University of Kentucky®

Procurement Services

REQUEST FOR PROPOSALS

UK-2563.30-9-25
UK CTC
Mechanical Equipment Purchases
ADDENDUM #1
10/08/2024

ATTENTION: This is not an order. Read all instructions, terms, and conditions carefully.

IMPORTANT: RFP AND ADDENDUM MUST BE RECEIVED BY: 10/22/2024 @ 3:00 P.M. LEXINGTON, KY TIME

Offeror should acknowledge receipt of this and any addendum as stated in the Request for Proposal.

ITEM #1: Notice to Offerors:

- The proposals "Due Date" has been extended to 10/22/2024. The time and location for submission of the proposals remains the same.

ITEM #2: Updates to Original Bid Documents and Questions and Answers:

- Please refer to and incorporate into your proposals the enclosed information from the project team.

OFFICIAL APPROVAL
UNIVERSITY OF KENTUCKY

10/08/2024

Ken Scott

Ken Scott, Purchasing Officer

SIGNATURE

_____

_____

Typed or Printed Name

University of Kentucky
Procurement Services
322 Peterson Service Building
Lexington, KY 40506-0005

An Equal Opportunity University

CHAMPLIN
ARCHITECTURE

Addendum #01

Client	University of Kentucky Healthcare	Date	10/2/2024
Project	UK CTC Mechanical Equipment Package	UK Project #	2563.0
	UK-2563.30-9-25	Champlin Project #	514-6926

This addendum provides information to clarify or adjust construction items which may affect any or all trade contractors. The original documents for the referenced project are amended as noted in this addendum and made part of said documents and shall govern the work covered by the Form of Proposal. All work to be in strict accordance with the terms, stipulations and conditions of contract documents.

CLARIFICATION:
Drawings with revision clouds have changes as described below.

SUMMARY OF ATTACHMENTS

PART A - DRAWINGS:

M700 – SHELL & CORE – MECHANICAL SCHEDULES

1. *Refer to bubbled changes to EF9_GE_678N*
2. *Refer to bubbled changes to EF10_PHM_5N*
3. *Refer to bubbled changes to EF11_LAB_2N*
4. *Refer to bubbled changes to EF13_ISO_1S*
5. *Refer to bubbled changes to EF20_SUR_2S*
6. *Refer to bubbled changes to EF22_LAB_0S*

PART B - SPECIFICATIONS:

SECTION 236416 – CENTRIFUGAL WATER CHILLERS

1. *Replace "Section 236416 – Centrifugal Water Chillers" with new "Section 236426 FL – Screw Water Chillers" provide.*

SECTION 237314 – FACTORY BUILT CUSTOM INDOOR AIR HANDLING UNITS

1. *Refer to subsection 2.3 line H, revise minimum door thickness from 3" to 4".*
2. *Refer to subsection 2.8 line F, revise fin thickness from 0.0075" to 0.0095".*
3. Refer to subsection 2.9 line D, revise reference to wash down duty requirements to be wipe down duty for bipolar ionization.

PART C – RESPONSES TO BIDDER QUESTIONS:

See project team responses to bidder questions.

PART D – EXHIBITS

T 513.241.4474 TF 800.925.4424 720 East Pete Rose Way, Cincinnati, OH 45202 thinkchamplin.com

Updated OFCI exhibit to include new M700 and to add M702 (previously omitted).

Part E – SKETCHES

None.

PART F – UPDATED BID FORMS

None.

End of Addendum

C&S - AIR HANDLING UNIT SCHEDULE

MARK	MANUFACTURER	TYPE	SERVICE	LOCATION	PHYSICAL DATA WIDTH (IN.)	LENGTH (IN.)	HEIGHT (IN.)	WEIGHT (LBS)	SUPPLY FAN TOTAL SA CFM	MIN. OA CFM	# OF FANS	FAN RPM	E.S.P. (" WC)	T.S.P. (" WC)	RATED H.P. (PER FAN)	B.H.P. (PER FAN)	VOLT.	PH.	MCA	MOCP	VFD	OP. FREQ.	RETURN FAN TOTAL RA CFM	# OF FANS	FAN RPM	E.S.P. (" WC)	T.S.P. (" WC)	RATED H.P. (PER FAN)	B.H.P. (PER FAN)	VOLT.	PH.	MCA	MOCP	VFD	OP. FREQ.	REMARKS
AHU1_DT_0S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	RAD / ONC	CSA00F MECH/PLUMBING	156	582	120	40572	41000	12300	8	2982	3.50	7.09	15.00	8.87	460 V	3	175.0 A	200	Yes	60	32800	6	1260	2.00	2.52	5.00	3.15	460 V	3	54.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU2_DT_1S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	URGENT CARE	CSA00F MECH/PLUMBING	114	516	112	26065	22500	6750	4	2976	3.50	6.56	15.00	9.13	460 V	3	87.5 A	100	Yes	60	18000	4	1453	2.00	2.52	5.00	2.76	460 V	3	33.5 A	40	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU3_LAB_12N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	IMAGING / LAB	B003A MECH/PLUMBING	150	588	132	37772	45000	13500	8	3187	3.50	7.46	15.00	10.88	460 V	3	175.0 A	200	Yes	60	36000	6	1276	2.00	2.52	5.00	3.47	460 V	3	54.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU4_AUX_012N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	LOADING DOCK / CONFERENCE CENTER	C006 MECHANICAL	108	494	132	22497	29000	12000	6	3091	3.50	7.15	15.00	8.58	460 V	3	132.0 A	150	Yes	60	23200	4	1368	2.00	2.52	7.50	3.46	460 V	3	48.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU5_CLIN_567N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH,6TH,7TH FL CLINIC / PH SUPPORT	PH800 MECHANICAL	140	504	132	29473	41000	12300	8	3281	3.00	6.31	15.00	8.31	460 V	3	175.0 A	200	Yes	60	32800	6	1618	2.00	2.52	7.50	3.63	460 V	3	83.0 A	100	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU6_SUR_2N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	ASC	PH800 MECHANICAL	110	576	132	26502	30000	6000	6	2955	3.00	6.85	15.00	8.74	460 V	3	132.0 A	150	Yes	60	24000	4	1496	2.00	2.52	7.50	3.76	460 V	3	48.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU7_OFC_4S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	4TH FL ADMIN / SHELL	PH800 MECHANICAL	152	504	132	32160	45000	13500	8	3015	3.00	6.27	15.00	8.96	460 V	3	175.0 A	200	Yes	60	36000	6	1167	2.00	2.52	5.00	3.60	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU8_CLIN_34N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	3RD FL CINIC / 4TH FL SHELL	PH800 MECHANICAL	156	576	132	36960	49000	14700	8	3111	3.00	6.77	15.00	10.48	460 V	3	175.0 A	200	Yes	60	39200	6	1176	2.00	2.52	5.00	3.94	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU9_DT_5N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH FL COMPOUNDING PHARMACY	PH800 MECHANICAL	90	453	100	17824	17000	7500	4	3071	3.00	6.14	10.00	6.55	460 V	3	56.0 A	70	Yes	60	13600	4	1770	2.00	2.52	5.00	2.09	460 V	3	34.0 A	50	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU10_CLIN_3S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	3RD FL CLINICS	PH800 MECHANICAL	150	504	132	31778	42000	12600	8	2960	3.00	6.3	15.00	8.62	460 V	3	175.0 A	200	Yes	60	33600	6	1132	2.00	2.52	5.00	3.28	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU11_CLIN_6S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	6TH FL CLINICS	PH800 MECHANICAL	138	498	132	26690	40000	12000	8	2934	3.00	6.7	15.00	8.55	460 V	3	175.0 A	200	Yes	60	32000	6	1373	2.00	2.52	7.50	3.30	460 V	3	83.0 A	100	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU12_DT_5S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH FL INFUSION	PH800 MECHANICAL	114	576	132	27615	32000	9600	6	2958	3.00	6.19	15.00	8.66	460 V	3	132.0 A	150	Yes	60	25600	4	1155	2.00	2.52	7.50	3.70	460 V	3	55.0 A	70	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU13_CLIN_7S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	7TH FL CLINIC	PH800 MECHANICAL	152	504	132	32214	44000	13200	8	2978	3.00	6.24	15.00	8.66	460 V	3	175.0 A	200	Yes	60	35200	6	1157	2.00	2.52	7.50	3.50	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU14_SUR_2S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CENTRAL STERILE	PH800 MECHANICAL	132	624	132	33310	38000	13000	6	3158	3.00	6.59	15.00	10.68	460 V	3	131.0 A	150	Yes	60	30400	6	1575	2.00	2.94	7.50	3.78	460 V	3	72.0 A	90	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,19
AHU15_MER_0S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CSA00F MECH/PLUMBING	CSA00F MECH/PLUMBING	48	162	62	5124	5000	0	1	2975	2.50	4.98	10.00	5.83	460 V	3	15.0 A	20	Yes	60	[redacted]													1,3,4,5,6,7,8,10,11,12,13,14,15,17,19
AHU16_MER_8	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	PH800 MECHANICAL	PH800 MECHANICAL	90	234	98	8796	16000	0	4	2968	3.00	5.5	10.00	5.57	460 V	3	58.0 A	70	Yes	60	[redacted]													1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU17_LOB_1S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CAFE / LOBBY	CSA00F MECH/PLUMBING	120	492	120	24740	30000	6000	6	2902	3.50	6.69	15.00	8.17	460 V	3	132.0 A	120	Yes	60	24000	4	1249	2.00	2.52	5.00	3.45	460 V	3	36.0 A	45	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19

C&S - AIR HANDLING UNIT SCHEDULE - CHILLED WATER COIL

MARK	CHILLED WATER COIL COOLING CAPACITY (MBH)	COOLING CAPACITY SENSIBLE (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	MAX. FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN. WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX. COIL ROWS	COILS PER BANK	MAX. FIN SPACING (FINS/IN)
AHU1_DT_0S	2082.0	1298.0	81	68	52	51	452	0.59	42	58	259	12.90	8	3	9
AHU2_DT_1S	1109.0	701.0	81	68	52	51	444	0.58	42	58	138	7.80	8	2	9
AHU3_LAB_12N	2483.0	1458.0	81	68	52	51	454	0.65	42	58	309	12.44	8	3	10
AHU4_AUX_012N	1571.0	924.0	81	68	52	51	448	0.58	42	58	196	17.65	8	3	9
AHU5_CLIN_567N	1981.0	1254.0	81	68	52	51	448	0.52	42	58	247	15.39	8	3	8
AHU6_SUR_2N	1335.0	891.0	79	66	52	51	449	0.58	42	58	166	12.75	8	3	9
AHU7_OFC_4S	2260.0	1420.0	81	68	52	51	451	0.59	42	58	282	11.87	8	3	9
AHU8_CLIN_34N	2347.0	1471.0	80	68	52	51	473	0.64	42	58	292	12.98	8	3	9
AHU9_DT_5N	1072.0	626.0	82	69	48	48	448	0.86	42	58	134	15.14	10	2	11
AHU10_CLIN_3S	1996.0	1251.0	79	67	52	51	448	0.58	42	58	249	15.86	8	3	9
AHU11_CLIN_6S	1946.0	1229.0	81	68	53	52	448	0.53	42	58	243	14.68	8	3	8
AHU12_DT_5S	1474.0	928.0	80	67	53	52	449	0.53	42	58	184	15.82	8	3	8
AHU13_CLIN_7S	2209.0	1389.0	81	68	52	52	448	0.58	42	58	275	11.29	8	3	9
AHU14_SUR_2S	824.0	697.0	65	56	48	48	448	0.72	42	58	102	19.16	8	3	10
AHU15_MER_0S	220.8	140.7	79	67	53	52	470	0.72	42	54	28	13.16	6	1	11
AHU16_MER_8	710.4	452.2	79	67	53	52	444	0.65	42	54	89	8.23	6	2	11
AHU17_LOB_1S	1592.0	941.0	81	69	52	52	448	0.58	42	58	198	11.45	8	3	9

C&S - AIR HANDLING UNIT SCHEDULE - HOT WATER COIL

MARK	HOT WATER COIL TOTAL HEATING CAP (MBH)	EAT (°F)	LAT (°F)	MAX. FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX COIL ROWS	COILS PER BANK	MAX. FIN SPACING (FINS/IN)
AHU1_DT_0S	801.3	45	65	495	0.06	130	110	81	4.27	1	2	4
AHU2_DT_1S	247.5	45	55	500	0.03	130	110	25	6.56	1	2	4
AHU3_LAB_12N	1061.0	45	66	499	0.06	130	110	107	5.37	1	3	4
AHU4_AUX_012N	317.9	45	55	496	0.03	130	110	32	4.24	1	3	4
AHU5_CLIN_567N	504.0	45	56	497	0.06	130	110	51	4.10	1	3	4
AHU6_SUR_2N	662.0	45	66	490	0.06	130	110	67	5.70	1	3	4
AHU7_OFC_4S	492.4	45	55	500	0.03	130	110	50	4.13	1	3	4
AHU8_CLIN_34N	1084.0	45	65	473	0.06	130	110	109	5.16	1	3	4
AHU9_DT_5N	322.2	38	55	500	0.05	130	110	33	3.32	1	2	7
AHU10_CLIN_3S	457.4	45	55	500	0.03	130	110	46	3.47	1	3	4
AHU11_CLIN_6S	444.3	45	55	497	0.03	130	110	45	9.36	1	3	4
AHU12_DT_5S	701.7	45	65	500	0.06	130	110	71	6.50	1	3	4
AHU13_CLIN_7S	480.7	45	55	500	0.03	130	110	49	3.90	1	3	4
AHU14_SUR_2S	890.7	45	66	498	0.11	130	110	90	3.60	1	3	4
AHU15_MER_0S	[redacted]											
AHU16_MER_8	947.9	38	92	498	0.30	130	110	96	3.89	3	2	10
AHU17_LOB_1S	332.3	45	55	500	0.03	130	110	34	9.22	1	3	4

C&S - AIR HANDLING UNIT SCHEDULE - PRE COOLING CHILLED WATER COIL

MARK	PRE COOLING CHILLED WATER COIL COOLING CAPACITY (MBH)	COOLING CAPACITY SENSIBLE (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	MAX. FACE VELOCITY (FPM)	MAX AIR PRESSURE DROP (IN. WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX COIL ROWS	COILS PER BANK	MAX. FINS SPACING (FINS/IN)
AHU14_SUR_2S	1456	728	95	78	44	44	153	0.09	35	47	256	14.74	8	3	9

REMARKS:

1. PROVIDE ACCESS RAIL AT EACH FAN ARRAY FOR FAN REMOVAL.
2. PROVIDE DEDICATED SECTION FOR ADIABATIC HUMIDIFIER DISPERSION GRID. COORDINATE REQUIREMENTS WITH HUMIDIFIER MANUFACTURER
3. FAN ARRAY VFD'S, DAMPER ACTUATORS, AND ALL OTHER CONTROLS APPURTENANCES TO BE PROVIDED BY CONTROLS CONTRACTOR IN SEPARATE BID PACKAGE.
4. INDIVIDUAL PLENUM FANS SHALL NOT EXCEED 15 HP IN SIZE.
5. PROVIDE STAINLESS STEEL DRAIN PANS AT HUMIDIFIER AND COOLING COIL SECTIONS.
6. PROVIDE BI-POLAR IONIZATION UPSTREAM OF COOLING COIL. PROVIDE ALL FIELD WIRING, DISCONNECTS, AND BACNET CONTROLS INTERFACE.
7. PROVIDE CAMFIL C78 FILTER CLIPS AT FILTER RACKS. CLIPS SHALL BE SIZED TO MATCH FILTER DIMENSIONS.
8. PROVIDE INDIVIDUAL BACKDRAFT DAMPERS AT ALL FANS.
9. N+1 FAN ARRANGEMENT ON SUPPLY AND RETURN FAN ARRAYS (IF APPLICABLE).
10. CHILLED WATER AND HOT WATER COILS SHALL BE 0.035" THICK. MAX FIN SPACING = 12 FINS/INCH.
11. REFER TO AHU SECTION DETAIL FOR DOOR, COIL CONNECTIONS AND HUMIDIFIER SECTION LOCATION.
12. PROVIDE PREMIUM EFFICIENT MOTORS COMPLETE WITH TYPE H INSULATION.
13. PROVIDE MARINE LIGHTS INSIDE AHU.
14. PROVIDE SINGLE POWER DISTRIBUTION PANEL FOR EACH FAN ARRAY. COORDINATE WITH TEMPERATURE CONTROLS CONTRACTOR FOR VFD SELECTIONS.
15. AHU'S TO BE PROVIDED AND INSTALLED WITH UE ONTRACK SYSTEMS WIRELESS GREASER SENSOR, GREASER SENSOR TO BE TIED INTO BAS.
17. REFER TO AHU SECTION ON SHEET M400 THROUGH M404. CONTRACTOR SHALL COORDINATE UNIT SECTIONS, CONFIGURATION, DIMENSIONS AND ALL OTHER PROVIDED DATA WITH PROVIDED SECTIONS.
18. PROVIDE WITH LOW TEMP AHU CONFIGURATION (REFER TO AHU SECTIONS). SEE "AIR HANDLING UNIT SCHEDULE - PRE COOLING CHILLED WATER COIL". LOW TEMP CHILLER AND ALL ASSOCIATED PIPING, FINAL CONNECTIONS, ETC TO BE PROVIDED IN FUTURE FIT-OUT PACKAGE
19. REFER TO VFD SCHEDULE FOR VFD INFORMATION.

C&S - AIR HANDLING UNIT SCHEDULE - FILTER SECTION

MARK	PREFILTER TYPE	FILTER EFFICIENCY	NO. OF 24"X24"X2" FILTERS	NO. OF 12"X24"X2" FILTERS	FACE VELOCITY (FPM)	PRESSURE DROP (CLEAN) ("WC)	PRESSURE DROP (DIRTY) ("WC)	FINAL FILTER TYPE	FILTER EFFICIENCY	NO OF 24"X24"X12" FILTERS	NO. OF 12"X24"X12" FILTERS	FACE VELOCITY (FPM)	PRESSURE DROP (CLEAN) ("WC)	PRESSURE DROP (DIRTY) ("WC)	REMARKS
AHU1_DT_0S	PLEATED	MERV 8	24	0	427	0.26	0.76	RIGID	MERV 14	24	0	427	0.59	1.09	NONE
AHU2_DT_1S	PLEATED	MERV 8	16	0	352	0.22	0.72	RIGID	MERV 14	16	0	352	0.49	0.99	NONE
AHU3_LAB_12N	PLEATED	MERV 8	20	9	459	0.28	0.78	RIGID	MERV 14	20	9	459	0.63	1.13	NONE
AHU4_AUX_012N	PLEATED	MERV 8	16	4	403	0.25	0.75	RIGID	MERV 14	16	4	403	0.56	1.06	NONE
AHU5_CLIN_567N	PLEATED	MERV 8	20	5	456	0.28	0.78	RIGID	MERV 14	20	5	456	0.64	1.14	NONE
AHU6_SUR_2N	PLEATED	MERV 8	20	5	444	0.27	0.77	RIGID	MERV 14	20	5	444	0.62	1.12	1
AHU7_OFC_4S	PLEATED	MERV 8	20	9	459	0.28	0.78	RIGID	MERV 14	20	9	456	0.64	1.14	NONE
AHU8_CLIN_34N	PLEATED	MERV 8	24	6	454	0.28	0.78	RIGID	MERV 14	24	6	454	0.64	1.14	NONE
AHU9_DT_5N	PLEATED	MERV 8	9	3	405	0.25	0.75	RIGID	MERV 14	9	3	405	0.56	1.06	NONE
AHU10_CLIN_3S	PLEATED	MERV 8	20	9	429	0.27	0.77	RIGID	MERV 14	20	9	429	0.60	1.10	NONE
AHU11_CLIN_6S	PLEATED	MERV 8	20	5	444	0.27	0.77	RIGID	MERV 14	20	5	444	0.62	1.12	NONE
AHU12_DT_5S	PLEATED	MERV 8	16	4	444	0.27	0.77	RIGID	MERV 14	16	4	444	0.62	1.12	NONE
AHU13_CLIN_7S	PLEATED	MERV 8	20	9	449	0.28	0.78	RIGID	MERV 14	20	9	449	0.63	1.13	NONE
AHU14_SUR_2S	PLEATED	MERV 8	20	5	422	0.26	0.76	RIGID	MERV 14	20	5	422	0.60	1.10	2
AHU15_MER_0S	PLEATED	MERV 8	2	2	417	0.26	1.26	[redacted]							NONE
AHU16_MER_8	PLEATED	MERV 8	8	3	381	0.24	1.24	[redacted]							NONE
AHU17_LOB_1S	PLEATED	MERV 8	16	4	417	0.26	0.76	RIGID	MERV 14	16	4	417	0.58	1.08	NONE

REMARKS:

1. PROVIDE WITH PREE COOL PRE FILTERS (REFER TO AHU SECTION ON M400 SERIES SHEETS): (20) 24"X24"X2" PLEATED MERV 8 FILTERS, (5) 12"X24"X2" PLEATED MERV 8 FILTERS, 356FPM FACE VELOCITY, 0.25" PRESSURE DROP (CLEAN), 1.08" PRESSURE DROP (DIRTY)
2. PROVIDE WITH PREE COOL PRE FILTERS (REFER TO AHU SECTION ON M400 SERIES SHEETS): (20) 24"X24"X2" PLEATED MERV 8 FILTERS, (5) 12"X24"X2" PLEATED MERV 8 FILTERS, 338FPM FACE VELOCITY, 0.26" PRESSURE DROP (CLEAN), 1.06" PRESSURE DROP (DIRTY)

C&S - AIR HANDLING UNIT SCHEDULE - HUMIDIFIER

AIR HANDLER	DISPERSION GRID MANUFACTURER	TYPE	CAPACITY (LBS/HR)	ABSORPTION DISTANCE (IN)	DISPERSION GRID WIDTH (IN)	DISPERSION GRID HEIGHT (IN)	ENTERING ABSOLUTE HUMIDITY (GR/LB)	LEAVING ABSOLUTE HUMIDITY (GR/LB)	HUMIDIFIER AIR PRESSURE DROP (IN. WG)	CENTRAL/CONTROL UNIT MARK	MANUFACTURER	MODEL	CENTRAL UNIT (H"XW"D")	CONTROL UNIT (H"xW"XD")	CENTRAL UNIT WEIGHT (LB)	CONTROL UNIT WEIGHT (LB)	BOOSTER PUMP	FREQUENCY (HZ)	RO SKID MARK	MODEL	MANUFACTURER	CAPACITY (GPM)	RESERVOIR TANK(GAL)	VOLTAGE/PHASE	MOCP (A)	REMARKS
AHU1_DT_0S	CONDAIR	ADIABATIC	312	24	148	108	35.80	48.30	0.12	HUM_AHU1	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU1	ML RO 300	CONDAIR	1.2	13	480/3	16	1,2,3,4
AHU3_LAB_12N	CONDIAR	ADIABATIC	343	24	142	120	33.70	48.30	0.13	HUM_AHU3	CONDIAR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU_3	ML RO 300	CONDAIR	1.2	13	480/3	16	1,2,3,4
AHU6_SUR_2S	CONDAIR	ADIABATIC	355	24	102	120	35.80	48.30	0.14	HUM_AHU6	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU6,14	ML RO 500	CONDAIR	2.2	52	480/3	20	1,2,3,4,5
AHU8_CLIN_34N	CONDAIR	ADIABATIC	373	24	148	120	35.80	48.30	0.13	HUM_AHU8	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	[redacted]							
AHU12_DT_5S	CONDAIR	ADIABATIC	355	24	106	120	33.70	48.30	0.13	HUM_AHU12	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU8,12	ML RO 500	CONDAIR	2.2	52	480/3	20	1,2,3,4,6
AHU14_SUR_2N	CONDAIR	ADIABATIC	338	24	126	120	33.70	48.30	0.13	HUM_AHU14	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	[redacted]							

REMARKS:

1. PROVIDE REVERSE OSMOSIS (RO) WATER SYSTEM SIMILAR TO CONDAIR MLRO 800. RO WATER SYSTEM SHALL PROVIDE RO WATER TO MEET ALL HUMIDIFIER INTAKE WATER REQUIREMENTS. REFER TO RO WATER SYSTEM SPECIFICATIONS.
2. PROVIDE RO WATER SYSTEM WITH BACNET INTEGRATION.
3. PROVIDE DISPERSION GRID AND INSTALL IN ASSOCIATED AHU CASING. REFER TO AHU SUBMITTALS FOR HUMIDIFIER SECTION DIMENSIONS AND COORDINATE DISPERSION GRID DESIGN.
4. PROVIDE DISCONNECTS AND SINGLE POINT POWER CONNECTIONS FOR BOTH THE HUMIDIFIER AND THE RO WATER SYSTEM.
5. AHU6 AND AHU14 SHARE A COMMON RO SKID.
6. AHU8 AND AHU12 SHARE A COMMON RO SKID.

