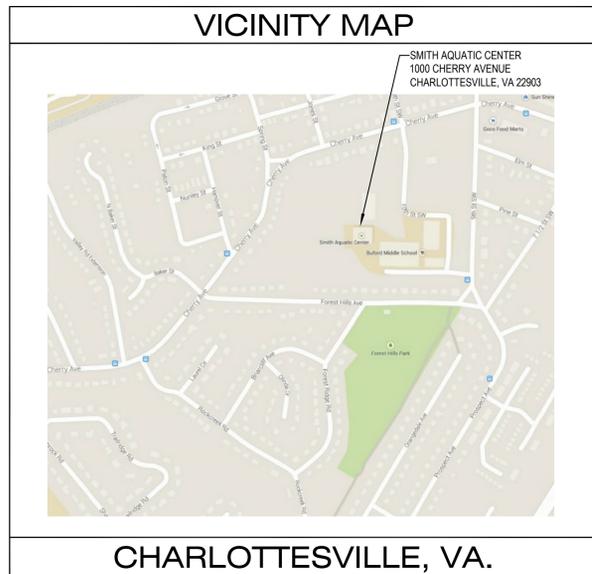


# SMITH AQUATIC CENTER INDOOR AIR QUALITY RENOVATIONS

CITY OF CHARLOTTESVILLE  
DEPARTMENT OF PUBLIC WORKS  
CHARLOTTESVILLE, VIRGINIA



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REFERENCE CODES AND INFORMATION

2015 VIRGINIA CONSTRUCTION CODE (VCC)  
2015 VIRGINIA PLUMBING CODE  
2015 VIRGINIA MECHANICAL CODE  
2011 NATIONAL ELECTRICAL CODE, NFPA 70  
2014 EDITION OF THE CONSTRUCTION AND PROFESSIONAL SERVICES MANUAL

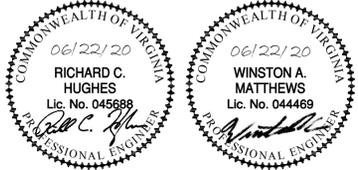
THIS PROJECT CONSISTS OF THE COMPLETE REMOVAL AND REPLACEMENT OF THE HVAC SYSTEMS SERVING THE NATATORIUM AND ANCILLARY SPACES AND ASSOCIATED WORK INCLUDING ARCHITECTURAL, ELECTRICAL AND FIRE PROTECTION. ADDITIONAL WORK INCLUDES CONTROL SYSTEM UPGRADES AND AIR DISTRIBUTION MODIFICATIONS.

PROJECT TEAM

**OWNER**  
CITY OF CHARLOTTESVILLE  
DEPARTMENT OF PUBLIC WORKS  
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CHARLOTTESVILLE, VA 22902  
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ROANOKE, VA 24011  
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FAX 540-344-3410

**ARCHITECT**  
VIRGINIA A & E, PLLC  
1115 VISTA PARK DRIVE  
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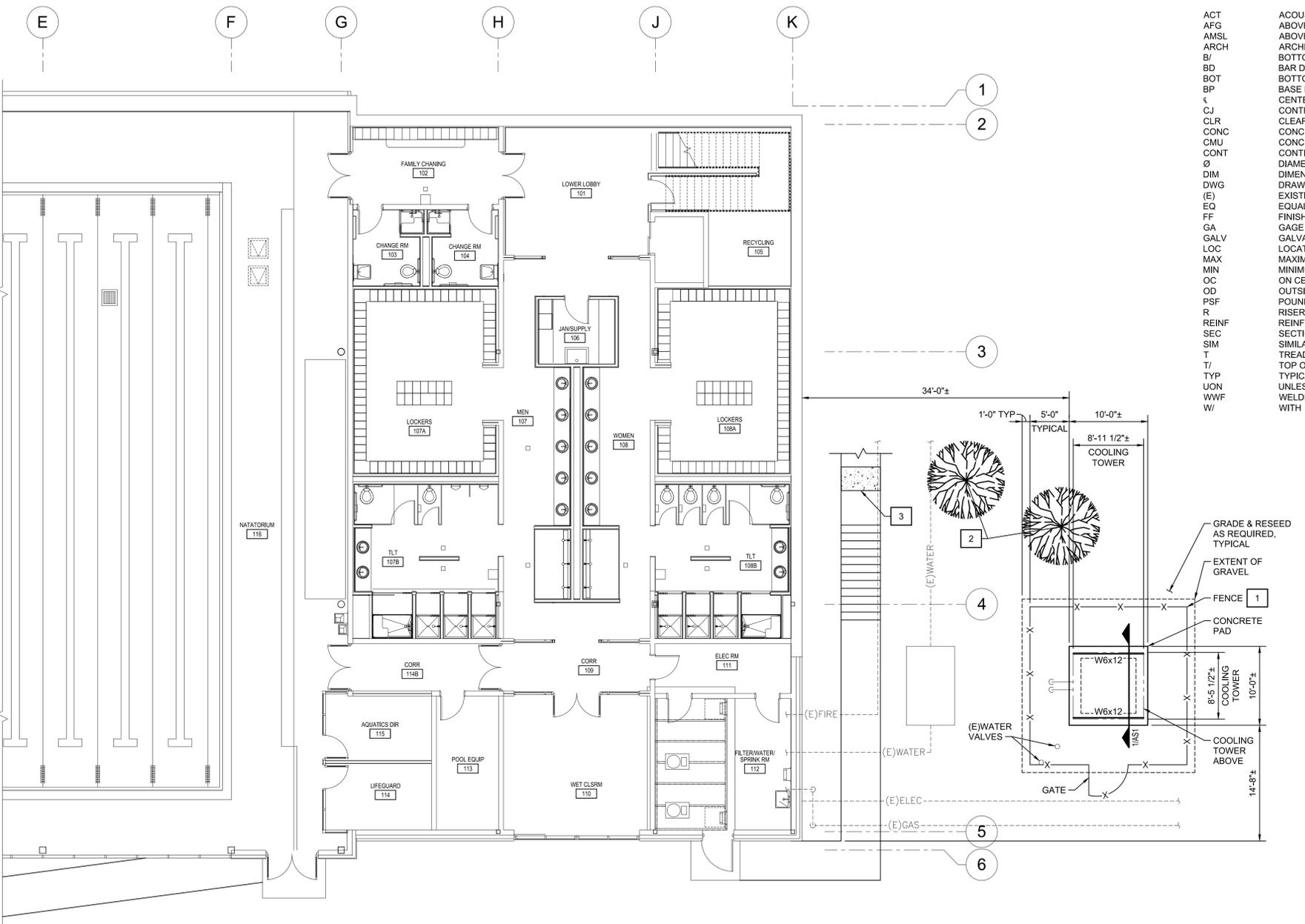


REVISION	DATE

SMITH AQUATIC CENTER  
INDOOR AIR QUALITY RENOVATIONS  
CHARLOTTESVILLE, VIRGINIA

TITLE SHEET

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET T-1	

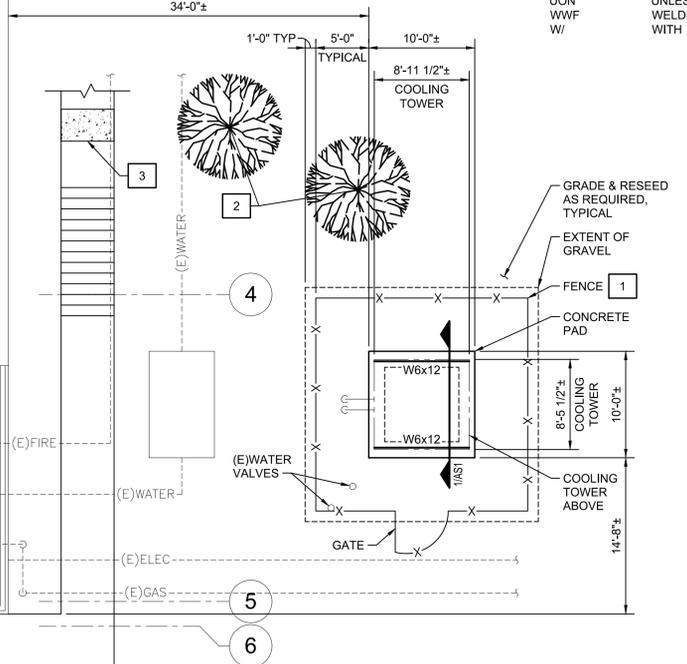


**ABBREVIATIONS:**

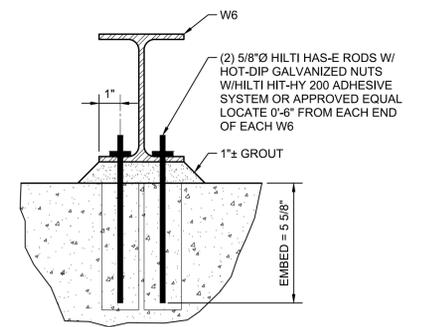
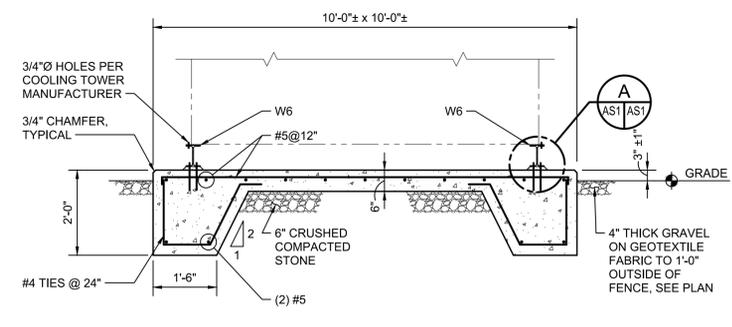
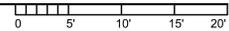
ACT	ACOUSTICAL TILE
AFG	ABOVE FINISHED GRADE
AMSL	ABOVE MEAN SEA LEVEL
ARCH	ARCHITECTURAL
B/	BOTTOM OF
BD	BAR DIAMETER
BOT	BOTTOM
BP	BASE PLATE
CL	CENTERLINE
CLR	CONTROL / CONSTRUCTION JOINT
CONC	CONCRETE
CMU	CONCRETE MASONRY UNIT
CONT	CONTINUOUS
Ø	DIAMETER
DIM	DIMENSION
DWG	DRAWING
(E)	EXISTING
EQ	EQUAL
FF	FINISHED FLOOR
GA	GAGE
GALV	GALVANIZED
LOC	LOCATION
MAX	MAXIMUM
MIN	MINIMUM
OC	ON CENTER
OD	OUTSIDE DIAMETER
PSF	POUNDS PER SQUARE FOOT
R	RISER
REINF	REINFORCEMENT
SEC	SECTION
SIM	SIMILAR
T	TREAD
T/	TYP OF
TYP	TYPICAL
UON	UNLESS OTHERWISE NOTED
WWF	WELDED WIRE FABRIC
W	WITH

- GENERAL NOTES:**
- THE CONTRACTOR SHALL LOCATE ALL EXISTING UNDERGROUND UTILITIES AND PROTECT FROM DAMAGE DURING EXCAVATION OPERATIONS. CONTRACTOR TO ALERT ARCHITECT/ENGINEER AND OWNER IF EXISTING UNDERGROUND UTILITY LOCATIONS CONFLICT WITH COOLING TOWER PAD OF FENCE POST LOCATION.
  - CONCRETE: CONCRETE SHALL BE F<sub>c</sub> = 4500 PSI WITH MAXIMUM W/CM RATIO = 0.45, AND AIR CONTENT = 6% ± 1.5%. REINFORCING BARS SHALL BE ASTM A615, GRADE 60.
  - GROUT: GROUT UNDER ALL BEAMS WITH NON-SHRINK, NON-METALLIC, NON-STAINING GROUT WHICH CONFORMS TO ASTM C1107.
  - STEEL: STRUCTURAL SHAPES SHALL BE ASTM A992, GRADE 50. ANGLES SHALL BE ASTM A36. ALL EXPOSED STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123. REPAIR DAMAGE TO GALVANIZING IN ACCORDANCE WITH A780.
  - COORDINATE PAD AND BEAM DIMENSIONS TO FIT ACTUAL COOLING TOWER PROVIDED.

- CONSTRUCTION NOTES:**
- FENCE SHALL HAVE 3"Ø MINIMUM PAINTED ALUMINUM POSTS SPACED NOT MORE THAN 4'-0" OC AND AT ALL FOUR CORNERS SET IN CONCRETE. HORIZONTAL RAILS SHALL BE PRESSURE TREATED 2x6 AT 3'-0" OC VERTICALLY. FACING SHALL BE 1"x4" COMPOSITE DECKING MATERIAL POSITIONED VERTICALLY. ALL FASTENERS AND CONNECTORS SHALL BE HOT-DIP GALVANIZED. GATE SHALL BE SINGLE-SWING AND 5'-0" WIDE MINIMUM. TOP OF FENCE SHALL BE (+10'-0") AFG. SUBMIT PRODUCT DATA AND COLOR CHARTS FOR ALL MATERIAL FOR OWNER TO SELECT COLOR.
  - REMOVE TREE. REMOVE ROOTS AS REQUIRED FOR PIPE TRENCH EXCAVATION.
  - REMOVE AND PATCH SIDEWALK AS REQUIRED FOR PIPE TRENCH EXCAVATION. SAWCUT CLEAN JOINT WITH SIDEWALK TO REMAIN. SIDEWALK INFILL SHALL BE 5,000 PSI CONCRETE WITH AIR CONTENT = 6% ± 1.5%. DOWEL #4x3'-0" BARS WITH 4" EMBEDMENT INTO EXISTING SIDEWALK @ 8" OC EACH SIDE OF INFILL.

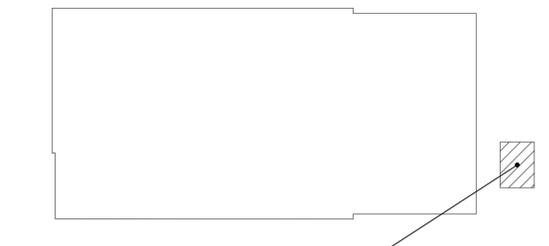


**PARTIAL FIRST FLOOR PLAN**  
SCALE: 1/8"=1'-0"



**SECTION 1**  
SCALE: 1/2"=1'-0"

**DETAIL A**  
SCALE: 3"=1'-0"



**KEY PLAN**  
SCALE: NONE



**SMITH AQUATIC CENTER  
PDU UPGRADES**  
CITY OF CHARLOTTEVILLE  
CHARLOTTEVILLE, VIRGINIA

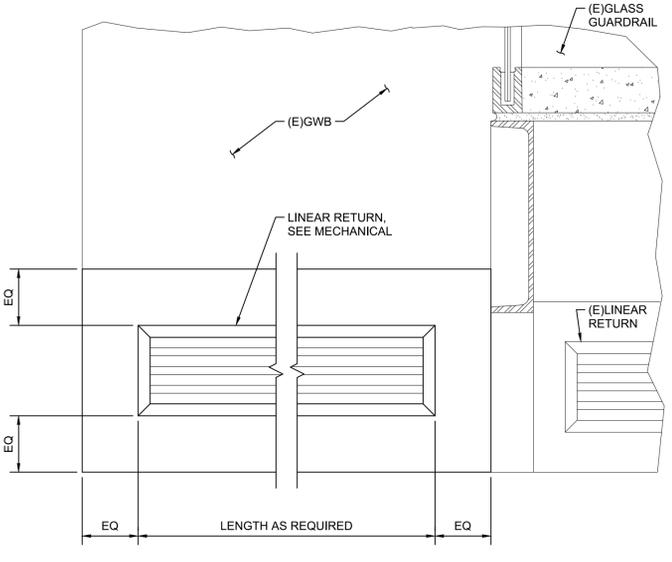
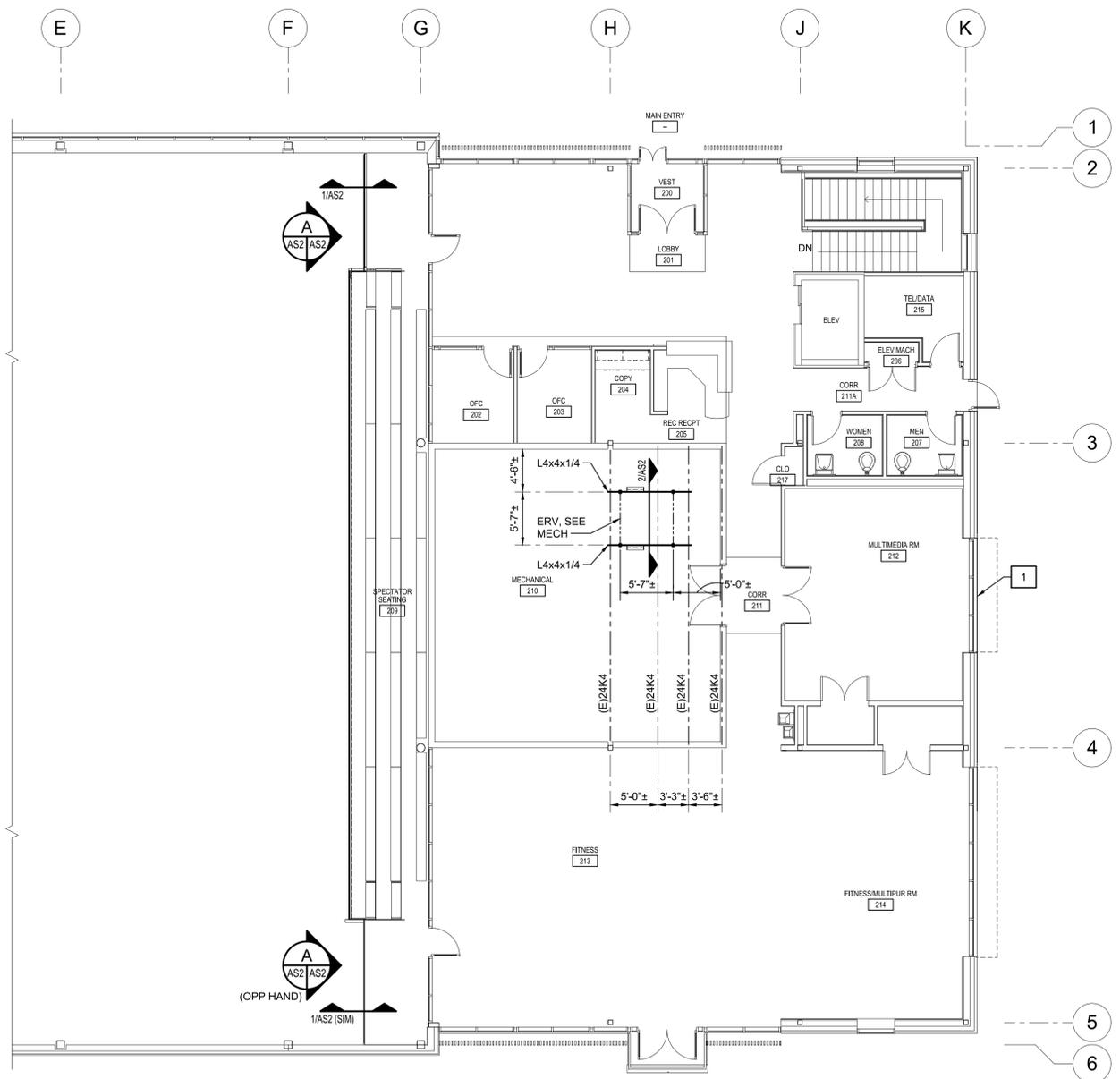
**PARTIAL FIRST FLOOR PLAN**

Full Scale Verification  
0' 1'

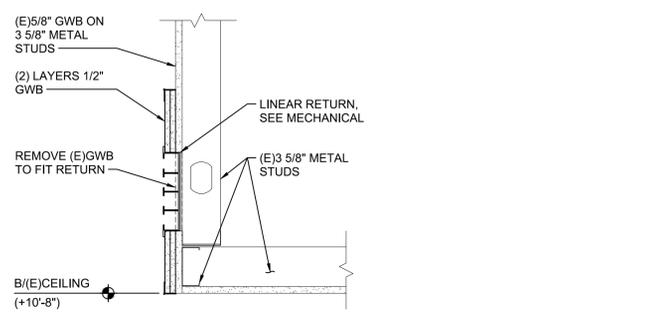
**AS1**

NO.	BY	REVISIONS	DATE

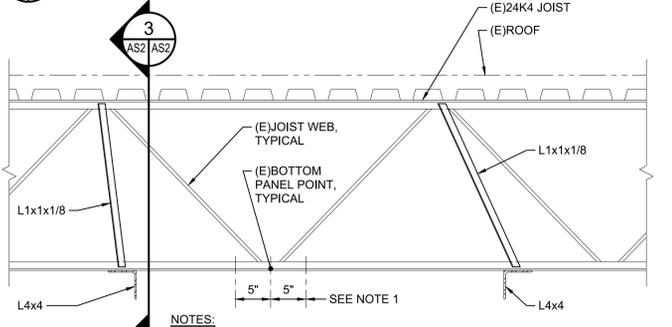
PROJECT NO. 20086  
DATE: 2020-04-17



**A ELEVATION**  
SCALE: 1 1/2"=1'-0"



**1 SECTION**  
SCALE: 1 1/2"=1'-0"



**3 SECTION**  
SCALE: 1 1/2"=1'-0"

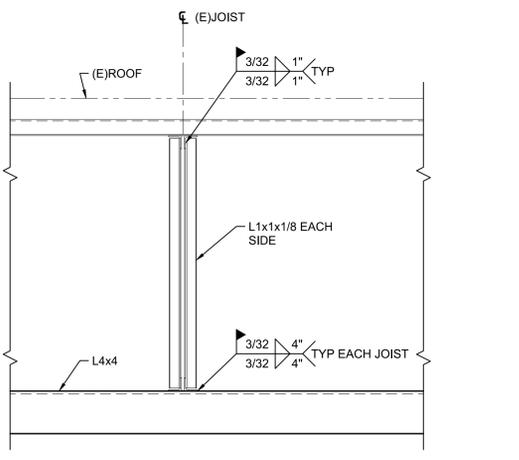
**GENERAL NOTES:**

- CUTTING AND PATCHING:
  - ANY EXISTING CONSTRUCTION THAT IS TO BE REMOVED SHALL BE REMOVED CAREFULLY SO AS NOT TO DAMAGE ANY EXISTING CONSTRUCTION THAT IS TO REMAIN. FLOORS, WALLS, AND CEILINGS ARE TO BE PATCHED (IN A RECTANGULAR PATTERN) TO MATCH EXISTING CONDITIONS AND MADE READY TO RECEIVE ANY NEW FINISHES WHERE APPLICABLE.
  - WHERE EXISTING FLOORING, CEILING, OR WALL FINISHES ARE TO BE REMOVED AND REPLACED WITH NEW FINISHES, SURFACES SHALL BE STRIPPED CLEAN OF ALL EXISTING FINISHES AND MADE READY TO RECEIVE NEW FINISHES, UNLESS OTHERWISE NOTED.
- ALL EXISTING FIREPROOFING REMOVED DURING DEMOLITION SHALL BE PATCHED TO MEET CURRENT CODE.
- CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS AND REPORTING OF ANY DISCREPANCIES TO THE A/E OF RECORD BEFORE STARTING THE DEMOLITION.
- GYPSUM BOARD: GYPSUM BOARD SHALL COMPLY WITH ASTM C36 OR ASTM C1396 WITH MANUFACTURER'S STANDARD EDGES. TRIM SHALL COMPLY WITH ASTM C1047 AND FORMED OF ALUMINUM-COATED STEEL SHEET. GYPSUM BOARD INSTALLATION AND FINISH SHALL COMPLY WITH ASTM C840 WITH A LEVEL 5 FINISH. PAINT GYPSUM BOARD WITH TWO FINISH COATS OF A PRIMER. PRIMER SHALL BE SHERWIN WILLIAMS PROMAR 400 INTERIOR PRIMER APPLIED AT SPREADING RATE RECOMMENDED BY THE MANUFACTURER TO ACHIEVE A TOTAL DRY FILM THICKNESS OF NOT LESS THAN 1.2 MILS. FINISH COATS SHALL BE SHERWIN WILLIAMS PROMAR 400 LATEX PAINT APPLIED AT SPREADING RATE RECOMMENDED BY THE MANUFACTURER TO ACHIEVE A TOTAL DRY FILM THICKNESS OF NOT LESS THAN 2.8 MILS. COLOR SHALL MATCH EXISTING ADJACENT GYP BOARD FINISH.
- FOAM BAR: CYLINDRICAL SEALANT BACKINGS (FOAM BAR) SHALL COMPLY WITH ASTM C1330, TYPE C (CLOSED-CELL MATERIAL WITH A SURFACE SKIN), AND OF SIZE AND DENSITY TO CONTROL SEALANT DEPTH AND OTHERWISE CONTRIBUTE TO PRODUCING OPTIMUM SEALANT PERFORMANCE.
- LATEX JOINT SEALANT: ACRYLIC LATEX OR SILICONIZED ACRYLIC LATEX SHALL COMPLY WITH ASTM C834, TYPE OP, GRADE NS, MANUFACTURED BY PECORA CORPORATION AND LABELED AC-20+ OR APPROVED EQUAL PRODUCT.
- CLOSED-CELL SPRAY POLYURETHANE FOAM: SPRAY FOAM SHALL COMPLY WITH ASTM C1029, TYPE II, MINIMUM DENSITY OF 2.0LB/CU FT AND MINIMUM R-VALUE AT 1-INCH THICKNESS OF 6.2 DEG F X H X SF AT 75 DEG F. PERFORM SPRAY FOAM INSULATION WITH ICYNENE PROSEAL MD-C-200V3 OR APPROVED EQUAL PRODUCT.

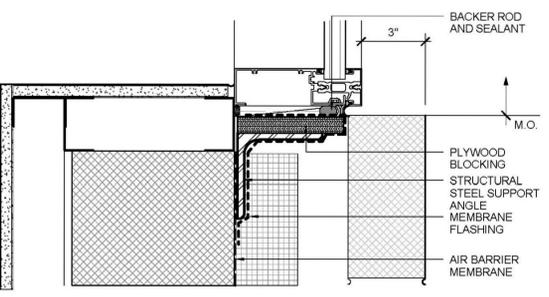
**CONSTRUCTION NOTES:**

- REMOVE AND REINSTALL WINDOW FOR REMOVAL AND REPLACEMENT OF PDU'S IN THE MECHANICAL ROOM 201. SEE REFERENCE DETAILS 2, 3, AND 7. THIS DRAWING FOR ASSUMED EXISTING CONDITIONS. PATCH AND SEAL GYP BOARD AND FLOORING TO WINDOW FRAME AS REQUIRED. SEAL EXTERIOR PERIMETER OF WINDOW FRAME TO MASONRY AS REQUIRED. RESET GLAZING AS REQUIRED.

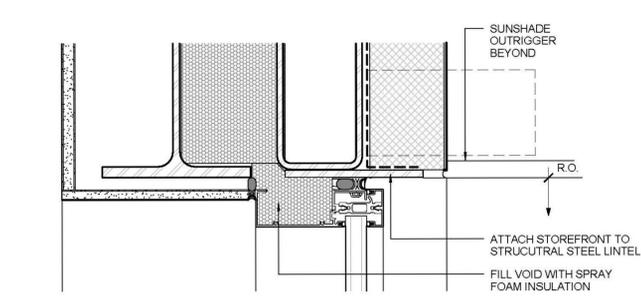
**PARTIAL SECOND FLOOR AND ROOF PLAN**  
SCALE: 1/8"=1'-0"



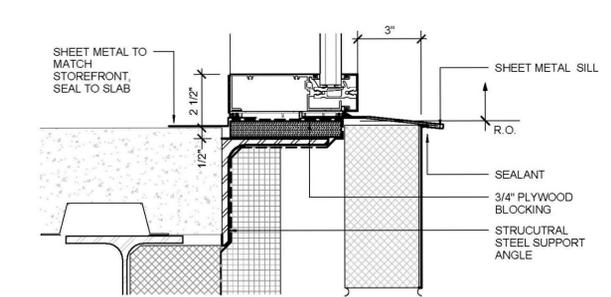
**2 SECTION**  
SCALE: 1 1/2"=1'-0"



**2 JAMB AT WINDOW**  
SCALE: 3"=1'-0"

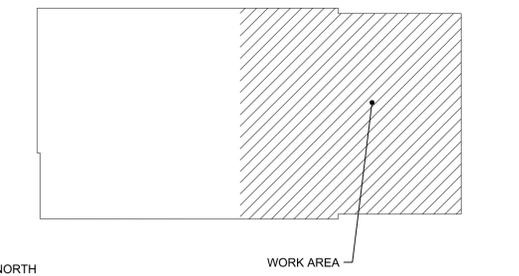


**3 HEAD AT MASONRY**  
SCALE: 3"=1'-0"



**7 TOP OF EAST RETAINING WALL**  
SCALE: 3"=1'-0"

**REFERENCE DETAILS**  
SCALE: 3"=1'-0"



**KEY PLAN**  
SCALE: NONE

NO.	BY	REVISIONS	DATE



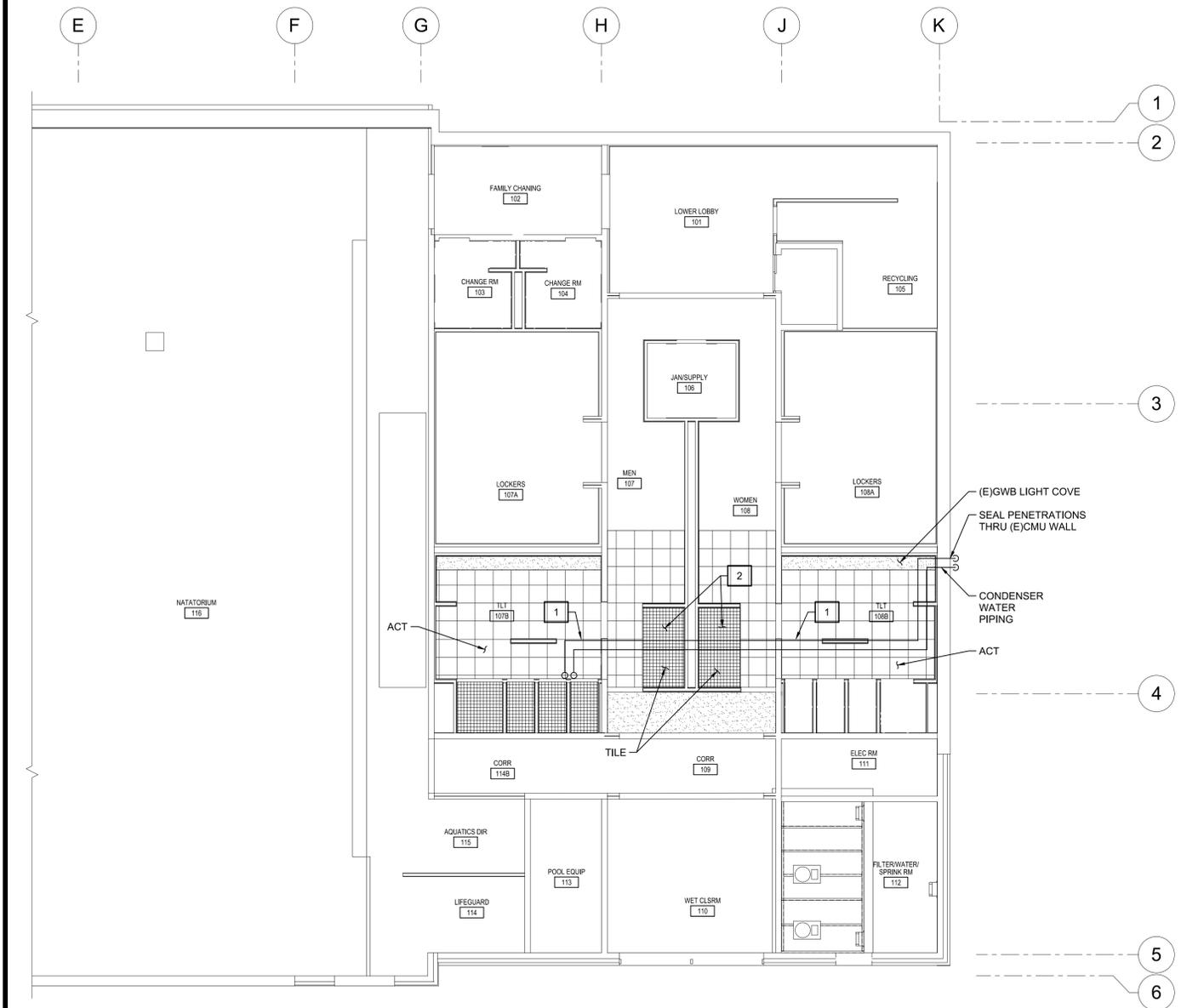
**Virginia A & E**  
VIRGINIA A&E, PLLC  
1115 VISTA PARK DRIVE  
FOREST, VIRGINIA 24551  
PHONE: (434) 316-6001

**SMITH AQUATIC CENTER  
PDU UPGRADES**  
CITY OF CHARLOTTESVILLE  
CHARLOTTESVILLE, VIRGINIA

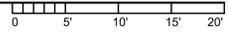
**PARTIAL SECOND FLOOR  
AND ROOF PLAN**  
PROJECT NO. 20006  
DATE: 2020-04-17

Full Scale Verification  
0" 1"  
Drawing No.

**AS2**



NORTH  
 PARTIAL FIRST FLOOR REFLECTED CEILING PLAN  
 SCALE: 1/8"=1'-0"

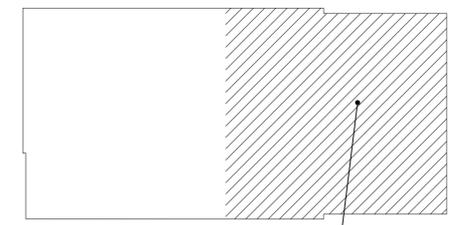


**GENERAL NOTES:**

1. CUTTING AND PATCHING:
  - A. ANY EXISTING CONSTRUCTION THAT IS TO BE REMOVED SHALL BE REMOVED CAREFULLY SO AS NOT TO DAMAGE ANY EXISTING CONSTRUCTION THAT IS TO REMAIN. FLOORS, WALLS, AND CEILINGS ARE TO BE PATCHED (IN A RECTANGULAR PATTERN) TO MATCH EXISTING CONDITIONS AND MADE READY TO RECEIVE ANY NEW FINISHES WHERE APPLICABLE.
  - B. WHERE EXISTING FLOORING, CEILING, OR WALL FINISHES ARE TO BE REMOVED AND REPLACED WITH NEW FINISHES, SURFACES SHALL BE STRIPPED CLEAN OF ALL EXISTING FINISHES AND MADE READY TO RECEIVE NEW FINISHES, UNLESS OTHERWISE NOTED.
2. ALL EXISTING FIREPROOFING REMOVED DURING DEMOLITION SHALL BE PATCHED TO MEET CURRENT CODE.
3. CONTRACTOR IS RESPONSIBLE FOR VERIFYING EXISTING CONDITIONS AND REPORTING OF ANY DISCREPANCIES TO THE A/E OF RECORD BEFORE STARTING THE DEMOLITION.
4. ACOUSTICAL CEILING SYSTEM: MATCH EXISTING LOCKER ROOM AND TOILET ROOM. EXISTING CEILING PANELS ARE USG CLEAN ROOM CLIMAPLUS CLASS 10M-100M 2'X2'X5/8" PANELS. EXISTING CEILING GRID IS USG AX 15/16" WIDE BY 1 1/2" TALL.
5. CEILING CERAMIC TILE: EXISTING CEILING TILE IS 4 1/4x4 1/4 GLAZED WHITE ASSUMED INSTALLED OVER CEMENTITIOUS BACKER BOARD WITH LATEX-PORTLAND THIN-SET MORTAR AND POLYMER-MODIFIED UNSANDED GROUT - MAPEI-#38 AVALANCHE.

**XX CONSTRUCTION NOTES:**

1. REMOVE, SALVAGE, AND REINSTALL ACOUSTICAL CEILING SYSTEM AS REQUIRED TO INSTALL CONDENSER WATER PIPING.
2. REMOVE AND REPLACE CEILING CERAMIC TILE AND BACKER BOARD IN SHOWER AS REQUIRED TO INSTALL CONDENSER WATER PIPING.



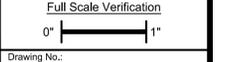
NORTH  
 KEYPLAN  
 SCALE: NONE

NO.	BY	REVISIONS	DATE



SMITH AQUATIC CENTER  
 PDU UPGRADES  
 CITY OF CHARLOTTESVILLE  
 CHARLOTTESVILLE, VIRGINIA

PARTIAL FIRST FLOOR  
 REFLECTED CEILING PLAN  
 PROJECT NO. 20006  
 DATE: 2020-04-17



AS3

**EQUIPMENT NOTES**

**POOL DEHUMIDIFICATION UNITS: SERESCO (4 UNITS TOTAL, EACH UNIT SCHEDULED AS BELOW)**

MARK	SUPPLY AIR CFM	MINIMUM OUTSIDE AIR CFM	ESP IN. W.C.	COOLING								HOT GAS REHEAT		AUXILIARY HEATING COIL						POOL HEATING			ESP	FAN POWER	ELECTRICAL		MODEL (SERESCO)	NOTES
				TOTAL MBH	SENS. MBH	LATENT CAPACITY, LBHR	GPM	MAX ΔP FT. W.C.	EWT/LWT °F	EAT °F DBWB	EER	MBH	GPM	MAX ΔP FT. W.C.	EWT/LWT °F	EAT °F DB	CAPACITY (MBH)	GPM	MAX ΔP FT. W.C.	COP	IN. W.C.	HP			VOLTS/PH	MOP		
PDU-1 A,B,C,D	10,100	1,675	1.5	334.6	204.3	119.1	69.0	11.0	90/102	80/67	---	418.3	170.0	17.0	1.0	180/160	68.0	252.0	40.0	14.0	3.8	1.5	4.9/4.9	208/3	150.0	NE-224	1,2,3,4	

NOTES:  
 1. CONTRACTOR SHALL PROVIDE SINGLE POINT POWER CONNECTION AND FUSED DISCONNECT SWITCH. REFER TO ELECTRICAL PLANS.  
 2. UNIT SHALL BE PROVIDED WITH NEOPRENE VIBRATION ISOLATION PADS UNDER EACH PEDASTAL.  
 3. UNIT SHALL BE PROVIDED WITH A COMPLETE SET OF MICRO-PROCESSOR CONTROLS. PROVIDE ALL HARDWARE REQUIRED FOR INTEGRATION WITH THE OWNER'S EXISTING BUILDING MANAGEMENT SYSTEM.  
 4. UNIT PERFORMANCE BASED ON: 85°F/50% RH SPACE CONDITIONS, LAP POOL TEMPERATURE OF 83°F (AS REPORTED BY THE OWNER); FAMILY/REC POOL TEMPERATURE OF 86°F. OUTDOOR DESIGN CONDITIONS (ASHRAE): 92.1°F/73.9°F.

**WATER SOURCE HEAT PUMP UNITS: FLORIDA HEAT PUMP**

MARK	SUPPLY AIR CFM	OUTSIDE AIR CFM (FROM ERV)	CONFIGURATION	COOLING								HOT GAS REHEAT		HEATING						HEAT OF ABSORPTION (MBH)	COP	ESP IN. W.C.	FAN POWER HP	ELECTRICAL		MODEL	NOTES			
				NOMINAL TONS	TOTAL MBH	SENSIBLE MBH	GPM	MAX ΔP FT. W.C.	EWT/LWT °F	EAT °F DBWB	EER	MBH	GPM	MAX ΔP FT. W.C.	EWT/LWT °F	EAT °F DB	CAPACITY (MBH)	GPM	MAX ΔP FT. W.C.					COP	IN. W.C.			HP	VOLTS/PH	MOP
WSHP-1A	1,360	780	VERTICAL DOWNFLOW	4.0	44.9	32.5	12.0	9.5	90/100	80/67	26.4	76.0	12.5	53.2	12.0	10.5	60/53	67.0	23.3	4.3	1.0	0.33	208/3	35.0	ES049	1, 2				
WSHP-1B	680	395	VERTICAL DOWNFLOW	2.0	24.1	18.6	6.0	4.0	90/100	80/66	14.7	74.9	12.1	30.0	6.0	4.4	60/53	67.0	23.3	4.3	1.0	0.33	208/1	25.0	ES025	1, 2				
WSHP-1C	510	160	VERTICAL DOWNFLOW	1.5	23.6	18.0	5.0	2.9	90/102	78/65	14.2	73.1	12.0	29.1	5.0	3.2	60/52	70.0	22.5	4.1	0.8	0.33	208/1	25.0	ES025	1, 2				
WSHP-2A	2,800	365	VERTICAL	8.0	95.0	69.2	21.0	14.5	90/101	78/66	55.0	73.9	14.1	105.8	21.0	16.0	60/52	67.0	82.4	4.7	0.8	2.0	208/3	50.0	EC096	1, 2, 3				
WSHP-2B	2,800	1090	VERTICAL	8.0	98.2	69.0	21.0	14.5	90/101	80/68	54.8	75.9	14.6	107.0	21.0	16.0	60/52	60.0	86.4	5.0	0.8	2.0	208/3	50.0	EC096	1, 2, 3				
WSHP-2C	680	265	VERTICAL	2.0	23.5	17.8	6.0	6.5	90/100	78/66	13.9	73.9	14.9	28.0	6.0	7.2	60/53	62.0	22.7	5.1	0.8	0.33	208/1	30.0	EP024	1, 2				
WSHP-2D	1,700	960	VERTICAL	5.0	58.6	38.3	14.0	7.7	90/101	80/69	31.2	76.4	13.8	69.7	14.0	8.4	60/52	62.0	56.2	5.3	1.0	1.0	208/3	40.0	EP060	1, 2				

NOTES:  
 1. UNIT SHALL BE PROVIDED WITH CONDENSATE OVERFLOW SWITCH.  
 2. UNIT FAN SHALL BE PROVIDED WITH ECM MOTOR.  
 3. UNIT SHALL BE PROVIDED WITH MULTI-STAGE COMPRESSOR.

**PUMPS: BELL & GOSSETT**

MARK	CAPACITY (GPM)	HEAD (FT. H <sub>2</sub> O)	MOTOR (HP)	RPM	VOLTAGE & PHASE	SERIES	MODEL NO.
CDP-1*	360	70.0	10.0	1750	208V/3PH	1510	2.58B
CDP-2*	360	70.0	10.0	1750	208V/3PH	1510	2.58B
PDP-1	80	30	1.5	1750	208V/3PH	80	2.5 x 2.5 x 7B
PDP-2	80	30	1.5	1750	208V/3PH	80	2.5 x 2.5 x 7B

\* PUMP MOTOR SHALL BE SUITABLE FOR AND PROVIDED WITH VARIABLE SPEED DRIVE.

**CLOSED CIRCUIT COOLER (QTY 1): EVAPCO**

MODEL ESWA-77-24H-C; TOTAL CAPACITY 1,830 MBH (122 NOMINAL TONS); 100°F EWT, 90°F LWT; 78°F WET BULB; 360 GPM @ 6 FT. W.C. ΔP; 7.5 HP VARIABLE SPEED FAN MOTOR, SUPER LOW SOUND FAN; 5 HP DISTRIBUTION PUMP; 208/3PH, 7kW BASIN HEATER PACKAGE WITH CONTACTOR, TRANSFORMER AND DISCONNECT; WATER LEVEL CONTROLS, VIBRATION SWITCH, 304 WELDED STAINLESS STEEL COIL AND COLD WATER BASIN.

**BOILER-1 (QTY 1): LOCHINVAR COPPER FIN 2 (FAMILY POOL HEATER)**

MODEL CPN9992; 160 PSIG, NATURAL GAS-FIRED, COPPER FINNED TUBE TYPE WITH INTEGRAL PUMPED BYPASS, PIPING, CONTROLS, AND ACCESSORIES; HEATING INPUT 990 MBH, HEATING OUTPUT 841.5 MBH (94% CSA EFF), MAX. 6 FT. H<sub>2</sub>O PRESSURE LOSS, MINIMUM CIRCUIT AMPS 17.9, MOP 20 AMPS AT 120V/1PH/60HZ, COMBUSTION AIR AND VENTING AND ACCESSORIES AS REQUIRED FOR OUTDOOR INSTALLATION. PROVIDE WITH Bacnet MS/TP COMMUNICATION.

**AIR SEPARATORS: BELL AND GOSSETT ROLAIRTROL**

MARK	SERVICE	CAP. GPM	MAX ΔP FT. H <sub>2</sub> O	MODEL NO.	MAX FLOODED WEIGHT (LBS)	NOTES
AS-1	CONDENSER WATER	300	2	RL-6F	570	1, 2

NOTES:  
 1. SUSPEND UNIT FROM STRUCTURE.  
 2. PROVIDE LIFTING RINGS.

**ASME EXPANSION TANKS: BELL & GOSSETT**

MARK	CAP., GAL.	LENGTH, IN.	DIAMETER, IN.	MODEL #
ET-CW	30	48	14	116031

REMARKS:  
 1. PROVIDE AIR CONTROL FITTINGS AS REQUIRED.

**100% OUTSIDE AIR ENERGY RECOVERY UNIT: GREENHECK**

UNIT MARK	ERV-1
AREA SERVED	OFF/CR/TLTS
SUPPLY FAN (CV OR VAV)	CV
TOTAL AIR, CFM	4,000
EXTERNAL S.P., IN. H <sub>2</sub> O	1.0
FAN HORSEPOWER	5.0
ENERGY RECOVERY WHEEL	
SUMMER CONDITIONS	
OUTSIDE AIR CFM	4,000
ENT. AIR, DEG. F DBWB	93.1/74.0
LEAVING AIR, DEG. F DBWB	83.8/68.6
EXHAUST AIR CFM	2,040
ENT. AIR, DEG. F DBWB	75.0/63.0
ENERGY RECOVERY CAPACITY (MBH)	86.4
EXHAUST AIR RECOVERY EFF. (%)	90.0
WINTER CONDITIONS	
OUTSIDE AIR CFM	4,000
ENT. AIR, DEG. F DB	16.1
LEAVING AIR, DEG. F DB	40.9
EXHAUST AIR CFM	2,040
ENT. AIR, DEG. F DB	68.0
ENERGY RECOVERY CAPACITY (MBH)	108.0
EXHAUST AIR RECOVERY EFF. (%)	91.3
EXHAUST FAN (CV OR VAV)	CV
TOTAL AIRFLOW, CFM	2,040
EXTERNAL S.P., IN. H <sub>2</sub> O	1.0
FAN HORSEPOWER	1.0
UNIT ELECTRICAL	
VOLTAGE & PHASE	208/3
MCA	26.7
MOP	40.0
UNIT WEIGHT (LBS)	1,500
UNIT MODEL NO. (LOSSNAY MODEL LISTED)	ERV-45-15H

NOTES:  
 1. UNIT SHALL BE PROVIDED WITH MERV-13 O/A FILTERS AND MERV-8 E/A FILTERS.  
 2. REFER TO FLOOR PLANS TO VERIFY SUPPLY AND RETURN ARRANGEMENTS.  
 3. UNIT SHALL BE ARRANGEMENT WITH SIDE-BY-SIDE OUTSIDE AIR AND EXHAUST AIR STREAMS.  
 4. PROVIDE SINGLE POINT POWER CONNECTION.

**SHELL & TUBE HEAT EXCHANGER: BELL & GOSSETT**

MARK	BOILER WATER FLOW, GPM	EWT/LWT, °F	MAX ΔP, FT. H <sub>2</sub> O	CONDENSER WATER FLOW, GPM	EWT/LWT, °F	MAX ΔP, FT. H <sub>2</sub> O	EWT/LWT, °F	FOULING FACTOR	HEAT LOAD (MBH)	MODEL NO.	DIMENSIONS
HX-1	35.0	180/160	3.0	35.0	50/70	3.0	160/180	0.001	341.8	WU-44-24	54.44"x4.50"x0

REMARKS:  
 UNIT SHALL BE WATER TO WATER, SHELL & TUBE TYPE, ASME STAMPED FOR PRESSURE VESSELS. TUBE BUNDLE SHALL BE COPPER U-BEND TYPE WITH STATIONARY TUBE SHEET.

**FANS: GREENHECK**

MARK	AREA SERVED	CFM	ESP	RPM	MOTOR HP	VOLTS/PH	MODEL	NOTES
IEF-POOL	NATORIUM	7,500	1.50	3,500	5	208/3	AX-54-190	1

NOTES:  
 1. PROVIDE MOTOR OPERATED DAMPERS (MOD) UNLESS OTHERWISE NOTED.  
 2. FAN MOTOR SHALL BE SUITABLE FOR OPERATION WITH VARIABLE SPEED DRIVE.

**ROOF VENTS: GREENHECK**

MARK	SERVICE	AIRFLOW, CFM	MAX ΔP, IN. H <sub>2</sub> O	MODEL NO.	THROAT SIZE, IN. (L x W)	LOUVER HEIGHT, IN.	WEIGHT, LB.	NOTES
RV-1	ERV-1 O/A INTAKE	4,000	.07	WIH	30 x 30	16	57	1
RV-2	NATORIUM EXH	7,500	.15	WRH	34 x 34	28	75	1, 2

NOTES:  
 1. PROVIDE MIN 14" INSULATED ROOF CURB, DAMPER TRAY AND MOTOR OPERATED DAMPER.  
 2. PROVIDE CURB ADAPTER FOR EXISTING CURB FOR RV-2.

