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Technical Memorandum

April 19, 2024

To: **Rusty Shivers, Project Manager**

Subject: **Conceptual Design and Cost Estimate**

Project: **Dimond Park Aquatic Center Natatorium AHU Replacement**

Summary

Introduction

The natatorium air handling unit (AHU) at the Dimond Park Aquatic Center has an estimated remaining service life of 3-8 years. It is recommended that replacement occur within five years to minimize the risk that a component failure could render the AHU inoperable and cause an unplanned shutdown of the facility.

This memo provides a conceptual design for replacement of the AHU and a replacement cost estimate.

AHU Replacement

The AHU provides critical temperature, pressure, humidity and indoor air quality functions for the natatorium environment. Replacing the AHU will negate these controls and can only be accomplished through a planned shutdown of the facility.

An AHU replacement will require the following major work elements:

- Multi-discipline design of the AHU removal and replacement
- Disassembly of the existing AHU, connecting ductwork, outside air plenum and the end wall of the mechanical penthouse
- Two cranes to remove the items and install the new ductwork and AHU
- Connecting the AHU to the distribution ductwork
- Reconstruction of the end wall with a removeable wall section for future equipment replacement

A shutdown period of 4-6 months is estimated for this work, which should occur in the summer so the natatorium is not subject to cool or freezing temperatures.

Timeline and Cost Estimate

A timeline of five years is recommended for AHU replacement. This will allow sufficient time to secure funding, design the replacement AHU, award a construction contract and perform the work. The proposed AHU manufacturer estimates a 1-year period from submittal approval to delivery of the AHU.

The estimated cost to replace the AHU in 2028 is $3,300,000.

Natatorium Air Handling Unit

Improved Performance

The AHU will be replaced with a custom natatorium-specific AHU that has capacity equal to the existing air handling unit. The proposed AHU will improve the natatorium environment through improved equipment design and optimal control sequences.

The proposed AHU will feature several significant improvements over the existing AHU that will increase its service life and operation. The AHU will be constructed of materials that are resistant to the corrosive natatorium environment and be supplied by a manufacturer that routinely designs and constructs equipment for natatoriums.

- Materials: All surfaces and components in the natatorium airstream will be constructed of corrosion-resistant materials or be epoxy coated. The AHU walls and supports will be constructed of 5052-H32 aluminum which is the industry standard for natatorium equipment.
- Weight: The proposed AHU will weigh 21,000 lbs. which is considerably less than the existing AHU at 37,000 lbs. The decreased weight is due to the aluminum construction. Since the AHU has a similar footprint, the load density is lower and no reinforcement of the building structure is required.
- Orientation: The proposed AHU has the supply and return/exhaust airstreams vertically aligned with each other. This allows exhaust air condensation within the heat exchanger to gravity drain in the direction of airflow to drain pans. In the existing AHU, the airstreams are horizontally aligned and condensation often accumulates in the heat exchanger.
- Pressures: The existing AHU has a return fan that pressurizes the heat exchanger, which has pushed condensation into other compartments within the AHU. The proposed AHU has a relief fan which draws air through the heat exchanger, keeping it at a negative relative pressure and negating condensation migration issues.
- Fan Horsepower: The proposed AHU will have lower filter, heat exchanger and heating coil pressure drop. Total fan horsepower decreases from 89 HP to 62 HP and the installed motor horsepower decreases from 150 HP to 70 HP.
- Service Life: The proposed natatorium AHU is constructed of corrosion-resistant materials and has an estimated service life of 20-25 years. The existing AHU is expected to last 15-20 years due to persistent corrosion issues.

A schematic of the existing and proposed AHU is provided on the following page.

Replacing a natatorium AHU is expensive and disruptive. In the interest of limiting AHU replacements over the life of the facility, material options were sought to further increase the AHU service life. There are no regularly-manufactured material options available.

Heat Exchanger Performance

The heat exchanger is critical to the energy performance of the system. The proposed AHU has the largest and most efficient heat exchanger that can be utilized while allowing the AHU to fit in the building. It is 75% effective during the coldest weather.

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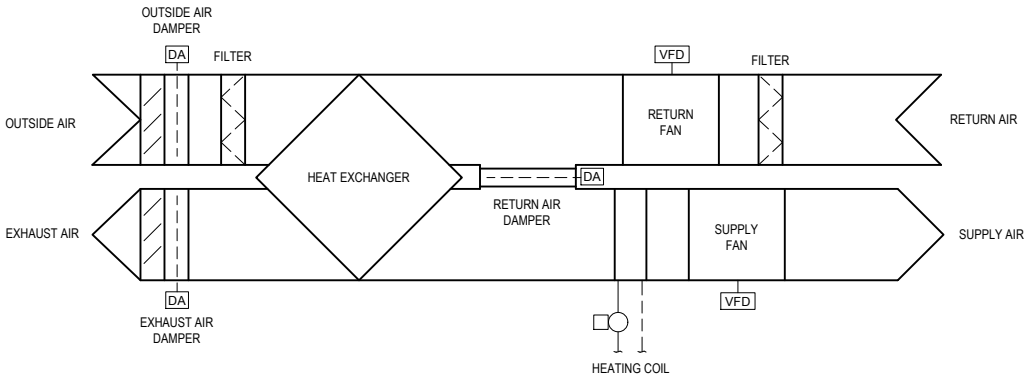
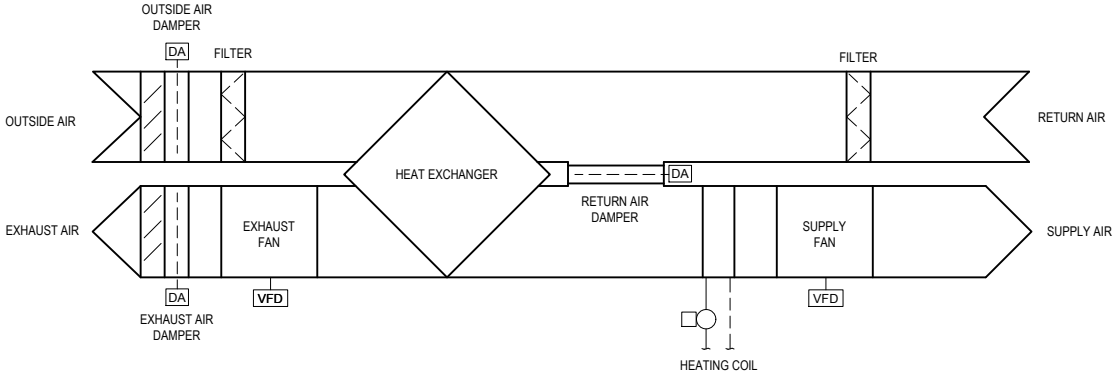


EXISTING AIR HANDLING UNIT AHU-1 SCHEMATIC

A. Supply Fan: Fan speed set during TAB for occupied operation at minimum outside air.
B. Return Fan: Fan speed modulates to maintain 1.1" pressure in the return air plenum.
C. Natatorium Ventilation and Humidity Control: OAD and RAD modulate to maintain minimum outside air flow during occupied periods and maintain Natatorium relative humidity setpoint.
D. Natatorium Temperature Control: Heating coil valve modulates to maintain Natatorium temperature setpoint.
E. Natatorium Pressure Control: EAD modulates to maintain negative natatorium pressure.



PROPOSED AIR HANDLING UNIT AHU-1 SCHEMATIC

A. Supply Fan: Fan speed set during TAB for occupied operation at minimum outside air.
B. Exhaust Fan: Fan speed modulates to maintain negative Natatorium pressure.
C. Natatorium Ventilation and Humidity Control: OAD and RAD modulate to maintain minimum outside air flow during occupied periods and maintain Natatorium relative humidity setpoint.
D. Natatorium Temperature Control: Heating coil valve modulates to maintain Natatorium temperature setpoint.

Proposed AHU-1 Replacement
Dimond Park Aquatic Center
City and Borough of Juneau
Juneau, Alaska

Control Improvements

The proposed AHU will have optimal DDC controls for maintaining temperature, humidity, pressure and indoor air quality. The control devices and program can be provided by the equipment manufacturer or be installed by the building DDC control contractor. The proposed control sequence decouples the AHU's various control functions so they independently respond as needed:

- Supply Fan: Maintains constant airflow to the natatorium to meet code air circulation requirements.
- Exhaust Fan: Modulates as needed to remove contaminants and discharge the air to the outdoors while maintaining a negative natatorium pressure so chlorine-laden air does not flow to other spaces or into the structure.
- Mixing Dampers (outside air and return air): Position to maintain minimum ventilation requirements and modulate as needed to increase outside air and maintain humidity control.
- Heating Coil: Modulates the coil output to maintain the natatorium room temperature.

