The RTU system is similar to what was installed within the library addition in 2007 and renovation in 2018. The RTU system would be connected to a network of ducts above the ceiling. The above ceiling ductwork network would provide additional zoning capability. The zones would be served by a reheat variable volume box which would also improve dehumidification and comfort within the library space. It is estimated (2) 45 ton RTU's would be adequate to serve the library portion reviewed as part of the study. Additional structural reinforcement would be necessary to support the equipment. The location of the RTU's would be in strategic locations to avoid visibility through the existing library clearstory and from grade.

The RTU system would require the existing ceilings to be removed and replaced in order to install the new ductwork. The existing lighting would need to remain hanging in place however this would present a challenge to the contractor to work around the existing equipment without damaging it. The contractor would need to provide floor protection and the area would need to be isolated during this installation.

Advantages

- Able to provide multiple climate-controlled zones
- Improved dehumidification compared to System 1
- Familiar System to facility maintenance

- Existing System could remain active during installation

Disadvantage

- Intrusive to the existing space
- Longer installation time
- Equipment located on the roof
- More expensive option

See Appendix 4 for and image of the proposed Roof Top Unit.

System 3 Description:

System 3 would be similar to System 2, however it would utilize multiple rooftop units that would be of a single zone variable air volume design. In this configuration, the RTU's would serve specific zones without the reheat boxes as proposed in System 2. This system would be similar to the other configurations within the library space. It is estimated that there could be up to 12 roof top zones in this configuration. Each unit would heat or cool the respective zone.

Advantages

- Able to provide multiple climate-controlled zones (estimated 12)
- Redundancy if a system were to fail
- Familiar System to facility maintenance
- Existing System to remain active during installation

Disadvantage

- Intrusive to the existing space
- Longer installation time
- Equipment located on the roof
- More roof penetrations

HVAC System Recommendation

Several factors and assumptions went into the life cycle cost analysis, which include initial system costs, annual maintenance costs, and annual utility costs. Replacement costs were not included as part of the 20-year life cycle analysis.

System Initial Opinion of Probable Cost

- System 1: $720,000
- System 2: $1,261,000
- System 3: $1,178,000

The 20-year life cycle costs are:

- System 1: 2.05 Million
- System 2: 2.50 Million
- System 3: 2.30 Million

System 2 and System 3 had substantially higher costs due to the interior renovation that would be necessary to complete the above ceiling mechanical work. Based on the interior renovation, these systems had a simple payback in excess of 50 years.

It is recommended to install System 1. This option provides the lowest probable cost, reduces impact to library occupants, and utilizes existing system infrastructure.

4.2 – ELECTRICAL RECOMMENDATIONS

Electrical Service

The existing electrical service was reviewed along with historical power usage. The existing 2000 Amp service will support any of the three recommended mechanical systems.

Lighting Systems

If funds are available, new lighting shall be provided in all remodeled spaces. We recommend the use of LED volumetric type light fixtures in all open offices, private offices and conference rooms. Industrial-type LED fixtures may be used in storage and mechanical and electrical spaces that do not contain ceilings. Also, LED type battery back-up exit signs shall be added where required to provide adequate marking of the egress path. Battery-backed up emergency lighting shall be added in all areas to provide proper illumination of the path of egress.

It is recommended that a low-voltage lighting control system be provided for all spaces and that occupancy sensors be provided in all private offices, conference rooms, storage rooms, and restrooms.

4.3 – Additional Considerations

As part of the study some additional items are included for consideration. These options have **not** been included within the life cycle cost analysis

- Lighting Improvement (LED Conversion – 19,000 SF Approximately) $100,000 – $150,000
    - Opinion of Probable Cost includes Equipment & Installation

Pictures Above: Illustration of the Existing Parabolic Lighting

- Boiler System Upgrade $140,000 – $160,000
    - Provide (3) 1,000 MBH High Efficiency Condensing Boilers
    - Opinion of Probable Cost includes Equipment & Installation

Appendix 1

Grand Island Public Utility Electrical Rate Structure

ELECTRIC RATE SCHEDULE
EFFECTIVE OCTOBER 1, 2018
ORDINANCE NO. 9133

010, RESIDENTIAL SERVICE

Applicable in urban and rural distribution areas. Available in single phase, through a single meter, to residential consumers for domestic use in a single family dwelling unit, but is not available for commercial or non-domestic use.

Individual single-phase motors not to exceed 10 HP each may be connected, however the City Utilities Department must be notified in writing if a motor over 5 HP is installed.

This schedule has two sets of rates; one for the summer period of five months beginning with the June billing and the second for the winter season of seven months beginning with the November billing.

Summer Rate (June—October)

Kilowatt Hours Used Per Month	Rate
First 300 KWH	0.105 per KWH
Next 700 KWH	0.083 per KWH
All Additional KWH	0.083per KWH

Winter Rate (November—May)

Kilowatt Hours Used Per Month	Rate
First 300 KWH	0.105 per KWH
Next 700 KWH	0.064 per KWH
All Additional KWH	0.057 per KWH

Plus a customer charge of $8.00 per month, in addition to that charged for the electrical energy used, plus the applicable Power Cost Adjustment Charge. The minimum monthly bill shall be the monthly customer charge.

Service Specifications
Residential Service shall be supplied at a nominal voltage of 120/240 Volts, single phase, only.

030, SINGLE-PHASE COMMERCIAL SERVICE

Applicable in urban and rural distribution areas. Available for commercial customers, for lighting and small appliances. Available for single meter multi-family dwelling units, and combined residential-commercial use, where the Residential Rate is not applicable. Service shall be through a single meter.

Individual single-phase motors, not to exceed 10 HP each may be Connected, however the City Utilities Department must be notified in writing if a motor over 5 HP is installed.

Kilowatt Hours Used Per Month	Rate
First 1,000 KWH	0.107 per KWH
All additional KWH	0.080 per KWH

Plus a customer charge of $12.00 per month, in addition to that charged for the electrical energy used, plus the applicable Power Cost Adjustment Charge. The minimum monthly bill shall be the monthly customer charge.

Service Specifications
Single-Phase Commercial service shall be supplied at a nominal voltage of 120/240 Volts, single phase. At the discretion of the Utilities Department 240/480 Volts, single phase, may be furnished.

