City of Tacoma

Facilities Management

ADDENDUM NO. 2 **DATE:** 1/30/2023

REVISIONS TO:
Request for Bids Specification No. PW22-0268F
Fire Station 11 and 13 Improvements

NOTICE TO ALL BIDDERS:

This addendum is issued to clarify, revise, add to or delete from, the original specification documents for the above project. This addendum, as integrated with the original specification documents, shall form the specification documents. The noted revisions shall take precedence over previously issued specification documents and shall become part of this contract.

REVISIONS TO THE SUBMITTAL DEADLINE:

The submittal deadline remains the same.

REVISIONS TO THE SPECIFICATIONS:

Add Approved Substitution Request Form Brasch Duct Electrical Heaters and Approved Substitution Request Form ConsERV Energy Recovery Ventilator.

REVISIONS TO THE PROPOSAL FORM AND SIGNATURE PAGE:

Remove and replace with the Bid Proposal pages marked Addendum #2 and Signature Page marked Addendum #2. The bid proposal form has been updated to include the Additive Alternate #01 per the plans and specifications.

REVISION TO THE TECHNICAL SPACIFICATIONS:

Remove and replace the following technical specifications with the attached marked Addendum #2..

- Section 237223, Energy Recovery Ventilator
- Section 238246, Electric Heaters
- Section 259000, Integrated Automation Control Sequence

Add following attached technical specifications marked Addendum #2.

- Section 230933, Electric and Electronic Control System for HVAC
- Section 230993, Sequence of Operation for HVAC Controls

City of Tacoma

REVISION TO THE DRAWINGS:

Remove and replace the following drawings with the attached.

- Fire Station #11
  - Sheets M-001 and M4-02
  - Sheets S-101, S-102 and S-201
- Fire Station #13
  - Sheet M-001
  - Sheets S-101, S-102 and S-201

NOTE: Acknowledge receipt of this addendum by initialing the corresponding space as indicated on the signature page. Vendors who have already submitted their bid/proposal may contact the Purchasing Division at 253-502-8468 and request return of their bid/proposal for acknowledgment and re-submittal. Or, a letter acknowledging receipt of this addendum may be submitted in an envelope marked Request for Bids Specification No. PW22-0268F Addendum No. 02. The City reserves the right to reject any and all bids, including, in certain circumstances, for failure to appropriately acknowledge this addendum.

cc: David Pagel, Project Manager
Facilities Management, Capital Projects

SUBSTITUTION REQUEST FORM

Fire Station 11 & 13 HVAC Improvements

SPECIFICATION NO.: PW22-0268F

Prospective bidders may request substitutions in writing on this form. Substitutions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer.
E-mail address: Teide@cityoftacoma.org

All e-mails must be received by **Noon on Friday, January 20, 2023.** Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on www.tacomapurchasing.org.

Submitted By

Signature _____

Company Custom Mechanical Solutions, Inc.

Mailing Address 12507 Bel-Red Road

City Bellevue State WA Zip 98005

Phone 206-973-3900 Fax _____ E-mail joe@cmswa.com

☒ Please check if there are attachments

1. We hereby submit for your consideration the following product instead of the specified item for the above project:

Section	Page	Line/Paragraph	Specified Item
23 82 46	2-3	ALL	DUCT ELECTRIC HEATERS

2. Proposed Substitution. Add Brasch as approved equal to Indeeco

3. Reason for Substitution. To provide owner another competitive option to the basis of design

4. Attach complete technical data, catalog cuts, drawings, samples, etc. Exact models and description of products shall be noted with any deviation noted.

5. Include complete information on changes to Drawings, and/or Specifications which proposed substitution will require for its proper installation. Brasch should be like-for-like alt, no substantial change from BOD.

6. Does the substitute affect dimensions shown on Drawings? No major dimensional changes.

6a. If so, how? _____

7. Describe the effect substitution has on other trades. No substantial effects on other trades.

8. Describe differences between proposed substitution and specified item. No substantial differences between Brasch and the basis of design duct heaters.

9. Manufacturer's warranties of the proposed and specified items are: ☒ Same ○ Different (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item. The undersigned agrees to pay for changes to the building and systems design, including engineering and detailing costs caused by the requested substitution.

SUBSTITUTION REQUEST FORM

Fire Station 11 & 13 HVAC Improvements
SPECIFICATION NO.: PW22-0268F

For Reviewer

X ☐ Approved for Bidding subject to review and approval of Submittals (and as noted below) ☐ Rejected - Inadequate Information

☐ Not Accepted ☐ Received Too Late

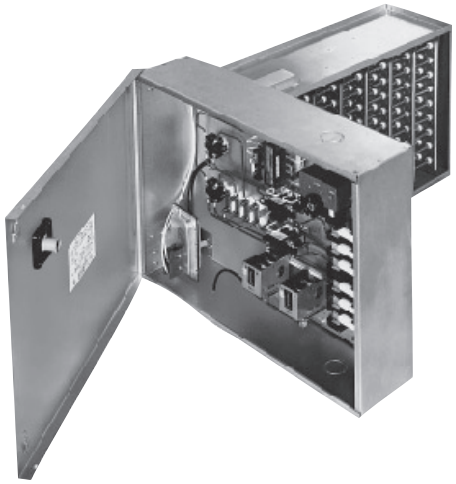
By Michael Tagles Date 01-24-23

Remarks

Standard Duct Heater Open Coil

HUA Slip-In and HUP Flanged Heaters

Figure 44.



Brasch has developed HUA (Figure 44) and HUP (Figure 46) heater lines to satisfy most typical space heating requirements, simplifying specification, ordering and delivery.

Both standard and quick ship delivery programs are available for the full line of HUA and HUP heaters.

KW Ratings

HUA and HUP heaters are available up to 456 KW. The KW ratings are limited both by frame size and electrical characteristics. Heater availability can be determined by contacting an Brasch representative, who can provide a computerized heater selection with exact heater dimensions in minutes.

Frame Sizes

The use of a standard open coil HUA slip-in heater will both reduce cost and permit rapid shipment. HUA frame sizes range from the smallest at 8” wide by 6” high to the largest 48” wide by 40” high or 72” wide by 30” high. The HUA offering has been opened up to allow for any duct size in between these sizes and includes fractional widths and heights dimensions (i.e. 24.625” by 17.25”). Brasch can manufacture a custom slip-in frame size if your requirements exceed the HUA offering.

The 80% Rule – Brasch recommends the heater should occupy at least 80% of the actual inside area of the duct, as shown in Figure 45. Only small amounts of air will bypass the heater around its perimeter and normal turbulence will rapidly mix this unheated air with heated air downstream.

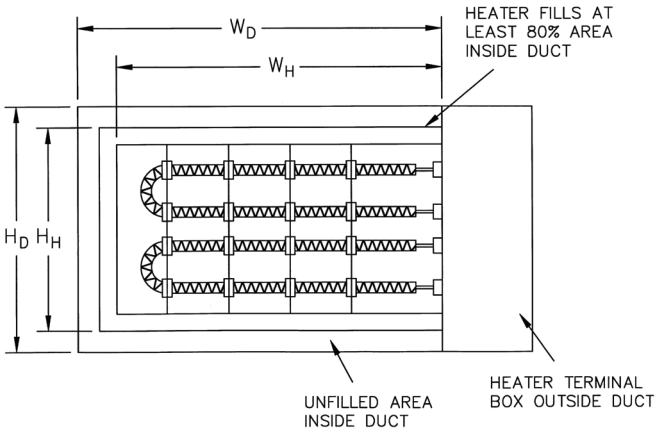


Figure 45.

All HUA heaters may be installed in ducts with up to 1” of interior lining, but the heater must be selected to fit the inside duct dimensions. For example, to fit a duct with 36” x 16” outside dimensions, but with 1” of interior insulation, specify a 35” x 14” heater.

HUP flanged open coil heater frame sizes range from the smallest at 8” wide by 6” high to the largest at 48” wide by 38” high or 72” wide by 28” high or any duct size in between these sizes (i.e. 35.75” by 27.75”).

Figure 46.

Standard Duct Heater Open Coil

Table VII

Commonly used duct widths and heights are shown in the charts below, in-between widths and heights are also available as standard HUA (slip-in) and HUP (flanged) duct heaters.

Sizes and Maximum KW Ratings

Duct Width	Duct Height 6”	8”	10”	12”	14”	16”	18”	20”	24”	30”	36”	40”
8”	6	9	12	16	19	22	25	28	35	45	54	61
10”	8	12	16	20	24	28	33	37	45	57	70	78
12”	10	15	20	25	30	35	40	45	55	70	85	96
14”	11	17	23	29	35	41	47	53	65	83	101	113
16”	13	20	27	34	41	48	55	62	75	96	117	131
18”	15	23	31	39	46	54	62	70	85	109	132	148
20”	17	26	34	43	52	61	69	78	96	122	148	165
22”	19	28	38	48	57	67	77	86	106	135	164	183
24”	21	31	42	52	63	74	84	95	116	148	179	200
26”	22	34	45	57	68	80	91	103	126	160	195	218
28”	24	37	49	62	74	86	99	111	136	173	211	235
30”	26	39	53	66	79	93	106	119	146	186	226	253
32”	28	42	57	71	85	99	114	128	156	199	242	270
34”	30	45	60	75	91	106	121	136	166	212	257	288
36”	32	48	64	80	96	112	128	144	176	225	273	305
38”	34	51	68	85	102	119	136	153	187	238	289	323
40”	35	53	71	89	107	125	143	161	197	251	304	340
42”	37	56	75	94	113	131	150	169	207	263	320	358
44”	39	59	79	98	118	138	158	177	217	276	336	375
48”	43	64	86	108	129	151	172	194	237	302	367	410
54”	48	73	97	121	146	170	194	219	268	341	—	—
60”	54	81	108	135	162	189	216	244	298	379	—	—
66”	59	89	119	149	179	209	239	268	328	418	—	—
72”	65	97	130	163	195	228	261	293	359	456	—	—

Type HUA Slip-in Heater

Maximum KW ratings in available frame sizes shown at left.

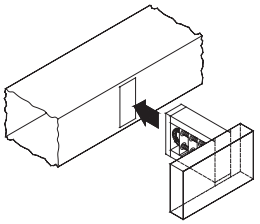


Figure 47.

Installation of Slip-in Heater

Duct Width	Duct Height 6”	8”	10”	12”	14”	16”	18”	22”	28”	30”	34”	38”
8”	11	14	18	22	25	29	33	40	51	55	62	69
10”	13	18	22	27	32	36	41	50	64	68	78	87
12”	16	22	27	33	38	44	49	60	77	82	93	104
14”	19	25	32	38	45	51	57	70	90	96	109	122
16”	22	29	36	44	51	58	66	80	102	110	125	139
18”	24	33	41	49	57	66	74	91	115	124	140	157
20”	27	36	45	55	64	73	82	101	128	137	156	174
22”	30	40	50	60	70	80	91	111	141	151	171	192
24”	33	44	55	66	77	88	99	121	154	165	187	209
26”	35	47	59	71	83	95	107	131	167	179	203	227
28”	38	51	64	77	90	102	115	141	180	193	218	244
30”	41	55	68	82	96	110	124	151	193	206	234	262
32”	44	58	73	88	102	117	132	161	205	220	250	279
34”	46	62	78	93	109	125	140	171	218	234	265	296
36”	49	66	82	99	115	132	148	182	231	248	281	314
38”	52	69	87	104	122	139	157	192	244	262	296	331
40”	55	73	91	110	128	147	165	202	257	275	312	349
42”	57	77	96	115	135	154	173	212	270	289	328	366
44”	60	80	101	121	141	161	182	222	283	303	343	384
48”	66	88	110	132	154	176	198	242	308	331	375	419
54”	74	99	124	148	173	198	223	273	347	—	—	—
60”	82	110	137	165	193	220	248	303	386	—	—	—
66”	91	121	151	182	212	242	273	333	424	—	—	—
72”	99	132	165	198	231	264	297	364	463	—	—	—

Type HUP Flanged Heater

Maximum KW ratings in available frame sizes shown at left.

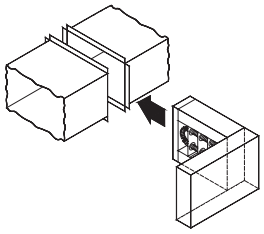


Figure 48.

Installation of Flanged Heater

Note: Maximum KW ratings may vary based on voltage and phase combinations.

Standard Duct Heater Open Coil

Detail Dimensions

The wide variety of HUA and HUP (Figures 47 and 48) heaters makes it impractical to list the exact heater dimensions for every possible heater. For dimensional details, contact your local Brasch representative.

Voltage and Phase

Heaters are available in the voltage and phase combinations shown below. All are for operation at 50 or 60 Hz.

When three-phase is specified, each heating stage will be furnished with a multiple of three elements to give a balanced three-phase load.

Voltage	120 208 240 277	208 240 380 400 415 480 600
Phase	1	3

Control Circuit Options & Special Features

HUA and HUP heaters are available with Control Options G, J and K and a full range of Special Features. These are described briefly in **Table VIII** and in more detail in the standard Control Options section of this catalog, pages 10 and 11.

Number of Heating Stages

Single and three-phase HUA and HUP heaters are available with multiple heating stages. To comply with our UL and NEC maximum circuit sizes, no stage is rated at more than 48 amps.

Table VIII

Control Options

Control Option	Disconnect Switch	Thermal Cutouts	Airflow Switch	Contactors	Control Transformer	Fuses	PE Switches	SCR	Thermostat
G Basic	■	■	■	■	■	■[1]			
J Pneumatic	■	■	■	■[2]	■[3]	■[1]	■		
K Proportional	■	■	■	■[2]	■	■[1]		■	■[4]

Notes:
1. Fuses supplied only on heaters over 48 amps.
2. Contactors supplied only when other devices cannot carry heater load.
3. Transformer only supplied on heaters rated higher than 277 volts.
4. Choice of room or duct thermostat, 135 ohms, 2200 ohms, 0-10 VDC or 4-20 mA inputs.

See pages 12 and 13 for full description of thermostats.

Special Features

While HUA slip-in and HUP flanged heaters may be specified with one of the standard control circuit options, individual job requirements may demand slight variations from the standards. The most common variations are covered by Brasch's set of Special Features which may be used to modify HUA/HUP heaters both mechanically and electrically. These are listed in **Table IX** with a brief description, availability, and notes on any limitations of their use.

Table X provides a summary of thermostats offered with Brasch HUA/HUP heaters. See pages 12 and 13 for more detailed descriptions.

Table IX

Special Features	Special Feature Code	Description	Page Ref.	Availability & Limitations
Mechanical				
Horizontal Airflow	U8	Allows heater to be used in applications where airflow is either right (U4) or left (U6)	23	Available on all heaters.
Vertical Airflow	U9	Allows heater to be used in applications where airflow is either vertical up (U3) or vertical down (U5.)	23	Available on all heaters.
Pressure Plate	V1	40% open perforated plate installed onto the inlet side of the heater frame to help even out irregular airflow patterns.	35	Available on all heaters. Exact airflow direction must be specified U3, U4, U5 or U6.
Protective Screen	V/V2	Wire mesh screen for attachment to the heater frame. Can be furnished for one or both sides.	36	Available on all heaters. Screens are shipped loose for field installation.
Stainless Steel Frame and Terminal Box	H2	Heater frame and terminal box constructed of 304 stainless steel.		Available on all heaters.
Aluminized Steel Frame and Terminal Box	H1	Heater frame and terminal box constructed of aluminized steel.		Available on all heaters.
Insulated Duct Construction for Slip-in Heaters	GG2	Used in ducts lined with more than 1" thick interior insulation. Inside duct dimensions and insulation thickness must be specified. Maximum 6" thick lining.	36	Available on all heaters.
Unheated Sections	G2	Extended terminal pins to provide an unheated section adjacent to the heater terminal box. Maximum extended terminal pin length of 6".	36	Available on all heaters.
Substitute Negative Pressure Switch	Q5/Q6	Allows heater to be used on inlet side of fan.	15	Available on all heaters.
Right/Down Terminal Box Overhang	L4/L5	Heater will be supplied with terminal box overhang on right (if horizontal airflow installation) or downward (if vertical airflow installation).	23	Available on all heaters.

Standard Duct Heater Open Coil

Table IX (continued)

Special Features	Special Feature Code	Description	Page Ref.	Availability & Limitations
Mechanical (cont.)				
Insulated Terminal Box	B2	Prevents condensation inside terminal box when heater is installed in air conditioning duct running through un-airconditioned area.	35	Available on all heaters.
Dust-Tight Terminal Box	B7	Allows installation in dusty areas and satisfies local codes requiring dust-tight box, if installed in area used as return air plenum.	34	Available on all heaters.
Remote Panelboard	B5	All controls except thermal cutouts, airflow switch and pilot switch will be supplied in a separate NEMA 1 panelboard.	37	Available on all heaters except when transformer and contactors are deleted.
Electrical				
Add “Stage On” Pilot Light(s)	P1	To indicate when each heating stage is producing heat.	17	Available on all heaters except Option K SCR stages.
Add “Low Airflow” and “Heater On” Pilot Lights	P2, P3	Separate pilot lights to indicate that power has been supplied to the heater, that it is ready for operation, and whether airflow has been interrupted.	17	Available on all heaters. When fan relay has been substituted for airflow switch, only “Heater On” will be supplied.
Fan Relay	N(000)	When static pressure in the duct is too low (below .07” WC) to operate the airflow switch or when airflow switch is not desired. (000) denotes holding coil 24, 120, 208, 240, or 277 volts.	15	Available on Option G & K heaters except Option G heaters where deletion of contactors and transformers is specified.
Add Brasch Electronic Step Controller	S	Allows better temperature control of high capacity heater by using multiple stages controlled by electronic thermostat and step controller.	19-20	Only available on Option G heaters with 2 or more heating stages.
Low Watt Density Coils	D3, D4	To meet specifications which call for low watt density coils.		Available on all heaters.
Add Built-in PE Transducer	E32, S19	To allow for pneumatic control.	13	Available on Option K heaters or Option G heaters with step controller and 6 or more stages.
Transformer Primary Fusing	T1	Standard for all heaters with 120 VAC and Class I control circuits. Available with all heaters with 24 VAC and Class II control circuits.		Available with all heaters with built-in transformer.

Table IX (continued)

Special Features	Special Feature Code	Description	Page Ref.	Availability & Limitations
Electrical (cont.)				
Delete Transformer		Allows control circuit to be obtained from source outside the heater or, when line voltage is equal to control voltage, directly from power lines within the heater.	16	Only available on Option G heaters. Must be specified if control voltage is not 120 or 24 volts. Customer must specify control volts.
Delete Transformer & Contactors		Allows for control of heater directly using load carrying thermostats.	16	Available only on single stage, single-phase, Option G heaters with KW not exceeding the following. Voltage | 120 277 Max KW | 1.8 4.1
Transformer Secondary Fusing	T3	External fused and grounded transformer secondary for Class II 24 volt control circuits.		Available on all heaters.
Additional User Control Circuit Voltage		Heater control circuit transformer sized for additional user VA. A control terminal block is furnished for field connection.		Available on all heaters. Consult factory for 1 week or 72 hour heater availability.
Delete Disconnect		Allows for use of field installed disconnecting means. (Must be within sight of the heater.)	16	Available on all heaters.
Fused Disconnect Switch	Q1	Door interlocking disconnect with line fusing for heaters loads up to 48 amps or less.	16	Available on all heaters.
Linear Limit Automatic Reset Thermal Cutout	Z/Z1	Automatic reset linear limit thermal cutout wired in series with the disc type automatic reset to provide redundant primary over temperature protection.	14	Available on all heaters. Exact airflow direction must be specified U3, U4, U5 or U6.
Add Fuses for Heaters Rated 48 Amps or Less	F1	Allows for addition of one set of fuses to low amperage heaters that do not need internal fusing to meet UL and NEC requirements	16	Available on all heaters whose KW is lower than or equal to the following. (Other heaters include fusing as standard): Line | KW (at 48 amps) Volts | 1 Phase 3 Phase 120 5.7 - 208 9.9 17.2 240 11.5 19.9 277 13.2 - 480 23.0 39.9
Remote enable terminals	R1	Enables heater operation with remote dry contacts.		Available on all heaters.

Standard Duct Heater Open Coil

Table X

Summary of Thermostats Available with Option G or K Heaters (No Thermostats are supplied on Option J Heaters)

Type of Thermostat			Used with Control Option	Catalog Number	Comments
ROOM	Pilot Duty	1 Stage	G	1006998 (Fig.11)	Rated for 30 volts max. Offered with Duct Heater Selection
		1 Stage	G	1023721 (Fig. 12)	Digital Display, Rated for 30 volts max. Special Ordered
		2 Stage	G	1007030 (Fig. 13)	Digital Display, Rated for 30 volts max.
		2 or 3 Stage	G	1023723 (Fig. 14)	Programmable with Digital Display, Rated for 30 volts max.
	† Proportional Electronic		G or K	SCR Controlled or Vernier Controlled. 1016941 (Fig. 16)	With Option G, can be used only when step controller is also specified
DUCT	Pilot Duty	1 Stage	G	1023953 (Fig. 18)	Rated for 277 volts max.
		2 Stage	G	1007044 (Fig. 19)	Rated for 240 volts. max.
	† Proportional Electronic		G or K	SCR Controlled or Vernier Controlled. 1016941 and 1016942 (Fig. 16)	With Option G, can be used only when step controller is also specified.
	† No Thermostat (Special inputs for controller or SCR when customer supplied thermostat is used)		G or K	— — —	2200 ohm Input 135 ohm Input 4-20 mA Input 0-10 VDC Input

†A thermostat or input must be specified with all Option K heaters and all Option G heaters with step controllers.
Step controllers with 4-20 mA or 0-10 VDC will be furnished with proportional control.

Standard Duct Heater Open Coil

HUA/HUP – Sample Specification

A job specification can be prepared by using the following information. Simply darken the applicable circles. Material which is part of the basic specification has already been darkened. Additional copies of this specification guide are available from your local Brasch representative.

- 1. Duct heaters shall be Brasch
  - ◦ Type HUA Standard Slip-in Heaters
  - ◦ Type HUP Standard Flanged Heaters
- 2. Approvals – Heaters and panelboards (if required) shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero spacing between the duct and combustible surfaces and for use with heat pumps and air conditioning equipment.
- 3. Heating elements shall be open coil, 80% nickel, 20% chromium, Grade A resistance wire. Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the airstream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets.
- 4. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 type construction and shall be provided with a hinged, latching cover and multiple concentric knockouts for field wiring.
- 5. All heaters shall be furnished with a disc type, automatic reset thermal cutout for primary over-temperature protection. All heaters shall also be furnished with disc type, load carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable.
- 6. Heaters shall be rated for the voltage, phase, and number of heating stages indicated in the schedule. All three-phase heaters shall have equal, balanced, three-phase stages. All internal wiring shall be stranded copper with 105°C insulation and shall be terminated in crimped connectors or box lugs.
- 7. Terminal blocks shall be provided for all field wiring and shall be sized for installation of 75°C copper wire rated in accordance with NEC requirements.
- 8. Heaters shall be furnished, either with the Control Option specified in the schedule and described below, or with the specific components listed in the schedule.
- Option G – Thermal cutouts, airflow switch, contactors, fuses (if over 48 amps), control circuit transformer (where required) and built-in, snap-acting, door interlocked disconnect switch.

◦ Option J – Thermal cutouts, airflow switch, PE switches, contactors (where required), fuses (if over 48 amps), control circuit transformer (where required), and built-in snap-acting door interlocked disconnect switch.

◦ Option K – Thermal cutouts, airflow switch, contactors (where required), SCR (with step controller if heater draws over 96 amps three-phase or 192 amps single-phase), fuses (if over 48 amps), control circuit transformer, and built-in snap-acting door interlocked disconnect switch.

◦ 9. When specified in the schedule, or below, heaters will be supplied with the following Special Features:

- ◦ Airflow switch for negative pressure operation
- ◦ Insulated terminal box
- ◦ Dust-tight terminal box
- ◦ Stainless steel frame and terminal box
- ◦ Aluminized steel frame and terminal box
- ◦ Insulated duct construction for slip-in heaters (>1" ≤6" thick lining)
- ◦ Unheated section (≤6" terminal pin)
- ◦ Pressure plate
- ◦ Protective screen(s); ◦ one side ◦ both sides
- ◦ Controls mounted in NEMA 1 remote panelboard
- ◦ Deletion of transformer
- ◦ Deletion of transformer and contactor
- ◦ Transformer primary fusing (standard for Class I)
- ◦ Transformer secondary fusing (Class II)
- ◦ Aditional user control circuit voltages (specify user VA)
- ◦ Deletion of disconnect switch
- ◦ Fused disconnect switch (≤ 48 amps)
- ◦ Fusing for heaters rated 48 amps or less
- ◦ "Low Airflow" pilot light
- ◦ "Heater On" pilot light
- ◦ Each "Stage On" pilot light(s)
- ◦ Fan relay (instead of airlfow switch)
- ◦ Fan relay (in additional to airflow switch)
- ◦ Remote enable heater operation
- ◦ Step controller
- ◦ Linear limit automatic rest thermal cutout
- ◦ 25 watts per square inch resistance coils
- ◦ 35 watts per square inch resistance coils
- ◦ Built-in PE transducer

◦ 10. When specified in the schedule, or below, heaters shall be supplied with the following thermostats:

- ◦ Pilot duty single stage room thermostat
- ◦ Pilot duty digital display single stage room thermostat
- ◦ Pilot duty two stage digital display room thermostat
- ◦ Pilot duty two or three stage programmable with digital display room thermostat
- ◦ Proportional electronic room thermostat
- ◦ Pilot duty single stage duct thermostat
- ◦ Pilot duty two stage duct thermostat
- ◦ Proportional electronic duct thermostat with set point adjuster
- ◦ Special inputs (135 ohms, 2200 ohms, 4-20 mA, 0-10 VDC)

SUBSTITUTION REQUEST FORM

Fire Station 11 & 13 HVAC Improvements

SPECIFICATION NO.: PW22-0268F

Prospective bidders may request substitutions in writing on this form. Substitutions shall be submitted on this form via e-mail to:

Tina Eide, Senior Buyer.
E-mail address: Teide@cityoftacoma.org

All e-mails must be received by **Noon on Friday, January 20, 2023.** Where changes in the project documents are required, an addendum will be issued to everyone on the plan holder's list and posted on www.tacomapurchasing.org.

Submitted By

Signature _____

Company Custom Mechanical Solutions, Inc.

Mailing Address 12507 Bel-Red Road

City Bellevue State WA Zip 98005

Phone 206-973-3900 Fax _____ E-mail joe@cmswa.com

☒ Please check if there are attachments

1. We hereby submit for your consideration the following product instead of the specified item for the above project:

Section	Page	Line/Paragraph	Specified Item
23 72 23	ALL	ALL	ENERGY RECOVERY VENTILATOR

2. Proposed Substitution. Add ConsERV as approved equal to RenewAire

3. Reason for Substitution. To provide owner another competitive option to the basis of design

4. Attach complete technical data, catalog cuts, drawings, samples, etc. Exact models and description of products shall be noted with any deviation noted.