This is a standard control natatorium sequence and is much simpler than the existing AHU control sequence. The biggest challenge is the pressure control which relies on a sufficiently tight enclosure and accurate pressure sensors in the natatorium.

Heat Pump Heat Recovery Option

A natatorium AHU exhausts significant amounts of warm, humid air that contains valuable heat. The proposed AHU has a heat exchanger that is capable of recovering 65% of the total exhaust heat by transferring it to the ventilation air.

An option was considered to use a heat pump to recover the exhaust air heat. The heat pump is capable of recovering more heat than the heat exchanger and also has the benefit of separating the cold outside air flow from the warm, humid exhaust air, eliminating detrimental frost and ice formation on the heat exchanger.

A preliminary heat analysis determined that a heat pump has the potential to recover 400% more heat from the exhaust air than the heat exchanger. The recovered heat would be used to supply heat to the natatorium and the rest of the building. However, the heat pump option is not recommended for the following reasons:

- The heat pump would add $1.5M to $2.0 to the cost of replacing the AHU.
- Additional mechanical space would be needed for the heat pump.
- There would be minimal energy savings because the heat recovered by the heat pump would be minimally less-expensive than the heat that is currently supplied by DPAC's ground source heat pump system.

The heat recovery heat pump would reduce the load on the geothermal loopfield. It was reported that the loopfield temperature dropped too low this winter and the heat pump was shut down for a period. If low temperatures reoccur annually, it would be beneficial to consider the heat recovery heat pump since it would improve energy efficiency and extend the life of the loopfield. This option may warrant reconsideration as part of the AHU replacement design process.

Scope of Work

Replacing the AHU will be a complex process requiring an estimated construction period of 4-6 months. The natatorium will need to be closed with the pools drained or covered during construction. The replacement scope is addressed below. Equipment submittals and floor plans that further illustrate the scope of work are appended to this report.

Site Access

Two cranes will be utilized to remove the existing AHU and install the new AHU. Trucano Construction has determined that the cranes will need closer access to the mechanical room than the existing back parking lot. A 100' long by 12' wide access road with D-1 top will be permanently constructed for crane support.

Demolition

Exterior Wall: The end of the mechanical room wall and associated structural braces will be removed to facilitate AHU replacement.

AHU Demolition: A crane will be used to remove the AHU and ductwork from the mechanical room:

- The outside air louvers will be removed and stored for reuse.
- The outside air plenum will be removed.
- The connecting supply, return and exhaust ductwork will be removed as needed.
- The heating coil piping will be disconnected and removed as needed.
- The outdoor air plenum will be removed.
- The DDC controls will be removed.
- The electrical service including two VFDs, conduits and conductors will be removed between the AHU and the control panel.
- The AHU will be disassembled and removed.

New Work

The new AHU is slightly smaller than the existing unit and will be mounted to the existing concrete pad.

- New connecting ductwork will be moved into the mechanical room and installed prior to installation of the AHU.
- The new AHU will be craned into the building in sections, assembled on-site and secured to the existing concrete pad. The assembly will be seal tested per the manufacturer's instructions prior to operation.
- The end wall will be replaced with a removeable wall section that allows for future equipment replacement.
- An outside air plenum will be constructed and connected to the louvers and AHU.
- The return air ducts will be connected to the AHU.
- The supply air ducts will be connected to the AHU. One supply duct will be rerouted in the natatorium ceiling to accommodate the new AHU arrangement.
- The exhaust air duct will be connected to the AHU.
- DDC controls will be installed.
- A single point power supply will be connected to the AHU. The AHU will be supplied with integral VFDs for each fan.

The AHU will be assembled, tested and started by factory-trained technicians and commissioned and fine-tuned for optimal ventilation, heating, humidity control and pressure control of the natatorium.

Cost Estimate

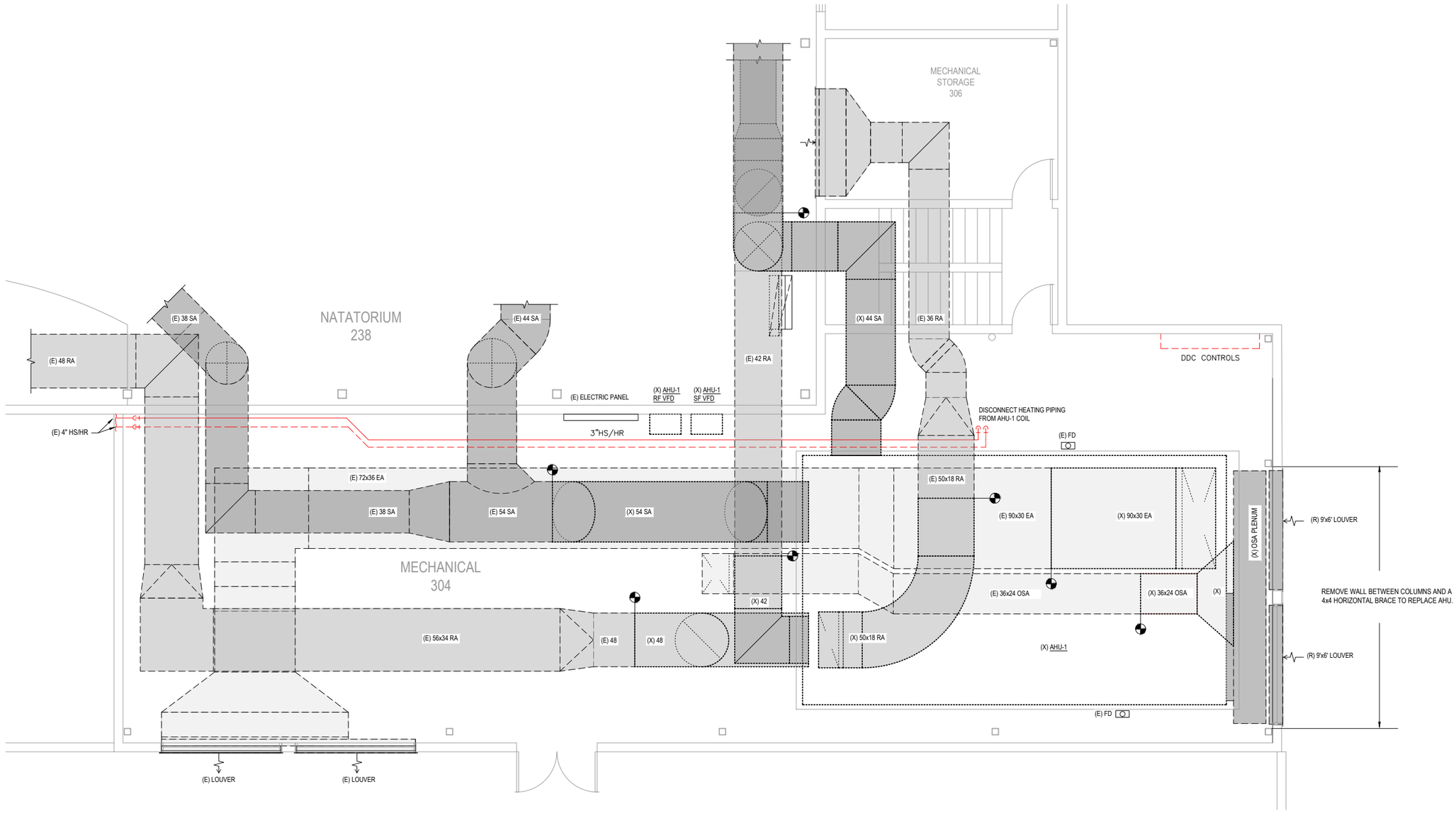
The AHU replacement requires a timeline of 3-5 years to secure funding, design, procure and construct the replacement. It is recommended that replacement occur in 5-years to maximize the life of the existing AHU while minimizing the risk of AHU failure that will result in an unplanned shutdown of the facility.

Estimations Inc. has estimated the cost to replace the AHU at $2.2M in 2024 dollars. The estimate does not include escalation to the construction period, design fees, construction contingency or construction administration costs. The following table shows that when these factors are applied, including 4% inflation per year to 2028, the estimate cost increases to $3,300,000.