**SPECIAL PROJECT NOTES:**

- IN ADDITION TO ALL OF THE REQUIREMENTS SHOWN ON THE DRAWINGS AND IN THE SPECIFICATIONS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL OF THE FOLLOWING:
- FOR THE EXISTING PDUS, WSHPS, ERV, AND BOILER THE CONTRACTOR SHALL REMOVE EXISTING ELECTRICAL WIRING, STARTERS, PANELS, CONTROLS, CONDENSER WATER PIPING, AND REFRIGERANT PIPING AND INSTALL ALL NEW ITEMS TO REPLACE THE EXISTING ITEMS. THE EXISTING SUPPORTS AND INDOOR PIPE HANGERS FOR THE EXISTING WATER PIPING SHALL BE REUSED FOR SUPPORT OF THE NEW PIPING. ADJUST THE LOCATIONS OF EXISTING PIPE SUPPORTS AND PROVIDE ADDITIONAL PIPE SUPPORTS AS REQUIRED FOR THE NEW CHILLED WATER PIPING.
  - NEW CONTROLS FOR PDUS, WSHPS, ERV, CDP's, & BOILER SHALL BE PROVIDED FOR CONNECTION TO THE OWNER'S EXISTING TRENDS BUILDING AUTOMATION SYSTEM (BAS). ALL NEW SOFTWARE AND EQUIPMENT SHALL BE ALERTON. THE CONTRACTOR SHALL PROVIDE ALL HARDWARE AND SOFTWARE REQUIRED FOR CONTROL FROM AND FULL COMMUNICATIONS WITH THE OWNER'S EXISTING BAS SYSTEM. THE CONTRACTOR WILL DISCONNECT THE EXISTING BAS COMMUNICATION WIRING FROM EXISTING PDUS, WSHPS, ERV & BOILER AND RECONNECT TO THE NEW TERMINALS. THE BAS CONTRACTOR SHALL PROVIDE AND INSTALL NEW CONTROL WIRING AND THE GC SHALL PROVIDE AND INSTALL NEW CONDUIT FOR ALL NEW CONTROLS AS REQUIRED. THE BAS CONTRACTOR WILL MAKE FINAL BAS COMMUNICATION WIRING CONNECTIONS.
  - THE CONTRACTOR SHALL COORDINATE WITH THE OWNER TO ENSURE A PROPER AND TIMELY INSTALLATION OF THE NEW EQUIPMENT. ALL PIPING, DOORS AND WALL PANELS REQUIRED TO BE REMOVED FOR UNIT INSTALLATION SHALL BE STORED BY THE CONTRACTOR FOR RE-INSTALLATION FOLLOWING INSTALLATION OF NEW PDUS, WSHPS, ERV, CDP'S, & BOILER.
  - EXISTING INSULATION DAMAGED AS A RESULT OF THE WORK SHALL BE REPAIRED OR REPLACED AS SPECIFIED FOR NEW INSULATION.
  - DAMAGED INSULATION ON REMAINING PIPING SHALL BE REPAIRED OR REPLACED AS SPECIFIED FOR NEW PIPING.
  - CONTRACTOR SHALL ENSURE THAT THE OWNER SHALL WITNESS ALL PIPING PRESSURE TESTS, WATER SYSTEM DRAIN DOWN AND REFILL.
  - THE CONTRACTOR SHALL VISIT THE SITE AND CONSULT THE OWNER TO DETERMINE THE EXTENT OF THE WORK FOR THIS PROJECT BEFORE SUBMITTING BIDS. CONTRACTOR SHALL BE EXPERIENCED IN THIS TYPE OF CONSTRUCTION AND CAPABLE OF PROVIDING COMPLETE FUNCTIONING SYSTEMS AT THE COMPLETION OF THIS PROJECT.
  - PROJECT SCOPE INCLUDES 3RD PARTY COMMISSIONING. THE CONTRACTOR IS REFERRED TO THE COMMISSIONING SPECIFICATION FOR REQUIREMENTS AND RESPONSIBILITIES RELATIVE TO THE COMMISSIONING PROCESS. THE COMMISSIONING WILL BE PERFORMED BY THE OWNER'S REPRESENTATIVE AND IS NOT PART OF THE CONSTRUCTION CONTRACT EXCEPT AS IT RELATES TO THE RESPONSIBILITIES AND INFORMATION REQUIRED TO COORDINATE WITH THE OWNER'S REPRESENTATIVE THAT IS PERFORMING THE COMMISSIONING.

**GENERAL NOTES:**

- CONTRACTOR SHALL VISIT THE SITE TO REVIEW THE SCOPE OF THE WORK AND VERIFY EXISTING CONDITIONS PRIOR TO PRICING.
- HVAC DRAWINGS ARE DIAGRAMMATICAL IN NATURE AND REPRESENT EXISTING CONDITIONS BASED ON DRAWINGS AND SITE OBSERVATIONS. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFICATION OF ALL ACTUAL CONDITIONS INCLUDING, DUCTWORK AND PIPING LOCATIONS AND SIZES.
- MATERIALS AND INSTALLATION SHALL COMPLY WITH 2012 USVBC, APPLICABLE PROVISIONS OF LATEST EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION, LOCAL UTILITY REGULATIONS AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.
- PROVIDE AND INSTALL NECESSARY DUCTWORK TRANSITIONS AND PIPING INCREASERS/REDUCERS AS REQUIRED FOR EQUIPMENT CONNECTIONS. CONSULT MANUFACTURERS DATA FOR ACTUAL DUCTWORK AND PIPING CONNECTIONS SIZES, INCLUDING, BUT NOT LIMITED TO THOSE SHOWN.
- ALL FINISHES AND SURFACES TO REMAIN WHICH ARE DAMAGED DURING DEMO AND/OR CONSTRUCTION WORK SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE OWNER AT NO ADDITIONAL COST TO THE OWNER.
- SEAL ALL WALL PENETRATIONS WEATHER TIGHT AT DUCTWORK PENETRATIONS. ALL PENETRATIONS THRU FIRE RATED WALLS SHALL BE SEALED IN ACCORDANCE TO UL DETAILS.
- FIELD VERIFY EXISTING ELECTRICAL, PLUMBING, FIRE PROTECTION, ARCHITECTURAL AND STRUCTURAL FOR COORDINATION WITH THESE DRAWINGS.
- ALL DUCTWORK AND PIPES SHALL BE COORDINATED WITH EXISTING DUCTS, PIPES, LIGHTS, STRUCTURAL SYSTEM, CEILING SUPPORTS AND FRAMING BEFORE INSTALLATION. MINOR DUCT AND PIPE OFFSETS AND MINOR DUCT TRANSITIONS SHALL BE PROVIDED AS REQUIRED. WHERE TRANSITIONS ARE REQUIRED, CROSS SECTIONAL AREA OF DUCT SHALL NOT BE REDUCED. MEASUREMENTS FOR CLEARANCES OF DUCTWORK SHALL BE TAKEN AT THE JOB SITE BEFORE FABRICATION OF ANY DUCTWORK.
- TEMPORARY AND/OR PERMANENT ALTERATIONS TO EXISTING MECHANICAL AND ELECTRICAL SYSTEMS MAY BE NECESSARY FOR INSTALLATION OF NEW SYSTEMS. PROVIDE ALL ALTERATIONS REQUIRED FOR A COMPLETE AND PROPER INSTALLATION.
- EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTRUCTIONS.
- VERIFY WALL AND FLOOR OPENINGS WITH STRUCTURE.
- VERIFY THE LOCATION OF EXISTING THERMOSTATS, TEMPERATURE SENSORS, PANELS AND CONTROL INSTRUMENTS.
- VERIFY LOCATIONS OF NEW AND EXISTING EQUIPMENT AND ROUTE OF DUCTWORK AND PIPING WITH EXISTING CONDITIONS.
- CONTRACTOR SHALL PROVIDE ALL SUPPORTS REQUIRED TO MOUNT MECHANICAL EQUIPMENT, PIPING AND DUCTWORK.
- EXPOSED DUCTWORK SHALL BE INSTALLED IN PRACTICAL ALIGNMENT WITH THE BUILDING AND SHALL BE ADEQUATELY SECURED TO THE BUILDING STRUCTURE.
- PROVIDE ACCESS DOORS OF SUFFICIENT SIZE FOR ALL CONCEALED CONTROLS, MANUAL DAMPERS OR ANY ITEMS REQUIRING ACCESS.
- AIR DEFLECTORS SHALL BE PROVIDED IN ALL SQUARE/RECTANGULAR ELBOWS OF DUCTWORK.
- DO NOT BLOCK SERVICE SPACE WITH PIPING, DUCTWORK, ETC.
- ALL NATATORIUM DUCTWORK SHALL BE INSTALLED WITH SUFFICIENT PITCH TO INSURE ADEQUATE DRAINAGE.
- WHERE PIPE AND DUCT CONNECTIONS ARE SHOWN CONNECTING TO EXISTING, CONTRACTOR SHALL DETERMINE EXACT LOCATIONS AND CONNECTION SIZES PRIOR TO INSTALLATION.
- MAINTAIN SPECIFIED CEILING HEIGHTS. INSTALL ITEMS AS CLOSE TO LOWEST PART OF STRUCTURE AS POSSIBLE.
- EXISTING PIPE INSULATION AND DUCT INSULATION DAMAGED DURING DEMOLITION OR CONSTRUCTION SHALL BE REPLACED, REPAIRED AND SEALED.
- SYSTEMS SHALL OPERATE UNDER CONDITIONS OF LOAD WITHOUT UNUSUAL OR EXCESSIVE NOISE OR VIBRATION. UNUSUAL OR EXCESSIVE NOISE OR VIBRATION SHALL BE CORRECTED.
- EQUIPMENT, MATERIALS AND LABOR REQUIRED BY THESE CONTRACT DRAWINGS SHALL BE GUARANTEED TO BE FREE FROM DEFECTIVE MATERIALS OR WORKMANSHIP FOR ONE YEAR AFTER SUBSTANTIAL COMPLETION OF THE PROJECT. DEFECTIVE MATERIALS OR WORKMANSHIP OCCURRING DURING THIS PERIOD SHALL BE CORRECTED AT NO ADDITIONAL COST.

**GENERAL DEMOLITION NOTES:**

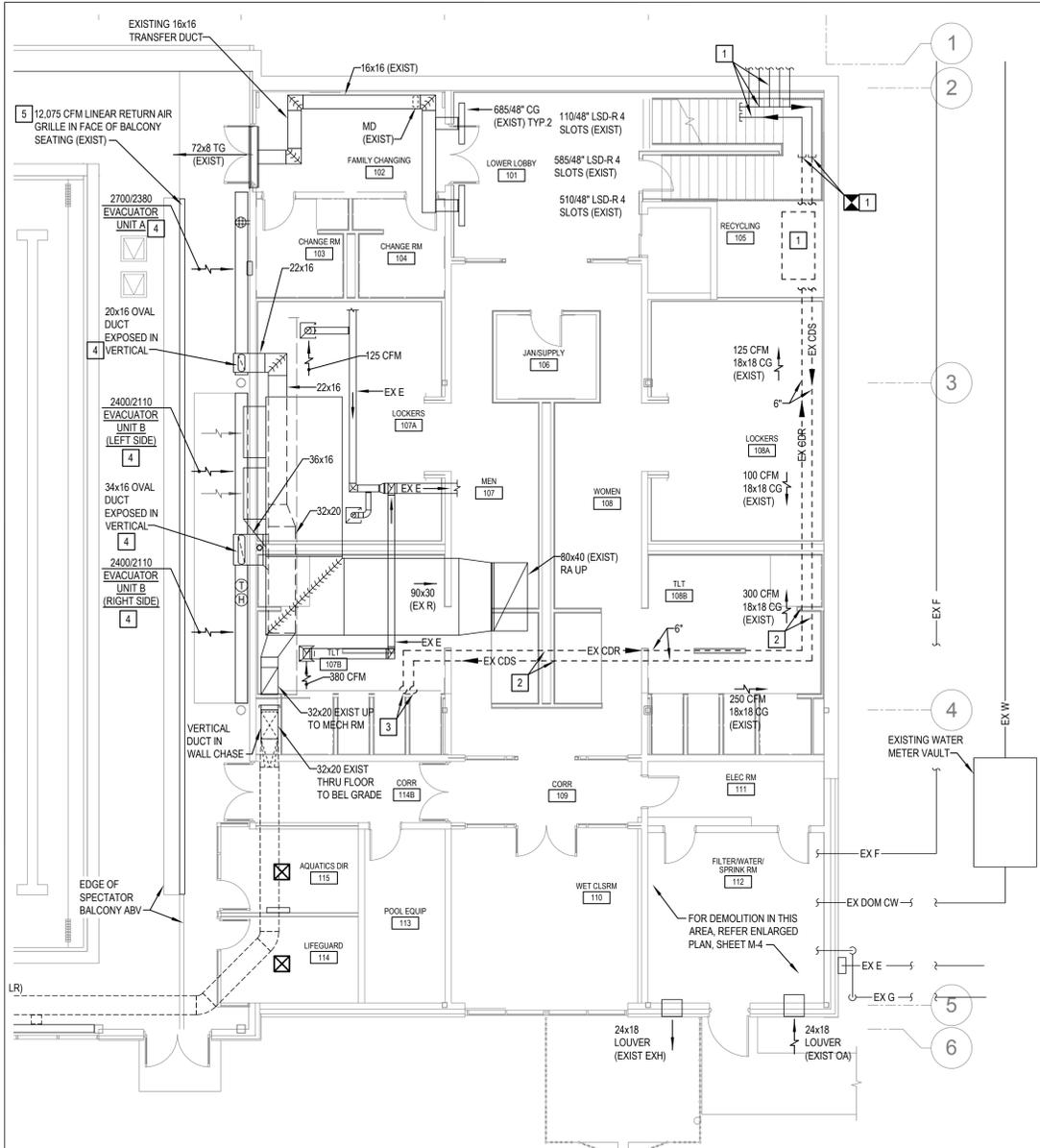
- THE CONTRACTOR SHALL REMOVE OR ALTER AS NECESSARY ALL EXISTING PIPING, EQUIPMENT, AND APPURTENANCES THAT ARE NOT REQUIRED FOR THE EXISTING SYSTEMS TO REMAIN. CONTRACTOR SHALL VISIT THE SITE TO REVIEW THE SCOPE OF THIS WORK AND VERIFY EXISTING CONDITIONS PRIOR TO PRICING.
- EXISTING EQUIPMENT SHALL BE TURNED OVER TO THE OWNER, UNLESS DIRECTED OTHERWISE AND LOCATED ON SITE AS DIRECTED BY THE OWNER. ALL OTHER ITEMS TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE PREMISES.
- INSULATION ON EXISTING PIPING THAT IS DAMAGED OR REMOVED DUE TO THE DEMOLITION WORK SHALL BE REPLACED AND SEALED AS REQUIRED.
- THE CONTRACTOR SHALL PROTECT EXISTING SYSTEMS TO REMAIN. SYSTEMS THAT ARE DAMAGED OR INCORRECTLY REMOVED DUE TO THE DEMOLITION WORK SHALL BE REPAIRED OR REPLACED.
- THE EXISTING SYSTEMS INDICATED ARE FROM CONSTRUCTION DOCUMENTS DATED FEBRUARY 20, 2009, JULY 8, 2011, NOVEMBER 20, 2012 AND SEVERAL SITE VISITS. THE CONTRACTOR IS CAUTIONED THAT THE EXISTING HVAC SYSTEM LAYOUTS ARE INDICATED AS ONLY AN APPROXIMATION OF EXISTING CONDITIONS. NOT ALL EXISTING SYSTEMS ARE SHOWN AND SELECTIVE DEMOLITION IS REQUIRED. THE CONTRACTOR SHALL VERIFY ACTUAL SYSTEM CONFIGURATIONS IN THE FIELD AND SHALL COORDINATE ACCORDINGLY.

**SPRINKLER SYSTEM NOTES AND SPECIFICATIONS:**

- THE EXISTING SPRINKLER SYSTEM IN THE RENOVATED AREAS SHALL BE MODIFIED AS REQUIRED TO PROVIDE FULL SPRINKLER COVERAGE IN ACCORDANCE WITH NFPA 13 AND THE 2015 VIRGINIA CONSTRUCTION CODE.
- INSTALLATION SHALL BE ACCOMPLISHED BY A CONTRACTOR WHO IS DULY LICENSED AND ACCREDITED IN THE INSTALLATION OF AUTOMATIC SPRINKLER SYSTEMS AND FIRE PROTECTION EQUIPMENT FOR THE PAST THREE YEARS.
- EXISTING SPRINKLER HEADS SHALL BE REMOVED WHERE INDICATED. NEW SPRINKLER HEADS SHALL BE RECESSED PENDENT IN FINISHED CEILING WITH THREADED ESCUTCHEONS.
- PIPING SHALL BE FERROUS PIPING (WELDED AND SEAMLESS), ASTM A795, ASTM A53 OR ASTM A153 IN ACCORDANCE WITH NFPA 13.
- CONTRACTOR SHALL COORDINATE THE LOCATIONS OF ALL SPRINKLERS AND SPRINKLER PIPING WITH OTHER NEW AND EXISTING PIPES, DUCTS, LIGHTS, EQUIPMENT, CONDUIT, STRUCTURAL SYSTEMS, CEILING SUPPORTS, AND FRAMING BEFORE INSTALLATION. SPRINKLER PIPING SHALL NOT BE INSTALLED WHERE ITS LOCATION INHIBITS ACCESS TO EQUIPMENT FILTER ACCESS OR INFRINGES UPON CLEARANCE DICTATED BY THE NATIONAL ELECTRIC CODE. ALL SPRINKLERS TO BE CENTERED IN CEILING TILES - "CENTER OF TILE."
- THE SPRINKLER SYSTEM IN TOILET 107B SHALL BE LIGHT HAZARD DESIGNED TO PROVIDE 0.10 GPM/SQ. FT. OVER 1500 SQ. FT. PLUS A 100 GPM HOSE ALLOWANCE. THE SYSTEM SHALL BE WET USING 155 DEG. F. SPRINKLER HEADS AND COVER NO MORE THAN 225 SQ. FT. PER HEAD.
- THE SPRINKLER SYSTEM IN LOCKER ROOM 107A SHALL BE ORDINARY HAZARD GROUP 1 DESIGNED TO PROVIDE 0.15 GPM/SQ. FT. OVER 1500 SQ. FT. PLUS A 250 GPM HOSE ALLOWANCE. THE SYSTEM SHALL BE WET USING 155 DEG. F. SPRINKLER HEADS AND COVER NO MORE THAN 130 SQ. FT. PER HEAD.
- PROVIDE FIRESTOPPING AT ALL LOCATIONS WHERE PIPES PENETRATE RATED WALL ASSEMBLIES.
- THE EXISTING SPRINKLER SYSTEM SERVING AREAS NOT BEING RENOVATED MUST BE MAINTAINED DURING CONSTRUCTION.
- INFORMATION ON EXISTING SPRINKLERS SHOWN WAS OBTAINED FROM PLANS DATED FEBRUARY 6, 2009. THE CONTRACTOR SHALL ADJUST WORK AS REQUIRED TO SUIT ACTUAL LOCATIONS IF DIFFERENT FROM CONTRACT DOCUMENTS.

**HVAC LEGEND**

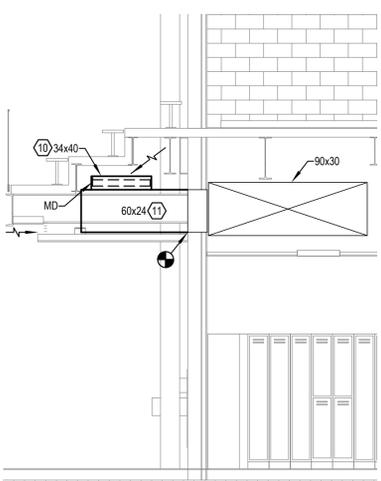
ABOVE FINISHED FLOOR	ABV	ANGLE VALVE	AV
ACCESS DOOR	ADR	BALANCING VALVE	BV
ADJUSTABLE DEFLECTOR	AD	BELOW BETWEEN CAPACITY CHECK VALVE CIRCUIT SETTER	BEL
AIR CONDITIONING UNIT	AC	CONDENSER WATER PUMP	C
AIR HANDLING UNIT	AHU	CONDENSER WATER RETURN PIPE	CDR
AIR SEPARATOR	AS	CONDENSER WATER SUPPLY PIPE	CDS
ANCHOR		CONTROL SWITCH	S
ANGLE VALVE		COOLING COIL CONDENSATE DRAIN PIPE	CCCD
BALANCING VALVE		CUBIC FEET PER MINUTE	CFM
BELOW BETWEEN CAPACITY CHECK VALVE CIRCUIT SETTER		DEGREES FAHRENHEIT	°F
CONDENSER WATER PUMP	CO	DIRECTION OF FLOW	→
CONDENSER WATER RETURN PIPE	CDR	DIRECTION OF SLOPE DOWN	↘
CONDENSER WATER SUPPLY PIPE	CDS	DOMESTIC COLD WATER PIPE	CW
CONTROL SWITCH	S	DRY BULB	DB
COOLING COIL CONDENSATE DRAIN PIPE	CCCD	DUCTWORK (EXISTING TO REMAIN)	EX
CUBIC FEET PER MINUTE	CFM	RETURN	EX R
DEGREES FAHRENHEIT	°F	EXHAUST	EX E
DIRECTION OF FLOW	→	SUPPLY	EX S
DIRECTION OF SLOPE DOWN	↘	DUCTWORK (EXISTING TO BE REMOVED)	---
DOMESTIC COLD WATER PIPE	CW	RETURN	---
DRY BULB	DB	EXHAUST	---
DUCTWORK (EXISTING TO REMAIN)	EX	SUPPLY	---
RETURN	EX R	EACH	EA
EXHAUST	EX E	ELECTRIC WALL HEATER	EW
SUPPLY	EX S	ENTERING AIR TEMPERATURE	EAT
EACH	EA	ENTERING WATER TEMPERATURE	EWT
ELECTRIC WALL HEATER	EW	EXISTING, REMOVE FROM THIS POINT	EX
ENTERING AIR TEMPERATURE	EAT	EXPANSION JOINT	EJ
ENTERING WATER TEMPERATURE	EWT	EXPANSION TANK	ET
EXISTING, REMOVE FROM THIS POINT	EX	FAN COIL UNIT	FC



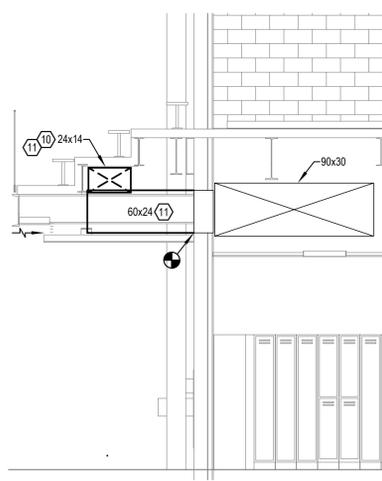
**PARTIAL FIRST FLOOR PLAN - DEMOLITION**  
SCALE: 1/8" = 1'-0"  
(PLAN)

**DEMOLITION NOTES:**

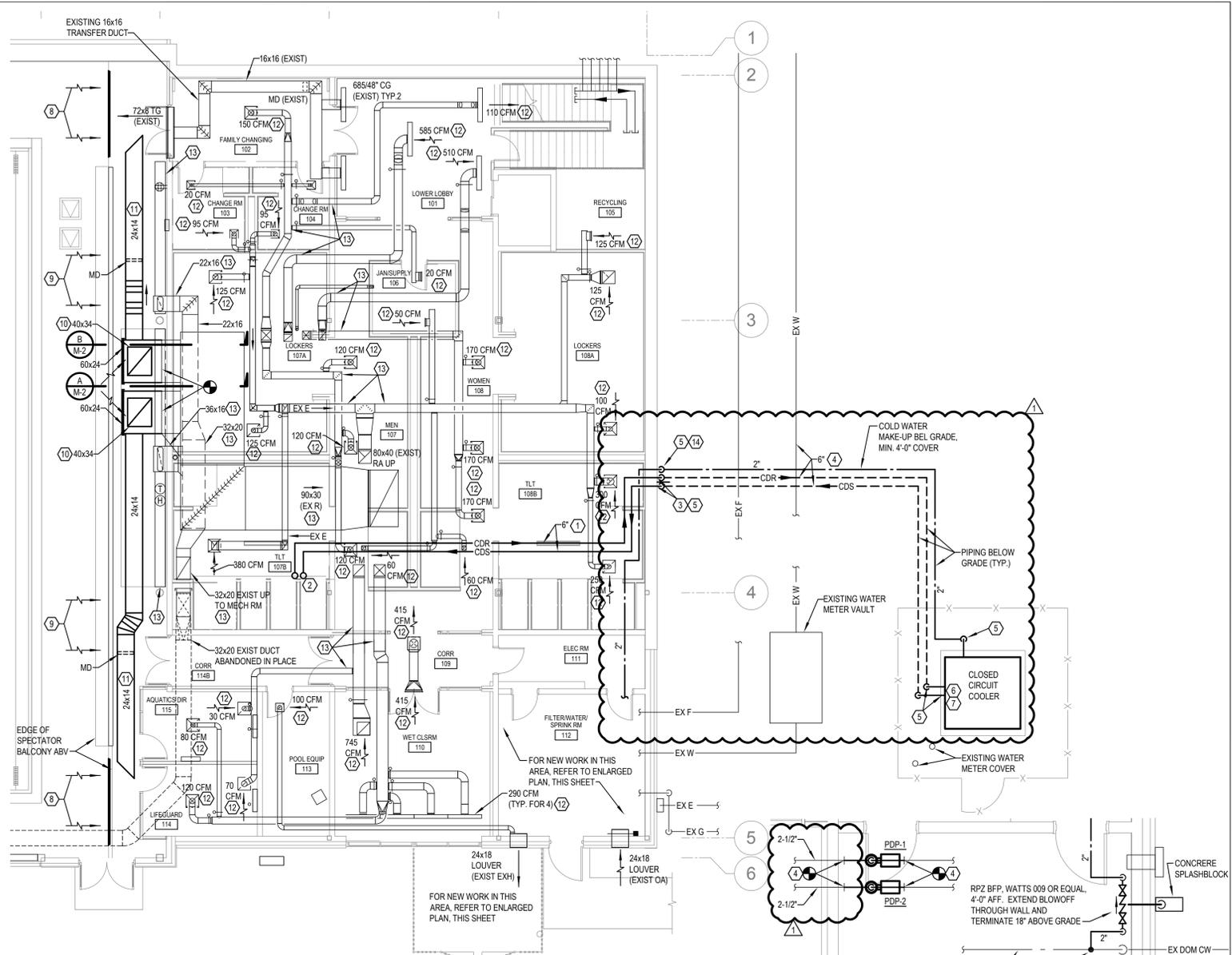
- REMOVE EXISTING WELL FIELD SEDIMENT FILTRATION SYSTEM, PIPING, ACCESSORIES, WIRING, AND CONTROLS TO THE EXTENT SHOWN. CAP EXISTING PIPING TO OPEN WELL-FIELD AND ABANDON IN PLACE. OPEN WELL-FIELD ABANDONMENT SHALL BE IN STRICT ACCORDANCE WITH ALL REQUIREMENTS BY STATE AND LOCAL CODES.
- REMOVE EXISTING CPVC CONDENSER WATER PIPING AND ASSOCIATED SUPPORTS AND ACCESSORIES TO THE EXTENT SHOWN. PREPARE LOCATION FOR NEW PIPING.
- REMOVE EXISTING CPVC CONDENSER WATER PIPING RISER AND ASSOCIATED SUPPORTS. PREPARE OPENINGS TO ACCEPT NEW STEEL PIPING.
- EXISTING EVACUATOR AND ASSOCIATED DUCTWORK TO REMAIN. BALANCE TO EXISTING AIRFLOWS INDICATED.
- THOROUGHLY CLEAN EXISTING AIR DEVICE.



**A SECTION AT BALCONY SEATING**  
SCALE: 1/4" = 1'-0"  
M-2



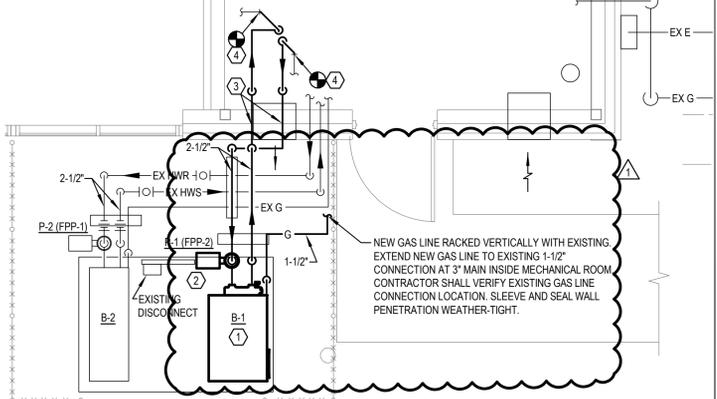
**B SECTION AT BALCONY SEATING**  
SCALE: 1/4" = 1'-0"  
M-2



**PARTIAL FIRST FLOOR PLAN**  
SCALE: 1/8" = 1'-0"  
(PLAN)

**PLAN NOTES:**

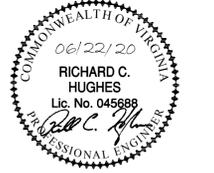
- NEW STEEL CONDENSER WATER PIPING ABOVE CEILING. COORDINATE EXACT ROUTE WITH EXISTING UTILITIES AND STRUCTURE. PROVIDE NEW SUPPORTS AS REQUIRED.
- 6" CDS/CDR TO/FROM MECHANICAL 210 ABOVE. PROVIDE SLEEVE IN FLOOR PENETRATION. EXTEND SLEEVE 12" ABOVE MECHANICAL ROOM FINISH FLOOR. SEAL WATER TIGHT.
- NEW CONDENSER WATER PIPING THROUGH EXTERIOR WALL ABOVE CEILING. SLEEVE AND SEAL PENETRATIONS WEATHER TIGHT. COORDINATE WITH EXISTING LANDSCAPING.
- UNDERGROUND CONDENSER WATER PIPING TO/FROM CLOSED CIRCUIT COOLER. BURY BELOW FROST LINE (MINIMUM 4") COORDINATE WITH OWNER FOR LOCATION OF EXISTING UTILITIES AND LANDSCAPING.
- PROVIDE HEAT TRACE FOR ALL WATER PIPING ABOVE GRADE.
- INSTALL CLOSED CIRCUIT COOLER IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. COORDINATE LOCATION WITH NEW STRUCTURAL CONCRETE PAD AND STEEL.
- CONNECT CONDENSER WATER PIPING TO FULL SIZE OF CLOSED CIRCUIT COOLER. COORDINATE UNDERGROUND PIPING LOCATION WITH TOWER CONNECTIONS.
- 2,200 CFM 10'-0" LINEAR RETURN AIR DEVICE (4 SLOTS @ 1" EACH) IN FACE OF BALCONY SEATING. INSTALL NEW LINEAR RETURN DEVICE AS SHOWN. COORDINATE LOCATION WITH EXISTING CONDITIONS AND MATCH ELEVATION OF EXISTING DEVICE BELOW SEATING. REFER TO ARCHITECTURAL PLANS.
- EXISTING LINEAR RETURN IN FACE OF BALCONY. EXISTING AIRFLOW (12,075 CFM) INCREASE TO 15,525 CFM.
- OPEN END DUCT IN BALCONY SEATING CAVITY. COVER WITH 1/2" X 1/2" WIRE MESH. PROVIDE MANUAL DAMPER AND SET FOR 7,760 CFM (TYP. FOR 2).
- DUCTWORK ROUTED BETWEEN STRUCTURE. PROVIDE OFFSETS AS REQUIRED. COORDINATE ELEVATION WITH FRAMING AND LIGHT FIXTURES.
- CLEAN AND BALANCE EXISTING AIR DEVICE FOR THE AIRFLOW SHOWN.
- CLEAN EXISTING DUCTWORK IN ITS ENTIRETY (INTERNALLY AND EXTERNALLY). RE-SEAL ALL DUCT JOINTS AND CONNECTIONS AIR-TIGHT. TIGHTEN SELF TAPPING SCREWS AS REQUIRED. REPLACE WHERE MISSING OR CORRODED.
- NEW COLD WATER MAKE-UP PIPING THROUGH EXTERIOR WALL ABOVE CEILING. SLEEVE AND SEAL PENETRATIONS WEATHER TIGHT. COORDINATE WITH EXISTING LANDSCAPING.



**ENLARGED MECHANICAL 112 - PIPING**  
SCALE: 1/4" = 1'-0"  
(PLAN)

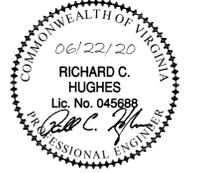
**PLAN NOTES:**

- INSTALL NEW POOL WATER HEATER IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. COORDINATE LOCATION WITH EXISTING WATER HEATER, SERVICE CLEARANCES, AND ELECTRICAL DISCONNECT.
- P-1 IS INTEGRAL TO AND SPECIFIED TO BE PROVIDED WITH THE NEW WATER HEATER.
- ROUTE PIPING AND ALIGN WITH EXISTING HW/SWIR FROM EXISTING B-2 FOR A HEAT AND COORDINATED INSTALLATION. PROVIDE PIPING SUPPORTS AS REQUIRED. SLEEVE AND SEAL WALL PENETRATIONS WEATHER-TIGHT. PROVIDE HEAT TRACE FOR ALL WATER PIPING OUTSIDE EXPOSED TO OUTDOOR CONDITIONS.
- CONNECT NEW POOL WATER HEATER PIPING TO EXISTING PIPING IN THE MECHANICAL ROOM. COORDINATE SUPPLY AND RETURN WITH EXISTING.



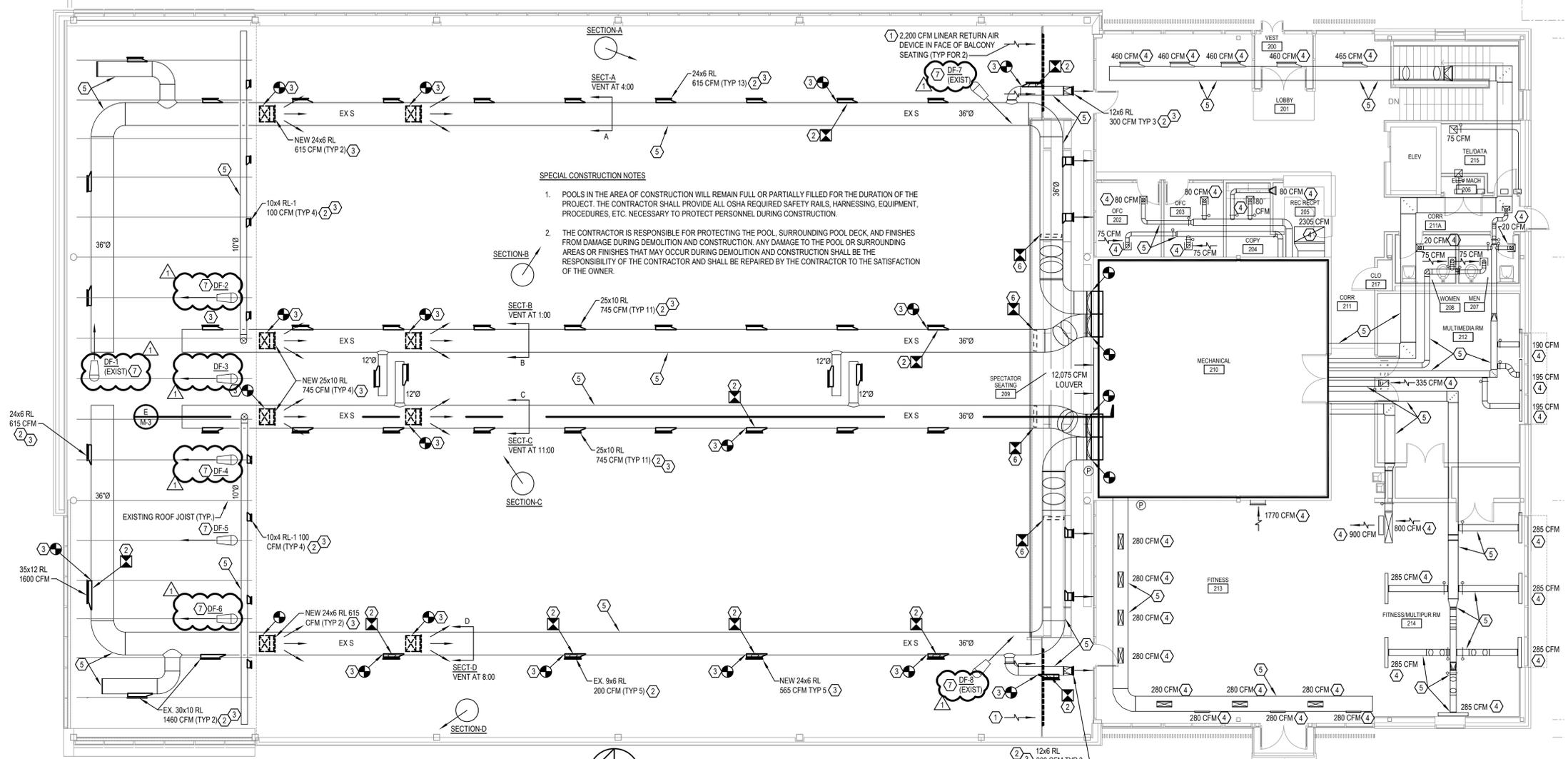
REVISION	DATE
ADDENDUM 4	JULY 24, 2020

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>M-2</b>	



REVISION	DATE
ADDENDUM 4	JULY 24, 2020

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>M-3</b>	



**SPECIAL CONSTRUCTION NOTES**

1. POOLS IN THE AREA OF CONSTRUCTION WILL REMAIN FULL OR PARTIALLY FILLED FOR THE DURATION OF THE PROJECT. THE CONTRACTOR SHALL PROVIDE ALL OSHA REQUIRED SAFETY RAILS, HARNESING, EQUIPMENT, PROCEDURES, ETC. NECESSARY TO PROTECT PERSONNEL DURING CONSTRUCTION.
2. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING THE POOL, SURROUNDING POOL DECK, AND FINISHES FROM DAMAGE DURING DEMOLITION AND CONSTRUCTION. ANY DAMAGE TO THE POOL OR SURROUNDING AREAS OR FINISHES THAT MAY OCCUR DURING DEMOLITION AND CONSTRUCTION SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE OWNER.

**EXISTING DESTRATIFICATION FANS: AIRIUS (115V-1PH-60HZ)**

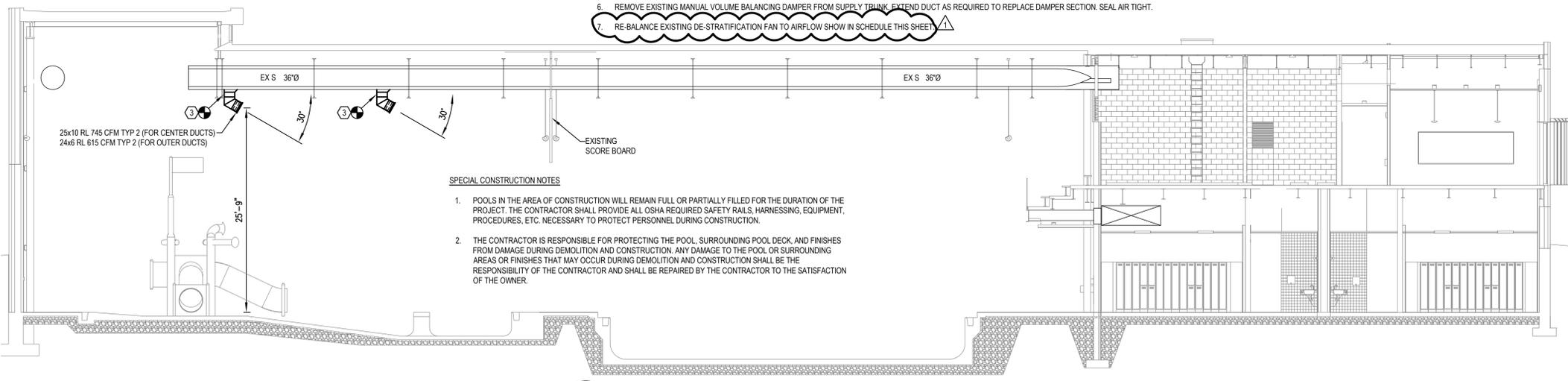
MARK	MAX CFM (1)	STATIC PD IN. H <sub>2</sub> O	MAX RPM (1)	WATTS	MODEL NO.
DF-1 THRU DF-6	1825	NA	1660	170	60-EC

**NOTE (1):** THE FAN SPEED SHALL BE MANUALLY REDUCED THRU ITS EXISTING VARIABLE SPEED CONTROLLER AS REQUIRED TO ESTABLISH PROPER AIRFLOW AS INDICATED ON THE FLOOR PLANS.

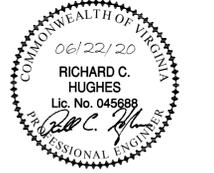
**NOTE (2):** THE EXISTING FANS DF-2 THRU DF-6 SHALL BE RELOCATED AS INDICATED ON THE FLOOR PLAN. MOUNT FANS RIGIDLY TO BUILDING STRUCTURE WITH STAINLESS STEEL HARDWARE AND RE-INSTALL EXISTING SAFETY CABLE. APPROXIMATE FAN WEIGHT 25 POUNDS.

**SECOND FLOOR PLAN - HVAC**  
 SCALE: 1/8" = 1'-0"  
**PLAN NOTES:**

1. INSTALL NEW LINEAR RETURN DEVICE AS SHOWN. COORDINATE LOCATION WITH EXISTING CONDITIONS AND MATCH ELEVATION OF EXISTING DEVICE BELOW SEATING. REFER TO ARCHITECTURAL PLANS.
2. REMOVE EXISTING HIGH CAPACITY DRUM LOUVER, DUCT EXTENSION AND ACCESSORIES. CLEAN AND PREPARE OPENING TO ACCEPT NEW WORK.
3. INSTALL NEW HIGH CAPACITY DRUM LOUVER WITH VOLUME CONTROL DEVICE IN EXISTING DUCTWORK AND ALIGN AS INDICATED. BALANCE TO AIRFLOW SHOWN ON THE PLAN.
4. CLEAN AND BALANCE EXISTING AIR DEVICE FOR THE AIRFLOW SHOWN. IF BALANCING DAMPER IS NOT PRESENT IN AIR DEVICE, INSTALL NEW AIR DEVICE WITH BALANCING DAMPER TO ACHIEVE THE DESIRED AIRFLOW.
5. CLEAN EXISTING DUCTWORK IN ITS ENTIRETY (INTERNALLY AND EXTERNALLY). RE-SEAL ALL DUCT JOINTS AND CONNECTIONS AIR-TIGHT. TIGHTEN SELF TAPPING SCREWS AS REQUIRED; REPLACE WHERE MISSING OR CORRODED.
6. REMOVE EXISTING MANUAL VOLUME BALANCING DAMPER FROM SUPPLY TRUNK. EXTEND DUCT AS REQUIRED TO REPLACE DAMPER SECTION. SEAL AIR TIGHT.
7. RE-BALANCE EXISTING DE-STRATIFICATION FAN TO AIRFLOW SHOWN IN SCHEDULE THIS SHEET.



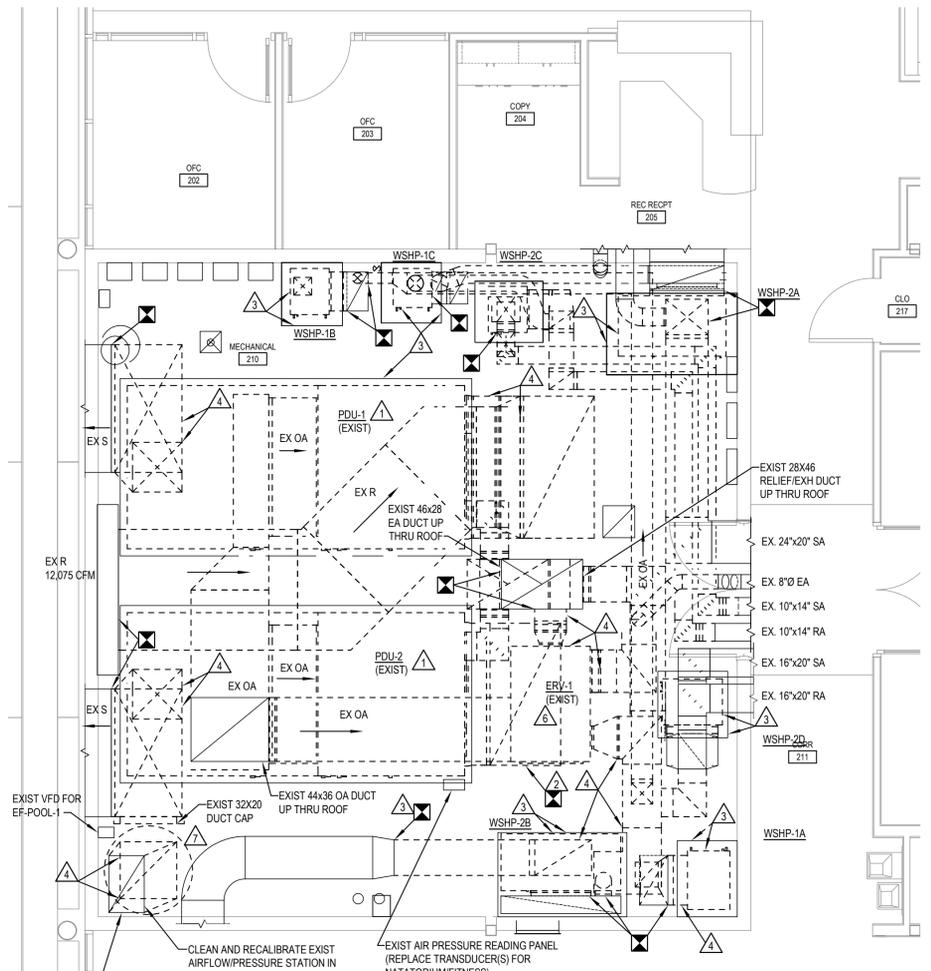
**SECTION AT MAIN SUPPLY TRUNK**  
 SCALE: 1/8" = 1'-0"



REVISION	DATE
△ ADDENDUM 4	JULY 24, 2020

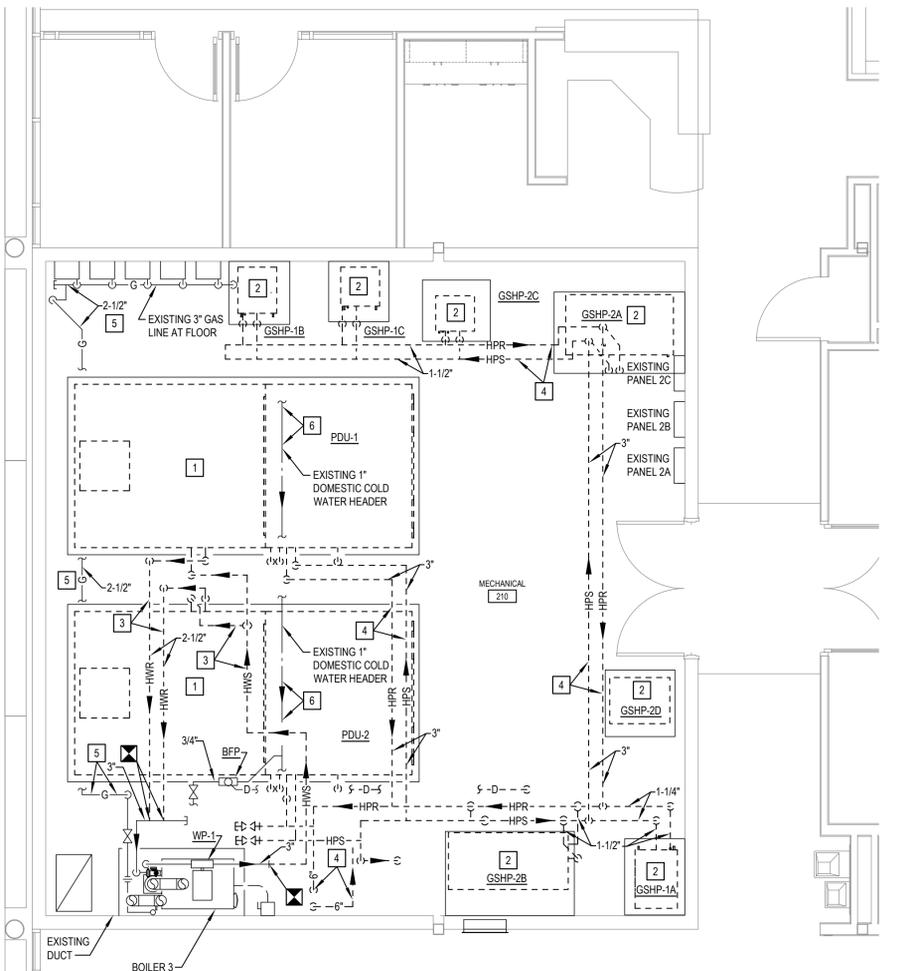
**SMITH AQUATIC CENTER**  
**INDOOR AIR QUALITY HVAC RENOVATIONS**  
 CHARLOTTESVILLE, VIRGINIA  
**ENLARGED MECHANICAL ROOM PLANS - DEMOLITION**

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>M-4</b>	



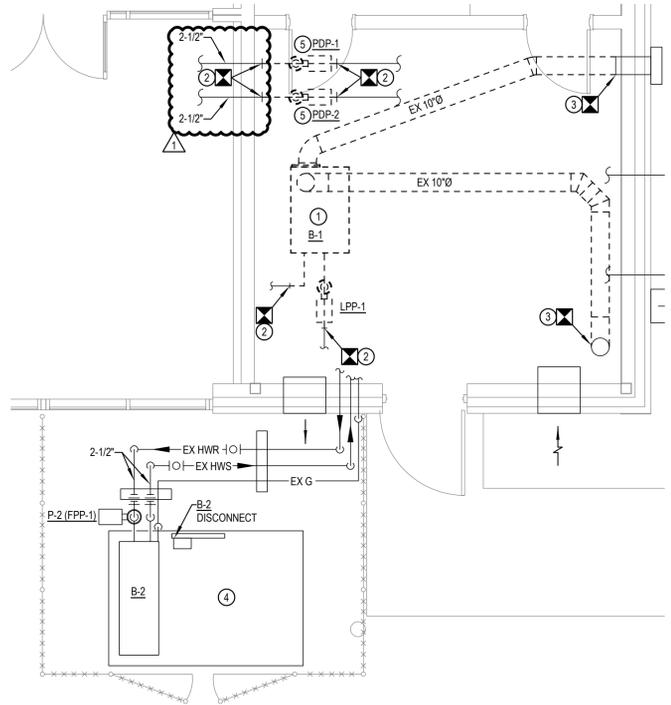
**ENLARGED MECHANICAL 210 DUCTWORK - DEMOLITION**  
 SCALE: 1/4" = 1'-0"

- DEMOLITION NOTES:** △
- REMOVE EXISTING POOL DEHUMIDIFICATION UNIT, ASSOCIATED DUCTWORK, PIPING, WIRING, CONTROLS AND ACCESSORIES TO THE EXTENT SHOWN. CLEAN AND PREPARE EXISTING CONCRETE HOUSEKEEPING PAD TO ACCEPT NEW UNITS. CAP AND PREPARE EXISTING CONDENSATE AND POOL WATER HEATING PIPING FOR RE-ROUTING, RE-USE, AND CONNECTION TO NEW WORK.
  - REMOVE EXISTING THROUGH THE FLOOR RETURN DUCT TO WITHIN 6" OF FINISH FLOOR ELEVATION. CLEAN, CAP AND PREPARE DUCT FOR CONNECTION TO NEW WORK.
  - REMOVE EXISTING WATER-SOURCE HEAT PUMP UNIT, ASSOCIATED DUCTWORK, PIPING, WIRING, CONTROLS AND ACCESSORIES TO THE EXTENT SHOWN. CLEAN AND PREPARE EXISTING CONCRETE HOUSEKEEPING PAD TO ACCEPT NEW UNIT.
  - REMOVE EXISTING DUCTWORK TO THE EXTENT SHOWN. CLEAN, CAP AND PREPARE FOR CONNECTION TO NEW WORK.
  - PREPARE EXISTING DUCTWORK TO ACCEPT CONNECTION TO NEW WORK.
  - REMOVE EXISTING ERV, ASSOCIATED DUCTWORK, WIRING, CONTROLS, ACCESSORIES, AND SUPPORTS.
  - REMOVE EXISTING ROOF EXHAUST FAN, EF-POOL-1, ASSOCIATED DUCTWORK, WIRING, CONTROLS, AND ACCESSORIES TO THE EXTENT SHOWN. EXISTING VFD TO REMAIN AND TO BE RE-USED. CLEAN AND PREPARE EXISTING CURB TO ACCEPT NEW WORK.
  - REMOVE EXISTING SPRINKLER PIPING AS REQUIRED TO FACILITATE REMOVAL OF EXISTING DUCTWORK AND MECHANICAL EQUIPMENT.