Discounts for Primary Service
If the Single-Phase Commercial user owns and maintains all necessary transformation equipment and structures, a 3% reduction will be made in the energy billed. If energy is metered on the primary side (7.2 KV or above) of the service, a 2% reduction will be made in the energy billed. These discounts, however do not apply to the minimum stated.

050, THREE-PHASE COMMERCIAL SERVICE Applicable in the territory served by the City of Grand Island; and is available through a single meter at three phase, for any electric service uses where three-phase service is available.

This schedule has two sets of rates; one for the summer period of five months beginning with the June meter reading and the second for the winter season of seven months beginning with the November meter reading.

Summer Rate (June-October)

Kilowatt Hours Used Per Month	Rate
First 1,000 KWH	0.107 per KWH
Next 4,000 KWH	0.095 per KWH
All Additional KWH	0.087 per KWH

Winter Rate (November-May)

Kilowatt Hours Used Per Month	Rate
First 500 KWH	0.107 per KWH
Next 1,000 KWH	0.095 per KWH
All Additional KWH	0.082 per KWH

Plus a customer charge of $16.00 per month, in addition to that charged for the electrical energy used, plus the applicable Power Cost Adjustment Charge.

Minimum
The minimum monthly bill shall be the larger of the customer charge or the total connected HP x $0.70.

050, THREE-PHASE COMEMRCIAL SERVICE, *continued*

The billing horsepower shall be determined as follows:

1. Total connected horsepower, if total connected horsepower is less than 20 HP.
2. If total connected horsepower exceeds 20 HP, then the billing horsepower shall be the larger of 20 HP, or the largest single connected motor.
3. If questions arise as to the actual billing horsepower, the City Utilities Department may, at its option, install demand meters. The Kilowatt reading shall determine the billing horsepower on the basis of 0.75 Kilowatt = 1.0 HP.

It is the responsibility of the customer to inform the City Utilities . Department of changes that my affect minimum billings.

Service Specifications
Three-Phase Commercial Service is supplied at three phase, four wire wye, at 120/208 Volts or 277/480 Volts; or three phase, three wire delta, at 240 Volts or 480 Volts. Delta services must operate ungrounded, unless prior written approval is obtained by the customer from the City Utilities Department.

Current unbalance between phases should not exceed 15%.

Discounts for Primary Service
If the Three-Phase Commercial user owns and maintains all necessary transformation equipment and structures, a 3% reduction will be made in the energy billed. If energy is metered on the primary side (7.2 KV or above) of the service, a 2% reduction will be made in the energy billed. These discounts, however do not apply to the minimum stated.

Power Factor
The customer shall install power-factor correction equipment, if necessary to ensure a power factor of no less than 90%, lagging or leading.

100, THREE-PHASE POWER SERVICE

Applicable in the territory served by the City of Grand Island, available through a single meter at three phase. Available for any commercial or industrial use of energy.

Demand Charge
$14.30 KW of billing demand during summer months (June-October)
$ 9.70 KW of billing demand during winter months (November-May)

Energy Charge	Summer	Winter
First 450 hours of demand	$0.051	$0.047
All additional energy	$0.042	$0.039

Plus applicable Power Cost Adjustment Charge

Customer Charge
$300 per month

Minimum—
The minimum monthly bill shall be no less than $700.00. The Power Cost Adjustment charge is applied to energy consumption only.

The monthly demand shall be the highest integrated demand (in KW) during a 15-minute time interval in the billing period. The billing demand shall be the greater of (1) the monthly demand or (2) 65% of the monthly demand in the five (5) most recent summer months.

100, THREE-PHASE POWER SERVICE, *continued*

The Monthly Demand shall be the highest rate of use in KW during a time interval of the billing period as established by the City Utilities Department, based upon the nature of the business of the customer. In no event shall the Monthly Demand be less than 50 KW.

The Summer Demand shall be defined as the maximum of the Monthly Demands established during June through October.

Discounts for Primary Service
If Three-Phase Power energy is metered on the primary side (7.2 KV or above) of the service, a 3% reduction will be made in the energy billed. In addition, if the user owns and maintains all necessary transformation equipment and structures, a 5% reduction will be made in the demand billed. These discounts, however do not apply to the minimum stated.

Service Specifications
Any standard, nationally recognized, three-phase voltage will be supplied if transformation is available.

Power Factor
The customer shall install power-factor correction equipment, if necessary, to ensure a power factor of no less than 90%, lagging or leading.

114, AREA FLOODLIGHTING

Applicable in the territory served by the City of Grand Island and is available for any outdoor area floodlighting of consumer's property from dusk to dawn, where such service can be rendered directly from existing secondary distribution lines of the City.

Luminare will be selected by Electric Department and provided from Electric Department stock. For installation on an existing wood pole and connected to existing overhead secondary conductors on such pole, please refer to City Code 15-68 for lighting rates, billed on a monthly basis.

Power Cost Adjustment is not applicable to the Area Floodlighting Rate.

CONTRACT PERIOD AND CONDITIONS

Service under Rate 114 is available for a minimum of 24 months and thereafter until terminated by thirty (30) days notice in writing.

The City of Grand Island will install, own, and operate and maintain all area lighting equipment under this schedule. If underground service is desired, approval of the City must be obtained and the additional cost therefore shall be paid in advance to the City by the consumer on a nonrefundable basis.

The burning of the lamps shall be controlled by automatic control equipment installed by the City and burning time shall be approximately thirty minutes after sunset to approximately thirty minutes before sunrise.

The City shall be notified by the consumer of any operational failure of lamps. Lamp replacement or repairs will be performed only during regular working hours.

Non-Standard Installation: If underground service is desired or extension of overhead secondary facilities is required or special materials are requested, approval of the City must be obtained. All additional cost for materials and labor shall be paid in advance to the City, by the consumer, on a nonrefundable basis.