Cost Item	Factor	Amount	Estimate
Cost Estimate, 2024 dollars			$2,200,000
Escalation to 2028, 4% per year	17%	$380,000	$2,580,000
Design Fees	6%	$160,000	$2,740,000
Construction Contingency	10%	$280,000	$3,020,000
Construction Administration	8%	$250,000	**$3,300,000**

by: _____

Jim Rehfeldt, P.E.



1 / M-1 **MECHANICAL 304 DEMO PLAN**

SCALE: 0 2' 4' 8'

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CONCEPTUAL DESIGN

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Air Handling Unit Replacement
Dimond Park Aquatic Center

City and Borough of Juneau
Juneau, Alaska

No.	Description	Date

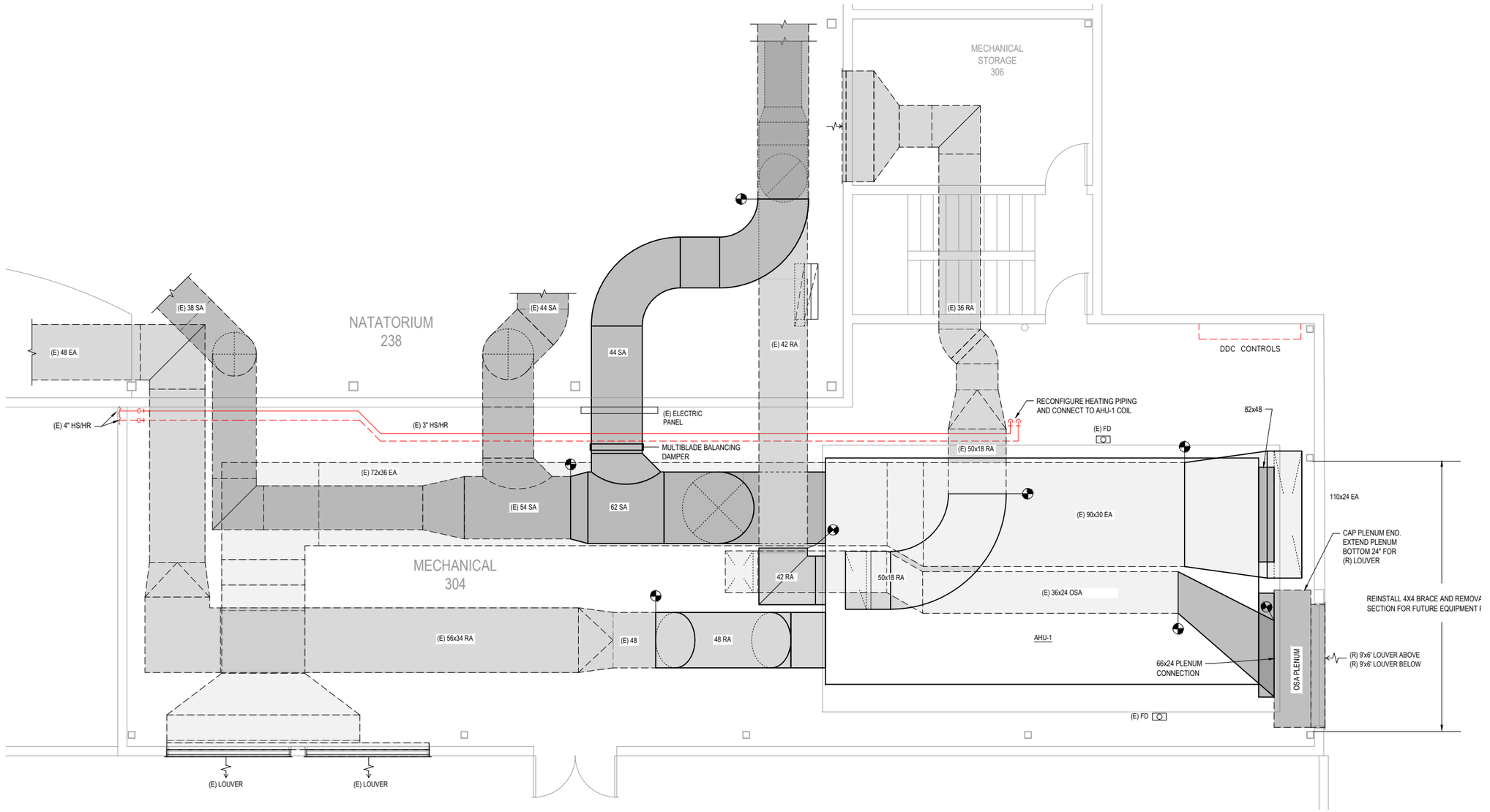
SHEET TITLE:

MECHANICAL 304
DEMO PLAN

DATE: 4/18/2024
SCALE:
DRAWN: KB/JR
CHECKED: JR

SHEET NO.

M-1



1 M-2 **MECHANICAL 304 FLOOR PLAN**

SCALE: 0 2' 4' 8'

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Air Handling Unit Replacement
Dimond Park Aquatic Center

City and Borough of Juneau
Juneau, Alaska

No.	Description	Date

SHEET TITLE:

MECHANICAL 304
FLOOR PLAN

DATE: 4/18/2024
SCALE:
DRAWN: KB/JR
CHECKED: JR

SHEET NO.

M-2

SHEET 2 OF 2

Scope Of Supply

Innovent®
Air Handling Equipment

PDU-1

CONSTRUCTION

CASING

- SMACNA leakage class rating of 5.0
- Maximum panel deflection shall not exceed L/250 at design total static pressure
- Minimum R-13 insulation value for walls, ceilings, and flooring
- 2" thick double wall thermal-break panels, 22 gauge galvanized steel outer wall, 0.040" aluminum inner wall
- 2 lb/ft3 polyurethane foam injected insulation in the walls and ceiling
- Designed for indoor installation
- Unit shall be shipped in 4 sections. Sections shall be reassembled by others in the field. All silicone, gasketing, flashing and fasteners required to reassemble the unit sections shall be provided and shipped loose inside the unit sections.

FLOOR

- Floor shall be 2" thick paneled construction with 0.063" flat aluminum walk-on surface and 22 gauge galvanized steel underside of paneled floor (not exposed to air stream)
    - Shelf floor in top air tunnel shall be 0.063" flat aluminum
- 2 lb/ft3 polyurethane foam injected insulation

FRAME & STRUCTURAL BASE

- Frame and panel construction provided with aluminum structural tube framing members
- 10 ga coated welded steel structural base
- Lifting lugs mounted on unit base

ACCESS

- Double wall insulated access doors with stainless steel hinges, corrosion resistant compression latches
- Doors shall be tool lockable
- Doors shall have pressure relief safety latches (doors that open with pressure)

UNIT INLETS/OUTLETS

- Outside air inlet with duct connection
- Return air inlet with duct connection
- Supply air outlet with duct connection
- Exhaust air outlet with duct connection

COMPONENTS

PLATE HEAT EXCHANGER

- Aluminum sensible cross flow flat plate heat exchanger
- Smooth aluminum plates separated by formed ribs
- Aluminum frame and end plates
- Aluminum drain pan
- Accessories:
    - Magnehelic pressure gauge (2)

HOT WATER COIL

- AHRI rated hot water coil with galvanized steel casing, 0.02 thick copper tubes, and 0.006 thick aluminum fins
- A baked epoxy corrosion resistant coating is provided
- Supply and return connections supplied with grooved steel connection
- Water control valve is provided by others and field mounted by others (valves must accept 0-10 VDC control signal, 24 VAC power supply)

SUPPLY FAN

- Aluminum wheel, aluminum inlet cone with galvanneal drive frame that is coated with an acrylic urethane
- AMCA certified ratings for sound and performance
- Direct drive assembly
- 1" spring isolated unitary fan/motor base, flex connectors provided at fan inlet
- Fan airflow probes provided, (see controls section of specification)
- TEFC premium efficiency motors
    - VFD-rated with class F insulation

EXHAUST FAN

- Aluminum wheel, aluminum inlet cone with galvanneal drive frame that is coated with an acrylic urethane
- AMCA certified ratings for sound and performance
- Direct drive assembly
- 1" spring isolated unitary fan/motor base, flex connectors provided at fan inlet
- Fan airflow probes provided, (see controls section of specification)
- TEFC premium efficiency motors
    - VFD-rated with class F insulation