C&S - BOILER SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	FUEL	EWT (°F)	LWT (°F)	WATER FLOW (GPM)	INPUT (MBH)	GROSS OUTPUT (MBH)	GAS INLET PRESSURE (in W.C.)	VOLTAGE	PHASE	FLA	HZ	REMARKS
B-1	FULTON	EDR+6000	CONDENSING	NATURAL GAS	110	130	580	6000.0	5882.0	12.00	460 V	3	22 A	60	ALL
B-2	FULTON	EDR+6000	CONDENSING	NATURAL GAS	110	130	580	6000.0	5882.0	12.00	460 V	3	22 A	60	ALL

REMARKS:

1. PROVIDE DISCONNECT AND SINGLE-POINT POWER CONNECTION.
2. PROVIDE CONDENSATE ACID NEUTRALIZATION KIT.
3. DIRECT VENT CONFIGURATION. PROVIDE AL-29C INLET AND COMBUSTION VENT.
4. PROVIDE WITH FACTORY-MOUNTED CONTROLS. PROVIDE ALL EQUIPMENT/PROGRAMMING NECESSARY TO INTEGRATE CONTROLS INTO BUILDING AUTOMATION SYSTEM.
5. PROVIDE WITH VENTLESS GAS TRAIN.
6. PROVIDE WITH MERV 8 COMBUSION AIR INTAKE FILTER WITH SPARE.
7. PROVIDE WITH 160PSIG ASME SAFETY RELIEF VALVE.
8. PROVIDE WITH INDIFIDUAL BOILER CONDENSATE DRAIN TRAP.
9. PROVIDE WITH NATURAL GAS REGULATOR. CONFIRM TYPE WITH MANUFACTURE.

C&S - HYDRONIC PUMP SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	SERVICE	GPM	PRESSURE (FEET HEAD)	IMPELLER DIAMETER (IN)	VFD	MINIMUM EFFICIENCY (%)	RPM	ELECTRICAL DATA HZ	HP	NOL HP	VOLTAGE	PHASE	REMARKS
BBP-1	TACO	1509D	BASEMOUNTED END SUCTION	BASEBOARD HEATERS	75	70.00	8.30	Yes	60	1760	60	5	3.81	460 V	3	2,3,4,6,7,10,11,12
BBP-2	TACO	1509D	BASEMOUNTED END SUCTION	BASEBOARD HEATERS	75	70.00	8.30	Yes	60	1760	60	5	3.81	460 V	3	2,3,4,6,7,10,11,12
BP-1	TACO	6011D	CENTRIFUGAL IN-LINE	BOILER (B-1)	580	30.00	9.05		86	1160	60	7.5	5.64	460 V	3	1,2,3,4,5,6,7,9
BP-2	TACO	6011D	CENTRIFUGAL IN-LINE	BOILER (B-2)	580	30.00	9.05		86	1160	60	7.5	5.64	460 V	3	1,2,3,4,5,6,7,9
CHPP-1	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHPP-2	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHPP-3	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHWP-1	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CHWP-2	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CHWP-3	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CWP-1	TACO	3007D	BASEMOUNTED END SUCTION	CONDENSOR WATER LOOP	400	30.00	6.60		79	1760	60	5	3.97	460 V	3	1,3,4,6,7,11,12
CWP-2	TACO	3007D	BASEMOUNTED END SUCTION	CONDENSOR WATER LOOP	400	30.00	6.60		79	1760	60	5	3.97	460 V	3	1,3,4,6,7,11,12
GWP-1	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
GWP-2	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
GWP-3	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
HRCP-1	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HRCP-2	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HRCP-3	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HWP-1	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HWP-2	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HWP-3	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HXP-1	TACO	6011D	BASEMOUNTED END SUCTION	STEAM BACKUP HEATING WATER SYSTEM	1250	35.00	10.35	Yes	87	1160	60	15	13.28	460 V	3	2,3,4,6,7,10,11,12
HXP-2	TACO	6011D	BASEMOUNTED END SUCTION	STEAM BACKUP HEATING WATER SYSTEM	1250	35.00	10.35	Yes	87	1160	60	15	13.28	460 V	3	2,3,4,6,7,10,11,12
LFP-1	TACO	VR15L	IN-LINE	LF-1	15	10.00			47	2400	60	0.33	0.08	208 V	1	1,2,3,4,6,7,9
LFP-2	TACO	VR25H	IN-LINE	LF-2	130	20.00			62	4000	60	2	1.00	208 V	1	1,2,3,4,6,7,9
LFP-3	TACO	VR15M	IN-LINE	LF-3	50	27.00			63	4000	60	0.6	0.60	208 V	1	1,2,3,4,6,7,9

REMARKS:

1. PROVIDE DISCONNECT AND SINGLE-POINT POWER CONNECTION.
2. PROVIDE SHAFT GROUNDING RINGS.
3. PROVIDE SUCTION DIFFUSER WITH STRAINER.
4. PROVIDE ISOLATION VALVE, CHECK VALVE, AND FLEXIBLE COUPLINGS
5. CONSTANT SPEED PUMP TO BE CONTROLLED WITH BOILER OPERATION. CONFIRM REQUIRED INTERFACE WITH BOILER MANUFACTURER.
6. PUMPS TO BE INSTALLED UTILIZING VIBRATION ANALYSIS TO ENSURE PROPER ALIGNMENT. VIBRATION ANALYSIS SHALL BE PERFORMED BY A RMIC CERTIFIED INSTALLER.
7. PUMPS TO BE PROVIDED AND INSTALLED WITH UE ONTRACK SYSTEMS WIRELESS GREASER SENSOR, GREASER SENSOR TO BE TIED INTO BAS.
9. PROVIDE AND INSTALL WITH MANUFACTURED APPROVED FLOOR MOUNTED SUPPORTS.
10. REFER TO VFD SCHEDULE FOR VFD INFORMATION
11. REFER TO MECHANICAL ACCESS PLANS FOR PUMP MOTOR ELECTRICAL CONNECTION SIDE COORDINATION.
12. REFER TO MECHANICAL ACCESS PLAN FOR PUMP HANDYNESS/CONFIGURATION.

C&S - HEAT RECOVERY CHILLER

TAG	MANUFACTURER	MODEL #	TYPE	DIMENSIONS (IN) LENGTH	WIDTH	HEIGHT	WEIGHT (LBS)	FLUID TYPE	COOLING CAPCITY (TONS)	HEATING COP (KW/KW)	COMPRESSOR NET HEATING CAPACITY (MBH)	VOLTAGE	PHASE	MCA	MOCP	EVAPORATOR EWT (°F)	LWT (°F)	FLUID FLOW MIN (GPM)	FLUID FLOW MAX (GPM)	FLUID PD (FT HD)	CONDENSER EWT (°F)	LWT (°F)	FLUID FLOW MIN (GPM)	FLUID FLOW MAX (GPM)	FLUID PD (FT HD)	REMARKS
HRC-1	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL
HRC-2	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL
HRC-3	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL

REMARKS:

1. PROVIDE SINGLE-POINT POWER CONNECTION AND FACTORY MOUNTED DISCONNECT.
2. PROVIDE VIBRATION ISOLATORS.
3. PROVIDE FLOW SWITCH AND FACTORY-MOUNTED CONTROL PANEL. PROVIDE ALL EQUIPMENT/PROGRAMMING NECESSARY TO INTEGRATE CONTROLS INTO BUILDING AUTOMATION SYSTEM.
4. HEAT RECOVERY CHILLER. PROVIDE HOT GAS BYPASS TO PROVIDE 15% CAPACITY TURNDOWN.
5. PROVIDE 100 kAIC SCCR RATING.
6. PROVIDE PRESSURE RELIEF VALVE
7. SOUND DATA AT 100% LOAD: 88DB @ 63 HZ, 85 LPA

C&S - EXHAUST FAN SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	AIRFLOW (CFM)	E.S.P.	DRIVE	RPM	FAN HP	ELECTRICAL DATA VOLTAGE	PHASE	HZ	SONES	REMARKS
EF2_HTE_05S	GREENHECK	FJI-15-BI	LL HOT ROOM EXHAUST	CENTRIFUGAL WITH DISCHARGE STACK	1800	1.50	DIRECT	1533	1.00	460 V	3	60	19.4	2,5,7,8,9,10,13,14
EF6_GE_0123S	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.50	DIRECT	1770	10.00	460 V	3	60	30	2,5,9,12,13,14
EF7_GE_4567S	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.00	DIRECT	1770	10.00	460 V	3	60	27	2,5,9,12,13,14
EF8_GE_2345N	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.25	DIRECT	1770	10.00	460V	3	60	30	2,5,9,12,13,14
EF9_GE_678N	GREENHECK	CUE-300HP-VG	GENERAL EXHAUST	CENTRIFUGAL UPBLAST	7500	2.00	DIRECT	989	7.50	460 V	3	60	26	2,5,9,12,13,14
EF10_PHM_5N	STROBIC AIR	M33A20N100I4	COMPOUND PHARMACY EXHAUST	HIGH PLUME DILUTION	7150	3.00	DIRECT	1800	10.00	460 V	3	60	65	1,2,3,4,5,8,9,12,13,14,15,17,18
EF11_LAB_2N	STROBIC AIR	M33C20N200I4	LAB EXHAUST	HIGH PLUME DILUTION	8200	3.00	DIRECT	1800	20.00	460 V	3	60	65	1,2,3,4,5,8,912,13,14,15,17,18
EF13_ISO_1S	GREENHECK	FJI-10-BI	1ST FL ISOLATION EXHAUST	CENTRIFUGAL WITH DISCHARGE STACK	600	1.50	DIRECT	1948	0.33	115 V	1	60	17.4	2,5,7,8,9,10,13,14
EF15_LAB_5N	GREENHECK	G-097-A	LAB TANK STORAGE EXHAUST	CENTRIFUGAL DOWNBLAST	150	1.13	DIRECT	2070	0.25	115 V	1	60	9.2	2,5,7,9,13,14
EF20_SUR_2S	GREENHECK	QEID-20-90	CENTRAL STERILE	MIXED FLOW UPBLAST	8000	4.32	DIRECT	2109	10.00	460 V	3	60	37	2,5,9,12,13,14
EF21_MED_2S	GREENHECK	CUE-100HP-VG	2ND FLOOR MED GAS STORAGE	CENTRIFUGAL UPBLAST	200	0.75	DIRECT	1449	0.25	115 V	1	60	6.6	2,5,9,12,13,14
EF22_LAB_0S	GREENHECK	VEKTOR-H-16-11	MOLD FABRICATION HOOD	FUME EXHAUST SYSTEM	2000	2.00	DIRECT	1917	1.50	460 V	3	60	21	2,3,5,6,7,9,11,13,14,15,19
EF24_ISO_2N	GREENHECK	VEKTOR-H-10	2ND FLOOR ISOLATION FAN	FUME EXHAUST SYSTEM	500	2.00	DIRECT	2993	0.75	460V	3	60	71	2,3,5,6,7,9,11,13,14,15
EF25_MED_2N	GREENHECK	CUE-100HP-VG	2ND FLOOR MED GAS STORAGE	CENTRIFUGAL UPBLAST	200	0.75	DIRECT	1449	0.25	115 V	1	60	6.6	2,5,9,12,13,14

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REMARKS:

1. PROVIDE WITH 100% REDUNDANT FAN.
2. AIRFLOW CFM IS PER FAN.
3. PROVIDE WITH EXPLOSION PROOF MOTORS.
4. MINIMUM EFFECTIVE STACK HEIGHT IN 10 MPH WIND : 32 FT; MINIMUM EFFECTIVE STACK HEIGHT IN 15 MPH WIND: 24 FT.
5. PROVIDE 18" ROOF CURB.
6. FAN HORSEPOWER IS PER FAN.
7. PROVIDE ECM SPEED CONTROLLER.
8. PROVIDE WITH SHAFT GROUDING KIT.
9. PROVIDE WITH SPRING ISOLATORS.
10. PROVIDE TWO FANS OF THIS TYPE FOR REDUNDANCY.
11. PROVIDE DISCONNECT AND SINGLE POINT POWER CONNECTION.
12. REFER TO VFD SCHEDULE FOR VFD INFORMATION.
13. FANS TO BE PROVIDED AND INSTALLED WITH UE SYSTEM ONTRACK WIRELESS TEMP/VIBRATION SENSOR.
14. FANS TO BE PROVIDED AND INSTALLED WITH UE SYSTEM ONTRACK WIRELESS GREASER SENSOR.
15. PROVIDE WITH INTEGRAL SILENCERS.
16. IN-LINE EXHAUST FAN TO BE HUNG FROM STRUCTURE PER MANUFACTURE REQUIREMENETS
17. PROVIDE WITH REMOVABLE JIB CRANE SOCKET.
18. PROVIDE WITH FACTORY INSTALLED ACCESSIBLE PLENIUM.
19. PROVIDE WITH GREENHECK LAB COAT OR EQUAL ANTI-CHROSIVE COATING.

C&S - STAIRWELL PRESSURIZATION FAN SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	AIRFLOW (CFM)	E.S.P. (" WG)	DRIVE	RPM	FAN HP	ELECTRICAL DATA VOLTAGE	PHASE	HZ	dBA	REMARKS
SPF-1	GREENHECK	USF-24	STAIR ST01A	UNIVERSAL SINGLE WIDTH FAN	12850	0.75	DIRECT	1770	10.00	460 V	3	60	88	ALL
SPF-2	GREENHECK	USF-24	STAIR ST01B	UNIVERSAL SINGLE WIDTH FAN	13500	0.75	DIRECT	1770	10.00	460 V	3	60	83	ALL
SPF-3	GREENHECK	USF-24	STAIR ST01C	UNIVERSAL SINGLE WIDTH FAN	16750	0.75	DIRECT	1770	15.00	460 V	3	60	88	ALL

REMARKS:

1. PROVIDE AND INSTALL ON EQUIPMENT RAILS FOR MOUNTING. THYBAR TEMS-3 OR EQUAL EQUIVALENT.
2. PROVIDE AND INSTALL ON MANUFACTURE PROVIDED ISOLATION BASE AND SPRING ISOLATORS.
3. PROVIDE WITH SINGLE POINT CONNECTION AND UNIT MOUNTED DISCONNECT.
4. REFER TO VFD SCHEDULE FOR VFD INFORMATION.

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bell engineering
CDM Smith
PIVOTAL lighting design
UK HEALTHCARE

Cancer Treatment Center + Advanced Ambulatory Center

1220 Elizabeth St.
Lexington, KY 40536

UK Project Number 2563.0

ISSUANCES

No.	Description	Date
1	C&S 100% DD REVIEW	01/10/24
2	C&S 80% CD	03/05/24
3	C&S 100% CD REVIEW	04/09/24
4	BP-07 BID & PERMIT	04/30/24
5	BP-07 ADDENDUM #1	05/28/24
6	BP-07 ADDENDUM #2	06/12/24
7	MECHANICAL EQUIPMENT PACKAGE ADDENDUM #1	10/02/24

Drawn By: KAS
Checked By: SAC
Client Number: 514
Project Number: 6926

DRAWING TITLE: SHELL & CORE - MECHANICAL SCHEDULES

SHEET NO. M700

10/2/2024 1:51:43 PM

KAS 10/2/2024 1:51:43 PM Autodesk Docs://514-6926 - UKHC Cancer Treatment & Advance Ambulatory Center/M23-UKC_5146926.rvt

C&S - AIR HANDLING UNIT SCHEDULE

					PHYSICAL DATA				SUPPLY FAN															RETURN FAN														
MARK	MANUFACTURER	TYPE	SERVICE	LOCATION	WIDTH (IN.)	LENGTH (IN.)	HEIGHT (IN.)	WEIGHT (LBS)	TOTAL SA CFM	MIN. OA CFM	# OF FANS	FAN RPM	E.S.P. (" WC)	T.S.P. (" WC)	RATED H.P. (PER FAN)	B.H.P. (PER FAN)	VOLT.	PH.	MCA	MOCP	VFD	OP. FREQ.	TOTAL RA CFM	# OF FANS	FAN RPM	E.S.P. (" WC)	T.S.P. (" WC)	RATED H.P. (PER FAN)	B.H.P. (PER FAN)	VOLT.	PH.	MCA	MOCP	VFD	OP. FREQ.	REMARKS
AHU1_DT_0S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	RAD / ONC	CSA00F MECH/PLUMBING	156	582	120	40572	41000	12300	8	2982	3.50	7.09	15.00	8.87	460 V	3	175.0 A	200	Yes	60	32800	6	1260	2.00	2.52	5.00	3.15	460 V	3	54.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU2_DT_1S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	URGENT CARE	CSA00F MECH/PLUMBING	114	516	112	26065	22500	6750	4	2976	3.50	6.56	15.00	9.13	460 V	3	87.5 A	100	Yes	60	18000	4	1453	2.00	2.52	5.00	2.76	460 V	3	33.5 A	40	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU3_LAB_12N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	IMAGING / LAB	B003A MECH/PLUMBING	150	588	132	37772	45000	13500	8	3187	3.50	7.46	15.00	10.88	460 V	3	175.0 A	200	Yes	60	36000	6	1276	2.00	2.52	5.00	3.47	460 V	3	54.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU4_AUX_012N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	LOADING DOCK / CONFERENCE CENTER	C006 MECHANICAL	108	494	132	22497	29000	12000	6	3091	3.50	7.15	15.00	8.58	460 V	3	132.0 A	150	Yes	60	23200	4	1368	2.00	2.52	7.50	3.46	460 V	3	48.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU5_CLIN_567N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH,6TH,7TH FL CLINIC / PH SUPPORT	PH800 MECHANICAL	140	504	132	29473	41000	12300	8	3281	3.00	6.31	15.00	8.31	460 V	3	175.0 A	200	Yes	60	32800	6	1618	2.00	2.52	7.50	3.63	460 V	3	83.0 A	100	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU6_SUR_2N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	ASC	PH800 MECHANICAL	110	576	132	26502	30000	6000	6	2955	3.00	6.85	15.00	8.74	460 V	3	132.0 A	150	Yes	60	24000	4	1496	2.00	2.52	7.50	3.76	460 V	3	48.0 A	60	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU7_OFC_4S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	4TH FL ADMIN / SHELL	PH800 MECHANICAL	152	504	132	32160	45000	13500	8	3015	3.00	6.27	15.00	8.96	460 V	3	175.0 A	200	Yes	60	36000	6	1167	2.00	2.52	5.00	3.60	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU8_CLIN_34N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	3RD FL CINIC / 4TH FL SHELL	PH800 MECHANICAL	156	576	132	36960	49000	14700	8	3111	3.00	6.77	15.00	10.48	460 V	3	175.0 A	200	Yes	60	39200	6	1176	2.00	2.52	5.00	3.94	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU9_DT_5N	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH FL COMPOUNDING PHARMACY	PH800 MECHANICAL	90	453	100	17824	17000	7500	4	3071	3.00	6.14	10.00	6.55	460 V	3	56.0 A	70	Yes	60	13600	4	1770	2.00	2.52	5.00	2.09	460 V	3	34.0 A	50	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU10_CLIN_3S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	3RD FL CLINICS	PH800 MECHANICAL	150	504	132	31778	42000	12600	8	2960	3.00	6.3	15.00	8.62	460 V	3	175.0 A	200	Yes	60	33600	6	1132	2.00	2.52	5.00	3.28	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU11_CLIN_6S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	6TH FL CLINICS	PH800 MECHANICAL	138	498	132	26690	40000	12000	8	2934	3.00	6.7	15.00	8.55	460 V	3	175.0 A	200	Yes	60	32000	6	1373	2.00	2.52	7.50	3.30	460 V	3	83.0 A	100	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU12_DT_5S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	5TH FL INFUSION	PH800 MECHANICAL	114	576	132	27615	32000	9600	6	2958	3.00	6.19	15.00	8.66	460 V	3	132.0 A	150	Yes	60	25600	4	1155	2.00	2.52	7.50	3.70	460 V	3	55.0 A	70	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU13_CLIN_7S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	7TH FL CLINIC	PH800 MECHANICAL	152	504	132	32214	44000	13200	8	2978	3.00	6.24	15.00	8.66	460 V	3	175.0 A	200	Yes	60	35200	6	1157	2.00	2.52	7.50	3.50	460 V	3	54.0 A	60	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU14_SUR_2S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CENTRAL STERILE	PH800 MECHANICAL	132	624	132	33310	38000	13000	6	3158	3.00	6.59	15.00	10.68	460 V	3	131.0 A	150	Yes	60	30400	6	1575	2.00	2.94	7.50	3.78	460 V	3	72.0 A	90	Yes	60	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,19
AHU15_MER_0S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CSA00F MECH/PLUMBING	CSA00F MECH/PLUMBING	48	162	62	5124	5000	0	1	2975	2.50	4.98	10.00	5.83	460 V	3	15.0 A	20	Yes	60	[redacted]													1,3,4,5,6,7,8,10,11,12,13,14,15,17,19
AHU16_MER_8	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	PH800 MECHANICAL	PH800 MECHANICAL	90	234	98	8796	16000	0	4	2968	3.00	5.5	10.00	5.57	460 V	3	58.0 A	70	Yes	60	[redacted]													1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19
AHU17_LOB_1S	AIR FLOW EQUIPMENT	CUSTOM AIR HANDLING UNIT	CAFE / LOBBY	CSA00F MECH/PLUMBING	120	492	120	24740	30000	6000	6	2902	3.50	6.69	15.00	8.17	460 V	3	132.0 A	120	Yes	60	24000	4	1249	2.00	2.52	5.00	3.45	460 V	3	36.0 A	45	Yes	60	1,3,4,5,6,7,8,9,10,11,12,13,14,15,17,19

C&S - AIR HANDLING UNIT SCHEDULE - CHILLED WATER COIL

	CHILLED WATER COIL													
MARK	COOLING CAPACITY (MBH)	COOLING CAPACITY SENSIBLE (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	MAX. FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN. WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX. COIL ROWS	COILS PER BANK	MAX. FIN SPACING (FINS/IN)
AHU1_DT_0S	2082.0	1298.0	81	68	52	51	452	0.59	42	58	259	12.90	8	3	9
AHU2_DT_1S	1109.0	701.0	81	68	52	51	444	0.58	42	58	138	7.80	8	2	9
AHU3_LAB_12N	2483.0	1458.0	81	68	52	51	454	0.65	42	58	309	12.44	8	3	10
AHU4_AUX_012N	1571.0	924.0	81	68	52	51	448	0.58	42	58	196	17.65	8	3	9
AHU5_CLIN_567N	1981.0	1254.0	81	68	52	51	448	0.52	42	58	247	15.39	8	3	8
AHU6_SUR_2N	1335.0	891.0	79	66	52	51	449	0.58	42	58	166	12.75	8	3	9
AHU7_OFC_4S	2260.0	1420.0	81	68	52	51	451	0.59	42	58	282	11.87	8	3	9
AHU8_CLIN_34N	2347.0	1471.0	80	68	52	51	473	0.64	42	58	292	12.98	8	3	9
AHU9_DT_5N	1072.0	626.0	82	69	48	48	448	0.86	42	58	134	15.14	10	2	11
AHU10_CLIN_3S	1996.0	1251.0	79	67	52	51	448	0.58	42	58	249	15.86	8	3	9
AHU11_CLIN_6S	1946.0	1229.0	81	68	53	52	448	0.53	42	58	243	14.68	8	3	8
AHU12_DT_5S	1474.0	928.0	80	67	53	52	449	0.53	42	58	184	15.82	8	3	8
AHU13_CLIN_7S	2209.0	1389.0	81	68	52	52	448	0.58	42	58	275	11.29	8	3	9
AHU14_SUR_2S	824.0	697.0	65	56	48	48	448	0.72	42	58	102	19.16	8	3	10
AHU15_MER_0S	220.8	140.7	79	67	53	52	470	0.72	42	54	28	13.16	6	1	11
AHU16_MER_8	710.4	452.2	79	67	53	52	444	0.65	42	54	89	8.23	6	2	11
AHU17_LOB_1S	1592.0	941.0	81	69	52	52	448	0.58	42	58	198	11.45	8	3	9