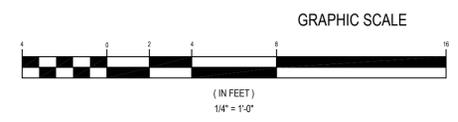
**ENLARGED MECHANICAL 210 PIPING - DEMOLITION**  
 SCALE: 1/4" = 1'-0"

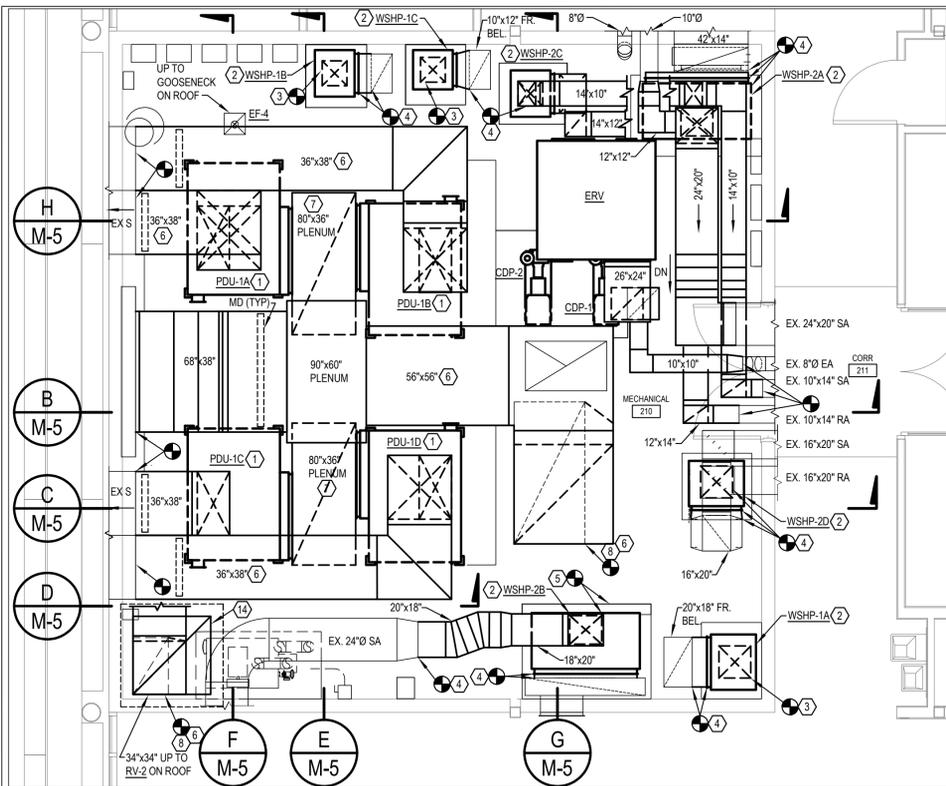
- DEMOLITION NOTES:** □
- REMOVE EXISTING POOL DEHUMIDIFICATION UNIT, ASSOCIATED DUCTWORK, PIPING, WIRING, CONTROLS AND ACCESSORIES TO THE EXTENT SHOWN. CLEAN AND PREPARE EXISTING CONCRETE HOUSEKEEPING PAD TO ACCEPT NEW UNITS. CAP AND PREPARE EXISTING CONDENSATE AND POOL WATER HEATING PIPING FOR CONNECTION TO NEW WORK.
  - REMOVE EXISTING WATER-SOURCE HEAT PUMP UNIT, ASSOCIATED DUCTWORK, PIPING, WIRING, CONTROLS AND ACCESSORIES TO THE EXTENT SHOWN. CLEAN AND PREPARE EXISTING CONCRETE HOUSEKEEPING PAD TO ACCEPT NEW UNIT.
  - REMOVE EXISTING HEATING WATER PIPING TO THE EXTENT SHOWN. CLEAN, CAP AND PREPARE FOR CONNECTION TO NEW WORK. EXISTING PK BOILER TO REMAIN FOR RE-USE.
  - REMOVE EXISTING CPVC CONDENSER WATER PIPING IN ITS ENTIRETY.
  - RELOCATE EXISTING GAS LINE. ELEVATE AS REQUIRED FOR NEW DUCTWORK AND PIPING SHOWN ON SHEET M-5.
  - RELOCATE EXISTING DOMESTIC WATER PIPING. ELEVATE AS REQUIRED FOR NEW DUCTWORK AND PIPING SHOWN ON SHEET M-5.



**ENLARGED MECHANICAL 112 - DEMOLITION**  
 SCALE: 1/4" = 1'-0"

- DEMOLITION NOTES:** ○
- REMOVE EXISTING SUSPENDED POOL WATER HEATER, ASSOCIATED PUMP, PIPING, CONDUIT, AND CONTROLS TO THE EXTENT SHOWN.
  - CAP EXISTING PIPING AND PREPARE FOR CONNECTION TO NEW WORK.
  - REMOVE EXISTING OUTSIDE AIR INTAKE AND FLUE VENT AND ASSOCIATED SUPPORTS AND ACCESSORIES. CAP AND SEAL VENT OPENING BETWEEN STRUCTURE - REMAINING VERTICAL FLUE VENT TO BE ABANDONED IN PLACE. INSULATED, CAP AND SEAL OUTSIDE INTAKE OPENING WEATHER-TIGHT AT THE WALL INSIDE THE ROOM.
  - CLEAN AND PREPARE EXISTING CONCRETE PAD TO ACCEPT NEW POOL WATER HEATER.
  - REMOVE EXISTING PUMP, ASSOCIATED PIPING, ACCESSORIES, CONDUIT AND CONTROLS.

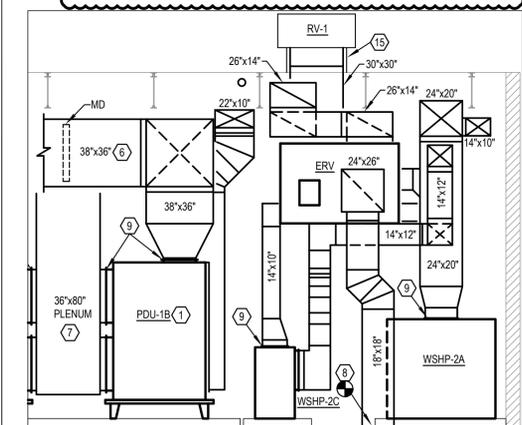




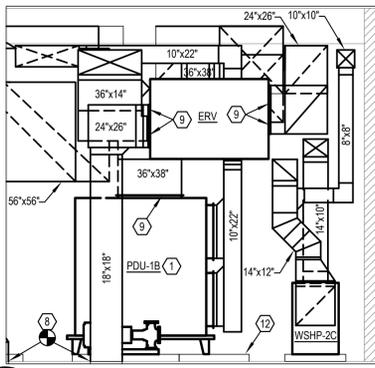
**N ENLARGED MECHANICAL 210 - DUCTWORK**  
SCALE: 1/4" = 1'-0"

PLAN NOTES:

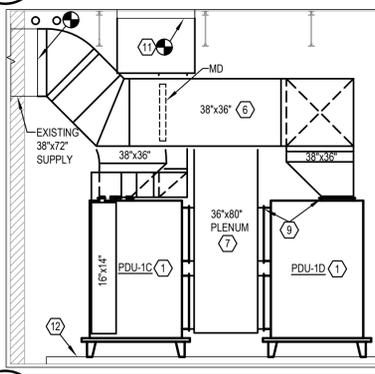
- INSTALL NEW PDU UNIT IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE NEOPRENE VIBRATION ISOLATION PADS UNDER UNIT FEET. COORDINATE LOCATION WITH NEW AND EXISTING DUCTWORK, UTILITIES, AND PIPING.
- INSTALL NEW WSHP UNIT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE NEOPRENE VIBRATION ISOLATION PADS UNDER UNIT FEET. COORDINATE LOCATION WITH NEW AND EXISTING DUCTWORK, UTILITIES, AND PIPING.
- DOWN-FLOW WSHP UNIT. CONNECT EXTEND TO EXISTING SUPPLY DUCT ABOVE THE CEILING OF THE FLOOR BELOW. SEAL DUCT CONNECTION AIR TIGHT.
- EXTEND EXISTING DUCT AND CONNECT TO FULL SIZE OF UNIT AS REQUIRED. SEAL CONNECTION AIR TIGHT.
- EXTEND EXISTING CONCRETE HOUSEKEEPING PAD AS REQUIRED TO INSTALL NEW UNIT. PAD EXTENSION ELEVATION SHALL MATCH EXISTING FOR SMOOTH, LEVEL FINISH ACROSS ENTIRE PAD.
- COORDINATE NEW DUCT ELEVATION AND ROUTING WITH NEW EQUIPMENT, EXISTING DUCTWORK, STRUCTURE, AND UTILITIES.
- EXTEND RETURN PLENUM BETWEEN UNITS AND CONNECT TO FULL SIZE OF EACH UNIT RETURN OPENING.
- CONNECT TO EXISTING DUCT AT FLOOR AND TRANSITION IN VERTICAL.
- CONNECT TO FULL SIZE OF UNIT OPENING.
- DUCT ROUTED BETWEEN STRUCTURE.
- EXISTING 44"x36" OUTSIDE AIR INTAKE DUCT. EXTEND AS SHOWN, CAP AND SEAL BOTTOM, AND PROVIDE NEW CONNECTIONS AS SHOWN.
- EXISTING 46"x28" EXHAUST AIR DUCT. EXTEND AS REQUIRED AND CONNECT NEW EXHAUST DUCTWORK AS SHOWN.
- INSTALL NEW RV-2 ON EXISTING ROOF CURB. PROVIDE CURB ADAPTER.
- INSTALL NEW RV-1 ON ROOF. COORDINATE OPENING WITH STRUCTURAL FRAMING. INSTALL IN STRICT ACCORDANCE WITH OWNER'S EXISTING ROOFING SYSTEM AND ROOFING SYSTEM WARRANTY.
- RELOCATE SPRINKLER PIPING AND HEADS AS REQUIRED TO FACILITATE NEW DUCT LAYOUT.



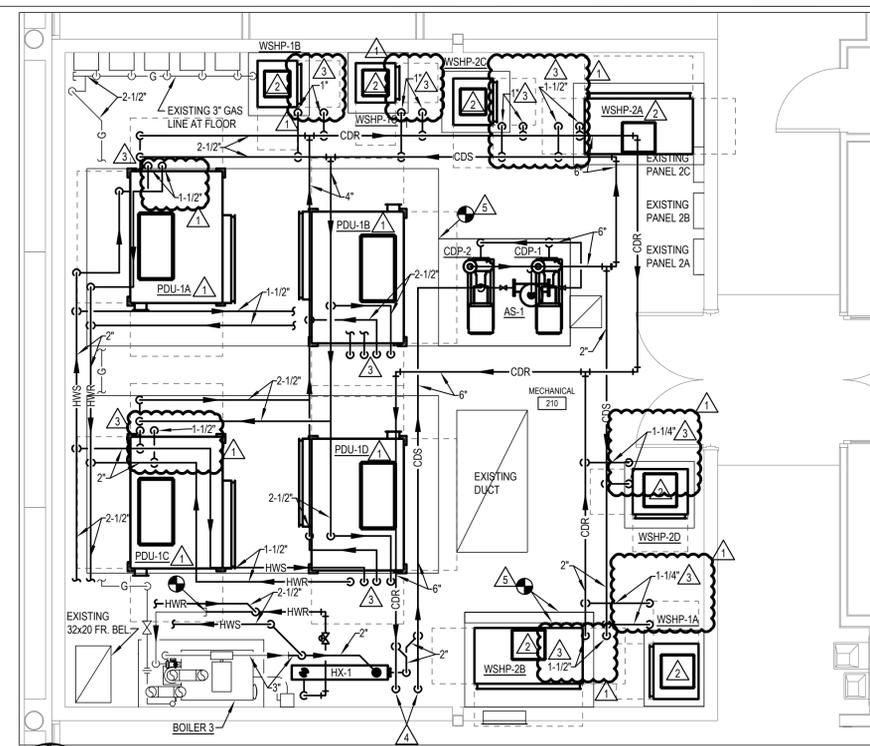
**H SECTION AT PDU-1B & WSHP**  
SCALE: 1/4" = 1'-0"



**G SECTION AT ERV**  
SCALE: 1/4" = 1'-0"



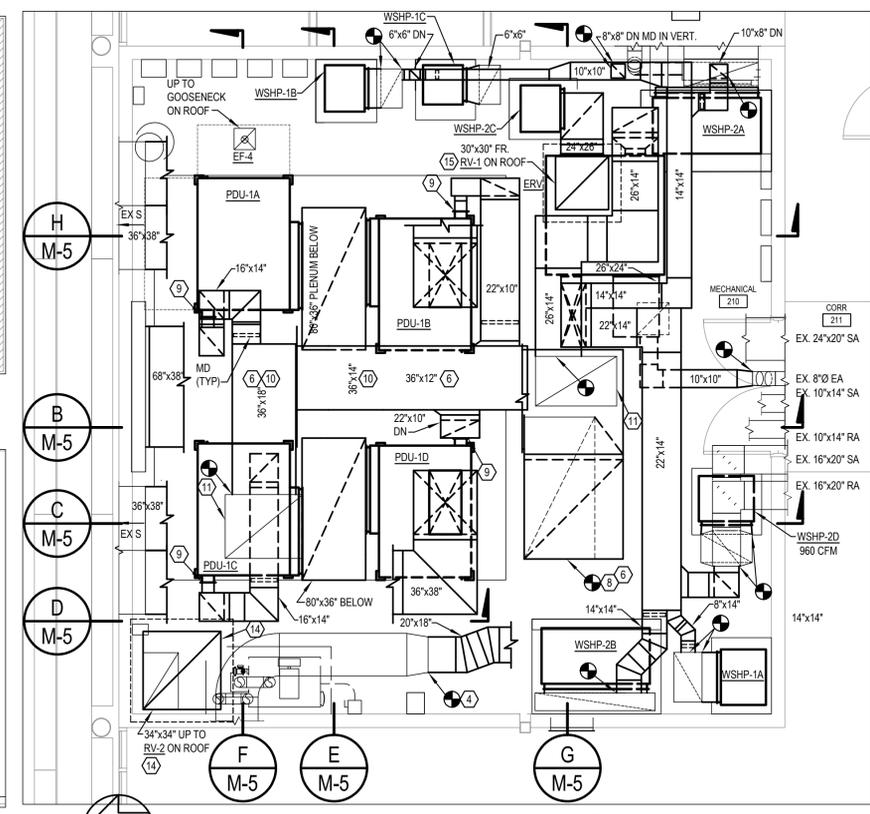
**D SECTION AT PDU-1C & 1D**  
SCALE: 1/4" = 1'-0"



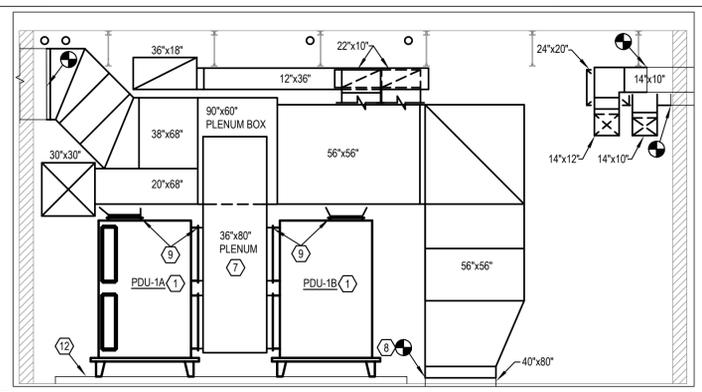
**N ENLARGED MECHANICAL 210 - PIPING**  
SCALE: 1/4" = 1'-0"

PLAN NOTES:

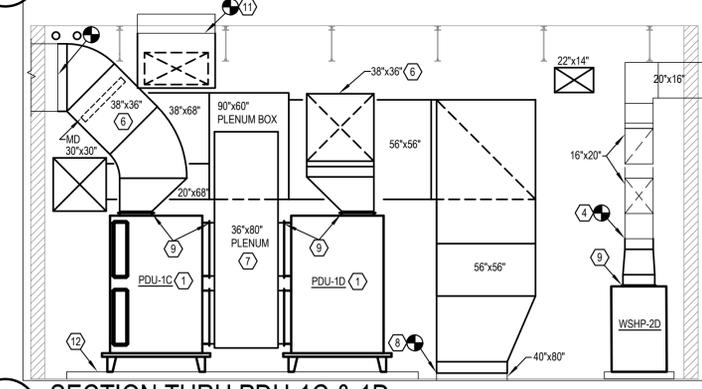
- INSTALL NEW PDU UNIT IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE NEOPRENE VIBRATION ISOLATION PADS UNDER UNIT FEET. COORDINATE LOCATION WITH NEW AND EXISTING DUCTWORK, UTILITIES, AND PIPING.
- INSTALL NEW WSHP UNIT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE NEOPRENE VIBRATION ISOLATION PADS UNDER UNIT FEET. COORDINATE LOCATION WITH NEW AND EXISTING DUCTWORK, UTILITIES, AND PIPING.
- CDS/CDR & HWS/HWR TO/FROM UNIT BELOW. CONNECT TO FULL SIZE OF UNIT COIL HEADER.
- 6" CDS/CDR TO/FROM BELOW AND UP.
- CONNECT HEATING WATER SUPPLY AND RETURN TO SUPPLEMENTAL HEATING COIL ON NEW PDU.
- EXTEND NEW CONDENSATE DRAIN AND CONNECT TO EXISTING CONDENSATE RECLAIM LINE IN CEILING BELOW.
- EXTEND EXISTING POOL WATER PIPING TO NEW PDU UNIT WATER CONNECTIONS.



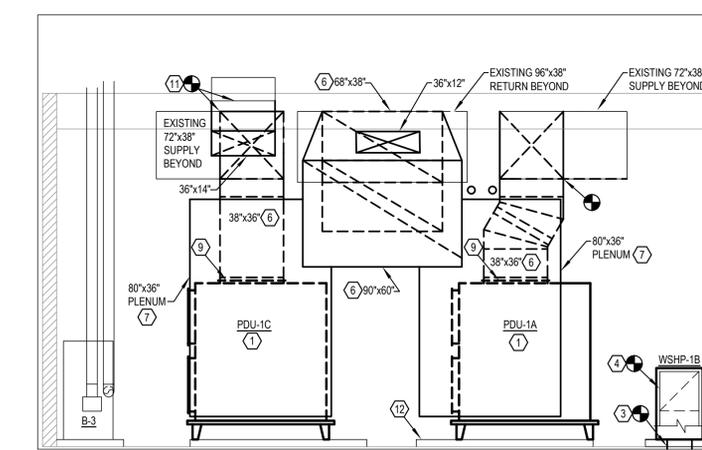
**N ENLARGED MECHANICAL 210 - OUTSIDE AIR DUCTWORK**  
SCALE: 1/4" = 1'-0"



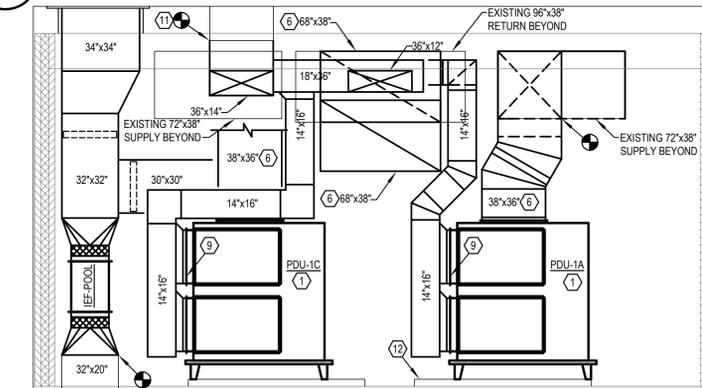
**B SECTION AT PDU-1A & 1B**  
SCALE: 1/4" = 1'-0"



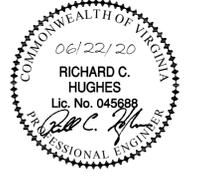
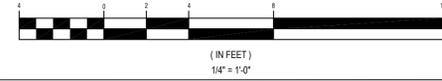
**C SECTION THRU PDU-1C & 1D**  
SCALE: 1/4" = 1'-0"



**E SECTION AT PDU-1C & 1A**  
SCALE: 1/4" = 1'-0"

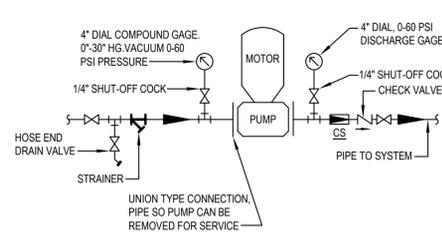


**F SECTION AT PDU-1C & 1A**  
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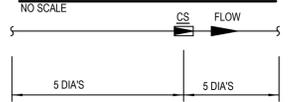


REVISION	DATE
ADDENDUM 4	JULY 24, 2020

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET	<b>M-5</b>



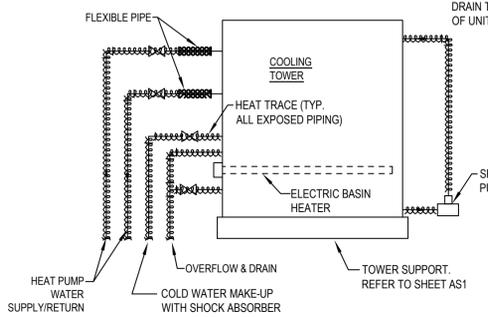
**INLINE CIRCULATING PUMP CONNECTIONS**



NOTE:  
1. THERE SHALL BE UNINTERRUPTED STRAIGHT PIPE 5 DIAMETERS OF PIPE DOWNSTREAM AND 5 DIAMETERS OF PIPE UPSTREAM FROM EACH CIRCUIT SETTER. BALANCE VALVE SHALL BE ADJUSTED TO PROVIDE GPM INDICATED AT EACH C.S.  
2. THE ENTIRE CIRCUIT SENSOR & BALANCING VALVE SHALL BE INSULATED WITH REMOVABLE SECTIONS OF PIPE INSULATION SIZED TO OVERLAP THE CONNECTED PIPE INSULATION. INSULATION SHALL OVERLAP 3 INCHES. CHILLED WATER SYSTEMS SHALL BE VAPOR SEALED AS SPECIFIED.

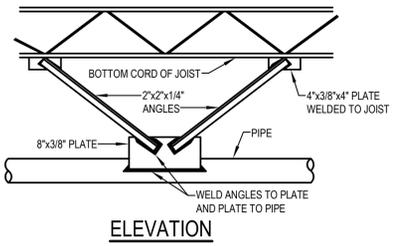
**CIRCUIT SETTER DETAIL**

SCHEMATIC

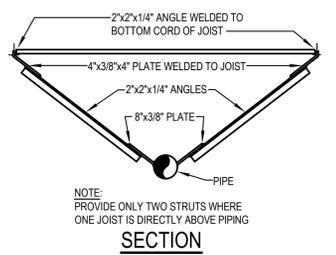


**COOLING TOWER CONNECTION DETAIL**

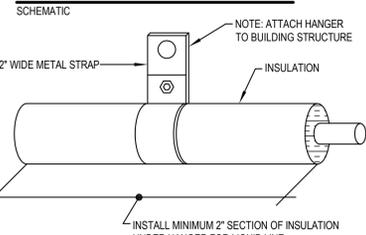
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**ELEVATION**

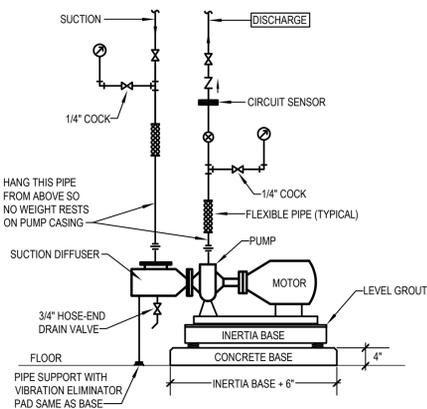


**PIPE ANCHOR WITH JOIST AND PIPE PARALLEL DETAIL**



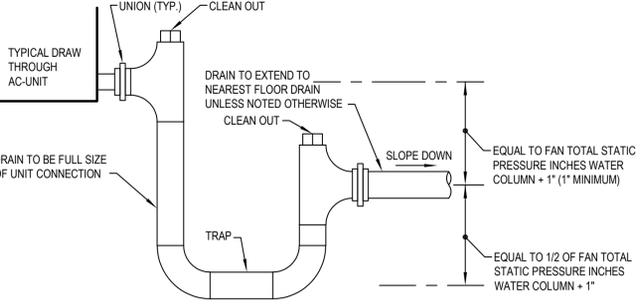
**REFRIGERANT PIPING HANGER DETAIL**

NO SCALE



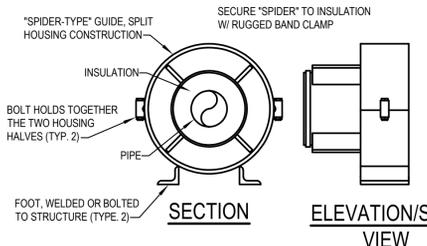
**BASE MOUNTED PUMP DETAIL**

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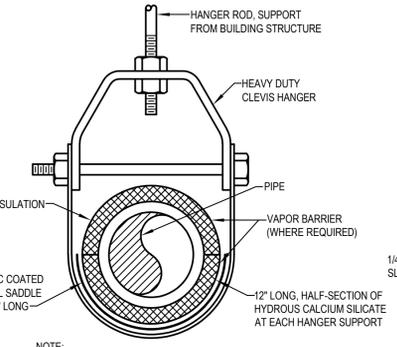
**COOLING COIL CONDENSATE DRAIN**

NO SCALE



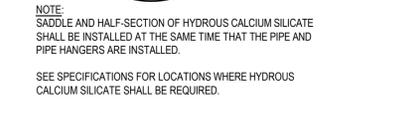
**PIPE GUIDE DETAIL**

NO SCALE



**WATER PIPE SUPPORT (NON-INSULATED) DETAIL**

NO SCALE



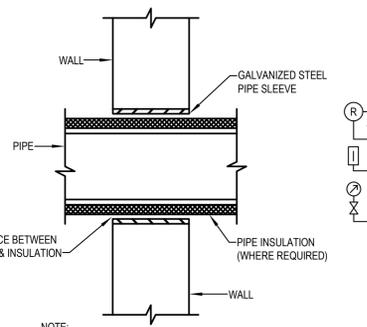
**PIPE SUPPORT DETAIL**

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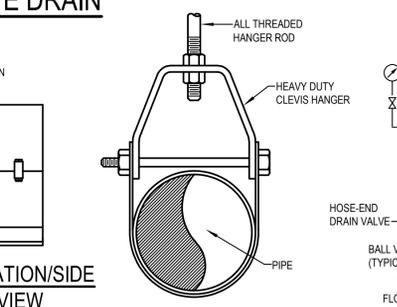
**WALL PIPE SLEEVE DETAIL**

NO SCALE



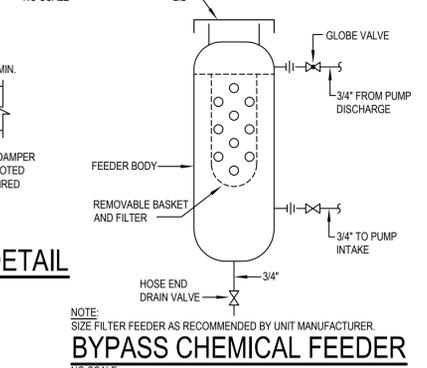
**WATER-TO-WATER HEAT EXCHANGER CONNECTION DETAIL**

NO SCALE



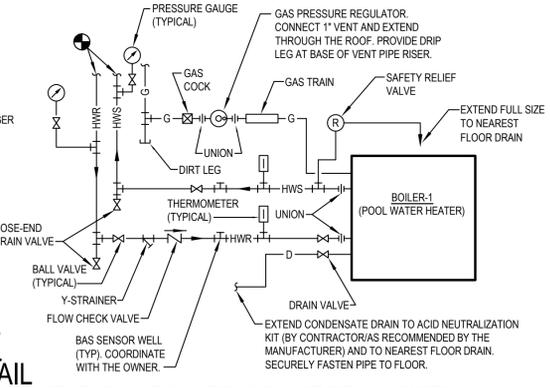
**BRANCH DUCT CONNECTION DETAIL**

SCHEMATIC



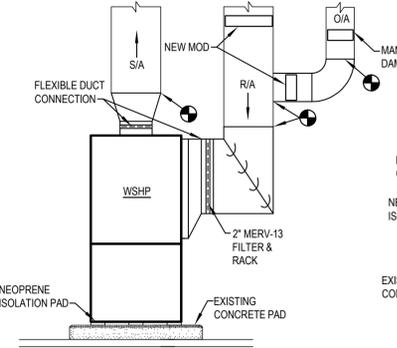
**BYPASS CHEMICAL FEEDER**

NO SCALE



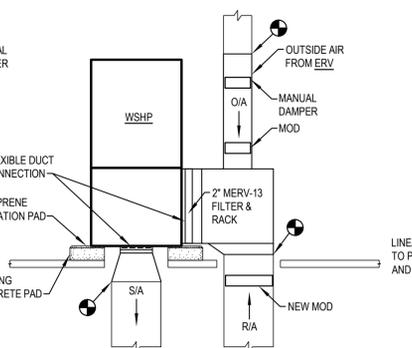
**TYPICAL BOILER CONNECTION DETAIL**

NO SCALE



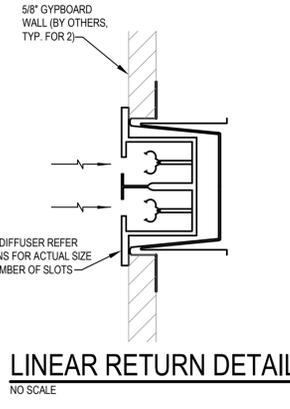
**VERTICAL WATER SOURCE HEAT PUMP CONNECTION DETAIL**

NO SCALE



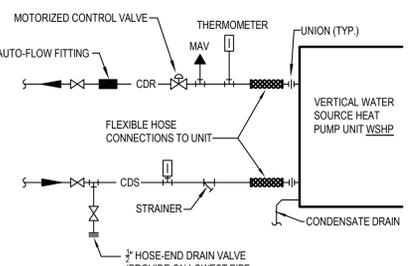
**DOWNFLOW WATER SOURCE HEAT PUMP CONNECTION DETAIL**

NO SCALE



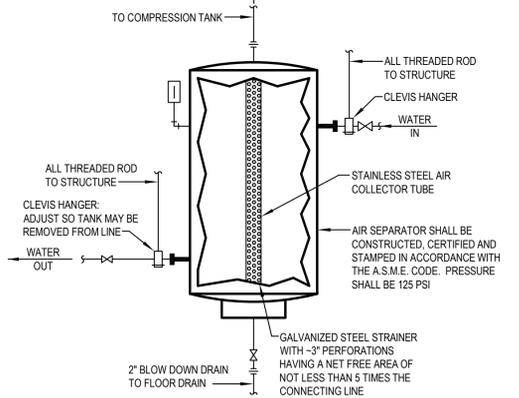
**LINEAR RETURN DETAIL**

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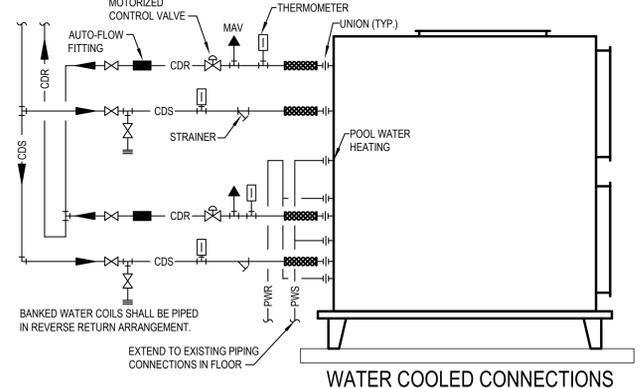
**WATER SOURCE HEAT PUMP CONNECTION DETAIL**

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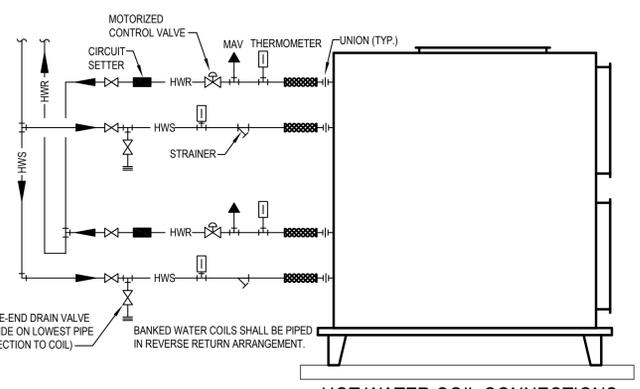


**AIR SEPARATOR DETAIL**

NO SCALE



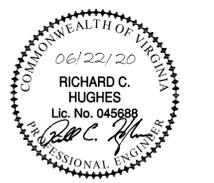
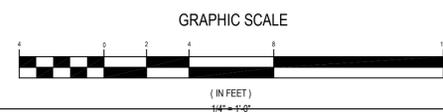
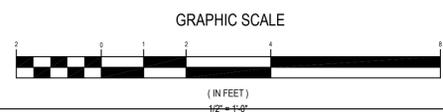
**WATER COOLED CONNECTIONS**



**HOT WATER COIL CONNECTIONS**

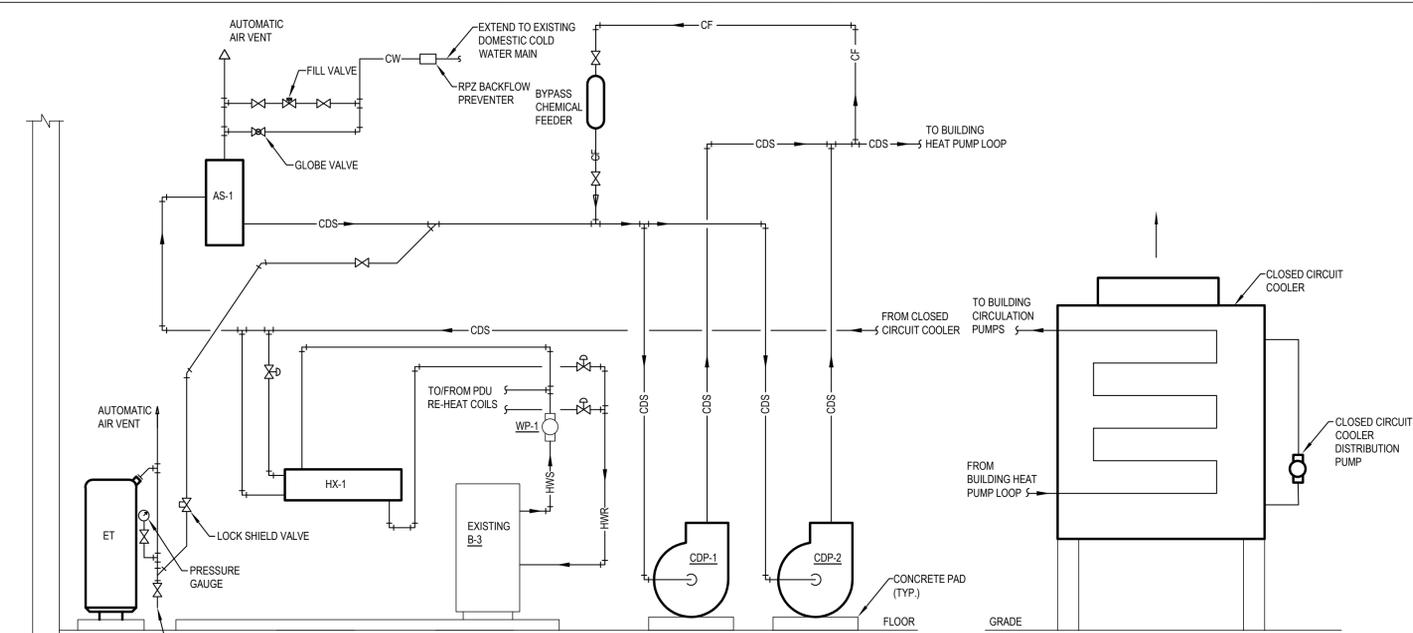
**POOL DEHUMIDIFICATION UNIT (PDU-) CONNECTION DETAILS**

SCHEMATIC



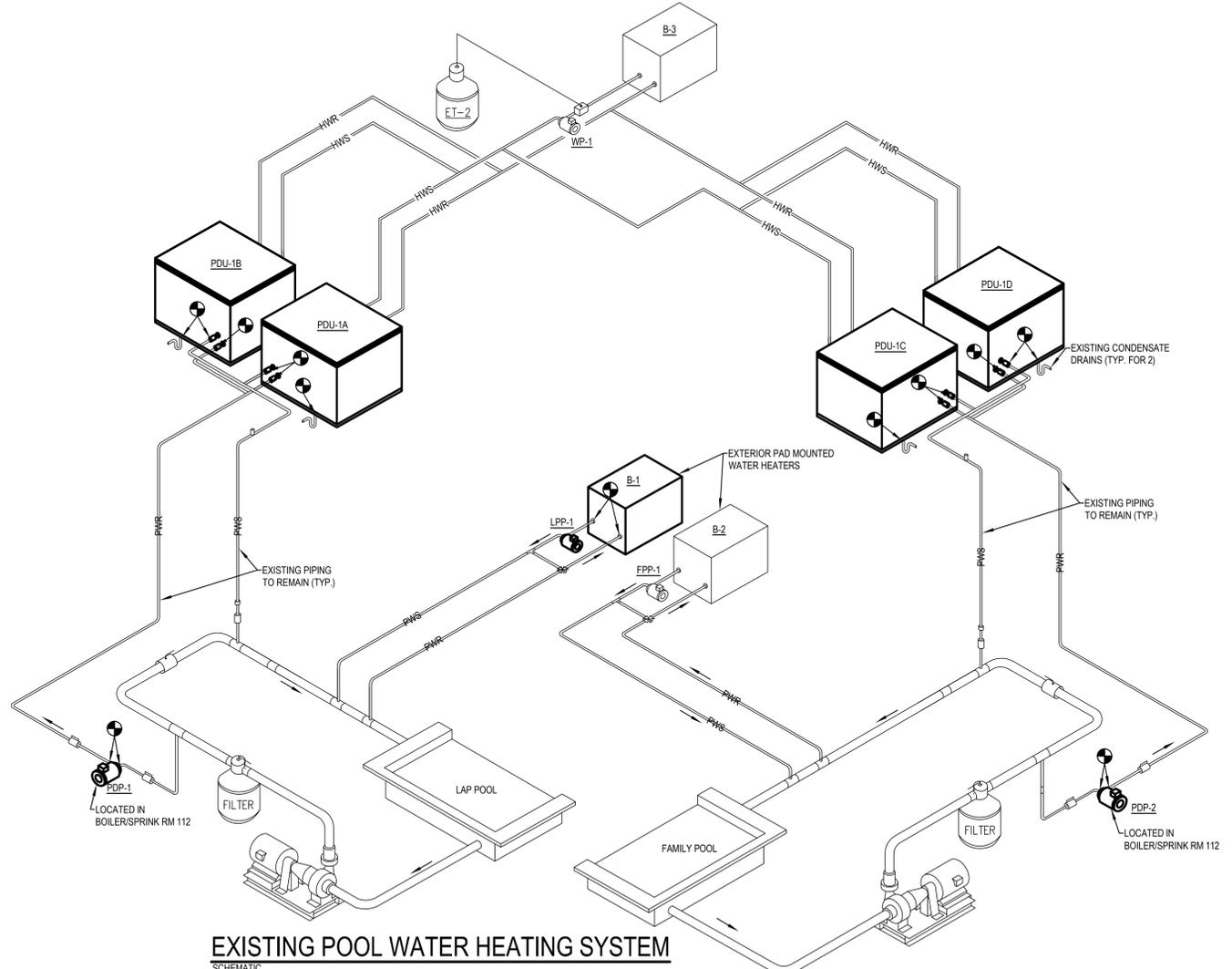
REVISION	DATE

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20



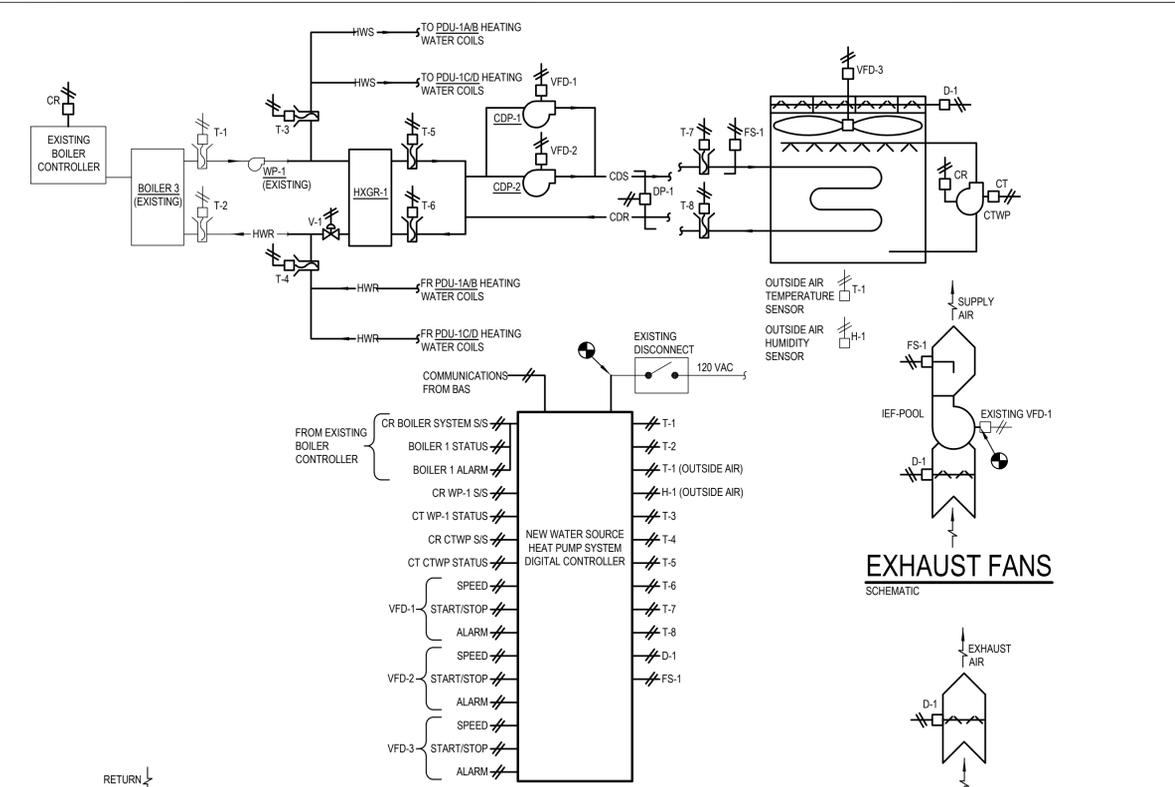
**WATER SOURCE HEAT PUMP SYSTEM**

SCHEMATIC  
PROVIDE ALL VALVES AND PIPING SPECIALTIES SHOWN ON THIS DIAGRAM. SEE DETAIL SHEETS FOR ADDITIONAL VALVES AND PIPING SPECIALTIES REQUIRED.