OUTSIDE FILTER

- 2" pleated MERV 8 filter
- Side access filter rack construction to be aluminum

RETURN FILTER

- 2" aluminum filter
- Side access filter rack construction to be aluminum

DAMPERS

- Recirculation: aluminum airfoil blade, aluminum frame, modulating actuator
- Supply fan isolation: aluminum extruded blade, aluminum frame gravity
- Exhaust fan isolation: aluminum extruded blade, aluminum frame gravity
- Outside air inlet: galvanized steel formed blade, galvanized steel frame airflow monitoring, modulating actuator
- Exhaust air outlet: aluminum airfoil blade, aluminum frame, two-position actuator
- Plate heat exchanger face and bypass: galvanized steel formed blade, galvanized steel frame, modulating actuator
- Motorized dampers:
    - AMCA certified performance
    - Leakage rating of 3 CFM/ft2 at 1" wg
    - Synthetic bearings
- Airflow monitoring dampers:
    - AMCA certified performance
    - Integral airflow straightener
    - Leakage rating of 3 CFM/ft2 at 1" wg
    - Synthetic bearings
- Gravity Dampers:
    - Tested in accordance with AMCA standard 500-D
    - 0.125" aluminum blade

ELECTRICAL

- Unit ETL listed as a complete package, unit factory wired to unit mounted NEMA 3R control panel
- Major electrical components UL listed (non-fused disconnect switch, control circuit fusing, control circuit transformer, fan motor starters, and overloads as applicable)
- Power wiring enclosed in conduit
- Single point power connection
- Unit shall have a short circuit current rating (SCCR) of 5 kA
- IP67 rated LED light strips provided as shown on unit drawing are wired to a single light switch, separate 120V power by others must be provided to the circuit
- A VFD per supply fan is provided by Innovent and factory installed by Innovent
    - No manual bypass included
    - Variable frequency drive shall be mounted on the exterior of the unit
- A VFD per exhaust fan is provided by Innovent and factory installed by Innovent
    - No manual bypass included
    - Variable frequency drive shall be mounted on the exterior of the unit
- All power wiring shall be coiled into the section with its respective electrical component. Field extension of wire through air handler tunnel and termination of wires at control panel shall be by others.
- Unit shall be fully factory wired for testing purposes with labeled quick connections at section splits. After testing, all control wiring will be disconnected at section splits and placed inside a junction box. Field reconnection of wires shall be by others after the unit is set.

CONTROLS

- A fully-programmed Carel DDC controller is provided.
    - A standard Innovent sequence of operation will be provided. Any customization of the standard sequence will require factory approval, revised pricing and a revised PO.
- This pricing does not include any controls start-up or commissioning services (those can be added for additional cost if required - consult factory for pricing).
- Type of BMS interface to be specified to Innovent at or before the release of the job. If the type of interface has not been specified by the time of release, no BMS interface card will be provided.
- Pressure transducer provided by Innovent and wired directly to main unit DDC controller (CFM readout viewable at DDC controller)
- Sensors/transducers/switches are provided and installed by Innovent.

ADDITIONAL UNIT DETAILS

EQUIPMENT MOUNTING

- Unit to be mounted on a solid non-curb surface that supports the entire perimeter of the unit

ETL Listing

- ANSI/U.L. 1995: Heating and Cooling Equipment

WARRANTIES

- All Innovent warranties begin at equipment start up or 6 months from shipment, whichever occurs first. If the warranties need to be extended from what is shown, please contact the factory for pricing.
- 1 year PARTS ONLY unit warranty is provided per Innovent's standard warranty terms

FACTORY TESTING/REPORTS

- Standard run testing done (consult factory for more details)

START UP

- Start up by others

OWNER TRAINING SERVICES

- Owner training by others

MISCELLANEOUS

- Unit shall be shrink-wrapped prior to shipment

Performance Data Summary

Innovent®
Air Handling Equipment

PDU-1

MODEL	ALTITUDE (Ft)
NDHU-OU-PL-46800-HW-460	0.00

OUTSIDE FILTER — **OUTSIDE**

CFM	TYPE	DEPTH (in)	FACE VEL. (FPM)	MERV	QTY	WIDTH (in)	HEIGHT (in)	CLEAN PD	TOTAL PD
30400	Pleated	2	475	8	16	24	24	0.24	0.24

PLATE HEAT EXCHANGER — **SUPPLY & RETURN**

	OUTSIDE AIR DATA				RETURN AIR DATA			
MODE	CFM	EAT (DB/WB)(°F)	LAT (DB/WB)(°F)	PD	CFM	EAT (DB/RH)(°F/%)	LAT (DB/RH)(°F/%)	PD
Cooling	30400	71.9/61.3	80.0/64.1	0.85	35080	84.0/60.0	76.9/75.4	1.10
Heating	23400	-4.0/-6.0	62.7/40.1	0.53	28080	84.0/43.0	45.8/100.0	0.82
Purge Heating	30400	-4.0/-6.0	58.6/37.9	0.72	35080	84.0/37.5	43.1/100.0	1.04
MODEL: H-1-80C-2700								

SUPPLY FAN — **SUPPLY**

QTY	CFM	CLASS	SIZE (mm)	TYPE	TSP ("WC)	BHP	MHP	RPM	MOTOR RPM	VFD Hz	MOTOR TYPE
4	11700	N/A	630	Plenum	3.19	9.0	10.0	1713	1800	58.7	TEFC
TOTAL:	46800	-	-	-	3.19	35.8	40.0	-	-	-	-

TSP CALCULATION

RA ESP ("WC)	1.15	Casing Loss ("WC)	0.30	Hot Water Coil ("WC)	0.50
SA ESP ("WC)	1.10	Return Filter Clean PD ("WC)	0.14	TSP:	3.19 "WC

The recirculation path (return to supply) leads to a greater TSP than the outside air path, so its components are listed above.

HOT WATER COIL — **SUPPLY**

CFM	FPM	EAT (°F)	LAT (°F)	MBH	GPM	GLYCOL %	EWT (°F)	LWT (°F)	WPD (ft)	ROWS	FPI	PD
46800	623	67.6	96.2	1452	366.4	0%	118.0	110.0	5.7	3	10	0.50

RETURN FILTER — **RETURN**

CFM	TYPE	DEPTH (in)	FACE VEL. (FPM)	MERV	QTY	WIDTH (in)	HEIGHT (in)	CLEAN PD	TOTAL PD
51480	Aluminum	2	537	N/A	24	24	24	0.14	0.57

EXHAUST FAN — **EXHAUST**

QTY	CFM	CLASS	SIZE (mm)	TYPE	TSP ("WC)	BHP	MHP	RPM	MOTOR RPM	VFD Hz	MOTOR TYPE
3	11694	N/A	630	Plenum	3.12	8.8	10.0	1705	1800	58.5	TEFC
TOTAL:	35080	-	-	-	3.12	26.4	30.0	-	-	-	-

TSP CALCULATION

RA ESP ("WC)	1.15	Return Filter Clean PD ("WC)	0.14	Plate Heat Exchanger ("WC)	1.10
Casing Loss ("WC)	0.30	Return Filter Loading PD ("WC)	0.43	TSP:	3.12 "WC

ELECTRICAL INFORMATION — **UNIT POWER**

COMPONENT	VOLTS	PHASE	FREQ. (Hz)	MOP	MCA
Electrical Enclosure	460	3	60	100	92.1
LIGHTS, GFCI*	120	1	60	N/A	N/A