C&S - AIR HANDLING UNIT SCHEDULE - HOT WATER COIL

	HOT WATER COIL											
MARK	TOTAL HEATING CAP (MBH)	EAT (°F)	LAT (°F)	MAX. FACE VELOCITY (FPM)	MAX. AIR PRESSURE DROP (IN WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX COIL ROWS	COILS PER BANK	MAX. FIN SPACING (FINS/IN)
AHU1_DT_0S	801.3	45	65	495	0.06	130	110	81	4.27	1	2	4
AHU2_DT_1S	247.5	45	55	500	0.03	130	110	25	6.56	1	2	4
AHU3_LAB_12N	1061.0	45	66	499	0.06	130	110	107	5.37	1	3	4
AHU4_AUX_012N	317.9	45	55	496	0.03	130	110	32	4.24	1	3	4
AHU5_CLIN_567N	504.0	45	56	497	0.06	130	110	51	4.10	1	3	4
AHU6_SUR_2N	662.0	45	66	490	0.06	130	110	67	5.70	1	3	4
AHU7_OFC_4S	492.4	45	55	500	0.03	130	110	50	4.13	1	3	4
AHU8_CLIN_34N	1084.0	45	65	473	0.06	130	110	109	5.16	1	3	4
AHU9_DT_5N	322.2	38	55	500	0.05	130	110	33	3.32	1	2	7
AHU10_CLIN_3S	457.4	45	55	500	0.03	130	110	46	3.47	1	3	4
AHU11_CLIN_6S	444.3	45	55	497	0.03	130	110	45	9.36	1	3	4
AHU12_DT_5S	701.7	45	65	500	0.06	130	110	71	6.50	1	3	4
AHU13_CLIN_7S	480.7	45	55	500	0.03	130	110	49	3.90	1	3	4
AHU14_SUR_2S	890.7	45	66	498	0.11	130	110	90	3.60	1	3	4
AHU15_MER_0S	[redacted]											
AHU16_MER_8	947.9	38	92	498	0.30	130	110	96	3.89	3	2	10
AHU17_LOB_1S	332.3	45	55	500	0.03	130	110	34	9.22	1	3	4

C&S - AIR HANDLING UNIT SCHEDULE - PRE COOLING CHILLED WATER COIL

	PRE COOLING CHILLED WATER COIL														
MARK	COOLING CAPACITY (MBH)	COOLING CAPACITY SENSIBLE (MBH)	EAT DB (°F)	EAT WB (°F)	LAT DB (°F)	LAT WB (°F)	MAX. FACE VELOCITY (FPM)	MAX AIR PRESSURE DROP (IN. WG)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)	MAX COIL ROWS	COILS PER BANK	MAX. FINS SPACING (FINS/IN)
AHU14_SUR_2S	1456	728	95	78	44	44	153	0.09	35	47	256	14.74	8	3	9

REMARKS:

1. PROVIDE ACCESS RAIL AT EACH FAN ARRAY FOR FAN REMOVAL.
2. PROVIDE DEDICATED SECTION FOR ADIABATIC HUMIDIFIER DISPERSION GRID. COORDINATE REQUIREMENTS WITH HUMIDIFIER MANUFACTURER
3. FAN ARRAY VFD'S, DAMPER ACTUATORS, AND ALL OTHER CONTROLS APPURTENANCES TO BE PROVIDED BY CONTROLS CONTRACTOR IN SEPARATE BID PACKAGE.
4. INDIVIDUAL PLENUM FANS SHALL NOT EXCEED 15 HP IN SIZE.
5. PROVIDE STAINLESS STEEL DRAIN PANS AT HUMIDIFIER AND COOLING COIL SECTIONS.
6. PROVIDE BI-POLAR IONIZATION UPSTREAM OF COOLING COIL. PROVIDE ALL FIELD WIRING, DISCONNECTS, AND BACNET CONTROLS INTERFACE.
7. PROVIDE CAMFIL C78 FILTER CLIPS AT FILTER RACKS. CLIPS SHALL BE SIZED TO MATCH FILTER DIMENSIONS.
8. PROVIDE INDIVIDUAL BACKDRAFT DAMPERS AT ALL FANS.
9. N+1 FAN ARRANGEMENT ON SUPPLY AND RETURN FAN ARRAYS (IF APPLICABLE).
10. CHILLED WATER AND HOT WATER COILS SHALL BE 0.035" THICK. MAX FIN SPACING = 12 FINS/INCH.
11. REFER TO AHU SECTION DETAIL FOR DOOR, COIL CONNECTIONS AND HUMIDIFIER SECTION LOCATION.
12. PROVIDE PREMIUM EFFICIENT MOTORS COMPLETE WITH TYPE H INSULATION.
13. PROVIDE MARINE LIGHTS INSIDE AHU.
14. PROVIDE SINGLE POWER DISTRIBUTION PANEL FOR EACH FAN ARRAY. COORDINATE WITH TEMPERATURE CONTROLS CONTRACTOR FOR VFD SELECTIONS.
15. AHU'S TO BE PROVIDED AND INSTALLED WITH UE ONTRACK SYSTEMS WIRELESS GREASER SENSOR, GREASER SENSOR TO BE TIED INTO BAS.
17. REFER TO AHU SECTION ON SHEET M400 THROUGH M404. CONTRACTOR SHALL COORDINATE UNIT SECTIONS, CONFIGURATION, DIMENSIONS AND ALL OTHER PROVIDED DATA WITH PROVIDED SECTIONS.
18. PROVIDE WITH LOW TEMP AHU CONFIGURATION (REFER TO AHU SECTIONS). SEE "AIR HANDLING UNIT SCHEDULE - PRE COOLING CHILLED WATER COIL". LOW TEMP CHILLER AND ALL ASSOCIATED PIPING, FINAL CONNECTIONS, ETC TO BE PROVIDED IN FUTURE FIT-OUT PACKAGE
19. REFER TO VFD SCHEDULE FOR VFD INFORMATION.

C&S - AIR HANDLING UNIT SCHEDULE - FILTER SECTION

	FILTER SECTION														
	PREFILTER							FINAL FILTER							
MARK	TYPE	FILTER EFFICIENCY	NO. OF 24"X24"X2" FILTERS	NO. OF 12"X24"X2" FILTERS	FACE VELOCITY (FPM)	PRESSURE DROP (CLEAN) ("WC)	PRESSURE DROP (DIRTY) ("WC)	TYPE	FILTER EFFICIENCY	NO OF 24"X24"X12" FILTERS	NO. OF 12"X24"X12" FILTERS	FACE VELOCITY (FPM)	PRESSURE DROP (CLEAN) ("WC)	PRESSURE DROP (DIRTY) ("WC)	REMARKS
AHU1_DT_0S	PLEATED	MERV 8	24	0	427	0.26	0.76	RIGID	MERV 14	24	0	427	0.59	1.09	NONE
AHU2_DT_1S	PLEATED	MERV 8	16	0	352	0.22	0.72	RIGID	MERV 14	16	0	352	0.49	0.99	NONE
AHU3_LAB_12N	PLEATED	MERV 8	20	9	459	0.28	0.78	RIGID	MERV 14	20	9	459	0.63	1.13	NONE
AHU4_AUX_012N	PLEATED	MERV 8	16	4	403	0.25	0.75	RIGID	MERV 14	16	4	403	0.56	1.06	NONE
AHU5_CLIN_567N	PLEATED	MERV 8	20	5	456	0.28	0.78	RIGID	MERV 14	20	5	456	0.64	1.14	NONE
AHU6_SUR_2N	PLEATED	MERV 8	20	5	444	0.27	0.77	RIGID	MERV 14	20	5	444	0.62	1.12	1
AHU7_OFC_4S	PLEATED	MERV 8	20	9	459	0.28	0.78	RIGID	MERV 14	20	9	456	0.64	1.14	NONE
AHU8_CLIN_34N	PLEATED	MERV 8	24	6	454	0.28	0.78	RIGID	MERV 14	24	6	454	0.64	1.14	NONE
AHU9_DT_5N	PLEATED	MERV 8	9	3	405	0.25	0.75	RIGID	MERV 14	9	3	405	0.56	1.06	NONE
AHU10_CLIN_3S	PLEATED	MERV 8	20	9	429	0.27	0.77	RIGID	MERV 14	20	9	429	0.60	1.10	NONE
AHU11_CLIN_6S	PLEATED	MERV 8	20	5	444	0.27	0.77	RIGID	MERV 14	20	5	444	0.62	1.12	NONE
AHU12_DT_5S	PLEATED	MERV 8	16	4	444	0.27	0.77	RIGID	MERV 14	16	4	444	0.62	1.12	NONE
AHU13_CLIN_7S	PLEATED	MERV 8	20	9	449	0.28	0.78	RIGID	MERV 14	20	9	449	0.63	1.13	NONE
AHU14_SUR_2S	PLEATED	MERV 8	20	5	422	0.26	0.76	RIGID	MERV 14	20	5	422	0.60	1.10	2
AHU15_MER_0S	PLEATED	MERV 8	2	2	417	0.26	1.26	[redacted]							NONE
AHU16_MER_8	PLEATED	MERV 8	8	3	381	0.24	1.24								NONE
AHU17_LOB_1S	PLEATED	MERV 8	16	4	417	0.26	0.76	RIGID	MERV 14	16	4	417	0.58	1.08	NONE

REMARKS:

1. PROVIDE WITH PREE COOL PRE FILTERS (REFER TO AHU SECTION ON M400 SERIES SHEETS): (20) 24"X24"X2" PLEATED MERV 8 FILTERS, (5) 12"X24"X2" PLEATED MERV 8 FILTERS, 356FPM FACE VELOCITY, 0.25" PRESSURE DROP (CLEAN), 1.08" PRESSURE DROP (DIRTY)
2. PROVIDE WITH PREE COOL PRE FILTERS (REFER TO AHU SECTION ON M400 SERIES SHEETS): (20) 24"X24"X2" PLEATED MERV 8 FILTERS, (5) 12"X24"X2" PLEATED MERV 8 FILTERS, 338FPM FACE VELOCITY, 0.26" PRESSURE DROP (CLEAN), 1.06" PRESSURE DROP (DIRTY)

C&S - AIR HANDLING UNIT SCHEDULE - HUMIDIFIER

	DISPERSION GRID									CENTRAL/CONTROL UNIT										RO SKID							
AIR HANDLER	MANUFACTURER	TYPE	CAPACITY (LBS/HR)	ABSORPTION DISTANCE (IN)	DISPERSION GRID WIDTH (IN)	DISPERSION GRID HEIGHT (IN)	ENTERING ABSOLUTE HUMIDITY (GR/LB)	LEAVING ABSOLUTE HUMIDITY (GR/LB)	HUMIDIFIER AIR PRESSURE DROP (IN. WG)	MARK	MANUFACTURER	MODEL	CENTRAL UNIT (H"XW"D")	CONTROL UNIT (H"xW"XD")	CENTRAL UNIT WEIGHT (LB)	CONTROL UNIT WEIGHT (LB)	BOOSTER PUMP	FREQUENCY (HZ)	MARK	MODEL	MANUFACTURER	CAPACITY (GPM)	RESERVOIR TANK(GAL)	VOLTAGE/PHASE	MOCP (A)	REMARKS
AHU1_DT_0S	CONDAIR	ADIABATIC	312	24	148	108	35.80	48.30	0.12	HUM_AHU1	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU1	ML RO 300	CONDAIR	1.2	13	480/3	16	1,2,3,4
AHU3_LAB_12N	CONDIAR	ADIABATIC	343	24	142	120	33.70	48.30	0.13	HUM_AHU3	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU_3	ML RO 300	CONDAIR	1.2	13	480/3	16	1,2,3,4
AHU6_SUR_2S	CONDAIR	ADIABATIC	355	24	102	120	35.80	48.30	0.14	HUM_AHU6	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU6,14	ML RO 500	CONDAIR	2.2	52	480/3	20	1,2,3,4,5
AHU8_CLIN_34N	CONDAIR	ADIABATIC	373	24	148	120	35.80	48.30	0.13	HUM_AHU8	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	[redacted]							
AHU12_DT_5S	CONDAIR	ADIABATIC	355	24	106	120	33.70	48.30	0.13	HUM_AHU12	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	RO_SYS_AHU8,12	ML RO 500	CONDAIR	2.2	52	480/3	20	1,2,3,4,6
AHU14_SUR_2N	CONDAIR	ADIABATIC	338	24	126	120	33.70	48.30	0.13	HUM_AHU14	CONDAIR	DL-A	32X21X12	20X14X9	120	33	YES	60	[redacted]							

REMARKS:

1. PROVIDE REVERSE OSMOSIS (RO) WATER SYSTEM SIMILAR TO CONDAIR MLRO 800. RO WATER SYSTEM SHALL PROVIDE RO WATER TO MEET ALL HUMIDIFIER INTAKE WATER REQUIREMENTS. REFER TO RO WATER SYSTEM SPECIFICATIONS.
2. PROVIDE RO WATER SYSTEM WITH BACNET INTEGRATION.
3. PROVIDE DISPERSION GRID AND INSTALL IN ASSOCIATED AHU CASING. REFER TO AHU SUBMITTALS FOR HUMIDIFIER SECTION DIMENSIONS AND COORDINATE DISPERSION GRID DESIGN.
4. PROVIDE DISCONNECTS AND SINGLE POINT POWER CONNECTIONS FOR BOTH THE HUMIDIFIER AND THE RO WATER SYSTEM.
5. AHU6 AND AHU14 SHARE A COMMON RO SKID.
6. AHU8 AND AHU12 SHARE A COMMON RO SKID.

C&S - BOILER SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	FUEL	EWT (°F)	LWT (°F)	WATER FLOW (GPM)	INPUT (MBH)	GROSS OUTPUT (MBH)	GAS INLET PRESSURE (in W.C.)	VOLTAGE	PHASE	FLA	HZ	REMARKS
B-1	FULTON	EDR+6000	CONDENSING	NATURAL GAS	110	130	580	6000.0	5882.0	12.00	460 V	3	22 A	60	ALL
B-2	FULTON	EDR+6000	CONDENSING	NATURAL GAS	110	130	580	6000.0	5882.0	12.00	460 V	3	22 A	60	ALL

REMARKS:

1. PROVIDE DISCONNECT AND SINGLE-POINT POWER CONNECTION.
2. PROVIDE CONDENSATE ACID NEUTRALIZATION KIT.
3. DIRECT VENT CONFIGURATION. PROVIDE AL-29C INLET AND COMBUSTION VENT.
4. PROVIDE WITH FACTORY-MOUNTED CONTROLS. PROVIDE ALL EQUIPMENT/PROGRAMMING NECESSARY TO INTEGRATE CONTROLS INTO BUILDING AUTOMATION SYSTEM.
5. PROVIDE WITH VENTLESS GAS TRAIN.
6. PROVIDE WITH MERV 8 COMBUSION AIR INTAKE FILTER WITH SPARE.
7. PROVIDE WITH 160PSIG ASME SAFETY RELIEF VALVE.
8. PROVIDE WITH INDIFIDUAL BOILER CONDENSATE DRAIN TRAP.
9. PROVIDE WITH NATURAL GAS REGULATOR. CONFIRM TYPE WITH MANUFACTURE.

C&S - HYDRONIC PUMP SCHEDULE

											ELECTRICAL DATA					
MARK	MANUFACTURER	MODEL	TYPE	SERVICE	GPM	PRESSURE (FEET HEAD)	IMPELLER DIAMETER (IN)	VFD	MINIMUM EFFICIENCY (%)	RPM	HZ	HP	NOL HP	VOLTAGE	PHASE	REMARKS
BBP-1	TACO	1509D	BASEMOUNTED END SUCTION	BASEBOARD HEATERS	75	70.00	8.30	Yes	60	1760	60	5	3.81	460 V	3	2,3,4,6,7,10,11,12
BBP-2	TACO	1509D	BASEMOUNTED END SUCTION	BASEBOARD HEATERS	75	70.00	8.30	Yes	60	1760	60	5	3.81	460 V	3	2,3,4,6,7,10,11,12
BP-1	TACO	6011D	CENTRIFUGAL IN-LINE	BOILER (B-1)	580	30.00	9.05		86	1160	60	7.5	5.64	460 V	3	1,2,3,4,5,6,7,9
BP-2	TACO	6011D	CENTRIFUGAL IN-LINE	BOILER (B-2)	580	30.00	9.05		86	1160	60	7.5	5.64	460 V	3	1,2,3,4,5,6,7,9
CHPP-1	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHPP-2	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHPP-3	TACO	3011D	BASEMOUNTED END SUCTION	CHILLED WATER PROCESS LOOP	400	100.00	10.35	Yes	78	1760	60	20	16.73	460 V	3	2,3,4,6,7,10,11,12
CHWP-1	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CHWP-2	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CHWP-3	TACO	6013D	BASEMOUNTED END SUCTION	CHILLED WATER BUILDING LOOP	2000	100.00	11.35	Yes	81	1760	60	75	67.68	460 V	3	2,3,4,6,7,10,11,12
CWP-1	TACO	3007D	BASEMOUNTED END SUCTION	CONDENSOR WATER LOOP	400	30.00	6.60		79	1760	60	5	3.97	460 V	3	1,3,4,6,7,11,12
CWP-2	TACO	3007D	BASEMOUNTED END SUCTION	CONDENSOR WATER LOOP	400	30.00	6.60		79	1760	60	5	3.97	460 V	3	1,3,4,6,7,11,12
GWP-1	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
GWP-2	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
GWP-3	TACO	2007D	BASEMOUNTED END SUCTION	GLYCOL WATER LOOP	150	40.00	6.75		78	1760	60	3	2.47	460 V	3	1,3,4,6,7,11,12
HRCP-1	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HRCP-2	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HRCP-3	TACO	4007D	BASEMOUNTED END SUCTION	HEAT RECOVERY CHILLERS	450	40.00	6.95	Yes	84	1760	60	7.5	6.33	460 V	3	2,3,4,6,7,10,11,12
HWP-1	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HWP-2	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HWP-3	TACO	4011C	BASEMOUNTED END SUCTION	HEATING WATER LOOP	650	100.00	10.40	Yes	81	1760	60	25	24.70	460 V	3	2,3,4,6,7,10,11,12
HXP-1	TACO	6011D	BASEMOUNTED END SUCTION	STEAM BACKUP HEATING WATER SYSTEM	1250	35.00	10.35	Yes	87	1160	60	15	13.28	460 V	3	2,3,4,6,7,10,11,12
HXP-2	TACO	6011D	BASEMOUNTED END SUCTION	STEAM BACKUP HEATING WATER SYSTEM	1250	35.00	10.35	Yes	87	1160	60	15	13.28	460 V	3	2,3,4,6,7,10,11,12
LFP-1	TACO	VR15L	IN-LINE	LF-1	15	10.00			47	2400	60	0.33	0.08	208 V	1	1,2,3,4,6,7,9
LFP-2	TACO	VR25H	IN-LINE	LF-2	130	20.00			62	4000	60	2	1.00	208 V	1	1,2,3,4,6,7,9
LFP-3	TACO	VR15M	IN-LINE	LF-3	50	27.00			63	4000	60	0.6	0.60	208 V	1	1,2,3,4,6,7,9

REMARKS:

1. PROVIDE DISCONNECT AND SINGLE-POINT POWER CONNECTION.
2. PROVIDE SHAFT GROUNDING RINGS.
3. PROVIDE SUCTION DIFFUSER WITH STRAINER.
4. PROVIDE ISOLATION VALVE, CHECK VALVE, AND FLEXIBLE COUPLINGS
5. CONSTANT SPEED PUMP TO BE CONTROLLED WITH BOILER OPERATION. CONFIRM REQUIRED INTERFACE WITH BOILER MANUFACTURER.
6. PUMPS TO BE INSTALLED UTILIZING VIBRATION ANALYSIS TO ENSURE PROPER ALIGNMENT. VIBRATION ANALYSIS SHALL BE PERFORMED BY A RMIC CERTIFIED INSTALLER.
7. PUMPS TO BE PROVIDED AND INSTALLED WITH UE ONTRACK SYSTEMS WIRELESS GREASER SENSOR, GREASER SENSOR TO BE TIED INTO BAS.
9. PROVIDE AND INSTALL WITH MANUFACTURED APPROVED FLOOR MOUNTED SUPPORTS.
10. REFER TO VFD SCHEDULE FOR VFD INFORMATION
11. REFER TO MECHANICAL ACCESS PLANS FOR PUMP MOTOR ELECTRICAL CONNECTION SIDE COORDINATION.
12. REFER TO MECHANICAL ACCESS PLAN FOR PUMP HANDYNESS/CONFIGURATION.