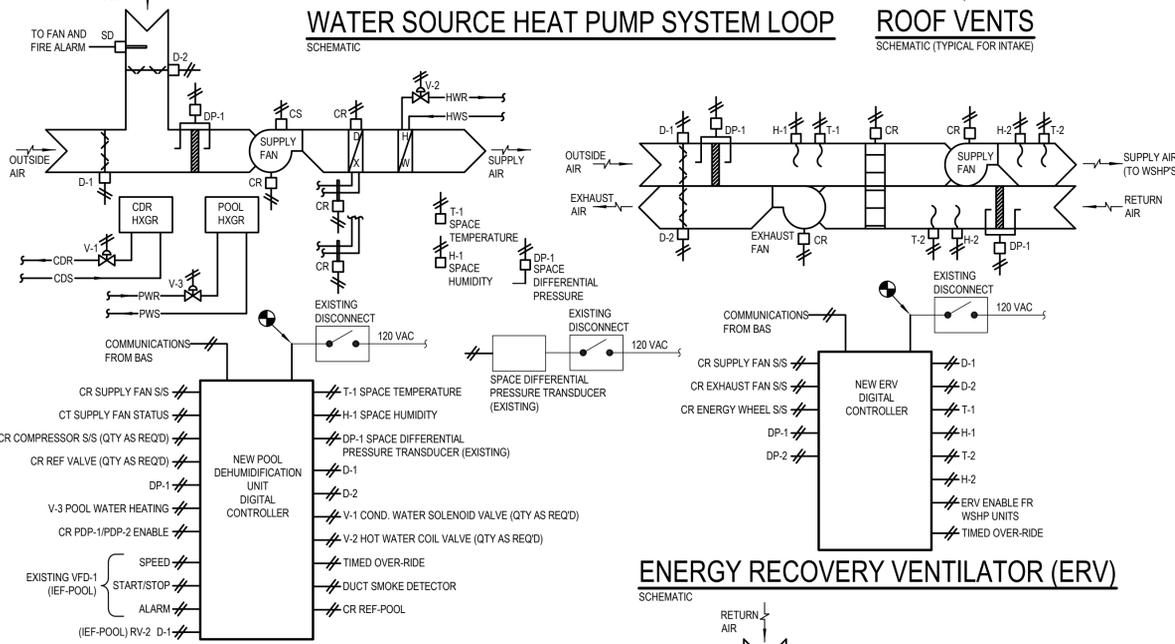
**EXISTING POOL WATER HEATING SYSTEM**

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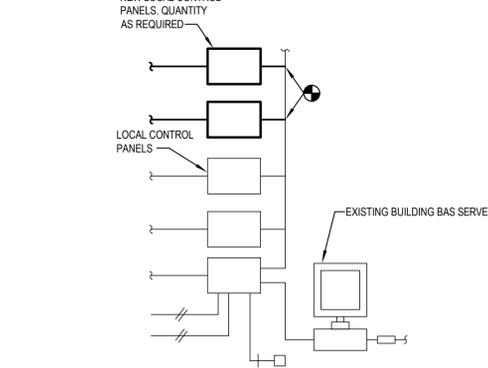
**WATER SOURCE HEAT PUMP SYSTEM LOOP**

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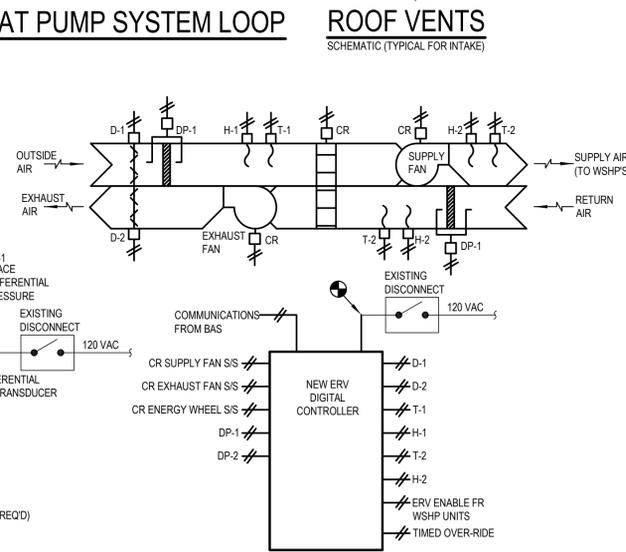


**POOL DEHUMIDIFICATION UNIT (PDU)**

SCHEMATIC TYPICAL FOR 4

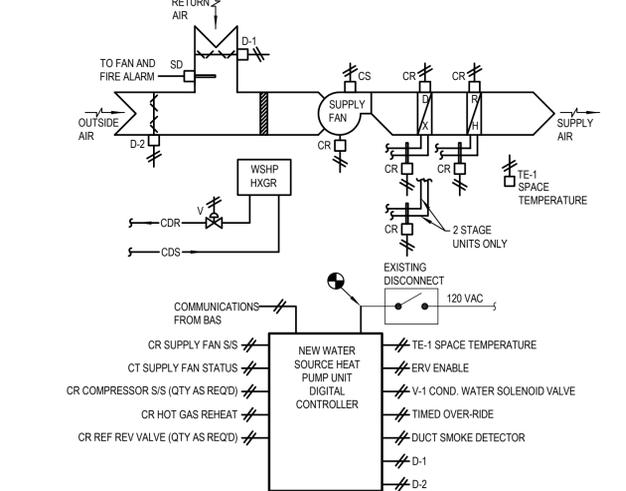


**EXISTING NETWORK COMMUNICATIONS**



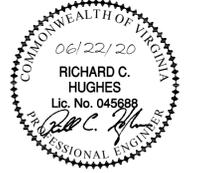
**ENERGY RECOVERY VENTILATOR (ERV)**

SCHEMATIC



**WATER SOURCE HEAT PUMP UNIT (WSHP)**

SCHEMATIC



REVISION	DATE

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>M-7</b>	

**SPECIFICATIONS FOR GENERAL REQUIREMENTS:**

1. **SUMMARY OF WORK**
    - A. **RELATED DOCUMENTS:** The specifications for General Requirements are applicable for all drawings and for all on drawing specifications for this Contract.
    - B. **PROJECT DESCRIPTION:** This project consists of removing two (2) existing water-cooled pool dehumidification units and replacing them with four (4) new water-cooled pool dehumidification units and associated piping, electrical and controls work required, the removal and replacement of existing water-source heat pump units, one (1) pool water heater, and one (1) energy recovery ventilator (ERV) and associated, piping, electrical and controls work required; also included are the abandonment of the existing open geothermal well system, pumping and piping and replacement with one (1) pad-mounted closed circuit cooler, two (2) system circulation pumps and associated piping, electrical, controls, structural, and architectural work required. Additional work includes control system upgrades/modifications for the addition of the new water source heat pump system and modifications to the existing air distribution ductwork in the Natatorium.
    - C. **CONTRACT:** The Work will be constructed under a single prime contract. The Owner intends to award the contract to the responsible bidder submitting the lowest lump sum bid.
    - D. **ASBESTOS:** It is not expected that asbestos will be encountered in the Work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Engineer and the Owner.
    - E. **CONTRACTOR USE OF PREMISES:**
      1. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits.
      2. Driveways and Entrances: Keep driveways and parking areas open and unblocked during all hours. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
      3. Utilities: Do not interrupt utility service to the building or surrounding neighborhood without prior approval by Owner. Work involving interruption of utility service shall be done on nights, weekends or holidays if requested by Owner.
      4. Use of the Existing Building: Maintain the existing building in a weatheright and secure condition throughout the construction period. Repair damage caused by construction operations, including, but not limited to the pool and pool deck area. It is intended that the pools will remain full or partially filled during construction. The contractor shall take all precautions necessary to protect the building and its occupants during the construction period.
    - F. **ENVIRONMENTAL PRODUCTS:** All new products for this project shall be furnished and installed by the Contractor unless noted otherwise.
    - G. **MISCELLANEOUS PROVISIONS:**
      1. Permits: Apply for, obtain and pay for permits required to perform the work. Display permits in appropriate location.
      2. Codes: Comply with applicable codes and regulations of authorities having jurisdiction. Schedule and coordinate inspections by various Building Inspectors.
      3. Dimensions: Verify dimensions indicated on drawings with field dimensions before fabrication or ordering of materials. Do not scale drawings.
      4. Existing Conditions: Notify Engineer of existing conditions differing from those indicated on the drawings. Do not remove or alter structural components without prior written approval.
      5. The term 'Provide' shall be defined as furnish and install, complete with all necessary accessories, ready for intended use. Pay for all related costs.
      6. The term 'Approved' shall be defined as acceptance of item to be submitted for approval. Not a limitation or release for compliance with the Contract Documents or regulatory requirements.
      7. The term 'Match Existing' shall be defined to match existing as Acceptable to the Engineer.
      8. Intent: Drawings and specifications are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the project shall be included.
      9. Writing Style: Specifications are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, Provide tile means Contractor shall provide tile.
      10. Lead-Containing Paint Abatement: The Owner is not aware that current Virginia law requires abatement of lead-containing paint. The Contractor shall take any and all precautions advisable or required by law to safeguard his employees and the public from the hazards of exposure to lead-containing paint and other hazardous materials. The Owner has not conducted any tests related to possible lead content in the existing paint.
      11. Retainage: Retainage in the amount of 5% of the Contract shall be applied to all requests for payment prior to final acceptance.
  2. **COORDINATION**
    - A. **COORDINATION OF OPERATIONS:** Coordinate construction operations as specified for all disciplines to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different drawings that depend on each other for proper installation, connection, and operation.
      1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
      2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
      3. Make provisions to accommodate items scheduled for later installation.
      4. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings. Prepare similar memoranda for the Owner where coordination of his work is required.
    - B. **ADMINISTRATIVE PROCEDURES:** Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
      1. Preparation of schedules.
      2. Installation and removal of temporary facilities.
      3. Delivery and processing of submittals.
      4. Progress meetings.
      5. Permit closing activities.
    - C. **INSPECTION OF CONDITIONS:** Require the Installer of each major component to inspect the conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
    - D. **TEMPORARY ENCLOSURE:** Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.
    - E. **CLEANING AND PROTECTION:** Clean and protect construction in progress and adjoining materials in place, during handling and installation of all components, before or after its own installation. Provide protective covering where required to assure protection from damage or deterioration at Substantial Completion. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operating components to assure operability without damaging effects.
    - F. **LIMITING EXPOSURES:** Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:
      1. Excessive dust or debris loading.
      2. Excessively high or low temperatures.
      3. Water or ice.
      4. Solvents.
      5. Chemicals.
      6. Heavy traffic.
      7. Soiling, staining, and corrosion.
      8. Rodent and insect infestation.
      9. Combustion.
      10. Electrical current.
      11. Unusual wear or other misuse.
      12. Contact between incompatible materials.
      13. Unprotected storage.
      14. Theft.
      15. Vandalism.
  3. **CUTTING AND PATCHING**
    - A. **QUALITY ASSURANCE:** Requirements for Structural Work: Do not cut and patch structural elements in a manner that would change their load-carrying capacity or load-deflection ratio. Obtain approval of the Engineer before cutting and patching the following structural elements:
      1. Bearing walls.
      2. Structural steel.
      3. Lintels.
      4. Structural decking.
    - B. **OPERATIONAL LIMITATIONS:** Do not cut and patch operating elements or related components in a manner that would result in reducing their capacity to perform as intended. Do not cut and patch operating elements or related components in a manner that would result in increased maintenance or decreased operational life or safety. Obtain approval of the Engineer before cutting and patching the following operating elements or safety related systems:
      1. Primary operational systems and equipment.
      2. Air or smoke barriers.
      3. Water, moisture, or vapor barriers.
      4. Membranes and flashings.
      5. Fire protection systems.
      6. Noise and vibration control elements and systems.
      7. Control systems.
      8. Communication systems.
      9. Electrical wiring systems.
    - C. **VISUAL REQUIREMENTS:** Do not cut and patch construction exposed to the exterior in a manner that would, in the Engineer's opinion, reduce the building's aesthetic quality. Do not cut and patch construction in a manner that would result in visual evidence of cutting and patching. Remove and replace construction cut and patched in a visually unsatisfactory manner.
    - D. **EXISTING WARRANTIES:** Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.
    - E. **MATERIALS:** Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.
    - F. **INSPECTION:** Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.
    - G. **PREPARATION:** Provide temporary support of work to be cut. Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.
    - H. **PERFORMANCE:** Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
      1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
  4. **PROJECT CONTROLS**
    - A. **PROJECT MANAGEMENT AND COORDINATION:**
      1. Verify layout information shown on Drawings, in relation to property survey and existing benchmarks, before laying out the Work.
      2. Coordinate construction to ensure efficient and orderly execution of each part of the Work.
      3. Progress meetings will be held weekly (as determined by Owner) at the Project site. Notify Owner and Engineer of meeting dates. Each subcontractor or other entity concerned with current progress or involved with planning or coordination of future activities, shall attend. Prepare minutes of each meeting and distribute to parties present not later than two days after the meeting.
    - B. **CONSTRUCTION SCHEDULE:** Prepare a horizontal bar-chart construction schedule. Provide a separate time bar for each activity and a vertical line to identify the first workday of each week. Use same breakdown of Work indicated in the Schedule of Values. As Work progresses, mark each bar to indicate actual completion. Submit within thirty (30) days after date established for Commencement of the Work.
    - C. **SUBMITTAL PROCEDURES:** Coordinate submittal preparation with construction schedule, fabrication lead-times, other submittals, and activities that require sequential operations. No extension of Contract Time will be authorized due to failure to transmit submittals in time to permit processing sufficiently in advance of when materials are required in the Work. Engineer will not accept submittals from sources other than Contractor.
      1. Prepare submittals by placing a permanent label on each for identification. Provide a 4- by 5-inch (100- by 125-mm) space on the label or beside title block to record review and approval markings and action taken. Include the following information on the label:
        - a. Project name.
        - b. Date.
        - c. Name and address of contractor.
        - d. Name and address of subcontractor or supplier.
        - e. Number and title of appropriate Specification Section.
        - f. Contractor's certification that materials comply with specified requirements.
      2. Coordinate each submittal with other submittals and with work that does not require submittals.
      3. Product Data: Mark each copy to show applicable choices and options. Include the following:
        - a. Data indicating compliance with specified standards and requirements.
        - b. Notation of alternate requirements.
        - c. For equipment data, include rated capacities, dimensions, weights, required clearances, and furnished specialties and accessories.
      4. Shop Drawings: Submit newly prepared information drawn to scale. Do not reproduce Contract Documents or copy standard information. Submit 1 reproducible print and 1 blue- or black-line print on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (762 by 1067 mm). Engineer will return the reproducible print. Include the following:
        - a. Dimensions, profiles, methods of attachment, coordination with adjoining work, large scale details, and other information, as appropriate for the Work.
        - b. Identification of products and materials.
        - c. Notation of coordination requirements.
        - d. Notation of dimensions established by field measurement.
        - e. Identification of deviations from Contract Documents.
    5. Engineer will review each submittal, mark as appropriate to indicate action taken, and return copies less those retained. Compliance with specified requirements remains Contractor's responsibility.
  5. **QUALITY CONTROL**
    - A. **SERVICES:** Quality-control services include inspections, tests, and related actions by independent agencies. They do not include contract enforcement activities performed by Engineer.
    - B. **INSPECTIONS:** Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
    - C. **REQUIREMENTS:** Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
      1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
      2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
      3. Requirements for Contractor to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
    - D. **RESPONSIBILITIES:** Only where specifically indicated to be his responsibility shall the Contractor provide inspections, tests, and other quality-control services specified in the Contract Documents. Costs for these services are included in the Contract Sum. Except where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform those services.
    - E. **RETESTING:** The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.
    - F. **ASSOCIATED SERVICES:** The Contractor shall cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:
      1. Provide access to the Work.
      2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
      3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
      4. Provide facilities for storage and curing of test samples.
      5. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
      6. Test and seal and protect samples and test equipment at the Project Site.
    - G. **DUTIES OF THE TESTING AGENCY:** The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Engineer and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.
      1. The agency shall notify the Engineer and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
      2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
      3. The agency shall not perform any duties of the Contractor.
    - H. **COORDINATION:** The Contractor shall coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
    - I. **SUBMITTALS:** The independent testing agency shall submit a certified written report, in duplicate, of each of inspection, test, or similar service to the Engineer, with one copy to the Owner and one to the Contractor. Written reports of each inspection, test, or similar service include, but are not limited to, the following:
      1. Date of issue.
      2. Project title and number.
      3. Name, address, and telephone number of testing agency.
      4. Dates and locations of samples and tests or inspections.
      5. Names of individuals making the inspection or test.
      6. Designation of the Work and test method.
      7. Identification of product and Specification Section.
      8. Complete inspection or test data.
      9. Test results and an interpretation of test results.
      10. Ambient conditions at the time of sample taking and testing.
      11. Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
      12. Name and signature of laboratory inspector.
    - J. **REPAIR AND PROTECTION:** Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for specification Note 3 'Cutting and Patching.' Protect construction exposed by or for quality-control service activities, and protect repaired construction. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.
  6. **MATERIALS AND EQUIPMENT:**
    - A. **DEFINITIONS:**
      1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
      2. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
      3. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
      4. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.
    - B. **SUBMITTALS:** Prepare a list showing products specified in tabular form acceptable to the Engineer. Include generic names of products required. Include the manufacturer's name and proprietary product names for each item listed.
      1. Coordinate product list with the Contractor's Construction Schedule and the Schedule of Submittals.
      2. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of an initial product list. Provide a written explanation for omissions of data and for known variations from Contract requirements. At the Contractor's option, the initial submittal may be limited to selections and designations that must be established early in the Contract period.
      3. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of the completed product list. Provide a written explanation for omissions of data and for known variations from Contract requirements.
      4. Engineer's Action: The Engineer will respond in writing to Contractor within two (2) weeks of receipt of the completed product list. No response within this period constitutes no objection to listed manufacturers or products but does not constitute a waiver of the requirement that products comply with Contract Documents. The Engineer's response will include a list of unacceptable product selections, containing a brief explanation of reasons for this action.
    - C. **QUALITY ASSURANCE:** Source Limitations: To the fullest extent possible, provide products of the same kind from a single source. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
    - D. **PRODUCT DELIVERY, STORAGE, AND HANDLING:** Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
      1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
      2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
      3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
      4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
      5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
      6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
      7. Store products subject to damage by the elements above ground, under cover in a weatheright enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
    - E. **CONSTRUCTION SCHEDULE:** General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
      1. Proprietary Specification Requirements: Where Specifications name only a single product or manufacturer, provide the product indicated. No substitutions will be permitted.
      2. Semi-proprietary Specification Requirements: Where Specifications name two (2) or more products or manufacturers, provide 1 of the products indicated. No substitutions will be permitted.
      3. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
      4. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
      5. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
      6. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
    - F. **INSTALLATION OF PRODUCTS:** Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
  7. **CONTRACT CLOSEOUT:**
    - A. **SUBSTANTIAL COMPLETION (Preliminary Procedures):** Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
      1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.
      2. Advise the Owner of pending insurance changeover requirements.
      3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.
      4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
      5. Deliver tools, spare parts, extra stock, and similar items.
      6. Complete startup testing of systems and instructions to the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.
      7. Complete final cleanup requirements, including touchup painting.
      8. Touch up and otherwise repair and restore marred, exposed finishes.
    - B. **SUBSTANTIAL COMPLETION (Inspection Procedures):** On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfiled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued. Results of the completed inspection will form the basis for final acceptance.
    - C. **FINAL ACCEPTANCE (Preliminary Procedures):** Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
      1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
      2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
      3. Products certified copy of the Engineer's final inspection list of items to be completed or corrected, endorsed and dated by the Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by the Engineer.
      4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
      5. Submit consent of surety to final payment.
    - D. **FINAL ACCEPTANCE (Re-inspection Procedure):** The Engineer will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Engineer.
      1. Upon completion of re-inspection, the Engineer will prepare a certificate of final acceptance. If the Work is incomplete, the Engineer will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
      2. If necessary, re-inspection will be repeated.
    - E. **RECORD DOCUMENT SUBMITTALS:** Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Engineer's reference during normal working hours.
    - F. **RECORD DRAWINGS:** Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference to the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
      1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
      2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
      3. Note related change-order numbers where applicable.
      4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
    - G. **RECORD SPECIFICATIONS:** Maintain one complete copy of the Specifications, including addenda. Include with the Specifications one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.
      1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
      2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
      3. Note related record drawing information and Product Data.
      4. Upon completion of the Work, submit record Specifications to the Engineer for the Owner's records.
    - H. **MAINTENANCE MANUALS:** Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:
      1. Emergency instructions.
      2. Spare parts list.
      3. Copies of warranties.
      4. Wiring diagrams.
      5. Inspection procedures.
      6. Shop Drawings and Product Data.
    - I. **OPERATION AND MAINTENANCE INSTRUCTIONS:** Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
      1. Maintenance manuals.
      2. Spare parts and materials.
      3. Tools.
      4. Lubricants.
      5. Fuels.
      6. Identification systems.
      7. Control sequences.
      8. Hazards.
      9. Cleaning.
      10. Warranties and bonds.
      11. Maintenance agreements and similar continuing commitments.
    - J. **DEMOCRATE:** As part of instruction for operating equipment, demonstrate the following procedures:
      1. Startup.
      2. Shutdown.
      3. Emergency operations.
8. **NOISE AND VIBRATION ADJUSTMENTS:**
  1. Noise and vibration adjustments.
  2. Safety procedures.
  3. Economy and efficiency adjustments.
  4. Effective energy utilization.
9. **FINAL CLEANING:** The General Requirements require general cleaning during construction. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.
    - a. Remove labels that are not permanent labels.
    - b. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
    - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and vacuum foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Clean carpeted surfaces.
    - d. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
    - e. Clean the site, including landscape areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits.
  2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.
  3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.
10. **WARRANTIES**
  - A. **DISCLAIMERS AND LIMITATIONS:** Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to counterclaim special warranties with the Contractor.
  - B. **DEFINITIONS:**
    1. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
    2. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
  - C. **WARRANTY REQUIREMENTS:**
    1. Related Damages and Losses: When covered failing or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
    2. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
    3. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
    4. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies. The Owner reserves the right to limit warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
    5. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entitles required to counterclaim such commitments are willing to do so.
  - D. **SUBMITTALS:**
    1. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.
    2. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Engineer, for approval prior to final execution.
    3. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.
11. **SELECTIVE DEMOLITION**
  - A. **DEFINITIONS:**
    1. Remove: Remove and legally dispose of items except those indicated to be reinstated, salvaged, or to remain the Owner's property.
    2. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.
    3. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstated in their original locations.
  - B. **MATERIALS OWNERSHIP:** Except for items or materials indicated to be reused, salvaged, reinstated, or otherwise included to remain the Owner's property, demolished materials shall be the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
  - C. **QUALITY ASSURANCE:** Utilize experienced personnel that have successfully completed selective demolition Work similar to that indicated for this Project. Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
  - D. **PROJECT CONDITIONS:** Owner assumes no responsibility for actual condition for the portions of buildings to be selectively demolished. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical. Owner reserves the right to remove materials and equipment from the building for re-use up until the Contractor commences work on the site.
  - E. **ASBESTOS:** It is not expected that asbestos will be encountered in the Work. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Engineer and the Owner.
  - F. **ON SITE:** Storage or sale of removed items or materials on-site will not be permitted.
  - G. **SCHEDULING:** Arrange selective demolition schedule so as not to interfere with Owner's on-site operations.
  - H. **REPAIR MATERIALS:** Use repair materials identical to existing materials. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance equals or surpasses that of existing materials.
  - I. **EXAMINATION:**
    1. Verify that utilities have been disconnected and capped.
    2. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
    3. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
  - J. **UTILITY SERVICES:**
    1. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
    2. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving building to be selectively demolished. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.
  - K. **PREPARATION:**
    1. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
    2. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
    3. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
  - L. **POLLUTION CONTROL:**
    1. Use water mist, lampray enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
    3. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.
  - M. **SELECTIVE DEMOLITION:**
    1. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete Work within limitations of governing regulations.
    2. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.
    3. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand and small power tools designed for sawing or grinding, not hammering and chipping. Temporarily cover openings to remain.
    4. Cut or drill from the exposed or finished side into concealed surfaces to avoid marking existing finished surfaces.
    5. Do not use cutting torches until work areas is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
    6. Maintain adequate ventilation when using cutting torches.
    7. Remove decayed, vermin-infested, or otherwise damaged or unsuitable materials and promptly dispose of off-site.
    8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
    9. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
    10. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
    11. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
  - N. **PATCHING AND REPAIRS:** Promptly patch and repair holes and damaged surfaces caused by adjacent construction by selective demolition operations. Patching is specified in Specification Note 3 'Cutting and Patching.' Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
  - O. **DISPOSAL OF DEMOLISHED MATERIALS:** Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. Do not burn demolished materials. Transport demolished materials off Owner's property and legally dispose of them.
  - P. **CLEANING:** Leave the construction area clean on completion of selective demolition operation.



REVISION	DATE

**SMITH AQUATIC CENTER**  
**INDOOR AIR QUALITY HVAC RENOVATIONS**  
 CHARLOTTESVILLE, VIRGINIA

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET	
<b>M-8</b>	

**SPECIFICATIONS FOR HVAC WORK:**

- SCOPE OF THE WORK:** WORK SHALL INCLUDE COMPLETE HVAC SYSTEMS. PROVIDE SUPERVISION, LABOR, MATERIAL, EQUIPMENT, MACHINERY, PLANT AND ITEMS NECESSARY FOR COMPLETE SYSTEMS TESTED AND READY FOR OPERATION.
- REGULATIONS:** MATERIALS AND INSTALLATION SHALL COMPLY WITH LOCAL CODES, APPLICABLE PROVISIONS OF LATEST EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION, LOCAL UTILITY REGULATIONS AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.
- DRAWINGS:** THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED. WHERE VARIANCES OCCUR INCLUDE THE ITEMS OF BETTER QUALITY, GREATER QUANTITY OR HIGHER COST.
- COORDINATION OF WORK:** THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION AND PROPER RELATION OF HIS WORK TO THE BUILDING STRUCTURE AND TO THE WORK OF OTHER TRADES. CONTRACTOR SHALL PROVIDE DIMENSIONS AND LOCATIONS OF ALL OPENINGS, SHAFTS AND SIMILAR ITEMS TO THE PROPER TRADES AND SHALL INSTALL WORK AS REQUIRED SO AS NOT TO DELAY THE BUILDING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED BY HIS WORK OR WORKMEN. REPAIRING OF DAMAGED WORK SHALL BE DONE BY THE CONTRACTOR AT NO ADDITIONAL COST.
- VISITING THE SITE:** EACH CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE BEFORE PRICING THE JOB TO FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS TO BE MET IN THE EXECUTION OF THE WORK UNDER THIS CONTRACT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED RELATING TO SITE CONDITIONS.
- INTERRUPTION OF SERVICES:** INTERRUPTIONS OF SERVICE TO EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER AS TO TIME AND DURATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY INTERRUPTIONS TO SERVICE AND SHALL REPAIR ANY DAMAGES TO EXISTING SYSTEMS CAUSED BY HIS OPERATIONS.
- WORK IN OCCUPIED AREAS:** WORK IN OCCUPIED AREAS SHALL BE COORDINATED WITH THE OCCUPANT AND OWNER AS TO TIME AND DURATION. THE CONTRACTOR SHALL PROTECT THE OCCUPIED AREA AND SHALL BE RESPONSIBLE FOR CLEANING AND REPAIRING ANY DAMAGES CAUSED BY HIS WORK. SAFETY OF BUILDING OCCUPANTS SHALL BE ASSURED AT ALL TIMES. TOOLS, MATERIAL, DIRT AND DEBRIS SHALL BE REMOVED FROM OCCUPIED AREAS WHENEVER WORK AREAS ARE LEFT UNATTENDED.
- ACCESSIBILITY:** LOCATE EQUIPMENT WHICH MUST BE SERVICED OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS WHERE POSSIBLE. OTHERWISE, FURNISH ACCESS PANELS OF SUFFICIENT SIZE AND LOCATED SO THAT THE CONCEALED EQUIPMENT CAN BE SERVICED.
- FOUNDATION PADS AND ROUGH-IN:** PROVIDE 4-INCH HIGH CONCRETE FOUNDATION PADS FOR FLOOR-MOUNTED EQUIPMENT. ROUGH-IN OPENINGS SHALL ALIGN VERTICALLY AND HORIZONTALLY WITH BUILDING STRUCTURE. WALL-MOUNTED THERMOSTATS SHALL BE MOUNTED 5'-4" ABOVE FINISHED FLOOR TO BOTTOM OF THERMOSTAT.
- SLEEVES:** LOCATE SLEEVES DURING NORMAL COURSE OF WORK. PROVIDE SLEEVES FOR PIPING PASSING THROUGH CONCRETE FLOOR SLABS AND CONCRETE, MASONRY, TILE AND GYPSUM WALL CONSTRUCTION. SLEEVES SHALL NOT BE REQUIRED FOR PIPING EMBEDDED IN CONCRETE OR SLAB ON GRADE, EXCEPT THAT COPPER PIPING SHALL REQUIRE SLEEVES THROUGH SLABS ON GRADE. SLEEVES PLACED IN EXTERIOR WALLS BEING WEATHERED SHALL BE WEATHERED. SLEEVES ARE LOCATED THROUGH FIRE-RATED WALLS OR FLOORS, THE SLEEVES ASSEMBLIES SHALL MAINTAIN THE FIRE RATING OF THE WALL OR FLOOR. SLEEVES SHALL BE CONSTRUCTED OF 20 GAUGE GALVANIZED STEEL WITH LOCK SEAM JOINTS FOR ALL SLEEVES SET IN CONCRETE FLOOR SLABS. ALL OTHER SLEEVES SHALL BE CONSTRUCTED OF GALVANIZED ZINC PIPE.
- CUTTING AND PATCHING:** THE CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING NECESSARY TO INSTALL HIS WORK. PATCHING SHALL MATCH ADJACENT SURFACES. NO STRUCTURAL MEMBERS SHALL BE CUT WITHOUT THE APPROVAL OF THE ARCHITECT.
- CLEANING:** EQUIPMENT AND PIPING SHALL BE CLEANED TO REMOVE FOREIGN MATERIALS. PROVIDE TYPICAL FILTERS FOR AIR UNITS THAT ARE OPERATED DURING CONSTRUCTION. PLUG OR CAP OPENINGS IN EQUIPMENT, DUCTWORK, PIPING AND MATERIALS UNTIL CONNECTION IS MADE TO THE SYSTEM. REMOVE FROM THE PREMISES ALL UNUSED MATERIAL AND DEBRIS RESULTING FROM THE PERFORMANCE OF HVAC WORK.
- WIRING:** STARTERS THAT ARE SPECIFIED TO BE FURNISHED AS AN INTEGRAL PART OF THE MECHANICAL EQUIPMENT SHALL BE COMPLETE WITH PROPERLY SIZED OVERLOAD HEATERS. TEMPERATURE CONTROL WIRING, EQUIPMENT CONTROL WIRING AND CONTROL INTERLOCK WIRING FOR MECHANICAL EQUIPMENT SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR. CONTROL WIRING SHALL NOT INCLUDE ANY WIRING WHICH CARRIES MOTOR CURRENT. ALL WIRING SHALL BE IN METAL CONDUIT AND SHALL COMPLY WITH THE ELECTRICAL SPECIFICATIONS.
- START-UP:** ALL MAJOR PIECES OF HVAC EQUIPMENT, INCLUDING, BUT NOT LIMITED TO POOL DEHUMIDIFICATION UNITS, WATER SOURCE HEAT PUMPS, CLOSED CIRCUIT COOLER, BOILER, AND PUMPS SHALL INCLUDE FACTORY START-UP AND VERIFICATION BY TRAINED AND CERTIFIED FACTORY REPRESENTATIVE OF THE EQUIPMENT MANUFACTURER. START-UP AND VERIFICATION REPORTS SHALL BE INCLUDED WITH BOUND SETS OF OPERATING AND MAINTENANCE INSTRUCTIONS.
- QUIET OPERATION:** SYSTEMS SHALL OPERATE UNDER CONDITIONS OF LOAD WITHOUT UNUSUAL OR EXCESSIVE NOISE OR VIBRATION. UNUSUAL OR EXCESSIVE NOISE OR VIBRATION SHALL BE CORRECTED.
- TESTING AND BALANCING:** THE CONTRACTOR SHALL PROVIDE THE SERVICES OF A FIRM CERTIFIED BY THE ASSOCIATED AIR BALANCING COUNCIL, OR THE NATIONAL ENVIRONMENTAL BALANCING BUREAU TO ADJUST AND BALANCE ALL HEATING, VENTILATING, AIR CONDITIONING, AND EXHAUST SYSTEMS. ALL PERSONNEL INVOLVED IN THE EXECUTION OF THE WORK SHALL BE EXPERIENCED IN THE BALANCING OF MECHANICAL SYSTEMS. THE FIRM SHALL NOT BE THE INSTALLER OF THE SYSTEMS TO BE TESTED AND SHALL BE OTHERWISE INDEPENDENT OF THE PROJECT. THE TAB CONTRACTOR SHALL BE INDEPENDENT OF MECHANICAL CONTRACTOR AND SHALL BE HIRED AS PART OF THIS CONTRACT. THE CONTRACTOR SHALL FURNISH THE A COMPLETE SET OF HVAC DRAWINGS AND SPECIFICATIONS TO THE TAB AGENCY. THE CONTRACTOR SHALL PROVIDE SUPPORT THROUGH FACTORY REPRESENTATIVES, EQUIPMENT MECHANICS, AND CONTROL TECHNICIANS TO WORK WITH THE BALANCING ORGANIZATION TO ADJUST EQUIPMENT AND CONTROLS TO OBTAIN DESIGN PERFORMANCE. THE TAB AGENCY SHALL BE RESPONSIBLE FOR ALL ITEMS NECESSARY FOR CONNECTION OF ITS INSTRUMENTATION TO DUCTWORK, PIPING AND EQUIPMENT AND SHALL NOT PROCEED WITH BALANCING WORK UNTIL SYSTEMS ARE ADJUSTED. THE TAB CONTRACTOR SHALL PROVIDE TEST AND BALANCE FOR ALL AIR HANDLING UNITS, CHILLED WATER COILS, AND FLOW MEASURING DEVICES ASSOCIATED WITH THE NEW WORK FOR THIS PROJECT. PRIOR TO BALANCING, THE TAB CONTRACTOR SHALL VERIFY THAT ALL SYSTEMS HAVE BEEN PROPERLY BLEED OF AIR, THAT ALL COIL STRAINERS ARE CLEAN, AND THAT ALL SYSTEMS ARE COMPLETE AND OPERATIONAL. TAB CONTRACTOR SHALL BALANCE SYSTEMS TO DESIGN RATINGS LISTED ON THE PLANS ASSURE THAT THE WRITTEN SEQUENCE OF CONTROL IS ESTABLISHED. THE WATER QUANTITIES FOR CHILLED WATER COILS SHALL BE BALANCED FOR THE GPM AS INDICATED ON THE DRAWING. ADJUST AIR FLOWS BY ADJUSTMENT OF BALANCING VALVES. FLOW MEASURING DEVICES TAKE PRECEDENCE OVER PUMP HEAD READINGS. REPORT TEST AND BALANCE READINGS ACROSS ALL MAJOR SYSTEM COMPONENTS BOTH FOR FLOW DETERMINATION AND DEVIATIONS BETWEEN ACTUAL AND DESIGN VALUES. RECORD ON FLOW DIAGRAMS THE FLOWS OBTAINED IN EACH OF THE VARIOUS CIRCUITS AND MODES OF OPERATION. DESIGNATE THE MANUAL RE-BALANCING EFFORT THAT IS NECESSARY FOR OPTIMUM OPERATIONS. THE TAB CONTRACTOR SHALL PROVIDE A TYPE-WRITTEN TAB REPORT IN ACCORDANCE WITH NEBB AND SHALL INCLUDE THE FOLLOWING:

REPORT THE AIR BALANCE READINGS FOR THE FOLLOWING AS FURTHER SPECIFIED IN 3.01.G:

- AIR HANDLING EQUIPMENT - OUTDOOR AIR QUANTITY, RETURN AIR QUANTITY, SUPPLY AIR QUANTITY, FAN SPEED (RPM), STATIC PRESSURE AT FAN SUCTION AND DISCHARGE (INCHES WG.), AND ACTUAL MOTOR AMP AND VOLTAGE READING.
  - EXHAUST FANS - AIR QUANTITY, FAN SPEED (RPM) AND STATIC PRESSURE, ACTUAL MOTOR AMPS AND VOLTAGE READING.
  - EACH AIR DISTRIBUTION OUTLET AND INLET IDENTIFIED BY LOCATION AND SIZE, AIR VELOCITY (FPM) AND COMPUTED AIR QUANTITY (CFM).
  - WATER COILS - AIR FLOW (CFM), ENTERING AND LEAVING AIR TEMPERATURES (DB AND WB), LOAD (BTU OR MBH).
  - TEMPERATURE IN EACH ROOM IN BUILDING AND THERMOSTAT SETTING.
- HYDRONIC BALANCE:
- PERFORM FINAL HYDRONIC BALANCE AFTER ALL SYSTEMS HAVE BEEN FLUSHED, CLEANED, AND FILLED.
  - HYDRONIC BALANCE INCLUDES PERFORMANCE READINGS ON ALL POOL DEHUMIDIFICATION UNITS, WATER SOURCE HEAT PUMPS, CLOSED CIRCUIT COOLERS, BOILERS, AND FLOW MEASURING DEVICES. ADJUST PUMP FLOWS TO ACTUAL SYSTEM HEAD BY ADJUSTMENT OF BALANCING VALVES. FLOW MEASURING DEVICES TAKE PRECEDENCE OVER PUMP HEAD READINGS. RECORD DISCREPANCIES FOR EVALUATION. THE DRIVE MOTORS SHALL NOT BE LOADED OVER THE CORRECTED FULL LOAD AMPERAGE RATING OF THE MOTOR INVOLVED.
  - REPORT PRESSURE DROP READINGS ACROSS ALL MAJOR SYSTEM COMPONENTS BOTH FOR FLOW DETERMINATION AND DEVIATIONS BETWEEN ACTUAL AND DESIGN VALUES.
  - RECORD ON FLOW DIAGRAMS THE FLOWS OBTAINED IN EACH OF THE VARIOUS CIRCUITS AND MODES OF OPERATION. DESIGNATE THE MANUAL REBALANCING EFFORT THAT IS NECESSARY FOR OPTIMUM OPERATIONS.
  - REPORT THE HYDRONIC BALANCE READINGS FOR THE FOLLOWING:
    - WATER COILS - WATER FLOW (GPM), ENTERING AND LEAVING WATER TEMPERATURES
    - REFRIGERANT COILS - FLOW (CFM), ENTERING AND LEAVING AIR TEMPERATURES (DB AND WB), LOAD (BTU AND MBH)
    - BOILERS - WATER SUPPLY AND RETURN TEMPERATURES, STACK TEMPERATURE, AND CO2 READING
    - PUMPS - WATER FLOW (GPM), SUCTION AND DISCHARGE PRESSURES, OPERATING HEAD, AND FULL LOAD AMPS
    - CLOSED CIRCUIT COOLER - WATER FLOW (GPM) AND WATER SUPPLY AND RETURN TEMPERATURES

AFTER SYSTEMS HAVE BEEN ADJUSTED AND BALANCED COMPLETELY, A SIX HOUR TEST SHALL BE RUN ON THE COOLING CYCLE, TO

DETERMINE WHETHER THE SYSTEMS ARE RESPONDING TO THE TEMPERATURE CONTROLS, THERMOSTAT SETTINGS, TEMPERATURE READINGS, AND AN INDEPENDENT TEMPERATURE MEASUREMENT SHALL BE RECORDED FOR THE CHILLED WATER. IF TESTS ON THE COOLING CYCLE CANNOT BE MADE TOGETHER BECAUSE OF THE TIME OF YEAR, THE TEST NOT MADE SHALL BE PERFORMED LATER WHEN CONDITIONS ARE FAVORABLE AND ACCEPTABLE TO THE OWNER AND ENGINEER. A SUPPLEMENT TO THE FINAL REPORT SHALL BE FILED WHEN LATER TESTS ARE PERFORMED. THE TAB AGENCY SHALL VERIFY BY LETTER THAT ALL EQUIPMENT HAS BEEN WIRED AND TESTED TO SEE THAT THE INDICATED SEQUENCE OF MOTOR CONTROL IS ESTABLISHED, THAT ALL SAFETY CONTROLS FUNCTION PROPERLY, THAT ALL MOTOR PROTECTIVE DEVICES ARE SIZED CORRECTLY, AND THAT THE SYSTEMS ARE OPERATING AT THE POINTS SET ON THE CONTROLS. DURING THE PERFORMANCE TESTS, THE CONTROL SETTINGS MAY REQUIRE ADJUSTMENT AND IF SO SHALL BE ADJUSTED TO PRODUCE THE BEST BALANCED SYSTEM OPERATION. THE FINAL SETTING OF EACH OPERATING AND SAFETY CONTROL SHALL BE RECORDED. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO THERMOSTATS, LIMIT CONTROLS, AQUASTATS, AND OTHER SIMILAR ITEMS. UPON COMPLETION OF SYSTEM BALANCING, THE SETTINGS OR ADJUSTMENT DEVICES SHALL BE PERMANENTLY MARKED.

- INSTRUCTIONS TO OWNER:** INSTRUCT THE OWNER IN THE PROPER OPERATION AND MAINTENANCE OF THE MECHANICAL SYSTEMS UNTIL THE OWNER IS FULLY PREPARED TO OPERATE AND MAINTAIN THE SYSTEMS. HOWEVER, LENGTH OF INSTRUCTION TIME SHALL BE LIMITED TO ONE (1) FULL DAY.
- OPERATING AND MAINTENANCE:** PROVIDE THE OWNER WITH THREE (3) BOUND SETS AND ONE ELECTRONIC COPY (ON THUMBFLASH DRIVE) OF OPERATING AND MAINTENANCE INSTRUCTIONS FOR ALL HVAC EQUIPMENT AND CONTROLS. BOUND SETS SHALL HAVE SPINE LABELS WITH "INSTALLATION, OPERATION AND MAINTENANCE MANUAL" AND PROJECT NAME.
- GUARANTEE:** EQUIPMENT, MATERIALS AND LABOR REQUIRED BY THESE CONTRACT DRAWINGS SHALL BE GUARANTEED TO BE FREE FROM DEFECTIVE MATERIALS OR WORKMANSHIP FOR ONE (1) YEAR AFTER FINAL ACCEPTANCE OF THE PROJECT UNLESS SPECIFIED FOR A LONGER PERIOD IN OTHER PORTIONS OF THE SPECIFICATIONS. DEFECTIVE MATERIALS OR WORKMANSHIP OCCURRING DURING THIS PERIOD SHALL BE CORRECTED AT NO ADDITIONAL COST.
- PAINTING:** GENERAL - PAINT MECHANICAL EQUIPMENT AND MATERIALS (WHERE NOT CONCEALED). PAINTING (IN CONCEALED SPACES) SHALL BE LIMITED TO EQUIPMENT AND MATERIALS NOT OTHERWISE PROTECTED FROM RUSTING SUCH AS HANGERS AND SUPPORTS. PAINT SHALL BE PRODUCTS OF SHERWIN-WILLIAMS, PITTSBURGH, PRATT-LAMBERT OR EQUAL. SURFACE PREPARATION: PRIME SURFACES SHALL BE PREPARED WITH A PHOSPHORIC ACID CLEANING SOLUTION AND PRIMED. AFTER PREPARATION EACH ITEM SHALL BE PAINTED, EXCEPT COLOR OF PAINT FOR EQUIPMENT AND MATERIAL WHERE NOT CONCEALED SHALL BE AS SELECTED BY THE ARCHITECT. ITEMS NOT CONCEALED IN ROOMS SHALL BE PAINTED OF THE SAME COLOR TO MATCH ADJACENT WALLS OR CEILINGS. PAINTING IS NOT REQUIRED OF ITEMS WITH A FACTORY-FINISH COAT. PATCH PAINTING IS REQUIRED OF ANY DAMAGED AREAS TO MATCH FACTORY-FINISH COAT. NAMEPLATES ON EQUIPMENT SHALL NOT BE PAINTED.
- IDENTIFICATION OF PIPES AND EQUIPMENT:** EACH MAJOR PIECE OF EQUIPMENT, SUCH AS PIPING SHALL BE IDENTIFIED BY MARKING THAT WILL READ THE SAME AS THE IDENTIFICATION SHOWN ON THE DRAWINGS. LABELS FOR EQUIPMENT SHALL BE BLACK PLASTIC ENGRAVED NAMEPLATES. STENCIL LETTERS SHALL BE 2 INCHES HIGH UPPER CASE PAINTED WITH WHITE ENAMEL ON EQUIPMENT AND BLACK ENAMEL ON PIPING AND CONDUIT. IDENTIFICATION SHALL BE PAINTED ON EACH PIPE OR CONDUIT WHERE EXPOSED OR ACCESSIBLE AND SHALL BE PLACED EVERY 15 FEET ALONG THE PIPE OR CONDUIT.
- PUMPS (SHOP DRAWING REQUIRED):**
  - GENERAL - WATER PUMPS SHALL OPERATE AT NOT OVER 1750 RPM AND SHALL BE SUITABLE FOR PUMPING WATER AT 210 DEGREES F.
  - LINE-MOUNTED PUMPS SHALL BE BELL & GOSSETT SERIES 80 OR EQUAL. PUMPS SHALL BE IN LINE TYPE. CLOSE, COUPLED, SINGLE STAGE DESIGN. FOR INSTALLATION IN VERTICAL OR HORIZONTAL POSITION, AND CAPABLE OF BEING SERVICED WITHOUT DISTURBING PIPING CONNECTIONS. PUMP CASING SHALL BE CLASS 30 CAST IRON. THE IMPELLER SHALL BE OF CAST BRONZE, ENCLOSED TYPE, DYNAMICALLY BALANCED, KEYS TO THE SHAFT AND SECURED BY A LOCKING CAP SCREW. THE LIQUID CAVITY SHALL BE SEALED OFF AT THE MOTOR SHAFT BY AN IMPELLER AND A FLANGE SEAL. SEAT AND CASING SEAL RINGS, SUITABLE FOR CONTINUOUS OPERATION AT 225 DEG. F. A BRONZE SHAFT SHAFT SHALL COMPLETELY COVER THE WETTED AREA UNDER THE SEAL. PUMPS SHALL BE RATED FOR MINIMUM OF 175 PSI WORKING PRESSURE. THE PUMP CASE SHALL HAVE GAUGE TAP MEETS AT THE SUCTION AND DISCHARGE NOZZLES AND WILL INCLUDE VENT AND DRAIN PORTS. MOTOR SHALL MEET NEMA SPECIFICATIONS AND SHALL BE THE SIZE AND VOLTAGE CALLED FOR ON THE PLANS. IT SHALL HAVE HEAVY DUTY GREASE LUBRICATED BALL BEARINGS, COMPLETELY ADEQUATE FOR THE MAXIMUM LOAD FOR WHICH THE PUMP IS DESIGNED. EACH PUMP SHALL BE FACTORY TESTED, CLEANED, AND PAINTED WITH HIGH-GRADE MACHINERY ENAMEL PRIOR TO SHIPMENT.
  - END SUCTION WATER PUMP SHALL BE BELL & GOSSETT BASE-MOUNTED PUMP SERIES 1510 WITH CLASS 30 CAST IRON VOLUTE WATER INTEGRAL SUPPORT. CAST BRONZE IMPELLER, ENCLOSED TYPE, DYNAMICALLY BALANCED. MECHANICAL SHAFT SEALS WITH CARBON SEAL RING FOR CONTINUOUS OPERATION @ 225 DEG. F. MINIMUM WORKING PRESSURE OF 175 PSI. CASINGS SHALL HAVE GAUGE PORTS AT NOZZLES AND VENT AND DRAIN PORTS AT TOP AND BOTTOM OF CASING. HOUSING ASSEMBLY SHALL HAVE REPLACEABLE HEAVY-DUTY REGREASABLE BALL BEARINGS. PUMP AND MOTOR SHALL BE MOUNTED ON A COMMON BASE. BASE ENDS, WITH SECURELY WELDED CROSS MEMBERS AND FULLY OPEN GROUTING AREA. A FLEXIBLE-TYPE COUPLER SHALL CONNECT THE PUMP AND U.L. LISTED MOTOR. THE COUPLER SHALL BE COMPLETE WITH SAFETY GUARD MEETING COMPLIANCE WITH ANSI B15.1, SECTION 8 AND OSHA 1910.219. CONTRACTOR TO LEVEL AND GROUT EACH UNIT ACCORDING TO MANUFACTURER'S INSTRUCTIONS. THE MOTOR SHALL MEET NEMA SPECIFICATIONS AND SHALL BE THE SIZE AND VOLTAGE CALLED FOR ON THE PLANS. PUMP AND MOTOR SHALL BE FACTORY ALIGNED, AND SHALL BE REALIGNED BY CONTRACTOR AFTER INSTALLATION. EACH PUMP SHALL BE FACTORY TESTED, CLEANED, AND PAINTED WITH HIGH-GRADE MACHINERY ENAMEL. UNIT SHALL BE CHECKED BY THE CONTRACTOR AND REGULATED FOR PROPER DIFFERENTIAL PRESSURE, VOLTAGE, AND AMPERAGE DRAW. DATA SHALL BE NOTED ON A PERMANENT TAG AND FASTENED TO THE PUMP.
  - SUBMIT THE MANUFACTURER'S CERTIFIED CHARACTERISTICS PERFORMANCE CURVE FOR THE IMPELLER SIZE TO BE FURNISHED. THE OPERATING POINT ON THE CHARACTERISTIC PERFORMANCE CURVE SHALL BE TO THE LEFT (SHUT-OFF) SIDE OF THE CURVE. THE PUMP MOTOR SHALL BE NON-OVERLOADING AT ANY POINT ON THE HEAD-CAPACITY CURVE.
- PIPING:**
  - HEATING WATER PIPING AND HEAT PUMP WATER PIPING (2-1/2 INCH AND LARGER): BLACK STEEL. ASTM A 53 SCHEDULE 40 STANDARD WEIGHT.
  - HEATING WATER PIPING AND HEAT PUMP WATER PIPING (2-INCH AND SMALLER): BLACK STEEL. ASTM A 53 SCHEDULE 40 STANDARD WEIGHT. COPPER WATER TUBE OPTION: ASTM B 88, TYPE 1, HARD DRAWN, EXCEPT UNDERGROUND LINES SHALL BE FUSION WELDED HIGH DENSITY POLYETHYLENE (HDPE).
  - COOLING COIL CONDENSATE DRAIN LINES SHALL BE TYPE "M" HARD DRAWN COPPER TUBING. PROVIDE WATER SEAL FROM EACH AIR HANDLING UNIT OF SUFFICIENT DEPTH TO PREVENT BLOW OUT OR SIPHONING OF WATER.
  - SERVICE VALVES: UP TO AND INCLUDING 2" SHALL BE BALL VALVES. VALVES OVER 2" FOR WATER SERVICE SHALL BE IRON BODY BUTTERFLY DISC TYPE WITH EPT NORDEL SEATS.
  - GLOBE VALVES SHALL BE ALL BRASS WITH BRASS DISC, EXCEPT GLOBE VALVES OVER 2" SIZE MAY BE BUTTERFLY TYPE.
  - FEED CHECK VALVES SHALL BE BRASS OR IRON BODY, SWING TYPE, REGRINDING SEAT, SIZES 2-1/2 INCH AND LARGER SHALL BE IRON BODY, BRONZE-TRIMMED, REGRINDING SEAT, SWING TYPE, FOR WATER SERVICE.
  - BALANCING COCKS SHALL BE ALL BRASS, SQUARE HEAD OR SCREWDRIVER HEAD WITH CHECK. BALANCING COCKS OVER 2" SIZE MAY BE IRON BODY.
  - TRIPLE-DUTY VALVE: ITT BELL AND GOSSETT TRIPLE DUTY VALVE DESIGNED TO PERFORM THE FUNCTIONS OF A NON-SLAM CHECK VALVE, THROTTLING VALVE, SHUT-OFF VALVE, CALIBRATED BALANCING VALVE AND SYSTEM SWIT. THE VALVE SHALL BE OF HEAVY-DUTY CAST IRON CONSTRUCTION WITH STANDARD 125 PSIG ANSI FLANGED CONNECTIONS, AND RATED FOR A MAXIMUM WORKING PRESSURE OF 175 PSIG @ 250 DEGREES F. THE VALVE SHALL BE FITTED WITH A BRONZE SEAT, REPLACEABLE BRONZE DISC, STAINLESS STEEL STEM AND CHATTER-PREVENTING SPRING. THE VALVE DESIGN SHALL PERMIT REPAKING UNDER FULL SYSTEM PRESSURE. EACH VALVE SHALL BE EQUIPPED WITH BRASS READOUT VALVES WITH INTEGRAL CHECK VALVE FOR TAKING DIFFERENTIAL PRESSURE READINGS ACROSS THE ORIFICE TO ACCURATELY BALANCE THE SYSTEM TO SPECIFIED DESIGN CONDITIONS.
- PROVIDE BELL & GOSSETT MODEL FLG SUCTION DIFFUSER FOR EACH BASE-MOUNTED PUMP. UNITS SHALL CONSIST OF ANGLE TYPE BODY WITH STRAIGHTENING VANES AND COMBINATION DIFFUSER, STRAINER, ORIFICE CYLINDER WITH MAXIMUM 3/16" DIAMETER OPENINGS FOR PUMP PROTECTION. DIFFUSER SHALL BE EQUIPPED WITH A DISPOSABLE, BRONZE, 16 FINE MESH STRAINER WHICH SHALL BE REMOVED AFTER SYSTEM START-UP. ORIFICE CYLINDER SHALL BE DESIGNED TO WITHSTAND PRESSURE DIFFERENTIAL EQUAL TO PUMP SHUT-OFF HEAD AND SHALL HAVE A FREE AREA EQUAL TO FIVE TIMES CROSS SECTION AREA OF PUMP SUCTION OPENING. STRAIGHTENING VANES SHALL EXTEND THE FULL LENGTH OF THE ORIFICE CYLINDER AND SHALL BE REPLACEABLE. UNIT SHALL BE PROVIDED WITH ADJUSTABLE SUPPORT FOOT TO HELP CARRY WEIGHT OF SECTION PIPING. MAXIMUM WORKING PRESSURE SHALL BE 175 PSI @ MAXIMUM OPERATING TEMPERATURE OF 250°F. THE UNIT PRESSURE DROP SHALL NOT EXCEED 1.0 PSI FOR DESIGN PUMP GPM.
- STRAINERS SHALL BE Y TYPE WITH BRONZE BASKET SUITABLE FOR 125 PSI SERVICE.
- MANUAL AIR VENTS SHALL BE CHROMIUM-PLATED BRASS 1/8" NPT COIN-OPERATED TYPE.
- SAFETY RELIEF VALVES FOR COOLING SYSTEMS SHALL BE WATTS ASME SERIES 174A, 3/4" X 3/4". PIPE DISCHARGE PORTS FULL SIZE TO FLOOR DRAIN.
- BYPASS RELIEF VALVE SHALL BE ADJUSTABLE SETTING TYPE, BRONZE BODY, MODULATING ACTION PRESSURE RELIEF VALVE AS MANUFACTURED BY CLA-WAL OR EQUAL. SIZE TO RELIEVE 50% OF PUMP CAPACITY. SET TO RELIEVE WHEN SYSTEM HEAD IS 5 FOOT W.G. ABOVE SPECIFIED SYSTEM PUMP HEAD.
- AUTOMATIC FLOW CONTROL VALVES SHALL BE GRISWOLD, AUTOFLOW, HAYS OR EQUAL AND SHALL BE PROVIDED AT ALL WATER SOURCE HEAT PUMP UNITS. VALVES SHALL BE AUTOMATIC PRESSURE COMPENSATING TYPE AND FACTORY SET TO PROVIDE SPECIFIED FLOW RATES WITH FIVE (5) PERCENT REGARDLESS OF SYSTEM PRESSURE. VALVES SHALL BE SELECTED TO PROVIDE SPECIFIED FLOW RATES WITH A MINIMUM PRESSURE DIFFERENTIAL OF 2 PSIG AND MAXIMUM PRESSURE DROP OF 10 FEET OF WATER. WHERE SYSTEM DIFFERENTIAL EXCEEDS 32 PSIG, VALVES SHALL BE SELECTED FOR A RANGE OF 4-57 PSIG. VALVE BODY SHALL BE SUITABLE FOR USE WITH PIPING SYSTEM AND INTERNAL WORKING PARTS SHALL BE STAINLESS STEEL, NICKEL PLATED BRASS OR ELASTOMERIC DIAPHRAGM. ALL VALVES SHALL BE PROVIDED WITH UNION AND PRESSURE-TEMPERATURE TEST PORTS SUITABLE FOR CONNECTING DIFFERENTIAL PRESSURE MEASURING DEVICES. ALL VALVES SHALL BE WYE CONFIGURATION FOR REMOVAL OF CONTROLLING ELEMENT WITHOUT REMOVING VALVE FROM PIPING. EACH VALVE SHALL BE IDENTIFIED AS TO DIRECTION OF FLOW AND WITH A FLOW ORIFICE. DIFFERENTIAL PRESSURE MEASURING SHALL BE PROVIDED COMPLETE WITH DUAL HOSE KIT, VALVES, FLOW CONVERSION CHART AND CARRYING CASE. METER AND ACCESSORIES SHALL BE TURNED OVER TO THE OWNER UPON FINAL ACCEPTANCE OF THE PROJECT.