AMP SUMMARY

Exhaust Fan	12.3 x 3	Supply Fan	12.3 x 4	Total:	86.1

*Note: Power source for lights/GFCI is by others

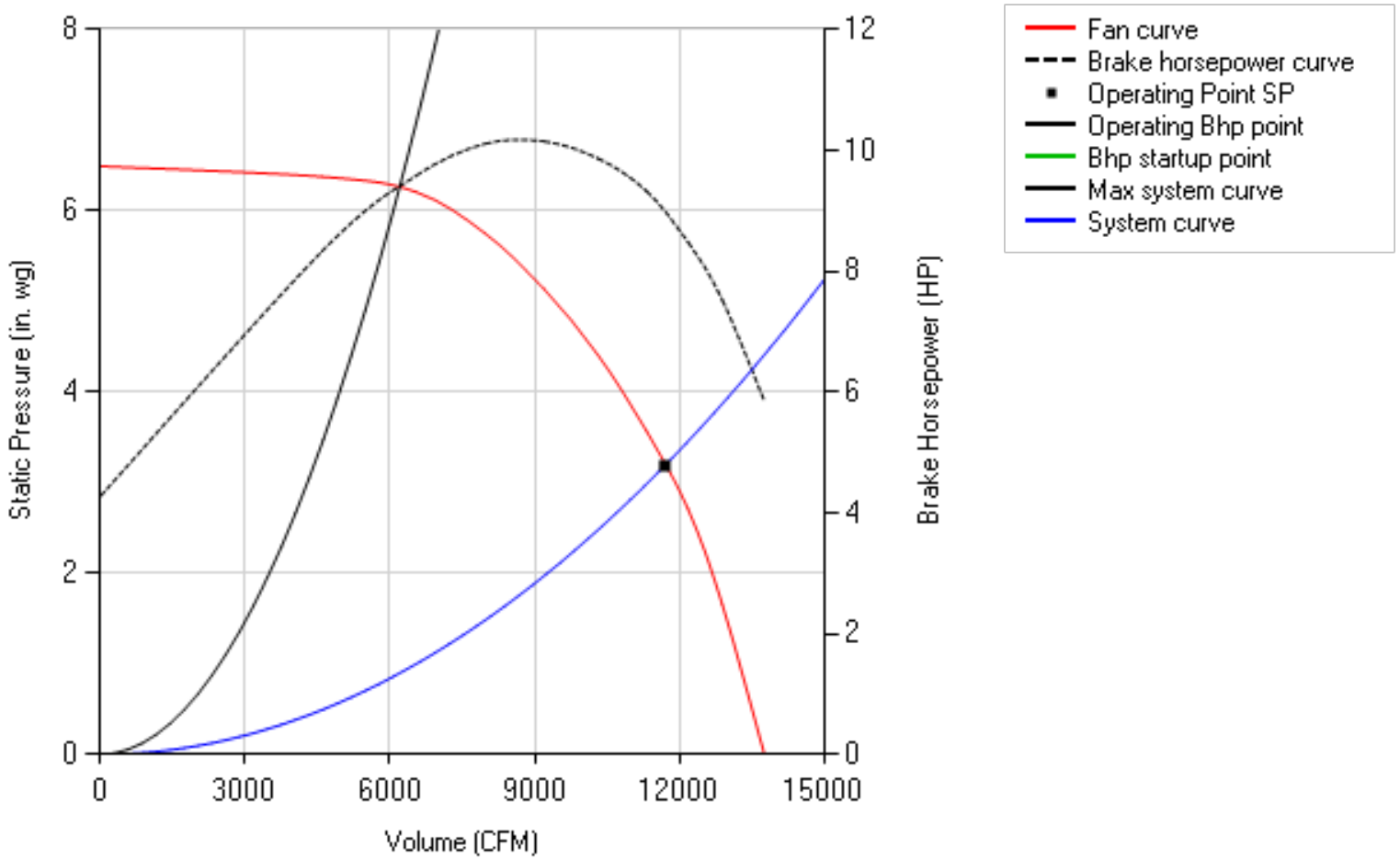
Fan Curve

Innovent®
Air Handling Equipment

PDU-1 Supply Fan

APD-630

Volume Per Fan (CFM)	11,700	Total Volume (CFM)	46,800	Drive Loss (%)	-
External SP (In. wg)	2.25	Total SP (In. wg)	3.19	Static Efficiency (%)	65.56
Elevation (ft.)	0	Brake Horsepower (bhp)	35.84	Fan Manufacturer	Greenheck
Airstream Temp. (F)	68.0	Fan RPM	1713	Fan Size (mm)	630
Motor Horsepower (hp)	40.0	Max Fan Speed (RPM)	1780		



Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA
Inlet	86	91	102	95	91	90	89	81	99	93
Outlet	93	94	103	105	101	100	98	86	107	101

Fan arrays display sound data for the array.

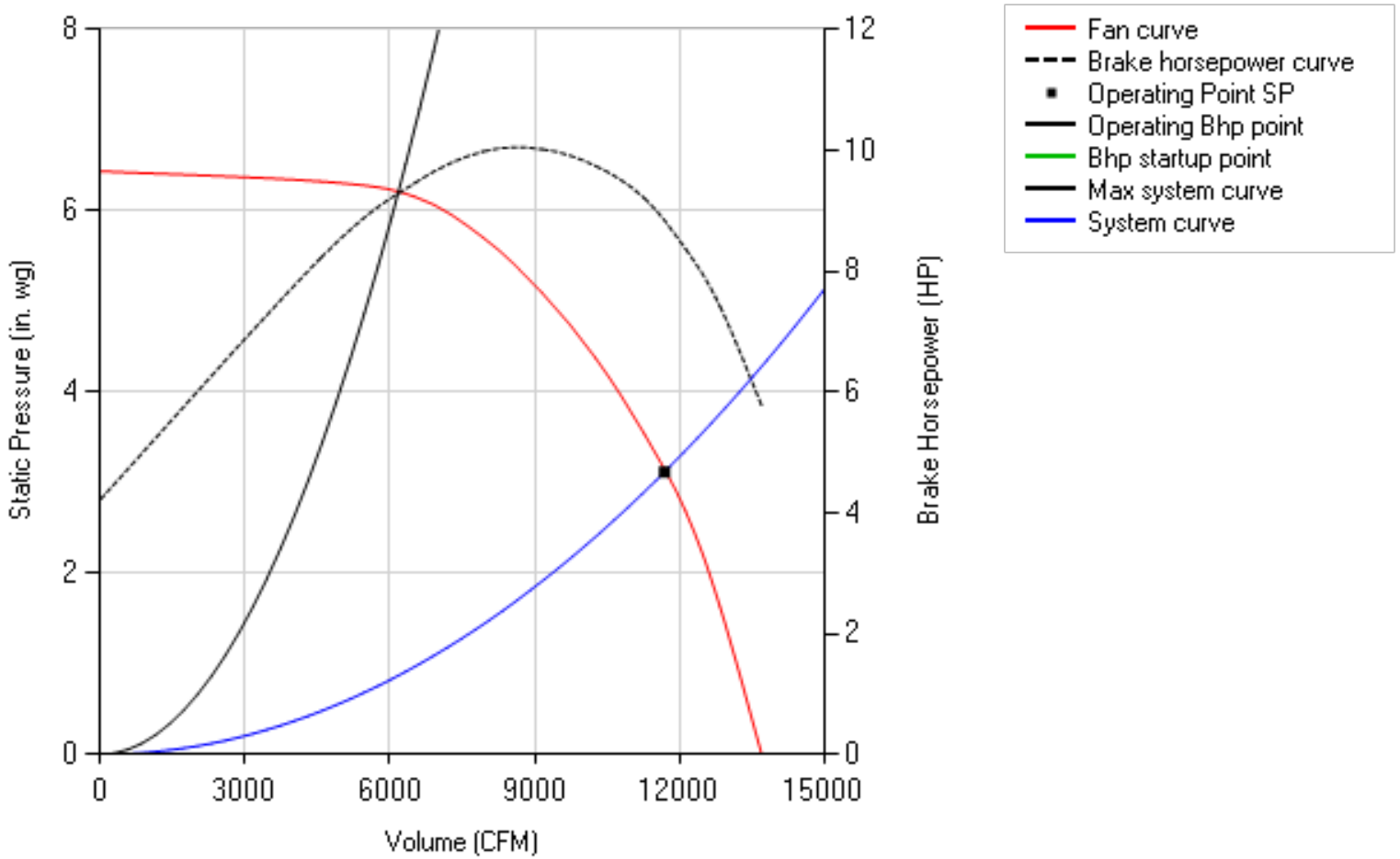
Fan Curve

Innovent®
Air Handling Equipment

PDU-1 Exhaust Fan

APD-630

Volume Per Fan (CFM)	11,693	Total Volume (CFM)	35,080	Drive Loss (%)	-
External SP (In. wg)	1.15	Total SP (In. wg)	3.12	Static Efficiency (%)	65.22
Elevation (ft.)	0	Brake Horsepower (bhp)	26.40	Fan Manufacturer	Greenheck
Airstream Temp. (F)	68.0	Fan RPM	1705	Fan Size (mm)	630
Motor Horsepower (hp)	30.0	Max Fan Speed (RPM)	1780		



Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA
Inlet	85	90	101	94	90	89	88	80	98	91
Outlet	91	93	101	103	99	98	96	85	105	99