C&S - HEAT RECOVERY CHILLER

				DIMENSIONS (IN)							COMPRESSOR					EVAPORATOR					CONDENSER					
TAG	MANUFACTURER	MODEL #	TYPE	LENGTH	WIDTH	HEIGHT	WEIGHT (LBS)	FLUID TYPE	COOLING CAPCITY (TONS)	HEATING COP (KW/KW)	NET HEATING CAPACITY (MBH)	VOLTAGE	PHASE	MCA	MOCP	EWT (°F)	LWT (°F)	FLUID FLOW MIN (GPM)	FLUID FLOW MAX (GPM)	FLUID PD (FT HD)	EWT (°F)	LWT (°F)	FLUID FLOW MIN (GPM)	FLUID FLOW MAX (GPM)	FLUID PD (FT HD)	REMARKS
HRC-1	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL
HRC-2	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL
HRC-3	YORK	YVWAM2M3EEBE1053AA	HEAT RECOVERY SCREW	165	56	72	12747	WATER	153	5.3	2700.0	460 V	3	414 A	500	52	42	230	890	6.85	118	130	280	1100	6.85	ALL

REMARKS:

1. PROVIDE SINGLE-POINT POWER CONNECTION AND FACTORY MOUNTED DISCONNECT.
2. PROVIDE VIBRATION ISOLATORS.
3. PROVIDE FLOW SWITCH AND FACTORY-MOUNTED CONTROL PANEL. PROVIDE ALL EQUIPMENT/PROGRAMMING NECESSARY TO INTEGRATE CONTROLS INTO BUILDING AUTOMATION SYSTEM.
4. HEAT RECOVERY CHILLER. PROVIDE HOT GAS BYPASS TO PROVIDE 15% CAPACITY TURNDOWN.
5. PROVIDE 100 kAIC SCCR RATING.
6. PROVIDE PRESSURE RELIEF VALVE
7. SOUND DATA AT 100% LOAD: 88DB @ 63 HZ, 85 LPA

C&S - EXHAUST FAN SCHEDULE

										ELECTRICAL DATA				
MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	AIRFLOW (CFM)	E.S.P.	DRIVE	RPM	FAN HP	VOLTAGE	PHASE	HZ	SONES	REMARKS
EF2_HTE_05S	GREENHECK	FJI-15-BI	LL HOT ROOM EXHAUST	CENTRIFUGAL WITH DISCHARGE STACK	1800	1.50	DIRECT	1533	1.00	460 V	3	60	19.4	2,5,7,8,9,10,13,14
EF6_GE_0123S	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.50	DIRECT	1770	10.00	460 V	3	60	30	2,5,9,12,13,14
EF7_GE_4567S	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.00	DIRECT	1770	10.00	460 V	3	60	27	2,5,9,12,13,14
EF8_GE_2345N	GREENHECK	QEID-22	GENERAL EXHAUST	MIXED FLOW UPBLAST	12000	2.25	DIRECT	1770	10.00	460 V	3	60	30	2,5,9,12,13,14
EF9_GE_678N	GREENHECK	CUE-300HP-VG	GENERAL EXHAUST	CENTRIFUGAL UPBLAST	7500	2.00	DIRECT	989	7.50	460 V	3	60	26	2,5,9,12,13,14
EF10_PHM_5N	STROBIC AIR	M33A20N100I4	COMPOUND PHARMACY EXHAUST	HIGH PLUME DILUTION	7150	3.00	DIRECT	1800	10.00	460 V	3	60	65	1,2,3,4,5,8,9,12,13,14,15,17,18
EF11_LAB_2N	STROBIC AIR	M33C20N200I4	LAB EXHAUST	HIGH PLUME DILUTION	8200	3.00	DIRECT	1800	20.00	460 V	3	60	65	1,2,3,4,5,8,912,13,14,15,17,18
EF13_ISO_1S	GREENHECK	FJI-10-BI	1ST FL ISOLATION EXHAUST	CENTRIFUGAL WITH DISCHARGE STACK	600	1.50	DIRECT	1948	0.33	115 V	1	60	17.4	2,5,7,8,9,10,13,14
EF15_LAB_5N	GREENHECK	G-097-A	LAB TANK STORAGE EXHAUST	CENTRIFUGAL DOWNBLAST	150	1.13	DIRECT	2070	0.25	115 V	1	60	9.2	2,5,7,9,13,14
EF20_SUR_2S	GREENHECK	QEID-20-90	CENTRAL STERILE	MIXED FLOW UPBLAST	8000	4.32	DIRECT	2109	10.00	460 V	3	60	37	2,5,9,12,13,14
EF21_MED_2S	GREENHECK	CUE-100HP-VG	2ND FLOOR MED GAS STORAGE	CENTRIFUGAL UPBLAST	200	0.75	DIRECT	1449	0.25	115 V	1	60	6.6	2,5,9,12,13,14
EF22_LAB_0S	GREENHECK	VEKTOR-H-16-11	MOLD FABRICATION HOOD	FUME EXHAUST SYSTEM	2000	2.00	DIRECT	1917	1.50	460 V	3	60	21	2,3,5,6,7,9,11,13,14,15,19
EF24_ISO_2N	GREENHECK	VEKTOR-H-10	2ND FLOOR ISOLATION FAN	FUME EXHAUST SYSTEM	500	2.00	DIRECT	2993	0.75	460 V	3	60	71	2,3,5,6,7,9,11,13,14,15
EF25_MED_2N	GREENHECK	CUE-100HP-VG	2ND FLOOR MED GAS STORAGE	CENTRIFUGAL UPBLAST	200	0.75	DIRECT	1449	0.25	115 V	1	60	6.6	2,5,9,12,13,14

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REMARKS:

1. PROVIDE WITH 100% REDUNDANT FAN.
2. AIRFLOW CFM IS PER FAN.
3. PROVIDE WITH EXPLOSION PROOF MOTORS.
4. MINIMUM EFFECTIVE STACK HEIGHT IN 10 MPH WIND : 32 FT; MINIMUM EFFECTIVE STACK HEIGHT IN 15 MPH WIND: 24 FT.
5. PROVIDE 18" ROOF CURB.
6. FAN HORSEPOWER IS PER FAN.
7. PROVIDE ECM SPEED CONTROLLER.
8. PROVIDE WITH SHAFT GROUDING KIT.
9. PROVIDE WITH SPRING ISOLATORS.
10. PROVIDE TWO FANS OF THIS TYPE FOR REDUNDANCY.
11. PROVIDE DISCONNECT AND SINGLE POINT POWER CONNECTION.
12. REFER TO VFD SCHEDULE FOR VFD INFORMATION.
13. FANS TO BE PROVIDED AND INSTALLED WITH UE SYSTEM ONTRACK WIRELESS TEMP/VIBRATION SENSOR.
14. FANS TO BE PROVIDED AND INSTALLED WITH UE SYSTEM ONTRACK WIRELESS GREASER SENSOR.
15. PROVIDE WITH INTEGRAL SILENCERS.
16. IN-LINE EXHAUST FAN TO BE HUNG FROM STRUCTURE PER MANUFACTURE REQUIREMENETS
17. PROVIDE WITH REMOVABLE JIB CRANE SOCKET.
18. PROVIDE WITH FACTORY INSTALLED ACCESSIBLE PLENIUM.
19. PROVIDE WITH GREENHECK LAB COAT OR EQUAL ANTI-CHROSIVE COATING.

C&S - STAIRWELL PRESSURIZATION FAN SCHEDULE

										ELECTRICAL DATA				
MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	AIRFLOW (CFM)	E.S.P. (" WG)	DRIVE	RPM	FAN HP	VOLTAGE	PHASE	HZ	dBA	REMARKS
SPF-1	GREENHECK	USF-24	STAIR ST01A	UNIVERSAL SINGLE WIDTH FAN	12850	0.75	DIRECT	1770	10.00	460 V	3	60	88	ALL
SPF-2	GREENHECK	USF-24	STAIR ST01B	UNIVERSAL SINGLE WIDTH FAN	13500	0.75	DIRECT	1770	10.00	460 V	3	60	83	ALL
SPF-3	GREENHECK	USF-24	STAIR ST01C	UNIVERSAL SINGLE WIDTH FAN	16750	0.75	DIRECT	1770	15.00	460 V	3	60	88	ALL

REMARKS:

1. PROVIDE AND INSTALL ON EQUIPMENT RAILS FOR MOUNTING. THYBAR TEMS-3 OR EQUAL EQUIVALENT.
2. PROVIDE AND INSTALL ON MANUFACTURE PROVIDED ISOLATION BASE AND SPRING ISOLATORS.
3. PROVIDE WITH SINGLE POINT CONNECTION AND UNIT MOUNTED DISCONNECT.
4. REFER TO VFD SCHEDULE FOR VFD INFORMATION.

Owner Furnished, Contractor Received & Installed Equipment

CHAMPLIN ARCHITECTURE
720 EAST PETE ROSE WAY
CINCINNATI, OH 45202
T 513.241.4474
thinkchamplin.com
THINK CREATE REALIZE

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420 North 5th Street, Suite 100
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THP
AEI Affiliated Engineers
CMTA
OLIN
CARMAN LANDSCAPE ARCHITECTURE URBAN PLANNING CIVIL ENGINEERING
WALSH CONSULTING GROUP
bell engineering
CDM Smith
PIVOTAL lighting design
UK HEALTHCARE

Cancer Treatment Center + Advanced Ambulatory Center

1220 Elizabeth St.
Lexington, KY 40536

UK Project Number 2563.0

ISSUANCES

No.	Description	Date
1	C&S 100% DD REVIEW	01/10/24
2	C&S 80% CD	03/05/24
3	C&S 100% CD REVIEW	04/09/24
4	BP-07 BID & PERMIT	04/30/24
5	BP-07 ADDENDUM #1	05/28/24
6	BP-07 ADDENDUM #2	06/12/24
7	MECHANICAL EQUIPMENT PACKAGE ADDENDUM #1	10/02/24

OFCI MECH EQUIP EXHIBIT

UPDATE

10/8/24

1 OF 3

SHEET NO.

M700

C&S - VARIABLE FREQUENCY DRIVE SCHEDULE (FOR REFERENCE ONLY)

MARK	MANUFACTURER	MODEL #	SERVICE	MOTOR HP	MOTOR AMPERAGE	ELECTRICAL VOLTAGE	PHASE	HZ	FUSED AND DISCONNECT	BYPASS STARTER	REDUNDANT DRIVE W/ AUTOMATIC BYPASS	REMARKS
VFD-AHU1_DT_0S-RF	ABB	ACH580	AHU-1 RETURN FANS	40.00	52 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU1_DT_0S-SF	ABB	ACH580	AHU-1 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU2_DT_1S-RF	ABB	ACH580	AHU-2 RETURN FANS	25.00	34 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU2_DT_1S-SF	ABB	ACH580	AHU-2 SUPPLY FANS	75.00	96 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,114,15,16,17,18,19,20
VFD-AHU3_LAB_2N-RF	ABB	ACH580	AHU-3 RETURN FANS	40.00	52 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU3_LAB_2N-SF	ABB	ACH580	AHU-3 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU4_AUX_012N-RF	ABB	ACH580	AHU-4 RETURN FANS	30.00	44 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU4_AUX_012N-SF	ABB	ACH580	AHU-4 SUPPLY FANS	125.00	156 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU5_CLIN_567N-RF	ABB	ACH580	AHU-5 RETURN FANS	60.00	77 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU5_CLIN_567N-SF	ABB	ACH580	AHU-5 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU6_SUR_2S-RF	ABB	ACH580	AHU-6 RETURN FANS	30.00	44 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU6_SUR_2S-SF	ABB	ACH580	AHU-6 SUPPLY FANS	125.00	156 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU7_CLIN_4S-RF	ABB	ACH580	AHU-7 RETURN FANS	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU7_CLIN_4S-SF	ABB	ACH580	AHU-7 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU8_CLIN_34N-RF	ABB	ACH580	AHU-8 RETURN FANS	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU8_CLIN_34N-SF	ABB	ACH580	AHU-8 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU9_DT_5N-RF	ABB	ACH580	AHU-9 RETURN FANS	25.00	34 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU9_DT_5N-SF	ABB	ACH580	AHU-9 SUPPLY FANS	50.00	65 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU10_CLIN_3S-RF	ABB	ACH580	AHU-10 RETURN FANS	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU10_CLIN_3S-SF	ABB	ACH580	AHU-10 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU11_CLIN_6S-RF	ABB	ACH580	AHU-11 RETURN FANS	60.00	77 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU11_CLIN_6S-SF	ABB	ACH580	AHU-11 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU12_DT_5S-RF	ABB	ACH580	AHU-12 RETURN FANS	30.00	44 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU12_DT_5S-SF	ABB	ACH580	AHU-12 SUPPLY FANS	125.00	156 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU13_CLIN_6S-RF	ABB	ACH580	AHU-13 RETURN FANS	60.00	77 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU13_CLIN_6S-SF	ABB	ACH580	AHU-13 SUPPLY FANS	150.00	180 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU14_SUR_2N-RF	ABB	ACH580	AHU-14 RETURN FANS	60.00	77 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU14_SUR_2N-SF	ABB	ACH580	AHU-14 SUPPLY FANS	125.00	156 A	460 V	3	60	YES	NO	YES	1,2,3,4,5,6,13,14,15,16,17,18,19,20
VFD-AHU15_MER_02-SF	ABB	ACH580	AHU-15 SUPPLY FAN	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU16_MER_8-SF	ABB	ACH580	AHU-16 SUPPLY FAN	50.00	65 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU17_LOB_1S-RF	ABB	ACH580	AHU-17 RETURN FANS	25.00	34 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-AHU17_LOB_1S-SF	ABB	ACH580	AHU-17 SUPPLY FANS	125.00	156 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-BBP-1	ABB	ACH580	BBP-1	5.00	7 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-BBP-2	ABB	ACH580	BBP-2	5.00	7 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHPP-1	ABB	ACH580	CHPP-1	20.00	27 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHPP-2	ABB	ACH580	CHPP-2	20.00	27 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHPP-3	ABB	ACH580	CHPP-3	20.00	27 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHWP-1	ABB	ACH580	CHWP-1	75.00	96 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHWP-2	ABB	ACH580	CHWP-2	75.00	96 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-CHWP-3	ABB	ACH580	CHWP-3	75.00	96 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF6_GE_0123S	ABB	ACH580	EF6_GE_0123S	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF7_GE_4567S	ABB	ACH580	EF7_GE_4567S	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF8_GE_2345N	ABB	ACH580	EF8_GE_2345N	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF9_GE_678N	ABB	ACH580	EF9_GE_678N	5.00	7 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF10_LAB_5N-1	ABB	ACH580	EF10_LAB_5N	20.00	27 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF10_LAB_5N-2	ABB	ACH580	EF10_LAB_5N	20.00	27 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF11_PHM_2N-1	ABB	ACH580	EF11_PHM_2N	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF11_PHM_2N-2	ABB	ACH580	EF11_PHM_2N	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-EF20_SUR_2S	ABB	ACH580	EF20_SUR_2S	10.00	7 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HRCP-1	ABB	ACH550	HRCP-1	7.50	12 A	460 V	3	60	YES	NO	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HRCP-2	ABB	ACH550	HRCP-2	7.50	12 A	460 V	3	60	YES	NO	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HRCP-3	ABB	ACH580	HRCP-3	7.50	12 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HWP-1	ABB	ACH580	HWP-1	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HWP-2	ABB	ACH580	HWP-2	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HWP-3	ABB	ACH580	HWP-3	40.00	52 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HXP-1	ABB	ACH580	HXP-1	15.00	23 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-HXP-2	ABB	ACH580	HXP-2	15.00	23 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-SPF-1	ABB	ACH580	SPF-1	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-SPF-2	ABB	ACH580	SPF-2	10.00	14 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20
VFD-SPF-3	ABB	ACH580	SPF-3	15.00	23 A	460 V	3	60	YES	YES	NO	1,2,3,4,5,6,7,8,9,10,11,12,18,19,20

REMARKS:

1. AT MINIMUM, VFD SHALL INCLUDE 5% IMEDANCE VIA 5% AC LINE REACTOR OR DUAL DC BUS CHOKES SIZED TO 5% EQUIVALENT IMPENDANCE. VFD INPUT AMPS SHALL NOT EXCEED VFD OUTPUT AMPS.
2. PROVIDE UL1449 SURGE SUPPRESSION DEVICE.
3. VFD SHALL INCLUDE ALPHA-NUMERIC KEYPAD INERFACE, WITH DISPLAY IN PLAIN ENGLISH. (DISPLAYS RELYING SOLELY ON CODES ARE NOT ACCEPTABLE).
4. PROVIDE INTERNAL EMI/RFI FILTER PER IEC 61800-3.
5. VFD SHALL BE BTL LISTED FOR BACNET MS/TP, AND ALSO INCLUDE MODBUS AND N2.
6. VFD SHALL INCLUDE REAL TIME CLOCK WITH BATTERY BUCKUP (INLUDE 10 YEAR BATTERY).
7. PHASE LOSS PROTECTION & BROKEN BELT (LOSS OF LOAD) INDICATION WHILE IN BYPASS.
8. BYPASS CONTRACTORS SHALL BE POWERED BY SWITCH MODE POWER SUPPLY, ALLOWING +30% TO -30% INPUT VOLTAGE TOLERANCE. (120V CPT NOT ALLOWED).
9. VFD AND BYPASS SHALL BOTH INCLUDE BACNET MS/TP, DAMPER CONTROL AND FIREMAN'S OVERRIDE FUNCTIONALITY.
10. BYPASS OPERATION TO AUTO-RESET AFTER A BROWN OUT CONDITION.
11. INCLUDE FACST ACTION DRIVE ISOLATION FUSES.
12. BYPASS SHALL BE FULLY FUNCTIONAL IN THE EVENT OF A VFD FAILURE. BYPASS SHALL NOT RELAY ON THE VFD OR THE VFD'S CONTROL BOARD/RELAYS.
13. ABILITY FOR LOCAL OR REMOTE ALTERNATION. CONFIGURABLE FOR AUTOMATIC OR MANUAL TRANSFER UPON VFD FAULT.
14. BOTH VFDS MOUNTED IN COMMON ENCLOSURE. SINGLE MAIN DISCONNECTION MEANS. DRIVE ISOLATION FUSS FOR BOTH DRIVES.
15 INCLUDE A VFD1/ALTERNATION/VD2 SWITCH.
16. SINGLE POINT CONNECTION FOR RUN STATUS, FAULT STATUS, AND FOR DAMPER CONTROL AND FIREMAN'S OVERRIDE FUNCTIONALITY.
17. OUTPUT ISOLATION CONTRACTOR AFTER EACH VFD.
18. SYSTEM TO MEET IEEE 519-2014 BASE ON THE HARMONIC MITIGATION METHOD(S) IDENTIFIED IN THE ABOVE SCHEDULE.
19. VFD SELECTIONS ARE BASED ON MOTOR AMPERAGE NOT EXCLUSIVELY HORSE POWER.
20. VFDS'S ARE SHOWN FOR REFERENCE ONLY. VFD'S TO BE PROVIDED BY THE CONTROLS CONTRACTOR AS PART OF A FUTURE BID PACKAGE.

C&S - HEAT EXCHANGER S&T STEAM TO WATER

MARK	MANUFACTURER	MODEL #	TYPE	SERVICE	DIAMETER (IN)	LENGTH (IN)	PASSES	TOTAL HEATING (MBH)	SHELL (STEAM) LBS/HR	SHELL (STEAM) ENTERING PRESS. (PSI)	TUBE (WATER) GPM	P.D. (FT)	EWT (°F)	LWT (°F)	REMARKS
BHX-1	TACO	E06206-S	ENHANCED SURFACE U-TUBE	BASEBOARD HEATING WATER SYSTEM	6	40	2	731.9	774	15	75	0.84	160	180	ALL
BHX-2	TACO	E06206-S	ENHANCED SURFACE U-TUBE	BASEBOARD HEATING WATER SYSTEM	6	40	2	731.9	774	15	75	0.84	160	180	ALL
HX-1	TACO	E20206	ENHANCED SURFACE U-TUBE	HEATING WATER SYSTEM	20	58	2	12346.4	13056	15	1250	1.63	110	130	ALL
HX-2	TACO	E20206	ENHANCED SURFACE U-TUBE	HEATING WATER SYSTEM	20	58	2	12346.4	13056	15	1250	1.63	110	130	ALL

REMARKS:

1. MOUNT ON 4' TALL MOUNTING STAND.
2. PROVIDE WITH K-HEAD.
3. MAINTAIN MANUFACTURERS SERVICE CLEARANCES.

Owner Furnished, Contractor Received & Installed Equipment

C&S - CONDENSATE PUMPS AND RECEIVERS

MARK	MANUFACTURER	MODEL #	PUMPS GPM	DISCHARGE PRESSURE (PSI)	HP	RPM	PHASE	VOLTAGE	RECEIVER CAPACITY (GALS)	INLET SIZE	REMARKS
CP-1	SKIDMORE	VNS 2000-1	60	40.00	3	3450	3	460 V	110.0	4"	ALL

REMARKS:

1. PROVIDE DUPLEX PUMP SKID.
2. PROVIDE DISCONNECT AND SINGLE POINT POWER CONNECTION.
3. PROVIDE AND INSTALL ON ELEVATED LEGS PER MANUFACTURES REQUIRMENTS.
4. PROVIDE WITH STAINLESS STEEL RECEIVER.

C&S - FUEL OIL PUMP SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	TYPE	FLOW (GPM)	MOTOR HP	ELECTRICAL DATA VOLTAGE	PHASE	HZ	REMARKS
FOP-1	PREFERRED UTILITIES	ATPS-203-208-50	EMERGENCY GENERATOR FUEL OIL SYSTEM	DUPLEX	13	0.75	208 V	3	60	ALL
FORP-1	PREFERRED UTILITIES	11874	DAY TANK FUEL OIL RETURN PUMP	SIMPLEX	10	0.75	120 V	1	60	ALL

REMARKS:

1. HORSEPOWER IS PER MOTOR.

C&S - FUEL OIL TANK SCHEDULE

MARK	MANUFACTURER	MODEL	STORAGE CAPACITY (GAL)	DIAMETER (FT)	LENGTH (FT)	REMARKS
FOT-1	HIGHLAND TANK	3000HGDW126	30000	11	47	ALL

REMARKS:

1. DOUBLE-WALL TANK.
2. PROVIDE HYDROGUARD HYDROSTATIC MONITORING SYSTEM WITH AUDIBLE AND VISUAL ALARM.
3. PROVIDE 22" FLANGED MANWAY AND 42" CONTAINMENT COLLAR.
4. PROVIDE GRADE RINGS TO MATCH FINAL GRADE ELEVATION. REFER TO CIVIL DRAWINGS

C&S - FREEZE PROTECTION PUMP SCHEDULE

MARK	INSTANCE MARK	MANUFACTURER	SERIES	MODEL	TYPE	SERVICE	GPM	PRESSURE (FEET HEAD)	MINIMUM EFFICIENCY (%)	RPM	HP	ELECTRICAL DATA VOLTAGE	PHASE	HZ	REMARKS
FPP-1	AHU1	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU1_DT_0S	85	15.00	58	1760	0.75	460 V	3	60	ALL
FPP-2	AHU2	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU2_DT_2S	25	17.00	49	1750	0.33	460 V	3	60	ALL
FPP-3	AHU3	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU3_LAB_2S	110	16.00	57	1760	1	460 V	3	60	ALL
FPP-4	AHU4	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU4_AUX_012N	36	16.00	55	1750	0.33	460 V	3	60	ALL
FPP-5	AHU5	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU5_CLIN_567N	51	15.00	65	1750	0.5	460 V	3	60	ALL
FPP-6	AHU6	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU6_SUR_2S	70	20.00	62	1760	0.75	460 V	3	60	ALL
FPP-7	AHU7	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU7_OFC_4S	50	15.00	55	1750	0.5	460 V	3	60	ALL
FPP-8	AHU8	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU8_CLIN_34N	110	17.00	59	1760	1	460 V	3	60	ALL
FPP-9	AHU9	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU9_DT_5N	33	14.00	53	1750	0.33	460 V	3	60	ALL
FPP-10	AHU10	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU10_CLIN_3S	46	14.00	55	1750	0.33	460 V	3	60	ALL
FPP-11	AHU11	TACO	1900	1915	INLINE-CENTRIFUGAL	AHU11_CLIN_6S	45	20.00	51	1750	0.5	460 V	3	60	ALL
FPP-12	AHU12	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU12_DT_5S	75	16.00	59	1760	0.75	460 V	3	60	ALL
FPP-13	AHU13	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU13_CLIN_7S	49	14.00	55	1750	0.5	460 V	3	60	ALL
FPP-14	AHU14	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU14_SUR_2N	95	20.00	63	1760	1	460 V	3	60	ALL
FPP-16	AHU16	TACO	1900	1935	INLINE-CENTRIFUGAL	AHU16_MER_8	100	20.00	63	1750	1	460 V	3	60	ALL
FPP-17	AHU17	TACO	1900	1911	INLINE-CENTRIFUGAL	AHU17_LOB_1S	46	15.00	56	1750	0.5	460 V	3	60	ALL

REMARKS:

1. PROVIDE DISCONNECT AND SINGLE POINT POWER CONNECTION.
2. PROVIDE SUCTION DIFFUSER, CHECK VALVE, BALANCING VALVE AND ISOLATION VALVES.
4. INSTALL AND SUPPORT PUMP PER MANUFACTURES SPECIFICATIONS

SOUND ATTENUATOR SCHEDULE

MARK	MANUF.	MODEL #	DIMENSIONS (IN) HEIGHT	LENGTH	WIDTH	AIRFLOW MAX. (CFM)	VELOCITY MAX. (FPM)	SILENCER PD (IN WG)	PD INCL. SYS. EFF. (IN WG)	DYNAMIC INSERTION LOSS, dB 63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	REMARKS
SA-1	VIBRO-ACOUSTICS	RD-MV-FG	180	84	130	62000	382	0.10	0.27	10	16	24	26	28	15	12	10	ALL

REMARKS:

1. RD = RECTANGULAR DISSIPATIVE
2. TRANSITION ATTENUATOR. LENGTH SHOWN IS MEASURED ALONG THE CENTERLINE. INLET = 96"x110". OUTLET = 130"x180".
3. FIELD VERIFY VERTICAL OFFSET BETWEEN INLET AND OUTLET AS NECESSARY.
4. GALVANIZED CONSTRUCTION.
5. ACOUSTIC MEDIA SHALL BE EQUAL TO VIBRO-ACOUSTICS "MOLDBLOCK MEDIA" CONTAINING 100% NATURAL COTTON FIBERS TREATED WITH AN EPA REGISTERED, NON-TOXIC BORATE SOLUTION, FLASH DRIED TO PROVIDE RESISTANCE TO MOLD, MILDEW AND FUNGI. MEDIA SHALL NOT CAUSE OR ACCELERATE CORROSION OF ALUMINUM OR STEEL. GLASS FIBER, FIBERGLASS AND ROCKWOOL WILL NOT BE PERMITTED AS A SUBSTITUTE FOR MOLDBLOCK MEDIA.
6. PROVIDE SOUND ATTENUATOR ON THE RADIATOR DISCHARGE OF EACH GENERATOR, TOTAL OF 3.