5. Include complete information on changes to Drawings, and/or Specifications which proposed substitution will require for its proper installation. ConsERV should be like-for-like alt, no substantial change from BOD.

6. Does the substitute affect dimensions shown on Drawings? No major dimensional changes.

6a. If so, how? _____

7. Describe the effect substitution has on other trades. No substantial effects on other trades.

8. Describe differences between proposed substitution and specified item. No substantial differences between ConsERV and the basis of design ERV.

9. Manufacturer's warranties of the proposed and specified items are: ☒ Same ○ Different (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item. The undersigned agrees to pay for changes to the building and systems design, including engineering and detailing costs caused by the requested substitution.

SUBSTITUTION REQUEST FORM

Fire Station 11 & 13 HVAC Improvements
SPECIFICATION NO.: PW22-0268F

For Reviewer

X ☐ Approved for Bidding subject to review and approval of Submittals (and as noted below) ☐ Rejected - Inadequate Information

☐ Not Accepted ☐ Received Too Late

By Michael Tagles Date 01-24-23

Remarks

ConsERV™ by DAIS

N Series

Breakthrough ConsERV™ technology and performance up to 4800 CFM

Healthier. Wealthier Wiser ...

Extensive scientific research shows that improving air quality improves the cognitive skills and productivity of building occupants. A rigorous study in real-world conditions by researchers with Harvard and the National Institutes of Health documented **gains of 299% on information usage and 287% on strategic thinking** when building occupants received twice the minimum required ventilation air and the volatile organic compounds (VOCs) are kept low[1]. Across nine categories, ventilation improved performance 101% on average. ConsERV™ harnesses a patented Aqualyte™ 'smart polymer' material in a reliable fixed-plate energy recovery ventilator design that reduces energy consumption, capital and operating expenses, and carbon dioxide emissions.

An energy recovery ventilator ("ERV") uses the air being exhausted from the building to pre-condition the ventilation air entering a building to reduce the load on the HVAC system. In humid summer conditions, outside air is cooled and dehumidified before it enters the building, reducing the load on the air conditioning system. During winter, the opposite occurs; the outside air is heated and humidified. With a ConsERV™ system, nothing has to be reset, moved, or changed – this behavior is inherent to the device.

ConsERV™ systems offer compelling advantages over the competition:

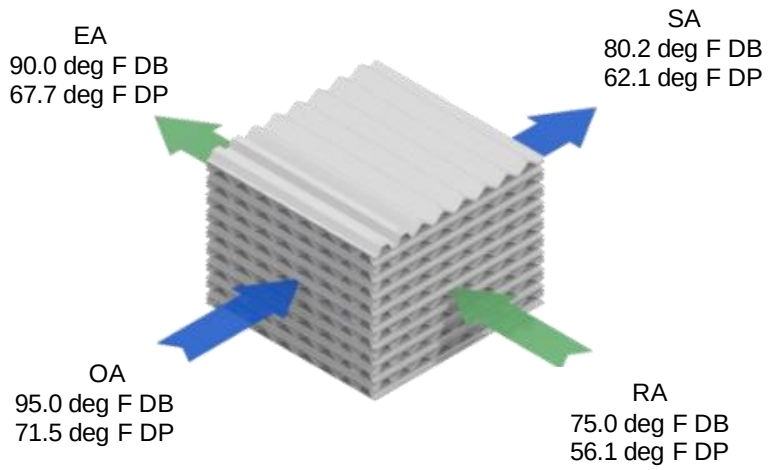
- High sensible effectiveness and class-leading latent effectiveness reduce energy consumption from fresh air ventilation. This AHRI 1060 certified performance has been trusted by thousands of customers for almost two decades.
- No motorized, rotating, or moving parts in the exchanger mean less energy consumption, lower maintenance costs, and peace of mind.
- Superior long-term reliability allows the capacity and size of the rest of the HVAC plant to be reduced, saving even more energy and capital costs. Reductions in HVAC capacity > 30% are typical and engineers and owners have the comfort of knowing that heat and moisture are always being exchanged and they will not be left with an undersized system because a component stops rotating.
- Nonporous Aqualyte membranes form a barrier to the transmission of pollutants, odors, and other contaminants between the air streams. The material itself has been ASTM G-21 and G-22 tested to demonstrate that it doesn't support fungal or bacterial growth.
- ConsERV™ systems are well suited to use in sensitive applications where recirculation of exhaust air cannot be tolerated, such as hospitals and medical facilities.
- Superior moisture management in difficult conditions eliminates the drip pan and drain systems, as moisture stays in the vapor state, and allows operation at very low temperatures without freezing or damage.

[1] Allen, Joseph G., Piers MacNaughton, Usha Satish, Suresh Santanam, Jose Vallarino, and John D. Spengler. 2015. "Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments." Environmental Health Perspectives 124 (6): 805-812. doi:10.1289/ehp.1510037. http://dx.doi.org/10.1289/ehp.1510037.

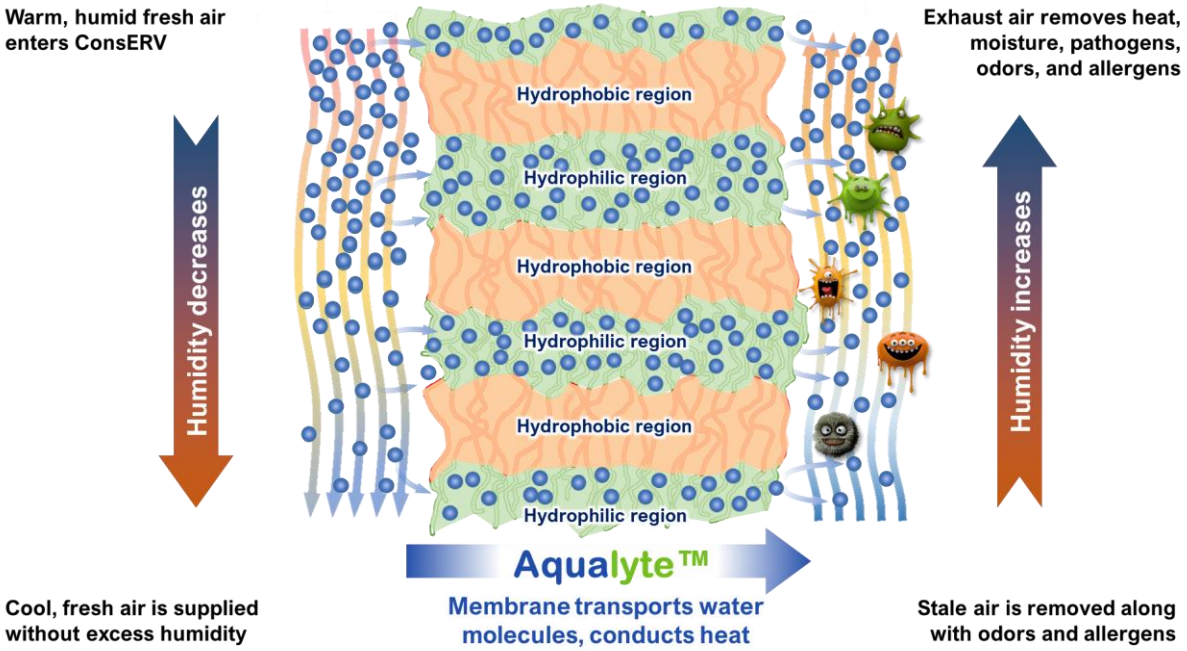
HOW CONSERV™ CORES WORK

The example below is an illustration of ConsERV™ energy recovery. The OA (Outside Air) is the fresh air coming into the building as SA (Supply Air). The RA (Return Air) is the stale air leaving the building as EA (Exhaust Air). As the two airstreams pass over the Aqualyte™ membrane the sensible and latent energy transfer from one airstream to the other. In the summertime example below the enthalpy of the incoming air or SA (supply air) is reduced by 22%. This reduces the load on the air conditioning system by reducing the amount of dehumidification that is needed to cool the room air.

- Energy recovery component manages ventilation air in an HVAC system.
- Building exhaust air is used to precondition incoming fresh air, bringing fresh supply air conditions closer to return air conditions.
- Best-in-class humidity control increases overall energy efficiency to save $ and reduce carbon emissions.
- Enables high ventilation rates that vastly improve indoor air quality (IAQ) and address PM2.5



In ConsERV™ ERV systems, Aqualyte™ forms a thin, nonporous barrier between the two air streams that does a superior job of preventing crossover of polluted air, odors, or contaminants into the ventilation air. The controlled nanostructure of the material forms carefully organized regions of extremely hydrophilic polymer that communicate from one face of material to the other. Water molecules readily enter this solid hydrophilic material and permeate rapidly between the surfaces to maintain a dynamic equilibrium between the moisture content of the two air streams, with water molecules moving from the surface seeing a higher vapor pressure to the surface at a lower vapor pressure. This free and easy movement of water molecules gives ConsERV™ the highest latent effectiveness of any fixed plate ERV.



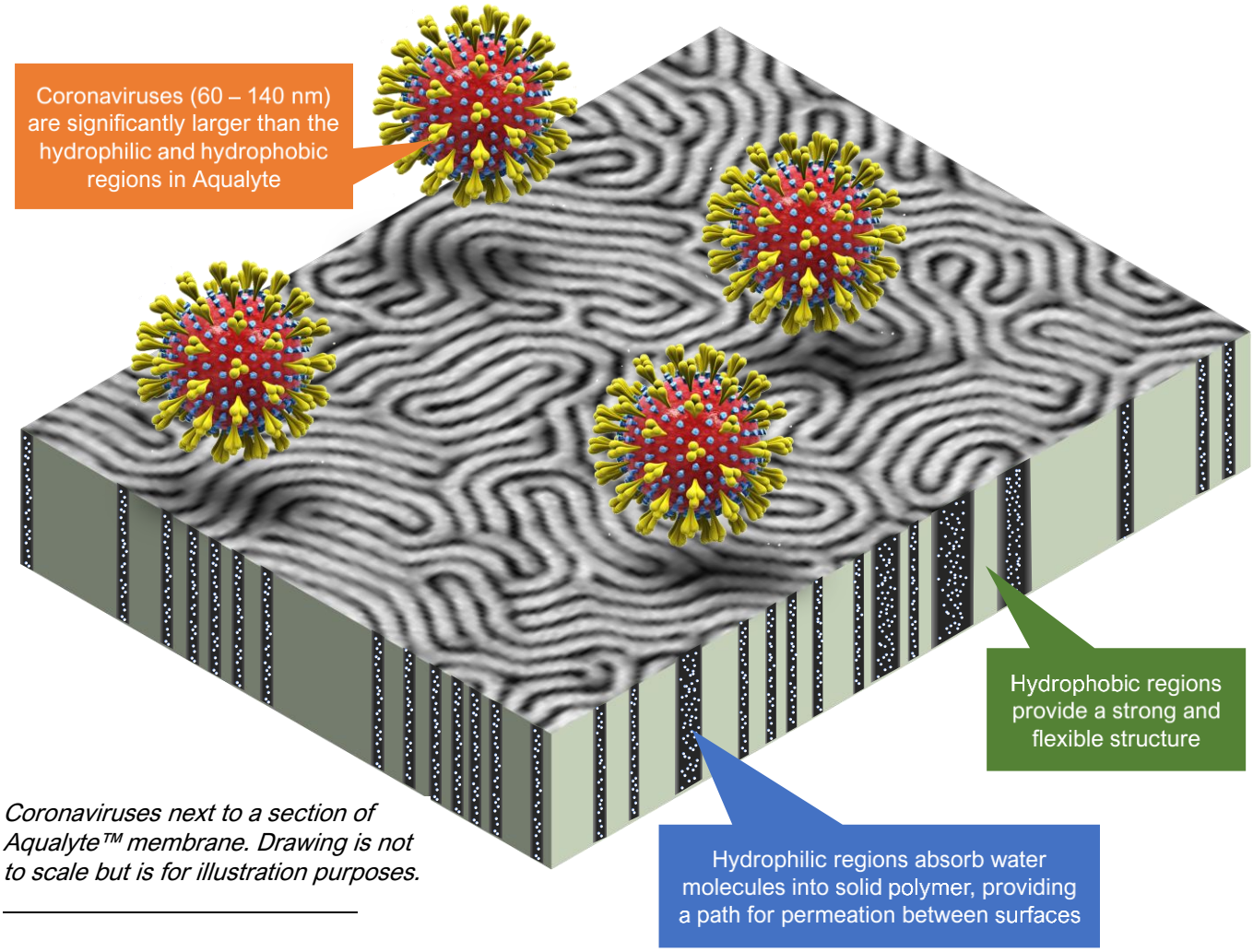
Moisture transfer through the Aqualyte™ membrane in ConsERV™ while cooling (not to scale).

Aqualyte™ PROTECTS AGAINST PATHOGENS

Data generated by US National Institute of Health (NIH) and US Army projects, research at the University of South Wales in Australia and the University of Wisconsin, independent ASTM testing, and industry data on Aqualyte™ materials[2] show the material kills greater than 99.9% of bacteria and viruses in contact with its surface lasting at least seven days. **ASTM E1053 testing by an accredited independent testing laboratory shows that Aqualyte™ inactivated at least > 99.9% of human coronaviruses within 5 minutes of contact (the limit of resolution for this test)[3].** The **SARS-CoV-2** human coronavirus causing the **COVID-19** global pandemic is a member of this closely related family of viruses.

Zero transfer of pathogens between airstreams

First, Aqualyte™ is not porous and will not allow SARS-CoV-2 coronaviruses or other pathogens to move between air steams. Water molecules dissolve into the spaces between polymer molecules, but nitrogen and oxygen molecules with roughly the same diameter as water (0.3 nanometers) will not. They lack the polar nature that makes water interact so strongly with the hydrophilic regions and are therefore blocked from passing so effectively that a strong vacuum can be maintained across an Aqualyte™ membrane without drawing air through the material. Pathogens are much larger and have no chance of entering Aqualyte™; the SARS-CoV-2 coronavirus is roughly 60 – 140 nanometers in diameter (> 200X the size of a water molecule)[4], while influenza viruses are similar in size and bacteria range from 200 – 1500 nanometers across.



Coronaviruses next to a section of Aqualyte™ membrane. Drawing is not to scale but is for illustration purposes.

[2] Multiple references, available on request

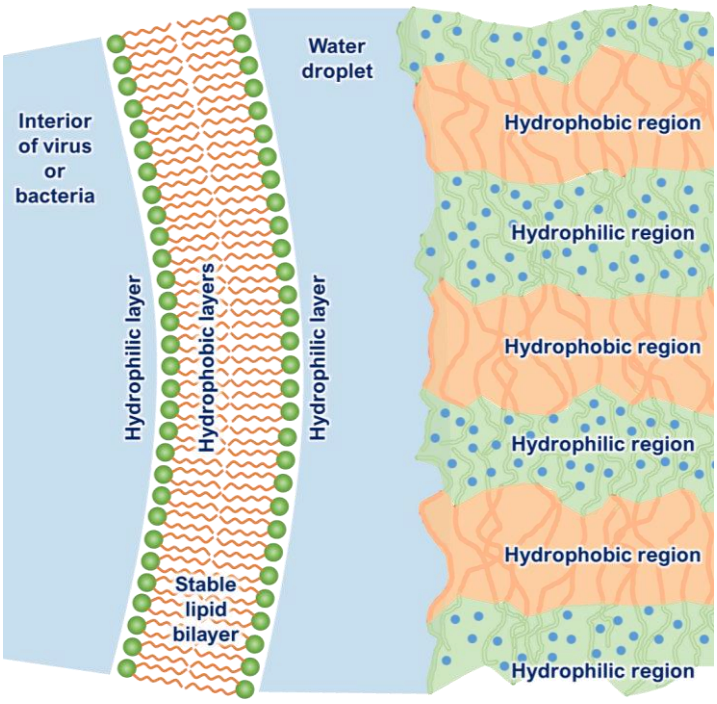
[3] Test data available on request

[4] Cascella et al. "Features, Evaluation, and Treatment Coronavirus (COVID-19)" https://www.ncbi.nlm.nih.gov/books/NBK554776/

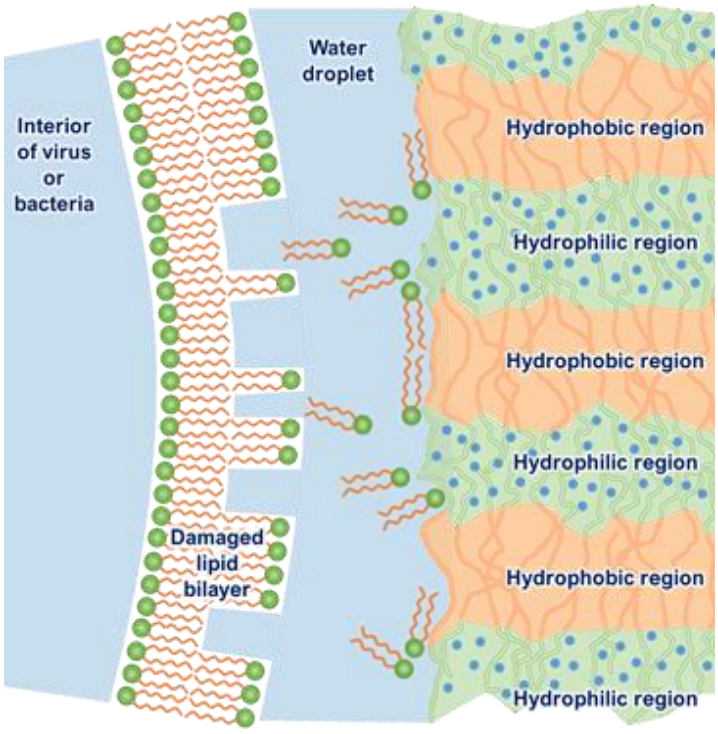
AQUALYTE™ ACTIVELY COMBATS PATHOGENS THAT REACH ITS SURFACE

The envelope around a SARS-CoV-2 virus and the cellular membrane surrounding most bacteria is composed of lipids, molecules that possess a polar end with an unbalanced distribution of positive and negative charges and a nonpolar end with a more uniform charge distribution. The surface of Aqualyte™ interacts with these lipid bilayers to combat microbes in two ways:

- First, Aqualyte™ materials contain a significant number of permanently bound acid groups. These functional groups lower the pH at the Aqualyte™ surface to point that kills bacteria and viruses. As these groups are permanently incorporated into the plastic Aqualyte™ retains its antimicrobial action over time instead of seeing the active ingredient consumed. The polar end of the lipid forms a temporary hydrogen bond with the acid groups bound into the hydrophilic region of Aqualyte™, while the nonpolar end of the lipid is more compatible with the hydrophobic regions of Aqualyte™. These attractive forces draw lipids away from a pathogen in contact with the membrane, destabilizing the outer envelope or membrane and destroying the pathogen.
- Second, the distinctive surface pattern of two powerful, alternating regions disrupts the envelopes around many viruses and bacteria in the same way hand soaps function. Interactions between these regions and the lipids of a pathogen help to pull apart the lipid bilayer protecting the interior of the bacteria or virus, killing or inactivating it so that it no longer poses a threat.



A water droplet brings a microbe to the Aqualyte™ surface, exposing its outer layer to a low pH and attractive forces from the hydrophilic regions.



Acidic water damages the virus envelope or bacterial membrane, destabilizing the lipid structure and allowing individual molecules to be pulled out.

CONSERV™ ENERGY RECOVERY VENTILATION SYSTEM SPECIFICATIONS:

Energy recovery ventilation units shall be factory assembled, wired and tested prior to shipment. Units shall be constructed and assembled to UL 1812 and inspected by an approved NRTL. Field wiring shall require a single point power connection and a numbered terminal strip for low voltage remote wiring connections.

UNIT CONSTRUCTION

Unit construction for indoor or outdoor applications, with all seams sealed with weather-resistant sealant. The interior cabinet surfaces shall be lined with 1" thick fiberglass insulation board with a foil face. The base rail for exterior/rooftop units shall be constructed with heavy gauge galvanized steel with integral supports. Perimeter base frame designed to be such that it overhangs when mounted on a roof curb.

CONSERV ENERGY RECOVERY VENTILATOR CORES

The energy recovery cores shall be made of an Aqualyte™ moisture transfer membrane. The moisture transfer membrane shall be made of polymeric materials without using paper products and shall form a positive barrier between air streams without pores or holes communicating between the air streams. The moisture transfer membrane shall be selectively permeable to water molecules to facilitate the transfer of heat and moisture across the membrane while reducing the permeation of nitrogen, oxygen, carbon dioxide, and the other molecules comprising dry air. The housing of the energy recovery cores shall be constructed of a galvanized sheet metal (G60 rated) or equivalent material capable of protecting the energy transfer core and preventing corrosion. The crossflow energy flow separation layers are thermoformed corrugated plastic spacer that provides support and separation to the membrane layers.

The ConsERV™ core is the heart of the energy recovery ventilator and shall be tested and certified by the Air-Conditioning, Heating and Refrigeration Institute (AHRI) to AHRI Standard 1060. At the nominal certified CFM, the ConsERV™ core shall provide at least 60% total effectiveness for both heating and cooling conditions and 0% exhaust air transfer ratio (EATR) when tested at AHRI differential pressure between airstreams. These values are to be produced from official AHRI certification data and verification may be obtained via the www.ahri.org website which is made available to the public by AHRI to ensure proper comparison of air to air energy recovery products.

The system will have independent testing of the ConsERV™ core to UL Standard 900 with a flame spread result less than 25 and a smoke generation less than 50. These results meet NFPA 90A and 90B for a component within a ducted air system. The moisture transfer membrane shall not allow for growth of bacteria or fungus in accordance with ASTM G21 and G22 testing.

The ConsERV™ cores shall be capable of operating from -10°F to 140°F and will be frost-proof down to -10°F and shall survive temperatures from -40°F to +140°F without damage.

Drain pans are not required. The ConsERV™ cores shall be cleanable using a simple vacuuming method.

FANS

Supply and exhaust fans shall be motorized impellers with electronically commutated (EC) motors and backward-inclined aluminum blades. Motor speed is adjustable via external potentiometers or voltage sources that provide a variable 0 – 10 VDC signal to the EC motor.

FILTERS

The entering Outside Air and entering exhausting air side of the enthalpy cores have a 2" deep MERV-8 medium efficiency pleated throwaway type filters.

OUTDOOR UNITS

Outdoor units shall be provided with factory installed fresh air inlet and exhaust hoods. Hoods are constructed with minimum 20-gauge coated steel with the same finish as the unit. Fresh air inlet hoods are complete with

galvanized steel wire mesh on the entering air sides of the filter that doubles as bird screen. Exhaust hoods are complete with a galvanized steel wire mesh bird screen. All flanges that meet the unit shall be sealed with caulking.

Optional Accessories

FRESH AIR MOTORIZED INLET DAMPER

Units shall be completed with a factory installed and wired two-position, gear-driven motorized damper on the fresh air inlet. Damper motor shall be spring return, 24 V powered, and complete with an internal circuit to ensure fan activation when damper is fully open. Outdoor applications will mount the damper assembly within the fresh air hood, while indoor applications will require the damper assembly to be mounted within a sleeve.

EXHAUST AIR MOTORIZED DISCHARGE DAMPER

Units shall be completed with a factory installed and wired two-position, gear-driven motorized damper on the exhaust air discharge. Damper motor shall be spring return, 24 V powered, and complete with an internal circuit to ensure fan activation when damper is fully open. Outdoor applications will mount the damper assembly within the exhaust air hood, while indoor applications will require the damper assembly to be mounted within a sleeve.

FILTER PRESSURE DIFFERENTIAL SWITCHES

Units shall be complete with two (2) factory-installed and wired differential pressure switches. One switch will measure the differential pressure at the inlet and exit of the Outside Air filter bank, while the other switch will measure the differential pressure at the inlet and exit of the Return Air filter bank. The customer shall have the ability to adjust the activation point of the switches to match a desired maximum pressure drop for the filters at each location. Switches shall be SPDT and rated for 115 – 277 VAC with 300 VA pilot duty and 15 A noninductive load ratings.

MERV-13 PLEATED FILTERS

Units shall be supplied with disposable, 2” thick pleated filters that are rated MERV-13 instead of the standard MERV-10 pleated filters.

DOUBLE WALLS

Units shall be complete with factory installed internal liner constructed from 24-gauge galvanized steel to cover all interior insulation surfaces.

BACnet CONTROLLER

Unit shall be provided with an internally mounted controller that connects to a building management system via the BACnet MS/TP protocol. At a minimum, the controller replaces the standard manual control of blower rpm via external potentiometer or voltage source and allows the blower rpm to be set directly on the controller or remotely via BACnet. Internal feedback control of blower speed to vary automatically in response to sensor settings is not included in this option. The controller will connect to any sensors installed in the unit and relay their information to the building management system via BACnet.

BACnet CONTROLLER (ONBOARD FLOW CONTROL)

Unit shall be provided with an internally mounted controller that connects to a building management system via the BACnet MS/TP protocol. At a minimum, the controller replaces the standard manual control of blower rpm via external potentiometer or voltage source and allows the blower rpm to be set directly on the controller or remotely via BACnet. Onboard sensor measurements will be used by the controller to calculate air flow rates and vary the blower speed control voltages to maintain a desired flow rate as conditions change. The controller will also connect to any sensors installed in the unit and relay their information to the building management system via BACnet.

TEMPERATURE SENSORS (PER QUADRANT)

Please order a BACnet controller as an additional option when requesting this option. A temperature probe will be mounted in each specified quadrant and connected to the BACnet controller, which will make its data

available to the BMS.

TEMPERATURE/RELATIVE HUMIDITY SENSORS (PER QUADRANT)

Please order a BACnet controller as an additional option when requesting this option. Measurements of temperature and humidity will be performed in each specified quadrant and reported to the BACnet controller, which will make its data available to the BMS.

STANDARD PROTECTIVE CABINET COATING

All sheet metal will be fabricated with a G90 galvanized coating. All parts exposed to the exterior of the unit will be factory-coated with a grey, weather-resistant coating for enhanced protection vs. the galvanized coating. The protective coating shall be rated to a minimum of 1000 hours of life in ASTM B117 testing.

ENHANCED PROTECTIVE CABINET COATING

All sheet metal will be fabricated with a G90 galvanized coating. All parts exposed to the exterior of the unit will be factory-coated with a weather-resistant coating for enhanced protection vs. the galvanized coating. The protective coating shall be rated to a minimum of 2500 hours of life in ASTM B117 testing. Custom coating coloration will also be available with this option.

FUSED DISCONNECTS

All systems include a non-fused disconnect switch as standard. With this option, appropriately sized fused shall be installed inside the system on the incoming power circuit.

ADDITIONAL FILTERS

Units shall be supplied with additional filters that are shipped with the unit for later installation. These filters shall be disposable, 2” thick pleated filters that are rated MERV-8 or MERV-13 according to which rating is used in the system.