WATER RATE SCHEDULE
EFFECTIVE December 7, 2016
ORDINANCE NO. 9613

SCHEDULE OF RATES WITHIN CITY

The rate to be charged for water within the corporate limits of the City shall be as follows:

MONTHLY BILLINGS

First 500	$0.800
Next 500	$1.040
Next 500	$1.352
Next 2,500	$1.352
Next 6,000	$0.800
Next 90,000	$0.750
Next 100,000	$0..700
Over 200,000	$0.635
Cubic feet per month	Rate per 100 cubic feet

SCHEDULE OF RATES: OUTSIDE CITY

The rate to be charged for water furnished outside and beyond the corporate limits of the City shall be as follows:

MONTHLY BILLINGS

Cubic feet per month	Rate per 100 cubic feet
First 500	$0.800
Next 500	$1.248
Next 500	$1.622
Next 2,500	$1.622
Next 6,000	$0.960
Next 90,000	$0.900
Next 100,000	$0.840
Over 200,000	$0.762

*Plus a customer charge of $0.70 per month for unfunded federal mandates for the Clean Water Act and the City's back-flow program, in addition to the regular rates charged for water furnished to the customer.

In addition to consumption, a monthly fee would be charged according to the meter size supplying water to the property:

Meter Size	Monthly Fee
≤1"	$6.50
1 1/2"	$12.00
2"	$28.50
3"	$48.50
4"	$66.00
6"	$225.00
8"	$1,250.00
10"	$4,000.00

SEWER RATE SCHEDULE
EFFECTIVE OCTOBER 1, 2017
ORDINANCE NO. 9524

The charges to be paid by residential consumers for use of the sewerage system and disposal plant shall be based upon water consumption. The monthly residential sewer charges for the twelve months following April 1st of each year will be based on the average water consumption for that property during the months of January, February and March. Commercial customers shall pay according to the meter reading which precedes billing.

RESOLUTION NO. 2017-219
SCHEDULE OF RATES: WITHIN CITY
MONTHLY BILLINGS

Service Charge	$8.24
Per each 100 Cu. Ft. used	$3.52
Unmetered Customers	$30.00

RESOLUTION 2016-192
SCHEDULE OF RATES: OUTSIDE CITY
MONTHLY BILLINGS

Service Charge	$9.89
Per each 100 Cu. Ft. used	$4.23
Unmetered Customers	$23.81

The service charge for sewer contributions to consumers and users, shall be billed regardless of the volume of sewer contributed.

If more than one dwelling unit is served from a single water meter or single water source , a minimum charge will be made for each dwelling unit.

In case of apartment and mobile courts, the minimum charge shall be computed on the yearly average of dwelling units occupied.

*These rates apply only to ordinary domestic sewage. See the Director of Public Works for information on the "Extra Strength Surcharge" and "Industrial Four Part Charge".

PAYMENT CONDITIONS
EFFECTIVE MARCH 17, 2015
§15-51 of Grand Island City Code

1. All bills are due when received.
2. If full payment is not received by the due date stated on the bill, a late payment charge shall be assessed in accordance with the City of Grand Island Fee Schedule. This charge shall be $2.00, plus 1% of the unpaid balance of $5.00 or more.
3. A $50.00 service charge shall be collected before reconnection, in each instance of disconnection for non-payment of billing.
4. A $50.00 service charge will be assessed for each check returned for insufficient funds. This charge is in addition to any other charges.
5. A $20.00 service charge shall be collected, before all new connections are made by the City Utilities Department.
6. A $20.00 service charge shall be collected, to transfer service from one occupant to another occupant at the same location.
7. A $50.00 trip fee shall be collected when payment is made to stop disconnection when disconnect personnel are on site.
8. A $50.00 final notice fee shall be collected when a trip is required to notify of pending shut off.
9. Service periods are normally for periods of one year or longer. If it appears that services are being disconnected and reconnected within a twelve month period, in order to avoid minimum billing charges, an amount equivalent to the minimum billings for the disconnection period (not to exceed eleven months) must be paid before the service is reconnected. This is in addition to the normal connection charges.

RATE ASSIGNMENT

The Grand Island Utility Department will attempt to assign customers to the lowest applicable rate. It is the customer's responsibility to inform the Utility Department of any changes that may affect the assignment of billing conditions within a given rate.

The customer is in a better position than the Utility Department to analyze electric usage. When more than one rate assignment is applicable, the customer may select the rate considered the most beneficial. Customer-requested rate reassignments will not be made more frequently than once every twelve months. In no event will the Utility Department be responsible for losses incurred due to improper rate assignment.

At customer request, demand metering will be installed by the Utility Department. The Utility Department may, at its option, assess a one-time charge of $200.00 to pay for the additional metering facilities.