C&S - FAN COIL SCHEDULE

MARK	INSTANCE	SUPPLY/RETURN CONFIGURATION	TYPE	MANUFACTURER	MODEL #	WEIGHT (lb)	DIMENSIONS (IN) LENGTH	WIDTH	HEIGHT	SUPPLY FAN NOM. CFM	ESP (" WC)	MOTOR HP	MCA	MOP	VOLTAGE	PHASE	COOLING COIL EAT DB (°F)	LAT DB (°F)	EAT WB (°F)	LAT WB (°F)	TOTAL COOLING CAPACITY (MBH)	SENSIBLE COOL CAPACITY (MBH)	EWT (°F)	LWT (°F)	GPM	WPD (FT)	REMARKS
RFCU-36	ST08B		2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	FCVH112	155	69	10	24	1150	0.20	0.25	8.80 A	15	115 V	1	75	63	55	53	32.3	25.0	45	55	7	12.75	1,2,5,8
RFCU-36	ST08C		2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	FCVH112	155	69	10	24	1150	0.20	0.25	8.80 A	15	115 V	1	75	63	55	53	32.3	25.0	45	55	7	12.75	1,2,5,8
RFCU-36	ST07A		2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	FCVH112	155	69	10	24	1150	0.20	0.25	8.80 A	15	115 V	1	75	63	55	53	32.3	25.0	45	55	7	12.75	1,2,5,8
RFCU-36A	ST00C		2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	FHVH112	155	69	10	24	1150	0.20	0.25	8.80 A	15	115 V	1	[redacted]										1,5,8,9
VFCU-24.1	PH804	TOP/REAR	2-PIPE VERTICAL FAN COIL UNIT	ENVIRO-TEC	VR08	196	19	26	46	660	0.50	0.5	7.13 A	15	208 V	1	80	55	67	54	27.0	18.4	42	54	5	4.74	1,2,4,5
VFCU-24.1	PH802	TOP/REAR	2-PIPE VERTICAL FAN COIL UNIT	ENVIRO-TEC	VR08	196	19	26	46	660	0.50	0.5	7.13 A	15	208 V	1	80	55	67	54	27.0	18.4	42	54	5	4.74	1,2,4,5
VFCU-36.1	B003A1	TOP/REAR	2-PIPE VERTICAL FAN COIL UNIT	ENVIRO-TEC	VR12	221	21	26	46	990	0.50	1	10.38 A	15	208 V	1	80	55	67	54	39.3	26.8	42	54	7	5.39	1,2,4,5
VFCU-36A	B003A	TOP/FRONT	4-PIPE VERTICAL FAN COIL UNIT	DAIKIN	VR12	248	21	26	46	990	0.50	1	10.38 A	15	208 V	1	80	55	67	54	39.3	26.8	42	54	7	5.39	1,3,4,5
VFCU-36A	C006	TOP/FRONT	4-PIPE VERTICAL FAN COIL UNIT	DAIKIN	VR12	248	21	26	46	990	0.50	1	10.38 A	15	208 V	1	80	55	67	54	39.3	26.8	42	54	7	5.39	1,3,4,5
VFCU-36A.1	D001	TOP/REAR	4-PIPE VERTICAL FAN COIL UNIT	ENVIRO-TEC	VR12	248	21	26	46	990	0.50	1	10.38 A	15	208 V	1	80	55	67	54	39.3	26.8	42	54	7	5.39	1,3,4,5
VFCU-60	PH805	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCAD0201	215	18	43	69	1650	0.50	1.5	13.40 A	15	208 V	1	80	55	67	55	59.9	42.8	42	54	10	2.16	1,2,4,5
VFCU-60	PH806	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCAD0201	215	18	43	69	1650	0.50	1.5	13.40 A	15	208 V	1	80	55	67	55	59.9	42.8	42	54	10	2.16	1,2,4,5
VFCU-60	B003C	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCAD0201	215	18	43	69	1650	0.50	1.5	13.40 A	15	208 V	1	80	55	67	55	59.9	42.8	42	54	10	2.16	1,2,4,5
VFCU-60	PH807	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCAD0201	215	18	43	69	1650	0.50	1.5	13.40 A	15	208 V	1	80	55	67	55	59.9	42.8	42	54	10	2.16	1,2,4,5
VFCU-60	B003B	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCAD0201	215	18	43	69	1650	0.50	1.5	13.40 A	15	208 V	1	80	55	67	55	59.9	42.8	42	54	10	2.16	1,2,4,5
VFCU-90	CSA00G	TOP/FRONT	2-PIPE VERTICAL FAN COIL UNIT	DAIKIN	BCVD0301	376	35	50	62	2475	0.50	3	10.20 A	15	208 V	3	80	55	67	55	92.1	64.8	42	54	15	3.05	1,2,4,5
VFCU-300.1	PH801	TOP/REAR	2-PIPE VERTICAL FAN COIL UNIT	ENVIRO-TEC	MQL-V17	1366	45	82	44	8250	0.50	5	11.00 A	15	460 V	3	80	54	53	67	365.2	243.4	42	54	61	12.68	1,2,4,5
WFCU-24	PH803	-	CHILLED/HOT WATER WALL FAN COIL	MULTIAQUA	MHQWW-24-H-3	46	46	8	14	600	[redacted]	0.05	0.81 A	15	120 V	1	80	55	67	54	26.6	17.8	42	54	6	14.50	1,2,5,7

C&S - FAN COIL UNIT SCHEDULE - HOT WATER COIL

MARK	HOT WATER COIL TOTAL HEATING CAP (MBH)	EAT (°F)	LAT (°F)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	MAX. WATER PRESSURE DROP (FT)
RFCU-36A	54.6	65	109	120	100	6	8.18
VFCU-36A	24.8	65	88	120	100	3	2.39
VFCU-36A.1	24.8	65	88	120	100	3	2.39

REMARKS:

1. PROVIDE SECONDARY DRAIN PAN.
2. COOLING ONLY UNIT.
3. HEATING AND COOLING UNIT.
4. PROVIDE WITH MERV 8 FILTER.
5. PROVIDE WITH INTEGRAL DISCONNECT AND SINGLE POINT POWER CONNECTION.
6. HORIZONTAL FAN COIL UNIT TO BE SUPPORTED FROM STRUCTURE PER MANUFACTURES REQUIRMENTS.
7. REFER TO FLOOR PLANS FOR MOUNTING HEIGHT.
8. PROVIDE UNIT WITH DECORATE FACE PLATE PANEL.
9. HEATING ONLY UNIT.

C&S - BASEBOARD HEATER SCHEDULE - HOT WATER

MARK	MANUFACTURER	MODEL #	DIMENSIONS (IN) LENGTH	WIDTH	HEIGHT	HEATING CAPACITY (MBH)	EWT (°F)	LWT (°F)	WATER FLOW RATE (GPM)	WPD (FT HD)	REMARKS
BBH-2	STERLING	BARE ELEMENTS	24	3.25	3.25	1244.0	180	160	0.13	0.08	ALL
BBH-4	STERLING	BARE ELEMENTS	48	3.25	3.25	2488.0	180	160	0.25	0.08	ALL
BBH-8	STERLING	BARE ELEMENTS	96	3.25	3.25	4976.0	180	160	0.50	0.08	ALL
BBH-10	STERLING	BARE ELEMENTS	120	3.25	3.25	6220.0	180	160	0.62	0.20	ALL
BBH-12	STERLING	BARE ELEMENTS	216	3.25	3.25	7464.0	180	160	0.75	1.08	ALL
BBH-16	STERLING	BARE ELEMENTS	216	3.25	3.25	15550.0	180	160	1.00	1.08	ALL
BBH-18	STERLING	BARE ELEMENTS	216	3.25	3.25	11196.0	180	160	1.12	1.08	ALL
BBH-22	STERLING	BARE ELEMENTS	264	3.25	3.25	13684.0	180	160	1.36	1.76	ALL
BBH-25	STERLING	BARE ELEMENTS	300	3.25	3.25	15550.0	180	160	1.55	2.50	ALL
BBH-28	STERLING	BARE ELEMENTS	336	3.25	3.25	17416.0	180	160	1.75	2.75	ALL

REMARKS:

1. TO BE INSTALLED IN FIELD-FABRICATED ENCLOSURE. REFER TO ARCHITECTURAL DRAWINGS FOR ENCLOSURE SPECIFICATIONS.
2. PROVIDE SECTIONS IN LENGTHS NECESSARY TO ACCOMPLISH OVERALL SECTION LENGTH. REFER TO MECHANICAL SHEETS. CONFIRM FINAL INSTALLATION LENGTHS WITH ENCLOSURE FABRICATOR.
3. SELECTIONS BASED AROUND AVERAGE HOT WATER TEMPERATURE OF 170F @ 622 BTU/FT.

C&S - AIR/DIRT SEPARATOR SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	MOUNTING	INLET PIPE SIZE	OUTLET PIPE SIZE	WATER FLOW RATE (GPM)	WATER PRESSURE DROP (FT HD)	REMARKS
ADS-1	SPIROTHERM	VHT1400FA	CHILLED WATER SYSTEM	FLOOR MOUNTED	12"	12"	4000	9.00	ALL
ADS-2	SPIROTHERM	VHT800FA	HOT WATER SYSTEM	FLOOR MOUNTED	8"	8"	1000	4.00	ALL
ADS-3	SPIROTHERM	VDT600FA	GLYCOL WATER SYSTEM	FLOOR MOUNTED	6"	6"	300	1.00	ALL

REMARKS:

C&S - FLASH TANK SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	PHYSICAL SIZE (IN) LENGTH	DIAMETER	CAPACITY (GALS)	INITIAL PRESSURE (PSI)	FLASH PRESSURE (PSI)	REMARKS
FT	WHEATLEY	FT-125-HRZ	FLASH	48	30	125.0	150	15	ALL

REMARKS:

1. ASME RATED HORIZONTAL FLASH TANK.
2. PROVIDE WITH INTERNAL SPARGE TUBE AND DROP LEG, VENT, DRAIN, AND HAND HOLE.
3. SUPPORT WITH STEEL FRAME OFF FLOOR.

C&S - LOUVERED PENTHOUSE SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	MAXIMUM CFM	HEIGHT (IN.)	THROAT WIDTH (IN.)	THROAT LENGTH (IN.)	THROAT VELOCITY (FPM)	PRESSURE DROP (IN. WG)	THROAT AREA (SF)	REMARKS
LP-5	GREENHECK	WRH	AHU-5 RELIEF AIR	41000	54	56	108	976	0.15	42	ALL
LP-6	GREENHECK	WRH	AHU-6 RELIEF AIR	40000	54	58	106	937	0.13	43	ALL
LP-7	GREENHECK	WRH	AHU-7 RELIEF AIR	45000	58	60	120	900	0.12	50	ALL
LP-8	GREENHECK	WRH	AHU-8 RELIEF AIR	49000	58	60	118	997	0.15	49	ALL
LP-9	GREENHECK	WRH	AHU-9 RELIEF AIR	17000	43	46	62	858	0.11	20	ALL
LP-10	GREENHECK	WRH	AHU-10 RELIEF AIR	42000	54	58	106	984	0.15	43	ALL
LP-11	GREENHECK	WRH	AHU-11 RELIEF AIR	40000	54	58	106	937	0.13	43	ALL
LP-12	GREENHECK	WRH	AHU-12 RELIEF AIR	32000	54	58	106	750	0.08	43	ALL
LP-13	GREENHECK	WRH	AHU-13 RELIEF AIR	44000	58	58	110	993	0.15	44	ALL
LP-14	GREENHECK	WRH	AHU-14 RELIEF AIR	38000	54	58	106	890	0.12	43	ALL

REMARKS:

1. PROVIDE 24" ROOF CURB, CONTRACTOR TO VERIFY HEIGHT TO ACCOMODATE DUCT TRANSITION TO LOUVERED PENTHOUSE OPENING.
2. PROVIDE WITH BIRDSCREEN.

C&S - EXPANSION TANK SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	SERVICE	PHYSICAL SIZE (IN) HEIGHT	DIAMETER	CAPACITY TANK VOLUME (GALS)	AIR CHARGE PRESSURE	REMARKS
ET-1	TACO	CA800-125	FULL ACCEPTANCE	HEATING WATER SYSTEM	90	30	200.0	12.00	ALL
ET-2	TACO	CA90-125	FULL ACCEPTANCE	BASEBOARD HEATING WATER SYSTEM	29	20	23.0	12.00	ALL
ET-3	TACO	CA140-125	FULL ACCEPTANCE	CHILLED WATER SYSTEM	37	20	37.0	12.00	ALL
ET-4	TACO	CA90-125	FULL ACCEPTANCE	GLYCOL WATER SYSTEM	29	30	23.0	12.00	ALL

REMARKS:

C&S - REGISTERS, GRILLES, AND DIFFUSERS

MARK	MANUFACTURER	MODEL #	TYPE	GRILLE SIZE	PANEL SIZE	DUCT INLET SIZE	DUCT BRANCH SIZE	MAX CFM	P.D.	NOISE CRITERIA	THROW PATTERN	REMARKS
R-1	TITUS	350FL	ALUMINUM SIDEWALL	26"X20"	28"X22"	26"X20"	26"X20"	700	0.01	10	-	3
R-2	TITUS	350FL	ALUMINUM SIDEWALL	26"X22"	28"X24"	26"X22"	26"X22"	1000	0.01	10	-	3
R-3	TITUS	350FL	ALUMINUM SIDEWALL	42"X24"	44"X26"	42"X24"	42"X24"	1650	0.01	10	-	3
R-4	TITUS	350FL	ALUMINUM SIDEWALL	78"X40"	80"X42"	78"X40"	78"X40"	8250	0.03	16	-	3
S-1	TITUS	300RS	STEEL SIDEWALL	36"x24"	38"x26"	36"x24"	36"x24"	3400	0.07	30	1-WAY	1, 2, 3
S-2	TITUS	300RS	STEEL SIDEWALL	48"x30"	50"x32"	48"x30"	48"x30"	5600	0.07	30	1-WAY	1, 2, 3
S-3	TITUS	300FL	ALUMINUM SIDEWALL	8"X8"	10"X10"	10"X10"	10"X10"	250	0.09	23	4-WAY	1, 2, 3
S-4	TITUS	300FL	ALUMINUM SIDEWALL	10"X10"	12"X12"	12"X12"	12"X12"	425	0.10	26	4-WAY	1, 2, 3
S-5	TITUS	300FL	ALUMINUM SIDEWALL	48"X24"	50"X26"	48"X24"	48"X24"	8000	0.21	49	4-WAY	1, 2, 3

REMARKS:

1. PROVIDE WITH BALANCING DAMPER.
2. REFER TO FLOOR PLANS FOR MOUNTING HEIGHT.
3. VERIFY FINISH WITH ARCHITECT.

C&S - AIR SEPARATOR SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	MOUNTING	INLET PIPE SIZE	OUTLET PIPE SIZE	WATER FLOW RATE (GPM)	REMARKS
AS-1	TACO	4900	CHILLED WATER PROCESS LOOP	IN-LINE	8"	8"	816	ALL
AS-2	TACO	4900	BASEBOARD HEATING WATER SYSTEM	IN-LINE	3"	3"	113	ALL

REMARKS:

1. PROVIDE WITHOUT STRAINER.

C&S - LOOP FILTER SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	FILTER	GPM	P.D. (PSI)	DIAMETER (IN)	HEIGHT (IN)	REMARKS
LF-1	HARMSCO	HUR 40 HP	BASEBOARD HEATING WATER SYSTEM	HC/40-50	15	0.30	13	20	ALL
LF-2	HARMSCO	HUR 170 HP	HEATING WATER SYSTEM	HC/170-50	130	4.00	13	41	ALL
LF-3	HARMSCO	HUR 40 HP	GLYCOL WATER SYSTEM	HC/140-50	30	0.30	13	20	ALL

REMARKS:

1. PROVIDE TWO CLEAN FULL SETS TO OWNER (AFTER FLUSHING IS COMPLETE AND FIRST CLEAN FILTER SET IS IN) AS PART OF ATTIC STOCK. DELIVER TO ADDRESS SHOWN ON THIS SHEET.

C&S STEAM TRAP SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	TYPE	MAX. INLET PRESSURE (PSI)	DIFFERENTIAL PRESSURE (PSI)	CAPACITY (LB/HR)	CONNECTION SIZE	REMARKS
T-1	ARMSTRONG	175-A	HIGH PRESSURE DRIP LEG	FLOAT AND THERMOSTATIC	150	10	1,100	3/4"	1, 2
T-2	ARMSTRONG	125-A	MEDIUM PRESSURE DRIP LEG	FLOAT AND THERMOSTATIC	90	5	1,150	3/4"	1, 2
T-3	ARMSTRONG	30-A	LOW PRESSURE DRIP LEG	FLOAT AND THERMOSTATIC	15	5	1,750	3/4"	1, 2
T-4	ARMSTRONG	FLT17-4.5	STEAM HEAT EXCHANGER	FLOAT AND THERMOSTATIC	15	5	14,000	2"	1, 2

REMARKS:

1. PROVIDE Y-STRAINER UPSTREAM OF TRAP.
2. PROVIDE INLET CHECK VALVE TO PROTECT TRAP PRIME.

STEAM PRESSURE REGULATOR SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	CAPACITY (LB/HR)	VALVE SIZE	INLET PRESSURE (PSIG)	OUTLET PRESSURE (PSIG)	REMARKS
PRV-1	LESLIE	GPS-1	LOW PRESSURE STEAM STATION 1/3	4700	3	150	15	ALL
PRV-2	LESLIE	GPS-1	LOW PRESSURE STEAM STATION 2/3	9500	4	150	15	ALL
PRV-3	LESLIE	GPS-1	MED. PRESSURE STEAM STATION 1/3	2000	2	150	90	ALL
PRV-4	LESLIE	GPS-1	MED. PRESSURE STEAM STATION 2/3	4000	2-1/2	150	90	ALL

REMARKS:

1. EXTERNAL PRESSURE PILOT. DUCTILE IRON BODY WITH ALL STAINLESS STEEL INTERVALS 300PSI, 500 DEG F. THREADED CONNECTION. INSTALL VALVES IN A 1/3-2/3 ARRANGEMENT.

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CDM Smith
PIVOTAL lighting design
UK HEALTHCARE

Cancer Treatment Center + Advanced Ambulatory Center

1220 Elizabeth St.
Lexington, KY 40536
UK Project Number 2563.0

ISSUANCES

No.	Description	Date
1	C&S 100% DD REVIEW	01/10/24
2	C&S 80% CD	03/05/24
3	C&S 100% CD REVIEW	04/09/24
4	BP-07 BID & PERMIT	04/30/24
5	BP-07 ADDENDUM #1	05/28/24
6	BP-07 ADDENDUM #2	06/12/24

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EXHIBIT

UPDATE

10/8/24

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C&S - CHILLER - WATER COOLED SCHEDULE

MARK	MANUFACTURER	MODEL #	TYPE	SERVICE	DIMENSIONS (IN)			WEIGHT (LBS)	COMPRESSOR						EVAPORATOR												REMARKS
					LENGTH	WIDTH	HEIGHT		COOLING CAPACITY (MBH)	VOLTAGE	PHASE	MCA	MOCP	NPLV	FLUID TYPE	EWT (°F)	LWT (°F)	GPM	FLUID PD (FT HD)	FOULING FACTOR	FLUID TYPE	EWT (°F)	LWT (°F)	GPM	FLUID PD (FT HD)	FOULING FACTOR	
CH-1	YORK	YVWACCCBFXJE0121SA	WATER COOLED SCREW	GLYCOL WATER LOOP	140	55	73	8907	1576.0	460 V	3	148 A	250	0.4871	20% PROPYLENE GLYCOL	47	35	272	5.48	0.0001	WATER	70	80	373	10.70	0.00025	ALL
CH-2	YORK	YVWACCCBFXJE0121SA	WATER COOLED SCREW	GLYCOL WATER LOOP	140	55	73	8907	1576.0	460 V	3	148 A	250	0.4871	20% PROPYLENE GLYCOL	47	35	272	5.48	0.0001	WATER	70	80	373	10.70	0.00025	ALL

REMARKS:

1. PROVIDE SINGLE-POINT POWER CONNECTION AND FACTORY MOUNTED DISCONNECT
2. PROVIDE VIBRATION ISOLATORS.
3. PROVIDE FLOW SWITCH AND FACTORY-MOUNTED CONTROL PANEL. PROVIDE ALL EQUIPMENT/PROGRAMMING NECESSARY TO INTEGRATE CONTROLS INTO BUILDING AUTOMATION SYSTEM.
4. PROVIDE MINIMUM 25% CAPACITY TURNDOWN.
5. PROVIDE 65 kAIC SCCR RATING.
6. PROVIDE PRESSURE RELIEF VALVE
7. SOUND DATA AT 100% LOAD: 76DB @ 63 HZ, 86 LPA

C&S - BUFFER TANK SCHEDULE

MARK	MANUFACTURER	MODEL #	SERVICE	PHYSICAL SIZE (IN)		TANK VOLUME (GALS)	WEIGHT (POUNDS)	REMARKS
				HEIGHT	DIAMETER			
BT-1	TACO	BTH0450F	GLYCOL WATER SYSTEM	72	48	450.0	1080.00	ALL

REMARKS:

1. PROVIDE PRE-INSULATED BUFFER TANK.
2. PROVIDE WITH RELIEF PORT, INSPECTION OPENING, DRAIN AND BOTTOM 6" INLET/OUTLET CONNECTION FLANGE.

Owner Furnished, Contractor Received & Installed Equipment

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2	C&S 80% CD	03/05/24
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UPDATE

10/8/24

3 OF 3

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SECTION 236426 - ROTARY-SCREW WATER CHILLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Packaged, water-cooled, single-compressor chillers.

B. Related Section:

1. Division 28 Section "Refrigerant Detection and Alarm" for refrigerant monitors, alarms, supplemental breathing apparatus, and ventilation equipment interlocks.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

C. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in terms of Btu/h to the total power input given in terms of watts at any given set of rating conditions.

D. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by ARI 550/590 and referenced to ARI standard rating conditions.

E. kW/Ton (kW/kW): The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons (kW) at any given set of rating conditions.

F. NPLV: Nonstandard part-load value. A single-number part-load efficiency figure of merit calculated per the method defined by ARI 550/590 and intended for operating conditions other than ARI standard rating conditions.

1.4 PERFORMANCE REQUIREMENTS

A. Condenser-Fluid Temperature Performance:

1. Startup Condenser-Fluid Temperature: Chiller shall be capable of starting with an entering condenser-fluid temperature of 44F and providing stable operation until the system temperature is elevated to the minimum operating entering condenser-fluid temperature.

2. Maximum Operating Condenser-Fluid Temperature: Chiller shall be capable of continuous operation over the entire capacity range indicated with an entering condenser-fluid temperature of 120F heat recovery chillers only.
3. Make factory modifications to standard chiller design if necessary to comply with performance indicated.

B. Site Altitude: Chiller shall be suitable for altitude in which installed without affecting performance indicated. Make adjustments to affected chiller components to account for site altitude.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.

1. Performance at ARI standard conditions and at conditions indicated.
2. Performance at ARI standard unloading conditions.
3. Minimum evaporator flow rate.
4. Refrigerant capacity of chiller.
5. Oil capacity of chiller.
6. Fluid capacity of evaporator.
7. Characteristics of safety relief valves.
8. Fluid capacity of condenser **and heat-reclaim condenser**.
9. Minimum entering condenser-fluid temperature.
10. Performance at varying capacities with constant-design entering condenser-fluid temperature. Repeat performance at varying capacities for different condenser-fluid temperatures from design to minimum in **5 deg F (3 deg C)** <**Insert temperature**> increments.
11. Performance at varying capacities with constant-design entering condenser-air temperature. Repeat performance at varying capacities for different entering condenser-air temperatures from design to minimum in **10 deg F (6 deg C)** increments.

B. LEED Submittals:

1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, load distribution, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Structural supports.
2. Piping roughing-in requirements.
3. Wiring roughing-in requirements, including spaces reserved for electrical equipment.

4. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

B. Certificates: For certification required in "Quality Assurance" Article.

C. Source quality-control reports.

D. Startup service reports.

E. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each chiller to include in emergency, operation, and maintenance manuals.

1.8 QUALITY ASSURANCE

A. ARI Certification: Certify chiller according to **ARI 550 and ARI 590** certification program(s).

B. ARI Rating: Rate chiller performance according to requirements in ARI 550/590.

C. ASHRAE Compliance:

1. ASHRAE 15 for safety code for mechanical refrigeration.
2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.

D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

E. ASME Compliance: Fabricate and label chiller to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, and include an ASME U-stamp and nameplate certifying compliance.