SLOPED ROOF

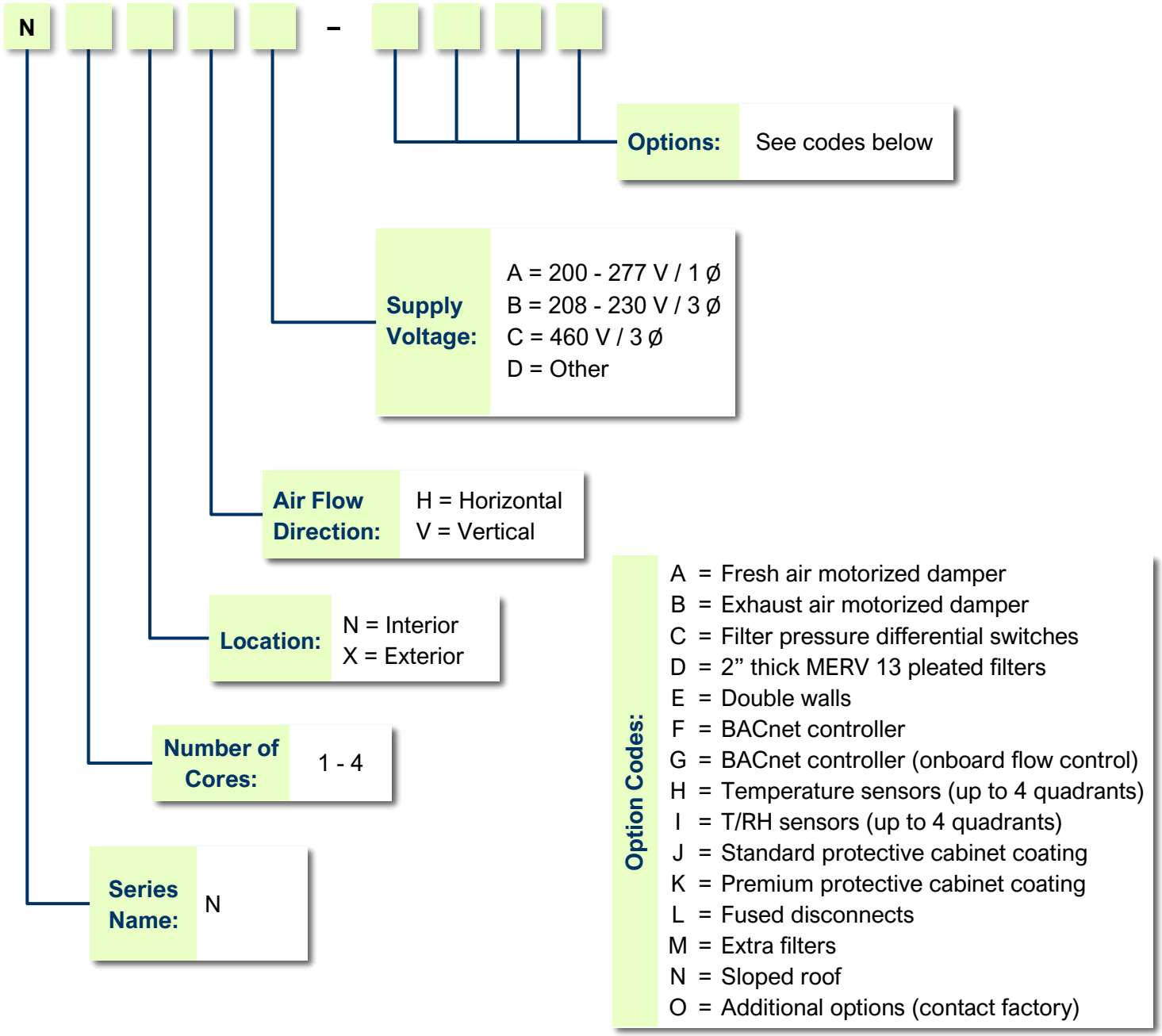
Rooftop units will be supplied with a continuous roof membrane over a level, horizontal sheet metal roof surface as standard equipment. This option adds additional hardware to slope the roof away from the side with the primary access panel. A continuous roof membrane of the same construction as the standard equipment shall then be mounted over the sloped roof to prevent liquid intrusion into the system.

ADDITIONAL OPTIONS & ACCESSORIES

Please contact the factory to request additional options.

THE N SERIES PRODUCT LINE

Three models of ConsERV™ systems are available to cover a range from 200 to 4250 CFM (three phase models have additional flow capability). Each model is a distinct physical size and can be outfitted with C750A ConsERV™ cores to provide the appropriate performance. Each of these systems can be configured for use indoors or outdoors and for vertical or horizontal return and supply air streams.



EXAMPLE: A system with the product code N3XVB-ABCF would have three (3) C750A ConsERV™ cores, would be suitable for exterior (rooftop) use, would be supplied in a vertical configuration where the return and supply air openings are on the bottom of the unit for mating with a roof curb (supplied by others), and would have an electrical system suitable for operation with medium voltage (208 VAC) three phase power. Extra cost options installed at the factory would include motorized dampers on the fresh and exhaust air streams; differential pressure switches triggered by excessive static pressure differential across either bank of filters; and an internally mounted PLC with the ability to relay unit status back to a building management system via BACnet while sending the fan speed control voltage requested via BACnet to the onboard blowers.

SYSTEM SUMMARY

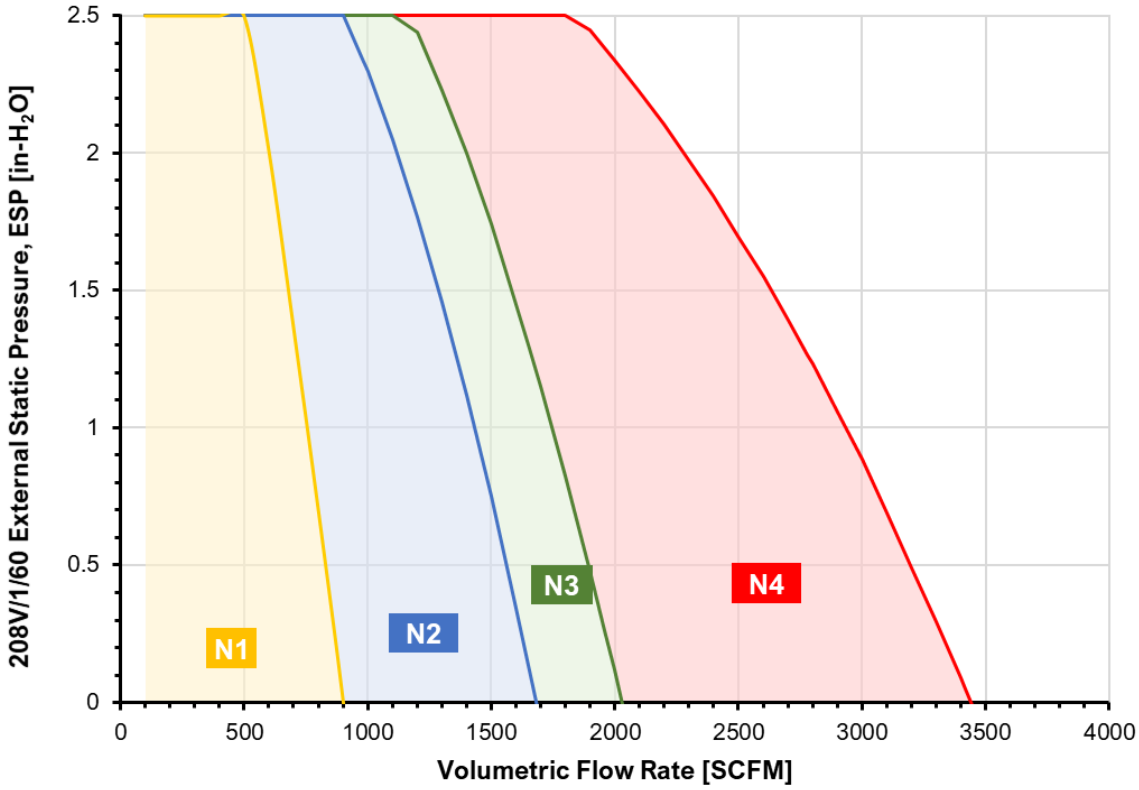
Models	C750 Cores	CFM Range	Total Filters*	Total Fans	Supply VAC / Phase**	Unit Power†	MCA / MOP
N1NH N1XH N1XV	1	200 – 1300	2	2	200 - 277 / 1 200 - 240 / 3 380 - 480 / 3	2.0 kW 3.8 kW 5.2 kW	12 / 15 13 / 15 8 / 15
N2NH N2XH N2XV	2	400 – 2300	4	2	200 - 277 / 1 200 - 240 / 3 380 - 480 / 3	2.0 kW 3.8 kW 5.2 kW	12 / 15 13 / 15 8 / 15
N3NH N3XH N3XV	3	600 – 3200	6	2	200 - 277 / 1 200 - 240 / 3 380 - 480 / 3 380 - 480 / 3††	2.0 kW 3.8 kW 5.2 kW 7.6 kW††	12 / 15 13 / 15 8 / 15 11 / 15††
N4NH N4XH N4XV	4	800 – 4800	8	4	200 - 277 / 1 200 - 240 / 3 380 - 480 / 3	4.0 kW 7.4 kW 10.2 kW	24 / 25 25 / 30 18 / 20

* Filters are 20” x 20” x 2” thick pleated MERV 10 by default. 2” thick MERV 13 pleated filters are available as an option.
** Each configuration (NH, XH, and XV) is available with any of the electrical power combinations in the sixth column.
† This table shows the faceplate power rating for the system as a whole.
†† N3 High Static variant uses higher power impellers.

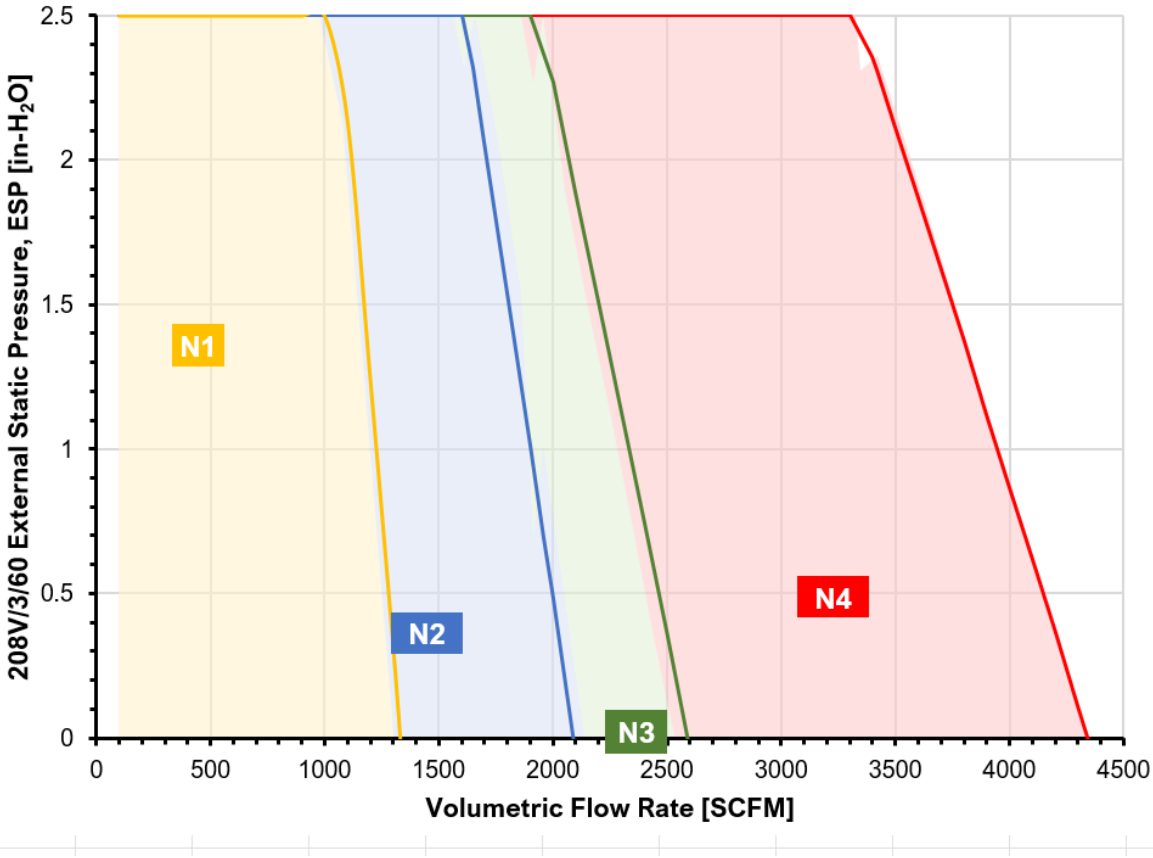
FAN SELECTIONS

External Static Pressure (ESP) capability shown. Fan speed is continuously variable to operate in the shaded areas.

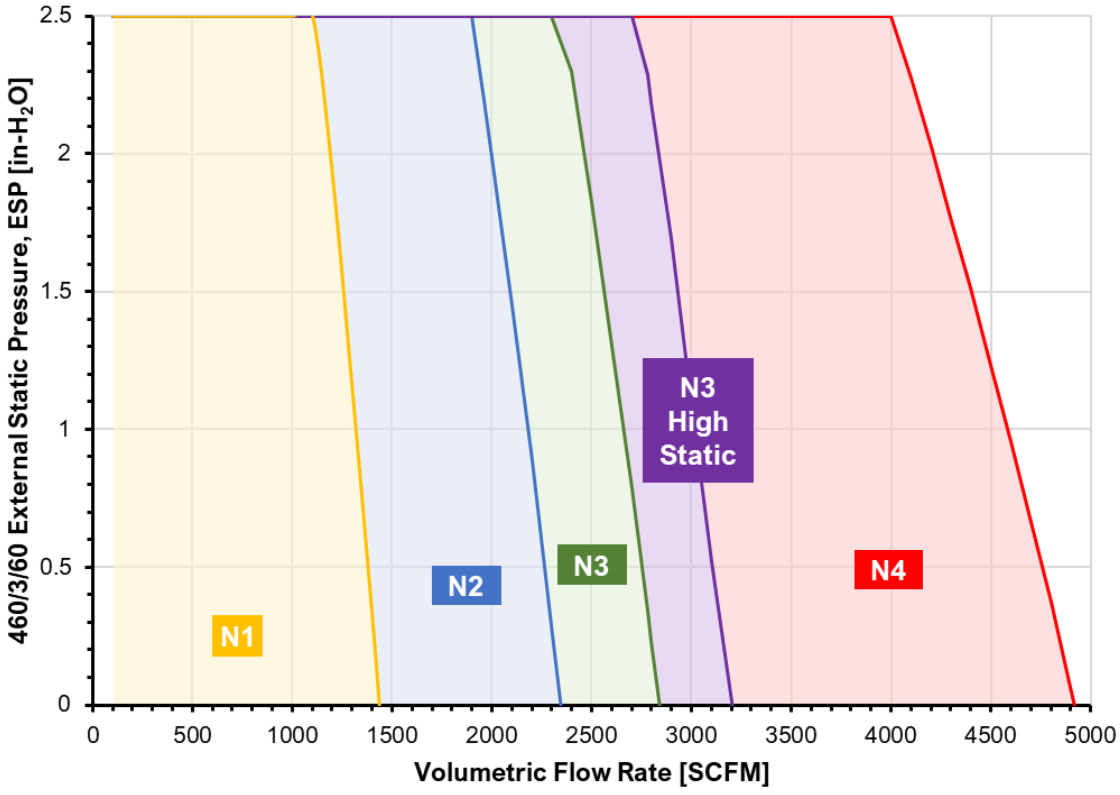
Single phase fans (200 – 277 V / 1 Ø / 60 hz)



Three phase fans (200 – 240 V / 3 Ø / 60 hz)

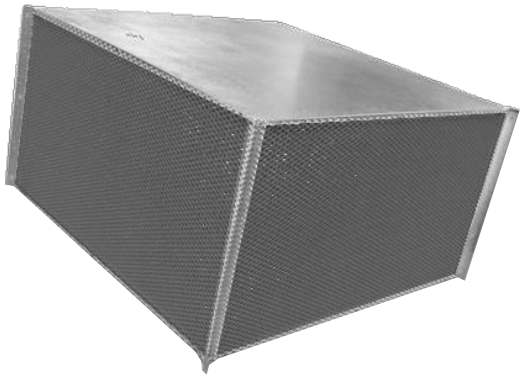


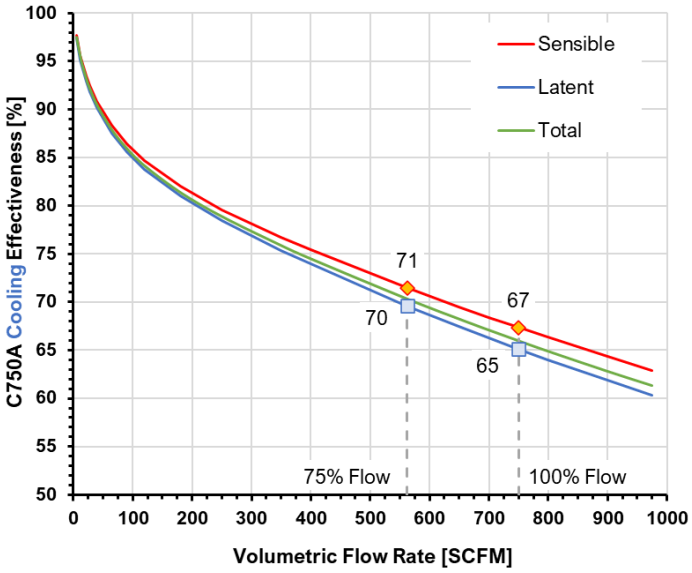
Three phase fans (380 – 460 V / 3 Ø / 60 hz)

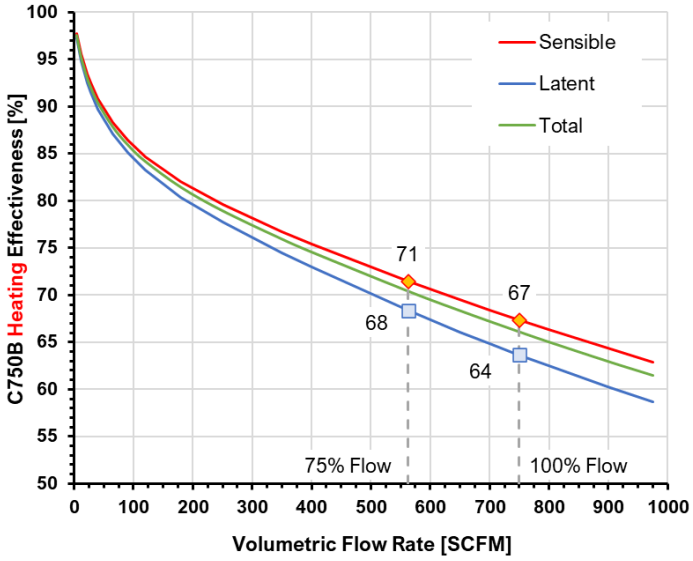


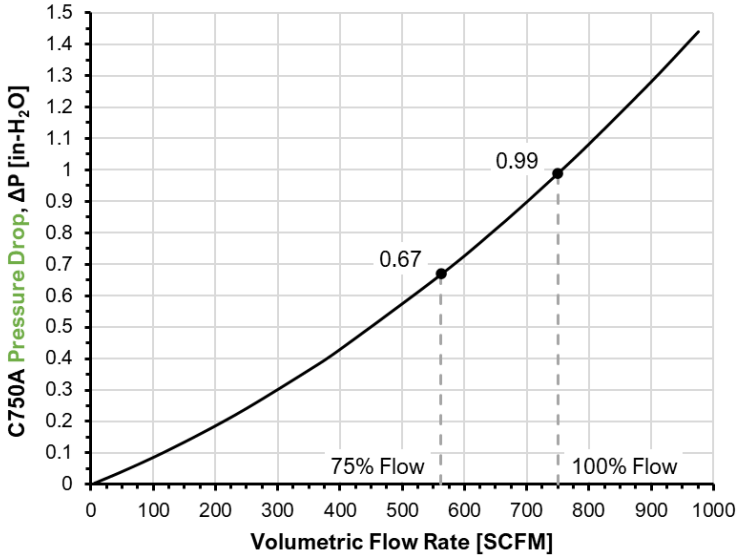
ConsERV™ C750 Core Specifications

Dimensions:	21.75” x 21.75” x 19.5” (552 x 552 x 495 mm)
Weight:	50 lb (22.7 kg)
Performance Certification:	AHRI 1060
Safety Certification:	ETL Listed to the UL 900 standard
Warranty:	Limited 10 year

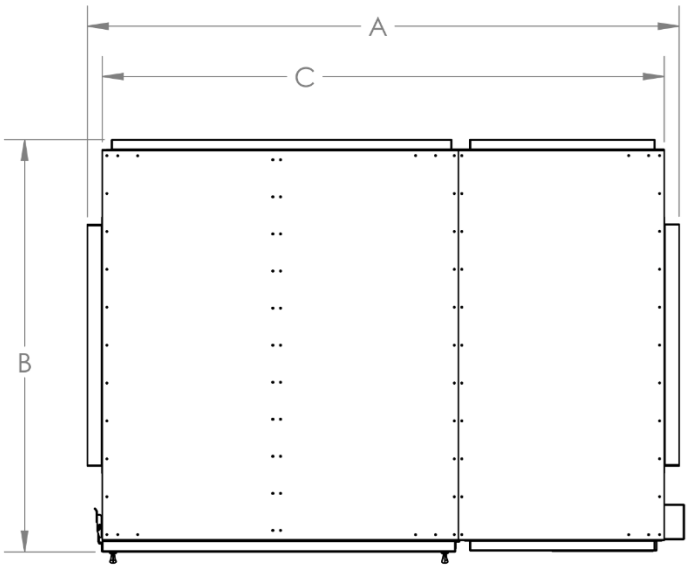


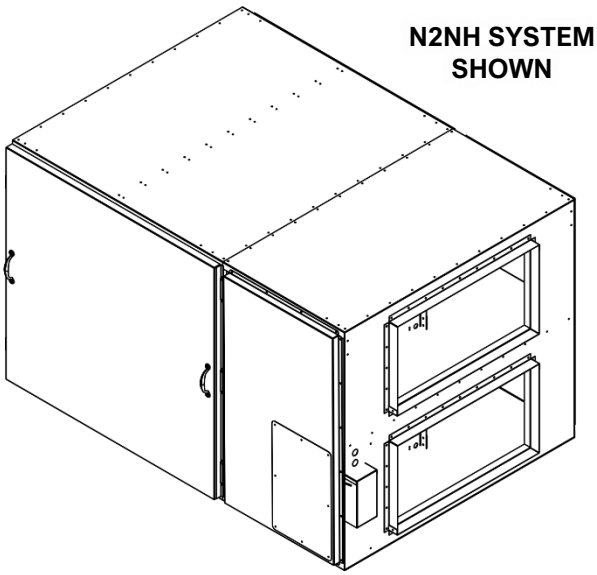


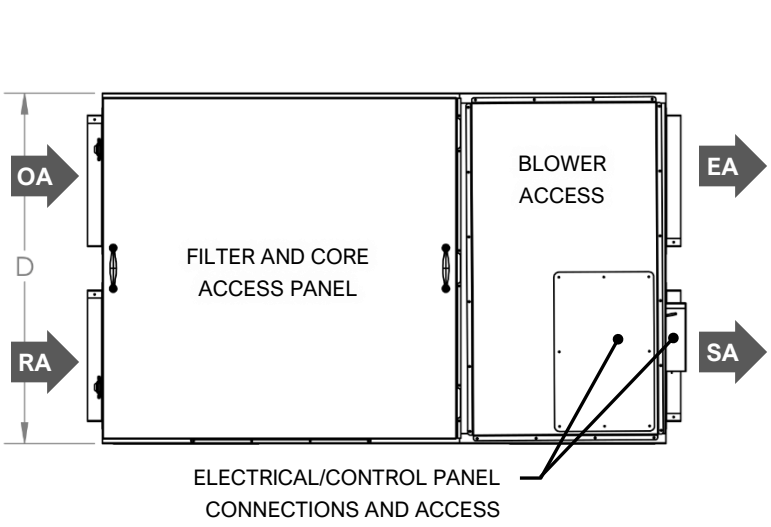


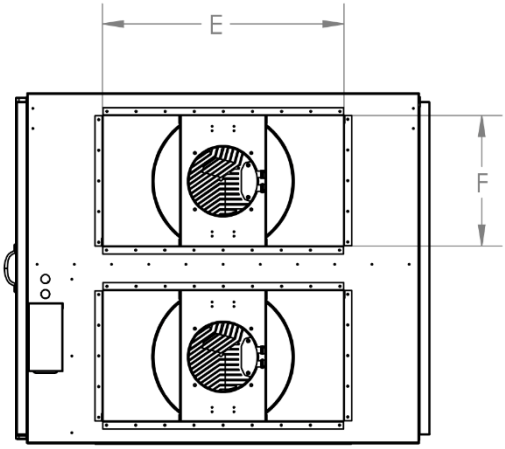


ConsERV™ N SERIES INDOOR UNIT







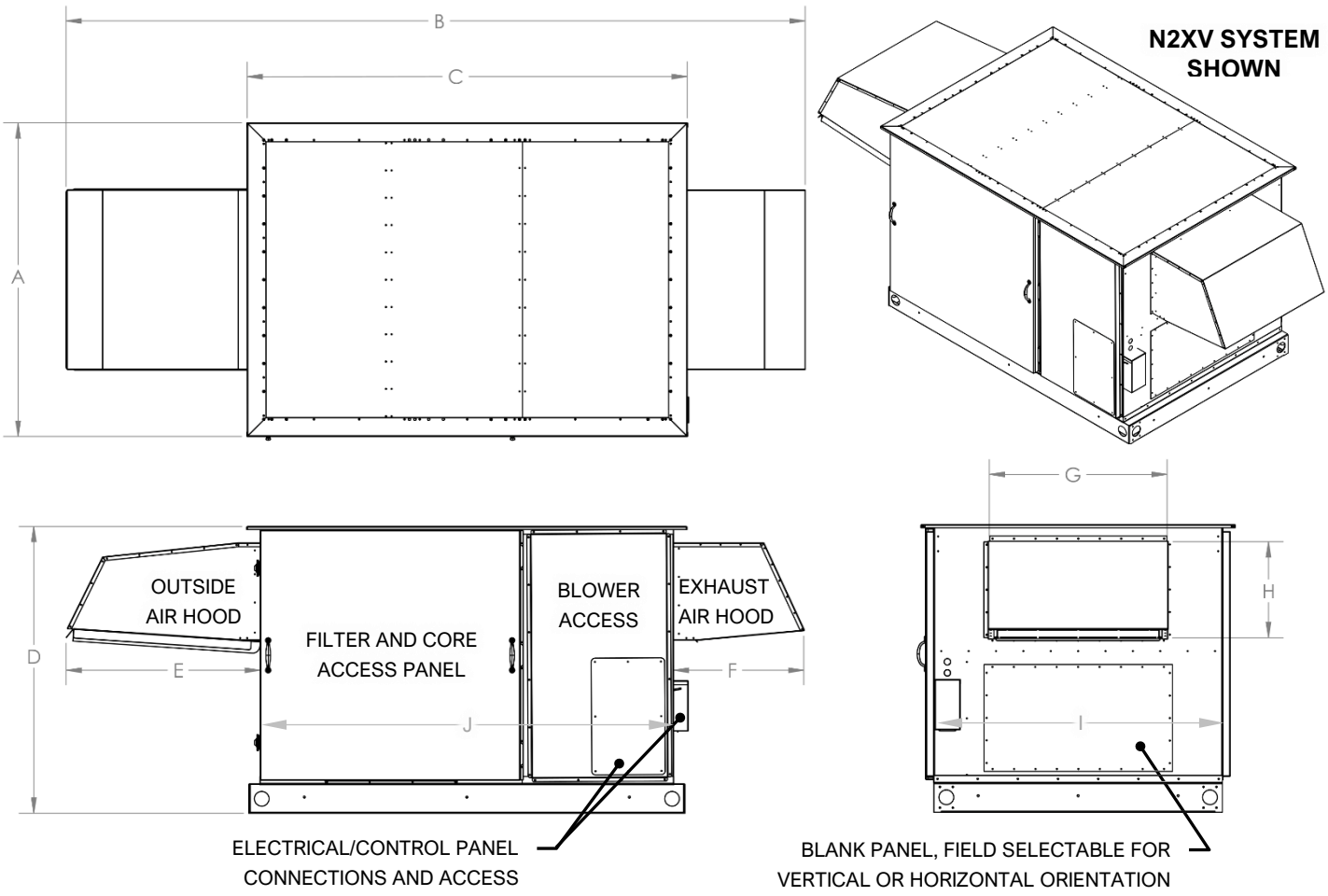


IMAGES ARE NOT TO SCALE – ALL DIMENSIONS ARE INCHES, ALL WEIGHTS ARE LB

DIMENSIONS	N1NH	N2NH	N3NH	N4NH
A*	59.3	59.3	59.3	59.3
B	21.8	41.3	60.8	80.4
C	56.3	56.3	56.3	56.3
D	34.9	34.9	34.9	34.9
E	12.0	24.0	36.0	48.0
F	13.0	13.0	13.0	13.0
WEIGHT	**510**	**640**	**800**	**940**

* ADD 3.5 FOR EACH OPTIONAL MOTORIZED DAMPER THAT IS INSTALLED ON THE UNIT.