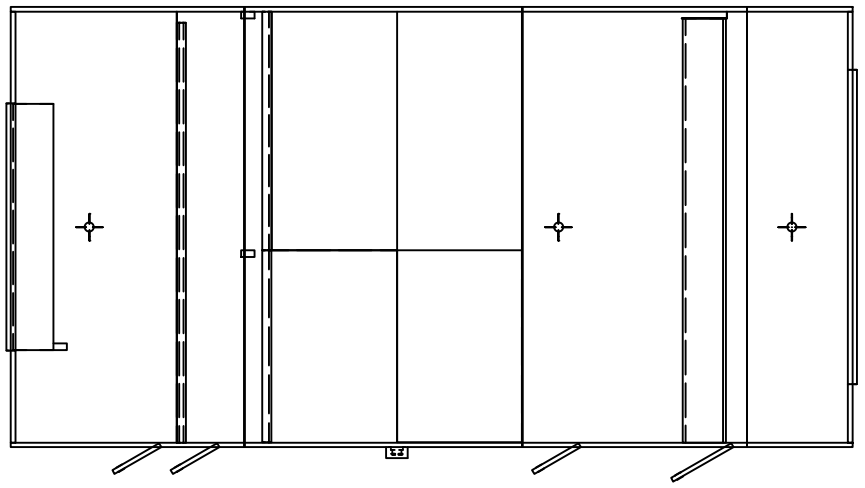
Fan arrays display sound data for the array.

Prepared Date: 9/22/2023
Job: Juneau Dimond Park Aquatic Center

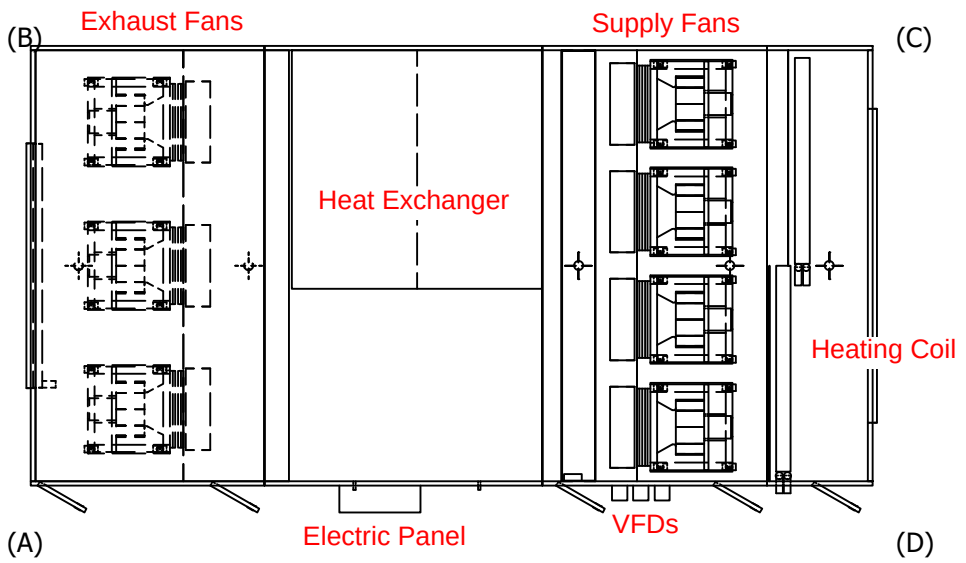
Rev #: 3
Job #: 2300810

COMPONENTS:

1) OUTSIDE AIR INLET W/ DAMPER (33.00" X 110.00")
2) 2" MERV 8 FILTERS
3) ELECTRICAL ENCLOSURE
4) PLATE HEAT EXCHANGER (1.00" MPT DRAIN)
5) MAGNEHELIC GAUGE
6) RECIRCULATION
7) RECIRCULATIONDAMPER
8) 2" ALUMINUM FILTERS
9) RETURN AIR INLET (57.00" X 140.00")
10) EXHAUST AIR OUTLET W/ DAMPER (39.00" X 109.00")
11) EXHAUST FAN, TYP. OF 3
12) VARIABLE FREQUENCY DRIVES
13) SUPPLY FAN, TYP. OF 4
14) HOT WATER COIL, TYP. OF 2
15) SUPPLY AIR OUTLET (67.00" X 140.00")

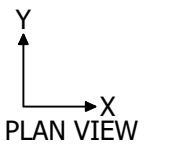


PLAN VIEW (UPPER)

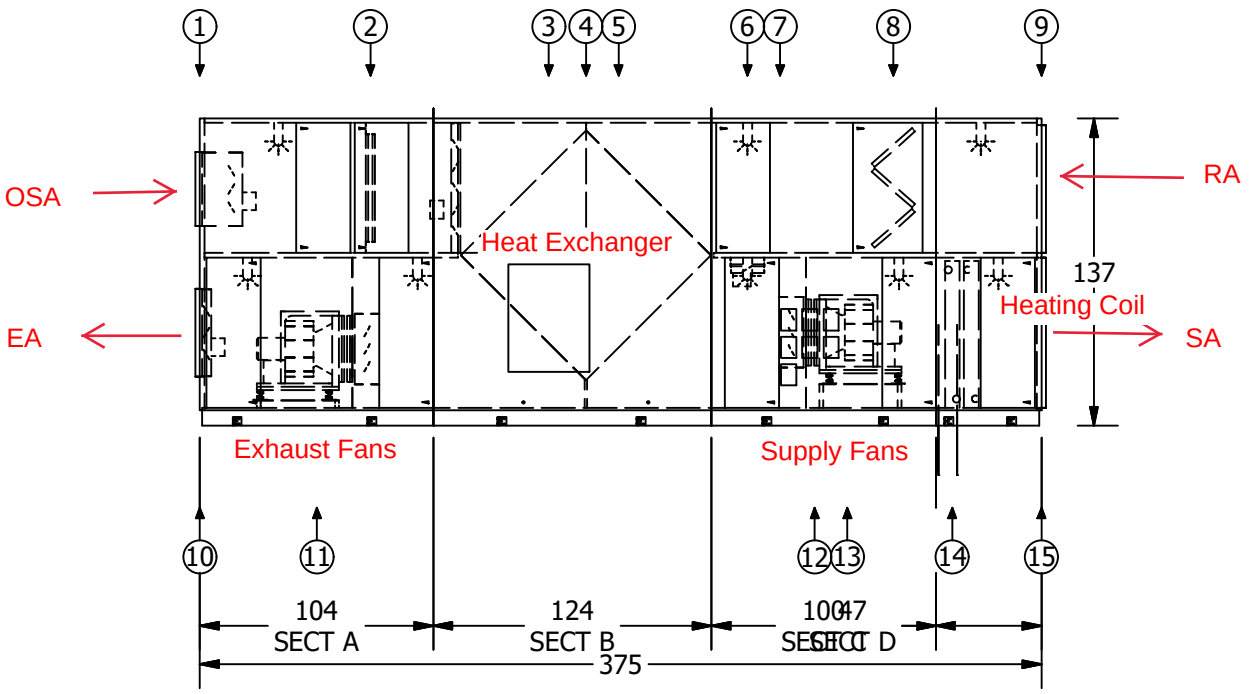


PLAN VIEW (LOWER)

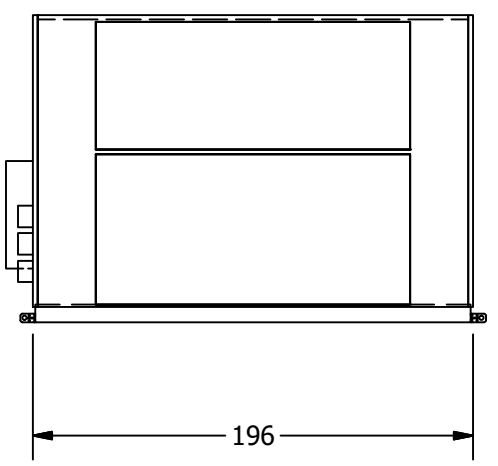
		Center of Gravity		Corner Weights			
Section	Weight	CGx	CGy	a	b	c	d
A	5100	45	98	1452	1452	1098	1098
B	7800	65	98	1860	1860	2040	2040
C	4900	54	98	1124	1124	1326	1326
D	2900	19	98	855	855	595	595
Total	20700						



PLAN VIEW



ELEVATION VIEW



RIGHT END VIEW

RECOMMENDED CLEARANCES

- MINIMUM 40" IN FRONT OF ALL SERVICE ACCESS LOCATIONS.
- MINIMUM 36", OR AS LOCAL CODES DICTATE, IN FRONT OF ALL ELECTRICAL PANELS. EXTERNALLY MOUNTED PANEL DEPTH CAN VARY FROM 8" - 16". 52" OF CLEAR SPACE IS RECOMMENDED AT EVERY ELECTRICAL PANEL LOCATION SHOWN.
- COMPONENT REMOVAL MAY REQUIRE MORE SPACE THAN LISTED RECOMMENDED CLEARANCES.