CITY OF GRAND ISLAND

ELECTRIC, WATER AND SEWER RATE SCHEDULES

Appendix 2

Library Historical Energy Consumption Past 24 Months

Created Date/Time: 11/06/2019 08:08:11 AM
Service Address: 1124 W 2ND ST

Service	Read Date	Meter #	Read Type	Read Status	Previous	Current	Days	Billed Usage
Electric	10/4/2019 0:00	0143618660	KWH	Actual Read	5651	6149	28	49800
Demand	10/4/2019 0:00	0143618660	KW	Actual Read	2.191	2.191	28	219.1
Electric	9/6/2019 0:00	0143618660	KWH	Actual Read	5125	5651	30	52600
Demand	9/6/2019 0:00	0143618660	KW	Actual Read	2.142	2.191	30	219.1
Electric	8/7/2019 0:00	0143618660	KWH	Actual Read	4471	5125	33	65400
Demand	8/7/2019 0:00	0143618660	KW	Actual Read	2.005	2.142	33	214.2
Electric	7/5/2019 0:00	0143618660	KWH	Actual Read	3983	4471	28	48800
Demand	7/5/2019 0:00	0143618660	KW	Actual Read	1.896	2.005	28	200.5
Electric	6/7/2019 0:00	0143618660	KWH	Actual Read	3515	3983	32	46800
Demand	6/7/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	32	189.6
Electric	5/6/2019 0:00	0143618660	KWH	Actual Read	3063	3515	32	45200
Demand	5/6/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	32	189.6
Electric	4/4/2019 0:00	0143618660	KWH	Actual Read	2628	3063	29	43500
Demand	4/4/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	29	189.6
Electric	3/6/2019 0:00	0143618660	KWH	Actual Read	2150	2628	29	47800
Demand	3/6/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	29	189.6
Electric	2/5/2019 0:00	0143618660	KWH	Actual Read	1704	2150	28	44600
Demand	2/5/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	28	189.6
Electric	1/8/2019 0:00	0143618660	KWH	Actual Read	1227	1704	34	47700
Demand	1/8/2019 0:00	0143618660	KW	Actual Read	1.896	1.896	34	189.6
Electric	12/5/2018 0:00	0143618660	KWH	Actual Read	812	1227	30	41500
Demand	12/5/2018 0:00	0143618660	KW	Actual Read	1.896	1.896	30	189.6
Electric	11/5/2018 0:00	0143618660	KWH	Actual Read	370	812	32	44200
Demand	11/5/2018 0:00	0143618660	KW	Actual Read	1.896	1.896	32	189.6
Electric	10/4/2018 0:00	0143618660	KWH	Actual Read	0	370	22	37000
Demand	10/4/2018 0:00	0143618660	KW	Actual Read	0	1.896	22	189.6
Electric	9/12/2018 0:00	0005013167	KWH	Actual Read	71109	71149	2	4000
Demand	9/12/2018 0:00	0005013167	KW	Actual Read	1.888	1.824	2	182.4
Electric	9/10/2018 0:00	0005013167	KWH	Actual Read	70528	71109	34	58100
Demand	9/10/2018 0:00	0005013167	KW	Actual Read	2.043	1.888	34	188.8
Electric	8/7/2018 0:00	0005013167	KWH	Actual Read	69951	70528	29	57700
Demand	8/7/2018 0:00	0005013167	KW	Actual Read	2.078	2.043	29	204.3
Electric	7/9/2018 0:00	0005013167	KWH	Actual Read	69274	69951	34	67700
Demand	7/9/2018 0:00	0005013167	KW	Actual Read	1.955	2.078	34	207.8
Electric	6/5/2018 0:00	0005013167	KWH	Actual Read	68728	69274	32	54600
Demand	6/5/2018 0:00	0005013167	KW	Actual Read	1.788	1.955	32	195.5
Electric	5/4/2018 0:00	0005013167	KWH	Actual Read	68279	68728	30	44900
Demand	5/4/2018 0:00	0005013167	KW	Actual Read	1.316	1.788	30	178.8
Electric	4/4/2018 0:00	0005013167	KWH	Actual Read	67866	68279	28	41300

Demand	4/4/2018 0:00	0005013167	KW	Actual Read	1.385	1.316	28	131.6
Electric	3/7/2018 0:00	0005013167	KWH	Actual Read	67397	67866	30	46900
Demand	3/7/2018 0:00	0005013167	KW	Actual Read	1.363	1.385	30	138.5
Electric	2/5/2018 0:00	0005013167	KWH	Actual Read	66983	67397	28	41400
Demand	2/5/2018 0:00	0005013167	KW	Actual Read	1.374	1.363	28	136.3
Electric	1/8/2018 0:00	0005013167	KWH	Actual Read	66535	66983	32	44800
Demand	1/8/2018 0:00	0005013167	KW	Actual Read	1.79	1.374	32	137.4
Electric	12/7/2017 0:00	0005013167	KWH	Actual Read	66110	66535	31	42500
Demand	12/7/2017 0:00	0005013167	KW	Actual Read	1.876	1.79	31	179
Electric	11/6/2017 0:00	0005013167	KWH	Actual Read	65640	66110	32	47000
Demand	11/6/2017 0:00	0005013167	KW	Actual Read	1.925	1.876	32	187.6
Electric	10/5/2017 0:00	0005013167	KWH	Actual Read	65157	65640	28	48300
Demand	10/5/2017 0:00	0005013167	KW	Actual Read	1.922	1.925	28	192.5
Electric	9/7/2017 0:00	0005013167	KWH	Actual Read	64522	65157	35	63500
Demand	9/7/2017 0:00	0005013167	KW	Actual Read	2.136	1.922	35	192.2
Electric	8/3/2017 0:00	0005013167	KWH	Actual Read	63914	64522	28	60800
Demand	8/3/2017 0:00	0005013167	KW	Actual Read	2.119	2.136	28	213.6
Electric	7/6/2017 0:00	0005013167	KWH	Actual Read	63290	63914	30	62400
Demand	7/6/2017 0:00	0005013167	KW	Actual Read	1.974	2.119	30	211.9
Electric	6/6/2017 0:00	0005013167	KWH	Actual Read	62758	63290	33	53200
Demand	6/6/2017 0:00	0005013167	KW	Actual Read	1.824	1.974	33	197.4
Electric	5/4/2017 0:00	0005013167	KWH	Actual Read	62339	62758	28	41900
Demand	5/4/2017 0:00	0005013167	KW	Actual Read	1.082	1.824	28	182.4
Electric	4/6/2017 0:00	0005013167	KWH	Actual Read	61838	62339	31	50100
Demand	4/6/2017 0:00	0005013167	KW	Actual Read	1.846	1.082	31	108.2
Electric	3/6/2017 0:00	0005013167	KWH	Actual Read	61359	61838	31	47900
Demand	3/6/2017 0:00	0005013167	KW	Actual Read	1.394	1.846	31	184.6
Electric	2/3/2017 0:00	0005013167	KWH	Actual Read	60949	61359	25	41000
Demand	2/3/2017 0:00	0005013167	KW	Actual Read	1.414	1.394	25	139.4
Electric	1/9/2017 0:00	0005013167	KWH	Actual Read	60445	60949	34	50400
Demand	1/9/2017 0:00	0005013167	KW	Actual Read	1.879	1.414	34	141.4