ConsERV™ N SERIES EXTERIOR UNIT

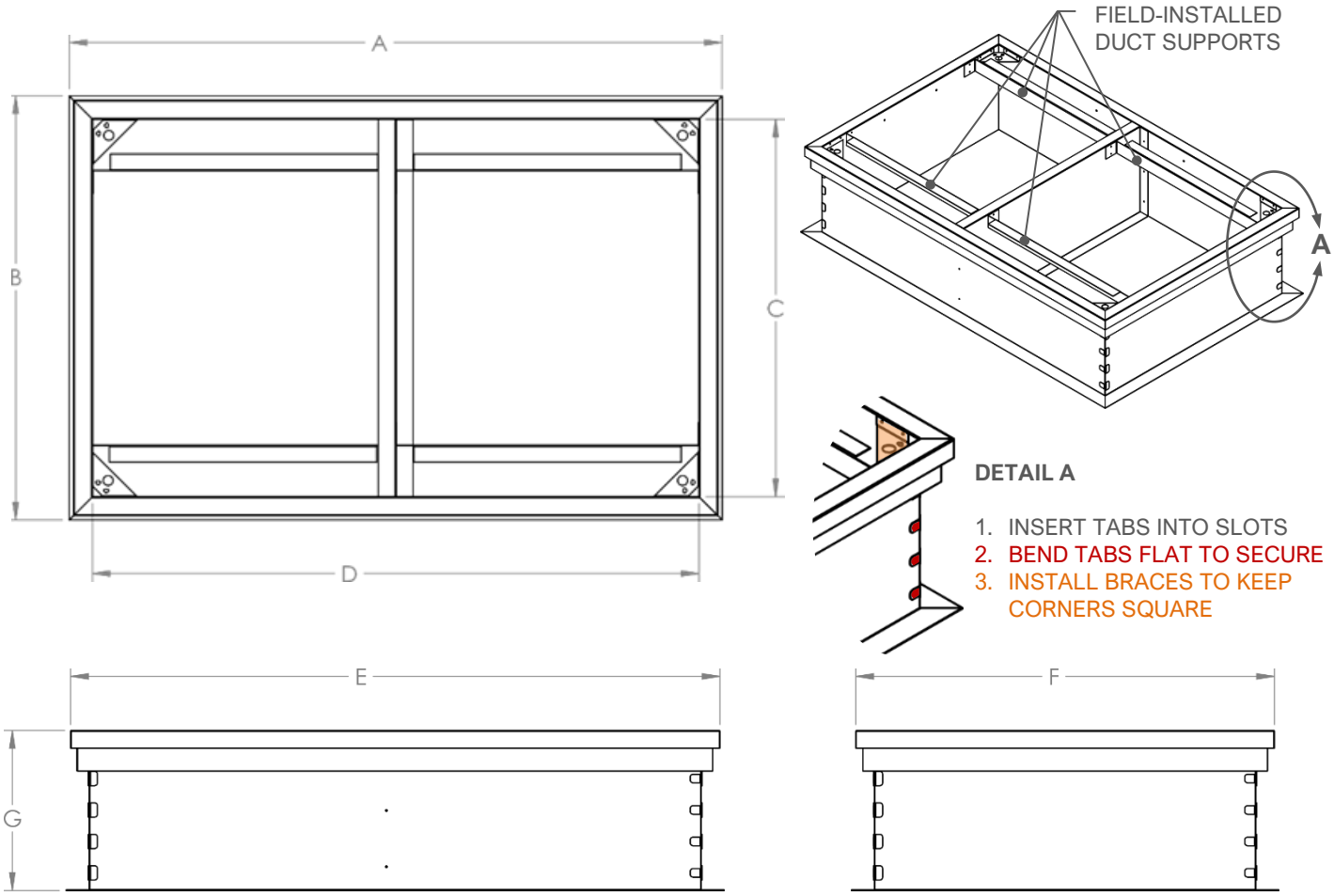


IMAGES ARE NOT TO SCALE – ALL DIMENSIONS ARE INCHES, ALL WEIGHTS ARE LB

DIMENSIONS	N1XH N1XV	N2XH N2XV	N3XH N3XV	N4XH N4XV
A	23.1	42.6	62.1	81.6
B*	110.7	110.7	110.7	110.7
C	59.9	59.9	59.9	59.9
D	38.9	38.9	38.9	38.9
E*	26.5	26.5	26.5	26.5
F*	17.8	17.8	17.8	17.8
G	12.0	24.0	36.0	48.0
H	13.0	13.0	13.0	13.0
I	21.8	41.3	60.8	80.4
J	56.3	56.3	56.3	56.3
WEIGHT	**550**	**700**	**850**	**1000**

* ADD 3.5 FOR EACH OPTIONAL MOTORIZED DAMPER THAT IS INSTALLED ON THE UNIT

KNOCKDOWN ROOF CURBS



IMAGES ARE NOT TO SCALE – ALL DIMENSIONS ARE INCHES, ALL WEIGHTS ARE LB

DIMENSIONS	N2XH N2XV	N2XH N2XV	N3XH N3XV	N4XH N4XV
A	57.7	57.7	57.7	57.7
B	18.1	37.6	57.1	76.7
C	33.11	33.4	53.0	72.6
D	53.6	53.6	53.6	53.6
E	56.9	56.9	56.9	56.9
F	17.3	36.8	56.4	76.0
G	14	14	14	14
WEIGHT	**60**	**80**	**100**	**120**

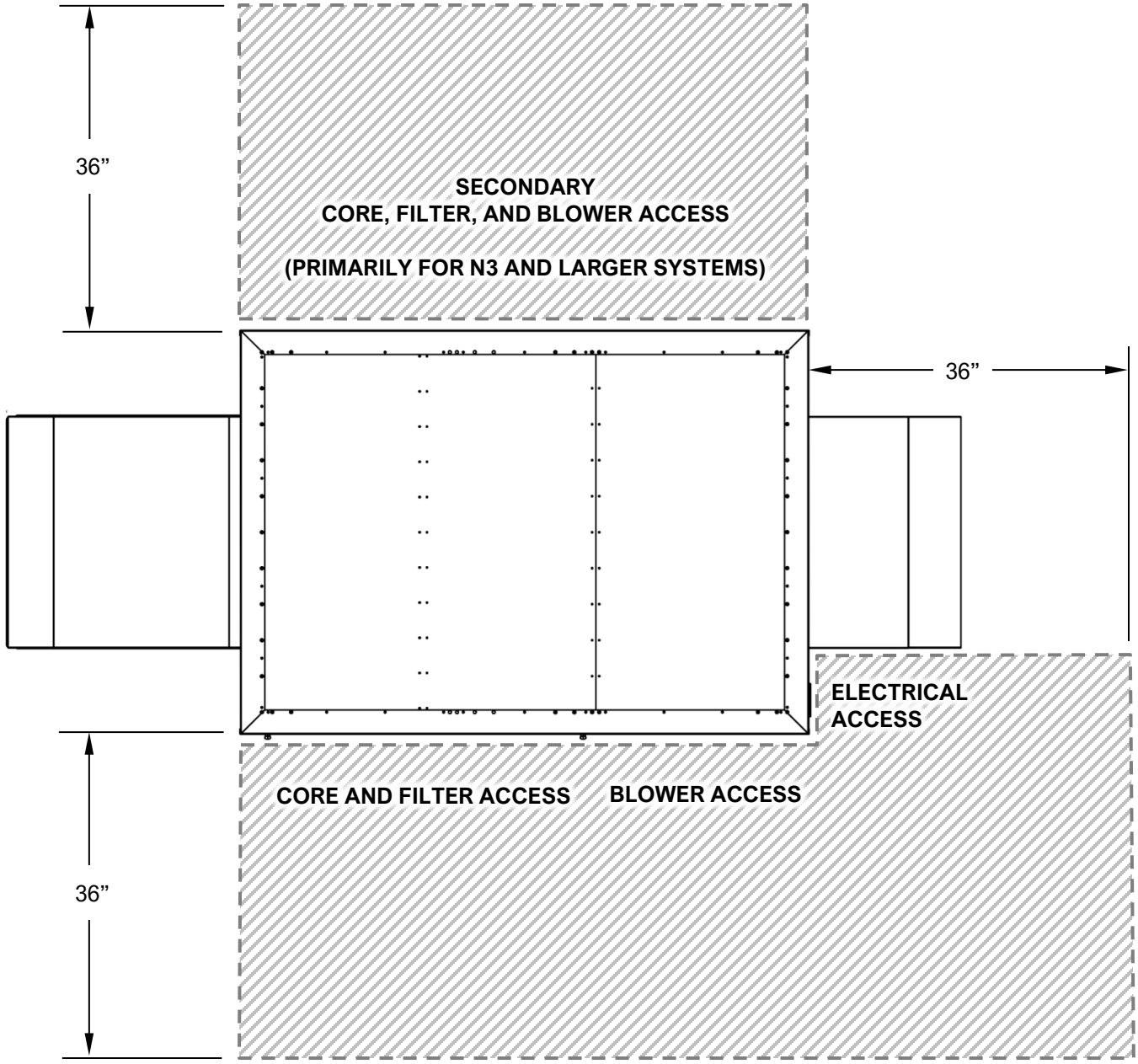
Roof curbs shall be knock down construction with minimum 18-gauge galvanized steel; 14" high with perimeter wood nailer, and corner clips to facilitate field assembly. Adhesive backed foam gasket seal shall be provided loose for field installation to act as a seal between the unit and the roof curb.

SERVICE CLEARANCES

THE MINIMUM CLEARANCE SHOWN BELOW MUST BE MAINTAINED FOR ACCESS AND REMOVAL OF INTERNAL COMPONENTS.

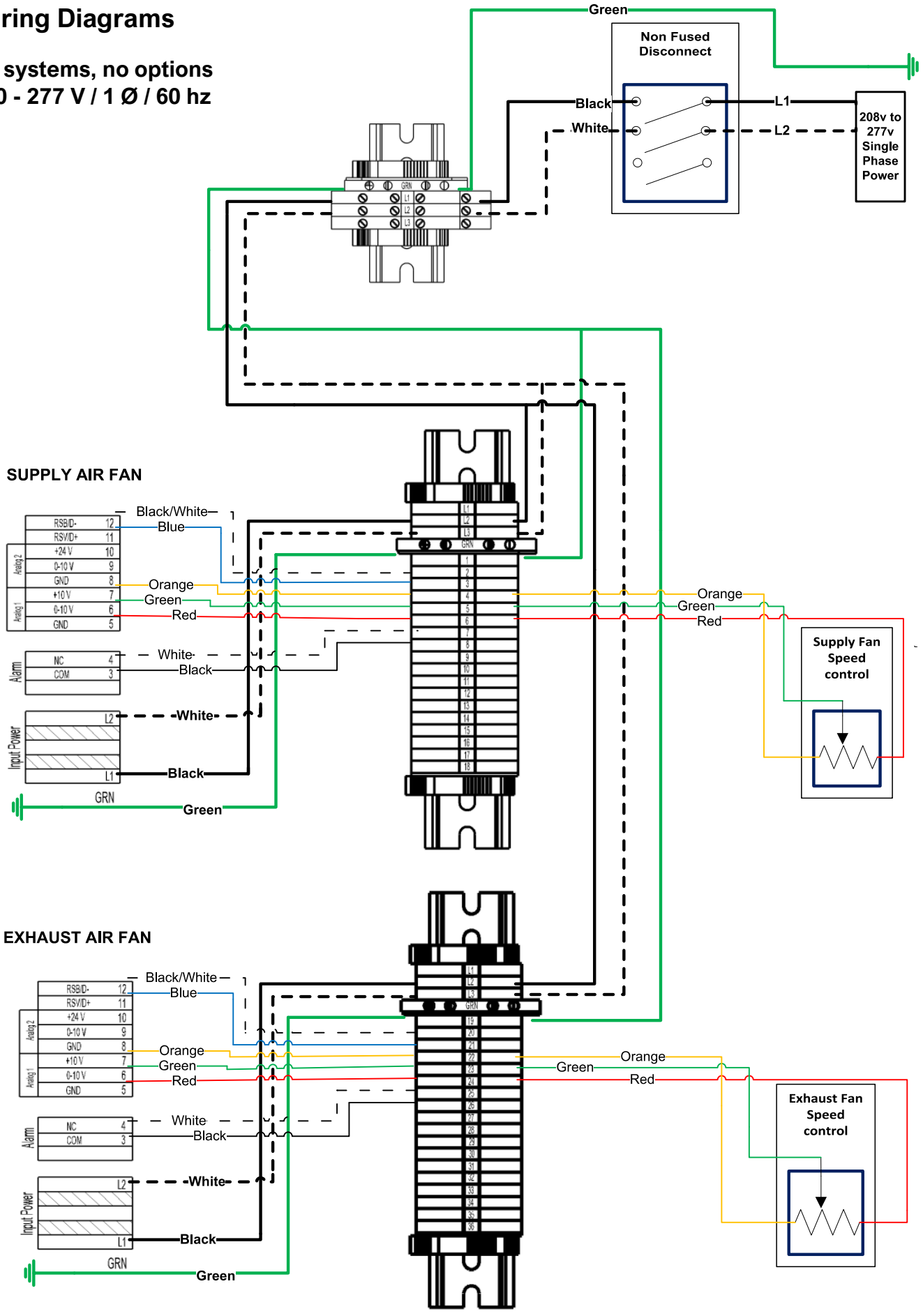
THE FRESH AIR INLET SHOULD BE AWAY FROM SOURCES OF CONTAMINANTS SUCH AS DISCHARGE AIR FROM OTHER VENTILATION UNITS.

TOP VIEW OF AN N2XV SYSTEM SHOWN, BUT DIMENSIONS ARE REPRESENTATIVE OF THE ENTIRE PRODUCT LINE.

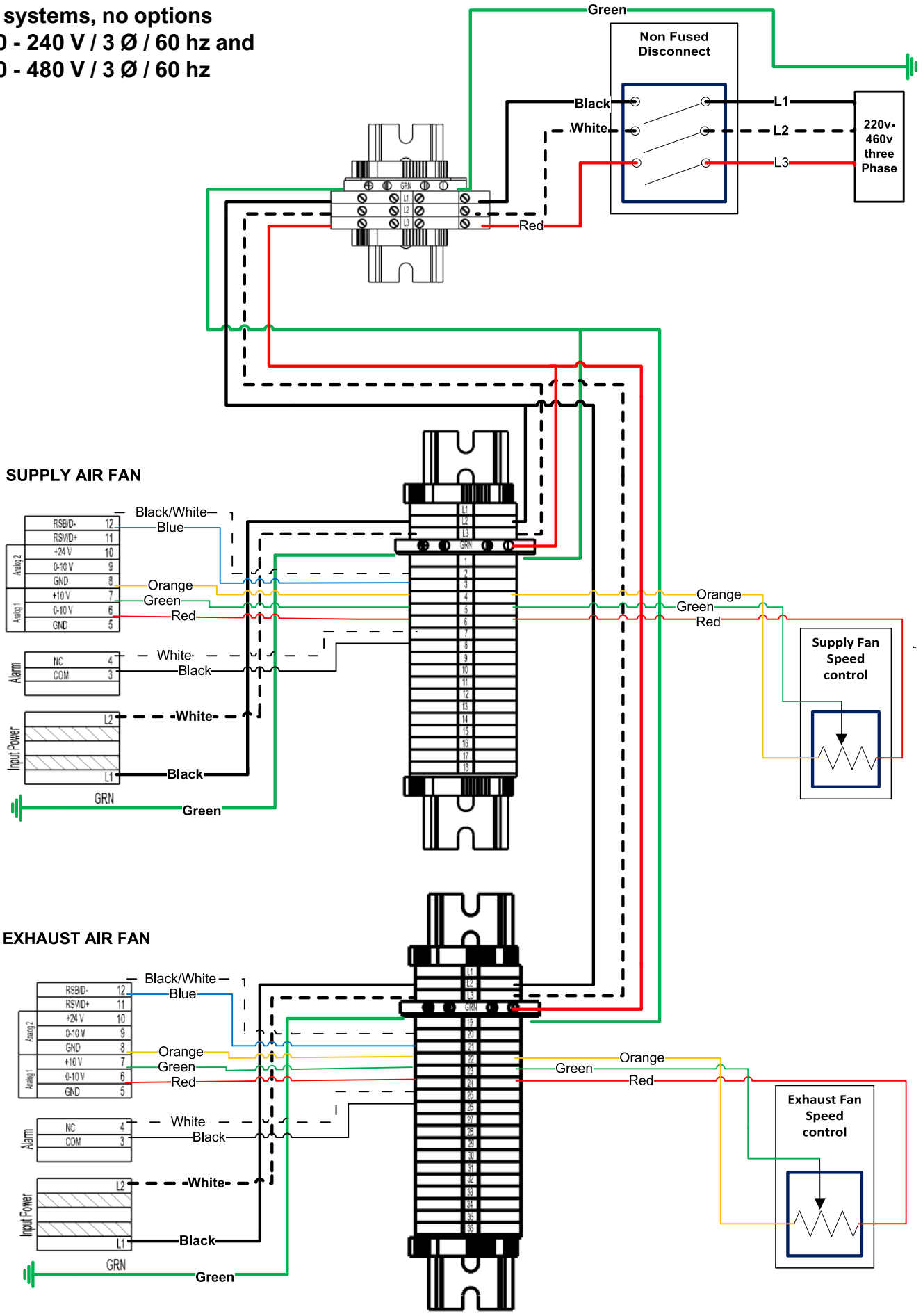


Wiring Diagrams

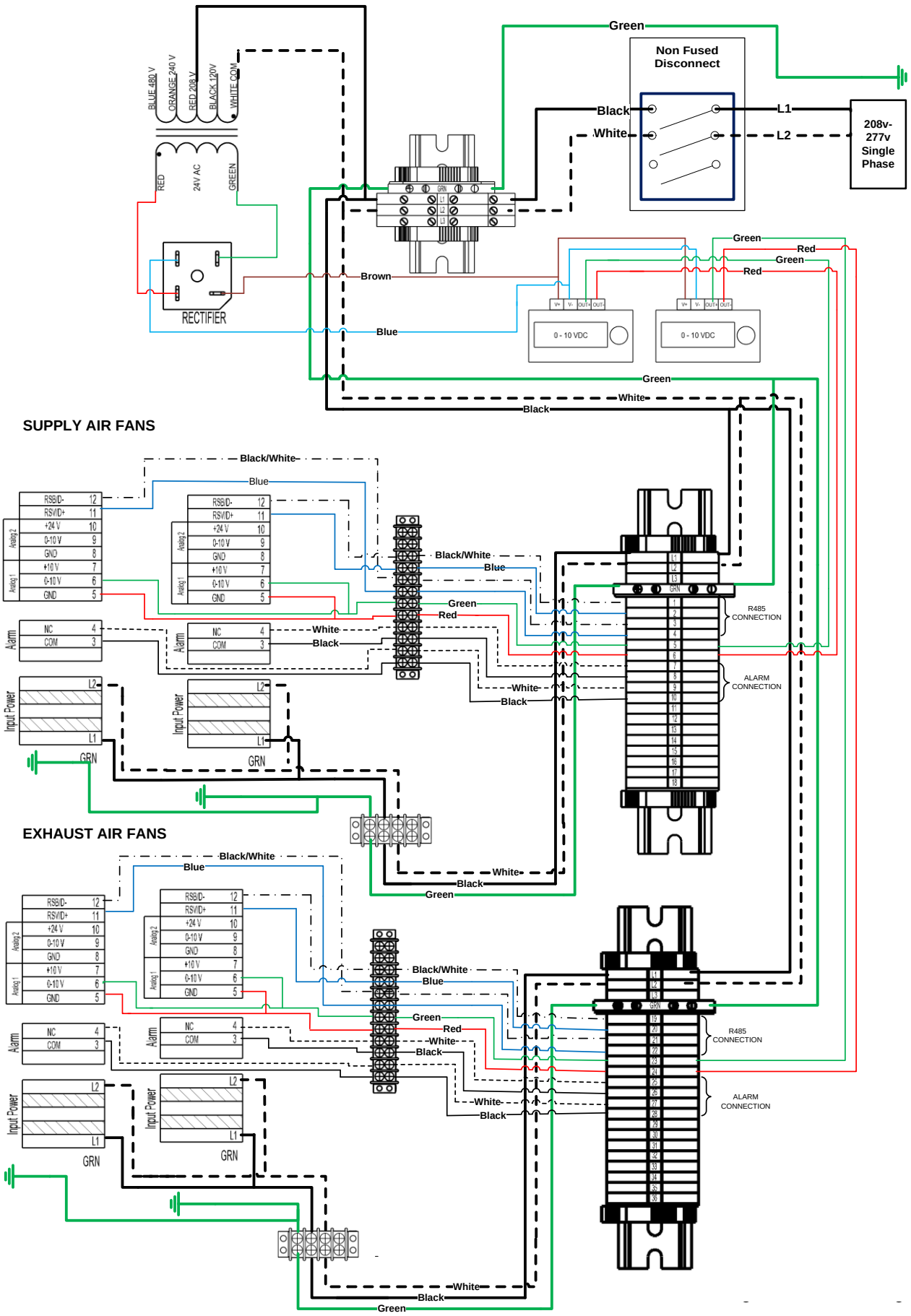
N2 systems, no options
200 - 277 V / 1 Ø / 60 hz



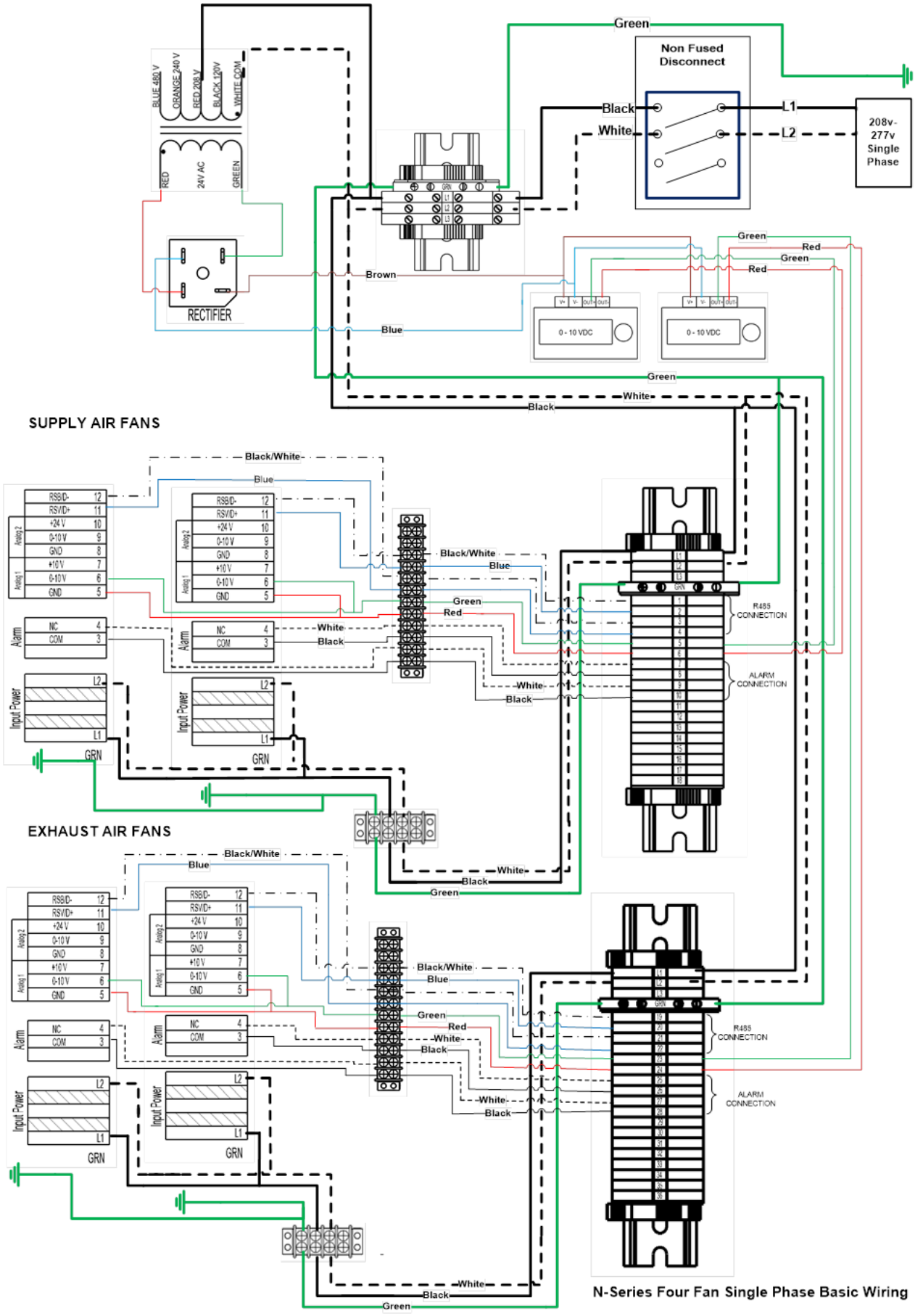
N2 systems, no options
200 - 240 V / 3 Ø / 60 hz and
460 - 480 V / 3 Ø / 60 hz



N3 and N4 systems, no options
200 - 277 V / 1 Ø / 60 hz



N3 and N4 systems, no options
200 - 240 V / 3 Ø / 60 hz and 380 - 460 V / 3 Ø / 60 hz



N-Series Four Fan Single Phase Basic Wiring

ConsERV™ ERV Limited Warranty

COVERAGE AND TERMS

ConsERV™ N Series units and all ERV accessories as manufactured by Dais Corporation are warranted to the original buyer to be free from defects in materials or workmanship provided that these units and accessories have been installed and maintained in accordance with instructions and operated under normal conditions. Dais Corporation's sole obligation under this Limited Warranty is to repair or replace, at its opinion, free of charge to the customer (except as provided below), FOB factory, any part determined by Dais Corporation (in its sole discretion) to be defective. Warranty terms, from original ship date are as follows:

- Energy Recovery Core(s) ……10 Years
- All other components……..……..……..1 Year

EXCLUSIONS

Dais Corporation Limited Warranty does not cover defects, reduced performance, or failure caused, directly or indirectly, by improper installation, abuse, misuse, misapplication, improper maintenance, lack of maintenance, negligence, accident, or normal deterioration, including wear and tear. This Limited Warranty shall not apply to items that require replacement due to normal wear i.e. fan drive belts, filters, etc., or to failures, defects, or reduced performance resulting, directly or indirectly, from use of its products exposed to corrosive gasses or liquids. Warranty claims that are not supported with a copy of the original start up report will not be considered.