- PRESSURE GAUGES SHALL BE 4" DIAL ASHCROFT BOURDON TUBE TYPE SUITABLE FOR 125 PSI SERVICE. PROVIDE PSI SCALE ONLY.
- FLEXIBLE PIPE JOINTS SHALL BE PIPE LINE TYPE, FLANGED, MINIMUM 125 PSI WORKING PRESSURE AT 250 DEG. F. FLEXONICS MODEL PCS.
- THERMOMETERS SHALL BE WEISS 9" VARI-ANGLE NON-MERCURY TYPE WITH SEPARATE SOCKET.
- PIPE SUPPORTS: SUSPENDED HORIZONTAL PIPING SHALL BE SUPPORTED BY ADJUSTABLE WROUGHT STEEL CLEVIS HANGERS. ALL SUPPORTS SHALL BE ATTACHED TO THE BUILDING STRUCTURE SPACED 10' ON CENTER. HANGING RODS SHALL BE 3/8" DIAMETER SIZE FOR PIPES UP THROUGH 2", 1/2" DIAMETER SIZE FOR 2 1/2" THROUGH 3", 5/8" DIAMETER FOR PIPES 4" THROUGH 5" AND 7/8" DIAMETER SIZE FOR 6" THROUGH 12". PIPE HANGER RODS SHALL BE ATTACHED TO THE TOP CHORD ONLY ON STEEL JOISTS AND BEAMS WITH CLAMPS. PIPING SHALL BE INSTALLED IN PRACTICAL ALIGNMENT WITH THE BUILDING.
- ANCHORS FOR PIPE SHALL BE PROVIDED AS INDICATED OR AS REQUIRED AT THE JOB SITE TO LOCALIZE EXPANSION AND CONTRACTION OF PIPE.
- VERTICAL PIPING SHALL BE GUIDED OR SUPPORTED IN THE CENTER OF EACH RISER AND NOT OVER 15'-0" ON CENTER AND SHALL BE SUPPORTED AT THE BASE OF EACH RISER.
- INSTALLATION: INSTALL PIPING GENERALLY PARALLEL TO WALLS AND COLUMN CENTERLINES, UNLESS SHOWN OTHERWISE ON THE DRAWINGS. SPACE PIPING, INCLUDING INSULATION, TO PROVIDE ONE INCH MINIMUM CLEARANCE BETWEEN ADJACENT PIPING OR OTHER SIZE. PIPE SHALL BE INSTALLED TO PERMIT FREE EXPANSION AND CONTRACTION WITHOUT DAMAGE TO JOINTS OR HANGERS. ALL PIPING SHALL BE INSTALLED WITH SUFFICIENT PITCH TO INSURE ADEQUATE DRAINAGE AND VENTING. ALL HIGH POINTS IN WATER LINES SHALL BE PROVIDED WITH AUTO-AIR VENTS, ALL LOW POINTS WITH DRAINS. CONDENSATE DRAIN LINES SHALL SLOPE 1/8" PER FOOT IN DIRECTION OF FLOW. ALL TAKE-OFFS/PIPING RUN-OUTS SHALL BE INSTALLED ON THE SIDE OR ON THE TOP OF THE MAIN PIPE TO WHICH IT IS CONNECTED. LOCATE AND ORIENT VALVES TO PERMIT PROPER OPERATION AND ACCESS FOR MAINTENANCE OF PACKING, SEAT AND DISC. GENERALLY LOCATE VALVE STEMS IN OVERHEAD PIPING IN HORIZONTAL POSITION. CONTROL VALVES USUALLY REQUIRE REDUCERS TO CONNECT TO PIPE SIZES SHOWN ON THE DRAWINGS. ISOLATION SERVICE VALVES SHALL BE INSTALLED ON EACH SIDE OF MAJOR PIECE OF EQUIPMENT SUCH AS A PUMP, CHILLER, AND OTHER SIMILAR ITEMS, AND AT ANY OTHER POINTS INDICATED OR REQUIRED FOR DRAINING, ISOLATION OR SECTORIALIZING PURPOSES. CONTROL VALVES SHALL BE INSTALLED IN ACCORDANCE WITH CONTROL MANUFACTURER'S RECOMMENDATIONS. OFFSET EQUIPMENT CONNECTIONS TO ALLOW VALVING OFF FOR MAINTENANCE AND REPAIR WITH MINIMAL REMOVAL OF PIPING. PROVIDE FLEXIBILITY IN EQUIPMENT CONNECTIONS AND BRANCH LINE TAKEOFFS WITH 3-ELBOW SWING JOINTS WHERE NOTED ON THE DRAWINGS.
- DIELECTRIC FITTINGS SUCH AS COUPLINGS, UNIONS OR FLANGES SHALL BE INSTALLED TO ISOLATE PIPES OF NON-FERROUS METAL WHERE CONNECTION IS MADE TO FERROUS METAL.
- FLUSHING AND CLEANING PIPING SYSTEMS: CLEAN SYSTEMS AS RECOMMENDED BY THE CLOSED CIRCUIT COOLER, POOL DEHUMIDIFICATION UNIT, BOILER, AND WATER SOURCE HEAT PUMP UNIT MANUFACTURERS AND THE OWNER'S EXISTING SUPPLIER OF THE WATER TREATMENT CHEMICALS. INITIAL FLUSHING: REMOVE LOOSE DIRT, MILL SCALE, METAL CHIPS, WELD BEADS, RUST, AND LIKE DELETERIOUS SUBSTANCES WITHOUT DAMAGE TO ANY SYSTEM COMPONENT. BYPASS FACTORY CLEANED EQUIPMENT UNLESS ACCEPTABLE MEANS OF PROTECTION ARE PROVIDED AND SUBSEQUENT INSPECTION OF HIDE-OUT AREAS TAKES PLACE. ISOLATE OR PROTECT CLEAN SYSTEM COMPONENTS, INCLUDING PUMPS AND PRESSURE VESSELS, AND REMOVE ANY COMPONENT WHICH MAY BE DAMAGED. OPEN ALL VALVES, DRAINS, VENTS AND STRAINERS AT ALL SYSTEM LEVELS. REMOVE PLUGS, COPS, SPOOL PIECES, AND COMPONENTS TO FACILITATE EARLY DEBRIS DISCHARGE FROM SYSTEM. SECTORIALIZE SYSTEM TO OBTAIN DEBRIS CARRYING VELOCITY OF 2 FEET PER SECOND, IF POSSIBLE. CONNECT DEADEND SUPPLY AND RETURN HEADS AS NECESSARY. FLUSH BOTTOMS OF RISERS. INSTALL TEMPORARY STRAINERS WHERE NECESSARY TO PROTECT DOWN-STREAM EQUIPMENT. SUPPLY AND REMOVE FLUSHING WATER AND DRAINAGE BY VARIOUS TYPE HOSE, TEMPORARY OR PERMANENT PIPING AND CONTRACTOR'S BOOSTER PUMPS. FLUSH UNTIL CLEAN. CLEANING: USING PRODUCTS RECOMMENDED BY THE CLOSED CIRCUIT COOLER, POOL DEHUMIDIFICATION UNIT, BOILER, AND WATER SOURCE HEAT PUMP UNIT MANUFACTURER AND THE OWNER'S EXISTING SUPPLIER OF THE WATER TREATMENT CHEMICALS, CIRCULATE SYSTEMS AT NORMAL TEMPERATURE TO REMOVE ADHERENT ORGANIC SOIL. HYDROCARBONS, FLUX, PIPE MILL WASHES, PIPE JOINT COMPOUNDS, IRON OXIDE, AND LIKE DELETERIOUS SUBSTANCES NOT REMOVED BY INITIAL FLUSHING, WITHOUT CHEMICAL OR MECHANICAL DAMAGE TO ANY SYSTEM COMPONENT. REMOVAL OF TIGHTLY ADHERENT MILL SCALE IS NOT REQUIRED. KEEP ISOLATED EQUIPMENT WHICH IS "CLEAN" AND WHERE DEADEND DEBRIS ACCUMULATION CANNOT OCCUR. SECTORIALIZE SYSTEM AS POSSIBLE, TO CIRCULATE AT VELOCITIES NOT LESS THAN 6 FEET PER SECOND. CIRCULATE EACH SECTION FOR NOT LESS THAN 3 HOURS. BLOWDOWN ALL STRAINERS, OR REMOVE AND CLEAN AS FREQUENTLY AS NECESSARY. DRAIN AND PREPARE FOR FINAL FLUSHING: FINAL FLUSHING: RETURN SYSTEM TO CONDITIONS REQUIRED BY INITIAL FLUSHING AFTER ALL CLEANING SOLUTION HAS BEEN DISPOSED BY CLEAN MAKE-UP. FLUSH ALL DEADENDS AND ISOLATED CLEAN EQUIPMENT. GENTLY OPERATE ALL VALVES TO DISLodge ANY DEBRIS IN VALVE BODY BY THROTTLING VELOCITY. FLUSH NOT LESS THAN ONE HOUR.
- THE CONTRACTOR SHALL OBTAIN THE SERVICES OF THE OWNER'S EXISTING WATER TREATMENT FIRM (COMPLETE CARE VIRGINIA - DAVE PURK) TO TEST THE RAW WATER AT THE SITE AND PROVIDE CHEMICALS NECESSARY TO MAINTAIN THE CLOSED CIRCUIT COOLER, POOL DEHUMIDIFICATION UNIT, BOILER, AND WATER SOURCE HEAT PUMP MANUFACTURER'S RECOMMENDED CHARACTERISTICS OF WATER FOR A PERIOD OF ONE YEAR. GLOBE AND FILL SYSTEM AS SOON AS POSSIBLE AFTER FINAL FLUSHING TO MINIMIZE CORROSION, CHARGE SYSTEM WITH CHEMICALS.
- THERMAL COVERING (SHOP DRAWING REQUIRED):**
  - INSULATION SHALL BE JOHNS MANVILLE, OWENS CORNING, ARMSTRONG OR EQUAL. INSULATION SHALL NOT BE APPLIED UNTIL AFTER THE EQUIPMENT, PIPES OR DUCTS TO BE INSULATED HAVE BEEN SATISFACTORY UNDER TESTS. ALL MATERIALS USED SHALL HAVE COMPOSITE FLAME SPREAD RATING NOT EXCEEDING 25 AND A SMOKE-DEVELOPED RATING NOT EXCEEDING 50. UNDERWRITERS' LABORATORIES, INC. LABEL OR LISTING, OR SATISFACTORY CERTIFIED TEST REPORT FROM AN APPROVED TESTING LABORATORY WILL BE REQUIRED TO SHOW THAT SURFACE BURNING CHARACTERISTICS FOR MATERIALS TO BE USED DO NOT EXCEED SPECIFIED RATINGS. ALL SEALANTS AND ADHESIVES MUST COMPLY WITH ALL APPLICABLE SOUTH CAROLINA BUILDING DEPARTMENT (SACMAG) DISTRICT (SACMAG) RULES. BUT NOT LIMITED TO RULE #1188. ALL MASTICS AND COATINGS MUST COMPLY WITH ALL APPLICABLE GREEN SEAL GS-11 VOC LIMITS. PIPE INSULATION JACKETS SHALL HAVE 1-1/2 INCH MINIMUM LAP AT LONGITUDINAL JOINTS AND NOT LESS THAN 3-INCH BUTT STRIPS AT END JOINTS. FRAP ON BOARD, BLANKET AND BLOCK INSULATION SHALL HAVE 2-INCH LAPS OR 3-INCH MINIMUM BUTT STRIPS. BUTT STRIP MATERIAL SHALL BE THE SAME AS THE JACKET OR FACING. LAPS AND BUTT STRIPS MAY BE SELF-SEALING TYPE WITH FACTORY APPLIED PRESSURE SENSITIVE ADHESIVE.
  - MINERAL FIBER INSULATION SHALL BE OWENS-CORNING FACED DUCT WRAP FIBERGLASS INSULATION - FRK TYPE 100, ASTM C 553-92 (BLANKET, FLEXIBLE), DENSITY 1 P.C.F., K = 0.31, FOR TEMPERATURES UP TO 250 DEG. F.
  - CONCEALED SUPPLY AIR DUCTWORK WITHIN BUILDING'S THERMAL ENVELOPE SHALL BE 1-1/2 INCH THICK INSULATION CONCEALED OUTDOOR AIR DUCTWORK WITHIN BUILDING'S THERMAL ENVELOPE SHALL BE 2-INCH THICK INSULATION. CONCEALED SUPPLY AIR DUCTWORK OUTSIDE BUILDING'S THERMAL ENVELOPE SHALL BE 2-INCH THICK INSULATION. CONCEALED RETURN AIR DUCTWORK WITHIN BUILDING'S THERMAL ENVELOPE NEED NOT BE INSULATED. CONCEALED RETURN AIR DUCTWORK OUTSIDE BUILDING'S THERMAL ENVELOPE SHALL BE 2-INCH THICK INSULATION. CONCEALED EXHAUST AIR DUCTWORK WITHIN BUILDING'S THERMAL ENVELOPE AND WITHIN 10 FEET OF CONNECTION TO OUTDOORS SHALL BE 1-1/2 INCH THICK INSULATION. CONCEALED EXHAUST AIR DUCTWORK OUTSIDE BUILDING'S THERMAL ENVELOPE SHALL BE 1-1/2 INCH THICK INSULATION.
  - PIPING: INSULATION SHALL BE INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
  - FIBERGLASS PIPE INSULATION SHALL HAVE A WHITE FRAP BONDED TO ALUMINUM FOIL, REINFORCED WITH FIBERGLASS YARN JACKET. ELASTOMERIC INSULATION SHALL BE CONSTRUCTED OF A CLOSED CELL STRUCTURE TO EFFECTIVELY RETARD THE FLOW OF MOISTURE VAPOR AND SERVE AS A VAPOR BARRIER. INSULATION THICKNESS AND TYPE FOR VARIOUS PIPING SYSTEMS SHALL BE AS INDICATED IN THE FOLLOWING TABLE: (PIPE SIZE/INSULATION THICKNESS)

SYSTEM	TEMP. RANGE (DEG. F)	RUNOUTS UP TO 2"	1" & LESS	1-1/4" TO 2"	2-1/2" TO 4"	5" & 6"	8" & ABOVE	INS. TYPE (3)
DOMESTIC COLD WATER	56-79	1.0	1.0	1.0	1.0	1.0	1.0	A
CONDENSER WATER	45-105		1.0	1.5	1.5	1.5	1.5	A
HEATING WATER	90-159	1.0	1.0	1.0	1.0	2.0	2.0	A
CONDENSATE DRAIN	45-75		0.5	0.5	1.0	1.0	1.0	AB

- NOTES:
- MINIMUM FIBERGLASS INSULATION THICKNESS SHALL BE INCREASED FOR MATERIALS HAVING THERMAL RESISTANCE (R) VALUES LESS THAN FOUR (4.0) PER INCH OF THICKNESS. MINIMUM ELASTOMERIC INSULATION THICKNESS SHALL BE INCREASED FOR MATERIAL HAVING THERMAL RESISTANCE (R) VALUES LESS THAN 3.7 PER INCH THICKNESS.
  - SEE PLUMBING FIXTURE SPECIFICATIONS FOR HANDICAPPED FIXTURE INSULATION.
  - A - FIBERGLASS TYPE INSULATION; B - ELASTOMERIC TYPE INSULATION.
- ELASTOMERIC INSULATION SHALL BE ARMSTRONG ARMAFLEX II PIPE INSULATION, FED. SPEC. HH-573 AND HH-17512, K=0.27, FLAME SPREAD NOT OVER 25, SMOKE DEVELOPED NOT OVER 50 (1/2-INCH THICK TEST MATERIAL), FOR TEMPERATURES FROM MINUS 40 DEG. F. TO 211 DEG. F.
  - FIBERGLASS PIPE INSULATION FITTINGS SHALL BE COVERED WITH PRE-MOLDED PVC FITTING COVERS. JACKETS ON FIBERGLASS PIPE INSULATION BELOW 80 DEG. F. SHALL BE SELF-SEALING LAP, LAP SEAL, GUN OR ADHESIVE. ALL INSULATION JOINTS, LAPS, VOIDS, PUNCTURES AND END TAPERS SHALL BE SEALED WITH 1/32" THICKNESS OF VAPOR ADHESIVE. 1-1/2" LONG, 1/2 SECTION OF HYDROUS CALCIUM SILICATE OR FOAMGLASS INSULATION SHALL BE USED BETWEEN HANGERS AND PIPING. ON PIPE, SIZES 1-1/2" AND BELOW, HYDROUS CALCIUM SILICATE OR FOAMGLASS WILL NOT BE REQUIRED. ALL PIPING SHALL HAVE LOAD-DISTRIBUTING GALVANIZED 1/8 GAUGE METAL SHIELDS INSTALLED AROUND THE LOWER HALF OF THE INSULATION.
  - ELASTOMERIC PIPE INSULATION SEAMS, VOIDS AND BUTT JOINTS SHALL BE SEALED WITH A VAPOR BARRIER ADHESIVE OR TAPED WITH 1-1/2 INCH WIDE 3M #417 TAPE.
  - HYDRONIC SYSTEM COMPONENTS:**
    - TANGENTIAL AIR SEPARATORS: BELL AND GOSSETT "ROLAIRTROL", ASME PRESSURE VESSEL CODE CONSTRUCTION FOR 125 PSIG WORKING PRESSURE, FLANGED TANGENTIAL INLET AND OUTLET CONNECTION. INTERNAL PERFORATED STAINLESS STEEL AIR COLLECTOR TUBE DESIGNED TO DIRECT RELEASED AIR INTO EXPANSION TANK, BOTTOM BLOWDOWN CONNECTION.
    - CLOSED EXPANSION (COMPRESSION) TANKS: BELL AND GOSSETT ASME PRESSURE VESSEL CODE CONSTRUCTION FOR 125 PSIG

- WORKING PRESSURE, RUSTPROOF COATED. PROVIDE GAGE GLASS, WITH PROTECTION GUARD, AND ANGLE VALVES WITH TAPPED OPENINGS FOR DRAIN (BOTTOM) AND PLUGGED VENT (TOP). PROVIDE CRADLE SUPPORTS AND FOLLOWING ACCESSORIES:
- AIR CONTROL TANK FITTINGS: PROVIDE IN EACH EXPANSION TANK BELL AND GOSSETT NO. ATF OR ATF1 "ARTICOR" TANK FITTING TO FACILITATE AIR TRANSFER FROM AIR SEPARATOR, OR PURGER, INTO TANK WHILE RESTRICTING GRAVITY CIRCULATION. FITTING SHALL INCLUDE AN INTEGRAL OR SEPARATE AIR VENT TUBE. TUB TO LENGTH OF ABOUT 2/3 OF TANK DIAMETER, TO ALLOW VENTING AIR FROM THE TANK WHEN ESTABLISHING THE INITIAL WATER LEVEL IN THE TANK.
  - TANK DRAINER-AIR CHARGER: BELL AND GOSSETT NO. DT-2 "DRAIN-O-TANK" AIR CHARGER SHALL INCORPORATE A VENT TUBE, CUM TO ABOVE 2/3 OF TANK DIAMETER, AND DRAIN VALVE WITH WOOD CONNECTION DRAINING AND RECHARGING WITH AIR.
  - FILL VALVES SHALL BE WATTS NO. N266 COMPLETE WITH STRAINER AND CHECK VALVE. VALVES SHALL BE ADJUSTABLE 10 TO 25 PSI AND SHALL BE FACTORY SET AT 15 PSI. PROVIDE FULL SIZE MANUAL BYPASS WITH CUTOFFS AROUND FILL VALVE FOR FAST FILL AND PURGING.
  - SAFETY RELIEF VALVES FOR COOLING SYSTEMS SHALL BE WATTS ASME RATED, SERIES 174A, 3/4" X 3/4" AND SHALL HAVE A SET PRESSURE OF 10 PSI OVER THE OPERATING PRESSURE AND NOT TO EXCEED THE OPERATING DESIGN PRESSURE OF THE COOLING EQUIPMENT). PIPE DISCHARGE PORTS FULL SIZE TO FLOOR DRAIN AND SUPPORT SO THAT NO STRAIN IS ON VALVE BODY.
  - REGULATING RELIEF VALVES SHALL BE ADJUSTABLE SETTING TYPE, BRONZE BODY, MODULATING ACTION RELIEF VALVE AS MANUFACTURED BY KLIPPEL, ILLINOIS, OR CONSOLIDATED. SIZE TO RELIEVE 50% OF PUMP CAPACITY. SET TO RELIEVE WHEN SYSTEM HEAD IS 5 FOOT W.G. ABOVE SPECIFIED SYSTEM PUMP HEAD.
  - AIR VENTS: MANUAL AIR VENTS SHALL BE CHROMIUM-PLATED BRASS 1/8" NPT COIN. OPERATED TYPE. PROVIDE EXTENSION TUBE IF REQUIRED TO MAINTAIN ACCESS TO VENT OPERATOR.
  - DRAINS: DRAINS SHALL BE ACCESSIBLE WITH 3/4" HOSE. END DRAIN VALVE UNLESS INDICATED OTHERWISE.
  - CHEMICAL FEEDER: CHEMICAL FEEDERS SHALL CONSIST OF A ONE SHOT FILTER FEEDER AND A ONE-YEAR SUPPLY OF CHEMICALS, MODEL FT-2HP AS MANUFACTURED BY NEPTUNE. THE FEEDER SHALL HAVE AN 11 GALLON STEEL BODY OF 2-1/2 GALLON CAPACITY, WITH HOLES AT TOP AND BOTTOM TAPPED FOR 3/4" PIPE THREAD. TANK HEAD SHALL BE MINIMUM 11 GAUGE STEEL. THE FEEDER SHALL BE COMPLETE WITH FILL AND DRAIN VALVES, MINIMUM 3-1/2" OPENING, FLOW REGULATOR VALVE, AND MISCELLANEOUS FITTINGS FOR CONNECTION OF FILL AND DRAIN ACCESSORIES. DESIGN OPERATING PRESSURE SHALL BE 300 PSI MAXIMUM @ 200°F. THE CAP SHALL BE CONSTRUCTED OF CAST IRON WITH EPOXY COATED UNDERSIDE AND SQUARE RING GASKET SEAL. THE FEEDER OFF THE FLOOR. THE FEEDER SHALL HAVE HOLES TO ELIMATE THE FEEDER OFF THE FLOOR. THE LEGS SHALL HAVE HOLES TO ALLOW MOUNTING BY ANCHOR BOLTS. PROVIDE 5 MICRON RING TOP FILTER BAGS SUPPORTED BY A STAINLESS STEEL FILTER BASKET FOR SIMULTANEOUS SIDE STREAM FILTERING.
  - VARIABLE SPEED DRIVES (SHOP DRAWING REQUIRED):**
    - THE VARIABLE SPEED DRIVES SHALL BE FULL WIDTH MODULATOR (VFD) TYPE, MICROPROCESSOR CONTROLLED DESIGN. UNIT SHALL BE THE VLT 6000 SERIES MANUFACTURED BY DANFOS OR EQUAL. THE VARIABLE SPEED DRIVE, INCLUDING ALL FACTORY INSTALLED OPTIONS, SHALL HAVE UL APPROVAL. ENCLOSURE SHALL BE NEMA 1 VENTILATED FOR INSTALLATION AS A WALL OR FREE STANDING RACK MOUNTED UNIT, DEPENDING ON THE AMP RATING. DRIVE SHALL BE EQUIPPED WITH AN INPUT DISCONNECT SWITCH AND FUSES TO PROTECT AGAINST GROUND FAULTS. A HAND-OFF-AUTOMATIC SWITCH AND SPEED POTENTIOMETER SHALL BE MOUNTED ON THE FRONT OF THE ENCLOSURE. VSD'S SHALL BE PROVIDED WITH PHASE LOSS PROTECTION. SPEED DRIVE SHALL UTILIZE A DIODE BRIDGE RECTIFIER TO CONVERT THREE PHASE AC TO A FIXED DC VOLTAGE. POWER FACTOR SHALL REMAIN ABOVE 0.95 REGARDLESS OF SPEED OR LOAD. VSDS EMPLOYING POWER FACTOR CORRECTION CAPACITORS SHALL NOT BE ACCEPTABLE. INSULATED GATE BIPOLAR TRANSISTORS SHALL BE USED IN THE INVERTER SECTION TO CONVERT THE FIXED DC VOLTAGE TO A THREE PHASE, ADJUSTABLE FREQUENCY. THE FOLLOWING CUSTOMER MODIFIABLE ADJUSTMENTS SHALL BE PROVIDED: ACCEL. TIME: 0.1 TO 1800 SECONDS; DECEL. TIME: 0.1 TO 1800 SECONDS; MINIMUM FREQUENCY: 0.2HZ; MAXIMUM FREQUENCY: 120.4HZ; ANALOG INPUT FREQ.: 0.1 TO 10 SECONDS; ANALOG OUTPUTS: 10 TO 10K VOLTS/HERTZ RATIO. PROVIDED WITH FUSED DISCONNECT FOR VSDS.
    - SPEED REFERENCE SIGNAL SHALL BE CUSTOMER SELECTABLE FOR 0-10 VDC AT 4-20 MA. THE VSD SHALL BE SUITABLE FOR ELEVATIONS TO 330 FEET ABOVE SEA LEVEL. SPEED REFERENCE SIGNAL TEMPERATURE SHALL BE 100 DEGREES F. THE VSD SHALL BE SUITABLE FOR OPERATION IN ENVIRONMENTS UP TO 95% NON-CONDENSING HUMIDITY. THE VSD SHALL BE CAPABLE OF DISPLAYING THE FOLLOWING INFORMATION IN PLAIN ENGLISH VIA A 40 CHARACTER ALPHANUMERIC DISPLAY: FREQUENCY, VOLTAGE, CURRENT, KILOWATTS PER HOUR, FAULT IDENTIFICATION, PERCENT TORQUE, PERCENT POWER, AND RPM. ALL VSDS SHALL BE WARRANTED FOR A PERIOD OF 24 MONTHS AFTER SHIPMENT. THIS WARRANTY SHALL COVER PARTS AND LABOR. VSDS SHALL BE COMPATIBLE AND COORDINATED TO OPERATE WITH THE CONTROL SYSTEM AS PROVIDED UNDER INSTRUMENTATION AND CONTROL FOR HVAC.
    - VARIABLE SPEED DRIVE BYPASS: THE VARIABLE SPEED DRIVE SYSTEM SHALL BE EQUIPPED WITH BYPASS FOR THE SYSTEM. BYPASS SHALL CONSIST OF A MAIN POWER DISCONNECT WITH GROUND FAULT PROTECTION, A PAIR OF INTERLOCKED CONTACTORS AND A MOTOR OVERLOAD RELAY. ALL ARE TO BE MOUNTED IN THE ENCLOSURE. BYPASS CONTACTORS SHALL BE EQUIPPED WITH THERMAL MOTOR OVERLOAD PROTECTION. A DRIVE-OFF-BYPASS SWITCH SHALL BE PROVIDED ON THE FRONT OF THE VSD ENCLOSURE.
    - INSTALL UNIT AND ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND NEC. VERIFY VARIABLE SPEED DRIVE IS BEING PROVIDED COMPATIBLE WITH THE ASSOCIATED MOTOR. VARIABLE SPEED DRIVES SHALL BE INSTALLED AND COORDINATED TO OPERATE AND COMMUNICATE WITH THE SYSTEM SPECIFIED IN INSTRUMENTATION AND CONTROL FOR HVAC.
  - AIR DISTRIBUTION (SHOP DRAWING REQUIRED):**
    - DUCT MATERIALS AND SEALANTS: EXCEPT FOR SYSTEMS SPECIFIED OTHERWISE, CONSTRUCT DUCTS, CASINGS, AND ACCESSORIES OF GALVANIZED SHEET STEEL, ASTM A 653, COATING G90.



**SPECIFICATIONS FOR HVAC WORK:**

**32. ENERGY RECOVERY VENTILATOR (SHOP DRAWING REQUIRED):**

- A. FURNISH AND INSTALL A FACTORY FABRICATED ENERGY RECOVERY VENTILATOR CONSISTING OF AN INSULATED METAL CABINET, ENERGY WHEEL, MOTORIZED INTAKE DAMPER, MOTORIZED EXHAUST DAMPER, SENSORS, FROST CONTROL, FILTER ASSEMBLY FOR INTAKE AND EXHAUST AIR, SUPPLY AIR BLOWER ASSEMBLY, EXHAUST AIR BLOWER ASSEMBLY AND AN ELECTRICAL CONTROL CENTER. ALL SPECIFIED COMPONENTS AND INTERNAL ACCESSORIES FACTORY INSTALLED AND TESTED AND PREPARED FOR SINGLE-POINT HIGH VOLTAGE CONNECTION.
- B. CABINET: FORMED DOUBLE WALL INSULATED METAL CABINET, FABRICATED TO PERMIT ACCESS TO INTERNAL COMPONENTS FOR MAINTENANCE. OUTSIDE CASING SHALL BE 18 GAUGE, GALVANIZED (G90) STEEL, MEETING ASTM A653 FOR COMPONENTS THAT DO NOT RECEIVE A PAINTED FINISH. UNITS EXTERIOR SHALL BE 260 GALVANEAL STEEL WITH PROPRIETARY PRE-PAINTED MATERIAL. FINISH COLOR: CONCRETE GRAY-RAI. 7023 (SALT SPRAY TEST PER ASTM-B117 AND EVALUATED USING ASTM-D714 AND ASTM-D610 2500 HOURS. INTERNAL ASSEMBLIES SHALL BE 16 GAUGE, GALVANIZED (G90) STEEL EXCEPT FOR MOTOR SUPPORTS WHICH SHALL BE MINIMUM 14 GAUGE GALVANIZED (G90) STEEL. ACCESS DOORS SHALL BE HINGED. UNIT SHALL HAVE FACTORY-INSTALLED DUCT FLANGES ON ALL DUCT OPENINGS. CABINET INSULATION SHALL COMPLY WITH NFPA 90A AND NFPA 90B AND EROSION REQUIREMENTS OF UL 181 AND SHALL BE FIBERGLASS TYPE, 1 INCH (25 MM) THICK, MAXIMUM FLAME SPREAD OF 25 AND SMOKE DEVELOPED OF 50. WHEN TESTED IN ACCORDANCE WITH ASTM C-411. INSULATION SHALL PROVIDE FULL COVERAGE OF ENTIRE CABINET EXTERIOR TO INCLUDE WALLS, ROOF AND FLOOR OF UNIT AND SHALL BE OF SEMI-RIGID TYPE AND INSTALLED BETWEEN INNER AND OUTER SHELLS OF ALL CABINET EXTERIOR COMPONENTS.
- C. ENERGY WHEEL: ENERGY WHEEL SHALL BE TOTAL ENTHALPY, ROTARY AIR-TO-AIR TYPE, AND SHALL BE AN ELEMENT OF A REMOVABLE ENERGY WHEEL CASSETTE. THE CASSETTE SHALL CONSIST OF A GALVANIZED STEEL FRAMEWORK, AN ENERGY WHEEL AS SPECIFIED AND A MOTOR AND DRIVE ASSEMBLY. THE CASSETTE SHALL INCORPORATE A PRE-TENSIONED DRIVE BELT. THE WHEEL MEDIA SHALL BE A POLYMER FILM MATRIX IN A STAINLESS STEEL FRAMEWORK AND BE COMPRISED OF INDIVIDUAL SEGMENTS THAT ARE REMOVABLE FOR SERVICING. NON-SEGMENTED ENERGY WHEELS ARE NOT ACCEPTABLE. SILICA GEL DESICCANT SHALL BE PERMANENTLY BONDED TO THE POLYMER FILM AND SHALL BE DESIGNED AND CONSTRUCTED TO PERMIT CLEANING AND SERVICING. THE ENERGY WHEEL IS TO HAVE A FIVE YEAR WARRANTY. PERFORMANCE CRITERIA ARE TO BE AS SPECIFIED IN AHRI STANDARD 106Q, COMPLYING WITH THE COMBINED EFFICIENCY DATA IN THE SUBMITTAL. FROST CONTROL SHALL BE MODULATING WHEEL TYPE. ECONOMIZER CONTROL SHALL BE STOP WHEEL TYPE.
- D. SUPPLY AIR AND EXHAUST AIR BLOWER ASSEMBLIES SHALL CONSIST OF AN ELECTRIC MOTOR AND A BELT DRIVEN BLOWER. ASSEMBLY SHALL BE MOUNTED ON HEAVY GAUGE GALVANIZED RAILS AND FURTHER MOUNTED ON 1.125 INCH THICK NEOPRENE VIBRATION ISOLATORS.
- E. CONTROL PANEL/CONNECTIONS: ENERGY RECOVERY VENTILATOR SHALL HAVE AN ELECTRICAL CONTROL CENTER WHERE ALL HIGH AND LOW VOLTAGE CONNECTIONS ARE MADE. CONTROL CENTER SHALL BE CONSTRUCTED TO PERMIT SINGLE-POINT HIGH VOLTAGE POWER SUPPLY CONNECTIONS
- F. [TIMED EXHAUST SHALL BE PROVIDED FOR FROST CONTROL OF THE ENERGY WHEEL. CONTROL SYSTEM SHALL INCLUDE AN OUTDOOR AIR THERMOSTAT AND PRESSURE SENSOR ON THE WHEEL ASSEMBLY TO INITIATE FROST CONTROL SEQUENCE]. MODULATING FROST CONTROL. CONTROL SYSTEM SHALL INCLUDE AN OUTDOOR AIR THERMOSTAT AND PRESSURE SENSOR ON THE WHEEL ASSEMBLY TO INITIATE FROST CONTROL SEQUENCE. PREHEATER SHALL BE PROVIDED FOR FROST CONTROL OF THE ENERGY WHEEL. PREHEATER ASSEMBLY SHALL INCLUDE A THERMOSTAT AND PRESSURE SENSOR ON THE WHEEL ASSEMBLY TO INITIATE FROST CONTROL SEQUENCE. PREHEATER SHALL COMPLY WITH UL 1996 AND BE CONSTRUCTED ON A GALVANIZED STEEL FRAME. (SEE FROST CONTROL APPLICATION IOM).
- G. MOTORIZED DAMPERS SHALL BE FACTORY INSTALLED INSULATED LOW LEAKAGE TYPE.
- H. SENSORS AND DEVICE CONTROLLERS AND SHALL BE FACTORY SUPPLIED AND INSTALLED.
- I. BLOWER SECTION (SUPPLY AIR AND EXHAUST AIR) SHALL BE BELT DRIVE MOTOR AND BLOWER AND SHALL BE ASSEMBLED ONTO A 14 GAUGE GALVANIZED STEEL PLATFORM WITH NEOPRENE VIBRATION ISOLATION PADS. BLOWER ASSEMBLIES SHALL BE STATIONARILY AND DYNAMICALLY BALANCED AND DESIGNED FOR CONTINUOUS OPERATION AT MAXIMUM RATED FAN SPEED AND HORSEPOWER. CENTRIFUGAL BLOWER HOUSING SHALL BE FORMED AND REINFORCED STEEL PANELS TO MAKE CURVED SCROLL HOUSING WITH SHAPED CUTOFF. FORWARD CURVED BLOWER (FAN) WHEELS SHALL BE GALVANIZED OR ALUMINUM CONSTRUCTION WITH INLET FLANGE AND SHALLOW BLADES CURVED FORWARD IN DIRECTION OF AIRFLOW AND MECHANICALLY ATTACHED TO SHAFT WITH SET SCREWS. BLOWER PERFORMANCE SHALL BE FACTORY TESTED FOR FLOW RATE, PRESSURE, POWER, AIR DENSITY, ROTATION SPEED, AND EFFICIENCY. RATINGS ARE TO BE ESTABLISHED IN ACCORDANCE WITH AMCA 210, "LABORATORY METHODS OF TESTING FANS FOR RATING".
- J. MOTORS: BLOWER MOTORS GREATER THAN ½ HORSEPOWER SHALL BE "NEMA PREMIUM™" UNLESS OTHERWISE INDICATED. MINIMUM COMPLIANCE WITH EPACT MINIMUM ENERGY EFFICIENCY STANDARDS FOR SINGLE SPEED ODP AND TEC ENCLOSURES IS NOT ACCEPTABLE. MOTORS SHALL BE HEAVY-DUTY, PERMANENTLY LUBRICATED TYPE TO MATCH THE FAN LOAD AND FURNISHED AT THE MOTOR FACE. PHASE AND ENCLOSURE DRIVES SHALL BE SIZED FOR A MINIMUM OF 150% OF DRIVEN HORSEPOWER AND PULLEYS SHALL BE FULLY MATCHED CAST-TYPE, KEVED AND FULLY SECURED TO THE FAN WHEEL AND MOTOR SHAFTS. ELECTRIC MOTORS OF TEN HORSEPOWER OR LESS SHALL BE SUPPLIED WITH AN ADJUSTABLE DRIVE PULLEY. COMPLY WITH REQUIREMENTS IN DIVISION 23 05 13, MATCHED WITH FAN LOAD. MOTORS SHALL BE CLE, 1 PHASE 208 VOLTS [60 CYCLE, 1 PHASE 230 VOLTS] [60 CYCLE, 3 PHASE 208 VOLTS] [60 CYCLE, 3 PHASE 230 VOLTS] [60 CYCLES, 3 PHASE 460 VOLTS] [60 CYCLE, 3 PHASE 575 VOLTS]. THE DESIGNATION "NEMA PREMIUM™" APPLIES TO ELECTRIC MOTORS WITH EFFICIENCIES THAT ARE "BETTER THAN EPACT". THE TERMS "HIGH EFFICIENCY" OR "PREMIUM EFFICIENCY" HAVE NO INDUSTRY DEFINITIONS.
- K. UNIT CONTROLS: THE UNIT SHALL BE CONSTRUCTED SO THAT IT CAN FUNCTION AS A STAND-ALONE HEATING AND COOLING SYSTEM CONTROLLED BY FACTORY SUPPLIED CONTROLLERS, THERMOSTATS, AND SENSORS OR IT CAN BE OPERATED AS A HEATING AND COOLING SYSTEM CONTROLLED BY A BUILDING MANAGEMENT SYSTEM (BMS). THIS UNIT SHALL BE CONTROLLED BY A FACTORY-INSTALLED MICROPROCESSOR PROGRAMMABLE CONTROLLER (DDC) THAT IS CONNECTED TO A BMS. UNIT SHALL INCORPORATE A DDC CONTROLLER WITH INTEGRAL LCD SCREEN THAT PROVIDES TEXT READOUTS OF STATUS, OPERATING SETTINGS, AND ALARM CONDITIONS. DDC CONTROLLER SHALL HAVE A BUILT-IN KEYPAD TO PERMIT OPERATOR TO ACCESS READ-OUT SCREENS AND CHANGE SETTINGS WITHOUT THE USE OF ANCILLARY EQUIPMENT. DEVICE SOFTWARE: THE USE OF EQUIPMENT OR SOFTWARE THAT IS NOT FACTORY-INSTALLED IN THIS UNIT ARE NOT ACCEPTABLE. ALARM READOUTS CONSISTING OF FLASHING LIGHT CODES ARE NOT ACCEPTABLE. THE DDC SHALL BE FACTORY-PROGRAMMED FOR BACNET MSTP/BACNET PFOR MONITORING OF THE UNITS STATUS AND POINTS AS INDICATED IN THE SEQUENCE OF CONTROLS.
- L. PROVIDE FACTORY INSTALLED SENSORS AS FOLLOWS: DIRTY FILTER SENSOR, TEMPERATURE SENSORS- OAI, EAW, RAI, OAD, OAAW, PESSURE SENSOR- OAW-P, OAF-P, EW-P, EF-P, CURRENT SENSOR- OAF-A, EF-A, AND ROTATION SENSOR.
- M. FILTERS: MERV 13 PLEATED FILTERS SHALL BE PROVIDED IN THE INTAKE AIR STREAM AND MERV8 PLEATED FILTERS IN THE EXHAUST AIR STREAM.

**33. CONTROLS (SHOP DRAWING REQUIRED):**

- A. THE CONTROLS SYSTEM SPECIFIED HERE-IN IS INTENDED TO INTERFACE WITH THE OWNER'S EXISTING TRENDS SYSTEM AND THE BACNET INTERFACE MODULE PROVIDED WITH THE NEW EQUIPMENT. NEW CONTROLLERS REQUIRED SHALL BE BY ALERTION WITH PROVISION FOR AUTOMATIC CONTROL FROM AND FULL COMMUNICATIONS WITH THE OWNER'S EXISTING CONTROL SYSTEM. THE EXTENT OF WHICH IS TO PROVIDE CONTROL FOR THE NEW POOL DEHUMIDIFICATION UNITS, WATER SOURCE HEAT PUMPS, CLOSED CIRCUIT COOLER, PUMPS, AND ASSOCIATED ACCESSORIES IN THE SEQUENCE OF OPERATION SHOWN ON SHEET M-11. EXISTING CONTROL WIRING DETERMINED TO BE IN ACCEPTABLE CONDITION MAY BE REUSED AT THE DISCRETION OF THE OWNER.
- B. THE BASIATC SYSTEM SHALL BE SUPPLIED AND INSTALLED COMPLETELY UNDER THE BASIATC CONTRACT. CONTROL COMPONENTS SHALL BE MOUNTED AND WIRED BY THE BASIATC CONTRACTOR. REFER TO SPECIAL PROJECT NOTES, SHEET M-1 FOR INSTALLATION COORDINATION WITH THE OWNER, THE ENGINEERING, INSTALLATION, CALIBRATION, SOFTWARE PROGRAMMING AND CHECKOUT NECESSARY FOR COMPLETE AND FULLY OPERATIONAL BASIATC SYSTEMS, AS SPECIFIED HEREAFTER, SHALL BE PROVIDED BY THE BASIATC CONTRACTOR.
- C. IT SHALL BE THE RESPONSIBILITY OF THE BASIATC CONTRACTOR TO FULLY COORDINATE WITH ALL EQUIPMENT SUPPLIERS TO PROVIDE A COMPLETE FUNCTIONAL CONTROL SYSTEM AS DESCRIBED IN THE SEQUENCE OF CONTROL SHOWN ON SHEET M-1.
- D. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING PROPER CONTROL FOR ALL AREAS THAT ARE TO BE OCCUPIED DURING THE INSTALLATION OF THE NEW WORK. PHASING OF THE NEW WORK SHALL BE COORDINATED WITH THE OWNER.
- E. PROVIDE THE OWNER'S PERSONNEL DIRECT ACCESS TO ALL SOFTWARE COMPONENTS NECESSARY FOR THE OWNER'S PERSONNEL TO DESIGN, ENGINEER, CONFIGURE, AND MAINTAIN PROJECTS OR WORK USING THE MANUFACTURER'S PRODUCTS. SOFTWARE COMPONENTS INCLUDED, BUT ARE NOT LIMITED TO, ENGINEERING SOFTWARE FOR DEVELOPING LIVE AND INTERACTIVE ENGINEERING DRAWINGS OF CONTROLLERS, SERVER CONFIGURATION SOFTWARE, DATABASE CONFIGURATION SOFTWARE, AND WEB APPLICATIONS.
- F. PROVIDE THE OWNER'S PERSONNEL DIRECT ACCESS TO TECHNICAL SUPPORT INFORMATION, INCLUDING, BUT NOT LIMITED TO, TECHNICAL SUPPORT CASES, PRODUCT BRIEFINGS, AND SOFTWARE UPDATES.
- G. APPLICATION SPECIFIC CONTROLLERS SHALL PROVIDE DISTRIBUTED, PRE-ENGINEERED CONTROL SPECIFIC TO THE MECHANICAL EQUIPMENT SPECIFIED. CUSTOM APPLICATION CONTROLLERS WITH DISTRIBUTED CUSTOM PROGRAMMING CAPABILITY SHALL PROVIDE CONTROL FOR NON-STANDARD CONTROL SEQUENCES. THE DATA COMMUNICATIONS CAPABILITY SHALL ALLOW DATA TO BE SHARED BETWEEN THE VARIOUS CONTROLLERS IN THE ARCHITECTURE. THE SYSTEM SOFTWARE SHALL INCLUDE SYSTEM SOFTWARE FOR THE GLOBAL APPLICATION FUNCTIONS, APPLICATION SOFTWARE FOR DISTRIBUTED CONTROLLERS, AND OPERATOR INTERFACE SOFTWARE END DEVICES SUCH AS SENSORS,

ACTUATORS, DAMPERS AND RELAYS. THE FAILURE OF ANY SINGLE COMPONENT SHALL NOT INTERRUPT THE CONTROL STRATEGIES OF OTHER OPERATIONAL DEVICES. SYSTEM EXPANSION SHALL BE THROUGH THE ADDITION OF END DEVICES, CONTROLLERS, AND OTHER DEVICES DESCRIBED IN THIS SPECIFICATION. COMMUNICATION: ALL SYSTEM APPLICATION CONTROLLERS AND THE OPERATOR WORKSTATION SHALL COMMUNICATE VIA BACNET AND SHALL BE CONTROLLED FROM AND FULLY COMMUNICATE WITH THE OWNER'S EXISTING BUILDING AUTOMATION SYSTEM. WHERE FACTORY MOUNTED CONTROLLERS ARE PROVIDED BY EQUIPMENT MANUFACTURERS, THE CONTROLS CONTRACTOR SHALL COORDINATE WITH THE EQUIPMENT MANUFACTURER TO PROVIDE HARDWARE AND SOFTWARE REQUIRED FOR CONTROL AND COMMUNICATION WITH THE OWNER'S EXISTING BUILDING AUTOMATION SYSTEM.

H. SUBMITTALS: THE FOLLOWING DATA/INFORMATION SHALL BE SUBMITTED FOR APPROVAL: COMPLETE CONTROL SEQUENCE AND POINTS LIST, CONTROL SYSTEM CAPABILITY INCLUDING ALL PERTINENT DATA TO PROVIDE A FUNCTIONAL OPERATING SYSTEM, AS WELL AS POINT TO POINT WIRING DIAGRAMS, DAMPER SCHEDULES SHOWING ALL DAMPER SIZES AND CONFIGURATION FOR MOTORIZED DAMPERS, DATA SHEETS FOR ALL HARDWARE AND SOFTWARE CONTROL COMPONENTS, A DESCRIPTION OF THE INSTALLATION MATERIALS INCLUDING CONDUIT, WIRE, FLEX, ETC., PANEL LOCATIONS, PROVIDE AS PART OF THE SUBMITTAL EIGHT COPIES OF ALL DATA AND CONTROL DRAWINGS.

I. APPLICATION SPECIFIC CONTROLLER: APPLICATION SPECIFIC CONTROLLERS SHALL BE STANDALONE, MICROPROCESSOR BASED DIRECT DIGITAL CONTROLLERS WITH SUFFICIENT MEMORY TO HANDLE ITS OPERATING SYSTEM, DATABASE AND PROGRAMMING REQUIREMENTS. THE CONTROLLER SHALL BE FULLY TESTED UPON INSTALLATION TO ENSURE THAT IT IS PROPERLY MATCHED TO THE EQUIPMENT IT IS CONTROLLING. THE SYSTEM APPLICATION CONTROLLERS SHALL BE THE LATEST GENERATION PRODUCT LINE UTILIZING OPEN PROTOCOL COMMUNICATION. COMMUNICATION SHALL USE BACNET PROTOCOLS ONLY. NO PROPRIETARY SYSTEMS SHALL BE ACCEPTABLE. THE CONTROLLER SHALL COMMUNICATE WITH OTHER DEVICES ON THE COMMUNICATION NETWORK AND BE FULLY INTEGRATED WITH THE OTHER SYSTEM COMPONENTS.