Appendix 3

System 1 – Multi Zone AHU & Condensing Unit

SYSTEM 1: REPLACEMENT MULTI - ZONE AIR HANDLER

Job Number: YGW3LR
Job Name: Grand Island Public Library Clark

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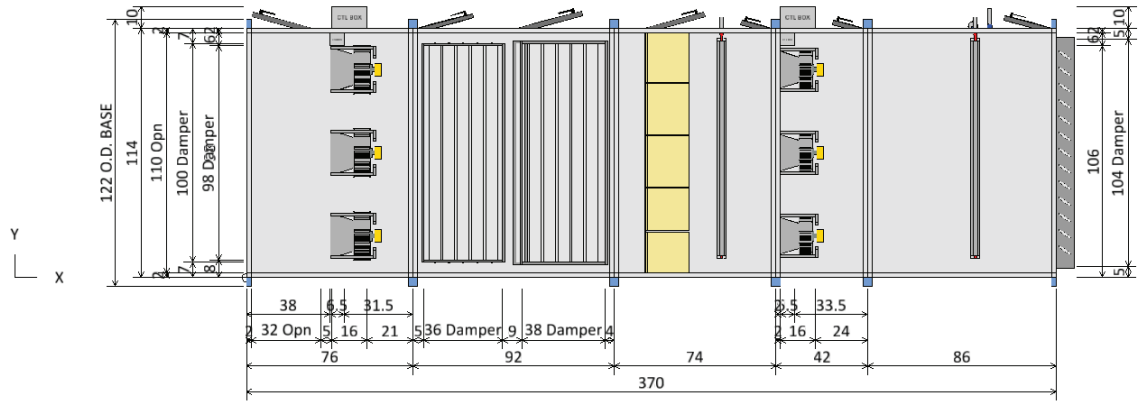
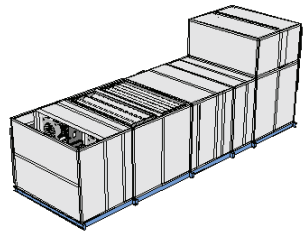
Prepared Date: 11/5/2019

www.DaikinApplied.com

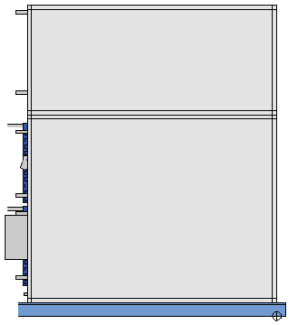
Drawing for AHU-MZ-1



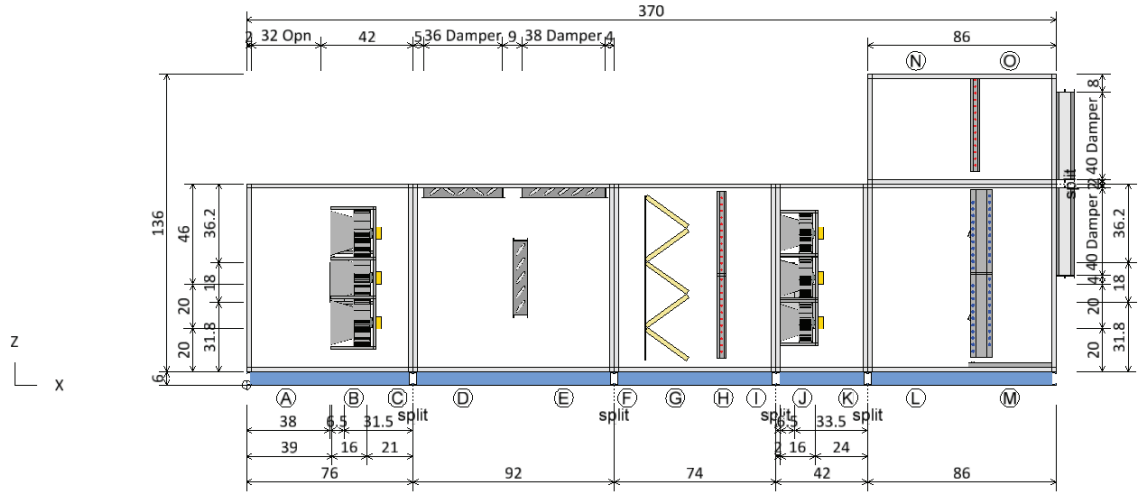
PLAN VIEW



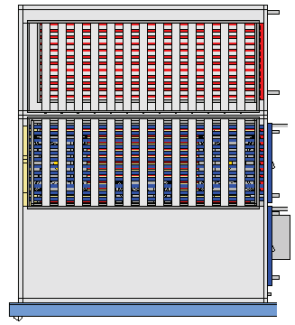
ISOMETRIC VIEW



FRONT END VIEW



ELEVATION VIEW



REAR END VIEW

Plan/Elevation	Unit Tag: AHU-MZ-1			Sales Office: Mechanical Sales, Inc. (Omaha)		
Product: Vision Air Handler	Project Name: Grand Island Public Library Clark Energy Model			Sales Engineer: Multizone AHU Study		
Model: CAH055GMQM	Nov. 5, 2019	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/-0.25"	Dwg Units: in

DAIKIN
13600 Industrial Park Blvd, Minneapolis, MN 55441
www.DaikinApplied.com Software Version: 11.92