Dais Corporation Limited Warranty does not include costs for transportation (including, without limitation, freight and return freight charges, costs, and insurance), costs for removal or re-installation of parts or equipment, cranes and hoisting, premiums for overtime, labor for performing repairs or replacement made in the field, roofing contractors or any other sub trades. Dais Corporation is not responsible for damages occurring during transport of any product to or from its facilities.

RETURN PROCEDURE

To return defective parts under these warranty terms, please contact Dais Corporation at +1 (727) 375-8484 to confirm the ship to address. The serial number located on the rating label of the unit must be provided so that the original ship date of the unit can be verified. All defective parts must be authorized for return and shipped pre-paid to an address provided by Dais for inspection. A purchase order must be received prior to shipment of repaired or replacement parts. Repaired or replacement parts will be invoiced and shipped collect FOB Factory. A credit will be issued only if the defective parts are deemed the responsibility of Dais Corporation. Dais Corporation is not responsible for any damage or loss occurring during shipment to or from Dais Corporation

THE OBLIGATION AND LIABILITY OF DAIS CORPORATION UNDER THIS LIMITED WARRANTY DOES NOT INCLUDE LOSSES, DIRECT OR INDIRECT, FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. THIS LIMITED WARRANTY IS PROVIDED EXCLUSIVELY TO THE ORIGINAL BUYER OF PRODUCTS AND MAY NOT BE ASSIGNED OR OTHERWISE TRANSFERRED.

THIS LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

ConsERV™ *is a proud member of the Dais Corporation's family of products focused on positively impacting the life-supporting resources needed by people around the globe.*

Air, Energy, Food, and Water.

Industrialization. Electronics … and now: Advanced Materials. Each has – or will – change the world in which we, and generation to come, will live and prosper. Today and for decades to come the use of 'Advanced Materials' having proven functionality will drive our lives which in turn will drive industry and world economies.

What finds Dais a leader in this area? Nearing twenty years' experience with this "family" of novel Advanced Materials and creating a growing list of diversified uses addressing worldwide market needs that include: energy efficient, carbon dioxide reducing Heating-Ventilation-and Air-Conditioning; a demonstrated better way to clean contaminated water; improving the life of fresh food thus reducing waste; and energy generation/storage uses.

The Company has a strong, long tenured team, and a skilled supply chain along with a strong and growing patent portfolio. "New" advanced materials pop up routinely with few moved to a functional stage as Dais has meticulous accomplished in nearly 20 years' experience in the field.

Key Resources to Support LIFE

Air, Energy, Food, and Water

B I D P R O P O S A L

City of Tacoma
Department of Public Works
Facilities Management

Name of Firm: _____
(Write in company name)

In compliance with the contract documents, the following bid proposal is submitted:

BASE BID:

Lump sum base bid is inclusive of the Scope of Work described in the Contract Documents.

BASE BID:	**$**_____	
ALLOWANCE # 1:	**$**_____	**$10,000.00**
SUBTOTAL:	**$**_____	
WA STATE SALES TAX @ 10.3%:	**$**_____	
GRAND TOTAL:	**$**_____	

ALLOWANCE # 1: (Do not include Washington State Sales Tax)

- This allowance shall be included in all submitted bids and shall be used solely to address any unforeseen conditions not already known or present in the construction documents, specifications, contract documents, or on-site visual condition assessment performed by the contractor at the pre-proposal meeting. This allowance shall not be used to address any issue, which the contractor knew or should have known about at the time of bidding based on the evaluation of existing on-site conditions, provided construction documents, specifications, and contracts associated with the project.

BID ALTERNATES: (Do not include Washington State Sales Tax)

- The undersigned proposes to modify the contract requirements and scope of work as defined in the Contract Documents and as described in the Project Manual, for the following amounts to be added to the Base Bid. The Owner reserves the right to accept or reject any or alternates within (90) days of the bid date.
- This alternate shall be for the provision and installation of Allerton controls which will allow for the remote monitoring and manipulation of the installed mechanical system per the project manual, specifications, and drawings contained within this project.

Additive Alternate #01 **$**_____

B I D P R O P O S A L

UNIT PRICES: (Not used)

INTENT AND AFFIDAVIT OF WAGES PAID:

In compliance with Chapter 296-127 WAC the Contractor shall pay all fees associated with the Intent and Affidavit of Wages Paid to the Department of Labor and Industries. These costs shall be included in the base bid.

CITY OF TACOMA PROGRAMS:

The City of Tacoma's Equity in Contracting (EIC) Program will NOT be utilized on this project. There are LEAP requirements on this project, 15 percent of total labor hours. Reference the LEAP section in the project manual.

TIME FOR COMPLETION:

The undersigned hereby agrees to substantially complete all the work under the Base Bid (and accepted alternates and/or unit prices) within **104** calendar days after the Notice to Proceed.

LIQUIDATED DAMAGES:

The undersigned agrees to pay the Owner as liquidated damages the sum of $500 for each consecutive calendar day beyond the SUBSTANTIAL COMPLETION date. Liquidated damages shall be deducted from the contract by change order.

B I D P R O P O S A L

SUSTAINABILITY:

1) Have you incorporated sustainability into your everyday business practices? **Yes / No**

Please Describe:

2) Have you taken measures to minimize impacts to the environment in the delivery of proposed goods and services? **Yes / No**

Please Describe:

3) Will you be incorporating and implementing sustainable practices during the construction of this project? **Yes / No**

Please Describe:

B I D P R O P O S A L

SIGNATURE PAGE

All submittals must be in ink or typewritten and must be executed by a duly authorized officer or representative of the bidding/proposing entity. If the bidder/proposer is a subsidiary or doing business on behalf of another entity, so state, and provide the firm name under which business is hereby transacted.

Submittals will be received and time stamped only at the City of Tacoma Purchasing Division, located in the Tacoma Public Utilities Administration North Building, Main Floor, at 3628 South 35th Street, Tacoma, WA 98409. **See the Request for Bids page near the beginning of the specification for additional details.**

The undersigned bidder/proposer hereby agrees to execute the proposed contract and furnish all materials, labor, tools, equipment and all other facilities and services in accordance with these specifications.

The bidder/proposer agrees, by submitting a bid/proposal under these specifications, that in the event any litigation should arise concerning the submission of bids/proposals or the award of contract under this specification, Request for Bids, Request for Proposals or Request for Qualifications, the venue of such action or litigation shall be in the Superior Court of the State of Washington, in and for the County of Pierce.

Non-Collusion Declaration
The undersigned bidder/proposer hereby certifies under penalty of perjury that this bid/proposal is genuine and not a sham or collusive bid/proposal, or made in the interests or on behalf of any person or entity not herein named; and that said bidder/proposer has not directly or indirectly induced or solicited any contractor or supplier on the above work to put in a sham bid/proposal or any person or entity to refrain from submitting a bid/proposal; and that said bidder/proposer has not, in any manner, sought by collusion to secure to itself an advantage over any other contractor(s) or person(s).

Bidder/Proposer's Registered Name	Signature of Person Authorized to Enter Date into Contracts for Bidder/Proposer
Address	Printed Name and Title
City, State, Zip	(Area Code) Telephone Number / Fax Number
E-Mail Address	State Business License Number in WA, also known as UBI (Unified Business Identifier) Number
E.I.No. / Federal Social Security Number Used on Quarterly Federal Tax Return, U.S. Treasury Dept. Form 941	State Contractor's License Number (See Ch. 18.27, R.C.W.)

Addendum acknowledgement #1_____ #2_____ #3_____ #4_____ #5_____

SECTION 237223

ENERGY RECOVERY VENTILATOR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.2 WORK INCLUDED

A. Energy Recovery Ventilators

B. Start-up

1.3 SUBMITTALS

A. General: Submittals shall comply with Section 20 05 00.

B. Product Data: Submit product information on unit including fan curves, coil performance, unit construction details, wiring diagram, data showing energy recovery, filter data, and weight.

C. Shop Drawing: Submit drawings of unit showing all dimensions, locations of unit components, and point of connection of all utilities.

D. Operation and Maintenance: Submit Operation and Maintenance data and submittal data for inclusion in project O&M Manuals.

1.4 GENERAL REQUIREMENTS

A. Standardization: All units of the same type shall be the product of the same manufacturer.

B. Substituted Equipment: The drawings show design configuration based on a particular manufacturer's equipment (i.e. basis of design). Use of another manufacturer's equipment (i.e. substituted equipment) that is configured different from what is shown will require redesign of mechanical ductwork, piping, electrical, structural, unit support systems, and general building construction to accommodate the substituted equipment. Such redesign shall meet the requirements and have the approval of the Architect/Engineer prior to fabrication. Contractor shall submit complete shop drawings showing all alternate unit installation plans and details; shop drawings shall comply with Section 20 05 00. The redesign shall be equal or superior in all respects to the Architect/Engineer's design (as judged by the Architect/Engineer), including such aspects as equipment access, ease of maintenance, duct connection locations, unit electrical requirements, noise considerations, vibration unit performance, and similar concerns. Cost of redesign and all additional costs incurred to accommodate the substitutional equipment shall be borne by the contractor. Contractor is cautioned that certain aspects of the equipment cannot be fully evaluated until items are installed and operational, and all added costs after installation to make units equal to the basis of design shall be by the Contractor.

1.5 REFERENCES

A. AMCA 230: Laboratory Methods of Testing Air Circulating Fans for Rating and Certification.

B. AHRI 1060: Standard for Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment.

1.6 WARRANTY

A. General: See Division 00 and Section 20 05 00 for basic warranty requirements.

B. Extended Warranty: The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances or normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of two years from the date of installation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00, Paragraph 2.01, Acceptable Manufacturers.

B. Energy Recovery Ventilator: RenewAire, ConsERV.

2.2 GENERAL

A. Guards: Exposed openings into fan housings shall be protected with substantial metal screens or gratings. Electrical components with shock potential shall be physically protected and labeled (label as to hazard and items being accessed).

B. Fan Balancing: The shaft and fan wheel(s) shall be factory statically and dynamically balanced.

C. Motors: Shall be UL listed and comply with Section 20 05 00. Motor efficiency shall comply with Code. Motors shall have integral thermal protection with automatic reset.

D. Outlets and Inlets: Equipment shall be furnished with attachment angles and/or flanges to allow for attaching external ductwork.

E. Fan Performance: Shall be based on laboratory tests conducted in accordance with AMCA 230. Fan capacity shall not be less than the values scheduled on the drawings and shall be constructed to be able to operate with total pressures 20% higher than that indicated.

F. Controls: Coordinate with Division 25 Contractor for required interfaces between air handling equipment and building control system.

G. Gasketing: Where units are furnished in sections, unit manufacturer shall furnish unit with gasketing to allow sealing of adjoining sections.

H. Sound Tests: Shall be done by fan manufacturer in an AMCA certified sound testing laboratory. Sound tests shall be conducted in accordance with AMCA 300. Provide necessary testing and calculations to develop required sound data. Tested sound power levels shall not exceed specified levels by more than 3 dB in any octave band.

I. Factory Tests: Every unit shall be factory tested prior to shipping. Tests shall include (as a minimum): Motor dielectric voltage-withstand test, unit dielectric voltage-withstand test, continuity of internal control circuits test, unit amperage test, proper fan operation.

2.3 RECOVERY VENTILATOR

A. Type: Indoor energy recovery ventilator using fixed plate enthalpy heat exchanger.

B. General:
   1. Unit shall be complete single package, self contained factory assembled unit, requiring only electrical, duct, and control connections to operate.
   2. Capacity: Shall be as scheduled at the conditions noted.
   3. Unit configuration shall be as shown on plans.

C. Cabinet:
   1. General: Constructed of minimum 20 gauge G-90 galvanized steel, reinforced and constructed for maximum anticipated static pressures involved, but no less than 4" w.c. with cabinet leakage less than 1% of scheduled airflow.
   2. Liner: Interior of cabinet shall be insulated with minimum 1-inch thick, 4 pound per cubic foot density foil scrim faced fiberglass insulation to provide a cleanable surface. Double-wall construction with foam injected insulation and interior 20 gauge G-90 galvanized steel is also acceptable.
   3. Access Doors: Constructed same as cabinet, size to access unit internals, with full perimeter gasket. Doors shall be opened by releasing multiple latches or similar method requiring no tools.

D. Fan(s): Integral supply and exhaust fans, direct drive, steel or aluminum construction, multi-blade centrifugal type. Motors shall be ECM type.

E. Energy Recovery Core:
   1. General: Total enthalpy type, capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air. No condensate drains shall be required.
   2. Certifications: The energy recovery cores used in these products shall be third party Certified by AHRI 1060 for Energy Recovery Ventilators. AHRI published certifications shall confirm manufacturer’s published performance for airflow, static pressure, temperature and total effectiveness, outdoor air (OACF) and exhaust air leakage (EATR). OACF shall be no more than 1.02 and EATR shall be a 0% against balanced airflow.

F. Filters: Unit shall be provided with filter racks for accommodating 2” thick filters (unless noted otherwise), with minimum filter area (or sizes) as scheduled. Access to filters shall be through unit access doors.

G. Electrical:
   1. General: Unit shall be for use with single point electrical power connection. Unit shall be furnished with all necessary wiring, raceway, transformers, contactors, relays, motor starters, and accessories with power and controls connected to all unit devices for unit operation and with the specified sequence. Electrical shall comply with NEC and local code requirements. Unit shall have a main fused power disconnect. Disconnects shall comply with NEC, and be accessible from outside unit enclosure.

H. Controls: Unit control shall be by Section 23 09 33 (unless otherwise noted); unit shall have limited factory controls to provide necessary safeties and to allow for control by Section 23 09 33. Section 23 09 33 shall enable unit fans when “run” terminals are connected. Unit shall be furnished with all necessary relays, starters, wiring terminal strips, timers, safety devices, etc. to allow for the sequence of operation as specified in Section 23 09 33 using the Section 23 09 33 control system. Unit wiring shall be color coded and numbered corresponding to unit’s wiring diagram. Access panels to unit controls shall be hinged with latches (or equivalent device), requiring no tools to open. Provide output contact for use by Division 23 controls contractor for Electric Duct Heater. Provide contacts for use by Division 23 controls contactor for control of OA and Relief Dampers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install the units as shown on the drawings, in accordance with manufacturer's instructions, Code, and best construction practices.

B. Locations: Install at locations indicated, to allow for maintenance access and proper clearances.

C. Duct Connections: Provide flexible connections in ductwork connections to units.

3.2 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and ready to ensure safe and proper unit operation.

B. Testing and Adjustment: Operate unit to test for proper operation, including fan rotation, and correct interface to other controls.

END OF SECTION 237223

SECTION 238246

ELECTRIC HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.2 WORK INCLUDED

A. Electric Heaters.

1.3 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Product Data: Submit product information on all items.

1.4 GENERAL REQUIREMENTS

A. Listing: All heaters shall be listed by an independent testing laboratory for the application indicated.

B. Installation Verification: Prior to ordering units confirm finishes at heater location and type of installation and associated trim required; i.e. fully recessed, semi recessed, surface mount, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products: Shall comply with Section 20 05 00 Part 2.01 - Acceptable Manufacturers.

B. Unit Heaters: Q-Mark, Chromalox, Aztec, Berko.

C. Duct Heaters: Indeeco, Berko, Markel, Q-Mark, Warren, Brasch.

2.2 UNIT HEATERS

A. Type: Fan forced, horizontal discharge unit heater. Q-mark “MUH” series or approved.

B. Casing: Shall be die formed heavy gauge steel with factory baked enamel finish. Casing shall entirely enclose unit, and have adjustable louvers on unit discharge side.

C. Heat Elements: All steel or aluminum finned copper clad/steel type.

D. Motor and Fan: Draw through fan design; motor shall have permanently lubricated sealed bearings with built in overload protection. Airflow rate shall be such that the temperature rise is no less than 30 deg F and no more than 50 deg F.

E. Controls: Safety controls shall include automatic reset high temperature cut-out and fusing (element, motor, and transformer primary) as required by the NEC. Unit shall include all contactors, relays and accessories to automatically operate heater upon a call from energy recovery ventilator.

Duct heater shall be provided with a remote mounted temperature sensor. Duct heater controls shall modulate SCR controls to provide min 72°F discharge air from duct heater whenever the energy recovery ventilator is operating.

F. Accessories:
   1. Support: Steel support bracket for wall mounting.
   2. Control: Low voltage thermostat, wall mounting type, adjustable 40 to 55 deg F.

2.3 DUCT ELECTRIC HEATERS

A. Type: Open coil type electric duct heaters; of size and capacity as shown on the drawings.

B. Listing: Heaters shall be UL listed for zero clearance to combustibles, and shall be built to meet all requirements of the National Electric Code and NFPA.

C. Construction: Heating coils shall be made of 80% nickel and 20% chromium coiled resistance wire. Coils shall be supported in an aluminized steel frame and insulated by floating ceramic bushings. Heaters shall be of the configuration to suit the application as shown on the drawings.

D. Overtemperature Protection: All heaters shall be equipped with primary and secondary overtemperature safety devices. The primary safety device shall be a disc or liquid filled bulb type with automatic reset; the secondary device shall be a disc type with manual reset, wired in series with each heater stage, set to trip at a higher temperature than the primary safety device.

E. Overcurrent Protection: Fuses shall be provided for overcurrent protection; fuse capacities shall be rated for at least 125% of the circuit amperage.

F. Proof of Air Flow: Where project's control system is the DDC type, and heater is controlled by the DDC, proof of airflow is to be provided via the DDC system; no proof of airflow devices are required to be furnished integral with the heater. For non-DDC control systems or where the DDC control system is not providing heater control, provide heater with differential air pressure device and sensing tube (or sail flow switch), interlocked with the heater to prevent heater operation in case of insufficient airflow across the coil. Differential air pressure device (or sail flow switch) shall have sufficient sensitivity to suit velocity and duct pressures of the application. Configure and arrange differential air pressure device (or sail flow switch) for proper operation as the application requires. Air differential air pressure device shall have a pitot tube on high pressure side installed to sense duct total air pressure; except where heater is used on the suction side of a fan, the air differential air pressure device shall be connected to the low pressure side and be configured sensor to measure static pressure only. Where sensitive enough differential air pressure devices (or sail flow switches) are not available, provide heater with 24 volt relay for interlocking to a fan proof device (i.e. motor starter auxiliary contacts, fan start relay, or equivalent).

G. Terminal Box: All heater controls shall be mounted in a side mounted terminal box, unless a separate remote mounted terminal box is shown on the drawings. Terminal box shall be insulated from the heater casing.

H. Disconnect: Heaters shall be provided with a built-in power disconnect switch, having a terminal door interlock.

I. Controls: Heaters shall be furnished with 24 volt transformer and shall be for use with 24 volt controls unless indicated otherwise. Transformer shall have secondary fusing, and transformers which are not class 2 shall have primary fusing. Mercury control contactors shall be used for controlling heater stages unless indicated otherwise. Where SCR control has been indicated the heater shall be furnished with a solid state proportional power controller allowing modulation of heater capacity from 0 to 100% of full capacity. The SCR control shall energize the heater only for the number of AC cycles necessary to produce the amount of heat required. For heaters with loads greater than 90 amps SCR control combined with a step controller in a vernier configuration

(still providing full proportional control) is acceptable. (Backup or safety contactors - where used - shall be magnetic type).

J. Electrical: Heaters shall be for use with electricity of the voltage and phase indicated, and provide the output and number of control stages indicated. Three phase heaters shall have equal balanced three phase circuits. Heater element circuits shall be subdivided so that no circuit load exceeds 48 amperes. All internal wiring shall be suitable for 220 degrees.

K. Pressure Plate/Baffle: Provide plate to allow for uniform flow across heater; fabricate of galvanized steel; pressure drop shall not exceed 0.20” wc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Comply with Section 20 05 00. Install in accordance with manufacturer’s written instructions, code, applicable standards and best construction practices.

B. Coordination: Coordinate heater power and control requirements with other trades; confirm location of any required heater contactors, relays, thermostats, and similar devices. Provide any required wiring for proof of fan operation between fan devices and heater; wiring shall comply with the HVAC control portion of the specifications and Division 26.

C. Location and Trim Verification: Install equipment at locations indicated in accordance with the Contract Documents. Review and confirm installation locations, that proper clearances are provided, unit controls are accessible, and installation has been coordinated with other trades.

D. Complete Connections: Connect and install all items shipped loose with units; provide and connect all contactors, relays, wiring, interconnections and accessories as required for proper unit operation.

E. Cleaning: Units shall be thoroughly cleaned (internally and externally) of all debris prior to operation. Units shall be clean and in new condition prior to Owner acceptance.

F. Owner Instruction: Instruct Owner on equipment operation and maintenance.

3.2 START-UP

A. Pre Start-Up Inspection: Inspect equipment and connecting systems to confirm equipment and connecting systems to confirm equipment has been installed properly and is ready for start-up. As a minimum, check for: proper voltage and phases, correct electrical connections, complete control connections, all unit safety devices properly set and connected, coils clear of obstructions, and other items as listed by the manufacturer are properly provided/connected and operating to ensure safe and proper start-up. If items are discovered that prevent start-up to be completed, notify the installing Contractor and Engineer of issues. Coordinate and re-schedule start-up after items are corrected.

B. Start-Up: Perform start-up in accordance with manufacturers written start-up procedures. Observe proper operation of all unit components.

C. Adjustments: Adjust and set unit components to allow for proper operation. Observe unit to detect any unusual vibration, leakage, loose wiring, or other situations that could affect unit operation.

3.3 COMMISSIONING

A. General: The Products referenced in this section are to be commissioned. The Contractor has specific responsibilities for scheduling, coordination, testing, and documentation of the commissioning. The Contractor shall provide a documented and signed record to verify that all

equipment and systems installed under this contract have been inspected and functionally tested to verify full compliance with the contract specifications. See Section 20 08 00.

END OF SECTION 238246

SECTION 259000

INTEGRATED AUTOMATION CONTROL SEQUENCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.2 WORK INCLUDED

A. Control System Design.

B. Control System Sequence of Operation.

1.3 SUBMITTALS

A. General: Comply with Section 20 05 00.

B. Sequences: Submit complete description of sequence of operation for all systems. Sequence submitted shall not be a direct copy of the sequence specified herein, but shall be written to reflect the actual control sequences provided and to more closely match the actual programming used.

C. Programming: Submit copy of system programming logic.

1.4 GENERAL REQUIREMENTS

A. Bidder Design: The control system is bidder designed subject to the requirements of the Contract Documents.

B. Modifications: Software, graphics, and sequences shall be revised and updated as necessary to reflect Owner or Engineer desired changes. Contractor to include in bid no less than 16 hours of control technician's/programmer's time to accomplish the required system modifications.

C. Sequence Terminology: Wherever the control sequences refer to an article, device or piece of equipment in the singular number, such reference shall mean to include as many of such articles, devices, or equipment as are shown on the plans, required for the sequence, or required to complete the installation. Wherever the control sequence refers to an operating stage in the singular number, such reference shall mean to include as many stages as are specified for the equipment and shall mean analog (i.e. proportional) type control where specified for the equipment (reference drawings and equipment specifications).

D. Division 25 Scope, General: Division 25 Controls are an Alternate Bid Item (Base bid controls are stand-alone local controls by Division 23). Under the Alternate Bid Item, provide Division 25 controls that integrate the Division 23 controls to DDC and connect controls to central city owned facilities. In lieu of Division 23 controls of the duct heater control by integral control, provide DDC interlocks and controls of duct heaters, to show duct heater status and discharge air temperature on graphics. In lieu of Division 23 controls of OA and Exhaust Dampers, provide DDC control of dampers, and show damper status on graphics.

PART 2 - PRODUCTS

NOT USED

PART 3 - INSTALLATION

3.1 GENERAL

A. Complete System:
1. General: Provide complete control system design, all software, programming, wiring, and control devices as required to allow for automatic control of all mechanical equipment and other systems as indicated; with sequences of operation and features specified. Provide all control interconnections between indoor and outdoor units, all required control connections between equipment components, and to any other devices needed for proper operation. See also Section 25 50 00 for related requirements.
2. Various thermostats, motorized dampers, and other devices are not shown on the drawings but are required per the sequence of operation specified. Coordinate with Engineer for location of all such devices prior to installing. Indicate proposed locations on submittals.

B. Sequences:
1. Additional Sequences: See Section 25 50 00 for system requirements that relate to control sequences; see drawings for additional control sequences and requirements.
2. Control Action: Sequences which involve maintaining a setpoint in response to variable conditions shall use proportional-integral (PI) or proportional-integral-derivative (PID) control (unless noted otherwise). Sequences shall comply with the system performance requirements and other requirements of Section 25 50 00.
3. Missing Sequences: Where no sequence of operation is indicated submit a proposed sequence to the Engineer for review. Such sequences shall match the intended equipment use, code, and ASHRAE standards for the type of equipment and application. HVAC equipment shall have control of heating/cooling operation by area thermostats and control of unit components (i.e. fans dampers) to allow for distribution of heating/cooling and control of ventilation air; fans and similar on/off items shall have time schedule and thermostat control (unless the application clearly implies a different method).

C. Settings:
1. Adjustability: All settings, setpoints, and differentials shall be adjustable. All setpoints indicated are initial settings.
2. Confirm Settings: Confirm with Owner all setpoints, all time schedules, and all other adjustable programming parameters before substantial completion.
3. Thermostat Setpoints: Shall be adjustable at operator's workstation, with initial settings as follows unless indicated otherwise:

Occupied Heating	70 degrees F
Unoccupied Heating	65 degrees F
Occupied Cooling	75 degrees F
Unoccupied Cooling	85 degrees F

D. Time Control:
1. Control system shall provide time schedules for occupied/unoccupied mode switching for all items having sequences with occupied/unoccupied modes, and for all items indicted as having time schedule control.
2. Provide independent time schedules for all mechanical equipment, except where equipment is indicated to be interlocked to other equipment.
3. Provide seasonal (i.e. time of year) control for all mechanical equipment.