J. INPUT/OUTPUT INTERFACE: HARDWIRED INPUTS AND OUTPUTS MAY TIE INTO THE SYSTEM THROUGH APPLICATION SPECIFIC CONTROLLERS. SLAVE DEVICES ARE NOT ACCEPTABLE. ALL STATUS POINTS SHOWN ON THE POINT LIST SHALL BE POSITIVE PROOF CURRENT SENSING BINARY SWITCHES. ANALOG OUTPUTS SHALL PROVIDE A MODULATING SIGNAL FOR THE CONTROL OF END DEVICES. OUTPUTS SHALL PROVIDE A 0 OR 10 VDC SIGNAL AS REQUIRED TO PROPER CONTROL OF THE OUTPUT DEVICE.

K. SYSTEM SECURITY: USER ACCESS SHALL BE SECURED USING INDIVIDUAL SECURITY PASSWORDS FOR A MINIMUM OF 500 USERS. PASSWORDS SHALL HAVE AT LEAST THREE LEVELS OF USER ACCESS WITH DATA ENTRY RESTRICTIONS BEING ASSIGNABLE BY PASSWORD.

L. ALARMS: THE BUILDING AUTOMATION SYSTEM SHALL PROVIDE ALARM POINTS OVER NETWORK IP FOR REMOTE EQUIPMENT FAILURE, EQUIPMENT RUN TIME, NUMBER OF START/STOPS, PROGRAM FAILURE, CARD FAILURE, AND SENSOR FAILURE. WHEN AN ALARM STATE IS DETECTED, THE ALARM SHALL AUTOMATICALLY BE STORED AND THE USER NOTIFIED BY SENDING THE ALARM MESSAGE TO THE EXISTING HEAD END WORKSTATION. CONTROLLERS SHALL AUTOMATICALLY COMMUNICATE WITH OPERATOR WORKSTATIONS TO REPORT ALARMS, AND UPLOAD HISTORICAL DATA AND REPORTS. IN THE EVENT THAT THE CONTROLLER IS UNABLE TO CONNECT WITH THE WORKSTATION, IT SHALL CONTINUE TO ATTEMPT COMMUNICATION ON A PREDETERMINED INTERVAL UNTIL COMMUNICATION IS SUCCESSFUL.

M. ENERGY MANAGEMENT SOFTWARE: THE FOLLOWING ENERGY MANAGEMENT CAPABILITIES SHALL BE FURNISHED STANDARD AS PART OF THE BUILDING AUTOMATION SYSTEM.

SCHEDULING: THE SCHEDULING PROGRAM SHALL HAVE A MINIMUM OF 32 NAMED MASTER SCHEDULES. EACH MASTER SCHEDULE SHALL HAVE A MINIMUM OF EIGHT DAY SCHEDULES (SEVEN PLUS HOLIDAYS).

OPTIMUM START/STOP: AN OPTIMUM START/STOP PROGRAM SHALL DETERMINE THE REQUIRED EQUIPMENT START/STOP TIMING BY APPLYING INSIDE/OUTSIDE TEMPERATURE INFORMATION TO THE USER'S TIME OF DAY SCHEDULE.

MORNING WARM-UP/COOL-DOWN: A SCHEDULING PROGRAM ALLOWING OPERATION OF EQUIPMENT TO BRING ROOM TEMPERATURES TO SETPOINT WITH THE OUTDOOR AIR DAMPERS CLOSED.

DEMAND LIMITING: THE DEMAND LIMITING PROGRAM SHALL BE BASED ON A PREDICTIVE SLIDING WINDOW ALGORITHM. THE PROGRAM SHALL BE SELF-ADJUSTING AND SHALL CONTROL A MINIMUM OF TWO INDEPENDENT DEMAND LIMITING APPLICATIONS.

N. BUILDING MANAGEMENT SOFTWARE: THE FOLLOWING BUILDING MANAGEMENT CAPABILITIES SHALL BE FURNISHED AS PART OF THE BUILDING AUTOMATION SYSTEM.

TIMED OVERRIDE: A TIMED OVERRIDE PROGRAM SHALL BE PROVIDED TO ENABLE THE BUILDING OPERATOR TO SET UP DEVICES OR GROUPS OF DEVICE TO BE TEMPORARILY TURNED ON FOR DEFINED PERIOD OF TIME BASED ON BINARY INPUTS, ANALOG INPUTS, OR CRT INPUTS.

DIRECT DIGITAL CONTROL: THE DIRECT DIGITAL CONTROL PROGRAM SHALL ALLOW MODULATING CONTROL OF REMOTE DEVICES BASED ON SENSED DATA. STANDARD CONTROL STRATEGIES SHALL INCLUDE PROPORTIONAL, PROPORTIONAL PLUS INTEGRAL, AND PROPORTIONAL PLUS INTEGRAL PLUS DERIVATIVE CONTROL.

CUSTOM PROGRAMMING LANGUAGE: A CUSTOM CONTROL LANGUAGE CAPABILITY SHALL BE PROVIDED TO ALLOW THE OPERATOR TO CREATE REAL TIME, EQUATION BASED, CUSTOMER CONTROL ROUTINES. EQUATION OPERATIONS SHALL INCLUDE MATH FUNCTIONS SUCH AS ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION, SQUARE ROOT, MINIMUM, MAXIMUM AND AVERAGE. LOGICAL FUNCTIONS SUCH AS GREATER THAN, LESS THAN, EQUAL TO, NOT EQUAL TO, LESS THAN OR EQUAL TO, GREATER THAN OR EQUAL TO, VARIABLE TIMING AND DELAYS SHALL ALSO BE ALLOWED.

REPORTS AND LOGS: THE SYSTEM SHALL INCLUDE THE CAPABILITY TO STORE, REVIEW AND PRINT THE FOLLOWING REPORTS AND LOGS. IN ADDITION, IF A PC INTERFACE IS SPECIFIED, THESE REPORTS SHALL BE SAVED TO DISKETTE AS AN ASCII FILE FOR USE BY OTHER OWNER FURNISHED SOFTWARE PACKAGES.

CUSTOM REPORT CAPABILITY: THE BUILDING OPERATOR SHALL BE PROVIDED WITH A SIMPLE METHOD OF CREATING CUSTOM REPORTS.

ANTI-RECYCLE TIMER PROTECTION: A SOFTWARE PROGRAM SHALL BE PROVIDED TO ALLOW EACH INDIVIDUAL PIECE OF HVAC EQUIPMENT TO BE INDIVIDUALLY PROGRAMMABLE WITH "MINIMUM ON" AND "MINIMUM OFF" TIMERS TO PROTECT HVAC EQUIPMENT FROM RAPID CYCLING DUE TO SYSTEM OR OPERATOR ERROR.

DIAGNOSTICS: A SYSTEM SELF-TEST SHALL BE PROVIDED. ON SELF-TEST INITIATION, PANELS FAILING TO RESPOND SHALL BE IDENTIFIED ON THE PRINTER.

CUSTOM PROGRAMMING REQUIREMENTS: A USER FRIENDLY CUSTOM DDC PROGRAMMING UTILITY SHALL BE PROVIDED TO ALLOW THE BUILDING OPERATOR TO TAILOR THE SYSTEM TO MEET INDIVIDUAL NEEDS AND RESPOND TO CHANGING BUILDING REQUIREMENTS.

THE BUILDING OPERATOR SHALL BE ABLE TO CREATE CUSTOM DDC ROUTINES USING ANALOG AND BINARY POINT VALUES, ALARM STATES, CONSTANTS AND SHARED VARIABLES TO PERFORM CALCULATIONS. THE RESULTS OF THESE CALCULATIONS SHALL BE USED TO CONTROL BINARY CONTROL POINTS. BINARY CONTROL POINTS SHALL BE USED TO OPERATE OTHER CONTROL FUNCTIONS. THE BUILDING OPERATOR SHALL BE ABLE TO DOWNLOAD THESE ROUTINES TO THE SYSTEM OR CUSTOM APPLICATION CONTROLLERS EITHER VIA DIRECT CONNECT, OR THROUGH A PORTABLE OPERATOR INTERFACE.

O. AUXILIARY CONTROL DEVICES: VALVE ACTUATORS 1/2" TO 6"; MECHANICAL NON-SPRING RETURN ACTUATORS FOR VAV HEATING COILS SHALL BE BELIMO - NO SUBSTITUTES. THE VALVE ACTUATOR SHALL BE CAPABLE OF PROVIDING THE MINIMUM TORQUE REQUIRED FOR PROPER VALVE CLOSE OFF FOR THE REQUIRED APPLICATION. ALL CONTROL VALVES ACTUATORS SHALL HAVE AN ATTACHED 3-FOOT CABLE FOR EASY INSTALLATION TO A JUNCTION BOX. OVERRIDE HANDLES AND GEARBOX RELEASE SHALL BE PROVIDED FOR ALL NON-SPRING RETURN VALVE ACTUATORS. VALVES FOR WATER SOURCE HEAT PUMP UNITS AND POOL DEHUMIDIFICATION UNITS SHALL BE FAST OPENING AND SLOW CLOSING TYPE.

TEMPERATURE SENSORS: TEMPERATURE SENSORS SHALL BE RESISTANCE TEMPERATURE DETECTOR (RTD) OR THERMISTOR AS DICTATED BY THE REQUIREMENTS OF THIS SPECIFICATION. ACCURACIES SHALL BE +/- 1 DEG. F. FOR STANDARD APPLICATIONS. WHERE HIGH ACCURACY IS REQUIRED, ACCURACIES SHALL BE +/- 2 DEG. F.

OUTSIDE AIR TEMPERATURE SENSORS: THERMISTOR TEMPERATURE SENSORS WITH AN ACCURACY OF +/- 0.2 DEG. C. OUTSIDE AIR SENSORS SHALL INCLUDE AN INTEGRAL SUN SHIELD.

CURRENT SENSITIVE SWITCHES: SOLID STATE, SPLIT CORE CURRENT SWITCH THAT OPERATES WHEN THE CURRENT LEVEL (SENSED BY THE INTERNAL CURRENT TRANSFORMER) EXCEEDS THE ADJUSTABLE TRIP POINT. CURRENT SWITCH TO INCLUDE AN INTEGRAL LED FOR INDICATION OF TRIP CONDITION AND A CURRENT LEVEL BELOW TRIP SET POINT.

HIGH LIMIT THERMOSTATS: HIGH LIMIT THERMOSTATS SHALL BE MANUAL RESET TYPE SET AT 120 DEG. F.

LOW LIMIT THERMOSTATS: SAFETY LOW LIMIT THERMOSTATS SHALL BE VAPOR PRESSURE TYPE WITH A 20 FOOT MINIMUM ELEMENT. ELEMENT SHALL RESPOND TO THE LOWEST TEMPERATURE SENSORED BY ANY ONE FOOT LOW LIMIT SHALL BE MANUAL RESET ONLY.

P. WIRING: PROVIDE WIRING AND MISCELLANEOUS APPURTENANCES FOR A COMPLETE SYSTEM. WIRING SHALL BE CONCEALED IN CONDUIT IN MECHANICAL ROOMS AND PLENUM RATED CABLING SHALL BE USED WHERE ACCESSIBLE.

WIRING DIAGRAMS FOR POWER AND CONTROL WIRING AND CONTROL PANELS SHALL BE INCLUDED IN THE BAS SHOP DRAWINGS.

Q. INSTALLATION REQUIREMENTS: ALL ELECTRICAL WORK PERFORMED IN THE INSTALLATION OF THE BASIATC SYSTEM AS DESCRIBED IN THIS SPECIFICATION SHALL BE PER THE NATIONAL ELECTRICAL CODE (NEC) AND PER APPLICABLE STATE

AND LOCAL CODES. WHERE EXPOSED, CONDUIT SHALL BE RUN PARALLEL TO BUILDING LINES PROPERLY SUPPORTED AND SIZED AT A MAXIMUM OF 40% FILL. INSTALL WIRING AS HERE-IN-BEFORE SPECIFIED.

IN NO CASES SHALL FIELD INSTALLED CONDUIT SMALLER THAN 1/2" TRADE SIZE BE ALLOWED. WHERE CONDUCTORS ARE CONCEALED, CABLE RATED FOR USE IN RETURN AIR PLENUMS SHALL BE USED WITHOUT EMIT OR CONDUIT.

THE ATC CONTRACTOR SHALL PROVIDE COORDINATION TO ASSIST THE TESTING AND BALANCING CONTRACTOR.

R. OWNER TRAINING: THE BASIATC CONTRACTOR SHALL PROVIDE THREE COPIES OF AN OPERATOR'S MANUAL DESCRIBING ALL OPERATING AND ROUTINE MAINTENANCE SERVICE PROCEDURES TO BE USED WITH THE TEMPERATURE CONTROL AND BUILDING AUTOMATION SYSTEM SUPPLIED. THIS CONTRACTOR SHALL INSTRUCT THE OWNER'S DESIGNATED REPRESENTATIVES IN THESE PROCEDURES DURING THE STARTUP AND TEST PERIOD. THE DURATION OF THE INSTRUCTION PERIOD SHALL BE NO LESS THAN 24 HOURS, DURING NORMAL WORKING HOURS. PROVIDE FOLLOW-UP EIGHT (8) HOUR INSTRUCTION PERIOD TO BE SCHEDULED SIX (6) MONTHS AFTER INITIAL TRAINING.

S. SERVICE AND GUARANTEE - THE CONTROL SYSTEM UPGRADES SHALL BE SERVICED AND MAINTAINED IN FIRST-CLASS CONDITION BY THE CONTROL MANUFACTURER FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE AT NO EXTRA COST TO THE OWNER.

**34. SEQUENCES OF CONTROL:**

A. WATER SOURCE HEAT PUMP SYSTEM: CLOSED CIRCUIT COOLER (CT-) - ON A RISE IN LOOP TEMPERATURE ABOVE 84°F (ADJUSTABLE) LEAVING THE COOLER, THE BAS SHALL CLOSE THE STARTER CIRCUIT TO THE EVAPORATIVE COOLER SPRAY PUMP MOTOR AND THE COOLER DISCHARGE DAMPER SHALL OPEN. ON A RISE IN LOOP TEMPERATURE ABOVE 86°F (ADJUSTABLE) LEAVING THE COOLER, THE BAS SHALL ENABLE THE COOLER FAN THROUGH ITS VFD TO VARY THE FAN SPEED AS REQUIRED TO MAINTAIN LOOP TEMPERATURE; MAXIMUM 90°F (ADJUSTABLE). ON A FALL IN LOOP TEMPERATURE, THE REVERSE SHALL OCCUR.

BOILER/SUPPLEMENTAL HEAT - ON A FALL IN LOOP TEMPERATURE BELOW 70°F (ADJUSTABLE), THE BAS SHALL ENABLE THE EXISTING HEATING WATER BOILER TO MODULATE THROUGH ITS OPERATING AND SAFETY CONTROLS TO MAINTAIN MINIMUM LOOP TEMPERATURE OF 70°F DURING THE HEATING SEASON.

SAFETIES - BAS SAFETY AND ALARM FUNCTIONS SHALL PROVIDE FOR THE FOLLOWING AT MINIMUM: LOSS OF LOOP WATER FLOW SHALL DE-ACTIVATE ALL STAGES OF CONTROL AND ALARM THE BAS. PUMP, FANS, AND SUPPLEMENTAL HEAT SHALL NOT OPERATE UNTIL FLOW IS PROVEN AND SHALL STOP UPON LOSS OF FLOW. WHEN FLOW IS PROVEN OR RESTORED OR IN THE EVENT OF A POWER INTERRUPTION, ALL WATER SOURCE HEAT PUMP UNITS SHALL BE STAGED TO LIMIT MURSH CURRENT. THE BAS SHALL ALARM WHEN THE LOOP TEMPERATURE FALLS BELOW 57°F (ADJUSTABLE), THE BAS SHALL ALARM WHEN THE LOOP TEMPERATURE RISES ABOVE 105°F (ADJUSTABLE).

B. CONDENSER WATER PUMPS (CDP-): THE CONDENSER WATER PUMPS SHALL OPERATE IN CONJUNCTION WITH THE WATER SOURCE HEAT PUMP SYSTEM TO PROVIDE CONDENSER WATER FLOW TO THE POOL DEHUMIDIFICATION UNITS (POU) AND THE WATER SOURCE HEAT PUMP UNITS (WSPH). CDP'S SHALL BE CONTROLLED THROUGH THE BAS. THE BAS SHALL ENABLE THE CDP TO OPERATE THROUGH ITS VFD UPON A CALL FOR HEATING OR COOLING FROM ANY WSPH OR PDU. THE BAS SHALL MODULATE THE VFD SPEED TO MAINTAIN SYSTEM DIFFERENTIAL PRESSURE SET POINT AS INDICATED BY THE SYSTEM DIFFERENTIAL PRESSURE SENSOR. THE BAS SHALL MAINTAIN A TIME LOG OF HOURS OF OPERATION FOR EACH PUMP AND EACH LEAD PUMP STATUS SHALL BE ALTERNATED EVERY 40 HOURS (ADJUSTABLE) OF OPERATION. ON A FAILURE OF THE LEAD PUMP TO START, THE SECONDARY PUMP SHALL BE ENERGIZED AND AN ALARM SENT TO THE BAS. ON A SIGNAL FROM THE BAS, INDICATING OUTSIDE AIR TEMPERATURE IS BELOW 20°F (ADJUSTABLE), THE LEAD PUMP SHALL BE ENERGIZED AT A MINIMUM SPEED TO MAINTAIN CONDENSER WATER FLOW THROUGH THE WSPH AND PDU UNITS.

C. WATER SOURCE HEAT PUMP UNITS (WSPH-):

UNITS SHALL BE ENABLED BY THE BAS TO OPERATE THROUGH THEIR FACTORY INSTALLED MICROPROCESSOR CONTROLS TO PROVIDE HEATING, COOLING, AND DEHUMIDIFICATION FOR THE OFFICES AND ANCILLARY SPACES THAT THEY SERVE. THE BAS SHALL COMMUNICATE WITH EACH UNIT TO PROVIDE STATUS AND DIAGNOSTIC INFORMATION FROM THE UNIT FOR MONITORING AND ALARMS. THE BAS MANUFACTURER SHALL PROVIDE ANY AND ALL ADDITIONAL POINTS, HARDWARE, SOFTWARE, AND ACCESSORIES REQUIRED TO MEET THE SEQUENCE OF CONTROLS.

OCCUPIED MODE: ON A SIGNAL FROM THE BAS (BASED ON OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN OCCUPIED MODE. THE OUTSIDE AIR DAMPER SHALL OPEN, THE RETURN DAMPER SHALL MODULATE CLOSED PROPORTIONALLY AND THE UNIT SHALL OPERATE AS NEEDED IN COOLING OR HEATING MODE TO MAINTAIN OCCUPIED MODE SPACE TEMPERATURE SET-POINTS (ADJUSTABLE); 70°F HEATING AND 75°F COOLING.

UNOCCUPIED MODE: ON A SIGNAL FROM THE BAS, (BASED ON THE OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN UNOCCUPIED MODE. THE OUTSIDE AIR DAMPER SHALL CLOSE, THE RETURN AIR DAMPER SHALL OPEN, AND THE UNIT SHALL CYCLE AS NEEDED IN COOLING OR HEATING MODE TO MAINTAIN UNOCCUPIED MODE SPACE TEMPERATURE SETPOINTS (ADJUSTABLE); 68°F HEATING AND 85°F COOLING.

AFTER-HOURS OCCUPANCY: ON A SIGNAL FROM THE BAS INDICATING THAT THE SPACE OCCUPANCY OVER-RIDE HAS BEEN ENABLED, THE UNIT SHALL BE PLACED IN OCCUPIED MODE FOR A PERIOD OF TWO HOURS (ADJUSTABLE).

COOLING MODE: ON A RISE IN SPACE TEMPERATURE ABOVE THE SETPOINT, THE UNIT SHALL BE PLACED IN COOLING MODE. THE SUPPLY FAN SHALL BE ENERGIZED AND THE TWO WAY CONDENSER WATER VALVE SHALL OPEN. UPON PROOF OF WATER FLOW, THE REVERSING VALVE SHALL BE INDEXED TO THE COOLING POSITION AND THE COMPRESSOR(S) SHALL BE ENERGIZED. ON A CONTINUED RISE IN SPACE TEMPERATURE ABOVE THE SET-POINT (TWO-STAGE UNITS ONLY), THE SUPPLY FAN SHALL OPERATE ON HIGH SPEED AND THE SECOND COMPRESSOR STAGE SHALL BE ENERGIZED.

DEHUMIDIFICATION: ON A CALL FOR DEHUMIDIFICATION, AS SENSED BY THE RETURN AIR HUMIDITY SENSOR IN THE RETURN AIR DUCTWORK, THE UNIT MICROPROCESSOR CONTROLLER SHALL ENERGIZE THE UNIT HOT GAS RE-HEAT TO PREVENT OVER-COOLING THE SPACE.

HEATING MODE: ON A FALL IN SPACE TEMPERATURE BELOW THE SETPOINT, THE UNIT SHALL BE PLACED IN HEATING MODE. THE SUPPLY FAN SHALL BE ENERGIZED, AND THE TWO-WAY CONDENSER WATER CONTROL VALVE SHALL OPEN. UPON PROOF OF FLOW, THE REVERSING VALVE SHALL BE INDEXED TO THE HEATING POSITION AND THE COMPRESSOR SHALL BE ENERGIZED. ON A CONTINUED FALL IN SPACE TEMPERATURE BELOW THE SETPOINT (TWO STAGE UNITS ONLY), THE SUPPLY FAN SHALL OPERATE ON HIGH SPEED AND THE SECOND COMPRESSOR STAGE SHALL BE ENERGIZED.

MORNING WARM-UP/COOL-DOWN: UNIT SHALL BE ENERGIZED PRIOR TO OCCUPANCY AND PLACED IN THE APPROPRIATE COOLING OR HEATING MODE SO THAT OCCUPIED SPACE TEMPERATURE SETPOINT SHALL BE ACHIEVED PRIOR TO THE SCHEDULED OCCUPANCY. OPTIMAL RUN-TIME REQUIRED FOR WARM-UP/COOL-DOWN MODE SHALL BE DETERMINED BY THE BAS.

SAFETIES: ON A SIGNAL OF ANY MECHANICAL FAULT OR FAILURE, AS INDICATED BY THE UNIT MICROPROCESSOR CONTROLLER (EX HEAD PRESSURE, COMPRESSOR FAILURE, ETC.), AN ALARM SHALL BE SENT BY THE BAS. ON A FAILURE TO MAINTAIN SPACE TEMPERATURE, AN ALARM SHALL BE SENT BY THE BAS. ON A DETECTION OF CONDENSATE BACK-UP, AS INDICATED BY THE CONDENSATE OVERFLOW SENSOR, THE UNIT SHALL BE DISABLED.

D. POOL DEHUMIDIFICATION UNITS (POU)- UNITS SHALL BE ENABLED BY THE BAS TO OPERATE THROUGH THEIR FACTORY INSTALLED MICROPROCESSOR CONTROLS TO PROVIDE HEATING, COOLING, DEHUMIDIFICATION, AND POOL WATER HEATING FOR THE NATATORIUM. THE BAS SHALL INTEGRATE THE OPERATION OF THE MICRO-PROCESSOR CONTROLLERS OF THE FOUR PDUS TO OPERATE SIMULTANEOUSLY.

THE BAS SHALL COMMUNICATE WITH EACH UNIT TO PROVIDE STATUS AND DIAGNOSTIC INFORMATION FROM THE UNITS FOR MONITORING AND ALARMS. THE BAS MANUFACTURER SHALL PROVIDE ANY AND ALL ADDITIONAL POINTS, HARDWARE, SOFTWARE, AND ACCESSORIES REQUIRED TO MEET THE SEQUENCE OF CONTROLS THAT ARE NOT ALREADY INCLUDED IN THE FACTORY PROVIDED MICROPROCESSOR CONTROLLER.

OCCUPIED MODE: ON A SIGNAL FROM THE BAS (BASED ON OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN OCCUPIED MODE AND SHALL OPERATE AS NEEDED IN COOLING OR HEATING MODE TO MAINTAIN OCCUPIED MODE SPACE TEMPERATURE AND HUMIDITY SET-POINTS (ADJUSTABLE). THE OUTSIDE AIR DAMPERS SHALL BE OPENED AND THE RETURN AIR DAMPERS SHALL MODULATE CLOSED PROPORTIONALLY.

UNOCCUPIED MODE: ON A SIGNAL FROM THE BAS, (BASED ON THE OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN UNOCCUPIED MODE AND SHALL OPERATE AS NEEDED IN COOLING OR HEATING MODE TO MAINTAIN UNOCCUPIED MODE SPACE TEMPERATURE SETPOINTS (ADJUSTABLE). THE OUTSIDE AIR DAMPERS SHALL BE CLOSED AND THE RETURN AIR DAMPERS SHALL BE FULLY OPEN.

AFTER-HOURS OCCUPANCY: ON A SIGNAL FROM THE BAS INDICATING THAT THE SPACE OCCUPANCY OVER-RIDE HAS BEEN ENABLED, THE UNIT SHALL BE PLACED IN OCCUPIED MODE FOR A PERIOD OF TWO HOURS (ADJUSTABLE).

COOLING MODE: ON A RISE IN SPACE TEMPERATURE ABOVE THE SETPOINT, THE UNITS SHALL BE PLACED IN COOLING MODE. THE TWO WAY CONDENSER WATER VALVE SHALL OPEN. UPON PROOF OF WATER FLOW, THE COMPRESSORS SHALL BE ENERGIZED AND STAGED TO MAINTAIN COOLING SET-POINT.

POOL WATER HEATING: UPON A CALL FOR POOL WATER HEATING WHEN THE COMPRESSORS ARE OPERATING (DURING COOLING OR DEHUMIDIFICATION), POOL WATER CONDENSERS WILL BE ENERGIZED AS THE FIRST STAGE.

DEHUMIDIFICATION: ON A CALL FOR DEHUMIDIFICATION, AS SENSED BY THE SPACE HUMIDITY SENSOR, THE UNIT MICROPROCESSOR CONTROLLER SHALL ENERGIZE AND MODULATE THE UNIT HOT GAS RE-HEAT TO PREVENT OVER-COOLING THE SPACE.

HEATING MODE: ON A FALL IN SPACE TEMPERATURE BELOW THE SETPOINT, THE UNIT SHALL BE PLACED IN HEATING MODE. THE TWO-WAY CONDENSER WATER CONTROL VALVE SHALL BE CLOSED. THE BAS SHALL MODULATE THE HEATING WATER CONTROL VALVE TO THE HEATING WATER COIL TO MAINTAIN SPACE TEMPERATURE SET-POINT.

MORNING WARM-UP/COOL-DOWN: UNIT SHALL BE ENERGIZED PRIOR TO OCCUPANCY AND PLACED IN THE APPROPRIATE COOLING OR HEATING MODE SO THAT OCCUPIED SPACE TEMPERATURE SETPOINT SHALL BE ACHIEVED PRIOR TO THE SCHEDULED OCCUPANCY. OPTIMAL RUN-TIME REQUIRED FOR WARM-UP/COOL-DOWN MODE SHALL BE DETERMINED BY THE BAS.

SAFETIES: ON A SIGNAL OF ANY MECHANICAL FAULT OR FAILURE, AS INDICATED BY THE UNIT MICROPROCESSOR CONTROLLER (EX HEAD PRESSURE, COMPRESSOR FAILURE, ETC.), AN ALARM SHALL BE SENT BY THE BAS. ON A FAILURE TO MAINTAIN SPACE TEMPERATURE, AN ALARM SHALL BE SENT BY THE BAS. ON A DETECTION OF CONDENSATE BACK-UP, AS INDICATED BY THE CONDENSATE OVERFLOW SENSOR, THE UNIT SHALL BE DISABLED.

SYSTEM GRAPHICS: IN ADDITION TO THE ABOVE SEQUENCE, THE FOLLOWING POINTS SHALL BE PROVIDED IN THE GRAPHIC DISPLAY FOR MONITORING AND CONTROL: OUTDOOR AIR TEMPERATURE AND HUMIDITY, SUPPLY AIR TEMPERATURE (EACH UNIT), SPACE TEMPERATURE AND RELATIVE HUMIDITY, SPACE TEMPERATURE SET-POINT, SPACE HUMIDITY SET-POINT, POOL WATER TEMPERATURE, POOL WATER TEMPERATURE SET-POINT, SUPPLY FAN STATUS (EACH UNIT), EXHAUST FAN STATUS, COMPRESSOR STATUS (EACH COMPRESSOR, EACH UNIT), AUXILIARY POOL HEATER ENABLE/DISABLE (EACH UNIT), SUPPLY AIRFLOW STATUS (EACH UNIT), POOL WATER FLOW STATUS (EACH UNIT), SMOKE DETECTOR STATUS (QTY AS REQUIRED), EVAPORATOR BYPASS STATUS (EACH UNIT), OUTSIDE AIR DAMPER STATUS (EACH UNIT), UNIT STATUS - OFF/HEAT/COOL/DEHUMIDIFICATION (EACH UNIT), LEAVING POOL WATER TEMPERATURE (EACH UNIT), WATER SOURCE HEAT PUMP LOOP RETURN TEMPERATURE (EACH UNIT), ISOLATION VALVE STATUS (EACH UNIT), STATUS (EACH UNIT), UNIT ALARM AND TYPE (EACH UNIT), OCCUPANCY/OVERRIDE/EVENT MODE/STATUS (EACH UNIT), SPECIFIC DIAGNOSTIC MESSAGES (EACH UNIT).

UNIT MICRO-PROCESSOR CONTROLLER STANDARD SEQUENCES: THE SYSTEM SHALL BE DESIGNED AND SIZED TO MAINTAIN THE SPECIFIED SPACE CONDITIONS.

SYSTEM STARTUP: POWER IS TURNED ON OR THE SYSTEM IS RESTARTED. AFTER A SHORT INITIAL DELAY TO ALLOW THE SENSORS TO STABILIZE, THE BLOWER STARTS AND OPERATES CONTINUOUSLY. BASED ON SENSOR FEEDBACK, THE SYSTEM SHALL BEGIN OR RESUME OPERATION BASED ON THE SEQUENCE BELOW.

AIRSIDE CONFIGURATION: THE SYSTEM CONTINUOUSLY DELIVERS THE SPECIFIED SUPPLY AIR VOLUME TO THE NATATORIUM. THE MINIMUM EXHAUST AIR VOLUME IS SET TO MEET THE ENGINEER'S SCHEDULE. THE MINIMUM OUTDOOR AIR VOLUME IS SET TO MEET THE ENGINEER'S SCHEDULE.

DEHUMIDIFICATION MODE: THE RETURN AIR RELATIVE HUMIDITY IS ABOVE THE HUMIDITY SETPOINT. RETURN AIR SETPOINT IS ABOVE DEWPOINT SETPOINT. THE COMPRESSOR ENTERS THE COMPRESSOR START SEQUENCE. IF THE SYSTEM CANNOT MAINTAIN THE RELATIVE HUMIDITY BELOW SETPOINT, THE SECOND COMPRESSOR CIRCUIT WILL START.

AIR CONDITIONING MODE: THE RETURN AIR TEMPERATURE IS ABOVE THE ROOM TEMPERATURE SETPOINT. THE COMPRESSOR STARTS, IF NOT ALREADY OPERATING IN DEHUMIDIFICATION MODE. EXCESS COMPRESSOR HOT GAS IS DIVERTED TO A FLUID-COOLED BRAZED PLATE HEAT EXCHANGER. UP TO 100% OF COMPRESSOR HEAT IS REJECTED INTO THE FLUID LOOP. IF THE SYSTEM CANNOT MAINTAIN THE RETURN AIR TEMPERATURE SETPOINT, THE SECOND COMPRESSOR WILL START.

SPACE HEATING MODE: THE RETURN AIR TEMPERATURE IS BELOW THE ROOM TEMPERATURE SETPOINT. THE MICROPROCESSOR SPACE HEATING OUTPUT SIGNAL IS SENT TO THE HEATING COIL CONTROLLER. THE MICROPROCESSOR SPACE HEATING OUTPUT SIGNAL (0-10 VOLTS) IS SENT TO THE HEATING COIL CONTROLLER. THE SIGNAL OUTPUT WILL REGULATE BASED ON THE RETURN AIR TEMPERATURE.

POOL WATER HEATING MODE: THE RETURN POOL WATER TEMPERATURE IS BELOW THE POOL WATER SETPOINT. IF THE COMPRESSOR IS ALREADY OPERATING DUE TO A DEHUMIDIFICATION OR AIR CONDITIONING DEMAND, THE CONTROL VALVES WILL DIVERT THE COMPRESSOR HOT GAS THROUGH THE COAXIAL HEAT EXCHANGER TO HEAT THE POOL WATER. WITH THE REMAINDER OF HEAT AFFECTED AT THE AIR REHEAT COIL OR THE AC HEAT EXCHANGER. IF THERE IS NO PRE-EXISTING DEMAND FOR THE COMPRESSOR TO OPERATE, THE MICROPROCESSOR SENDS A SIGNAL TO THE AUXILIARY POOL WATER HEATER (REMOTE. BY OTHERS) TO OPERATE. THE COMPRESSOR WILL NOT OPERATE SOLELY FOR A POOL WATER HEATING DEMAND UNLESS SPECIFICALLY CONFIGURED TO DO SO AT THE CONTROLLER.

FREEZE PROTECTION: THE SUPPLY AIR TEMPERATURE FALLS BELOW THE FREEZESTAT SETPOINT OR THE OPTIONAL FREEZESTAT SENSOR INDICATES A FREEZESTAT CONDITION. EXHAUST FAN(S) ARE STOPPED AND OUTDOOR AIR DAMPER(S) ARE FULLY CLOSED WHEN THE FREEZESTAT ALARM IS TRIPPED, IT MUST BE MANUALLY CLEARED BY THE OPERATOR.

E. ENERGY RECOVERY VENTILATOR (ERV)-: THE ENERGY RECOVERY VENTILATOR SHALL BE ENABLED BY THE BAS TO OPERATE THROUGH THEIR FACTORY INSTALLED MICROPROCESSOR CONTROLS TO PROVIDE HEATING AND COOLING FOR THE WATER SOURCE HEAT PUMP UNITS SERVING THE OFFICES AND ANCILLARY SPACES THAT THEY SERVE. THE BAS SHALL COMMUNICATE WITH THE ERV TO PROVIDE STATUS AND DIAGNOSTIC INFORMATION FROM THE UNIT FOR MONITORING AND ALARMS. THE BAS MANUFACTURER SHALL PROVIDE ANY AND ALL ADDITIONAL POINTS, HARDWARE, SOFTWARE, AND ACCESSORIES REQUIRED TO MEET THE SEQUENCE OF CONTROLS.

OCCUPIED MODE: ON A SIGNAL FROM THE BAS (BASED ON OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN OCCUPIED MODE. THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE OPENED, THE ENERGY RECOVERY WHEEL AND THE SUPPLY AND EXHAUST FANS SHALL BE ENERGIZED.

UNOCCUPIED MODE: ON A SIGNAL FROM THE BAS, (BASED ON THE OWNER DETERMINED OPERATION SCHEDULE), THE UNIT SHALL BE PLACED IN UNOCCUPIED MODE. THE OUTSIDE AIR AND EXHAUST AIR DAMPERS SHALL BE CLOSED, THE ENERGY RECOVERY WHEEL AND THE SUPPLY AND EXHAUST FANS SHALL BE DE-ENERGIZED.

ENERGY RECOVERY WHEEL: DURING OCCUPIED MODE, THE EXHAUST DAMPER SHALL OPEN FULLY AND POSITION PROVEN BY AN END SWITCH, AND THE EXHAUST FAN SHALL BE ENERGIZED. THE OUTSIDE AIR DAMPER SHALL OPEN FULLY AND POSITION PROVEN BY AN END SWITCH

**SPECIFICATIONS FOR HVAC WORK:**

**35. IN-LINE VANEAXIAL FANS (SHOP DRAWING REQUIRED):**

- A. TYPE: GREENHECK MODEL AS INDICATED ON DRAWINGS OR EQUAL BY PENN OR COOK, VANEAXIAL FAN. COMPLETE WITH MOTOR AND DIRECT DRIVE, DISCONNECT SWITCH, INLET BELL, INLET AND OUTLET FLANGES, AND HANGING VIBRATION ISOLATORS FOR VERTICAL MOUNTING. FAN SHALL CONFORM TO AMCA 211 AND BEAR THE AMCA CERTIFIED RATING SEAL. FAN SHALL BE CAPABLE OF ACCOMMODATING STATIC PRESSURE VARIATIONS OF PLUS OR MINUS 10 PERCENT.
- B. CASING SHALL BE CONSTRUCTED OF CONTINUOUSLY WELDED STEEL AND INCLUDE INTEGRAL PUNCHED INLET AND OUTLET FLANGES. CASING AND MOTOR BASE SHALL BE CONSTRUCTED FROM HEAVY GAUGE STEEL. MOTOR SUPPORT BRACKETS SHALL BE WELDED TO THE FAN CASING.
- C. FAN SHALL BE DYNAMICALLY BALANCED AT THE DESIRED OPERATING SPEED. FAN WHEEL SHALL BE ALUMINUM SINGLE PIECE WITH RADIALY PROJECTED BLADES, AIR-FOIL CROSS SECTION, DYNAMICALLY BALANCED AND KEVED TO FAN SHAFT.
- D. FAN SHALL BE COATED WITH BASE OF ZINC-RICH PRIMER AND TOP-COAT OF HIPRO-Z (OR EQUAL) FOR CHLORINE RESISTANCE PRIOR TO FINAL ASSEMBLY. TOTAL COAT THICKNESS SHALL BE MINIMUM 4.0-6.0 MILS. FINISH COAT OF HIPRO-Z SHALL BE APPLIED TO THE SURFACES AFTER ASSEMBLY.
- E. BEARINGS SHALL BE SELF-ALIGNING BEARINGS WITH EXTENDED GREASE LINES AND SELECTED FOR A MINIMUM AVERAGE LIFE (AFBMA L-50) IN EXCESS OF 200,000 HOURS.
- F. SHOP DRAWING SUBMITTAL SHALL INCLUDE FAN INLET, OUTLET AND RADIATED SOUND POWER LEVELS AT RATED CAPACITY.

**36. ROOF VENTS (SHOP DRAWING REQUIRED):**

- A. TYPE: GREENHECK MODEL AS INDICATED ON DRAWINGS OR EQUAL BY PENN OR COOK. RELIEF AND INTAKE AIR ROOF VENTS SHALL BE LOUVERED PENTHOUSE TYPE AS INDICATED ON THE PLANS.
- B. CONSTRUCTION: ROOF VENTS SHALL HAVE EXTRUDED ALUMINUM LOUVERS, MITERED AND CONTINUOUSLY WELDED AT CORNERS, ANGLES OR CHANNELS FOR SUPPORT, REINFORCED AND INSULATED ALUMINUM COVER AND BIRDSCREEN. UNITS SHALL BE PROVIDED WITH MOTORIZED DAMPERS.
- C. ROOF VENTS SHALL BE COATED WITH AAMA 2605 COMPLIANT (70% KYNAR PVDF/100% FLOUROPOLYMER FEVE) COATING, COLOR BY ARCHITECT.
- D. PREFABRICATED CURB SHALL BE GALVANIZED STEEL OR EXTRUDED ALUMINUM, WITH CONTINUOUS WELDED AND MITERED CORNER SEAMS, TO FORM A RIGID AND LEAK-PROOF SHELL. CURB MATERIAL SHALL BE COMPATIBLE WITH THE ROOF MATERIALS. TWO INCH WALL THICKNESS, RACK OR FLANGE TO SUPPORT DAMPERS, TREATED WOOD NAILER 1. 1/2 INCH THICK, 3 POUND DENSITY RIGID MINERAL FIBERBOARD INSULATION WITH METAL LINER, BUILT-IN CANT STRIP. FOR SURFACE INSULATED ROOF, DECK FLANGE SHALL BE RECESSED SO THE CANT STRIP STARTS AT THE UPPER SURFACE OF THE INSULATION. CURBS SHALL BE BUILT FOR PITCHED ROOF OR RIDGE MOUNTING AS REQUIRED TO KEEP TOP OF CURB LEVEL. DIMENSIONS: CURB HEIGHT SHALL BE MINIMUM 12 INCHES ABOVE THE TOP OF THE ROOFING SYSTEM. PERIMETER DIMENSIONS SHALL MATCH EQUIPMENT.

**37. AIR INLETS AND OUTLETS DEVICES (SHOP DRAWING REQUIRED):**

- A. LINEAR SLOT RETURNS FOR THE NATATORIUM SHALL BE EXTRUDED ALUMINUM SERIES SDR ADJUSTABLE PATTERN TYPE COMPLETE WITH VOLUME CONTROL, MOUNTING FRAMES, DUCT PLENUM, AND ACCESSORIES. COLOR SHALL MATCH EXISTING. FINISH AND ALL CONSTRUCTION SHALL BE SUITABLE FOR USE IN CHLORINE ENVIRONMENT.
- B. HIGH CAPACITY DRUM LOUVERS SHALL BE HCD1 WITH INDIVIDUALLY ADJUSTABLE SPREAD CONTROL VANES HOUSED IN A ROTATABLE DRUM. CURVED OUTER DRUM AND VANES SHALL BE EXTRUDED ALUMINUM. ALL OTHER COMPONENTS SHALL BE ALUMINUM OR STEEL COATED FOR USE IN CHLORINE ENVIRONMENT. THE DRUM PIVOT MECHANISM SHALL INCORPORATE A POSITIVE POSITIONING DETENT DEVICE TO HOLD FIELD ADJUSTED DRUM ANGLES UP TO 30° OFF CENTER. BORDER SHALL BE CONSTRUCTED OF FORMED STEEL WITH WELDED RE-INFORCED CORNERS FOR EXTRA STRENGTH. SCREW HOLES SHALL BE COUNTER SUNK. UNIT SHALL BE FINISHED WITH CUSTOM COLOR POWDER COAT.
- C. AIR DEVICE SUBMITTALS SHALL INCLUDE CUSTOMIZED PERFORMANCE DATA WITH FREE AREA, NC (NOISE CRITERION) LEVEL, THROW, AND AIR VELOCITY PROFILES AT THE SPECIFIED AIRFLOW CONDITIONS.

**38. SMOKE TEST:**

- A. THE CONTRACTOR SHALL OBTAIN THE SERVICES OF AN INDEPENDENT SMOKE TESTING AGENCY. UPON COMPLETION OF TESTING, ADJUSTING, AND BALANCING AND ACCEPTANCE OF THE FINAL TESTING AND BALANCING REPORT BY THE ENGINEER, AT A TIME APPROVED BY AND COORDINATED WITH THE OWNER, THE CONTRACTOR SHALL PERFORM A COMPREHENSIVE SMOKE TEST OF THE BUILDING WITH ALL AIR SYSTEMS RUNNING AT THEIR OCCUPIED AND UNOCCUPIED SETTINGS TO VERIFY PRESSURIZATION RELATIONSHIP WITH THE NATATORIUM AND ANCILLARY SPACES. PRIOR TO THE SMOKE TEST, THE CONTROLS CONTRACTOR, INSTALLER, ENGINEER AND COMMISSIONING AUTHORITY SHALL VERIFY THAT ALL SYSTEMS ARE OPERATING AS DESIGNED. FOLLOWING THE SMOKE TEST, THE INDEPENDENT SMOKE TESTING AGENCY SHALL PROVIDE A TYPE-WRITTEN REPORT OF THE TEST DETAILING SMOKE TEST METHODS, PROCEDURES, ETC. AND RESULTS (INCLUDING ADJUSTMENTS MADE) TO THE OWNER, ENGINEER, AND COMMISSIONING AUTHORITY FOR REVIEW. THE CONTRACTOR SHALL ASSIST THE INDEPENDENT SMOKE TESTING AGENCY IN THE TEST IN MAKING ADJUSTMENTS TO THE MECHANICAL EQUIPMENT NECESSARY TO ACHIEVE THE DESIGN PRESSURE RELATIONSHIP. THIS INCLUDES, BUT IS NOT LIMITED TO ANY ADJUSTMENTS TO CONTROLS, DAMPERS, VALVES, AND DUCTWORK REQUIRED TO ACHIEVE THE DESIRED RESULTS.

**39. COMMISSIONING:**

- A. THE OWNER SHALL OBTAIN THE SERVICES OF AN INDEPENDENT AGENCY TO PROVIDE ENGINEERING AND COMMISSIONING SERVICES FOR THE SYSTEMS ASSOCIATED WITH THIS PROJECT. COMMISSIONING (CX) IS THE PROCESS OF ENSURING THAT (I) ALL BUILDING SYSTEMS ARE INSTALLED AND PERFORM INTERACTIVELY ACCORDING TO THE DESIGN INTENT; (II) THAT SYSTEMS ARE EFFICIENT AND COST EFFECTIVE AND MEET THE OWNER'S OPERATIONAL NEEDS; (III) THAT THE INSTALLATION IS ACCURATELY DOCUMENTED; AND (IV) THAT THE OPERATORS ARE ADEQUATELY TRAINED. COMMISSIONING SERVES AS A TOOL TO MINIMIZE POST-OCCUPANCY OPERATIONAL PROBLEMS, AND ESTABLISHES TESTING AND COMMUNICATION PROTOCOLS TO ADVANCE THE BUILDING SYSTEMS FROM INSTALLATION TO OPTIMIZED, FULLY-DYNAMIC OPERATION. THE COMMISSIONING AUTHORITY (CXA) SHALL WORK WITH THE CONTRACTOR AND DESIGN ENGINEER TO DIRECT AND OVERSEE THE CX PROCESS AND PERFORM FUNCTIONAL PERFORMANCE TESTING. THE COMMISSIONING PLAN OUTLINES THE CX PROCESS BEYOND THE CONSTRUCTION CONTRACT. THE SPECIFICATION SECTIONS DICTATE ALL REQUIREMENTS OF THE COMMISSIONING PROCESS RELATIVE TO THE CONSTRUCTION CONTRACT. THE CX PLAN IS NOT PART OF THE CONSTRUCTION CONTRACT, ALTHOUGH IT IS AVAILABLE FOR REFERENCE AT THE REQUEST OF THE CONTRACTOR. THIS SECTION OUTLINES THE CX PROCEDURES SPECIFIC TO THE INSTALLING CONTRACTORS.
- B. SCOPE: THE FOLLOWING SYSTEMS AND EQUIPMENT ARE INCLUDED IN THE SCOPE OF COMMISSIONING FOR THIS PROJECT. ALL MECHANICAL/HVAC EQUIPMENT AND SYSTEMS ARE SUBJECT TO COMMISSIONING, INCLUDING BUT NOT LIMITED TO THE SYSTEMS LISTED BELOW. ALL COMPONENTS AND DEVICES (SENSORS, VALVES, ETC.) THAT MAKE UP THESE SYSTEMS ARE INCLUDED.
  - POOL DEHUMIDIFICATION UNITS (PDU-)
  - WATER SOURCE HEAT PUMP UNITS (WSHP-)
  - CLOSED CIRCUIT COOLER (CT-)
  - CONDENSER WATER PUMPS (CDP-)
  - POOL WATER DISTRIBUTION PUMPS (PDP-)
  - POOL WATER HEATER (B-)
  - SHELL & TUBE HEAT EXCHANGER (HX-)
  - EXHAUST FAN (EF-)
  - ENERGY RECOVERY UNIT (ERV-)
  - BUILDING AUTOMATION SYSTEMS (BAS): THE ENTIRE BAS SHALL BE SUBJECT TO COMMISSIONING, INCLUDING ALL HARDWARE COMPONENTS, SOFTWARE, NETWORKING, PROGRAMMING AND ENGINEERING SERVICES, AND CONTROLS DOCUMENTATION.
  - TESTING ADJUSTING AND BALANCING: SPOT CHECK OF TAB AIRFLOWS BY DUCT TRAVERSE OR FLOW HOOD; SPOT CHECK OF TAB WATER FLOWS.
  - EQUIPMENT START-UP SUPERVISION: THE COMMISSIONING AUTHORITY SHALL MANAGE, SUPERVISE AND COORDINATE START-UP OF THE EQUIPMENT. THE CONTRACTOR SHALL COORDINATE AND PARTICIPATE WITH THE COMMISSIONING AUTHORITY AND NOTIFY THE COMMISSIONING AUTHORITY AT LEAST 14 DAYS IN ADVANCE FOR ALL SYSTEM AND EQUIPMENT START-UPS, TRAINING, PRESSURE TESTS, OR SYSTEM FLUSH AND FILL.
  - SMOKE TEST REPORT: THE COMMISSIONING AUTHORITY SHALL REVIEW THE SMOKE TEST REPORT TO VERIFY COMPLIANCE WITH AIR PRESSURE REQUIREMENTS FOR THE NATATORIUM AND ANCILLARY SPACES.
- C. DOCUMENTATION: THE CONTRACTOR SHALL PROVIDE THE FOLLOWING TO THE COMMISSIONING AUTHORITY:
  - FACTORY TEST REPORTS: CONTRACTOR SHALL PROVIDE ANY FACTORY TESTING DOCUMENTATION OR CERTIFIED TEST REPORTS REQUIRED BY THE SPECIFICATIONS. THESE SHALL BE PROVIDED PRIOR TO THE ACCEPTANCE PHASE. FACTORY TEST REPORTS SHOULD BE PROVIDED IN PDF ELECTRONIC FORMAT. THESE MAY INCLUDE BUT ARE NOT LIMITED TO:
    - POOL DEHUMIDIFICATION UNITS (PDU-)
    - WATER SOURCE HEAT PUMP UNITS (WSHP-)
    - CLOSED CIRCUIT COOLER (CT-)
    - CONDENSER WATER PUMPS (CDP-)

- POOL WATER DISTRIBUTION PUMPS (PDP-)
- POOL WATER HEATER (B-)
- SHELL & TUBE HEAT EXCHANGER (HX-)
- EXHAUST FAN (EF-)
- ENERGY RECOVERY UNIT (ERV-)

FIELD TESTING AGENCY REPORTS (OTHER THAN TAB): PROVIDE ALL DOCUMENTATION OF WORK OF INDEPENDENT TESTING AGENCIES REQUIRED BY THE SPECIFICATION. THESE SHALL BE PROVIDED PRIOR TO ACCEPTANCE PHASE. FIELD TESTING AGENCY REPORTS SHOULD BE PROVIDED IN PDF ELECTRONIC FORMAT. THESE MAY INCLUDE BUT ARE NOT LIMITED TO, PIPE PRESSURE TESTING, DUCT LEAKAGE TESTING, VIBRATION TESTING, GENERATED NOISE AND RESULTANT NOISE LEVEL, AND WATER TREATMENT.