F. Comply with NFPA 70.

G. Comply with requirements of UL and UL Canada and include label by a qualified testing agency showing compliance.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Ship each chiller with a full charge of refrigerant. Charge each chiller with nitrogen if refrigerant is shipped in containers separate from chiller.

B. Package chiller for export shipping in totally enclosed [**crate**] [**and**] [**bagging**].

1.10 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

B. Coordinate sizes, locations, and anchoring attachments of structural-steel support structures.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period.

1. Extended warranties include, but are not limited to, the following:

a. Complete chiller including refrigerant and oil charge.
b. Complete compressor and drive assembly including refrigerant and oil charge.
c. Refrigerant **and oil** charge.
d. Parts **only and labor**.
e. Loss of refrigerant charge for any reason.

2. Warranty Period **Five** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PACKAGED, WATER-COOLED, SINGLE-COMPRESSOR CHILLERS

A. Manufacturers: Subject to compliance with requirements.

1. Carrier Corporation; a United Technologies company.
2. Trane; a division of American Standard.
3. YORK International Corporation (JCI)
4. Daikin

B. Description: Factory-assembled and [**run**]-tested chiller with compressor, compressor motor, compressor motor controller, lubrication system, evaporator, condenser, **heat-reclaim condenser as indicated,** controls, interconnecting unit piping and wiring, and indicated accessories.

1. Disassemble chiller into major assemblies as required by the installation after factory testing and before packaging for shipment.

C. Fabricate chiller mounting base with reinforcement strong enough to resist chiller movement during a seismic event when chiller is anchored to field support structure.

D. Compressor:

1. Description: **Hermetic or open**, positive displacement, and oil lubricated.
2. Casing: Cast iron, precision machined for minimum clearance about periphery of rotors.
3. Rotors: Manufacturer's standard one-, two-, or three-rotor design.
4. Drive Coupling: For chillers with open drives, provide flexible disc with all-metal construction and no wearing parts to ensure long life without the need for lubrication.
5. Seals: Seal drive assembly to prevent refrigerant leakage.

E. Compressor Motor:

1. Continuous-duty, squirrel-cage, induction-type motor with energy efficiency required to suit chiller energy efficiency indicated.
2. Factory mounted, aligned, and balanced as part of compressor assembly before shipping.
3. Motor shall be of sufficient capacity to drive compressor throughout entire operating range without overload and with sufficient capacity to start and accelerate compressor without damage.
4. For chillers with open drives, provide motor with **open-drip proof** enclosure.
5. Provide motor with thermistor or RTD in **each of three-phase motor windings** to monitor temperature and report information to chiller control panel.
6. Provide motor with thermistor or RTD to monitor bearing temperature and report information to chiller control panel.
7. Provide open-drive motor with internal electric heater, internally powered from chiller power supply.

F. Vibration Balance: Balance chiller compressor and drive assembly to provide a precision balance that is free of noticeable vibration over the entire operating range.

1. Overspeed Test: 25 percent above design operating speed.

G. Service: Easily accessible for inspection and service.

1. Compressor's internal components shall be accessible without having to remove compressor-drive assembly from chiller.
2. Provide lifting lugs or eyebolts attached to casing.

H. Capacity Control: Modulating slide-valve assembly or port unloaders combined with **a variable frequency controller, if applicable, and** hot-gas bypass, if necessary, to achieve performance indicated.

1. Maintain stable operation throughout range of operation. Configure to achieve most energy-efficient operation possible.
2. Operating Range: From 100 to **10** percent of design capacity.
3. Condenser-Fluid Unloading Requirements over Operating Range: **Constant-design entering condenser-fluid temperature**.

I. Oil Lubrication System: Consisting of pump if required, filtration, heater, cooler, factory-wired power connection, and controls.

1. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, shutdown, and standby conditions including power failure.
2. Thermostatically controlled oil heater properly sized to remove refrigerant from oil.
3. **Dual oil filers, one redundant,** shall be the easily replaceable cartridge type, minimum 0.5-micron efficiency, with means of positive isolation while servicing.
4. **Refrigerant- or water**-cooled oil cooler.
5. Factory-installed and pressure-tested piping with isolation valves and accessories.
6. Oil compatible with refrigerant and chiller components.
7. Positive visual indication of oil level.

J. Refrigerant Circuit:

1. Refrigerant: Type as indicated on Drawings.
2. Refrigerant Type: Classified as Safety Group A1 according to ASHRAE 34.

3. Refrigerant Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
4. Refrigerant Flow Control: Manufacturer's standard refrigerant flow-control device satisfying performance requirements indicated.
5. Pressure Relief Device:

    a. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
    b. ASME-rated, spring-loaded pressure relief valve; single- or multiple-reseating type. Pressure relief valve(s) shall be provided for each heat exchanger. Condenser shall have dual valves with one being redundant and configured to allow either valve to be replaced without loss of refrigerant.

6. Refrigeration Transfer: Provide service valves and other factory-installed accessories required to facilitate transfer of refrigerant from chiller to a remote refrigerant storage and recycling system. Comply with requirements in ASHRAE 15 and ASHRAE 147.
7. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line to the condenser and the refrigerant liquid line leaving the condenser to allow for isolation and storage of full refrigerant charge in the chiller condenser shell.

K. Evaporator:

1. Description: Shell-and-tube design with water in tubes and refrigerant surrounding tubes within shell. Shell is separate from condenser.
2. Shell Material: Carbon-steel rolled plates with continuously welded seams or seamless pipe.
3. Designed to prevent liquid refrigerant carryover from entering compressor.
4. Provide evaporator with sight glass or other form of positive visual verification of liquid-refrigerant level.
5. Tubes:

    a. Individually replaceable from either end and without damage to tube sheets and other tubes.
    b. Mechanically expanded into end sheets and physically attached to intermediate tube sheets.
    c. Material: Copper

6. End Tube Sheets: Continuously welded to each end of shell; drilled and reamed to accommodate tubes with positive seal between fluid in tubes and refrigerant in shell.
7. Water Box:

    a. Cast-iron or carbon-steel construction; arranged to provide visual inspection and cleaning of tubes from either end without disturbing refrigerant in shell.
    b. **Marine** type for water box with piping connections. Standard type for water box without piping connections.
    c. Provide water boxes **and marine water-box covers** with lifting lugs or eyebolts.
    d. Nozzle Pipe Connections: **Welded, ASME B16.5, flat-face flange.**
    e. Thermistor or RTD temperature sensor factory installed in each nozzle.

8. Additional Corrosion Protection:

    a. Electrolytic corrosion-inhibitor anode.
    b. Coat wetted surfaces with a corrosion-resistant finish.

L. Condenser:

1. Description: Shell-and-tube design with water in tubes and refrigerant surrounding tubes within shell. Shell is separate from evaporator.
2. Shell Material: Carbon-steel rolled plates with continuously welded seams or seamless pipe.
3. Designed to prevent direct impingement of high-velocity hot gas from compressor discharge on tubes.
4. Provide condenser with sight glass or other form of positive visual verification of refrigerant charge and condition.
5. Tubes:

    a. Individually replaceable from either end and without damage to tube sheets and other tubes.
    b. Mechanically expanded into end sheets and physically attached to intermediate tube sheets.
    c. Material: **Copper-nickel alloy** [**Copper or copper-nickel alloy**] <**Insert material**>.

6. End Tube Sheets: Continuously welded to each end of shell; drilled and reamed to accommodate tubes with positive seal between fluid in tubes and refrigerant in shell.

7. Intermediate Tube Sheets: Installed in shell and spaced along length of tube at intervals required to eliminate vibration and to avoid contact of tubes resulting in abrasion and wear.
8. Water Box:

    a. Cast-iron or carbon-steel construction; arranged to provide visual inspection and cleaning of tubes from either end without disturbing refrigerant in shell.
    b. **Marine** type for water box with piping connections. Standard type for water box without piping connections.
    c. Provide water boxes **and marine water-box covers** with lifting lugs or eyebolts.
    d. Hinged water boxes.
    e. Hinged marine water box covers.
    f. Nozzle Pipe Connections: **Welded, ASME B16.5, flat-face flange**.
    g. Thermistor or RTD temperature sensor factory installed in each nozzle.
    h. Fit each water box with 1 inch (25-mm) drain connection at low point and vent connection at high point, each with threaded plub.

9. Additional Corrosion Protection:

    a. Electrolytic corrosion-inhibitor anode.
    b. Coat wetted surfaces with a corrosion-resistant finish.

M. Electrical Power:

1. Factory installed and wired, and functionally tested at factory before shipment.
2. Single-point, field-power connection to **circuit breaker**. Minimum withstand rating shall be as required by electrical power distribution system, but not less than **65,000 A.**

    a. Provide branch power circuit to each motor, electric heater, dedicated electrical load, and controls **with disconnect switch or circuit breaker**.

b. NEMA- and ICS 2-rated motor controller for auxiliary motors, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller for each variable-speed motor furnished.
c. Control-circuit transformer with primary and secondary side fuses.

3. Terminal blocks with numbered **and color-coded** wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.
4. Factory-installed wiring outside of enclosures shall be in metal raceway except make connections to each motor and heater with not more than a 24-inch (610-mm) length of liquid tight conduit.
5. Factory install and wire capacitor bank for the purpose of power factor correction to **0.95** at all operating conditions.

a. If capacitors are mounted in a dedicated enclosure, use same NEMA enclosure type as motor controller. Provide enclosure with service entrance knockouts and bushings for conduit.
b. Capacitors shall be non-PCB dielectric fluid, metallized electrode design, low loss with low-temperature rise. The kVAr ratings shall be indicated and shall not exceed the maximum limitations set by NFPA 70. Provide individual cells as required.
c. Provide each cell with current-limiting replaceable fuses and carbon-film discharge resistors to reduce residual voltage to less than 50 V within 1 minute after de-energizing.
d. Provide a ground terminal and a terminal block or individual connectors for phase connection.

N. Motor Controller:

1. Enclosure: **Factory installed, unit mounted**], with hinged full-front access door.
2. Control Circuit: Obtained from **integral control power transformer** with a control power of enough capacity to operate connected control devices.
3. Overload Relay: Shall be sized according to UL 1995 or shall be an integral component of chiller control microprocessor.
4. Across-the-Line Controller: NEMA ICS 2, Class A, full voltage, nonreversing; include isolation switch and current-limiting fuses.
5. Star-Delta, Reduced-Voltage Controller: NEMA ICS 2, closed transition.
6. Autotransformer Reduced-Voltage Controller: NEMA ICS 2, closed transition; include isolation switch and current-limiting fuses.
7. Solid-State, Reduced-Voltage Controller: NEMA ICS 2.

a. Surge suppressor in solid-state power circuits providing three-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
b. Visual indication of motor and control status, including the following conditions:

1) Controller on.
2) Overload trip.
3) Loss of phase.
4) Starter fault.

8. Accessories: Devices shall be factory installed in controller enclosure unless otherwise indicated.

a. Externally Operated Disconnect: **Circuit breaker**. Minimum withstand rating shall be as required by electrical power distribution system, but not less than **65,000 A**.
b. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
c. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
d. Control Relays: Time-delay relays.
e. Elapsed-Time Meters: Numerical readout in hours on face of enclosure.
f. Number-of-Starts Counter: Numerical readout on face of enclosure.
g. Meters: Panel type, **2-1/2 inches (64 mm)** with **90** degree scale and **1** percent accuracy. Where indicated, provide transfer device with an off position. Meters shall indicate the following:

1) Ammeter: Output current for each phase, with current sensors rated to suit application.
2) Voltmeter: Output voltage for each phase.
3) Frequency Meter: Output frequency.
4) Real-time clock with current time and date.
5) Total run time.

h. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1) Selectable, digital display of the following:

a) Phase Currents, Each Phase: Plus or minus 1 percent.
b) Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c) Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
d) Three-Phase Real Power: Plus or minus 2 percent.
e) Three-Phase Reactive Power: Plus or minus 2 percent.
f) Power Factor: Plus or minus 2 percent.
g) Frequency: Plus or minus 0.5 percent.
h) Integrated Demand with Demand Interval Selectable from 5 to 60 Minutes: Plus or minus 2 percent.
i) Accumulated energy, in megawatt hours (joules), plus or minus 2 percent; stored values unaffected by power outages for up to 72 hours.

2) Mounting: Display and control unit flush or semirecessed in instrument compartment door.

i. Phase-Failure, Phase-Reversal, Undervoltage Relays: Solid-state sensing circuit with adjustable undervoltage setting and isolated output contacts for hardwired connection.
j. Power Protection: Chiller shall shut down within six cycles of power interruption.

O. Variable Frequency Controller:

1. Motor controller shall be factory mounted and wired on the chiller to provide a single-point, field-power termination to the chiller and its auxiliaries.
2. Description: NEMA ICS 2; listed and labeled as a complete unit and arranged to provide variable speed by adjusting output voltage and frequency.

3. Enclosure: Unit mounted, NEMA 250, with hinged full-front access door with lock and key.
4. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker with lockable handle. Minimum withstand rating shall be as required by electrical power distribution system, but not less than **65,000**.
5. Technology: Pulse width modulated (PWM) output suitable for constant or variable torque loads.
6. Output Rating: Three phase; with voltage proportional to frequency throughout voltage range.
7. Operating Requirements:

    a. Input AC Voltage Tolerance: **460-V ac, plus 10 percent or 506 V maximum**.
    b. Input frequency tolerance of 60 Hz, plus or minus 2 Hz.
    c. Capable of driving full load, without derating, under the following conditions:

        1) Ambient Temperature: 0 to 40 deg C.
        2) Relative Humidity: Up to **95** percent (noncondensing).
        3) Altitude: **3300 feet (1005 m)**.

    d. Minimum Efficiency: 96 percent at 60 Hz, full load.
    e. Minimum Displacement Primary-Side Power Factor: 98 percent.
    f. Overload Capability: 1.05 times the full-load current for 7 seconds.
    g. Starting Torque: As required by compressor-drive assembly.
    h. Speed Regulation: Plus or minus 1 percent.
    i. Isolated control interface to allow controller to follow control signal over a 10:1 speed range.
    j. To avoid equipment resonant vibrations, provide critical speed lockout circuitry to allow bands of operating frequency at which controller shall not operate continuously.
    k. Capable of being restarted into a motor coasting in either the forward or reverse direction without tripping.

8. Internal Adjustability Capabilities:

    a. Minimum Output Frequency: 6 Hz.
    b. Maximum Output Frequency: 60 Hz.
    c. Acceleration: 2 seconds to 60 seconds.
    d. Deceleration: Zero seconds to 60 seconds.
    e. Current Limit: 30 to a minimum of 100 percent of maximum rating.

9. Self-Protection and Reliability Features: Subjecting the controller to any of the following conditions shall not result in component failure or the need for replacement:

    a. Overtemperature.
    b. Short circuit at controller output.
    c. Ground fault at controller output. Variable frequency controller shall be able to start a grounded motor.
    d. Open circuit at controller output.
    e. Input undervoltage.
    f. Input overvoltage.
    g. Loss of input-phase.
    h. Reverse phase.
    i. AC line switching transients.
    j. Instantaneous overload, line to line or line to ground.

k. Sustained overload exceeding 100 percent of controller rated current.
l. Starting a rotating motor.

10. Motor Protection: Controller shall protect motor against overvoltage and undervoltage, phase loss, reverse phase, overcurrent, overtemperature, and ground fault.
11. Automatic Reset and Restart: Capable of **three** restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Controller shall be capable of automatic restart on phase-loss, and overvoltage and undervoltage trips.
12. Visual Indication: On face of controller enclosure or chiller control enclosure; indicating the following conditions:

    a. Power on.
    b. Run.
    c. Overvoltage.
    d. Line fault.
    e. Overcurrent.
    f. External fault.
    g. Motor speed (percent).
    h. Fault or alarm status (code).
    i. Motor output voltage.
    j. Input kilovolt amperes.
    k. Total power factor.
    l. Input kilowatts.
    m. Input kilowatt-hours.
    n. Three-phase input voltage.
    o. Three-phase output voltage.
    p. Three-phase input current.
    q. Three-phase output current.
    r. Output frequency (Hertz).
    s. Elapsed operating time (hours).
    t. Diagnostic and service parameters.

13. Operator Interface: At controller or chiller control panel; with start-stop and auto-manual selector with manual-speed-control potentiometer.
14. Harmonic Distortion Filter: Factory mounted and wired to limit total voltage and current distortion to **5** percent.

P. Controls:

1. Standalone and microprocessor based with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.
2. Enclosure: Unit mounted, NEMA 250, hinged or lockable; factory wired with a single-point, field-power connection and a separate control circuit.
3. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units, display the following information:

    a. Date and time.
    b. Operating or alarm status.
    c. Fault history with not less than last 10 faults displayed.
    d. Set points of controllable parameters.
    e. Trend data.
    f. Operating hours.

g. Number of chiller starts.
h. Outdoor-air temperature or space temperature if required for chilled-water reset.
i. Temperature and pressure of operating set points.
j. Entering- and leaving-fluid temperatures of evaporator and condenser.
k. Difference in fluid temperatures of evaporator and condenser.
l. Fluid flow of evaporator and condenser.
m. Fluid pressure drop of evaporator and condenser.
n. Refrigerant pressures in evaporator and condenser.
o. Refrigerant saturation temperature in evaporator and condenser.
p. Pump status.
q. Antirecycling timer status.
r. Percent of maximum motor amperage.
s. Current-limit set point.
t. Compressor bearing temperature.
u. Motor bearing temperature.
v. Motor winding temperature.
w. Oil temperature.
x. Oil discharge pressure.
y. Phase current.
z. Percent of motor rated load amperes.
aa. Phase voltage.
bb. Demand power (kilowatts).
cc. Energy use (kilowatt-hours).
dd. Power factor.

4. Control Functions:

a. Manual or automatic startup and shutdown time schedule.
b. Entering and leaving chilled-water temperatures, control set points, and motor load limits.
c. Current limit and demand limit.
d. Condenser-fluid temperature.
e. External chiller emergency stop.
f. Antirecycling timer.
g. Variable evaporator flow.
h. Thermal storage.
i. Heat reclaim.

5. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:

a. Low evaporator pressure or temperature; high condenser pressure.
b. Low evaporator fluid temperature.
c. Low oil differential pressure.
d. High or low oil pressure.
e. High oil temperature.
f. High compressor-discharge temperature.
g. Loss of condenser-fluid flow.
h. Loss of evaporator-fluid flow.
i. Motor overcurrent.
j. Motor overvoltage.
k. Motor undervoltage.
l. Motor phase reversal.
m. Motor phase failure.
n. Sensor- or detection-circuit fault.

o. Processor communication loss.
p. Motor controller fault.
q. Extended compressor surge.

6. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.
7. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.
8. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.
9. Communication Port: RS-232 port or equivalent connection capable of connecting a printer **and a notebook computer**.
10. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display chiller status and alarms.

    a. Hardwired Points:

        1) Monitoring: On-off status.
        2) Control: On-off operation.

    b. **ASHRAE 135 (BACnet)** communication interface with the BAS shall enable the BAS operator to remotely control and monitor the chiller from an operator workstation. Control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

Q. Insulation:

1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
2. Thickness: **1-1/2 inches (38 mm)**.
3. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.
4. Factory-applied insulation over cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator shell and end tube sheets, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.

    a. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.
    b. Seal seams and joints to provide a vapor barrier.
    c. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.

R. Finish:

1. Paint chiller, using manufacturer's standard procedures, except comply with the following minimum requirements:

    a. Provide at least one coat of primer with a total dry film thickness of at least 2 mils (0.05 mm).
    b. Paint surfaces that are to be insulated before applying the insulation.
    c. Paint installed insulation to match adjacent uninsulated surfaces.

2. Provide Owner with quart container of paint used in application of topcoat to use in touchup applications after Project Closeout.

S. Accessories:

1. Flow Switches:

a. If required and not factory installed, chiller manufacturer shall furnish a switch for each e**vaporator and condenser** and verify field-mounting location before installation.
b. Paddle Flow Switches:

1) Vane operated to actuate a double-pole, double-throw switch with one pole field wired to the chiller control panel and the other pole field wired to the BAS.
2) Contacts: Platinum alloy, silver alloy, or gold-plated switch contacts with a rating of 10 A at 120-V ac.
3) Pressure rating equal to pressure rating of heat exchanger.
4) Construct body and wetted parts of Type 316 stainless steel.
5) House switch in a NEMA 250, enclosure constructed of die-cast aluminum.
6) Vane length to suit installation.

c. Pressure Differential Switches:

1) Construction: Wetted parts of body and trim constructed of Type 316 stainless steel.
2) Performance: Switch shall withstand, without damage, the full-pressure rating of the heat exchanger applied to either port and exhibit zero set-point shift due to variation in working pressure.
3) Set Point: Screw type, field adjustable.
4) Electrical Connections: Internally mounted screw-type terminal blocks.
5) Switch Enclosure: NEMA 250.
6) Switch Action: Double-pole, double-throw switch with one pole field wired to the chiller control panel and the other pole field wired to the BAS.

2. Vibration Isolation:

a. Chiller manufacturer shall furnish vibration isolation for each chiller.
b. Neoprene Pad:

1) Two layers of 0.375-inch- (10-mm-) thick, ribbed- or waffle-pattern neoprene pads separated by a 16-gage, stainless-steel plate.
2) Fabricate pads from 40- to 50-durometer neoprene.
3) Provide stainless-steel square bearing plate to load the pad uniformly between 20 and 40 psig (138 and 276 kPa) with a 0.12- to 0.16-inch (3- to 4-mm) deflection.

3. Tool Kit: Chiller manufacturer shall assemble a tool kit specially designed for use in serving the chiller(s) furnished. Include special tools required to service chiller components not readily available to Owner service personnel in performing routine maintenance. Place tools in a lockable case with hinged cover. Provide a list of each tool furnished and attach the list to underside of case cover.

2.2 SOURCE QUALITY CONTROL

A. Perform functional tests of chillers before shipping.

B. Factory run test each air-cooled chiller with water flowing through evaporator.

C. Factory performance test water-cooled chillers, before shipping, according to ARI 550/590.
1. Test the following conditions:
a. Design conditions indicated.
b. Reduction in capacity from design to minimum load in steps of 10 with condenser fluid at design conditions.
c. Reduction in capacity from design to minimum load in steps of 10 with varying entering condenser-fluid temperature from design to minimum conditions in 5 deg F (3 deg C) increments.
d. At five points of varying part-load performance to be selected by Owner at time of test.
2. Allow Owner access to place where chillers are being tested. Notify Architect 14 days in advance of testing.
3. Prepare test report indicating test procedures, instrumentation, test conditions, and results. Submit copy of results within one week of test date.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine chillers before installation. Reject chillers that are damaged.

B. Examine rough-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting chiller performance, maintenance, and operations before equipment installation.
1. Final chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CHILLER INSTALLATION FOR INSTALLING CONTRACTORS ONLY

D. Install chillers on support structure indicated.

E. Equipment Mounting: Install chiller on concrete bases using **elastomeric pads**. Comply with requirements for concrete bases specified in Division 03 Section "**Cast-in-Place Concrete** [**Miscellaneous Cast-in-Place Concrete**]." Comply with requirements for vibration isolation devices specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

F. Maintain manufacturer's recommended clearances for service and maintenance.

G. Charge chiller with refrigerant and fill with oil if not factory installed.

H. Install separate devices furnished by manufacturer and not factory installed.

3.3 CONNECTIONS

I. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.

J. Install piping adjacent to chiller to allow service and maintenance.

K. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, **flow meter,** and drain connection with valve. Make connections to chiller with a **flange**.

L. Condenser Fluid Connections: Connect to condenser inlet with shutoff valve, thermometer, and plugged tee with pressure gage. Connect to condenser outlet with shutoff valve, balancing valve, flow switch, thermometer, plugged tee with shutoff valve and pressure gage, **flow meter** and drain connection with valve. Make connections to chiller with a **flange**.

M. Refrigerant Pressure Relief Device Connections: For chillers installed indoors, extend **vent piping** to the outdoors without valves or restrictions. Comply with ASHRAE 15. Connect vent to chiller pressure relief device with flexible connector and dirt leg with drain valve.

N. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

2.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that refrigerant charge is sufficient and chiller has been leak tested.
3. Verify that pumps are installed and functional.
4. Verify that thermometers and gages are installed.
5. Operate chiller for run-in period.
6. Check bearing lubrication and oil levels.
7. For chillers installed indoors, verify that refrigerant pressure relief device is vented outdoors.
8. Verify proper motor rotation.
9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
10. Verify and record performance of fluid flow and low-temperature interlocks for evaporator **and condenser**.
11. Verify and record performance of chiller protection devices.
12. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

2.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain chillers. **Video record the training sessions.**

END OF SECTION 236426

SECTION 237314 - FACTORY BUILT CUSTOM INDOOR AIR HANDLING UNITS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Design, performance criteria, controls, and installation requirements for indoor mounted Custom Air Handling Units.

1.2 REFERENCES

A. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings
B. AMCA Publication 99 – Standards Handbook
C. AMCA Standard 203 – Field Performance Measurement of Fan Systems
D. AMCA Standard 210 – Laboratory Methods of Testing Fans for Performance Rating
E. AMCA Standard 300 – Reverberant Room Method for Sound Testing of Fans
F. AMCA Standard 500 – Laboratory Methods for Testing of Dampers and Louvers
G. ARI Standard 410 – Forced Circulation Air-Cooling and Air-Heating Coils
H. ANSI/ASHRAE Standard 111 – Practices for Measurement, Testing, Adjusting and Balancing of Building HVAC Systems
I. ASHRAE Standard 52.1 – Dust-Spot Procedures for Testing Air-Cleaning Devices
J. ANSI/ASHRAE Standard 52.2 – Method of Testing Air-Cleaning Devices for Removal Efficiency by Particle Size
K. ANSI/ASHRAE 15 – Safety Standard for Refrigeration Systems
L. ANSI/ASHRAE 62.1 – Ventilation for Acceptable Indoor Air Quality
M. ANSI/ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential
N. ASTM A-653 – Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dipped Process
O. ASTM B117 – Standard Practice for Operating Salt Spray Apparatus
P. NEMA MG1 – Motors and Generators
Q. NFPA 70 – National Electric Code
R. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems
S. UL 900 – Test Performance of Air Filters
T. UL 1995 – Standard for Heating and Cooling Equipment

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Division 1
B. Submittals shall include the following:
    1. Dimensioned plan and elevation view drawings, including motor starter and control cabinets, required clearances, and location of all field connections.
    2. Cabinet material, metal thickness, finishes, insulation and accessories.
    3. Ladder-type schematic drawing of the power and auxiliary utility field hookup requirements, indicating all items that are furnished by the manufacturer.
    4. Manufacturer's performance of each unit. Selection shall indicate, as a minimum, the following:
        a. Fan curves with system operating conditions indicated.

b. Certified coil performance ratings with system operating conditions.
c. Calculations required for base rail heights to satisfy condensate trapping requirements of cooling coil.
d. Filters with performance characteristics.
e. Rated load amp draw.
f. Approximate unit shipping weight.

1.4 OPERATION AND MAINTENANCE DATA

A. Include data on design, inspection and procedures related to preventative maintenance. Operation and maintenance manuals shall be submitted at the time of unit shipment.

1.5 QUALIFICATIONS

A. Manufacturer shall be a company specializing in the design and manufacture of custom air handling equipment and in business for no less than 15 years.
B. Each unit shall bear an ETL label, conforming to UL Standard 1995.
C. Units shall comply with the requirements of UL 1995 and NFPA 90.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under the supervision of the owner in accordance with the manufacturers Operation and Maintenance Instructions.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate work performed under this section with work performed under the separate installation contract.

1.8 WARRANTY

A. The complete unit shall be covered by a parts only warranty issued by the manufacturer covering the first year of operation. The warranty period shall start on the date of equipment startup or six months after the date of shipment, whichever occurs first.
B. The installing contractor shall provide labor warranty during the unit’s first year of operation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to the specification requirements listed herein, provide custom air handling units as manufactured by:
1. Air Flow Systems, Inc.
2. ClimateCraft
3. Nortek Air Solutions
4. Trane Custom
5. Air Enterprises

2.2 GENERAL

A. Units shall be completely factory assembled and tested with the exception of unit splits as required for shipping or installation requirements as indicated on the schedule and drawings. The equipment's cooling, heating, humidifying, ventilating, exhausting capacity and performance shall meet or exceed that shown on the schedule. Tags and decals to aid in service or to indicate caution areas shall be provided. Electrical wiring diagrams shall be attached to the control panel access doors. Operation and Maintenance manuals shall be furnished with each unit.

2.3 CABINET CONSTRUCTION

A. Cabinets shall be constructed in a watertight and airtight manner. The manufacturer's cabinet construction shall result in an ASHRAE/ANSI Standard 111 Leakage Class 5 rating, or better, as measured in accordance with AMCA Standard 210. A leakage rate as a percent of airflow shall only be submitted following calculation at specific project conditions. Maximum casing leakage (cfm/100 ft^2 of casing surface area) = CL X $P^{0.65.}$ Published leakage rates at generic conditions shall not be submitted.

B. Casing deflection shall not exceed L/200 (.0005" per inch) at 1.5 times the casing internal operating pressure at design airflow conditions, not to exceed 12" w. g., whichever is less. L is defined as the panel span taken at the panel seam joint.

C. The unit shall be constructed on an 8" welded structural ~~*tubular*~~ steel base. Base tubing shall be cold-formed carbon steel, electric resistance welded. Equipment using a die-formed sheet metal base is not acceptable. Formed intermediate cross members shall be constructed of hot rolled 12-gauge galvanized steel. After fabrication, the base frame shall be thoroughly cleaned and coated with high solids, polyamide epoxy paint system for superior corrosion resistance.

D. Units shipped in multiple sections shall be engineered for ease of field assembly. Gasket supplied with the unit shall be a high-quality weather resistant closed-cell EPDM sponge rubber. Each section shall include a permanent label to aid in proper field assembly. All gasket and necessary assembly hardware shall ship loose with unit. Floors shall be designed to deflect no more than 1/200 of span under operating conditions.

E. Floors

   a. Shall be fabricated of 3/16″ aluminum tread plate. All floor sheets seams shall be continuously welded and welded to the unit base structure with a 2" turned up lip at the perimeter.

   b. Floor seams at shipping splits shall be welded in the field by the installing contractor. The manufacturer shall provide 3/16" aluminum tread plate strips to cover the floor seams. The strip shall be continuously welded on both sides.

   c. Adiabatic humidifier sections shall have floors fabricated of 10-gauge 316 stainless steel. All floor sheets seams shall be continuously welded and welded to the unit base structure with a 2" turned up lip at the perimeter.

   d. Adiabatic humidifier section floor seams at shipping splits shall be welded in the field by the installing contractor. The manufacturer shall provide 10-gauge 316 stainless steel strips to cover the floor seams. The strip shall be continuously welded on both sides.

   e. All accessible sections without a drain pan shall have a 1.25" diameter floor drain piped through the unit base for drainage.

   f. Floors shall be insulated with a two-part polyurethane water impervious foam insulation. A 20-gauge G90 galvanized steel under liner shall be provided.

F. Wall and roof panels

   a. Panels shall be *4" thick* double wall construction. Panel joints shall be sealed with an industrial EPDM gasket to form a water and airtight seal.

   b. Panels shall be individually removable for service without removing the roof or compromising the integrity of the cabinet wall. Panels shall be joined with 5/16" bolts that can be removed and refastened. Panel attachment with screws is not acceptable. All panels shall utilize thermal break construction between the exterior panel and the interior liner and between the panels and the base and roof frames.

c. For long term durability, exterior panels shall be a minimum 16-gauge G60 galvanized steel *or aluminum* pre-painted with a baked-on polyester-ceramic paint system that passes a 1,000-hour ASTM B-117 salt spray resistance test and 3000-hour ASTM G-23 accelerated weathering test.

d. Interior liners shall be a minimum 20-gauge 304 stainless steel. Panel liners shall be of a single piece construction and attached to the exterior panels with a full thermal break. To allow for cleaning, no fasteners shall be used on the exposed liner surface. Single wall units are not acceptable.

e. Adiabatic humidifier section interior liners shall be a minimum 20-gauge 316 stainless steel.

G. Insulation

a. All wall and roof panels shall be insulated with an injected foam insulation with an R value of 6.6/inch. Panels shall be designed to deflect no more than 1/200 of span under operating design conditions when measured at the panel seam. Insulation shall fill the panel without voids. Panels shall have a minimum 20-gauge 304 stainless steel solid interior liner. The composite R-value of the 4" unit casing shall be no less than *R-17*.

H. Access doors shall be provided into all sections of the air-handling unit as indicated in the plan documents. Doors shall be sized as shown on plan drawings, shall be a minimum 4" thick with *R-17* polyurethane foam insulation and shall be double wall construction using the same material type as the corresponding section. Doors shall comply with the requirements of UL 1995 and NFPA 90. The door frame shall be 0.125" extruded 6063-T5 aluminum. Each door shall be mounted with adjustable die cast aluminum hinges. All doors and mounting frames shall incorporate a thermal break design and the doors shall seal to a replaceable extruded EPDM sponge rubber gasket. Doors shall open against static pressure or shall include a pressure relief feature on the door latch.

a. The door latch assembly shall consist of a roller cam compression arm with a chrome plated steel inner handle and glass fiber/nylon composite outer handle. One tool operated lock shall be provided on each fan section access door. All doors shall have a minimum of two latches.

b. A 10"x12" thermal pane viewing window with one wire mesh safety glass pane and one clear pane shall be provided. The frame shall have a no-through-metal thermal break design. Viewing windows shall be on all doors serving a lighted section. Windows on doors exposed to unit mounted UVC light shall use glass that is resistant to UVC transmission.

I. The entire unit, including walls, roof, doors, joints, and seams shall include thermal break construction. This construction shall be supported by tested performance producing no condensation on the exterior surface when the air tunnel temperature is 50°F DB under the following exterior conditions:

i. $(Th - 50) / (Th - Tdp) < 3.4$

b. Th = Ambient dry bulb temperature (°F) external to housing

c. Tdp = Ambient dew point temperature (°F) external to housing

2.4 FAN ASSEMBLIES – GENERAL

A. The fan shall be of the size and type specified in the unit schedule. To assure maximum performance, fans shall be supplied by a manufacturer specializing in fan design and production.

All fan assemblies shall be designed for heavy-duty industrial applications. Fan framing assemblies shall be fabricated from structural steel electrically welded to form a rigid, integral base. Individual fan assemblies shall be independently isolated.

All motors shall be NEMA design B with Class F insulation. Electrical characteristics and horsepower shall be as specified on the project schedule. All motors shall have a minimum service factor of 1.15. Motors shall have ball bearings. Motors shall be premium efficiency ODP type and shall be factory wired to a fan array motor overload panel. The motor shall be located within the unit and mounted on an adjustable heavy steel base. The motor base shall be fastened securely to the structural steel framing of the fan assembly.

All fans shall meet the minimum efficiency and maximum brake horsepower values as scheduled. All fans shall be selected to operate at a point no higher than 90% of the peak static pressure rating as defined by the fan performance curve at the selected operating speed. Manufacturer must ensure maximum fan RPM is below the first critical speed.

B. Each fan shall be provided with a factory installed airflow measuring device. Airflow device to be mounted out of the direct air stream so as not to affect system static pressure or sound performance. Sensor accuracy shall be +/- 3%. Factory installed assembly shall include flow sensors for field connection to a transducer provided by others.

C. The maximum individual fan size shall be 15 hp.

2.5 FAN ASSEMBLIES – DIRECT DRIVE FAN ARRAY

a) Fan Arrays shall be direct-drive, non-overloading SWSI plenum fans designed for industrial duty and suitable for continuous operation.

i) Fans shall be arranged in an array using one or more welded structural steel assemblies and shall be of the size and quantity specified in the unit schedule. Screwed or riveted frames are unacceptable. Fan assemblies shall be attached directly to base structural members.

ii) Fan wheels shall have a minimum of 12 airfoil blades for superior sound characteristics and shall be constructed of aluminum to reduce rotational weight and vibration. Fan blades shall be extruded aluminum for uniformity and improved vibration characteristics.

iii) Each fan and motor assembly shall be independently isolated within the structural assembly using 1-inch deflection spring isolators. Isolators shall be mounted in a three-point arrangement that provides both vertical and horizontal (thrust) isolation and shall not require field adjustment. If hard mounted or rubber in shear is used in place of internal spring isolations, external isolation of the entire air handling unit is required, no exceptions. Isolation system shall be seismic rated to withstand seismic forces in excess of 4G horizontally and vertically to satisfy specified IBC seismic requirements.

iv) A fan inertia base shall be provided or the fan structure shall exceed an equivalence of 2x mass of the total rotating parts of the fan array. Fan and motor assemblies shall be designed such that no natural frequencies exist within the operating RPM range of the fan, eliminating the need for “lockout” frequency settings in the variable speed drive. The purchasing contractor will be responsible for all costs associated with externally isolating any unit that does not include individual fan isolation.

v) All fan arrays shall meet the minimum motor efficiency, maximum brake horsepower and total motor horsepower values scheduled. All fans shall be selected to operate at a point no higher than 90% of the peak static pressure rating as defined by the fan performance curve at the selected operating speed. Manufacturer must ensure maximum fan RPM is below the first critical speed. Fans shall be Class 2 construction.

vi) All fan and motor assemblies shall be dynamically balanced by the manufacturer to a maximum allowable vibration of 0.040 inches per second at design RPM and a maximum 0.080 inches per second overall vibration limit to bring the fan balance in conformance to a BV-5 Grade G1 per ANSI/AMCA 204. In addition, the manufacturer shall insure that no critical frequencies exist in the fan operating range by varying motor speed in 1Hz increments from design RPM to 50% of design RPM.

b) Unloading

i) Fan curves shall be submitted with the system curve indicating the minimum system operating static pressure and the point of fan surge.

c) Motors

i) Electrical characteristics and horsepower shall be as specified on the project schedule.

ii) Motors shall be Premium Efficiency per NEMA MG1 Table 12-12 type, shall have NEMA Class F insulation, shall meet NEMA Standard MD-1 Inverter Duty rating and shall be designed to withstand 1600V peak voltage spikes and rise times ≥0.1 microseconds.

iii) Motors shall have grease lubricated ball bearings designed to deliver a minimum L10 life of 250,000 hours at full load and the maximum operating RPM of the associated fan. Grease zerks and spring-loaded grease relief valves shall be provided in each motor to allow easy bearing lubrication without damaging the seals due to over lubrication. Permanently lubricated bearings are allowed if a spare motor per fan array is provided.

iv) For efficient operation in a direct drive application, motors shall be capable of operating greater than 60HZ to at least the design operating speed of the fan.

v) Motors shall be factory wired to a motor control center for connection to a VFD. The motor control center shall include for each motor circuit a control device providing overload protection, short circuit protection and a manual disconnect means, and all circuits shall be wired to a common main panel terminal block. Each control device shall include an auxiliary output capable of providing remote notification of a motor failure. All motors shall operate at all times and be controlled in unison, maintaining a consistent and uniform airflow pattern over coils, filters and other devices.

vi) Each motor shall be provided with a shaft grounding device to harmlessly bleed potential induced shaft voltages to ground.

d) Warranty

i) All rotating parts shall be warranted by the unit manufacturer for a full five (5) years from date of unit start-up. Parts warranties provided by third parties are not acceptable.

e) Options

i) In the fan section, provide an overhead motor removal system to facilitate motor replacement. One of the two options below is to be provided.

(1) The assembly shall include a manually operated winch, capable of being easily moved to any motor location.

(2) A structural steel I beam for mounting a trolley to assist in fan motor removal. The beam system shall be mounted overhead of the fan and motor. The beam system shall be supported and mounted to the unit's base support system.

ii) Double wall, sound insulated perforated metal, acoustical baffle plates shall be provided on both side of each individual fan to provide acoustical attenuation.

iii) Ruskin BD6 aluminum gravity backdraft dampers shall be provided on the inlet of each fan to prevent recirculation of air in the event of motor failure.

2) Fan Array Controls

A. Fan arrays shall be controlled using a common control signal, such as the duct static control signal, to modulate the fan speed.

B. Each fan array in the air handling unit shall be provided with a factory installed airflow measuring instrument. Every fan in the array will have an airflow measuring device that is guaranteed by the unit manufacturer to have no impact on the fan airflow performance and will not increase the fan sound power. The output of the airflow measurement device on each fan shall be wired by the unit manufacturer back to a central processor mounted on the cabinet exterior that will add the flow from each fan to provide a total airflow for the fan array. Using one air flow measuring device and multiplying by the number of fans provided is not acceptable due to lack of accuracy.
The central processor shall be able to detect and report a fan failure. Auxiliary contacts

on the motor starters are not acceptable as fans can fail without tripping overloads. Current sensors wired into the central processors can be utilized.

C. Piezometric volume taps with pressure transducers are acceptable. Transducer accuracy shall be 1% of pressure reading from full scale down to 30% of full scale reading to improve accuracy to less than 0.5% of calculated flow from 100%-30% of flow. The square root linearization and conversion of the pressure signal to flow shall be done at the central processor. Acceptable pressure transducers are: MatrixMonitor™ Fan Sensor, Omega PX656, Greenheck FMS, Setra Model 239.

D. Measure the airflow back flowing through all failed fans in the array. The backflow shall be subtracted from the sum of the operating fans to provide an accurate delivered airflow for the entire fan array. The system measurement accuracy shall be ±5% of measurement throughout the entire operating range of the fan array down to 15% of design flow. Systems with accuracy rated as a percentage of full scale are not acceptable. The system shall adjust for changes in barometric pressure and temperature to maintain accuracy in changing atmospheric conditions and at any altitude. The system shall be able to measure airflow and report it in units of ACFM or SCFM as selected by the user.
The system shall have the capability to communicate to the BMS with discretely wired analog signals or through an RS485 two wire multi drop network using the BACnet protocols. All information available through the local keypad display unit shall be made available through the BANCet interface. At a minimum, there shall be two locally scalable 0 to 10 VDC signals to report airflow and array pressure rise to the BMS. In addition, there shall be three SPDT relay outputs to report on the condition of the fan array. One relay will switch when the control is energized, one will switch in the event of fan failure detection and one will switch if fan surge is detected.

E. In addition to fan failure detection the system shall also be able to detect and report when any fan is in surge. The system shall have self-diagnostic capabilities and be able to report measurement and system errors. Individual and total flow measurements, entering air temperature and fan array pressure rise shall be available at a unit mounted keypad display.

F. Unit manufacturer shall supply and mount for each fan in the air handler a tri-axial accelerometer used to measure fan vibration. The output of each accelerometer shall be processed in real time through a FFT processor to provide frequency domain vibration for each fan. The vibration readings shall be reported in velocity and available for a frequency range that is a minimum of 3 times the operational speed of the fans. The system shall be capable of checking the fan vibration against user selectable vibration limits and reporting when those limits are exceeded. Each fan vibration sensor will be tied back to the airflow monitor where the individual fan vibration levels can be displayed on the local keypad display and the alarms and data can be transmitted to the BMS through the ~~*MODBUS or*~~ BACnet communication link.

G. Each fan array in the air handler shall be equipped with a grease monitoring system to track the intervals between motor bearing greasing. The system shall monitor the motor shaft speed for every fan motor in the array and integrate this data over time to determine the optimum elapsed time between bearing greasing. The system shall maximize the time interval between motor bearing greases while maintain proper lubrication of the bearings to maximize the motor life. The system shall notify the operator when it is time to grease the motor bearings through a locally mounted keypad display. The system will also estimate the number of days remaining until the motor bearings need to be greased. The system shall be capable of reporting the grease life information to the BMS through an RS485 two wire multi drop network using the ~~*MODBUS or*~~ BACnet communication protocol.

H. ~~*If a BACnet communication interface is desired in lieu of using the standard MODBUS protocol,*~~ the BACnet interface shall be capable of the following protocols: BACnet

MS/TP, BACnet/IP, Modbus/TCP. The following BACnet points shall be available for viewing at the BAS system:

1. Supply fan array total airflow, pressure rise, average temperature, density, average speed, and operating hours left until motor bearings require lubrication.
2. Return fan array total airflow, pressure rise, average temperature, density, average speed, and operating hours left until motor bearings require lubrication.
3. Barometric pressure
4. Monitor board temperature
5. Relay 1 status – power
6. Relay 2 status – fan failure
7. Relay 3 status - warning

2.6 FAN ARRAY SPEED CONTROL AND MOTOR PROTECTION

A. Each variable air volume supply and return fan array shall be provided with an individual variable frequency drive as specified under another specification section.

B. For projects where a VFD controls more than one fan motor, the CAHU manufacturer shall provide, mount, and wire a ***single*** fan array power distribution panel. The power distribution panel shall have a NEMA 3R enclosure. It shall have a main disconnect switch on the incoming line voltage side, a combination motor overload / disconnect for each fan motor, and all necessary wire termination blocks and terminal strips. It shall have a 65,000-amp short circuit withstand rating.

2.7 UNIT SOUND POWER

A. Fan sound power levels (dB) for the unit shall not exceed values as specified on the equipment schedule.

B. Unit manufacturer shall provide certified inlet, supply and casing radiated, sound power levels based on the final unit configuration.

2.8 COILS

A. Provide complete coil section(s) with service access door(s) as shown on the plan drawings. Coil connections shall extend through the section casing for ease of installation. Coil connections must be sealed from both the inside and exterior surfaces of the panel with the sleeve of the inner seal covering the pipe within the depth of the panel, all to minimize leakage and condensation. An integral double wall stainless steel air seal which completely seals around the cooling coil casing and extends to the unit pressure bearing surface shall be provided. Air seals/safing materials that are mechanically fastened to the inner liner of the cabinet only shall be constructed of 16 gage materials to match the material type in the appropriate section and shall be gasketed and have fasteners every 3 inches.

B. Multiple, “stacked” coil arrangements must be constructed so as to allow independent removal of any coil without the removal of another within the coil bank.

C. All coils shall meet or exceed the capacities specified on the mechanical schedule and all water coil performances shall be certified in accordance with the AHRI Forced Circulation Air Heating and Air Cooling Coil certification program which is based on AHRI Standard 410. Face velocities shall not exceed those specified on the mechanical schedule.

D. All blow-through cooling coils shall have removable stainless-steel mist eliminators as manufactured by Mistop regardless of coil face velocity, no exception.

E. All cooling coil and heating coil sections shall include a double sloped drain pan constructed from 304L stainless steel. All corners shall be welded watertight. Coils shall rest on stainless steel supports. The pan shall have a minimum pitch of 2" from high point to the bottom of the drain outlet connection, providing at least a 1/8” per foot slope. The drain pan shall be

insulated with a 2-part sprayed on polyurethane, water impervious foam. Insulation shall be applied to the entire under side of the drain pan and coil section base assembly. If multiple stacked coils are used, intermediate drain pans are required. Intermediate pans shall be insulated and drained with 3/4" copper down-comers to the main pan. All drain pan openings shall be covered with walk-on aluminum grating for safety. Open drain pan openings are not acceptable.

F. Water coils shall be of a staggered tube design with high efficiency die formed corrugated plate-type fins for maximum performance. All coils shall be tested with 400 psig compressed air under clear water. Coils shall be designed to operate at 300 psig internal pressure and up to 250ºF. Tubes shall be 5/8" diameter, seamless *0.035"* wall copper, mechanically expanded into full drawn fin collars for a continuous compression bond over the full finned length for high efficiency performance. Cooling coil and heating casings shall be a minimum 16-gauge stainless steel. Coil casing reinforcements shall be required for fin lengths over 42". Coil fins shall be 0.0095" thick aluminum as a minimum, *spaced no more than 12 fins/inch*. Coils shall be serviceable using 0.25" M.P.T. drain and vent taps on the supply and return headers. Threaded seamless red brass coil connections shall be brazed to copper supply and return headers.

2.9 NEEDLEPOINT BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Needlepoint Bipolar Ionization system with output as described here within.

B. The Needlepoint Bipolar Ionization system shall be capable of:

1. Effectively eliminating or inactivating microorganisms downstream of the Needlepoint Bipolar Ionization equipment (mold, bacteria, virus, etc.).

2. Controlling gas phase contaminants generated from human occupants, building structure and furnishings.

3. Capable of reducing static space charges.

4. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum deactivation rates for the following pathogens given the allotted time and in a space condition:

   A. SARS-CoV-2 >98% in 60 minutes or less
   B. MRSA >96% in 30 minutes or less
   C. E.coli > 99% in 15 minutes or less
   D. TB > 69% in 60 minutes or less
   E. C.diff >86% in 30 minutes or less

5. Increasing the interior ion levels, both positive and negative, to a minimum of 2,500 ions/cm³ measured 5 feet from the floor.