4. Provide a single Holiday Schedule or Master Holiday schedule for logical equipment groups as directed by the Owner at submittal time and revised by the Owner during the Owner training. At the end of the warranty period readjust the grouping of equipment as directed by the Owner.
5. Provide independent optimum start schedules (i.e. warm-up cycles) for mechanical equipment indicated to have (or required to have) optimum start.
6. VRF Heat Pump System: Shall operate under its own controls with interface to DDC System. See Section 23 81 27 for VRF sequences.

E. Hand-Off-Auto Control: Provide all control devices and connections to allow Hand-Off-Auto (HOA) control of all controlled items; where unit starters or VFD's provide HOA control no additional controls are required, but this Section controls shall be arranged to allow for HOA controls.

F. Average Thermostats: Where average thermostats are indicated on plans combine and average requirements from each sensor and use these average requirements to control unit. Averaging shall combine the deviation from setpoint from each thermostat and rate of change of this deviation combined to create control values as if they are from a single thermostat to determine control actuation. Each thermostat shall have the same functions as the other. Provide means (at GUI, in single screen command) the ability to select between use of either thermostat.

G. Variable Speed Operation: On variable speed (including staged) equipment, start equipment low speed (or other appropriate speed as recommended by equipment manufacturer or system requirements) and control speed changes at a rate that is coordinated with other equipment to provide proper system operation without undesirable effects, nuisance trips and system alarms.

H. Alarms: Provide alarms for the following:
1. Status of item does not equal commanded status (where proof of status is monitored, e.g. supply fan not proven on when commanded on).
2. Equipment in alarm (where equipment alarm state is monitored).
3. System response is not consistent with commanded response (e.g. air handling unit SA temperature is not less than MA temperature and unit is commanded to cooling).
4. Freezestat alarm (for all hydronic coils).
5. Safety device alarm (where device is monitored by or connected to the control system).
6. Space temperature in alarm range (10 deg F or more above cooling setpoint; 10 deg F or more below heating setpoint).
7. Sensor failure (out of range).

I. Automatic Restart:
1. General: Equipment shall automatically restart after being shut-off by a power outage, fire alarm, smoke detector, or similar alarm (or fault); upon clearing of the alarm (or fault). System shall revert to its normal operation for the conditions at the time of restarting.
2. Controlled Restart: Provide controlled re-start by building wing or building floor and in a manner to prevent pressure differentials, equipment issues, or other undesirable effects. Provide time delay on the re-start of equipment 2.5 KW and larger to minimize electrical surges.

3.2 VRF SYSTEM – SEQUENCE OF OPERATION

A. Heat Pumps: See Section 23 81 27.

B. DOAS ERV Units: See Section 23 81 27.

C. ERV Outside Air and Exhaust Dampers: Control per sequence in 23 81 27 with dampers and controls provided under this Section, connected to VRF contacts for tome control.

D. VRF Off/Auto: Provide output to VRF controls to enable (in auto) or disable (off) the VRF system.

E. OA/Relief Damper serving DOAS HRUs: Shall open when the system is in the occupied mode, and shall close when the system is in the unoccupied mode.

F. DDC system shall provide interface to allow reset of temperature setpoint, occupied/unoccupied schedule, and VRF system alarms at the campus facilities office.

3.3 EXHAUST AND TRANSFER FANS

A. General: See "Control" column on Fan Schedule for which of the following control method is required. See notes on plans for control of fans not listed below and other requirements. Where interval timer, switch control, or a similar manual control is indicated, the control device shall provide an input to the DDC system with the DDC system providing an output for control. No line voltage controls or other controls which do not “pass through” the DDC control system are allowed, unless directly stated that is the method of control to be used.

B. Wall Switch: Fan shall be controlled by on/off wall switch. Fan shall be on when switch is in the on position, and be off otherwise.

C. Interval Timer: Fan shall be controlled by interval timer, to be on when timer is activated and off otherwise.

D. Time Schedule: Fan shall run from time schedule.

E. Time Schedule and Interval Timer: Fan shall run in low speed via time schedule, and operate in high speed when interval timer is activated (regardless of time schedule).

3.4 ELECTRIC HEATERS – DUCT TYPE

A. General: Heater shall be controlled by a space thermostat to provide heating to satisfy space conditions.

B. Operation, SCR Heaters: Provide proportional control of heater to vary heater output to match space heating requirements.

C. Interlock: Shall be hard-wire interlocked with the supply fan on the unit which serves the heater, to only allow heater operation when the unit’s fan is proven on. Provide differential pressure switch or CT’s at unit fan to provide interlock and proof of operation.

3.5 ELECTRIC UNIT HEATERS

A. General: Shall cycle on and off via integral thermostat. No DDC monitoring shall be required. Provide roll-up door end switch and relay to prevent heater operation while the door is not closed.

END OF SECTION 259000

SECTION 230933

ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.2 WORK INCLUDED

A. Control System Design.

B. Control System for Building Heating, Ventilation, Air Conditioning, Exhaust.

C. Control Devices, Components, and Wiring.

D. Testing, Adjustment, and Commissioning.

E. Owner Training.

1.3 SUBMITTALS

A. General: Shall comply with Section 20 05 00.

B. Product Data: Submit product information on all items to be used.

C. Shop Drawings: Submit a complete set of shop drawings prior to installation containing the following information: interconnect drawings showing all wiring and control connections; control panel details; arrangement of devices in panels; schedule of dampers with sizes and where used; sequence of operation for all equipment; location of all control devices on scaled building plans; and list of actuators with sizes and where used.

D. Labeling: Submit list of proposed component labeling.

E. Operation and Maintenance Manuals: See Section 20 02 00. In addition to the information required by that Section and Division 01, provide (for inclusion in the Manual) the following:
   1. System description.
   2. Complete sequence of operation.
   3. Reduced size (11" x 17") copies of record drawings.
   4. Submittal data on all products.

F. Commissioning Plan and Report: See Section 20 08 00. Provide commissioning plan; including a checklist of control items to be reviewed and method of testing sequence of operation. Submit final report documenting tests performed and results.

1.4 GENERAL REQUIREMENTS

A. Design and Installation: The control system is design/build type; all design is by the contractor with the system providing the features and sequences specified. The entire control system shall be designed and installed by skilled control system designers, electricians and mechanics, all of whom are properly trained and qualified for the work they perform.

B. Sole Responsibility: One single Contractor shall be responsible to design, furnish and install the complete Section 23 09 33 control system.

C. Sequence: System shall have sequence of operation as specified in Section 23 09 93.

1.5 WARRANTY

A. Warranty: After completion of the installation of the control system and acceptance by the Owner, the system shall be warranted as free against defects in manufacturing, workmanship and materials for a period of two years from date of substantial completion. In addition, the system shall be warranted to provide the sequence of operation and basic features specified, with the accuracy and flexibility also specified. The system shall be repaired or replaced, including materials and labor, if in Owner's and Engineer's reasonable opinion, system is other than as warranted.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products shall comply with Section 20 05 00, Acceptable Manufacturers.

B. Actuators: Belimo, Honeywell, Siemens, Johnson Controls.

C. Dampers: Ruskin, Greenheck.

D. Control Accessories: Idec, Hoffman, McDonnell, Tridelta, Edwards, Mamac, Penn, Belimo, Honeywell, Johnson Controls, Leviton, Arrow-Hart, Alerton.

2.2 BASIC SYSTEM

A. System Type: The system shall be an electronic or electric type.

2.3 CONTROL DAMPERS

A. Type: Dampers shall be parallel blade or opposed blade type, as selected by contractor to best suit application (unless a specific type is indicated).

B. Leakage: Class 1A leakage rated in accordance with AMCA 511 (or better, as required by Code).

C. Construction: Construct of galvanized steel, except where installed in ducts of stainless steel or aluminum construction or handling corrosive air, shall be of stainless steel or aluminum construction (to match duct material). All materials in contact with the airstream shall be suitable for the conditions without deterioration. Provide special coatings as necessary to provide corrosion resistance. Frame shall be minimum 16 gauge.

D. Blades: Single blade type, not exceeding 6 inches in width,16 gauge, with neoprene, extruded vinyl or butyl rubber edge seals and flexible metal jamb seals; linkage interconnecting all blades and actuator axle.

E. Bearings: Nylon, molded synthetic or oil impregnated sintered metal bearings (or other materials as conditions require).

2.4 ACTUATORS

A. Type: Actuators shall be a brushless DC motor type controlled by a microprocessor.

B. Operation: Shall be compatible with control devices used with to provide specified sequence and system features. Run time shall be constant, independent of torque. Actuator shall have manual

positioning mechanism and control direction of rotation switch accessible on its cover. Provide with auxiliary switches as required for sequence of operation. Actuator shall be proportional or two position type, as required for application.

C. Sizing: Provide actuator with sufficient power and torque to suit items being controlled and allow proper operation against system pressures liable to be encountered. Actuator shall be capable of driving controlled items from full closed to full open in less than 15 seconds.

D. Spring Return: All actuators shall spring return upon power interruption: The spring return position shall be a “fail safe" position as dictated by freeze, fire, temperature protection, energy saving, or safe operating requirements. Outside air dampers shall spring return closed; return air dampers shall spring return open. VAV terminal units and zone dampers do not require spring return actuators.

E. Accessories: Units shall be complete with all linkages, brackets, and hardware required for mounting and to allow for proper control and operation.

2.5 SWITCHES

A. Interval Timer: 4 hour (unless specified longer) spring operated interval timer with wall plate indicating timer setting, and control knob. Timers shall not have a permanent HOLD position.

2.6 ACCESSORIES

A. Wiring and Conduit: Shall comply with Division 26 specifications and with code. Wiring that performs code required life safety shutdown of equipment or fire alarm interface shall comply with NFPA standards and local codes for fire alarm system wiring.

B. Control Cabinet: Wall mounted, NEMA construction type to suit application, minimum 14 gauge sheet metal, hinged front door with latch. Size as required to house controls.

C. Relays: Shall be rated for the application, with a minimum of two sets of Form C contacts, enclosed in a dust-proof enclosure. Relays shall have Hand-Off-Auto switch, and LED’s (or pilot lights) to indicate the energized mode. Relays shall be rated for a minimum life of one million cycles. Operating time shall be 20 milliseconds or less, with release time of 10 milliseconds or less. Relays should be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage. Contact rating, and configuration selected to suit application.

D. Condensate Overflow Switch: Overflow switch to detect high condensate level to stop unit operation and indicate an alarm, low voltage, PVC or ABS construction, with switch rated for voltage/amperage used with. Style to best suit application (i.e. in drain pan type, in drain line type, or type that installs in unit auxiliary drain outlet); selected by Contractor subject to Engineer review. Little Giant Nos. ACS-2, -3, -4, or -5 (or approved equal).

E. Miscellaneous Components/Sensors/Transmitters/Transformers: Shall be manufacturer's standard, designed for application in commercial building HVAC control systems, compatible with other components so as to provide sequence of operation specified.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Provide all devices, sensors, relays, switches, dampers, actuators, conduit, tubing, wiring, motor starters and all other devices required to provide a complete integrated control system with the sequence of operation and features as specified. It is the Contractor’s responsibility to coordinate with other trades for the installation of control devices in systems installed by others.

B. Installation: Install all control components in accordance with manufacturer's instructions and recommendations and best professional practices.

C. Coordination: Coordinate work with other trades to ensure that all trades have the information necessary so that they may properly install any necessary control components, interconnect with control components, and install their work to accommodate controls. Identify all items requiring ceiling or wall access doors (or other special requirements) to trade installing access doors or performing related work.

D. Space Requirements and Locations: Carefully check space requirements and coordinate with other trades to ensure that items can be installed in the allotted spaces, including above finished suspended ceilings. Adjust locations of panels, equipment, devices, and the like, to accommodate work and prevent interferences. Determine the exact route and location of wiring, conduit and other control devices prior to beginning work.

E. Mounting: Mount controls adjacent to associated equipment on vibration free elements on free standing fabricated supports; mount and locate for best access.

F. Control Cabinets: All electrical devices, relays, and components shall be installed in protective covers (i.e. control cabinets), except where installed concealed above ceilings a cover is not required. Controls/devices shall be logically assembled in cabinet, with all devices and cabinet labeled.

G. Thermostats: Room thermostats shall be mounted 4'-6" above finished floor unless indicated otherwise. Thermostats shall connect to the HVAC unit serving the space the thermostat is located in, unless indicated otherwise. Not all thermostats are shown on the drawings and those shown are preliminary only. Contractor shall indicate all final thermostat locations on submittal drawings. Contractor is responsible to coordinate locations to avoid tackboards, casework, and other interferences.

H. Power: It shall be the responsibility of this Contractor to provide power for all control devices requiring power. Coordinate with the Division 26 Contractor to arrange for necessary power circuits. All control devices shall obtain power from circuits dedicated to control power.

I. Wiring, Conduit and Electrical:
   1. General: Provide all electrical wiring and devices in accordance with applicable codes and Division 26 requirements.
   2. Conduit: All wiring shall be installed in conduit and in accordance with Division 26 specifications, except that low voltage wiring within ceiling plenum spaces, mechanical mezzanines, and attics may be installed without conduit. Wiring in walls shall be in conduit.
   3. Wire Labeling: Label or code wiring at each end to show location of the opposite end. Each point of all field terminal strips shall be permanently labeled or coded to show the instrument of item served. Color coded cable with cable diagrams may be used to accomplish cable identification and terminal strip.
   4. Service Loop: Provide minimum of 6" extra wiring at all wiring terminations for ease of future maintenance/servicing. Such extra wiring shall be neatly coiled/bundled to allow for uncoiling when the connected equipment is serviced.
   5. Workmanship: Install all conduit and wiring parallel to building lines, in neat bundles, supported at not less than 5 foot intervals.

J. Component Labeling: All control components, except regular room thermostats, shall be equipped with name plates to identify each control component. Components in finished rooms shall be labeled as to generic item controlled for better user understanding; other devices shall be labeled with the same designation which appears on the Control Diagrams. Contractor shall submit list of proposed labeling prior to installing. Reference Section 20 05 00.

K. Thermostat Setpoints: Thermostat Setpoints (all adjustable) shall be as follows unless indicated otherwise:

Occupied Heating	70 degrees F
Unoccupied Heating	65 degrees F
Occupied Cooling	75 degrees F
Unoccupied Cooling	85 degrees F

L. Motor Starters: Shall be by Division 26; except for loads 1/2 hp and less which shall be by this Section.

M. Device Duct Installation: All control devices installed in ductwork shall be positively anchored and attached to the ductwork by mechanical means (fasteners, straps, unistrut, etc).

N. Miscellaneous Controls: Provide all miscellaneous control items as noted in the Contract Documents. Provide all necessary control wiring between items for proper control.

O. Condensate Overflow: Provide all cooling coils (except not required for room exposed wall mounted AC units) with field installed condensate overflow switches wired to stop cooling unit operation upon detection of a high condensate level.

3.2 OWNER INSTRUCTION

A. Owner Instruction: Provide instruction to Owner on the operation and maintenance of the control system. Provide field demonstrations and show Owner the locations of all control devices; explain and demonstrate how system adjustments are made; explain and demonstrate system sequences of operation.

END OF SECTION 230933

SECTION 230993

SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 00 and Division 01 Specification Sections, apply to this Section.

B. Requirements of Section 20 05 00 apply to this Section.

1.2 WORK INCLUDED

A. Sequence of Operation.

1.3 SUBMITTALS

A. General: Shall comply with Section 20 05 00.

B. Sequence: Submit complete description of sequence of operation. Sequence submitted shall not be a direct copy of the sequence specified herein, but shall be written to reflect the actual control sequence provided.

C. Shop Drawings: Provide complete control system shop drawings.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 GENERAL

A. General: Provide complete control system with sequences of operation as specified. All mechanical equipment shall be automatically controlled by the Division 23 control system, unless specifically indicated otherwise. Where no sequence of operation is indicated submit a proposed sequence for Engineer review; such sequences shall match the intended equipment use, code, and ASHRAE standards for the type of equipment and application.

B. Time Control: Section 23 81 27 system shall provide time clock control, and shall provide automatic warm-up control.

C. Adjustability: All temperature setpoints and time control settings shall be adjustable.

D. Thermostats: Various thermostats are not shown on the drawings but are required per the sequence of operation specified. Coordinate with Engineer for location of all such thermostats prior to installing. Indicate proposed locations on submittals.

E. Miscellaneous Items: See plans for units with motorized dampers in the ducts and miscellaneous other items requiring control.

3.2 VRF SYSTEM – SEQUENCE OF OPERATION

A. Heat Pumps: See Section 23 81 27.

B. DOAS ERV Units: See Section 23 81 27 and Section 23 72 23.

C. ERV Outside Air and Exhaust Dampers: Control per sequence in 23 81 27 with dampers and controls provided under this Section, connected to VRF contacts for tome control.

3.3 EXHAUST FANS

A. General: See "Control" column on Fan Schedule for which of the following control methods apply to each fan.

B. Interval Timer: Fan shall be controlled by wall mounted interval timer; fan shall be on when timer is activated and off otherwise.

C. Time Clock Control: Fan shall run from time clock control schedule; fan shall be on for the scheduled occupied period and be off otherwise.

3.4 ELECTRIC HEATERS

A. Wall Heaters: Shall be controlled by their integral thermostat. Heater shall be on once space temperature has fallen below setpoint, and shall be off once temperature has risen 2 deg F or more above setpoint.

3.5 ELECTRIC HEATERS – DUCT TYPE [SA TEMP CONTROL]

A. A. General: Heater shall be controlled by a duct mounted temperature sensor and status of the energy recovery ventilator. See Sections 23 72 23 and 23 82 46.

B. B. Interlock: Shall be hard-wire interlocked with the supply fan on the unit which serves the heater, to only allow heater operation when the unit’s fan is proven on. Provide differential pressure switch or CT’s at unit fan to provide interlock and proof of operation.

END OF SECTION 232128

ENERGY CODE NOTES

1. LOAD CALCULATIONS HAVE BEEN PERFORMED IN ACCORDANCE WITH WSEC.
2. EQUIPMENT HAS BEEN SELECTED PER WSEC REQUIREMENTS.
3. VENTILATION AND THE ABILITY TO REDUCE OUTSIDE AIR TO IMC MINIMUMS SHALL BE PROVIDED PER WSEC.
4. MOTORS 1 HP AND LARGER SHALL BE ENERGY EFFICIENT TYPE PER WSEC; MOTORS 1/12 HP TO 1 HP SHALL BE ECM TYPE OR MEET MINIMUM EFFICIENCY REQUIREMENTS PER WSEC.
5. HEAT PUMPS SHALL INCLUDE MICROPROCESSOR CONTROLS THAT MINIMIZE SUPPLEMENTAL HEAT USAGE DURING START-UP, SET-UP, AND DEFROST CONDITIONS. THESE CONTROLS SHALL ANTICIPATE THE NEED FOR HEAT AND PROVIDE COMPRESSION HEAT AS THE FIRST STAGE. PROVIDE A VISUAL INDICATION WHEN SUPPLEMENTAL HEAT IS IN USE AND A CONTROL LOCK-OUT OF SUPPLEMENTAL HEAT FOR OUTSIDE AIR TEMPERATURES ABOVE 40 DEG F PER WSEC.
6. TEMPERATURE CONTROL SYSTEM SHALL HAVE A MINIMUM DEAD BAND OF 5 DEGREES AS REQUIRED BY WSEC.
7. HVAC SYSTEMS SHALL BE EQUIPPED WITH AUTOMATIC CONTROLS CAPABLE OF PROVIDING NIGHT SETBACK, SEVEN DIFFERENT DAILY SCHEDULES, AND OPTIMUM START PER THE REQUIREMENTS OF WSEC.
8. OUTSIDE AIR INTAKES, EXHAUST OUTLETS, AND RELIEF OUTLETS SHALL BE PROVIDED WITH DAMPERS THAT COMPLY WITH WSEC. DAMPER SHALL AUTOMATICALLY CLOSE WHEN SYSTEM OR SPACES SERVED ARE NOT IN USE OR DURING WARM-UP, COOL-DOWN, AND SETBACK. DAMPER MAXIMUM LEAKAGE RATE SHALL NOT EXCEED MAXIMUM ALLOWED BY WSEC.
9. ALL DUCTWORK SHALL BE CONSTRUCTED AND SEALED IN ACCORDANCE WITH IMC, WSEC AND IBC REQUIREMENTS.
10. DUCTWORK SHALL BE INSULATED TO THE APPROPRIATE R-VALUE AS REQUIRED BY WSEC.
11. PIPING SHALL BE INSULATED AS REQUIRED BY WSEC.
12. PIPING INSULATION EXPOSED TO WEATHER SHALL BE PROTECTED FROM DAMAGE, INCLUDING THAT DUE TO SUNLIGHT, MOISTURE, EQUIPMENT MAINTENANCE AND WIND, AND SHALL BE SHIELDED FROM SOLAR RADIATION PER WSEC.
13. AIR SYSTEMS SHALL BE BALANCED AS REQUIRED BY THE WSEC.
14. PROVIDE COMMISSIONING PLAN & REPORT REQUIREMENTS FOR PRELIMINARY AND FINAL COMMISSIONING PER WSEC. PROVIDE SEQUENCE OF OPERATIONS AND TEST PROCEDURES PER WSEC AND SUBMIT COMPLIANCE CHECKLIST.
15. THESE "ENERGY CODE NOTES" ARE LISTED TO SATISFY THE BUILDING DEPARTMENT'S REQUIREMENT THAT CERTAIN INFORMATION BE PLACED ON THE PLANS, BUT DO NOT DIMINISH THE FULL PROJECT REQUIREMENTS. PROVIDE ITEMS IN EXCESS OF CODE WHERE NOTED ON DRAWINGS AND IN SPECIFICATIONS.

LIST OF MECHANICAL DRAWINGS

MECHANICAL GENERAL NOTES

1. ALL DUCT WALL PENETRATIONS SHALL BE PROVIDED WITH CLOSURE COLLARS AND BE TIGHTLY SEALED TO PREVENT THE TRANSMISSION OF NOISE OR SMOKE.
2. CONTRACTOR SHALL CAREFULLY COORDINATE WORK W/ ALL OTHER TRADES, ESPECIALLY IN CEILING SPACES WHERE SPACE IS TIGHT. SHEET METAL CONTRACTOR SHALL HAVE PRIORITY OVER OTHER MECHANICAL TRADES IN CEILING SPACE WHERE CONFLICTS OCCUR.
3. ALL DUCTWORK SHOWN IS SCHEMATIC, CONTRACTOR SHALL PROVIDE ALL OFFSETS/ELBOWS AS REQ'D TO ALLOW ROUTING AROUND STRUCTURE, ELECTRICAL, & OTHER INTERFERENCES.
4. FLEXIBLE DUCT LENGTH SHALL NOT EXCEED 8 FEET, AND MAY ONLY BE USED WHERE SPECIFICALLY SHOWN ON THE PLANS.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE & SELECT FINAL LOCATIONS OF ALL AIR INLETS/OUTLETS. SHIFT AIR INLETS/ OUTLETS FROM LOCATIONS SHOWN AS REQ'D TO AVOID CONFLICTS W/ STRUCTURE, LIGHTS, & OTHER ITEMS. SUCH SHIFTS SHALL MAINTAIN SYMMETRY OF AIR TERMINALS & SHALL HAVE PRIOR APPROVAL OF ARCHITECT/ENGINEER.
6. VARIOUS CEILING AIR INLET/OUTLET CONN'S REQUIRE SIDE INLET PLENUM. PROVIDE WHERE REQ'D DUE TO SPACE LIMITATIONS TO PREVENT KINKS IN FLEX. DUCT AND ALLOW PROPER CONN.
7. VERIFY LOCATIONS OF ITEMS INSTALLED IN CEILINGS WITH ARCHITECTURAL REFLECTED CEILING PLANS PRIOR TO BEGINNING WORK. NOTIFY ARCHITECT OF DISCREPANCIES.
8. MECHANICAL EQUIPMENT 1/2 HP AND LESS SHALL HAVE ANY REQUIRED STARTER/CONTROL RELAY PROVIDED BY THE CONTROL CONTRACTOR (EXCEPT WHERE SPECIFICALLY SHOWN OR SPECIFIED OTHERWISE).
9. PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCTS AND SPLITS IN MAIN DUCTS AND WHERE REQ'D BY BALANCERS; ONLY SOME OF THE REQ'D DAMPERS ARE SHOWN ON THE PLANS.
10. UNSIZED DUCTS SHALL MATCH THE SIZE OF THE LARGEST ADJACENT DUCT THAT IS SIZED. WHERE THE ADJACENT DUCT SIZE IS NOT SHOWN, PROVIDE SA, OA, & EA DUCTS SIZED AT 0.08" PD PER 100 FEET; PROVIDE RA & RELIEF AIR DUCTS SIZED AT 0.07" PD PER 100 FEET (OR LARGER AS FAN SP OR NOISE CONSIDERATIONS REQUIRE).
11. UNSIZED PIPING SHALL MATCH THE SIZE OF THE LARGEST ADJACENT PIPE THAT IS SIZED. WHERE THE ADJACENT PIPE SIZE IS NOT SHOWN OR UNCLEAR, PROVIDE PLUMBING PIPE SIZES PER THE UPC. SIZE HW/CW PIPING ON CONNECTED WATER SUPPLY FIXTURE UNITS AND MAX HW PIPE VELOCITY OF 5 FPS, AND MAX CW PIPE VELOCITY OF 8 FPS. SIZE WASTE/VENT PIPING PER THE UPC FOR DFU'S. SIZE GAS PIPING PER CODE.
12. WHERE RETURN GRILLE CFM'S ARE NOT INDICATED, BALANCER SHALL CALCULATE & SUBMIT FOR ENGINEER REVIEW. RA = SA-OA.
13. DRAWINGS SCALES APPLY TO FULL SIZE SHEET ONLY. USE CAUTION IN OBTAINING DIMENSIONS AND QUANTITIES FROM DRAWINGS THAT ARE NOT FULL SIZE; USE DIMENSIONS CALCULATED FROM DIMENSIONS ON THE ARCHITECTURAL AND STRUCTURAL DRAWINGS OVER OTHER METHODS OF OBTAINING DIMENSIONS.
14. VERIFY ALL POWER REQUIREMENTS & STARTERS, DISCONNECTS, RELAYS & LOCATIONS (& WHO PROVIDES) W/ EC.
15. PROVIDE MOTORIZED DAMPERS ON EXHAUST OUTLETS & OA INTAKES AS REQUIRED BY CODE.
16. PROVIDE ALL CUTTING/PATCHING TO INSTALL ITEMS AS SHOWN. PATCH TO PRE-CONSTRUCTION CONDITIONS OR BETTER.
17. FIRE SPRINKLERS INCLUDE AN ALLOWANCE FOR OFFSET OF EXISTING PIPING TO ALLOW HVAC WORK. ASSUME 3 OFFSETS OF 15 LINEAR FEET (FOUR ELBOWS EACH LOCATION) OF 1-1/4" PIPING.
18. CONTROLS: BASE BID CONTROLS ARE STAND-ALONE LOCAL CONTROLS BY DIVISION 23. UNDER AN ALTERNATE BID ITEM, PROVIDE DIVISION 25 CONTROLS THAT INTEGRATE THE DIVISION 23 CONTROLS TO DDC AND CONNECT CONTROLS TO CENTRAL CITY OWNED FACILITIES.