TAB PLAN: THE TESTING, ADJUSTING, AND BALANCING STRATEGIES AND PROCEDURES PLAN SHALL INCLUDE:

CERTIFICATIONS ON ALL INSTRUMENTS TO BE USED THROUGHOUT THE TESTING. CERTIFICATION MUST BE DOCUMENTED WITHIN THE PREVIOUS 6 MONTHS.  
 RÉSUMÉS AND CERTIFICATION OF INDIVIDUALS WHO WILL BE BALANCING THE SYSTEMS.  
 DETAILED STEP-BY-STEP PLANS FOR EACH PROCEDURE TO BE PERFORMED BY THE TAB CONTRACTOR.  
 SAMPLE FORMS TO BE USED FOR EACH MEASUREMENT.  
 SAMPLE BALANCING REPORT.  
 ALL REFERENCED CHARTS SUCH AS VIBRATION SEVERITY CHARTS AND ROOM NOISE CRITERIA (NC) CURVES.

PIPING CLEANING, FLUSH, AND FILL PLAN: CONTRACTOR SHALL PROVIDE THIS DOCUMENT IN ACCORDANCE WITH DETAILS IN THIS SECTION. CXA WILL REVIEW.  
 TEMPORARY OPERATING AND CONDITIONING PLAN: CONTRACTOR SHALL PROVIDE IN ACCORDANCE WITH DETAILS IN THIS SECTION. CXA WILL REVIEW.  
 COMPLETED TAB REPORTS. CXA WILL REVIEW PRIOR TO FPT.

**D. CONSTRUCTION: THE FOLLOWING ARE RESPONSIBILITIES COMMON TO THE CONTRACTOR DURING TO ASSIST THE COMMISSIONING AUTHORITY DURING THE CONSTRUCTION PROCESS:**

- ATTEND CONSTRUCTION PHASE KICK-OFF MEETING WITH THE CXA.
- SCHEDULE AND COORDINATE CX EFFORTS INTO THE CONSTRUCTION SCHEDULE.
- REMEDY ANY DEFICIENCIES IDENTIFIED THROUGHOUT CONSTRUCTION.
- PROVIDE SKILLED TECHNICIANS QUALIFIED TO PERFORM THE WORK REQUIRED.
- PROVIDE FACTORY-TRAINED AND AUTHORIZED TECHNICIANS WHERE REQUIRED BY THE CONTRACT DOCUMENTS.
- PREPARE AND SUBMIT REQUIRED DRAFT START-UP DOCUMENTATION AND SUBMIT ALONG WITH THE MANUFACTURERS APPLICATION, INSTALLATION AND START-UP INFORMATION.
- PROVIDE ASSISTANCE TO THE CXA IN PREPARATION OF THE SPECIFIC FUNCTIONAL PERFORMANCE TEST (FPT) PROCEDURES. CONTRACTORS, SUBCONTRACTORS AND VENDORS SHALL REVIEW FPT PROCEDURES TO ENSURE FEASIBILITY, SAFETY AND EQUIPMENT PROTECTION AND PROVIDE NECESSARY WRITTEN ALARM LIMITS TO BE USED DURING THE TESTS. DAMAGE CAUSED TO EQUIPMENT PERFORMED IN ACCORDANCE WITH THE APPROVED PROCEDURES WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- THOROUGHLY COMPLETE AND INSPECT INSTALLATION OF SYSTEMS AND EQUIPMENT AS DETAILED THROUGHOUT CONTRACT DOCUMENTS, AS REQUIRED BY REFERENCE OR INDUSTRY STANDARDS, AND AS SPECIFICALLY INDICATED ELSEWHERE THIS SECTION.
- START-UP, TEST/ADJUST/BALANCE, AND TURN-OVER SYSTEMS AND EQUIPMENT PRIOR TO FUNCTIONAL PERFORMANCE TESTING BY THE CXA. APPROVED START-UP DOCUMENTATION SHALL BE IN ACCORDANCE WITH CONTRACT DOCUMENTS, REFERENCE OR INDUSTRY STANDARDS, AND SPECIFICALLY ELSEWHERE IN PART I OF THIS SECTION.
- RECORD START-UP ON APPROVED START-UP DOCUMENTATION FORMS AND CERTIFY THAT THE SYSTEMS AND EQUIPMENT HAVE BEEN STARTED AND OR TESTED IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED ABOVE. EACH TASK OR ITEM SHALL BE INDICATED WITH THE PARTY ACTUALLY PERFORMING THE TASK OR PROCEDURE.
- TAB: SPECIFICALLY AS IT RELATES TO CX. ATTEND CONSTRUCTION PHASE CX KICK-OFF MEETING AND CX PROGRESS MEETINGS BEGINNING WITHIN 3 MONTHS OF START OF TAB WORK; SUBMIT TAB PLAN AS INDICATED ABOVE; MEET WITH CX TEAM TO REVIEW TAB PROCEDURES AND DOCUMENTATION REQUIRED; DEMONSTRATE TAB PROCEDURES FOR REPETITIVE TASKS (ZONE BALANCING, AHU ADJUSTING) AS CALLED FOR BY THE CXA; PARTICIPATE IN ACTION LIST DIALOGUE; PROVIDE ALL DOCUMENTATION ELECTRONICALLY.

**E. ACCEPTANCE PHASE: ASSIST CXA IN FUNCTIONAL PERFORMANCE TESTING. ASSISTANCE WILL TYPICALLY INCLUDE THE FOLLOWING:**

- MANIPULATE SYSTEMS AND EQUIPMENT TO FACILITATE FUNCTIONAL PERFORMANCE TESTING (AS SPECIFIED IN THE CX PLAN; IN SOME CASES THIS WILL ENTAIL ONLY AN INITIAL SAMPLE)
- PROVIDE ANY SPECIALIZED INSTRUMENTATION NECESSARY FOR FUNCTIONAL PERFORMANCE TESTING
- MANIPULATE BAS AND OTHER CONTROL SYSTEMS TO FACILITATE FUNCTIONAL PERFORMANCE TESTING (AS SPECIFIED IN THE CX PLAN; IN SOME CASES THIS WILL ENTAIL ONLY AN INITIAL SAMPLE)
- PROVIDE A TAB TECHNICIAN TO WORK AT THE DIRECTION OF CXA FOR UP TO 8 HOURS BEYOND ASSISTANCE SPECIFIED ABOVE.
- PROVIDE A BAS TECHNICIAN TO WORK AT THE DIRECTION OF CXA FOR UP TO 24 HOURS BEYOND ASSISTANCE SPECIFIED ABOVE. CORRECT ANY WORK NOT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

**F. WARRANTY PHASE: MAINTAIN RECORD DOCUMENTATION OF ANY CONFIGURATIONS, SETPOINTS, PARAMETERS, ETC. THAT CHANGE THROUGHOUT THE WARRANTY PERIOD; PROVIDE REPRESENTATIVE FOR OFF-SEASON TESTING AS REQUIRED BY CXA; RESPOND TO WARRANTY ISSUES AS REQUIRED BY DIVISION 01 AND THE GENERAL CONDITIONS.**

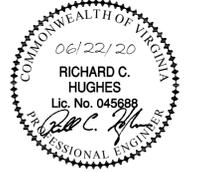
**G. DOCUMENTATION: THE CONTRACTOR SHALL PROVIDE ANY AND ALL DOCUMENTATION REQUIRED BY THE COMMISSIONING AUTHORITY INCLUDING, BUT NOT LIMITED TO FACTORY TEST REPORTS, START-UP REPORTS, FIELD TEST REPORTS, WARRANTIES, SHOP DRAWINGS, AND DEFICIENCY PUNCH-LISTS.**

**L | P | A**

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REVISION	DATE

**SMITH AQUATIC CENTER**  
**INDOOR AIR QUALITY HVAC RENOVATIONS**  
CHARLOTTESVILLE, VIRGINIA

**SPECIFICATION FOR HVAC WORK**

DESIGNED MEH	DRAWN MEH
CHECKED RCH	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20

SHEET

**M-12**

**GENERAL NOTES:**

- ALL VFD'S WILL BE FURNISHED BY THE MECHANICAL CONTRACTOR. THE ELECTRICAL CONTRACTOR SHALL MOUNT THE VFD'S (UNLESS THEY ARE INTEGRAL TO THE EQUIPMENT SERVED). CONNECT THE LINE SIDE POWER WIRING AND THE LOAD SIDE POWER WIRING FROM THE VFD'S TO THE EQUIPMENT. ALL CONTROL AND INTERLOCK WIRING FOR THE VFD'S WILL BE BY THE CONTROL SYSTEM CONTRACTOR.
- LOAD SIDE CONDUCTOR AND CONDUIT SIZES FROM DISCONNECT SWITCHES AND VFD'S TO EQUIPMENT SHALL BE THE SAME AS LINE SIDE CONDUCTORS AND CONDUIT.
- CAREFULLY COORDINATE ALL ELECTRICAL EQUIPMENT LOCATIONS WITH DUCTWORK, PIPING AND MECHANICAL EQUIPMENT. MAINTAIN ALL CLEARANCES AND SPACES REQUIRED BY THE NEC.
- WHERE MULTIPLE CIRCUITS ARE COMBINED IN A SINGLE CONDUIT, DERATE CONDUCTORS PER THE NEC.
- WHERE RE-USE OF EXISTING CONDUIT, WIRING AND/OR OUTLET BOXES IS INDICATED, ALSO PROVIDE NEW MATERIALS IF NECESSARY.
- FOR ALL EXISTING OUTLET BOXES THAT ARE NOT BEING REUSED, PROVIDE BLANK COVER PLATE TO MATCH WALL PLATES IN THAT AREA.
- MODIFY EXISTING PANEL SCHEDULES TO ACCURATELY REFLECT ALL CHANGES MADE AS PART OF THIS CONTRACT. ALL NEW BREAKERS IN EXISTING PANELS SHALL MATCH EXISTING AIC. PROVIDE NEW "TYPED" AS-BUILT PANEL SCHEDULES. HANDWRITTEN PANEL SCHEDULES WILL NOT BE ACCEPTED.
- FOR ALL EXTERIOR UNDERGROUND CONDUIT AND WIRING, CAREFULLY COORDINATE ALL WORK WITH EXISTING SOIL CONDITIONS AND WITH EXISTING UTILITIES IN ORDER TO AVOID CONFLICTS. NOTIFY ENGINEER IF ROUTING MUST BE DIFFERENT FROM WHAT IS SHOWN ON THE DRAWINGS.
- THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING BID IN ORDER TO VERIFY ALL EXISTING CONDITIONS, TO DETERMINE THE FULL EXTENT OF DEMOLITION WORK REQUIRED, AND TO DETERMINE THE FULL EXTENT OF RELOCATION AND MODIFICATION WORK REQUIRED FOR ELECTRICAL WORK (DUE TO OTHER DISCIPLINES INTERFERING OR ANY OTHER REASON). THE CONTRACTOR SHALL BE FULLY RESPONSIBLE TO COORDINATE ALL ELECTRICAL WORK WITH BOTH NEW AND EXISTING PIPING, DUCTWORK, CONDUIT, ETC. NO CHANGE ORDERS WILL BE APPROVED FOR ADDITIONAL WORK DUE TO THE CONTRACTOR NEGLECTING TO VISIT THE SITE AND GATHERING NECESSARY INFORMATION.

**GENERAL DEMOLITION NOTES:**

- SCOPE:** THE SCOPE OF ELECTRICAL DEMOLITION IS DEFINED IN THE FOLLOWING NOTES AND IN LIMITED FASHION ON THE DRAWINGS; THE DRAWINGS ARE ONLY INTENDED TO BE A PARTIAL REPRESENTATION OF THE ACTUAL DEMOLITION WORK REQUIRED. THESE NOTES ONLY APPLY TO THE AREAS OF RENOVATION.
- MECHANICAL EQUIPMENT:** DISCONNECT EXISTING MECHANICAL EQUIPMENT THAT IS BEING REMOVED, AND REMOVE ALL ASSOCIATED STARTERS, DISCONNECTS, ETC. ABANDON CONDUITS AND CONDUCTORS CONCEALED IN EXISTING WALLS TO REMAIN. WHERE CONDUIT COMES UP FROM FLOOR, CUT CONDUIT FLUSH WITH FLOOR, FILL IT WITH GROUT, AND FINISH TO MATCH FLOOR SURFACE. REMOVE CONDUITS AND CONDUCTORS EXPOSED, CONCEALED ABOVE CEILING, AND EXTERIOR EXPOSED. CONDUIT AND CONDUCTORS TO REMOVED MECHANICAL EQUIPMENT SHALL BE REUSED ONLY WHERE SPECIFICALLY INDICATED. SEE MECHANICAL DRAWINGS FOR MORE INFORMATION. UNLESS SPECIFICALLY INDICATED OTHERWISE, EXISTING WIRING TO EXISTING-TO-REMAIN EQUIPMENT SHALL REMAIN.
- ELECTRICAL SERVICE:** THE EXISTING ELECTRICAL SERVICE SHALL BE RE-USED, BUT SOME DOWNTIME WILL LIKELY STILL BE REQUIRED. ALL ELECTRICAL SERVICE DOWNTIME REQUIRED SHALL BE COORDINATED WITH OWNER AND SHALL BE AT THE OWNER'S CONVENIENCE. DOWNTIME SHALL BE KEPT TO THE MINIMUM. ALL EXTENDED DOWNTIME REQUIRED SHALL BE COORDINATED WITH OWNER AND SHALL BE OUTSIDE OF NORMAL SCHOOL HOURS.
- CONDUIT:** WHERE EXISTING CONDUIT IS EXPOSED DUE TO DEMOLITION OF WALLS, CONDUIT AND CONDUCTORS SHALL BE REMOVED. UNLESS INDICATED TO REMAIN OR NECESSARY TO MAINTAIN SERVICE TO EXISTING ITEMS TO REMAIN, WHERE CONDUIT RISES FROM FLOOR TO FEED REMOVED ITEMS, CUT CONDUIT FLUSH WITH FLOOR AND FILL IT WITH GROUT. FINISH TO MATCH FLOOR SURFACE. ALL ACCESSIBLE UNUSED CONDUIT SHALL BE REMOVED; ALL INACCESSIBLE UNUSED CONDUIT SHALL BE ABANDONED. ALL CONDUIT TO NEW DEVICES AND EQUIPMENT SHALL BE NEW, UNLESS NOTED OTHERWISE.
- WIRING:** ALL WIRING TO DEMOLISHED DEVICES AND EQUIPMENT SHALL BE REMOVED, UNLESS NOTED OTHERWISE. ALL EXISTING WIRING TO EXISTING-TO-REMAIN DEVICES AND EQUIPMENT SHALL REMAIN, UNLESS NOTED OTHERWISE. ALL ACCESSIBLE UNUSED WIRING SHALL BE REMOVED; ALL INACCESSIBLE UNUSED WIRING SHALL BE ABANDONED. ALL WIRING TO NEW DEVICES AND EQUIPMENT SHALL BE NEW, UNLESS NOTED OTHERWISE.
- MAINTAIN CIRCUIT CONTINUITY AS NECESSARY IN ALL DEMOLITION WORK.
- THE CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE OF ELECTRICAL EQUIPMENT REMOVED FROM THE BUILDING. IF THE OWNER DESIRES TO RETAIN EQUIPMENT, HE WILL REMOVE IT FROM THE SITE. ALL EQUIPMENT NOT RETAINED BY THE OWNER SHALL BECOME PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE. DISPOSAL OF ALL EQUIPMENT CONTAINING HAZARDOUS MATERIALS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND THE COST OF DISPOSAL SHALL BE INCLUDED.
- INFORMATION ON DEMOLITION DRAWINGS DOES NOT INDICATE ALL EXISTING EQUIPMENT AND DEVICES. REFER TO MECHANICAL DEMOLITION DRAWINGS FOR ADDITIONAL INFORMATION.
- THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING BID AND SHALL VERIFY ALL DEMOLITION REQUIRED. ADDITIONAL COMPENSATION WILL NOT BE ALLOWED FOR DEMOLITION DUE TO CONTRACTOR NOT VISITING SITE AND DETERMINING FULL SCOPE OF DEMOLITION REQUIRED.
- SEE THE DEMOLITION FLOOR PLANS FOR ADDITIONAL DEMOLITION REQUIREMENTS. ON THE DEMOLITION FLOOR PLANS, ALL DASHED ITEMS SHALL BE REMOVED AND ALL SOLID ITEMS SHALL REMAIN, UNLESS NOTED OTHERWISE.

**ELECTRICAL LEGEND**

MTG. HGT.	SYMBOL	DESCRIPTION
		PLAN NOTE DESIGNATION.
		DEMOLITION PLAN NOTE DESIGNATION.
1'-4" TO BOT		RECEPTACLE, DUPLEX GFCI, WALL.
		ELECTRIC MOTOR CONNECTION.
		CONDUIT EXPOSED.
		CONDUIT CONCEALED IN OR BELOW FLOOR SLAB OR BELOW GRADE.
		CONDUIT CONCEALED IN WALL OR ABOVE CEILING.
		CONDUIT TURNED UP.
		CONDUIT TURNED DOWN.
6'-0"		208/120 VOLT PANELBOARD.
5'-0"		FUSIBLE SAFETY SWITCH, WALL OR EQUIPMENT MOUNTED. NUMBER INDICATES FUSED/3-POLE/60 AMP RATING/45 AMP FUSES.
1'-4" TO BOT, UNO		JUNCTION BOX, WALL.
		JUNCTION BOX, CEILING.
5'-0"		NON-FUSIBLE SAFETY SWITCH, WALL OR EQUIPMENT MOUNTED. NUMBER INDICATES NON-FUSED/3-POLE/60 AMP RATING.
5'-0"		FUSIBLE SAFETY SWITCH, WALL OR EQUIPMENT MOUNTED. NUMBER INDICATES FUSED/3-POLE/60 AMP RATING/45 AMP FUSES.
	VFD	VARIABLE FREQUENCY DRIVE.
	PDU	POOL DEHUMIDIFICATION UNIT.
	WSHP	WATER SOURCE HEAT PUMP.
	CDP	CONDENSER WATER PUMP.
	WP	WEATHER PROOF.

**ELECTRICAL SPECIFICATIONS:**

- SCOPE OF WORK:** PROVIDE SUPERVISION, LABOR, MATERIAL, EQUIPMENT, MACHINERY, PLANT AND OTHER ITEMS NECESSARY FOR A COMPLETE AND OPERABLE ELECTRICAL SYSTEM.  
  
WHERE VARIANCES OCCUR BETWEEN DRAWINGS AND SPECIFICATIONS OR WITHIN EITHER DOCUMENT ITSELF, INCLUDE IN THE CONTRACT PRICE THE ITEM OR ARRANGEMENT OF BETTER QUALITY, GREATER QUANTITY, OR HIGHER COST.
- STANDARDS AND CODES:** THE MATERIALS AND EQUIPMENT SHALL BE NEW AND LISTED BY UNDERWRITERS LABORATORIES, INC. THE INSTALLATION SHALL BE IN ACCORDANCE WITH THE 2015 VIRGINIA UNIFORM STATEWIDE BUILDING CODE (USBC), THE 2015 INTERNATIONAL BUILDING CODE (IBC), AS ADOPTED AND MODIFIED BY THE 2015 VIRGINIA CONSTRUCTION CODE (VCC) THE 2014 NFPA-70 (NATIONAL ELECTRICAL CODE, OR NEC), AND OTHER RELATED CODES AND STANDARDS WORKMANSHIP SHALL MEET THE "STANDARDS OF INSTALLATION" AS PUBLISHED BY THE NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION (NECA).
- PERMITS AND FEES:** OBTAIN PERMITS, BONDS, LICENSES AND INSPECTION CERTIFICATES. PAY INSPECTION FEES AND TAXES. FILE PLANS AND PREPARE DOCUMENTS REQUIRED TO OBTAIN APPROVALS OF GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.
- CONDUIT:** PROVIDE SCHEDULE 40 PVC CONDUIT UNDERGROUND. PROVIDE RGS OR IMC WHERE EXTERIOR ABOVE-GRADE. WHERE NOT EXTERIOR OR UNDERGROUND OR IN CONCRETE SLABS, PROVIDE ELECTRICAL METALLIC TUBING (EMT) FOR BRANCH CIRCUITS. PROVIDE GALVANIZED SINGLE STRIP FLEXIBLE CONDUIT, MINIMUM 18" LONG, FOR MOTOR CONNECTIONS. USE PVC JACKETED FLEXIBLE LIQUID-TIGHT CONDUIT TYPE UA FOR MOTOR CONNECTIONS IN WET LOCATIONS. CONDUIT SHALL BE MINIMUM 3/4" SUPPORT CONDUIT AS REQUIRED BY THE NEC. EXPANSION/DEFLECTION FITTINGS SHALL BE PROVIDED WHERE REQUIRED PER NEC 300.4(H). FOR UNDERGROUND CONDUIT, PROVIDE SEALS WHERE REQUIRED PER NEC 225.27 AND 300.5(G). UNDERGROUND CONDUIT SHALL BE MINIMUM 24" BELOW FINISHED GRADE TO TOP OF CONDUIT, UNLESS NOTED OTHERWISE. FITTINGS SHALL NOT BE CAST POT METAL.  
  
ALL CONDUITS PASSING THROUGH RATED WALLS OR CEILINGS SHALL BE SLEEVED AND PACKED WITH U.L. LISTED SEALANT TO MAINTAIN RATING.  
  
TYPE AC, MC AND NMC CABLE ARE NOT ALLOWED.
- JUNCTION, OUTLET AND PULL BOXES:** PROVIDE JUNCTION, OUTLET AND PULL BOXES FOR WIRING DEVICES AND CONNECTIONS TO EQUIPMENT AND AS REQUIRED BY THE NEC. BOXES SHALL BE STEEL UNLESS REQUIRED OTHERWISE BY ENVIRONMENT.
- HANGERS AND SUPPORTS:** PROVIDE ALL HANGERS, SUPPORTS, ANCHORS, SLEEVES AND SEALS AS REQUIRED BY THE NEC.
- WIRING:** PROVIDE COPPER CONDUCTORS, XHHW OR XHHW-2 OR THHN OR THWN-2, 600 VOLT, 90 DEGREE C RATED. WIRING SHALL BE COLOR CODED. MATCH EXISTING BUILDING WIRING COLOR CODING. NUMBER 12 AWG SHALL BE THE SMALLEST SIZE WIRE USED FOR POWER. CONDUCTORS 8 AWG AND LARGER SHALL BE STRANDED. CONDUCTORS 10 AWG AND SMALLER SHALL BE SOLID. DO NOT INSTALL A SHARED NEUTRAL ON ANY CIRCUIT. ALL TERMINATIONS SHALL BE 75 DEGREES C.
- GROUNDING AND BONDING:** PROVIDE AN EQUIPMENT GROUNDING SYSTEM INSTALLED TO METALLIC STRUCTURES, ENCLOSURES, RACEWAYS, JUNCTION BOXES, OUTLET BOXES, PULL BOXES, CABINETS, MACHINE FRAMES AND OTHER CONDUCTIVE ITEMS IN CLOSE PROXIMITY TO ELECTRICAL CIRCUITS. ALL BRANCH CIRCUITS SHALL INCLUDE A GREEN GROUNDING CONDUCTOR.
- IDENTIFICATION:** IDENTIFY CONDUCTORS, INCLUDING VOLTAGE, PHASE AND FEEDER OR CIRCUIT NUMBER, ON EACH CONDUCTOR IN EACH BOX/ENCLOSURE/CABINET WHERE WIRES OF MORE THAN ONE CIRCUIT ARE PRESENT. WHEREVER REASONABLY REQUIRED FOR SAFETY, MAINTENANCE AND/OR OPERATIONAL PURPOSES, PROVIDE SELF-ADHESIVE PLASTIC SIGNS FOR IDENTIFICATION, INSTRUCTION OR WARNING ON OUTLETS, AS WELL AS OTHER CONTROLS, DEVICES AND ENCLOSURE COVERS. PROVIDE A DANGER SIGN WHEREVER IT IS POSSIBLE FOR PERSONS TO COME INTO CONTACT WITH A VOLTAGE HIGHER THAN 120 VOLTS. PROVIDE AN ENGRAVED PLASTIC LAMINATE LABEL ON EACH MAJOR UNIT OF ELECTRICAL EQUIPMENT, INCLUDING BUT NOT LIMITED TO: CONTROL PANELS, RELAY PANELS, CABINETS, ENCLOSURES, VFD'S AND DISCONNECT SWITCHES. EQUIPMENT LABELS SHALL INCLUDE WHAT IS REQUIRED IN NEC 408.4(B) ENCLOSURE TYPES SHALL BE MARKED PER NEC 110.28. WIRING COLOR-CODE KEY SHALL BE READILY AVAILABLE OR PERMANENTLY POSTED PER NEC 200.6(D).
- CONNECTIONS TO EQUIPMENT:** MAKE FINAL ELECTRICAL POWER CONNECTIONS TO MECHANICAL EQUIPMENT. PROVIDE CONDUITS, OUTLET BOXES AND POWER WIRING FROM THE POWER SOURCE TO THE MOTOR OR EQUIPMENT, JUNCTION BOX, INCLUDING WIRING THROUGH SAFETY SWITCHES OR VFD'S IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
- WIRING DEVICES (SHOP DRAWINGS REQUIRED):** WIRING DEVICES SHALL BE SPECIFICATION GRADE. BACK WIRING IS NOT ALLOWED. WIRING DEVICES SHALL BE OF COLOR TO MATCH EXISTING. GROUND FAULT RECEPTACLES SHALL BE BY SAME MANUFACTURER AS DUPLEX RECEPTACLES. GFCI TYPE DUPLEX RECEPTACLES SHALL BE RATED 5 MILLIAMPS, AND SHALL BE READILY ACCESSIBLE WHERE REQUIRED BY NEC 210.8. WIRING DEVICE WALL PLATES SHALL BE STEEL AND, BY SAME MANUFACTURER AS WIRING DEVICES. WEATHERPROOF COVERS SHALL HINGE FROM TOP. SHALL BE LISTED AS WEATHERPROOF WHEN IN USE AND SHALL BE "EXTRA DUTY" WHERE REQUIRED BY NEC 406.9(B)(1), AND RECEPTACLES IN THESE COVERS SHALL BE LISTED AS WEATHER-RESISTANT TYPE AND SHALL BE CAPABLE OF BEING PAD LOCKED.  
  
WIRING DEVICE MANUFACTURER SHALL BE BRYANT, EATON ARROWHART, HUBBELL, LEVITON OR PASS & SEYMOUR.
- FUSES (SHOP DRAWINGS REQUIRED):** FUSES SHALL BE CLASS RK5 DUAL ELEMENT TIME DELAY, WITH APPROPRIATE VOLTAGE. FURNISH 3 SPARE OF EACH TYPE. MANUFACTURER SHALL BE COOPER BUSSMANN, MERSEN OR LITTEL FUSE.
- SAFETY SWITCHES (SHOP DRAWINGS REQUIRED):** PROVIDE SURFACE-MOUNTED, GENERAL-DUTY HORSEPOWER-RATED, FUSIBLE OR NON-FUSIBLE AS INDICATED, SAFETY SWITCHES WITH LUGS SUITABLE FOR COPPER OR ALUMINUM CONDUCTORS AND ELECTRO-SILVER PLATED CURRENT CARRYING PARTS, AND WITH EQUIPMENT GROUND BUS WITH APPROPRIATE LUGS. FUSIBLE SWITCHES SHALL BE PROVIDED WITH SPRING-REINFORCED FUSE CLIPS TO REJECT ALL FUSES EXCEPT GLASS FUSE CURRENT LIMITING TYPE. FUSE EACH PHASE. SWITCHES SHALL HAVE HINGED DOOR WITH DEFEATABLE INTERLOCK TO PREVENT DOOR FROM BEING OPENED IN "ON" POSITION. OPERATING LEVER ARRANGED FOR PADLOCKING IN THE "OFF" POSITION. ARC QUENCHERS, CAPACITY AND CHARACTERISTICS AS REQUIRED. NON-TEASABLE QUICK-MAKE AND QUICK-BREAK MECHANISM; DEAD FRONT; LINE SIDE SHIELD. PROVIDE A SET OF AUXILIARY CONTACTS FOR DISCONNECTS SERVING VFD'S, TO SEND A "DISABLE" SIGNAL TO THE VFD WHEN THE DISCONNECT IS OPENED.  
  
MANUFACTURER SHALL BE SQUARE D, GENERAL ELECTRIC, EATON OR SIEMENS.



REVISION	DATE

DESIGNED WDC	DRAWN WBS
CHECKED WAM	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET	
<b>E-1</b>	

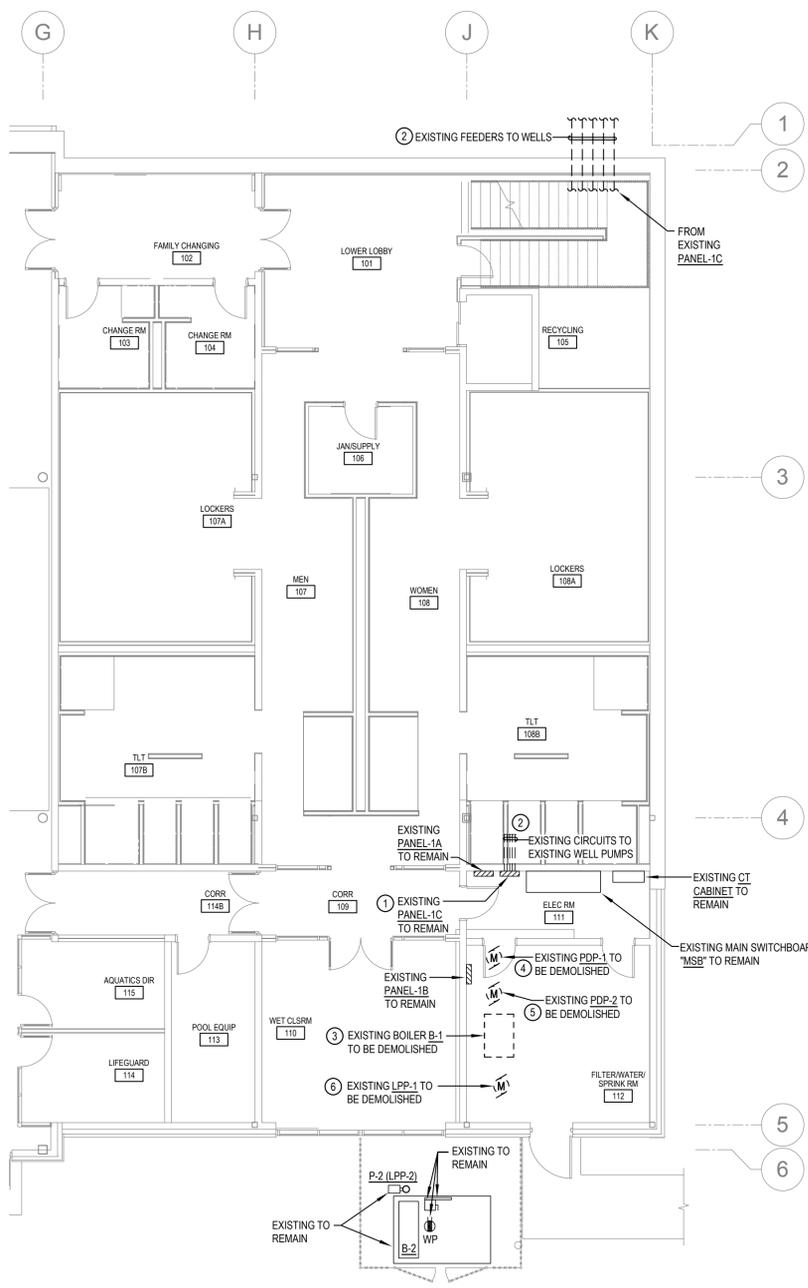


REVISION	DATE
ADDENDUM 4	07/24/2020

**SMITH AQUATIC CENTER  
 INDOOR AIR QUALITY HVAC RENOVATIONS  
 CHARLOTTESVILLE, VIRGINIA**

**PARTIAL FIRST FLOOR PLANS -  
 DEMOLITION AND NEW WORK - ELECTRICAL**

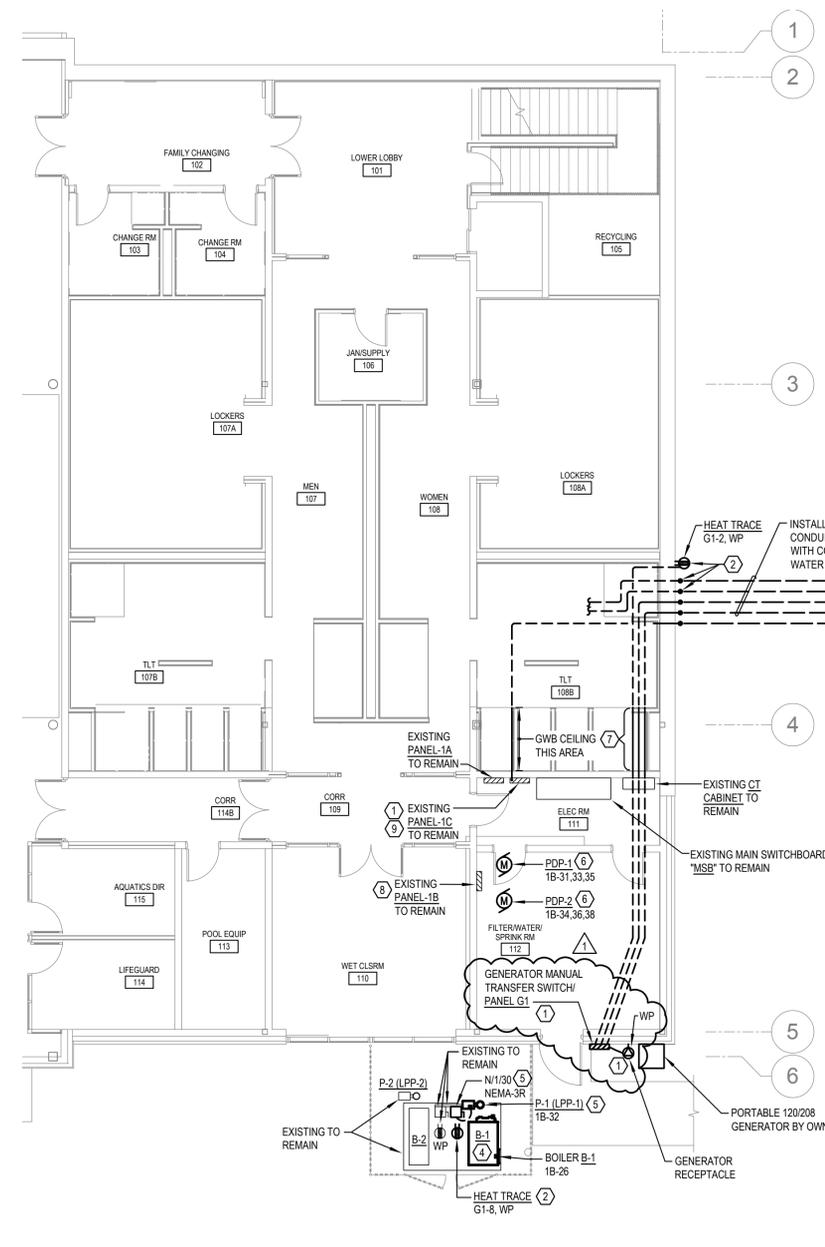
DESIGNED WAC	DRAWN WBS
CHECKED WAM	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>E-2</b>	



**PARTIAL FIRST FLOOR PLAN - ELECTRICAL - DEMOLITION**  
 SCALE: 1/8" = 1'-0"

**DEMOLITION NOTES:**

- DISCONNECT 5 WELL PUMP BRANCH CIRCUITS AT PANEL-1C. DISCONNECT 3 #6 AND 1 #10 GROUND FOR EACH PUMP AT PANEL-1C. WHERE EXISTING CONDUCTORS CAN BE REMOVED FROM EXISTING CONDUITS THEN REMOVE, OTHERWISE CUT CONDUCTORS INSIDE PANEL FLUSH WITH PANEL CAN AT CONDUIT EXITING PANEL.
- WHERE EXISTING 5 WELL PUMP CONDUCTORS CAN BE REMOVED FROM EXISTING CONDUITS THEN REMOVE, OTHERWISE ABANDON EXISTING CONDUCTORS IF THEY ARE DIRECT BURIED.
- DISCONNECT EXISTING BOILER B-1 FROM EXISTING PANEL 1B CIRCUIT 28 FOR REMOVAL BY MECHANICAL. DEMOLISH EXISTING CONDUIT AND WIRING BACK TO EXISTING PANEL 1B.
- DISCONNECT EXISTING PUMP PDP-1 FROM EXISTING PANEL 1B CIRCUITS 31, 33, 35 FOR REMOVAL BY MECHANICAL. EXISTING MOTOR STARTER, DISCONNECT SWITCH, AND CONDUIT AND WIRING FROM EXISTING MOTOR START THROUGH EXISTING DISCONNECT SWITCH TO EXISTING PANEL 1B SHALL REMAIN. DEMOLISH THE EXISTING FLEXIBLE CONDUIT AND WIRING FROM THE EXISTING MOTOR START TO EXISTING PDP-1.
- DISCONNECT EXISTING PUMP PDP-2 FROM EXISTING PANEL 1B CIRCUITS 34, 36, 38 FOR REMOVAL BY MECHANICAL. EXISTING MOTOR STARTER, DISCONNECT SWITCH, AND CONDUIT AND WIRING FROM EXISTING MOTOR START THROUGH EXISTING DISCONNECT SWITCH TO EXISTING PANEL 1B SHALL REMAIN. DEMOLISH THE EXISTING FLEXIBLE CONDUIT AND WIRING FROM THE EXISTING MOTOR START TO EXISTING PDP-2.
- DISCONNECT EXISTING PUMP LPP-1 FROM EXISTING PANEL 1B CIRCUIT 32 FOR REMOVAL BY MECHANICAL. DEMOLISH EXISTING MOTOR STARTER/DISCONNECT AND EXISTING CONDUIT AND WIRING BACK TO EXISTING PANEL 1B.

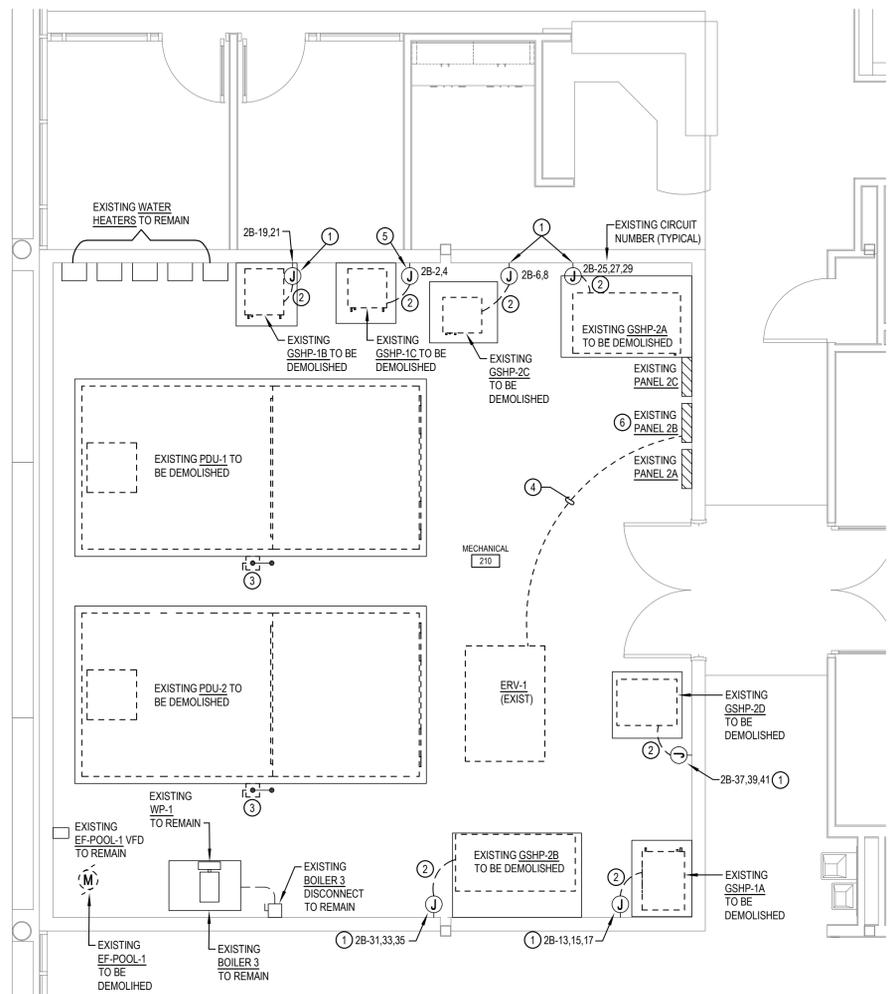


**PARTIAL FIRST FLOOR PLAN - ELECTRICAL - NEW WORK**  
 SCALE: 1/8" = 1'-0"

**NEW WORK PLAN NOTES:**

- PROVIDE GENERAC MANUAL TRANSFER SWITCH FOR PORTABLE GENERATOR, MODEL 6863, TO BE MOUNTED OUTSIDE. THIS ASSEMBLY INCLUDES NEMA-1 MANUAL TRANSFER SWITCH INTEGRATED INTO GENERATOR PANEL G1 WITH A 10 FEET LONG PRE-WIRED CORD TO A NEMA-3R L14-30R GENERATOR RECEPTACLE TO BE MOUNTED ON WALL OUTSIDE. SINCE THE TRANSFER SWITCH ASSEMBLY IS RATED NEMA-1 IT WILL REQUIRE A SEPARATE NEMA-3R ENCLOSURE CABINET SO IT CAN BE MOUNTED OUTSIDE. THE NEMA-3R ENCLOSURE SHALL BE A CABINET TYPE ENCLOSURE LARGE ENOUGH TO ACCOMMODATE THE TRANSFER SWITCH WHEN THE DOOR IS CLOSED. THE ENCLOSURE SHALL ALSO BE PROVIDED WITH A HINGED DOOR ON THE SIDE WITH A KEYPAD LOCK. PROVIDE ENGRAVED LABEL ON OUTSIDE OF ENCLOSURE THAT INDICATES "PANEL G1". LOCATE GENERATOR PANEL G1 OUTSIDE THE EXISTING BUILDING AT THE APPROXIMATE LOCATIONS ON THE FLOOR PLAN ON THE EXTERIOR WALL SO THAT THE PRE-WIRED 10 FEET CORD TO THE GENERATOR RECEPTACLE CAN BE USED. IF THE GENERATOR PANEL G1 IS LOCATED FURTHER THAN 10 FEET FROM THE RECEPTACLE THEN PROVIDE CONDUIT AND WIRING TO ACCOMMODATE THE FINAL LENGTH. REFER TO SHEET E-5 FOR NEW PANEL G1 SCHEDULE. UTILIZE EXISTING SPARE 50 AMP CIRCUIT BREAKER IN PANEL 1C TO PROVIDE NORMAL POWER TO THIS MANUAL TRANSFER SWITCH. REFER TO SHEET E-6 FOR REVISED PANEL 1C SCHEDULE.
- PROVIDE A NEMA 5-20P AMP WEATHER-TIGHT RATED CORD-&PLUG THAT WILL CONNECT TO THE HEAT TRACE. HEAT TRACE TO BE PROVIDED AND INSTALLED BY MECHANICAL SUBCONTRACTOR. PLUG THE CORD-&PLUG INTO THE GFCI RECEPTACLE, WITH LOCKING WHILE-IN-USE COVER PLATE, TO POWER THE HEAT TRACE. COORDINATE INSTALLATION OF RECEPTACLES IN THE FIELD. PROVIDE ALL REQUIRED STRUCTURAL ASSEMBLIES NECESSARY TO INSTALL TO EXISTING WALL, TO NEW CLOSED CIRCUIT COOLER, OR TO EXISTING UNISTRUCT NEXT TO BOILERS.
- PROVIDE GFCI SERVICE RECEPTACLE. COORDINATE INSTALLATION OF RECEPTACLES IN THE FIELD. PROVIDE ALL REQUIRED STRUCTURAL ASSEMBLIES NECESSARY TO INSTALL TO EXISTING WALL OR TO NEW CLOSED CIRCUIT COOLER.
- NEW BOILER B-1 IS PROVIDED WITH AN INTEGRAL DISCONNECT SWITCH. PROVIDE A

- DIRECT CONNECTION TO THE BOILER. UTILIZE THE SAME TRENCH AS THE WATER PIPES TO THE BOILER TO RUN THE NEW UNDERGROUND ELECTRICAL BRANCH CIRCUIT. CONDUIT SHALL BE A MINIMUM OF 18" BELOW FINISHED GRADE.
- NEW PUMP P-1 (LPP-1) WILL BE CONTROLLED BY NEW BOILER B-1. PROVIDE A NEW DISCONNECT SWITCH AND LOCATE ON EXISTING UNISTRUCT FOR POWER CONNECTION TO P-1 (LPP-1). MOUNT NEW DISCONNECT AT SAME HEIGHT AS EXISTING DISCONNECT SWITCH. UTILIZE THE SAME TRENCH AS THE WATER PIPES TO THE BOILER TO RUN THE NEW UNDERGROUND ELECTRICAL BRANCH CIRCUIT. CONDUIT SHALL BE A MINIMUM OF 18" BELOW FINISHED GRADE. PROVIDE LIQUID TIGHT FLEXIBLE CONDUIT FROM NEW DISCONNECT SWITCH TO P-1 (LPP-1).
- RECONNECT NEW PDP-1 AND PDP-2 TO THEIR EXISTING MOTOR STARTERS WITH FLEXIBLE METAL CONDUIT AND CONDUCTOR TO MATCH THE SAME SIZE AS EXISTING.
- FISH CONDUIT ABOVE EXISTING GWB CEILING.
- REFER TO REVISED PANEL 1B SCHEDULE ON SHEET E-6 FOR ADDITIONAL NEW WORK INSIDE THE EXISTING PANEL. NOTE THAT EXISTING PANEL 1B IS AN EXISTING EATON CUTLER HAMMER PLR2A TYPE PANEL.
- REFER TO REVISED PANEL 1C SCHEDULE ON SHEET E-6 FOR ADDITIONAL NEW WORK INSIDE THE EXISTING PANEL. NOTE THAT EXISTING PANEL 1C IS AN EXISTING EATON CUTLER HAMMER PLR2A TYPE PANEL.
- PROVIDE A NEW SINGLE-POINT POWER CONNECTION FROM EXISTING PANEL 1C TO NEW CLOSED CIRCUIT COOLER DISCONNECT SWITCH/CONTROL PANEL. REFER TO REVISED PANEL 1C FOR CHANGES TO EXISTING PANEL 1C. PROVIDE ALL POWER CONNECTIONS FROM DISCONNECT SWITCH/CONTROL PANEL TO BASIN HEATER, FAN, PUMP, WATER LEVELING SENSOR, VIBRATION SWITCH, FAN MOTOR HEATERS, ELECTRIC MAKE-UP VALVE, AND ALL OTHER POWER CONNECTIONS REQUIRED FOR A COMPLETE INSTALLATION. MECHANICAL CONTRACTORS LOW-VOLTAGE CONTRACTOR SHALL PROVIDE AND MAKE ALL LOW-VOLTAGE POWER CONNECTIONS TO ALL EQUIPMENT IN THE CLOSED CIRCUIT COOLER. WIRING TO FAN, PUMP, AND BASIN HEATER SHALL BE (3) #10 AWG CU & (1) #10 AWG CU GND IN 3/4" LIQUID TIGHT FLEXIBLE CONDUIT. ALL OTHER 120 VOLT CONNECTIONS SHALL BE #12 AWG CU WIRING IN LIQUID TIGHT FLEXIBLE CONDUIT.