SYSTEM 1: REPLACEMENT MULTI - ZONE AIR HANDLER

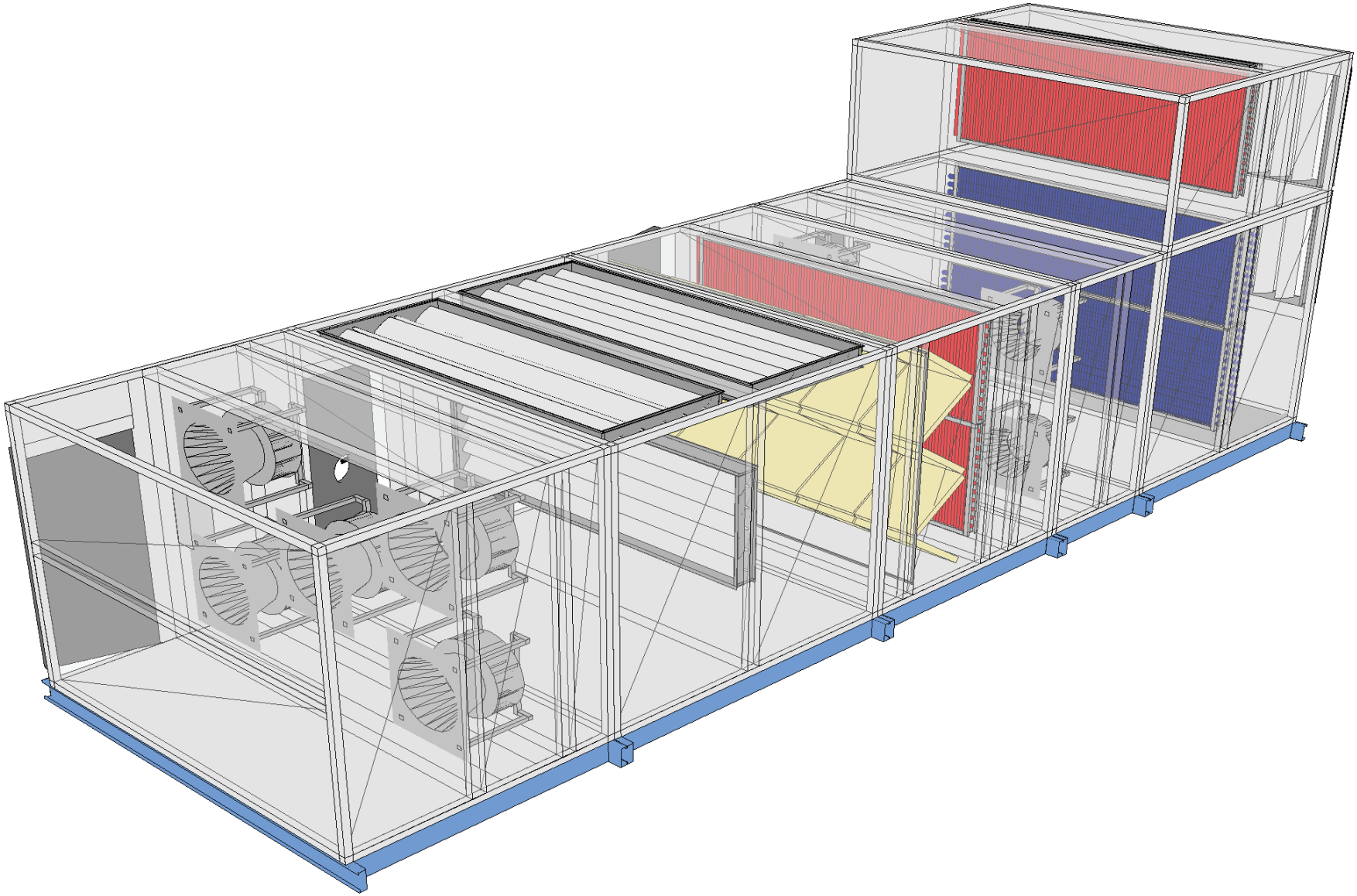
Job Number: YGW3LR
Job Name: Grand Island Public Library Clark

Page 20 of 35

Prepared Date: 11/5/2019

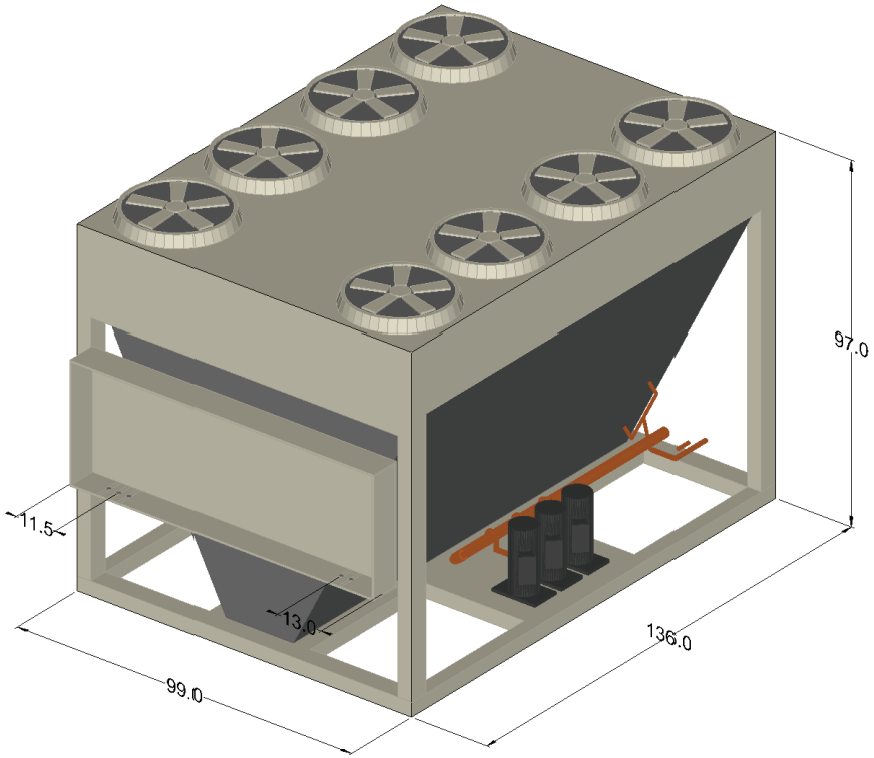
www.DaikinApplied.com

Drawing for AHU-MZ-1



Product Drawing	Unit Tag: AHU-MZ-1			Sales Office: Mechanical Sales, Inc. (Omaha)			DAIKIN
Product: Vision Air Handler	Project Name: Grand Island Public Library Clark Energy Model Multizone AHU Study			Engineer: Engineer			13600 Industrial Park Blvd, Minneapolis, MN 55441
Model: CAH055GMQM	Nov. 5, 2019	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/-0.25"	Dwg Units: in	www.DaikinApplied.com Software Version: 11.92