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GENERAL DEMOLITION NOTES

1. COORDINATE W/ GENERAL CONTRACTOR FOR DEMO SCOPE. ALL EXISTING MECHANICAL & PLUMBING ITEMS IN THE EXISTING BUILDING ARE TO BE DEMO'D.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW SITE CONDITIONS AND TO IDENTIFY ALL DEMOLITION WORK, AND INCLUDE IN HIS BID ALL COSTS FOR DEMOLITION & DISPOSAL.
3. ALL EXISTING MECHANICAL & PLUMBING ITEMS SHALL BE REMOVED (UNO). THIS INCLUDES SUCH ITEMS AS THERMOSTATS, CONTROL DEVICES, DUCTS, FANS, PIPING, GRILLES, SUPPORTS, VALVES, CURBS, AND RELATED ACCESSORIES.
4. ABANDONED ITEMS, ANCHORS, INSERTS, PIPE STUBS, AND OTHER PROJECTIONS NOT BEING CONCEALED BY NEW CONSTRUCTION SHALL BE REMOVED TO 1" BELOW THE ADJACENT FINISHED SURFACE, AND THE DISTURBED AREA PATCHED.
5. PATCH ALL WALL/FLOOR/CEILING OPENINGS LEFT BY REMOVAL OF EXISTING ITEMS. PATCH SO AS TO MATCH FINISH OF ADJACENT UNDISTURBED AREA.
6. REFERENCE ARCHITECTURAL DRAWINGS FOR OTHER GENERAL DEMOLITION WORK & OTHER REQUIREMENTS.
7. WHERE EXISTING PLUMBING FIXTURES ARE REMOVED, CAP OFF CW, HW, VENT & WASTE PIPING AT A CONCEALED LOCATION (I.E. ABOVE CEILING OR INSIDE WALL OR BELOW FLOOR).
8. VERIFY SIZE & LOCATION OF ALL EXISTING ITEMS.

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
	WASTE OR SOIL (W)
	VENT (V)
	COLD WATER (CW)
	HOT WATER (HW)
	HOT WATER CIRCULATING (HWC)
G	GAS PIPING
	PIPE UP
	PIPE DOWN
	PIPE TEE IN LINE, BRANCH PIPE DOWN
RG	REFRIGERANT GAS
RL	REFRIGERANT LIQUID
C	CONDENSATE LINE
	ISOLATION VALVE
	COMBINATION SHUT-OFF & BALANCING VALVE
	CHECK VALVE
	UNION
	RELIEF VALVE OR SAFETY VALVE
	STRAINER WITH BLOW-OFF VALVE
	CONCENTRIC REDUCER
	PRESSURE REDUCING VALVE
	PRESSURE GAUGE
	THERMOMETER
	CLEANOUT
	FLOOR DRAIN
20/12	DUCT (FIRST FIGURE, SIDE SHOWN)
20/12L	LINED DUCT (DIM. FOR NET FREE AREA) EOL= END OF LINING L= LINED
R (D)	RISE (R) OR DROP (D) ARROW IN DIRECTION OF FLOW
	VOLUME DAMPER (MANUAL)
M	MOTORIZED DAMPER
	FLEXIBLE CONNECTION
	FIRE DAMPER
	FLEXIBLE DUCT
SIZE SYMBOL CFM	CEILING OUTLET
SIZE SYMBOL CFM	CEILING INLET
SIZE SYMBOL CFM	WALL OUTLET (OR INLET)
T TG	THERMOSTAT G= WITH GUARD
S	SWITCH
IT	INTERVAL TIMER
C	CARBON DIOXIDE (C02) SENSOR (DEMAND VENTILATION)
M	ZONE DAMPER (ZD)
2 / M3	DETAIL IDENTIFICATION NUMBER SHEET ON WHICH DETAIL IS SHOWN
A / M3	SECTION IDENTIFICATION LETTER SHEET ON WHICH SECTION IS SHOWN

SYMBOL	DESCRIPTION
AFF	ABOVE FINISHED FLOOR
APPROX	APPROXIMATELY
ARCH	ARCHITECTURAL
B.O.D.	BOTTOM OF DUCT
B.O.B.	BOTTOM OF BEAM
B.O.J.	BOTTOM OF JOIST
B.O.S.	BOTTOM OF STRUCTURE
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT/HOUR
BLDG	BUILDING
CAP	CAPACITY
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CLG	CEILING
COP	COEFFICIENT OF PERFORMANCE
COMP	COMPRESSOR
CONN	CONNECTION
CONT	CONTINUE, CONTINUATION
CO2	CARBON DIOXIDE
CW	COLD WATER
DEG F, F	DEGREE FAHRENHEIT
DFU	DRAINAGE FIXTURE UNITS
DIA, Ø	DIAMETER
DOAS	DEDICATED OUTSIDE AIR SYSTEM
DN	DOWN
DWG	DRAWING
DB	DRY BULB
EA	EACH
EC	ELECTRICAL CONTRACTOR
ELEC	ELECTRICAL, ELECTRIC
(E), EXIST	EXISTING
EER	ENERGY EFFICIENCY RATIO
EAT	ENTERING AIR TEMPERATURE
EWB	ENTERING WET BULB
EDB	ENTERING DRY BULB
EOL	END OF LINING
EXH	EXHAUST
ESP	EXTERNAL STATIC PRESSURE
FV	FACE VELOCITY
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FLEX	FLEXIBLE
FLA	FULL LOAD AMPS
FLR	FLOOR
G	GAS
GAL	GALLON
GALV.	GALVANIZED
GC	GENERAL CONTRACTOR
GPH	GALLON PER HOUR
HW	HOT WATER
HWC	HOT WATER CIRCULATION
HP	HORSE POWER
IN	INCH
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB
LWB	LEAVING WET BULB
MFR	MANUFACTURER
MAX	MAXIMUM
MFS	MAXIMUM FUSE SIZE
MBH	THOUSAND BTUH
MECH	MECHANICAL
MIN	MINIMUM
MCA	MINIMUM CIRCUIT AMPS
MOP	MAXIMUM OVERCURRENT PROTECTION
NO.	NUMBER
NTS	NOT TO SCALE
OBD	OPPOSED BLADE DAMPER
OA	OUTSIDE AIR
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PH	PHASE
PD	PRESSURE DROP
PTHP	PACKAGED THERMAL HEAT PUMP
RLA	RATED LOAD AMPS
REF	REFERENCE
REQ'D	REQUIRED
RA	RETURN AIR
RPM	REVOLUTIONS PER MINUTE
RM	ROOM
RG	REFRIGERANT GAS
RL	REFRIGERANT LIQUID
SA	SUPPLY AIR
SS	SANITARY SEWER
TEMP	TEMPERATURE
T.O.D.	TOP OF DUCT
TD	TRANSFER DUCT
TG	TRANSFER GRILLE
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
UPC	UNIFORM PLUMBING CODE
V	VOLTS, VOLTAGE
VFD	VARIABLE FREQUENCY DRIVE
W	WATT
WB	WET BULB
W/	WITH
WSEC	WASHINGTON STATE ENERGY CODE
ZD	ZONE DAMPER

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LEO JAMES MCINNIS — REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON
SIGNED 05-23-2022

KMB Project # 22016

FIRE STATION 11 HVAC REPLACEMENT
CITY OF TACOMA
3802 E MCKINLEY AVE, TACOMA, WA 98404

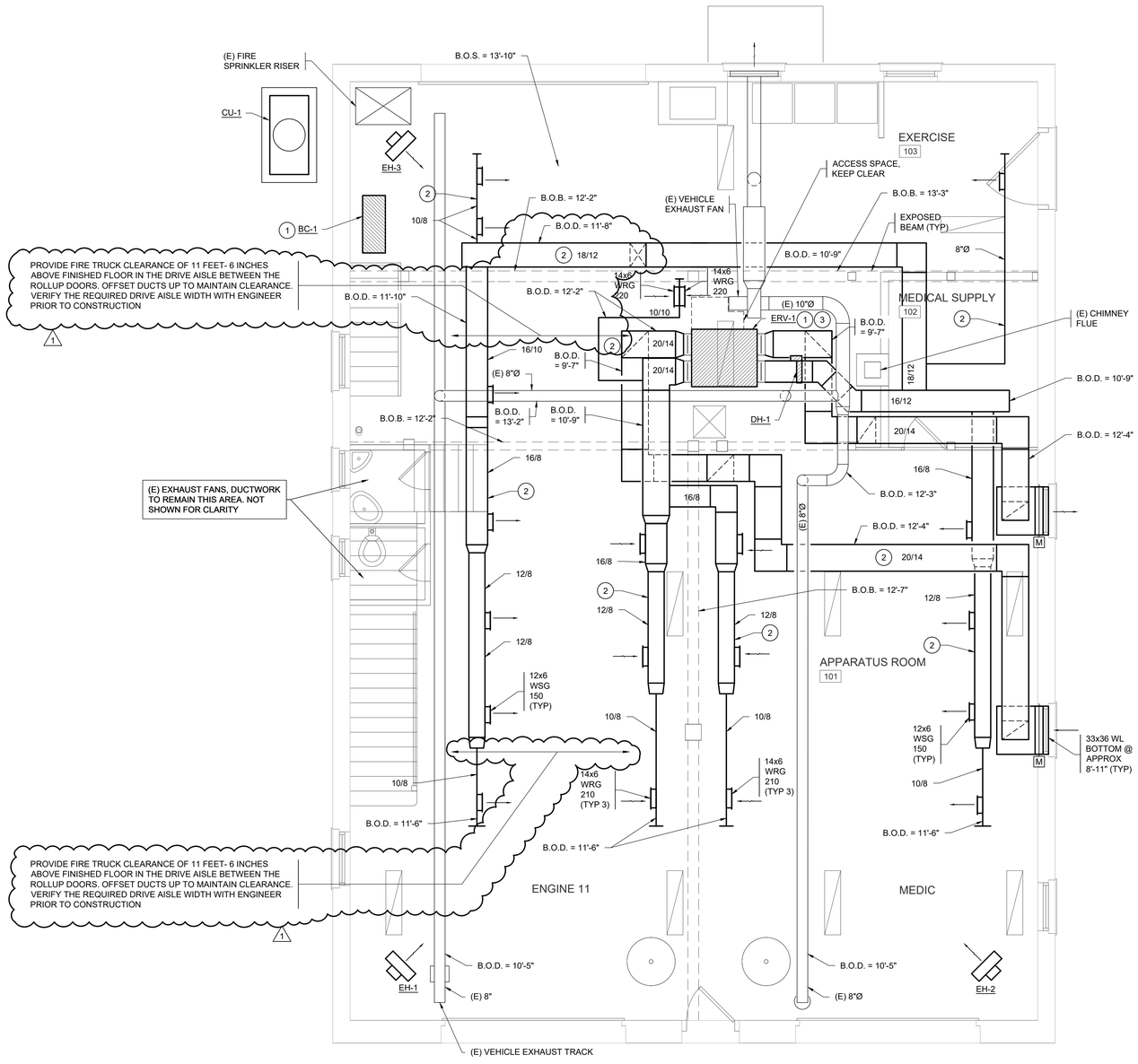
ORIGINAL SHEET SIZE = 24 x 36
HALF SIZE REDUCTIONS = 11 x 17

REVISIONS:
1 Duct Height & HVAC Controls 1-24-2023

DATE: 05/23/2022

CONSTRUCTION DOCUMENTS

SHEET NO.
M-001
MECHANICAL LEGEND & NOTES



GENERAL NOTES:

1. SEE NOTES SHEET M-001.
2. ROUTE DUCT & PIPING AS HIGH AS POSSIBLE.
3. THERMOSTATS CONNECT TO UNITS THAT SERVE THE SPACE THE THERMOSTAT IS LOCATED IN.
4. INDOOR HEAT PUMP TYPES:
   CC = CEILING CASSETTE
   FC = FAN COIL
   WM = WALL MOUNT
5. PROVIDE CONDENSATE DRAINS FOR ALL HVAC EQUIPMENT. PIPING UP TO 5 TONS 3/4"; LARGER TONNAGES TO BE 1". PROVIDE P-TRAP W/ CO AT CONNECTION TO EQUIPMENT PER MFR.
6. PROVIDE TRANSITIONS TO MATCH EQUIPMENT CONNECTION SIZES. WHERE DUCT IS LINED TRANSITION SHALL BE LINED.
7. FIELD VERIFY EXISTING STRUCTURE BEAM HEIGHTS & LOCATIONS. PROVIDE ADDED OFFSETS TO ACCOMMODATE BEAMS. SUBMIT HVAC DUCT SHOP DRAWINGS SHOWING FINAL DUCT FITTINGS & DUCT ROUTING.
8. PROVIDE REFRIGERANT PIPING BETWEEN OUTDOOR UNIT, BC CONTROLLER, AND INDOOR UNITS. SEE DIAGRAM ON SHEET M-407.
9. PROVIDE CONDENSATE PIPING FROM INDOOR AC AND HP UNITS TO NEAREST POINT OF DRAINAGE (LAVATORY/SINK TAILPIECE, SERVICE SINK, ETC.) VIA 3/4" POLY TUBING. SUBMIT DRAWING OF ROUTING FOR ENGINEER REVIEW.
10. NOT ALL KEYED NOTES USED ON EACH SHEET.

KEYED NOTES:

1. MOUNT AS CLOSE TO STRUCTURE AS POSSIBLE.
2. DUCTS ARE EXPOSED AND DUCTWORK SHALL BE NEAT. DUCTS SHALL BE SPIRAL WITH FLANGED FITTINGS AND NO DUCT SEALANT SHALL BE VISIBLE. CENTER DUCTS BETWEEN GLU-LAM BEAMS AND MOUNT TIGHT TO STRUCTURE.
3. DUCTS ARE VERTICALLY STACKED AT ERV. DUCTS ARE DRAWN AS IF CONNECTIONS ARE HORIZONTAL FOR CLARITY.

A FIRST FLOOR PLAN - HVAC
1/4" = 1'-0"

SCALE 1/4" = 1'-0"

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DATE: 05/23/2022

CONSTRUCTION DOCUMENTS

SHEET NO.
M-402
FIRST FLOOR PLAN - HVAC

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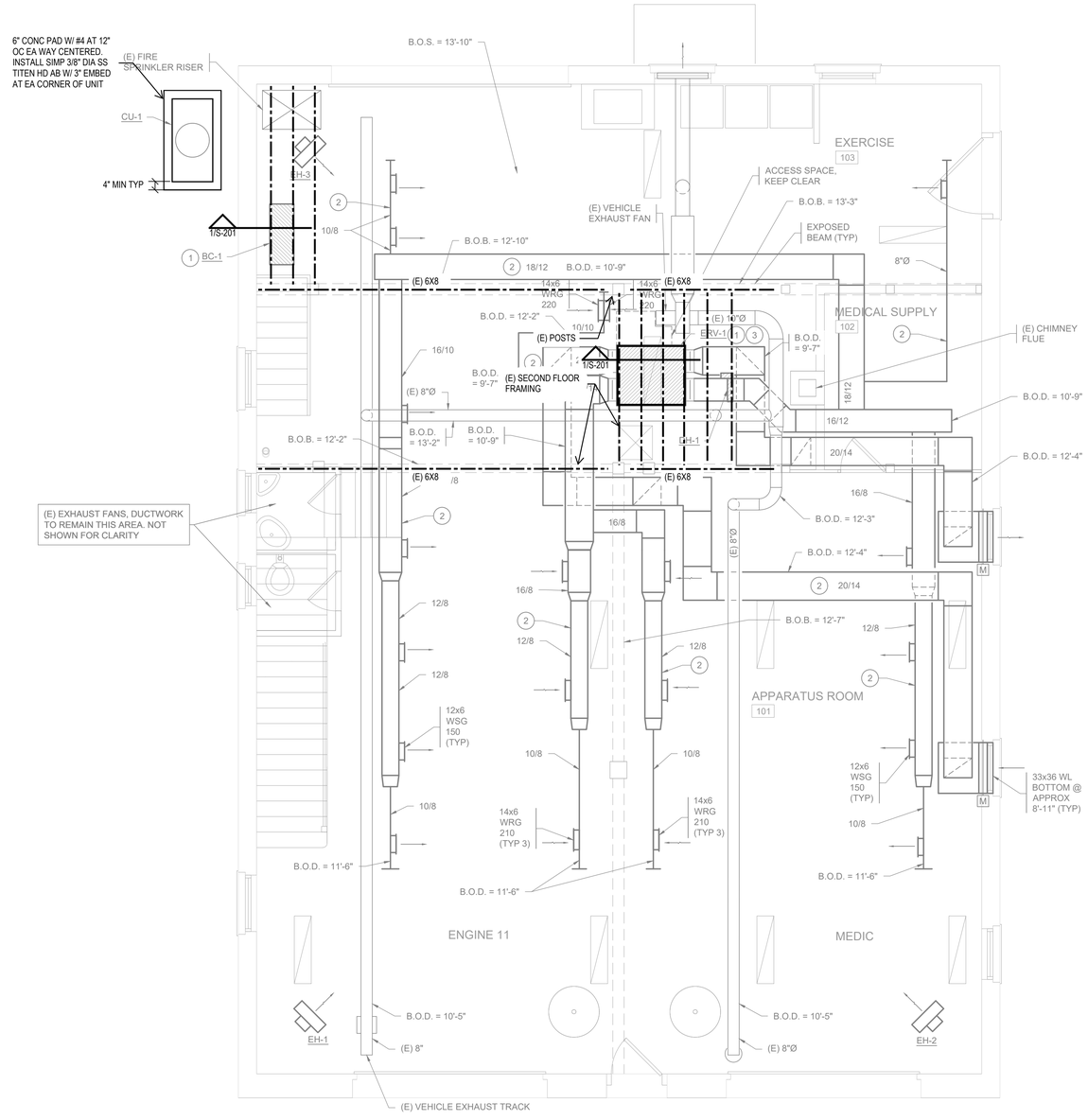
general@hultzbhu.com Job Number: 22-055



1 SECOND FLOOR FRAMING PLAN - HVAC
1/4" = 1'-0"

SCALE 1/4" = 1'-0"

GENERAL NOTES:

ALL NEW SAWN LUMBER TO BE DF #1 GRADE, UNLESS NOTED OTHERWISE.

ALL WOOD FRAMING HARDWARE BY SIMPSON STRONG-TIE OR EQUAL, UNLESS NOTED OTHERWISE.

ALL MECH UNIT SUPPORT HARDWARE BY UNISTRUT, UNLESS NOTED OTHERWISE.

VERIFY SIZE AND LOCATION OF ALL MECHANICAL PENETRATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.

EXISTING FRAMING IS IMAGE FROM ORIGINAL CONSTRUCTION DRAWINGS PROVIDED BY OWNER, CONTRACTOR REVIEW FOR ACCURACY PRIOR TO START OF FABRICATION/ CONSTRUCTION

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KENNETH P. RILAND STATE OF WASHINGTON 39278 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER

05/27/2022
AHBL Project # 2220439.20

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CITY OF TACOMA
3802 E MCKINLEY AVE, TACOMA, WA 98404

ORIGINAL SHEET SIZE = 24 x 36
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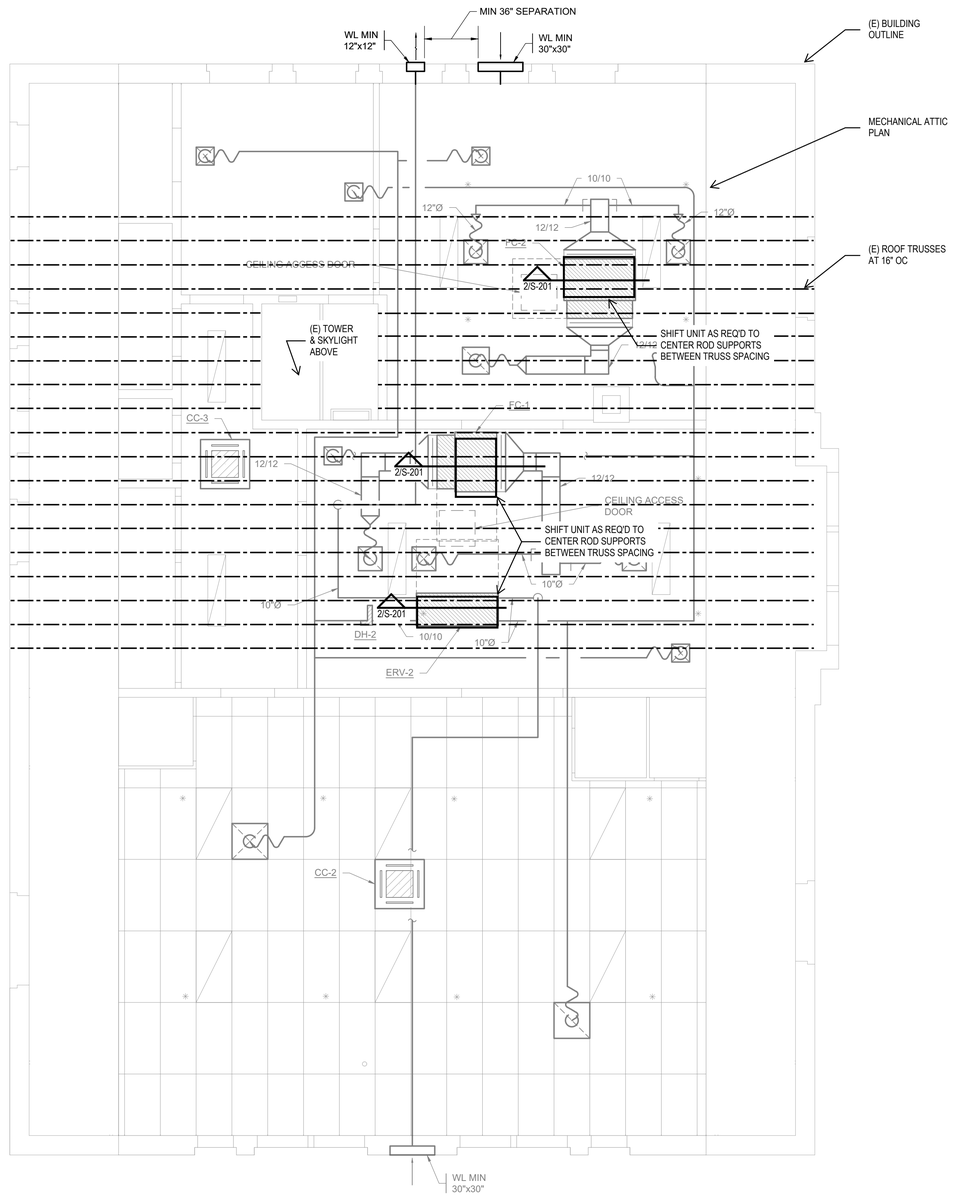
REVISIONS:
1 MECH UNITS PLACEMENT 01/25/23

DATE:
05/27/2022

CONSTRUCTION DOCUMENTS

SHEET NO.
S-101
SECOND FLOOR FRAMING PLAN

AHBL



1 ROOF FRAMING PLAN - HVAC
1/4" = 1'-0"

SCALE 1/4" = 1'-0"

GENERAL NOTES:

ALL NEW SAWN LUMBER TO BE DF #1 GRADE, UNLESS NOTED OTHERWISE.

ALL WOOD FRAMING HARDWARE BY SIMPSON STRONG-TIE OR EQUAL, UNLESS NOTED OTHERWISE.

ALL MECH UNIT SUPPORT HARDWARE BY UNISTRUT, UNLESS NOTED OTHERWISE.

VERIFY SIZE AND LOCATION OF ALL MECHANICAL PENETRATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.

EXISTING FRAMING IS IMAGE FROM ORIGINAL CONSTRUCTION DRAWINGS PROVIDED BY OWNER, CONTRACTOR REVIEW FOR ACCURACY PRIOR TO START OF FABRICATION/ CONSTRUCTION

EXISTING ATTIC ACCESS SHALL BE USED FOR NEW EQUIPMENT INSTALLATON AND FUTURE MAINTENANCE - DO NOT CUT TRUSS BOTTOM CHORD/ TIED RAFTERS WITHOUT PRIOR APPROVAL FROM STRUCTURAL ENGINEER!

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KENNETH P. RILAND
STATE OF WASHINGTON
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STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER

05/27/2022
AHBL Project #2220439.20

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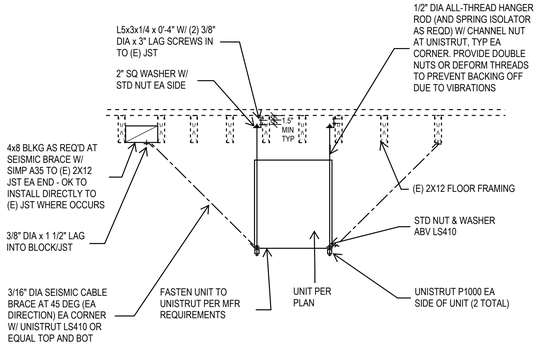
DATE:
05/27/2022

CONSTRUCTION DOCUMENTS

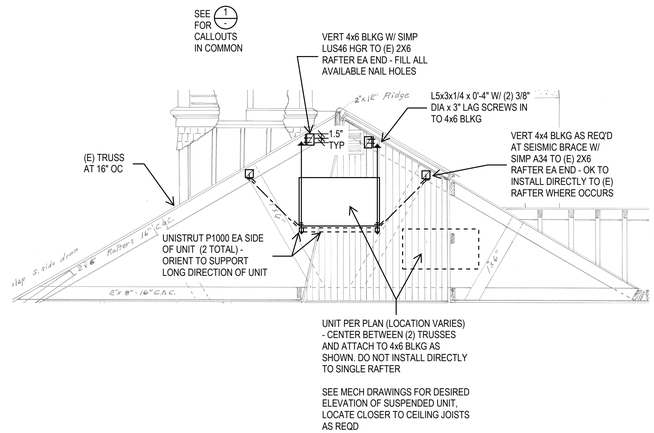
SHEET NO.
S-102
ROOF FRAMING PLAN

AHBL



SECTION 1

N.T.S.



SECTION 2

N.T.S.