Innovent
Air Handling Equipment

DESCRIPTION: UNIT DRAWING	MODEL #: NDHU-OU-PL-46800-HW-460
TAG # PDU-1	
PROJECT: Juneau Dimond Park Aquatic Center	PROJECT # 2300810
DATE: 9/22/2023	ENGINEER: M. KAHLE
	REV # 3

Air Handling Unit Replacement
CBJ Dimond Park Aquatic Center
Juneau, Alaska

Construction Cost Estimate
Concept Design Submittal
October 25, 2023

ESTIMATIONS
1225 E. International Airport Road, Suite 235
Anchorage, Alaska 99518
907.561.0790

Prepared for:
Alaska Energy Engineering, LLC
25200 Amalga Harbor
Juneau, Alaska 99801
907.789.1226

Air Handling Unit Replacement
CBJ Dimond Park Aquatic Center
Prepared for Alaska Energy Engineering, LLC by Estimations

Construction Cost Estimate
Concept Design Submittal
October 25, 2023

Documents

AHU-1 Innovent Submittal.pdf
Dimond Park Aqautic Center Drawings.pdf
DPAC AHU-1 Replacement Scope of Work.pdf
DPAC Drawings.pdf

Notes and Assumptions

1 Based on 2024 procurement/2024 construction.
2 Labor rates based on Davis Bacon, 50 hours/week.
3 Assumes open competitive bid procurement.
4 Materials storage area will be designated near the building.
5 Local contractor.

Air Handling Unit Replacement
CBJ Dimond Park Aquatic Center
Prepared for Alaska Energy Engineering, LLC by Estimations

Construction Cost Estimate
Concept Design Submittal
October 25, 2023

Description	Estimated Cost	Estimated Cost Plus Contingency & Escalation	Div.
Basic Bid			
01 - GENERAL REQUIREMENTS	$412,767	$505,536	1
02 - EXISTING CONDITIONS	$4,690	$5,744	2
05 - METALS	$5,349	$6,551	5
07 - THERMAL & MOISTURE PROTECTION	$11,179	$13,691	7
09 - FINISHES	$3,621	$4,435	9
21 - FIRE SUPPRESSION	$8,750	$10,717	21
23 - HVAC	$1,303,432	$1,596,378	23
26 - ELECTRICAL	$14,662	$17,957	26
31 - EARTHWORK	$10,943	$13,402	31
Total Estimated Cost - Basic Bid:	**$1,775,393**	**$2,174,413**	**<<<<<**

Estimating Contingency:				15.0%
Escalation For Inflation:	12 Mths	@	6.5%	6.5%

Air Handling Unit Replacement | **Construction Cost Estimate**

CBJ Dimond Park Aquatic Center | **Concept Design Submittal**

Prepared for Alaska Energy Engineering, LLC by Estimations | **October 25, 2023**

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
1	**01 - GENERAL REQUIREMENTS**										
2											
3	**Project Management**										
4	Project Manager, 16 Hour/Week	15	WEEKS			16.000	240.0	$19,488		$19,488	$19,488
5	Supervisor, 50 Hour/Week	13	WEEKS			50.000	650.0	$52,780		$52,780	$52,780
6	Time Keeper/Cost Control, 8 Hour/Week	13	WEEKS			8.000	104.0	$5,429		$5,429	$5,429
7											
8	**Small Tools & Consumables**										
9	Consumables	1	LS	$3,200.00	$3,200					$3,200	$3,200
10	Small Tools	1	LS	$3,550.00	$3,550					$3,550	$3,550
11											
12	**Mobilization**										
13	Mobilization/Demobilization	1	LS	$1,000.00	$1,000	60.000	60.0	$6,340	$1,500	$8,840	$8,840
14											
15	**Equipment**										
16	Pickup (2 Ea)	13	WEEKS						$4,875	$4,875	$4,875
17	Forklift (1 Ea)	13	WEEKS						$11,050	$11,050	$11,050
18	Flatbed (1 Ea)	13	WEEKS						$19,500	$19,500	$19,500
19	High Lift Manlift (1 Ea)	13	WEEKS						$19,500	$19,500	$19,500
20	Craning Included In Division 23										
21											
22	**Other Requirements**										
23	Shop Drawings	100	HRS			1.000	100.0	$10,567		$10,567	$10,567
24	Quality Control	1	LS	$1,000.00	$1,000	40.000	40.0	$2,320		$3,320	$3,320
25	Temporary Facilities	3	MTHS								
26	Project Office Trailer	3	MTHS						$4,500	$4,500	$4,500
27	Office Equipment/Supplies	3	MTHS	$500.00	$1,500					$1,500	$1,500
28	Project Tool Sheds	3	MTHS						$600	$600	$600
29	Project Safety Equipment	1	LS	$1,780.00	$1,780					$1,780	$1,780
30											
31											
32											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
33											
34	Temporary Services										
35	Chemical Toilets	3	MTHS	$690.00	$2,070					$2,070	$2,070
36	Electrical - Connection	1	EA	$2,500.00	$2,500					$2,500	$2,500
37	Electrical	3	MTHS	$350.00	$1,050					$1,050	$1,050
38											
39	Cleaning										
40	Progressive	13	WK	$4.00	$52	4.000	52.0	$5,495		$5,547	$5,547
41	Final	1	MSF	$800.00	$800					$800	$800
42											
43	Dumpsters (1 Ea)	3	MTHS	$1,400.00	$4,200					$4,200	$4,200
44											
45	Survey For Access Road	1	LS	$5,000.00	$5,000					$5,000	$5,000
46											
47	Construction Fence	400	LF	$15.00	$6,000					$6,000	$6,000
48											
49	Record Documents	1	LS	$4,000.00	$4,000					$4,000	$4,000
50	Operations and Maintenance Manuals	1	LS	$3,500.00	$3,500	24.000	24.0	$1,392		$4,892	$4,892
51	Contract Closeout and Training	1	LS	$2,500.00	$2,500					$2,500	$2,500
52	Certified Payroll Fee	1	LS	$2,964.34	$2,964					$2,964	$2,964
53											
54											
55											
56											
57											
58											
59	**General Contractor Profit (Fee)**	10.0%									$157,463
60	**General Contractor Bond & Insurance**	2.5%									$43,302
61											
62	**Subtotal: 01 - GENERAL REQUIREMENTS**				$46,666		1,270.0	$103,811	$61,525	$212,002	**$412,767**
63											
64											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
65											
66	**02 - EXISTING CONDITIONS**										
67											
68	**02 41 00 Demolition**										
69	Demo Exterior Wall For Access To Remove/Place New AHU - 20X18	360	SF								
70	Metal Siding - Salvage	360	SF			0.057	20.5	$2,166		$2,166	$2,166
71	GWB	360	SF			0.014	5.0	$528		$528	$528
72	Metal Stud Framing	360	SF			0.021	7.6	$803		$803	$803
73	Insulation	360	SF			0.010	3.6	$380		$380	$380
74											
75	Debris Handling & Disposal	1	TONS			4.000	4.0	$418		$418	$481
76	Hauling and Dump Fees	1	TONS	$150.00	$150	1.000	1.0	$104	$35	$289	$332
77											
78											
79											
80											
81	**Subtotal: 02 - EXISTING CONDITIONS**				$150		41.7	$4,399	$35	$4,584	**$4,690**
82											
83											
84											
85	**05 - METALS**										
86											
87	**05 40 00 Cold-Formed Metal Framing**										
88	Wall Framing	360	SF	$2.50	$900	0.060	21.6	$2,615		$3,515	$4,042
89	Wall Framing at Louver Reinstall	1	LS	$250.00	$250	10.000	10.0	$1,057		$1,307	$1,307
90											
91											
92											
93											
94	**Subtotal: 05 - METALS**				$1,150		31.6	$3,672		$4,822	**$5,349**
95											
96											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
97											
98	**07 - THERMAL & MOISTURE PROTECTION**										
99											
100	**07 21 13 Building Insulation**										
101	Wall Insulation	360	SF	$3.00	$1,080	0.021	7.6	$684		$1,764	$2,029
102											
103	**07 26 13 Vapor Retarders**										
104	Raven Industries Rocco 450	360	SF	$0.65	$234	0.006	2.2	$232		$466	$466
105											
106	**07 27 13 Air Retarders**										
107	Air Barrier - Vaproshield, WrapShield Self-Adhered Water-Resistive	360	SF	$1.80	$648	0.004	1.4	$148		$796	$796
108											
109	**07 42 13 Metal Wall Panels**										
110	Reinstall Metal Panels	360	SF	$1.00	$360	0.086	31.0	$3,590		$3,950	$4,543
111											
112	**07 62 00 Sheet Metal Flashing and Trim**										
113	Flash at Louvers	60	LF	$7.20	$432	0.100	6.0	$595		$1,027	$1,181
114	Misc Flashings	76	LF	$7.20	$547	0.057	4.3	$426		$973	$1,119
115											
116	**07 92 00 Joint Sealants**	**1**	**LS**	$200.00	$200	8.000	8.0	$845		$1,045	$1,045
117											
118											
119											
120											
121											
122											
123											
124											
125											
126	**Subtotal: 07 - THERMAL & MOISTURE PROTECTION**				$3,501		60.5	$6,520		$10,021	**$11,179**
127											
128											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
129											
130	**09 - FINISHES**										
131											
132	**09 29 13 Gypsum Board**										
133	GWB 5/8" Walls	360	SF	$0.55	$198	0.034	12.2	$1,305		$1,503	$1,728
134											
135	**09 91 00 Painting**										
136	Paint	360	SF	$0.35	$126	0.043	15.5	$1,520		$1,646	$1,893
137											
138											
139											
140											
141											
142											
143	**Subtotal: 09 - FINISHES**				$324		27.7	$2,825		$3,149	**$3,621**
144											
145											
146											
147	**21 - FIRE SUPPRESSION**										
148											
149	**21 13 00 Fire-Suppression Sprinkler Systems**										
150	Allow For Reconfigure Of Sprinkler Head To Assure Coverage With New Equipment and Duct Locations	1	EA	$7,000.00	$7,000					$7,000	$8,750
151											
152											
153											
154											
155											
156											
157	**Subtotal: 21 - FIRE SUPPRESSION**				$7,000					$7,000	**$8,750**
158											
159											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
160											
161	**23 - HVAC**										
162											
163	**23 05 05 HVAC Demolition**										
164	Demo Duct RA 50/18	23	LF			0.696	16.0	$1,716		$1,716	$2,231
165	Demo Duct EA 90/30	12	LF			2.000	24.0	$2,574		$2,574	$3,346
166	Demo Duct OA 36/24	7	LF			1.143	8.0	$858		$858	$1,115
167	Demo Duct SA 44" Dia	36	LF			1.111	40.0	$4,291		$4,291	$5,578
168	Demo Duct SA 54" Dia	20	LF			0.800	16.0	$1,716		$1,716	$2,231
169	Demo RA 48" Dia	14	LF			0.800	11.2	$1,201		$1,201	$1,561
170	Demo Plenum Osa 9'X6'	1	EA			16.000	16.0	$1,716		$1,716	$2,231
171	Disc Connect Controls	30	EA			1.000	30.0	$3,218		$3,218	$4,183
172	Remove Louvers 9'x6' - Salvage	2	EA			25.714	51.4	$5,513		$5,513	$7,167
173	Disc Connect Misc Ductwork	6	EA			4.000	24.0	$2,574		$2,574	$3,346
174	Remove Ahu, Craning Included With New Installation See 23 73 00	240	HRS			1.000	240.0	$25,743		$25,743	$33,466
175											
176	**23 05 48 Seismic Control**	**1**	**EA**	$2,000.00	$2,000	16.000	16.0	$1,716		$3,716	$4,831
177											
178	**23 05 53 Identification**	**1**	**EA**	$200.00	$200	16.000	16.0	$1,716		$1,916	$2,491
179											
180	**23 05 93 Testing Adjusting and Balancing**	**1**	**EA**	$52,500.00	$52,500					$52,500	$76,125
181											
182	**23 07 00 HVAC Insulation**										
183	**Pipe Insulation, Minimal**	**1**	**LS**	$200.00	$200	8.000	8.0	$862		$1,062	$1,540
184											
185	**Ductwork Insulation**										
186	2" Thick (Typical For O/A Ducts)	337	SF	$4.00	$1,348	0.080	27.0	$2,910		$4,258	$6,174
187	1" Thick (Typical For S/A Ducts)	692	SF	$2.00	$1,384	0.075	51.9	$5,593		$6,977	$10,117
188											
189	**23 09 00 Instrumentation & Control for HVAC**										
190	Building Controls	30	PT	$1,600.00	$48,000					$48,000	$48,000