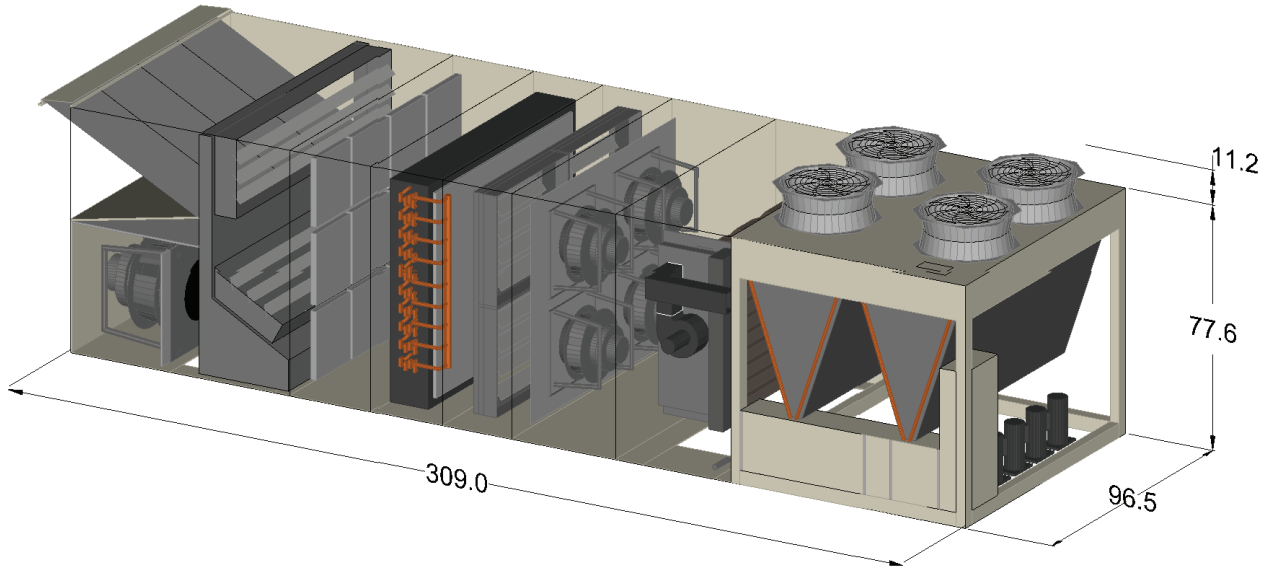
SYSTEM 1: AIR COOLED CONDENSER TO DX COIL



Product Drawing	Unit Tag: RCS 001			Sales Office: Mechanical Sales, Inc. (Omaha)			DAIKIN
Product:	Project Name: Grand Island Public Library			Sales Engineer:			13600 Industrial Park Blvd. Minneapolis, MN 55441
Model: RCS110D	Nov. 05, 2019	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/- 0.25"	Dwg Units: in [mm]	www.DaikinApplied.com Software Version: 07.10
No change to th							

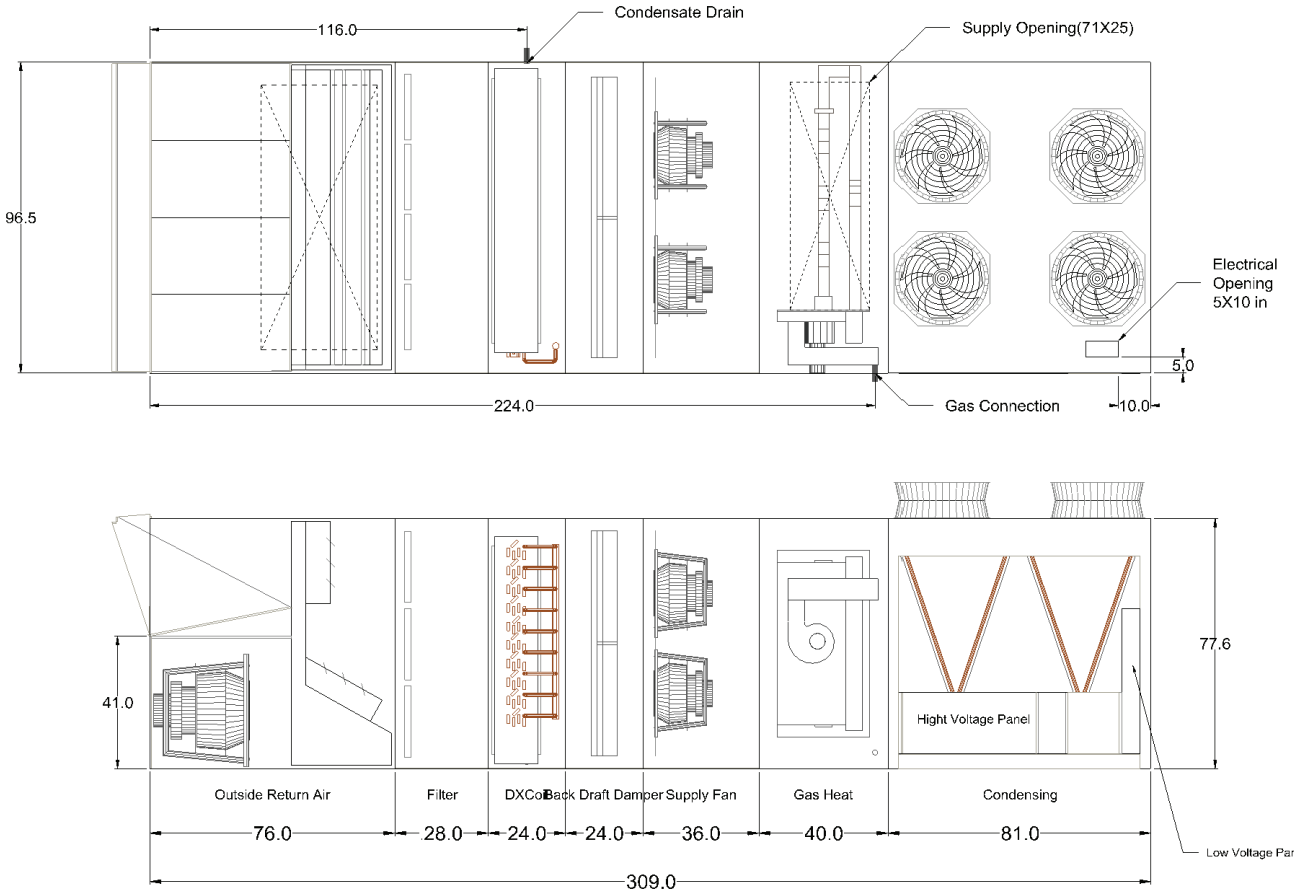
Appendix 4

System 2 – VAV Rooftop AHU with Reheat



Product Drawing	Unit Tag: RTU-1 & 2			Sales Office: Mechanical Sales, Inc. (Omaha)			DAIKIN
Product:	Project Name: Grand Island Public Library			Sales Engineer:			13600 Industrial Park Blvd. Minneapolis, MN 55441
Model: DPSA040	Nov. 05, 2019	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/- 0.25"	Dwg Units: in [mm]	www.DaikinApplied.com Software Version: 01.20
No change to th							