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KENNETH B. RELAND — STATE OF WASHINGTON — 39278 — STRUCTURAL ENGINEER — PROFESSIONAL ENGINEER

05/27/2022

AHBL Project #2220439.20

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CONSTRUCTION DOCUMENTS

SHEET NO.
S-201
STRUCTURAL DETAILS

AHBL

ENERGY CODE NOTES

1. LOAD CALCULATIONS HAVE BEEN PERFORMED IN ACCORDANCE WITH WSEC.
2. EQUIPMENT HAS BEEN SELECTED PER WSEC REQUIREMENTS.
3. VENTILATION AND THE ABILITY TO REDUCE OUTSIDE AIR TO IMC MINIMUMS SHALL BE PROVIDED PER WSEC.
4. MOTORS 1 HP AND LARGER SHALL BE ENERGY EFFICIENT TYPE PER WSEC; MOTORS 1/12 HP TO 1 HP SHALL BE ECM TYPE OR MEET MINIMUM EFFICIENCY REQUIREMENTS PER WSEC.
5. HEAT PUMPS SHALL INCLUDE MICROPROCESSOR CONTROLS THAT MINIMIZE SUPPLEMENTAL HEAT USAGE DURING START-UP, SET-UP, AND DEFROST CONDITIONS. THESE CONTROLS SHALL ANTICIPATE THE NEED FOR HEAT AND PROVIDE COMPRESSION HEAT AS THE FIRST STAGE. PROVIDE A VISUAL INDICATION WHEN SUPPLEMENTAL HEAT IS IN USE AND A CONTROL LOCK-OUT OF SUPPLEMENTAL HEAT FOR OUTSIDE AIR TEMPERATURES ABOVE 40 DEG F PER WSEC.
6. TEMPERATURE CONTROL SYSTEM SHALL HAVE A MINIMUM DEAD BAND OF 5 DEGREES AS REQUIRED BY WSEC.
7. HVAC SYSTEMS SHALL BE EQUIPPED WITH AUTOMATIC CONTROLS CAPABLE OF PROVIDING NIGHT SETBACK, SEVEN DIFFERENT DAILY SCHEDULES, AND OPTIMUM START PER THE REQUIREMENTS OF WSEC.
8. OUTSIDE AIR INTAKES, EXHAUST OUTLETS, AND RELIEF OUTLETS SHALL BE PROVIDED WITH DAMPERS THAT COMPLY WITH WSEC. DAMPER SHALL AUTOMATICALLY CLOSE WHEN SYSTEM OR SPACES SERVED ARE NOT IN USE OR DURING WARM-UP, COOL-DOWN, AND SETBACK. DAMPER MAXIMUM LEAKAGE RATE SHALL NOT EXCEED MAXIMUM ALLOWED BY WSEC.
9. ALL DUCTWORK SHALL BE CONSTRUCTED AND SEALED IN ACCORDANCE WITH IMC, WSEC AND IBC REQUIREMENTS.
10. DUCTWORK SHALL BE INSULATED TO THE APPROPRIATE R-VALUE AS REQUIRED BY WSEC.
11. PIPING SHALL BE INSULATED AS REQUIRED BY WSEC.
12. PIPING INSULATION EXPOSED TO WEATHER SHALL BE PROTECTED FROM DAMAGE, INCLUDING THAT DUE TO SUNLIGHT, MOISTURE, EQUIPMENT MAINTENANCE AND WIND, AND SHALL BE SHIELDED FROM SOLAR RADIATION PER WSEC.
13. AIR SYSTEMS SHALL BE BALANCED AS REQUIRED BY THE WSEC.
14. PROVIDE COMMISSIONING PLAN & REPORT REQUIREMENTS FOR PRELIMINARY AND FINAL COMMISSIONING PER WSEC. PROVIDE SEQUENCE OF OPERATIONS AND TEST PROCEDURES PER WSEC AND SUBMIT COMPLIANCE CHECKLIST.
15. THESE "ENERGY CODE NOTES" ARE LISTED TO SATISFY THE BUILDING DEPARTMENT'S REQUIREMENT THAT CERTAIN INFORMATION BE PLACED ON THE PLANS, BUT DO NOT DIMINISH THE FULL PROJECT REQUIREMENTS. PROVIDE ITEMS IN EXCESS OF CODE WHERE NOTED ON DRAWINGS AND IN SPECIFICATIONS.

LIST OF MECHANICAL DRAWINGS

MECHANICAL GENERAL NOTES

1. ALL DUCT WALL PENETRATIONS SHALL BE PROVIDED WITH CLOSURE COLLARS AND BE TIGHTLY SEALED TO PREVENT THE TRANSMISSION OF NOISE OR SMOKE.
2. CONTRACTOR SHALL CAREFULLY COORDINATE WORK W/ ALL OTHER TRADES, ESPECIALLY IN CEILING SPACES WHERE SPACE IS TIGHT. SHEET METAL CONTRACTOR SHALL HAVE PRIORITY OVER OTHER MECHANICAL TRADES IN CEILING SPACE WHERE CONFLICTS OCCUR.
3. ALL DUCTWORK SHOWN IS SCHEMATIC, CONTRACTOR SHALL PROVIDE ALL OFFSETS/ELBOWS AS REQ'D TO ALLOW ROUTING AROUND STRUCTURE, ELECTRICAL, & OTHER INTERFERENCES.
4. FLEXIBLE DUCT LENGTH SHALL NOT EXCEED 8 FEET, AND MAY ONLY BE USED WHERE SPECIFICALLY SHOWN ON THE PLANS.
5. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE & SELECT FINAL LOCATIONS OF ALL AIR INLETS/OUTLETS. SHIFT AIR INLETS/ OUTLETS FROM LOCATIONS SHOWN AS REQ'D TO AVOID CONFLICTS W/ STRUCTURE, LIGHTS, & OTHER ITEMS. SUCH SHIFTS SHALL MAINTAIN SYMMETRY OF AIR TERMINALS & SHALL HAVE PRIOR APPROVAL OF ARCHITECT/ENGINEER.
6. VARIOUS CEILING AIR INLET/OUTLET CONN'S REQUIRE SIDE INLET PLENUM. PROVIDE WHERE REQ'D DUE TO SPACE LIMITATIONS TO PREVENT KINKS IN FLEX. DUCT AND ALLOW PROPER CONN.
7. VERIFY LOCATIONS OF ITEMS INSTALLED IN CEILINGS WITH ARCHITECTURAL REFLECTED CEILING PLANS PRIOR TO BEGINNING WORK. NOTIFY ARCHITECT OF DISCREPANCIES.
8. MECHANICAL EQUIPMENT 1/2 HP AND LESS SHALL HAVE ANY REQUIRED STARTER/CONTROL RELAY PROVIDED BY THE CONTROL CONTRACTOR (EXCEPT WHERE SPECIFICALLY SHOWN OR SPECIFIED OTHERWISE).
9. PROVIDE MANUAL VOLUME DAMPERS IN ALL BRANCH DUCTS AND SPLITS IN MAIN DUCTS AND WHERE REQ'D BY BALANCERS; ONLY SOME OF THE REQ'D DAMPERS ARE SHOWN ON THE PLANS.
10. UNSIZED DUCTS SHALL MATCH THE SIZE OF THE LARGEST ADJACENT DUCT THAT IS SIZED. WHERE THE ADJACENT DUCT SIZE IS NOT SHOWN, PROVIDE SA, OA, & EA DUCTS SIZED AT 0.08" PD PER 100 FEET; PROVIDE RA & RELIEF AIR DUCTS SIZED AT 0.07" PD PER 100 FEET (OR LARGER AS FAN SP OR NOISE CONSIDERATIONS REQUIRE).
11. UNSIZED PIPING SHALL MATCH THE SIZE OF THE LARGEST ADJACENT PIPE THAT IS SIZED. WHERE THE ADJACENT PIPE SIZE IS NOT SHOWN OR UNCLEAR, PROVIDE PLUMBING PIPE SIZES PER THE UPC. SIZE HW/CW PIPING ON CONNECTED WATER SUPPLY FIXTURE UNITS AND MAX HW PIPE VELOCITY OF 5 FPS, AND MAX CW PIPE VELOCITY OF 8 FPS. SIZE WASTE/VENT PIPING PER THE UPC FOR DFU'S. SIZE GAS PIPING PER CODE.
12. WHERE RETURN GRILLE CFM'S ARE NOT INDICATED, BALANCER SHALL CALCULATE & SUBMIT FOR ENGINEER REVIEW. RA = SA-OA.
13. DRAWINGS SCALES APPLY TO FULL SIZE SHEET ONLY. USE CAUTION IN OBTAINING DIMENSIONS AND QUANTITIES FROM DRAWINGS THAT ARE NOT FULL SIZE; USE DIMENSIONS CALCULATED FROM DIMENSIONS ON THE ARCHITECTURAL AND STRUCTURAL DRAWINGS OVER OTHER METHODS OF OBTAINING DIMENSIONS.
14. VERIFY ALL POWER REQUIREMENTS & STARTERS, DISCONNECTS, RELAYS & LOCATIONS (& WHO PROVIDES) W/ EC.
15. PROVIDE MOTORIZED DAMPERS ON EXHAUST OUTLETS & OA INTAKES AS REQUIRED BY CODE.
16. PROVIDE ALL CUTTING/PATCHING TO INSTALL ITEMS AS SHOWN. PATCH TO PRE-CONSTRUCTION CONDITIONS OR BETTER.
17. FIRE SPRINKLERS INCLUDE AN ALLOWANCE FOR OFFSET OF EXISTING PIPING TO ALLOW HVAC WORK. ASSUME 3 OFFSETS OF 15 LINEAR FEET (FOUR ELBOWS EACH LOCATION) OF 1-1/4" PIPING.
18. CONTROLS: BASE BID CONTROLS ARE STAND-ALONE LOCAL CONTROLS BY DIVISION 23. UNDER AN ALTERNATE BID ITEM, PROVIDE DIVISION 25 CONTROLS THAT INTEGRATE THE DIVISION 23 CONTROLS TO DDC AND CONNECT CONTROLS TO CENTRAL CITY OWNED FACILITIES. 1

GENERAL DEMOLITION NOTES

1. COORDINATE W/ GENERAL CONTRACTOR FOR DEMO SCOPE. ALL EXISTING MECHANICAL & PLUMBING ITEMS IN THE EXISTING BUILDING ARE TO BE DEMO'D.
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3. ALL EXISTING MECHANICAL & PLUMBING ITEMS SHALL BE REMOVED (UNO). THIS INCLUDES SUCH ITEMS AS THERMOSTATS, CONTROL DEVICES, DUCTS, FANS, PIPING, GRILLES, SUPPORTS, VALVES, CURBS, AND RELATED ACCESSORIES.
4. ABANDONED ITEMS, ANCHORS, INSERTS, PIPE STUBS, AND OTHER PROJECTIONS NOT BEING CONCEALED BY NEW CONSTRUCTION SHALL BE REMOVED TO 1" BELOW THE ADJACENT FINISHED SURFACE, AND THE DISTURBED AREA PATCHED.
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8. VERIFY SIZE & LOCATION OF ALL EXISTING ITEMS.

MECHANICAL LEGEND

SYMBOL	DESCRIPTION
	WASTE OR SOIL (W)
	VENT (V)
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	HOT WATER (HW)
	HOT WATER CIRCULATING (HWC)
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	PIPE UP
	PIPE DOWN
	PIPE TEE IN LINE, BRANCH PIPE DOWN
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RL	REFRIGERANT LIQUID
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	ISOLATION VALVE
	COMBINATION SHUT-OFF & BALANCING VALVE
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	UNION
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	STRAINER WITH BLOW-OFF VALVE
	CONCENTRIC REDUCER
	PRESSURE REDUCING VALVE
	PRESSURE GAUGE
	THERMOMETER
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	FLOOR DRAIN
20/12	DUCT (FIRST FIGURE, SIDE SHOWN)
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	FLEXIBLE CONNECTION
	FIRE DAMPER
	FLEXIBLE DUCT
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SIZE SYMBOL CFM	WALL OUTLET (OR INLET)
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IT	INTERVAL TIMER
C	CARBON DIOXIDE (C02) SENSOR (DEMAND VENTILATION)
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SYMBOL	DESCRIPTION
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B.O.B.	BOTTOM OF BEAM
BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNIT/HOUR
BLDG	BUILDING
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COP	COEFFICIENT OF PERFORMANCE
COMP	COMPRESSOR
CONN	CONNECTION
CONT	CONTINUE, CONTINUATION
CO2	CARBON DIOXIDE
CW	COLD WATER
DEG F, F	DEGREE FAHRENHEIT
DFU	DRAINAGE FIXTURE UNITS
DIA, Ø	DIAMETER
DOAS	DEDICATED OUTSIDE AIR SYSTEM
DN	DOWN
DWG	DRAWING
DB	DRY BULB
EA	EACH
EC	ELECTRICAL CONTRACTOR
ELEC	ELECTRICAL, ELECTRIC
(E), EXIST	EXISTING
EER	ENERGY EFFICIENCY RATIO
EAT	ENTERING AIR TEMPERATURE
EWB	ENTERING WET BULB
EDB	ENTERING DRY BULB
EOL	END OF LINING
EXH	EXHAUST
ESP	EXTERNAL STATIC PRESSURE
FV	FACE VELOCITY
FOB	FLAT ON BOTTOM
FOT	FLAT ON TOP
FPM	FEET PER MINUTE
FPS	FEET PER SECOND
FLEX	FLEXIBLE
FLA	FULL LOAD AMPS
FLR	FLOOR
G	GAS
GAL	GALLON
GALV.	GALVANIZED
GC	GENERAL CONTRACTOR
GPH	GALLON PER HOUR
HW	HOT WATER
HWC	HOT WATER CIRCULATION
HP	HORSE POWER
IN	INCH
KW	KILOWATT
LAT	LEAVING AIR TEMPERATURE
LDB	LEAVING DRY BULB
LWB	LEAVING WET BULB
MFR	MANUFACTURER
MAX	MAXIMUM
MFS	MAXIMUM FUSE SIZE
MBH	THOUSAND BTUH
MECH	MECHANICAL
MIN	MINIMUM
MCA	MINIMUM CIRCUIT AMPS
MOP	MAXIMUM OVERCURRENT PROTECTION
NO.	NUMBER
NTS	NOT TO SCALE
OBD	OPPOSED BLADE DAMPER
OA	OUTSIDE AIR
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
PH	PHASE
PD	PRESSURE DROP
PTHP	PACKAGED THERMAL HEAT PUMP
RLA	RATED LOAD AMPS
REF	REFERENCE
REQ'D	REQUIRED
RA	RETURN AIR
RPM	REVOLUTIONS PER MINUTE
RM	ROOM
RG	REFRIGERANT GAS
RL	REFRIGERANT LIQUID
SA	SUPPLY AIR
SS	SANITARY SEWER
TEMP	TEMPERATURE
TD	TRANSFER DUCT
TG	TRANSFER GRILLE
T.O.D.	TOP OF DUCT
TSP	TOTAL STATIC PRESSURE
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
UPC	UNIFORM PLUMBING CODE
V	VOLTS, VOLTAGE
VFD	VARIABLE FREQUENCY DRIVE
W	WATT
WB	WET BULB
W/	WITH
WSEC	WASHINGTON STATE ENERGY CODE
ZD	ZONE DAMPER

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LEO CHARLES MEDINA — REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON — SIGNED 05-23-2022

KMB Project # 22016

FIRE STATION 13 HVAC REPLACEMENT
CITY OF TACOMA
3825 N 25TH ST, TACOMA, WA 98406

ORIGINAL SHEET SIZE = 24 x 36
HALF SIZE REDUCTIONS = 11 x 17

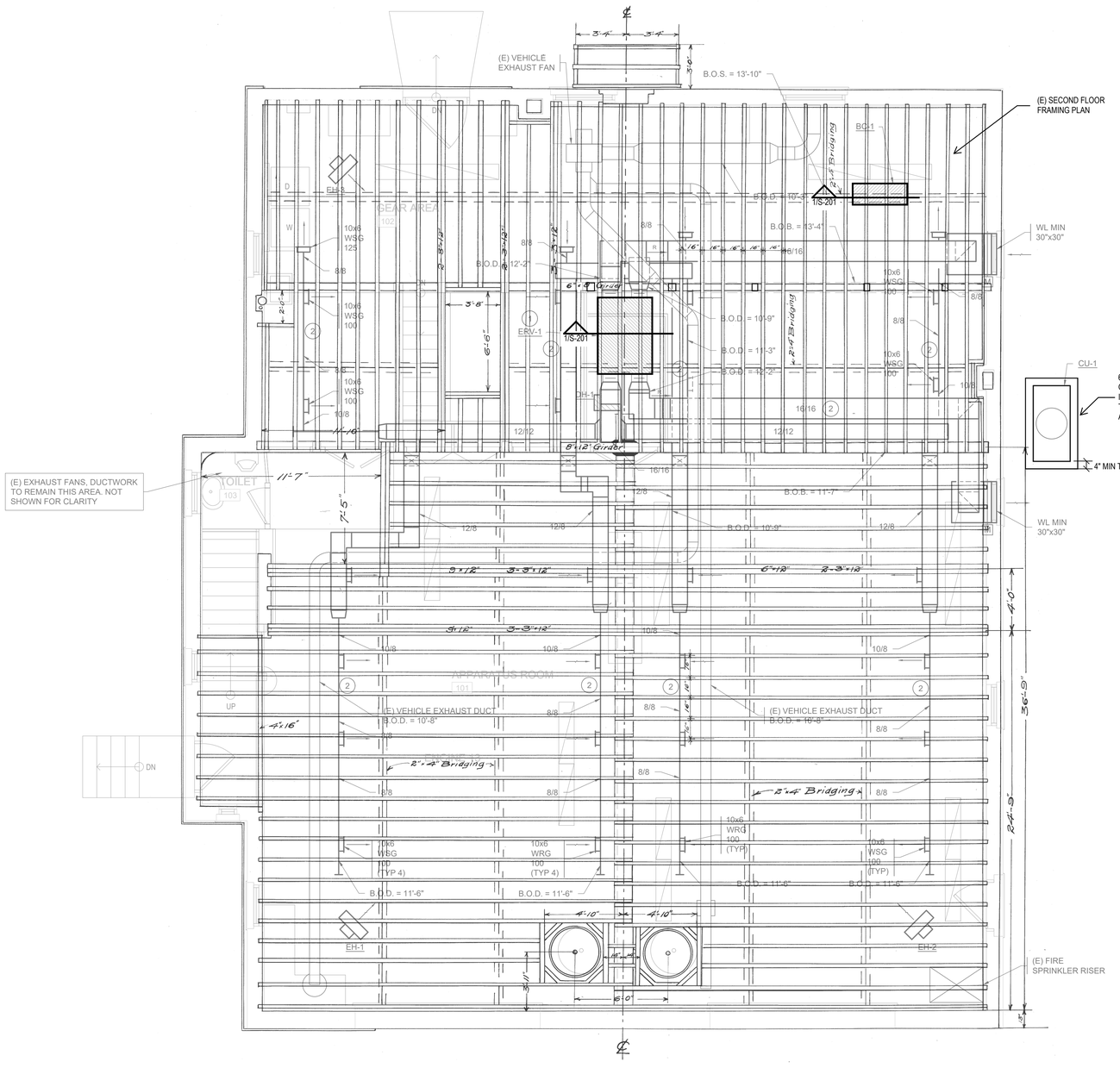
REVISIONS:
1 Duct Height & HVAC Controls 1-24-2023

DATE: 05/23/2022

CONSTRUCTION DOCUMENTS

SHEET NO.
M-001
MECHANICAL LEGEND & NOTES

HULTZ BHU engineers inc
1111 Fawcett Ave Suite 100 Tacoma, WA 98402
Phone: (253) 383-3257 Fax: (253) 383-3283
general@hultzbhu.com Job Number: 22-056



1 SECOND FLOOR FRAMING PLAN - HVAC
1/4" = 1'-0"

SCALE 1/4" = 1'-0"

GENERAL NOTES:

ALL NEW SAWN LUMBER TO BE DF #1 GRADE, UNLESS NOTED OTHERWISE.

ALL WOOD FRAMING HARDWARE BY SIMPSON STRONG-TIE OR EQUAL, UNLESS NOTED OTHERWISE.

ALL MECH UNIT SUPPORT HARDWARE BY UNISTRUT, UNLESS NOTED OTHERWISE.

VERIFY SIZE AND LOCATION OF ALL MECHANICAL PENETRATIONS WITH ARCHITECTURAL AND MECHANICAL DRAWINGS.

EXISTING FRAMING IS IMAGE FROM ORIGINAL CONSTRUCTION DRAWINGS PROVIDED BY OWNER, CONTRACTOR REVIEW FOR ACCURACY PRIOR TO START OF FABRICATION/ CONSTRUCTION

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05/25/2022
AHBL Project #2220439.20

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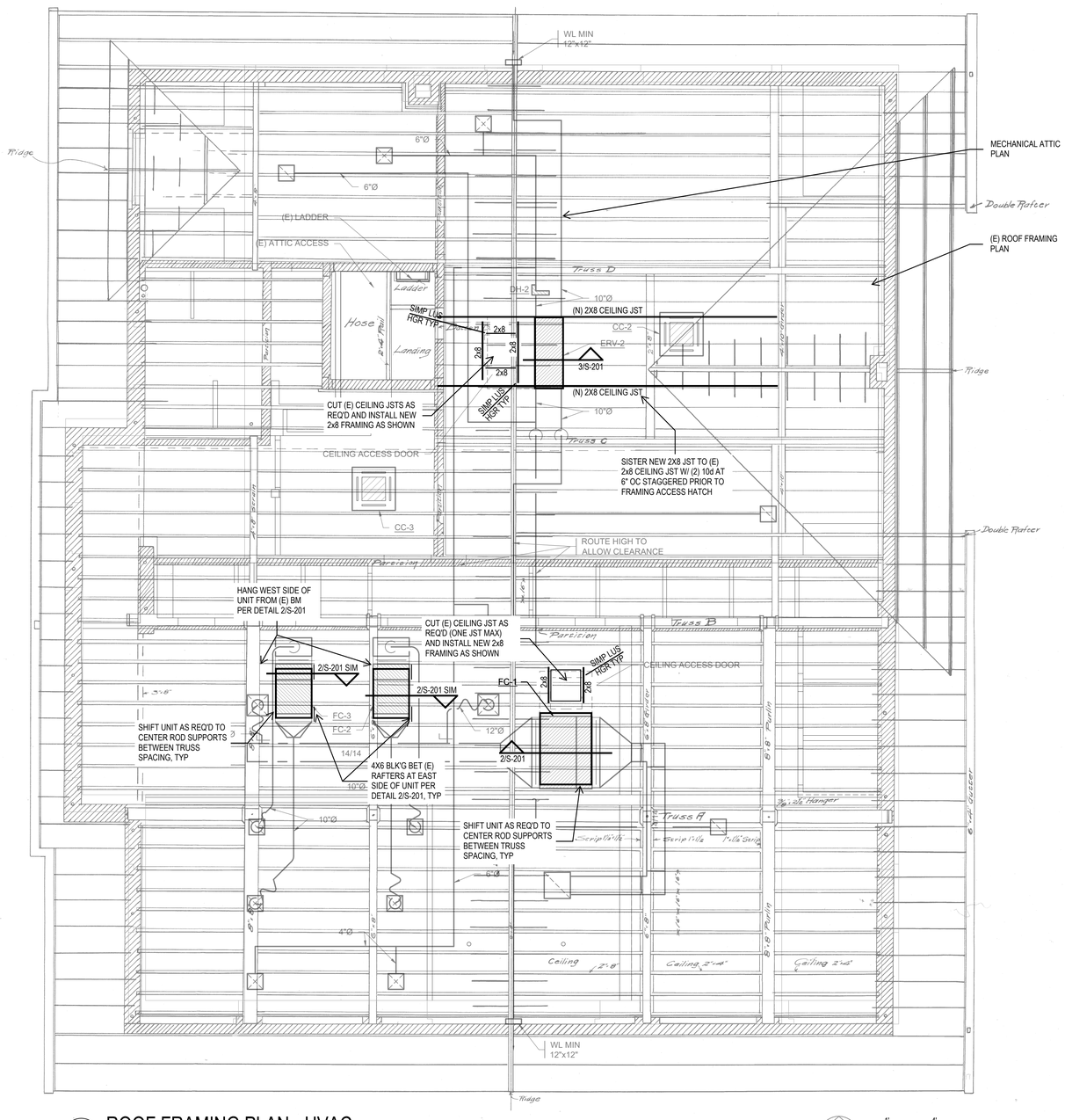
REVISIONS:
1 MECH UNITS PLACEMENT 01/25/23

DATE:
05/25/2022

CONSTRUCTION DOCUMENTS

SHEET NO.
S-101
SECOND FLOOR FRAMING PLAN

AHBL



1 ROOF FRAMING PLAN - HVAC
1/4" = 1'-0"

SCALE 1/4" = 1'-0"

GENERAL NOTES:

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DATE:
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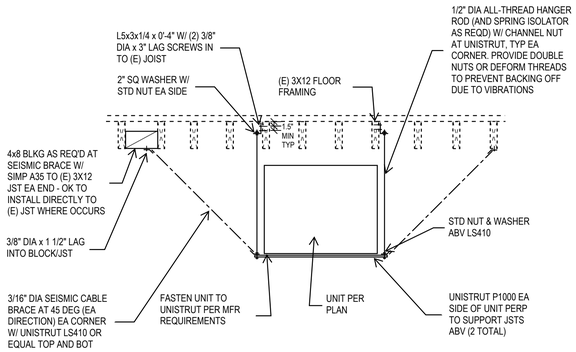
CONSTRUCTION DOCUMENTS

SHEET NO.
S-102
ROOF FRAMING PLAN

AHBL



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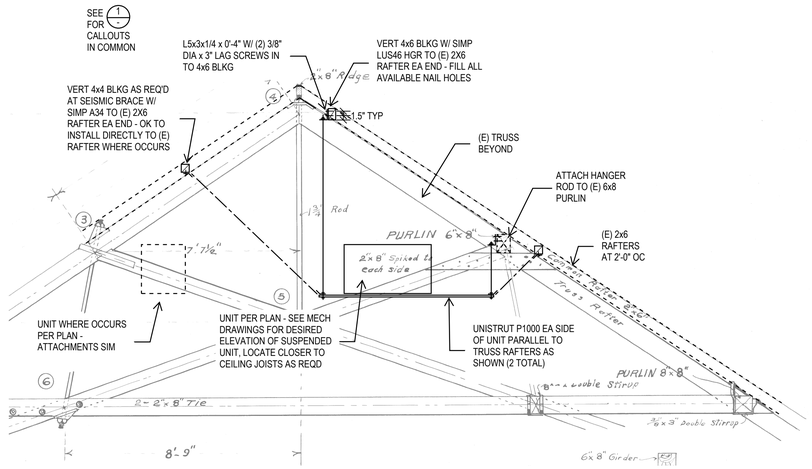

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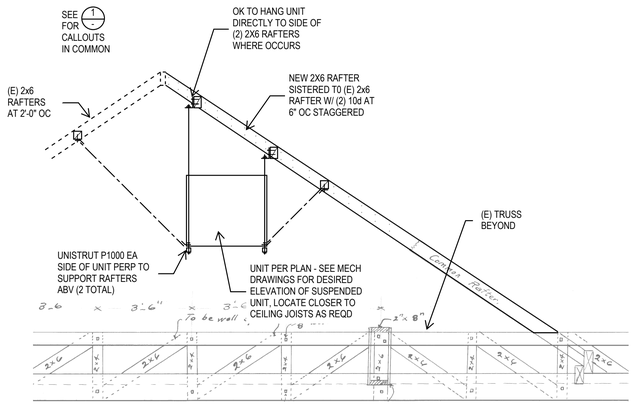

SECTION 3
N.T.S.

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CONSTRUCTION DOCUMENTS

SHEET NO.
S-201
STRUCTURAL DETAILS

AHBL