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
191											
192	**23 21 13 Hydronic Piping**										
193	Reconnect To Heating Coil 3"	1	EA	$3,500.00	$3,500	40.000	40.0	$4,185		$7,685	$9,606
194											
195	**23 31 13 Ducts**										
196	Round Spiral, Galvanized	2,351	LBS	$5.14	$12,084	0.077	181.0	$19,415		$31,499	$40,949
197	Rectangular, Galvanized	1,127	LBS	$7.71	$8,688	0.116	130.7	$14,019		$22,707	$29,519
198											
199	**23 33 00 Duct Accessories**										
200	Reinstall Louvers, Modify Exterior Wall Will Be Required	2	EA	$500.00	$1,000	30.857	61.7	$6,618		$7,618	$9,903
201											
202	**23 73 00 Air Handlers**										
203	AHU-1 Inovent Units With Plat Heating and Cooling Exchangers, Supply Return Fans, Coils, Filters. Price Includes Shipping and Startup. Labor For Setting and Assembly Onsite. Unit Will Be Installed In Sections.	1	EA	$560,000.00	$560,000	500.000	500.0	$53,632		$613,632	$797,722
204	Lifting With 2 Crane, Budget Number From Crane Contractor	1	EA	$200,000.00	$200,000					$200,000	$200,000
205											
206											
207											
208											
209											
210											
211											
212											
213	**Subtotal: 23 - HVAC**				$890,904		1,508.9	$161,786		$1,052,690	**$1,303,432**
214											
215											

Line No.	Description	Qty	UNITS	Material Costs Unit	Material Costs Total	Labor Hours Units	Labor Hours Totals	Labor Cost	Equip Cost	Total Cost	Total Cost w/ OH & P
216											
217	**26 - ELECTRICAL**										
218											
219	**26 05 05 Electrical Demolition**										
220	Demo VFD for AHU-1	2	EA			8.000	16.0	$1,718		$1,718	$2,233
221	Demo Feed to VFD	2	EA			8.000	16.0	$1,718		$1,718	$2,233
222	Demo Feed VFD to AHU	2	EA			4.000	8.0	$859		$859	$1,117
223											
224	**26 05 09 Conductors**										
225	**Feeders & Subfeeds**										
226	100 Amp: 1-1/4" EMT, 4#2, 1#8	100	LF	$19.10	$1,910	0.150	15.0	$1,585		$3,495	$3,495
227											
228	**26 29 23 Variable Frequency Drives**										
229	Install Cost, VFD Included With Inovent Package	2	EA			20.000	40.0	$4,295		$4,295	$5,584
230											
231	**Subtotal: 26 - ELECTRICAL**				$1,910		95.0	$10,175		$12,085	**$14,662**
232											
233											
234											
235	**31 - EARTHWORK**										
236											
237	**31 23 00 Excavation and Fill**										
238	**Access Road**	**1,500**	**SF**								
239	Excavation, 2 Ft	133	CY			0.014	1.9	$198	$274	$472	$543
240	Haul Exc To Waste	133	CY	$10.00	$1,333	0.029	3.9	$407	$480	$2,220	$2,553
241	Classified Fill, 2 Ft	222	TONS	$10.00	$2,222	0.091	20.2	$2,109	$1,013	$5,344	$6,146
242	D-1 6"	56	TONS	$12.50	$694	0.091	5.1	$532	$253	$1,479	$1,701
243											
244											
245	**Subtotal: 31 - EARTHWORK**				$4,249		31.1	$3,246	$2,021	$9,516	**$10,943**
246											
247											