C. The Needlepoint Bipolar Ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced from a two-sided electrode housing that includes the required count of needlepoint brush clusters. Uni-polar ion devices shall not be acceptable.

1. Air exchange rates may vary through the full operating range of a constant volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.

2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Needlepoint Bipolar Ionization systems shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wipe down duty.

E. Equipment Requirements:

1. Electrode Specifications (Needlepoint Bipolar Ionization):

a. Electrode housing must be a two-sided type with a minimum of 11 needlepoint brush clusters on each side of the bar, allowing free air flow across the electrodes for proper ion distribution into the air flow.

b. Each Needlepoint Bipolar Ionization system shall include the required number of electrodes and power generators sized to the air handling equipment capacity. Unit shall be capable of treating 6,000 CFM (C univ 6.0), 10,000 CFM (C univ10.0), 15,000 CFM (C univ15.0), or 20,000 CFM (C univ20.0). Bipolar ionization tubes manufactured of glass and steel mesh shall not be acceptable due to replacement requirements, maintenance, performance output reduction over time, ozone production and corrosion.

c. Unit and Electrodes shall generally be maintenance free, and it shall cycle polarity to enhance the self-cleaning capabilities of the unit with no moving parts involved. Any system requiring moving parts or routine cleaning, will not be allowed.

d. Electrodes shall be energized when the main unit disconnect is turned on and the fan is operating. Electrodes shall be made from carbon fiber to prevent oxidation over time.

e. Electrodes shall provide multiple needlepoint brush clusters with a minimum of 190 million ions per cubic centimeter per cluster. Devices with fewer than 22 needlepoint brush clusters (as is built into the C Univ6.0), 44 needlepoint clusters (as is built into the C Univ10.0), 66 needlepoint clusters (as is built into the C Univ15.0), 88 needlepoint clusters (as is built into the C Univ20.0) are not allowed unless multiple devices are used to equal the total number of ions produced per cubic centimeter as provided by the specified C units noted here in this section.

f. Devices with moving parts are not acceptable.

g. Each Device shall accept universal power supply and be capable of being powered by 24VAC, 110 VAC, or 240 VAC

F. Air Handler Mounted Units:

1. Where so indicated on the plans and/or schedules Needlepoint Bipolar Ionization system(s) shall be supplied and installed. The mechanical contractor shall mount the Needlepoint Bipolar Ionization Generator and wire it to the AHU control power (24VAC) as instructed by the Air Purification Manufacturer's instructions or line voltage subject to power available. Each unit shall be designed with an integral illuminated LED and dry contacts to prove ion output is operating properly. The dry contacts shall close to prove the ion generator is working properly and may be daisy chained in series such that only one dry contact per AHU is required to interface to the BAS. Dry contacts proving power has been applied in lieu of the ion output is actually operating, are not acceptable.

G. Ionization Requirements:

1. Needlepoint Bipolar Ionization device(s) shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

a. The Needlepoint Bipolar Ionization system shall consist of Needlepoint Bipolar Ionization system and power supply. The Needlepoint Bipolar Ionization system shall be installed where indicated on the plans or specified to be installed.

b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced.Imbalanced levels shall not be acceptable.

c. Ionization output from each electrode shall be a minimum of 190 million ions/cc when tested at 1" from each needle point brush. Single needlepoint devices are not allowed.

d. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum deactivation rates for the following pathogens given the allotted time and in a space condition:

A. MRSA - >96% in 30 minutes or less
B. E.coli - > 99% in 15 minutes or less
C. TB - > 69% in 60 minutes or less
D. C. diff - >86% in 30 minutes or less

Manufacturers not providing the equivalent space deactivation rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELEC accredited independent lab confirming deactivation rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C.

2. Ozone Generation:

a. The operation of the electrodes or Needlepoint Bipolar Ionization units shall conform to UL 867 ECVP 2998 Zero Ozone Emissions from Air Cleaners, first edition – 2016 with respect to ozone generation. There shall be no ozone generation during any operating condition, with or without airflow.

2.10 FILTERS (ALL EXCEPT HEPA)

A. Provide complete filter section(s) with filter racks and service access door(s) as shown on the plan drawings. Holding frames provided for medium efficiency applications will be accessible. Holding frames provided for high efficiency applications will be upstream accessible. Holding

frames shall be constructed from heavy gauge stainless steel and shall be equipped with polyurethane foam gaskets. Frames shall be installed with vertical stiffeners and appropriate frame-to-frame sealant to provide a rigid leak tight assembly. An integral air seal which completely seals around the filter frame assembly and extends to the unit pressure bearing surface shall be provided. Air seals/safing materials that are mechanically fastened to the inner liner of the cabinet only shall be constructed of 16 gage materials to match the material type in the appropriate section and shall be gasketed and have fasteners every 3 inches

Filter fasteners shall be capable of being installed without the requirement of tools, nuts or bolts. The holding frame shall be designed to accommodate standard size filters with the application of the appropriate fastener. *All frames shall be connected in a manner that does not provide protrusions into the filter installation/removal path.* The filter rack shall be designed to use standard 24"x24" and 12"x24" filters only. Odd sized filters are not allowed. Holding frame assemblies shall be sized to meet or exceed the face area specified by the mechanical schedule.

B. All filter racks shall be provided with Camfil C78 (or pre-approved equivalent) filter clips. Clip length shall be selected to match the filter being secured by the clip.

C. Gauges

a. A Magnehelic differential pressure gauge shall be provided factory installed for measuring the pressure drop across each filter type. The gauge shall be a diaphragm-actuated dial type, 4¾" O.D., with white dial, black figures and graduations and pointer zero adjustment.

D. Medium efficiency pleated filters shall be 2" thick MERV 8 as rated by ASHRAE Standard 52.1 test methods. Filter media shall be of the non-woven cotton fabric type. Filters shall be UL900 Class 2 listed. 100% outside air units shall have 4" thick MERV 8 filters.

E. High efficiency rigid filters shall be 12" deep, high capacity, pleated, totally rigid disposable type. Filters shall consist of micro-fine synthetic media laminated to a non-woven backing, media support grid, contour stabilizers and enclosing frame. The filter media shall have an average efficiency of MERV ~~*11, 13, 14, and 15*~~ ***16*** as rated by ASHRAE 52.1 test methods as shown on the equipment schedule. The enclosing frame shall be constructed of galvanized steel. It shall be constructed and assembled in such a manner that a rigid and durable enclosure for the filter pack is affected. The enclosing frame shall be equipped with protective diagonal support members on both the entering air and air leaving sides of the filters. The filters shall be UL900 Class 2 listed.

~~*2.11 HEPA FILTERS*~~

~~*A. Provide complete filter section with filter racks and service access door(s) as shown on the plan drawings. Holding frames shall consist of holding frame section, constructed of stainless steel of all welded construction and reinforcing flanges as an integral part of the holding frame to preclude the possibility of deflection of the sealing flange. Annular based dimples and mounting holes, gasket seals, receptacle guides, and removable swing bolt assemblies shall all be an integral part of the holding frame. Frames shall be installed with vertical stiffeners and appropriate frame-to-frame sealant to provide a rigid leak tight assembly. An integral air seal which completely seals around the filter frame assembly and extends to the unit pressure bearing surface shall be provided. The design of the frames shall be such that it will accommodate nominal 24"x24" HEPA filters (23⅝" x 23⅝" actual) in either 6" or 12" depth.*~~

~~*B. HEPA filters shall meet or exceed 99.97%, MERV 17 efficiency on 0.3-micron particles when tested with thermally generated D.O.P. in accordance with the latest industry and military standards. The clean static pressure shall be no greater than 1.0" W.G. when operated at rated airflow. The media shall be glass paper. Filters shall be factory constructed and assembled of galvanized steel frames, corrugated aluminum separators and 100% solid resin sealant.*~~

~~C. Gauges~~

~~a. A Magnehelic differential pressure gauge shall be provided factory installed for measuring the pressure drop across each filter type. The gauge shall be a diaphragm-actuated dial type, 4¾" O.D., with white dial, black figures and graduations and pointer zero adjustment.~~

2.12 CONTROL DAMPERS

A. Mixing box and economizer outdoor air, return air, and exhaust air openings shall have factory mounted aluminum airfoil low-leak dampers. Damper shall be opposed (exhaust air) and parallel (outdoor air and return air) blade type. Damper frame shall be 0.125" thick aluminum hat channel. Damper shall meet the leakage requirements of ASHRAE Std. 90.1 and of the International Energy Conservation Code by leaking less than 3 CFM/sq. ft. at 1" of static pressure, and shall be tested in accordance with AMCA Standard 500-D.

B. The dampers shall be equal to Ruskin CD50.

2.13 AIR BLENDERS

A. Air blenders shall be manufactured by Blender Product, Inc. Series IV.

B. The air blenders shall be installed where shown on the CAHU details to enhance the mixing of outside air with return air to a mixing effectiveness required to eliminate freeze stat trips, minimize sensor error and enhance outdoor air distribution. Additionally, the air mixing device shall provide even airflow across filters, coils and control sensors.

C. The static mixer shall be capable of 70% range mixing effectiveness when mixing 25% outside air with 75% return air at one mixer diameter downstream of mixer.

D. Static air mixers shall be geometrically scaled to ensure consistent performance across full range of sizes offered. Mixers that are not geometrically scaled are not acceptable. Mixers shall be of counter rotational design.

E. Static air mixers shall be welded and mechanically fastened .080" or .125" thick aluminum. Static air mixers shall have bare aluminum finish.

2.14 ADIABATIC HUMIDIFIERS

A. The humidifier section interior liners and floor shall be constructed of solid 316 stainless steel as noted in the casing construction section.

B. All adiabatic humidifier sections shall include double sloped drain pans constructed from 316L stainless steel. All corners shall be welded watertight. Coils shall rest on stainless steel supports. The pan shall have a minimum pitch of 2" from high point to the bottom of the drain outlet connection, providing at least a 1/8" per foot slope. The drain pan shall be insulated with a 2-part sprayed on polyurethane, water impervious foam. Insulation shall be applied to the entire under side of the drain pan and coil section base assembly. All drain pan openings shall be covered with walk-on aluminum grating for safety. Open drain pan openings are not acceptable.

C. See the adiabatic humidifier specification section for the humidifier requirements.

2.15 ELECTRICAL POWER AND CONTROLS

A. Unit operating voltage shall be 460V, 3-phase, 60Hz. All wiring and electrical equipment supplied by the manufacturer shall conform to and be installed in accordance with the requirements of UL1995.

B. Each section provided with a service access door, or as indicated on the plan drawings, shall be equipped with a vapor proof LED service light. All lights shall be completely installed and wired to a single 60-minute timer switch. All switch boxes shall include a GFCI convenience receptacle. Lights and GFCI outlets shall be wired to a separate 115VAC power connection.

C. Provide copper wires, bus bars, and fittings throughout, except internal wire of the control transformer may be aluminum if copper termination is provided. Identify power supply

terminals with permanent markers. The maximum temperature of terminals shall not exceed 167°F (75°C) when the equipment is tested in accordance with its rating.

D. All wiring, 460VAC and 115VAC, shall be run in plated EMT and Liquid Tight conduit.

E. Mount a permanent nameplate on the unit to display the manufacturer, serial number and model number, date of manufacture, horsepower, current rating and voltage.

2.16 UNIT TESTING AND QUALITY CONTROL

A. The fans shall be factory run tested to insure design integrity and proper RPM. All electrical circuits shall be tested to ensure correct operation before shipment of unit. Units shall pass all quality control checks and be thoroughly cleaned prior to shipment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. NOTE: Installation of this equipment shall be performed by a contractor yet to be selected. The equipment supplier and/or manufacturer shall provide all equipment, materials, labor, etc. required for installation and maintenance of this equipment, including required warranty work, inspections as noted herein, owner training, etc., to the installing contractor upon award of the installation.

B. Equipment rigging and assembly to be supervised by the manufacturer's representative. Provide for as long a period of time as is necessary to ensure proper assembly or onsite training but no less than 2 full days.

C. Adjust in alignment on concrete foundations, sole plates or other supporting structure. Level, grout, and bolt in place.

D. Coordinate electrical installation with electrical contractor.

E. Coordinate controls with control contractor.

F. Provide all appurtenances required ensuring a fully operational and functional system.

3.2 START-UP

A. Equipment start-up is to be supervised by the unit manufacturer's representative service organization. Physical connections and start-up are provided by the installing contractor. The start-up engineer shall conduct such operating tests as required to ensure that the unit is operating in accordance with design. Complete testing of all safety and emergency control devices shall be made. The start-up engineer shall submit a written report to the owner and manufacturer containing all test data recorded as required above and a letter certifying that the unit is operating properly.

B. Provide complete Operation & Maintenance Manuals with descriptive literature, model, and serial number of all equipment, performance data, manufacturer's instructions for operating and maintenance, lubrication recommendation and schedule, and winter shutdown procedure.

3.3 UNIT PRESSURE TESTING

A. The unit cabinet shall be tested in the field *by the test and balance contractor* after installation by the installing contractor to verify its cabinet leakage rating at design both positive and negative operating static pressure(s). Cabinet leakage shall not exceed a Leakage Class rating of 5 as defined by ANSI/ASHRAE Standard 111. Leak testing shall be performed by measuring the airflow pumped into and out of the air-handling unit at the cabinet design operating static pressure. All unit openings shall be sealed, and field testing shall occur after complete unit assembly and after all controls, power, and other final penetrations are made to the unit casing. The air shall then be pumped into and out of the unit until the appropriate operating pressures are achieved. Airflow measurements shall be performed in compliance with AMCA Standard 210. A detailed report, including all data and test methods, shall be

presented to the owner or his representative prior to equipment shipment. The Engineer shall be present during this testing.

END OF SECTION 237314

Mechanical Equipment RFP Question and Response Log Respones As Of: 10/8/24 @ 8:00 AM Through RFI # 28				
#	Question	Responder	Response	Release
1	•2.1 Intent and Scope: Proposal to include AHUs, Boilers, HR Chillers, Pumps and Louvered Penthouse etc. oDoes the bid include the additional (2) water cooled chillers? oDoes the bid include the AHU humidifier grid only, and/or generator / RO System? oDoes the bid include other items listed on the plan schedule pages	Walsh	See OFCI mechanical Exhibit has been updated to include M702. Items Not highlighted are being procured by the Core and Shell Mechanical And Plumbing Subcontractor(s). See additional comments below in other RFI as needed. Proposals should include 2 water cooled chillers. Provide the equipment required for the AHU / Humidication including the generator and RO system	
2	•7.1 Detailed Services Defined oMultiple specification sections are included that appear to potentially have been included in another bid or a future bid including but not limited to Condensate Drainage System, Variable Frequency Motor Controls, HVAC Power Ventilators, Air Coils, Terminal Units, and Fan Coil Units. These items do not appear under 2.1 Intent and Scope. Please clarify as these items are listed on Mechanical schedule pages M700, M701 and M702.	Walsh	Comply with the OFCI exhibit and RFP. RFP included the full BP7 C&S specification for coordination and reference.	
3	•237314 Factory Build Custom Indoor Air Handling Units o1.8 Warranty indicates “installing contractor shall provide labor warranty during the unit’s first year of operation”. To clarify, this bid package does NOT include the labor warranty on the equipment provided as installation services is not being provided in this bid package.	Walsh	Equipment supplier should provide parts and labor for repairs of equipment during the warranty period. Note extended warranty period shall be from equipment startup through 1 year after substantial completion (equipment will be started early for use in temporary conditioning of the building).	
4	•237314 Factory Build Custom Indoor Air Handling Units o2.3.C The requirement appears to contradict itself by stating provide a “welded structural tubular steel base” striking out tubular yet appears to indicate tubing in the next sentence, ‘base tubing’ shall be… Please clarify.	CMTA	This section requires a structural steel base and specifically prohibits units that simply use a sheet metal base.	
5	•237314 Factory Build Custom Indoor Air Handling Units o2.3.E Specification calls for drains in all accessible sections without a drain pan. Drawings show drain pans in every access section instead of just floor drains. How are you to have aluminum treadplate flooring if all flooring is stainless steel drain pans? Are these sections to not have full drain pans and just drains? Coil and humidifier sections are the only sections in the specifications that call for full width drain pans.	CMTA	Drain pans are only required in AHU section between the humidifier and the supply fan.	
6	•237314 Factory Build Custom Indoor Air Handling Units o2.3.F Do all units require 4” thick walls? R-values are reported in 2.3.G indicates only R-17 required but the foam insulation requirement is 6.6/inch at 4” panels results in much higher values of up to R-32. 2” injected foam has an R-16 value for reference. In addition, the door thickness for all the units is only 3” instead of 4” so the lowest R value will be found at every door. Why are 4” doors not required for 4” walls?	CMTA	Yes, we want 4" walls. The value of the insulation in the walls must equal or exceed 6.6/inch for a total of 26.4. Exceeding this is acceptable. The R-19.8 listed in G is a total casing minimum and takes into account frames, glass, etc. Doors are to be 4" to match the walls.	
7	•237314 Factory Build Custom Indoor Air Handling Units ▪Instead of wall thickness, is there an R-value that is to be meet as only a few units have leaving air temperatures off the cooling coil below 52F that might require higher R values than the majority of the units? For the lower temperature units, what R value is required?	CMTA	no, see spec for requirments	
8	•237314 Factory Build Custom Indoor Air Handling Units o2.3.F Air handler manufacturers panel and wall construction vary. For example, screw fasteners vs bolt does not change the requirement for full panel removal and full thermal break. What type of thermal break is acceptable for these air handlers? Is gasketed thermal break acceptable or is a true no-through metal thermal break required.	CMTA	Provide panels with a new through metal design per specifications.	
9	•237314 Factory Build Custom Indoor Air Handling Units o2.8.F Coil fin thickness is called out at 0.0075” aluminum. Previous UK standards required 0.0095” minimum thickness. Please advise.	CMTA	Provide 0.0095" thick fins.	
10	•237314 Factory Build Custom Indoor Air Handling Units o2.9.D Needlepoint bipolar ionization requirement states “washdown duty”. No other requirements state units are to be washdown grade. What units are required for ‘washdown’ and which units are considered ‘wipe down’?	CMTA	Wipe down duty is acceptable	
11	•236416 Centrifugal Water Chiller o1.1A, 2.3.A, and more indicate centrifugal chillers. Specified chiller type in the schedule indicate screw chillers. What is required? If screw, please provide an updated specification. oIs there a specification specific to the two (2) added chillers on the mechanical schedule on M702? o2.2A indicates that the chillers are to be disassembled into major assemblies as required by the installation. Are these units to be ‘knock-down’ construction? o2.3.A calls for oil free compressors if indicated. This is not indicated anywhere since scheduled unit is non-compliant. If this applies to the other chillers, please confirm. o2.3.G Economizers: For multistage chillers, provide interstage economizers. Please advise as chillers have VFD starters with variable capacity. o2.7.B indicates “For Heat Recovery Chiller HRC-5 Only”. Is this referring to the entire 2.7 section? Plans only show HRC-1, 2 and 3. Are there additional chillers on the project that are not on the mechanical schedules? o2.9.B calls for minimum of 65KAIC SCCR rating while schedule note calls for 100KAIC. Please confirm that 65KAIC as specified is the only requirement. ▪2.10.E calls for non-fused disconnect. High SCCR rating requires fused disconnects. Please advise. o2.4 Indicates R-123, 2.16 indicates R-134A and R-123. R-123 was phased out in 2020 and R-134a is being drawn down at this time. Please clarify what refrigerant requirements are to be provided for the equipment. Is R-513 acceptable? Is eddy current tube testing required (spec only details the requirements for R-134a and R-123). o2.16 Is UK requiring an owner witness test for all chillers or a single chiller?	CMTA	A new screw chiller spec will be issued by addendum.	
12	M700 Fan schedule on plans indicate that all fans are operating at exactly 60 Hz. Please confirm.	CMTA	No, 60 Hz is nominal, not operating frequency	
14	2. The AHU Filter spec., Section 2.10.E has MERV 16 filters highlighted, the Filter Schedule on sheet M700 has MERV 14 listed. Please verify which is correct.	CMTA	Scheduled filters should be provided.	

15	3. Under Fan Controls, Section 2.5.2.c – Can Dwyer KD616 to use as an acceptable pressure transducer?	CMTA	It is acceptable if it meets all of the list requirements	
16	4. Fan Controls Section 2.5.2 seems to be describing Climate Craft's Matrix Monitor System. Is it the intent to specify a particular AHU manufacturers Fan Monitoring System? Are all the functions listed truly needed/specified by UK Health. Can we get verification of what functions are needed.	CMTA	No, the intent is not to sole source any manufacturers's system. Provide a monitoring system that meets the requirements or offer a VE credit for those where there is potential cost savings to remove.	
17	5. On the Bid From page 41 description of work (base offer) , the AHU Reverse Osmosis skids are a separate line item. Can we get verification that the Adiabatic manifold and high-pressure pump skids, start-up etc , Are to be separate line bid or provided with the AHU pricing?	Walsh	Provide the AHU RO and Adiabatic equipment with the AHU. Line items are intended as means of cost estimate breakouts to compare proposals and compare against baseline estimate.	
18	6. Section 2.3.c is calling for painted unit exterior. This is not typical for projects at UK Health. Can we verify that is required?	CMTA	There must be some corrosion inhibitor applied to the unit. Paint is a typical way to apply. There are no color requirments for the units.	
19	7. On M701 Are the following pump and hydronics accessories to be bid as this prepurchase package (Pumps, shell and tube heat exchangers, Condensate pumps and receiver, Freeze Protection Pumps, Flash Tank, Air/dirt separator, Air separator, fan coils)? As some of the pumps are shade on M700 but none on M701. If not included in the prepurchase package when will these items be out for bidding to the mechanical contractors?	Walsh	Consistent with the OFCI exhibit - the Following 'accessory' devices are provided by the C&S subcontractor and are not to be provided by proposing firms: -BT-1 -shell and tube heat exchangers -condensate pump and receiver -Flash tank -Freeze Protection pumps -air separators -fan coil units Exhibit has been re-issued to include M702 via addendum.	
20	8. M702 Is the BT-1 buffer tank to be included in the purchase bid package?	Walsh	BT-1 is to be provided by the C&S subcontractor.	
21	9. P300.S Is the booster pump to be purchased as it are not shaded? If not included in the prepurchase package when will these items be out for bidding to the mechanical/ plumbing contractors?	Walsh	Plumbing pumps are not part of the prepurchase program. Bidding of C&S Mechanical and Plumbing Subcontractor was previously completed as part of UK Procurement CCK-2653.30-4-24.	
22	10. On the bid form please clarify that the equipment pricing will be broken out and not as the form shows as the total price for equipment. As is shown now it would appear we would have to provide one price for all the equipment on M700 and M701 as a total price carried form the breakdown bid form. This would show varying pricing totals if not bidding on all the items shades from M700 and M701.	Walsh	Proposing firms may provide additional cost breakdown beyond the requested breakdown. If firms are not providing pricing for the full scope of the RFP they must provide clear deliniation of scope that they are providing.	
23	11. M700 Are the chilled water pumps to be rated for 250 pound design pressure?	CMTA	yes	
24	12. M700 Please provide the glycol percentage of the pumps?	CMTA	GWP-1,2, shall be used in a 20% gylcol system.	
25	13. M108.3B Shows 2 tanks CFT and GT-1 Note H3 has no description. Is this to be a glycol feed system? If so please provide the tank size and pump flow rate required for the GWP pumps shown on the drawing and listed on M700 in the pump schedule. Are these to be bid with the pre purchase?	CMTA	CFT is not to be included. GT-1 requirements are shown on M604 in addendum #4	
26	Are bidders required to bid all aspects of the all scope?	Walsh	No, all bidders are not required to bid all aspects of the RFP. RFP section 3.6 defines how Firms should handle Deviations from the RFP. Further Paragraph 3.9 allows UK to award multiple firms. All firms should provide a list of equipment included in there proposal. Completeness of proposals may be a consideration of the selection process.	
27	Confirm if medical gas equipment on schedules is to be included with this RFP	Walsh	No. Medical Gas equipment is not being procured in this package.	
28	Are vendors required to be provide bonding (bid bond or P&P).	Walsh	No bid or P&P bonds.	