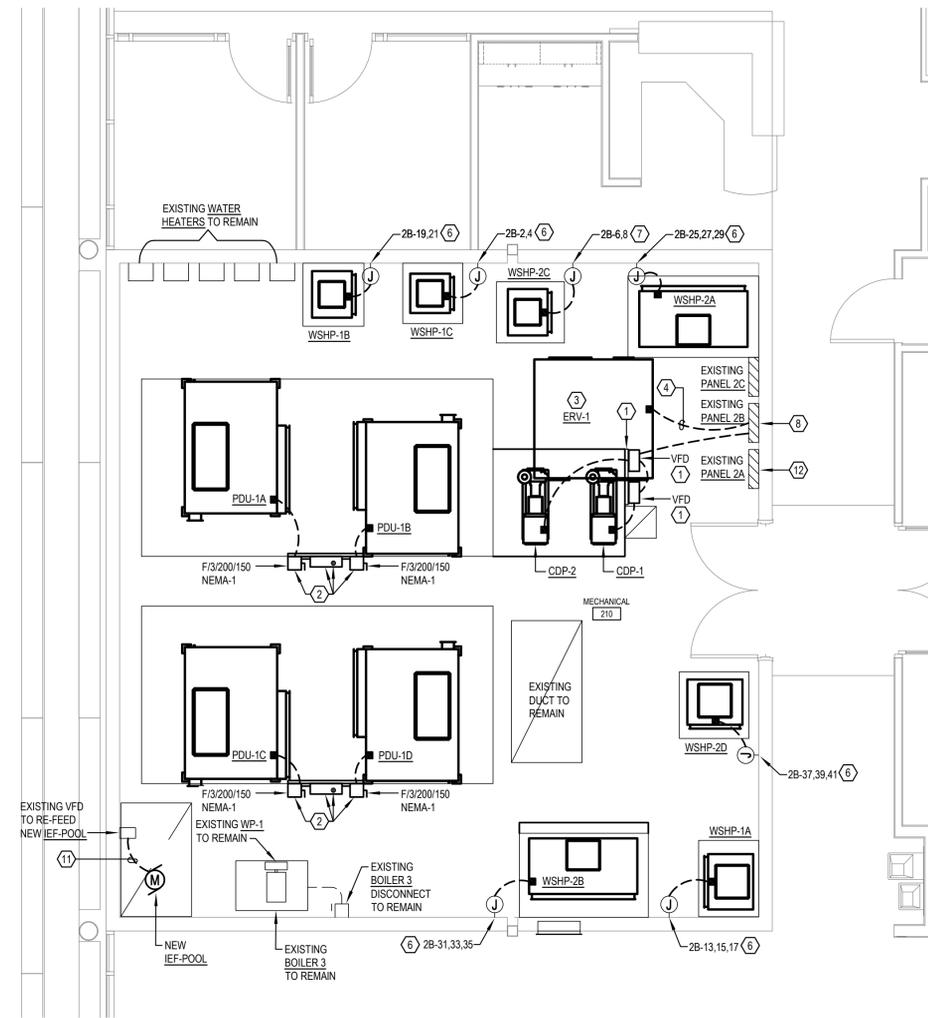
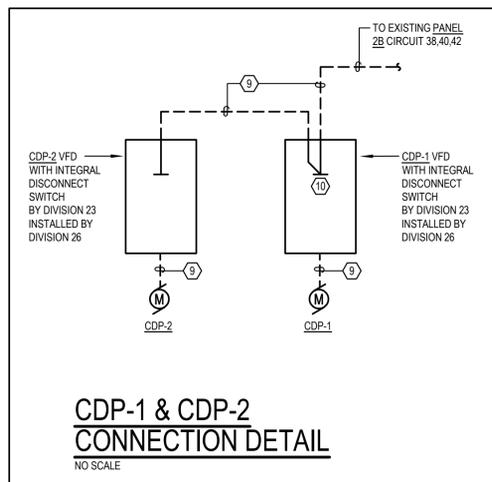
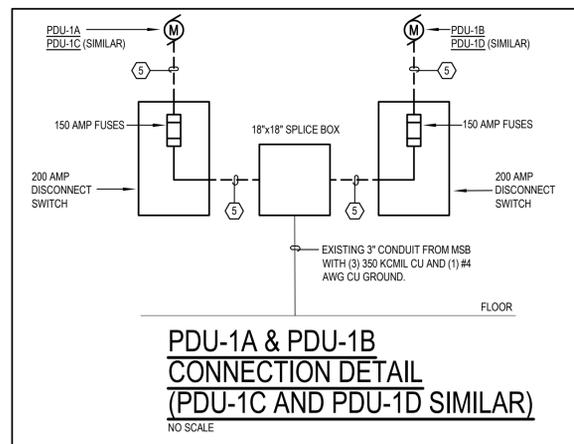


**ENLARGED MECHANICAL 210 ELECTRICAL - DEMOLITION**

SCALE: 1/4" = 1'-0"

**DEMOLITION NOTES:**

- EXISTING CONDUIT AND CONDUCTORS FROM EXISTING PANEL 2B TO JUNCTION BOX TO REMAIN. TO BE REUSED TO CONNECT TO THE NEW WATER SOURCE HEAT PUMP (WSHP).
- REMOVE FLEXIBLE CONDUIT AND CONDUCTORS FROM JUNCTION BOX TO HEAT PUMP.
- EXISTING PDU-1 AND PDU-2 DISCONNECT SWITCHES SHALL BE DEMOLISHED. RETAIN EXISTING FEEDERS (CONDUIT AND WIRING) FROM THE TWO EXISTING 250 AMP CIRCUIT BREAKERS IN EXISTING MAIN SWITCHBOARD "MSB" BELOW TO THE EXISTING DISCONNECT SWITCHES TO BE REUSED FOR CONNECTIONS TO THE NEW PDUS, REFER TO NEW WORK PLAN.
- REMOVE EXISTING WIRING AND CONDUIT FROM ERV-1 BACK TO EXISTING CIRCUIT BREAKER IN EXISTING PANEL 2B.
- REMOVE EXISTING WIRING FROM GSHP-1C BACK TO EXISTING CIRCUIT BREAKER IN EXISTING PANEL 2B. KEEP EXISTING CONDUIT TO ROUTE NEW WIRING IN.
- REFER TO EXISTING PANEL 2B SCHEDULE ON SHEET E-5 FOR ADDITIONAL DEMOLITION WORK INSIDE THE EXISTING PANEL.
- DISCONNECT EXISTING CONDUIT AND WIRING FROM EXISTING EF-POOL-1 TO EXISTING EF-POOL-1 VFD. EXISTING VFD WILL REMAIN TO RE-FEED NEW IEF-POOL.

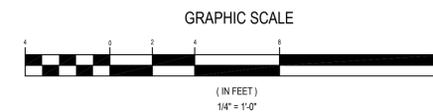


**ENLARGED MECHANICAL 210 - ELECTRICAL - NEW WORK**

SCALE: 1/4" = 1'-0"

**PLAN NOTES:**

- PROVIDE RACK CONSTRUCTED OF UNISTRUT CHANNELS FROM FLOOR TO CEILING TO MOUNT NEW CDP-1 AND CDP-2 VFD'S TO. INSTALL VFD'S (PROVIDED BY DIVISION 23) TO RACK AND PROVIDE ALL LINE VOLTAGE WIRING TO VFD'S AND CDP'S. REFER TO "CDP-1 & CDP-2 CONNECTION DETAIL" ON THIS SHEET.
- EXISTING 3" CONDUIT FROM THE 1600 AMP MAIN SWITCHBOARD ON THE FIRST FLOOR WITH (3) #350 KCMIL CU AND (1) #4 AWG CU GROUND. CONDUCTORS FROM MAIN SWITCHBOARD TO THIS POINT SHALL REMAIN. PROVIDE AN 18"x18" SPICE BOX ON TOP OF THE EXISTING RIGID PORTION OF THE EXISTING 3" CONDUIT. EXTEND CONDUCTORS FROM SPICE BOX TO NEW PDU DISCONNECT SWITCHES. SEE "PDU-1A & PDU-1B CONNECTION DETAIL" THIS SHEET. PROVIDE RACK CONSTRUCTED OF UNISTRUT CHANNELS FROM FLOOR TO CEILING TO MOUNT NEW SPICE BOX AND DISCONNECT SWITCHES TO.
- NEW ERV-1 SHALL BE PROVIDED WITH AN INTEGRAL DISCONNECT SWITCH BY MECHANICAL CONTRACTOR. SINGLE-POINT POWER CONNECTION ONLY.
- CONNECT NEW ERV-1 TO NEW 40 AMP 3-POLE CIRCUIT BREAKER IN CIRCUITS 20,22,24 IN EXISTING PANEL 2B WITH NEW CONDUIT AND WIRING AS INDICATED IN THE REVISED PANEL 2B SCHEDULE.
- PROVIDE (3) #10 AWG CU AND (1) #6 AWG CU GND IN A 1-1/2" EMT CONDUIT, PROVIDE FLEXIBLE CONDUIT FOR CONNECTIONS TO THE MOTORS.
- CONNECT NEW WSHP TO EXISTING OUTLET BOX WITH NEW FLEXIBLE CONDUIT AND NEW WIRING. CONNECT THE NEW WIRING TO THE EXISTING WIRING IN THE EXISTING OUTLET BOX.
- CONNECT NEW WSHP TO EXISTING OUTLET BOX WITH NEW FLEXIBLE CONDUIT AND NEW WIRING. UTILIZE THE EXISTING CONDUIT TO EXTEND THE NEW WIRING FROM THE EXISTING OUTLET BOX TO THE NEW 25 AMP 2-POLE CIRCUIT BREAKER IN REVISED PANEL 2B CIRCUITS 2,4.
- REFER TO REVISED PANEL 2B SCHEDULE ON SHEET E-5 FOR ADDITIONAL NEW WORK INSIDE THE EXISTING PANEL. NOTE THAT EXISTING PANEL 2B IS AN EXISTING EATON CUTLER HAMMER PLR2A TYPE PANEL.
- PROVIDE (3) #8 AWG CU AND (1) #10 AWG CU GND IN A 3/4" EMT CONDUIT, PROVIDE FLEXIBLE CONDUIT FOR CONNECTIONS TO THE MOTORS.
- WHERE POSSIBLE TAP OFF OF LUGS ON THE CDP-1 VFD TO FEED CDP-2 VFD. OTHERWISE PROVIDE SPICE BOX ABOVE THE CDP-1 VFD AND TAP THE CONDUCTORS INSIDE THE SPICE BOX.
- PROVIDE (3) #10 AWG CU AND (1) #10 AWG CU GND IN A 1/2" FLEXIBLE CONDUIT FOR CONNECTION TO MOTOR IN NEW IEF-POOL. EXISTING BRANCH CIRCUIT FROM EXISTING PANEL 2A TO VFD SHALL REMAIN.
- REFER TO REVISED PANEL 2A SCHEDULE ON SHEET E-4 FOR ADDITIONAL NEW WORK INSIDE THE EXISTING PANEL. NOTE THAT EXISTING PANEL 2A IS AN EXISTING EATON CUTLER HAMMER PLR2A TYPE PANEL.



REVISION	DATE

**SMITH AQUATIC CENTER**  
**INDOOR AIR QUALITY HVAC RENOVATIONS**  
 CHARLOTTESVILLE, VIRGINIA  
**ENLARGED MECHANICAL ROOM PLANS -**  
**DEMOLITION AND NEW WORK - ELECTRICAL**

DESIGNED WDC	DRAWN WBS
CHECKED WAM	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20
SHEET <b>E-3</b>	

EXISTING PANEL 2A																							
VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES				MAIN: 225A MLO BUS RATING: 225A GROUND BUS: YES				INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC															
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3		
1	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	.4			2	EXISTING LIGHTS 214	20/1	#12	#12	#12	1/2"	L	.3				
3	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		4	EXISTING LIGHTS 213	20/1	#12	#12	#12	1/2"	L		1.2			
5	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			.9	6	EXISTING LIGHTS 212	20/1	#12	#12	#12	1/2"	L					.8
7	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			8	EXISTING LIGHTS 210	20/1	#12	#12	#12	1/2"	L	.6				
9	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		10	EXISTING LIGHTS 205	20/1	#12	#12	#12	1/2"	L		1.5			
11	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	12	EXISTING LIGHTS 207	20/1	#12	#12	#12	1/2"	L					.6
13	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			14	EXISTING LIGHTS 206	20/1	#12	#12	#12	1/2"	L	.4				
15	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		16	EXISTING LIGHTS 116 QUARTZ	20/1	#12	#12	#12	1/2"	L		1.5			
17	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	18	EXISTING LIGHTS 116 QUARTZ	20/1	#12	#12	#12	1/2"	L					1.5
19	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			20	EXISTING EXHAUST FAN	20/1	#12	#12	#12	1/2"	M	1.18				
21	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		22	EXISTING EXHAUST FAN	20/1	#12	#12	#12	1/2"	M		1.18			
23	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	24	SPARE	20/1	-	-	-	-	-	-	-	-	-	-
25	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			26	EXISTING DESTRAT FANS	20/1	#12	#12	#12	1/2"	M	1.18				
27	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		28	SPARE	20/1	-	-	-	-	-	-	-	-	-	-
29	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			2	30	SPARE	20/1	-	-	-	-	-	-	-	-	-	-
31	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	.5			32	EXISTING BOILER 3	20/1	#12	#12	#12	1/2"	H	.96				
33	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			2	34	SPARE	20/1	-	-	-	-	-	-	-	-	-	-
35	EXISTING CONTROL PANEL FOR LIGHT PANEL	20/1	#12	#12	#12	1/2"	N			1	36	SPARE	20/1	-	-	-	-	-	-	-	-	-	-
37	EXISTING WP-1	15/3	#12	-	#12	1/2"	M	.55			38	EXISTING EF-POOL-1	30/3	#10	-	#10	1/2"	M	2				
39	EXISTING WP-1	-	#12	-	-	-	M		.55		40	EXISTING EF-POOL-1	-	#10	-	-	-	M		2			
41	EXISTING WP-1	-	#12	-	-	-	M			.55	42	EXISTING EF-POOL-1	-	#10	-	-	-	M					2
PHASE LOAD TOTALS																		15.67	17.63	13.25			

LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	
LIGHTING	33.4	1.25	41.75	KITCHEN EQUIPMENT	0	1.0	0	
REC TO 10 KVA	0	1.0	0	CONTINUOUS	0	1.25	0	
REC REMAINING	0	0.5	0	NON-CONTINUOUS	1	1.0	1	
SPACE HEATING	.96	1.0	.96	DEMAND	0	1.0	0	
AIR CONDITIONING	0	0.0	0					
NON-SEASONAL MOTORS	11.19	1.0	11.19	TOTAL CONNECTED LOAD	46.6	KVA	129.3	AMPS
LARGEST MOTOR	6.01	0.25	1.5	MIN. FEEDER / PANEL CAPACITY	56.4	KVA	156.7	AMPS
WATER HEATING	0	1.0	0	OVERALL DEMAND FACTOR	1.21			

REVISED PANEL 2A																						
VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES				MAIN: 225A MLO BUS RATING: 225A GROUND BUS: YES				INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC														
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	
1	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	.4			2	EXISTING LIGHTS 214	20/1	#12	#12	#12	1/2"	L	.3			
3	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		4	EXISTING LIGHTS 213	20/1	#12	#12	#12	1/2"	L		1.2		
5	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			.9	6	EXISTING LIGHTS 212	20/1	#12	#12	#12	1/2"	L				.8
7	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			8	EXISTING LIGHTS 210	20/1	#12	#12	#12	1/2"	L	.6			
9	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		10	EXISTING LIGHTS 205	20/1	#12	#12	#12	1/2"	L		1.5		
11	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	12	EXISTING LIGHTS 207	20/1	#12	#12	#12	1/2"	L				.6
13	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			14	EXISTING LIGHTS 206	20/1	#12	#12	#12	1/2"	L	.4			
15	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		16	EXISTING LIGHTS 116 QUARTZ	20/1	#12	#12	#12	1/2"	L		1.5		
17	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	18	EXISTING LIGHTS 116 QUARTZ	20/1	#12	#12	#12	1/2"	L				1.5
19	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			20	EXISTING EXHAUST FAN	20/1	#12	#12	#12	1/2"	M	1.18			
21	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		22	EXISTING EXHAUST FAN	20/1	#12	#12	#12	1/2"	M		1.18		
23	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			1.9	24	SPARE	20/1	-	-	-	-	-	-	-	-	-
25	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	1.9			26	EXISTING DESTRAT FANS	20/1	#12	#12	#12	1/2"	M	1.18			
27	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L		1.9		28	SPARE	20/1	-	-	-	-	-	-	-	-	-
29	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			2	30	SPARE	20/1	-	-	-	-	-	-	-	-	-
31	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L	.5			32	EXISTING BOILER 3	20/1	#12	#12	#12	1/2"	H	.96			
33	EXISTING LIGHTS 116	20/1	#12	#12	#12	1/2"	L			2	34	SPARE	20/1	-	-	-	-	-	-	-	-	-
35	EXISTING CONTROL PANEL FOR LIGHT PANEL	20/1	#12	#12	#12	1/2"	N			1	36	SPARE	20/1	-	-	-	-	-	-	-	-	-
37	EXISTING WP-1	15/3	#12	-	#12	1/2"	M	.55			38	NEW IEF-POOL	30/3	#10	-	#10	1/2"	M	2			
39	EXISTING WP-1	-	#12	-	-	-	M		.55		40	NEW IEF-POOL	-	#10	-	-	-	M		2		
41	EXISTING WP-1	-	#12	-	-	-	M			.55	42	NEW IEF-POOL	-	#10	-	-	-	M				2
PHASE LOAD TOTALS																		15.67	17.63	13.25		

LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	
LIGHTING	33.4	1.25	41.75	KITCHEN EQUIPMENT	0	1.0	0	
REC TO 10 KVA	0	1.0	0	CONTINUOUS	0	1.25	0	
REC REMAINING	0	0.5	0	NON-CONTINUOUS	1	1.0	1	
SPACE HEATING	.96	1.0	.96	DEMAND	0	1.0	0	
AIR CONDITIONING	0	0.0	0					
NON-SEASONAL MOTORS	11.19	1.0	11.19	TOTAL CONNECTED LOAD	46.6	KVA	129.3	AMPS
LARGEST MOTOR	6.01	0.25	1.5	MIN. FEEDER / PANEL CAPACITY	56.4	KVA	156.7	AMPS
WATER HEATING	0	1.0	0	OVERALL DEMAND FACTOR	1.21			

**PLAN NOTES:**

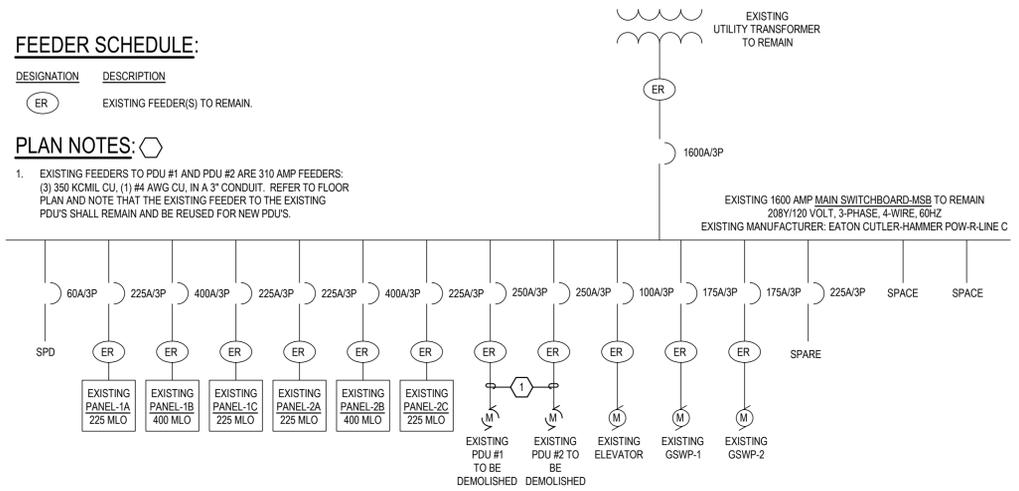
- EXISTING LOAD TO BE REMOVED AND REPLACED WITH NEW LOAD AS INDICATED IN REVISED PANEL 2B SCHEDULE. REUSE EXISTING WIRING FROM EXISTING CIRCUIT BREAKER TO EXISTING VFD.

**FEEDER SCHEDULE:**

DESIGNATION	DESCRIPTION
ER	EXISTING FEEDER(S) TO REMAIN.

**PLAN NOTES:**

- EXISTING FEEDERS TO PDU #1 AND PDU #2 ARE 310 AMP FEEDERS. (3) 350 KCMIL CU, (1) #4 AWG CU, IN A 3" CONDUIT. REFER TO FLOOR PLAN AND NOTE THAT THE EXISTING FEEDER TO THE EXISTING PDUS SHALL REMAIN AND BE REUSED FOR NEW PDUS.



**EXISTING ONE-LINE RISER DIAGRAM - DEMOLITION**

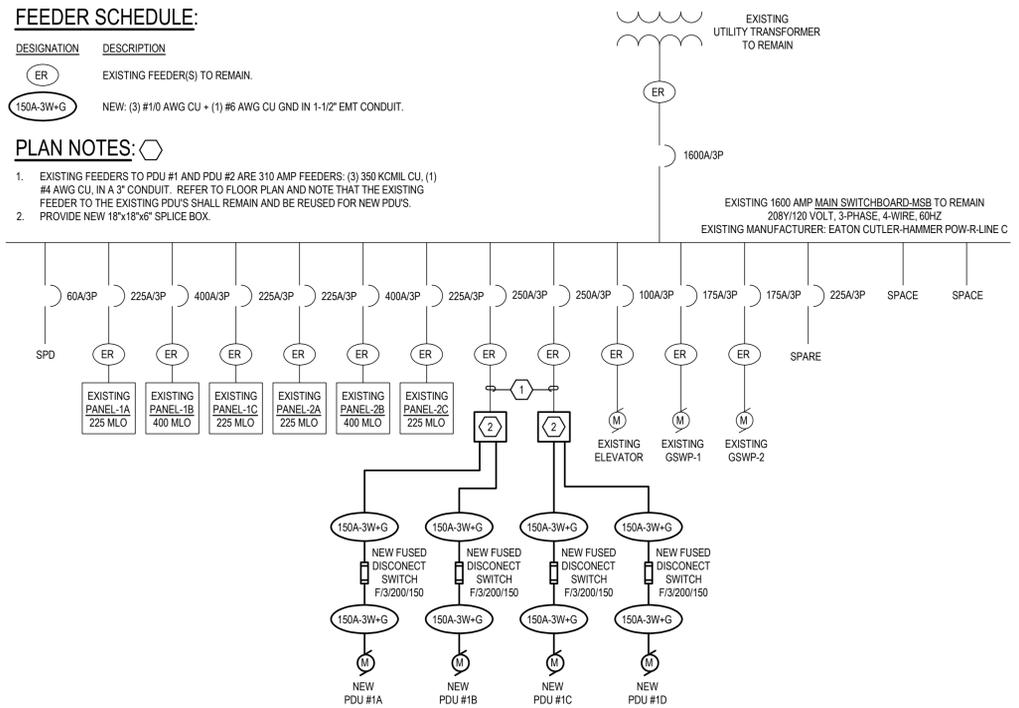
SCALE: NONE

**FEEDER SCHEDULE:**

DESIGNATION	DESCRIPTION
ER	EXISTING FEEDER(S) TO REMAIN.
150A-3W+G	NEW: (3) #10 AWG CU + (1) #6 AWG CU GND IN 1-1/2" EMT CONDUIT.

**PLAN NOTES:**

- EXISTING FEEDERS TO PDU #1 AND PDU #2 ARE 310 AMP FEEDERS. (3) 350 KCMIL CU, (1) #4 AWG CU, IN A 3" CONDUIT. REFER TO FLOOR PLAN AND NOTE THAT THE EXISTING FEEDER TO THE EXISTING PDUS SHALL REMAIN AND BE REUSED FOR NEW PDUS.
- PROVIDE NEW 18"x18"x6" SPLICE BOX.

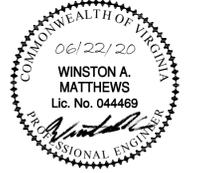


**REVISED ONE-LINE RISER DIAGRAM - NEW WORK**

SCALE: NONE

**LOAD SUMMARY:**

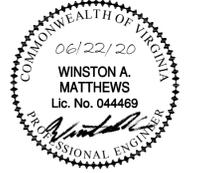
- PANEL 1B: REDUCTION IN LOAD OF 24 AMPS.
- PANEL 1C: REDUCTION IN LOAD OF 57.2 AMPS.
- PANEL 2A: NO LOAD CHANGES.
- PANEL 2B: ADDITION IN LOAD OF 32.5 AMPS.
  - EXISTING PANEL 2B IS A 400 AMP MLO PANEL FED FROM EXISTING MAIN SWITCHBOARD MSB WITH AN EXISTING 400 AMP CIRCUIT BREAKER AND AN EXISTING 400 AMP FEEDER. NEW DEMAND LOAD ON EXISTING PANEL 2B IS 314.8 AMPS, WHICH IS WITHIN THE CAPACITY OF THE EXISTING PANEL AND THE BREAKER AND FEEDER IT.
- TOTAL LOAD CHANGES: REDUCTION OF 27.1 AMPS ON EXISTING MAIN SWITCHBOARD MSB.



REVISION	DATE

DESIGNED WAM	DRAWN WAM
CHECKED WAM	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20

SHEET



REVISION	DATE

**SMITH AQUATIC CENTER**  
**INDOOR AIR QUALITY HVAC RENOVATIONS**  
 CHARLOTTESVILLE, VIRGINIA  
**PANEL SCHEDULES**

DESIGNED WAM	DRAWN WAM
CHECKED WAM	APPROVED LPA
COMM. NO. 19120	DATE 06-22-20

**GENERATOR MANUAL TRANSFER SWITCH PANEL G1**

VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES													MAIN: 30A MLO BUS RATING: 100A GROUND BUS: YES													INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC												
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3																	
1	SPARE	20/2	-	-	-	-	-	-	-	-	2	HEAT TRACE	15/1	#12	#12	#12	3/4"	H	.5																			
3	SPARE	-	-	-	-	-	-	-	-	-	4	HEAT TRACE	15/1	#12	#12	#12	3/4"	H			.5																	
5	SPARE	20/1	-	-	-	-	-	-	-	-	6	REC. CLOSED CIRCUIT COOLER	15/1	#12	#12	#12	3/4"	R				.18																
7	SPARE	15/1	-	-	-	-	-	-	-	-	8	HEAT TRACE	15/1	#12	#12	#12	3/4"	H	.5																			
											PHASE LOAD TOTALS																											
											1 .5 .18																											

LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND
LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0
REC TO 10 KVA	.18	1.0	.18	CONTINUOUS	0	1.25	0
REC REMAINING	0	0.5	0	NON-CONTINUOUS	0	1.0	0
SPACE HEATING	1.5	1.0	1.5	DEMAND	0	1.0	0
AIR CONDITIONING	0	0.0	0	TOTAL CONNECTED LOAD	1.7	KVA	4.7 AMPS
NON-SEASONAL MOTORS	0	1.0	0	MIN. FEEDER / PANEL CAPACITY	1.7	KVA	4.7 AMPS
LARGEST MOTOR	0	0.25	0	OVERALL DEMAND FACTOR	1.00		
WATER HEATING	0	1.0	0				

**EXISTING PANEL 2B**

VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES													MAIN: 400A MLO BUS RATING: 400A GROUND BUS: YES													INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC												
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3																	
1	EXISTING HLP-1	80/3	#3	-	#8	1"	A	5.54			2	EXISTING GSHP-1C	20/2	#12	-	#12	1/2"	A	1.53																			
3	EXISTING HLP-1	-	#3	-	-	-	A		5.54		4	EXISTING GSHP-1C	-	#12	-	-	-	A			1.53																	
5	EXISTING HLP-1	-	#3	-	-	-	A			5.54	6	EXISTING GSHP-2C	25/2	#10	-	#10	1/2"	A				1.48																
7	EXISTING HLP-2	80/3	#3	-	#8	1"	A	5.54			8	EXISTING GSHP-2C	-	#10	-	-	-	A	1.48																			
9	EXISTING HLP-2	-	#3	-	-	-	A		5.54		10	EXISTING DWH-2	35/3	#8	-	#10	3/4"	N				3																
11	EXISTING HLP-2	-	#3	-	-	-	A			5.54	12	EXISTING DWH-2	-	#8	-	-	-	N				3																
13	EXISTING GSHP-1A	35/3	#8	-	#10	3/4"	A	2.45			14	EXISTING DWH-2	-	#8	-	-	-	N	3																			
15	EXISTING GSHP-1A	-	#8	-	-	-	A		2.45		16	EXISTING DWH-1	20/1	#12	#12	#12	1/2"	N				5																
17	EXISTING GSHP-1A	-	#8	-	-	-	A			2.45	18	EXISTING SPARE	20/1	-	-	-	-	-																				
19	EXISTING GSHP-1B	25/2	#10	-	#10	1/2"	A	1.48			20	EXISTING ERV-1	30/3	#10	-	#10	1/2"	A	2.18																			
21	EXISTING GSHP-1B	-	#10	-	-	-	A		1.48		22	EXISTING ERV-1	-	#10	-	-	-	A			2.18																	
23	EXISTING ELECTRIC TRAP PRIMER	20/1	#12	#12	#12	1/2"	N			.04	24	EXISTING ERV-1	-	#10	-	-	-	A				2.18																
25	EXISTING GSHP-2A	45/3	#8	-	#10	3/4"	A	3.83			26	SPARE	20/1	-	-	-	-	-																				
27	EXISTING GSHP-2A	-	#8	-	-	-	A		3.83		28	EXISTING UH-4	20/2	#12	-	#12	1/2"	H				1.7																
29	EXISTING GSHP-2A	-	#8	-	-	-	A			3.83	30	EXISTING UH-4	-	#12	-	-	-	H				1.7																
31	EXISTING GSHP-2B	45/3	#8	-	#10	3/4"	A	3.83			32	EXISTING UH-3	20/2	#12	-	#12	1/2"	H	1.7																			
33	EXISTING GSHP-2B	-	#8	-	-	-	A		3.83		34	EXISTING UH-3	-	#12	-	-	-	H				1.7																
35	EXISTING GSHP-2B	-	#8	-	-	-	A			3.83	36	EXISTING SPARE	20/1	-	-	-	-	-																				
37	EXISTING GSHP-2D	45/3	#8	-	#10	3/4"	A	2.95			38	SPARE	20/3	-	-	-	-	-																				
39	EXISTING GSHP-2D	-	#8	-	-	-	A		2.95		40	SPARE	-	-	-	-	-	-																				
41	EXISTING GSHP-2D	-	#8	-	-	-	A			2.95	42	SPARE	-	-	-	-	-	-																				
											PHASE LOAD TOTALS																											
											35.51 36.23 32.54																											

LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND
LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0
REC TO 10 KVA	0	1.0	0	CONTINUOUS	0	1.25	0
REC REMAINING	0	0.5	0	NON-CONTINUOUS	9.54	1.0	9.54
SPACE HEATING	6.8	0.0	0	DEMAND	0	1.0	0
AIR CONDITIONING	87.94	1.0	87.94	TOTAL CONNECTED LOAD	104.3	KVA	289.7 AMPS
NON-SEASONAL MOTORS	0	1.0	0	MIN. FEEDER / PANEL CAPACITY	101.6	KVA	282.3 AMPS
LARGEST MOTOR	16.63	0.25	4.16	OVERALL DEMAND FACTOR	0.97		
WATER HEATING	0	1.0	0				

**REVISED PANEL 2B**

VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES													MAIN: 400A MLO BUS RATING: 400A GROUND BUS: YES													INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC												
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3																	
1	EXISTING HLP-1	80/3	#3	-	#8	1"	A	5.54			2	NEW WSH-1C	25/2	#10	-	#10	1/2"	A	1.51																			
3	EXISTING HLP-1	-	#3	-	-	-	A		5.54		4	NEW WSH-1C	-	#10	-	-	-	A				1.51																
5	EXISTING HLP-1	-	#3	-	-	-	A			5.54	6	NEW WSH-2C	30/2	#10	-	#10	1/2"	A				1.7																
7	EXISTING HLP-2	80/3	#3	-	#8	1"	A	5.54			8	NEW WSH-2C	-	#10	-	-	-	A	1.7																			
9	EXISTING HLP-2	-	#3	-	-	-	A		5.54		10	EXISTING DWH-2	35/3	#8	-	#10	3/4"	N				3																
11	EXISTING HLP-2	-	#3	-	-	-	A			5.54	12	EXISTING DWH-2	-	#8	-	-	-	N				3																
13	NEW WSH-1A	35/3	#8	-	#10	3/4"	A	2.5			14	EXISTING DWH-2	-	#8	-	-	-	N	3																			
15	NEW WSH-1A	-	#8	-	-	-	A		2.5		16	EXISTING DWH-1	20/1	#12	#12	#12	1/2"	N				5																
17	NEW WSH-1A	-	#8	-	-	-	A			2.5	18	EXISTING SPARE	20/1	-	-	-	-	-																				
19	NEW WSH-1B	25/2	#10	-	#10	1/2"	A	1.51			20	NEW ERV-1	40/3	#8	-	#10	3/4"	A	2.56																			
21	NEW WSH-1B	-	#10	-	-	-	A		1.51		22	NEW ERV-1	-	#8	-	-	-	A			2.56																	
23	EXISTING ELECTRIC TRAP PRIMER	20/1	#12	#12	#12	1/2"	N			.04	24	NEW ERV-1	-	#8	-	-	-	A				2.56																
25	NEW WSH-2A	50/3	#8	-	#10	3/4"	A	4.03			26	SPARE	20/1	-	-	-	-	-																				
27	NEW WSH-2A	-	#8	-	-	-	A		4.03		28	EXISTING UH-4	20/2	#12	-	#12	1/2"	H				1.7																
29	NEW WSH-2A	-	#8	-	-	-	A			4.03	30	EXISTING UH-4	-	#12	-	-	-	H				1.7																
31	NEW WSH-2B	50/3	#8	-	#10	3/4"	A	4.03			32	EXISTING UH-3	20/2	#12	-	#12	1/2"	H	1.7																			
33	NEW WSH-2B	-	#8	-	-	-	A		4.03		34	EXISTING UH-3	-	#12	-	-	-	H				1.7																
35	NEW WSH-2B	-	#8	-	-	-	A			4.03	36	EXISTING SPARE	20/1	-	-	-	-	-																				
37	NEW WSH-2D	40/3	#8	-	#10	3/4"	A	2.82			38	NEW CDP-1 (PRIMARY) & CDP-2 (STANDBY)	50/3	#8	-	#10	3/4"	A	3.04																			
39	NEW WSH-2D	-	#8	-	-	-	A		2.82		40	NEW CDP-1 (PRIMARY) & CDP-2 (STANDBY)	-	#8	-	-	-	A				3.04																
41	NEW WSH-2D	-	#8	-	-	-	A			2.82	42	NEW CDP-1 (PRIMARY) & CDP-2 (STANDBY)	-	#8	-	-	-	A				3.04																
											PHASE LOAD TOTALS																											
											39.48 39.98 36.5																											

LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)	CONNECTED	DEMAND FACTOR	DEMAND
LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0
REC TO 10 KVA	0	1.0	0	CONTINUOUS	0	1.25	0
REC REMAINING	0	0.5	0	NON-CONTINUOUS	9.54	1.0	9.54
SPACE HEATING	6.8	0.0	0	DEMAND	0	1.0	0
AIR CONDITIONING	99.62	1.0	99.62	TOTAL CONNECTED LOAD	116	KVA	322.1 AMPS
NON-SEASONAL MOTORS	0	1.0	0	MIN. FEEDER / PANEL CAPACITY	113.3	KVA	314.8 AMPS
LARGEST MOTOR	16.63	0.25	4.16	OVERALL DEMAND FACTOR	0.98		
WATER HEATING	0	1.0	0				

- PLAN NOTES:**
- EXISTING 45 AMP 3-POLE CIRCUIT BREAKER 31,33,35 TO BE REMOVED AND REPLACED WITH NEW. SEE REVISED PANEL 2B SCHEDULE FOR SIZE OF NEW CIRCUIT BREAKER. REUSE EXISTING WIRING.
  - EXISTING 45 AMP 3-POLE CIRCUIT BREAKER 25,27,29 TO BE REMOVED AND REPLACED WITH NEW. SEE REVISED PANEL 2B SCHEDULE FOR SIZE OF NEW CIRCUIT BREAKER. REUSE EXISTING WIRING.
  - EXISTING 20 AMP 2-POLE CIRCUIT BREAKER 24 TO BE REMOVED AND REPLACED WITH THE 25 AMP 2-POLE BREAKER REMOVED IN PLAN NOTE 4 BELOW. SEE REVISED PANEL 2B SCHEDULE FOR RELOCATED CIRCUIT BREAKER. DEMOLISH EXISTING WIRING FROM CIRCUIT BREAKER TO EQUIPMENT AND PROVIDE NEW AS INDICATED IN REVISED PANEL 2B SCHEDULE.
  - EXISTING 25 AMP 2-POLE CIRCUIT BREAKER 6,8 TO BE REMOVED AND REPLACED WITH NEW. SEE REVISED PANEL 2B SCHEDULE FOR SIZE OF NEW CIRCUIT BREAKER. REUSE EXISTING WIRING.
  - EXISTING 30 AMP 3-POLE CIRCUIT BREAKER 20,22,24 TO BE REMOVED AND REPLACED WITH WITH NEW. SEE REVISED PANEL 2B SCHEDULE FOR SIZE OF NEW CIRCUIT BREAKER. DEMOLISH EXISTING WIRING FROM CIRCUIT BREAKER TO EQUIPMENT AND PROVIDE NEW AS INDICATED IN REVISED PANEL 2B SCHEDULE.
  - EXISTING SPARE 20 AMP 3-POLE CIRCUIT BREAKER 38,40,42 TO BE REMOVED AND REPLACED WITH WITH NEW. SEE REVISED PANEL 2B SCHEDULE FOR SIZE OF NEW CIRCUIT BREAKER.
  - EXISTING LOAD TO BE REMOVED AND REPLACED WITH NEW LOAD AS INDICATED IN REVISED PANEL 2B SCHEDULE. REUSE EXISTING WIRING FROM EXISTING CIRCUIT BREAKER TO EXISTING JUNCTION BOX.

EXISTING PANEL 1B																									
VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES			MAIN: 400A MLO BUS RATING: 400A GROUND BUS: YES			INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC																			
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3				
1	EXISTING POOL EQUIPMENT PUMP (10HP)	50/3	#8	-	#10	3/4"	M	3.7			2	SPARE	20/3	-	-	-	-	-	-	-	-	-			
3	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M		3.7		4	SPARE	-	-	-	-	-	-	-	-	-	-			
5	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M			3.7	6	SPARE	-	-	-	-	-	-	-	-	-	-			
7	EXISTING POOL EQUIPMENT PUMP (10HP)	50/3	#8	-	#10	3/4"	M	3.7			8	EXISTING CHEM FEED BOOSTER PUMP F	20/1	#12	#12	#12	1/2"	M	1.66						
9	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M		3.7		10	EXISTING CHEM FEED BOOSTER PUMP L	20/1	#12	#12	#12	1/2"	M		1.66					
11	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M			3.7	12	EXISTING FILTER CONTROLLER F	30/1	#10	#10	#10	3/4"	N				2.9			
13	EXISTING POOL EQUIPMENT PUMP (25HP)	100/3	#3	-	#8	1-1/4"	M	8.98			14	EXISTING FILTER CONTROLLER L	30/1	#10	#10	#10	3/4"	N	2.9						
15	EXISTING POOL EQUIPMENT PUMP (25HP)	-	#3	-	-	-	M		8.98		16	EXISTING STRANTRONL CONTOLLER	20/1	#12	#12	#12	1/2"	N		1.8					
17	EXISTING POOL EQUIPMENT PUMP (25HP)	-	#3	-	-	-	M			8.98	18	EXISTING REC. AT PULSAR CONTOLLER	20/1	#12	#12	#12	1/2"	N		1.8					
19	EXISTING POOL EQUIPMENT PUMP (15HP)	60/3	#6	-	#10	1"	M	5.54			20	EXISTING BAS SYSTEM AT POOL EQUIP. RM.	20/1	#12	#12	#12	1/2"	N	1						
21	EXISTING POOL EQUIPMENT PUMP (15HP)	-	#6	-	-	-	M		5.54		22	EXISTING AUTO WATER LEVEL CONTROLLER	20/1	#12	#12	#12	1/2"	N		1					
23	EXISTING POOL EQUIPMENT PUMP (15HP)	-	#6	-	-	-	M			5.54	24	EXISTING AIR COMPRESSOR	20/1	#12	#12	#12	1/2"	M				1.18			
25	EXISTING POOL EQUIPMENT PUMP (15HP)	60/3	#6	-	#10	1"	M	5.54			26	EXISTING BOILER B-1	20/1	#12	#12	#12	1/2"	C	1.7						
27	EXISTING POOL EQUIPMENT PUMP (15HP)	-	#6	-	-	-	M		5.54		28	EXISTING BOILER B-2	20/1	#12	#12	#12	1/2"	C		2.2					
29	EXISTING POOL EQUIPMENT PUMP (15HP)	-	#6	-	-	-	M			5.54	30	SPARE	15/1	-	-	-	-	-	-	-	-	-			
31	EXISTING PDP-1	15/3	#12	-	#12	1/2"	M	.79			32	EXISTING LPP-1	20/1	#12	#12	#12	1/2"	M	.7						
33	EXISTING PDP-1	-	#12	-	-	-	M		.79		34	EXISTING PDP-2	15/3	#12	-	#12	1/2"	M		.79					
35	EXISTING PDP-1	-	#12	-	-	-	M			.79	36	EXISTING PDP-2	-	#12	-	-	-	-	-	-		.79			
37	EXISTING B-2 RECEPTACLE	20/1	#12	#12	#12	1/2"	R	.18			38	EXISTING PDP-2	-	#12	-	-	-	-	-	M	.79				
39	SPARE	20/1	-	-	-	-	-	-	-	-	40	SPARE	20/1	-	-	-	-	-	-	-	-	-			
41	EXISTING B-2 HEAT TRACE	20/1	#12	#12	#12	1/2"	C			1	42	SPARE	20/1	-	-	-	-	-	-	-	-	-			
PHASE LOAD TOTALS																		37.18	35.7	35.92					
LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND		
LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0	KITCHEN EQUIPMENT	0	1.0	0	LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0	KITCHEN EQUIPMENT	0	1.0	0		
REC TO 10 KVA	.18	1.0	.18	CONTINUOUS	4.9	1.25	6.13	CONTINUOUS	3	1.25	3.75	REC TO 10 KVA	.18	1.0	.18	CONTINUOUS	3	1.25	3.75	CONTINUOUS	3	1.25	3.75		
REC REMAINING	0	0.5	0	NON-CONTINUOUS	11.4	1.0	11.4	NON-CONTINUOUS	10.21	1.0	10.21	REC REMAINING	0	0.5	0	NON-CONTINUOUS	10.21	1.0	10.21	NON-CONTINUOUS	10.21	1.0	10.21		
SPACE HEATING	0	0.0	0	DEMAND	0	1.0	0	DEMAND	0	1.0	0	SPACE HEATING	0	0.0	0	DEMAND	0	1.0	0	DEMAND	0	1.0	0		
AIR CONDITIONING	0	1.0	0	TOTAL CONNECTED LOAD			108.8	KVA	302.2	AMPS	AIR CONDITIONING	0	1.0	0	TOTAL CONNECTED LOAD			61.3	KVA	170.3	AMPS	AIR CONDITIONING	0	1.0	0
NON-SEASONAL MOTORS	92.32	1.0	92.32	MIN. FEEDER / PANEL CAPACITY	116.8	KVA	324.3	AMPS	64.2	KVA	178.4	NON-SEASONAL MOTORS	47.92	1.0	47.92	MIN. FEEDER / PANEL CAPACITY	64.2	KVA	178.4	AMPS	64.2	KVA	178.4	AMPS	
LARGEST MOTOR	26.93	0.25	6.73	OVERALL DEMAND FACTOR	1.07				1.05				LARGEST MOTOR	8.71	0.25	2.18	OVERALL DEMAND FACTOR	1.05				LARGEST MOTOR	8.71	0.25	2.18
WATER HEATING	0	1.0	0												WATER HEATING	0	1.0	0				WATER HEATING	0	1.0	0

EXISTING PANEL 1C																									
VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES			MAIN: 225A MLO BUS RATING: 225A GROUND BUS: YES			INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC																			
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3				
1	EXISTING BLEED PUMP AT RM. 105	20/2	#12	-	#12	1/2"	M	.92			2	EXISTING UV FILTER VIA XFMR	30/3	#10	-	#10	1/2"	N	.67						
3	EXISTING BLEED PUMP AT RM. 105	-	#12	-	-	-	M		.92		4	EXISTING UV FILTER VIA XFMR	-	#10	-	-	-	N			.67				
5	EXISTING SUIT SPINNER 107B	20/1	#12	#12	#12	1/2"	M			.86	6	EXISTING UV FILTER VIA XFMR	-	#10	-	-	-	N				.67			
7	EXISTING SUIT SPINNER 108B	20/1	#12	#12	#12	1/2"	M	.86			8	EXISTING UV FILTER	40/2	#8	-	#10	1/2"	N	2.5						
9	EXISTING SUIT SPINNER RM. 102	20/1	#12	#12	#12	1/2"	M	.86		.86	10	EXISTING UV FILTER	-	#8	-	-	-	N			2.5				
11	EXISTING ELECTRIC DOOR LATCH	20/1	#12	#12	#12	1/2"	C			.5	12	SPARE	20/1	-	-	-	-	-	-	-	-	-			
13	EXISTING ELECTRIC DOOR LATCH	20/1	#12	#12	#12	1/2"	C	.5			14	EXISTING SCW PUMP #1	50/3	#8	-	#10	3/4"	M	2.9						
15	EXISTING LV TRANSF FOR FLUSH VALVES	20/1	#12	#12	#12	1/2"	N		.4		16	EXISTING SCW PUMP #1	-	#8	-	-	-	M		2.9					
17	EXISTING LV TRANSF FOR FLUSH VALVES	20/1	#12	#12	#12	1/2"	N		.3		18	EXISTING SCW PUMP #1	-	#8	-	-	-	M		2.9					
19	EXISTING SHUNT TRIP FOR ELEVATOR	20/1	#12	#12	#12	1/2"	N	.3			20	EXISTING SCW PUMP #2	50/3	#8	-	#10	3/4"	M	2.9						
21	EXISTING PIT RECEPTACLES	20/1	#12	#12	#12	1/2"	R	.18			22	EXISTING SCW PUMP #2	-	#8	-	-	-	M		2.9					
23	EXISTING BAS RM. 105	20/1	#12	#12	#12	1/2"	C			1	24	EXISTING SCW PUMP #2	-	#8	-	-	-	M		2.9					
25	EXISTING ADF CONTROL PANEL	20/1	#12	#12	#12	1/2"	N	1			26	EXISTING SCW PUMP #3	50/3	#8	-	#10	3/4"	M	2.9						
27	EXISTING AFO UNITS	20/1	#12	#12	#12	1/2"	N	.6		.6	28	EXISTING SCW PUMP #3	-	#8	-	-	-	M		2.9					
29	EXISTING BOOSTER PUMPS	20/1	#12	#12	#12	3/4"	M				30	EXISTING SCW PUMP #3	-	#8	-	-	-	M		2.9					
31	EXISTING AFO	20/1	#12	#12	#12	1/2"	N	.6			32	EXISTING SCW PUMP #4	50/3	#8	-	#10	3/4"	M	2.9						
33	SPARE	20/1	-	-	-	-	-	-	-	-	34	EXISTING SCW PUMP #4	-	#8	-	-	-	M		2.9					
35	SPARE	20/1	-	-	-	-	-	-	-	-	36	EXISTING SCW PUMP #4	-	#8	-	-	-	M		2.9					
37	SPARE	20/1	-	-	-	-	-	-	-	-	38	EXISTING SCW PUMP #5	50/3	#6	-	#10	3/4"	M	2.9						
39	SPARE	20/1	-	-	-	-	-	-	-	-	40	EXISTING SCW PUMP #5	-	#6	-	-	-	M		2.9					
41	EXISTING BAS BOILER PANEL	20/1	#12	#12	#12	1/2"	C			1	42	EXISTING SCW PUMP #5	-	#6	-	-	-	M		2.9					
PHASE LOAD TOTALS																		21.85	20.63	18.83					
LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND	LOADS (KVA)			CONNECTED	DEMAND FACTOR	DEMAND		
LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0	KITCHEN EQUIPMENT	0	1.0	0	LIGHTING	0	1.25	0	KITCHEN EQUIPMENT	0	1.0	0	KITCHEN EQUIPMENT	0	1.0	0		
REC TO 10 KVA	.18	1.0	.18	CONTINUOUS	4.9	1.25	6.13	CONTINUOUS	3	1.25	3.75	REC TO 10 KVA	.18	1.0	.18	CONTINUOUS	3	1.25	3.75	CONTINUOUS	3	1.25	3.75		
REC REMAINING	0	0.5	0	NON-CONTINUOUS	11.4	1.0	11.4	NON-CONTINUOUS	10.21	1.0	10.21	REC REMAINING	0	0.5	0	NON-CONTINUOUS	10.21	1.0	10.21	NON-CONTINUOUS	10.21	1.0	10.21		
SPACE HEATING	0	0.0	0	DEMAND	0	1.0	0	DEMAND	0	1.0	0	SPACE HEATING	0	0.0	0	DEMAND	0	1.0	0	DEMAND	0	1.0	0		
AIR CONDITIONING	0	1.0	0	TOTAL CONNECTED LOAD			61.3	KVA	170.3	AMPS	AIR CONDITIONING	0	1.0	0	TOTAL CONNECTED LOAD			42.2	KVA	117.2	AMPS	AIR CONDITIONING	0	1.0	0
NON-SEASONAL MOTORS	92.32	1.0	92.32	MIN. FEEDER / PANEL CAPACITY	116.8	KVA	324.3	AMPS	64.2	KVA	178.4	NON-SEASONAL MOTORS	47.92	1.0	47.92	MIN. FEEDER / PANEL CAPACITY	64.2	KVA	178.4	AMPS	64.2	KVA	178.4	AMPS	
LARGEST MOTOR	26.93	0.25	6.73	OVERALL DEMAND FACTOR	1.07				1.05				LARGEST MOTOR	8.71	0.25	2.18	OVERALL DEMAND FACTOR	1.05				LARGEST MOTOR	8.71	0.25	2.18
WATER HEATING	0	1.0	0												WATER HEATING	0	1.0	0				WATER HEATING	0	1.0	0

REVISED PANEL 1B																						
VOLTAGE: 208Y/120V SYSTEM: 3PH, 4W SOLID NEUTRAL: YES			MAIN: 400A MLO BUS RATING: 400A GROUND BUS: YES			INTEGRAL SPD: NO MOUNTING: SURFACE INTERRUPT RATING: 10,000 AIC																
CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	CKT	LOAD SERVED	BKR	PHASE	NEUT	GND	COND	DMD	L1	L2	L3	
1	EXISTING POOL EQUIPMENT PUMP (10HP)	50/3	#8	-	#10	3/4"	M	3.7			2	SPARE	20/3	-	-	-	-	-	-	-	-	-
3	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M		3.7		4	SPARE	-	-	-	-	-	-	-	-	-	-
5	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M			3.7	6	SPARE	-	-	-	-	-	-	-	-	-	-
7	EXISTING POOL EQUIPMENT PUMP (10HP)	50/3	#8	-	#10	3/4"	M	3.7			8	EXISTING CHEM FEED BOOSTER PUMP F	20/1	#12	#12	#12	1/2"	M	1.66			
9	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M		3.7		10	EXISTING CHEM FEED BOOSTER PUMP L	20/1	#12	#12	#12	1/2"	M		1.66		
11	EXISTING POOL EQUIPMENT PUMP (10HP)	-	#8	-	-	-	M			3.7	12	EXISTING FILTER CONTROLLER F	30/1	#10	#10	#10	3/4"	N	2.9			
13	EXISTING POOL EQUIPMENT PUMP (25HP)	100/3	#3	-	#8	1-1/4"	M	8.98		</												