System 2: Variable Air Volume Rooftop Unit with Reheat



Product Drawing	Unit Tag: RTU-1 & 2			Sales Office: Mechanical Sales, Inc. (Omaha)			DAIKIN
Product:	Project Name: Grand Island Public Library			Sales Engineer:			13600 Industrial Park Blvd. Minneapolis, MN 55441
Model: DPSA040	Nov. 05, 2019	Ver/Rev:	Sheet: 1 of 1	Scale: NTS	Tolerance: +/- 0.25"	Dwg Units: in [mm]	www.DaikinApplied.com Software Version: 01.20
No change to th							

Appendix 5

Opinion of Probable Cost

The Clark Enersen Partners

OPINION OF PROBABLE CONSTRUCTION COST

Project:	*GI Library Mechanical Study*	*Floor Area :*	*19,000*
Location:	*Lincoln, NE*	*Date:*	*February 13, 2020*
Client:		*Type Est.:*	*GME*
Project No.:	*566-014-19*		
Estimator:	*The Clark Enersen Partners*		

Section No.	*Classification of Work Option 1*		***Total Cost***
S.1	**SUMMARY**		
1.0	*FOUNDATIONS*		**$0**
2.0	*SUBSTRUCTURE AND DEMOLITION*		**$0**
3.0	*SUPERSTRUCTURE*		**$0**
4.0	*EXTERIOR CLOSURE*		**$0**
5.0	*ROOFING*		**$0**
6.0	*INTERIOR CONSTRUCTION*		**$0**
7.0	*CONVEYING*		**$0**
8.0	*MECHANICAL SYSTEMS*		**$508,500**
9.0	*ELECTRICAL SYSTEMS*		**$50,000**
10.0	*GENERAL CONDITIONS*		**$0**
11.0	*ARCHITECTURAL SPECIALTIES*		**$0**
12.0	*SITEWORK*		**$0**
13.0	*MISCELLANEOUS*		**$0**
	DIRECT COST		**$558,500**
	CONTRACTOR OVERHEAD AND PROFIT -	*10.0%*	$55,850
	A/E Design Fee -	*6.5%*	$39,933
	Contigency -	*10.0%*	$65,428
	TOTAL OPINON OF PROBABLE CONST. COST *		**$719,711**
	COST PER GROSS SQUARE FOOT		**$37.88**

Note: This Cost does not include; Escalation, Tests or Furnishings.

The Clark Enersen Partners

OPINION OF PROBABLE CONSTRUCTION COST

Project:	*GI Library Mechanical Study*	*Floor Area :*	*19,000*
Location:	*Lincoln, NE*	*Date:*	*February 13, 2020*
Client:		*Type Est.:*	*GME*
Project No.:	*566-014-19*		
Estimator:	*The Clark Enersen Partners*		

Section No.	*Classification of Work Option 2*		***Total Cost***	
S.1	**SUMMARY**			
1.0	*FOUNDATIONS*		**$0**	$0.00
2.0	*SUBSTRUCTURE AND DEMOLITION*		**$576**	$0.03
3.0	*SUPERSTRUCTURE*		**$10,854**	$0.57
4.0	*EXTERIOR CLOSURE*		**$0**	$0.00
5.0	*ROOFING*		**$5,000**	$0.26
6.0	*INTERIOR CONSTRUCTION*		**$100,500**	$5.29
7.0	*CONVEYING*		**$0**	$0.00
8.0	*MECHANICAL SYSTEMS*		**$811,500**	$42.71
9.0	*ELECTRICAL SYSTEMS*		**$50,000**	$2.63
10.0	*GENERAL CONDITIONS*		**$0**	$0.00
11.0	*ARCHITECTURAL SPECIALTIES*		**$0**	$0.00
12.0	*SITEWORK*		**$0**	$0.00
13.0	*MISCELLANEOUS*		**$0**	$0.00
	DIRECT COST		**$978,430**	
	CONTRACTOR OVERHEAD AND PROFIT -	*10.0%*	$97,843	
	A/E Design Fee -	*6.5%*	$69,958	
	Contigency -	*10.0%*	$114,623	
	TOTAL OPINON OF PROBABLE CONST. COST *		**$1,260,854**	
	COST PER GROSS SQUARE FOOT		**$66.36**	

Note: This Cost does not include; Escalation, Tests or Furnishings.

The Clark Enersen Partners

OPINION OF PROBABLE CONSTRUCTION COST

Project:	*GI Library Mechanical Study*	*Floor Area :*	*19,000*
Location:	*Lincoln, NE*	*Date:*	*February 13, 2020*
Client:		*Type Est.:*	*GME*
Project No.:	*566-014-19*		
Estimator:	*The Clark Enersen Partners*		

Section No.	*Classification of Work Option 2*		***Total Cost***	
S.1	**SUMMARY**			
1.0	*FOUNDATIONS*		**$0**	$0.00
2.0	*SUBSTRUCTURE AND DEMOLITION*		**$576**	$0.03
3.0	*SUPERSTRUCTURE*		**$10,854**	$0.57
4.0	*EXTERIOR CLOSURE*		**$0**	$0.00
5.0	*ROOFING*		**$12,000**	$0.63
6.0	*INTERIOR CONSTRUCTION*		**$90,500**	$4.76
7.0	*CONVEYING*		**$0**	$0.00
8.0	*MECHANICAL SYSTEMS*		**$674,000**	$35.47
9.0	*ELECTRICAL SYSTEMS*		**$48,000**	$2.53
10.0	*GENERAL CONDITIONS*		**$0**	$0.00
11.0	*ARCHITECTURAL SPECIALTIES*		**$0**	$0.00
12.0	*SITEWORK*		**$0**	$0.00
13.0	*MISCELLANEOUS*		**$0**	$0.00
	DIRECT COST		**$835,930**	
	CONTRACTOR OVERHEAD AND PROFIT -	*10.0%*	$83,593	
	A/E Design Fee -	*6.5%*	$59,769	
	Contigency -	*10.0%*	$97,929	
	TOTAL OPINON OF PROBABLE CONST. COST *		**$1,077,221**	
	COST PER GROSS SQUARE FOOT		**$56.70**	

Note: This Cost does not include; Escalation, Tests or Furnishings.